

October-2017-DAM

# DAMPER



**DONG YANG AIR-CONDITIONING Co., Ltd.**

Dong Yang Air-conditioning Company Limited has been doing its best to accomplish the better quality, performance and reliability of its products.

Now it is evaluated as a “Reliable Company” in the market.

Dong Yang will give customers “Better service than before”.

**PRODUCTS**

**UNITS**

- Air Handler
- Built-up Air Handler
- Ventilator
- Ice Maker System
  - Ice maker, Storage, Conveyor
- Fan Filter Unit

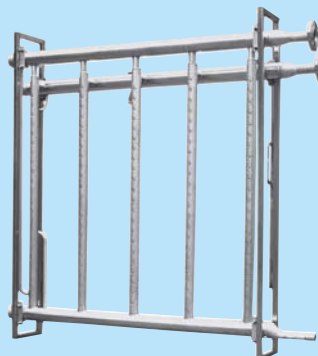


**DAMPERS**

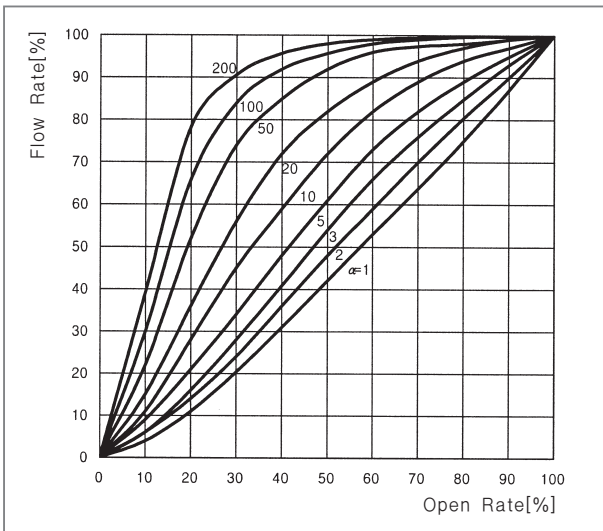
- Low Leakage Damper
- Back Draft Damper
- Heavy Duty Damper
  - For Sub-way, Tunnel and Power Plant
- Volume Control Damper
  - Steel / AL Structure
- Round Damper
- Other Dampers

**SUB-ASSEMBLY & ACCESSORIES**

- Steam Injection Humidifier
- Auto Roll Air Filter
- Eliminator
- Louver
- Turning Vane
- Access Door
- Filter Holding Frame



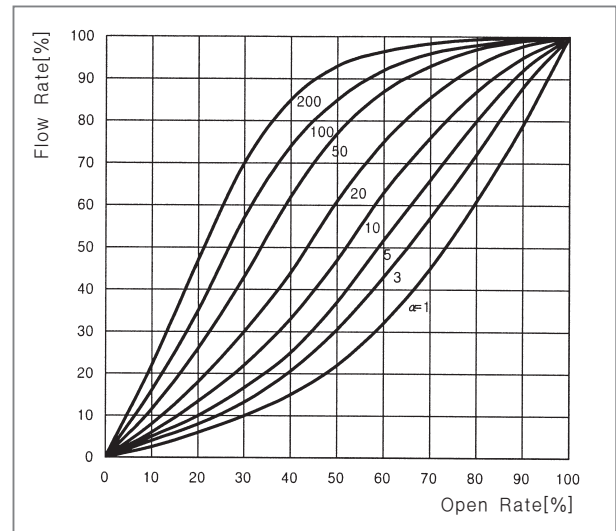
PARALLEL VS. OPPOSED BLADE CHARACTERISTIC



[Parallel Blade Damper characteristic curves]

◆ Curve 2 and 3 mean 50% and 30% of total system pressure drop across the damper.

- ※ Where  $\alpha$  is size of damper in percentage. (Bigger  $\alpha$  means larger damper.)
- ※ The upper charts are extracted from "ASHRAE JOURNAL June 1987".

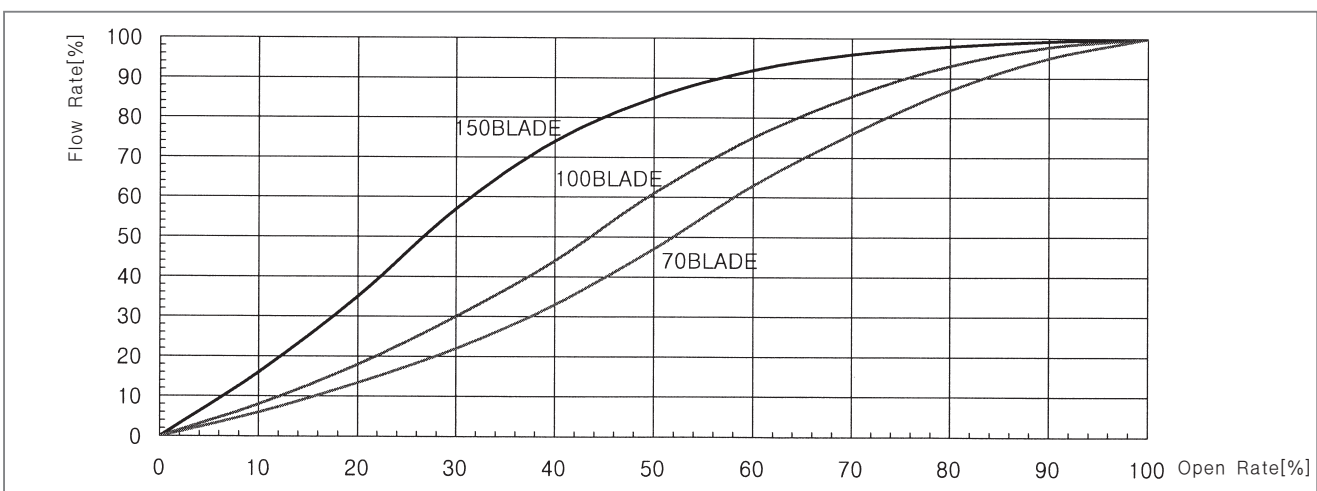


[Opposed Blade Damper characteristic curves]

◆ Curve 10 means 10 % of total system pressure drop across the damper.

- Parallel blade damper allows more air to pass when opened a fixed percent than opposed blade damper of equal size.
- Larger parallel blade damper allows a large air flow when dampers are open a small amount.
- For a given air flow rate in system smaller damper has more accurate control characteristic of volume at open stroke percent.

CHARACTERISTIC ON DAMPER BLADE PITCHES



- ※ Curves on the chart can be varied with system pressure drop, damper pressure drop, type of damper and other factors.
- ※ The upper charts are from the test results run by Dong Yang.

- For a given face area smaller blade pitch damper has more accurate control characteristic of volume at open stroke percent. For instance 70mm blade pitch damper is recommended than 150mm blade pitch damper for better control of air volume.
- When accurate control is required, please contact us.

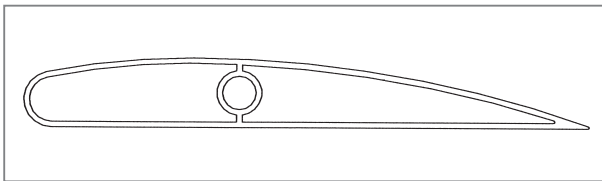
## APPLICATION

- For Protection of Reverse Rotation of Blowers installed in Parallel
- For Protection of Reverse Air Flow in Heavy Duty System

## FEATURES OF DYB

### ■ Airfoil Shaped Blade

Airfoil blade shaped like aircraft blade apparently reduces the pressure drop and sound level across the damper.



### ■ Balance Weight installed in Airfoil Blade

This gives simple structure and no change of weight balancing during and after installation.

### ■ Smooth Opening

Good balancing gives smooth operation when it opens and closes.

### ■ Good Persistence by Using Anti-corrosive Materials

Stainless steel and anodized aluminum materials only are used to give good operation and to prevent corrosion after time elapsed.

### ■ Air Performance and Leakage Rate AMCA Licensed

Ratings of leakage and pressure drop shown results from the tests based on AMCA Publication 511.

## STANDARD CONSTRUCTION

- |                |  |
|----------------|--|
| ■ Frame        | Channel shaped extruded aluminum             |
| ■ Blade        | Double skin airfoil shaped extruded aluminum |
| ■ Shaft        | Brass bar                                    |
| ■ Bearing      | Ball bearing or sleeve bearing               |
| ■ Corner Piece | Aluminum                                     |
| ■ Finish       | Anodized aluminum                            |



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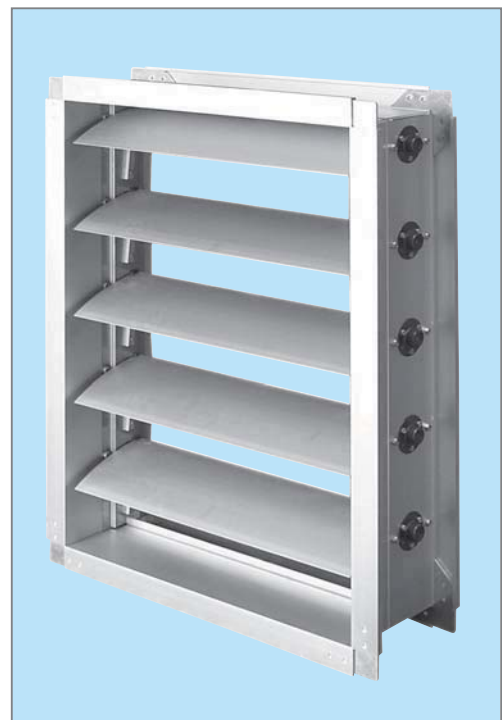
### ■ Max. Temperature 120°C

(For higher temperature, please contact us.)

