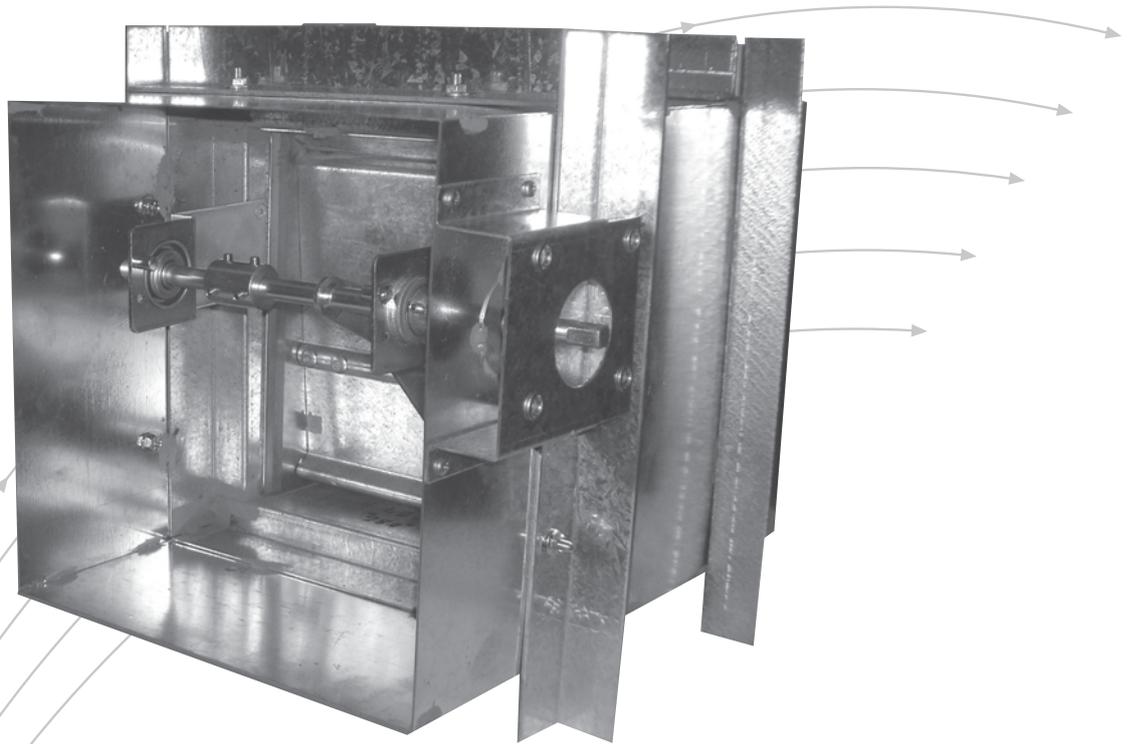


# Smoke Dampers and, Combination Fire and Smoke Dampers

Type MSD • SFD



**TROX<sup>®</sup> TECHNIK**

TROX Malaysia Sdn. Bhd.  
20 Persiaran Bunga Tanjung 1  
Senawang Land Industrial Park  
70400 Seremban  
Negeri Sembilan Darul Khusus  
Malaysia

Telephone + 606-678 8188  
Telefax + 606-678 8288 / 388  
E-mail enquiry@troxapo.com  
www.troxapo.com

# Contents · Description

Description _____	2	Accessories _____	13
Construction; Dimensions; Standard Sizes _____	3	Nomenclature; Technical Data _____	14
Installation Details _____	11	Technical Data _____	15
Product Range _____	12	Order Details _____	16

The TROX Combination Fire and Smoke Damper (Type 'SFD') and, Smoke Damper (Type 'MSD') are designed to provide an automatic means of localising fire and/or smoke in ventilation systems.

The TROX Combination Fire and Smoke Damper, Type 'SFD' have been independently tested for fire integrity for up to 4 hours to AS 1530.4, 1997 and for up to 3 hours to BS 476: Part 20, 1987 by an internationally recognised fire test centre.

Both types of dampers (i.e., 'SFD' and 'MSD') can be supplied with low closed blade leakage characteristics, for smoke control application. Both dampers have been tested independently for leakage and cycling tests, having completed more 20,000 cycles with electric spring return actuator which the requirements stated in the UL 555S Standard.

The Type MSD damper is capable of operating for a maximum period of 120 minutes with air temperature at 250 °C passing through the damper, using an electric spring return actuator housed in a thermal enclosure.

The Type SFD damper is capable of operating for a maximum period of 60 minutes with air temperature at 250 °C passing through the damper, using an electric spring return actuator housed in a thermal enclosure.

The Type 'SFD' fire and smoke damper is approved by BOMBA, the Malaysian Fire Services Department and, the Hong Kong Fire Services Department (HKFSD).

They can be mounted vertically or horizontally, fitted directly onto ventilation ducting, external walls, partition walls or intermediate floor slabs. In all cases, the installation of these dampers must be carried out in accordance with the manufacturer's recommendations and should comply with local national standards and fire authority regulations.

Note: Silicon based sealant will be used on TROX 'MSD' Type and 'SFD' Type dampers. If required, special silicon free sealant can be applied to these types of damper.

## SMOKE DAMPERS, Types MSD/MSP/MSE with Parallel Blade Arrangement

### Type MSD

- Damper casing and blades are made in galvanised steel sheets.
- Case bearings are made from sintered bronze (Oilite).
- Dampers blades are fitted with 12 mm diameter zinc plated mild steel spindle at both ends.
- The standard Type 'MSD' damper comes with face linkage for parallel blade operation. Alternatively, external side linkage with parallel blade operation can be provided if requested.
- The linkage consists of 16 mm diameter brass pivot pins connected to an 8 mm diameter link bar in zinc plated mild steel.  
This damper can be operated manually or, supplied with an electric or pneumatic actuator(s) as required. For further details, refer to "Accessories" on page 13.
- Side seals in Grade 301 stainless steel.

### Type MSP

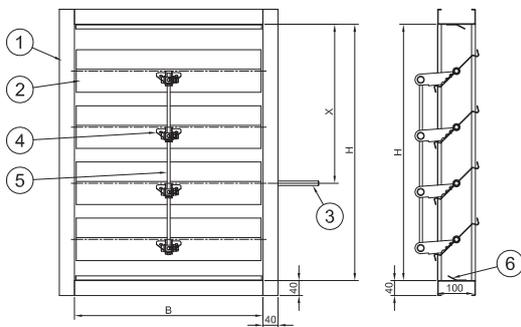
- The general construction for the MSP Type damper is the same as Type MSD except for the blades, spindles and blade to spindle fixings, which are in Grade 430 stainless steel or, equivalent as standard supply.

### Type MSE

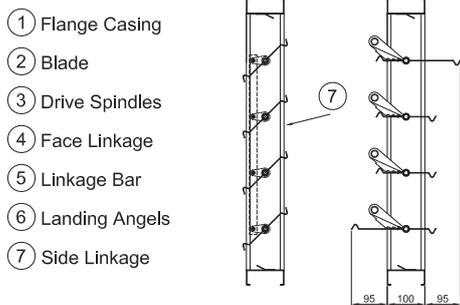
- The general construction for the MSE Type damper is the same as Type MSD except for the damper casing, blades, spindle and spindle fixings and, linkage are all made in Grade 430 stainless steel or, equivalent as standard supply.

