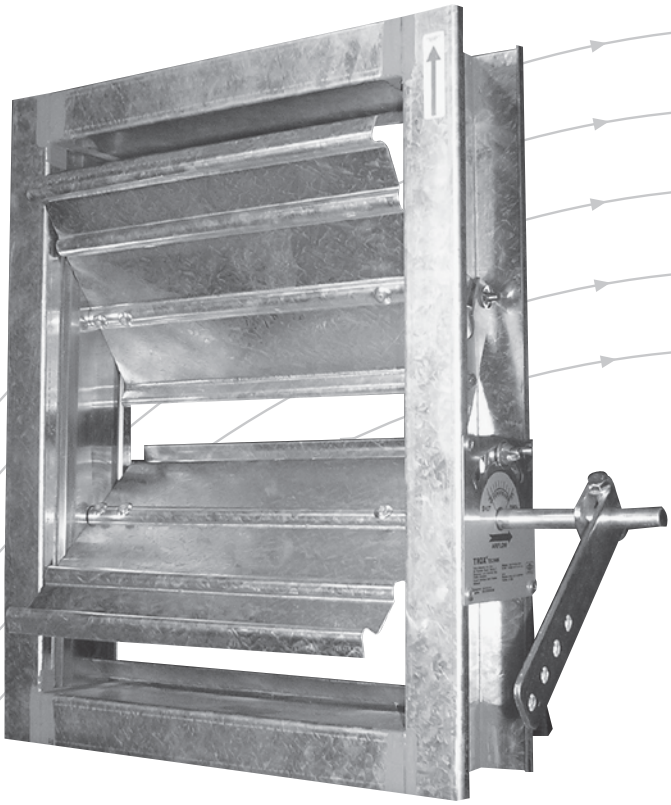
Volume Control Dampers

Type VCD



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Contents · Description

The TROX Type VCD/VCP/VCE damper is a multi-leaf volume control designed for the purpose of controlling air flow and pressure in low and medium pressure HVAC systems.

The standard VCD damper construction comes with parallel blade arrangement with face linkage. However, external linkage with either parallel or opposed blade arrangement is also available as alternatives.

The damper blades are formed single skin construction with grooved blade tips to provide an interlocking blade closure. Side seals and blade tip seals as per Seal Variant ‘C2’ can be provided if required for maintaining a low closed blade leakage rating to Class II of UL 555S Standard. Refer to page 9 of this catalogue for more information.

This damper can be operated manually or, powered by electric or pneumatic actuator(s). Refer to page 10 on ‘Accessories’ for more information.

Note: Silicon based sealant will be used on this ‘VCD’ Type dampers. If required, special silicon free sealant can be applied to the damper.

Types VCD/VCP/VCE

Type VCD Damper

- Damper casing and blades are made in galvanized sheet steel to JIS G 3302 ZCX Z27.
- Standard case bearings are in sintered bronze (Olite) capable of operating up to 200°C.
- Damper blades are fitted with 12 mm Ø zinc plated mild steel spindle.
- Standard VCD damper construction comes with parallel blade arrangement with face linkage.
- Linkage consists of 16 mm Ø brass pivot pins that are connected to an 8 mm Ø link rod that is of zinc plated mild steel.

Type VCP

- General construction for the Type VCP is as per Type VCD. But the blades, spindles and blade to spindle fixings will be in Grade 430 stainless steel or equivalent as standard supply.

Type VCE

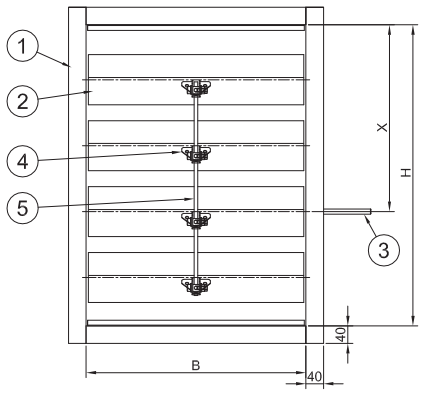
- General construction for the Type VCE is as per Type VCD. But the casing, blades, spindles, blade to spindle fixings and linkage will all be in Grade 430 stainless steel or equivalent as standard supply. **Note:** However, if required, 304 or 316 grade stainless steel can be provided.

