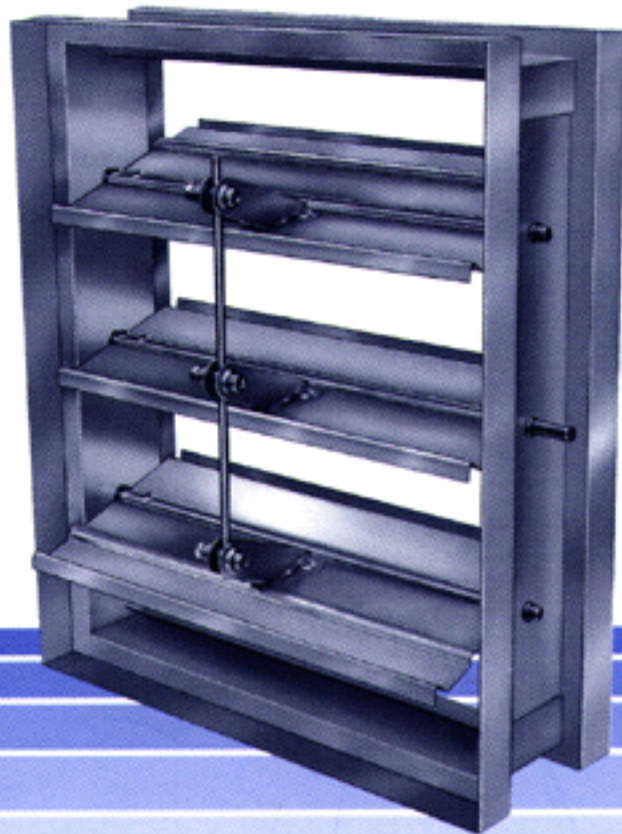


Smoke Fire Smoke and Fire Dampers

Type MSD • MFD • SFD



TROX[®] TECHNIK

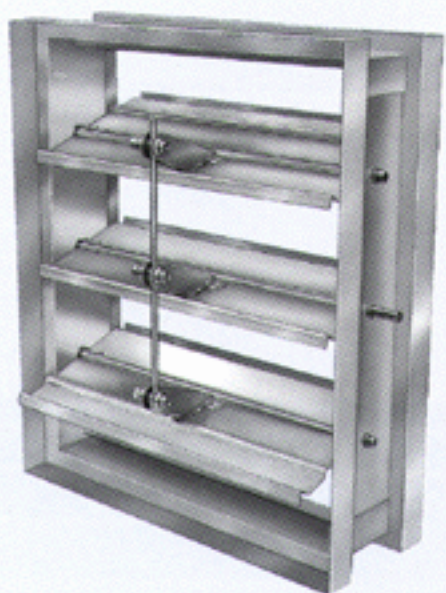
Trox (Malaysia) Sdn.Bhd
20 Persiaran Bunga Tanjung 1
Senawang Land Industrial Park
70400 SerembanNegeri Sembilan Darul Khusus
Malaysia

Telephone +60-6-678 81 88
Telefax +60-6-678 82 88
www.troxmal.com.my
e-mail: trox@troxmal.com.my

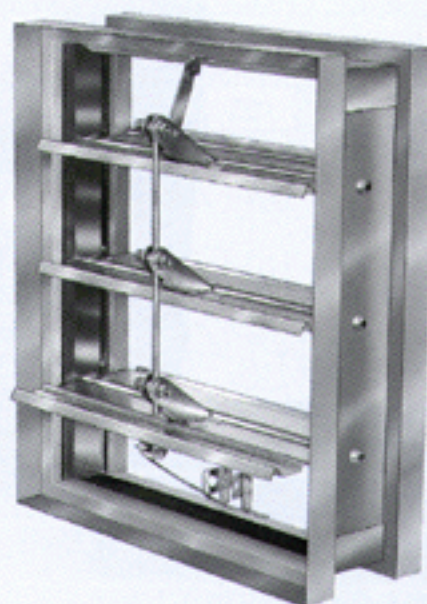
Contents · Description

Description	2	Accessories	17
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Product Range	16	Order Details	22

Type MSD



Type MFD



Trox smoke, fire, fire and smoke dampers provide an automatic means of localising areas of smoke and or fire in ventilation systems.

To prevent the distribution of fire and/or smoke through ventilation ductwork Trox dampers offer an effective barrier maintaining integrity in a fire situation up to 3 hours (MFD and SFD) and this is combined with low leakage characteristics for smoke management (MSD and SFD).

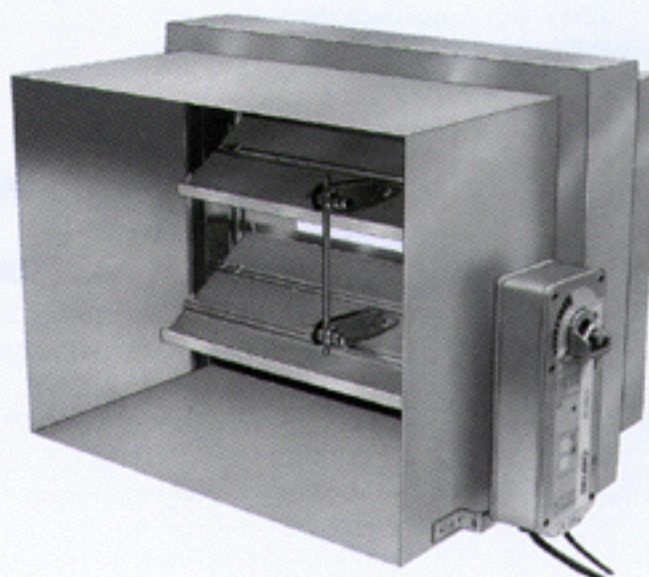
Trox dampers are suitable for installation in sheet metal ductwork, or in walls and ceiling slabs made from concrete or brickwork, and in lightweight partition walls.

In all cases the installations should be agreed with the relevant local authority or fire office responsible.

MSD, MFD and SFD dampers are available for square, rectangular, circular and flat oval duct fixings.

Trox smoke, fire and smoke dampers have been tested as appropriate to the requirements of BS 476 Part 20 1987 and UL555 1990 fire rating 3 hours, additionally leakage tested as appropriate to the requirements of UL555S 1993.

Type SFD



Construction · Materials · Standard Sizes

Fire Dampers Types MSD · MSP · MSE

Type MSD Parallel blade operation

- Casing and blades in galvanised sheet steel to BS EN 10142 1991 FE PO 2GZ275 NA or equivalent.
- Case bearings made from sintered bronze (Oilite) operational temperature resistance up to 200°C.
- Blades fitted with 12mm diameter zinc plated mild steel spindle.
- Blades have standard face linkage for parallel blade operation or optionally can be supplied with side linkage parallel blade operation.
- Face linkage consists of 16mm diameter stainless steel pivot pins connected to a link bar of 8mm diameter zinc plated mild steel.
- Side linkage consists of flat section link arms crimped to blade spindles and connected by flat section bar fitted with bushes running on 6mm diameter pins.
- Manual, pneumatic or electric actuator operation.

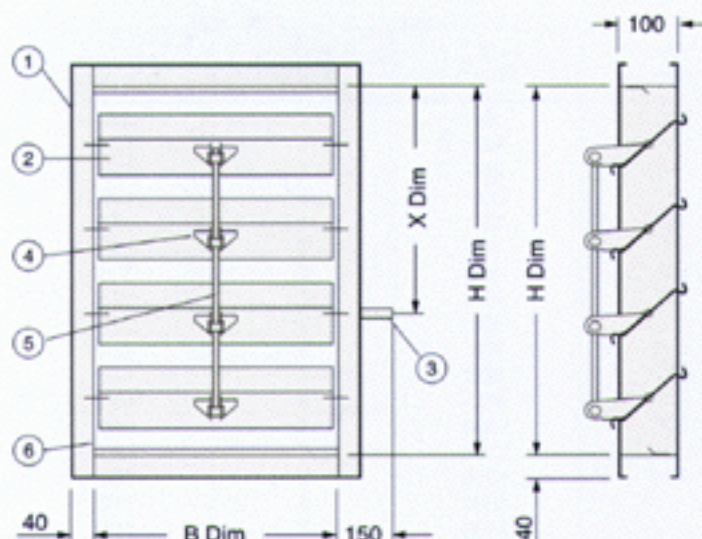
Type MSP

- General construction as type MSD but blades, spindles and blade to spindle fixings in stainless steel (Grade 304L or equivalent).

Type MSE

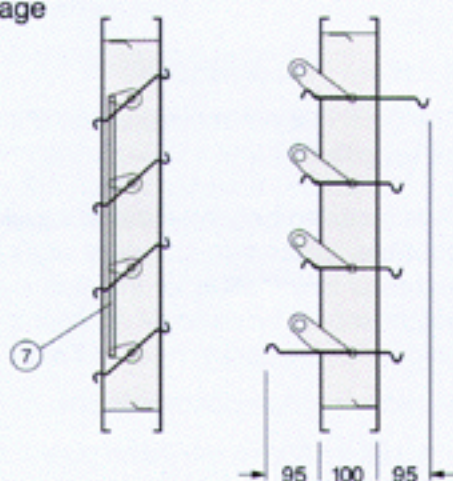
- General construction as type MSD but with case, blades, spindle and spindle fixings and linkage all from stainless steel (Grade 304L or equivalent).

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



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

- ① Flange Casing
- ② Blade
- ③ Drive Spindles
- ④ Face Linkage
- ⑤ Linkage Bar
- ⑥ Landing Angles
- ⑦ Side Linkage



Maximum blade extension outside of case when blades are fully open

Standard Sizes Type MSD...P...E - A

B in mm	H in mm	Number of Blades	Position of drive arm X in 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:

B x H are duct dimensions

Any combination of dimensions B x H listed above can be supplied.

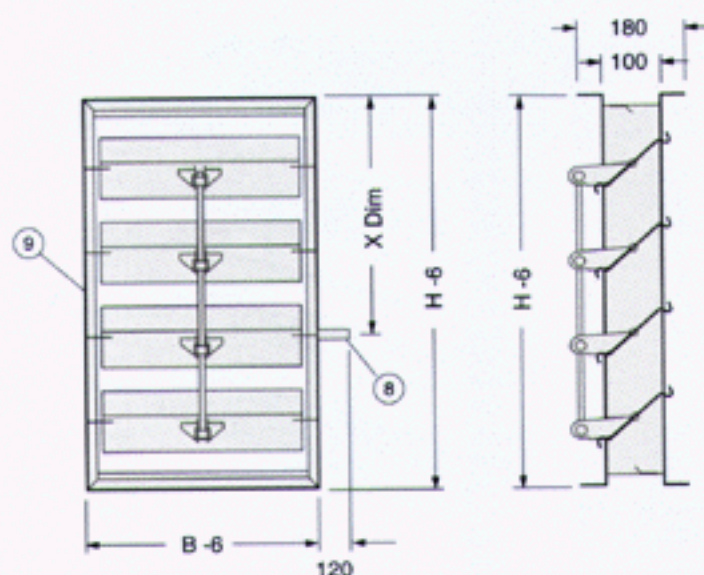
Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

- A 100 x 100mm minimum size
- A 1200 x 1800mm maximum size

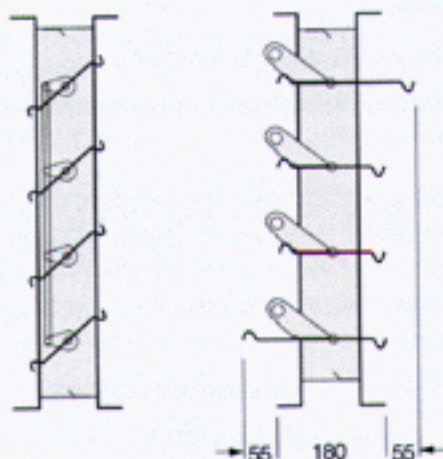
Standard Sizes

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



Type MSD...P...E - A1 - B1
Sleeve Case Side Linkage

- ⑧ Removable Drive Spindle
- ⑨ Sleeve Casing



Maximum blade extension outside of case when blades are fully open

Standard Sizes
Type MSD...P...E - A1

B in mm	H in mm	Number of Blades	Position of drive arm X in 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:

B x H are duct dimensions

Any combination of dimensions B x H listed above can be supplied.

