

**Flöriner**  
APPENDICES

# FLUE GAS DAMPER



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# SELECTION TABLE

Damper model				
<b>S</b>	straight damper			
<b>T</b>	three-way damper			
	Sealing type			
	<b>S-</b>	single blade		
	<b>D-</b>	double blades with sealing air		
		Interlock type		
		<b>E</b>	electrical interlock	
		<b>M</b>	mechanical linkage	
<b>S</b>	<b>S-</b>	<b>E</b>	Example (SS-E)	

# Why do you need flue gas damper valve?

## The MARPOL Annex VI Regulation 13 as following:

The IMO'S Marine Environment Protection Committee(MEPC) held its 57th session from 1 March to April 2008. During the session, both the revised Annex VI of MARPOL and the revised NO<sub>x</sub> Technical Code were approved, with the intention to adopt the two at the 58th MEPC session scheduled to take place in October 2008. The annex and the code are then expect to enter into force in February/March 2010.

The new revision substantially tightens the NO<sub>x</sub> and Sulphur limits compared to existing annex, and also includes requirements governing NO<sub>x</sub> emissions from ships constructed from 1 January 1990 to 1 January 2000.

Tier	Date	NO <sub>x</sub> Limit, g/kWh		
		n<130	130≤n≤2000	n≥2000
Tier I	2000	17.0	45 • n <sup>-0.2</sup>	9.8
Tier II	2011	14.4	45 • n <sup>-0.23</sup>	7.7
Tier III	2016 <sup>①</sup>	3.4	45 • n <sup>-0.2</sup>	1.96

① (Tier III have been reviewed by IMO and implementation postponed to 2021)

It should be noted that the Tier III limits cannot be achieved without additional means, such as Selective Catalytic Reduction (SCR) and Water Injection.

## The MARPOL Annex VI Regulation 14 as following:

MARPOL Annex VI Regulation 14

Regulation 14 limits fuel sulphur content to restrict SO<sub>x</sub> and PM emissions, and applies to all ships in service. The regulation specifies different limits for operating inside and outside ECAs for SO<sub>x</sub> (ECA-SO<sub>x</sub>) and these follow a stepped reduction over time, as shown in Figure 1.

## The requirements of the ABS specification for dampers as follows:

Where bypass arrangements for the SO<sub>x</sub> scrubber unit are provided, the isolation and bypass valves are to be arranged in an interlocked, fail safe manner, such that free flow of exhaust gases to the atmosphere is possible at all times, either through the scrubber unit or through the bypass. Bypass valves are to be provided with a local position indicator.

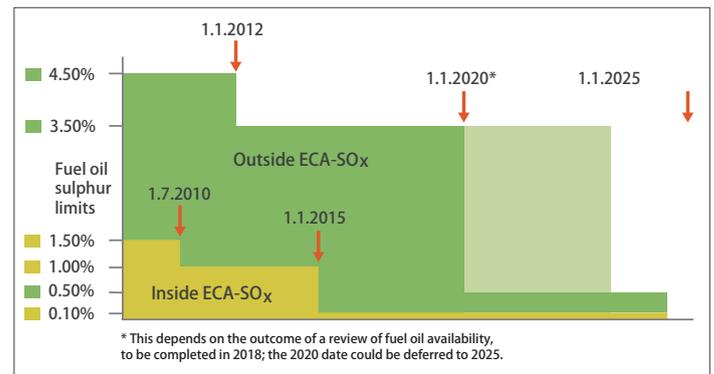


Figure 1: Marine fuel sulphur content reduction as required by Regulation 14.

## The requirements of the DNV-GL specification for dampers as follows:

Bypass shall be arranged where failure may lead to loss of power generation or propulsion.

### ◆ Soot cleaning

Exhaust dampers shall be fitted with a permanently connected soot cleaning arrangement for contact surfaces, or equipment arrangements maintaining the valve operability. Soot cleaning may be arranged by compressed air, steam or water.

### ◆ Soot cleaning (Exemption Clause)

Double-bladed(also known as split blade)dampers with sealing air, flush inner walls in the damper housing and no contact in closed position between the damper blades and the outer wall(i.e. designed not to be fully sealing), may be considered an equivalent arrangement as these are considered not requiring additional soot cleaning.

### ◆ Interlock Control

A single failure in the system(s) controlling the dampers shall not prevent free exhaust flow. Mechanical linkage and other independent mechanical interlock (e.g pneumatic) shall be implemented in the relevant control system(s).

### ◆ Low pressure alarm

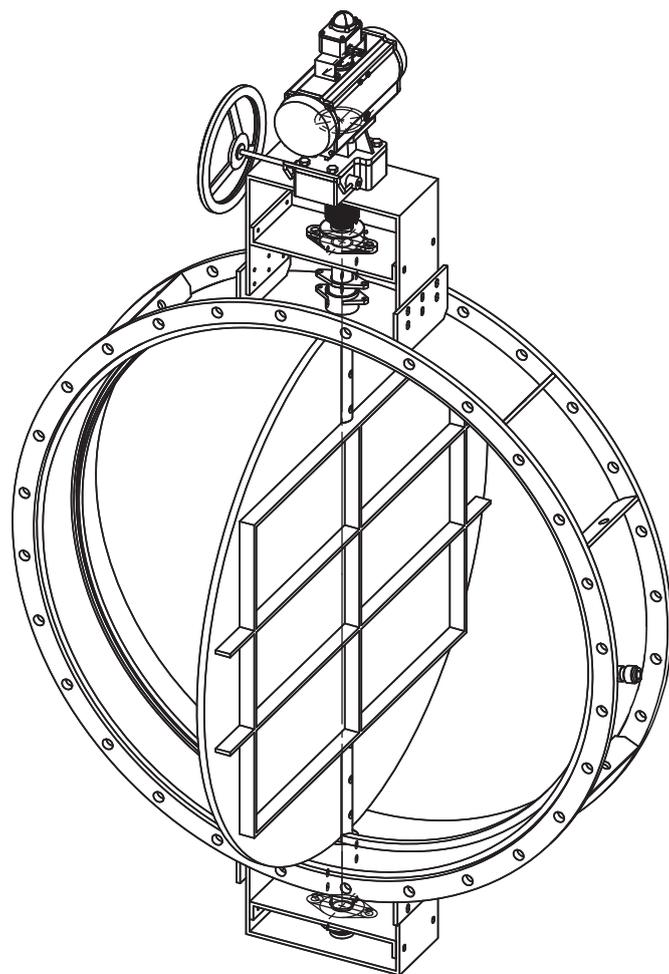
As the bypass shall be open when the inlet is closed, any exhaust backflow through a leaking inlet damper is excepted to flow to bypass line and not reach the idle machinery. Double-bladed (also known as split blade, non-sealing) dampers with non-redundant sealing air supply need alarm for loss of sealing air pressure.

# Why choose Floeriner?

## Advanced design

Our company adopts advanced design to produce various types of flue gas damper valves for desulfurization system in accordance with the market demand. Dampers are designed not to be fully sealing, but with sealing air connection could be **zero leakage when applied sealing air**. They are designed with **inspection hatches** for manual **soot cleaning** when required.

When designing the control system of the dampers, we adopt the **mechanical linkage** or independent **mechanical interlock** (e.g pneumatic) scheme to increase the reliability of system interlocking and meet the requirements of Class. This design can greatly reduce the amount of sealing air pipelines, control cable laying, reduce the construction difficulty and cost of customer.



## Classification society certification

The dampers produced by our company meet the requirements of the classification society, and has obtained the certificate of the relevant classification society of BV, ABS, etc., which can ensure the acceptance of the classification society. The double-blades damper is self-cleaning type. It can be used for soot purging by sealing air. It is equipped with inspection hatches. The soot accumulation can be checked through the inspection hatches. In special cases, it can be compressed through the inspection hatches. The air is purged and cleaned to ensure the performance of the damper valve and prolong the service life.

## Long-term quality assurance and timely after-sales service

The quality of our products is guaranteed. Our company can guarantee the quality of products within 30 months after delivery or 24 months after commissioning. During the quality assurance period, due to equipment failure caused by product quality problems, after the buyer or shipyard contacts us in the first time, we will make an initial reply within 8hours and provide 7X24 hours consulting service.

## Top brand cooperation

Our company cooperates with the world's top brands. such as Festo, Mobil, Exmar, ect. The related components and consumables are purchased from top brands. In the later maintenance, overhaul, you can get the spares you need all over the world.

## FAT experiment

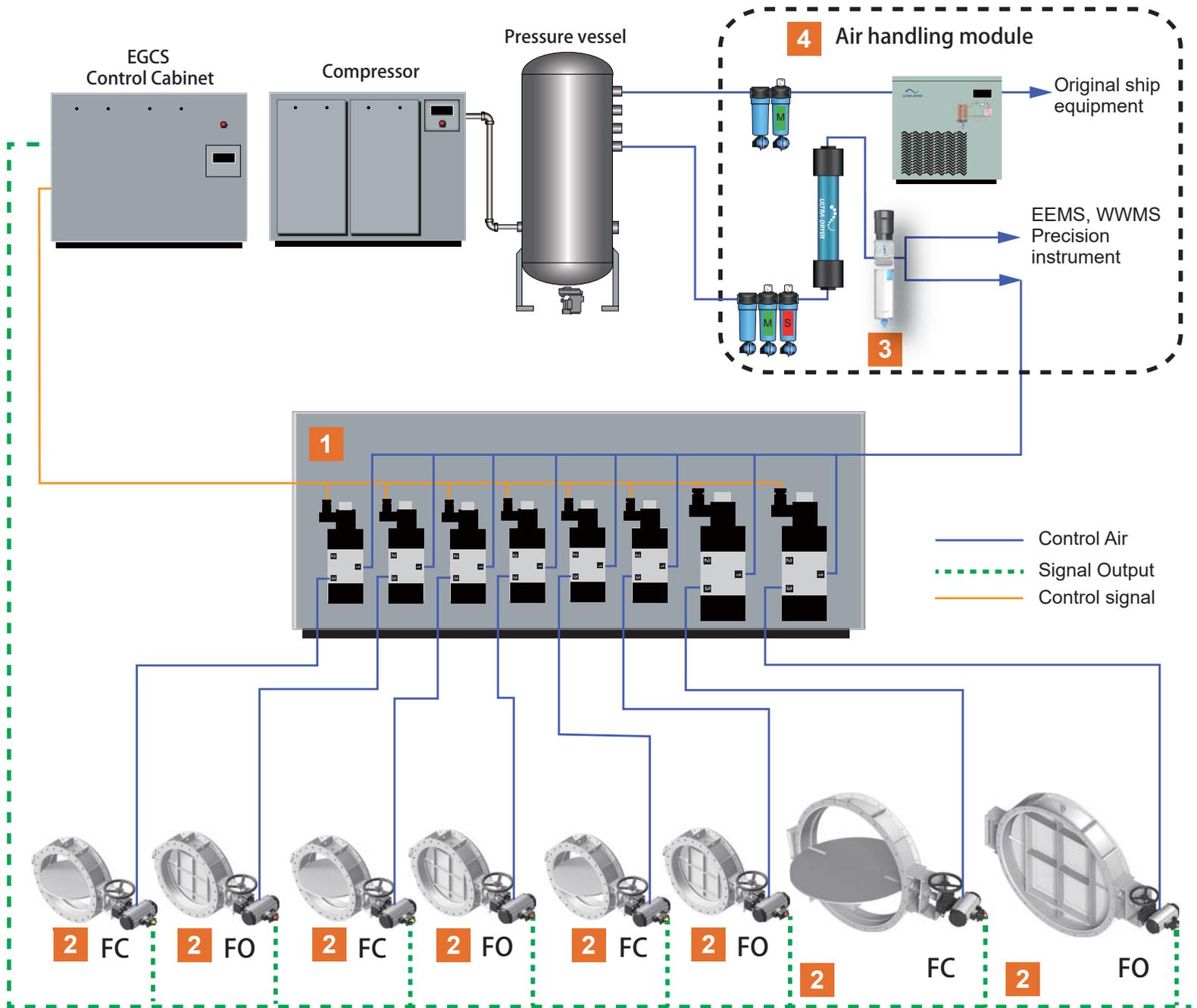
### 1. Strict and detailed inspection

Our company's damper valve production meets ISO9001 system certification. The manufacturing process follows strict and detailed inspections, and adopts standardized inspections in various steps such as raw materials, assembly, welding, painting, and finished products to control and ensure the stability of product quality.

