HCD – Airfoil Control Damper

Model: **HCD-150**

The Holyoake HCD-150 is a precisely made volume and pressure control device with extremely low leakage when closed.
It offers great structural strength and very low resistance when open.

Frame: 6063 T5 extruded aluminium with mitred corners, mechanically locked with heavy aluminium gussets.

Blades: 6063 T5 three cavity full airfoil extrusion for main blades on 146 mm centres and half airfoil part blade for intermediate heights.

Linkage: Concealed in frame, with stainless steel cranks and link pins and aluminium control bars.

Axles: Hexagonal stainless steel.

Bearings: Two piece moulded glass reinforced nylon, pressed into frame, with the outer sleeve locked by locating ribs. (-8°C to 220 °C)

Seals: Blade edge and Jamb: Extruded EPDM, (0°C to 80°C). Side Seal: Flexible (convex) aluminium.

Control Shaft: (Standard): Round Drive Shaft 120 mm, complete with Motor Mounting Plate - HCD32 Kit (HCD23 & 28).
(Optional):
(1) Hex Extension Shaft 23, 44, 93, or 300 mm, complete with Motor Mounting Plate - HCD 25, 26, 22, or 27, with a HCD 23.
(2) Hex Extension Shaft (93 mm) complete with Quadrant Arm and Plate – HCD31 Kit (HCD22/23/24).

Blade Rotation: (Standard): Opposed
(Optional): Parallel (specify if required).

Finish: Mill standard, anodized and powercoat options available.

Minimum Size:

Channel Surround	200 mm Wide x 225 mm High.
Flange Surround (Air Stream).	150 mm Wide x 168 mm High.

Maximum Single Unit Size:

Channel Surround	1525 mm Wide x 1831 mm High.
Flange Surround (Air Stream).	1400 mm Wide x 1774 mm High.

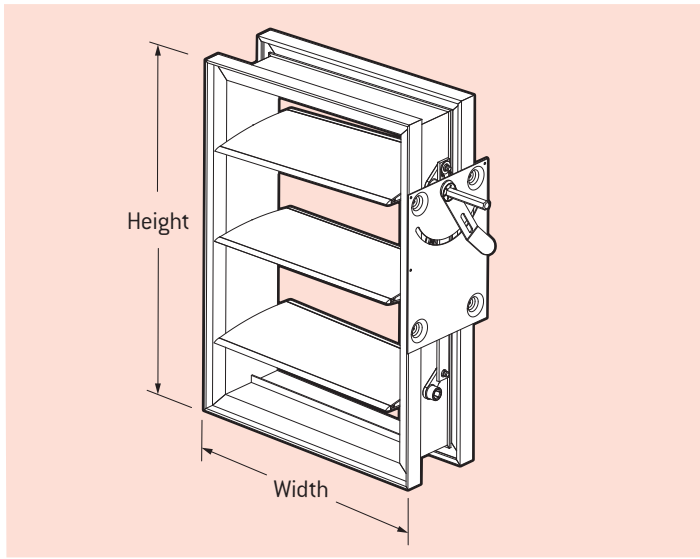
Special Construction Options

Frame: (1) Low Profile: Part blade and shallow frame members, top and bottom (12.5 mm), allow for heights between 150 and 225 mm (duct size).

(2) Flanged Surround: Extruded aluminium frame which is designed to match 35 mm proprietary duct flanging systems.

Smoke Damper: High Temperature HCD150-ET version available suitable for smoke applications see page 328H - 329H.

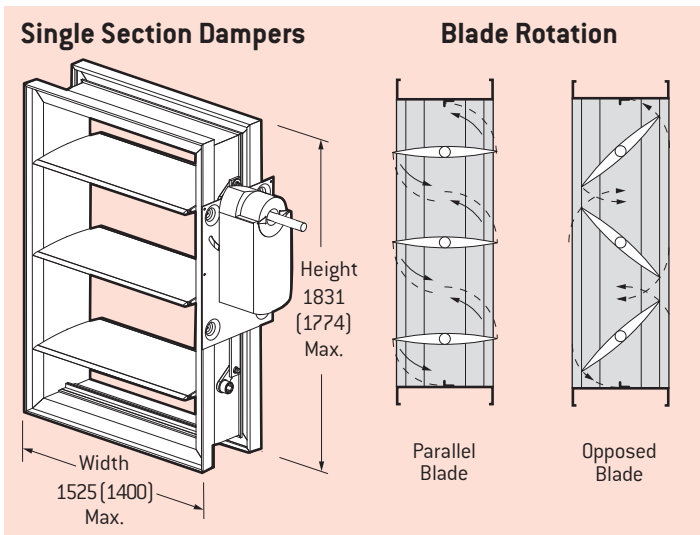
For other features contact your local Holyoake branch.

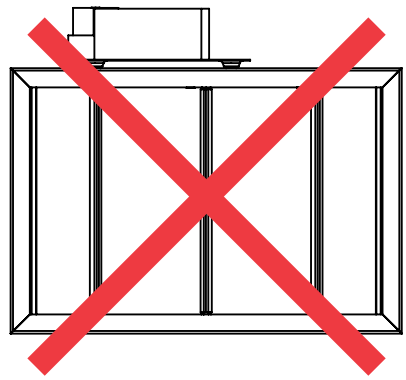


Installation

Dampers must be installed square and free from racking. Where mounted in large accessible plenum chambers, actuators can be located within, anchored to floor or ceiling, driving through either a blade bracket and swivel, or on multi section units, through a control arm on the jack shaft. Where the actuator is to be located externally, specify either Round Drive Shaft 120 mm, or for multi section dampers, extended jack shaft.

For manual control, use Hex Extension Shafts, Quadrant Arm and Plate. For multi section manual dampers, these are best fitted with individual Hex Extension Shafts, Quadrant Arm and Plates, per section.

