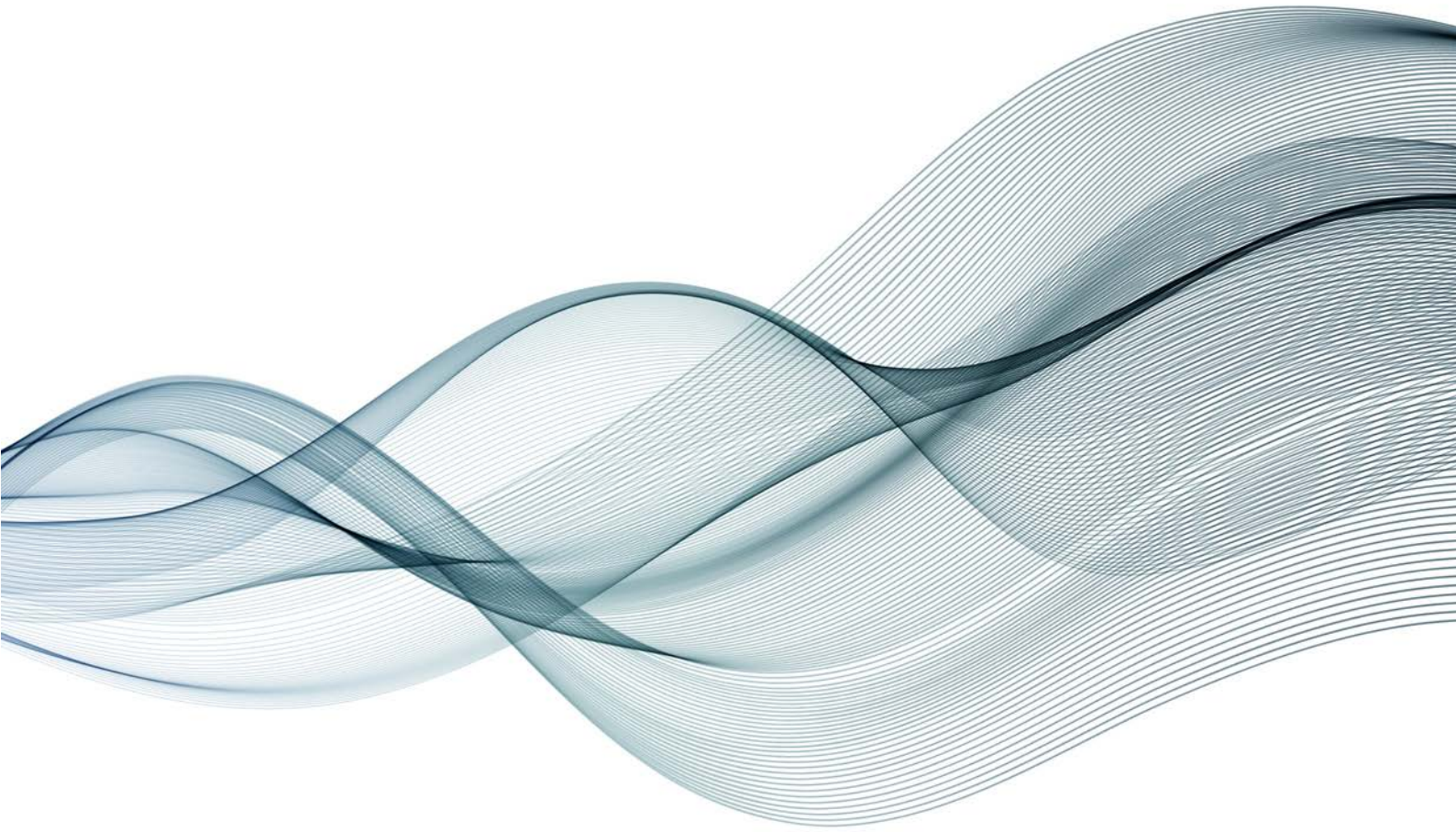

Operation and Maintenance Manual
Hy-Fex Hyperbaric Fire Extinguisher

Part Number:	SE480BA & SE481BA
Document Number:	P2141-OM-0334
Revision:	9

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APPROVAL SHEET

Document Information		
Advitium No	**Title**	**Classification**
P2141-OM-0334	Operation & Maintenance Manual for Hy-Fex Hyperbaric Fire Extinguisher, CE Marked	Commercial in confidence

Revision History					
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Responsibility	**Name**	**Position**
By	J. Cusson	Technical Author
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Approved	P. Black	Product Engineering Team Leader

Copyright Details

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Whilst every effort has been made to ensure the information within this document is correct at the time of publication, JFD Ltd reserves the right to make changes without notification. Users are recommended to visit www.jfdglobal.com for the most up-to-date versions of manuals.

Review

This document is subject to review and revision in accordance with ISO 9001.

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WARNINGS AND CAUTIONS

Warnings, Cautions and Notes where used within this manual are placed prior to the text to which they are pertinent. Their uses are as follows;

INFORMS THE READER OF AN OPERATION OR STATE WITH POTENTIAL FOR PERSONNEL INJURY.

Informs the reader of an operation or state with potential for damage to equipment.

Note ***Informs the user of additional information for clarification or to assist with an operation.***

The product range described by this document is CE marked. A certificate of conformity is available by contacting JFD Ltd.