### 2. Scientific and standardized FAT test

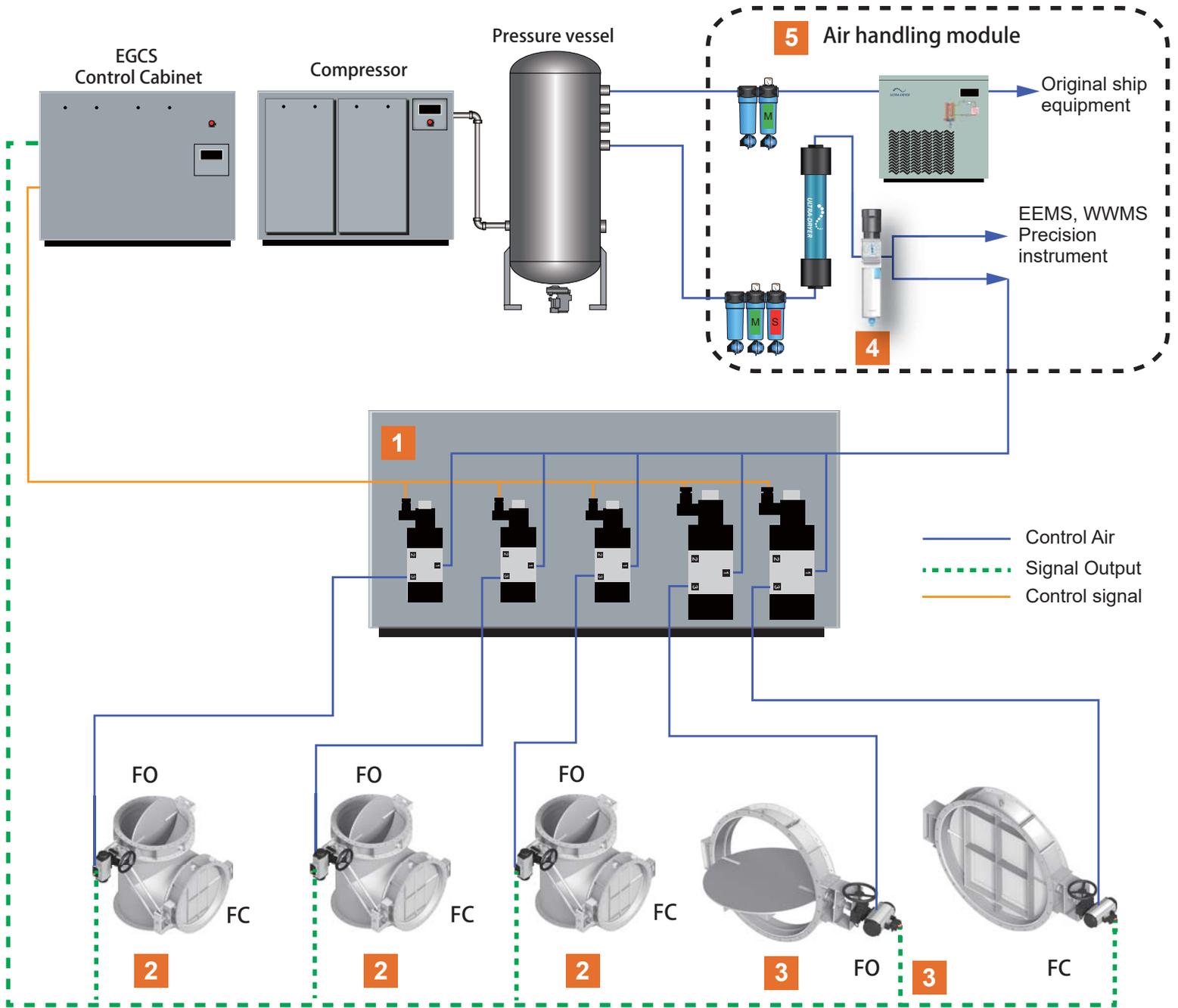
We have developed a scientific FAT experimental program, and carries out on-site simulation tests on each project's products. Use the sealing air unit and compressed air (meet the technical requirements) to test the tightness, opening and closing performance and time of the damper valves to ensure that each product manufactured by the factory meets the standards and requirements.

# SS-E type schematic diagram

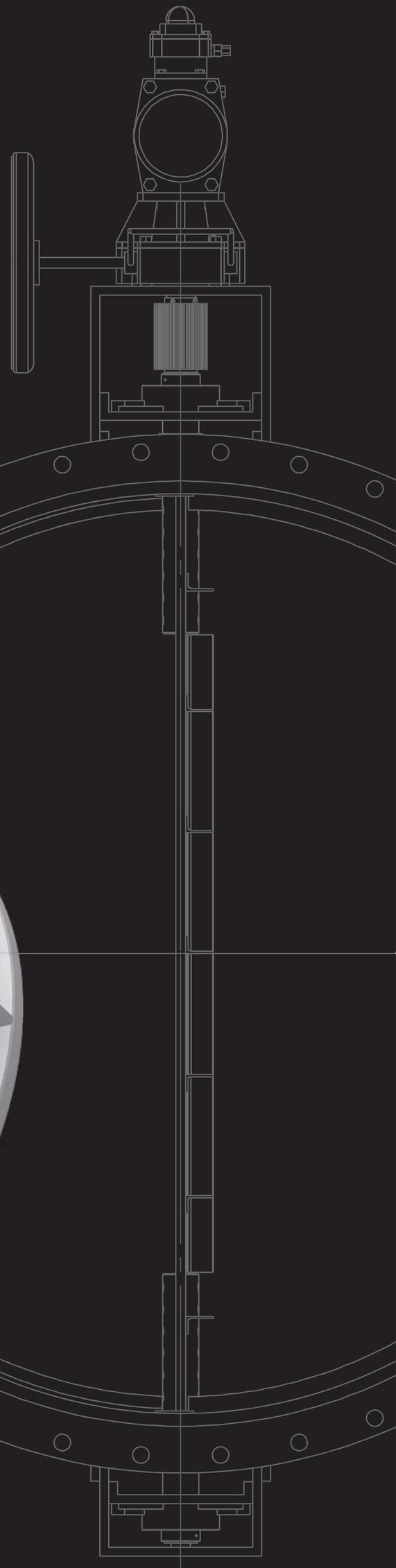
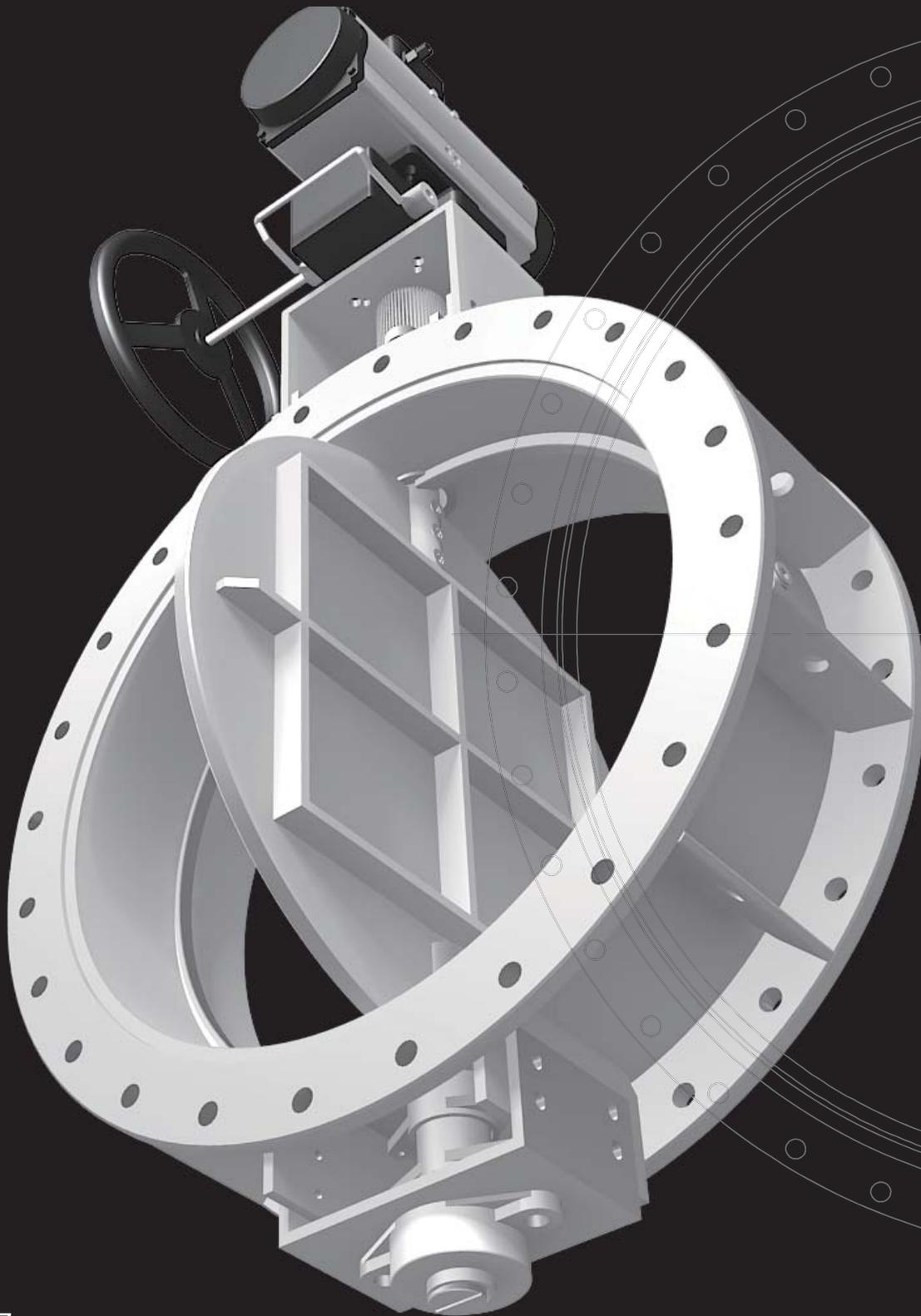


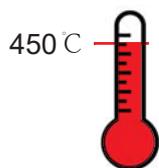
1	Solenoid valve	2	SS-E type damper	3	Pressure reducing valve	4	Air handling module
	The system selects a 2-position 3-way single electronically controlled solenoid valve, to control the opening and closing of a damper valve.		The flue gas damper is operated by manual clutch or single pneumatic actuator (could be FC or FO position when power failure). To close the damper, each damper disc touch the sealing rings to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing. Max. Leakage: ClassIII (0.1%) (FCI 70-2)		According to the supplied compressed air pressure, the pressure reducing valve should be applied once the compressed air pressure is over the pneumatic actuator working pressure 8kg, protect actuators and increase equipment life. (optional)		The air handling unit generally includes air dryer, air filter, etc. It is mainly used for processing compressed air to meet control requirements(ISO 8573-1class 1:2 :1 or class 2:4:2) and is capable of efficiently removing solid particles, water, oil. (We can provide various types of air dryers and filters)

# TS-M & SS-E type schematic diagram



1 Solenoid valve	2 TS-M type damper	3 SS-E type damper	4 Pressure reducing valve	5 Air handling module
<p>The system selects a 2-position 3-way single electronically controlled solenoid valve, to control the opening and closing of a damper valve.</p>	<p>TS-M flue gas damper is designed with two sets dampers and double mechanical linkages to ensure when one damper is in "close" position, another damper is in "open" position. The bypass damper is operated by manual clutch or single pneumatic actuator (FO position when power failure). To close the damper, discs touch the sealing rings to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing.</p>	<p>The flue gas damper is operated by manual clutch or single pneumatic actuator (could be FC or FO position when power failure). To close the damper, each disc touch the sealing rings to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing. Max.Leakage: ClassIII (0.1%) (FCI 70-2)</p>	<p>According to the supplied compressed air pressure, the pressure reducing valve should be applied once the compressed air pressure is over the pneumatic actuator working pressure 8kg, protect actuators and increase equipment life. (optional)</p>	<p>The air handling unit generally includes air dryer, air filter, etc. It is mainly used for processing compressed air to meet control requirements (ISO - 8573-1 class 1:2:1 or class 2:4:2), and is capable of efficiently removing solid particles, water, oil. (We can provide various types of air dryers and filters)</p>





Manual emergency operation

Heat dissipation

Soot Cleaning

# SS-E Series

## Specification

**Nominal diameter rating:** DN200 to DN3200.

**Max. Working temperature:** 450 °C .

(Depending on the material).