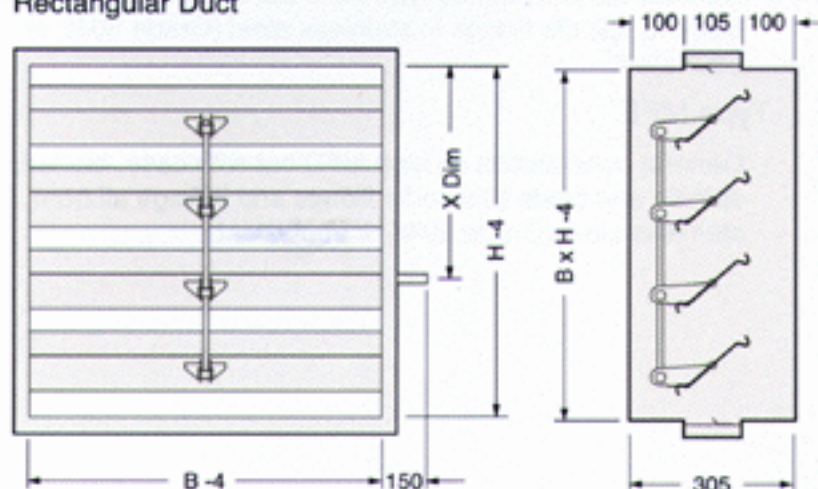
Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

- A 150 x 150mm minimum size
- A 1200 x 1800mm maximum size

Standard Sizes

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



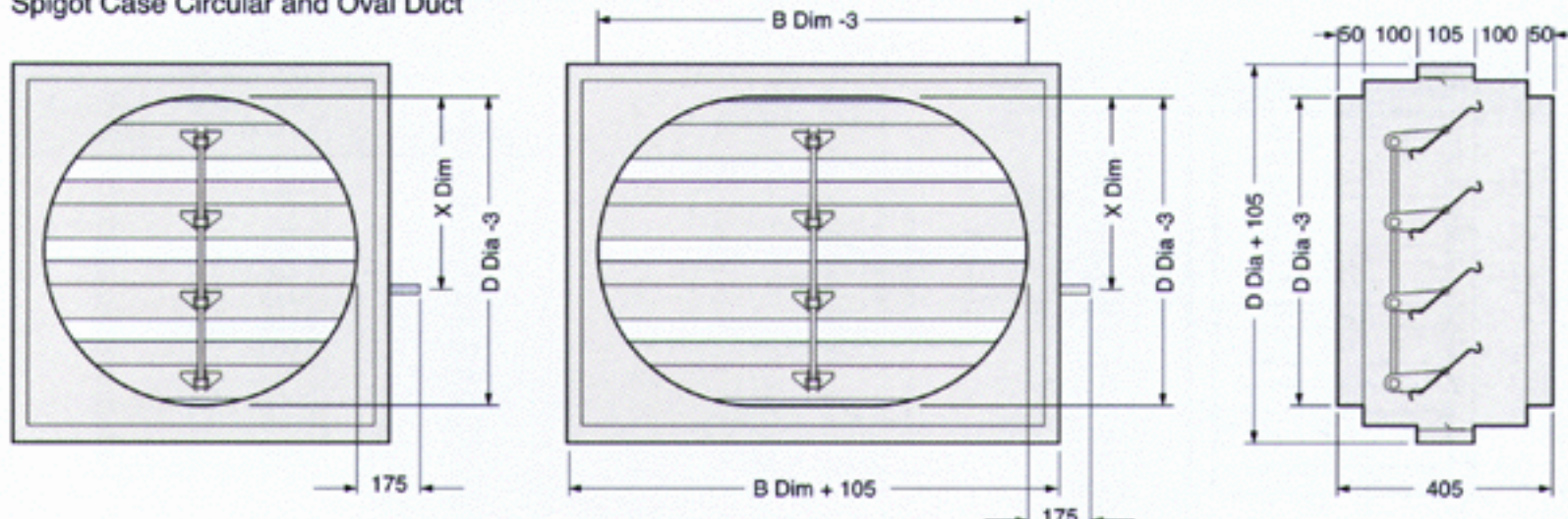
Standard Sizes

Type MSD...P...E - A2

B in mm	H in mm	Number of Blades	Position of drive arm 'X' in 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
550	600	3	300
600	700	4	425
650	800	5	390
700	900	5	450
750	1000	6	575
800	1100	7	540
850	1200	7	600
900	1300	8	725
950	1400	9	690
1000	1500	9	750
1050	1600	10	875
1100	1700	11	850
1150	1800	11	900
1200			

Type MSD...P...E - A3/A4

Spigot Case Circular and Oval Duct



Standard Sizes

Type MSD...P...E - A3/A4

B in mm	D in mm	Number of Blades	Position of drive arm 'X' in 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	1150	7	575
900			
950			
1000			
1050			
1100			
1150			

Note:

B x H, B x D or D are duct dimensions.

Any combination of dimensions listed can be supplied.

Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

Type MSD...P...E – A2/A3/A4

- A2/A3/A4 100 x 100mm or 100mm dia minimum size
- A2 1200 x 1800mm maximum size
- A3/A4 1150 x 1150mm or 1150mm dia maximum size

Construction · Materials · Standard Sizes

Fire Dampers Types MFD · MFP · MFE

Type MFD parallel blade operation

- Casing and blades in galvanised sheet steel to BS EN 10142 1991 FE PO 2GZ275 NA or equivalent.
- Case bearings made from sintered bronze (Oilite) operational temperature resistant up to 200°C.
- Blades fitted with 12mm diameter zinc plated mild steel spindles parallel blade operation.
- Blades have standard face linkage.
- Linkage consists of 16mm diameter stainless steel pivot pins connected to a link bar of 8mm diameter zinc plated mild steel.
- Stainless steel grade 302 side seals fitted to close gap between case and blades.
- Fitted with internally mounted fusible link, closing spring and catch device prevents blades from opening until manually released.

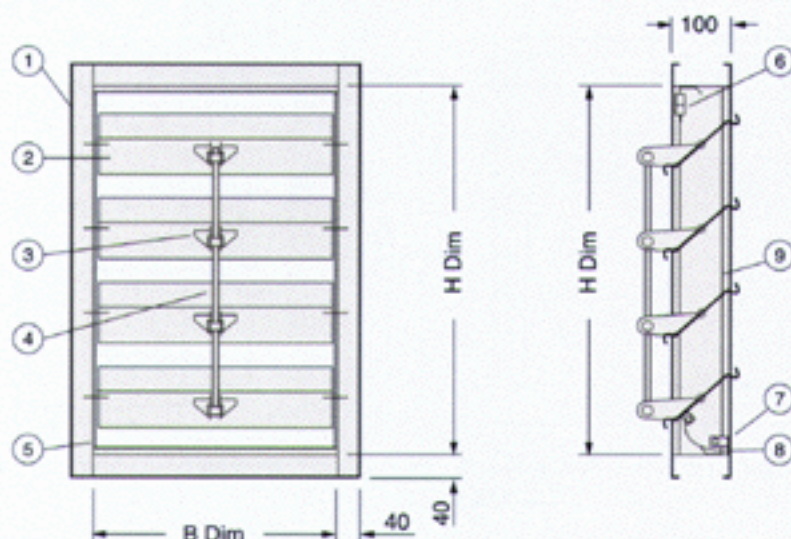
Type MFP

- General construction as type MFD but blades, spindles and blade to spindle fixings in stainless steel (Grade 304L or equivalent).

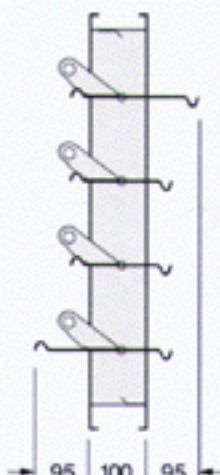
Type MFE

- General construction as type MFD but with case, blades, spindle and blade to spindle fixings and linkage all from stainless steel (Grade 304L or equivalent).

Type MFD...P...E - A (Standard Sizes Flange Case)



- ① Casing
- ② Blade
- ③ Face Linkage
- ④ Linkage Bar
- ⑤ Landing Angles
- ⑥ Fuse Link 72°C
- ⑦ Catch Device
- ⑧ Closing Spring
- ⑨ Side Seal



Maximum blade extension outside of case when blades are fully open

Standard Sizes Type MFD...P...E - A

B in mm	H in mm	Number of Blades
100	200	1
150	250	1
200	300	1
250	350	2
300	400	2
350	450	2
400	500	3
450	600	3
500	700	4
550	800	4
600	900	5
650	1000	6
700		
750		
800		
850		
900		
1000		

Note:

B x H are duct dimensions

Any combination of dimensions B x H listed above can be supplied.

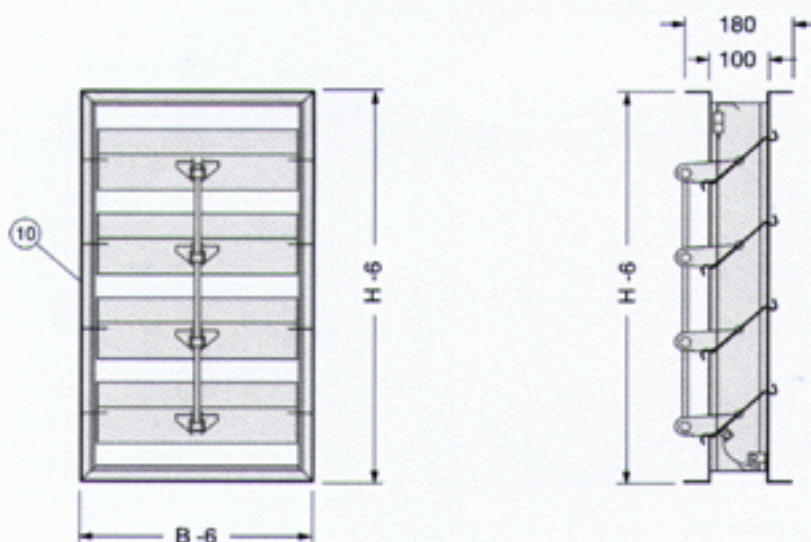
Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

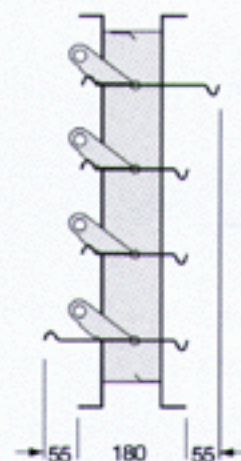
- A 100 x 200mm minimum size
- A 1000 x 1000mm maximum size

Standard Sizes

Type MFD...P...E - A1
Sleeve Case



⑩ Sleeve Casing



Maximum blade extension outside of case when blades are fully open

Standard Sizes
Type MFD...P...E - A1

B in mm	H in mm	Number of Blades
150	250	1
200	300	1
250	350	1
300	400	2
350	450	2
400	500	2
450	600	3
500	700	4
550	800	4
600	900	5
650	1000	6
700		
750		
800		
850		
900		
950		
1000		

Note:

B x H are duct dimensions

Any combination of dimensions B x H listed above can be supplied.

