Installation, Operation and Maintenance Manual

FLAME ARRESTER

KOREA STEEL POWER CORP.

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1. Introduction

Flame arrester is designed, manufactured and tested according to ISO 16852 code. Flame arrester is passive device with no moving parts. Flame arrester prevents the propagation of flame from the exposed side of the unit to the protected side by the use of wound crimped metal ribbon type flame cell element. If the mixture gas is ignited and the flame begins to back through the piping system, the flame arrester will protect the vapor gas storage tank from flame.

The international standard is valid for pressure ranging from 80 kPag to 160 kPag and temperatures ranging from -20°C(-68°F) to +150°C(+302°F). Our standard operating temperature and pressure of flame arrester is 60°C and 0.11 Mpag but other specifications are available up to request

Installation, operation and maintenance manual is intended to be used for flame arrester we supply. It is recommended to read this manual before handling the flame arrester.

From our website you can find more information like drawing, sizes range with our catalog.
www.ikspc.com

2. Safety precaution

In terms of their hazard potential, in addition to being subject to these instructions, our flame arrester should also be handled in accordance with general safe handling instructions. The handling and use of our flame arrester should be entrusted to properly trained personnel.

Proper installation, operation and maintenance are essential to protect and make flame arrester operate properly. This manual shows how to install, operate and maintain our flame arrester.

Prior to handling the flame arrester, personnel should be well informed this manual.

We noted 'Caution messages' in this manual. Make sure to be cautious prior to perform the procedures.

2.1 Explosive condition

Be safe and careful about the explosive mixture. Explosive mixtures can burn in various ways. The relevant combustion processes for flame arrester is defined by international standards. The following as below can influence the combustion process :

- The chemical composition of the mixture
- Possible pressure waves
- Pre-compression
- The geometric shape of the combustion chamber
- The flame propagation speed

3. Transportation and Storage

3.1 Transportation

All of our flame arresters are packed in wooden case with handling marks. Prior to handle the wooden case, make sure to check the marks, size and weight of the case.

When loading or unloading our flame arrester, ensure that it is handled with care and not subjected to sudden impacts like knocks or clashing. When unloading the wooden case on the site, make sure of a dry, dust and vibration free location.

If the flame arrester is to be shipped further after unloading, make sure to examine thoroughly the wooden case and each individual flame arrester is properly protected against damage and properly packed, taking into account the means of shipment.

3.2 Storage

On receipt of the wooden case at their destination, it should be examined thoroughly for signs of mishandling or damage during shipment, exposure to rain and/or ocean spray or ingress of foreign debris., it also should be examined thoroughly for any damages like foreign debris, scratch, corrosion and so on.

The wooden case should be on the flat-site without vibration. The storage environment must keep protect against harmful insects, vermin and chemicals. On site, after taking out the flame arrester, it must be stored properly to protect against mechanical damage, ingress of foreign objects and corrosion from the water.

We recommend that the flame arrester should be taken out the wooden case for concerning contamination and stored inside warehouse.

Unpack the wooden case and take out products with precaution as below.

* Precaution

a) Unloading and disassembling the wooden case should be on the site with dust, vibration and uneven free location. And when disassembling the wooden case, make sure that flame arrester is not subjected to scratch and/or any impacts.
b) Prior to taking out the flame arrester from the wooden case, make sure the lifting eye nuts of the flame arrester are fastened. Our flame arrester should be handled with a rope slung to the body of the flame arrester.

After taking out the flame arrester, perform visually inspection all flame arresters at first. Check the condition of the painted and uncoated surfaces from corrosion. If corrosion is observed, remove it and treat with rust-prevention agent.

The flame arrester is necessary to be stored proper condition such as flat-site without dust, vibration, harmful insects, vermin and chemicals. The suitable temperature from -29°C(-20°F) to 48°C(120°F) and humidity between 10% and 60% should be maintained.

Our flame arrester is packed with protective cap on/in all openings. Do not remove the protective cap prior to installation and use in order to protect uncoated surfaces and/or flange.

If protective cap is removed for inspection and/or checking purpose, ensure that the cap is put back in it's place and perform an anti-corrosive treatment.

3.3 Long-term storage

Long-term storage is not recommended, unless otherwise explicitly agreed with K.S.P.C. If there needs to be stored over 1 month, follow as below. When storing for long-term, prior to installation and/or use extra attention should be paid to the condition of the flame arrester.

