Operating and Safety Instructions v3.4_EN

VdS approved extinguishing technology

Automatic Miniature Fire Extinguishing - AMFE™ Series

VdS

Table of contents

1. Preamble

Thank you for choosing one of our automatic mini fire extinguishers (AMFE). This device is especially designed for fast and reliable use in electrical enclosures and sensitive areas and provides effective fire protection fully automatically. These operating instructions contain important information on the installation, operation and maintenance of the device to ensure its reliability in an emergency. Please read these instructions carefully and keep them for future reference. Responsible use ensures safety and protection in your environment.

2. General safety regulations

The AMFE is an industrial product that must be handled with care.
BEFORE working with the AMFE series, these operating instructions and safety instructions must be read and understood by all persons who work with, maintain, install or handle the AMFE (e.g. also in the warehouse).

Installation, operation and maintenance may only be carried out by technically trained personnel and must be performed in accordance with the instructions in this document.

Always handle 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.

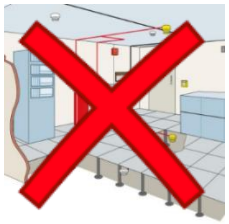
The cylinder containing the extinguishing agent and the initiation head may get cold during the initiation process. **Wait at least 2 minutes after activation** before touching the AMFE system again.

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

3. Product description

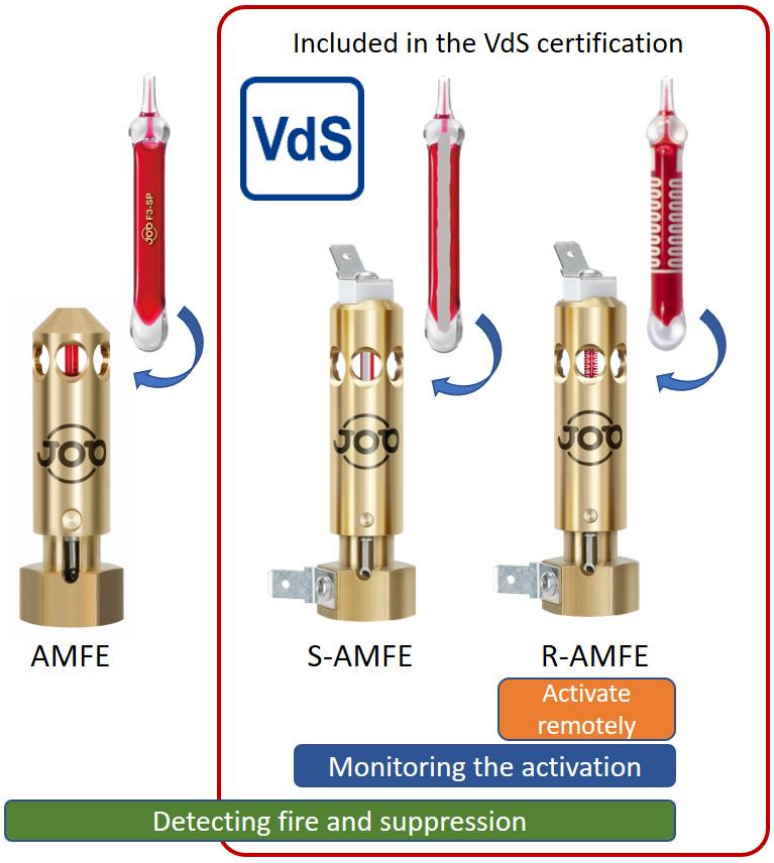
The AMFE series are automatic, stand-alone miniature fire extinguishers used in small equipment, control cabinets, etc. that are typically not fully accessible to persons (***no*** rooms, walk-in machine cabinets or open spaces).

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



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 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:



Also included in the VdS approval is the combination of AMFE with pressure sensor, as this enables permanent pressure loss monitoring.

The AMFE extinguishing unit always consists of an initiation head and a directly attached extinguishing agent cartridge, without or with pressure sensor or gauge. For fastening at the place of destination, one or more fastening clips are needed (see Chapter 7.3 , Page 22).

