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Safety Instructions

v2.4_En

Automatic Miniature Fire Extinguisher – AMFE™ Series

Content

1. Manufacturer Part Numbers

The list below specifies the part numbers of the manufacturer for the AMFE product series line and accessories:

Part number:	Product Name:
AMFE	
10899	AMFE SR3 68°C
10900	AMFE SR3 79°C
10901	AMFE SR3 93°C
11135	AMFE SR3 141°C
11128	AMFE SR3 182°C
S-AMFE	
11043	S-AMFE SR3 68°C
11044	S-AMFE SR3 79°C
11045	S-AMFE SR3 93°C
11264	S-AMFE SR3 141°C
R-AMFE	
11198	R-AMFE SR3 68°C
11199	R-AMFE SR3 79°C
11200	R-AMFE SR3 93°C
11263	R-AMFE SR3 141°C
NOVEC* Cylinder	
11100	Cylinder with NOVEC 24ml Size 0
11101	Cylinder with NOVEC 72ml Size 1
11102	Cylinder with NOVEC 120ml Size 2
11103	Cylinder with NOVEC 241ml Size 3
11104	Cylinder with NOVEC 360ml Size 4
11105	Cylinder with NOVEC 603ml Size 5
Accessories	
11025	AMFE mounting bracket set for size 0
11026	AMFE mounting bracket set for size 1
11027	AMFE mounting bracket set for size 2
11028	AMFE mounting bracket set for size 3&4
11029	AMFE mounting bracket set for size 5
11189	AMFE cabinet-top mounting bracket size 0-2
11190	AMFE cabinet-top mounting bracket size 3-5

*NOVEC™ is a registered trademark by 3M™. For better readability only “NOVEC” is being used when referencing to 3M™ NOVEC™ engineered fluid in this document.

2. General Safety Instructions

The AMFE is an industrial product which must be handled with care and following the instructions as lined out in this manual.
BEFORE handling products of the AMFE line, these instructions and safety guidelines have to be read and understood by all people handling and/or working with these products.

Assembly, installation, service and maintenance shall only be carried out by technically knowledgeable personnel.

Always handle the AMFE and cylinders with care!

Do not drop it!

Wear safety glasses when handling and/or installing the AMFE!

This instruction contains no information about general or special knowledge of fire extinguishing systems.

In addition to following the instructions of this manual, all locally applicable safety regulations have to be obeyed. The manufacturer cannot be held responsible for damages resulting from failure to use the AMFE products as intended.

Cylinders releasing the (pressurized) extinguishing agent are getting cold due to the sudden change of pressure at activation. Wait a suitable time after activation (> 5 min) before touching the cylinder and the AMFE or use protective gloves.

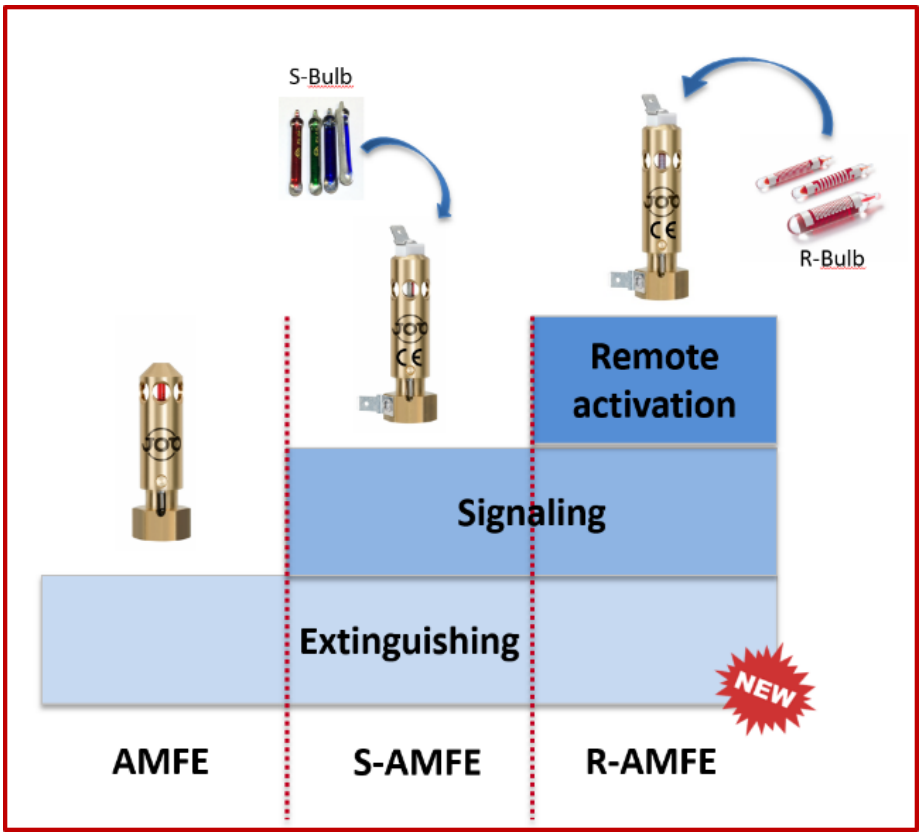
Never try to unscrew the cylinder adapter with the rupture disc sealing from the pressurized red extinguishing agent cylinder!