Annotation:

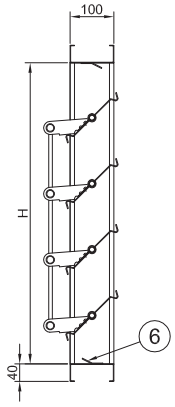
1. Casing
2. Blade
3. Drive spindle
4. Face linkage
5. Linkage rod
6. Landing angle
7. Linkage bar

Flange Case

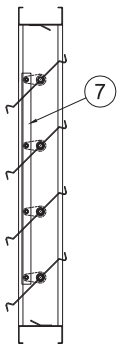
Type VCD...P...E - A



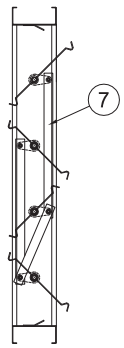
Type VCD...P...E - A-B



Type VCD...P...E - A-B1

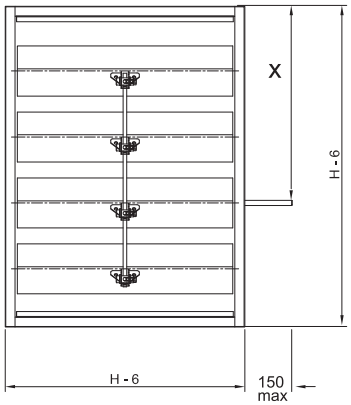


Type VCD...P...E - A-B2

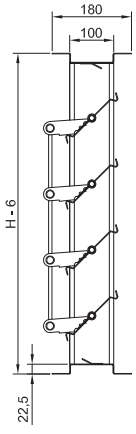


Sleeve Case

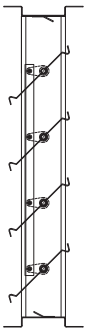
Type VCD...P...E - A1



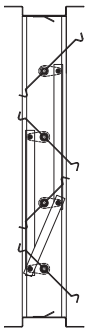
Type VCD...P...E - A1-B



Type VCD...P...E - A1-B1



Type VCD...P...E - A1-B2



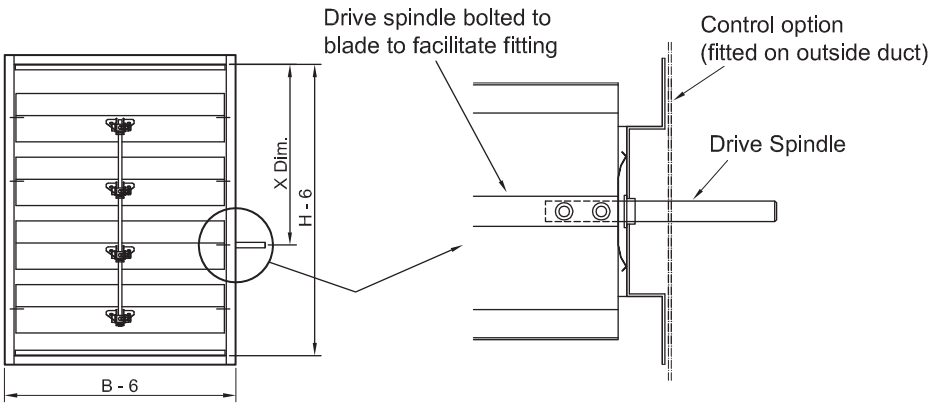
Note: B x H are duct dimensions

Type VCD/VCP/VCE Blade Tip and Side Seals

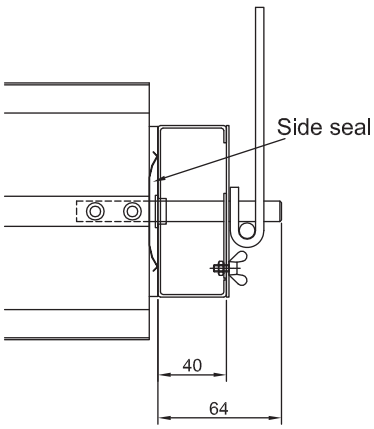
- Blade tip seals in Silicone tip seal with maximum operating temperature of 200°C.
- Side seals between the casing frame and blades in Grade 301 stainless steel or equivalent.

Note : PVC rubber can be provided if requested.

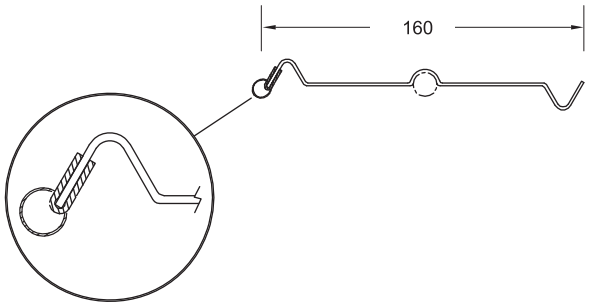
Type VCD...P...E - A1
Removable Drive Spindle



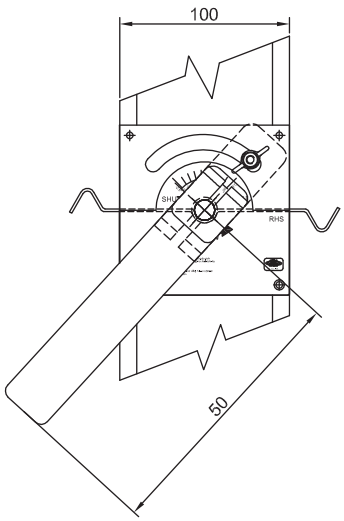
Type VCD...P...E - C1
Side Seals



Type VCD...P...E - C2/C3 Tip Seal
(includes side seal)



Standard Drive arm and hand Locking Quadrant



Standard Sizes

Type VCD/VCP/VCE – A
With 40 mm wide Flange Case

Standard damper dimensions as shown in the table below should be selected if possible. When non-standard sizes are required, it is advised that technical information given for the next smallest standard height should be used as an appropriate guide. For more details, please refer the matter to TROX.