**Note:** This damper can also be supplied in either 304 or 316 Grade stainless steel if requested.

### Type MSD...P...E -A Face Linkage (Flange Case)



### Type MSD...P...E -A -B1 Flange Case Side Linkage (Option)



Maximum blade extension outside of case when blades are fully open

**Table 1:** Standard Sizes for MSD/P/E – A

B (mm)	H (mm)	No. of blades	Position of drive arm, X (mm)
100	100	1	50
150	150	1	75
200	200	1	100
250	250	1	125
300	300	1	150
350	350	2	240
400	400	2	275
450	450	2	300
500	500	3	240
600	600	3	300
700	700	4	425
800	800	5	390
900	900	5	450
1000	1000	6	575
1100	1100	7	540
1200	1200	7	600
	1300	8	725
	1400	9	690
	1500	9	750
	1600	10	875
	1700	11	840
	1800	11	900

**Note:**

The breadth (B) and height (H) are external duct dimensions. Where possible, standard damper sizes as indicated above should be used. For non-standard sizes, performance data for the next smallest standard height should be used as an appropriate performance guide. Please contact TROX for further details.

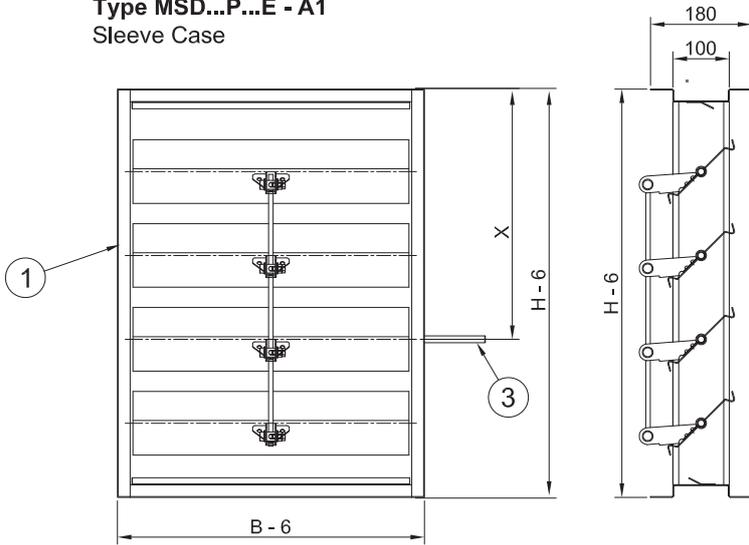
**Minimum and maximum module size:**

Min. size - 100 mm (B) x 100 mm (H)

Max. size - 1200 mm (B) x 1800 mm (H)

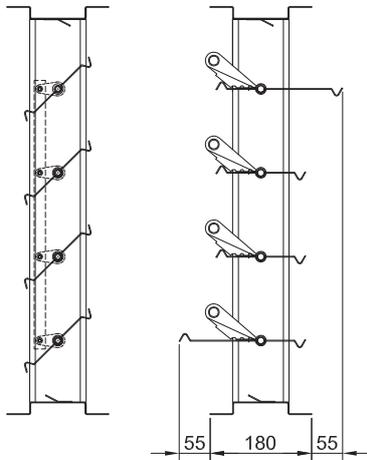
# Standard Sizes

## Type MSD...P...E - A1 Sleeve Case



## Type MSD...P...E - A1 - B1 Flange Case Side Linkage

- ③ Removable Drive Spindle
- ① Sleeve Casing



Maximum blade extension outside of case when blades are fully open

**Table 2: Standard Sizes for MSD/P/E – A1**

B (mm)	H (mm)	No. of blades	Position of drive arm, X (mm)
150	150	1	75
200	200	1	100
250	250	1	125
300	300	1	150
350	350	1	175
400	400	2	265
450	450	2	300
500	500	2	325
600	600	3	300
700	700	4	415
800	800	4	475
900	900	5	450
1000	1000	6	565
1100	1100	6	625
1200	1200	7	600
	1300	8	715
	1400	8	775
	1500	9	750
	1600	10	865
	1700	10	925
	1800	11	900

**Note:**

The breadth (B) and height (H) are external duct dimensions. Where possible, standard damper sizes as indicated in the table above should be used. If non-standard damper sizes are required, then the technical performance data for the next smallest standard height should be used as an appropriate performance guide. In this case, please contact TROX for further details.

**Minimum and Maximum module size:**

Min. size - 150 mm (B) x 150 mm (H)  
 Max. size - 1200 mm (B) x 1800 mm (H)

# Standard Sizes

**Table 3: Standard Sizes for MSD/P/E – A2**

B (mm)	H (mm)	No. of blades	Position of drive arm, X (mm)
100	100	1	50
150	150	1	75
200	200	1	100
250	250	1	125
300	300	2	215
350	350	2	250
400	400	2	275
450	450	3	215
500	500	3	250
550	600	4	365
600	700	4	425
650	800	5	400
700	900	6	515
750	1000	6	575
800	1100	7	550
850	1200	7	665
900	1300	8	725
950	1400	9	700
1000	1500	9	815
1050	1600	10	875
1100	1700	11	850
1150	1800	11	900
1200			

**Table 4: Standard Sizes for MSD/P/E – A3**

Diameter (mm)	No. of blades	Position of drive arm, X (mm)
100	1	50
150	1	75
200	1	100
250	1	125
300	2	215
350	2	250
400	2	275
450	3	215
500	3	250
600	4	365
700	4	425
800	5	400
900	6	515
1000	6	575
1100	7	550
1150	7	575

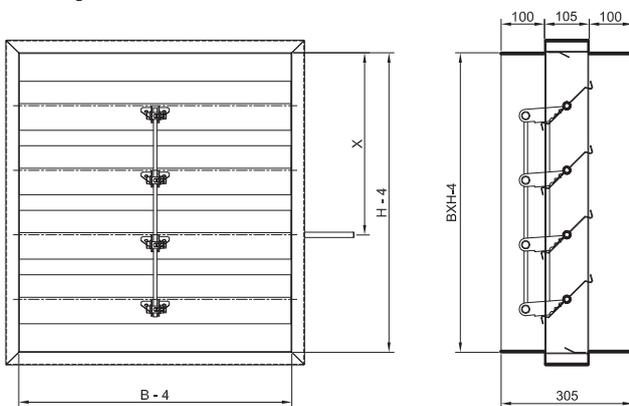
**Minimum and maximum module size:**

Min. size - 100 mm Ø  
 Max. size - 1150 mm Ø

**Minimum and maximum module size:**

Min. size - 100 mm (B) x 100 mm (H)  
 Max. size - 1200 mm (B) x 1800 mm (H)