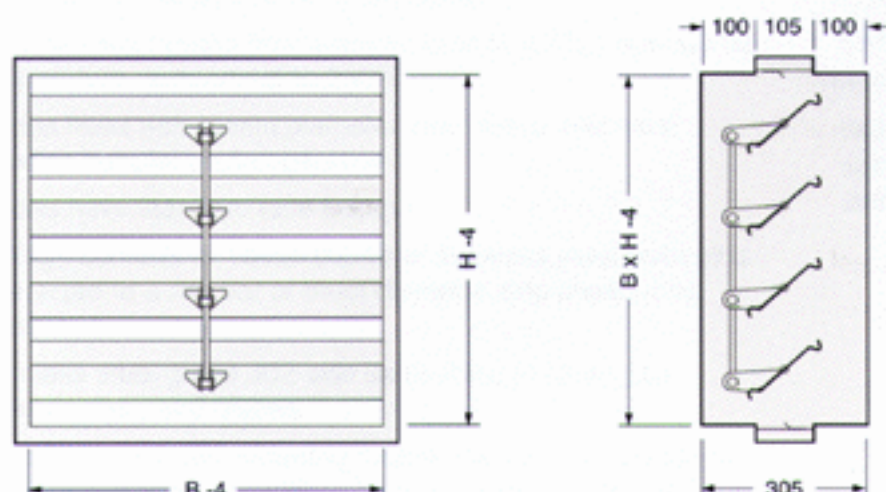
Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

- A 150 x 250mm minimum size
- A 1000 x 1000mm maximum size

Standard Sizes

Type MFD...P...E-A2 Spigot Case
Rectangular Duct

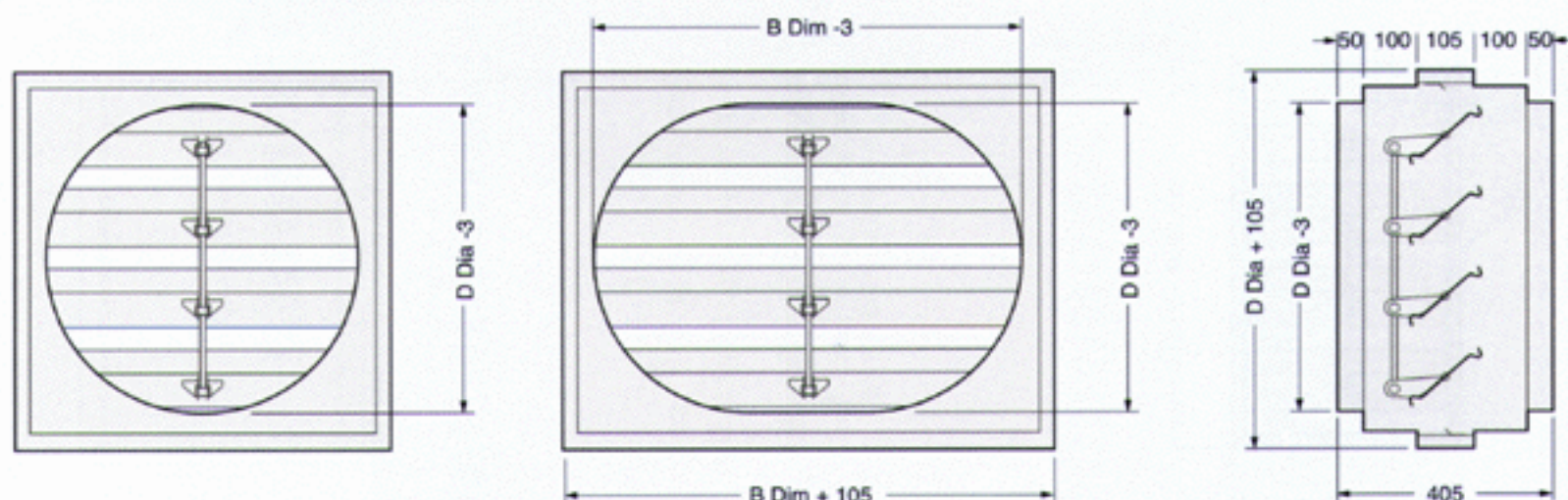


Standard Sizes

Type MFD...P...E - A2

B in mm	H in mm	Number of Blades
100	200	1
150	250	1
200	300	1
250	350	2
300	400	2
350	450	2
400	500	3
450	600	3
500	700	4
550	800	5
600	900	5
650	1000	6
700		
750		
800		
850		
900		
950		
1000		

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



Note:

B x H, B x D or D are duct dimensions.

Any combination of dimensions listed can be supplied.

Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

Type MFD...P...E - A2/A3/A4

- A2/A3/A4 100 x 200mm or 200mm dia minimum size
- A2 1000 x 1000mm maximum size
- A3/A4 1000 x 1000mm or 1000mm dia maximum size

For sizes below minimum values listed refer to Trox for details.

Standard Sizes

Type MFD...P...E - A3/A4

B in mm	D in mm	Number of Blades
100	200	1
150	250	1
200	300	2
250	350	2
300	400	2
350	450	3
400	500	3
450	600	4
500	700	4
550	800	5
600	900	6
650	1000	6
700		
750		
800		
850		
900		
950		
1000		

Construction · Materials · Standard Sizes

Smoke/Fire Dampers Types SFD · SFP · SFE

Type SFD parallel blade operation

- Casing and blades in galvanised sheet steel to BS EN 10142 1991 FE PO 2GZ275 NA or equivalent.
- Case bearings made from sintered bronze (oilite) operational temperature resistance up to 200°C.
- Blades fitted with 12mm diameter zinc plated mild steel spindle.
- Blades have standard face linkage parallel blade operation.
- Linkage consists of 16mm diameter stainless steel pivot pins connected to a link bar of 8mm diameter zinc plated mild steel.
- Side seals are stainless steel grade 302 or equivalent to close gap between blades and side frame.

Internally mounted fuse link and jack shaft, spring operated closing device fitted. Manual pneumatic or electric actuator operation.

Note : When Z48 and Z49 are fitted, jack shaft drive is not fitted (see page 19).

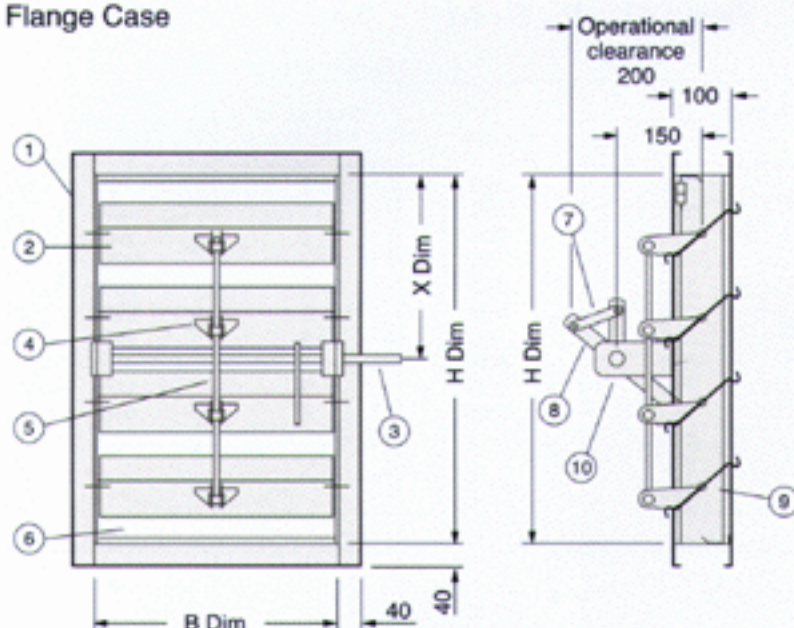
Type SFP

- General construction as type SFD but blades, spindles and blade to spindle fixings in stainless steel (Grade 304L or equivalent).

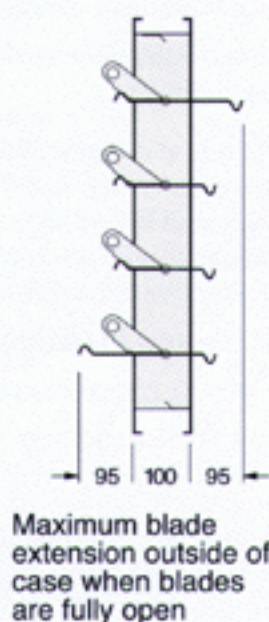
Type SFE

- General construction as type SFD but with case, blades, spindles and blade to spindle fixings and linkage all from stainless steel (Grade 304L or equivalent).

Type SFD...P...E - A
Flange Case



- 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



Standard Sizes
Type SFD...P...E - A

B in mm	H in mm	Number of Blades	Position of drive arm X in mm
250	250	1	75
300	300	1	75
350	350	2	165
400	400	2	200
450	450	2	225
500	500	3	165
550	600	3	225
600	700	4	350
650	800	5	315
700	900	5	375
750	1000	6	500
800			
850			
900			
950			
1000			

Note:

B x H are duct dimensions

Any combination of dimensions B x H listed above can be supplied.

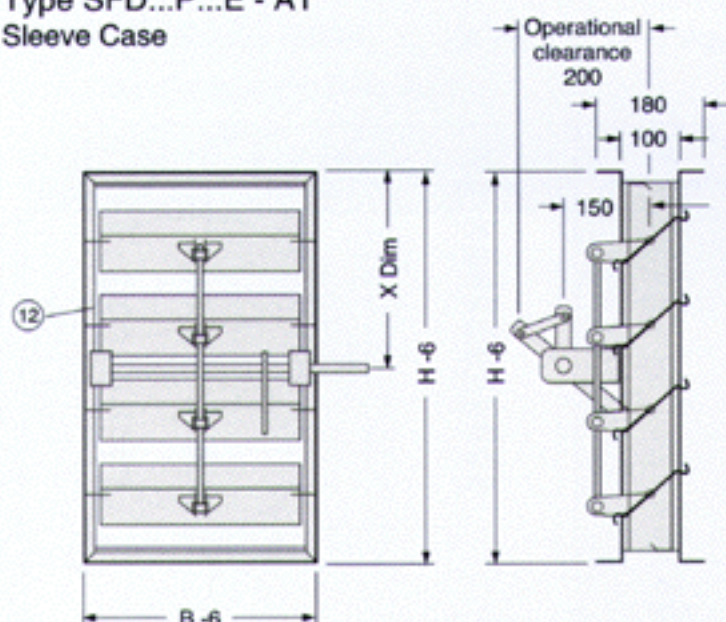
Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

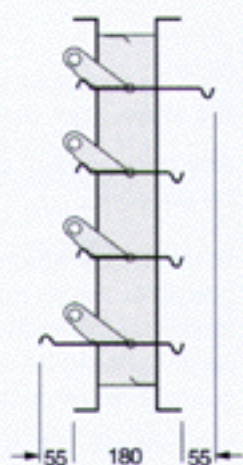
- A 250 x 250mm minimum size
- A 1000 x 1000mm maximum size

Standard Sizes

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



⑫ Sleeve Casing



Maximum blade extension outside of case when blades are fully open

Standard Sizes
Type SFD...P...E - A1

B in mm	H in mm	Number of Blades	Position of drive arm X in mm
300	300	1	75
350	350	1	100
400	400	2	190
450	450	2	225
500	500	2	250
550	600	2	225
600	700	4	340
650	800	4	400
700	900	5	375
750	1000	6	490
800			
850			
900			
950			
1000			

Note:

B x H are duct dimensions

Any combination of dimensions B x H listed above can be supplied.

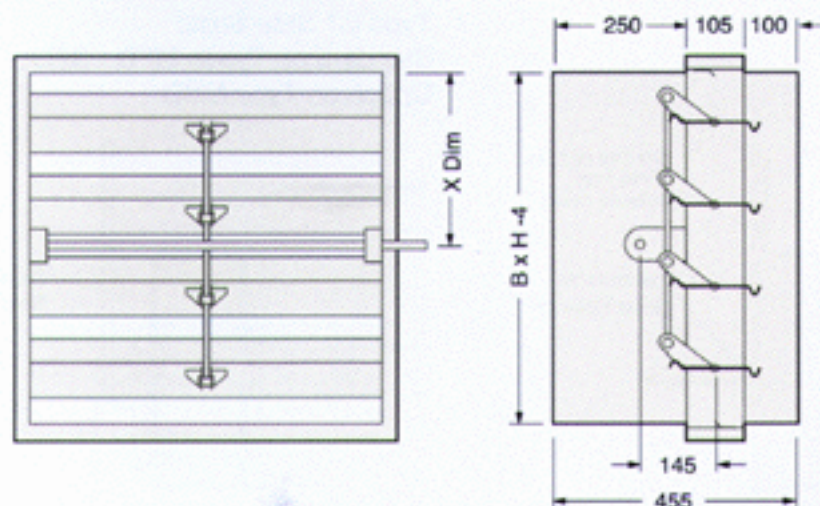
Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

- A 300 x 300mm minimum size
- A 1000 x 1000mm maximum size

Standard Sizes

Type SFD...P...E-A2 Spigot Case Rectangular Duct

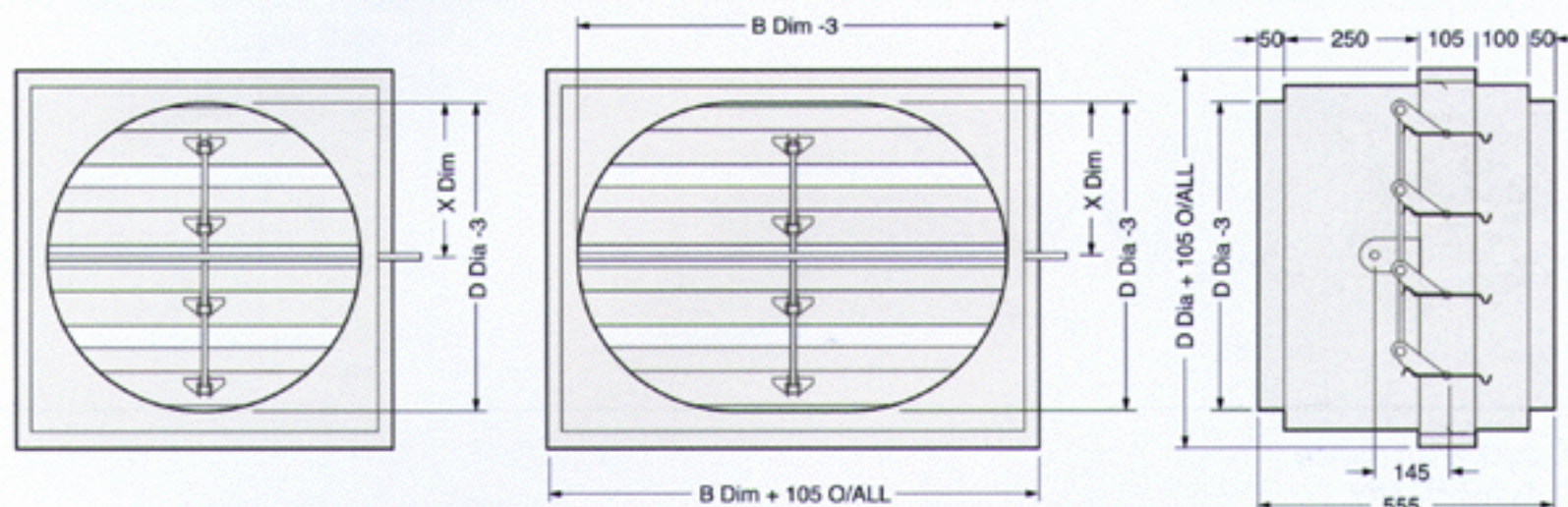


Standard Sizes

Type SFD...P...E - A2

B in mm	H in mm	Number of Blades	Position of drive arm 'X' in mm
200	250	1	75
250	300	1	75
300	350	2	165
350	400	2	200
400	450	2	225
450	500	3	165
500	600	3	225
550	700	4	350
600	800	5	315
650	900	5	375
700	1000	6	500
750			
800			
850			
900			
950			
1000			

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



Note:

B x H, B x D or D are duct dimensions.