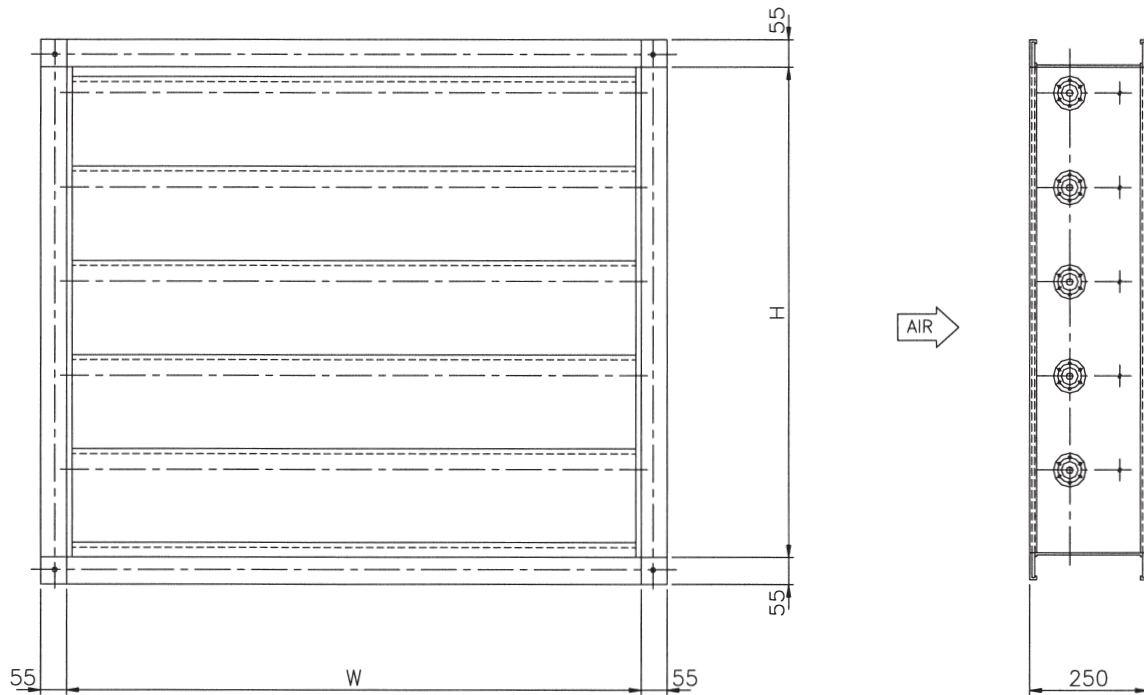
### ■ Max. Pressure

250mmAq when damper shut-off

(For higher pressure, please contact us.)



## STANDARD DIMENSIONS



◦ 55mm frame height for flange is a standard.

### ■ Standard Manufacturing Size

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	190 × Number of Blade + 30	2,500mm	600mm
Width (W)	600mm ~ 1,397mm	1,397mm	600mm

- Maximum size of this damper is 1,397W×2,500H and minimum size is 600W×600H.
- Two or more dampers are assembled on the job site for dampers larger than the standard size.  
For larger dampers than upper standard size, please contact us.

### ■ Standard Height per Number of Blades (H mm)

No. of Blade	3	4	5	6	7	8	9	10	11	12	13
Height (H)	600	790	980	1,170	1,360	1,550	1,740	1,930	2,120	2,310	2,500

- For non-standard height, we use one or two smaller blade(s) to avoid big air blockage.

### ■ Operation of Back Draft Damper

Blades of back draft damper should be opened by small pressure in air flow direction and be closed by the weight of blade itself or additional weight without external force when the pressure is removed or back pressure is added. DYB model of Dongyang has balance weight in blade itself. So there is no extrudes inside and outside of the damper. And the reliability of maintaining balancing is better than the exterior linkage weight type damper that the balancing may be destroyed by the big back pressure during the long period operation.

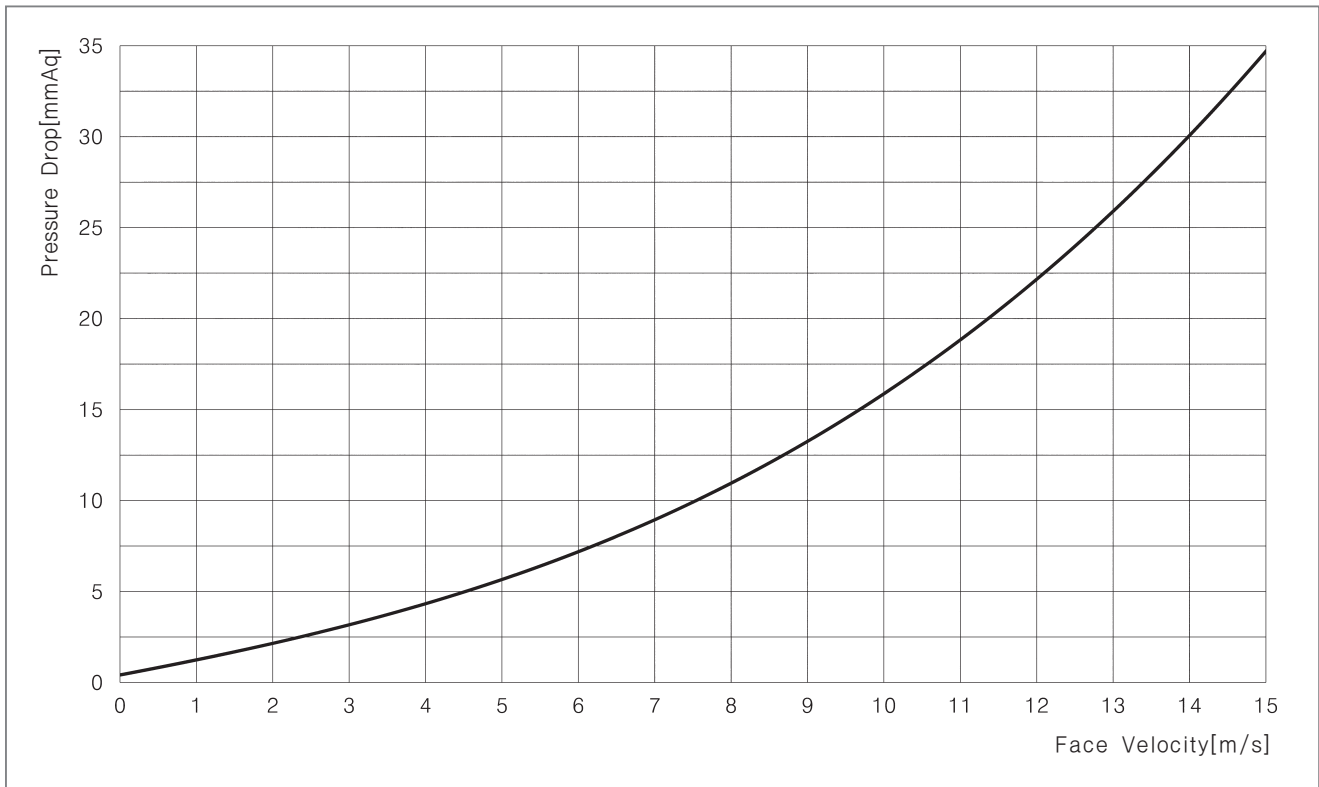
## PRESSURE DROP OF DYB (TEST OF CHAMBER TYPE)

■ Articles Related to the Test

- Test Standard                      AMCA Standard 500
- Test Set-up                         Figure 5.5
- Air Flow Measurement            Figure 6.5
- Temperature when Testing      0°C ~ 49°C
- Tested Damper Size                610 × 610
- Air Flow Test Mode                Intake mode



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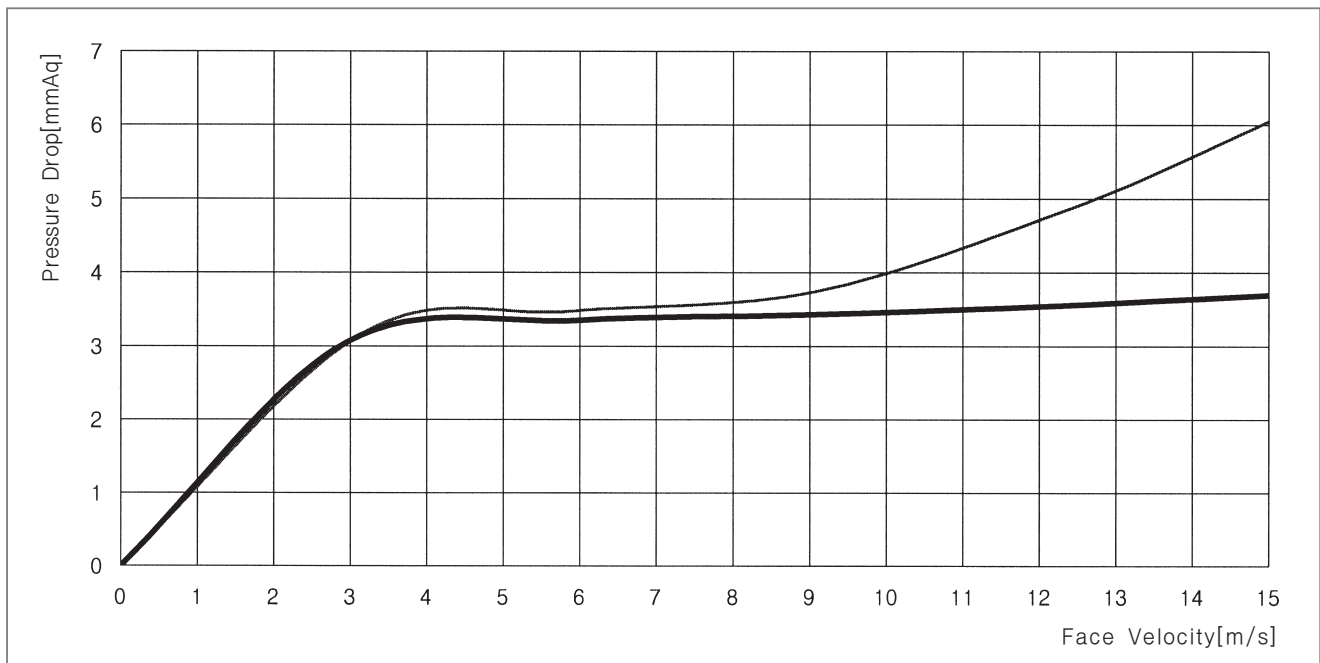
■ The Trend of Pressure Drop Across the Damper