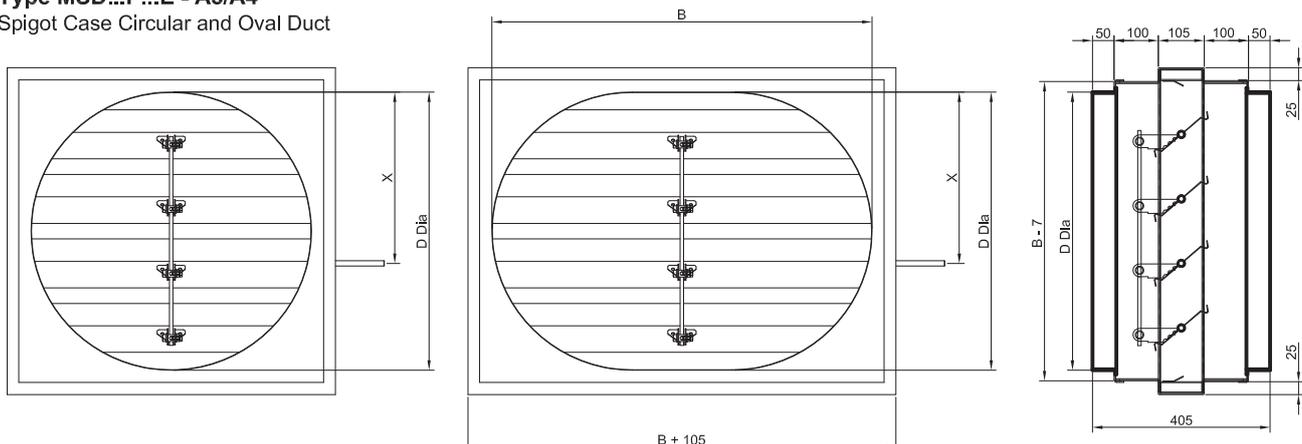
**Type MSD...P...E - A2 Spigot Case**  
 Rectangular Duct



Note:

The breadth (B) and height (H) are external duct dimensions. Where possible, standard damper sizes as indicated in the table on the left should be used. If non-standard damper sizes are required, then the technical performance data for the next smallest standard height should be used as an appropriate performance guide. In this case, please contact TROX for further details.

**Type MSD...P...E - A3/A4**  
 Spigot Case Circular and Oval Duct



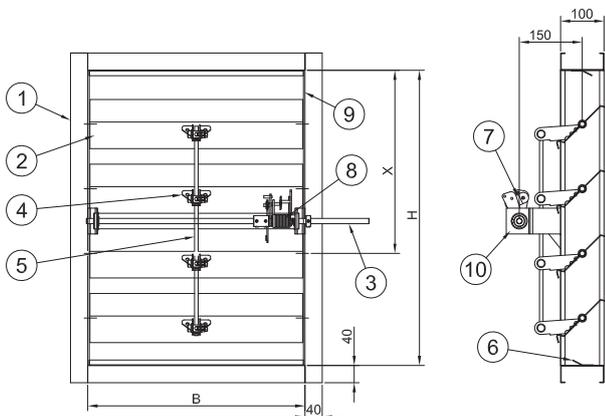
## COMBINATION FIRE AND SMOKE DAMPERS, Types SFD/P/E with Parallel Blade Arrangement

### Type SFD

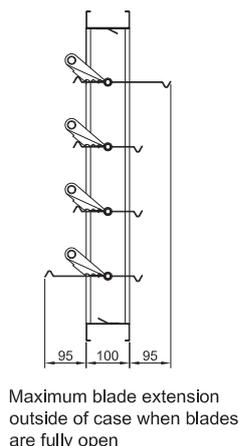
- Damper casing and blades are made in galvanised steel sheets.
- Case bearings are made from sintered bronze (Oilite).
- Dampers blades are fitted with 12 mm diameter zinc plated mild steel spindle at both ends.
- The standard Type 'SFD' Type damper comes with face linkage for parallel blade operation.
- The linkage consists of 16 mm diameter brass pivot pins connected to an 8 mm diameter link bar in zinc plated mild steel.
- The side seals are made in Grade 301 stainless steel or equivalent, with the purpose to close the gap between the ends of the blades and the side casing.
- The standard damper will be supplied with a 72 °C thermal fuse link.

**Note:** If elevated temperature application is required, then it is recommended that a higher fuse temperature rating is required subject to Design Consultant's approval.

### Type SFD/P/E – A With Flange Casing



- ① Casing
- ② Blade
- ③ Drive Spindle
- ④ Face Linkage
- ⑤ Linkage Bar
- ⑥ Landing Angles
- ⑦ Fuse Link 72 °C
- ⑧ Closing Spring
- ⑨ Side Seals
- ⑩ Jack Shaft Device



- This damper can be supplied as a manually operated damper or, with electrically or pneumatically operated actuator(s) as specified. For further details, please refer to "Accessories" on pages

### Type SFP

- The general construction for the SFP Type damper is the same as Type SFD except for the blades, spindles and blade to spindle fixings, which are in Grade 430 stainless steel or, equivalent as standard supply.

### Type SFE

- The general construction for the SFE Type damper is the same as Type SFD except for the damper casing, blades, spindle and spindle fixings and, linkage are all made in Grade 430 stainless steel or, equivalent as standard supply. **Note:** This damper can also be supplied in either 304 or 316 Grade stainless steel if requested.

**Table 5:** Standard Sizes for SFD/P/E – A

B (mm)	H (mm)	No. of blades	Position of drive arm, X (mm)
250	250	1	50
300	300	1	75
350	350	2	165
400	400	2	200
450	450	2	225
500	500	3	165
600	600	3	225
700	700	4	350
800	800	5	315
900	900	5	375
1000	1000	6	500

### Note:

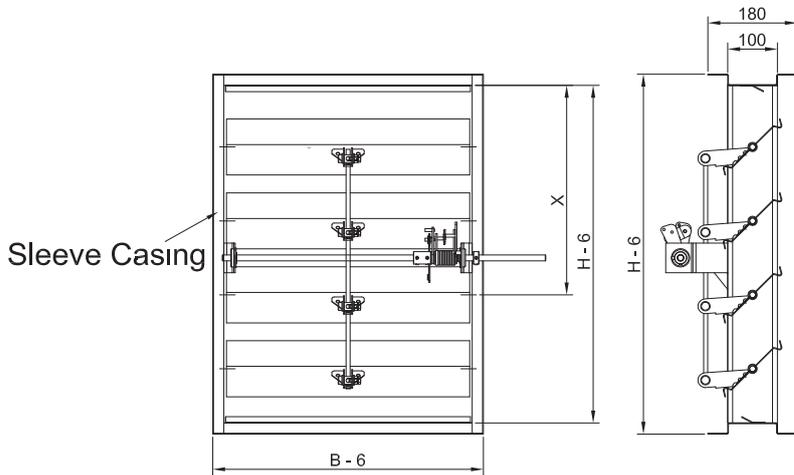
The breadth (B) and height (H) are external duct dimensions. Where possible, standard damper sizes as indicated above should be used. For non-standard sizes, performance data for the next smallest standard height should be used as an appropriate performance guide. Please contact TROX for further details.

