

# Pressure / or Vacuum Relief Valve

## INSTRUCTION MANUAL



## CONTENTS

- ◆ General Description
- ◆ Operation
- ◆ Shop / Job Site Testing
- ◆ Installation
- ◆ Maintenance

### K.S.P.C

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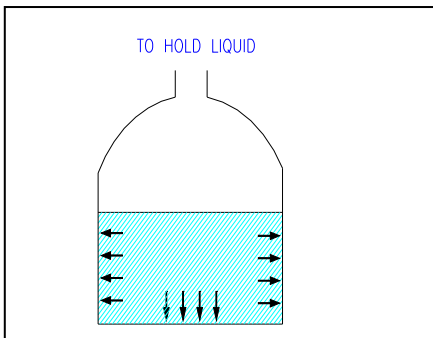
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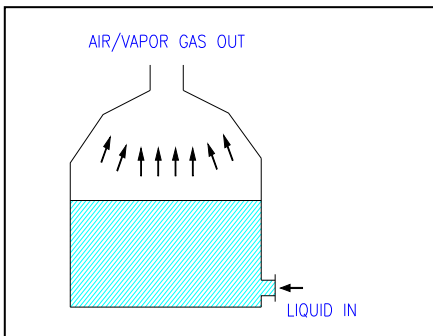
## Section 1. General Description

- 1-1 According to API 2000 code, the PVRV are designed, manufactured and tested.
- 1-2 The Pressure Vacuum Relief Valves are used on liquid storage Tanks which designed by API 520/API 650 and Others process vessels or systems to prevent structural damage due to excess internal pressure or vacuum.
- 1-3 This valve has functions to intake the air under constant pressure during unloading and rising Temperature, and to discharge the overpressure generated during pouring the liquid and falling Temperature on storage tank. This is the safe valve to control the deflation(vacuum) and inflation(pressure) of several storage tanks.



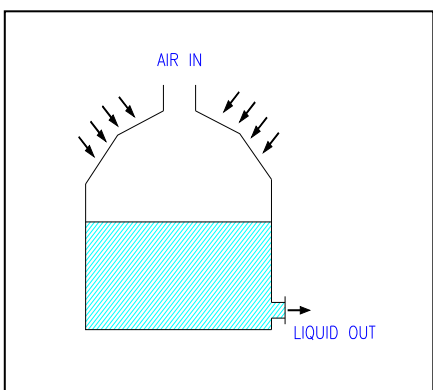
The function of prevention of natural evaporation of fluids

- ★ The effect of energy reduction  
In case of gasoline, to minimize the natural evaporation of stores saves 98 m<sup>3</sup> per year. (Based on the tank diameter : 30.4m x tank capacity 8690m)



The function of protection of over-pressure

- ★ The effect of prevention of exploration  
With the exception of influx and efflux of stores, it is kept always closed to prevent the diffusion of exploration into tank.



The function of protection of under pressure.

- ★ The effect of prevention of corrosion (The effect of extension of life)  
To keep the stabilization of constant gas pressure generated inside tank, prevents inside of the tank from corrosion by the temperature of gas.

## Section 2. Installation

- 2-1 Inspect the unit for indications of physical damage or internal contamination for all equipment before installation. The PVRV should be installed on the tank nozzle flange vertically.
- 2-2 First bleeding all pressure from the Tanks or Vessels before installation and replacement.
- 2-3 Inspect the flange surface of Tank / PVRV nozzle flange. It must be clean, free of scratches, corrosion, and flat.
- 2-4 Aluminum valves are furnished with flat face flanges and should match flat face flange with a full faced gasket.
- 2-5 Make sure the gasket that the material is suitable for the application.
- 2-6 Set the valve carefully on the nozzle. Install the studs and tighten nuts hand tight. Make sure that the flanges are not distorted and that the gasket is evenly compressed.
- 2-7 For the installation of tank nozzle, in case of draw up a purchase requirement should be description, use stud bolts and nuts supply whether or not and technical specification.

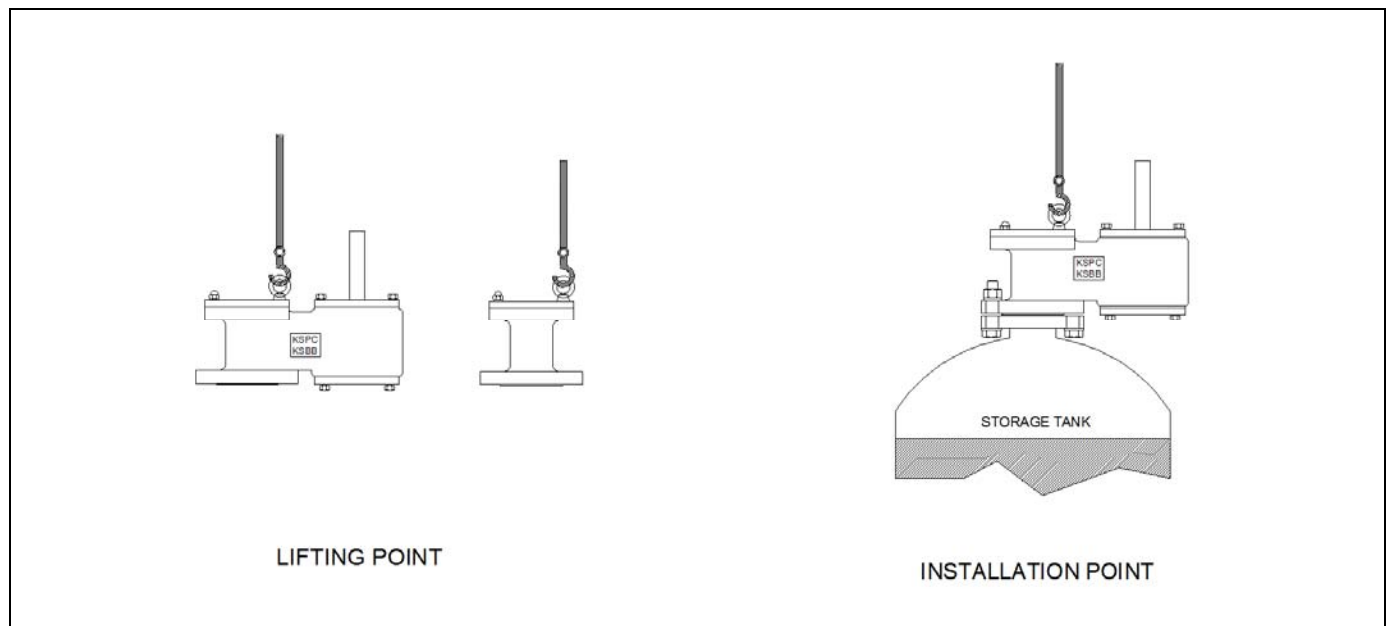


Figure 1.

## Section 3. Operation

- 3-1 When tank is unloading phenomena and the pressure is above the setting (operational fixing pressure), the PVRV operates automatically to protect the storage tank from the deflation or malformation.
- 3-2 The Model, KSBB/KSBG/KSBD/KSPR/KSVR which the weight loaded type are designed to provide tank protections for both pressure and/or vacuum of set point to max 75/-43 mbarg. Over above set point till 900/-900 mbarg, consider to be installed spring loaded type, KSBS/KSBBJS/KSGS/KSDS/KSPS. The safety relief valve is not used in controlling the extra setting of pressure and consider Emergency vent For External fire and Rupture case.
- 3.3 The set point of PVRV is fixed by the customer's order or Project's Specification. but it is designed to adjust the pressure/vacuum setting in case. The way of change adds additional counter weight for Weight loaded type. The way of change for spring loaded as follow, To increase the setting pressure turns the press. adjusting screw clockwise. To decrease the setting pressure turns the press. adjusting screw counter-clockwise. Before change set point of disc a'ssy, should be consulting the factory or our local representative.

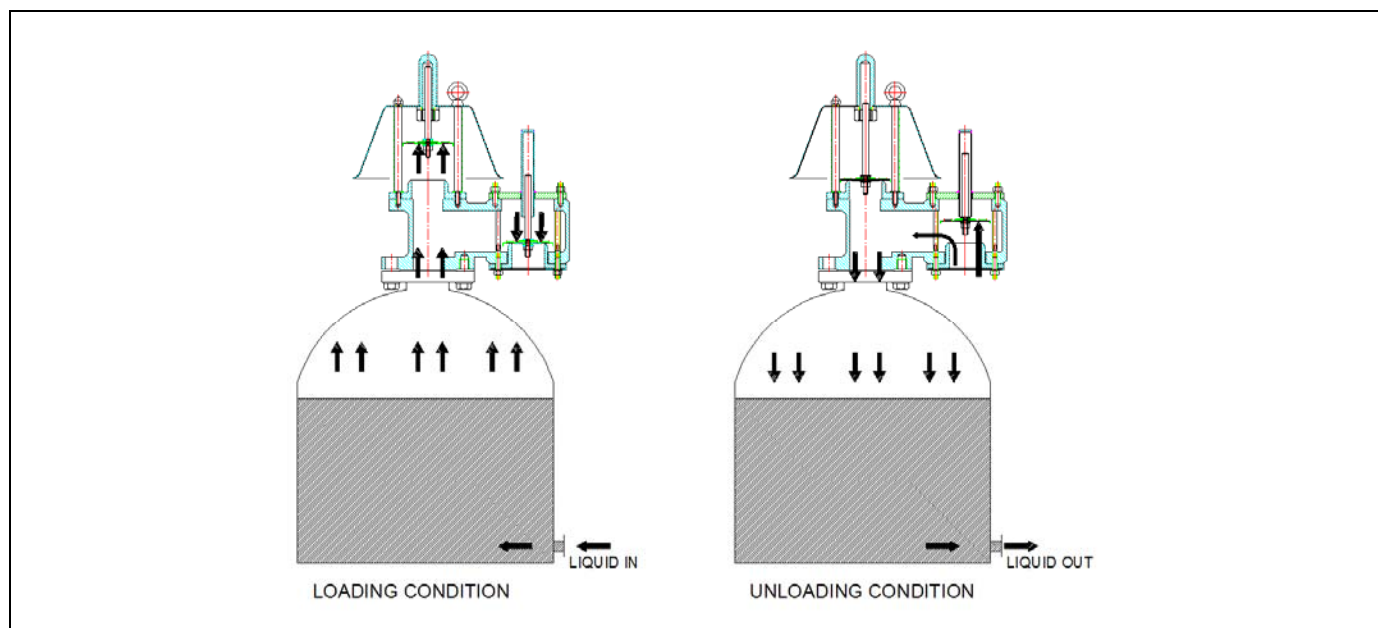


Figure 1 (KSBB/KSBS TYPE).

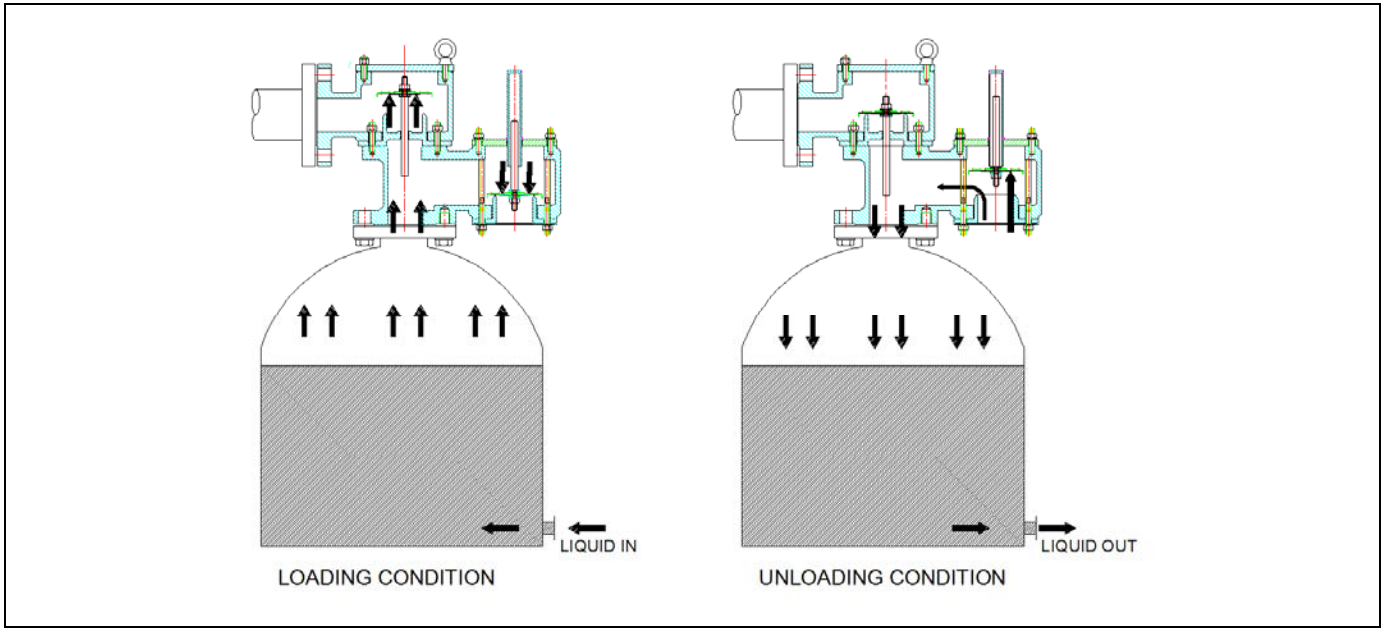


Figure 1 (KSBG/KSGS TYPE).