Manufactured by:

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Westhill,
Aberdeen
United Kingdom,
AB32 6TQ

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EU Declaration of Conformity

The EU Declaration of Conformity can be found within Related Documents at:

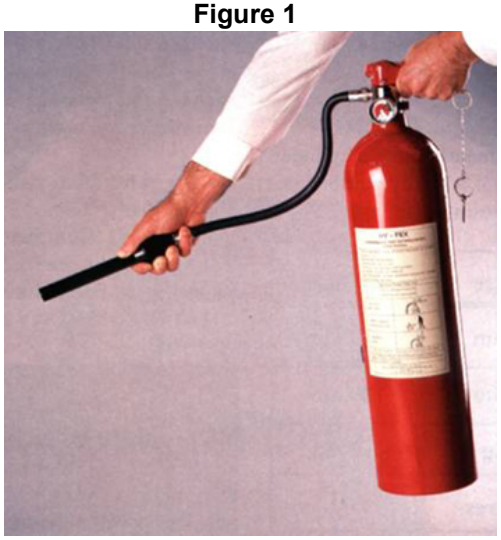
https://www.jfdglobal.com/products/
medical-and-safety-equipment/hy-fex-hyperbaric-fire-extinguisher/

or may be accessed via the link below

1 Product Information

1.1 Hy-Fex Hyperbaric Fire Extinguisher

Figure 1



- Portable
- Two standard sizes available
- Rapid deployment and instant response
- Economical

1.1.1 Hy-Fex Hyperbaric Fire Extinguishers are portable and designed for deployment within hyperbaric chambers up to the volume size stated in Section 1.3.

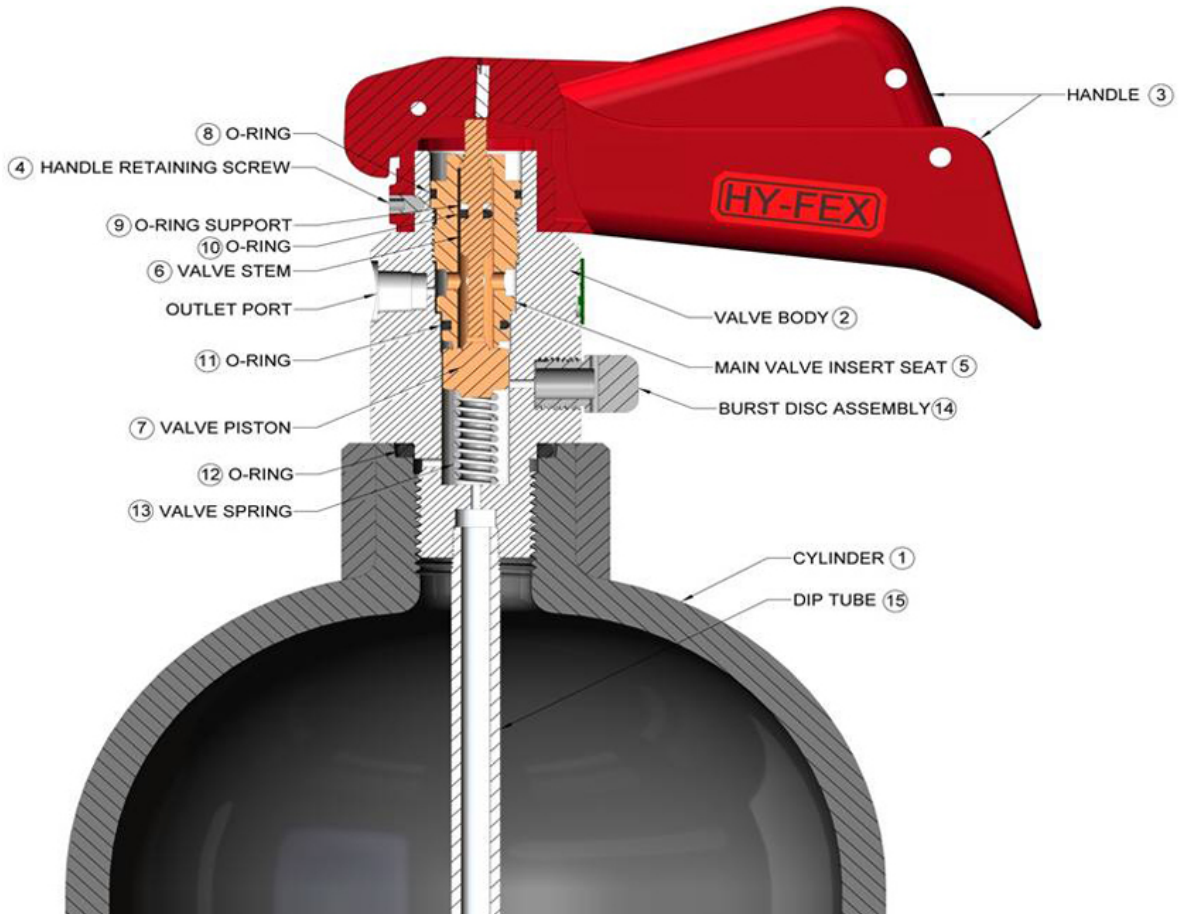
1.1.2 Available in two size options, the 3 litre Hy-Fex Extinguisher is generally suitable for air dive chambers and the entry and transfer locks of larger systems. The 6.7 litre Hy-Fex Extinguisher is suitable for main locks of large systems and large treatment chambers.