Any combination of dimensions listed can be supplied.

Standard damper dimensions should be selected if possible. When non-standard sizes are required the technical information for the next smallest standard height should be used as an appropriate performance guide. For full details refer to Trox.

Minimum / Maximum Sizes

Type SFD...P...E - A2/A3/A4

- A3/A4 250 x 250mm or 250mm dia
- A2 250 x 250mm minimum size
- A2 1000 x 1000mm maximum size
- A3/A4 1050 x 1000mm or 1000mm dia maximum size

For sizes below minimum values listed refer to Trox for details.

Standard Sizes

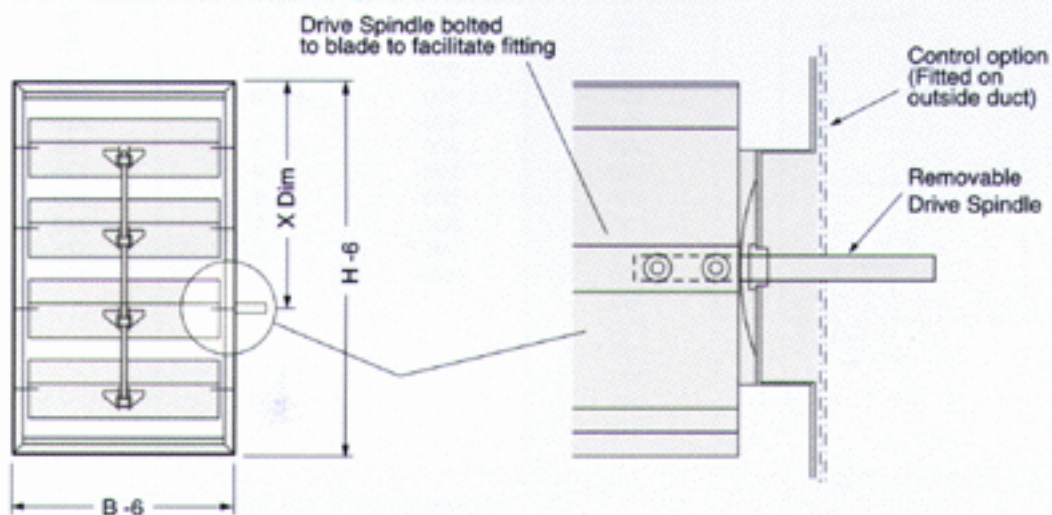
Type SFD...P...E - A3/A4

B in mm	D in mm	Number of Blades	Position of drive arm 'X' in mm
150	250	1	50
200	300	2	140
250	350	2	100
300	400	2	200
350	450	3	140
400	500	3	175
450	600	4	290
500	700	4	350
550	800	5	325
600	900	6	440
650	1000	6	500
700			
750			
800			
850			
900			
950			
1000			

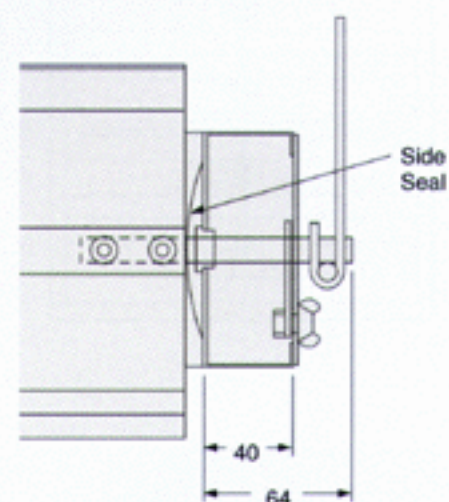
Construction · Materials

Type MSD · MFD · SFD

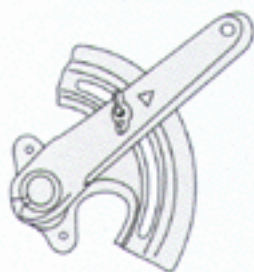
Type MSD...P...E - A1 Removable Drive Spindles



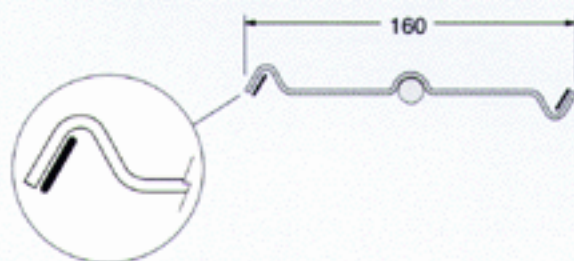
Type C1 Side Seals Standard on Types MFD · SFD Option on Type MSD



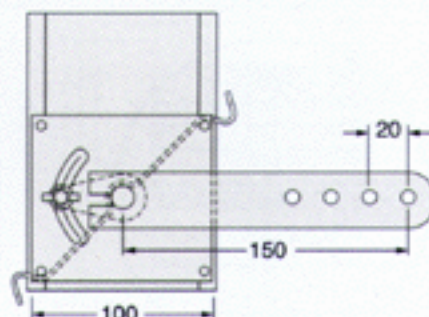
Hand Locking Quadrant Type MSD...P...E-A1 only Type SFD...P...E



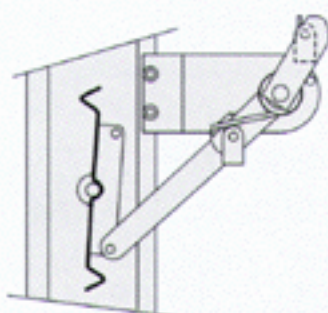
Type C2/C3 Tip Seal (includes side seal) Option on Types SFD · MSD



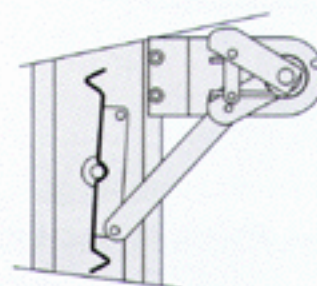
Standard Drive arm and hand Locking Quadrant (Except case A1) Type MSD only



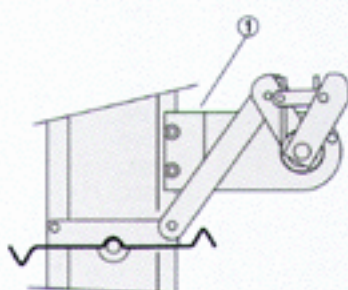
Jack shaft device Type SFD only



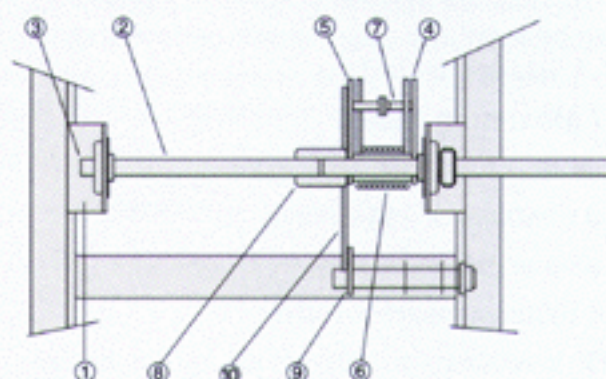
Section of drive device driven to blade closed position by firing of fuse link (fire failed position)



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



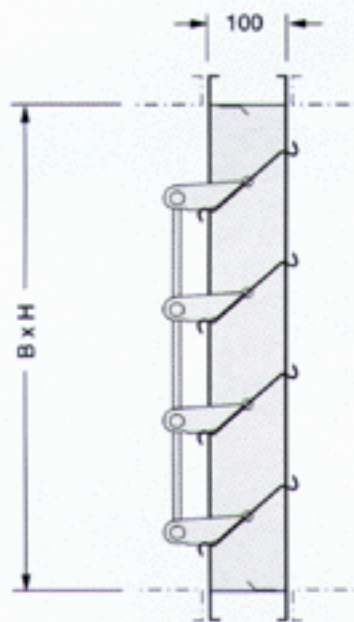
Section of drive device blade open position



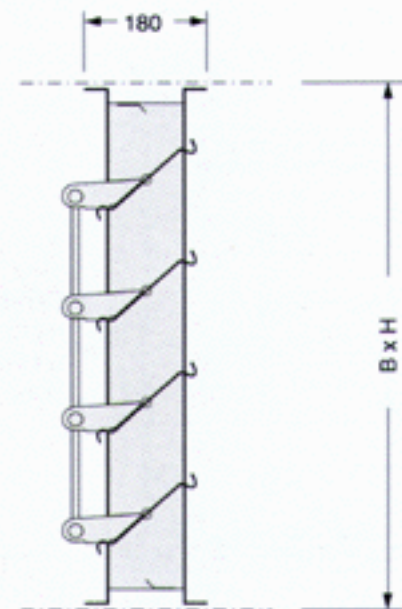
- | | | | | |
|------------------------|------------------|-----------------|----------------|-----------------------|
| ① Bracket case mounted | ③ Shaft bearing | ⑤ Free link arm | ⑦ Fuse link | ⑨ Blade rotation link |
| ② Through shaft | ④ Fixed link arm | ⑥ Coil spring | ⑧ Shaft joints | ⑩ Connecting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

Installation Details

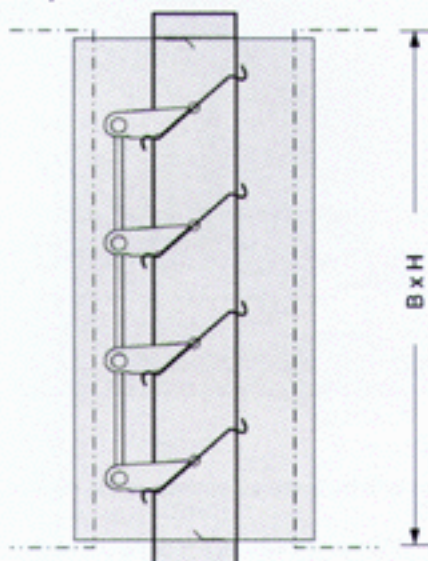
Type MSD...P...E - A
(Flange Installation)



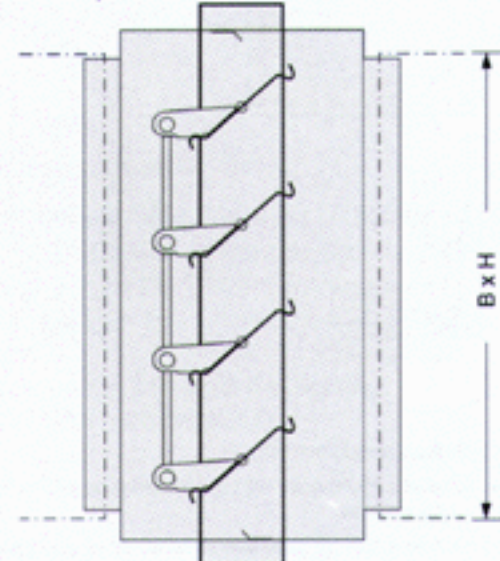
Type MSD...P...E - A1
(Sleeve Installation)



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



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



Installation Details

Type MFD • SFD

HEVAC Installation Frame Type H

The HEVAC Installation Frame Type H is built to specification HVC 6/5/83. Various fire damper design can be used with this installation frame, see below.