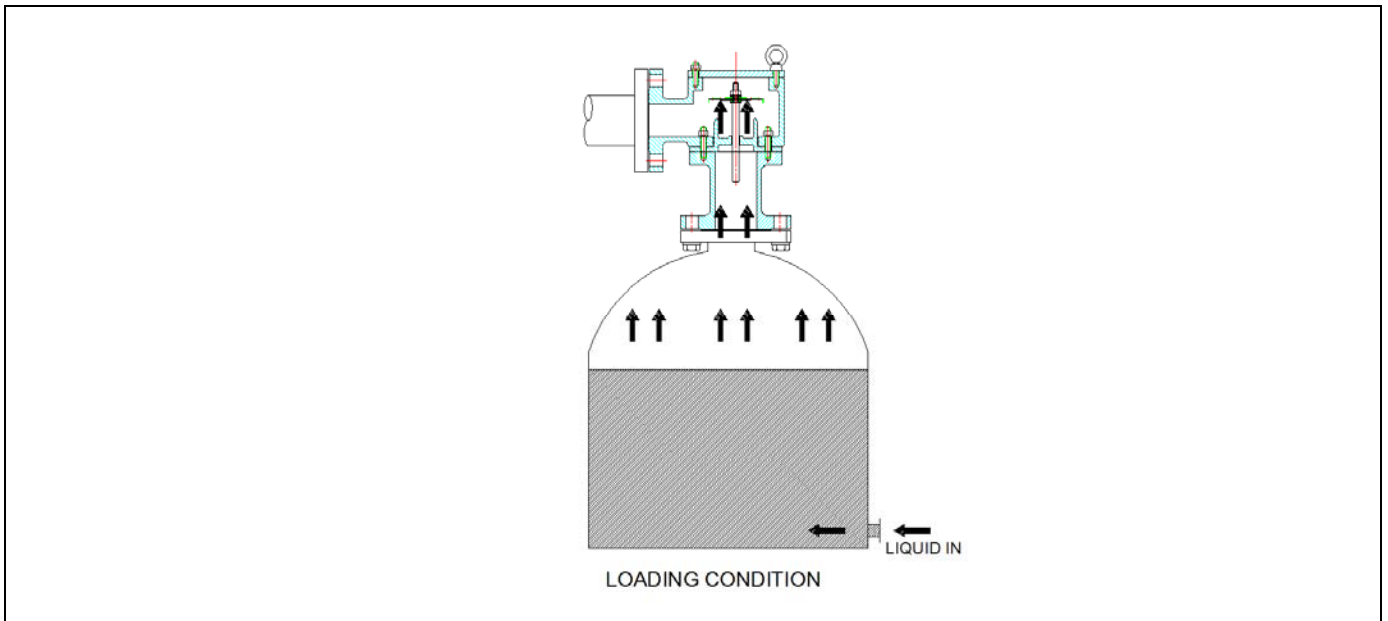


Figure 1 (KSBG/KSGS TYPE).

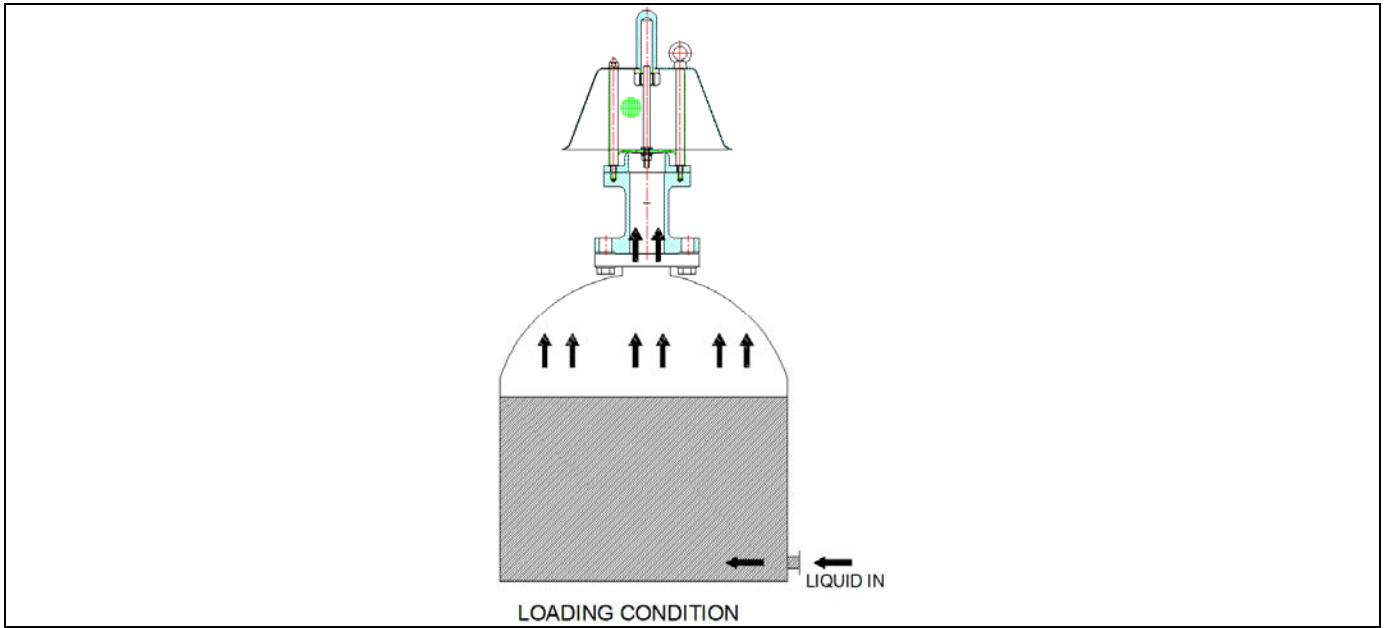


Figure 1 (KSPR/KSPS TYPE).

## **Section 4. Maintenance**

### **4-1 GENERAL**

4.1.1 It is necessary to regularly inspect the diaphragm, guides and seating surfaces to ensure the valve can open Freely.

4-1-2 Thereafter, it should be regularly checked and cleaned in every 6 months at least.

#### **👉 CAUTION**

The regular check-up and cleaning depend on the liquid type, the frequency of unloading and operation condition.

### **4-2 THE SAFETY RULES OF THE MAINTENANCE WORK**

4-2-1 For the maintenance work of the installed PVRV on storage tank, it is necessary to use the spark free tools.

4-2-2 For the maintenance work of the installed storage tank, it is necessary to keep the inside of the tank depressurized and gas freed before the work.

4-2-3 Loosen and remove all nuts and lift off the weather hood and vacuum / or vacuum cover

#### **👉 CAUTION**

For the maintenance work, it is necessary to take the preventive measures against the toxicity and inflammability of the liquid in the tank.

### **4-3 THE PROCEDURE DISASSEMBLY AND ASSEMBLY**

4-3-1 Loosen and remove all nuts and washers.

4-3-2 Lift of the vacuum cover and weather hood.

4-3-3 Remove and lift up the pressure and vacuum disc (=pallet) assemblies.

4-3-4 Carefully inspect all guides and disc Assemblies (disc / Teflon) for corrosion damages.  
If the disc / or Teflon are damaged, it must be replaced new one.

4-3-5 Check the metal seating surface for pitting and corrosion.

If the seats surface are damaged, they must be lapped using a perfectly flat ground metal disc and or sand paper.

4.3-6 Verify that the disc and weight are back in their proper position.

Assemble in reverse order and disc assemblies sit flat n the seat and the stem is not cocked when Weather hood and vacuum cover are installed.

Tighten all wing nuts firmly.

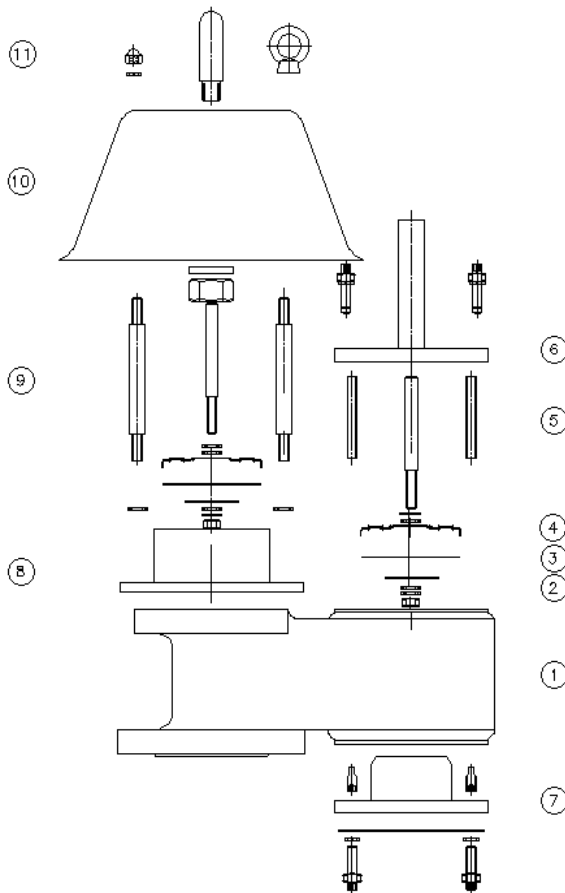
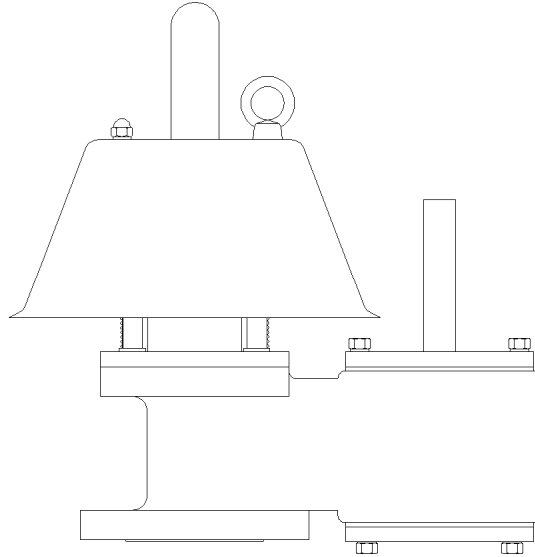
 **CAUTION**

- \* Put the pressure and vacuum pallet assemblies back in their original location and ensure that the stem is Straight and fits into the guide in the vacuum cover, seat guide or weather hood.
- \* Do not mixed pressure/vacuum disc assemblies, the setting will be changed.



● MODEL KSBB TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

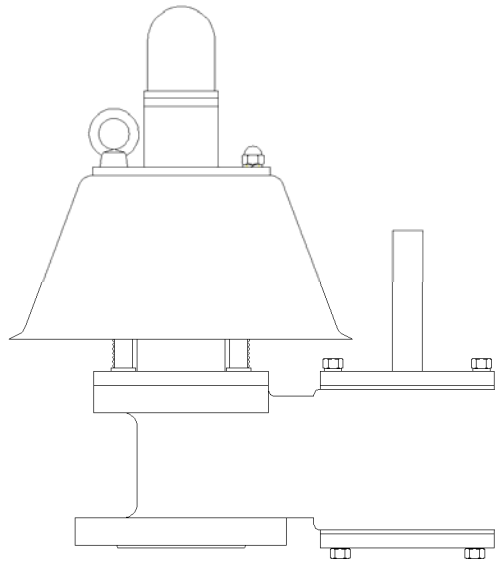


-DISASSEMBLY-

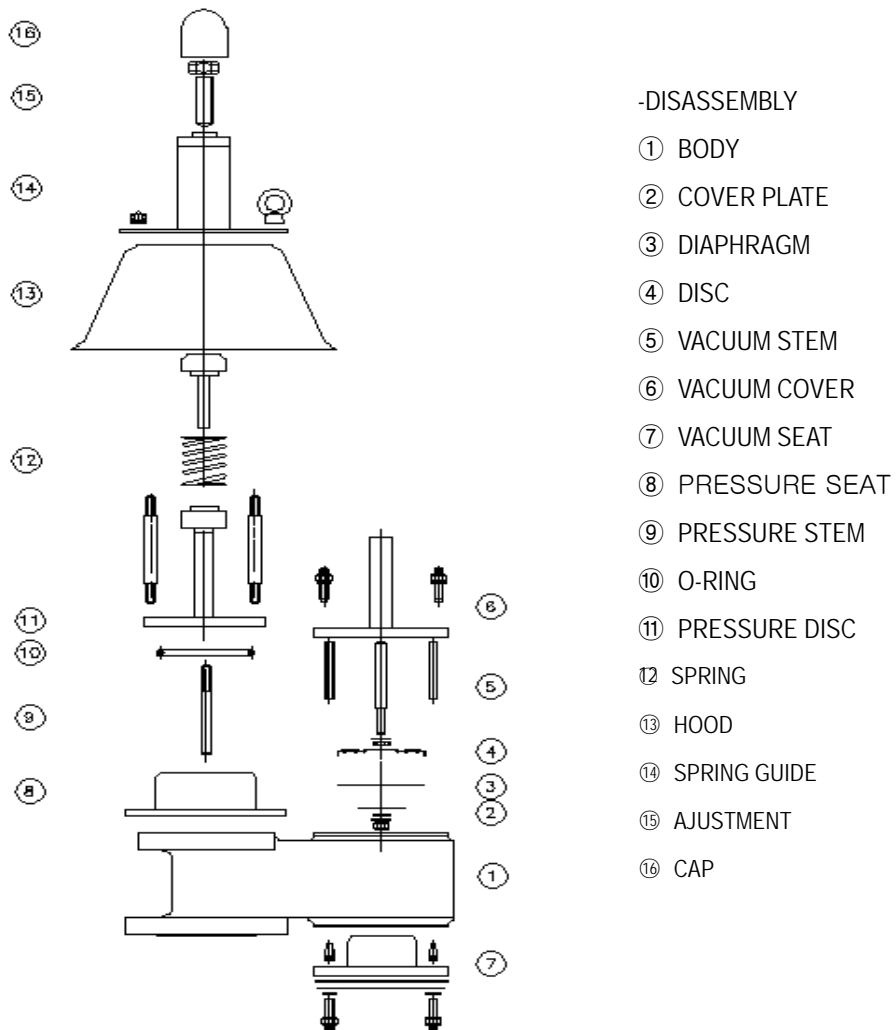
- ① BODY
- ② COVER PLATE
- ③ DIAPHRAGM
- ④ DISC
- ⑤ VACUUM STEM
- ⑥ COVER
- ⑦ VACUUM SEAT
- ⑧ PRESSURE SEAT
- ⑨ PRESSURE STEM
- ⑩ HOOD
- ⑪ PRESSURE STEM GUIDE