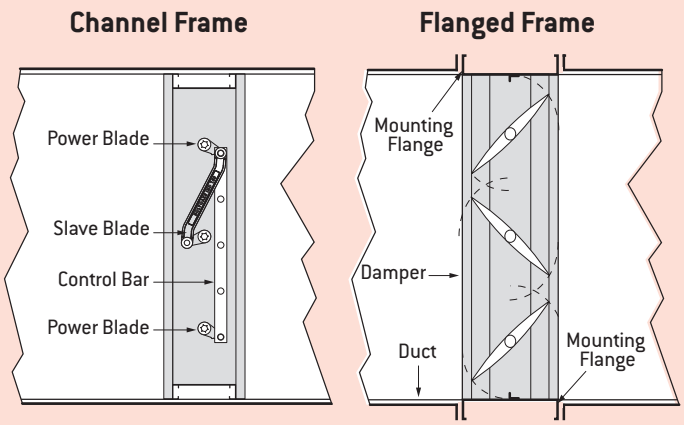




Motorised HCD-150 dampers must not be installed with the axles vertical.

Due to a policy of continuous development and improvement the right is reserved to supply products which may differ slightly from those illustrated and described in this publication.

Model: **HCD-150**



Duct Mounting

As most dampers are duct mounted, the HCD-150 is designed for quick, easy mounting by sliding into a section of duct.

Dampers with channel surrounds are fabricated approximately 7 mm less than given duct dimenions, unless specified otherwise.

Procedures

Standard Channel Surround:

(1) Identify the axle to be fitted with either Round Drive Shaft for Motorisation, or Hex Extension Shaft with Quadrant Arm and Plate for Manual operation. This must be a "power blade" axle, i.e. every second shaft on opposed blade units, or every blade on parallel blade units.

(2) Mark the side of the duct where this shaft will appear and cut a 25 mm hole with a chassis punch, or similar.

(3) Apply a 3 mm thick sponge seal gasket to both "hat-section" flanges and slide the damper into position.

(4) Use sheet metal screws to secure the damper. Do not over-tighten, to avoid "dimpling" the duct surface.

(5) Fit on Round Drive Shaft and Motor Mounting Plate, or Hex Extension Shaft, with either Quadrant Arm and Plate, or Motor Mounting Plate, as applicable.

(6) For high pressure units fit a sponge seal around the drive shaft.

Flanged Frame

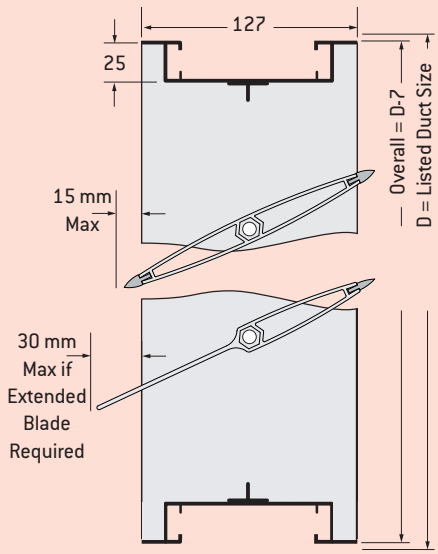
Dampers are supplied with Round Drive Shaft, or Optional Hexagonal Extension Shaft and / or quadrant and mounting plate, factory fitted.

Install using suitable cleating method and gaskets applicable to the proprietary flanging system being used.

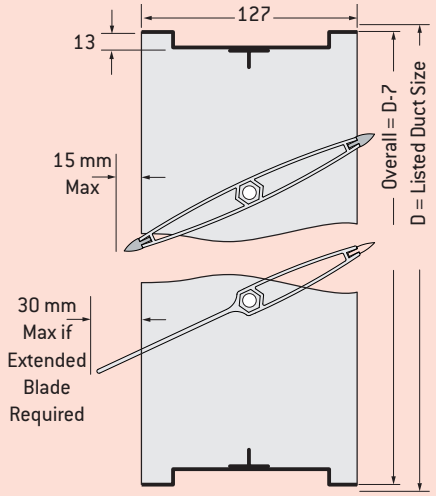
Guide Product Weights	
HCD 150 Airfoil Channel	Approximate Weight in Kg
300 x 200	2.39
500 x 200	3.16
HCD 150 Airfoil Flanged	Approximate Weight in Kg
800 x 400	6.24

Frame Styles

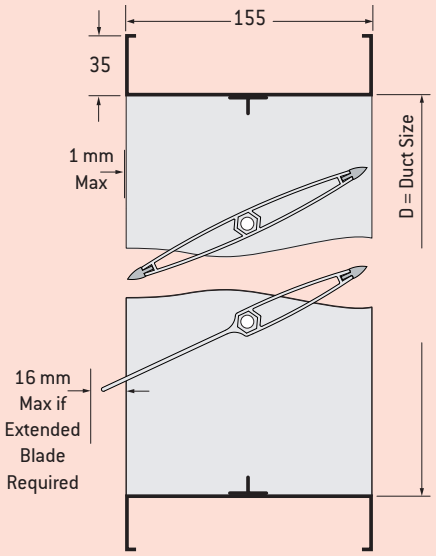
Channel Surround



Low Profile Channel



Flange Surround *



* This flange has been designed to couple with propriet duct flange systems

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Model: **HCD-150**

Multi Section Assembly and Dimensional Information

Dampers larger than the maximum single section are manufactured as an assembly of single section dampers and may be coupled for operation in a variety of ways.
Dampers may be connected using female to hex couplings, or a 25 mm diameter jackshaft can be used as illustrated below.
Assemblies may be constructed from unequal sized dampers.

Larger Multi-Section Assemblies require an understanding of the dampers function and the quantity and type of motors to be used, to determine the most suitable coupling method. Often it is more economical and mechanically efficient, to fit actuators to individual sections.

Examples:

A 1800 Wide x 1500 High damper would be an ASSEMBLY consisting of two 900 Wide x 1500 High damper sections, less tolerance and mullions.

A 3150 Wide x 2500 High damper would be an ASSEMBLY consisting of six 1050 Wide x 1250 High damper sections, less tolerance and mullions.