We also recommend that the flame arrester should be taken out the wooden case and stored inside warehouse during long term storage (over 1 month).

Superficial corrosion can be found on both interior and exterior surfaces after storage of over 6 months. This superficial corrosion does not affect the functionality of the flame arrester but periodic inspection and care are necessary.

Protective cap and grease protect the metal surface of the flame arrester from corrosion. So, never remove the cap prior to installation and/or use and periodic applying grease should be performed on carbon metal surfaces.

Periodic inspections should be performed on flame arresters in long-term storage. The frequency of these inspections should be determined on the basis of storage conditions available. We recommend that flame arrester should be inspected at least 1~3 months when storing long-term and outdoors. Inspect for dirt, humid, temperature or any other type of contamination. If any of the former are found, the flame arrester should be thoroughly cleaned and dried.

If you need to store the products in a wooden box not taking out, the lid of the wooden case should be opened for air circulation and keep the tent covered to protect against ingress of water and foreign debris. And then check the condition of dehumidifier. And consider removing it and applying new one such as silica gel.

3.4 Outdoors storage

Outdoors storage is not recommended, unless otherwise explicitly agreed with K.S.P.C. When the flame arrester needs to be stored outdoors, follow as below. If it is not stored indoors, all products should be inspected at least every 1 months.

During outdoors storage, ensure to prevent thoroughly rain from entering the flame arrester. The flame arrester must be protected from water.

Outdoors storage period should be limited maximum of 7 days. If the wooden case needs to be stored over 7 days, cover the whole box with water-proof tent and placed at least 100mm high rigid supports, as to make sure that no damp can enter

the flame arrester from as below.

Periodic inspections should be performed on flame arrester during outdoors storage. The wooden case should be examined thoroughly for signs of mechanical damage and exposure to rain. check the condition of products prior to installation.

<Storage wooden box – Outdoors>

4. Installation

The purchaser, contractor and/or end-user are obligated to properly install the flame arrester we supplied in the plant.

Installation errors can affect the normal operation of the flame arrester and cause dangerous and potential accidents such as leakage. So please take notice of the following this manual.

Our flame arrester should be handled with a rope slung to the body of the flame arrester or its designated lifting eye nut.

Prior to install, ensure to check if flame arrester type and element is considered according to system gas and length of piping system from ignition source.
The surface condition of the flange to be installed must be clean, free of scratches, corrosion, foreign debris and flat.

4.1 Deflagration flame arrester

Deflagration is explosion propagating at subsonic velocity.
It is used for protection storage tank from deflagration propagation (< 360 m/s) of flame.

In-line deflagration flame arrester must be installed as below.
The pipe diameter, D shall have the same size as the flame arrester connection. The pipe length from ignition point shall be not less than 10 x D and not greater than 50 x D for gas-air mixture (IIA1, IIA, IIB1, IIB2, IIB3) and not greater than 30 x D for gas-air mixture (IIB, IIC).

4.2 Detonation flame arrester

Detonation is explosion propagating at supersonic velocity and characterized by a shock wave.

Detonation flame arrester is used for protection storage tank from detonation propagation (1600~2200 m/s) of flame.
Detonation flame arrester provide positive protection against flame propagation in piping system that are manifolded or long runs.

In-line detonation flame arrester should be installed as below.
The pipe diameter, D shall have the same size as the flame arrester connection. In-line detonation must installed when the pipe length from ignition point is longer than 50 x D for gas-air mixture ((IIA1, IIA, IIB1, IIB2, IIB3) and 30 x D for gas-air mixture (IIB, IIC).

4.3 Installation Procedure

a) Lubricate all studs and nuts with an appropriate thread lubricant.
b) Make sure the gasket that the material is suitable for the application.
c) Set the flame arrester carefully on the nozzle. Install the studs and tighten nuts hand tight make sure that the flange is not distorted and that the gasket is evenly compressed.
d) Direction of the gas flow is not related with installation.
*KSFD/KSFM detonation model must be checked the direction of the gas flow when installation

After confirming the above, make up the final torque and check that no further nut rotation occurs at the torque value specified on <Table 1>, alternating pattern. At this time, Final check if the flame arrester is installed horizontally with nozzle and the gasket material is suitable for the purpose.

