	<b>FLAME ARRESTER</b> <b>933-S300.1/6x0,5/De1C</b> <b>933-S250.2/6x0,5/De1C</b> <b>933-200.3/6x0,5/De1C</b> <b>INSTRUCTIONS FOR OPERATING AND MAINTENANCE</b>	REV 1.0
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For the flame arrester type 933-S300.1/6x0,5/De1C the data sheet with dimensions and pressure drop/volume flow diagram is available.

## 1. Use

The flame arrester type 933-S300.1/6x0,5/De1C type series 2 and 3 complies with the standard EN 16852:2016 "Flame Arresters-Performance requirements, test methods and limits for use".

The general suitability as an in-line detonation flame arrester when used with inflammable gas/air mixture and vapour/air mixture of inflammable liquids of the explosion group IIB1 (standard gap width  $\geq 0,85$  mm) has been verified by tests executed at the Institute for Safety Technology IBExU Freiberg as a titled inspection authority No. 0637 according to article 9 of the directive 2014/34/EU of the European Parliament and Council. The results of it were confirmed by the issued EC prototype test certificate **IBExU16ATEX2186 X**.

For preventing a flame drift in-line detonation flame arrester as mentioned above can be used with atmospheric conditions [pressure : 0,8 bar (absolute) to 1,1 bar (absolute) and temperature : -20°C to +60°C] for protection against stable detonations, deflagrations and short-time burning of explosive vapour/gas - air - mixtures of the explosion group IIB1 on the flame arrester. In addition to that the following specific limits for the maximum permissible operating pressure  $p_0$  and the maximum permissible operating temperature  $T_0$  shall be kept:

Table 1 : Limits

DN	$p_0$ bar (absolute)	$T_0$ °C
300/250/200	1,2	120

For the case of an after burn on the flame arrester element the flame arrester is equipped with an integrated temperature sensing element (resistance thermometer). In the case of exceeding the operating temperature by  $\geq 20$  K a temporary unlimited after burn on the flame arrester element shall be prevented by installing a resistance thermometer at the unprotected side of the flame arrester in connection with an automatic initiating of emergency functions (interruption or blanketing of the mixture flow).

On delivery of the devices the technical parameters of the flame arrester with stating the EC prototype test certificate number are documented in the works test certificate according to EN 10204. In the declaration of compliance it is referred to the accordance with the harmonized standard EN 16852:2016 and EN 1127-1:2011, part 1. The maintenance of the basic safety requirements according to directive 2014/34/EU has been confirmed.


## 2. Construction

The flame arrester consists of the flame arrester element (3) chucked between the covers (1) and (2), the O-rings (4) for the outer sealing and the connecting elements threaded bolt (5) and hexagon nut (6) with protection cover (7). In the case of an application as a double-sided operating (bi-directional) flame arrester two covers (1) are used.

In its grid cage (8) the flame arrester element (3) allocates six metal foil elements (9) and (10) with different directions of winding : (9) = right-wound, (10) = left-wound. The metal foil elements are kept at a distance by clamp (11) and spacer (12) and axially fastened with the stars (13) and (30) by means of the screw (14). Against loosening the screw (14) is safeguarded by a locking plate (15) and additionally by an adhesive in the thread. The flame arrester element is positioned between the covers (1) and (2) by the eyebolts (17) which are kept by the threaded bolts.

On the inner sides of the cover flanges some connecting screws have additional nuts (6) and plates (18) which make an axial constricting possible for dismantling the flame arrester element.

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Two thread holes situated on the covers (1) are closed by the screw plug (19) and the appropriate gasket rings (20). The screw plug on the bottom-side is used as a condensate outlet. With the installation of a resistance thermometer the screw plug on the upper flange part will be exchanged together with the gasket ring on-side. On customer's demand there will be thread holes M10x1 for pressure measuring on the inlet and outlet flange which are closed by screw plug (22) and gasket ring (23).