● MODEL KSBS TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY



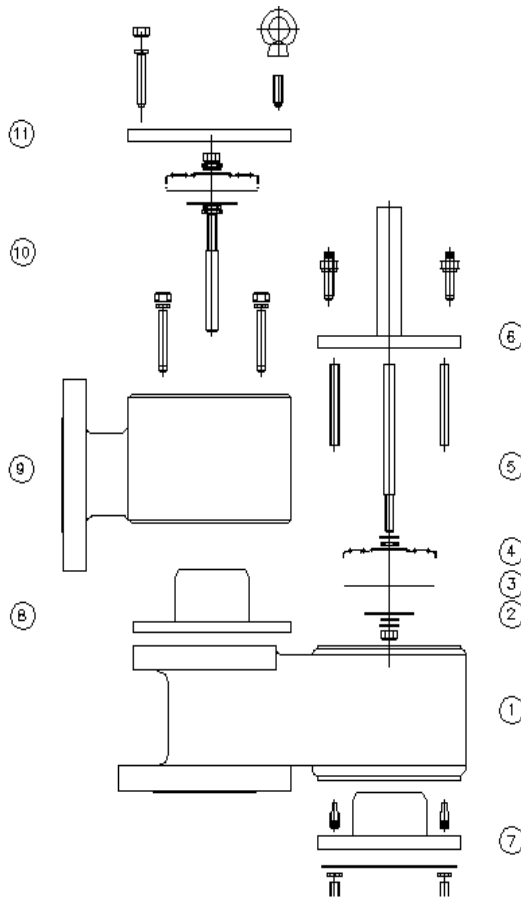
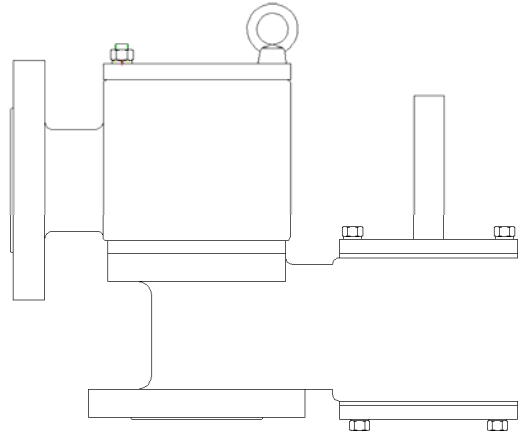
-DISASSEMBLY



- ① BODY
- ② COVER PLATE
- ③ DIAPHRAGM
- ④ DISC
- ⑤ VACUUM STEM
- ⑥ VACUUM COVER
- ⑦ VACUUM SEAT
- ⑧ PRESSURE SEAT
- ⑨ PRESSURE STEM
- ⑩ O-RING
- ⑪ PRESSURE DISC
- ⑫ SPRING
- ⑬ HOOD
- ⑭ SPRING GUIDE
- ⑮ AJUSTMENT
- ⑯ CAP

● MODEL KSBG TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

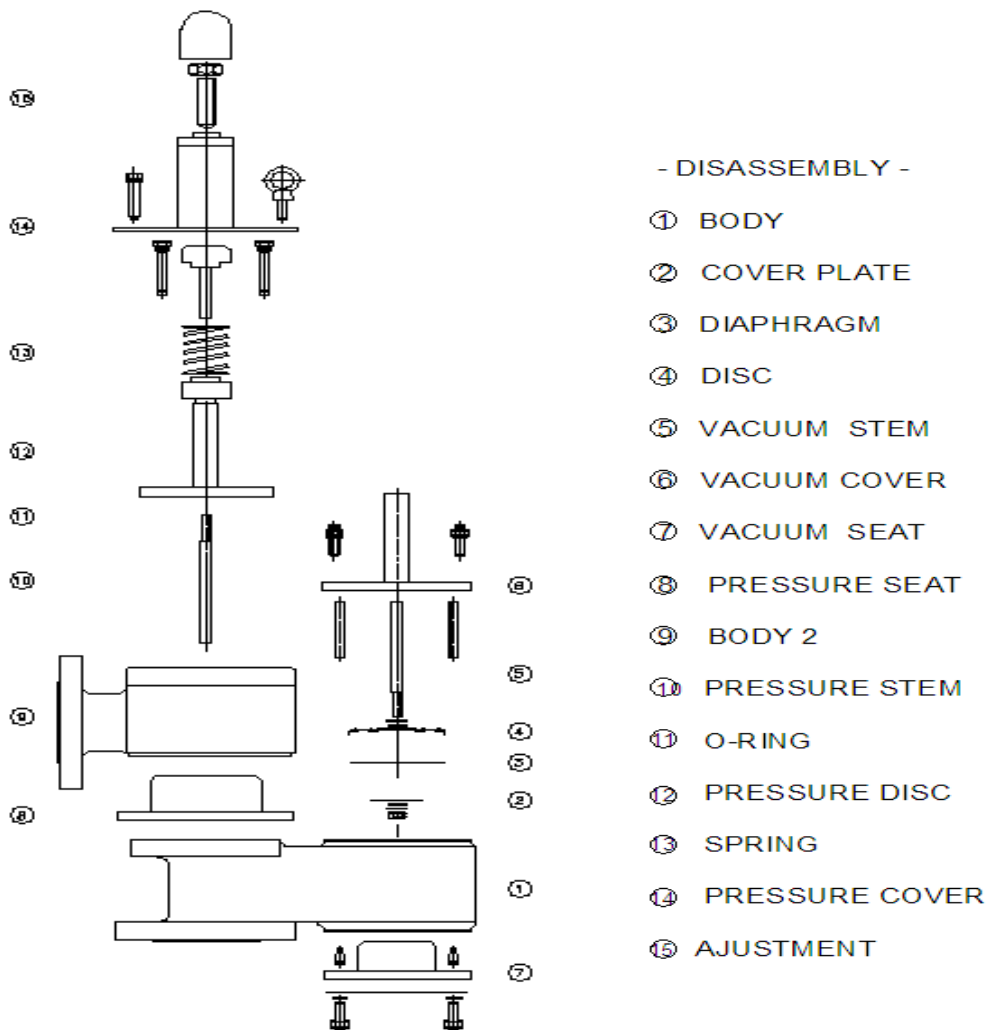
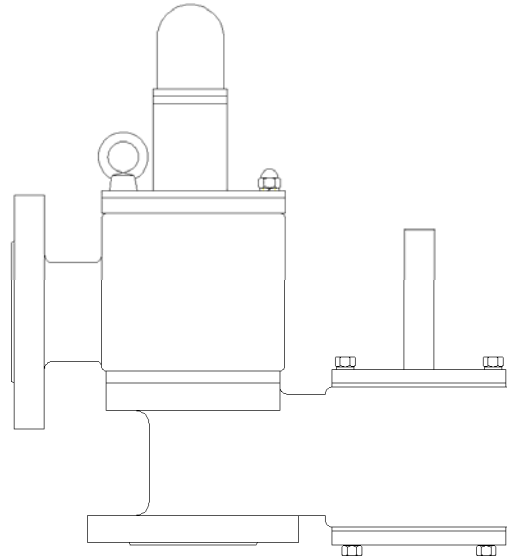


- DISASSEMBLY-

- ① BODY
- ② COVER PLATE
- ③ DIAPHRAGM
- ④ DISC
- ⑤ VACUUM STEM
- ⑥ VACUUM COVER
- ⑦ VACUUM SEAT
- ⑧ PRESSURE SEAT
- ⑨ BODY 2
- ⑩ PRESSURE STEM
- ⑪ PRESSURE COVER

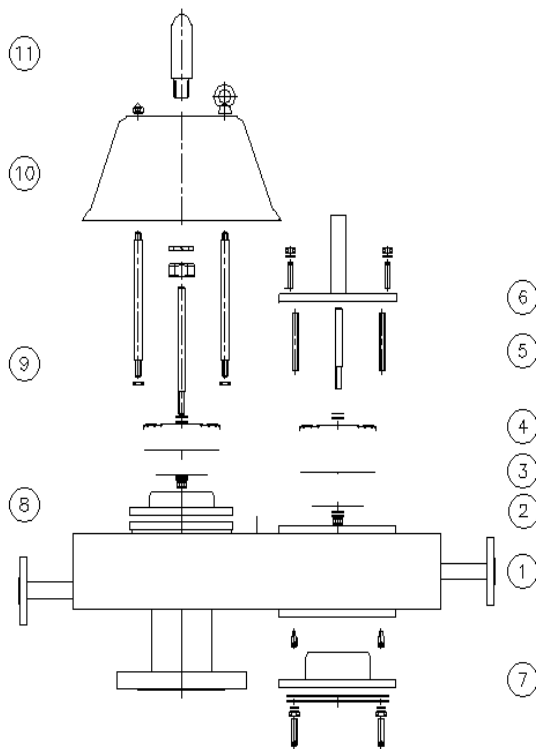
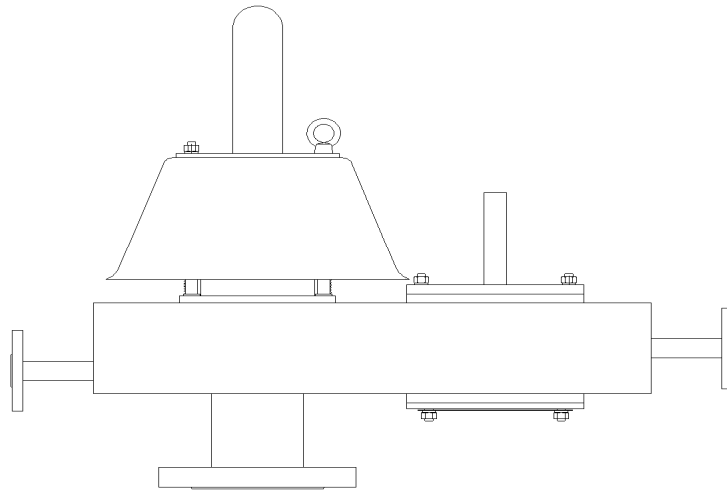
● MODEL KSGS TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY



● MODEL KSBBJ TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

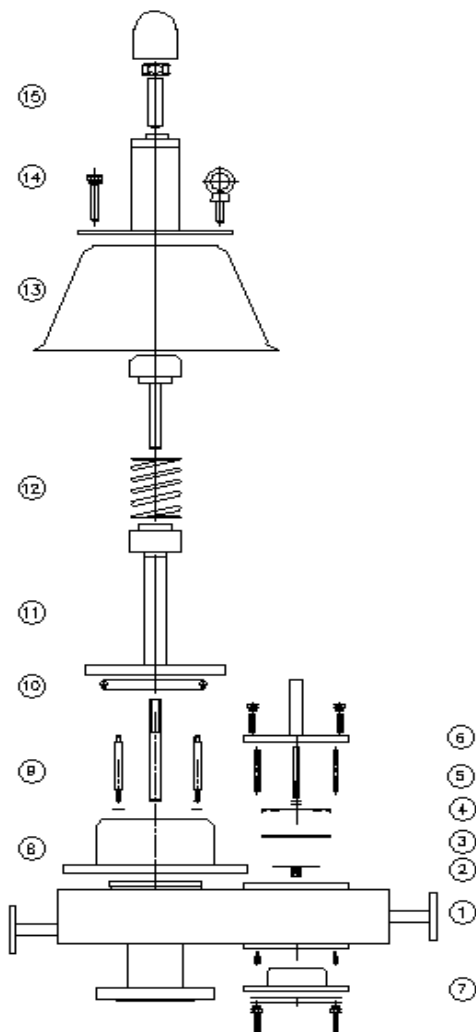
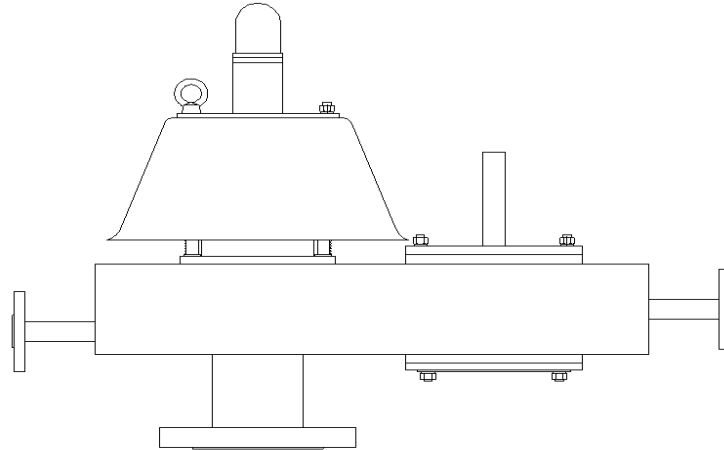


- DISASSEMBLY -

- ① BODY
- ② COVER PLATE
- ③ DIAPHRAGM
- ④ DISC
- ⑤ VACUUM STEM
- ⑥ VACUUM COVER
- ⑦ VACUUM SEAT
- ⑧ PRESSURE SEAT
- ⑨ PRESSURE STEM
- ⑩ HOOD
- ⑪ STEM GUIDE

● MODEL KSBBJS TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

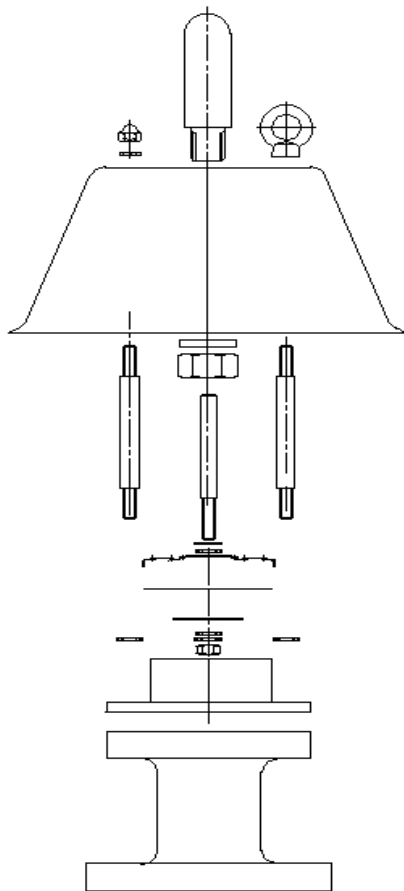
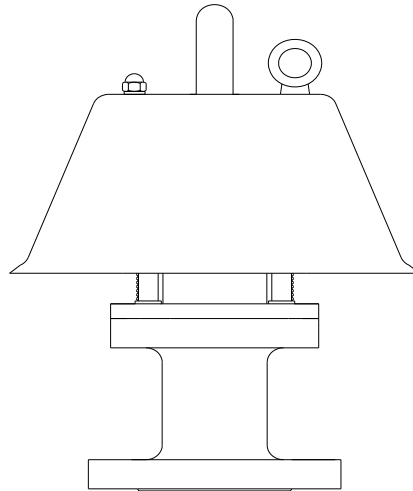