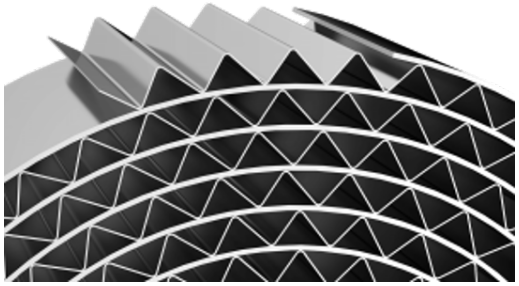
Refer to the <Table 1> and install at the specified torque value. In particularly, if the flame arrester material is aluminum, there could be some risk, so be sure to refer to the torque value.

In case of raised face (R.F) for aluminum flame arrester, consult bolt torque value to protect crack on neck of flame arrester's body.

5. Operation

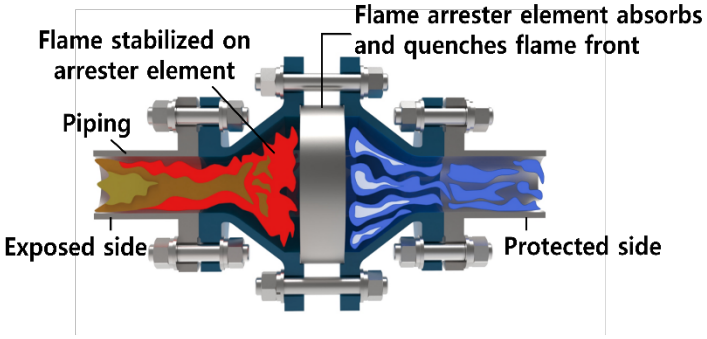
5.1 Principle

Flame arrester is designed, manufactured and tested according to ISO 16852 code. Flame arrester is passive device with no moving parts. Flame arrester prevents the propagation of flame from the exposed side of the unit to the protected side by the use of wound crimped metal ribbon type flame cell element. This construction produces a matrix of uniform openings that are carefully constructed to quench the flame by absorbing the heat of the flame.



<Flame cell element>

This provides an extinguishing barrier to the ignited vapor mixture. Under normal operating condition the flame arrester permits a relatively free flow of gas or vapor through the piping system. If the mixture is ignited and the flame begins to travel back through the piping, the flame arrester will prohibit the flame from moving back to the gas source.



<Operating of flame arrester>

5.2 MESG (Maximum Experimental Safe Gap

Each gases have different flame propagation capacities and are categorized into explosion groups according to their hazard level(Figure 1&2). The standard for this is the MESG = Maximum Experimental Safe Gap, a characteristic number measured in the laboratory for the flame propagation ability of the product.

The MESG width, is the largest gap width between the two parts of the inner chamber of a test setup which, when the internal gas mixture is ignited and under specified conditions, prevents ignition of the external gas mixture through long width (25 mm). When a normal condition, MESG can pass vapor, air, gas etc.

Range of application (marking)		Requirments for test mixture			
Explosion group	MESG of mixture mm	Gas type	Gas purity by volume %	Gas in air by volume[2] %	Safe gap of gas-air mixture mm
IIA1	≥1,14	Methane	≥98	8,4±0,2	1,16±0,02
IIA[b]	>0,90	Propane	≥95	4,2±0,2	0,94±0,02
IIB1[b]	≥0,85	Ethylene	≥98	5,2±0,2	0,83±0,02
IIB2[b]	≥0,75			5,7±0,2	0,73±0,02
IIB3[b]	≥0,65			6,6±0,3	0,67±0,02
IIB1[b]	≥0,50	Hydrogen	≥99	45,0±0,6	1,16±0,02
IIC	<0,50	Hydrogen	≥99	28,5±2,0	1,16±0,02

<Figure 1>

GAS GROUP CHART

Group A
Acetylene

Group B(IIC)
Butadiene
Ethylene oxide
Hydrogen
Manufactured gases containing more than 30% Hydrogen (by volume)
Propylene oxide
Propyl nitrate

Group C (IIB3)
Acetaldhyde
Cyclopropane
Diethyl ether
Dimethylhydrazine
Ethylene
Hydrogen sulfide
*Methanol (methyl alcohol)
Methyl mercoptan
Unisymmetrical dimethyl hydrazine UDMN)