### Minimum and maximum module size:

Min. size - 250 mm (B) x 250 mm (H)  
 Max. size - 1000 mm (B) x 1000 mm (H)

# Standard Sizes

## Type SFD/P/E – A1 With Sleeve Casing



**Table 6:** Standard Sizes for SFD/P/E – A1

B (mm)	H (mm)	No. of blades	Position of drive arm, X (mm)
300	350	1	75
350	400	1	100
400	450	2	190
450	500	2	225
500	600	2	250
600	700	4	225
700	800	4	356
800	900	5	400
900	1000	6	375
1000			

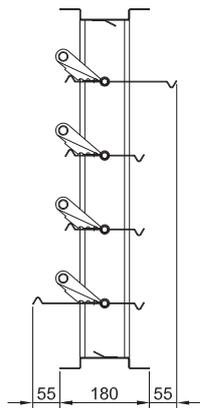
**Note:**

The breadth (B) and height (H) are external duct dimensions. Where possible, standard damper sizes as indicated above should be used. For non-standard sizes, performance data for the next smallest standard height should be used as an appropriate performance guide. Please contact TROX for further details.

**Minimum and maximum module size:**

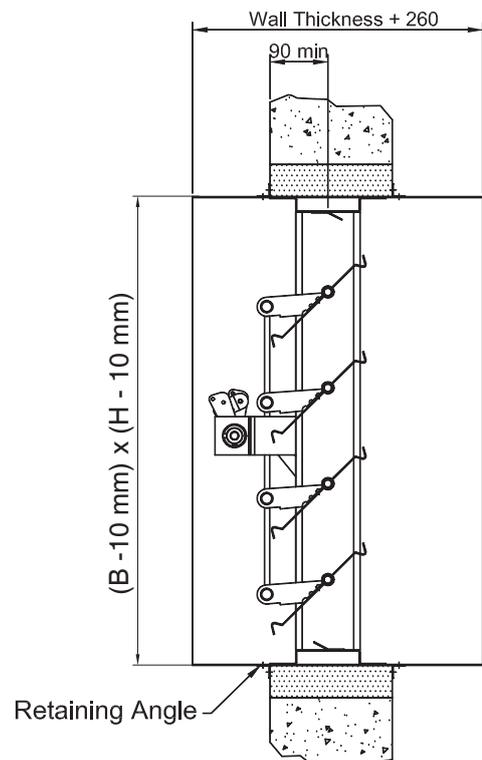
Min. size - 300 mm (B) x 350 mm (H)

Max. size - 1000 mm (B) x 1000 mm (H)



Maximum blade extension outside of case when blades are fully open

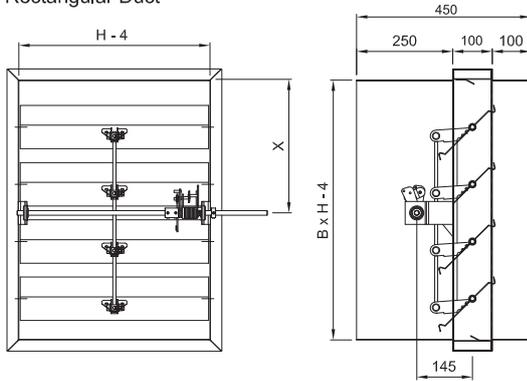
## Type SFD...P...E - A1 Sleeve



# Standard Sizes

## Type SFD/P/E – A2 With Rectangular Spigot Casing

### Type SFD...P...E - A2 Rectangular Duct



**Table 7:** Standard Sizes for SFD/P/E – A2

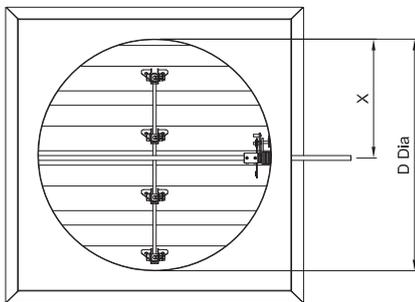
B (mm)	H (mm)	No. of blades	Position of drive arm, X (mm)
200	250	1	75
250	300	1	165
300	350	2	200
350	400	2	225
400	450	2	165
450	500	3	225
500	600	3	350
550	700	4	315
600	800	5	375
650	900	5	500
700	1000	6	
750			
800			
850			
900			
950			
1000			

## Type SFD/P/E – A3 With Circular Spigot Casing

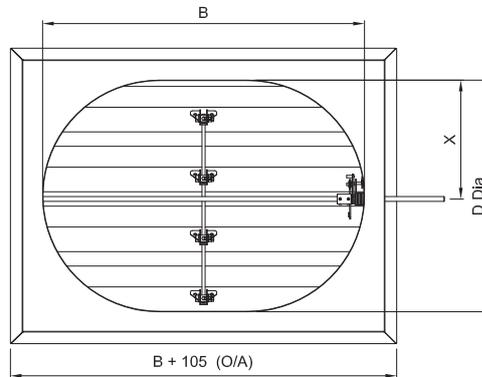
**Minimum and maximum module size:**

Min. size - 200 mm (B) x 250 mm (H)

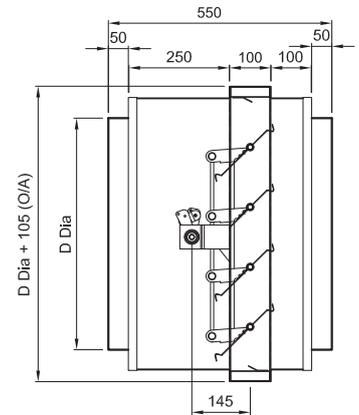
Max. size - 1000 mm (B) x 1000 mm (H)



A3 - Circular Spigot



A4 - Oval Spigot



**Note:**

The breadth (B) and height (H) are external duct dimensions. Where possible, standard damper sizes as indicated above should be used. For non-standard sizes, performance data for the next smallest standard height should be used as an appropriate performance guide. Please contact TROX for further details.

**Table 8:** Standard Sizes for SFD/P/E – A3

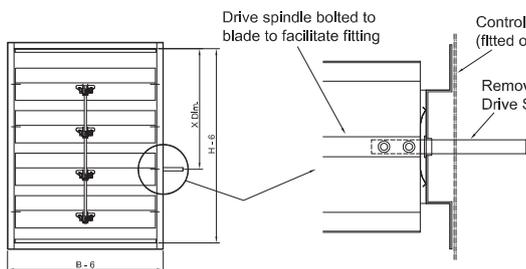
Diameter (mm)	No. of blades	Position of drive arm, X (mm)
250	1	50
300	2	140
350	2	100
400	2	200
450	3	140
500	3	175
600	4	290
700	4	350
800	5	325
900	6	440
1000	6	500

**Minimum and maximum module size:**

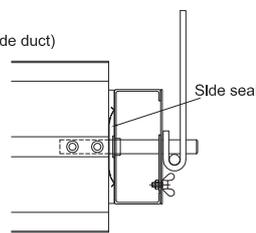
Min. size - 250 mm Ø

Max. size - 1000 mm Ø

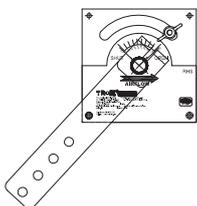
**Type MSD, MFD, SFD  
Type SFD...P...E -A1**  
Removable Drive Spindles



