# Documentation

## F 501 and F 502

### Detonation flame arrester/Pre-volume flame arrester

**PTB 02 ATEX 4012 X (F 501)**
**PTB 09 ATEX 4002 (F 502)**


**Read instructions before starting any work**
Status: 02/2022
Art.-no.: 605542

## Content

# 1. General

## 1.1 Information

This instruction provides important information for using denotation flame arrester/space monitoring device F 501 (Ex II G B3) and denotation flame arrester F 502 (Ex II G IIC and Ex G IIA (to $p_{abs}$ 400 kPa)). The precondition for safe operations is compliance with all the specified safety information and instructions for action.

Furthermore, all applicable, local accident prevention regulations and general safety guidelines must be observed for the application area of the detonation flame arrester (e.g. dome shaft).

## 1.2 Explanation of Symbols

Warning notices are marked with the symbol shown on the left in these instructions.

The signal word indicates the severity of the danger.

**DANGER:**
Points to an immediately dangerous situation, which will lead to death or serious injuries if it is not avoided.

**WARNING:**
Points to a possibly dangerous situation, which can lead to death or serious injuries if it is not avoided.

**CAUTION:**
Points to a possibly dangerous situation, which can lead to minor or light injuries if it is not avoided.

**Information:**
Highlights useful tips, recommendations and information.

## 1.3 Limitation of Liability

All details and guidelines in this documentation were prepared considering the applicable standards and regulations, the state-of-the-art technology as well as our experience gathered over many years.

The SGB does not accept liability for:

- Non-observance of these instructions
- Improper use
- Deployment of unqualified staff
- Unauthorised modifications
- Connecting to systems that are not approved by the SGB

## 1.4 Copyright

The content of these instruction, the texts, drawings, images and other illustrations are protected by copyright and are subject to the industrial property rights. Every improper use is liable to prosecution.

## 1.5 Warranty Conditions

We grant a 24-month warranty period from the day of installation on site in accordance with our General Terms & Conditions.

The warranty period lasts no longer than 27 months as of our sales date.

The function/test report documenting the initial starting-up by trained staff must be presented to fulfil the warranty conditions.
The serial number of the leak detector is required.

The obligation of warranty shall cease to exist in case of
- inadequate or improper installation
- unintended use
- modifications/repair works without the manufacturer's consent.

Our warranty does not include parts, which may be perished premature due to their consistence or category of usage (e.g., pumps, valves, gaskets, etc.). Furthermore, we are not liable for defects or corrosion damages caused by humid or inappropriate installation environments.

## 1.6 Customer service

Our customer service staff is happy to provide you with further information.

You can find your contact person in the Internet at sgb.de/en or on the label of the display unit.

# 2. Safety

## 2.1 Intended use

**WARNING!**

**Danger through misuse**

- Only for use in applications approved by SGB.
- Material stability must exist
- Grounding or equipotential b according to applicable regulations (e.g. EN 1127)
- Installation only in Zone 1, Zone 2 or outside the Ex-zone
- Explosive steam-air mixtures and pressures, see technical data
- Ambient temperature max. 90°C (F 501)
  Ambient temperature max. 60°C (F 502)
- Detonation flame arrester for stable detonations
- Space monitoring device (F 501)

Claims of any kind due to improper use are excluded.

## 2.2 Obligation of the Operating Company

The detonation flame arrester is used in the commercial sector. The operator is subject to the statutory obligation of occupational safety.

All applicable safefty, accident prevention and environmental regulations must be observed alonside the safety guidelines provided in this documentation. In particular:

**WARNING!**

**Danger through incomplete documentation**

- Preparing a risk assessment and implementing the results in operating instructions
- Checking regularly whether the operating instructions are in line with the current regulations
- The operating instructions must also contain the reaction to a possible alarm event.
- Provide for an annual inspection.

## 2.3 Qualification

**WARNING!**

**Danger to persons and environment if qualification not adequate**

The staff must be qualified to independently recognise and avoid potential dangers.