Group D (IIA)
Acelone
Acrylonitrile
Ammonia
Benzene
Butylene
1-Butanol (butyl alcoholl
2-Butand (secondary butyl dcohol
Cyclohexane
N Butyle ocetate
sobutyl gcetate
Ethone.echoll
Ethanol (ethyl alcohol)
Ethyl acetate.
Ethyl acrylate
Ethylene dichloride
Gasoline
Heptanes
Hexanes
soprene
Methane (natural gas)
Methyl acrylate
Methylamine
Methyl ethyl ketone
Methyl mercoptan

GAS GROUP CHART

Group D (IIA)continued)
3-Methyl-1-butanol
isoamyl alcobhol)
Methyl isobutylketone
2-Methyl-1 propanol
isobutyl clcohol)
Methyl-2-propanol
tertiary butyl alcohol
Naphtha (petroleum)
N Propyl acetate
Octanes
Pentanes
1-Pentanol (amyl aloohol)
Propane
1-Propanol (propyl alcohol
2-Propanol (isopropylalcohol
Propylene
Styrene
Toluene
Turpentine
Vinylacetafe
Vinyl chloride
Xylenes

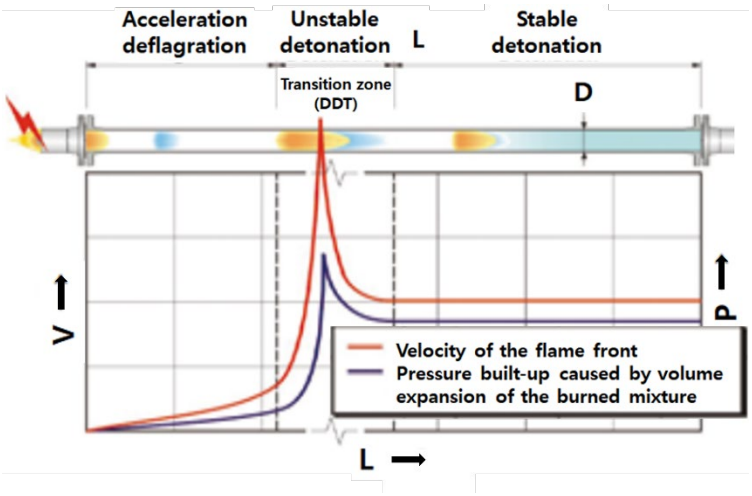
<Figure 2>

5.3 Deflagration & Detonation

A deflagration is characterized by a subsonic flame propagation velocity, typically far below 360 m/s and relatively modest overpressures, typically below 50 kPag (7.3 psig). The main mechanism of combustion propagation is of a flame front that moves forward through the gas mixture - in technical terms the reaction zone (chemical combustion) progresses through the medium by processes of diffusion of heat and mass. In its most benign form, a deflagration may simply be a flash fire.

In contrast, a detonation is characterized by supersonic flame propagation velocities, perhaps up to 1,600 m/s and substantial overpressures, up to 2 Mpag (290 psig). The main mechanism of detonation propagation is of a powerful pressure wave that compresses the unburnt gas ahead of the wave to a temperature above the autoignition temperature. In technical terms, the reaction zone (chemical combustion) is a self-driven shock wave where the reaction zone and the shock are coincident, and the chemical reaction is initiated by the compressive heating caused by the shock wave. The process is similar to ignition in a Diesel engine, but much more sudden and violent.

The position of this transition zone depends on, among other things, the operating pressure and operating temperature, the pipe diameter, the pipe configuration, the test gas, and the explosion group and must be predetermined by experiments in each case (Figure 3).



<Figure 3>

V : Velocity / L : Distance to ignition source
D : Diameter of the pipe line / P : Pressure
DDT : Deflagration to Detonation Transition

6. Maintenance

It is necessary to use the spark free tools for the maintenance work. And the inside of storage tank and connection pipe line should be depressurized and all hazardous of flammable gas freed.
Early detection of minor defects will prevent malfunctioning or major repairs in the future.

6.1 General

Prior to undertaking maintenance activities, please read the general safety precautions and relevant safety rules of the plant.