1.1.3 The Hy-Fex Extinguisher comprises an aluminium cylinder, a valve assembly including a carrying/operating handle, and a discharge hose incorporating a nozzle.

1.1.4 The Aqueous Film Forming Foam (AFFF) extinguishing agent is propelled by a gas media (air or Heliox with maximum 20% oxygen), pressurised to 133 bar, providing a discharge foam spray.

1.1.5 The control valve and handle assembly operates in a similar manner as conventional industrial extinguishers providing immediate on / off actuation control.

Figure 2



1.1.6 The discharge hose nozzle design incorporates a venturi which stimulates the extinguishing agent to mix with the water and gas charge to provide the foam discharge.

1.1.7 A contents gauge indicates the charge status.

1.1.8 Hy-Fex is suitable for multi-risk applications (fabrics, materials and liquid fires) and has been satisfactorily simulation-tested to various equivalent depths including verified (DNV) tests at surface and 120 msw and (Lloyds) tests at surface, 50 msw and at 500 msw.

1.2 Mounting Brackets

1.2.1 The Hy-Fex mounting bracket, sold separately, is available for installing the Hy-Fex to certain locations and comes equipped with a Velcro strap enabling rapid deployment of the extinguisher when required.

1.2.2 It is recommended that the Hy-Fex extinguisher is stowed using the appropriate Hy-Fex mounting bracket. See table below for details.

Figure 3 3.0 Litre Mount SE488010

Figure 4 6.7 Litre Mount SE488210

1.3 Dimensions and Performance Data

Hy-Fex Extinguisher Volume	3.0 Litre	6.7 Litre
Hy-Fex Part No	SE481BA	SE480BA
Bracket Part No	SE488010	SE488210
Refill Part No	SE4816	SE481710
Cylinder Volume	3.0 litres	6.7 litres
Gas Void Volume (25%)	0.75 litres	1.675 litres
Water (88% of combined liquid)	2 litres	4.5 litres
Foam (12% of combined liquid)	0.3 litres	0.6 litres
Extinguisher Height	540 mm	675 mm
Cylinder Diameter	117 mm	152 mm
Cylinder Centre to Handle Extremity	115 mm	
Cylinder Centre to Hose Extremity	130 mm	
Weight Charged (Approx.)	7 kg	14 kg
Foam Discharge Volume	22 litres	45 litres
Discharge Time	22 seconds	45 seconds
Discharge Distance	6 m	
Effective Discharge	99%	
Cylinder Test Pressure	310 bar	310 bar

Hy-Fex Extinguisher Volume	3.0 Litre	6.7 Litre
Extinguisher Working Pressure	Extinguisher Working Pressure 133 bar	
Temperature Rating	-15 to +55°C	
Maximum Operating Depth	450 msw	
Recommended Chamber Volume per Extinguisher	$6m^3$	$14m^3$

2 Principle of Operation

2.1 Introduction

2.1.1 The Hy-Fex Hyperbaric Fire Extinguisher comprises;

- Aluminium Cylinder
- Trigger Valve Assembly including pressure gauge and burst disc
- Outlet Hose & Nozzle
- Consumables
  - Foam concentrate
  - Water
  - Gas propellant

2.1.2 The fire extinguishing medium is an aqueous film forming foam (AFFF) concentrate mixed with water which is released as the discharge via propulsion of the pressurised air or heliox gas charge.

2.1.3 The volume of the foam/water mixture is 75% of the cylinder volume, the remainder being the pressurised gas charge.

2.1.4 The maximum working internal pressure of the extinguisher is 133 bar due to the gas charge limit. Externally, verified testing has been concluded to an equivalent depth of 450 msw.

2.1.5 The Hy-Fex fire extinguisher is ideally suited for hyperbaric environments due to;

- Propellant operating pressure substantially higher than conventional fire extinguishers, with a charge pressure differential of up to 88 bar for a potential operating depth of 450 msw, thus providing the energy potential to propel the extinguishing agent within a hyperbaric environment.
- An operating temperature range from -15°C to +55°C. Ambient temperatures below freezing may reduce foam expansion from the published >= 7:1 ratio to a lesser value.
- An optimised flow restrictor incorporated into the trigger valve assembly ensures a relatively constant discharge rate at all depths.
- A consistent foam texture at all depths improves extinguishing effectivity. At shallower depths higher pressure differentials between the propellant and ambient pressure, with the aid of the venturi nozzle, ensures a consistent foam texture is maintained.
- Suitable for fabrics, combustible solids, flammable liquids and electrical fires up to 24 Volt.

2.2 Servicing and Recharging Instructions

WARNING

USERS SHOULD ENSURE THAT THE CHARGING FACILITY HAS AN APPROPRIATE PRESSURE LIMITING OR WARNING DEVICE TO AVOID OVER-PRESSURISING THE EXTINGUISHER.

2.2.1 Ensure extinguisher is empty. Refer to 2.3 Service Discharge Guidance Notes for discharging prior to servicing or recharging.

2.2.2 Place safety pin in valve 'open' position

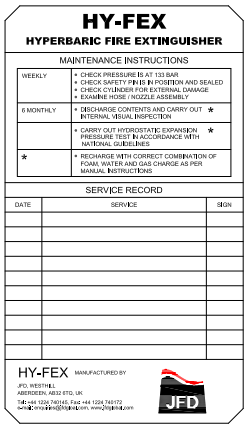
2.2.3 Remove nozzle by turning anti-clockwise.

