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thinking out of the box

Operating and Safety Instructions

VdS-approved extinguishing technology

Automatic Miniature Fire Extinguisher – AMFE™ Series

VdS

Content

NOVEC™ is a registered trademark owned by the 3M™ Company. For better readability only "NOVEC" is being used when referencing 3M™ NOVEC™ engineered fluid in this document.

The AMFE is a JOB Group product protected by patent in many countries.

2. General safety instructions

The AMFE is an industrial product, which must be handled with care.

BEFORE handling products of the AMFE series, these operating instructions and safety guidelines have to be read and understood by all persons working with or maintaining, installing or handling the AMFE (also in the storage place).

Installation, service and maintenance must only be carried out by technically qualified personnel, and must be performed in the framework of this document.

Always handle the AMFE and cylinders with care!

Do not drop the AMFE and cylinders!

Wear safety glasses when working with the AMFE!

This manual does not contain general information or special knowledge on fire extinguishing systems.

In addition to the instructions in this manual and the safety instructions contained therein, all locally applicable regulations – especially with regard to occupational health – must be complied with.

The manufacturer cannot be held responsible for damages resulting from failure to use the AMFE products as intended.

The cylinder containing the extinguishing agent and the initiation head may get cold during the initiation process. **Wait at least 2 minutes after activation** before touching the AMFE system again.

Never try to unscrew the cylinder/adapter containing the sealing from the pressurized extinguishing agent cylinder!

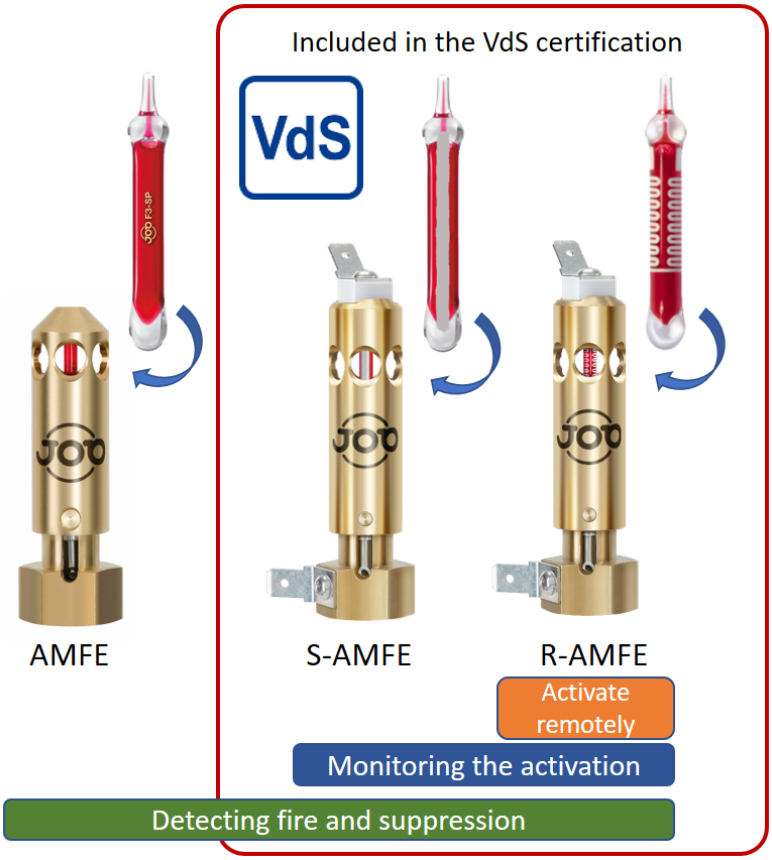
3. Product description

The AMFE series are automatic, stand-alone miniature fire extinguishers used in small equipment, control cabinets, etc. that are typically not fully accessible to persons (***no*** rooms, walk-in machine cabinets or open spaces).

The AMFE is no room extinguishing system!
It must not be used for the protection of rooms or systems accessible to people!

Die AMFE (short for "**A**utomatic **M**iniature **F**ire **E**xtinguisher") is an independent, thermally initiating fire extinguishing system.
The integrated and certified sprinkler bulbs (made by JOB) burst when a defined temperature is exceeded, thus activating a spring mechanism, which opens the cylinder containing the extinguishing agent. The pressurized extinguishing agent is then released.
The cylinder is mechanically sealed during the manufacturing process (and remains sealed even if the initiation head is screwed on). It is only opened in a release case through the heat-activated spring mechanism in the AMFE.

The AMFE series currently comprises three product versions: AMFE, S-AMFE and R-AMFE:



The AMFE extinguishing unit always consists of an initiation head and a directly attached extinguishing agent cartridge, without or with pressure sensor or manometer. For fastening at the place of destination, one or more fastening clips are needed (see Chapter 6.3, Page 17).