Maintenance is necessary to regularly check the Teflon, fastener and body for any signs of corrosion or paint damage, in addition to ensuring that the flame arrester can operate

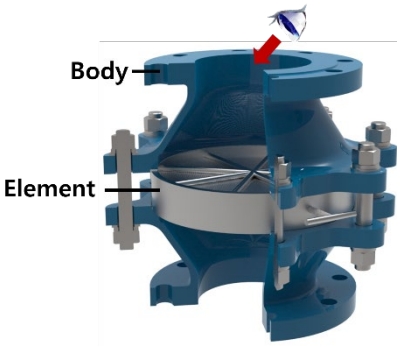
It is recommended to carry out the maintenance in the shop but if it is difficult to remove the flame arrester from the site, preventive measures against toxicity and flammability of the liquid in the tank are required for maintenance.

At least every 6 months, maintenance works have to be done. So please take notice of the following as below.

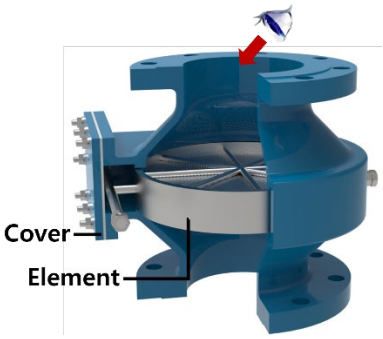
6.2 Cleaning

It is crucial that the flame element is kept clean and free of foreign debris. Be sure to check if foreign substances have penetrated into the flame arrester. In particular if it is observed in the flame element, normal operation is difficult. To remove the foreign substances and any dirt in the flame element, dip it in a solvent wash and blow it with compressed air or high pressure steam (below 7 barg).

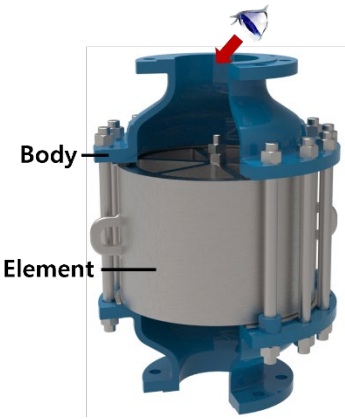
6.3 Maintenance procedure (Disassembly & Check point)



<In line of deflagration type (KSFI)>



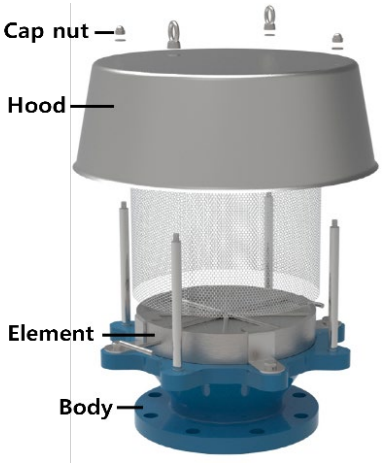
<In line of deflagration type (KSFH)>



<In line of detonation type (KFD)>

a) Check the leakage between body and element
- If it is observed, fasten the nuts

b) Check the condition of the element
- If there is debris in the gap, dip it in a solvent wash and blow it with compressed air or high pressure steam (below 7 barg)
- If damage is confirmed, it should be replaced



<End of line deflagration type (KSFE)>

a) Check the leakage between body and element
- If it is observed, fasten the nuts

b Loosen all nuts of weather hood and open it

* Extra attention should be paid due to spring bouncing (KSFE 1"~4")

c) Check the condition of the element
- If there is debris in the gap, dip it in a solvent wash and blow it with compressed air or high pressure steam (below 7 barg)
- If damage is confirmed, it should be replaced

d) After checking all parts, reassemble weather hood

6.4 Flame element

The aging and other artificial changes of flame element quenching could be a critical for flashback. In this case, replace the flame element ass'y with a new one.

6.5 Spare parts

While maintenance if replacement is needed, it is mandatory to use genuine parts to guarantee proper fit and operation of our flame arrester after maintenance.