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

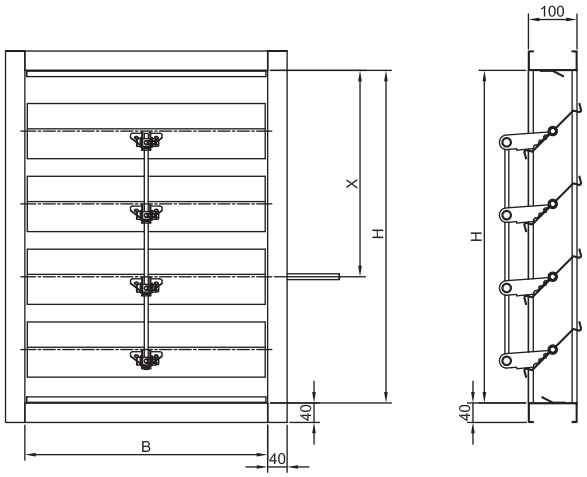


Table 1: Standard Sizes for Type VCD/P/E-A

B (mm)	H (mm)	No. of blades	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
550	600	3	500
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	840
1200	1800	11	900

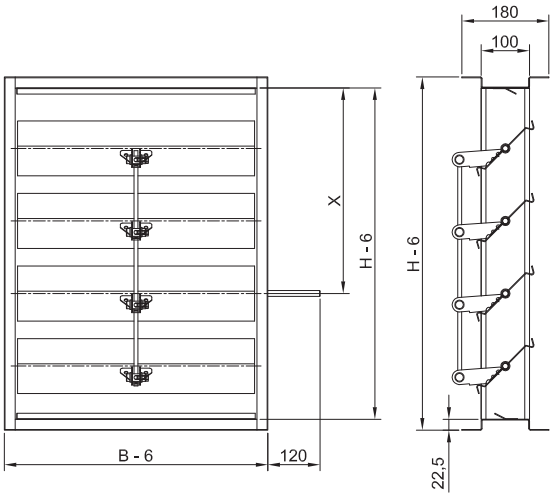
Note:
The dimensions given in Table 1 above are ductwork connection sizes. The Type VC.. – A damper can be supplied in any combination of B and H dimensions given in the table.

Minimum and Maximum Sizes
For Type VCD/VCP/VCE - A

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

Standard Sizes

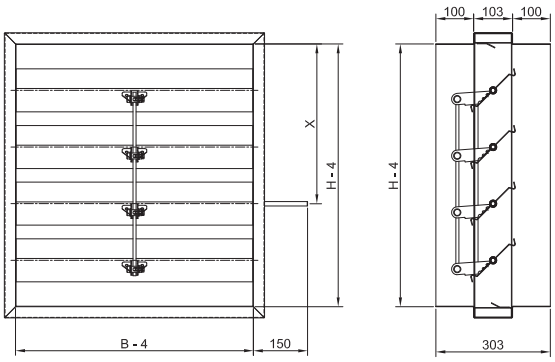
Type VCD/VCP/VCE – A1
With Sleeve Case



Minimum and Maximum Sizes
For Type VCD/VCP/VCE – A1

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

Type VCD/VCP/VCE – A2
With Rectangular Spigot Case



Minimum and Maximum Sizes
For Type VCD/VCP/VCE – A2

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

Note:
Dimensions given in Table 2 and 3 represent the ductwork connection sizes. The Type VC.. – A1 and A2 dampers can be supplied in any combination of B and H dimensions given in these tables.