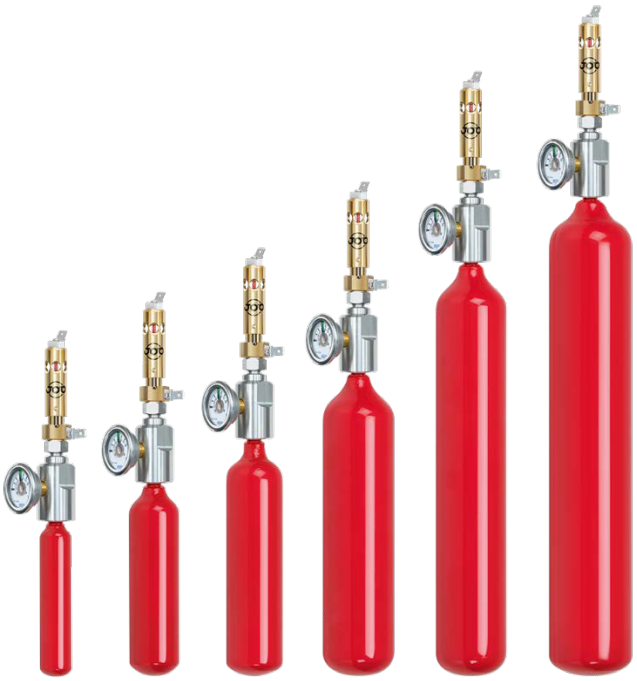


Image: Cartridge with manometer, sizes 0–5

All components are individually available with unique material numbers. Each initiation head fits each type of extinguishing agent cartridge. This allows for a variety of products and, at the same time, reduces storage costs. The individual extinguishing agent cartridges have different diameters and require different fastening clips (see Chapter 6.3, Page 17).

3.1 S-AMFE

The initiation head of the S-AMFE works with the manufacturer's billionfold deployed thermobulbs for a precise and reliable temperature detection in case of fire.

- 68°C / 155°F (red)
- 79°C / 175°F (yellow)
- 93°C / 200°F (green)
- 141°C / 286°F (blue)
- 181°C / 360°F (lilac)

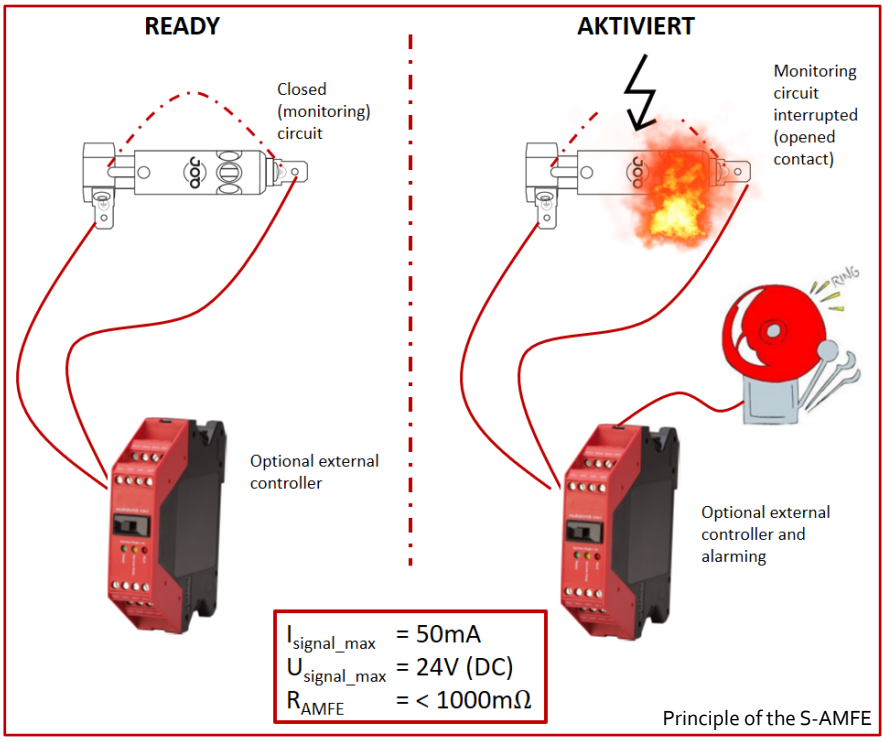
Deviating initiation temperatures beyond the VdS approval are available upon request.

With the S-AMFE, two electric contacts allow for the transmission (pass-through) of an electric signal.