- Dampers with higher face velocity have bigger pressure drop.
- Dampers with larger face area at a certain velocity have smaller pressure drop.
- Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.
- Rapid increase in pressure drop results from the initial pressure to open the blades.

## PRESSURE DROP OF DYB (TEST OF DUCT TYPE)

### ■ Articles Related to the Test

- Test Standard AMCA Standard 500
- Test Set-up Figure 5.3
- Air Flow Measurement Figure 6.5
- Temperature when Testing 0°C ~ 49°C
- Tested Damper Size 305×305, 305×1,220, 610×610,  
914×914, 1,220×305 (5 sets)
- Air Flow Test Mode Intake mode



#### ○ How to use the chart

1. Read ratings on the **thick line** for the dampers of 914mm or higher.
2. Read ratings on the thin line for the smaller height dampers than 914mm.

### ■ The Trend of Pressure Drop Across the Damper

- Dampers with higher face velocity have bigger pressure drop.
- Dampers with larger face area at a certain velocity have smaller pressure drop.
- Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.
- Rapid increase in pressure drop results from the initial pressure to open the blades.

LEAKAGE PERFORMANCE OF DYB

Articles Related to the Test

- Test Standard AMCA Standard 500
- Test Set-up Figure 5.5
- Air Flow Measurement Figure 6.5
- Temp. when Testing 0°C ~ 49°C
- Tested Damper Size 610×2540, 1397×610, 1397×2540 (3 sets)
- Ratings Selected Maximum value of two times



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Leakage Rate

(The AMCA Certified Ratings Seal applies to the following leakage values for the Back Draft Dampers.)

How to calculate of leakage rate.

Read leakage rate on Table A at 25mmAq static pressure and appropriate size. For higher pressure multiply leakage at 25mmAq by correction factor on Table B for pressure and appropriate width.

(Interpolation may be used for the values between two columns.)

Table A. Leakage Rate at 25mmAq Pressure Difference across the Damper [CMM]

Damper Width[mm]	Damper Height [mm]										
	600	790	980	1,170	1,360	1,550	1,740	1,930	2,120	2,310	2,500
610	1.92	2.07	2.35	2.59	2.83	3.07	3.30	3.51	3.64	3.81	4.38
800	2.10	2.30	2.63	2.93	3.21	3.51	3.79	4.02	4.20	4.44	5.13
900	2.19	2.41	2.76	3.10	3.40	3.73	4.04	4.30	4.50	4.77	5.53
1,000	2.28	2.52	2.89	3.27	3.59	3.95	4.29	4.58	4.80	5.10	5.92
1,100	2.34	2.63	3.02	3.44	3.78	4.17	4.54	4.86	5.10	5.43	6.32
1,220	2.42	2.76	3.18	3.65	4.03	4.44	4.84	5.20	5.47	5.83	6.79
1,300	2.46	2.85	3.28	3.78	4.18	4.61	5.04	5.42	5.70	6.08	7.11
1,397	3.21	3.64	4.07	4.50	4.92	5.35	5.78	6.21	6.64	7.06	7.49

Table B. Correction Factor

Damper Width[mm]	Pressure Difference across the Damper [mmAq]								
	25	50	60	75	90	100	125	150	175
610	1.000	1.509	1.603	1.803	1.979	2.097	2.398	2.549	2.699
800	1.000	1.536	1.622	1.822	1.998	2.116	2.505	2.699	2.893
900	1.000	1.550	1.632	1.832	2.008	2.126	2.561	2.778	2.996
1,000	1.000	1.564	1.642	1.842	2.018	2.136	2.617	2.857	3.098
1,100	1.000	1.577	1.652	1.852	2.028	2.146	2.673	2.937	3.200
1,220	1.000	1.594	1.664	1.864	2.040	2.158	2.740	3.032	3.323
1,300	1.000	1.605	1.672	1.872	2.048	2.166	2.785	3.095	3.405
1,397	1.000	1.619	1.681	1.881	2.057	2.260	2.882	3.193	3.504

\* Air volumes are based on the density of 1.2Kg/m<sup>3</sup>.

Example of leakage calculation : Leakage of 1300W×1360H damper at 100mmAq pressure difference ?

Find 4.18CMM in Table A and multiply this by correction factor 2.166 in Table B.

Then Leakage rate of this damper becomes 9.05CMM at 100mmAq static pressure difference.



## APPLICATION

- For Volume Control and Low Leakage when shut-off
- For Sub-way, Tunnel, Power Plant and Other Heavy Duty Usage

## FEATURES OF DYH

- **Low Pressure Resistant Blade Shape**  
Diamond shaped blade reduces the pressure drop and sound level across the damper.
- **Soft and Contact-easy Blade Seal**  
Soft and contact-easy blade seal gives good contact with adjacent blade seal and this reduces leakage rates.
- **Round Shaped Stainless Steel Jamb Seal**  
Stainless steel material jamb seal is shaped round and has good elasticity. This gives smooth sliding and good contact between the blades and jamb seal.
- **Good Persistence**  
Constructed with SGHC(Gal'v steel) and stainless materials. Special painting and coating are also available on option.
- **Air Performance and Leakage Rate AMCA Licensed**  
Ratings of leakage and pressure drop shown results from the tests based on AMCA Publication 511.

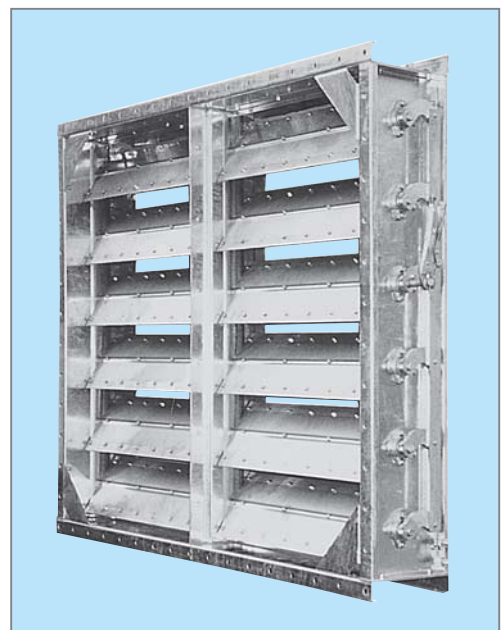


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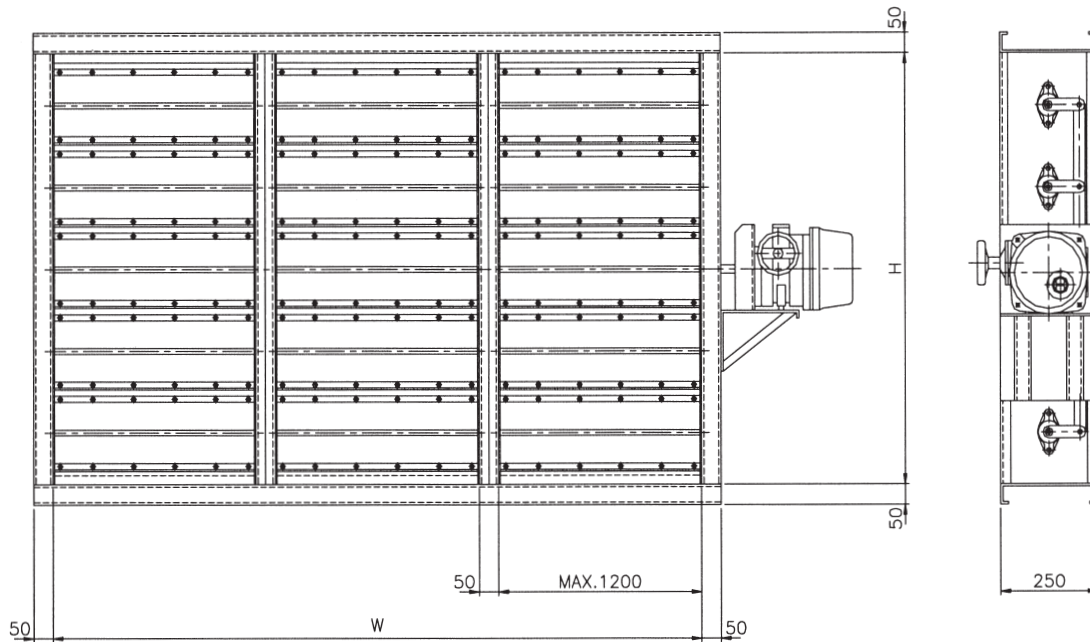
- **Max. Temperature 120°C**  
(For higher temperature, please contact us.)
- **Max. Pressure**  
250mmAq when damper shut-off  
(For higher pressure, please contact us.)