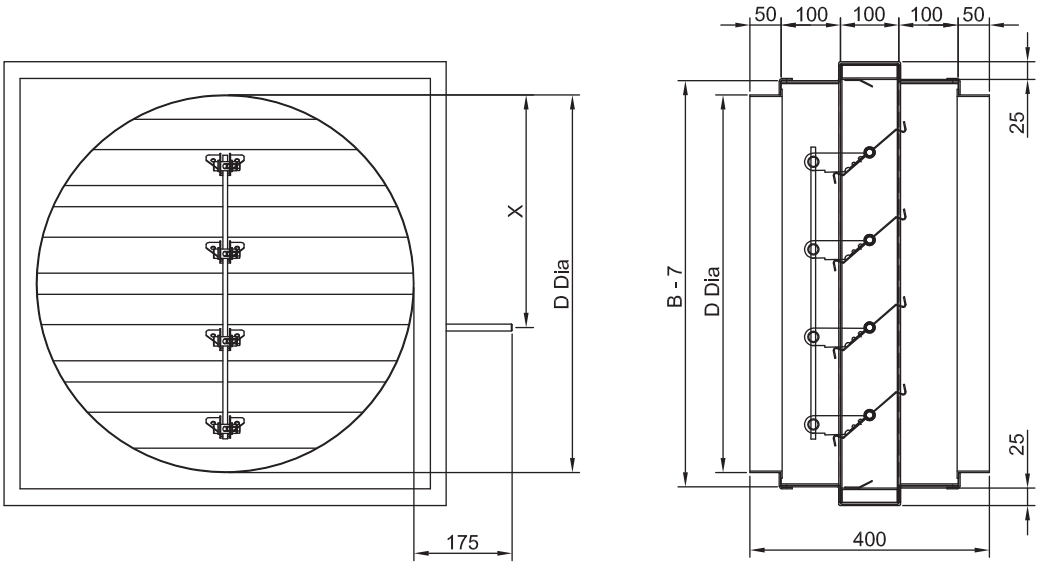
Table 2: Standard Sizes for Type VCD/P/E-A1

B (mm)	H (mm)	No. of blades	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
550	600	3	300
600	700	4	415
650	800	4	475
700	900	5	450
750	1000	6	565
800	1100	6	625
850	1200	7	600
900	1300	8	715
950	1400	8	775
1000	1500	9	750
1050	1600	10	865
1100	1700	10	925
1150	1800	11	900
1200			

Table 3: Standard Sizes for Type VCD/P/E-A2

B (mm)	H (mm)	No. of blades	X (mm)
150	150	1	50
200	200	1	75
250	250	1	100
300	300	1	125
350	350	2	215
400	400	2	250
450	450	2	275
500	500	3	215
550	600	3	250
600	700	4	365
650	800	5	425
700	900	5	400
750	1000	6	515
800	1100	7	575
850	1200	7	550
900	1300	8	665
950	1400	9	725
1000	1500	9	700
1050	1600	10	815
1100	1700	11	875
1150	1800	12	850
1200			900

Type VCD/VCP/VCE – A3
With Circular Spigot Case



Minimum and Maximum Sizes
For Type VCD/VCP/VCE – A3

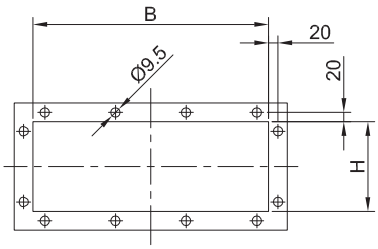
Min. module size: 100 mm Ø
Max. module size: 1100 mm Ø

Table 4: Standard Sizes for Type VCD/P/E-A3

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

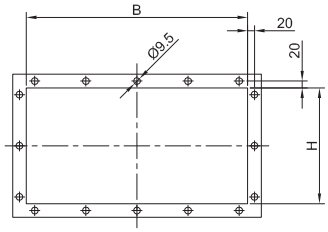
Note:
Dimensions given in Table 4 above represent nominal connection sizes for circular ductwork.

Flange Drilling Details



Even number
of holes
(hole pitch = 125 mm)

Fig. 1 With even numbers of holes at 125 mm hole pitch.



Odd number
of holes
(hole pitch = 125mm)

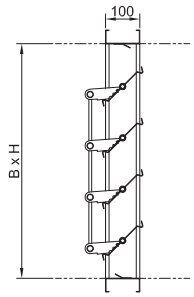
Note: Even number of holes are positioned equally about damper centre line, odd number of holes are positioned on damper centre line.

Fig. 2 With odd number of holes at 125 mm hole pitch.

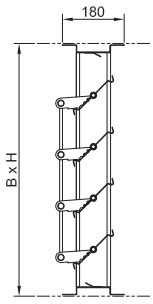
Table 5: Drilling Details (Type A, flanged casing only)

B (mm)	H (mm)	Number of holes on	
		B	H
100	100	1	2
150	150	2	2
200	200	2	2
250	250	2	3
300	300	3	3
350	350	3	4
400	400	4	4
450	450	4	4
500	500	4	5
600	600	5	6
700	700	6	6
800	800	7	7
900	900	8	8
1000	1000	8	9
1100	1100	9	10
1200	1200	10	10
	1300		11
	1400		12
	1500		13
	1600		14
	1700		14
	1800		15