The contacts are:

- Blade terminals, 6.3 mm x 0.3 mm (industry standard)

The installed thermobulb is electrically coated. This way, a low-voltage signal (see electrical data below) can be conducted via the glass. In case of thermal initiation, the glass bulb bursts intendedly, interrupting the current flow as with a switch. The S-AMFE therefore works as an electric breaker (normally closed).



Principle of the S-AMFE

Electrical data of the S-AMFE:

- Closed switch contact (breaker, normally closed)
- I_{max} = 50 mA (maximum permanent signal current via the S-AMFE)
- U= 0..24 V (DC)
- Resistance R_t < 1000 mΩ

The wiring of the S-AMFE must not cause any tension on the connecting terminals! The wires must be equipped with a respective tension relief.

3.2 R-AMFE

R-AMFE is a version that can be externally triggered by an electric current. In addition to the standard activation by heat, the R-AMFE can be connected to any external device, which – upon activation – supplies the required release current. The purpose is to initiate the extinguishing process independent of the heat of a fire. The activation may thus be triggered by, for example, a smoke detector, a manual switch or automatically by a PLC/logic control. At any time, however, the R-AMFE will also reliably activate by temperature, which means redundant operation in case the external electric activation fails.

The contacts are:

- Blade terminals, 6.3 mm x 0.3 mm (industry standard)

The installed JOB thermobulb features an integrated heating coil that can conduct low-power signal currents (I_{max} = 10 mA with U = 24 V). The R-AMFE is working as an S-AMFE here (see Chapter 3.1).

The terminals can also be used to heat the glass bulb intentionally up to the initiation temperature when the relevant activation current is applied. In case of activation, the bulb bursts, triggers the extinguishing process and permanently interrupts the electric connection, which can be used to “monitor” the activation. The R-AMFE can thus be intentionally activated electrically, e.g. by a connected manual switch or via a fire detector signal.

Typical (simplified) functional example*:

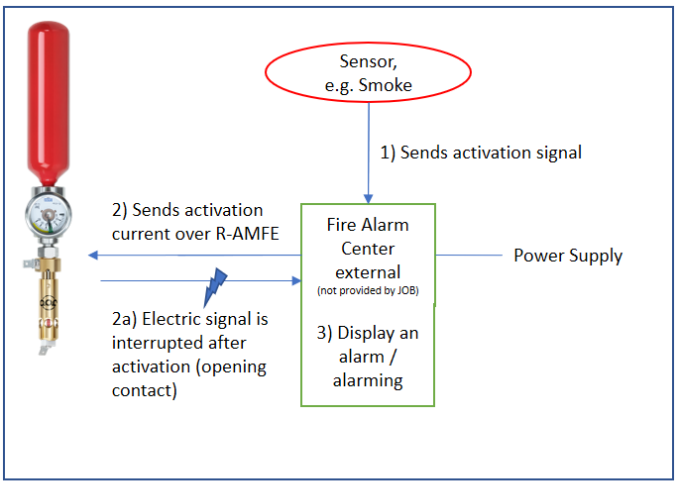


Image: Simplified schematic diagram of R-AMFE functionality

* For more R-AMFE wiring examples, please contact your JOB AMFE partner or the manufacturer (providing your application details).

The R-AMFE's electrical properties are:

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

The wiring of the R-AMFE must not cause any tension on the connecting terminals! The wires must be equipped with a respective tension relief.

4. AMFE series extinguishing agent cartridges

The initiation heads described in Chapters 3.1 to 3.3. are designed to intendedly open the extinguishing agent cartridges supplied by the manufacturer to release the contained pressurized extinguishing agent.
For this purpose, three different versions of extinguishing agent cartridges are available that are approved by the VdS and described in the following.

For all AMFE series extinguishing agent cartridges a general lower and upper temperature limits apply:

T_{min} = - 30°C
T_{max} = + 100°C (80°C with the manometer version)

For the safe and intended operation of the AMFE series, these temperature limits as general ambient temperatures for permanent use must not be undercut or exceeded.
In individual cases, deviating operating limits (permanent ambient temperature in operation) must be coordinated with the manufacturer and may be possible.

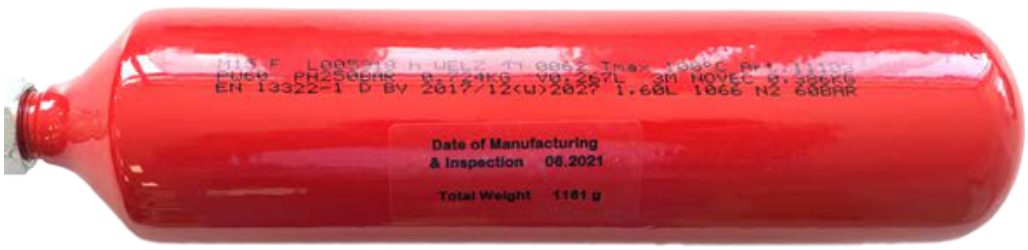
All versions of AMFE series extinguishing agent cartridges comprise six different sizes.