3. Product Description

The AMFE line is an automatic stand-alone fire extinguisher to be used in small enclosures or cabinets typically not fully accessible by humans (no rooms, walk-in machine cabinets or other open spaces).

AMFE (short for Automatic Miniature Fire Extinguisher) is an independent, thermally initiating, stand-alone fire extinguishing device.
The integrated certified and listed sprinkler bulb (made by JOB) bursts when a defined operating temperature is exceeded, thus activating a spring mechanism which opens the attached cylinder containing an extinguishing agent. The extinguishing agent is then released.
The connected cylinder with the extinguishing agent is permanently factory-sealed (even after assembly with the AMFE head) until the AMFE opens it, in case of an over-temperature situation.

The series currently comprises three product variants, the AMFE, S-AMFE, R-AMFE:



3.1. AMFE

This is the basic version. Easy retrofitting into existing installations provides AMFE instant fire protection. The activation temperature can be customized but typical standard temperatures are:

- 68°C / 155°F (red)
- 79°C / 175°F (yellow)
- 93°C / 200°F (green)
- 141°C / 286°F (blue)
- 182°C/ 360°F (lilac)

Other temperatures are available upon request.

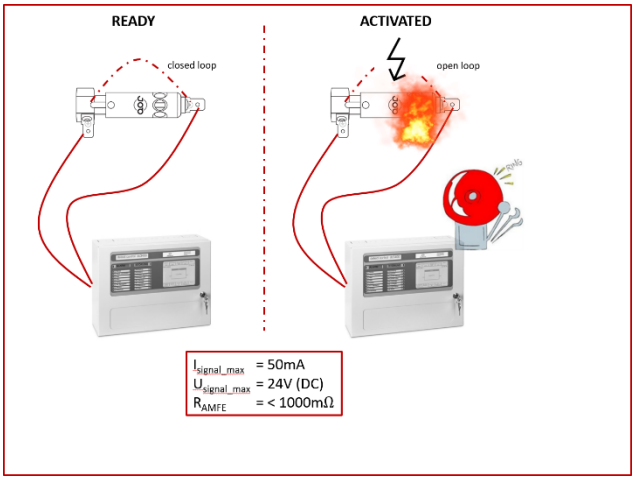
3.2. S-AMFE

S-AMFE is an extended version which besides of the basic functionality of the AMFE additionally has two electric contacts and can transmit an electric signal current for monitoring its status (not-activated/activated).

The connections are:

- Blade terminals, 6.3mm x 0,3mm (industry standard).

The installed JOB thermo-bulb is electrically coated and conducts low-power signal-currents over the insulated glass bulb. In case of activation, the bulb bursts thus permanently interrupting the electric connection. The S-AMFE electrically works as a normally closed “failsafe” breaker.



Picture 1: principle of the S-AMFE functionality

The technical data of the electric properties of the S-AMFE are

- Normally closed contact
- I_{max} = 50mA
- U = 0..24V (DC)
- transition resistance R_t < 1000mΩ

Wiring of the S-AMFE must not have any drag on the blade terminal connections.

