

	Flame Arrester 933-S50.1/4x0.4/EOP1T1 to 100.1/4x0.4/EOP1T1 Instructions for Operating and Maintenance	REV 1.0
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This Instruction for Operating and Maintenance is applicable for the following flame arrester models:

Table Type description

Nominal width	Type	EC-Type Examination Certificate Number
DN50 / 2"	933-S50.1/4x0,4/EOP1T1	IBExU19ATEX2111 X
DN65 / 2 1/2"	933-S65.1/4x0,4/EOP1T1	
DN80 / 3"	933-S80.1/4x0,4/EOP1T1	
DN100 / 4"	933-S100.1/4x0,4/EOP1T1	

The data sheet with dimensions and the pressure drop/volume flow rate diagram are available.

1. Use

The said models of the series 1 with flange joint of the nominal widths DN50 to DN100 meet the requirements of the European Guideline 2014/34/EU and the harmonised standard for flame arresters EN ISO 16852:2016 as autonomous protection systems for intended use in potentially explosive atmospheres.

Its general suitability as an **in-line deflagration flame arrester** for use in inflammable gas/air mixtures and vapour/air mixtures of inflammable liquids of explosive ethylene oxide /air mixture was proved in a test at the Institut für Sicherheitstechnik GmbH IBExU Freiberg as EUROPEAN NOTIFIED BODY no. 0637 according to Article 9 of the Guideline 94/9/EC.

For preventing a flame transmission, these in-line deflagration flame arresters can be used in atmospheric conditions [pressure: 0,8 bar (absolute) to 1,1 bar (absolute), temperature: -20°C to +60°C] for protection against deflagrations and short time burning at the flame arresters for explosive vapour/gas-air mixtures of the explosive ethylene oxide/gas mixture.

Furthermore, the limit values according to Table 1 for the maximum permissible operating pressure p_0 considering the maximum permissible operating temperature T_0 and the maximum permissible distance for potential source of ignition L_u must be adhered to:

Table 1: Limits for the operating status

Nominal width	p_0 MPa (absolute)	T_0 °C	L_u m
DN50 / 2"	0,11	60	1,50
DN65 / 2 1/2"			1.95
DN80 / 3"			2.4
DN100 / 4"			3.0


The flame arrester can be equipped in the case of stabilized burning on the flame arrester element with one or more integrated temperature sensors (resistance thermometers) on both the sides.

A stabilized burning on the flame arrester element must be stopped by installing an integrated temperature sensor at the unprotected side of the flame arrester in connection with an automatic triggering of emergency functions (interruption or inertisation of the mixture flow) when the operation temperature of ≥ 20 K is exceeded.

The maximum permissible burning duration t_{BT} for short time burning at the flame arrester is 1 min.

With the delivery of the flame arrester, the technical parameters are documented along with the EC-Type Examination Certificate Number in the factory test certificate.

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The Essential Health and Safety Requirements in accordance with the European Guideline 94/9/EU are assured by compliance with the harmonized standards specified in the Declaration of Compliance.

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 hexagon screw (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 four metal foil elements (9) and (10) with different directions of winding. 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 hexagon screws or the threaded bolt (5).

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.

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 (21) the screw plug on the upper flange part will be exchanged together with the gasket ring on-side. If a redundant position of the resistance thermometer is required it is carried out by shifted holes in the upper cover half.

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 informations 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-4x0,4.

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 – 0,4 – 1.4571 – R

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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:

- The FDS shall only be installed in pipelines whose nominal widths are smaller or equal the connection nominal width of the flame arrester.
- The distance between the ignition source and the flame arrester must not exceed a L/D-relation of 30 (compare point 1 – maximum permissible distance between ignition source and 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) and ISO 7005-2 (cast iron flanges) in the pressure steps PN 10 and PN 20 – with flange type 21 : integral 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 $k_D \leq 25b_D$ 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 1 minimum (compare spare part drawing, sheet 6/6).

Table 1: Dismantling dimensions and weights of the flame arrester element.

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DN		50	65	80	100
D	mm	400	410	450	470
E	mm	300	340	400	460
Weight	kg	4,4	6,8	10,6	14,2

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.