Each cartridge contains a defined minimum quantity of the NOVEC (FK-5-1-12) extinguishing agent and a volume fraction of approximately 10% of compressed nitrogen as blowing agent (P= ~33 bar @ 20°C +/-3 bar).

The extinguishing agent cartridges must only be used in connection with the JOB S-AMFE and R-AMFE heads.

Important instructions on the assembly of the initiation head to the extinguishing agent cartridge can be found in Chapter 7.1. Instructions on maintenance can be found in Chapter 9.

A quality label is affixed to each cartridge that contains the production date (calendar week and year) as well as the total weight in grams of the filled and factory-sealed extinguishing agent cartridge including the valve and any other attachments (without initiation head):



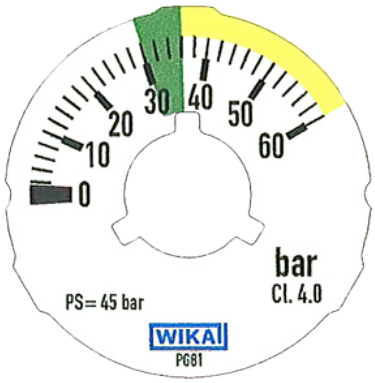
In addition to this quality label, the extinguishing agent cartridges have an imprint showing, among others, the unique serial number (e.g. L0786345) and information on the cartridge itself.

The technical data of the cartridges with manometer are listed in Annex “Drawings”.

4.1. Version with manometer

In addition to the data in the basic version of the extinguishing agent cartridges in Chapter 4.1, this version has a permanent pressure indicator in the form of a factory-installed and leakage-tested manometer for the easy check of the extinguishing agent cartridge’s internal pressure.

The manometer displays in bar.



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

The extinguishing agent cartridge must not be operated at ambient temperatures above +65°C on site to avoid any mechanical damage to the manometer!

The indicator needle for the current operating pressure must always be within the green range, to ensure the intended functioning of the AMFE unit in a release case.

The nominal range (green) for the internal pressure is

P_{nom} = 30 bar … 36 bar (@ $T_{Environment}$ = 20°C)

The indicator is designed for a visual inspection by the user of the AMFE extinguishing unit – directly on the equipment.

This results in specific temperature limits within which the manometer intendedly displays:

T_{min} = 30°C

T_{max} = 15°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: $t_{Waiting\ time} \geq 30$ min) as otherwise the pressure indicator is not meaningful.

If the displayed value is below the green range in the temperature range specified above (15°C–30°C), the extinguishing agent cartridge must not be further operated and must be replaced.

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.

The extinguishing agent cartridge's pressure must be checked at least once a year and should be documented.

The technical data of the cartridges with manometer are listed in Annex "Drawings".

4.2 Version with electronic pressure monitoring (cable)

In addition to the data on the extinguishing agent cartridge in Chapter 4.1, this version has a permanent pressure indicator in the form of a factory-installed and leakage-tested electronic pressure sensor for the permanent check of the extinguishing agent cartridge's internal pressure.

The installed sensor has a 4–20 mA current signal output to display the extinguishing agent cartridge's current internal pressure.

The sensor with a cable connection is an integral part of the extinguishing agent cartridge and must not be removed. The extinguishing agent cartridge and the adapter with pressure sensor form one unit.

The pressure sensor has a 2 m cable connection with three wires and a shielding cable.

Cable output (shielded)

Description	Color Code	Explaination
$U_{operation}$	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 relevant 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_{nom} = 30 bar … 36 bar (@ $T_{Environment}$ = 20°C)

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

I_{nom} = 12 mA–13.6 mA

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

$T_{Environment}$ = -30°C … +100°C

The functional temperature range is:

$T_{functional}$ = -30°C … +85°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_{Max} = +85°C. Everything above this is always 25 mA.

Checking the pressure in the sense of a maintenance check can only be done at room temperature as with higher temperatures (that must be within the system limits) the pressure indicator will display higher values than in the normal value range. This is a physical phenomenon and does not imply any damage.

At temperatures below 15°C, the pressure indicator will display lower values than in the normal value range. This is also a physical phenomenon and does not imply any damage to the extinguishing unit.

The technical data of the cartridges with manometer are listed in Annex “Drawings”.

4.3. Version with electronic pressure monitoring (plug)

This version of the extinguishing agent cartridge has the same pressure monitoring sensor as the version with cable (cf. Chapter 4.2).