When ordering spare parts, please specify the following :
- Type of flame arrester and Model
- Year of manufacture
- Size (Nominal diameter, Length, etc)
- Body markings (Heat No, Material, etc)
- gas group
- Drawing number
- Purchase order number the flame arrester we originally supplied.
- Manufacturing number

7. Periodic inspection

7.1 Every 1 month

- When store the flame arrester in a long period (over 1 month), Inspect the wooden case and flame arrester visually
- When store the flame arrester outdoors, Inspect the wooden case
- Inspect the uncoated surfaces to check corrosion or any damage

7.2 Every 2 months

- Inspect the painted surfaces to check corrosion or any damage

7.3 Every 3 months

- Check the condition of storage environment (humid, dust, etc.,)

7.4 Every 6 months

- Check the condition of flame element

8. Malfunction & Troubleshooting

Prior to disassembling the flame arrester to solve the malfunction, it must be clearly identified.
This guideline provides safe, reliable regulator performance, while this manual cannot cover all possible contingencies.

8.1 General

For troubleshooting, we recommend bringing the flame arrester to a repair shop. But if it is difficult to remove the flame arrester from the site, precautions must be taken against the toxicity and flammability of the liquid in the tank.

Additionally when disassembling/reassembling, parts should be handled with extra attention. If any parts are damaged, we recommend replacing them. If the problem persists after following this manual, please contact us for further assistance.
If corrosion occurs on the flame arrester due to external factors (e.g. mechanical damage, paint damage, chemical reactions, etc.), remove it promptly. If corrosion persists, it could cause serious damage to the flame arrester, so please contact us for assistance.

* After reassembling the flame arrester for troubleshooting, the leakage should be checked.

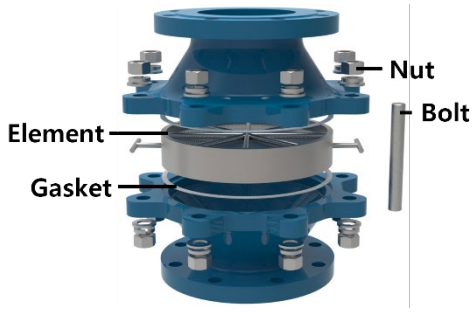
8.2 Leakage

It is most likely that nuts were loosened or gasket are damaged. Check the 2 points as below

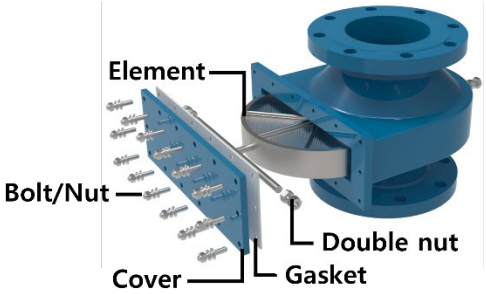
8.2.1 Check if nuts are loosened (See Figure 1~4)

8.2.2 Check the condition of gasket (See Figure 1~4)

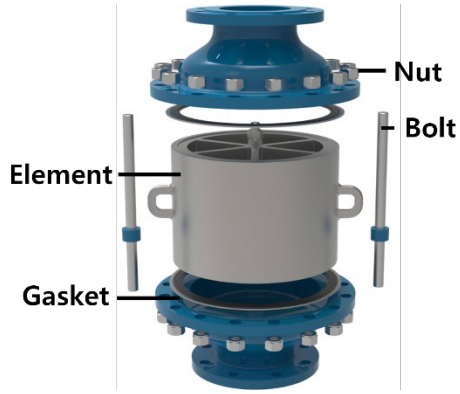
8.2.3 Check the condition of element (See Figure 1~4)



<Figure 1 – Disassembly of KSFI >



<Figure 2 – Disassembly of KSFH>

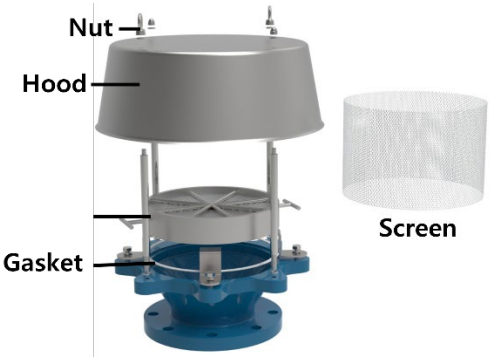


<Figure 3 – Disassembly of KFD >

a) Check the leakage first, fasten all nuts and then if it is not resolved follow as below
b) Loosen the nuts of the body and disassemble it
c) Check the condition of gasket
- If the gasket is not on adequate position, put it on correctly
- If it are damaged/deformed, it should be replaced