Companies that operate the leak detectors should have completed respective training with SGB, through SGB or its authorised representative.

National guidelines must be adhered to.

For Germany:

Certified company qualification for the installation, starting up and servicing leak detection systems.

## 2.4 Personal Protective Equipment (PPE)

It is necessary to wear protective gear while working.

- Wear the protective gear required for the respective task
- Observe and obey the signage on PPE signs

Entry in "Safety Book"

Wear suitable safety vest

Wear suitable safety boots

Wear suitable protective helmet

Wear suitable gloves – where required

Wear goggles – where required

## 2.5 Fundamental Hazards


**DANGER**

Due to explosive steam-air mixtures

Explosive steam-air mixtures may be present in the sensors, connecting lines and in the pump unit.

Check that no gas is present before starting and performing work

Observe ex-regulations such as e.g. BetrSichV (Work Safety Ordinance) (or RL 1999/92/EG and the resulting laws of the respective member states) and/or others.

**DANGER**

Due to working in shafts

The detonation flame arresters are also installed in dome shafts. The shaft must be inspected for the installation.

Before the inspection ensure that the necessary safety measures have been taken, there is no gas present and that there is sufficient oxygen.

## 2.6 Warning notices according to DIN EN ISO 16852:2010

*DET ≙ Denotation flame arrester*

*DEF ≙ Deflagration flame arrestor*

*VDEF ≙ Space monitoring device*

*4 ≙ Tested for stable detonations without flow disruption*

*$L_u$/D ≙ Ratio of pipe length to pipe diameter (pipe safety)*

*BC: c ≙ No combustion time (c) under stabilised burning (BC)*

*Ex. Gp ≙ Gas group*

*II ≙ Device group "Use in all other areas except mining"*

*G ≙ Ex-atmosphere caused by gases, vapours or mist*

*IIA / IIB3 / IIC ≙ Gas group*

*$T_0$ ≙ Maximum operating temperature*

*$p_0$ ≙ Maximum operating pressure (absolute pressure)*

*$V_u$ ≙ Maximum upstream volume*

### a) F 501

| Warning | | | |
|---|---|---|---|
| Flame arresters have installation and usage limitations.<br>Type designation in compliance with ISO 16852. | | | |
| DET4 | $L_u$/D = 50 | BC: c | |
| | Ex. Gp IIB3 | $T_0$ = 90°C | $p_0$ = 110 kPa (abs) |

| Warning | | | |
|---|---|---|---|
| Flame arresters have installation and usage limitations.<br>Type designation in compliance with ISO 16852. | | | |
| DEF | $L_u$/D = 50 | BC: c | |
| | Ex. Gp IIB3 | $T_0$ = 90°C | $p_0$ = 110 kPa (abs) |

| Warning | | | |
|---|---|---|---|
| Space monitoring devices have installation and usage limitations.<br>Type designation in compliance with ISO 16852. | | | |
| VDEF | $V_u$/D = 1.5 l | BC: c | |
| | Ex. Gp IIB3 | $T_0$ = 90°C | $p_0$ = 110 kPa (abs) |

### b) F 502

| Warning | | | |
|---|---|---|---|
| Flame arresters have installation and usage limitations.<br>Type designation in compliance with ISO 16852. | | | |
| DET4 | $L_u/D = 50$ | BC: c | |
| | Ex. Gp IIA | $T_0 = 60°C$ | $p_0 = 400$ kPa (abs) |
| | $L_u/D = 30$ | BC: c | |
| | Ex. Gp IIC | $T_0 = 60°C$ | $p_0 = 110$ kPa (abs) |

| Warning | | | |
|---|---|---|---|
| Flame arresters have installation and usage limitations.<br>Type designation in compliance with ISO 16852. | | | |
| DEF | $L_u/D = 50$ | BC: c | |
| | Ex. Gp IIA | $T_0 = 60°C$ | $p_0 = 400$ kPa (abs) |
| | $L_u/D = 30$ | BC: c | |
| | Ex. Gp IIC | $T_0 = 60°C$ | $p_0 = 110$ kPa (abs) |