The pressure sensor is of identical construction and type as the one with cable. Here, the signals are not transmitted via four single wires but via four pins of the M12 round plug.

The plug is a 4-pole M12 x 1 round plug (industry standard).

Connector (male) Output

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

Furthermore, the identical electrical parameters and instructions of the version with the electronic pressure monitoring with cable apply as described in Chapter 4.2 (cf. ibid.).

The technical data of the cartridges with manometer are listed in Annex “Drawings”.

Image: R-AMFE with cartridge with electronic pressure sensor with plug contact

5. Intended use

The AMFE product line is an innovative product for stand-alone device-integrated fire protection. The AMFE is typically used in small enclosed housings and equipment that are, among other things due to their limited size and installation position, not “accessible” (in the sense of “walkable”) to members of the public or professional staff during normal operation.

Most of the existing fire protection solutions are designed to cover large spaces and rooms, and are usually not suitable if applied to small housings, devices and equipment.
Smaller equipment is thus only passively protected by smoke detectors and fire sprinklers – lacking the active extinguishing capabilities in case of fires.

In any case, the national guidelines on personnel protection must be observed (e.g. VdS3518, DGUV Information 205-026)!

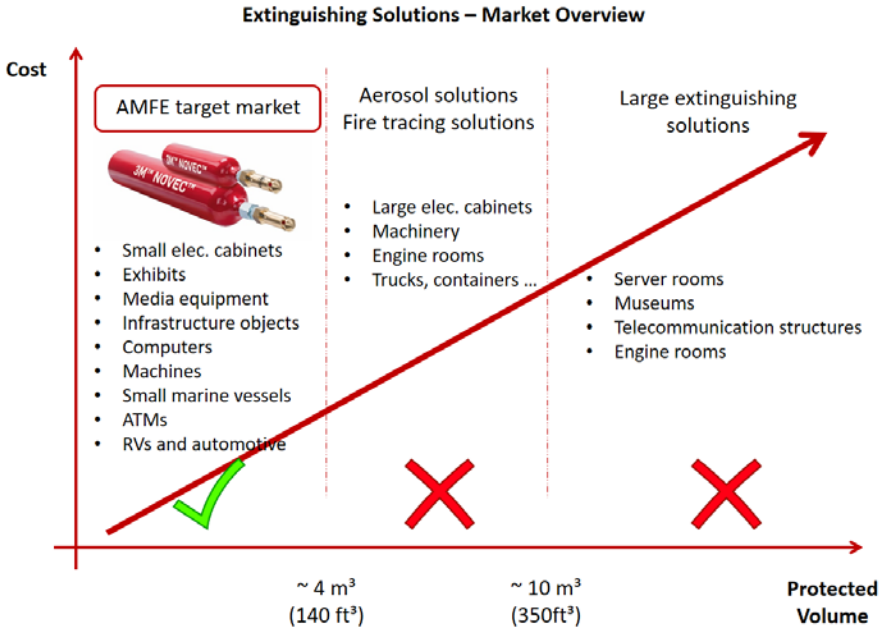


Image: Extinguishing solutions – Market overview

Some typical applications for the AMFE series are:

- Vending machines (e.g. in halls or escape routes)
- Production equipment, industrial equipment, including mobile equipment
- Switchgears and fuse boxes
- Maritime systems (e.g. engine compartments, junction boxes and fuse boxes on board ships)
- Computer/server cabinets, Digital Media Solutions
- Valuable collections (e.g. in museums or private)
- Waste containers, mailboxes, infrastructure equipment (e.g. also against vandalism)
- Military, space and telecommunication equipment
- Train and Railway equipment

The AMFE cannot be used to protect entire rooms! It must only be used to protect small enclosed equipment of any kind.

The S-AMFE/R-AMFE is intendedly operated with voltages lower than 60 V DC (U_{signal_max} = 24 V AC). Therefore and with regard to product safety guideline 2001/95/EC, a contact protection is not mandatory. In case the signaling voltage transmitted via the S-AMFE/R-AMFE is generated by a transformer, the latter must be a safety transformer according to EN 61558-2-6 (e.g. mains transformer of safety class III).

6. Extinguishing agent and AMFE dimensioning

The AMFE heads are typically used in conjunction with cylinders, which are filled with 3M™ NOVEC™, as a complete extinguishing unit.

The NOVEC™ cylinders are delivered in red by the manufacturer.