**Material:** Carbon Steel, ND Steel(09CrCuSb), Stainless Steel.

**End connections:** Flanged.

**Max.Leakage:** ClassIII (0.1%) (FCI 70-2)

**Inspection hatches :**soot cleaning.

*Provide customized services.*

## Range of application

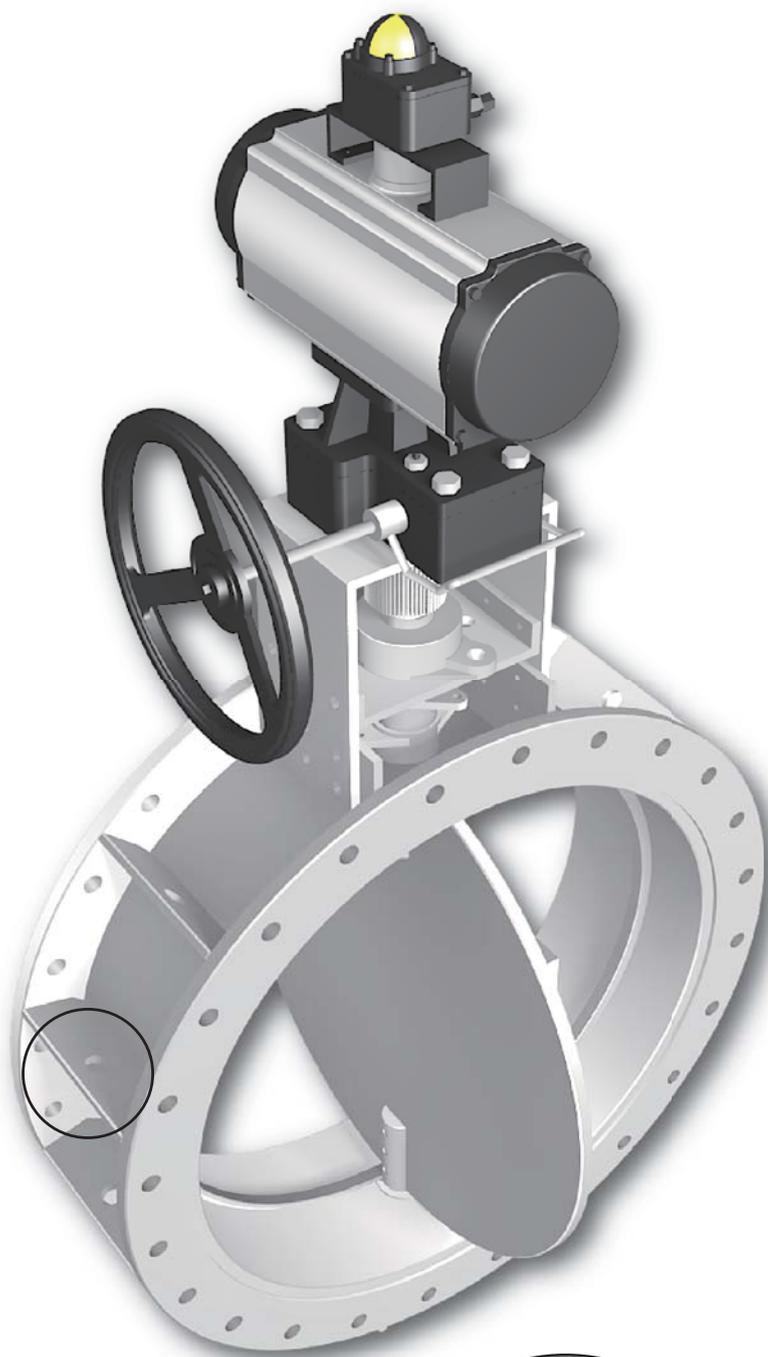
- Marine EGCS system
- NOx reduction system
- Power Plants
- Heat Recovery Systems
- Fluids: Gas and Fumes
- CHP and Incineration Plants (Waste to Energy)
- Biomass, Biogas and Renewable Energy Plants
- Steel Industry and Furnaces
- Boilers and Burners
- Oil and Gas
- Thermal Oxidizer

Customized for other applications.

## Working principle

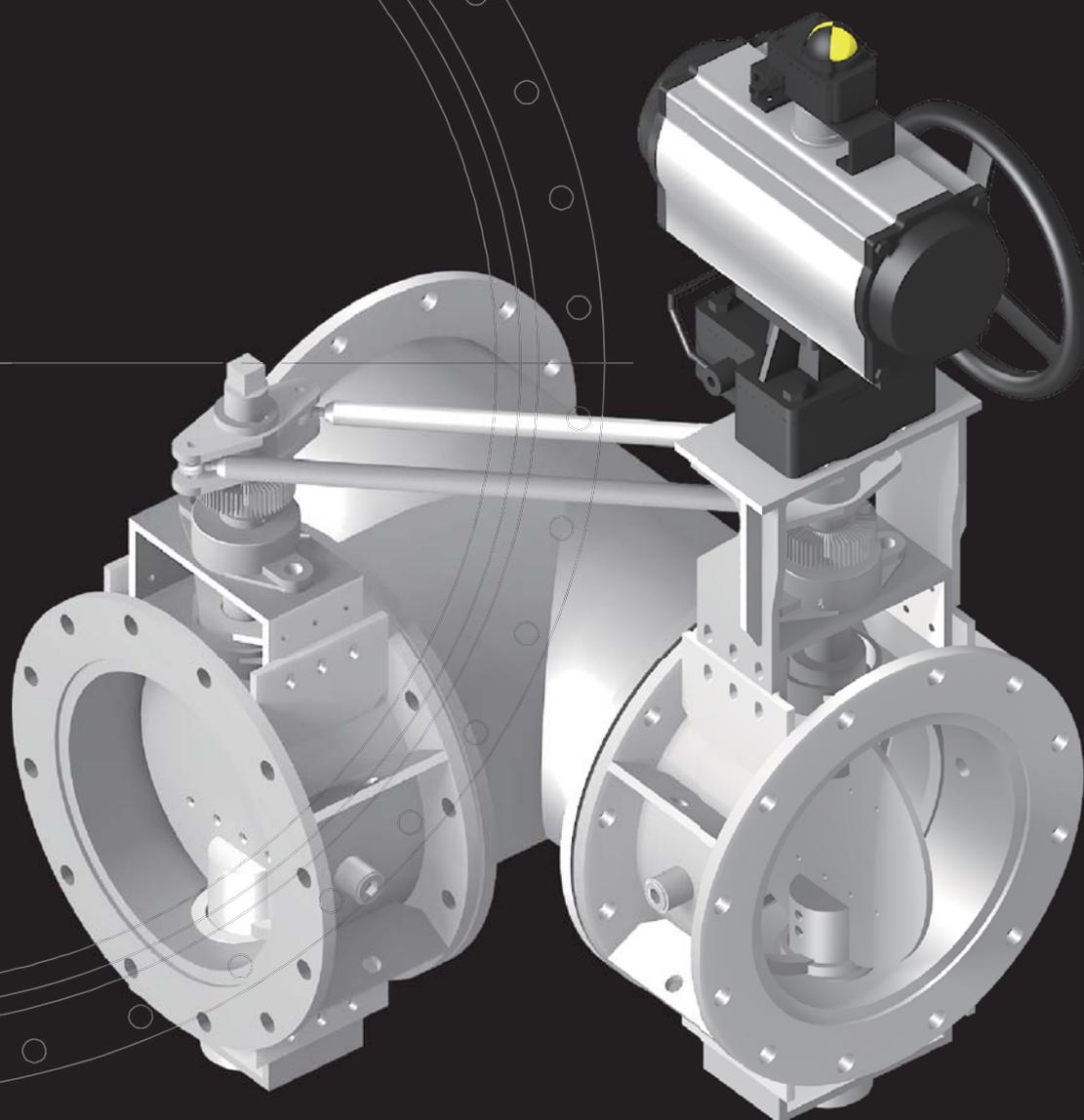
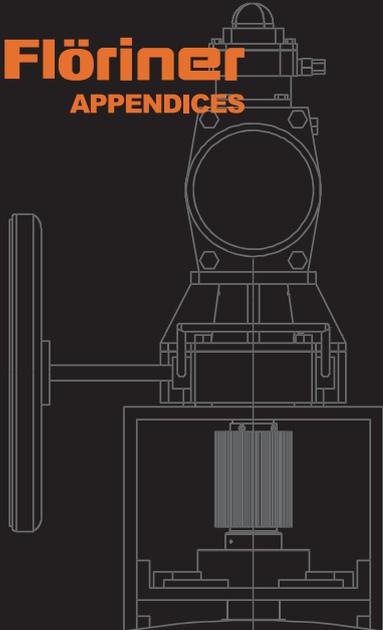
The flue gas damper with single disc is operated by manual clutch or single pneumatic actuator (could be FC or FO position when power failure).

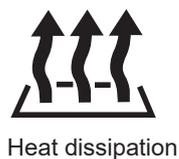
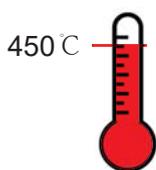
To close the damper, the damper disc touch the sealing rings (two malposed half rings) to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing.



Cleaning hatch for soot cleaning

DN	200-500	550-950	1000-1950	2000-2500	2600-3000	3100-3600
Temp.max	450°C	450°C	450°C	450°C	450°C	450°C
Design pressure max.	50mbar	50mbar	50mbar	50mbar	50mbar	50mbar
Test pressure	55mbar	55mbar	55mbar	55mbar	55mbar	55mbar
Connection flange	International standards					
Paint	High temp. paint	High temp. paint	High temp. paint	High temp. paint	High temp. paint	High temp. paint
Driver connection	ISO 5211					
Max.Leakage	ClassIII (0.1%) (FCI 70-2)					
L	200	250	300	350	400	450





# TS-M Series

## Specification

**Nominal diameter rating:** DN200 to DN3200.

**Max. Working temperature:** 450 C .  
(Depending on the material).

**Material:** Carbon Steel, ND Steel(09CrCuSb), Stainless Steel.

**End connections:** Flanged

**Max.Leakage:** ClassIII (0.1%) (FCI 70-2)

**Inspection hatches :**soot cleaning.

*Provide customized services.*

## Range of application

- Marine EGCS system
  - NOx reduction system
  - Power Plants
  - Heat Recovery Systems
  - Fluids: Gas and Fumes
  - CHP and Incineration Plants (Waste to Energy)
  - Biomass, Biogas and Renewable Energy Plants
  - Steel Industry and Furnaces
  - Boilers and Burners
  - Oil and Gas
  - Thermal Oxidizer
- Customized for other applications.

## Mechanical interlock working principle

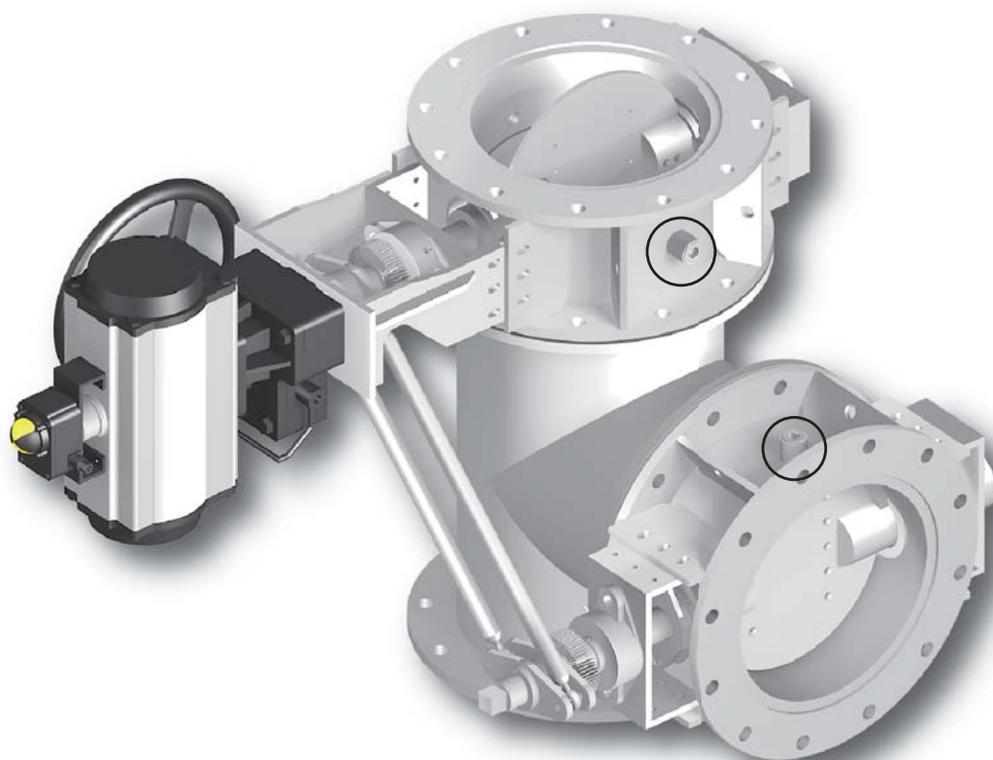
TS-M flue gas damper is designed with two sets dampers and double mechanical linkages to ensure when one damper is in "close" position, another damper is in "open" position. The bypass damper is operated by manual clutch or single pneumatic actuator (FO position when power failure).

To close the damper, damper discs touch the sealing rings (two malposed half rings) to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing.