3.3. R-AMFE

R-AMFE is a version that can be externally triggered by an electric activation signal. In addition to the standard activation by heat this R-AMFE can be connected to any external device which supplies an electric current when activation is intended. The purpose for this is to allow the extinguishing process to be initiated independently from the heat having reached the designated activation temperature of the thermo-bulb, e.g. by a smoke detector, a manual switch-button or automatically controlled by a PLC/logic controller. At any time, however, also the R-AMFE will reliably activate by temperature which

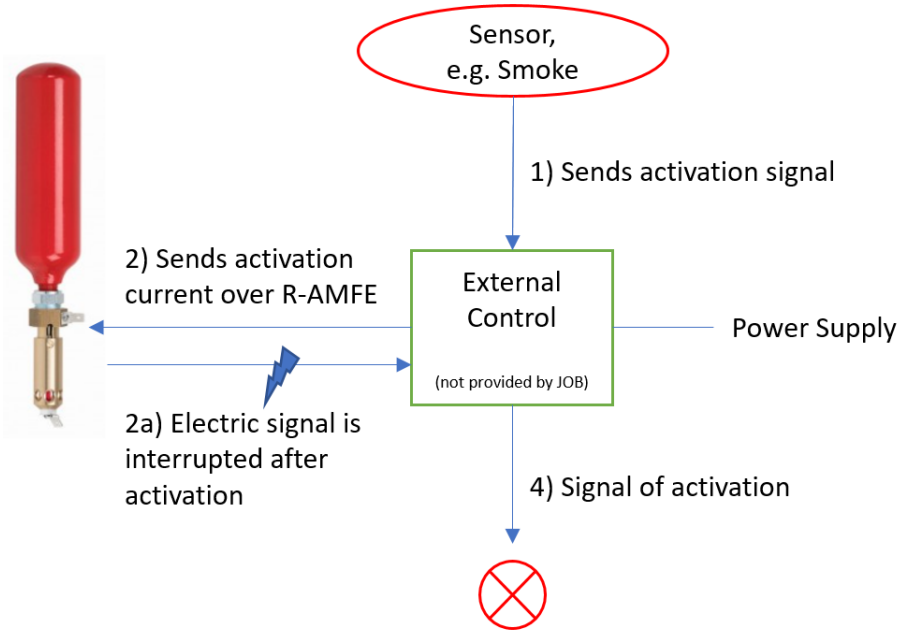
means redundant operation, should the external electric activation fail.

The connections are:

- Blade terminals, 6.3mm x 0,3mm (industry standard).

The installed JOB thermo-bulb features a heating coil which can conduct low-power signal currents, but will overheat the thermo-bulb intentionally when the activation current is applied. In case of activation and starting the suppression the bulb bursts, permanently interrupting the electric connection, which can be used to “monitor” the activation.

Typical (simple) operation example*:



Picture 2: general principle of how to use the R-AMFE functionality

*for additional connection examples please contact your JOB AMFE partner or the manufacturer (with your application details).

The technical data of the electric properties of the R-AMFE are

- Normally closed contact
- I_{signal_max} = 10mA
- U_{signal} = 0…24V (DV)
- $I_{activation}$ = 1.000mA
- $t_{activation}$ = < 5 sec @ $I_{activation}$ = 1.000mA, $U_{activation}$ = 12V, T ~ 20°C/
- $U_{activation}$ = 9..24V (DC)
- R_t = ~ 10 Ω

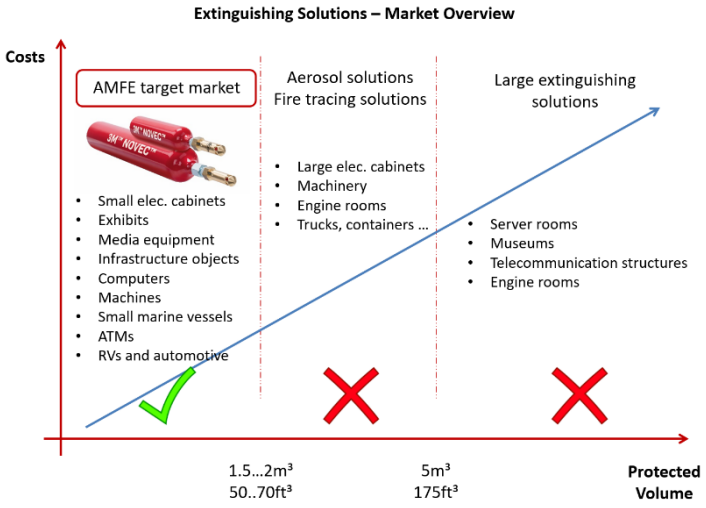
Wiring of the R-AMFE must not have any drag on the blade terminal connections.

4. Intended Use

JOB's AMFE product line is an innovative product for stand-alone device-integrated fire protection. AMFE is used to protect small enclosed volumes which are not accessible for members of the public or other, also professional personnel during normal operation.