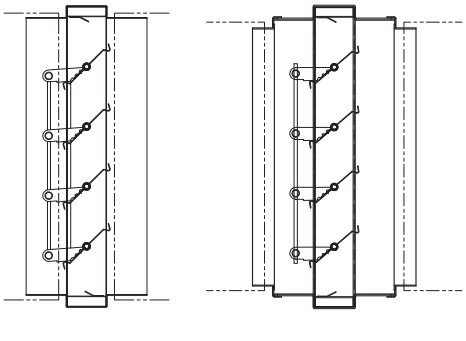
Type VCD/VCP/VCE – A
Flange Installation



Type VCD/VCP/VCE – A1
Sleeve Installation



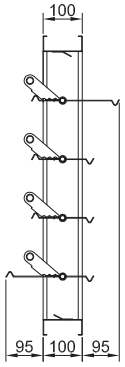
Type VCD/VCP/VCE – A2/A3
Installation diagram for dampers with spigot connections

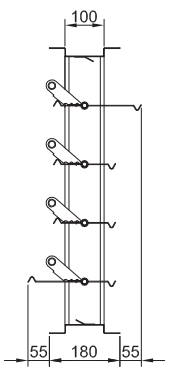


A2 A3

Maximum blade-overhang when the damper is in the fully open position.

For Flange Case (A) For Sleeve Case (A1)





Type VCD/VCP/VCE – Construction Variants

Casing options

Construction Variants	Description
A	30 mm wide Flange case in galvanized steel. **(Standard supply)**
A1	Sleeve case.
A2	Rectangular spigot case.
A3	Circular spigot case.

Options for Linkage

Construction Variants	Description
B	Parallel blade arrangement with face linkage **(Standard supply)**
B1	Parallel blade arrangement with external linkage
B2	Opposed blade arrangement with external linkage

Table 16.1: Leakage Classifications

Classification	Leakage ft³/min/ft² (*l/s/m²*) at standard conditions
	At 4.5 inches water (1.1KPa)
I	8 (*40.8*)
II	20 (*102.0*)
III	80 (*408.2*)

Note: The above table is taken from the UL 555S Standard, 2000, 4th Edition.

Options for Seals

Construction Variants	Description	Leakage rating*
C	Without side or tip seals **(Standard supply)**	—
C1	Side seals only.	Class III
C2	Side and tip seals for low closed blade leakage rating.	Class II

***Note:** Closed blade leakage to UL 555S. Refer to Table 16.1 as shown below is taken from UL 555S Standard.

Options for Bearings

Construction Variants	Description
D	Sintered bronze (Olite). **(Standard supply)**
D1	Plastic.

Accessories Installation Details

Fig.1 With Limit Switches

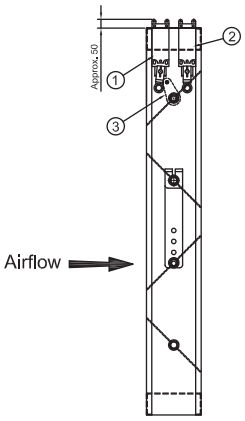


Fig.2 With Hand Locking Quadrant

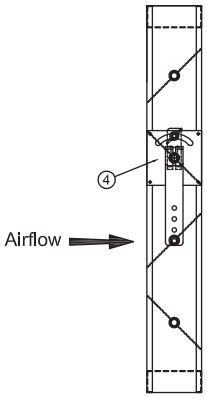


Fig. 3.1 With one actuator

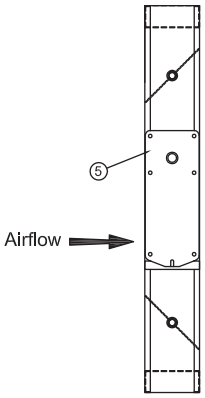
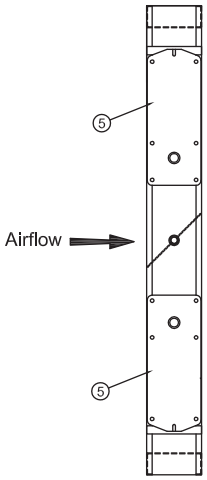


Fig. 3.2 With two actuators

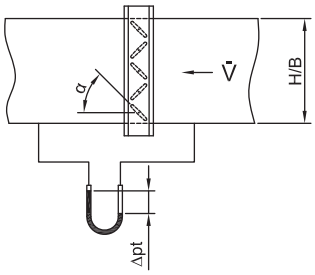


1. Electric limit switch with double chargeover contact, indicates damper "CLOSED".
2. Electric limit switch with double chargeover contact, indicates damper "OPEN".
3. Operating arm.
4. Hand locking quadrant
5. Spring return actuator.