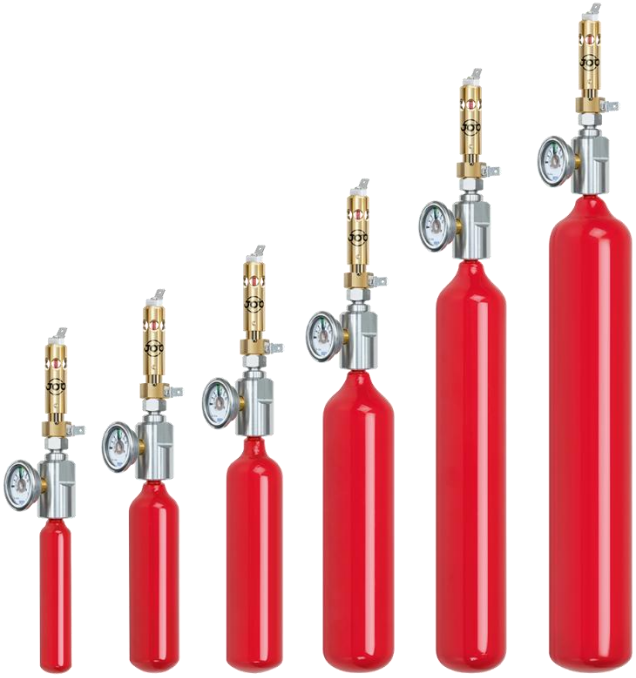


Image: Cartridge with gauge, sizes 0–5

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 7.3).

3.1 AMFE

The AMFE is the standard version. Simple retrofitting in existing systems enables immediate fire protection without wiring. The activation temperature can be freely selected over a wide range. The standard activation temperatures are as follows:

- 57 °C / 135 °F (orange)
- 68 °C / 155 °F (red)
- 79 °C / 175 °F (yellow)
- 93 °C / 200 °F (green)

3.2 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.

- 57 °C / 135 °F (orange)
- 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)

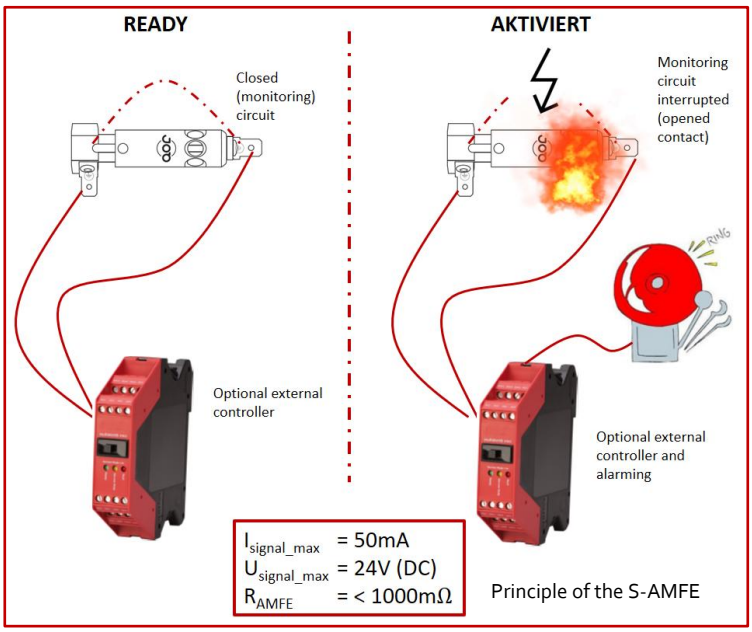
Deviating initiation temperatures beyond the VdS approval are available upon request.

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)

Die verbaute thermisch auslösende Ampulle ist elektrisch leitend beschichtet. So kann über das Glas ein Niederspannungssignal (siehe elektrische Daten weiter unten) übertragen werden. Bei thermischer Auslösung zerbricht die Glasampulle bestimmungsgemäß, wobei der Stromfluss wie bei einem Schalter unterbrochen wird. Die S-AMFE funktioniert dadurch wie ein elektrischer Öffner (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.

3.3 R-AMFE

R-AMFE is a variant that can be triggered externally by an electric current. In addition to the standard activation by heat, the R-AMFE can be connected to any external device that supplies the necessary triggering current when activated. The purpose of this is that the extinguishing process can be initiated independently of the heat of a fire. For example, activation can be triggered by a smoke detector, a simple switch or automatically by a PLC/logic controller. At any time, however, the R-AMFE is also reliably activated by temperature, which means redundant operation in the event that the external electrical activation fails. The triggering temperatures are available in the same way as the S-AMFE.