Existing solutions for integrated fire protection typically cover larger volumes and are not economic if applied to small device or enclosures.

Small machines, enclosures in both, commercial and residential environments are typically not actively protected but only passively monitored (e.g. by some alarms or temperature sensors) lacking the extinguishing capabilities in case of fires.



Picture 3: Extinguishing Solution - Market Overview

Typical applications are, but not limited to:

- Vending machines (e.g. in halls and evacuation paths)
- Production equipment (e.g. small machines)
- Conduit boxes/power distribution panels
- Industrial appliances
- Leisure marine vessels (e.g. engine compartment, fuse and connection boxes)
- Computer racks
- Valuable exhibits (e.g. at museums or personal)
- Deposit and Mailboxes at commercial buildings (e.g. in banks against vandalism)
- Military, aerospace and telecommunication applications

AMFE must not be used to protect entire rooms. AMFE shall be used to protect small enclosed equipment, cabinets, and applications of any kind.

The S-AMFE / R-AMFE will be used in according to regulations with voltages lower than 60V DC (U_{signal_max} = 24V DC).
Therefore, in regard to product safety guideline 2001/95/EG a protection against human contact is not mandatory.
Is the signaling voltage connected to the S-AMFE/R-AMFE generated by a transformer, the transformer must be designed based on EN 61558-2-6 (e.g. power transformer safety class III).

5. Extinguishing Agents and Sizing

The AMFE series initiation head is typically used in conjunction with cylinders containing 3M™ NOVEC™ engineered fluid as the extinguishing agent.

NOVEC™ cylinders provided by the manufacturer are red.

NOVEC™ cylinders available from the manufacturer contain 90% NOVEC™ and 10% pressurized N_2 which acts as a propellant gas for the extinguishing agent NOVEC™. The N_2 is pressurized at up to 60 bar / 870 psi. The gasification temperature of NOVEC™ is 49°C/120°F, meaning that in case of activation of the AMFE the agent becomes a gas as it emerges from the cylinder.

The ambient temperature in the enclosure where the 3M™ NOVEC™ engineered fluid cylinder is installed must not exceed 100°C/212°F.

For calculation of the required amount of extinguishing agent all applicable standards and norms shall be considered. Standards which could typically be applied for sizing the extinguishing agent amount needed include:

- NFPA 2001 (NOVEC™)
- ISO 14520 (NOVEC™)
- EN 15004 (NOVEC™)
- VdS 2381 (NOVEC™)

Typical design concentrations for NOVEC™ (a clean agent) can be found in the standards listed above are:

Type of Fire	EN15004-2008 ISO 14520-2008	VdS2381-2009-06	NFPA2001-2012
Surface Class A	5.3 %	5.8 %	4.5 %
High Hazard Class A	5.6 %	-	-
Class B (e.g. Heptane)	5.9 %	6.1 %	5.9 %
Class C	Not mentioned	Not mentioned	4.7 %

The manufacturer cannot be held responsible for the amount of extinguishing agent being used in a particular application.
Locally relevant and applicable standards and norms have to be applied to calculate the amount NOVEC™ needed.

The following table shows the cylinder sizes available from the manufacturer as standard, as well as the minimum amount of 3M™ NOVEC™ contained:

	Physical Dimensions Cylinder				Mounting Brackets	NOVEC™ Content
Size	Size Diameter x Length [mm]	Size Diameter x Length [inch]	Volume [Liter]	Volume [floz]	Reccomended bracket types similar to DIN 3016-1	NOVEC Volume [ml]
#0	22x133	$^{7}/_{8}$ x 5.24	0,026	0,88	RGSS 22	24
#1	35x149	$1\,^{3}/_{8}$ x 5,87	0,080	2,70	RGSS 35	72
#2	40x179	$1\,^{9}/_{16}$ x 7.05	0,133	4,50	RGSS 40	120
#3	50,8x226	2 x 8.90	0,267	9,00	RGSS 51	241
#4	50,8x311	2 x 12,24	0,400	13,50	RGSS 51	360
#5	60,3x357	$2\,^{3}/_{8}$ x 14.06	0,670	22,60	RGSS 60	603

(Details on dimensions and weights can be found in chapter 7 - Dimensions)
These numbers can be used for estimations of the extinguishing agent available per cylinder size.