Accessories

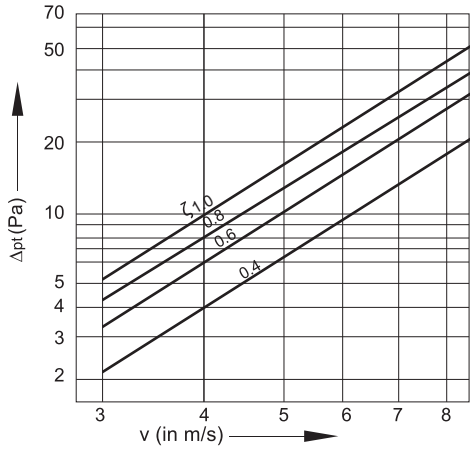
Accessories	Type of control and operation modes available	Setting	Code
None	Plain Drive Shaft		Z00
With hand locking quadrant	Without limit switch (Standard supply).		**Z04**
	Together with a limit switch to indicate 'Closed' position.		Z05
	Together with a limit switch to indicate 'Open' position.		Z06
	Together with two limit switches to indicate 'Open' and 'Closed' positions.		Z07
With electric spring return actuator	Damper with 230 V spring return actuator **without** integral limit switches	FO	Z08
		FC	Z09
	Damper with 230 V spring return actuator **with** integral limit switches	FO	Z10
		FC	Z11
	Damper with 24 V spring return actuator **without** integral limit switches	FO	Z12
		FC	Z13
	Damper with 24 V spring return actuator **with** integral limit switches	FO	Z14
		FC	Z15
	Damper with 230 V spring return actuator **with** one dependent limit switch (see Note below).	Open	Z16
		Closed	Z17
	Damper with 230 V spring return actuator **with** two independent limit switches to indicate 'open' and 'closed' positions.		Z18
	Damper with 24 V spring return actuator **with** one limit switch to indicate (see Note below).	Open	Z19
		Closed	Z20
	Damper with 24 V spring return actuator **with** two independent limit switches to indicate 'open' and 'closed' positions.		Z21
Electric two-position (i.e., open/close) actuator	Damper with 230 V two-position actuator **without** limit switches		Z22
	Damper with 230 V two-position actuator **with** integral limit switches		Z23
Electric modulating actuator with 2 to 10 V d.c. feedback signal.	Damper with 230 V modulating actuator.		Z24
	Damper with 24 V modulating actuator.		Z25

Note: When only one independent limit switch is required, the limit switch will be set to indicate the FC/FO position as required UNLESS stated otherwise by the Customer.

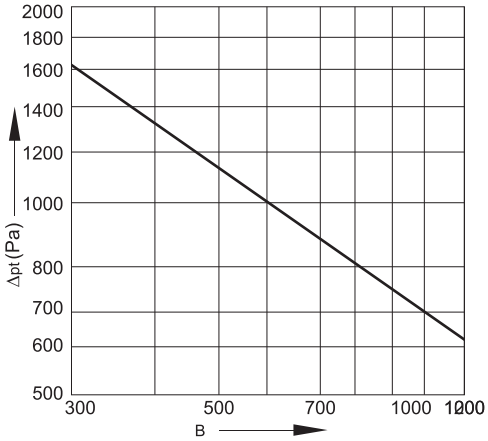


B (in mm)	Duct width
H (in mm)	Duct height
A (in mm²)	Duct opening area (i.e., B x H)
M_1 (in Nm)	Aerodynamic torque
M_2 (in Nm)	Blade closure torque

Graph 1: Pressure Drop for fully open damper
Type VCD/VCP/VCE Variants



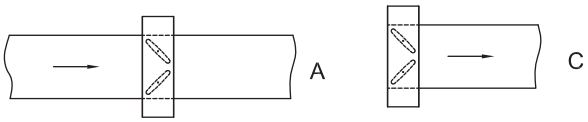
Graph 2: Maximum allowable pressure when damper in the fully closed position (i.e., α = 90°)



N	Number of damper blades
a (in cm)	Torque coefficient (Graph 2)
$\bar{V}$ (in l/s/m²)	Closed blade leakage rate
v (in m/s)	Face velocity based on A
α	Blade angle. When blades are fully open, α = 0°
Δpt(A-D) (Pa)	Total pressure drop (to state if it is for Installation A, B, C or D).
ζ	Pressure loss coefficient

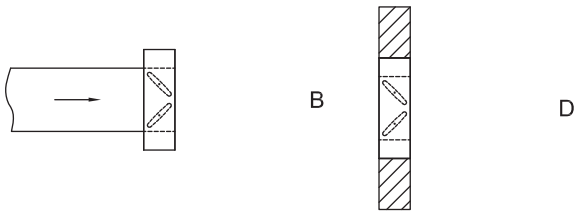
Note: For Type 'A' installation, Δpt across the damper is determined from Graph 1. For other installations, multiply the Δpt from Graph 1 with the correction factor 'F' given in Table 1 below.

Type of Installation



A – Ducting connected to both sides of damper

C – Ducting is connected to downstream of the damper



B – Ducting is connected to upstream of the damper

D – Damper installed directly to a wall.