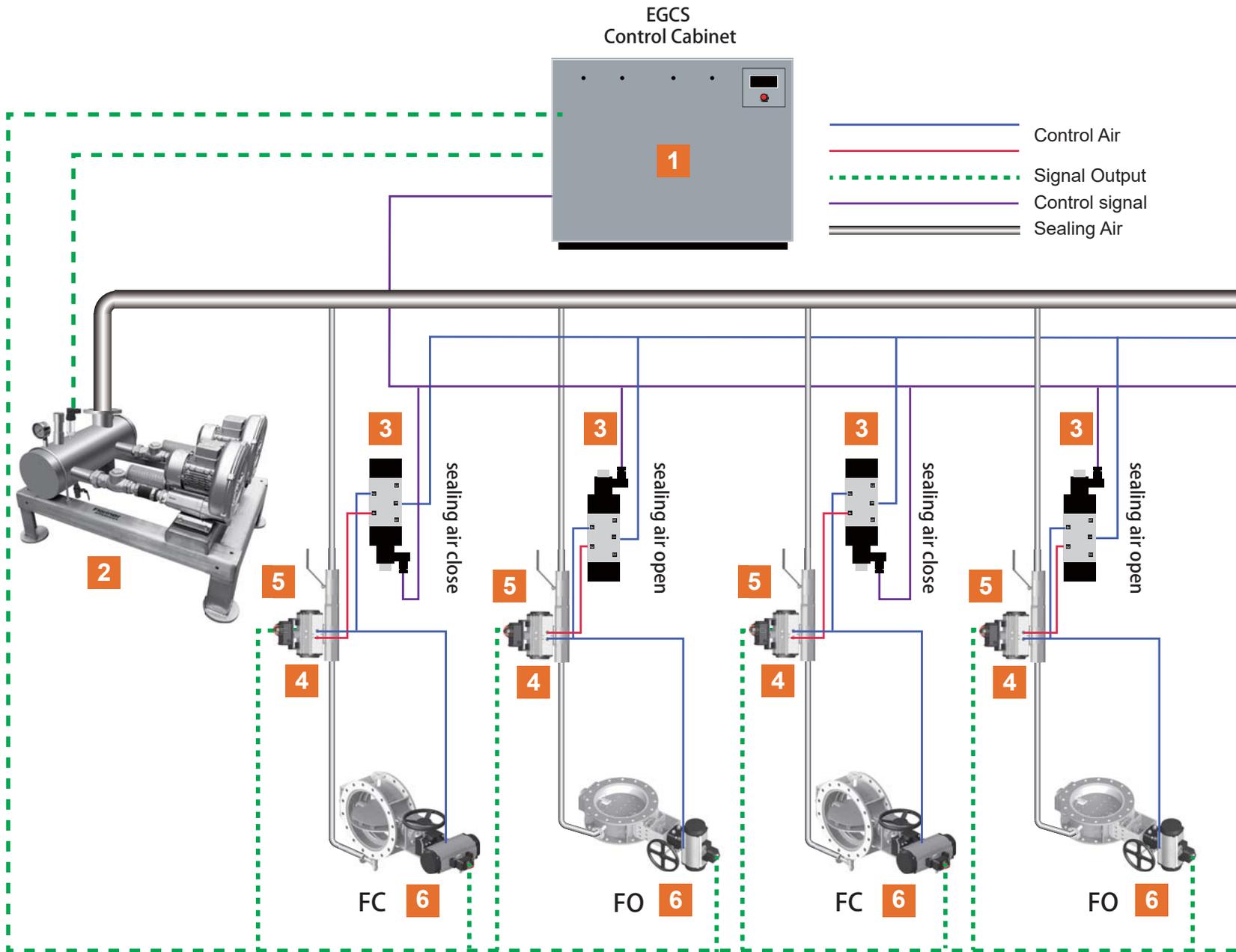
## Connection attachment

A high-temperature graphite gasket is arranged between the three-way pipeline and the dampers, which has excellent performance against high temperature and corrosion, and can ensure good sealing of the joint of the dampers.

### Mechanical linkage



# SD-E type schematic diagram



Special attention: Between the sealing air valve and the sealing air inlet of the damper valve, the length of the pipeline is not less than 2.5 meters.

When arranging the branch of the sealed air, shorten the arrangement length as much as possible, reduce the pipe elbow, reduce the pressure loss, and prevent the airtight performance of the equipment from being affected.

## 1 EGCS Control Cabinet

The EGCS control box is mainly used to output the power supply to the solenoid valve of the system according to the control requirements, to control the opening and closing of the damper valve and the sealing air valve by opening and closing the compressed air, and to receive the position signal feedback of the flue gas damper valve and the sealing air valve. (Supplied by others)

## 2 Sealing air unit

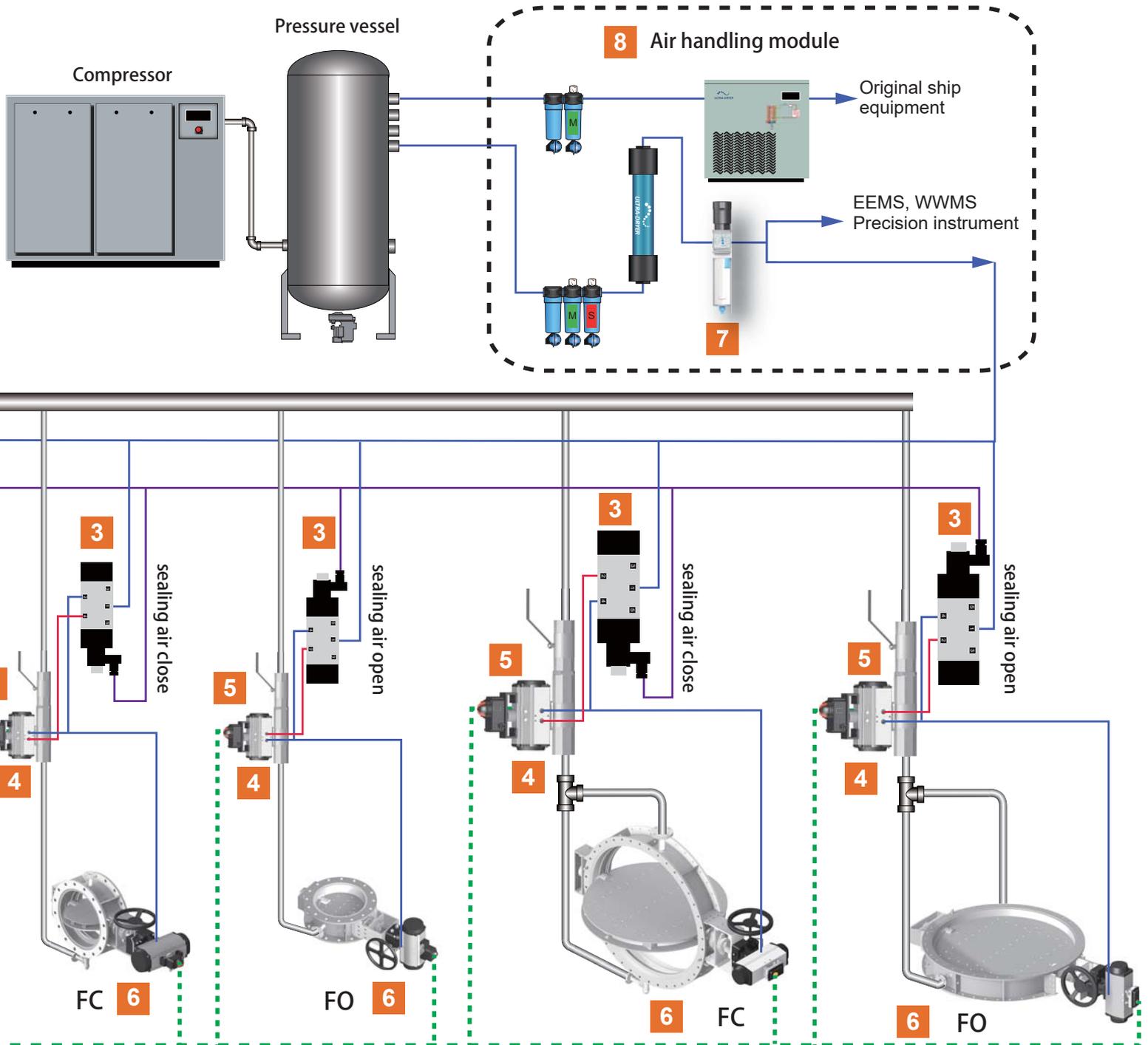
The sealing air unit consists of two blowers, pressure release valve, drain valve, check valve, etc. for conveying the sealing air to the airtight flue gas damper valve. The actual parameters of the buyer's flue gas and pipe-line, combined with the performance of the damper valve, are calculated by selecting different sizes of sealing air units.

## 3 Solenoid valve

The system selects a two-position five-way single electronically controlled solenoid valve, simultaneously controls a damper valve and its corresponding sealing air valve to open the sealing air valve when the damper valve is closed.

## 4 Pneumatic sealing air valve

The sealing air valve is composed of a pneumatic actuator, and a ball valve. The interlocking control of the sealing air valve and the flue gas damper valve is realized by the solenoid valve. Provide a variety of connection type, flange or threaded connection.



**5 Manual ball valve**

Manually close the ball valve during maintenance to isolate the sealing air for easy maintenance  
Provide a variety of connection type, flange or threaded connection.

**6 SD-E type Damper valve**

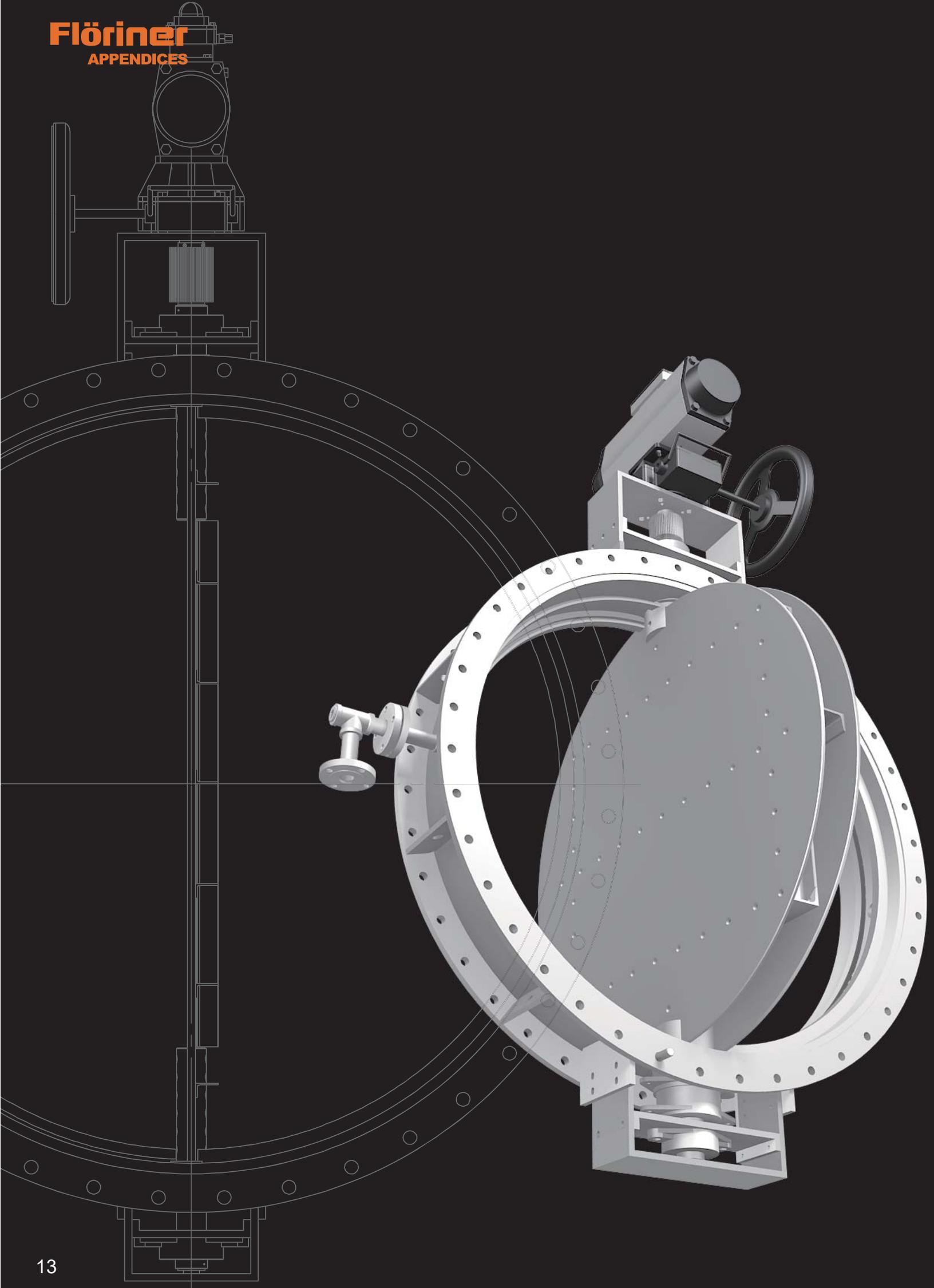
The flue gas damper is operated by manual clutch or single pneumatic actuator (could be FC or FO position when power failure). To close the damper, each damper disc touch the sealing rings (two couple of malposed half rings) to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing; both side of shaft end are sealed with H.T. resistant soft material stuffing. All sealings are designed for damper zero leakage.