Size	Protected volume [m³] with NOVEC™	
	Class A[E] fire (4,2% NFPA 2001)	Class B fire (5,9% NFPA 2001)
#0	0,06	0,04
#1	0,19	0,14
#2	0,32	0,23
#3	0,64	0,46
#4	0,96	0,69
#5	1,61	1,15

(Example calculation based upon NFPA2001 only, must not be used for actual sizing)

Please refer to applicable standards and norms to make a selection of the proper size for the individual application to assure the intended effectiveness of the AMFE series regarding extinguishing of fires.

To allow the NOVEC™ to be effective, the protected enclosure shall not have one dimension to exceed four times the dimension of the smallest of the three dimensions height, depth or width.

6. Installation Guidelines

6.1 Assembly of AMFE and NOVEC™ cylinders

The AMFE head and the extinguishing agent cylinder are two separate parts which are to be assembled by JOB or authorized AMFE distribution partners for the convenience of our customers.

AMFE assembly should be performed only by trained and authorized JOB partners!

Suggested assembly tools:

- 1 x SW19 metric 19mm open-jaw wrench
- 1 x SW15 metric 15mm wrench fixed to a table or in a vise as assembly aid
- medium strength thread-lock adhesive (JOB suggests Loctite 243)
- cleaner (to be used before Loctite 243 is applied)

Example of a simple SW15 wrench assembly-aid tool (not provided by JOB):

Assembly steps:

1. Use cleaner to clean the threads of both, agent-cylinder and the AMFE (internally) as good as possible. Let the remains of the cleaning agent vaporize for a short time before continuing.

2. Apply Loctite™ 243, be careful to only add it onto the first two turns (see picture)

3. Put the cylinder with the extinguishing agent into the SW15 assembly aid and screw the AMFE series product onto the cylinder valve, tightened by hand.

4. Use the SW19 open-jaw wrench to tighten the AMFE series activation head onto the cylinder (see picture)

The maximum torque applied must not exceed 10 Nm / 7.4 ft lbs !

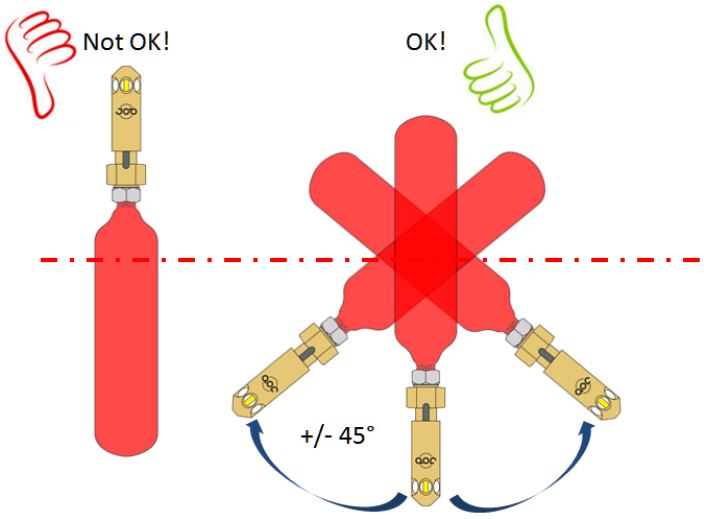
6.2 Installation orientation of AMFE with NOVEC™ cylinders

The AMFE/S-AMFE/R-AMFE is activated by heat. Therefore a requirement for reliable operation is to have the AMFE installed in a position where heat, in case of an over temperature scenario, accumulates quickly or heat circulation can be expected to produce flow of the warm air activating the AMFE's thermo-bulb. For the R-AMFE, the place of installation needs to assure free outflow of the NOVEC™ to fill the protected enclosure quickly and reliably when activated by initiation current, and not by heat.

The extinguishing agent NOVEC™ is heavier than air. A higher position in a protected enclosure will improve the extinguishing effectiveness and speed of how fast a fire is detected and extinguished.

Typically, such a position would be at the top of an enclosure:

For NOVEC™ cylinders it is important to observe the installation orientation to allow the N_2 expellant gas to rapidly push out the complete amount of NOVEC™ in a cylinder:



The AMFE activation head is to be installed to face downwards or at a max angle of +/-45° off this orientation.

6.3 Installation bracket recommendation

The AMFE with its extinguishing agent cylinder mounted should be attached to a suitably rigid wall or ceiling of the application's enclosure.