If specific section sizes are required for installation reasons, please advise your local Holyoake branch when ordering.

NOTE: Minimum damper height for Jack Shafted Multi-Section damper assemblies is 4 blades high, (Approximately 584 mm, varies dependant on frame style).

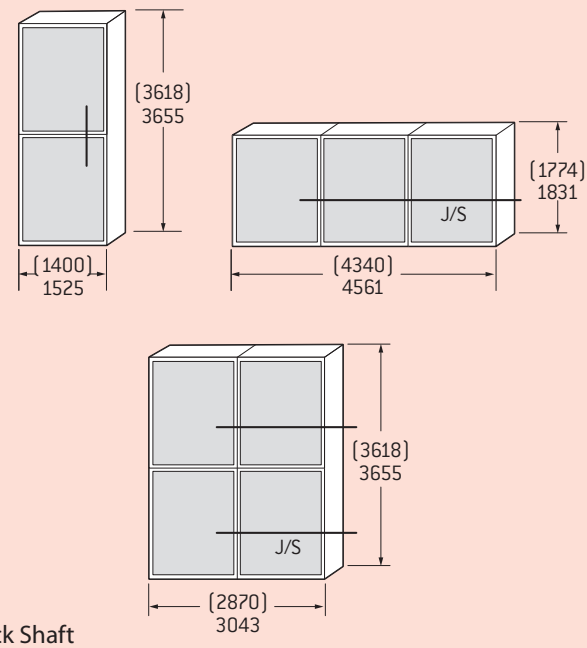
For smaller heights use hex-to-hex couplings between sections.

Multi-Section damper assemblies are shipped completely factory assembled (subject to shipping size limitations and other considerations).

Multi Section Maximum Dimensions

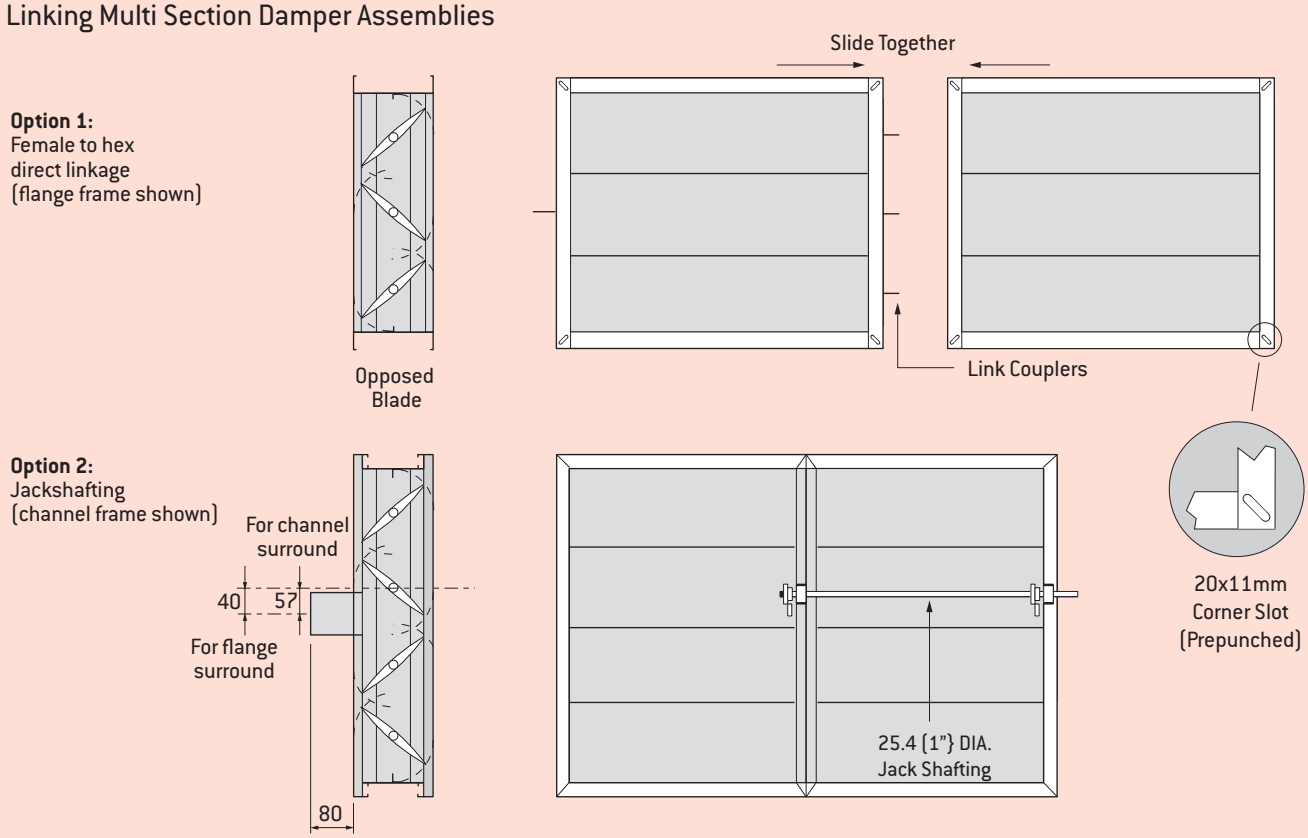
Nominate whether Parallel, or Opposed Blade for each Section.

Channel Frame: All dimensions include 7mm clearance.
Flanged Frame: (in brackets) all dimensions are duct size.



J/S Jack Shaft

Linking Multi Section Damper Assemblies



Model: **HCD-150**

Bracing of Multi Section Damper Assemblies

The HCD-150 is self supporting only in its largest single section size. Multi-Section damper assemblies require bracing to support the weight of the assembly and to hold against the system pressure, (supply and fit by others).
To support the damper horizontally, brace at least once for every 2.5m of damper width.
Vertical assemblies and high system pressures will require more bracing.

Linking Multi Section Damper Assemblies

Option 1:
For smaller dampers use female to hex direct linkage coupling.