Figure 5

Figure 6

2.2.4 Grip the cylinder and remove valve assembly by turning it anti-clockwise using tool SE4899 (not supplied with product - order separately).

Figure 7



2.2.5 Perform scheduled maintenance as stated on maintenance instruction label.

2.2.6 Check cylinder test date. If test is due, return to JFD for recertification.

Figure 8

2.2.7 Visually inspect cylinder internally, externally, including the cylinder and valve thread and O-ring sealing areas.

Figure 9

2.2.8 Unscrew three retaining screws until handle is loose, remove from valve body by pulling axially.

Figure 10

2.2.9 Using a 12 mm socket, remove the valve insert assembly. If burst disc is ruptured remove with a 5/8” A/F socket.

Figure 11

2.2.10 Inspect valve insert assembly components for wear or damage and replace as required. Clean, lubricate with DC4 Silicone Compound Grease and reassemble in reverse order. Ensure valve piston seal is facing upwards.

Figure 12

2.2.11 To re-fill the extinguisher pour contents of refill bottle into extinguisher and add correct volume of de-ionised water using either the refill bottle or a funnel & measuring jug.

2.2.12 Refer to Dimensions and Performance Data table (Section 1.3) for filling ratios.

Figure 13

2.2.13 Ensure that a serviceable O-ring is fitted before fitting the valve assembly into the cylinder. Torque valve assembly to 50 lbf/ft (67.8 Nm).

2.2.14 A 1/2” square drive adaptor is available from Divex, Part No. SE4899.

2.2.15 Invert the extinguisher repeatedly to ensure a good mixture.

Figure 14

2.2.16 Fit the 1/4” BSP charging fitting into the end of the outlet hose (supplied with SE4800101 charging whip - not supplied with product).

Figure 15

Figure 16

2.2.17 Connect charging whip SE4800101 (not supplied with product - order separately) to the charging fitting.

Figure 17

2.2.18 Lock extinguisher valve in ‘open’ position using the safety pin then charge to 133 bar. DO NOT OVERCHARGE. Once fully charged, fit safety pin to valve in ‘closed’ position.

Figure 18

2.2.19 Fit frangible wire into safety pin and seal with crimp. Add a new entry to the service label with service date and signature.

Figure 19

2.2.20 If a replacement label is required please return to JFD for a new label to be applied.

2.2.21 Replace the nozzle and stow in the Hy-Fex bracket ready for use.

2.3 Service Discharge Guidance Notes

2.3.1 Refer to Appendix A - Tridol MSDS.

2.3.2 Wear appropriate PPE such as gloves and full face protection.

2.3.3 Conduct a risk assessment prior to discharge operation, including the discharged extinguishant containment equipment.

2.3.4 Restrict access to work area and inform personnel.

2.3.5 Allow for expansion volume of discharged foam.

Note ***For guidance, an expansion value of 10:1 should be used on discharge due to the various conditions that influence the expansion.***

2.3.6 Capture and dispose of foam in accordance with local and national statutory regulations. Refer to MSDS for additional information.

2.3.7 Discharge the extinguisher into the containment equipment.

2.3.8 Once extinguisher is fully discharged dispose of the extinguishant in accordance with local regulations.

2.3.9 Allow 60 seconds of continuous activation to completely discharge a fully charged 6.7 litre extinguisher. Allow extra time if discharge is intermittent or interrupted.

2.4 Operating

Type:	Aqueous Film Forming Foam
Fire Class:	A + B
Fire Rating:	Refer to markings
Temp Rating:	-15°C to 55°C
Toxicity	Refer to Appendix A - Tridol MSDS
Cylinder Volume:	Refer to stamped data on cylinder
Test Pressure:	Refer to stamped data on cylinder
Working Pressure:	133 bar
Depth Rating:	450 msw

2.5 Instructions for Use

2.5.1 Use in upright position (controlled discharge).

1 Remove nozzle from velcro strap. Ensure discharge direction is opposite to user.

2 Pull out safety pin.

Figure 20

Figure 21

For fabrics combustible solids and electrical fires:

3 Direct nozzle at base of fire.

Figure 22

For flammable liquids fires:

4 Direct nozzle at a vertical surface adjacent the fire.
The foam formed will flow down the surface then onto the surface of the liquid.

Figure 23

5 Squeeze lever.

2.5.2 Suitable for use on fabrics, combustible solids, flammable liquids and electrical fires up to 24 Volt. Discharge range up to 6 metres.

3 Test Summary

3.1 Hy-Fex Valve body

3.1.1 The design of the valve body has been validated by hydrostatic over pressure testing to 522.5 bar in accordance with EN 12516-3.

3.1.2 All valve bodies are hydrostatically proof tested to 272 bar during manufacture and are further tested to 190 bar following installation of the burst disc to ensure they withstand the burst disc rated pressure.

3.2 Hy-Fex Hose Assembly

3.2.1 All hose assemblies are hydrostatically tested to 200 bar.

3.3 Hy-Fex Cylinder

3.3.1 Cylinders have a maximum working pressure of 206 bar and are hydrostatically tested to 310 bar. Refer to stamped data on cylinder.