# 3. Technical data of the detonation flame arrester

## 3.1 General data

| | |
|---|---|
| Dimensions, F 501 | SW = 27 mm, L = 50 mm |
| Dimensions, F 502 | SW = 27 mm, L = 55.5 mm |
| Weight, F 501 | 200 g |
| Weight, F 502 | 220 g |
| Storage temperature range | -40°C to +100°C |
| Use temperature range | -20°C to +90°C (F 501)<br>-20°C to +60°C (F 502) |

## 3.2 Ex-data

Explosive steam-air mixtures and pressures:

| | |
|---|---|
| F 501 | II A to II B3 |
| [Ex II G IIB3] | 1.1 bar (abs.) to 5 mbar (abs.)<br>Combustion duration BC: c at $p_{atm}$ |
| F 502 | II A |
| [Ex II G IIC and | 4 bar (abs) to 5 mbar (abs.) |
| Ex II G IIA (to $p_{abs}$ 400 kPA)] | |
| | and to II C |
| | 1.1 bar (abs) to 5 mbar (abs) |
| | Combustion duration BC: c at $p_{atm}$ |

## 3.3 Field of Application

The detonation flame arrester is usually used at interstitial spaces of leak detectors in compliance with the above conditions.

Other uses are feasible as long as the afore-mentioned and following conditions are satisfied.

### 3.3.1 Connection nominal widths

Max. DN 15 (input side)

Max. DN 25 (output side, on the side attached to the component to be protected de)

### 3.3.2 Upstream volume

Max. 1.5 litres (F 501)

### 3.3.3 Materials

F 5.. / V2A The material stainless steel 1.4301 (or similar) must resistant to the occurring vapours and liquids.

F 5.. / V4A The material stainless steel 1.4571(or similar) must resistant to the occurring vapours and liquids.

# 4. Design and function

## 4.1 Design

The detonation flame arrester consists of the housing, the insert and the centering screw.

The inside diameter is the housing is such that the required standard gap width is observed in conjunction with the outside diameter of the insert.

The centering screw centers the insert and fixes it in place at the same time.

## 4.2 Function

Should an ignition occur in the connected pipeline or in the connected volume, the flame runs to the detonation flame arrester/pre-volume flame arrester and is extinguished there.

The direction of the arrow with protection specification (see Chap. 8.5) designates the flow direction and points in the direction of the mounted components to be protected.

# 5. Installation and servicing of the detonation flame arrester

## 5.1 Basic instructions

- The documentation is to be read and understood before starting any work. Ask the manufacturer if there is anything unclear.
- Safety guidelines contained in this documentation must be observed.
- Feedthroughs for pneumatic and electric connecting lines must be sealed gas tight, since the ex-atmosphere could otherwise spread.
- Observe relevant accident prevention regulations.
- Observe ex-regulations (regulations that result from the Directive 1999/92/EG such as e.g. Betr.Sich.V)

## 5.2 Installation

- Within the pipes in which explosive steam-air mixtures may occur (e.g., n connecting lines of positive/negative pressure leak detectors).
- As flame arrester e.g. between condensate receptacle and interstitial spaces of a tank/pipeline (component to be protected).
- Installation position is arbitrary.
- The safety device is installed in the connecting lines using a thread fitting with / without screw joint (such as e.g.: bayonet ring, clamping ring or cutting ring fittings). ISO 7-1 and ISO 7-2 must be observed.
- Leak test of connections after installation.
- The safety device must be electro-conductively connected to the plant.

### 5.3 Servicing

- Regular (depending on the operating conditions) visual inspection for soiling and corrosion.
- Replace device if heavily corroded or device has no passage.
- Replace in case of detonation / deflagration.
- Replace only with manufacturer's original spare parts.