The installation frame is factory assembled with its respective fire damper and delivered to site as one unit. This unit should be installed centrally within the thickness of the surrounding wall or floor such that the centre line of the blade pivot is a minimum distance of 50mm from the nearest face of the wall or floor.

On installation all fixing tabs except those which are completely inaccessible shall be bent into the mortar joints between the brickwork or blockwork surrounding wall or floor, then with cement mortar fill all joints solidly.

In reinforced concrete the tabs should be bent out and tied with wire to the reinforced bars. The gap between the frame should then be backfilled with concrete or mortar both sides of the frame.

Where more than one duct penetrates a fire wall or floor, adjacent fire dampers and frame assemblies must be separated by builder's work of a minimum thickness of 225mm.

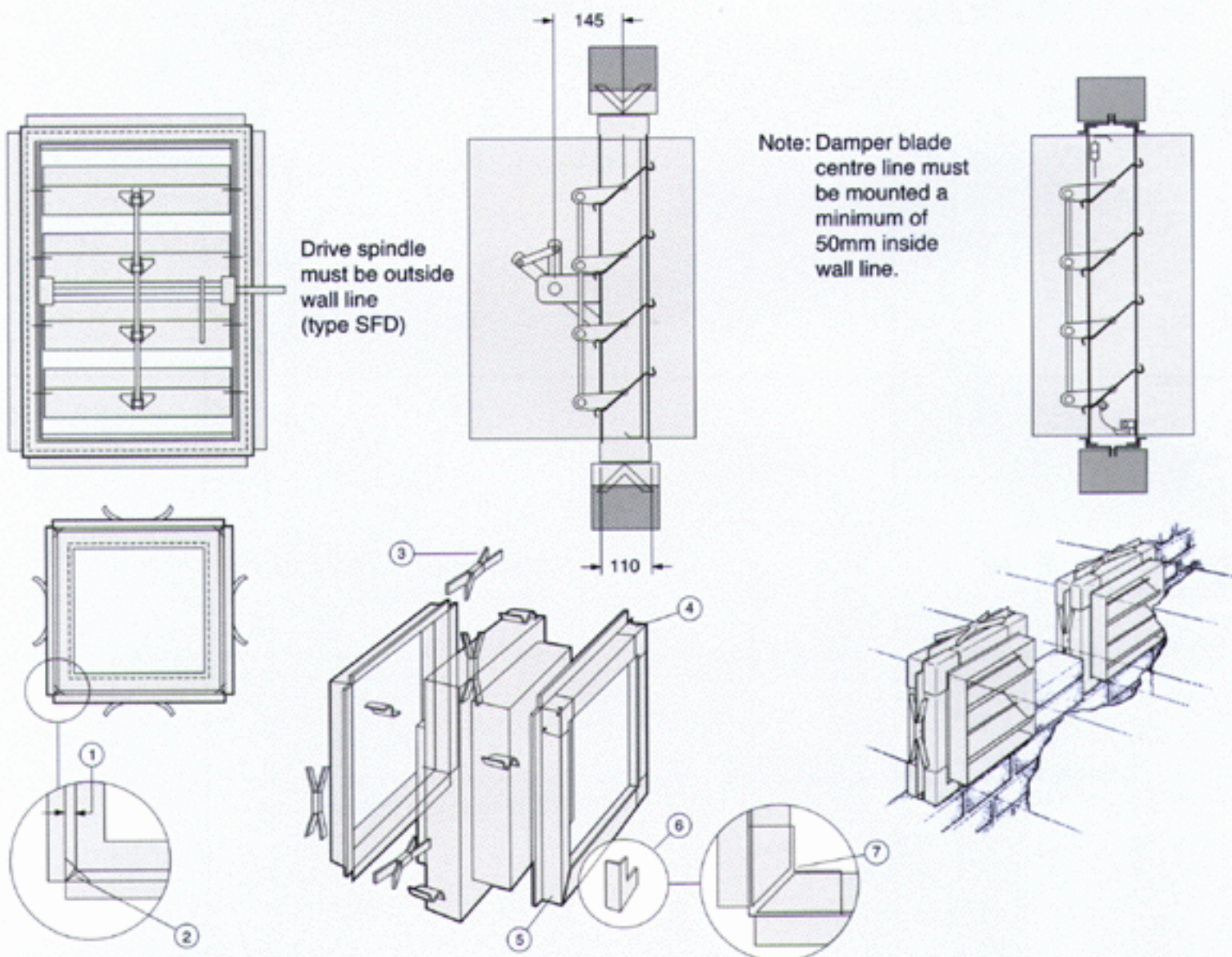
Note in all cases HEVAC frame is manufactured from galvanised mild steel.

- ① 10mm clearance between frame and fire damper to allow expansion.
- ② Galvanised steel spacer to permit expansion.
- ③ Galvanised steel building ties.
- ④ Aluminium rivets fix the corner angles to the frame.
- ⑤ Galvanised steel frame the corners left open.
- ⑥ Steel corner angles retain frame open corner.
- ⑦ 15mm clearance between mitre corner.

Suitable access must be provided to the fusible link and also locking devices Type SFD link arm, Type MFD catch device.

Type SFD...P...E A2/A3/A4 Spigot Case

Type MFD...P...E A2/A3/A4



Installation requirement:

The installer should note that the installation of the fire damper and location of access panels is to be to the satisfaction of the relevant local authority or fire officer responsible.

Two dampers can be supplied assembled in a single HEVAC frame up to size B x H 1524 x 1000mm. As with all fire damper installations the proposed arrangements must be to the satisfaction of the appropriate local authority and/or fire officer responsible for the installation. Receipt of an order requesting multiple sections will be taken by Trox as the client having obtained this approval.

Installation Details

Type MFD • SFD

Installation with Sleeve and Peripheral Angles:

As an alternative for use where the HEVAC frame is not desired, or cannot be fitted, peripheral sleeves and angle frames can be constructed in accordance with the following.

The damper should be installed centrally within the surrounding wall or floor thickness such that the centre line of the blade pivot is a minimum distance of 50mm from the nearest face of the wall or floor.

The damper should be installed in a rectangular galvanised steel sleeve with a minimum thickness of 1.2mm.

The fixing of the damper can be by tack welding the case on both sides directly to the sleeve or by the use of 20 x 20 x 1.2mm angles, which should be tack welded to the sleeve, in both cases welds to be at a maximum of 225 pitch.

The sleeve should be of a suitable length to extend through the wall or floor opening to enable the fitting of the cover angles and ductwork. The cover angles should be attached to the sleeve by 6mm diameter bolts or tack welds at a maximum of 225mm

centres, and should form a complete frame around the sleeve and cover over the expansion gap (see table) required between sleeve and wall or floor opening. The expansion gap should be filled with compressible non combustible material (mineral wool). The cover angles should be of such a size as always to form a cover over wall or floor opening by 25mm minimum, and should be manufactured from a minimum size of 38 x 38 x 5mm steel angle.

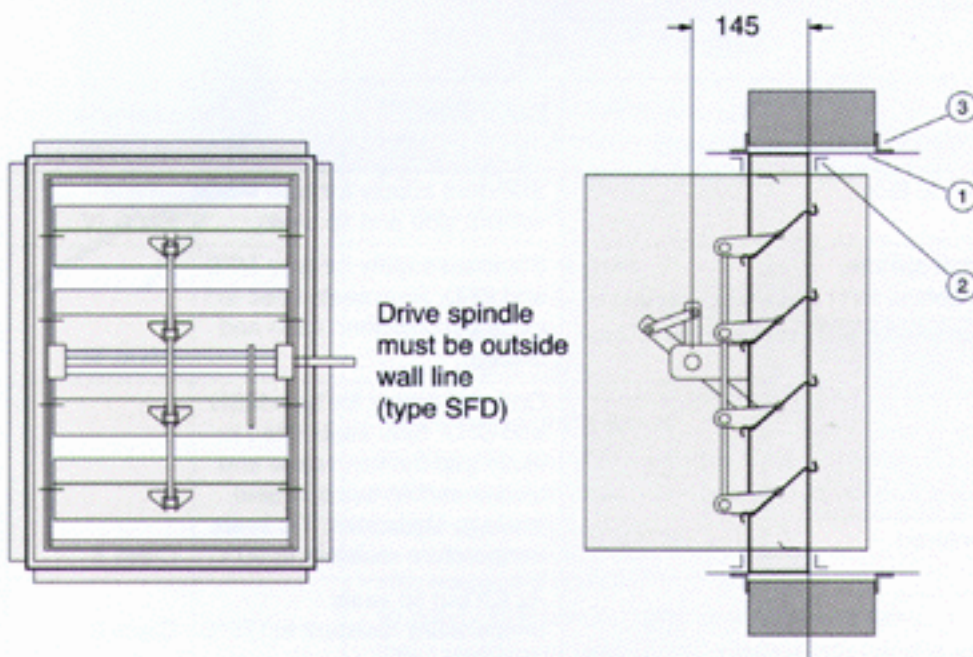
All fixings must be positioned clear of the damper blade path so as not to impede proper closure.

Suitable access must be provided to the fusible link and also locking devices Type SFD link arm. Type MFD catch device.

Warning Dampers supplied without installation frames as shown on page 14 or not being fitted into installation sleeves must not be installed within a solid masonry structure as the outer case has no facility to cater for expansion during fire conditions.

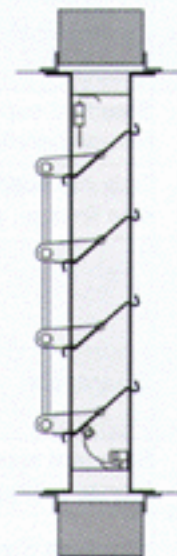
Note: Supply and fixing of sleeve and peripheral angles by others.

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



- ① Sleeve
- ② Fixing angles (optional)
- ③ Cover angles

Type MFD...P...E A1/A2/A3/A4



Expansion gap

Allowance for expansion between sleeve and builder's work in both horizontal and vertical planes.

B x H	Total Clearance	Clearance per side
0-500	6mm	3mm
500-1000	13mm	6mm

Installation requirement:

The installer should note that the installation of the fire damper and location of access panels is to be to the satisfaction of the District Surveyor or Building Inspector or the appropriate Fire Protection Authority.

Damper blade centre line must be mounted a minimum of 50mm inside wall line.

Product Range

Type MSD • MFD Construction Variants Casing

Construction Variants	Description
A	Standard supply construction flange case frame from 1.5mm sheet steel. Section size (100mm x 40mm) with a corner slot to suit proprietary flanges both sides.
A1	Sleeve case inverted channel frame from 1.5mm sheet steel. Section size (180mm x 22.5mm x 40mm) to suit duct mounting.
A2	Spigot case detail from 1.5mm sheet steel. Section size 305mm wide giving a square/rectangular duct slide in spigot connection.
A3	Spigot case detail from 1.5mm sheet steel. Section size 405mm wide with circular duct slide in spigot connection.
A4	Spigot case detail from 1.5mm sheet steel. Section size 405mm wide with oval duct slide in spigot connection.

Linkage

Construction Variants	Description
B	Standard supply for all types, internal face linkage parallel blade operation.
B1	Optional supply MSD only. External spindle, side linkage, parallel blade operation.

Bearings

Construction Variants	Description
D	Standard supply construction. Sintered bronze (oilite)
D2	Stainless Steel

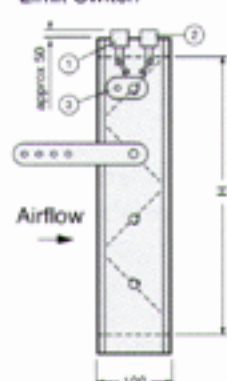
Type SFD Construction Variants Casing

Construction Variants	Description
A	Standard supply construction flange case frame from 1.5mm sheet steel. Section size (100mm x 40mm) with a corner slot to suit proprietary flanges both sides.
A1	Sleeve case inverted channel frame from 1.5mm sheet steel. Section size (180mm x 22.5mm x 40mm) to suit duct mounting.
A2	Spigot case detail from 1.5mm sheet steel. Section size 455mm wide giving a square/rectangular duct slide in spigot connection.
A3	Spigot case detail from 1.5mm sheet steel. Section size 555mm wide with circular duct slide in spigot connection.
A4	Spigot case detail from 1.5mm sheet steel. Section size 555mm wide with oval duct slide in spigot connection.