Option 2:
Larger dampers may require special jack shafting arrangements. Discuss with your local Holyoake branch.

Face and Bypass Mixing Dampers

Face and Bypass Mixing Dampers are available in a variety of combinations.

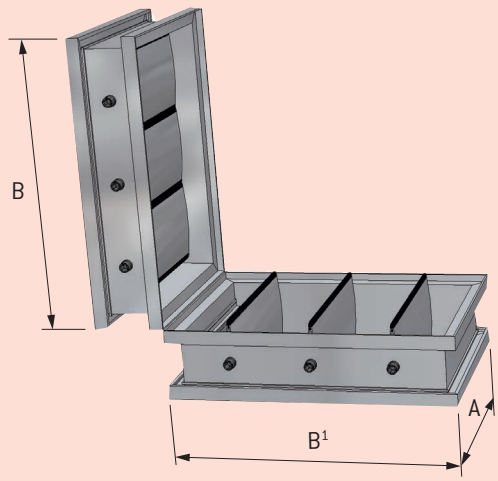
These can be operated with the use of opposing motors, driving one section open whilst the other closes, which is the most positive operation.

Other methods available include Jack Shaft, or Hex to Hex couplings.

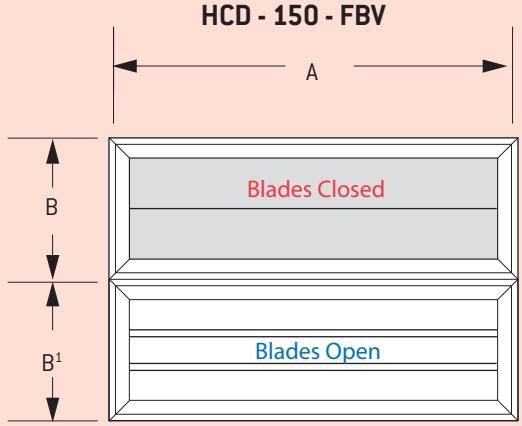
Please contact your local Holyoake Branch to discuss prior to ordering.

Face & Bypass Mixing Dampers

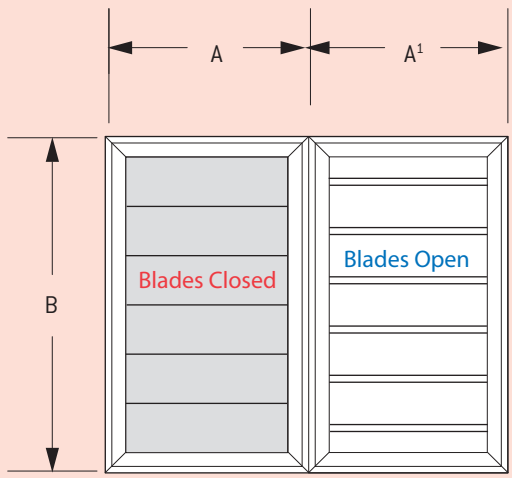
HCD - 150 - FBR



HCD - 150 - FBV

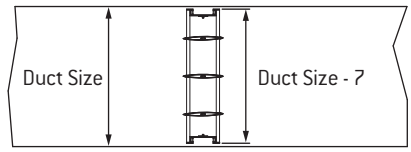


HCD - 150 - FBH



HCD – Performance Data

Model: **HCD-150 Pressure** Drop Data - Channel Surround



Area Factor Table

Duct Height (mm)	No. of Blades	Duct Width (mm)																							
		300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
225	1	34.5	28.6	24.4	21.3	18.9	17.0	15.4	14.1	13.0	12.1	11.3	10.6	9.9	9.4	8.9	8.4	8.0	7.7	7.3	7.0	6.7	6.5	6.2	6.0	5.8
371	2	16.4	13.6	11.6	10.2	9.0	8.1	7.4	6.7	6.2	5.8	5.4	5.0	4.7	4.5	4.2	4.0	3.8	3.7	3.5	3.3	3.2	3.1	3.0	2.9	2.8
517	3	10.8	8.9	7.6	6.7	5.9	5.3	4.8	4.4	4.1	3.8	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.8
663	4	8.0	6.7	5.7	5.0	4.4	4.0	3.6	3.3	3.0	2.8	2.6	2.5	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.5	1.4	1.4
809	5	6.4	5.3	4.5	3.9	3.5	3.1	2.9	2.6	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.2	1.1	1.1
955	6	5.3	4.4	3.8	3.3	2.9	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.9
1101	7	4.5	3.8	3.2	2.8	2.5	2.2	2.0	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8
1247	8	4.0	3.3	2.8	2.5	2.2	2.0	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7
1393	9	3.5	2.9	2.5	2.2	1.9	1.7	1.6	1.4	1.3	1.2	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6
1539	10	3.2	2.6	2.2	2.0	1.7	1.6	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.5
1685	11	2.9	2.4	2.0	1.8	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
1831	12	2.6	2.2	1.9	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4

(All dimensions include 7 mm clearance total between outside of damper frame and inside of duct).

To determine the pressure drop through a fully open HCD-150 use the following procedure:

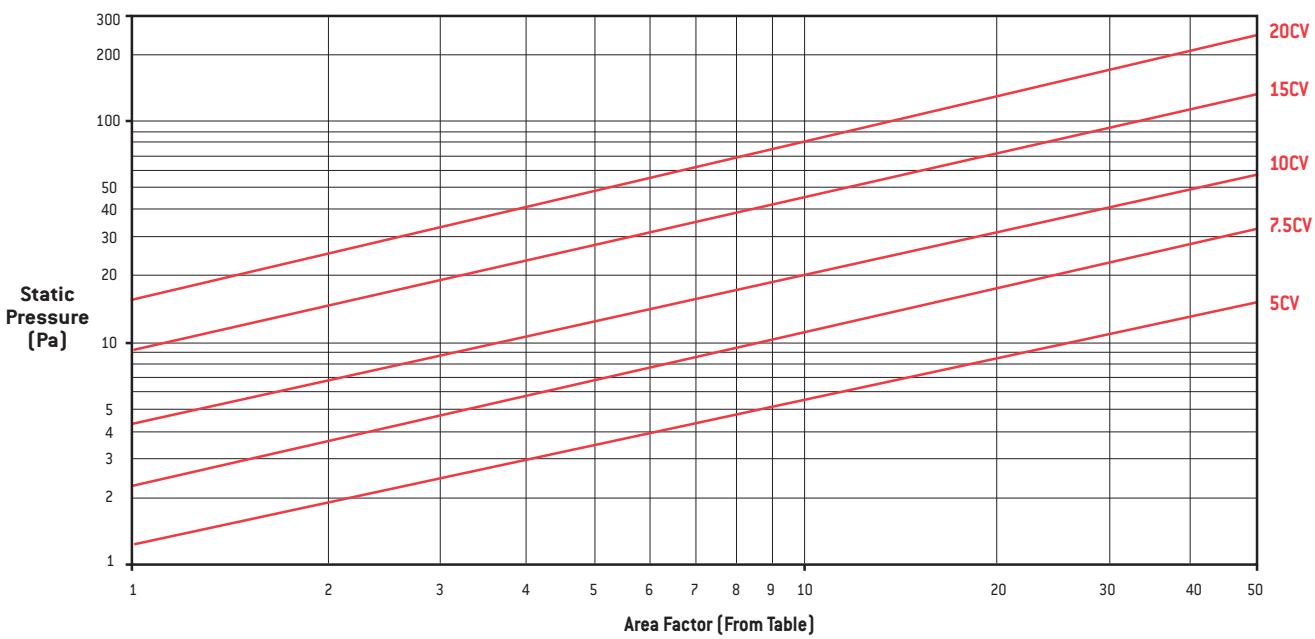
1. Find the Area Factor from the table above, enter Duct Width and Height.
2. Determine the Conversion Velocity (CV) by multiplying the Area Factor by the air flow in m³/s (CV = Area Factor x m³/s).
3. Enter the pressure drop chart below with the Area Factor and establish the intersection with the Conversion Velocity (CV) line just determined.
   Read the pressure drop (Pa) on the left hand side of the chart.

Note: Interpolations while not precise are adequate for most calculations.

Example:

Find the pressure drop across a 350 mm wide x 517 mm high model HCD-150 with a channel surround (Duct Size), passing an airflow of 0.84 m³/s.

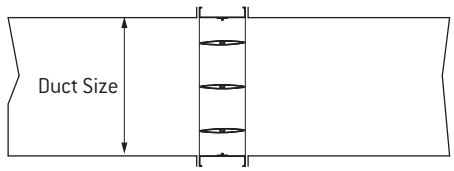
1. From the table using the interpolation, the Area Factor is 8.9.
2. CV = 0.84 x 8.9 = 7.5.
3. From the chart below, the pressure drop reads 10 Pa.



Notes

1. Static Pressure and Conversion Velocities are for air density of 1.2 kg/m³.
2. Pressure drop data is for dampers tested with ductwork on both the up and downstream sides. These values need to be suitably increased where dampers are mounted with ductwork on one side only, or when mounted onto plenum walls. (Refer to SMACNA, or ASHRAE system design guides).
3. Data is for the specific sizes in the Area Factor table. For other sizes use the next size down and make a proportional adjustment based on the approximate increase in free area.
4. Use a factor of 1 on the Pressure Drop chart above, when the Area Factor is less than 1.

Model: **HCD-150 Pressure** Drop Data - Flange Surround



Area Factor Table

Duct Height (mm)	No. of Blades	Duct Width (mm)																							
		250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400
168	1	33.5	28.0	24.0	21.0	18.6	16.8	15.2	14.0	12.9	12.0	11.2	10.5	9.9	9.3	8.8	8.4	8.0	7.6	7.3	7.0	6.7	6.5	6.2	6.0
314	2	16.0	13.3	11.4	10.0	8.9	8.0	7.3	6.7	6.1	5.7	5.3	5.0	4.7	4.4	4.2	4.0	3.8	3.6	3.5	3.3	3.2	3.1	3.0	2.9
460	3	10.5	8.7	7.5	6.5	5.8	5.2	4.8	4.4	4.0	3.7	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.9
606	4	7.8	6.5	5.6	4.9	4.3	3.9	3.5	3.2	3.0	2.8	2.6	2.4	2.3	2.2	2.1	1.9	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.4
752	5	6.2	5.2	4.4	3.9	3.4	3.1	2.8	2.6	2.4	2.2	2.1	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1
898	6	5.2	4.3	3.7	3.2	2.9	2.6	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9
1044	7	4.4	3.7	3.2	2.8	2.5	2.2	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8
1190	8	3.9	3.2	2.8	2.4	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7
1336	9	3.4	2.9	2.4	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6
1482	10	3.1	2.6	2.2	1.9	1.7	1.5	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5
1628	11	2.8	2.3	2.0	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5
1774	12	2.6	2.1	1.8	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5

(All dimensions assume the duct size is the airstream size of the damper).

To determine the pressure drop through a fully open HCD-150 use the following procedure:

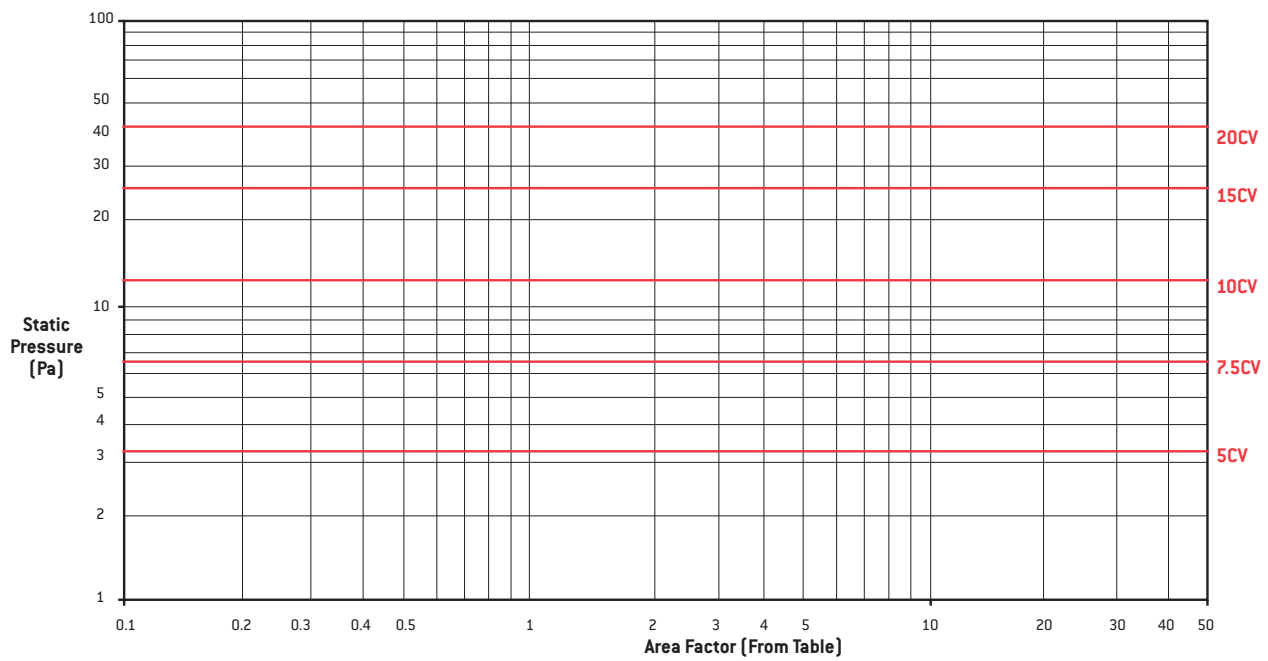
1. Find the Area Factor from the table above, enter Duct Width and Height.
2. Determine the Conversion Velocity (CV) by multiplying the Area Factor by the air flow in m³/s (CV = Area Factor x m³/s).
3. Enter the pressure drop chart below with the Area Factor and establish the intersection with the Conversion Velocity (CV) line just determined.
   Read the pressure drop (Pa) on the left hand side of the chart.

Note: Interpolations while not precise are adequate for most calculations.

Example:

Find the pressure drop across a 500 mm wide x 606 mm high model HCD-150 with a flange surround (Airstream Size), passing 2.8 m³/s.

1. From the table using the interpolation, the Area Factor is 3.9.
2. CV = 2.8 x 3.9 = 10.9.
3. From the chart below, the pressure drop reads 13 Pa.