The contacts are:

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

The installed Thermo Bulb 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 3.2 S-AMFE).

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*:

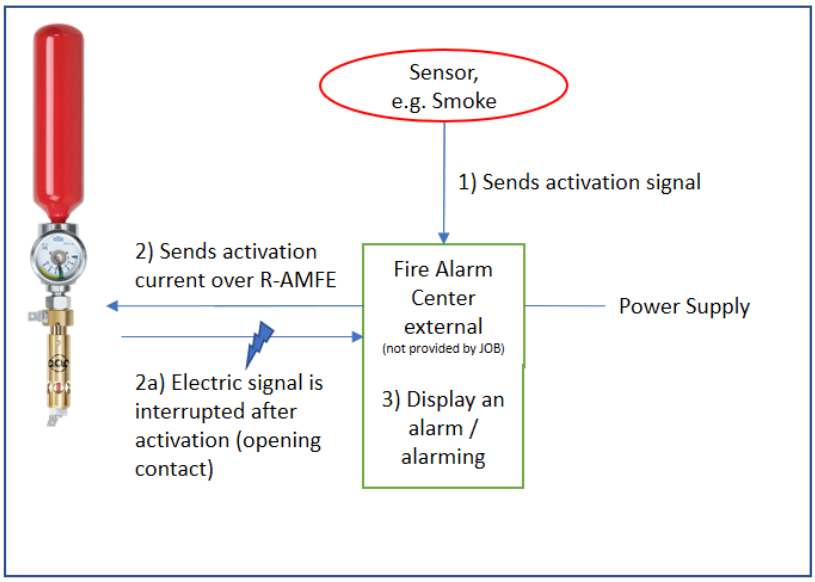


Image: Simplified schematic diagram of R-AMFE functionality

* For more R-AMFE wiring examples, please contact your 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 AMFE, 3.2 S-AMFE, and 3.3 R-AMFE 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} = - 20°C/ -4°F
T_{max} = + 50°C/ +122°F

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 FK-5-1-12 extinguishing agent and approx. 10 percent by volume of compressed nitrogen as propellant (P= ~33 bar @20°C +/-3bar).

The extinguishing agent cartridges may only be used in conjunction with the S-AMFE and R-AMFE heads.

Important information on mounting the trigger head on the extinguishing agent cartridge can be found in chapter 7. . Information 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 gauge are listed in Annex “Drawings”.

4.1. Version with gauge

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 gauge for the easy check of the extinguishing agent cartridge’s internal pressure.

The gauge displays in bar.

This variant is approved by VdS in the following operating temperature ranges $T_{Environment}$ = -20°C … +50°C.

The extinguishing agent cartridge must not be operated at ambient temperatures above +50°C on site to avoid any mechanical damage to the gauge!

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 gauge intendedly displays:

T_{min} = 15 °C

T_{max} = 30 °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 gauge are listed in Annex "Drawings".

4.2 Version with electronic pressure monitoring (cable)

In addition to the specifications for the extinguishing agent cartridge in Chapter 4, this variant features a permanent pressure indicator in the form of a factory-installed and leak-tested electronic pressure sensor for continuous monitoring of the internal pressure of the extinguishing agent cartridge. This variant is VdS-approved.

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

- Wires: 3 x 0.14 mm²
- Cable diameter: 4.3 mm
- Cable length: 2 m
- Measuring range: 0 … 60 bar (max. double overload capacity)
- Auxiliary voltage: 8 … 30 V DC
- Electric resistance: ≤ (auxiliary power – 8 V) / 0.02 A
- Measuring signal: 4 … 20 mA analog output signal
- Current output: corresponds to the 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)!