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 1 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 2).

Table 2: Tightening torque of the screw (14)

DN		50	65	80	100
Tightening torque	Nm	12	12	25	25

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

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- 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. 702015500) 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. 700556600) and fastened with a torque according to table 3.

Table 3: Tightening torque of the screw joints (5), (6)

DN		50	65	80	100
Tightening torque	Nm	20	20	30	30

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 BS&B 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 4 : Spare parts BS&B 933-S50.1 to 100.1/4x0,4/EO

item No.	Designation	No.	Material	Order-No.			
				DN 50	DN65	DN80	DN100
3*	Flame arrester element 4x0,4-VF	1	NSt	FET15516740VF	FET15519740VF	FET15522740VF	FET15525740VF
	Flame arrester element 4x0,4-VF	1	H-C4	FET15516751VF	FET15519751VF	FET15522751VF	FET15525751VF
	Flame arrester element 4x0,4-VF	1	H-C22	FET15516753VF	FET15519753VF	FET15522753VF	FET15525753VF
	Flame arrester element 4x0,4-VF	1	H-C276	FET15516755VF	FET15519755VF	FET15522755VF	FET15525755VF
4*	O-ring	2	FEP	802034700	802039600	802031400	802003300
5	Threaded bolt	6	St	232029139			
	Threaded bolt	6	NSt	232024239			
	Hexagon screw	6	St			232037123	
	Hexagon screw	6	NSt			232038823	
6	Hexagon nut	20	St	200507239			
	Hexagon nut	20	NSt	201268223			
	Hexagon nut	14	St			201358739	
	Hexagon nut	14	NSt			340050623	
7	Fender	12	K	700001400			
	Fender	6	K			702014700	
18	Plate	8	St	305420700		305480100	
	Plate	8	NSt	322050200		302050300	
19	Screw plug	2	St	215031200			
	Screw plug	2	NSt	212097500			
	Screw plug	2	H-C4	432043500			
	Screw plug	2	H-C22	232043500			
	Screw plug	2	H-C276	232072400			
20*	Gasket ring	2	LM	504650200			
	Gasket ring	2	PTFE	532036000			
21*	Ex(i)-thermometer						
	3-conductor	1	NSt	662026620			662036200
	4-conductor	1	NSt	662076423			662067623
	3-conductor + transmitter	1	NSt	662077223			662070723
22	Screw plug	2	St	215130500			
	Screw plug	2	NSt	212025100			
	Screw plug	2	H-C4	432042700			
	Screw plug	2	H-C22	232042700			
	Screw plug	2	H-C276	232073200			
23*	Gasket ring	2	LM	504580700			
	Gasket ring	2	PTFE	532037700			