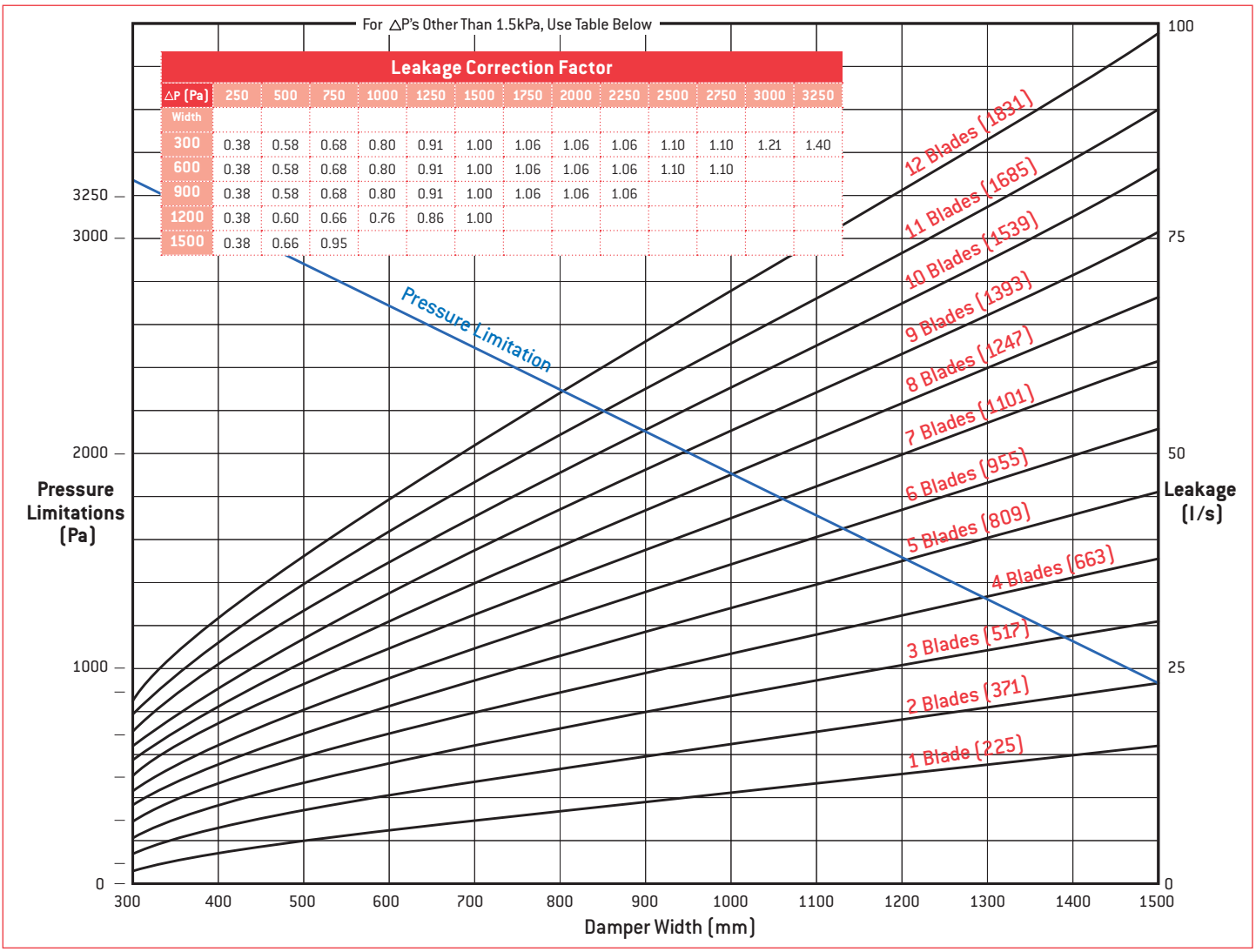


Notes

1. Static Pressure and Conversion Velocities are for air density of 1.2kg/m³.
2. Pressure drop data is for dampers tested with ductwork on both the up and downstream sides. These values need to be suitably increased where dampers are mounted with ductwork on one side only, or when mounted onto plenum walls. (Refer to SMACNA, or ASHRAE system design guides).
3. Data is for the specific sizes in the Area Factor Table. For other sizes use the next size down and make a proportional adjustment based on the approximate increase in free area.

HCD – Performance Data

Model: **HCD-150 Leakage Data**



Leakage Through a Closed HCD-150

Example:

To determine the leakage through a 1200 mm wide x 1101 mm high (7 bladed) damper at 500 Pa ΔP.

(A) Enter the graph above at 1200 mm width and read the intersection at the 7 blade line.
Read the right hand side of the chart at 50 l/s.

(B) Read the leakage correction factor for 1200 mm width and 500Pa from the table within the chart above = 0.60.

(C) Calculate the leakage as 50 x 0.60 = 30 l/s.

Pressure Limitations on a Closed HCD-150

Example:

To establish pressure differential limitations for a damper with 1 metre long blades.

(A) Enter the graph above at 1000 mm damper width.

(B) Read the intersection with the 'Pressure Limitation' line at the left hand side of the chart as 1900 Pa.

HCD-150 – Sound Rating

Damper Size	Damper Full Open		Damper 75% Open		Damper 50% Open		Damper 25% Open	
	m^3/s	NC	m^3/s	NC	m^3/s	NC	m^3/s	NC
300 x 300	0.943	17	0.708	11	0.472	11	0.236	*
	1.415	28	1.062	22	0.708	19	0.354	*
	1.887	35	1.415	29	0.943	24	0.472	*
450 x 450	1.062	17	0.797	10	0.531	21	0.266	*
	2.124	33	1.593	26	1.062	32	0.531	*
	3.185	43	2.389	37	1.593	40	0.797	15
600 x 600	1.887	11	1.415	10	0.943	26	0.472	*
	3.775	32	2.831	30	1.887	38	0.944	21
	5.663	43	4.247	42	2.831	46	1.415	31

NC = Noise Criteria in Decibels is based on 10 dB room attenuation.

* Less than 10 NC.

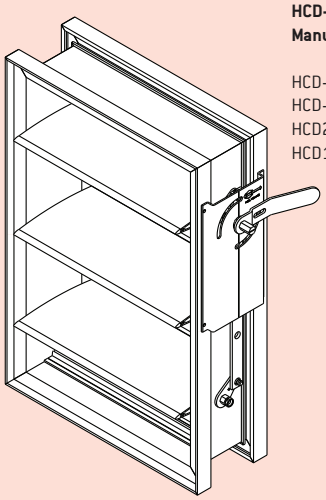
Note: Above are indicative examples of measured values.

Notes

1. Leakage is frequently specified as a percentage of maximum design flow. Typically full flow velocity on the above example would be 5 m/s, which would require volumetric flow of 5 x 1.2 x 1.101 = 6606 l/s.
   Leakage would in this case be (30 x 100) / 6606 = 0.45%.
2. Above leakage figures are based on a closing torque of 1.3 Nm per m^2 of damper area, with a minimum of 2.4 Nm.
3. Pressure limitations established by the above graph are intended to limit deflection on the longest blade (1500mm) to 8.3mm. deflections for 1200mm or shorter blades, at higher pressure differentials, will be substantially less.

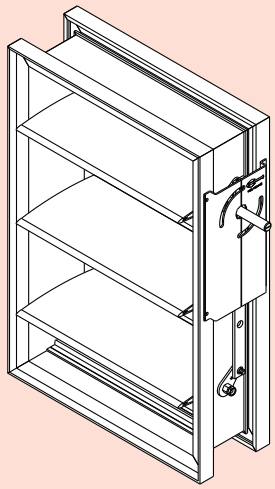
Standard Drive & Coupling Components

Standard Hardware



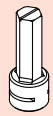
HCD-31 KIT
Manual Quadrant

HCD-02
HCD-22.36
HCD24
HCD16



HCD-32 KIT
Actuator

HCD-02
HCD-01.120
HCD-16

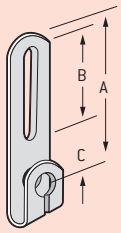


HCD-22
Hex Drive Shaft
36mm or 90mm

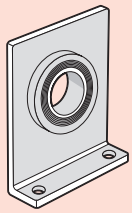
HCD-01
Actuator Drive Shaft
60mm or 120mm

HCD-18
Slotted Crank Arm
12.5 mm Hole

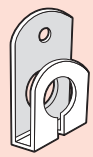
HCD-19
As Above with
25 mm Hole



HCD-09
Standard Jackshaft
Bearing (25.4 mm)