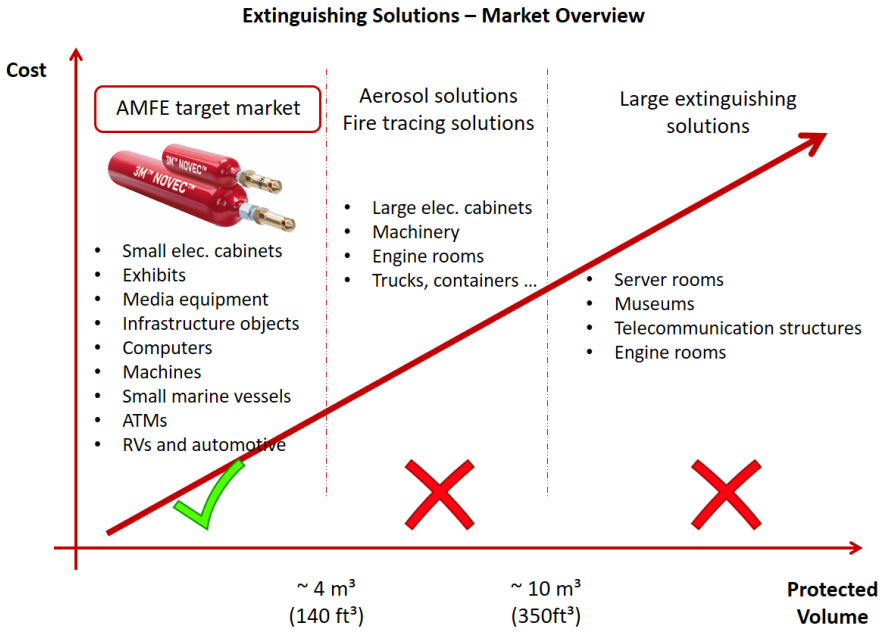


Image: Extinguishing solutions

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
- Medientechnik / Digital Signage

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 together with cylinders filled with FK-5-1-12 as a complete extinguishing unit.

The cylinders are supplied by the manufacturer in red.

The manufacturer fills these extinguishing agent cylinders with 90% FK-5-1-12 and 10% N_2 . N_2 serves as blowing agent for the FK-5-1-12 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 FK-5-1-12 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 FK-5-1-12 becomes gaseous upon emerging from the cylinder.

The ambient temperature within the equipment or cabinet to be protected must not permanently exceed 50°C/122°F!

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 fraction) for FK-5-1-12 (“clean agent”) according to VdS approval are:

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

*) for n-heptan

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 sizes of extinguishing agent cylinders available as standard from the manufacturer with the minimum quantities of FK-5-1-12 contained:

Size	**Cylinder dimensions without AMFE/S-AMFE head**				**Bracket**	**FK-5-1-12 min. content**
	Size Diameter x Length [mm]	Size Diameter x Length [inch]	Volume [liter]	Volume [floz]	Recommended bracket size [cf. DIN 3016-1]	FK-5-1-12 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 “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.)

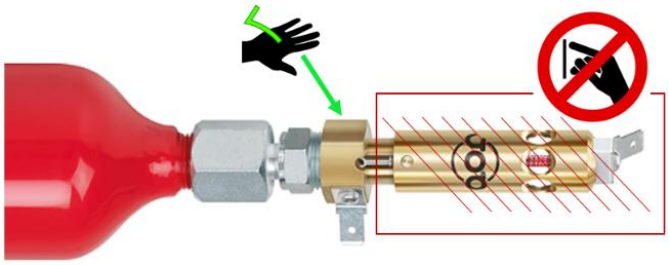
All local applicable guidelines and standards for calculating the suitable quantity of extinguishing agent must be complied with, to ensure the successful firefighting on a case-by-case basis.

In order for the FK-5-1-12 to be effective in the application, none of the dimensions of the device to be protected may exceed four times the smallest of the three dimensions (length, width, height)!

7. Installation guidelines

7.1 Assembly of the AMFE and FK-5-1-12 cylinders

For use, the trigger head and extinguishing agent cylinder must be installed. The following instructions must be observed:



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 (recommends Loctite 243)
- Cleaning agent (to be used before applying the Loctite 243)

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

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.

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. When disassembling the trigger unit, the valve must be held firmly to prevent it from unscrewing and causing improper triggering when the cylinder is full.