3.4 Pressure Gauge

3.4.1 Hy-Fex pressure gauges are calibrated and tested for use at up to 160 bar.

4 Spare Parts

Figure 24 Exploded View 3.0 Litre (SE481BA) & 6.7 Litre (SE480BA) Models

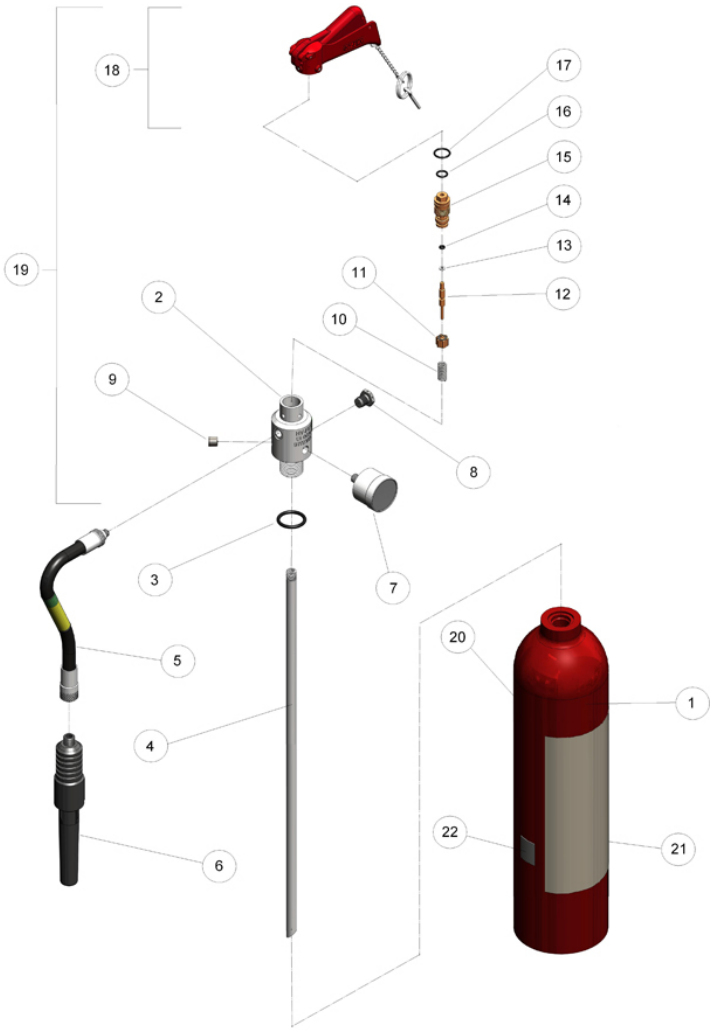


Table 1 Spare Parts

	Description	Order Code
1	Cylinder	Contact JFD
2	Valve Body, CE	Contact JFD
3	'O' Ring Seal *+	SE4826
4	Dip Tube (3l/6.7l)	SE486010/ 486210
5	Outlet Hose	SE4837/39
6	Nozzle	SE4815
7	Gauge, 0-160 bar	SE480610
8	Bust Disc Valve	SE4800339
9	Plug	FP198
10	Spring, Piston +	SE4827
11	Valve Piston *+	SE4802
12	Valve Stem +	SE4802
13	'O' Ring Seal *+	SE4801
14	'O' Ring Support *+	SE4801
15	'O' Ring Seal *+	SE4801
16	Valve Seat Insert +	SE4802
17	'O' Ring Seal *+	SE4801
18	Handle Assembly	Contact JFD
19	Handle & Valve Assy	Contact JFD
20	Service Label	SE4800325
21	Instruction Label	Contact JFD
22	Velcro Pad	SE4800336
23	Seal security	SE4829
	* Soft Seal Kit + Hard & Soft Seal Kit Foam Refill 3.0 Litre Foam Refill 6.7 Litre Bracket, 6.7 Litre Bracket, 3 Litre	SE4801 SE4802 (inc SE1801) SE4816 SE481710 SE488210 SE488010
Tools (not shown)		
	1/2" Drive Hy-Fex Valve Adaptor	SE4899

5 Maintenance Instructions

5.1 Periodic Inspection

Weekly	Check pressure is at 133 bar.
	Check safety pin is in position and sealed.
	Check cylinder for external damage.
	Examine hose / nozzle assembly.
Six Monthly	Discharge contents and carry out internal visual inspection.*
Five Yearly	Perform hydrostatic expansion test in accordance with BS EN 1802:2002, or IMCA D018, or in accordance with an equivalent recognised standard.*

5.1.1 *Recharge with correct combination of foam, water and air or heliox as per maintenance instructions.

5.2 Cylinder Inspection

5.2.1 Cylinders must be visually inspected internally every 6 months by a competent person.

Note ***Competent person is as defined by IMCA D018.***

5.2.2 Discharge the extinguisher and remove the valve to allow internal inspection of the cylinder.

5.2.3 EN 1802 'Periodic inspection and testing of seamless aluminium alloy gas cylinders' provides the following guidance on cylinder inspection:

5.2.4 Inspect each cylinder internally using illumination to identify any defects such as dents, cuts, cracks, lamination or corrosion (See EN 1802 6.2a & 6.2c). Ensure the method of illumination presents no hazard to the tester. Remove any internal liner or coating that obstructs visual inspection (Note: Cylinders used within the JFD Hy-Fex assembly are not normally lined or coated).

5.2.5 Any cylinder showing presence of foreign matter or signs of more than light surface corrosion should be cleaned internally under closely controlled conditions by shot blasting, water jet abrasive cleaning, flailing, steam jet, hot water jet, rumbling chemical cleaning or other suitable method. Refer to EN 1802 annex E for further information on cleaning methods which must be compatible with the cylinder material.