The manufacturer fills these extinguishing agent cylinders with 90% NOVEC™ (FK-5-1-12) and 10% N_2 . N_2 serves as blowing agent for the NOVEC™ here. The low quantity of N_2 is pressurized with 33 bar +/- 3 bar (@ T = 20°C) to ensure a quick escape of the fire-extinguishing agent. Due to the NOVEC™ extinguishing agent's low boiling temperature of 49°C/120°F and the usually higher initiation temperature of the AMFE/S-AMFE (from 68°C/155°F), the NOVEC™ becomes gaseous upon emerging from the cylinder.

The ambient temperature within the equipment or cabinet to be protected must not permanently exceed 100°C/212°F!

For the version with manometer, the permanent ambient temperature must not exceed 60°C!

When calculating the required quantity of extinguishing agent (cylinder size) for a specific application, all applicable regulations and guidelines must be complied with. The usual applicable standards are:

- VdS 2381
- EN 15004
- NFPA2 001

The design concentrations (gas volume content) for NOVEC™ (“clean agent”) according to the VdS approval are:

Fire classification	VdS 2381
Surface fire Class A	5.8%
Class B*	6.1%
Class C	Not listed

*) for n-heptane

The manufacturer cannot be held responsible for the dimensioning being used in a particular application! Local applicable regulations and standards must be observed to reliably calculate the required quantity of extinguishing agent.

The following table shows the extinguishing agent cylinder sizes available as standard from the manufacturer with the minimum quantities of 3M™ NOVEC™ contained:

Size	**Cylinder dimensions without AMFE/S-AMFE head** Size Diameter x Length [mm]	Size Diameter x Length [inch]	Volume [liter]	Volume [floz]	**Bracket** Recommended bracket size [cf. DIN 3016-1]	**3M™NOVEC™ min. content** NOVEC volume [ml]
#0	22 x 133	$^{7}/_{8}$ x 5.24	0.026	0.88	RGSS 22	24
#1	35 x 149	$1^{3}/_{8}$ x 5.87	0.080	2.70	RGSS 35	72
#2	40 x 179	$1^{9}/_{16}$ x 7.05	0.133	4.50	RGSS 40	120
#3	50.8 x 226	2 x 8.90	0.267	9.00	RGSS 51	241
#4	50.8 x 311	2 x 12.24	0.400	13.50	RGSS 51	360
#5	60.3 x 357	$2^{3}/_{8}$ x 14.06	0.670	22.60	RGSS 60	603

(Further details on dimensions and weights can be found in Chapter 7 “Dimensions and Sizes”)

The values in the below table can be used for estimations of the possible protection volume per cylinder size.

Size	Class A Fire (5.8% VdS 2381)
#0	0.046 = 46 liter
#1	0.137 = 137 liter
#2	0.229 = 229 liter
#3	0.459 = 459 liter
#4	0.686 = 686 liter
#5	1.149 = 1,149 liter

(Sample calculation based on the VdS 2381, which cannot be used for the dimensioning of a specific application.)

All local applicable guidelines and standards for calculating the suitable quantity of extinguishing agent must be complied with, to ensure the successful firefighting on a case-by-case basis.

For the NOVEC™ to be effective in case of application, the dimensions of the equipment to be protected must not exceed four times the dimensions of the smallest of the three dimensions (length, width, height).

7. Installation guidelines

7.1 Assembly of the AMFE and NOVEC™ cylinders

The AMFE head and the fire-extinguishing cylinder are two separate parts, which are pre-assembled by JOB or an authorized AMFE distribution partner for the convenience of the end customer.

The AMFE assembly shall only be performed by trained and authorized JOB partners.

Recommended tools:

- 1 x SW19 – 19 mm open-jaw wrench
- 1 x SW15 - 15 mm wrench fixed to a table or clamped into a vise
- Medium-strong screw-lock adhesive (JOB recommends Loctite 243)
- Cleaning agent (to be used before applying the Loctite 243)

Simple SW15 open-jaw wrench assembly tool (not provided by JOB):

Assembly steps:

1. Use the cleaning agent to optimally clean the threads of both ends, cylinder and the AMFE (inner side). Let the remains of the cleaning agent vaporize before continuing.

2. Carefully apply Loctite™ 243 onto the first two threaded rings (see picture).

3. Clamp the cylinder with the extinguishing agent into the open-jaw wrench assembly tool and screw the AMFE head onto the cylinder thread by hand.

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

The maximum torque must not exceed 10 Nm / 7.4 ft lbs! The minimum torque is 2 Nm.