7.2 Installation direction of the AMFE with FK-5-1-12 cylinder

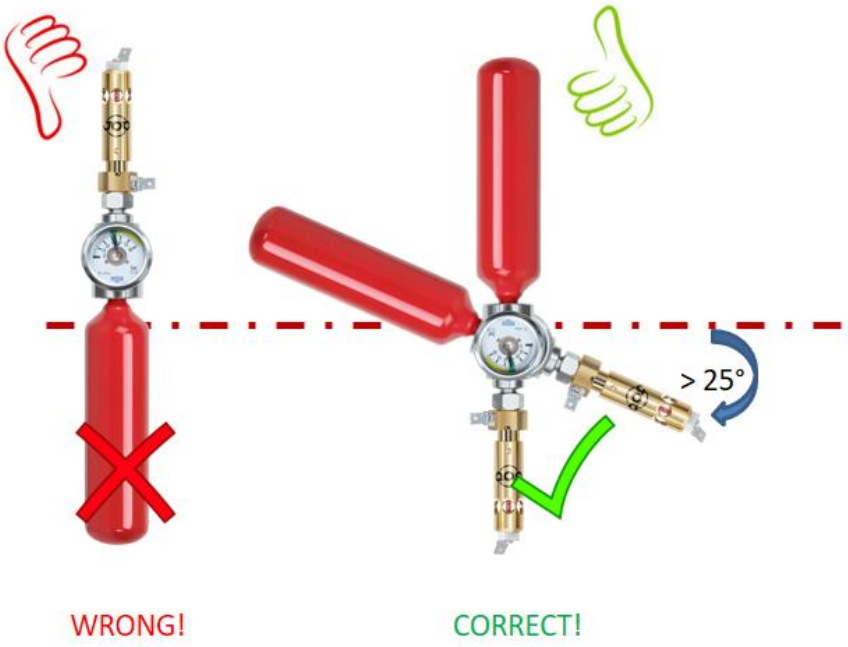
The AMFE/S-AMFE/R-AMFE is activated by heat. The extinguishing unit must therefore be installed in a place where heat, e.g. triggered by equipment fire, accumulates, or where the initiation temperature is reached quickly due to heat circulation within the equipment to be protected.

The FK-5-1-12 extinguishing agent is heavier than air. Installing it as high as possible in the device or system can positively influence the effectiveness of firefighting and the speed of extinguishing.

The usual installation positions in the equipment are the following:

With the FK-5-1-12 cylinders, it is particularly important to install them in such a way that the propellant gas nitrogen N2 can quickly and completely push the extinguishing agent out of the cylinder.

This is only the case if the AMFE release head is aligned 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-/R-AMFE with mounted extinguishing agent cylinder must be firmly mounted in the device to be protected with a sufficiently stable and load-bearing bracket!

Recommended brackets for the 6 available cylinder sizes are defined as follows:

- • DIN 3016-1 (or similar standards)

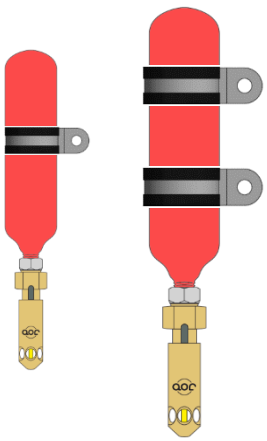
For a maximum bracket strength and robustness against vertical shifting and in case of vibrations and shocks, rubber lined brackets should be used.

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:

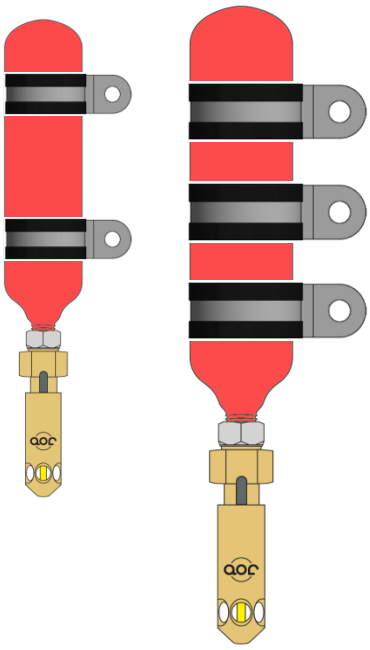
Sizes 0–2 *Sizes 3–5*



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

For more demanding applications - strong and permanent vibrations and where high impact resistance is required (e.g. in mobile applications such as shipping, rail and automotive applications as well as semi-mobile equipment and systems).