For the 6 cylinder sizes the mounting brackets recommended by JOB are pipe brackets similar to brackets described in:

- DIN 3016-1 (or similar local standards).

For maximum holding strength and robustness against vertical slipping, rubber lined brackets should be used.

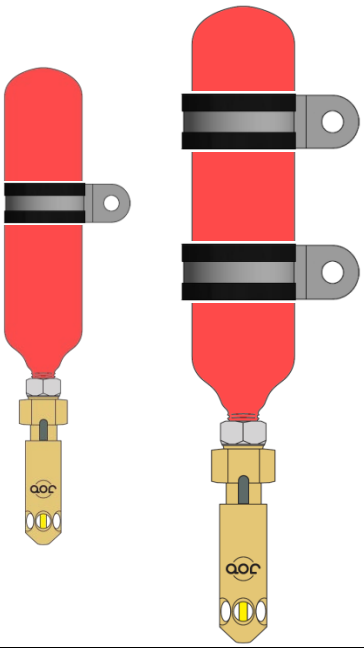
Brackets provided by JOB (see below) have CR (Polychloroprene) inlets.

The amount of brackets used depends on the shock and vibration requirements of the individual application:

A: Standard Application – normal vibration and shock robustness requirements

(Non-mobile applications, e.g. electrical cabinets, server racks, machines)

Size 0..2 *Size 3..5*

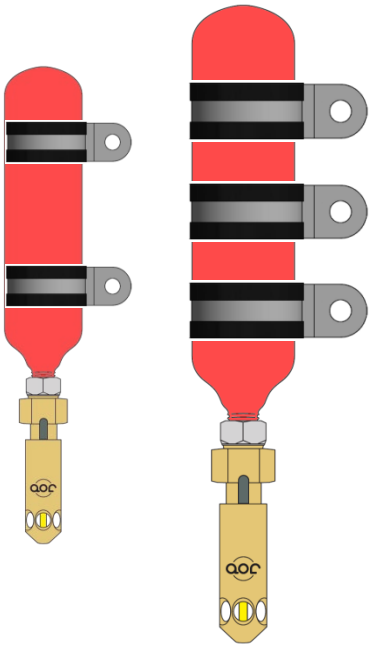


Part #	Name	for cylinder size	Reccomended number of brackets per cylinder
11025	AMFE mounting bracket set	0	1
11026	AMFE mounting bracket set	1	1
11027	AMFE mounting bracket set	2	1
11028	AMFE mounting bracket set	3 & 4	2
11029	AMFE mounting bracket set	5	2

B: 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*



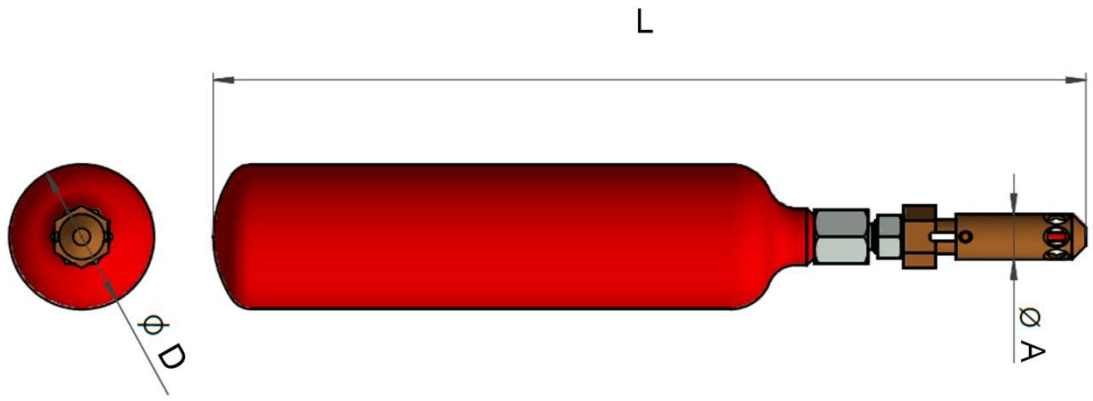
Part #	Name	for cylinder size	Reccomended number of brackets per cylinder
11025	AMFE mounting bracket set	0	2
11026	AMFE mounting bracket set	1	2
11027	AMFE mounting bracket set	2	2
11028	AMFE mounting bracket set	3 & 4	3
11029	AMFE mounting bracket set	5	3

The AMFE head with the heat sensitive element must not be covered with dirt, grease or any other substance capable of protecting hot air from reaching the activation element (the colored bulb).