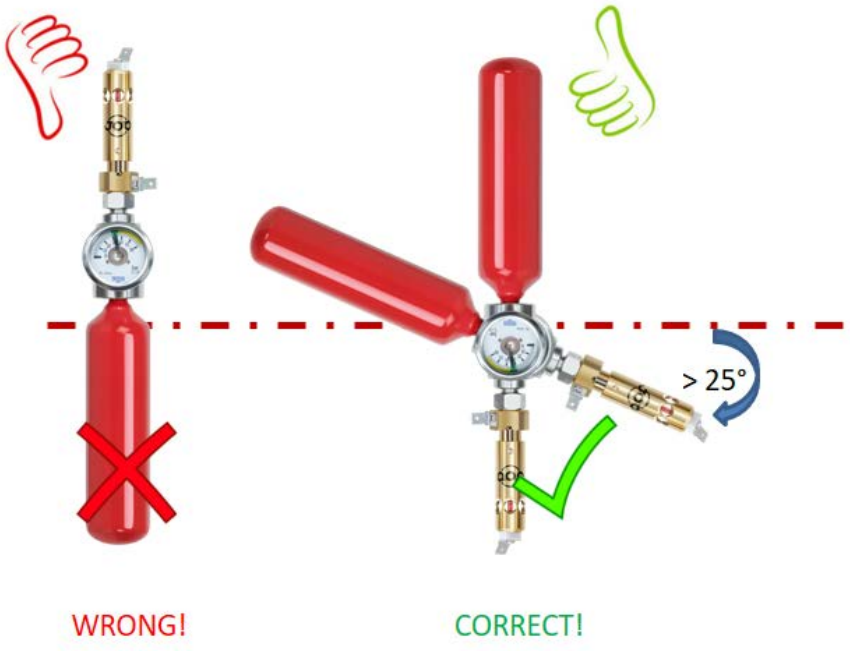
7.2 Installation direction of the AMFE with NOVEC™ cylinder

The AMFE/S-AMFE/R-AMFE is activated by heat. The extinguishing unit must therefore be installed in a place where heat, e.g. triggered by equipment fire, accumulates, or where the initiation temperature is reached quickly due to heat circulation within the equipment to be protected.

The NOVEC™ extinguishing agent is heavier than air. An installation at the highest position in the equipment or system can have a positive impact on the firefighting effectiveness and the fire extinguishing rate.

The usual installation positions in the equipment are the following:

For NOVEC™ cylinders, it is important to accomplish the installation in a way that allows the N_2 propellant to quickly and completely press the extinguishing agent out of the cylinder.



This is only possible, if the AMFE initiation head faces as vertically downwards as possible.

As shown in the picture, the initiation head of the fire extinguisher must be assembled facing downwards so that the propellant can completely expel the extinguishing agent in case of initiation.

With deviating installation positions, the proper and complete escape of the extinguishing agent (and thus the available quantity of extinguishing agent in case of fire) is not ensured!

7.3 Recommended brackets for assembly

The AMFE/S-AMFE with assembled extinguishing agent cylinder must be assembled to the equipment to be protected with a sufficiently robust and stable bracket.

For the six cylinder sizes available, the recommended brackets are defined as follows:

- DIN 3016-1 (or similar standards)

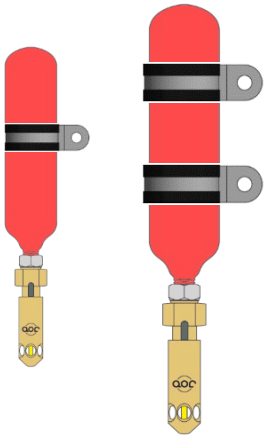
For a maximum bracket strength and robustness against vertical shifting and in case of vibrations and shocks, rubber lined brackets should be used.

Successfully tested brackets have a CR (polychloroprene rubber) coating (see picture).

The number of necessary brackets depends on the shock and vibration requirements of the respective application.

Recommended for non-mobile applications as in control cabinets:

Sizes 0–2 *Sizes 3–5*



Name	For cylinder Size	Recommende number per cylinder
AMFE bracket kit	0	1
AMFE bracket kit	1	1
AMFE bracket kit	2	1
AMFE bracket kit 3&4	3 & 4	2
AMFE bracket kit	5	2

The AMFE/S-AMFE initiation head with the heat-sensitive bulb must be free from dirt, grease, dust or any other substance. Any soiling may lead to the heat not being quickly and reliably detected in case of fire.

8. Dimensions and weights

The table below shows the physical dimensions as well as the combined weight (S/R-AMFE with cylinder and manometer). The data in this table are approximated values and must not be used for installation and maintenance purposes.

After the production and quality assurance, a label (or imprint) is affixed to each cylinder, indicating the exact total weight (without initiation head) of the filled extinguishing agent cylinder including the valve and manometer or sensor, if any. Details can be found in Chapter "Maintenance"**.**

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

Detailed drawings and data sheets of the individual products are available upon request.