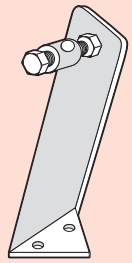


HCD-07
Standard Jackshaft
Link Arm
25.4 mm Dia

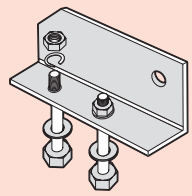


	A	B	C
HCD 18	92	67	15
HCD 19	142	79	52

HCD-17
Control Arm
& Swivel



HCD-15
Coupler Bracket Assembly



HCD-20
Swivel

Component	Description	Component	Description
HCD31	Manual Quandrant Kit includes HCD02, HCD22.36, HCD24, HCD16	HCD15	Coupler Bracket Assembly
HCD32	Actuator Kit includes HCD02, HCD01, HCD16	HCD16	Two Piece Hex Axle Bearing (-8 - 220°C)
HCD01	Round Actuator Drive Shaft 60, 120mm	HCD1602	Two Piece Round Axle Bearing (-8 - 220°C)
HCD02	Aluminium bracket for manual or actuated operation of damper	HCD17	Control Arm and Swivel
HCD04	Hex Coupler 29, 47mm	HCD18	Slotted Crank Arm 12.7mm Hole
HCD05	Tie Rod Arm	HCD19	Slotted Crank Arm 25.4mm Hole
HCD06	Tie Rod Bearing	HCD20	Swivel
HCD07	Standard Jackshaft Link Arm 25.4mm Dia	HCD21	8mm Stainless Steel Rod
HCD08	Mini Jackshaft Link Arm 12.7mm Dia	HCD22	Hex Manual Qundrant Drive Shaft 36,90mm
HCD09	Standard Jackshaft Bearing 25.4mm	HCD24	Manual Crank Arm
HCD10	Mini Jackshaft Bearing 12.7mm	HCD24EXT	PRD Counter Weight Arm
HCD11	25.4 x 1.8mm Stainless Steel Tubing	HCD34	One Piece Round Linkage Bearing (-8 - 220°C)
HCD11A	12.7 x 1.2mm Stainless Steel Tubing	HCD35	Manual Quadrant for 1/2" Shaft
HCD12	Stainless Steel Split Pin	HCDSSWIRECLIP	HCD Stainless Steel Wire Clip
HCD13E	Stainless Steel Axle & Crank	HCD150LINKARM	Aluminium Link Arm to suit HCD150
HCD13F	Stainless Steel Axle & Crank (Opposite Hand)	HCD75LINKARM	Aluminium Link Arm to suit HCD75
HCD13G	Stainless Steel Plain Hex Axle		

HBD & HCD

Product Ordering Key and Suggested Specifications

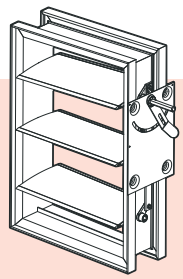
HBD-155 – [OPPOSED PARALLEL] – W x H – CONTROL

- HBD-155: Holyoake Balancing Dampers with 155 mm Aluminium Blades
- OPPOSED PARALLEL: Blade Rotation: **Opposed (Standard)** Specify Parallel
- W x H: Nominal Duct Size
- CONTROL: Quadrant Arm and Plate. Round Drive Shaft 120 mm. Hex Ext Shaft, (23, 44, 93 or 300 mm).

Balancing Dampers shall be of extruded aluminium construction. Frames shall be suitable for duct flange mounting.
Blades shall be fixed to 11 mm hexagonal shafts held by two piece acetal self lubricating bearings, with outer shells fluted to prevent rotation.
Linkages shall be out of the airstream. The damper may be furnished with a manual locking quadrant arm, a round shaft and plate, or a hexagonal shaft and plate, suitable for actuator mounting.
All shall be type HBD-155 as manufactured by Holyoake.

[HCD-75 HCD-150] – [CHANNEL LOW PROFILE CHANNEL FLANGE SURROUND] – [OPPOSED PARALLEL] – W x H – CONTROL – SPECIAL CONSTRUCTION OPTIONS

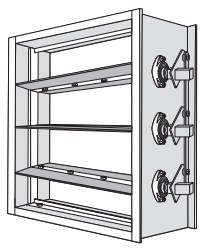
- HCD-75 HCD-150: Holyoake Control Dampers with 75 or 150 mm aluminium airfoil blades.
- CHANNEL LOW PROFILE CHANNEL FLANGE SURROUND: Frame Style
- OPPOSED PARALLEL: Blade Rotation: **Opposed (Standard)** Specify Parallel
- W x H: Nominal Duct Size
- CONTROL: Quadrant Arm and Plate. Round Drive Shaft 120mm. Hex Ext Shaft, (23, 44, 93, or 300 mm).
- SPECIAL CONSTRUCTION OPTIONS: For smoke damper see page 328H - 329H



Volume Control Dampers shall be low leakage type extruded aluminium construction, with single piece airfoil blades, fitted with self inflating edge seals. Blades shall be fixed to 11 mm hexagonal shafts, held by two piece acetal self lubricating bearings, with outer shells fluted to prevent rotation. Frames shall be suitable for either internal fixing within ductwork, or external duct flange mounting and shall be fitted with flexible aluminium side seals. Linkages shall be out of the airstream. Leakage shall be no greater than 0.04 $m^3/s/m^2$ at 1500 Pa Δp, or typically 0.45 % of full flow (at 5 m/s) with 500 Pa Δp. The damper may be furnished with a manual locking quadrant arm, a round shaft and plate, or a hexagonal shaft and plate, suitable for actuator mounting.
All shall be type HCD-75, or HCD-150, as manufactured by Holyoake.

HCD-225 – PARALLEL – W x H – CONTROL

- HCD-225: Holyoake Heavy Duty Control Dampers with 225 mm Airfoil Blades
- PARALLEL: Blade Rotation (No Opposed Option)
- W x H: **Nominal (Overall Size)**
- CONTROL: Electric Motor, Pneumatic Actuator, (Further discussion required with local Holyoake branch).



Heavy Duty Volume Control Dampers shall be constructed from extruded aluminium. Frames shall be suitable for duct flange mounting and be 6 mm thick. Blades shall be Parallel Airfoil 3 mm thick, with internal strengthening and fitted with externally mounted Heavy Duty Spherical Ball Bearings. Axle crank plates shall be 55 x 6 mm mild steel plate, with brass bearings; mounted outside of the airstream, providing a robust, long lasting operating mechanism, able to handle high turbulence/pressure and velocity. The damper shall be available with a range of control options to suit specialist applications.
All shall be type HCD-225 as manufactured by Holyoake.