5.2.6 If cleaning is required the cylinder should be re-inspected after the cleaning operation.

5.2.7 Where there is doubt concerning the type and/or severity of a defect found during visual inspection additional tests or methods should be conducted such as ultrasonic techniques, weighing check or other non-destructive tests. Only when all doubts are eliminated may the cylinder be further processed (Refer to Annex C of EN 1802 for detailed guidance on defect evaluation)

5.3 Hydrostatic Expansion Test

5.3.1 A hydrostatic expansion test shall be conducted at a period specified by national regulations and in accordance with those regulations by a competent body. Where no national regulations exist attention is drawn to IMCA document D018.

5.4 Misuse and Mishandling

5.4.1 The fire extinguisher and cylinder must never be misused and / or mishandled. Misuse or mishandling may result in injury or death and damage to property. Always stow, store, charge, operate, maintain, inspect and test in accordance with this manual.

5.4.2 Hy-Fex Hyperbaric Fire Extinguishers are approved in accordance with CE regulations. To maintain CE compliance only use JFD supplied spares and re-fill solutions.

5.5 Care and Maintenance

5.5.1 Suitable care and maintenance by competent personnel will reflect upon the service life of Hy-Fex Fire Extinguishers.

5.5.2 Hy-Fex Fire Extinguishers are designed for emergency use and should be handled with care, and stowed using the appropriate mounting bracket (see Section 1.3).

5.5.3 Damage to the protective coating of the cylinder must be repaired at the earliest opportunity by cleaning and re-painting the affected area with a red (RAL 3000) epoxy paint (EE 3000 90G TR LF).

5.5.4 If any part of the fire extinguisher has been exposed to seawater, or other corrosive fluids, rinse the fire extinguisher with fresh, clean potable water and dry thoroughly.

6 Service Record

Cylinder Serial Number ....

Date	Service	Sign

Date	Service	Sign

Date	Service	Sign

Date	Service	Sign

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APPENDIX A TRIDOL MSDS

ANGUS FIRE

Tridol^{C6} S6

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Date of issue: 05/11/2014 Revision date: 22/08/2017 Supersedes: 08/05/2017 Version: 1.2

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

1.1. Product identifier

Product form : Mixture

Product name : Tridol^{C6} S6

Product code : FNC 03 06

Type of product : Firefighting foam concentrate (AFFF)

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

1.2.1. Relevant identified uses

Industrial/Professional use spec : Industrial
For professional use only

Use of the substance/mixture : Firefighting foam concentrate

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

ANGUS FIRE Ltd
Station Road
Bentham LA2 7NA - United Kingdom
T +44 1524 264000 - F +441524 264180
general.enquiries@angusuk.co.uk - www.angusfire.co.uk

1.4. Emergency telephone number

Emergency number : T +44(0) 1524 264000 (Standard office hours: Monday to Friday 8:30am 4:30pm GMT)
Contact person: EH&S Manager

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Not classified

Adverse physicochemical, human health and environmental effects

The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.

2.2. Label elements

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

EUH-statements : EUH210 - Safety data sheet available on request

2.3. Other hazards

PBT: not relevant no registration required

vPvB: not relevant no registration required

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
2-(2-Butoxyethoxy)ethanol	(CAS-No.) 112-34-5 (EC-No.) 203-961-6 (EC Index-No.) 603-096-00-8 (REACH-no) 01-2119475104-44	4 - 10	Eye Irrit. 2, H319

Full text of H-statements: see section 16

Tridol^{C6} S6

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Assure fresh air breathing. Allow the victim to rest.

First-aid measures after skin contact : Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.

First-aid measures after eye contact : Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persists.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : No specific measures are necessary. This product is a fire extinguishing medium.

Unsuitable extinguishing media : Not applicable.

5.2. Special hazards arising from the substance or mixture

Fire hazard : No fire hazard.

5.3. Advice for firefighters

Firefighting instructions : Not applicable.

Protection during firefighting : Not applicable.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.4. Reference to other sections

8. Exposure controls/personal protection. 13. Disposal considerations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Avoid contact with skin and eyes. Wear recommended personal protective equipment. Read and follow manufacturer's recommendations. Handle in accordance with good industrial hygiene and safety procedures.

Hygiene measures : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in original container. Keep container tightly closed. Store at temperatures not exceeding 60°C (140°F) (intermittent). Protect from freezing. Keep/Store away from incompatible materials.

7.3. Specific end use(s)

Firefighting foam concentrate.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