- DISASSEMBLY -

- ① BODY
- ② COVER PLATE
- ③ DIAPHRAGM
- ④ DISC
- ⑤ VACUUM STEM
- ⑥ VACUUM COVER
- ⑦ VACUUM SEAT
- ⑧ PRESSURE SEAT
- ⑨ PRESSURE STEM
- ⑩ O-RING
- ⑪ PRESSURE DISC
- ⑫ SPRING
- ⑬ HOOD
- ⑭ SPRING GUIDE
- ⑮ AJUSTMENT

● MODEL KSPR TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

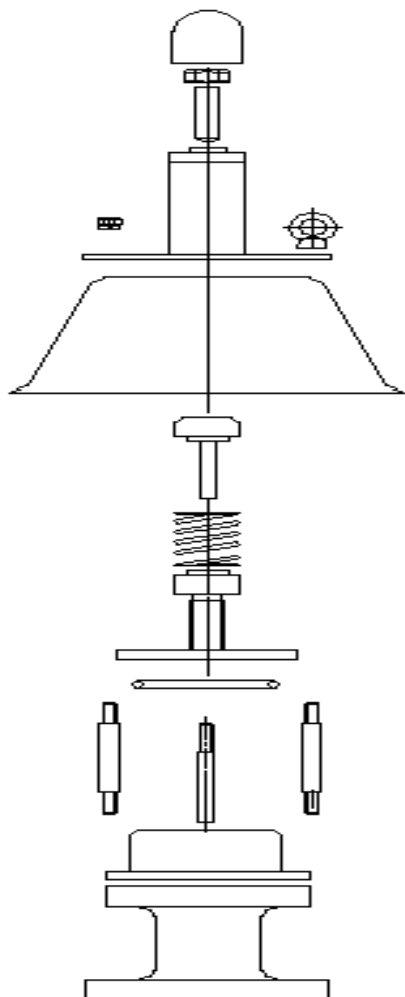
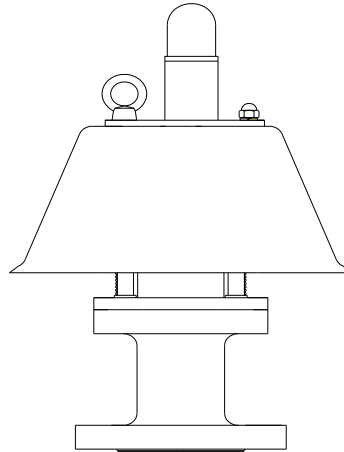


- DISASSEMBLY -

- ① BODY
- ② PRESSURE SEAT
- ③ COVER PLATE
- ④ DIAPHRAGM
- ⑤ DISC
- ⑥ PRESSURE STEM
- ⑦ HOOD
- ⑧ STEM GUIDE

● MODEL KSPS TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY



⑨

⑧

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- DISASSEMBLY -

① BODY

② PRESSURE SEAT

③ PRESSURE STEM

④ O-RING

⑤ PRESSURE DISC

⑥ SPRING

⑦ HOOD

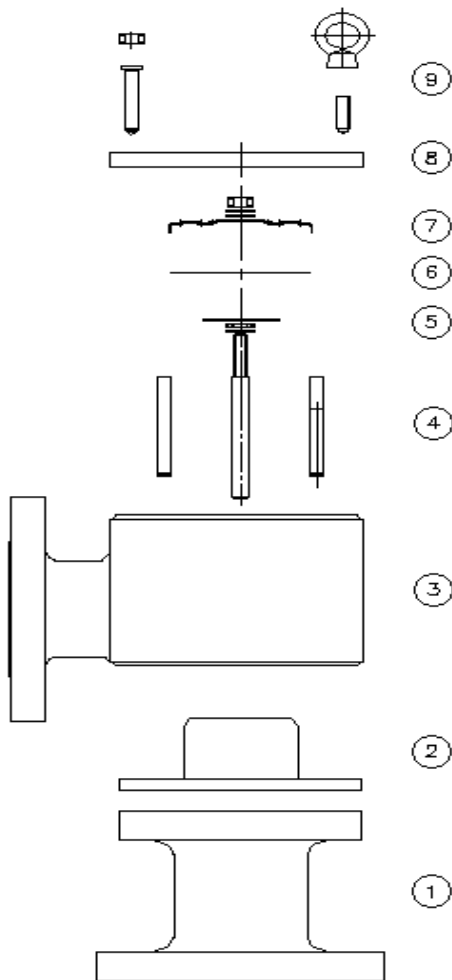
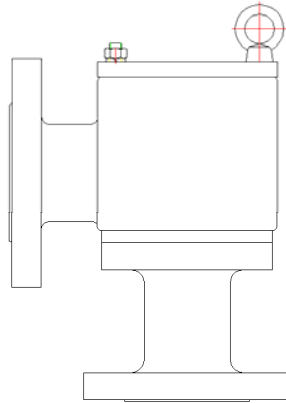
⑧ SPRING GUIDE

⑨ AJUSTMENT



● **MODEL KSBD TYPE DISASSEMBLY & ASSEMBLY**

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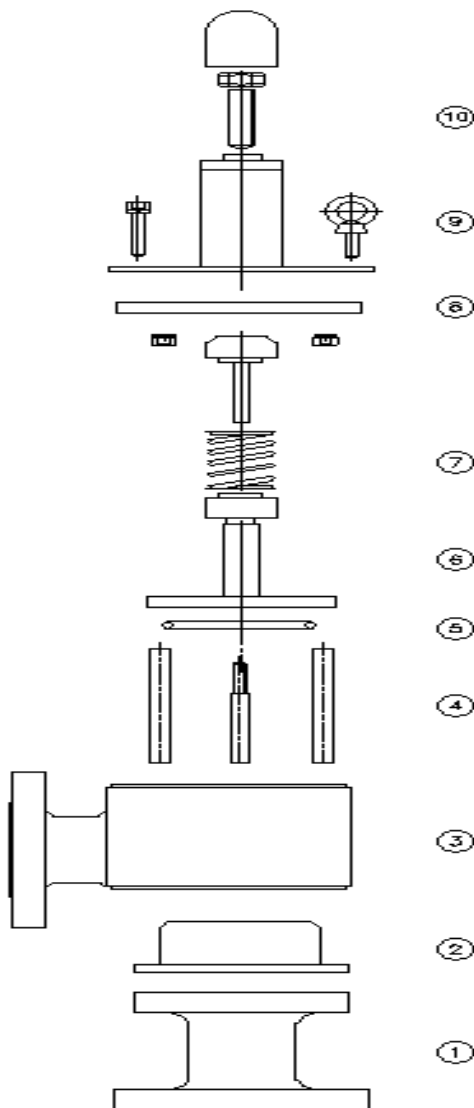
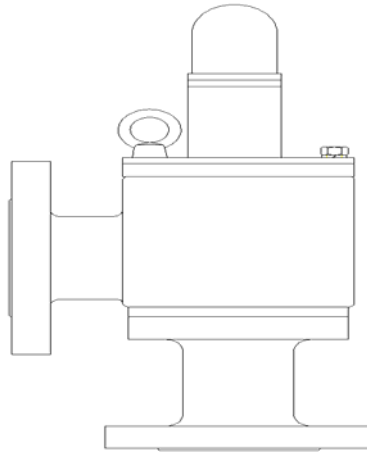


- DISASSEMBLY -

- ① BODY
- ② PRESSURE SEAT
- ③ BODY 2
- ④ PRESSURE STEM
- ⑤ COVER PLATE
- ⑥ DIAPHRAGM
- ⑦ DISC
- ⑧ PRESSURE CPVER
- ⑨ BOLT/EYE NUT

● MODEL KSDS TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

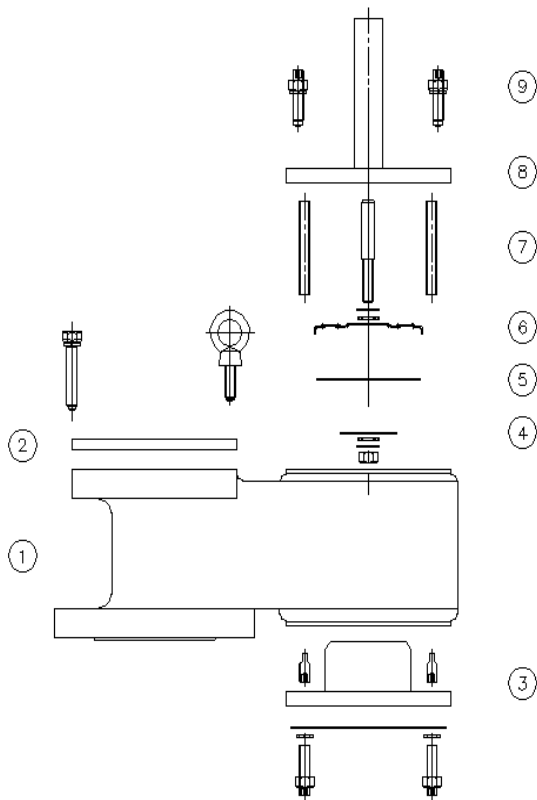
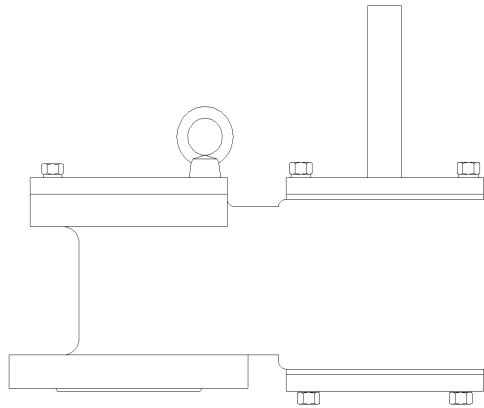


- DISASSEMBLY -

- ① BODY
- ② PRESSURE SEAT
- ③ BODY 2
- ④ PRESSURE STEM
- ⑤ O-RING
- ⑥ PRESSURE DISC
- ⑦ SPRING
- ⑧ SPRING GUIDE
- ⑨ COVER
- ⑩ ADJUSTMENT

● MODEL KSVR TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY-

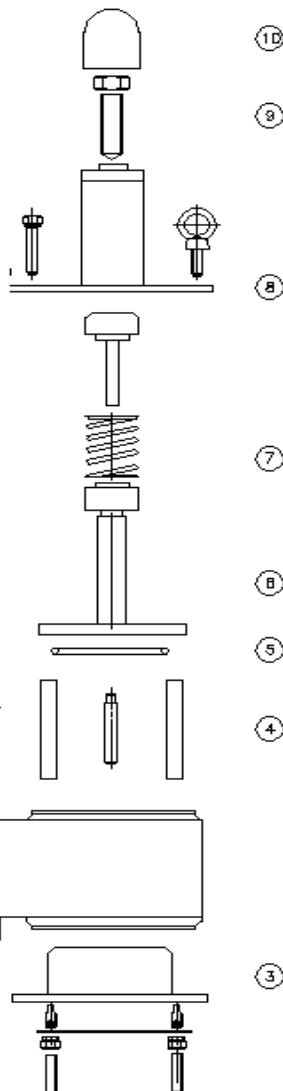
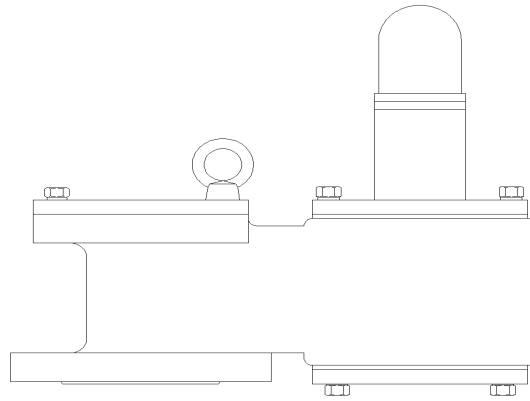


- DISASSEMBLY -

- ① BODY
- ② PRESSURE COVER
- ③ VACUUM SEAT
- ④ COVER PLATE
- ⑤ DIAPHRAGM
- ⑥ DISC
- ⑦ VACUUM STEM
- ⑧ VACUUM COVER
- ⑨ BOLT