### 3. Marking

The information for marking the flame arrester are arranged on the nameplate (position 25). The following data are indicated:

- name and address of the manufacturer
- serial number (including year of production and serial number)
- type title
- number of the certificate (EC prototype certificate-no.)
- EN number
- the specific mark for prevention of explosions in connection with the mark indicating the group of devices II, and the letter "G" (for areas where explosive gas, vapour, air mixtures are present)
- explosion group
- the CE mark with the number of the indicated inspection authority, which acts during production observance

The flame arrester is marked on the grid cage, as follows: BS&B-6x0,5.

The metal foil element is marked at the outermost winding element, as follows:

- short name of the manufacturer
- gap width
- material number
- direction of winding

example: BS&B – 0,5 – 1.4571 – R

The marking of the parts tested on leak proofness and strength is done by stamping.

The saved side is marked by a red sticker.

The flame arrester is marking on the cover (1) by a sticker (27) with the warning about short time burning if the flame arrester is equipped with a resistance thermometer.

### 4. Installation


The arrangement and the installation of the flame arrester in the plant shall be done under observance of the rules applicable to the relevant range of use. Especially the instructions for accident prevention have to be observed.

Before the installation in the pipe line the flange covers shall be removed.

The criteria stated in the EC prototype test certificate stated in point 17 – Special Conditions for the Safe Usage – have to be kept. Especially the use of the resistance thermometer for signaling an after burn on the flame arrester shall be checked.

The following assembly instructions must be observed under any circumstances:

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- The flame arrester shall only be installed in pipelines whose nominal widths are smaller or equal the connection nominal width of the flame arrester.
- If a temporary unlimited after burn on the flame arrester element cannot be excluded, at least one resistance thermometer shall be mounted on the side towards the ignition source. The marking (red point) on the cover (2) shows the connecting piece which shall be connected to those plant part which shall be protected against flame drift. In the case of a bi-directional type of the flame arrester temperature sensing elements can be fastened on both sides of the flame arrester element.

The flame arrester is equipped with a flange type according to ISO 7005-1 (steel flanges) in the pressure steps PN 10 and PN 20 – with flange type 11 : welding neck flange and sealing strip type B : RF. The pressure step PN 20 is compatible with the American flange class 150 RF according to ANSI B16.5. For the flanged joints flat gaskets with a sealing parameter  $k_{okD} \leq 25b_D$  are recommended. While flanging be careful that the sealing strips are not damaged and there is no foreign matter or dirt between the flanges, so that no gap to the atmosphere can occur. That's why a leakage test of the plant shall always be carried out before initial operation. The test pressures of the flame arrester stated in the test certificate EN 10204 must not be exceeded.

The flame arrester must not be a bed for the pipe and should be installed with only little stress. For dismantling the flame arrester element from the flame arrester a support of the pipeline is necessary immediately before and after the flame arrester which makes an axial movement of the pipeline possible.

For dismantling the flame arrester element and the resistance thermometer assembly freedom is necessary with the dimensions according to the table 2 minimum (compare spare part drawing, sheet 6/6).


Table 2: Dismantling dimensions and weights of the flame arrester element

DN		300/250/200
D	mm	730
E	mm	1120
Weight (stainless steel)	kg	146

The resistance thermometer delivered separately from the flame arrester has to be assembled by exchanging the screw plug in the appropriate thread hole of the cover flange part with the associated gasket ring. The screw joint is to be safeguarded against loosening by applying Loctite 221 to the thread.

When the temperature sensing element is fitted to the measuring device the installation guide lines of the resistance thermometer's manufacturer and the conditions for guaranteeing the compliance have to be considered. The circuit between the resistance thermometer and the device for stopping the mixture input or another equal event (release of an emergency function) has to be carried out in that way so that within 30 seconds after recognizing the flame by the resistance thermometer the hazardous state can be stopped.

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## 5. Maintenance

The maintenance includes a periodic visual control of the flame arrester, especially of the metal foil elements with regard to contamination and appearance as well as a periodic function control of the resistance thermometer. The intervals for the maintenance works depend on the operating conditions and how the individual media tend to contamination. They are determined by the operator. In order to check the level of contamination in the installed state a pressure leakage test would be useful, wherein a permanent bypass of the flame arrester is not permitted.