2-(2-Butoxyethoxy)ethanol (112-34-5)		
EU	Local name	2-(2-Butoxyethoxy)ethanol

2-(2-Butoxyethoxy)ethanol (112-34-5)		
EU	IOELV TWA (mg/m³)	67.5 mg/m³
EU	IOELV TWA (ppm)	10 ppm
EU	IOELV STEL (mg/m³)	101.2 mg/m³
EU	IOELV STEL (ppm)	15 ppm
Belgium	Limit value (mg/m³)	67.5 mg/m³ (2-(2-Butoxyéthoxy)éthanol; Belgium; Time-weighted average exposure limit 8 h)
Belgium	Limit value (ppm)	10 ppm (2-(2-Butoxyéthoxy)éthanol; Belgium; Time-weighted average exposure limit 8 h)
Belgium	Short time value (mg/m³)	101.2 mg/m³ (2-(2-Butoxyéthoxy)éthanol; Belgium; Short time value)
Belgium	Short time value (ppm)	15 ppm (2-(2-Butoxyéthoxy)éthanol; Belgium; Short time value)
France	Local name	2-(2-butoxyéthoxy)éthanol
France	VME (mg/m³)	67.5 mg/m³
France	VME (ppm)	10 ppm
France	VLE (mg/m³)	101.2 mg/m³
France	VLE (ppm)	15 ppm
France	Note (FR)	Valeurs règlementaires indicatives
Netherlands	Grenswaarde TGG 8H (mg/m³)	50 mg/m³ (2-(2-butoxyethoxy)ethanol; Netherlands; Time-weighted average exposure limit 8 h; Public occupational exposure limit value)
Netherlands	Grenswaarde TGG 8H (ppm)	7.4 ppm (2-(2-butoxyethoxy)ethanol; Netherlands; Time-weighted average exposure limit 8 h; Public occupational exposure limit value)
Netherlands	Grenswaarde TGG 15MIN (mg/m³)	100 mg/m³ (2-(2-butoxyethoxy)ethanol; Netherlands; Short time value; Public occupational exposure limit value)
Netherlands	Grenswaarde TGG 15MIN (ppm)	15 ppm (2-(2-butoxyethoxy)ethanol; Netherlands; Short time value; Public occupational exposure limit value)
United Kingdom	WEL TWA (mg/m³)	67.5 mg/m³ 2-(2-Butoxyethoxy)ethanol; United Kingdom; Time-weighted average exposure limit 8 h; Workplace exposure limit (EH40/2005)
United Kingdom	WEL TWA (ppm)	10 ppm 2-(2-Butoxyethoxy)ethanol; United Kingdom; Time-weighted average exposure limit 8 h; Workplace exposure limit (EH40/2005)
United Kingdom	WEL STEL (mg/m³)	101.2 mg/m³ 2-(2-Butoxyethoxy)ethanol; United Kingdom; Short time value; Workplace exposure limit (EH40/2005)
United Kingdom	WEL STEL (ppm)	15 ppm 2-(2-Butoxyethoxy)ethanol; United Kingdom; Short time value; Workplace exposure limit (EH40/2005)
USA - ACGIH	ACGIH TWA (ppm)	10 ppm (Diethylene glycol monobutyl ether; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value; Inhalable fraction and vapor)

8.2. Exposure controls

Appropriate engineering controls:

Ensure adequate ventilation. Follow the exposure limits given on this material safety data sheet.

Personal protective equipment:

Wear recommended personal protective equipment.

Hand protection:

Wear protective gloves (butyl rubber)

Eye protection:

Chemical goggles or safety glasses

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

In case of insufficient ventilation, wear suitable respiratory equipment (A2/P2).

Thermal hazard protection:

Wear thermal protective clothing, when necessary.

Environmental exposure controls:

Contain spills. Prevent releases. Observe national regulations on emissions. Ensure all national/local regulations are observed.

Other information:

Do not eat, drink or smoke when using this product.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Colour	:	Amber.
Odour	:	Characteristic.
Odour threshold	:	No data available
pH	:	6.6 - 7.6
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	No data available
Freezing point	:	-1 °C
Boiling point	:	No data available
Flash point	:	> 100 °C
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Density	:	0.99 - 1.03
Solubility	:	No data available
Log Pow	:	No data available
Viscosity, kinematic	:	2 mm²/s
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidising properties	:	No data available
Explosive limits	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

The product is stable and non reactive under normal conditions of use, storage and transport.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

Incompatible materials. Extremely high or low temperatures.

10.5. Incompatible materials

Alkali metals. Oxidizing agent. Water reactive substances.

10.6. Hazardous decomposition products

Carbon oxides. Sulphur oxides. Hydrogen fluoride. Nitrogen oxides (NOx). Sodium oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Not classified

2-(2-Butoxyethoxy)ethanol (112-34-5)	
LD50 oral rat	5660 mg/kg (Rat)
LD50 dermal rabbit	2764 mg/kg (Rabbit; Experimental value; OECD 402 : acute dermal toxicity)

Skin corrosion/irritation : Not classified
pH: 6.6 - 7.6
Additional information : Based on available data, the classification criteria are not met
Serious eye damage/irritation : Not classified
pH: 6.6 - 7.6
Additional information : Based on available data, the classification criteria are not met
Respiratory or skin sensitisation : Not classified
Additional information : Based on available data, the classification criteria are not met
Germ cell mutagenicity : Not classified
Based on available data, the classification criteria are not met
Carcinogenicity : Not classified
Additional information : Based on available data, the classification criteria are not met
Reproductive toxicity : Not classified
Additional information : Based on available data, the classification criteria are not met
STOT-single exposure : Not classified
Additional information : Based on available data, the classification criteria are not met
STOT-repeated exposure : Not classified
Additional information : Based on available data, the classification criteria are not met
Aspiration hazard : Not classified
Additional information : Based on available data, the classification criteria are not met