● MODEL KSVS TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY

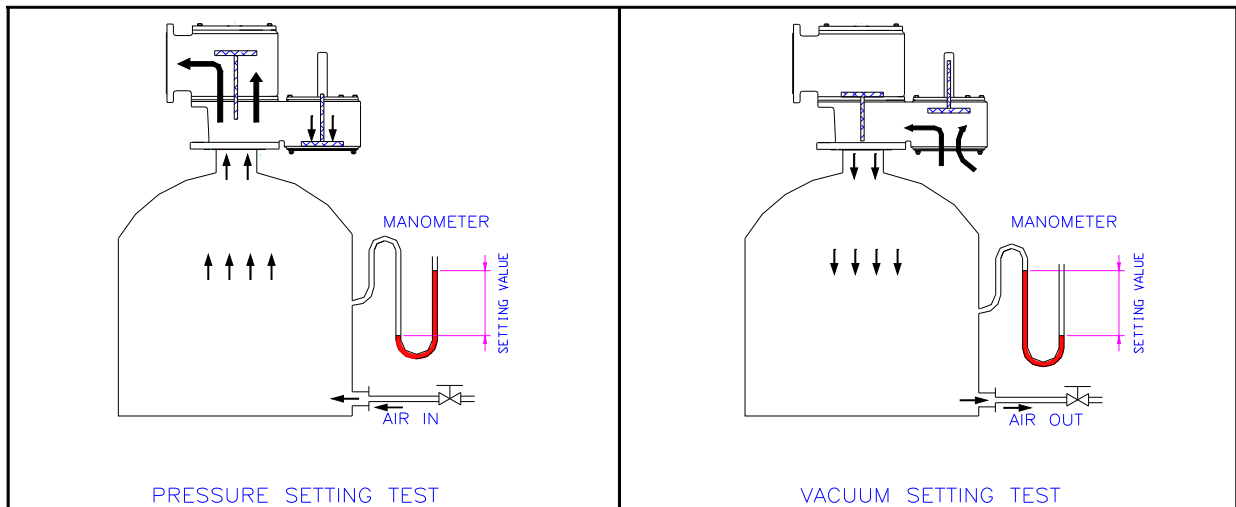
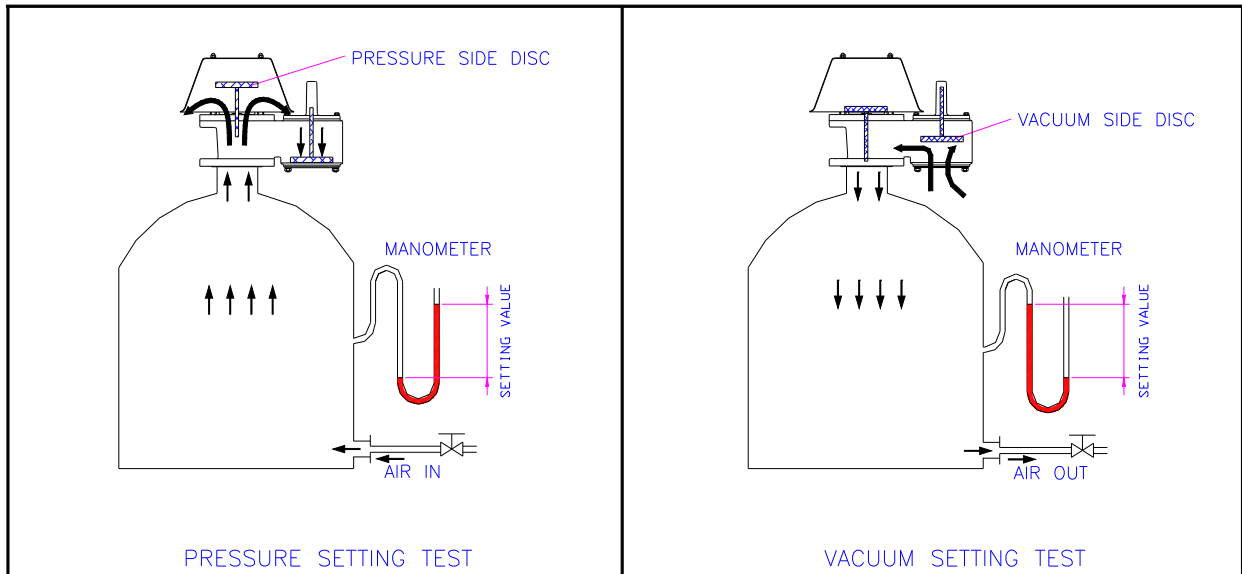


- DISASSEMBLY -

- ① BODY
- ② PRESSURE COVER
- ③ VACUUM SEAT
- ④ VACUUM STEM
- ⑤ O-RING
- ⑥ VACUUM DISC
- ⑦ SPRING
- ⑧ VACUUM COVER
- ⑨ ADJUSTMENT
- ⑩ CAP

## Section 5. SHOP TESTING

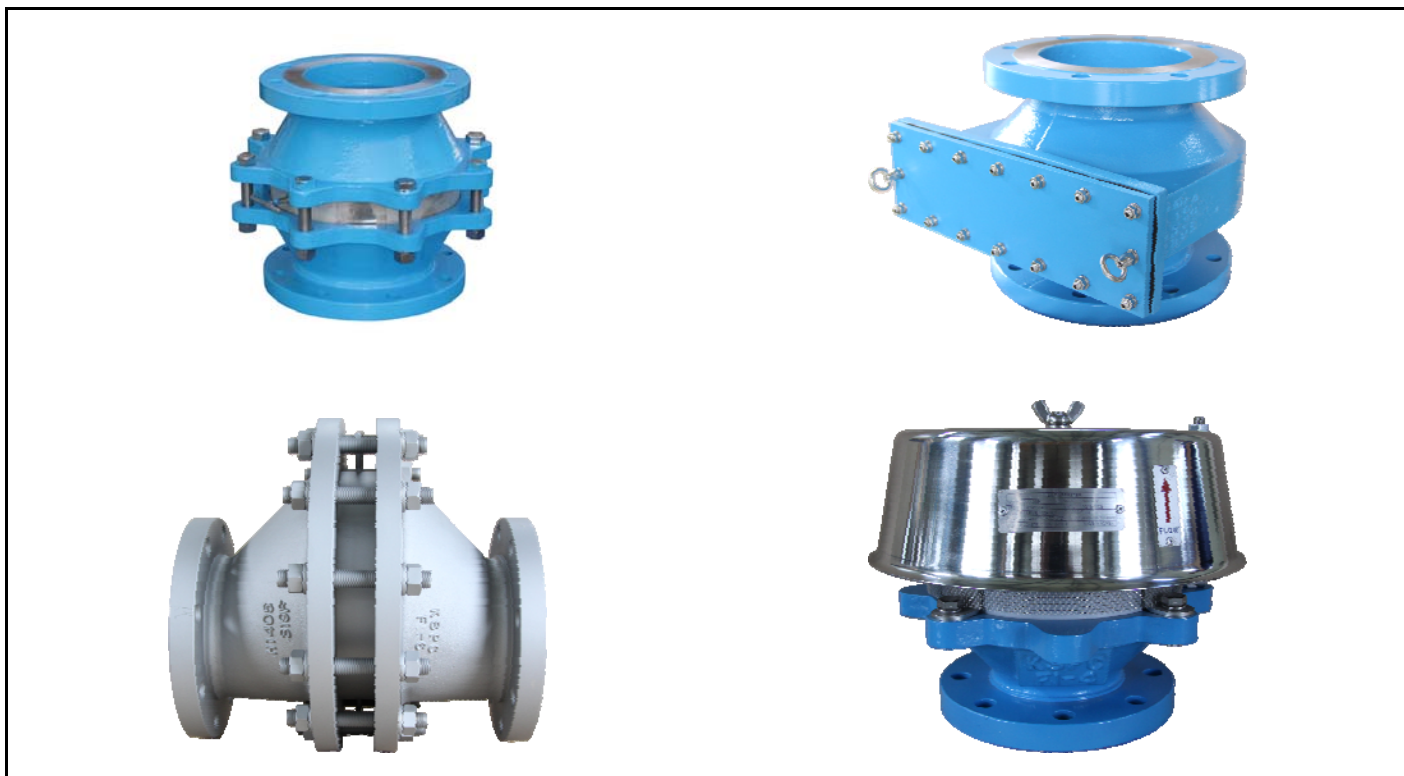
5-1 According to the "SET PRESSURE VERIFICATION", the API 2000 code 2,6,4, all product should be taken the setting test before shipping.



# KSFI / KSFH / KSFL / KSFE TYPE

## Deflagration Flame Arresters

### INSTRUCTION MANUAL



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## **Section 1. General Description**

- 1-1 The flame arrester is designed, manufactured, and tested according to API 2000 / BS 7244 (EN12874) code.
- 1-2 Flame arrester consist of two main components, the arrester bases and the flame element housing.  
The bases serve as the connecting interface to the piping system.  
The flame elements utilize spiral wound, crimped ribbon constructed of corrosion resistant materials (A240-316L), to insure the best flame quenching performances with minimum pressure drop.
- 1-3 Installed in the top nozzle of the several kinds of the inflammable low pressure storage tank(the ignition point below 65 °C), it is the explosion proof and deflagration proof which blocks the influx of flame ignifed externally into the tank.
- 1-4 In general it is combined with pressure and vacuum relief valve , and designed to provide a large quantity of flow under the small pressure differences.
- 1-5 Designed to use for the transport line of the inflammable low pressure gas and installed in a IN-LINE SYSTEM, like the pipe line which transfer the inflammable gas to the incinerator flame shell or the discharging line of combursted gas to the air, it blocks the spread of ignifed fire.

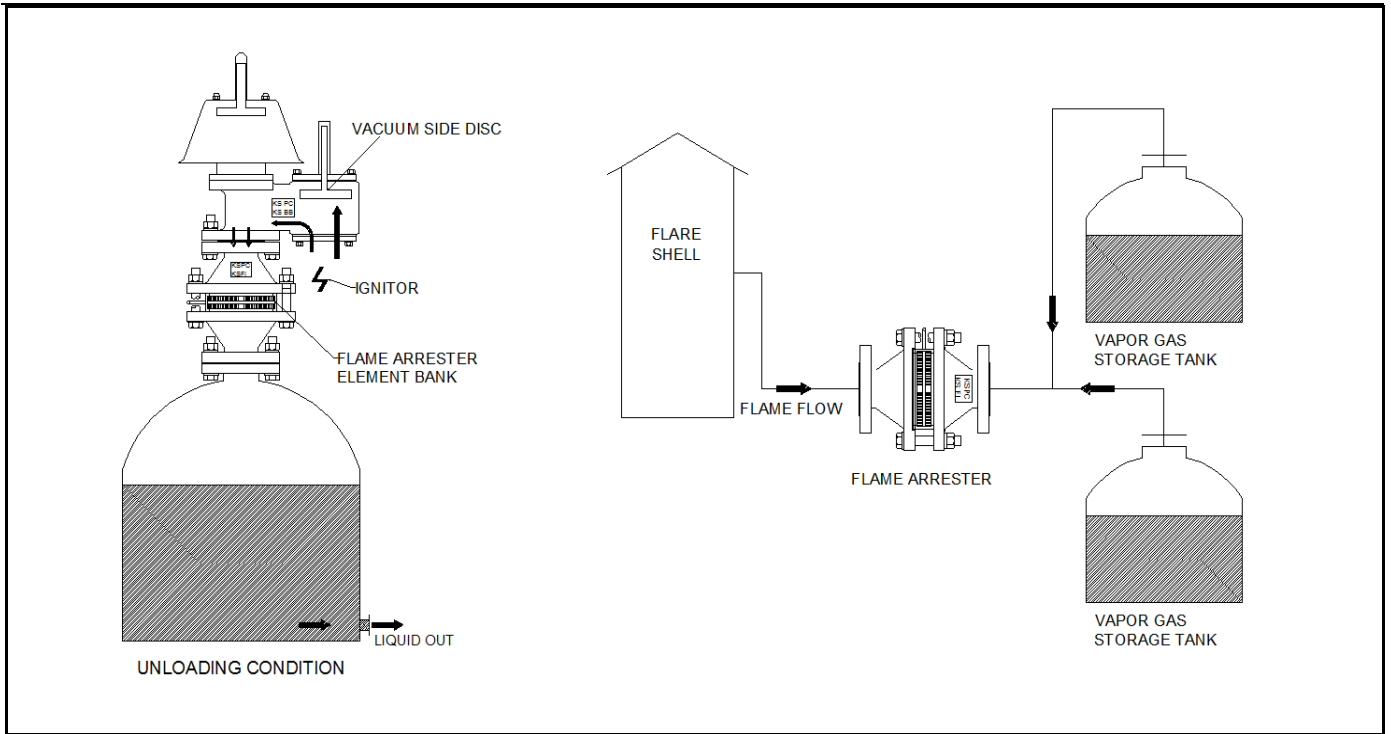


Figure 1.

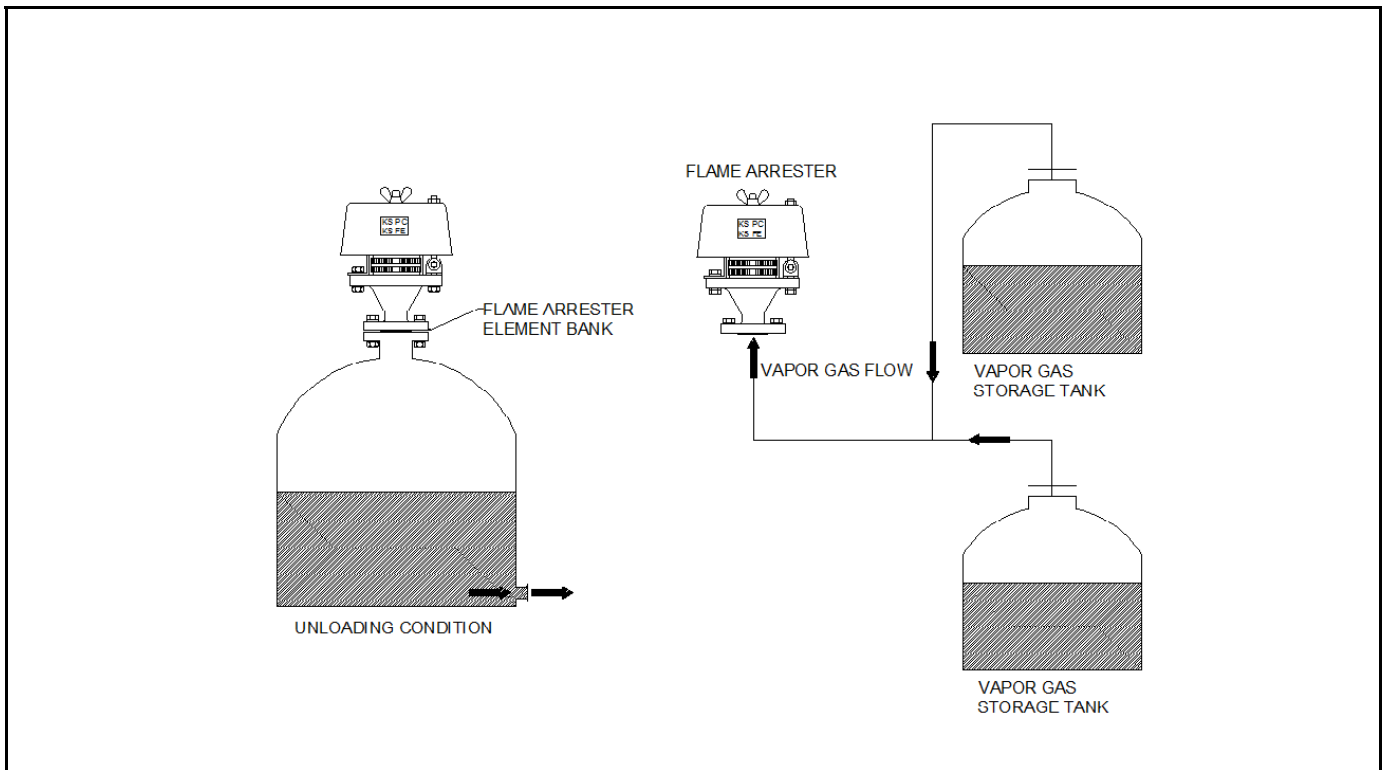


Figure 2



## Section 2-1. Installation of In Line.

2-1-1 Inspect flange faces and flame element for damage or contamination.