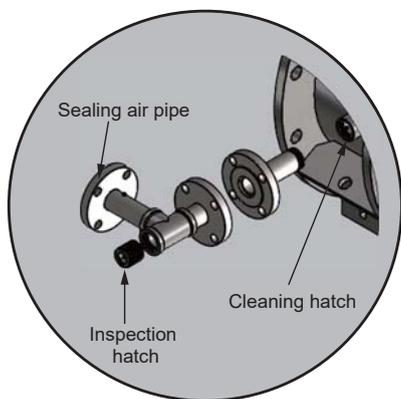
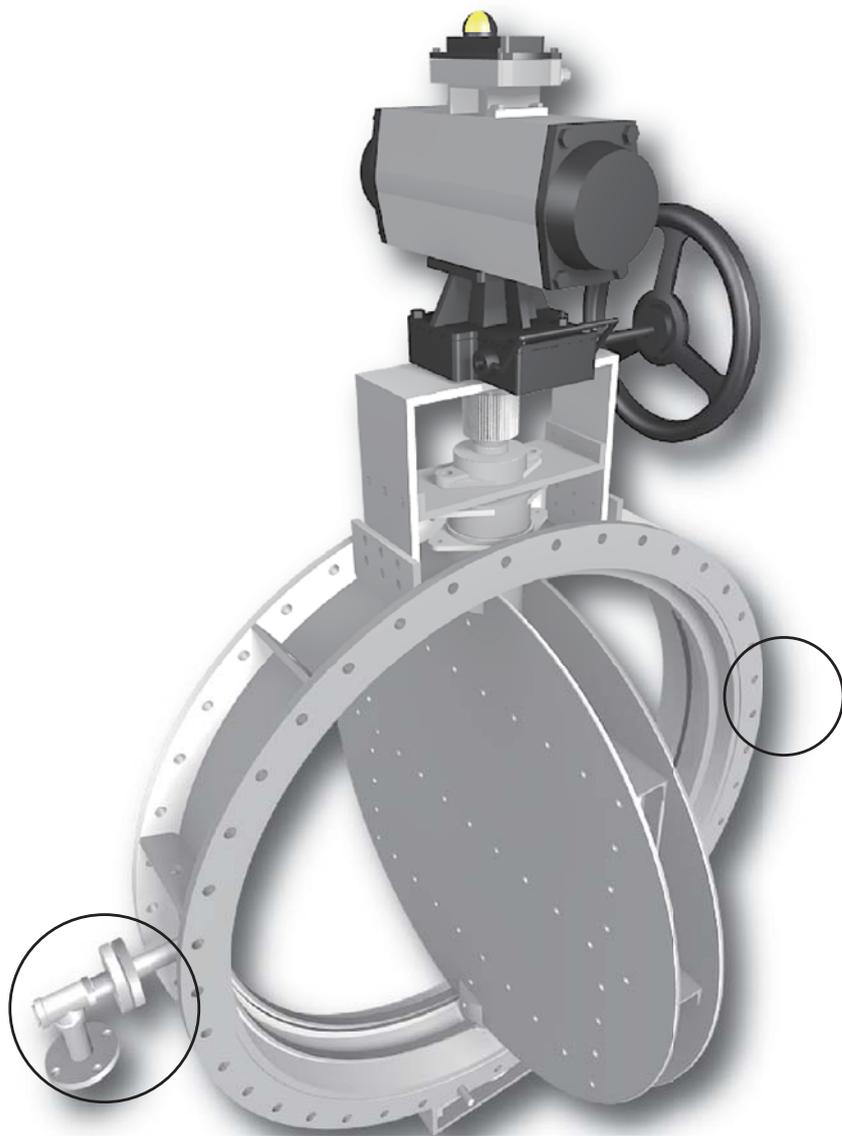
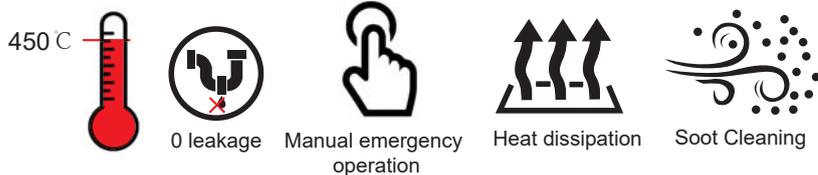
**7 Pressure reducing valve**

According to the supplied compressed air pressure, the pressure reducing valve should be applied once the compressed air pressure is over the pneumatic actuator working pressure 8kg, protect actuators and increase equipment life. (optional)

**8 Air handling module**

The air handling unit generally includes air dryer, air filter, etc. and is mainly used for processing compressed air to meet control requirements (ISO 8573-1 class 1:2 :1 or class 2:4:2), and is capable of efficiently removing solid particles, water, oil. (We can provide various types of air dryers and filters)





# SD-E Series

## Specification

**Nominal diameter rating:** DN200 to DN3200.  
**Max. Working temperature:** 450°C. (Depending on the material).  
**Material:** Carbon Steel, ND Steel(09CrCuSb), Stainless Steel.  
**End connections:** Flanged  
**Leakage rate:** 0  
**Inspection hatches :** soot cleaning.  
*Provide customized services.*

It is designed not to be fully sealing, but with sealing air connection could be zero leakage when applied sealing air. It is designed with inspection hatches for manual soot cleaning when required.

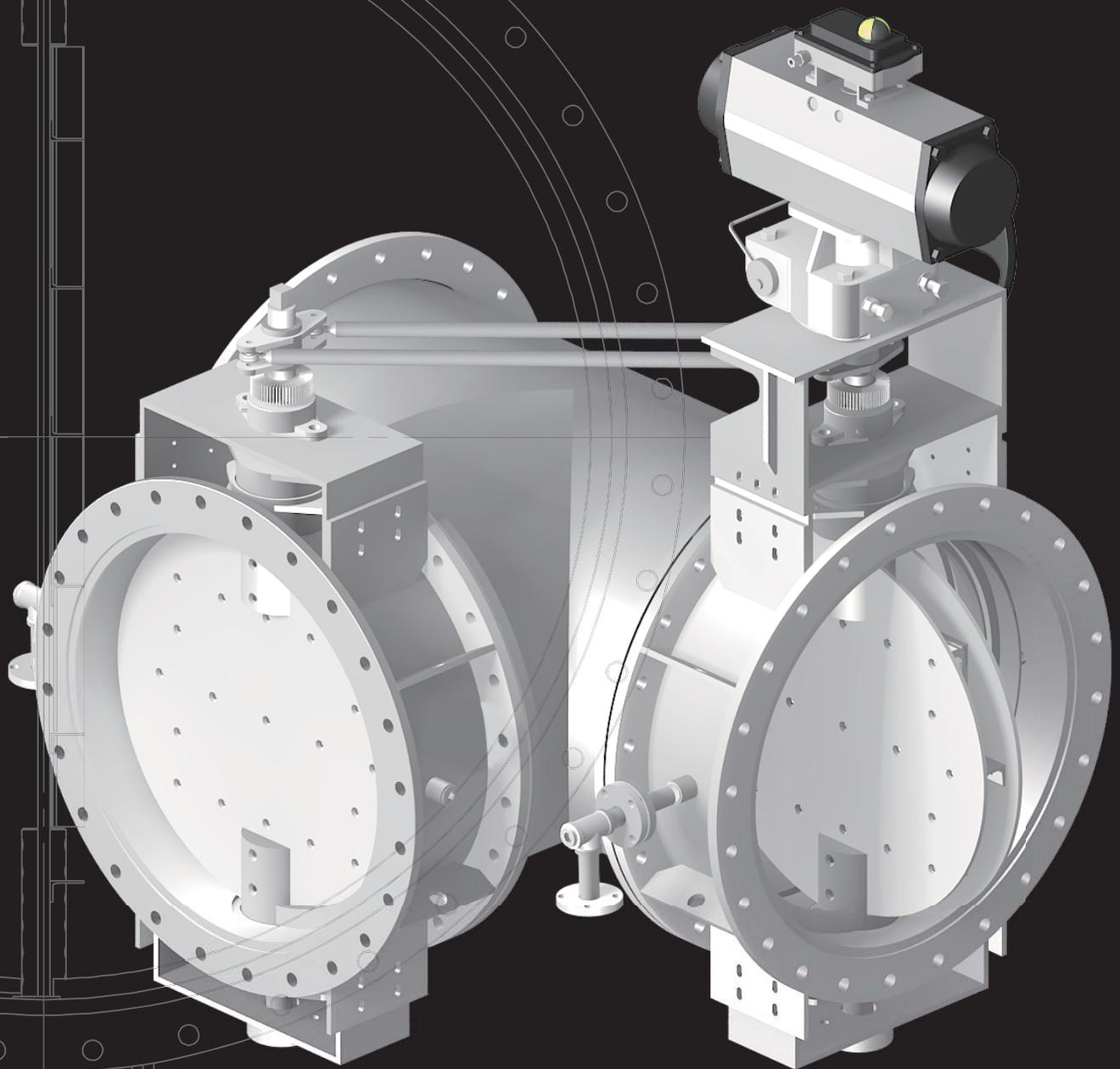
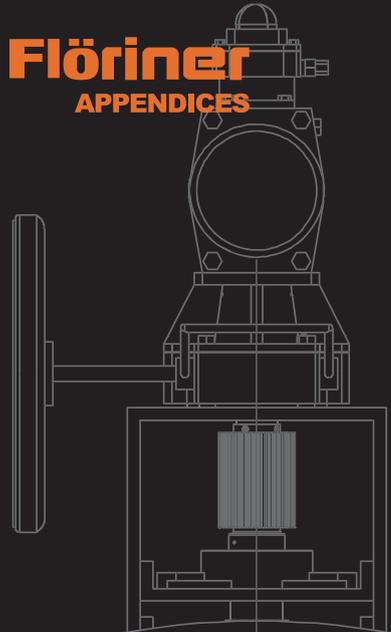
## Range of application

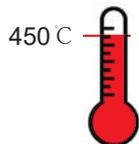
- Marine EGCS system
  - NOx reduction system
  - Power Plants
  - Heat Recovery Systems
  - Fluids: Gas and Fumes
  - CHP and Incineration Plants (Waste to Energy)
  - Biomass, Biogas and Renewable Energy Plants
  - Steel Industry and Furnaces
  - Boilers and Burners
  - Oil and Gas
  - Thermal Oxidizer
- Customized for other applications.

## Working principle

The flue gas damper with double combined discs is operated by manual clutch or single pneumatic actuator (could be FC or FO position when power failure). To close the damper, each damper disc touch the sealing rings (two couple of malposed half rings) to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing; both side of shaft end are sealed with H.T. resistant soft material stuffing. The air sealing connection for sealing air (sealing air pressure is slight higher than the flue gas pressure) is option according to customer's requirement.

DN	200-500	550-950	1000-1950	2000-2500	2600-3000	3100-3600
Temp.max	450°C	450°C	450°C	450°C	450°C	450°C
Design pressure max.	50mbar	50mbar	50mbar	50mbar	50mbar	50mbar
Test pressure	55mbar	55mbar	55mbar	55mbar	55mbar	55mbar
Connection flange	International standards					
Paint	High temp.paint					
Driver connection	ISO 5211					
Max.Leakage	0	0	0	0	0	0
L	200	250	300	350	400	450
Air connection (option)	G1" or DN25 flange	G1" or DN25 flange	G1-1/2" or DN40 flange	G1-1/2" or DN40 flange	G1-1/2" or DN40 flange	G2" or DN50 flange





450 °C



0 leakage



Manual emergency operation



Heat dissipation



Soot Cleaning

# TD-M Series

## Specification

**Nominal diameter rating:** DN200 to DN3200.

**Max. Working temperature:** 450 °C.  
(Depending on the material).

**Material:** Carbon Steel, ND Steel(09CrCuSb), Stainless Steel.

**End connections:** Flanged

**Leakage rate:** 0

**Inspection hatches :** soot cleaning.

**Provide customized services.**

It is designed not to be fully sealing, but with sealing air connection could be zero leakage when applied sealing air.

It is designed with inspection hatches for manual soot cleaning when required.

## Range of application

- Marine EGCS system
- NOx reduction system
- Power Plants
- Heat Recovery Systems
- Fluids: Gas and Fumes
- CHP and Incineration Plants (Waste to Energy)
- Biomass, Biogas and Renewable Energy Plants
- Steel Industry and Furnaces
- Boilers and Burners
- Oil and Gas
- Thermal Oxidizer

Customized for other applications.

## Mechanical interlock working principle

TD-ML 3-way flue gas damper is designed with two sets dampers and double mechanical linkages to ensure when one damper is in "close" position, another damper is in "open" position. The atmosphere damper is operated by manual clutch or single pneumatic actuator (FO position when power failure). To close the damper, damper discs touch the sealing rings (two couple of malposed half rings) to get the plane sealing effect; the damper shaft and half rings are unique designed for surface sealing. The air sealing connection for sealing air (sealing air pressure is slight higher than the flue gas pressure) is option according to customer's requirement.

## Connection attachment

A high-temperature graphite gasket is arranged between the three-way pipeline and the dampers, which has excellent performance against high temperature and corrosion, and can ensure good sealing of the pipe-system.