Tridol^{C6} S6	
Viscosity, kinematic	2 mm²/s

Potential adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

12.1. Toxicity

2-(2-Butoxyethoxy)ethanol (112-34-5)	
LC50 fish 1	1300 mg/l (96 h; Lepomis macrochirus)
LC50 fish 2	1805 mg/l (48 h; Leuciscus idus)
LC50 other aquatic organisms 1	10 - 100 mg/l (96 h)
EC50 Daphnia 1	2850 mg/l (24 h; Daphnia magna; GLP)
EC50 Daphnia 2	> 100 mg/l (48 h; Daphnia magna)
TLM fish 1	10 - 100,96 h; Pisces
TLM other aquatic organisms 1	10 - 100,96 h
Threshold limit other aquatic organisms 1	10 - 100,96 h
Threshold limit algae 1	53 mg/l (192 h; Microcystis aeruginosa)
Threshold limit algae 2	>= 100 mg/l (96 h; Scenedesmus subspicatus)

12.2. Persistence and degradability

Tridol^{C6} S6	
Persistence and degradability	The product is readily biodegradable.

2-(2-Butoxyethoxy)ethanol (112-34-5)	
Persistence and degradability	Readily biodegradable in water.
Biochemical oxygen demand (BOD)	0.25 g O_2/g substance
Chemical oxygen demand (COD)	2.08 g O_2/g substance
ThOD	2.173 g O_2/g substance
BOD (% of ThOD)	0.11

12.3. Bioaccumulative potential

Tridol^{C6} S6	
Bioaccumulative potential	The product is not expected to bioaccumulate.

2-(2-Butoxyethoxy)ethanol (112-34-5)	
BCF fish 1	0.46 (QSAR)
Log Pow	0.56 (Experimental value)
Bioaccumulative potential	Low bioaccumulation potential.

12.4. Mobility in soil

2-(2-Butoxyethoxy)ethanol (112-34-5)	
Surface tension	0.034 N/m (25 °C)

12.5. Results of PBT and vPvB assessment

Tridol^{C6} S6
PBT: not relevant no registration required
vPvB: not relevant no registration required

12.6. Other adverse effects

Other adverse effects : An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product/Packaging disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.
Ecology - waste materials : Avoid release to the environment.
European List of Waste (LoW) code : 16 03 05* - organic wastes containing dangerous substances

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

14.1. UN number

UN-No. (ADR) : Not applicable
UN-No. (IMDG) : Not applicable
UN-No. (IATA) : Not applicable
UN-No. (ADN) : Not applicable
UN-No. (RID) : Not applicable

14.2. UN proper shipping name

Proper Shipping Name (ADR) : Not applicable
Proper Shipping Name (IMDG) : Not applicable
Proper Shipping Name (IATA) : Not applicable
Proper Shipping Name (ADN) : Not applicable
Proper Shipping Name (RID) : Not applicable

14.3. Transport hazard class(es)

ADR

Transport hazard class(es) (ADR) : Not applicable

IMDG

Transport hazard class(es) (IMDG) : Not applicable

IATA

Transport hazard class(es) (IATA) : Not applicable

ADN

Transport hazard class(es) (ADN) : Not applicable

RID

Transport hazard class(es) (RID) : Not applicable

14.4. Packing group

Packing group (ADR) : Not applicable
Packing group (IMDG) : Not applicable
Packing group (IATA) : Not applicable
Packing group (ADN) : Not applicable

Packing group (RID) : Not applicable

14.5. Environmental hazards

Dangerous for the environment : No
Marine pollutant : No
Other information : No supplementary information available

14.6. Special precautions for user

- Overland transport

No data available

- Transport by sea

No data available

- Air transport

No data available

- Inland waterway transport

No data available

- Rail transport

No data available

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

The following restrictions are applicable according to Annex XVII of the REACH Regulation (EC) No 1907/2006:	
3. Liquid substances or mixtures which are regarded as dangerous in accordance with Directive 1999/45/EC or are fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008	2-(2-Butoxyethoxy)ethanol
3(b) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 3.1 to 3.6, 3.7 adverse effects on sexual function and fertility or on development, 3.8 effects other than narcotic effects, 3.9 and 3.10	2-(2-Butoxyethoxy)ethanol
55. 2-(2-butoxyethoxy)ethanol (DEGBE)	2-(2-Butoxyethoxy)ethanol

Contains no substance on the REACH candidate list

Contains no REACH Annex XIV substances

15.1.2. National regulations

Germany

VwVwS Annex reference : Water hazard class (WGK) 3, severe hazard to waters (Classification according to VwVwS, Annex 4)

12th Ordinance Implementing the Federal Immission Control Act - 12.BImSchV : Is not subject of the 12. BImSchV (Hazardous Incident Ordinance)

Netherlands

SZW-lijst van kankerverwekkende stoffen : None of the components are listed
SZW-lijst van mutagene stoffen : None of the components are listed
NIET-limitatieve lijst van voor de voortplanting giftige stoffen Borstvoeding : None of the components are listed
NIET-limitatieve lijst van voor de voortplanting giftige stoffen Vruchtbaarheid : None of the components are listed
NIET-limitatieve lijst van voor de voortplanting giftige stoffen Ontwikkeling : None of the components are listed

Denmark

Recommendations Danish Regulation : Pregnant/breastfeeding women working with the product must not be in direct contact with the product

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

Tridol^{C6} S6

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

SECTION 16: Other information

Data sources : REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Other information : None.

Full text of H- and EUH-statements:	
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
H319	Causes serious eye irritation
EUH210	Safety data sheet available on request

SDS EU (REACH Annex II) - Angus Fire

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product