## STANDARD CONSTRUCTION

- **Frame** Channel shaped steel, Gal'v steel or stainless steel 304
- **Blade** Double skinned diamond shape, Gal'v steel or stainless steel 304
- **Link** Stainless steel 304 or gal'v steel
- **Shaft** Stainless steel 304 or gal'v steel
- **Bearing** Brass sleeve bearing or ball bearing
- **Jamb seal** Stainless steel spring plate
- **Blade seal** STS or EPDM or Silicone
- **Others** Optional : STS 316 or STS 304 +  
Teflon coating, Steel + PE (Polyethylene) coating



## STANDARD DIMENSIONS



- Intermediate support frame will be placed at every maximum width of 1,200mm for strength.
- 50mm or different frame height for flange is available as a standard.

### ■ Standard Manufacturing Size

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	200 × Number of Blade + 30	2,430mm	630mm
Width (W)	630mm ~ 2,997mm	2,997mm	630mm

- The largest face area of this damper is 4.5m<sup>2</sup> per set.
- Two or more dampers are assembled on the job site for dampers larger than the standard size.  
For larger dampers than upper standard size, please contact us.

### ■ Standard Height per Number of Blades (H mm)

No. of Blade	3	4	5	6	7	8	9	10	11	12
Height (H)	630	830	1,030	1,230	1,430	1,630	1,830	2,030	2,230	2,430

- For non-standard height, we use one or two eccentric blade(s) to avoid big air blockage.

### ■ For Installation of Actuator

- Installation method and accessories for actuator vary with type and model of actuator.  
Please contact us for installation of actuator.
- We also supply dampers with installation work of actuators.

### ■ Shaft for Driving

- Shaft size  $\phi 20$
- Protruded length Length of shaft varies with the type and model of actuator.  
Please contact us for installation of actuator.

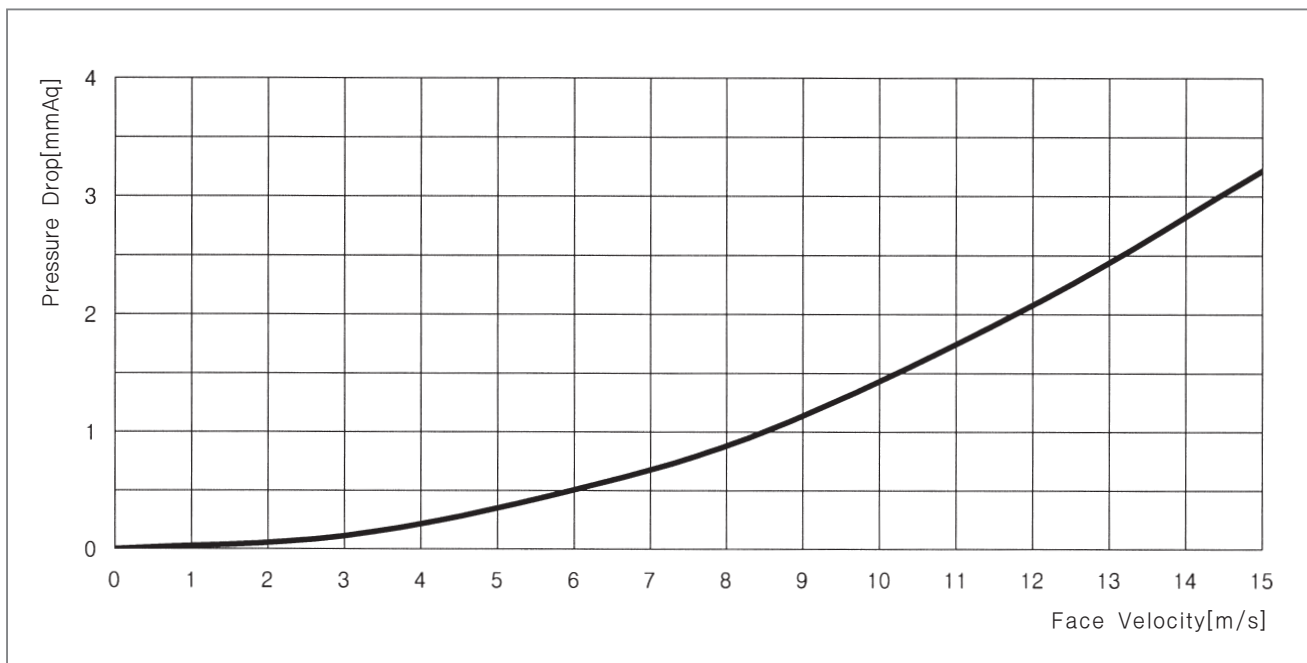
## PRESSURE DROP OF DYH

### Articles Related to the Test

- Test Standard AMCA Standard 500
- Test Set-up Figure 5.3
- Air Flow Measurement Figure 6.5
- Temperature when Testing 0°C ~ 49°C
- Tested Damper Size 305×305, 305×1,220, 610×610,  
914×914, 1,220×305 (5 sets)
- Air Flow Test Mode Intake mode



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#### How to use the chart

1. Ratings on the chart is based on the size of 610×610.
2. Read ratings on the line for the dampers larger than 610mm high.

### The Trend of Pressure Drop Across the Damper

- Dampers with higher face velocity have bigger pressure drop.
- Dampers with larger face area at a certain velocity have smaller pressure drop.
- Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.

## LEAKAGE PERFORMANCE OF DYH

■ Articles Related to the Test

- Test Standard AMCA Standard 500
- Test Set-up Figure 5.4
- Air Flow Measurement Figure 6.5
- Torque Applied to Dampers Data are based on a torque of 15.88Nm/m<sup>2</sup> (11.71in-lb/ft<sup>2</sup>) applied to close and seat the damper during the test  
Minimum torque: 16.76Nm/m<sup>2</sup> (12.36in-lb/ft<sup>2</sup>)
- Temp. when Testing 0°C ~ 49°C
- Tested Damper Size 305x305, 305x1,220, 610x610, 914x914, 1,220x305, 2,997x914 (6 sets)
- Ratings Selected Maximum value of two times leakage tests in each direction of air flow and back pressure



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■ Leakage Class (The AMCA Certified Ratings Seal applies only to the following leakage class for the volume control dampers.)

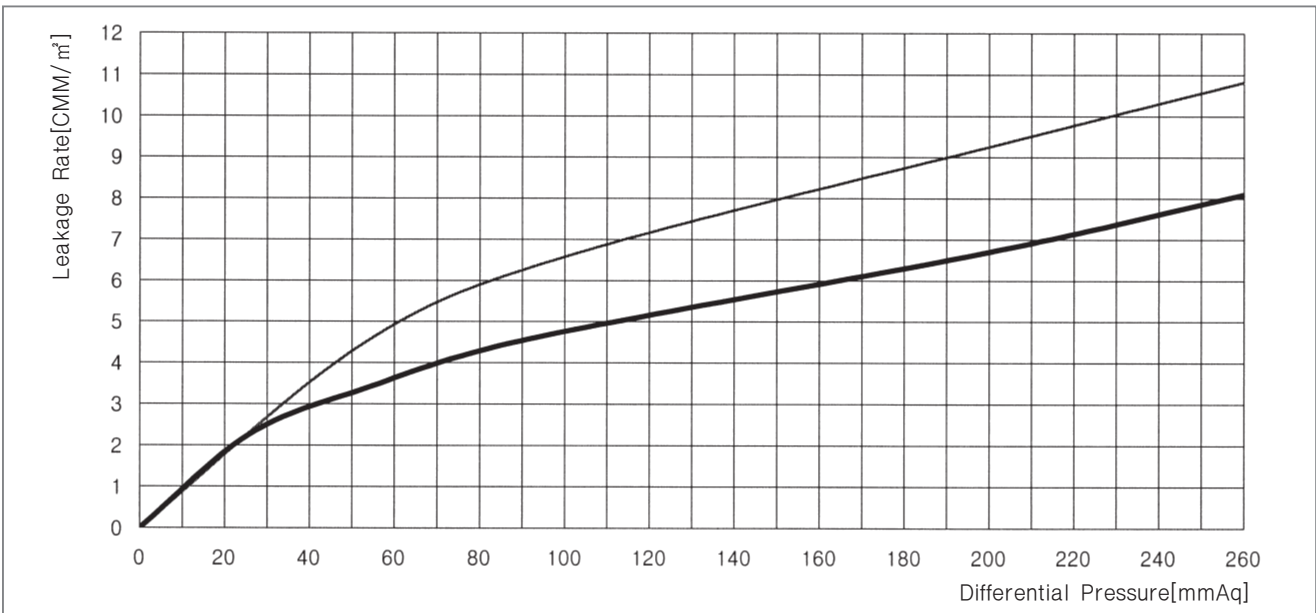
• Leakage Class of DYH by AMCA Leakage Class

Damper Width	25mmAq ΔP	100mmAq ΔP	200mmAq ΔP
24" (610mm)	2	2	2
36" (914mm)	2	2	2
118" (3,000mm)	2	2	N/A

• AMCA Leakage Classification

SI Class	Maximum Allowable Leakage, L/s/m <sup>2</sup>		
	at 0.25 kPa	at 1.0 kPa	at X kPa
1A	15.2	N/A	N/A
1	20	41	2√X × 20
2	51	102	2√X × 51
3	203	406	2√X × 203

■ Leakage Rate (The AMCA Certified Ratings Seal does not apply to the following leakage chart.)