d) Check the condition of element
- Refer to 8.3 Defect of element

e) After checking all parts, reassemble it



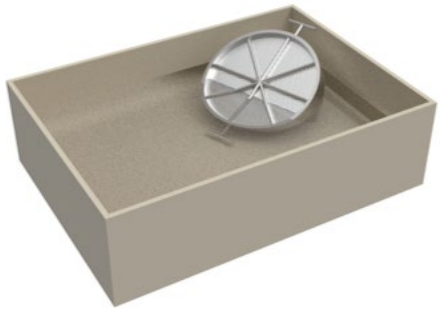
<Figure 4 – Disassembly of KSFE >

a) Check the leakage first, fasten all nuts and then if it is not resolved follow as below
b) Loosen all nuts of weather hood and open it
* Extra attention should be paid due to spring bouncing (KSFE 1″~4″)
c) Check the condition of gasket
- If the gasket is not on adequate position, put it on correctly
- If it are damaged/deformed, it should be replaced

d) Check the condition of element
- Refer to 8.3 Defect of element

e) After checking all parts, reassemble it

8.3 Defect of element (Minor)



<Figure 5 – Element with a solvent wash>

a) Check the condition of element gap
- If there is debris in the gap, dip it in a solvent wash and blow it with compressed air or high pressure steam below 7 barg (See Figure.5)

* According to element material, be careful solvent cleaning
- If the gap are damaged/deformed, it should be replaced

b) The following solvents are recommended for cleaning elements:
– Isopropyl Alcohol (IPA)
– Acetone
– Industrial-grade Paint Thinner (low-residue type only)

<Table 1 – Bolt Torque Values>

Bolt Torque Values – Deflagration type

Mounting	Bolt Torque N-m (Lb-ft)				Stud Bolt Specification		
Flange	Aluminum		C.S / S.S		Q'ty	Thread	
	Raised Face	Flat Face	Raised Face	Flat Face		M	UNC
2″ (50A)	50 (37)	60 (45)	80 (59)	80 (59)	4	5/8″-11	M16-2.0.P
3″ (80A)	50 (37)	60 (45)	80 (59)	80 (59)	4	5/8″-11	M16-2.0.P
4″ (100A)	50 (37)	60 (45)	80 (59)	80 (59)	8	5/8″-11	M16-2.0.P
6″ (150A)	80 (59)	95 (70)	140 (103)	180 (133)	8	3/4″-10	M20-2.5P
8″ (200A)	80 (59)	95 (70)	140 (103)	180 (133)	8	3/4″-10	M20-2.5P
10″ (250A)	120 (89)	135 (100)	200 (148)	230 (170)	12	7/8″-9	M22-2.5P
12″ (300A)	120 (89)	135 (100)	200 (148)	230 (170)	12	7/8″-9	M22-2.5P

<Table 1-1 Recommended Bolt Torque Values -ASME 150# Flange Connection>

Bolt Torque Values – Deflagration type

Mounting	Bolt Torque N-m (Lb-ft)		Stud Bolt Specification	
Flange	Aluminum	C.S / S.S	Q'ty	Thread
				M
2″ (50A)	40 (30)	70 (51)	4	M16-2.0P
3″ (80A)	40 (30)	70 (51)	4	M16-2.0P
4″ (100A)	40 (30)	70 (51)	8	M16-2.0P
6″ (150A)	70 (51)	100 (75)	8	M20-2.5P
8″ (200A)	70 (51)	100 (75)	8	M20-2.5P
10″ (250A)	100 (75)	130 (95)	12	M22-2.5P
12″ (300A)	100 (75)	130 (95)	12	M22-2.5P

<Table 1-2 Recommended Bolt Torque Values -Housing (Body) Flange Connection>

Bolt Torque Values – Detonation type

Mounting	Bolt Torque N-m (Lb-ft)		Stud Bolt Specification		
Flange	C.S / S.S		Q'ty	Thread	
	Raised Face	Flat Face		M	UNC
2″ (50A)	80 (59)	80 (59)	4	5/8″-11	M16-2.0.P
3″ (80A)	80 (59)	80 (59)	4	5/8″-11	M16-2.0.P
4″ (100A)	80 (59)	80 (59)	8	5/8″-11	M16-2.0.P
6″ (150A)	140 (103)	180 (133)	8	3/4″-10	M20-2.5P
8″ (200A)	140 (103)	180 (133)	8	3/4″-10	M20-2.5P
10″ (250A)	200 (148)	230 (170)	12	7/8″-9	M22-2.5P
12″ (300A)	200 (148)	230 (170)	12	7/8″-9	M22-2.5P