If this warning is not observed, the thermal activation in case of a fire or over temperature situation cannot be guaranteed!

7. Dimensions and weights

The table below shows the physical dimensions as well as the combined (AMFE and cylinder) weight. Weights in this table are approximate and cannot be used for maintenance purpose. Each cylinder carries a label with the exact weight after production, which should be used for leakage monitoring as detailed in chapter Maintenance.



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

8. Maintenance

The JOB AMFE product is maintenance free if used as described in this manual.
The cylinders supplied by JOB are factory sealed and remain closed (sealed) during normal operation. They are only opened in case of activation of the AMFE thermal element.

It is, however, *good practice to regularly check and verify the content of the extinguishing agent cylinder*. The period between the inspections may vary from application to application and depends on the characteristics of the application (like vibrations, frequency and severity of temperature changes, dirt accumulation, etc.).
It is recommended to check the AMFE head visually and to weight the AMFE and the attached extinguishing agent cylinder at least once per year and to replace the unit if necessary (e.g. if the content is insufficient to reach the design concentration required for the protected volume).

It is recommended to check the AMFE head visually and to weight the AMFE and the attached extinguishing agent cylinder at least once per year and to replace the unit if necessary (e.g. if the content is insufficient to reach the design concentration required for the protected volume).

9. Inspection of the system

For inspection purpose, the weight of the unit is the relevant indicator.

The cylinders are labeled with a total weight after filling, including the valve, adapter and sealing and a date of filling (similar to the picture below, changes are just of operational nature).

The weight on the label does not include the weight of an AMFE, S-AMFE or R-AMFE activation head.

Weight of AMFE/S-AMFE/R-AMFE initiation heads:

AMFE:	78g / 2.75 oz
S-AMFE and R-AMFE:	80g / 2.82 oz

It is not necessary to disassemble the activation head from the cylinder for the weight inspection (measuring), but the added weight (see above) of the head needs to be subtracted from the total weight.

In compliance with the UL2166 standard, leakage losses of less than 0.25% of the filling (weight) per year after manufacturing day (see production label) are considered acceptable by the manufacturer.

An extinguishing agent cylinder shall be replaced after 10 years of operation or if the weight differs more than 5% from the originally labeled weight.

10. Refilling, recharging of cylinders

The cylinders containing the extinguishing agent NOVEC™ as provided by JOB are intended for a single, one-time use only. They are not to be refilled or recharged.

The AMFE initiation heads cannot be re-used and can be discarded after use.

The initiation heads as well as the cylinders are non-hazardous after activation, contain no pressure and no residues. They can be recycled as scrap metal in accordance with local regulations.

The material of the initiation heads is brass, the material of the cylinders is steel.

11. Storage

11.1 AMFE initiation head storage

The AMFE initiation head shall be stored:

- Dry environment (w/o condensation)
- Storage temperature T_s= 0°C/32F …+40°C/105F
- Protected from strong vibrations (in its original packaging if possible)

It is recommended to leave the AMFE in the manufacturer provided packaging until being used.

11.2 Cylinder storage

The cylinders are pressurized devices which need to be handled in accordance with locally relevant standards and codes. It is advisable to store the cylinders in a horizontal position in its original manufacturer packaging.

Cylinders containing pressurized extinguishing agent must be handled with care.

The same storage conditions as for the AMFE initiation head apply for the extinguishing agent cylinders:

- Dry environment (w/o condensation)
- Maximum temperature T_S= 0°C/32F …+40°C/105F
- Protected from strong vibrations (in its original packaging if possible)

12. Disclaimer

The AMFE™ product line is manufactured by

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Email: info@job-group.com
Web: www.job-group.com

The AMFE™ is **“MADE IN GERMANY”** and manufactured in accordance with all applicable standards and laws for the place of manufacturing.

NOVEC™ is a registered trademark owned by the 3M™ cooperation.

AMFE™ is a registered trademark owned by the JOB Group.

The AMFE™ is internationally patented. S-AMFE and R-AMFE are CE marked.

Despite all efforts and care, the completeness and correctness of the information in this manual cannot be guaranteed. Technical developments can lead to deviations from the information in this manual. It is recommended that a more current version of this manual is obtained from the manufacturer before using the AMFE series products. The instructions in the Material Safety Data Sheet for NOVEC ™ cylinders (available from the manufacturer) must be observed.