## 6. Spare parts

Due to the construction of the detonation flame arrester, only the complete device should always be replaced


**F 501**

| | |
|---|---|
| 340 810 | F 501, V2A |
| 340 820 | F 501, V4A |


**F 502**

| | |
|---|---|
| 340 850 | F 502, V4A |

## 7. Disassembly and disposal

### 7.1 Disassembly

Check that no gas is present before and during work.

Observe or create grounding/equipotential bonding of components.

Close openings gas tight, so that the ex-atmosphere cannot spread.

Avoid working with tools that create sparks (saws, angle grinders...) when removing the device. If it cannot be avoided then observe EN 1127, or area must be free of explosive atmosphere.

Avoid electrostatic charges (e.g. caused by rubbing).

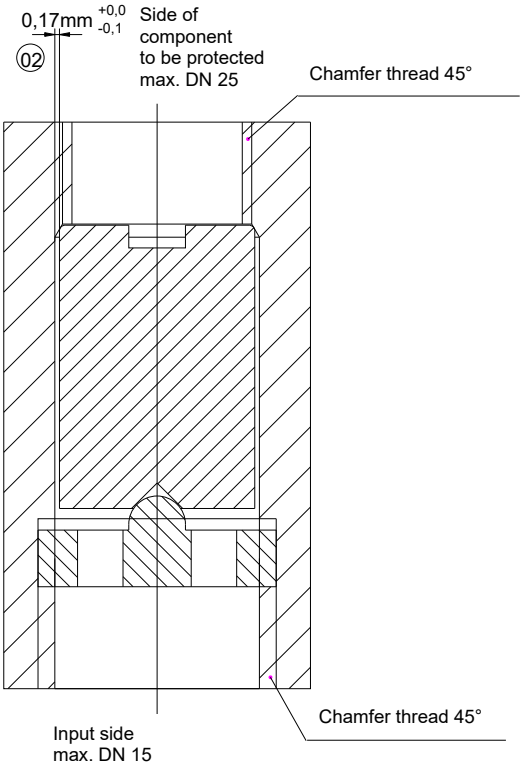
### 7.2 Disposal

Dispose of contaminated components appropriately (possibly allowing outgassing).