For cleansing works the flame arrester element has to be taken out of the plant. Therefore, the weights according to table 2 shall be taken into consideration. After dismantling the condition of the gasket ring (4) can be checked.

In case of minor contamination the flame arrester element shall be blown up with compressed air or hot vapour against the operating flow.

In case of major contamination or sticky impurity of the metal foil element a flushing with a cleansing agent can be carried out. After cleansing all parts which had been wetted by a cleansing agent shall be blown dry.

During the cleansing works no mechanical modifications may be done on the metal foil element or on the housing parts of the flame arrester. The tight position of the screw (14) safeguarded against loosening shall be checked (table 3).

Table 3: Tightening torque of the screw (14)

<b>DN</b>		<b>300/250/200</b>
Tightening torque	Nm	400

The occurrence of explosions with a succeeding stabilized burning at the flame arrester element leads to major mechanical and thermal stress. If due to a fire on the metal foil element changes in the burning structure appear or winds were loosened the flame arrester element has to be replaced.

On principle, the flame arrester element has to be replaced by a new one, if:

- a fire occurred at the flame arrester element
- loosening or distortions in the structure of the metal foil elements can be recognized
- corrosion damages on the metal foil elements have been detected
- in case of strongly contaminated metal foil elements, even after cleaning, a residual contamination of more than 30 % of the free flow cross-section remained

All works in connection with the cleaning and replacement of a flame arrester element shall be executed only by trained and authorized skilled personnel.

After a fire on the flame arrester element the functionality of the resistance thermometer shall be checked.

For exchanging the gasket rings (4) please slightly lubricate the parts using the silicone grease (order-no. 00 027 079) before reinstallation. During the assembly do not slide them over sharp edges.

The cover screws shall be slightly lubricated in the thread with the high pressure grease (order-no. 00 028 267) and fastened with a torque according to table 4.

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Table 4: Tightening torque of the screw joints (5), (6)


<b>DN</b>		<b>300/250/200</b>
Tightening torque	Nm	230

The outer density of all pressure loaded flange and tread joints shall be checked.

It is recommended to hold a spare flame arrester element ready for each flame arrester.

In case of replacement of structural units only original spare parts listed in the spare parts list may be installed to ensure the required safety.

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## 6. Spare part list

Table 5 : Spare parts 933-S300.1/6x0,5/De1C

Item No.	Designation	No	Material	Order-No.
				DN300/250/200
3*	Flame arrester element 6x0,5 Flame arrester element 6x0,5-VF Flame arrester element 6x0,5-N Flame arrester element 6x0,5-VF Flame arrester element 6x0,5-VF Flame arrester element 6x0,5-VF	1	NSt NSt NSt H-C4 H-C22 H-C276	FET15540582 FET15540582VF FET15540582N FET15540586VF FET15540590VF FET15540594VF
4*	O-ring	2	FPM FEP NBR	782072100 802046800 782071300
5	Threaded bolt	14	St NSt	222026123 222025923
6	Hexagon nut	36	St NSt	201521839 201542723
7	Fender	28	K	722044300
18	Plate	8	St NSt	302034300 302049700
19	Screw plug	2	St NSt H-C4 H-C22 H-C276	215031200 212097500 432043500 232043500 232072400
20*	Gasket ring	2	LM PTFE	504650200 532036000
21*	Ex(i)-thermometer 3-conductor 4-conductor 3-conductor + transmitter	1	NSt	662037020 662068423 662071523
22	Screw plug	2	St NSt H-C4 H-C22 H-C276	215130500 212025100 432042700 232042700 232073200
23*	Gasket ring	2	LM PTFE	504580700 532037700

Attention: Parts marked with \* shall be available for maintenance works.