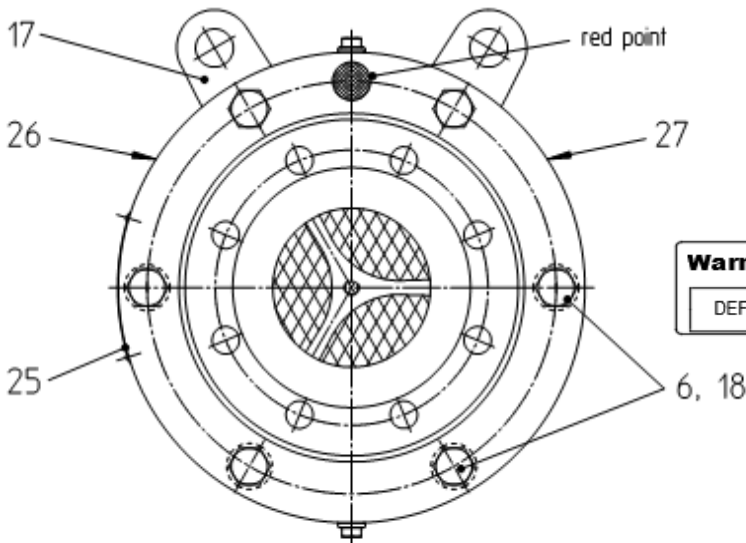
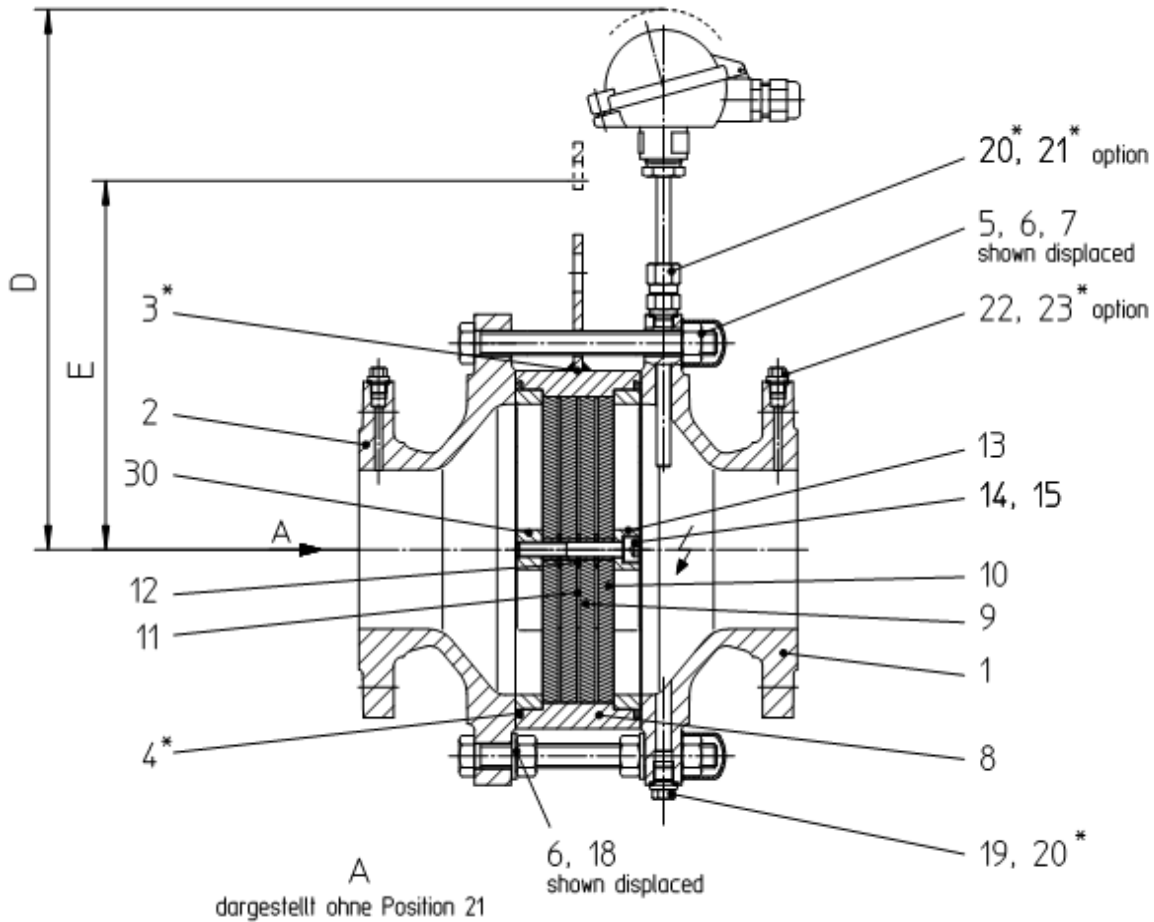
Attention: Parts marked with * shall be available for maintenance works.

Material marks

St ... steel	LM ... light alloy	FEP...fluoricplastics(VF)
NSt ... stainless steel	K ... plastics	PTFE ...fluoricplastics
H-C4... Hastelloy C4	H-C22 ...Hastelloy C22	H-C276 ... Hastelloy C276

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Spare part drawing DN100



Note : This flame arrester is safe for short time burning !
 Please refer to operating and maintenance instructions !

pos. 26

Warning			
Flame Arrester have build and application limits type designation according to ISO 16852			
DEF	L/D = 50	BC: c	l _w = --
Ex G EO	T _v = 60 °C	p _r = 0.11 MPa	

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