2-1-2 Inspect the gasket seating surface of the tank nozzle or pipe. It must be clean, flat, free of scratches, corrosion and tool marks. And the center of gasket within the bolt circle.

2-1-3 Set the arrester between its mating flanges or on the nozzle. It is possible to install the pipe laying vertically and horizontally and install the studs and tighten nuts hand tight.

2-1-4 It is possible to install unrelating to the direction of the gas flow.

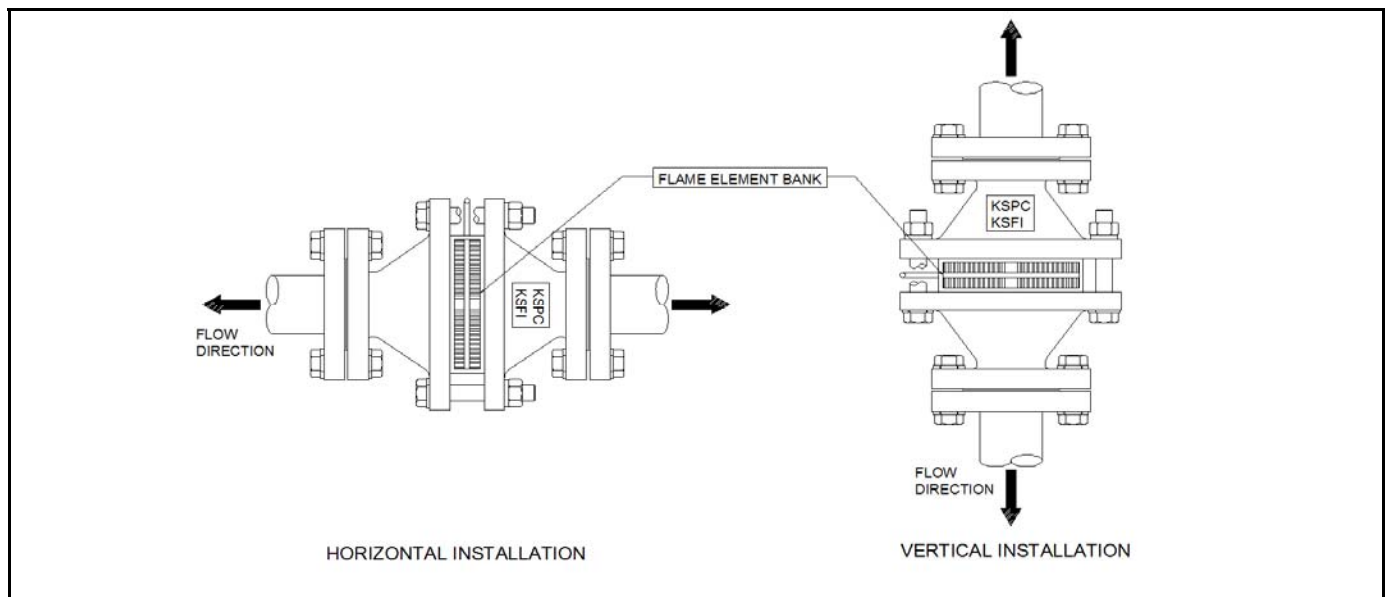


Figure 3 (KSFI TYPE)

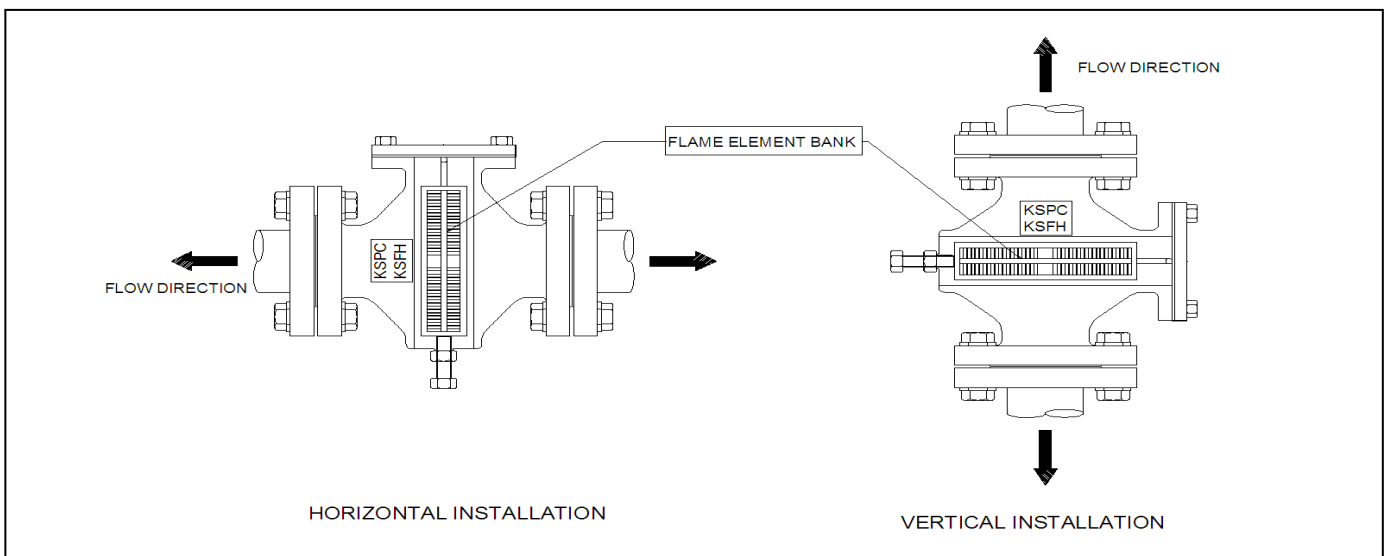
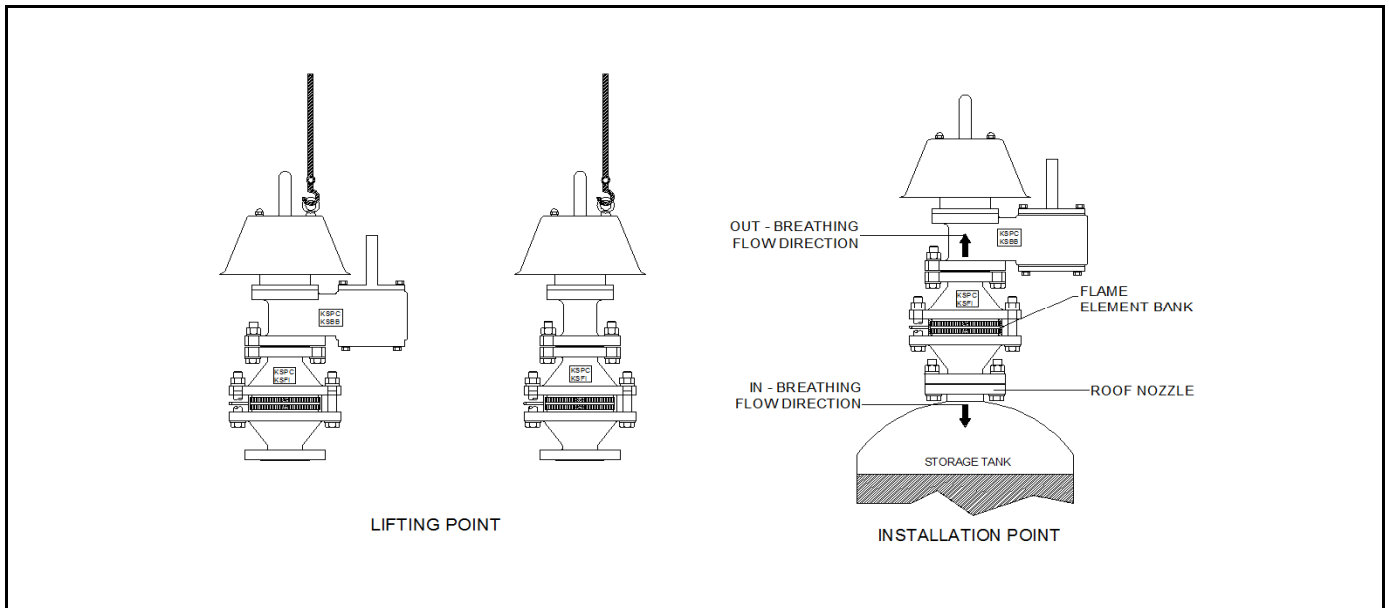


Figure 4 (KSFH TYPE)

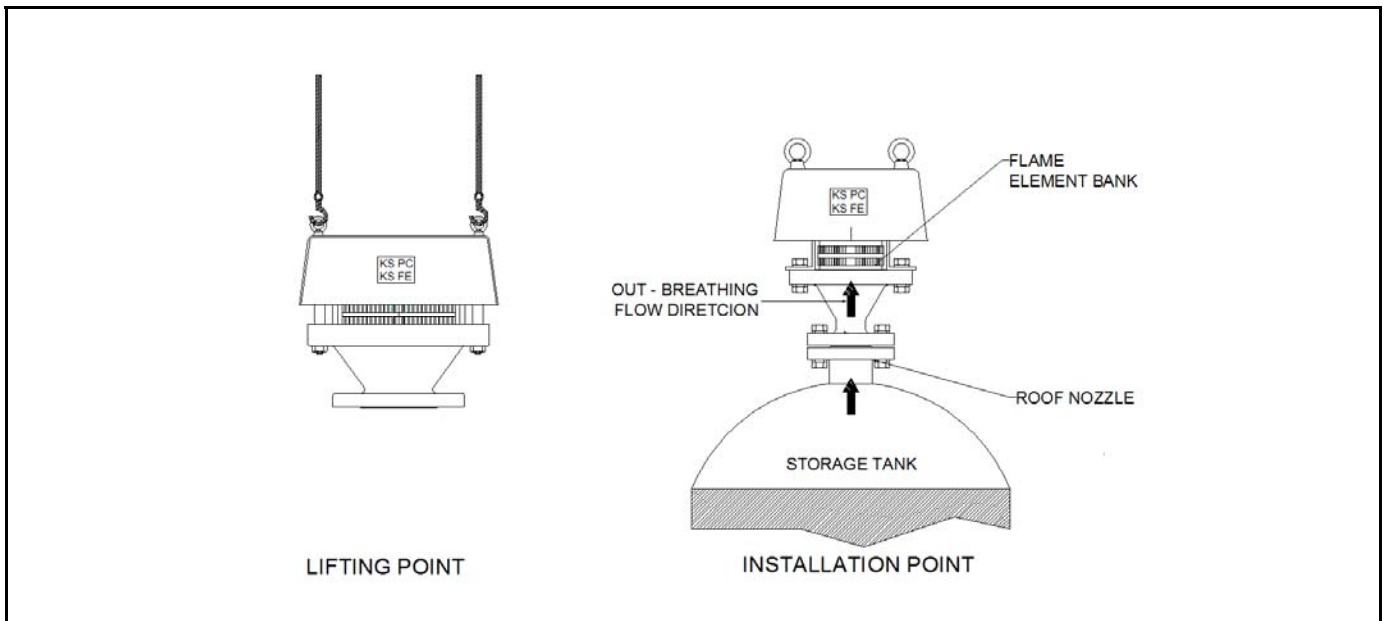


## Section 2-2. Installation of End Line.

2-2-1 It should be installed vertically in case of combination with pressure and vacuum relief valve (KSBB / KSBS / KSBG / KSGS model).



**Figure 5 (Combined PVRV)**



**Figure 6. (KSFE TYPE)**

**CAUTION**

- \* The handles on the arrester housing are to be used for handling the element only during inspection and maintenance. Do not use the handles to lift the entire flame arrester assembly.
- \* After installation, all connections must be inspected for vapor leakage.



### Section 3. Operation

3-1 When the combusted gas pass through the heat exchange lattace net of the element bank of the flame arrester in KSFI type, the combusted gas ignifed by the quenching is completely extinguished by lowering the temperature under below the natural ignition point.

3-2 Thus, this item is designed to extinguish the fire automatically, and the heat is absorbed by the element bank of flame arrester and the fire cannot be spread.