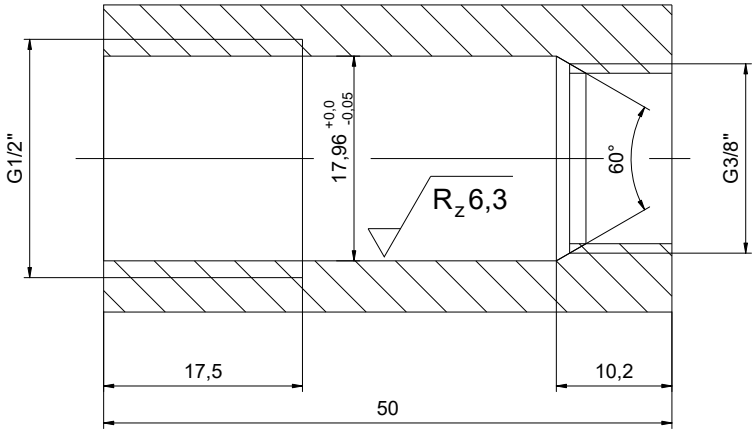
# 8. Appendix

## 8.1 Drawings

### 8.1.1 Assembly detonation flame arrester F 501

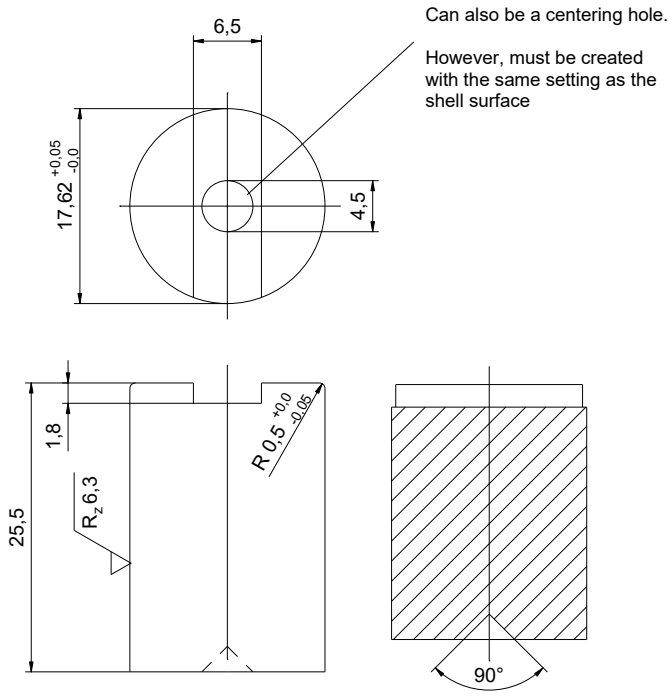



### 8.1.2 Housing F 501

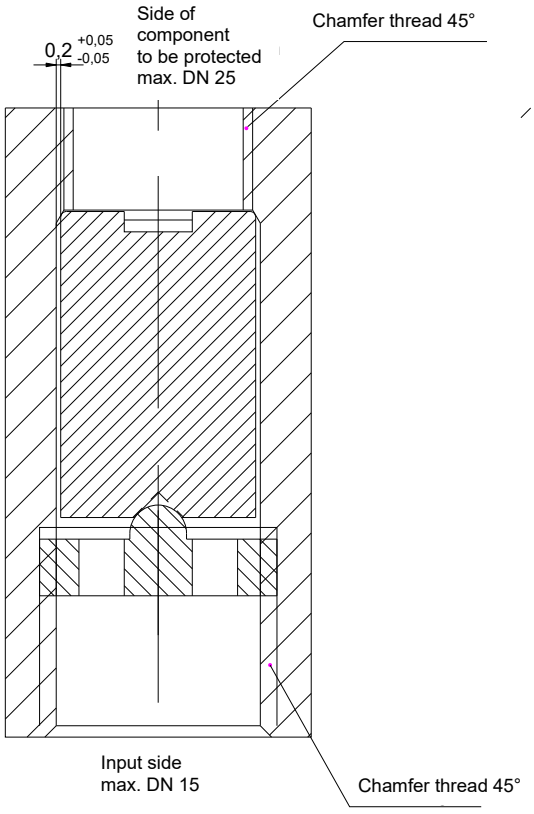



The housing can be purchased with a 1/8" thread instead of a 3/8" thread. The thread depth of 10.2 mm and all other dimensions are retained in both variants.