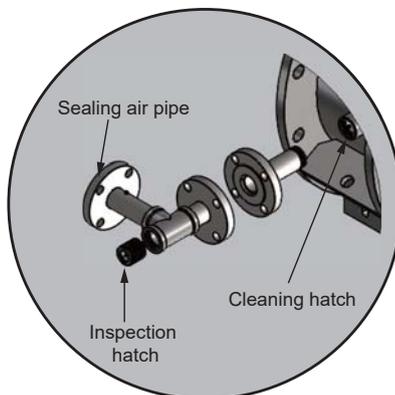
### Mechanical interlock



Cleaning hatch for soot cleaning



HT resistance graphite gasket



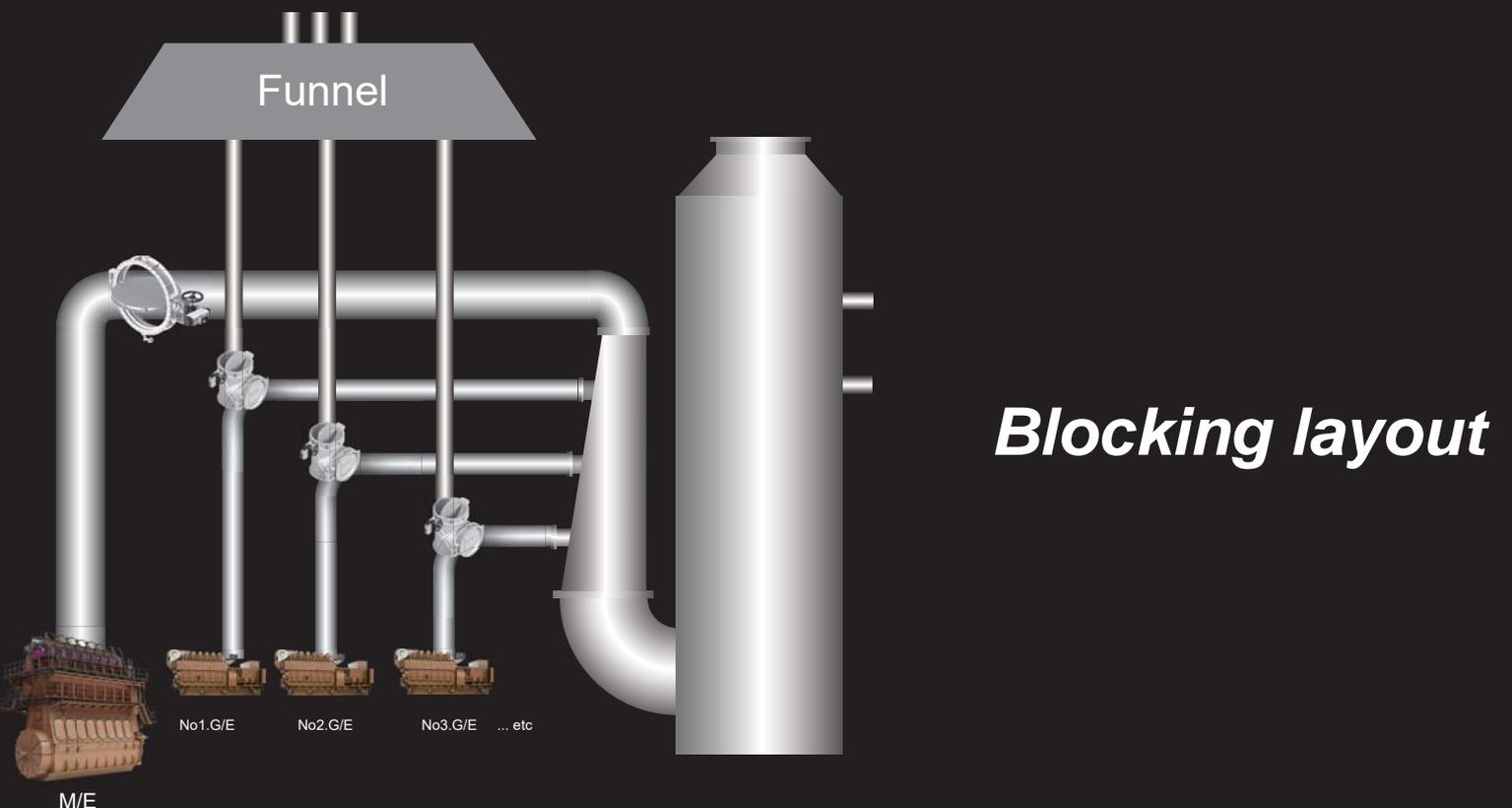
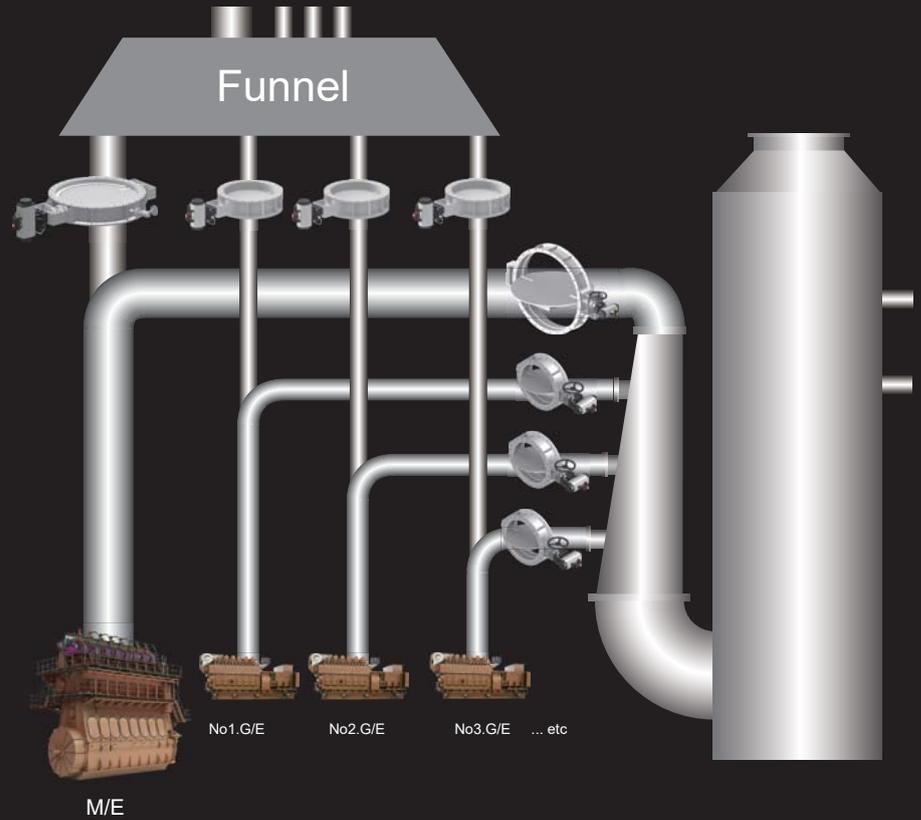
Sealing air pipe

Inspection hatch

Cleaning hatch

# Damper valve installation layout

*Bypass layout*



*Blocking layout*

# Sealing Air Unit

## Specification

Covers an area: 0.7 m<sup>2</sup> ~ 1.5 m<sup>2</sup>  
 Air volume: 175~840 m<sup>3</sup>/h  
 Power: 0.8~6.3Kw  
 Adapt to flue gas damper valves: DN200~3200  
 Base support & air manifold material:  
 stainless steel 1.4301 with polishing

## Benefits

Small size  
 Large air volume  
 Low power consumption  
 Long service life  
 Beautiful appearance

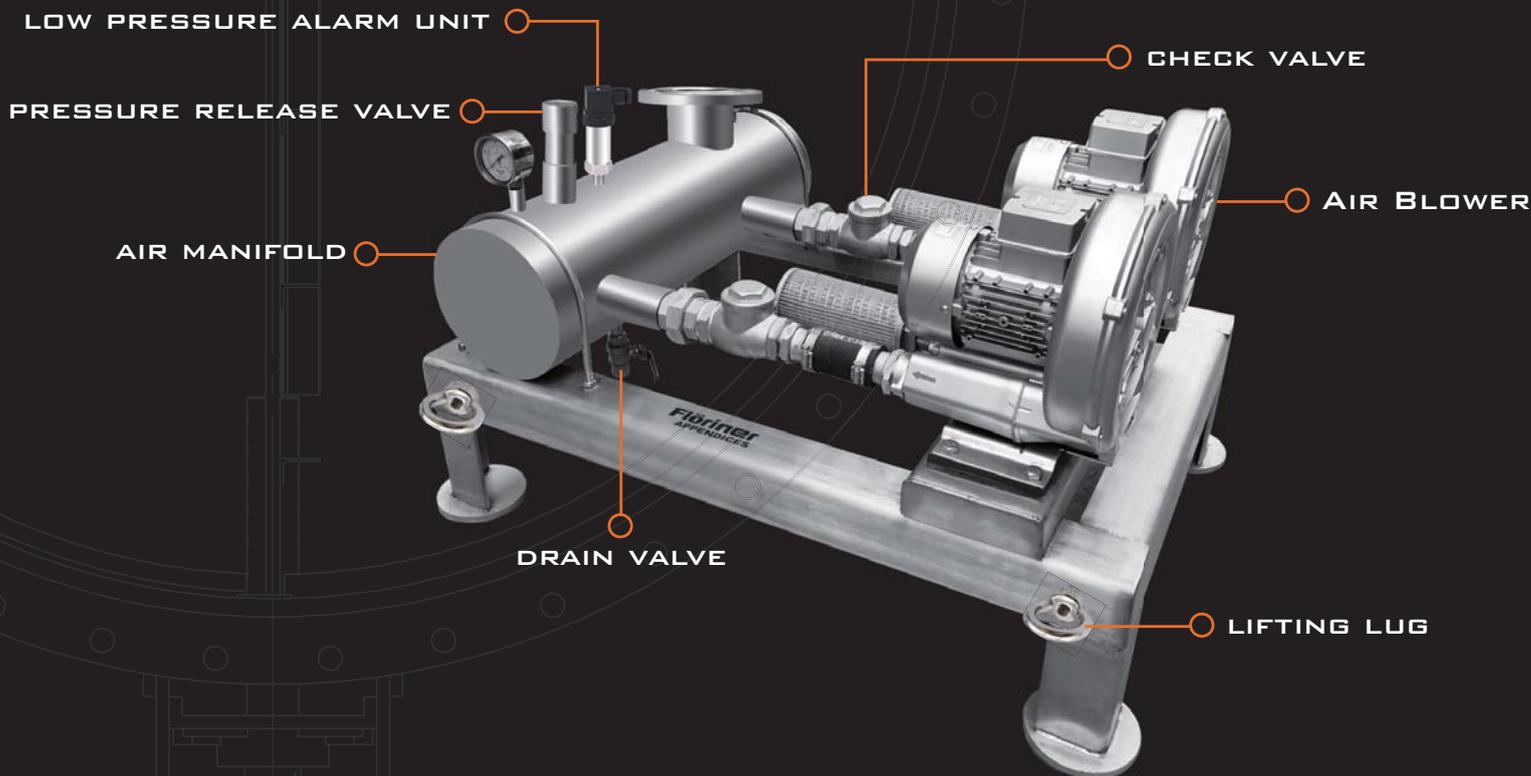
According to the characteristics of the flue gas damper valve, we designed the matched sealing air unit through calculation and experiment.

The unit is equipped with two sets of blowers, which can be recycled according to external control requirements, which can avoid long-term operation of a single blower, improve the service life of the sealing fan, and ensure that the flue gas damper valve is air tight and reliable.

The design is equipped with check valve, air manifold, pressure release valve, drain valve, low pressure alarm unit and other components. By controlling the blower to supply air into the air manifold, it is sent to each flue gas damper valve to achieve the effect of air tightness.

The sealing air unit has a pressure loss alarm, and can output the signal of the pressure to the outside system.

Description	Size	Design Pressure (mbar)	Test Pressure (mbar)	Qty.	Sealing fan blower parameter
Flus Gas Damper Valve	DN300	50	55	1	AC 440C 3Ph 60Hz 4.6kw 620 m <sup>3</sup> /h 160mbar
	DN400	50	55	1	
	DN450	50	55	2	
	DN1100	50	55	2	
	DN1300	50	55	1	
Flus Gas Damper Valve	DN500	50	55	4	AC 440C 3Ph 60Hz 4.6kw 500 m <sup>3</sup> /h 190mbar
	DN1600	50	55	1	
Flus Gas Damper Valve	DN500	50	55	4	AC 440C 3Ph 60Hz 6.3kw 840 m <sup>3</sup> /h 180mbar
	DN2800	50	55	1	
Flus Gas Damper Valve	DN800	50	55	3	AC 440C 3Ph 60Hz 6.3kw 840 m <sup>3</sup> /h 180mbar
	DN850	50	55	1	
	DN2200	50	55	1	
Flus Gas Damper Valve	DN300	50	55	3	AC 440C 3Ph 60Hz 2.05kw 315 m <sup>3</sup> /h 190mbar
	DN1000	50	55	1	
Flus Gas Damper Valve	DN400	50	55	3	AC 440C 3Ph 60Hz 2.55kw 415 m <sup>3</sup> /h 195mbar
	DN1400	50	55	1	



# Installation Guidance

## ISO 8573-1:2010 purity classes

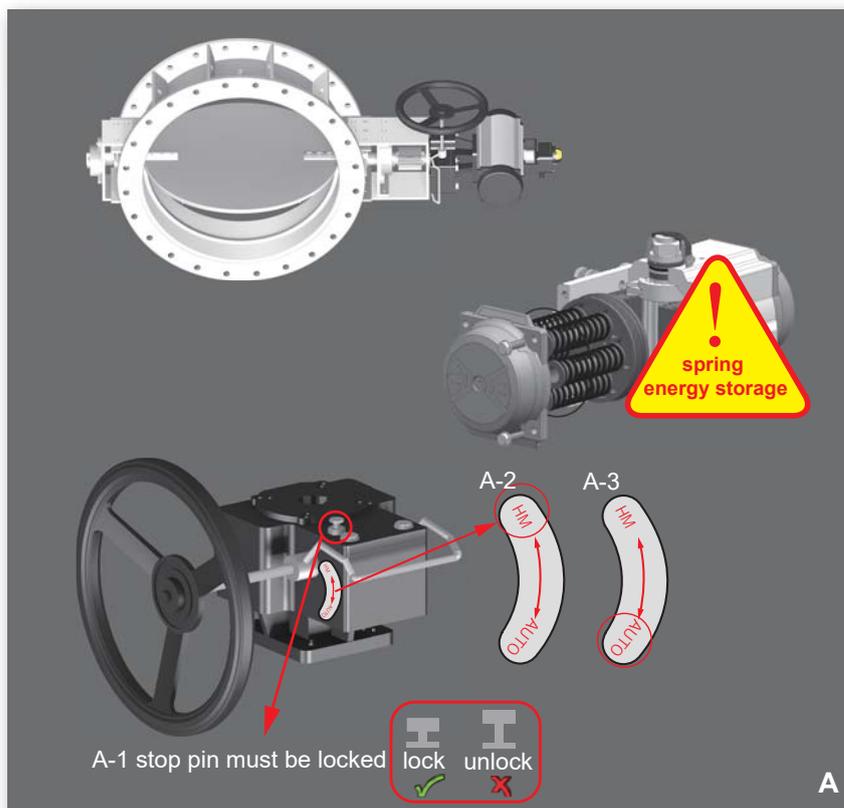
The ISO 8573 group of international standards is used for the classification of compressed air purity. The standard provides the test methods and analytical techniques for each type of contaminant. The table below summarises the maximum contaminant levels specified in ISO 8573.1: 2010 for the various compressed air quality classes. Each compressed air classification can be achieved by installing a specific filter grade or a combination of filter grades, depending upon the required performance as shown in the diagram opposite.