\* Air volumes are based on the density of 1.2Kg/m<sup>3</sup>

○ How to use the chart

1. Read ratings on the **thick line** for the dampers of 914mm or higher.
2. Read ratings on the **thin line** for the smaller height dampers than 914mm.

■ The Trend of Leakage Rate Across the Damper

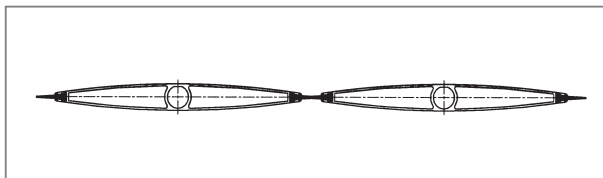
- Higher pressure difference across the damper gives more air leakage.
- Smaller damper at certain pressure difference across the damper has more air leakage per unit area.

## APPLICATION

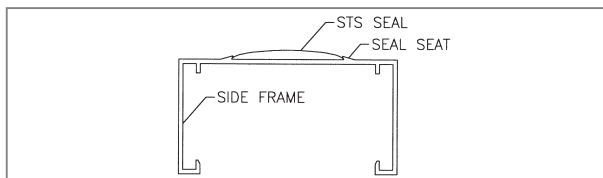
- For General Use and use of Volume Control
- For Low Leakage when Damper Shut-off
- For Air Handlers and for Duct

## FEATURES OF DYKA

- **Airfoil Shaped Blade for Low Leakage and Sound**  
Airfoil shaped blade apparently reduces the pressure drop and sound level across the damper.
- **Soft and Contact-easy Blade Seal**  
Soft and contact-easy blade seal gives good contact with adjacent blade seal and this reduces leakage rates.



- **Round Shaped Stainless Steel Jamb Seal**  
Stainless steel material jamb seal is shaped round and has good elasticity. This gives smooth sliding and good contact between the blades and jamb seal. Low leakage rate is obtained by this good contact.



- **Air Performance and Leakage Rate AMCA Licensed**  
Ratings of leakage and pressure drop shown results from the tests based on AMCA Publication 511.

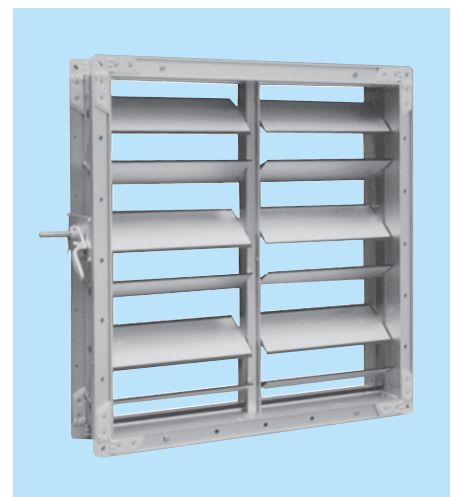
## STANDARD CONSTRUCTION

- |                |  |
|----------------|--|
| ■ Frame        | Channel shaped extruded aluminum                   |
| ■ Blade        | Double skin airfoil shaped extruded aluminum       |
| ■ Link         | Stainless steel 304 and aluminum                   |
| ■ Shaft        | Stainless steel 304, aluminum and zinc material    |
| ■ Bearing      | POM (Polyacetal-Polyoxymethylene) material bushing |
| ■ Jamb seal    | Stainless steel spring plate                       |
| ■ Blade seal   | Synthetic rubber                                   |
| ■ Corner piece | Aluminum or injection molded PC (Polycarbonate)    |
| ■ Finish       | Anodized aluminum                                  |

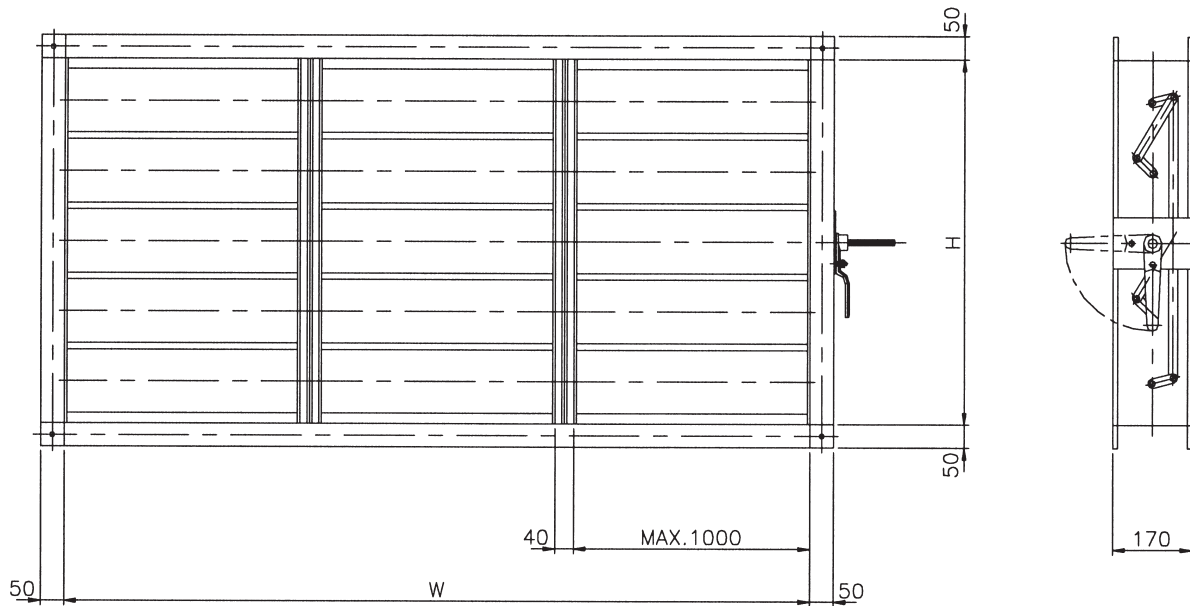


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- **Good Persistence by Using Anti-corrosive Materials**  
Stainless steel, aluminum and PVC materials only are used to give good operation and to prevent corrosion after time elapsed.
- **Max. Temperature 120°C**  
(For higher temperature, please contact us.)
- **Max. Pressure 200mmAq when damper shut-off**  
(For higher pressure please contact us.)



**STANDARD DIMENSIONS**



- Intermediate support frame will be placed at every maximum width of 1,000mm for strength.
- 50mm frame height for flange is standard. Please contact us for different height.

■ **Standard Manufacturing Size**

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	150 × Number of Blade + 30	2,430mm	180mm
Width (W)	180mm ~ 2,997mm	2,997mm	180mm

- The largest face area of this damper is 6.0m<sup>2</sup> per set.
- For larger dampers than upper standard size, please contact us.

■ **Standard Height per Number of Blades (H mm)**

No. of Blade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Height (H)	180	330	480	630	780	930	1,080	1,230	1,380	1,530	1,680	1,830	1,980	2,130	2,280	2,430

- For non-standard height, we use one or two eccentric blade(s) to avoid big air blockage.

■ **Two or more damper handles are used on followings cases.**

- In case that the face area of damper is larger than 3.5 m<sup>2</sup>
- In case that the width of damper is longer than 3,104mm
- In case that damper has three or more intermediate supports

■ **Shaft for Driving**

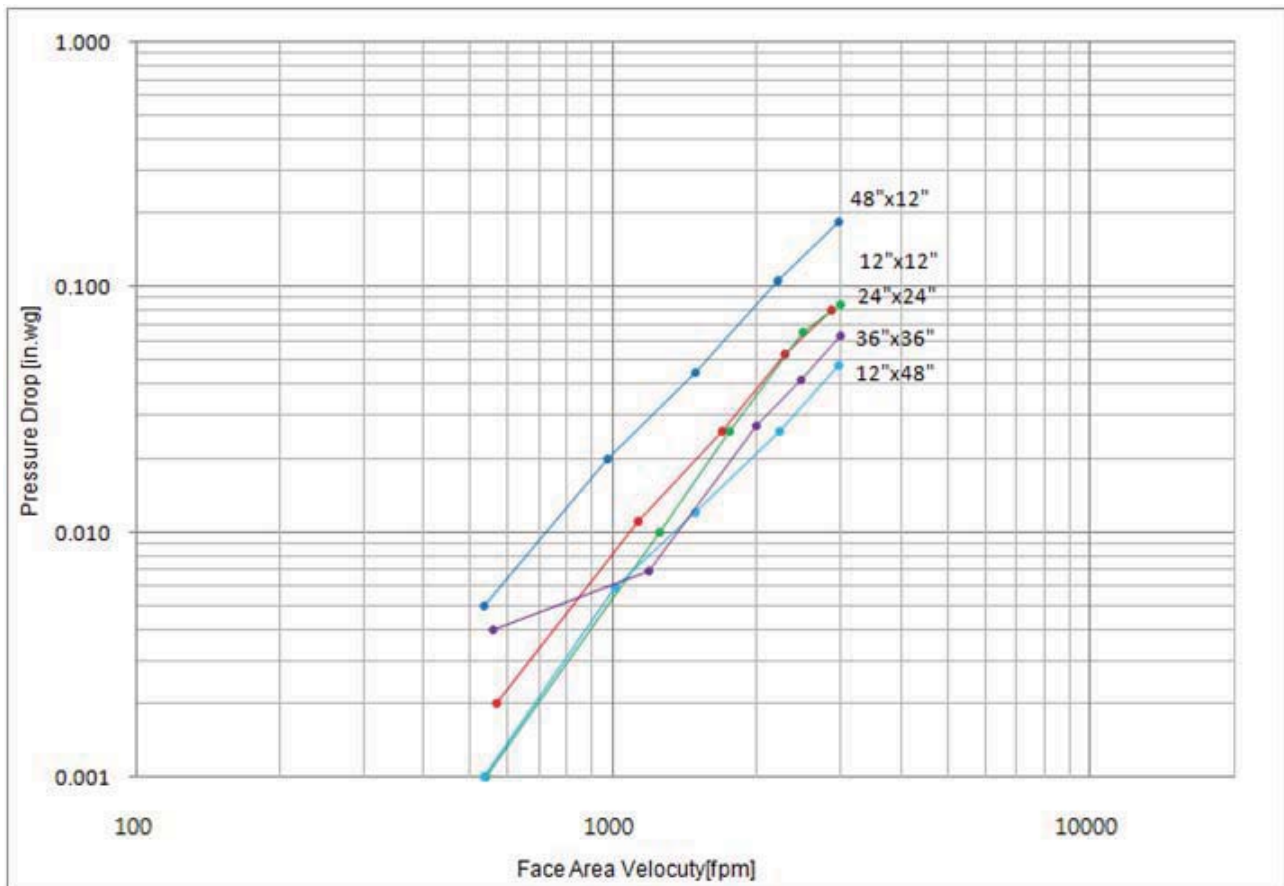
- Shaft size Hexagonal shape, nominal dimension 12 mm
  - Protruded length
    - Standard protruded length 120mm
    - For manual and electrical actuator 120mm
    - For pneumatic actuator 150mm
- (When exceptional length is required, please contact us.)