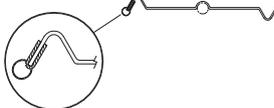
**Type C1 Side Seals**  
Standard on Type MFD,  
SFD Option on Type MSD



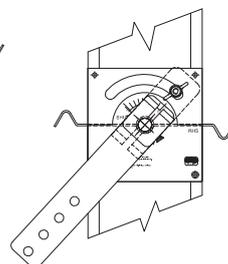
**Hand Locking Quadrant**  
Type MSD...P...E-A1 only  
Type SFD...P...E



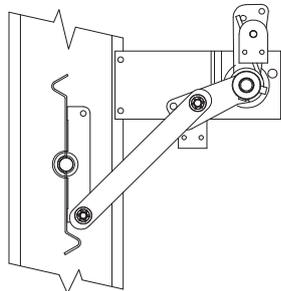
**Type C2 Tip Seal**  
(includes side seal)  
Option on SFD, MSD



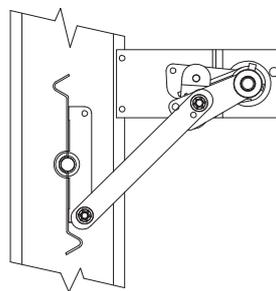
**Standard Drive arm and hand  
Locking Quadrant (except case A1)  
MSD ONLY**



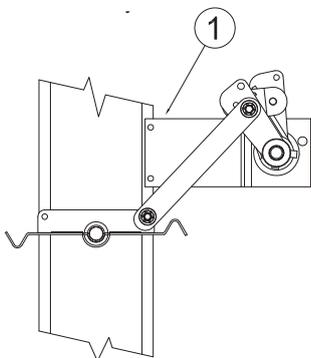
**Jack shaft device (Type SFD only)**



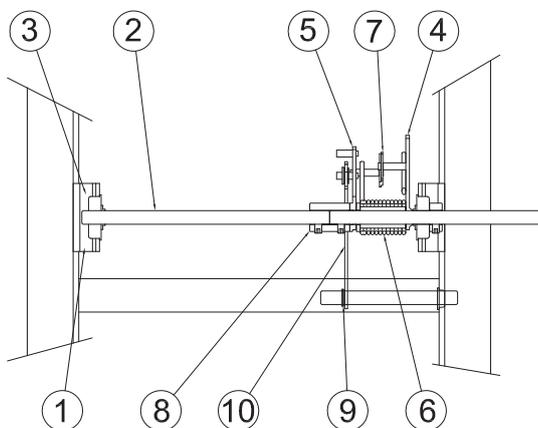
Section of drive device driven to blade closed position by firing if fuse link (fire failed position)



Section of drive device driven to blade closed position by external power source (actuator)



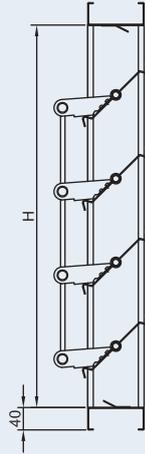
Section of drive device blade open position



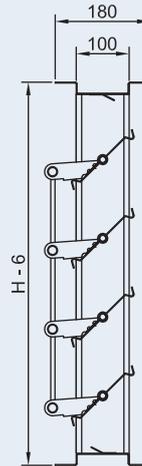
- |                        |                 |                 |                |                       |
|------------------------|-----------------|-----------------|----------------|-----------------------|
| ① Bracket case mounted | ③ Shaft bearing | ⑤ Free link arm | ⑦ Fuse link    | ⑨ Blade rotation link |
| ② Through shaft        | ④ Free link arm | ⑥ Coil spring   | ⑧ Shaft joints | ⑩ Connecting link arm |

# Installation Details

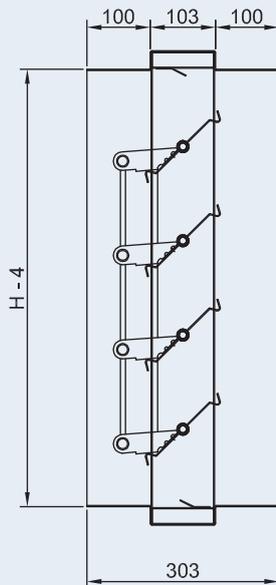
**Type MSD...P...E - A**  
(Flange Installation)



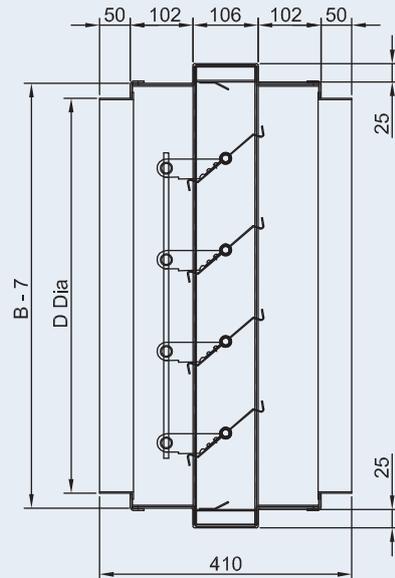
**Type MSD...P...E - A1**  
(Sleeve Installation)



**Type MSD...P...E - A2**  
(Spigot Installation)



**Type MSD...P...E - A3/A4**  
(Spigot Installation)



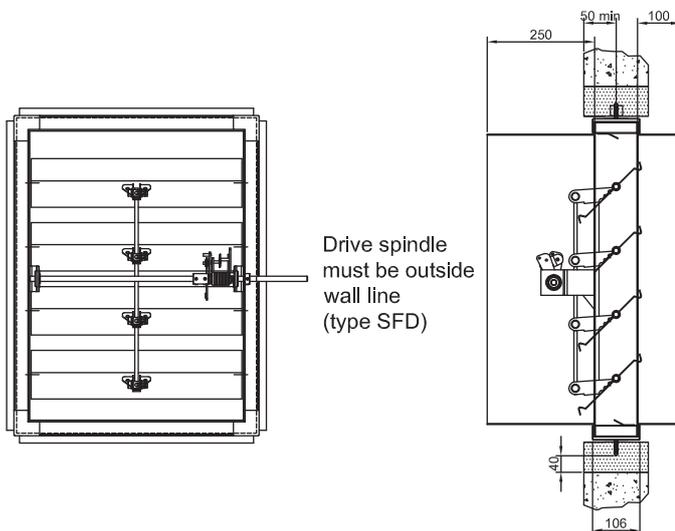
## **Installation with sleeve and retaining angles:**

The damper should be installed centrally within the thickness of the wall or floor slab. The centre line of the damper casing as shown in the diagram below should be at least 50 mm from both faces of the wall or floor slab.

The gap between the damper casing and the opening should be maintained and filled with compressible non-combustible mineral wool to allow for thermal expansion. The minimum dimension of the expansion gap is given in the table below.