Sizes 0–2 *Sizes 3–5*



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

The AMFE/S-AMFE trigger head with the heat-sensitive ampoule must not be soiled and must be free of grease, dust and other substances. Contamination could result in heat not being detected quickly and reliably in the event of a fire.

Other suitable accessories (e.g. mounting on the switch cabinet) are described in separate manuals.

8. Dimensions and weights

The table below shows the physical dimensions and the combined weight (S/R-AMFE with cylinder and gauge). The weights in this table are approximate and should not be used for installation or maintenance purposes.

After production and quality control, each cylinder is provided with a sticker (or imprint) on which the exact total weight (without release head) of the filled extinguishing agent cylinder including valve and, if applicable, gauge or sensor is listed. Details can be found in the “Maintenance” chapter.

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 low-maintenance as long as it is operated in accordance with the regulations and instructions in this manual.
The extinguishing agent cylinders are tightly closed at the factory and remain in this state during normal use. It is only opened when the thermal release element (the glass ampoule) is activated.

It is recommended that the cylinder and the release unit are checked regularly for integrity, cleanliness and pressure in the cylinder. The frequency of this inspection depends on the application and should be determined by the user based on the prevailing operating conditions such as vibration, temperature changes and degree of contamination.

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 production and quality assurance measures, the cylinder is provided with a sticker or imprint at the factory. This contains information about the weight of the cylinder including the valve and, if applicable, the adapter after filling with the extinguishing liquid, as well as the date of filling (see image).

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:

AMFE:	78g / 2,75 oz
S-AMFE and R-AMFE:	80g / 2,82 oz

Pressure monitoring and evaluation must be carried out in accordance with the defined characteristics (pressure or mA) in chapter 4.

When checking the filling weight by weighing (variant without pressure indicator), the trigger head does not have to be removed from the extinguishing agent cylinder, but the weight of the trigger head used must then be subtracted from the total weighed weight.

According to the manufacturer and in accordance with the UL2166 standard, a loss of approximately 0.25% of the imprinted filling weight per year after the date of manufacture is considered to be in accordance with the intended use.

- **The cylinder with the FK-5-1-12 extinguishing agent should be replaced after 10 years at the latest!**
- **If the pressure or weight of the cylinder is outside the permissible 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)

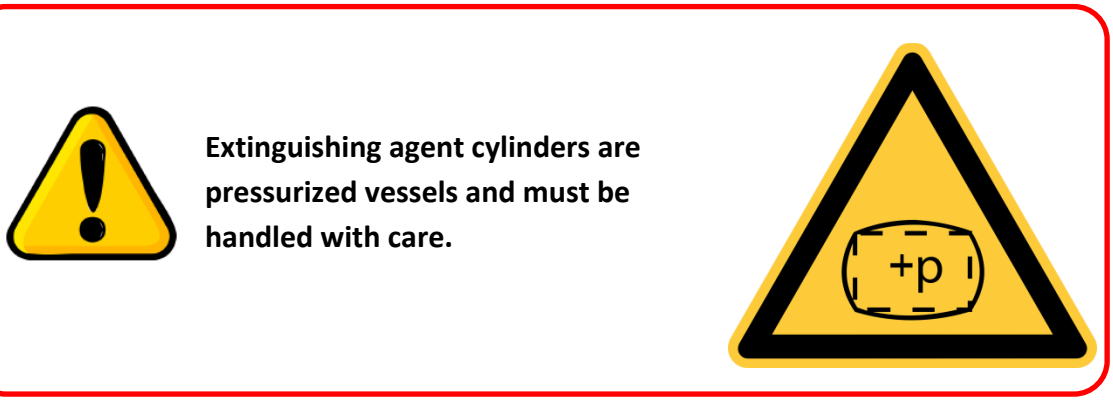
It is recommended to store the initiation heads in the original packaging until they are installed and used.

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.



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:

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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 accuracy of the information in this manual cannot be guaranteed. Technical developments may lead to deviations from the information in this manual. It is recommended that you obtain a more up-to-date version of this manual from the manufacturer before using AMFE series products. The instructions in the safety data sheet for FK-5-1-12 cylinders (available from the manufacturer) must be observed.