Seals

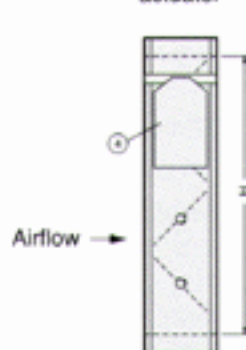
Construction Variants	Description	Leakage to UL555S
C	Standard supply for type MSD without side and tip seals.	Class IV
C1	Standard supply for type MFD and SFD. Side seals fitted to close gap between case and blades.	Class III
C2	Optional supply for type MSD and SFD. Side seals fitted to close gap between case and blades and tip seals to seal blade to blade joint. Tip seals temperature resistant to 90°C	Class II
C3	As C2 but tip seals temperature resistant to 175°C	Class II

Fig 1.1
Installation of Electric Limit Switch



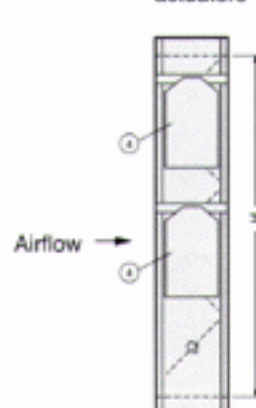
- ① Electric limit switch with double changeover contact, indicates damper "CLOSED".
- ③ Operating arm

Fig 2.1
One electric actuator



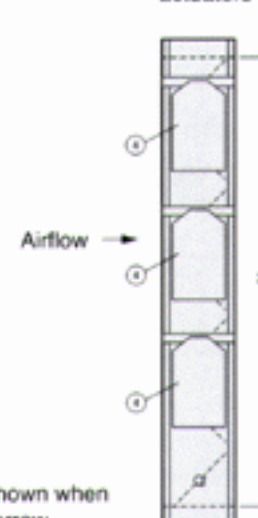
- ② Electric limit switch with double changeover contact, indicates damper "OPEN".
- ④ Spring return actuator


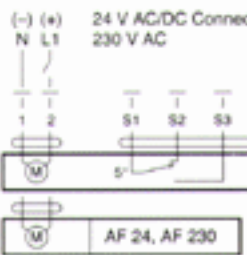
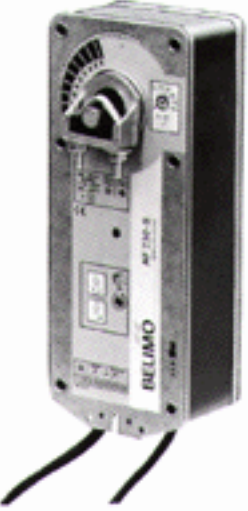
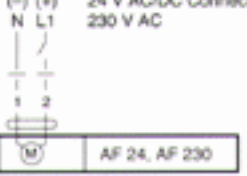
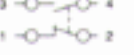
Fig 2.2
Two electric actuators




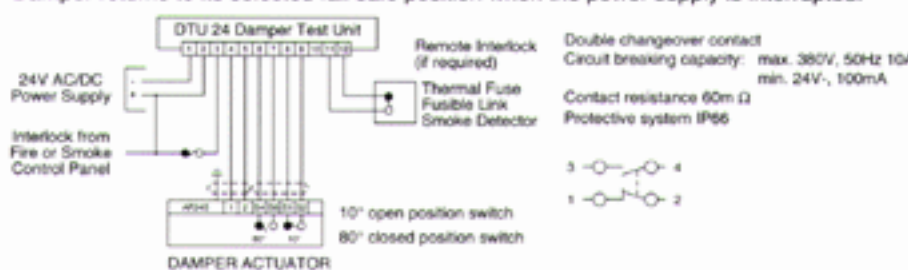
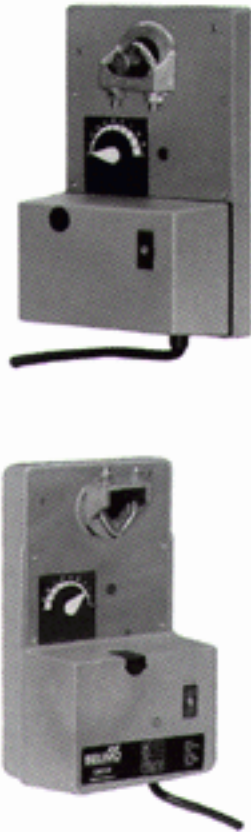

Right hand drive "R" shown when viewed in direction of arrow

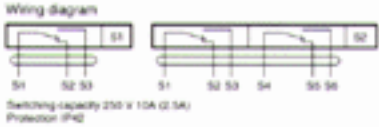

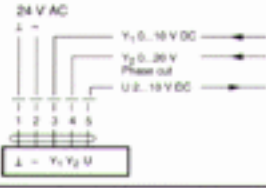
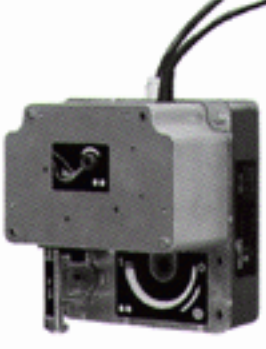
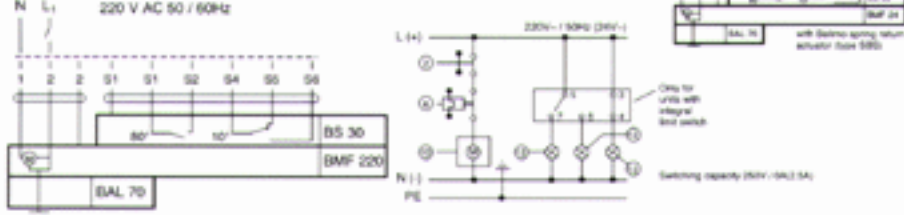
Fig 2.3
Three Electric actuators



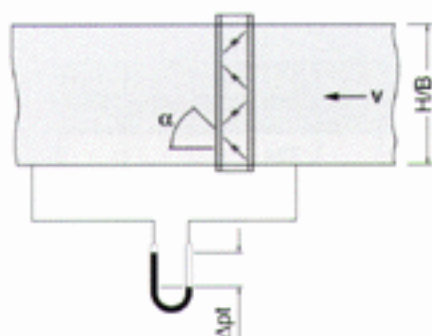
Accessories	Types of construction Variants combined with.	Fail	Code	MSD	MFD	SFD
	Plain Drive Shaft (Standard Construction)		-			
	Fusible link & Plain Drive Shaft (Standard Construction)		-			
	Fusible link & Catch Device (Standard Construction)		-			
	Limit switch, see Fig 1.1					
	Limit switch indicates damper "Closed"		Z01			
	Limit switch indicates damper "Open"		Z02			
	Limit switch indicates damper "Closed" & "Open"		Z03			
	Hand locking quadrant, see page 12		Z04			
	Hand locking quadrant and: Limit switch indicates damper "Closed"		Z05			
	Limit switch indicates damper "Open"		Z06			
	Limit switch indicates damper "Closed" & "Open"		Z07			
	Spring Return Electric Actuator (power off engages spring) Damper returns to its selected fail safe position when the power supply is interrupted. <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div> <p>(-) (+) 24 V AC/DC Connect via safety transformer. N L1 230 V AC</p>  </div> <div> <p>See Fig 2.1 - 2.3 AF 230 (-S): To isolate from the main power supply a device must be installed which provides all-pole disconnection (with at least a 3 mm contact gap). Parallel connection of several motors is possible. Power consumption must be observed.</p> <p>AF 24-S, AF 230-S</p> <p>*Switching capacity 250 V 5 A (2.5 A)</p> </div> </div>					
	- Without integral limit switches Actuator Type AF230	FO	Z08			
	230V, 50..60Hz / 6.5W opening / 1.5W open 11VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 16s Torque approx 15Nm.	FC	Z09			
	- With integral limit switches Actuator Type AF230S	FO	Z10			
	230V, 50..60Hz / 6.5W opening / 2.5W open 11VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 16s Torque approx 15Nm.	FC	Z11			
	- Without integral limit switches Actuator Type AF24	FO	Z12			
	50..60Hz / 5W opening / 1.5W open 10VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 16s Torque approx 15Nm.	FC	Z13			
	- With integral limit switches Actuator Type AF24-S	FO	Z14			
	50..60Hz / 3SW opening / 1.5W open 10VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 16s Torque approx 15Nm.	FC	Z15			
	Spring Return Actuator (power off engages spring) Damper returns to its selected fail safe position when the power supply is interrupted. <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div> <p>(-) (+) 24 V AC/DC Connect via safety transformer. N L1 230 V AC</p>  </div> <div> <p>See Fig 2.1 - 2.3 AF 230 (-S): To isolate from the main power supply a device must be installed which provides all-pole disconnection (with at least a 3 mm contact gap). Parallel connection of several motors is possible. Power consumption must be observed.</p> <p>AF 24, AF 230</p> </div> <div> <p>Double changeover contact Circuit breaking capacity: max. 380V, 50Hz 10A min. 24V-, 100mA Contact resistance 60mΩ Protective system IP66</p>  </div> </div>					
	- With independent limit switches indicates damper "Closed" 11VA 230V, 50..60Hz / 6.5W opening / 2.5W open wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z16			
		FC	Z17			
	- With independent limit switches indicates damper "Open" 11VA 230V, 50..60Hz / 6.5W opening / 2.5W open wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z18			
		FC	Z19			

Accessories

Accessories	Types of construction Variants combined with.	Fail	Code	MSD	MFD	SFD
	- With independent limit switches indicates damper Actuator Type AF230 "Closed" and "Open" 230V, 50..60Hz / 6.5W opening / 2.5N open 11VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z20	•		•
		FC	Z21	•		•
	- With independent limit switches indicates damper Actuator Type AF24 "Closed" 24V=, 50..60Hz / 5W opening / 15 open 10VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z22	•		•
		FC	Z23	•		•
	- With independent limit switches indicates damper Actuator Type AF24 "Open" 24V=, 50..60Hz / 5W opening / 2.5W open 10VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z24	•		•
		FC	Z25	•		•
	- With independent limit switches indicates damper Actuator Type AF24 "Closed" and "Open" 24V=, 50..60Hz / 5W opening / 2.5W open 10VA wire sizing. IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z26	•		•
		FC	Z27	•		•
	Spring Return Actuator (power off engages spring) Damper returns to its selected fail safe position when the power supply is interrupted. 					
	- With mini control panel for local test and independent limit switches indicates damper "Closed" and "Open". 24V=, 50..60Hz / p=5W capacity 10VA IP42 / continuously rated / opening approx 150s / closing approx 10s Torque approx 15Nm.	FO	Z28			•
		FC	Z29			•
	Two position rotary electric actuator, reversible open/closed see Fig 2.1 					
	- 240V, 50Hz 11W consumption 12VA wire sizing IP42 / continuously rated / running time approx 80s Torque approx 15Nm.		Z30	•		
	- 24V DC/AC, 50..60Hz 18W consumption 18VA wire sizing IP42 / continuously rated / running time approx 180s Torque approx 30Nm.		Z31	•		
	- 24V DC/AC, 50..60Hz 18W consumption 18VA wire sizing IP42 / continuously rated / running time approx 90s...150s Torque approx 15Nm.		Z32	•		
	- 24V DC/AC, 50..60Hz 3W consumption 7VA wire sizing IP42 / continuously rated / running time approx 80s...150s Torque approx 30Nm.		Z33	•		