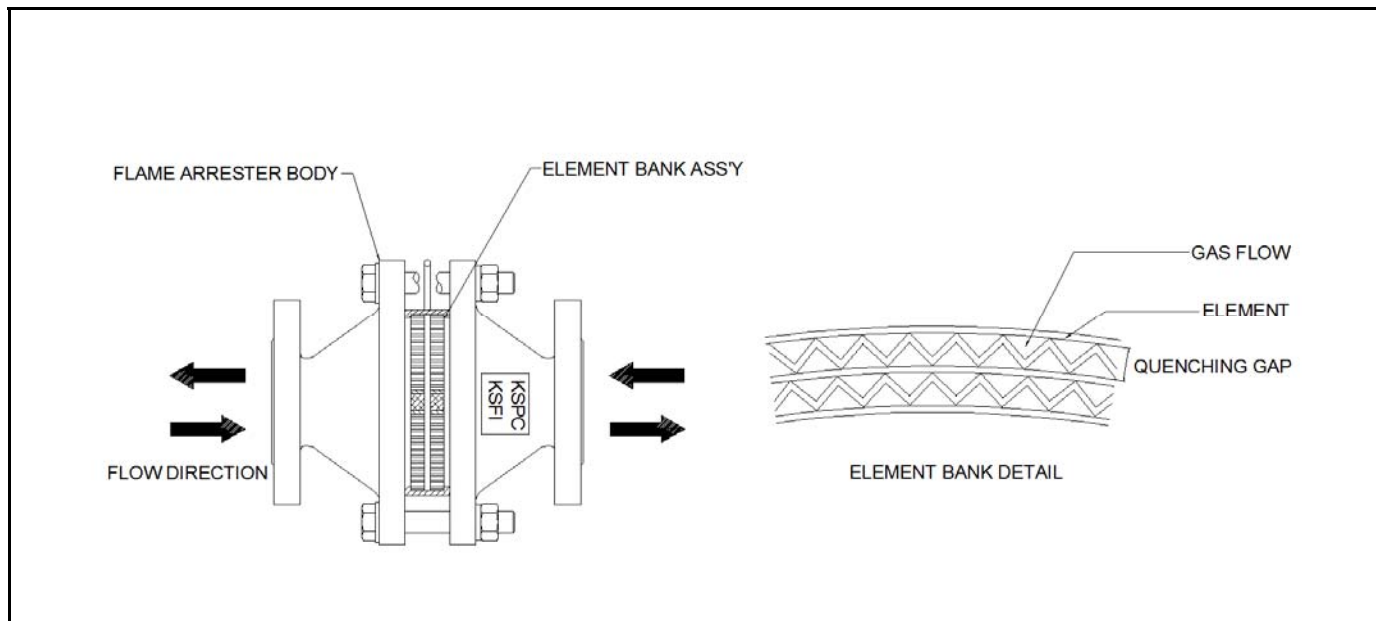


Figure 7 (KSFI TYPE).

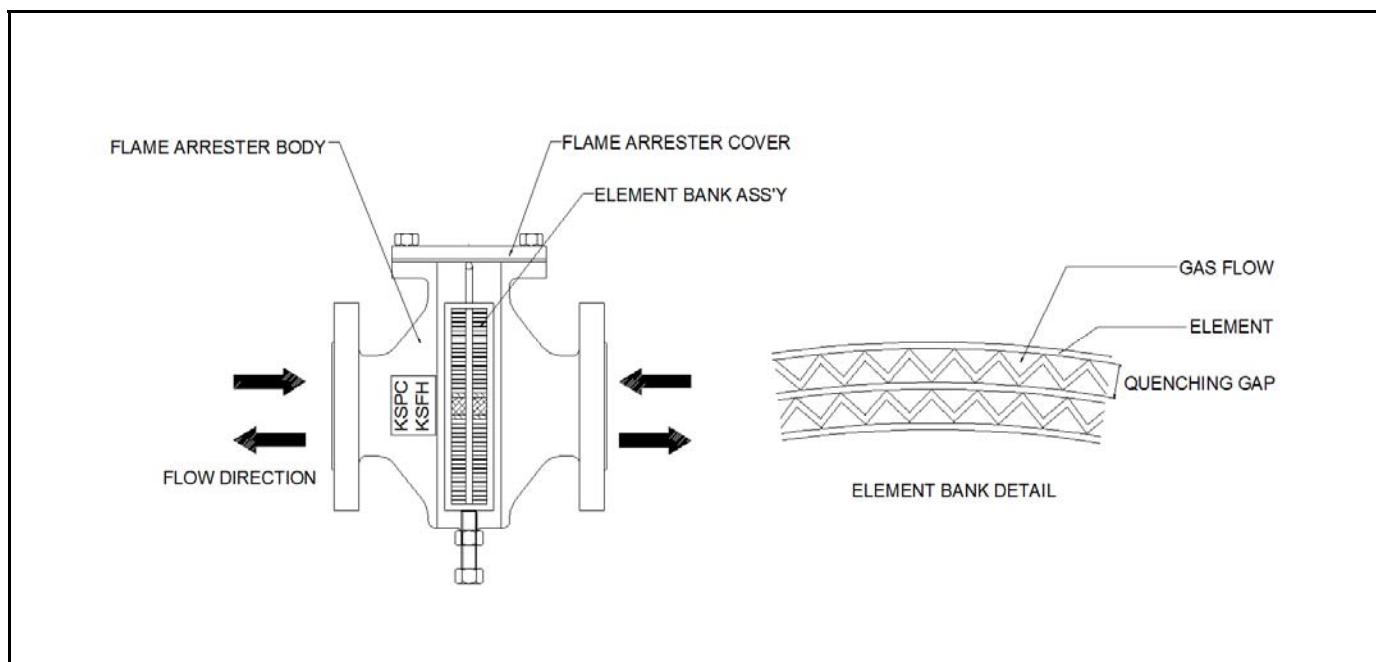


Figure 8 (KSFH TYPE).



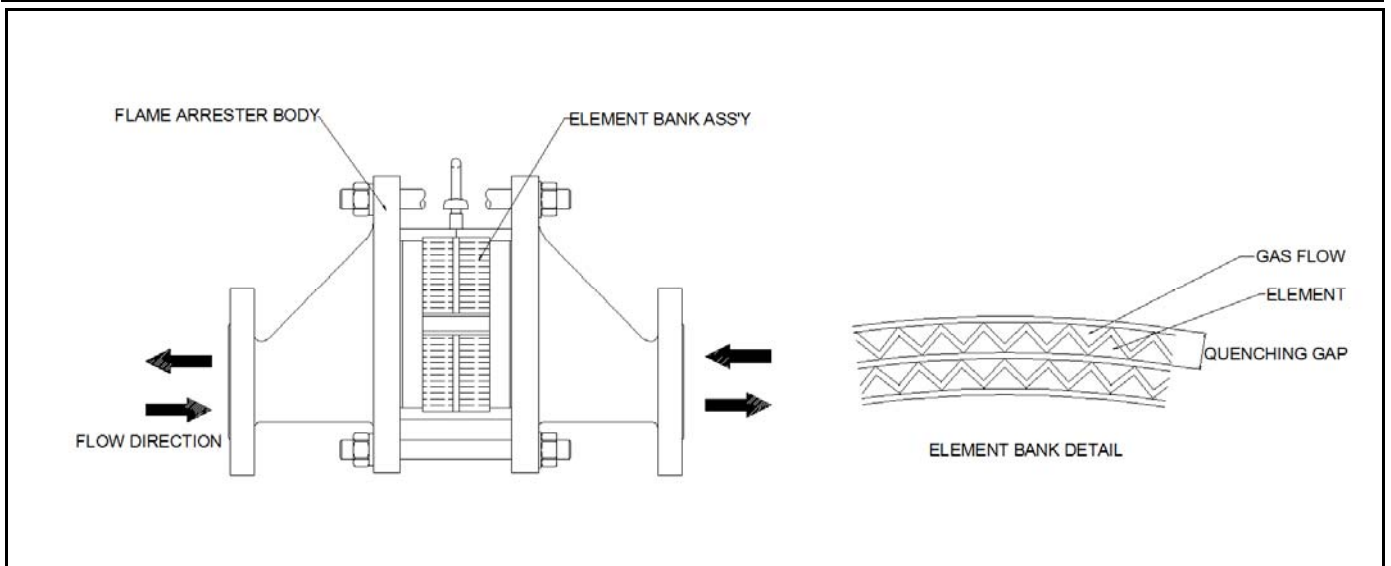


Figure 9 (KSFL TYPE).

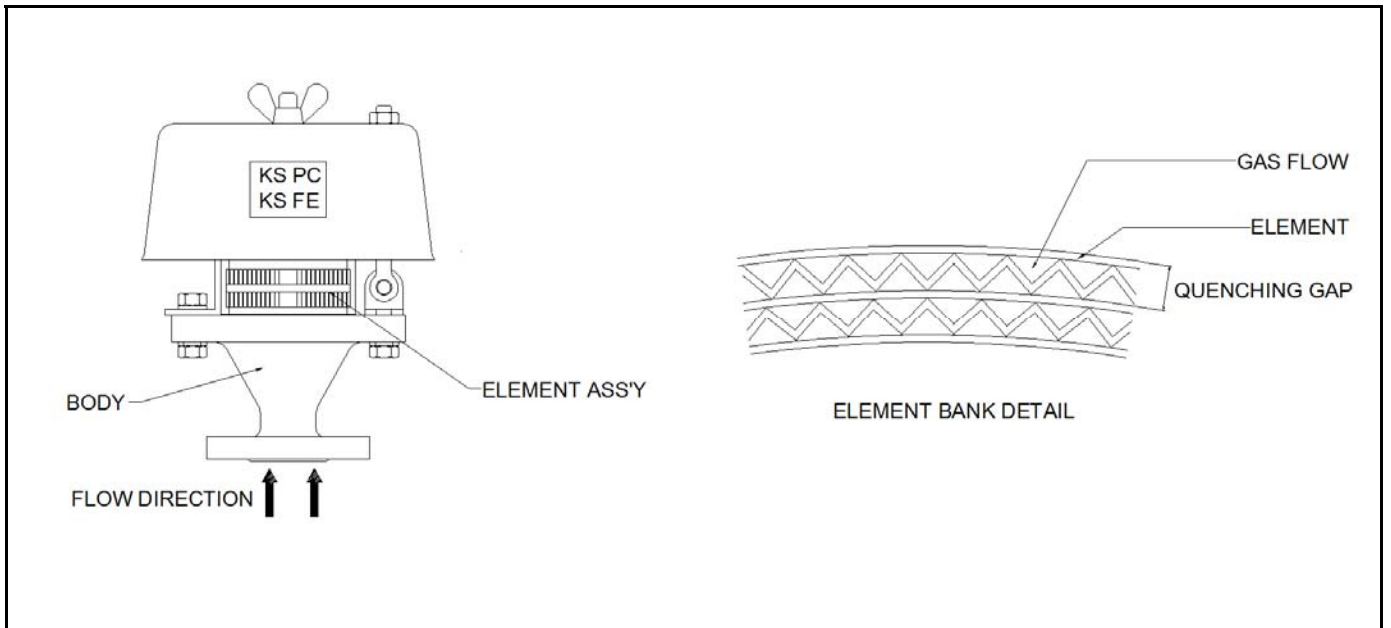


Figure 10 (KSFE TYPE).

## Section 4. Maintenance

### 4-1 General

- 4-1-1 It is recommended to check the flame arrester of element bank ass'y in the first 6 months after operation.
- 4-1-2 Thereafter, it need to be inspected and cleaned regularly in every 6 months at least.
- 4-1-3 To remove the oil dirt in the element of the element bank, soak it in a solvent wash and blow it with compressed air or high pressure steam.
- 4-1-4 The aging and other artificial changes of element quenching gap could be a critical for flashback. In this case, exchange the element bank ass'y into new one.

#### CAUTION

- \* The connection pipeline must be free of all hazardous of flammable vapors before inspection procedures begin.
- \* It is necessary to check the flame arrester regularly installed in the END-LINE of storage tank according to the liquid type and operation condition.
- \* It is necessary to check the element bank ass'y in case of pressure drop in IN-LINE.

### 4-2 THE SAFETY RULES OF MAINTENANCE

- 4-2-1 It is necessary to use the spark free tools for the maintenance work.
- 4-2-2 Before the maintenance work, the inside of storage tank and connection pipe line should be depressurized and all hazardous of flammable gas freed.

#### CAUTION

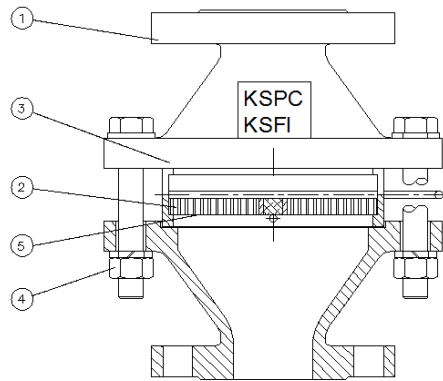
For the maintenance work, it is necessary to take the preventive measures against inflammability and toxicity of liquid or gas in the tank.