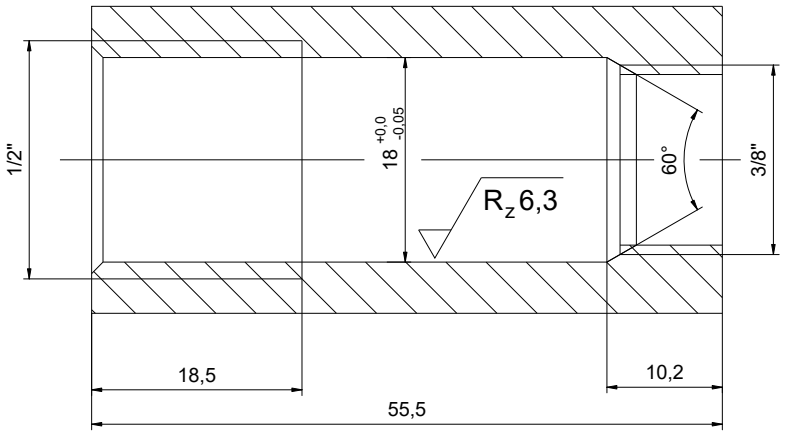
### 8.1.3 Insert F 501



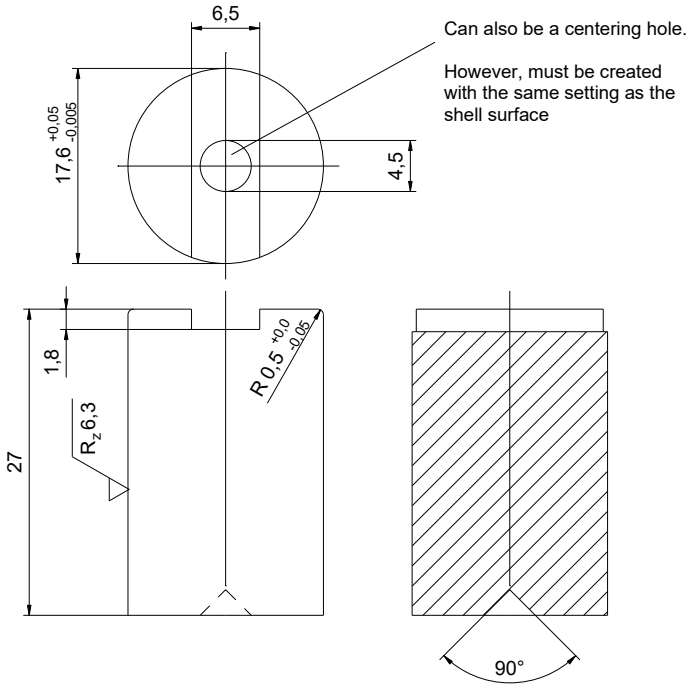

### 8.1.4 Assembly F 502



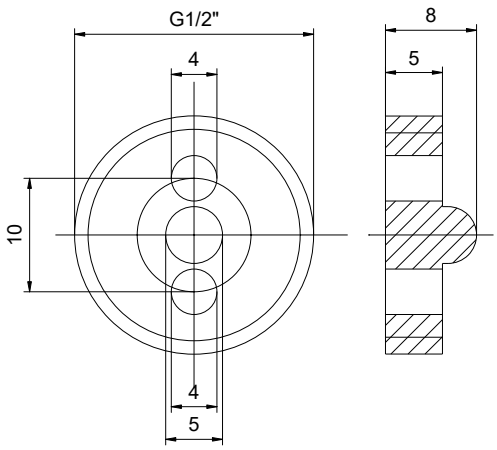
### 8.1.5 Housing F 502




### 8.1.6 Insert F 502



### 8.1.7 Centering screw F 501 and F 502



## 8.2 Declaration of Conformity

We,

SGB GmbH

Hofstr. 10

57076 Siegen, Germany,

Hereby declare in sole responsibility that the electronic detonation flame arresters/pre-volume flame arresters

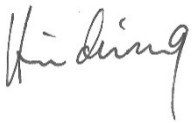
F 501 and F 502

Are in conformity with the essential requirements of the EU directives listed below.

In case the device is modified or used in a way that has not been agreed with us, this declaration shall lose its validity.

| **Number/short title** | **Satisfied regulations** |
|---|---|
| 2014/34/EU<br>Equipment for potentially explosive atmospheres | DIN EN ISO 16852: 2016 |
| EU-type-examination certificate | PTB 02 ATEX 4012X<br>PTB 09 ATEX 4002 |
| Notified body | Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany |
| Identification number | 0102 |
| EU-certificate, QM system | TÜV-A 18ATEX3054Q |
| Issued by | TÜV Austria Services GmbH |
| Identification number | 0408 |

Conformity is declared by:



As of: February 2021

ppa. Martin Hücking
(Technical director)

## 8.3 Ex-approval, F 501

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

# EU-TYPE-EXAMINATION CERTIFICATE

(Translation)

(1)

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

**PTB 02 ATEX 4012 X** **Issue: 3**

(4) Product: Detonation / pre-volume flame arrester, type F 501

(5) Manufacturer: SGB GmbH

(6) Address: Hofstraße 10, 57076 Siegen, Germany

(7) This protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 18-48004.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

**EN ISO 16852:2016**

(10) If the sign "X" is placed after the certificate number, it indicates that the protective system is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified protective system in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this protecitve system. These are not covered by this certificate.