Table 1: Installation Correction Factor

Type of Installation	Blade Setting	Correction Factor, F when α = 0° (Fully open)
B	Opposed	6
	Parallel	11
C	Opposed	4
	Parallel	7
D	Opposed	9
	Parallel	17

Table 2: Correction to Pressure Drop for 'H"

H	150	200	250	300	350	400	450
ζ	1.03	0.95	0.90	0.85	0.80	0.76	0.73
H	500	600	700	800	900 - 1800		
ζ	0.70	0.65	0.60	0.55	0.50		

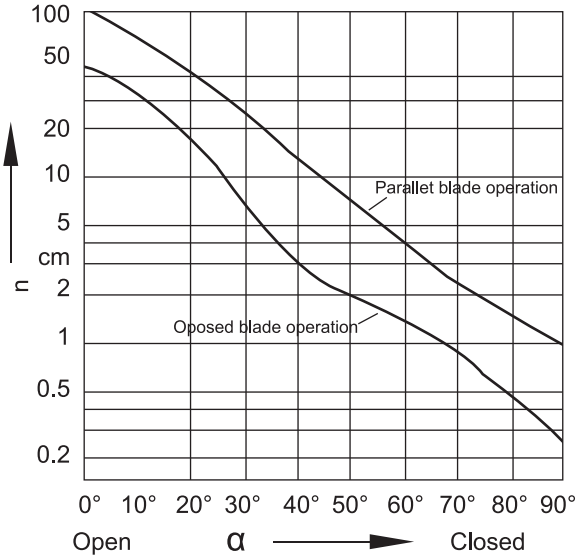
Torque Calculation

Aerodynamic Torque, M_1 = a. Δ_{pt}. A / 100

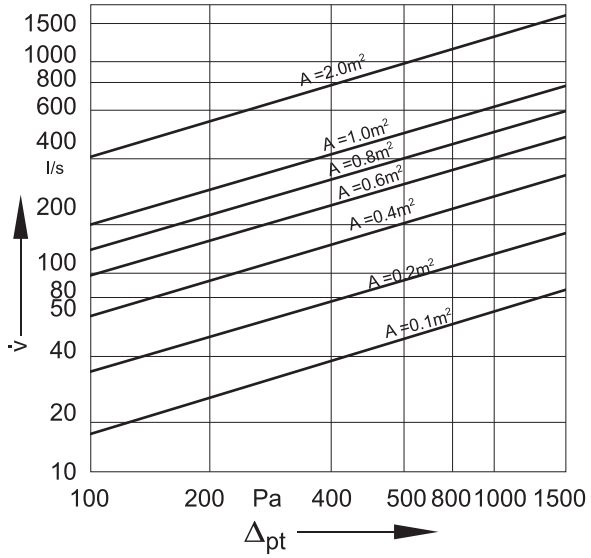
Blade Closure Torque, M_2
Use the appropriate formula given in the table below depending on the seal option selected.

Type	M_2
VCD/VCP/VCE - C	0.6 x N
VCD/VCP/VCE – C1	N
VCD/VCP/VCE – C2	20 x A

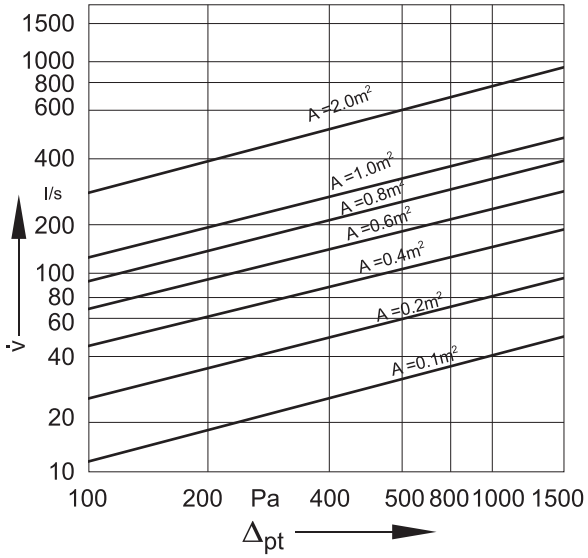
Graph 3: Torque Coefficient



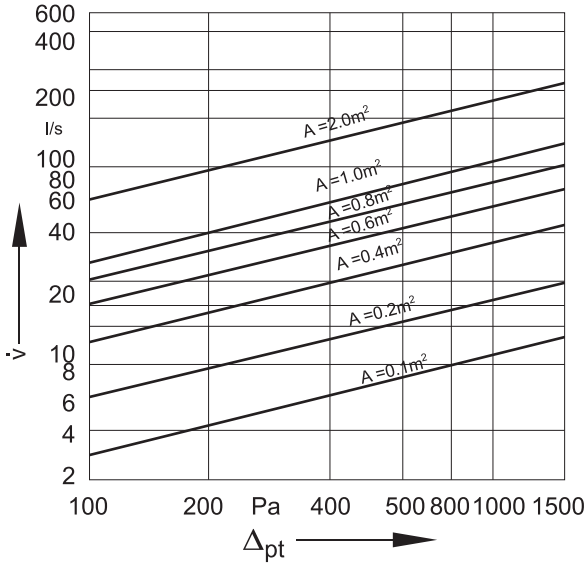
Graph 4: Leakage Flow Rate
For Type VCD/VCP/VCE - C