If the fire damper is connected to ductwork at both ends of the dampers, then the installer should provide access panel for access to the damper for inspection and maintenance purpose. The damper connection to the adjoining ductwork should have suitable breakaway joint. It should be noted however, that the installation of the fire damper must comply with the requirements laid down by the local fire authorities.

## **Type SFD...P...E A1/A2/A3/A4 Sleeve and Spigot Case**



When the damper is installed into the opening and locked in position with the retaining angles, it is recommended that the angles must overlap the opening by at least 25 mm<sup>1</sup> to ensure that the fire integrity of the damper installation is maintained.

### **Caution:**

If the expansion gap is inadequate, the damper will not be able to close in the event of fire. However, if the expansion gap is too big, this may compromise the performance of the fire damper installed in the opening. To avoid any of this, TROX can offer the HEVAC frame which will overcome these potential problems, which are largely due to poor workmanship on site. Kindly refer to TROX for more information.

<sup>1</sup> **Note:** For further information, refer to “Fire, Smoke and Radiation Damper Installation – Guide for HVAC Systems.” Pub. SMACNA, 4<sup>th</sup> Edition, 1992.

**Table 9:** Expansion Gap

Damper Size B or H (mm)	Minimum clearance on each side of the casing
300 to 500	3 mm
501 to 1000	6 mm

**Note:** The provision of the expansion gap around the damper casing is critical to the performance of the fire damper in the event of a fire.

# Product Range

## Type MSD/P/E and SFD/P/E Construction Variants Casing

Construction Variants	Description
A	<b>Standard supply</b> construction with 40 mm wide flange casing made from 1.5 mm thick sheet steel. Corner slot will be provided to both sides of the case to suit Doby flanges.
A1	Sleeve casing made from 1.5 mm thick sheet steel to suit duct mounting.
A2	1.5 mm thick steel casing with square or rectangular slide-in spigot to suit connecting ductwork.
A3	1.5 mm thick steel casing with circular slide-in spigot to suit connecting ductwork.

## Linkage options

Construction Variants	Description
B	For <b>standard supply</b> construction, internal face linkage with parallel blade operation will be provided.
B1	External spindle and side linkage with parallel blade operation. This option is <u>only available with the MSD Type damper</u> and not the SFD Type damper.

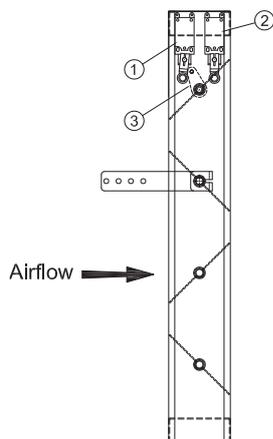
## Seal options

Construction Variants	Description	Leakage rating to UL 555S
C	For <b>standard supply construction</b> for MSD Type damper only <u>without</u> side and tip seals. <u>Not available with SFD Type damper.</u>	Class IV
C1	Supply with side seals to minimise leakage between the casing and the ends of the blade. This is a <b>standard supply construction</b> for <u>SFD Type damper.</u>	Class III
C2	Supply with side and tip seals to minimise closed blade leakage.	Class II

## Bearing options

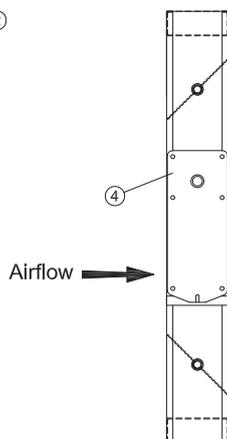
Construction Variants	Description
D	For <b>standard supply</b> construction, sintered (Olite) bronze bearings will be provided.
D2	Stainless steel

**Fig 1.1**  
Installation of  
Electric Limit Switch



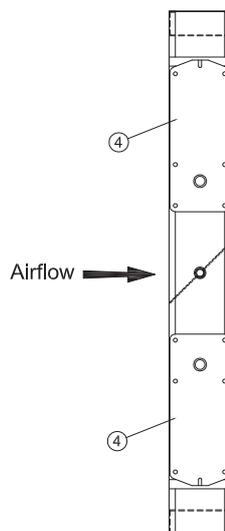
- ① Electric limit switch with double chargeover contact, indicates damper "CLOSED".
- ③ Operating arm.

**Fig 2.1**  
One electric actuator



- ② Electric limit switch with double chargeover contact, indicates damper "OPEN".
- ④ Spring return actuator.

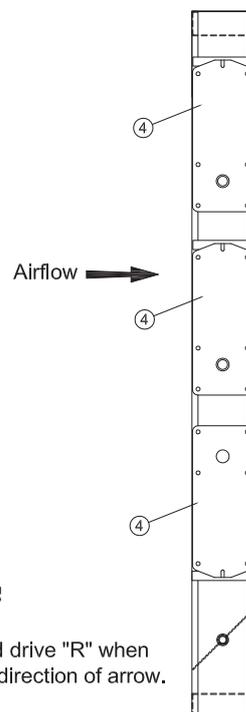
**Fig 2.2**  
Two electric actuators



12

Right hand drive "R" when viewed in direction of arrow.

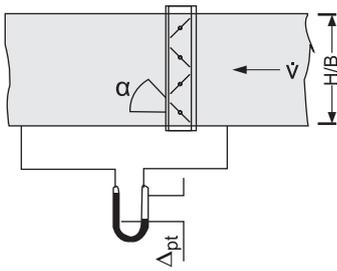
**Fig 2.3**  
Three electric actuators



Accessories	Type of construction variants and mode of operation	Fail safe setting	Product Coding	MSD	SFD
Without actuator	Plain drive shaft (STANDARD)		Z 00	●	●
	With limit switch(es); • Limit switch to indicate “Closed” position.		Z 01	●	●
	• Limit switch to indicate “Opened” position.		Z 02	●	●
	• Limits switches to indicate “Closed” and “Opened” positions.		Z 03	●	●
	With hand locking quadrant (HQL) only		Z 04	●	●
	• HQL with limit switch to indicate “Closed” position.		Z 05	●	●
	• HQL with limit switch to indicate “Opened” position.		Z 06	●	●
	• HQL with limit switches to indicate “Closed” and “Opened” positions.		Z 07	●	●
Electric spring return actuator(s)	With spring return actuator, operating at 230 V; 50/60 Hz with IP 54 rating. Typical cycle time for motor is 150 s (or seconds) and under spring force is 20 s.				
	• Actuator without integral limit switch.	FO	Z 08	●	●
		FC	Z 09	●	●
	• Actuator with integral limit switch.	FO	Z 10	●	
		FC	Z 11	●	
	• Actuator with an independent limit switch to indicate ‘Open/Closed’ position (see note).	FO	Z 12	●	●
		FC	Z 13	●	●
	• With independent limit switches to indicate ‘Open’ and ‘Closed’ positions.	FO	Z 14	●	●
FC		Z 15	●	●	
Fast acting electric spring return actuator(s)	With spring return actuator, operating at 230 V; 50/60 Hz with IP 40 rating. Typical cycle time for motor or under spring force should not exceed 75 s.				
	• Actuator with integral limit switch.	FO	Z 16	●	●
		FC	Z 17	●	●
	• Actuator with thermal protective housing.	FO	Z 18	●	●
FC		Z 19	●	●	
Modulating spring return actuator	Modulating spring return actuator operating at 24 V ac. Typical cycle time for motor is 150 s and under spring force is 20 s.				
	• Actuator without integral limit switch.	FO	Z 20	●	●
		FC	Z 21	●	●
	• Actuator with an independent limit switch to indicate ‘Open/Closed’ position (see note).	FO	Z 22	●	●
FC		Z 23	●	●	
Two position electric actuator(s)	With two-position (i.e., open/close) actuator, operating at 230 V; 50/60 Hz with typical running time of 150 s in either direction.				
	• Actuator without integral limit switch.		Z 24	●	
	• Actuator with integral limit switch.		Z 25	●	

**Note:** When only one independent limit switch is provided, this limit switch will be installed to indicate the damper position in the event of power failure to the actuator (e.g., for ‘FC’ limit switch will indicate ‘Closed’ position).