Accessories	Types of construction Variants combined with.	Fail	Code	MSD	MFD	SFD
	Z30 two position rotary electric actuator fitted with auxiliary switch S1		Z34			
	Z30 two position rotary electric actuator fitted with auxiliary switch S2		Z35			
	Z31 two position rotary electric actuator fitted with auxiliary switch S1		Z36			
	Z31 two position rotary electric actuator fitted with auxiliary switch S2		Z37			
	Z32 two position rotary electric actuator fitted with auxiliary switch S1		Z38			
	Z32 two position rotary electric actuator fitted with auxiliary switch S2		Z39			
	Z33 two position rotary electric actuator fitted with auxiliary switch S1		Z40			
	Z33 two position rotary electric actuator fitted with auxiliary switch S2		Z41			
	 <p>Wiring diagram Switching capacity 230 V 10A (2.5A) Protection IP42</p>					
	Modulating Rotary Electric Actuator, see Fig 2.1					
	 <p>24 V AC Y1 0...10 V DC Y2 0...20 V Phase out U 0...10 V DC A = Y1 Y2 U</p>					
	- 24V AC, 50..60Hz 3W consumption 5VA wire sizing IP42 / continuously rated / running time approx 100...240s Torque approx 15Nm.	Actuator Type SM 24SR	Z42			
	- 24V AC, 50..60Hz 4W consumption 7.5VA wire sizing IP42 / continuously rated / running time approx 100...240s Torque approx 30Nm.	Actuator Type GM 24SR	Z43			
	Z42 modulating rotary electric actuator fitted with auxiliary switch S1		Z44			
	Z42 modulating rotary electric actuator fitted with auxiliary switch S2		Z45			
	Z43 modulating rotary electric actuator fitted with auxiliary switch S1		Z46			
	Z43 modulating rotary electric actuator fitted with auxiliary switch S2		Z47			
	With spring return actuator, closing device integrated fusible link mechanism made by Belimo, type SBS (power off to close). Note jack shaft and fuse link no longer required					
	 <p>220 V AC 50 / 60Hz BS 30 BMF 220 BAL 70 Switching capacity (230V - 10A) (2.5A)</p>					
	Actuator Ref; Type BMF 220/BS30/BAL70 220V, 50..60Hz 5.3W opening / 3.1W open 7VA wire sizing / IP54 / continuously rated Opening time approx 360s Closing time approx 10s (actuator) ; in the case of fusible link release approx 1s	(with integrated limit switches) Spring (BMF & BS30) 7.5Nm. Spring (BS30) 5Nm.	Z48			
	Actuator Ref; Type BMF 24/BS30/BAL70 24V DC/AC, 50..60Hz 4.6W opening / 2.5W open 6VA wire sizing / IP54 / continuously rated Opening time approx 360s Closing time approx 10s (actuator) ; in the case of fusible link release approx 1s	(with integrated limit switches) Spring (BMF & BS30) 7.5Nm. Spring (BS30) 5Nm.	Z49			

Nomenclature · Technical Data



B in mm: Width

H in mm: Height

A in m^2 : Damper cross-sectioned area for
 A casing B x H
 A1 casing (B-50) x H-50
 A2,A3, A4 casing spigot area

Δp in Pa: Total pressure drop (installation A)

M_1 in Nm: Aerodynamic torque

M_2 in Nm: Blade closure torque

n : Number of blades

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^3/h : Leakage volume flow with blades closed $\alpha = 90^\circ$

v in m/s: Face velocity based on A

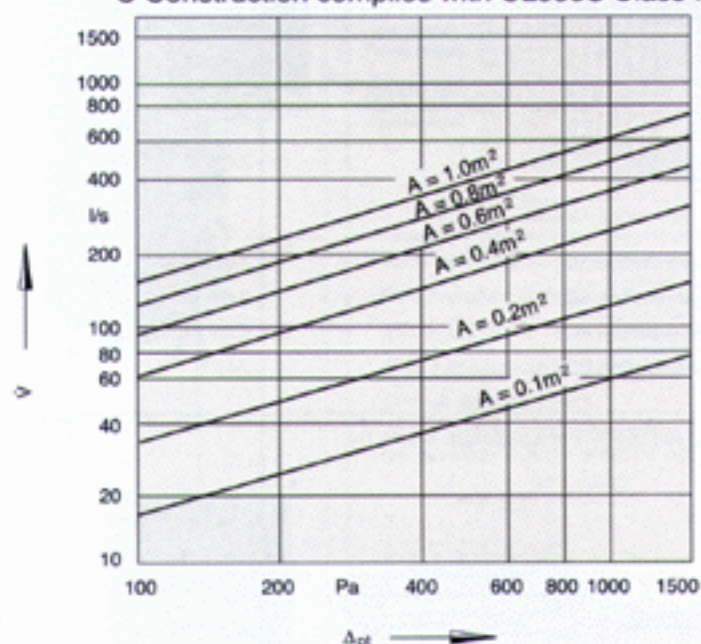
α : Blade angle $\alpha = 0^\circ$ blades fully open

Δp_t in Pa: Total pressure drop (installation type A)

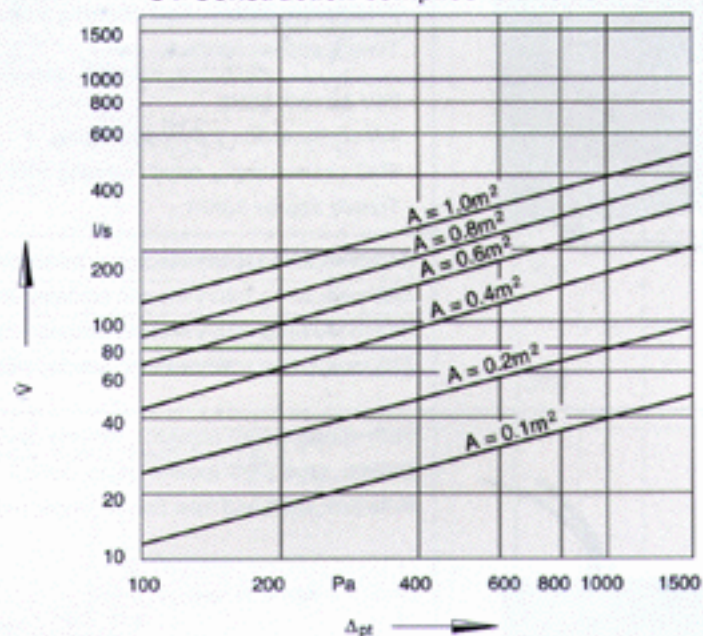
ζ : Pressure loss coefficient

Type MSD · MFD · SFD...E...P

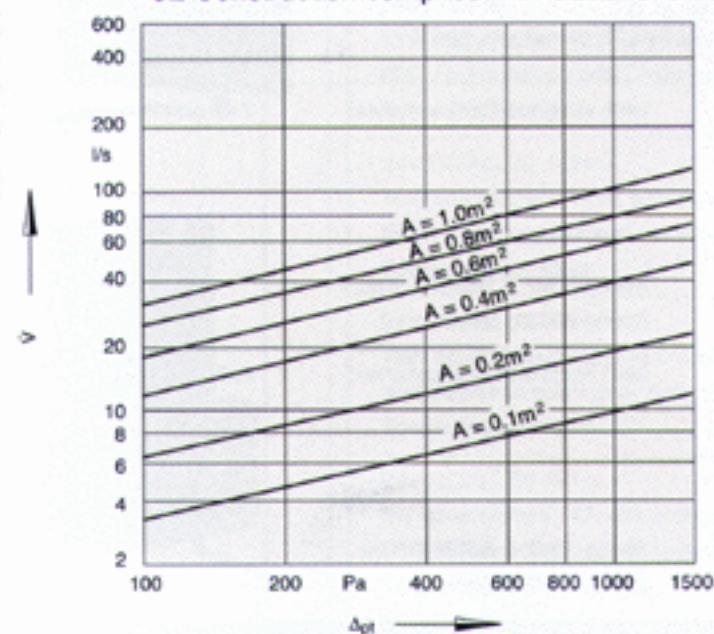
1 Leakage Volume Flow $\alpha = 90^\circ$ C Construction complies with UL555S Class IV



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



Closed Blade Pressure Drop

With blades closed ($\alpha = 90^\circ$) maximum recommended pressure drop across blades should not exceed 1000 Pa when $B = 1000\text{mm}$.

Torque Determination

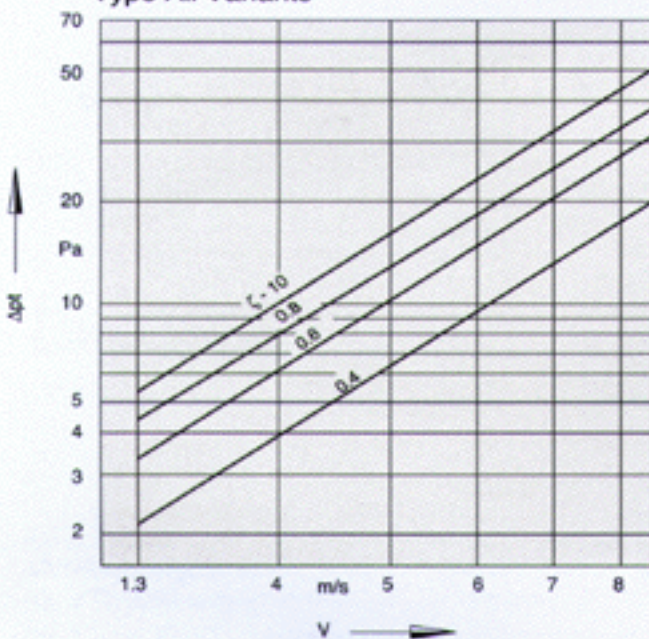
$$\text{Aerodynamic Torque } M_1 = \frac{\rho \Delta p_t \cdot A}{100}$$

Blade Closure Torque

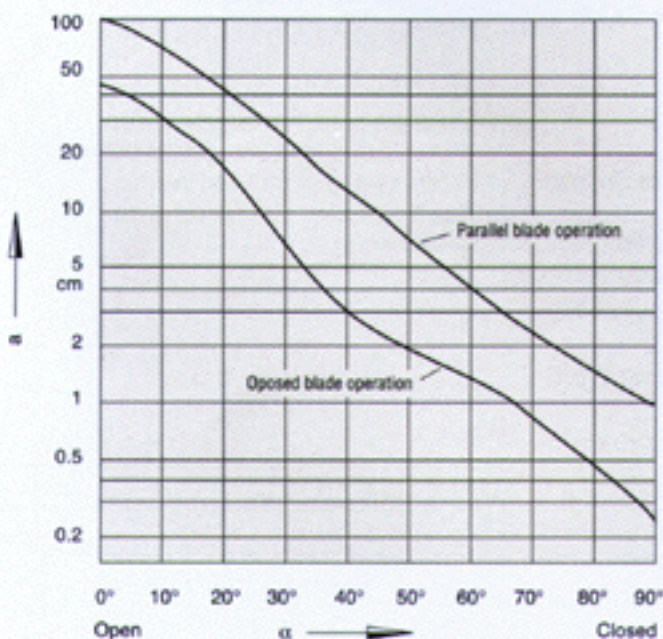
Seal Configuration	M_2
C	n
C1	$1.5 \times n$
C2	$20 \times A$

The pressure drop ΔP_t shown in diagram 4 is based on installation type A fully ducted entry and discharge. With other types of installation ΔP_t values should be multiplied by the correction factor shown in table 1.

4 Pressure Drop across fully open blades
Type All Variants



5 Torque Coefficient



Types of Installation

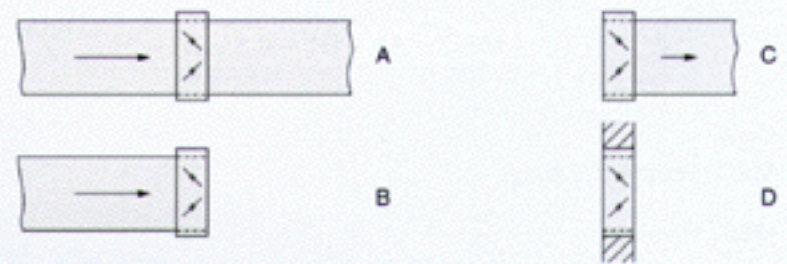


Table 1 Installation Correction Factor

Type of installation	Additional Pressure Drop Pa $\alpha = 0$ (fully open)
B	$0.75 V^2$
C	$0.4 V^2$
D	$1.1 V^2$

Table 2 Correction to Pressure Drop for 'H'
(see diagram 4)

H	150	200	250	300	350	400	450
ζ	1.03	0.95	0.9	0.85	0.8	0.76	0.73
H	500	600	700	800	900 and 1800		
ζ	0.7	0.65	0.6	0.55	0.5		

For A Casing

v based on $B \times H$

For A1 Casing

v based on $(B - 50) \times (H - 50)$

For A2, A3, A4 casing v based on spigot area

Order Details

Specification Text

Smoke damper Type MSD designed for the smoke isolation of sections of ducting in ventilation systems, basically consisting of a flanged casing, shut off blades with overlapping interlocking joints. Blades are connected by internal linkage for parallel action. External linkage parallel action also available. Smoke dampers to be leakage tested as appropriate to the requirements of UL555S, 1993