**PRESSURE DROP OF DYKA**

- Articles Related to the Test
  - Test Standard                      AMCA Standard 500
  - Test Set-up                         Figure 5.3
  - Air Flow Measurement           Figure 6.5
  - Temperature when Testing      0°C ~ 49°C
  - Tested Damper Size               305 × 305, 305 × 1,220, 610 × 610,  
914 × 914, 1,220 × 305 (5 sets)
  - Air Flow Test Mode               Exhaust Mode



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- The Trend of Pressure Drop Across the Damper
  - Dampers with higher face velocity have bigger pressure drop.
  - Dampers with larger face area at a certain velocity have smaller pressure drop.
  - Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.

**LEAKAGE PERFORMANCE OF DYKA**

- **Articles Related to the Test**
  - **Test Standard**                    AMCA Standard 500
  - **Test Set-up**                        Figure 5.4, Figure 5.6A
  - **Air Flow Measurement**        Figure 6.5
  - **Torque**                                Data are based on a torque of 15.79Nm/m<sup>2</sup> (12.98in-lb/ft<sup>2</sup>) applied to close and seat the damper during the test
  - Applied to Dampers**            Minimum torque : 44.69Nm/m<sup>2</sup> (36.75in-lb/ft<sup>2</sup>)
  - **Temp. when Testing**            0°C ~ 49°C
  - **Tested Damper Size**            305x 1,220, 2,997x914 (2 sets)
  - **Ratings Selected**                 Maximum value of two times leakage tests in each direction of air flow and back pressure

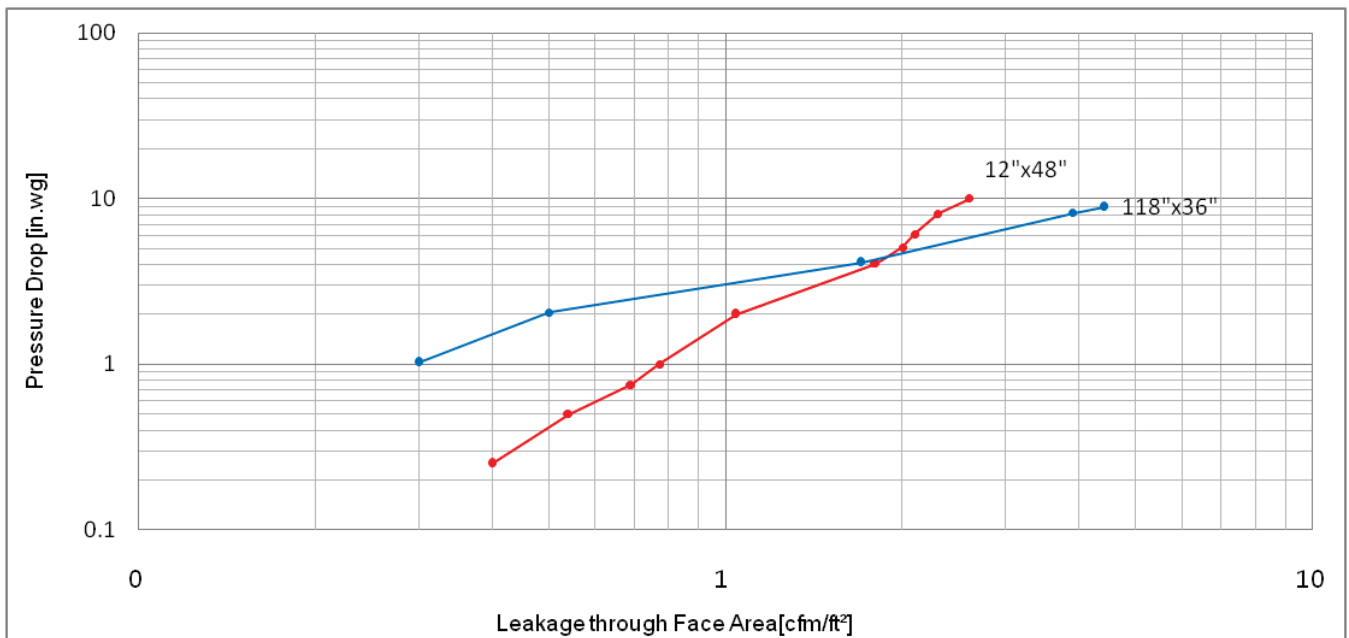


DONG YANG AIR-CONDITIONING Co., Ltd. certifies that DYKA Model shown hereon is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to air performance and air leakage ratings only.

- **Leakage Class** (The AMCA Certified Ratings Seal applies only to the following leakage class for the volume control dampers.)

Leakage Class			
1 in. wg	4 in. wg	6 in. wg	8 in. wg
1A	1	1	1

- **Leakage Rate** (The AMCA Certified Ratings Seal does not apply to the following leakage chart.)



- **The Trend of Leakage Rate Across the Damper**
  - Higher pressure difference across the damper gives more air leakage.
  - Smaller damper at certain pressure difference across the damper has more air leakage per unit area.

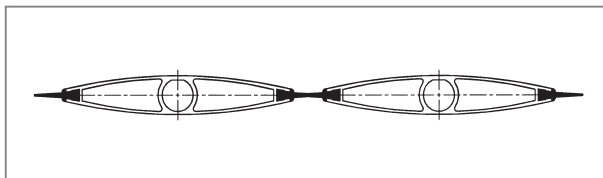


## APPLICATION

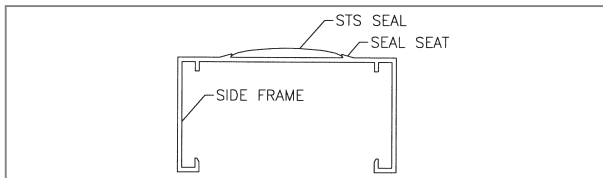
- For General Use and Proportional use of Volume Control
- For Low Leakage when Damper Shut-off
- For Air Handlers and for Duct

## FEATURES OF DYKL

- **Airfoil Shaped Blade for Low Leakage and Sound**  
Airfoil shaped blade apparently reduces the pressure drop and sound level across the damper.
- **Soft and Contact-easy Blade Seal**  
Soft and contact-easy blade seal gives good contact with adjacent blade seal and this reduces leakage rates.



- **Round Shaped Stainless Steel Jamb Seal**  
Stainless steel material jamb seal is shaped round and has good elasticity. This gives smooth sliding and good contact between the blades and jamb seal. Low leakage rate is obtained by this good contact.



- **Air Performance and Leakage Rate AMCA Licensed**  
Ratings of leakage and pressure drop shown results from the tests based on AMCA Publication 511.