# Nomenclature · Technical Data

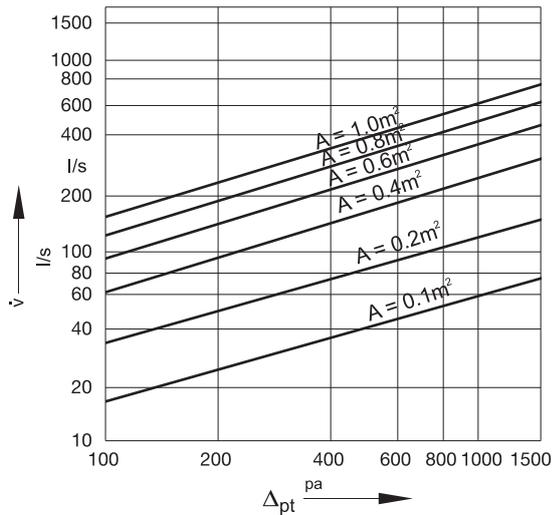


- B in mm : Width
- H in mm : Height
- A in m<sup>2</sup>: Damper cross-sectioned area for  
A casing B X H  
A1 casing (B-50) x H-50)

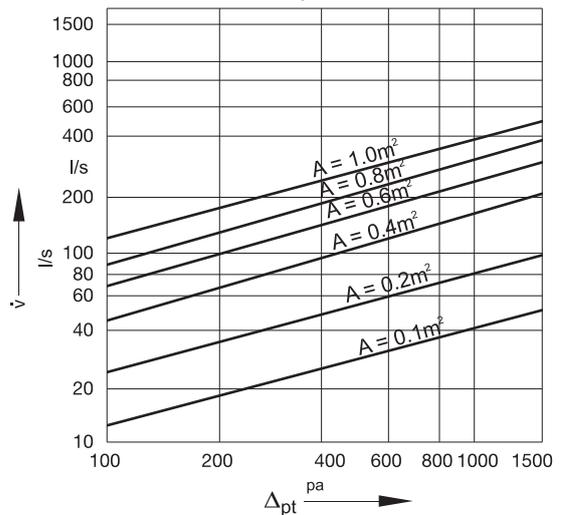
- $\Delta_p$  in Pa : Total pressure drop (installation A)
- $M_1$  in Nm : Aerodynamic torque
- $M_2$  in Nm : Blade closure torque
- a in cm : Torque coefficient (diagram 5)
- $\dot{V}$  in l/s : Leakage volume flow with blades closed  $\alpha=90^\circ$
- $\dot{V}$  in m<sup>3</sup>/h : Leakage volume flow with blades closed  $\alpha=90^\circ$
- v in m/s : Face velocity based on A
- $\alpha$  : Blade angle  $\alpha=0^\circ$  blades fully open
- $\Delta_{pt}$  in Pa : Total pressure drop (installation type A)
- $\zeta$  : Pressure loss coefficient

## Type MSD · MFD · SFD...E...P

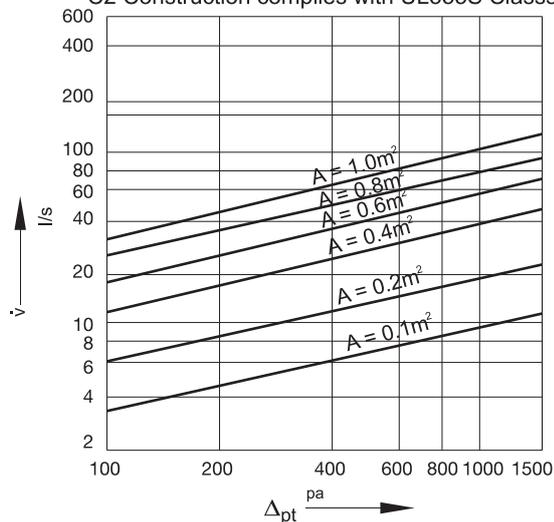
### 1 Leakage Volume Flow $\alpha=90^\circ$ C Construction (without side and tip seals)