CLASS	SOLID PARTICLES			HUMIDITY AND LIQUID WATER	OIL
	Maximum number of particles per cubic meter as a function of particle size, d <sup>(a)</sup>			Pressure dew point	Concentration of total oil <sup>(a)</sup> (liquid, aerosol and vapour)
	0,1 µm < d ≤ 0,5 µm	0,5 µm < d ≤ 1,0 µm	1,0 µm < d ≤ 5,0 µm	°C	mg/m <sup>3</sup>
0	As specified by the equipment user or supplier and more stringent than class 1				
1	≤ 20 000	≤ 400	≤ 10	≤ -70	≤ 0,01
2	≤ 400 000	≤ 6 000	≤ 100	≤ -40	≤ 0,1
3	Not specified	≤ 90 000	≤ 1 000	≤ -20	≤ 1
4	Not specified	Not specified	≤ 10 000	≤ +3	≤ 5
5	Not specified	Not specified	≤ 100.000	≤ +7	Not specified
6				≤ ±10	Not specified
	Mass concentration <sup>(a)</sup> C <sub>p</sub> mg/m <sup>3</sup>			concentration of liquid water <sup>(a)</sup> C <sub>w</sub> g/m <sup>3</sup>	
6	0 < C <sub>p</sub> ≤ 5				Not specified
7	5 < C <sub>p</sub> ≤ 10			C <sub>w</sub> ≤ 0,5	Not specified
8	Not specified			0,5 ≤ C <sub>w</sub> ≤ 5	Not specified
9	Not specified			5 < C <sub>w</sub> ≤ 10	Not specified
X	C <sub>p</sub> > 10			C <sub>w</sub> > 10	> 5

(a) At reference conditions: air temperature of 20° C, absolute air pressure of 100 kPa (1 bar), relative water vapour pressure 0.

The compressed air discharged from the air compressor may contain a large amount of mixed impurities such as water, oil and dust particles. If the compressed air containing these impurities is directly supplied to the downstream compressed air equipment, the following adverse effects may be happened:

1. The mixture of water, oil and dust is deposited in the pipeline, the flow area of the pipeline is reduced, and the airflow resistance is increased. In severe cases, even the pipeline is blocked, resulting in unstable operation of the entire system.
2. The oil vapor and water may form an organic acid, which has a corrosive effect on the metal equipment.
3. Impurities such as dust in the compressed air may cause abrasive effects on components with relative motion. When the wear is severe, it will cause leakage and affect the accuracy and service life of the equipment.
4. During the freezing season, the condensation of water vapor may cause damage to the pipes and accessories due to freezing.



◆ **Damper Operation Model (Special attention)**

The actuator of the flue gas valve is single-acting, so the actuator has spring energy storage, improper operation can cause personal injury.

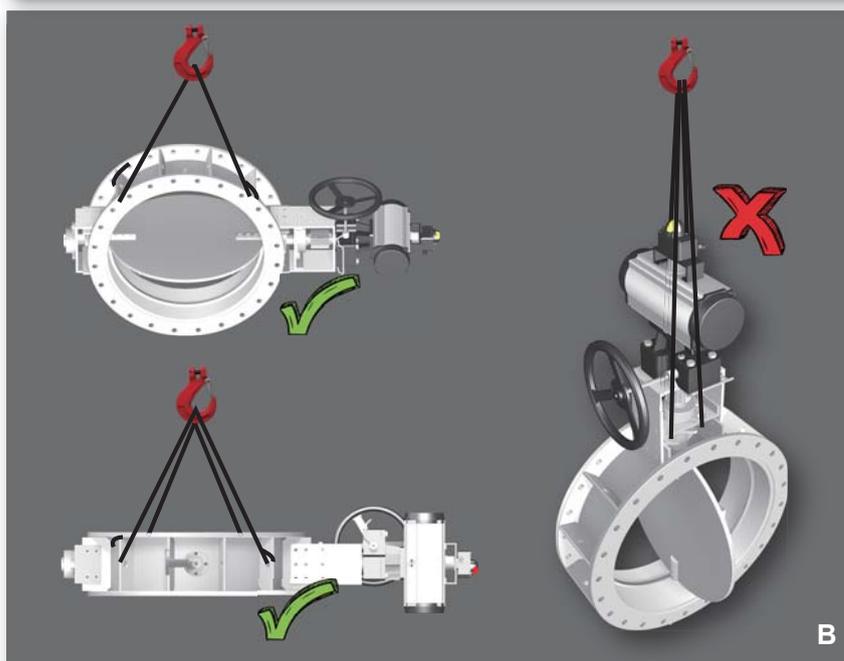
Before hoisting and installation, the clutch hand-wheel mode and damper plate must be checked. Confirm that the Hand-wheel mode switching position is locked (fig. A-1) in the manual mode (HM) (fig. A-2), and do not supply compressed air to actuator under manual mode.

When Commissioning

First, confirm the hand-wheel in the manual mode (fig. A-2), according to the damper valve type to adjust them to the initial state (the Failure Close type is adjusted to the fully closed state, and the Failure Open type is adjusted to the fully open state).

Second, adjust the hand-wheel mode to the automatic mode-(AUTO)(fig. A-3) connect the air source, manually open and close the solenoid (fig. G) valve to control the air on and off to realize the damper valve action.

Finally, connect the power supply and signal cable of the solenoid valve and limit switch, and test the actual function and signal feedback.



◆ **Hoisting**

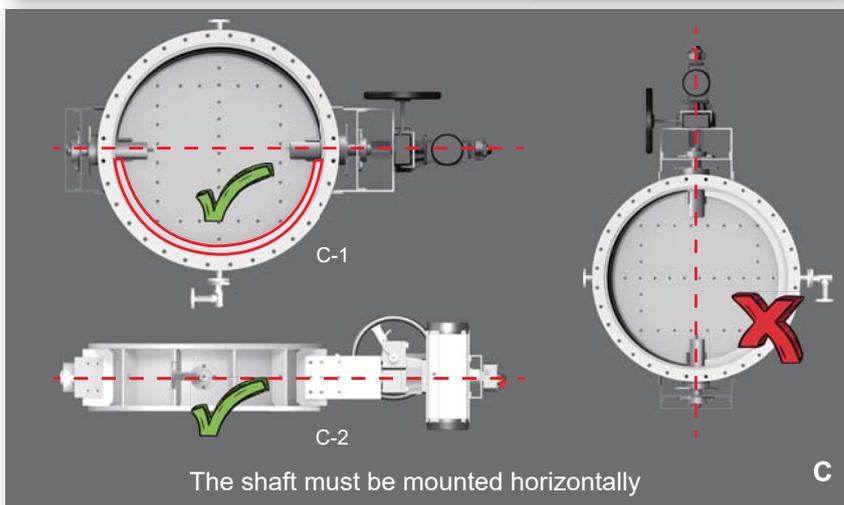
The hoisting point can only be the lifting lug on the flue gas damper valve body (fig. B) to prevent structural deformation and component damage caused by collision and hoisting errors.

◆ **Installation space**

According to the actual site and the size of the damper, it is recommended that the installation space of the flue gas valve has a 20% margin in all directions to ensure the normal installation and post maintenance of the damper.

◆ **Installation Protection**

When installing the damper valve, pay attention to adding effective protective measures to all important components (such as actuators, radiators, limit switches, etc.) to prevent unnecessary damage and valve failure caused by sloshing collision during lifting.



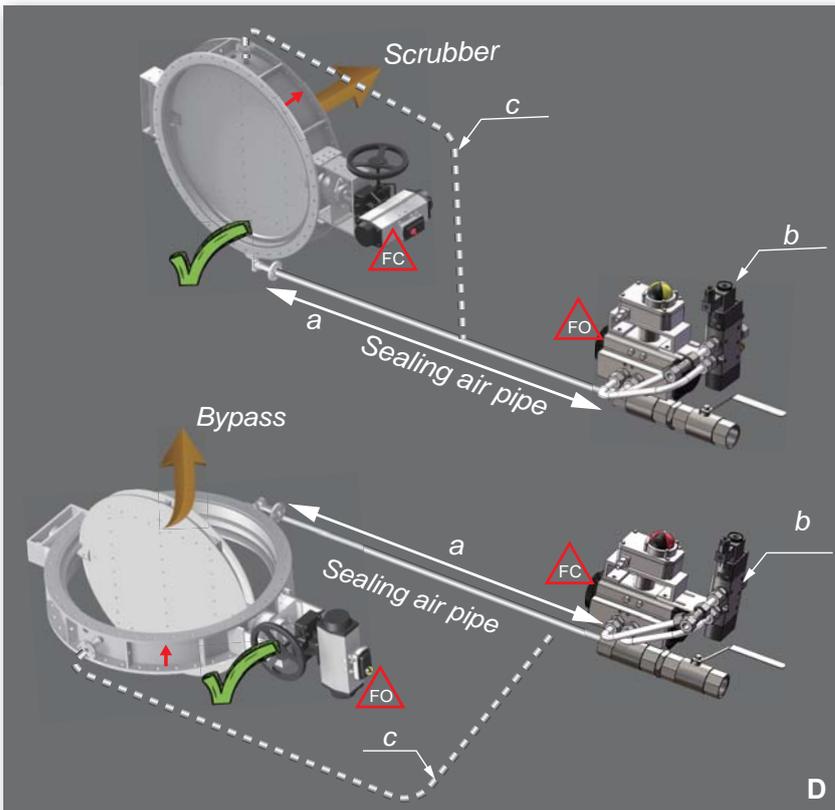
◆ **Damper Installation Points**

(1) Installation direction

The damper is designed for installation either vertically (fig. C-2) or horizontally (fig. C-1), the shaft must be mounted horizontally (floor level).

When the damper valve is installed in horizontal pipeline, air inlet keep the large ring downwards (fig. C-1). this installation requirements are in order to reduce the accumulation of soot during use that can prevent soot from accumulating in the seal, thus affecting the sealing effect of the valve.

The shaft must be mounted horizontally



◆ **Sealing Air valve Installation Points**

The sealing air control valve is a ball valve (Fig. D), which is interlocked with the dampers. when damper is FO, the sealing air control valve must be FC. It can control the action of the single-acting actuator by controlling the opening and closing of the compressed air, and switch the sealing air path to ensure that the sealing air can be reliably supplied to the closed damper.

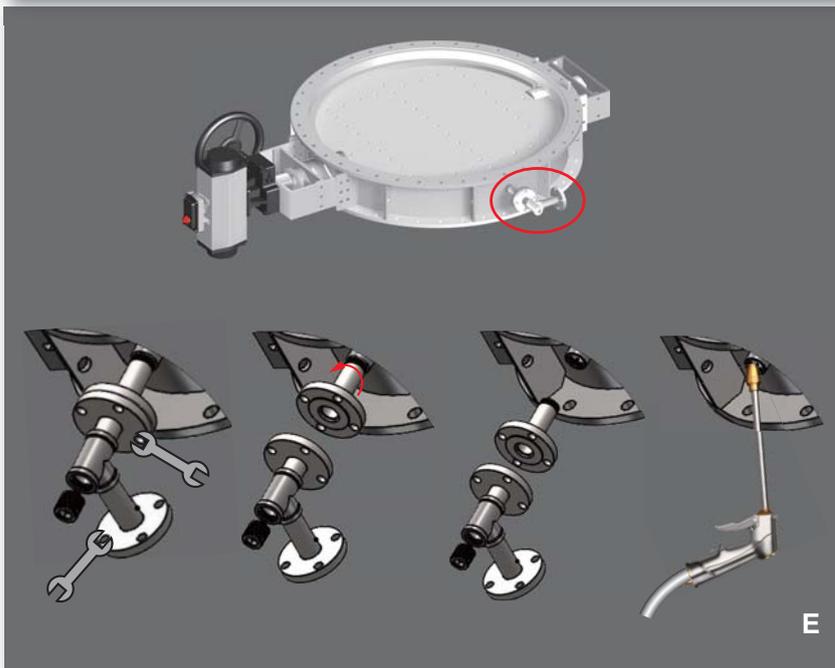
Flue Gas Damper	Sealing Air Pipe	a
DN250-950	DN25 G1"	≥2500mm
DN1000-3000	DN40 G1 1/2"	≥2500mm

b: the distance between the sealing air valve unit and the flue gas pipe (after insulation) is not less than 500mm; because the working temp. of solenoid valve can't be higher than 60°C

C: ≥DN1500 Two-side air inlet;

<DN1500 Single side air inlet.