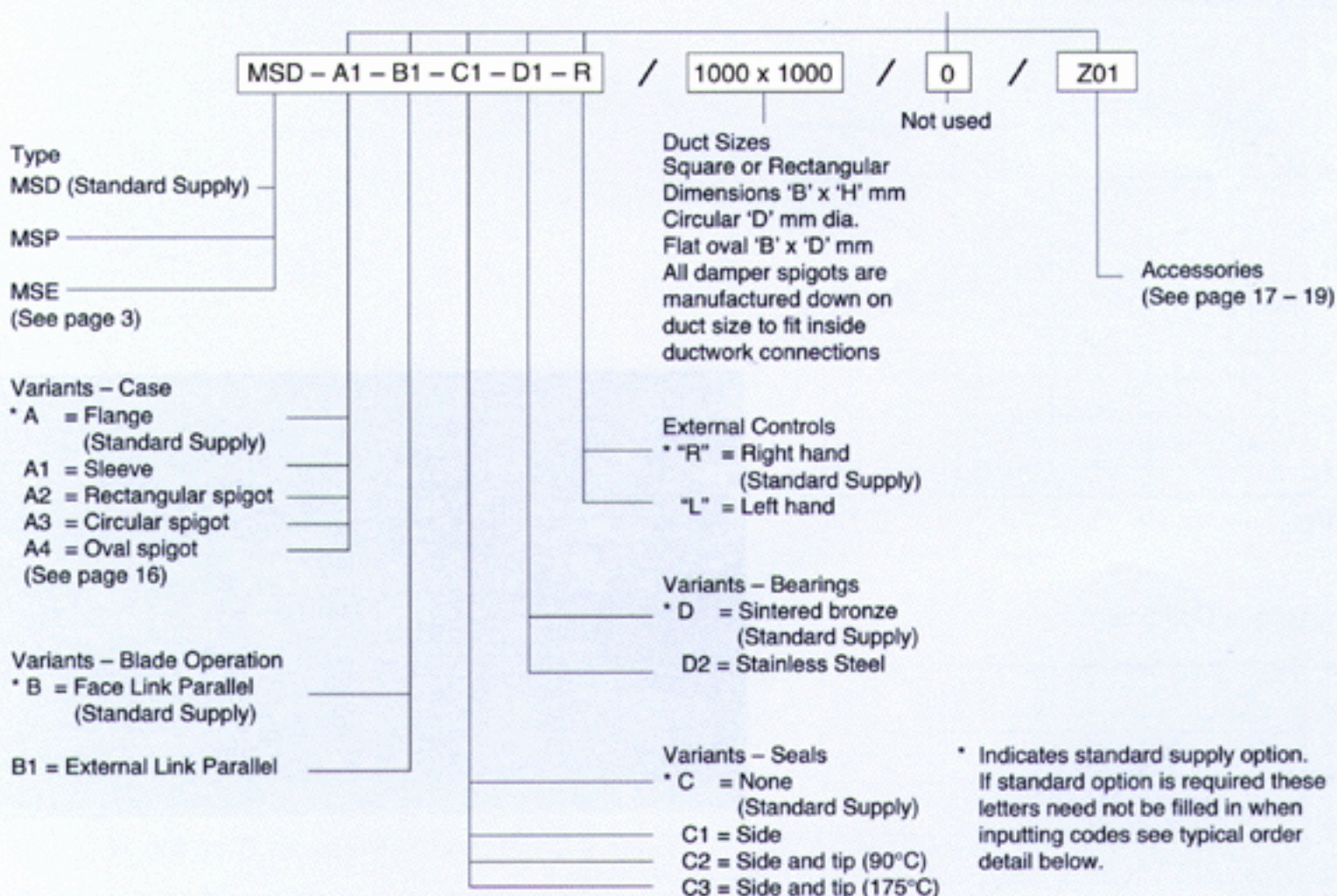
With manual, electric or pneumatic drive. Low leakage blade construction available.

Materials: See pages 3 to 5 for details.

Accessories: See pages 17 to 19.

Order Code

These codes do not need to be completed for standard products



Order Example

Make: TROX

Type: MSD - A1 / 1000 x 1000 / 0 / Z01

Qty: 4

Specification Text

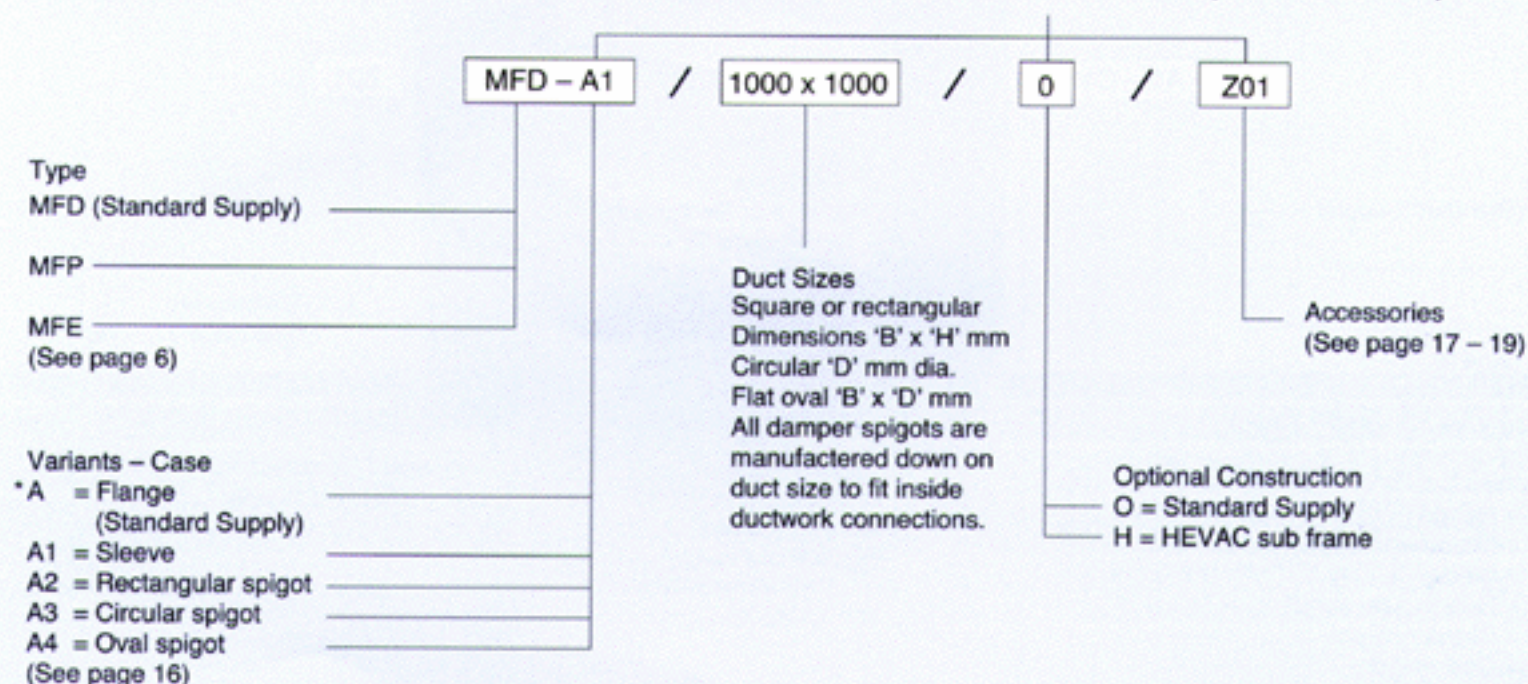
Fire damper type MFD designed for the fire isolation of sections of ducting in ventilation systems, basically consisting of a flanged casing, shut off blades with overlapping interlocking joints, with side seals to close off gap between case and blades, with internal fuse link control and spring operated closing device. Blades are connected by internal linkage for parallel action. Fire dampers to be independently tested as appropriate to the requirements of BS 476 Part 20 1987, and UL555 1990 (Fire rating 3 hours).

Materials: See pages 6 to 8 for details.

Accessories: See pages 17 to 19.

Order Code

These codes do not need to be completed for standard products



* Indicates standard supply option. If standard option is required these letters need not be filled in when inputting codes see typical order detail below.

Order Example

Make : TROX
 Type : MFD - A1 / 1000 x 1000 / 0 / Z01
 Qty : 6

Order Details

Specification Text

Combination fire/smoke dampers Type SFD designed for the fire/smoke isolation of sections of ducting in ventilation systems, basically consisting of a flanged casing, shut off blades with overlapping interlocking joints, with side seals to close off gap between case and blades. Blades are connected by internal linkage for parallel action. Damper is fitted with internal jack shaft incorporating fusible link assembly.

Fire dampers to be independently tested as appropriate to the requirements of BS 476 Part 20 1987 and UL555 1990 (Fire rating 3 hours). Additional leakage tested as appropriate to the requirements of UL555S, 1993.

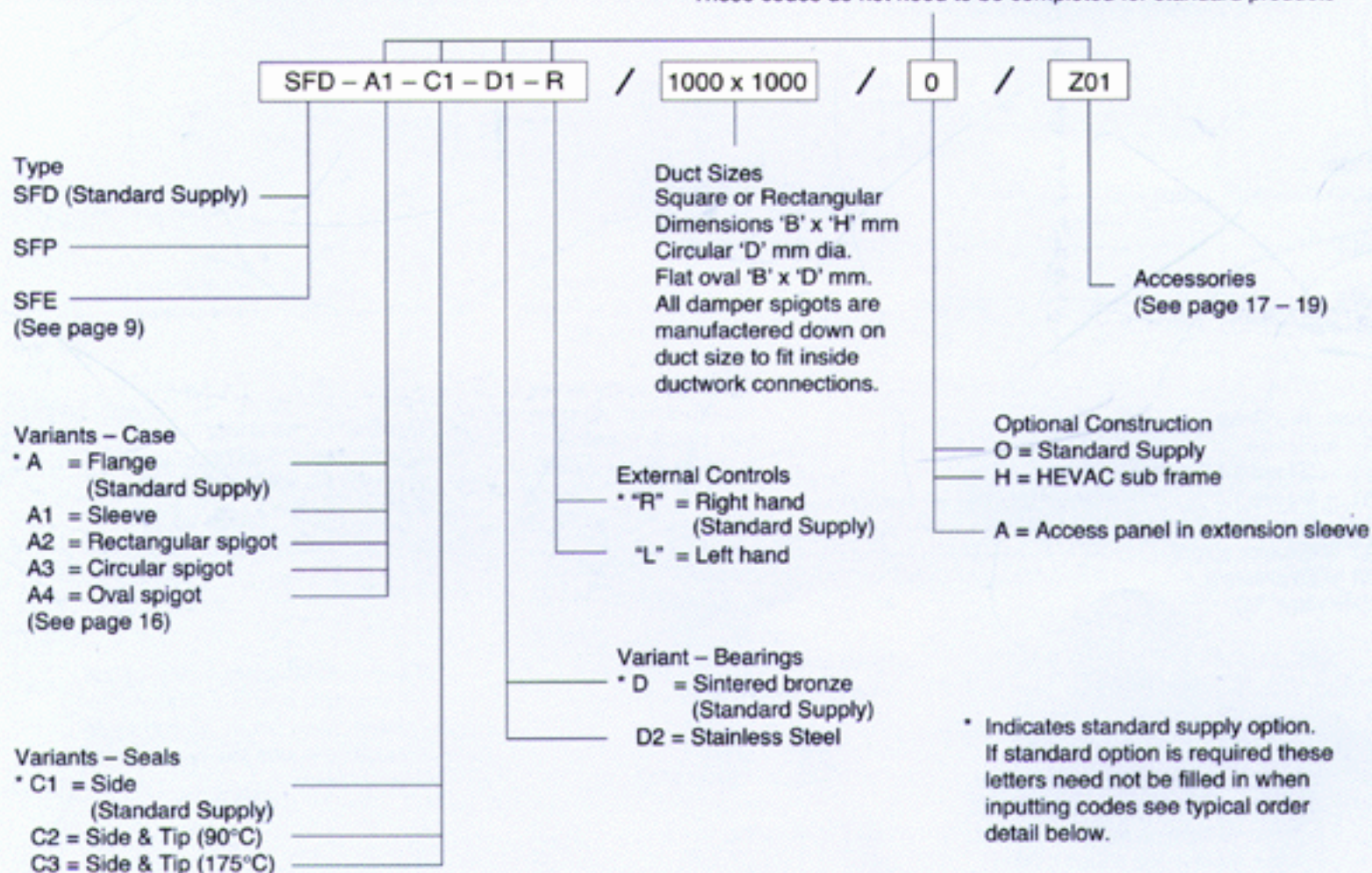
With manual, electric or pneumatic drive. Low leakage blade construction available.

Materials: See pages 9 to 11 for details.

Accessories: See pages 17 to 19.

Order Code

These codes do not need to be completed for standard products



Order Example

Make : TROX
 Type : SFD - A1 - C2 - D2 - R / 1000 x 1000 / H-A / Z01
 Qty : 4