<Table 1-3 Recommended Bolt Torque Values -ASME 150# Flange Connection>

Bolt Torque Values – Detonation type

Mounting	Bolt Torque N-m (Lb-ft)	Stud Bolt Specification	
Flange	C.S / S.S	Q'ty	Thread
			M
2″ (50A)	80 (59)	8	M16-2.0P
3″ (80A)	180 (133)	12	M20-2.5P
4″ (100A)	180 (133)	12	M20-2.5P
6″ (150A)	230 (170)	16	M22-2.5P
8″ (200A)	270 (200)	16	M24-3.0P
10″ (250A)	270 (200)	20	M24-3.0P
12″ (300A)	340 (250)	24	M30-3.5P

<Table 1-4 Recommended Bolt Torque Values -Housing (Body) Flange Connection>

<Table 2– Weight of fame arrester>

Deflagration type / Element width : 25 mm(S.S) **Unit : kg**

Model / Size	KSFI	KSFE	KSFH	KSFL
2″ (50A)	15	9	19	25
3″ (80A)	19	13	28	34
4″ (100A)	33	23	39	49
6″ (150A)	51	33	55	80
8″ (200A)	77	51	75	120
10″ (250A)	132	90	152	206
12″ (300A)	177	118	209	262

* For more details, please contact K.S.P.C

<Table 2-1 Weight of Deflagration flame arrester>

Deflagration type / Element width : 25 mm(C.S) **Unit : kg**

Model / Size	KSFI	KSFE	KSFH	KSFL
2″ (50A)	15	9	19	25
3″ (80A)	21	13	27	34
4″ (100A)	33	22	41	49
6″ (150A)	52	33	55	79
8″ (200A)	73	45	75	118
10″ (250A)	131	77	151	204
12″ (300A)	167	117	207	259

* For more details, please contact K.S.P.C

<Table 2-2 Weight of Deflagration flame arrester>

Deflagration type / Element width : 25 mm(AL) **Unit : kg**

Model / Size	KSFI	KSFE	KSFH	KSFL
2″ (50A)	7	5	10	13
3″ (80A)	10	9	12	16
4″ (100A)	16	14	18	23
6″ (150A)	25	23	25	39
8″ (200A)	38	31	35	56
10″ (250A)	70	59	72	101
12″ (300A)	90	74	96	124

* For more details, please contact K.S.P.C

<Table 2-3 Weight of Deflagration flame arrester>

Detonation type / Element width : 25 mm(S.S) **Unit : kg**

Model / Size	KFD Element width : 75 mm	KSFLD Element width : 75 mm	KSFD	KSFM
2″ (50A)	33	35	*	*
3″ (80A)	48	48	*	*
4″ (100A)	83	64	145	145
6″ (150A)	142	116	224	224
8″ (200A)	251	168	324	324
10″ (250A)	374	301	467	467
12″ (300A)	553	378	662	662

* For more details, please contact K.S.P.C

<Table 2-4 Weight of Detonation flame arrester>

Detonation type / Element width : 25 mm(C.S) **Unit : kg**

Model / Size	KFD Element width : 75 mm	KSFLD Element width : 75 mm	KSFD	KSFM
2″ (50A)	33	35	*	*
3″ (80A)	44	48	*	*
4″ (100A)	82	64	136	136
6″ (150A)	141	115	196	196
8″ (200A)	249	167	322	322
10″ (250A)	372	300	448	448
12″ (300A)	550	376	657	657

* For more details, please contact K.S.P.C

<Table 2-5 Weight of Detonation flame arrester>

Deflagration type / Element width : 25 mm(AL) **Unit : kg**

Model / Size	KFD Element width : 75 mm(	KSFLD Element width : 75 mm(	KSFD	KSFM
2″ (50A)	21	23	*	*
3″ (80A)	30	31	*	*
4″ (100A)	53	38	97	97
6″ (150A)	96	75	101	101
8″ (200A)	165	106	144	144
10″ (250A)	251	196	212	212
12″ (300A)	384	264	310	310

* For more details, please contact K.S.P.C

<Table 2-6 Weight of Detonation flame arrester>