## STANDARD CONSTRUCTION

- **Frame** Channel shaped extruded aluminum
- **Blade** Double skin airfoil shaped extruded aluminum
- **Link** Stainless steel 304 and aluminum
- **Shaft** Stainless steel 304, aluminum and zinc material
- **Bearing** POM (Polyacetal-Polyoxymethylene) material bushing
- **Jamb seal** Stainless steel spring plate
- **Blade seal** Synthetic rubber
- **Corner piece** Aluminum or injection molded PC (Polycarbonate)
- **Finish** Anodized aluminum

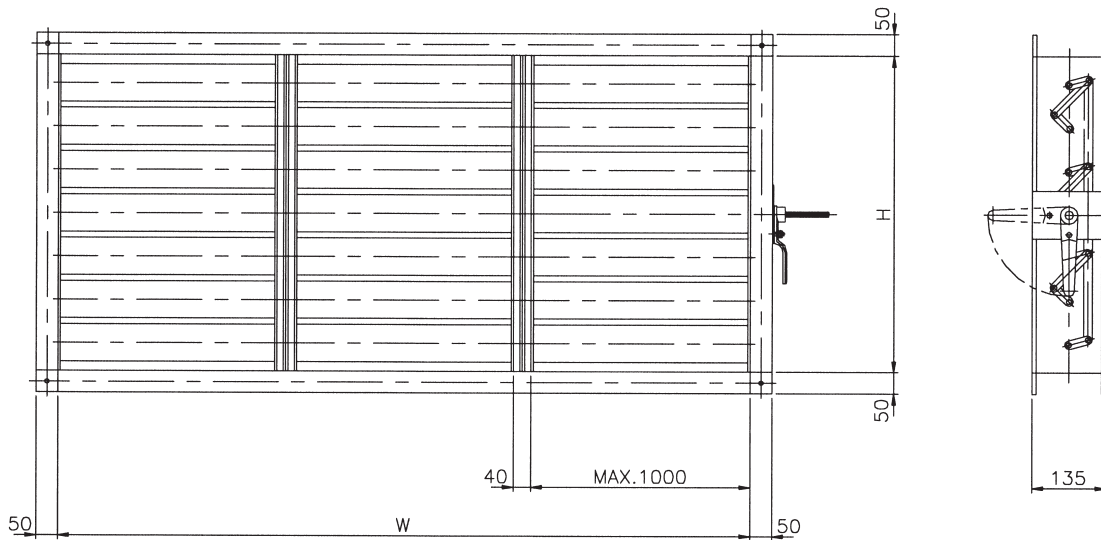


DONG YANG AIR-CONDITIONING Co., Ltd. certifies that DYKL Model shown hereon is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to air performance and air leakage ratings only.

- **Good Persistence by Using Anti-corrosive Materials**  
Stainless steel, aluminum and PVC materials only are used to give good operation and to prevent corrosion after time elapsed.
- **Max. Temperature 120°C**  
(For higher temperature, please contact us.)
- **Max. Pressure 200mmAq when damper shut-off**  
(For higher pressure please contact us.)



STANDARD DIMENSIONS



- Intermediate support frame will be placed at every maximum width of 1,000mm for strength.
- 50mm frame height for flange is standard. Please contact us for different height.

■ Standard Manufacturing Size

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	100 × Number of Blade + 30	2,430mm	330mm
Width (W)	330mm ~ 2,997mm	2,997mm	330mm

- The largest face area of this damper is 4.0m<sup>2</sup> per set.
- For larger dampers than upper standard size, please contact us.

■ Standard Height per Number of Blades (H mm)

No. of Blade	3	4	5	6	7	8	9	10	11	12	13
Height (H)	330	430	530	630	730	830	930	1,030	1,130	1,230	1,330
No. of Blade	14	15	16	17	18	19	20	21	22	23	24
Height (H)	1,430	1,530	1,630	1,730	1,830	1,930	2,030	2,130	2,230	2,330	2,430

- For non-standard height, we use one or two eccentric blade(s) to avoid big air blockage.

■ Two or more damper handles are used on followings cases.

- In case that the face area of damper is larger than 3.5m<sup>2</sup>
- In case that the width of damper is longer than 3,104mm
- In case that damper has three or more intermediate supports

■ Shaft for Driving

- Shaft size Hexagonal shape, nominal dimension 12mm
- Protruded length
  - Standard protruded Length 100mm
  - For Manual and Electrical Actuator 120mm
  - For Pneumatic Actuator 150mm
 (When exceptional length is required, please contact us.)

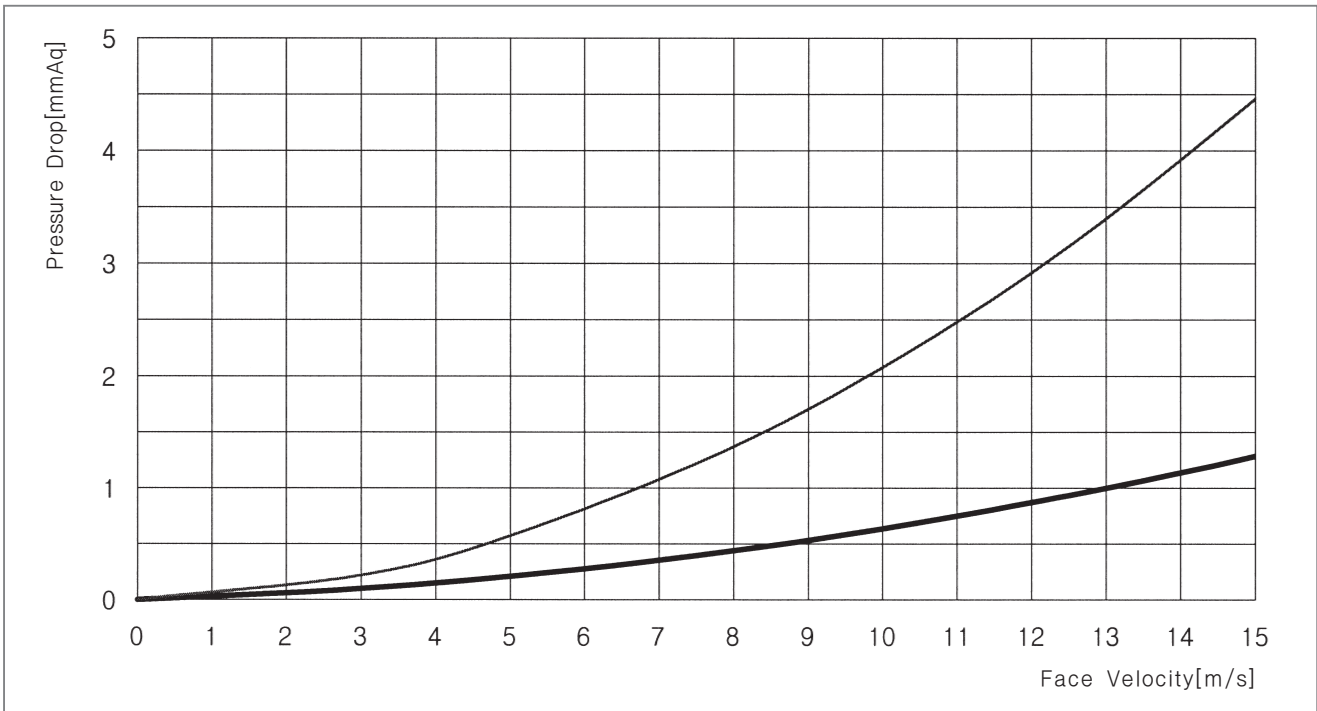
## PRESSURE DROP OF DYKL

■ Articles Related to the Test

- Test Standard                                    AMCA Standard 500
- Test Set-up                                        Figure 5.3
- Air Flow Measurement                        Figure 6.5
- Temperature when Testing                0°C ~ 49°C
- Tested Damper Size                            305 × 305, 305 × 1,220, 610 × 610,  
914 × 914, 1,220 × 305 (5 sets)
- Air Flow Test Mode                            Intake mode



DONG YANG AIR-CONDITIONING Co., Ltd. certifies that DYKL Model shown hereon is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to air performance and air leakage ratings only.



○ How to use the chart

1. Read ratings on the **thick line** for the dampers of 610mm or higher.
2. Read ratings on the thin line for the smaller height dampers than 610mm.

■ The Trend of Pressure Drop Across the Damper

- Dampers with higher face velocity have bigger pressure drop.
- Dampers with larger face area at a certain velocity have smaller pressure drop.
- Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.

**LEAKAGE PERFORMANCE OF DYKL**

■ **Articles Related to the Test**

- Test Standard                      AMCA Standard 500
- Test Set-up                            Figure 5.5
- Air Flow Measurement            Figure 6.5
- Torque  
Applied to Dampers                Data are based on a torque of 17.06Nm/m<sup>2</sup> (12.58in-lb/ft<sup>2</sup>) applied to close and seat the damper during the test  
Minimum torque : 20.1Nm/m<sup>2</sup> (14.82in-lb/ft<sup>2</sup>)
- Temp. when Testing                0°C ~ 49°C
- Tested Damper Size                305x305, 305x1,220, 610x610, 914x914, 1,220x305, 2,997x914 (6 sets)
- Ratings Selected                    Maximum value of two times leakage tests in each direction of air flow and back pressure



DONG YANG AIR-CONDITIONING Co., Ltd. certifies that DYKL Model shown hereon is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to air performance and air leakage ratings only.

■ **Leakage Class** (The AMCA Certified Ratings Seal applies only to the following leakage class for the volume control dampers.)