9. Maintenance and inspection

The S/R-AMFE is maintenance-free as long as it is intendedly operated in the framework of the regulations and instructions in this manual.
The extinguishing agent cylinders are factory-sealed and remain in this state during normal operation. They are only opened in case the thermal initiation element (the glass bulb) is activated.

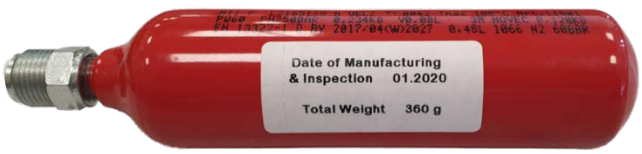
We recommend to regularly check the cylinder and the initiation unit for integrity, cleanliness and pressure in the cylinder. The periods between these inspections depend on the application and should be defined by the user depending on the prevailing operating conditions such as vibrations, temperature changes and degree of soiling.

It is recommended to carry out a visual inspection and to check the pressure in the extinguishing agent cylinder at least once a year, to document them and to replace the automatic extinguishing units if required.

10. Inspection of the system

For an inspection of the extinguishing unit, the pressure in the cylinder is the main factor.

After the production and quality assurance measures, a label or an imprint is affixed to the cylinder in the factory. It contains information on the cylinder's weight including the valve and adapter, if any, when filled with the extinguishing agent as well as the date of filling (see picture).



The imprinted weight on the cylinder label does not comprise the weight of the S-AMFE or R-AMFE initiation head.

Weight of the S-AMFE/R-AMFE initiation head:

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

Pressure monitoring and evaluation must be carried out according to the characteristics (pressure or mA) defined in Chapter 4.

- **The cylinder with the NOVEC™ extinguishing agent should be replaced after 10 years!**
- **If the pressure in the cylinder is beyond the permitted range (see Chapter 4), it must be replaced.**

11. Refilling the extinguishing agent cylinders / recycling

The AMFE series extinguishing agent cylinders are designed for single use only. They contain a unique serial number with traceability information. The cylinders cannot be refilled after initiation.

The activation renders the S-/R-AMFE initiation heads unusable and they cannot be reused.

After the activation, the initiation heads and the extinguishing agent cylinders are depressurized, contain no residues and are non-hazardous. They can be disposed and recycled as scrap metal.

The S/R-AMFE is made of brass; the extinguishing agent cylinders are made of steel.

12. Storage

12.1 Storage of the S-AMFE and R-AMFE initiation heads

The storage location for the AMFE/S-AMFE initiation heads must meet the following requirements:

- Dry place, protected against direct sunlight, no condensation
- Temperature: T_S = 0°C/32°F … +40°C/105°F
- Protected from strong vibrations (in original packaging if possible)

It is recommended to store the initiation heads in the original packaging until they are installed and used.

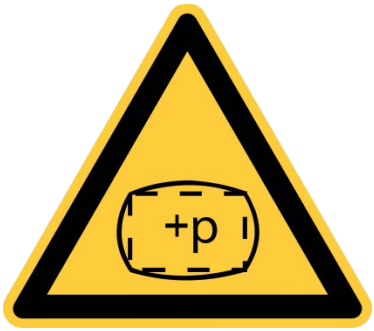
12.2 Storage of the filled extinguishing agent cylinders

The extinguishing agent cylinder is a pressure vessel and must therefore be handled according to the locally applicable standards and regulations for pressure equipment.

It is recommended to store the cylinders in a horizontal position in their original packaging.

The instructions in the manufacturer's safety data sheet apply.

Extinguishing agent cylinders are pressurized vessels and must be handled with care.



The same storage conditions apply to the cylinder as to the initiation heads:

- Dry place, protected against direct sunlight, no condensation
- Maximum temperature: T_s = 0°C/32°F … +40°C/105°F
- Protected from strong vibrations (in original packaging if possible)

13. Disclaimer

The AMFE series products are developed and sold by:

JOB GmbH
Kurt-Fischer-Str. 30
D-22926 Ahrensburg / Deutschland
Phone: +49 (0) 4102 2114-0

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

Sold by:

Multicomsystem OHG
Lise-Meitner-Straße. 14
40721 Hilden
Phone: +49 (0) 211 580 980 20

Email: info@multicomsystem.de
Web: www.multicomsystem.de

The AMFE series is **“MADE IN GERMANY”**, and manufactured and continuously refined in accordance with the applicable local laws and regulations.

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

AMFE is protected by patent in many countries.

S-AMFE and R-AMFE carry the CE label.

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 to order a more current version of this manual from the manufacturer before using the AMFE series products. The instructions in the safety data sheet for NOVEC™ cylinders (available from the manufacturer) must be observed.