(12) The marking of the protective system shall include the following:

**II G IIB3**

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Dr.-Ing. D.-H. Frobese
Oberregierungsrat

Braunschweig, February 28, 2018

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EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

# SCHEDULE

(13)

(14) **EU-Type Examination Certificate Number PTB 02 ATEX 4012 X, Issue: 3**

(15) Description of Product

The flame arrester of the type F 501 is to prevent the transmission of flames along pipelines, should a stable detonation occur in the presence of gas/air mixtures and vapour/air mixtures of explosion group IIB3 with a maximum experimental safe gap ≥ 0.65 mm at an operating pressure of up to 110 kPa and operating temperatures ≤ 90 °C. It is to resist explosions of a maximum volume of 1.5 litres of explosive mixtures of explosion group IIB3, maximum experimental safe gap ≥ 0.65 mm, and prevent the transmission of flames into the connected piping system.

(16) Test Report PTB Ex 18-48004

The Test Report consists of 4 pages, drawings (4 pages), and the technical documentation (22 pages).

Result: The protective system meets the requirements for explosion protection as described in item (15).

(17) Specific conditions of use

The following conditions must be complied with, when flame arresters of the type F 501 are used:

1) The nominal diameter of the pipeline on the unprotected side between the potential source of ignition and the flame arrester must not be larger than DN15.
2) Flammable gases and vapours that occur during operation may at an operating pressure up of to 110 kPa (absolute) be gases and vapours of explosion group IIB3 with a maximum experimental safe gap ≥ 0.65 mm.
3) The operating temperature must not be higher than 90 °C and not lower than -20 °C.
4) When used as a pre-volume flame arrester, the unprotected volume must not exceed 1.5 litres.
5) Stabilised burning does not form part of the test programme. This fact must be accounted for when using the flame arrester.
6) The flame arrester was only tested from one side. The protected side must be marked on the flame arrester.

The conditions set out above shall be included in the instructions for operation and be implemented by the operating company.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

**SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 02 ATEX 4012 X, Issue: 3**

(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

According to Article 41 of Directive 2014/34/EU, EC-type examination certificates which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such EC-type examination certificates and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbewertungsstelle, Sektor Explosionsschutz — Braunschweig, February 28, 2018
On behalf of PTB:

Dr.-Ing. D.-H. Frobese
Oberregierungsrat

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## 8.4 Ex-approval, F 502

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(1) **EU-TYPE-EXAMINATION CERTIFICATE**
**(Translation)**

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

**PTB 09 ATEX 4002** **Issue: 1**

(4) Product: Detonation flame arrester, type F 502

(5) Manufacturer: SGB GmbH

(6) Address: Hofstraße 10, 57076 Siegen, Germany

(7) This protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 18-48003.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
**EN ISO 16852:2016**

(10) If the sign "X" is placed after the certificate number, it indicates that the protective system is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified protective system in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this protecitve system. These are not covered by this certificate.

(12) The marking of the protective system shall include the following:

**II G IIC and IIA (up to $P_{abs}$ 400kPa)**

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, February 28, 2018
On behalf of PTB:

Dr.-Ing. D.-H. Frobese
Oberregierungsrat

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EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(13) # SCHEDULE

(14) **EU-Type Examination Certificate Number PTB 09 ATEX 4002, Issue: 1**

(15) Description of Product

The inline detonation flame arrester of the type F-502 is to prevent the transmission of flames along pipelines, should a stable detonation occur in the presence of gas/air mixtures and vapour/air mixtures of explosion group IIC with a maximum experimental safe gap < 0.5 mm at an operating pressure of up to 110 kPa, and of explosion group IIA with a maximum experimental safe gap > 0.9 mm at an operating pressure of up to 400 kPa.