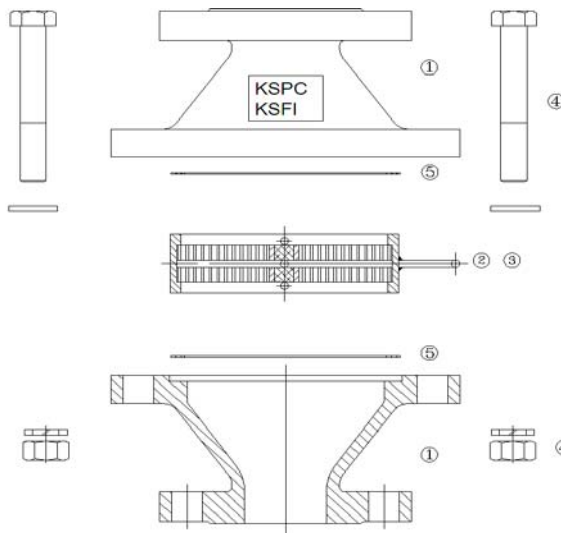
4.3 The Procedure Disassembly and Assembly (Figure 4)

● MODEL KSFI TYPE DISASSEMBLY & ASSEMBLY

**-ASSEMBLY-**



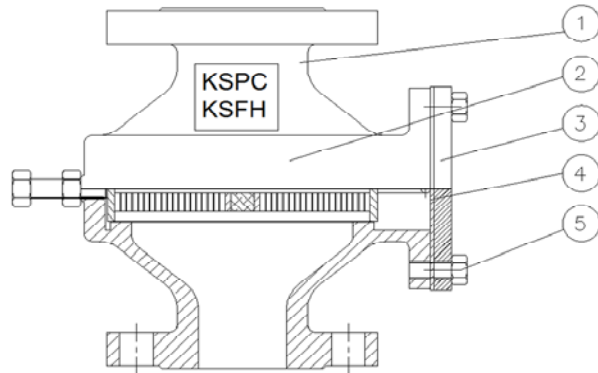
**- DIASSEMBLY-**



- ① BODY
- ② ELEMENT
- ③ ELEMENT RING
- ④ HEX BOLT/NUT
- ⑤ GASKET

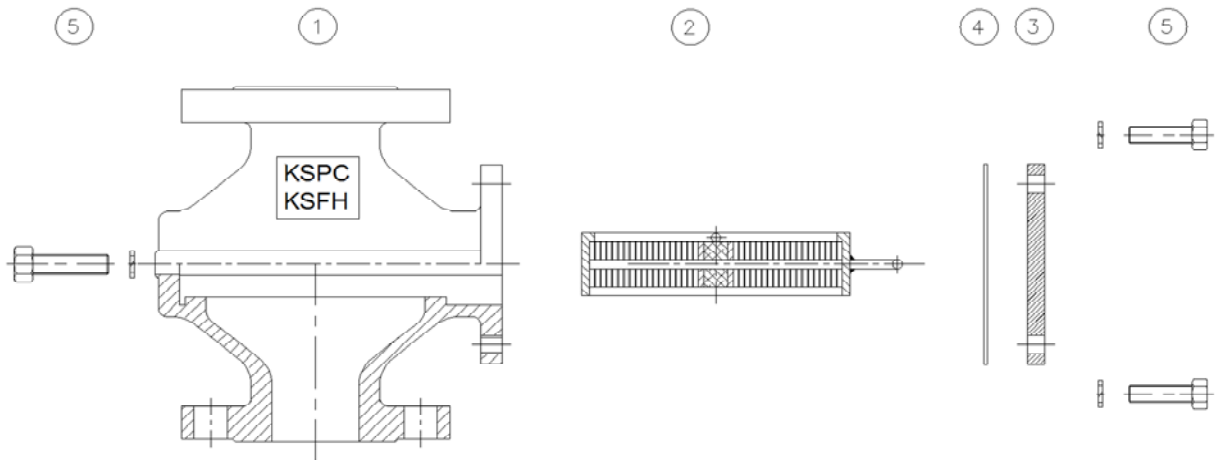
● MODEL KSFH TYPE DISASSEMBLY & ASSEMBLY

-ASSEMBLY-



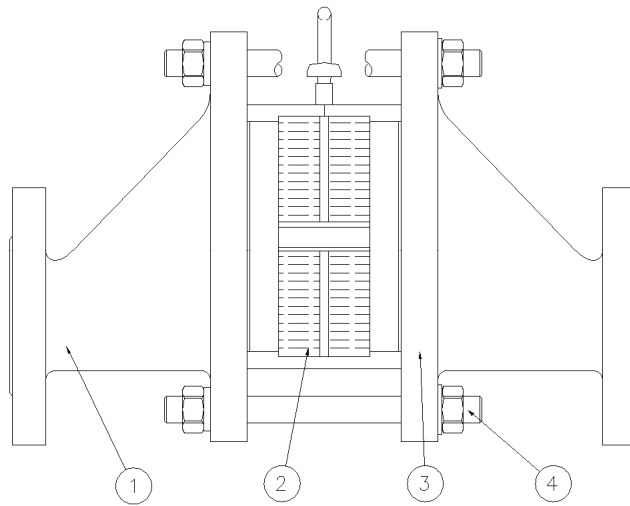
-DIASSEMBLY-

- ① BODY    ② ELEMENT    ③ COVER    ④ GASKET    ⑤ HEX BOLT



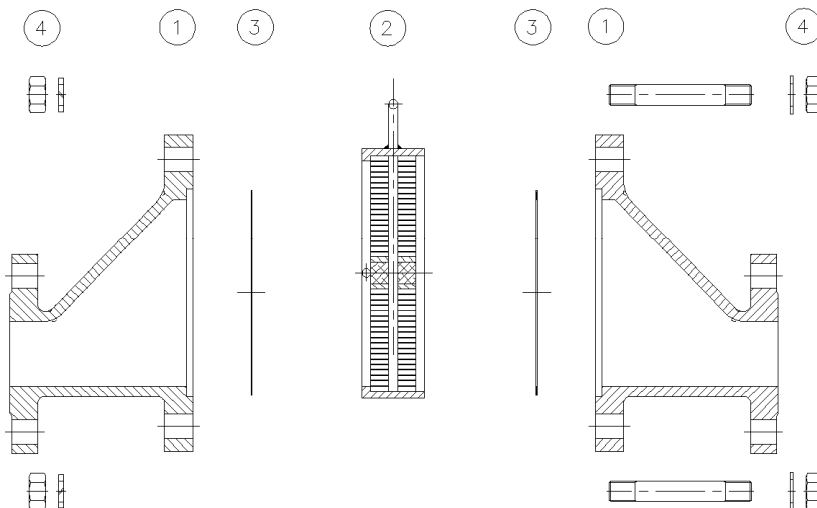
● MODEL KSFL DISASSEMBLY & ASSEMBLY

-ASSEMBLY-



-DIASSEMBLY-

- ① BODY      ② ELEMENT      ③ GASKET      ④ HEX BOLT/NUT



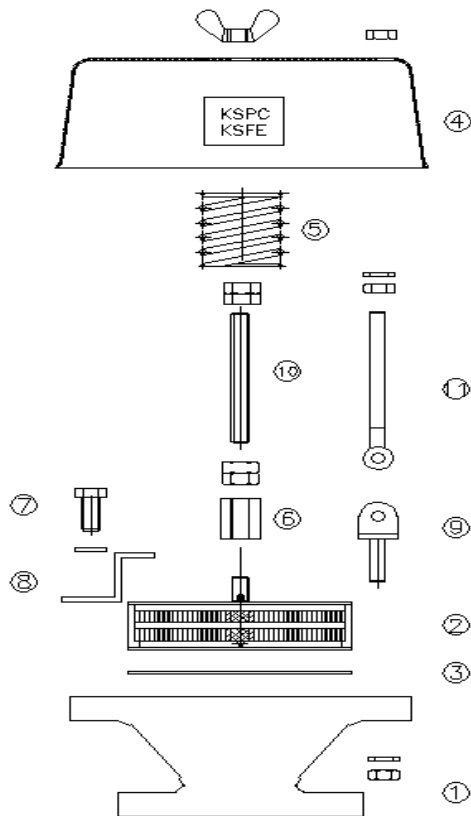
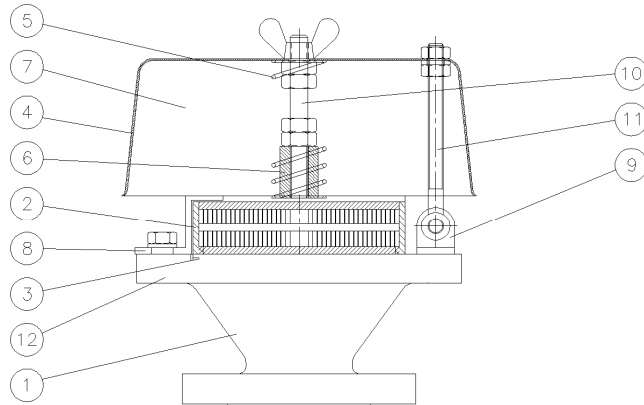
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● MODEL KSFE(2"-4)" TYPE DISASSEMBLY & ASSEMBLY

- ASSEMBLY-

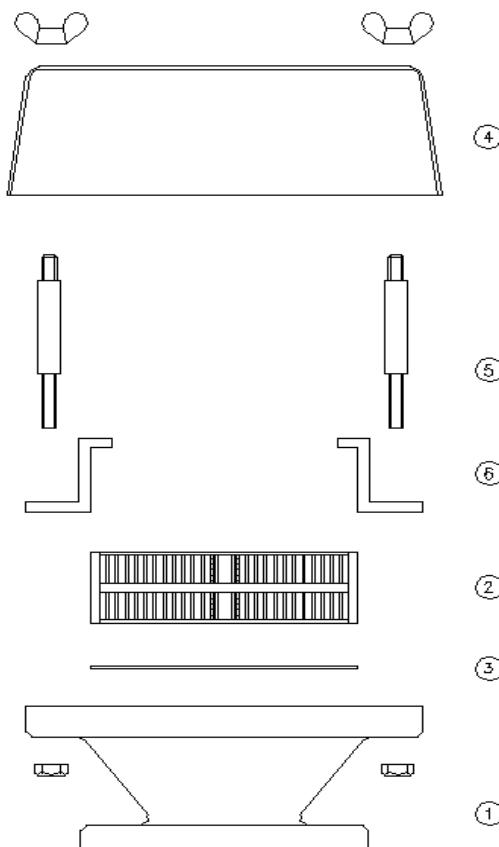
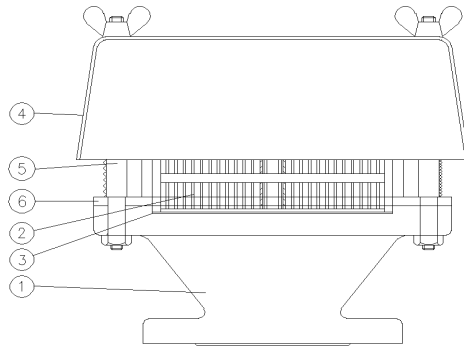


- DISASSEMBLY -

- 1 BODY
- 2 ELEMENT
- 3 GASKET
- 4 HOOD
- 5 SPRING
- 6 PE FREE
- 7 HEX BOLT
- 8 ELEMENT BRACKET
- 9 HANGER BOLT BRACKET

● MODEL KSFE(6~)" TYPE DISASSEMBLY & ASSEMBLY

- ASSEMBLE -



- DISASSEMBLY -

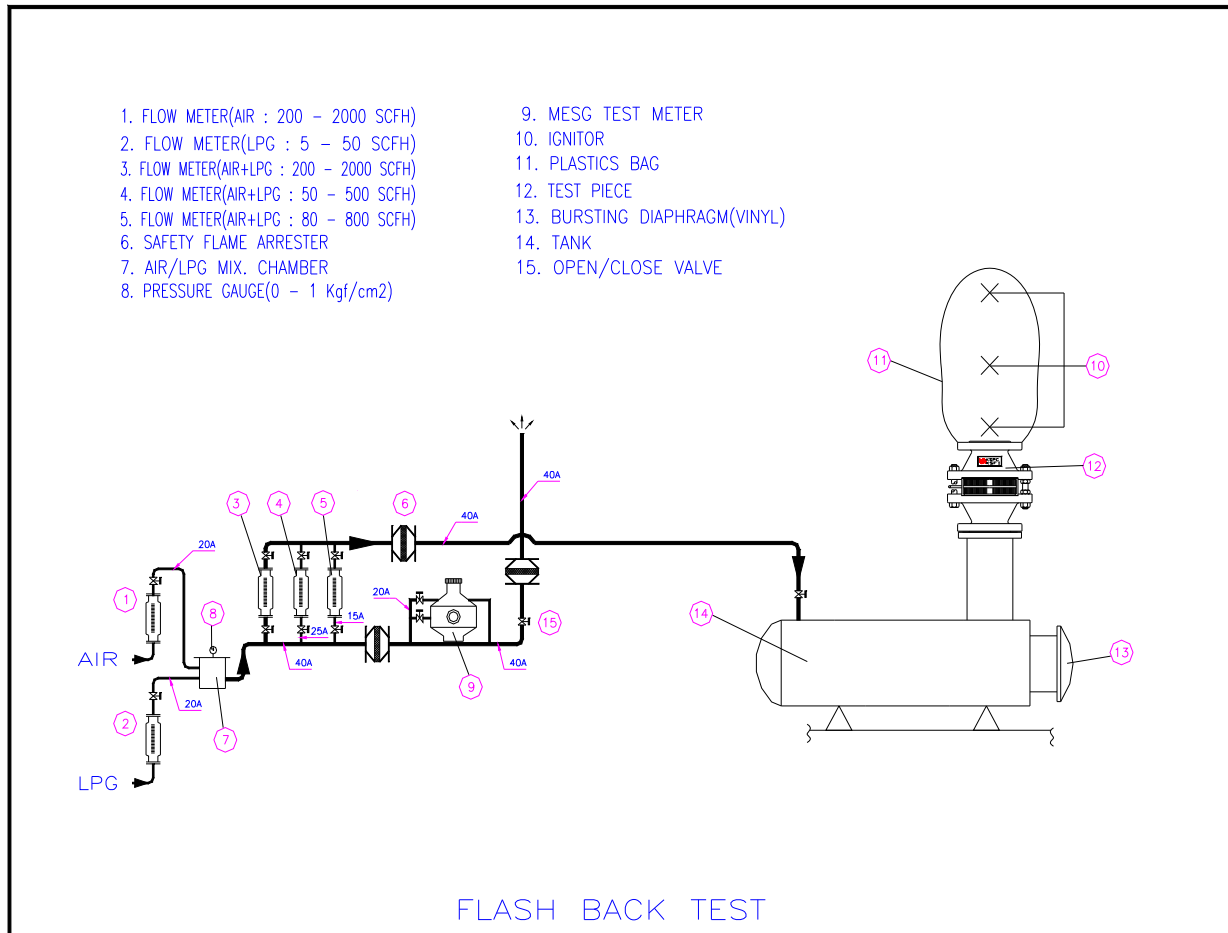
- ① BODY
- ② ELEMENT
- ③ GASKET
- ④ HOOD
- ⑤ STUD BOLT
- ⑥ ELEMENT BRACKET

- 4-3-1 Purge the line or tank with an inert gas before attempting to remove the arrester for maintenance.
- 4-3-2 Loosen the arrester body nuts and remove only those studs or tie rods necessary to withdraw the body.  
Do not remove studs, which have spreader nuts.
- 4-3-3 If the flame arrester is in a horizontal line, attach whatever lifting equipments is required to remove the element.
- 4-3-4 If a vertically mounted flame arrester is used to support a pressure and vacuum relief valve, tightening the housing nuts after separating the bases will provide sufficient support for the PVRV.
- 4-3-5 Remove the housing assembly for inspection.  
Visually inspect the flame element, supporting grids, and steam line for damage or corrosion build-up from both sides.  
If the flame element appears to be damaged, it should be replaced immediately.



## 5. SHOP TESTING

5-1 All products should be examined by the flash back test before the shipping according to arrester group IIA / IIB / IIC of EN ISO 16852.



**Figure 11.**