Before compressing the air, ensure that the compressed air is clean and free of impurities, so as not to damage the actuators and solenoid valves on the pipeline



◆ **Soot Cleaning**

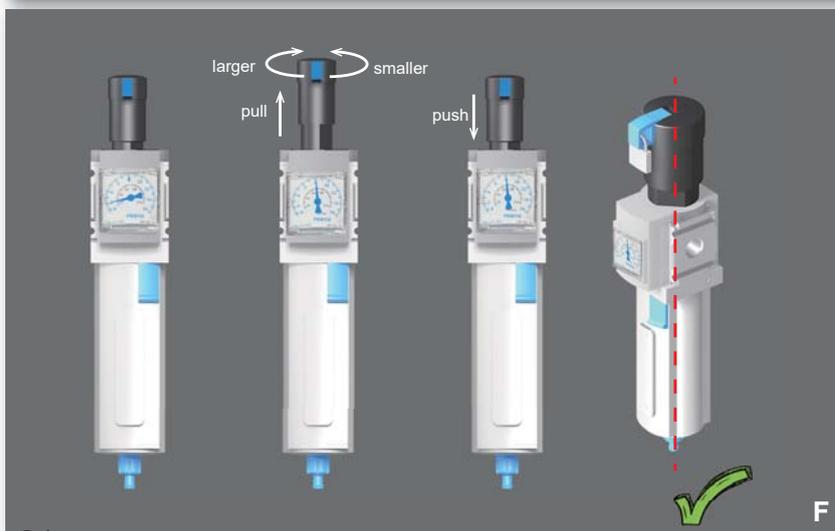
Flue gas butterfly damper (valve) with double combined discs is designed not to be fully sealing, but with sealing air connection could be zero flue gas leakage when applied sealing air. It is designed to be the self-cleaning type and with inspection hatches for manual soot cleaning when required.

In daily use and maintenance, it is recommended to check the sealing air & soot cleaning unit regularly (Fig. E). Under normal circumstances, unscrew the inspection hatch, observe the soot accumulation of the valve, and unblock the sealing air pipe if necessary to ensure the sealing air supply. It is not excluded that after a long period of use, the valve generates a certain amount of soot accumulation. At this time, the user can first remove the unit by unscrewing all the bolts of the unit, and only retain the cleaning port. Then, at the soot cleaning hatch, using the relevant tools, by means of compressed air purging, etc., to achieve further soot purging purposes.

**Soot cleaning for damper (By crew)**

After EGC system operating a while, crew shall be open the inspection hatch of exhaust pipe which be close to the damper, blowing the soot in the damper by compress air with temporary flexible pipe.

**Noted:** There should be regular inspections (every annual survey) for the damper.



◆ **Pressure Reducing Valve (with filter)**

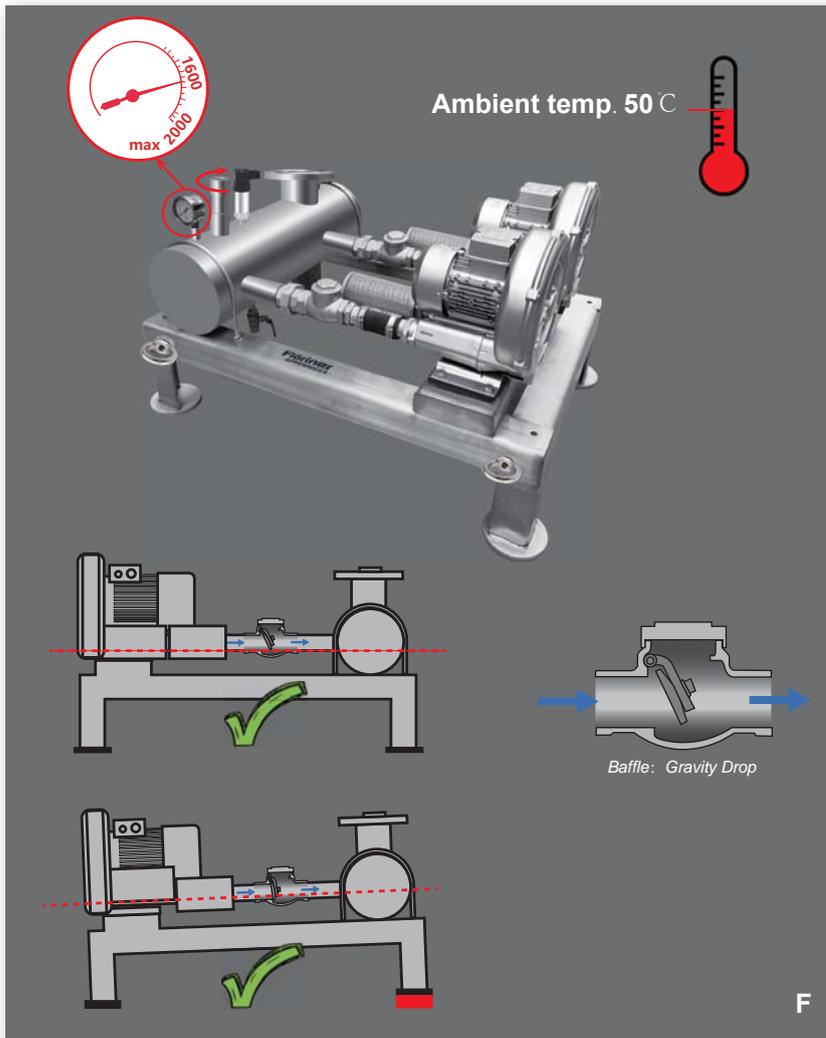
1. The pressure reducing valve (with filter) is installed to ensure the quality of the air and filter out the dust and water mist in the air. Avoid problems with impurities and pressure, resulting in poor valve opening and closing.

2. Installation requirements: The pressure reducing valve (with filter) needs to be installed vertically to ensure that the accumulated water vapor and debris can be discharged normally during routine maintenance.

3. Pay special attention

Inlet compressed air level: ISO8573-1:2010 2:4:2 (See details P19)

4. When in use, pull out the handle upwards, turn the handle, adjust the pressure to the specified value of 7~8bar, press the handle, push the blue locking device out, and buckle the lock to prevent others from misadjusting. At the same time, during daily use, regularly check the water vapor and impurities in the filter pressure reducing valve, and unscrew the lower release valve to remove water vapor and impurities.



### ◆ Sealing Air Unit

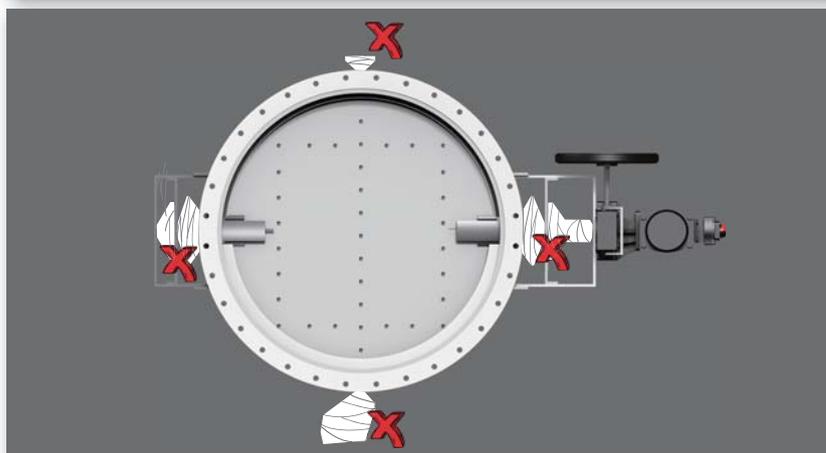
1. Lifting and transport: the equipment has four lifting-eyes on the support (see attached dimensional drawings). In the dimensional drawings, the necessary data for lifting the unit can be found, number, diameter, position of lifting-eyes. (Fig. G)
2. Installation environment not exceeding 50°C and in a well ventilated room. (Fig. G)
3. The position of the sealing air unit or fan product should be arranged as close as possible to the damper, shortening the length of the sealing air main pipe and branch pipes, reducing the elbow of the pipes, and reducing the sealing air pressure loss caused by the long pipe length and excessive elbow.
4. There are two sealing air fans in the unit, which requires external control to be set to intermittent operation. The continuous working time of a single fan does not exceed 24 hours, which reduces the risk of overloading and burning of the fan caused by the heat generated by the continuous operation.
5. The sealing air unit is equipped with a pressure gauge and a pressure relief valve. According to the sealing air pressure level required by the flue gas damper system and the actual working condition of the fan unit, the pressure relief valve needs to be adjusted so that excess sealing air is released through the pressure relief valve to reduce the pressure, the pressure meets the condition, and the value of the pressure gauge is not allowed to exceed the range (80%), so as to avoid overloading and heating of the fan due to overpressure, and burning the fan motor coil.

The Sealing air unit is equipped with a check valve at the outlet of each fan. Check valves are gravity reset type. When the fan outlet outputs air, blow the check baffle open and the pipe is opened. When the fan stops, the baffle gravity drops back and the pipe is closed.

When installing the sealing air unit, the equipment should be kept level or keep the side of the manifold slightly higher than the side of the fan to ensure that the check valve can work well.

When the installation does not meet the requirements, it needs to be adjusted to achieve the installation requirements. The following methods are for reference:

Modify the height of the mounting feet of the Manifold end. Add some pads under the feet of the support. So that the relative position of the manifold end shelf is raised to achieve installation requirement of the equipment;



### ◆ Insulated

The damper valve must be insulated. The insulation layer should be rockwool or better material to ensure that the high temperature of the damper valve will not pose a threat to people.

**Pay special attention: the two ends of the valve shaft and the sealed air interface cannot be covered with insulation, so as not to affect the heat dissipation performance of the device.**

It is forbidden to wrap the valve seat with heat insulation material, which may cause poor heat dissipation of the valve shaft and the radiator, affecting the opening and closing performance of the valve and damaging the actuator of the valve.

### ◆ Control Air Pipe Connection Requirements

The pneumatic interfaces of the flue gas dampers provided by our company is imported brand. When connecting the control air pipeline, the customer shall meet the joint technical standards in terms of dimensions and tolerances, so as to avoid the impact of poor tightness on the opening and closing performance of the damper. See the (Fig. G).

### ◆ Cable wiring

The solenoid valves provided by our company are all Festo brand, featuring low power consumption and reliable performance. According to the standard selection, the solenoid valve coil cable stuffing box is provided for cables with an outer diameter of 6-8mm.

Calculate the cable load according to the actual parameters of the solenoid valve, and select the appropriate specification cable by calculating the current value. See the (Fig. G).

#### Recommendation for stainless steel tubes material

stainless steel 1.4571/ANSI 316 Ti or 1.4301 / ANSI 316 according to EN 10305-1/EN10216-5/ISO 1127

#### Type

seamless, cold finished, bright, annealed, state of delivery CFA, according to DIN EN 10216-5

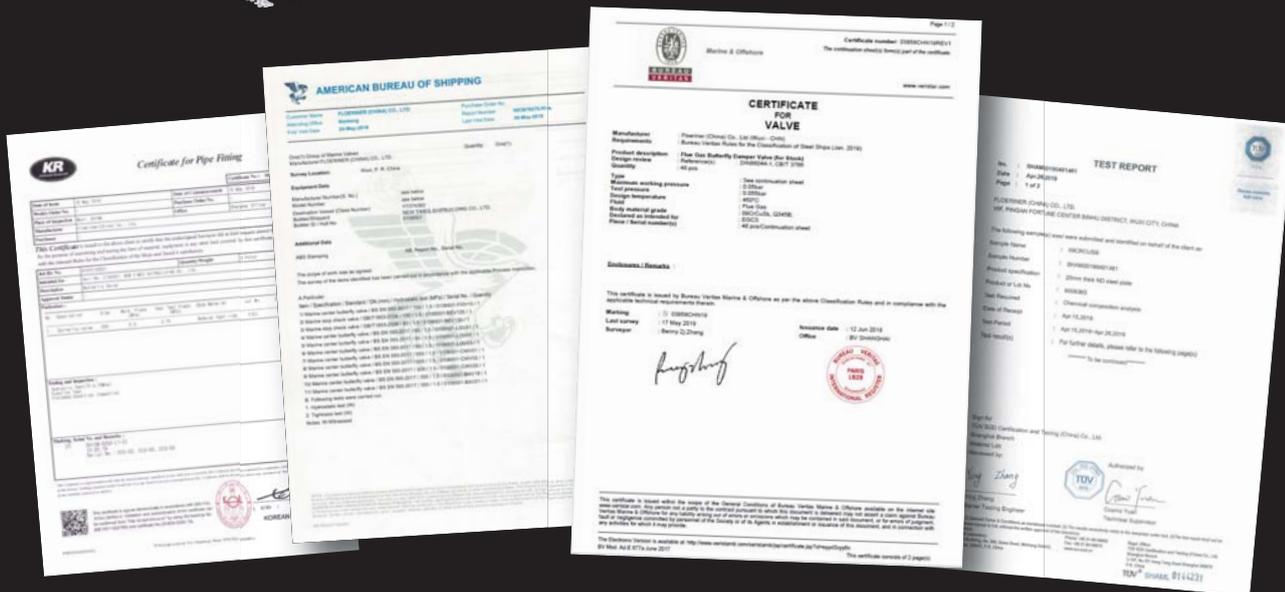
#### Tolerances

EN 10305-1, option 10

ISO 1127(tolerance classes D4/T4)

Press this button





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