### Material marks

St ... Steel	LM ... Light alloy	FPM ... Vitone	FEP ... fluoricplasics(VF)
NSt ... Stainless steel	K ... Plastics	NBR ... Perbunan(N)	PTFE .. fluoricplasics
H-C4 ... Hastelloy C4	H-C22 ... Hastelloy C22	H-C276..Hastelloy C276	

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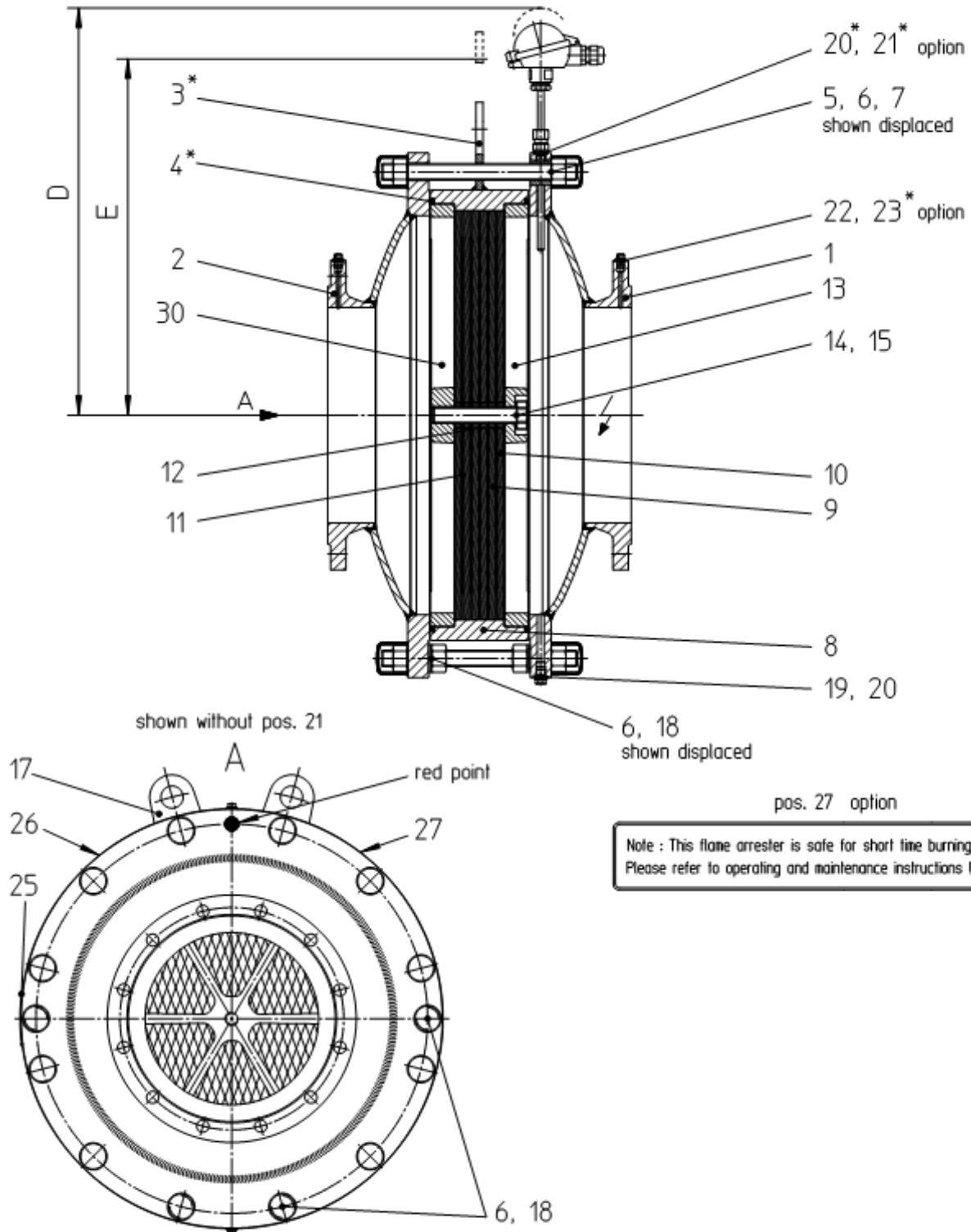


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Spare part drawing



Note: Parts marked with \* shall be available for maintenance works.  
Dimensions D and E are dismantling dimensions.

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