### 2 Leakage Volume Flow $\alpha=90^\circ$ C1 Construction complies with UL555S Class III

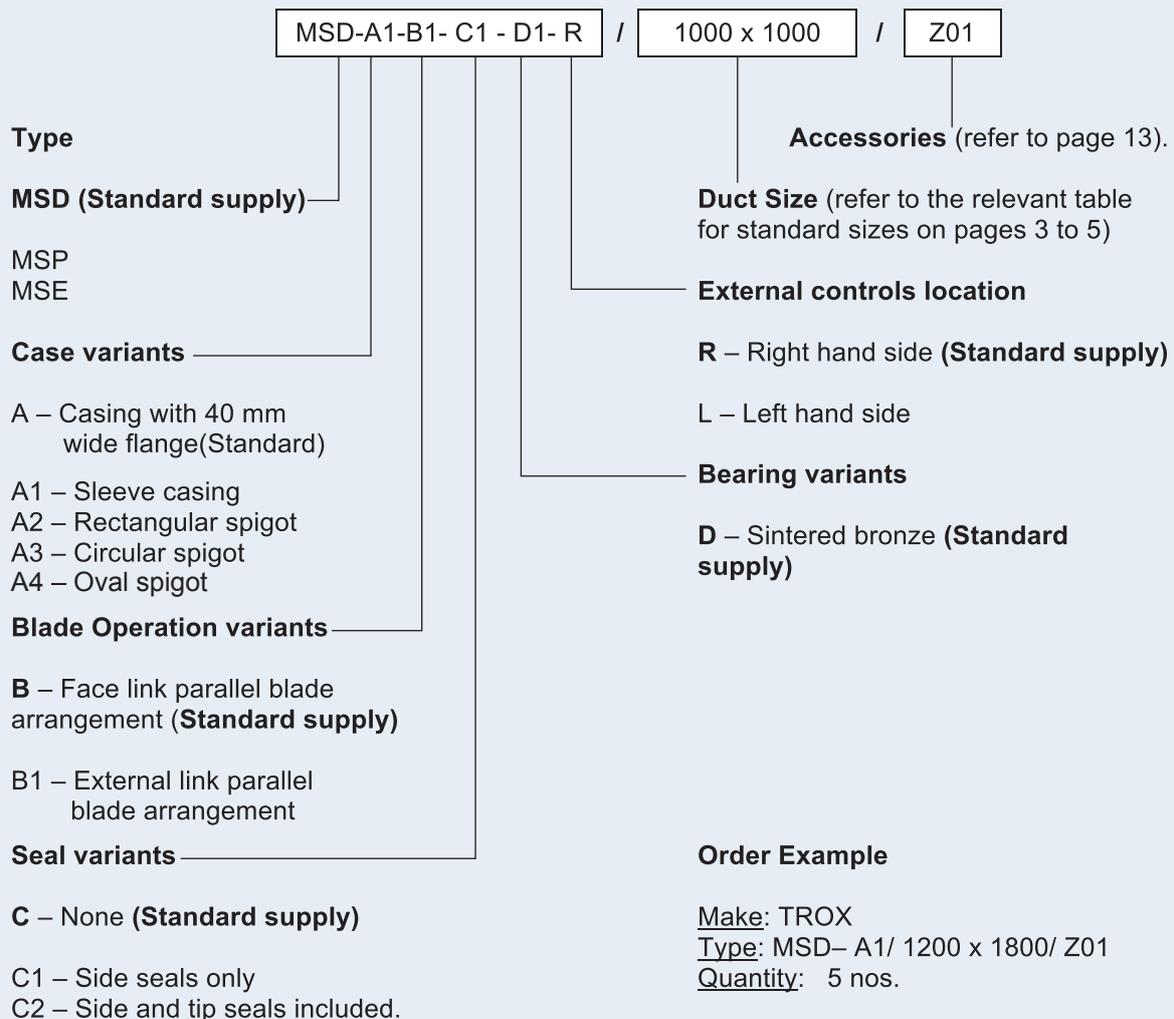


### 3 Leakage Volume Flow $\alpha=90^\circ$ C2 Construction complies with UL555S Class II



## Order Code for Type MSD/MSP/MSE Smoke Damper

Note: If the order codes below are incomplete, then it is assumed that a standard damper construction is required.



### General Specification:

Smoke damper Type MSD is designed for smoke isolation in sections of ducting in a typical mechanical ventilation system. Generally this damper consists of flanged casing and shut-off blades with overlapping interlocking joints as a standard construction. The blades are connected by internal face linkage for parallel blade operation. This damper has been independently tested for;

- Closed blade leakage to UL 555S Standard.
- Damper cycling test for more than 20,000 complete cycles with electric actuator as required under UL 555S.
- Elevated temperature test at **250°C for 120 minutes** with actuator in a thermal housing.

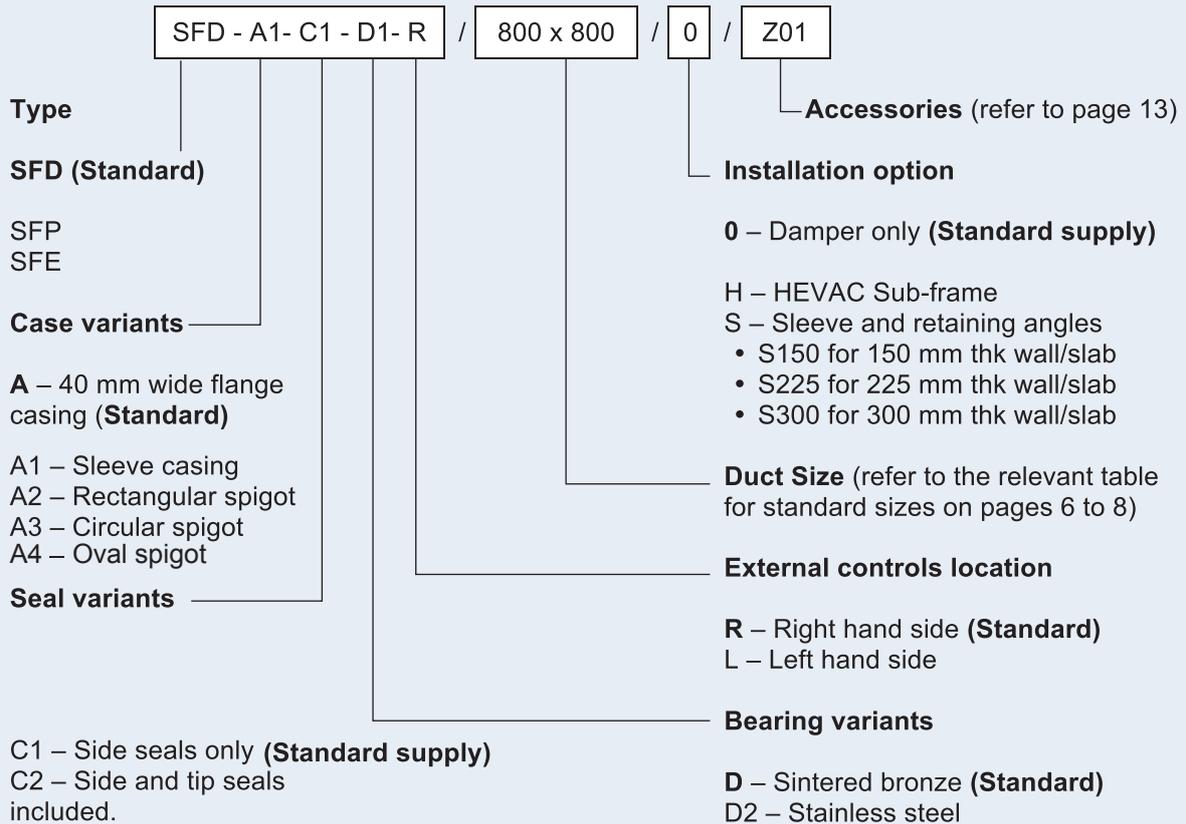
### **NOTE:**

Standard supply does **NOT** include pre-drilled flanges. This is only provided as optional extra when requested.

# Order Details

## Order Code for Type SFD/SFP/SFE Smoke Damper

**Note:** If the order codes below are incomplete, then it is assumed that a standard damper construction is required.



### Order Example

Make: TROX  
Type: SFD-A1-C2-D2-R/ 800 x 500/Z01  
Quantity: 15 nos.

### General Specification:

The combination fire and smoke damper Type SFD is designed for fire and/or smoke isolation in sections of ducting for a typical mechanical ventilation system. Generally this damper consists of flanged casing and shut-off blades with overlapping interlocking joints as a standard construction. The blades are connected by internal face linkage for parallel blade operation. This damper has been independently tested for;

- Three hours** fire integrity to BS 476 Part 20, 1987 and for **four hours** to AS 1530.4, 1997.
- Closed blade leakage test to UL 555S Standard.
- Damper cycling test for more that 20,000 complete cycles with actuator as required under UL 555S.
- Elevated temperature test at **250°C for 60 minutes** with actuator in a thermal housing.

### NOTE:

Standard supply does **NOT** include pre-drilled flanges. This is only provided as optional extra when requested.