Graph 5: Leakage Flow Rate
For Type VCD/VCP/VCE – C1

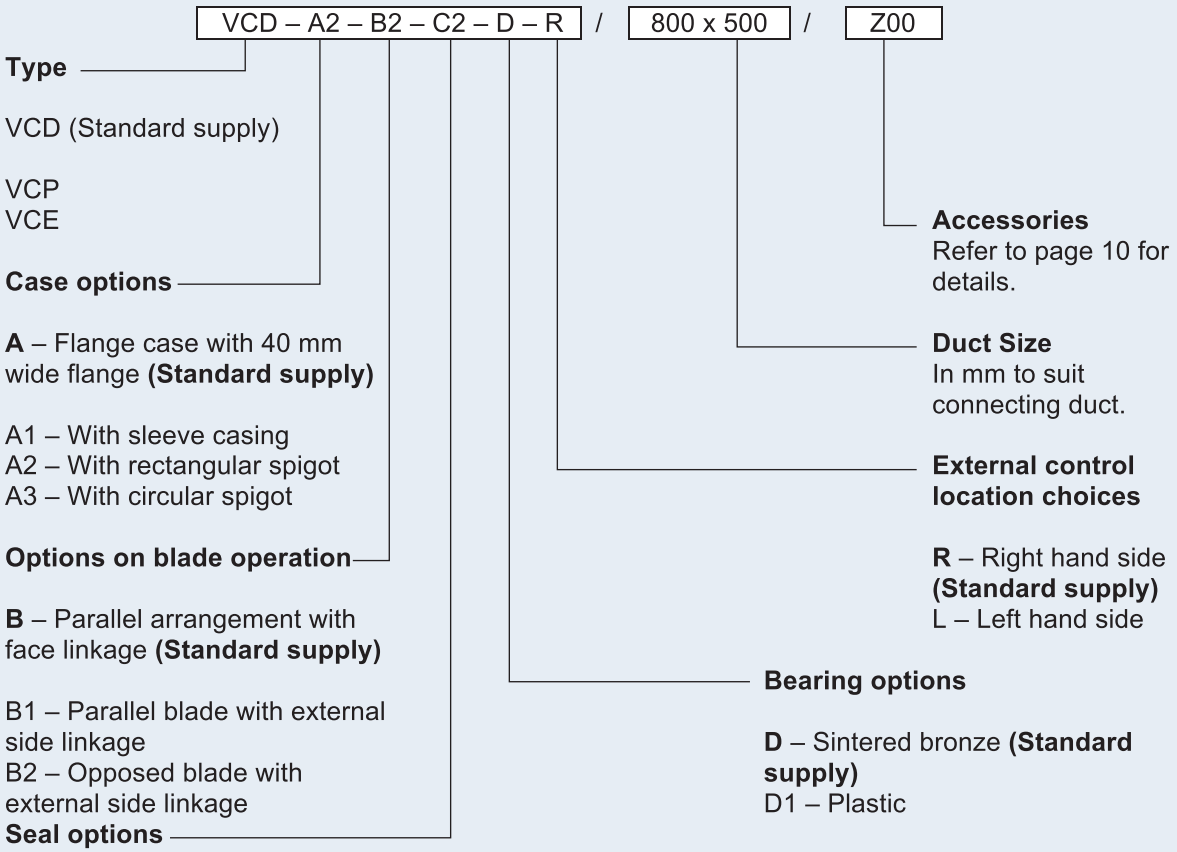


Graph 6: Leakage Flow Rate
For Type VCD/VCP/VCE – C2



Order Code

Note: If the order code below is incomplete as shown in the order example below, then it is assumed than a standard supply is required.



General specification

This volume control damper is suitable for air flow regulation, pressure control and/or to isolate a section of the ductwork from the rest of the HVAC system. The VCD damper blades are made from galvanized sheet steel and, can be supplied with either parallel or opposed blade arrangement.

It can be supplied with side and tip seals to meet specified low closed blade leakage requirements. The damper can be operated manually using a hand locking quadrant or, powered by electric or pneumatic actuator(s).

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

The actuator can be supplied with an integral auxiliary switch or independent limit switch(es) to provide a feedback on damper position, if required.

Order example

Make:	TROX
Type:	VCD-A-B-C-D-R/700 X 500 / Z04
Quantity:	12 nos.