(16) Test Report PTB Ex 18-48003

The Test Report consists of 4 pages, drawings (1 page), and the technical documentation (22 pages).

Result: The protective system meets the requirements for explosion protection as described in item (15).

(17) Specific conditions of use

The following conditions must be complied with, when detonation flame arresters of the type F 502 are used:

1) The nominal diameter D of the pipeline on the unprotected side between the potential source of ignition and the detonation flame arrester must not be larger than DN15.
2) Flammable gases and vapours that occur during operation may at an operating pressure up of to 110 kPa (absolute) be gases and vapours of explosion group IIC with a maximum experimental safe gap < 0.5mm.
3) At an operating pressure of up to 400 kPa (absolute), the gases and vapours that occur during operation may be gases and vapours of explosion group IIA with a maximum experimental safe gap ≥ 0.9 mm.
4) The operating temperature must not be higher than 60 °C and not lower than -20 °C.
5) Stabilised burning does not form part of the test programme. This fact must be accounted for when using the flame arrester.
6) The detonation flame arrester was only tested from one side. The protected side must be marked on the flame arrester.

The conditions set out above shall be included in the instructions for operation and be implemented by the operating company.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

**SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 09 ATEX 4002, Issue: 1**

(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

According to Article 41 of Directive 2014/34/EU, EC-type examination certificates which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such EC-type examination certificates and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbewertungsstelle, Sektor Explosionsschutz — Braunschweig, February 28, 2018
On behalf of PTB:

Dr.-Ing. D.-H. Frobese
Oberregierungsrat

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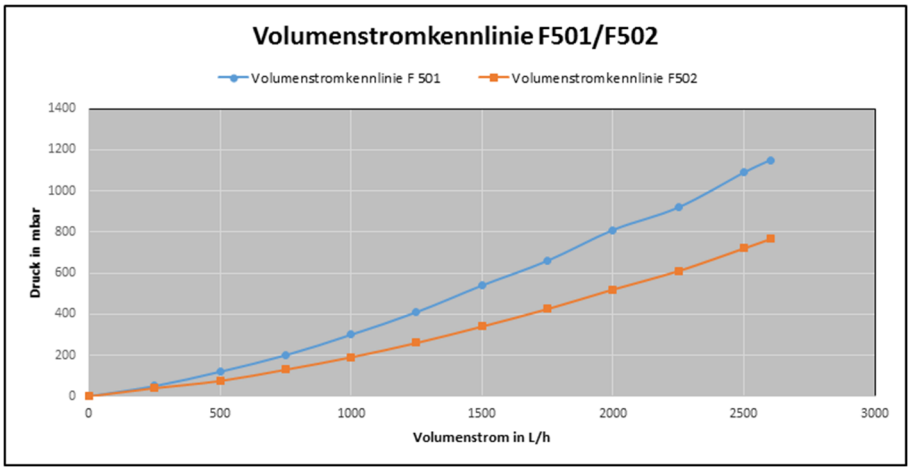
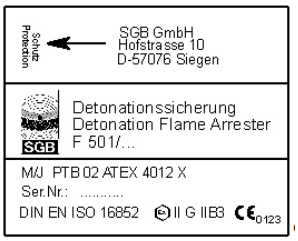
## 8.5 Pressure loss/volume flow diagram

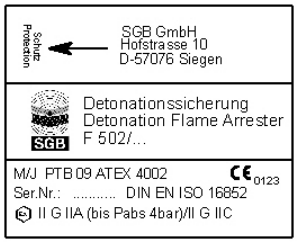



## 8.6 Labelling

Example F 501




Example F 502

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