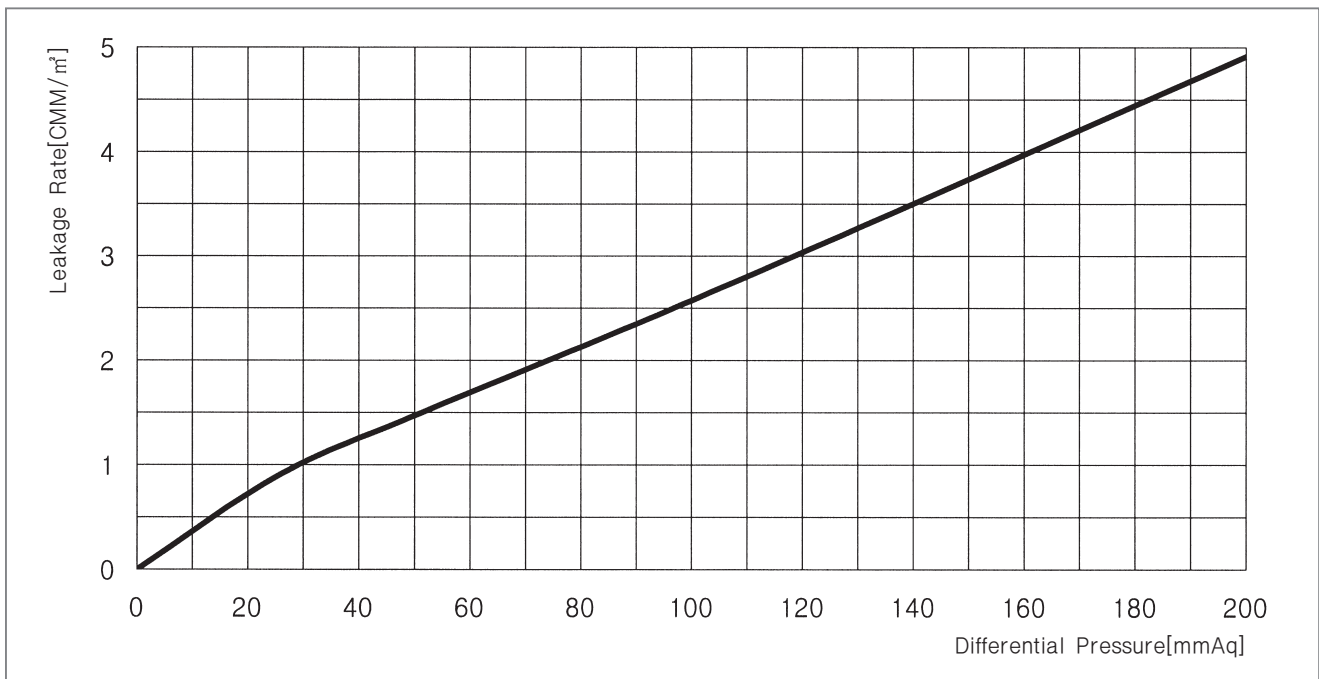
• **Leakage Class of DYKL by AMCA Leakage Class**

Damper Width	25mmAq ΔP	100mmAq ΔP	200mmAq ΔP
12" (305mm)	1A	1	2
24" (610mm)	1A	1	1
36" (914mm)	1A	1	2
48" (1,220mm)	1A	1	1
118" (3,000mm)	1A	1	1

• **AMCA Leakage Classification**

SI Class	Maximum Allowable Leakage, L/s/m <sup>2</sup>		
	at 0.25 kPa	at 1.0 kPa	at X kPa
1A	15.2	N/A	N/A
1	20	41	2√X × 20
2	51	102	2√X × 51
3	203	406	2√X × 203

■ **Leakage Rate** (The AMCA Certified Ratings Seal does not apply to the following leakage chart.)



\* Air volumes are based on the density of 1.2Kg/m<sup>3</sup>

■ **The Trend of Leakage Rate Across the Damper**

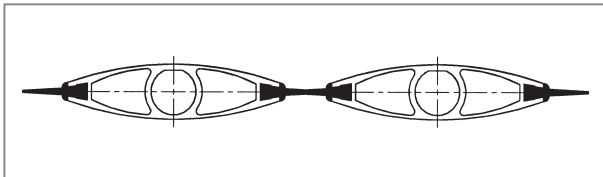
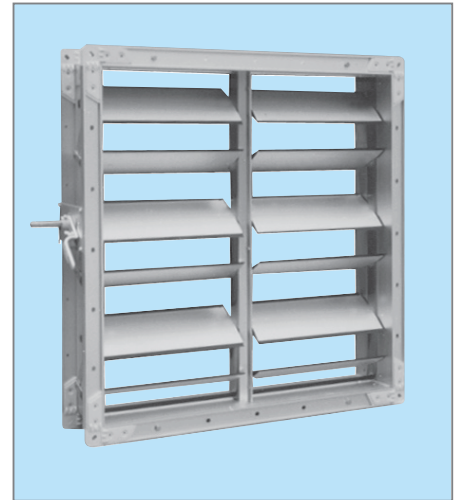
- Higher pressure difference across the damper gives more air leakage.
- Smaller damper at certain pressure difference across the damper has more air leakage per unit area.

APPLICATION

- For Proportional use of Volume Control
- For Low Leakage when Damper Shut-off
- For Air Handlers and for Duct

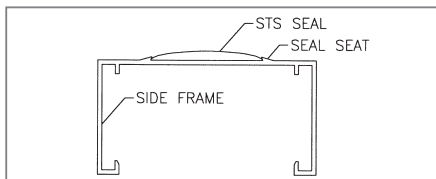
FEATURES OF DYKS

- **Airfoil Shaped Blade for Low Leakage and Sound**  
Airfoil shaped blade apparently reduces the pressure drop and sound level across the damper.
- **Soft and Contact-easy Blade Seal**  
Soft and contact-easy blade seal gives good contact with adjacent blade seal and this reduces leakage rates.



- **Good Persistence by Using Anti-corrosive Materials**  
Stainless steel, aluminum and PVC materials only are used to give good operation and to prevent corrosion after time elapsed.
- **Round Shaped Stainless Steel Jamb Seal**  
Stainless steel material jamb seal is shaped round and has good elasticity. This gives smooth sliding and good contact between the blades and jamb seal. Low leakage rate is obtained by this good contact.

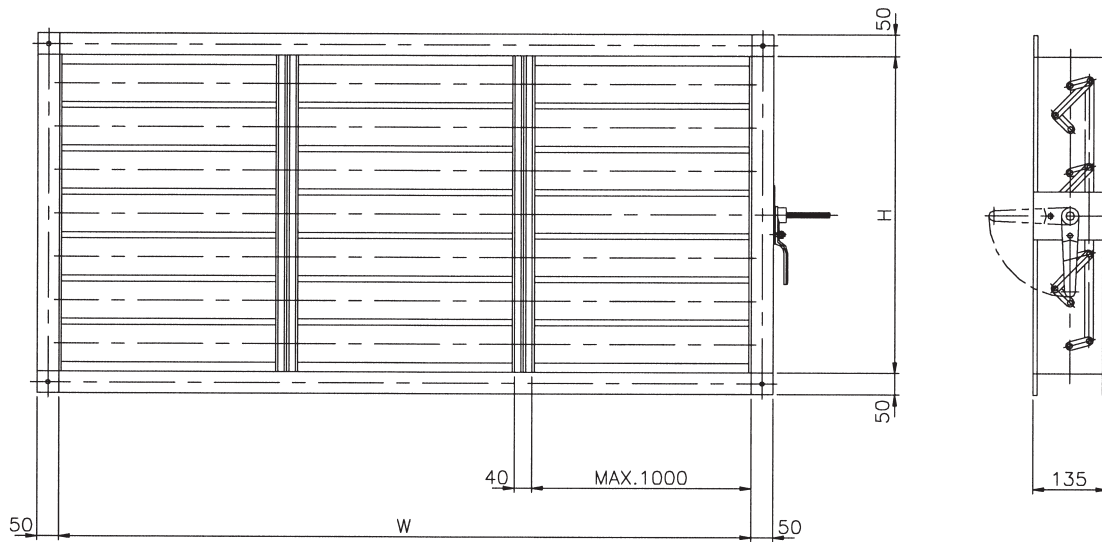
- **Max. Temperature 120°C**  
(For higher temperature, please contact us.)
- **Max. Pressure 200mmAq** when damper shut-off  
(For higher pressure please contact us.)



STANDARD CONSTRUCTION

- |                  |  |                       |   |
|------------------|--|-----------------------|---|
| ■ <b>Frame</b>   | Channel shaped extruded aluminum                   | ■ <b>Jamb seal</b>    | Stainless steel spring plate                    |
| ■ <b>Blade</b>   | Double skin airfoil shaped extruded aluminum       | ■ <b>Blade seal</b>   | Synthetic rubber                                |
| ■ <b>Link</b>    | Stainless steel 304 and aluminum                   | ■ <b>Corner piece</b> | Aluminum or injection molded PC (Polycarbonate) |
| ■ <b>Shaft</b>   | Stainless steel 304, aluminum and zinc material    | ■ <b>Finish</b>       | Anodized aluminum                               |
| ■ <b>Bearing</b> | POM (Polyacetal-Polyoxymethylene) material bushing |                       |   |

STANDARD DIMENSIONS



- Intermediate support frame will be placed at every maximum width of 1,000mm for strength.
- 50mm frame height for flange is standard. Please contact us for different height.

■ Standard Manufacturing Size

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	70 × Number of Blade + 30	1,570mm	100mm
Width (W)	100mm ~ 2,997mm	2,997mm	100mm

- The largest face area of this damper is 3.0m<sup>2</sup> per set.
- For larger dampers than upper standard size, please contact us.

■ Standard Height per Number of Blades (H mm)

No. of Blade	1	2	3	4	5	6	7	8	9	10	11
Height (H)	100	170	240	310	380	450	520	590	660	730	800
No. of Blade	12	13	14	15	16	17	18	19	20	21	22
Height (H)	870	940	1,010	1,080	1,150	1,220	1,290	1,360	1,430	1,500	1,570

- For non-standard height, we use one or two eccentric blade(s) to avoid big air blockage.

■ Two or more damper handles are used on followings cases.

- In case that the face area of damper is larger than 3.0m<sup>2</sup>
- In case that the width of damper is longer than 3,104mm
- In case that damper has three or more intermediate supports

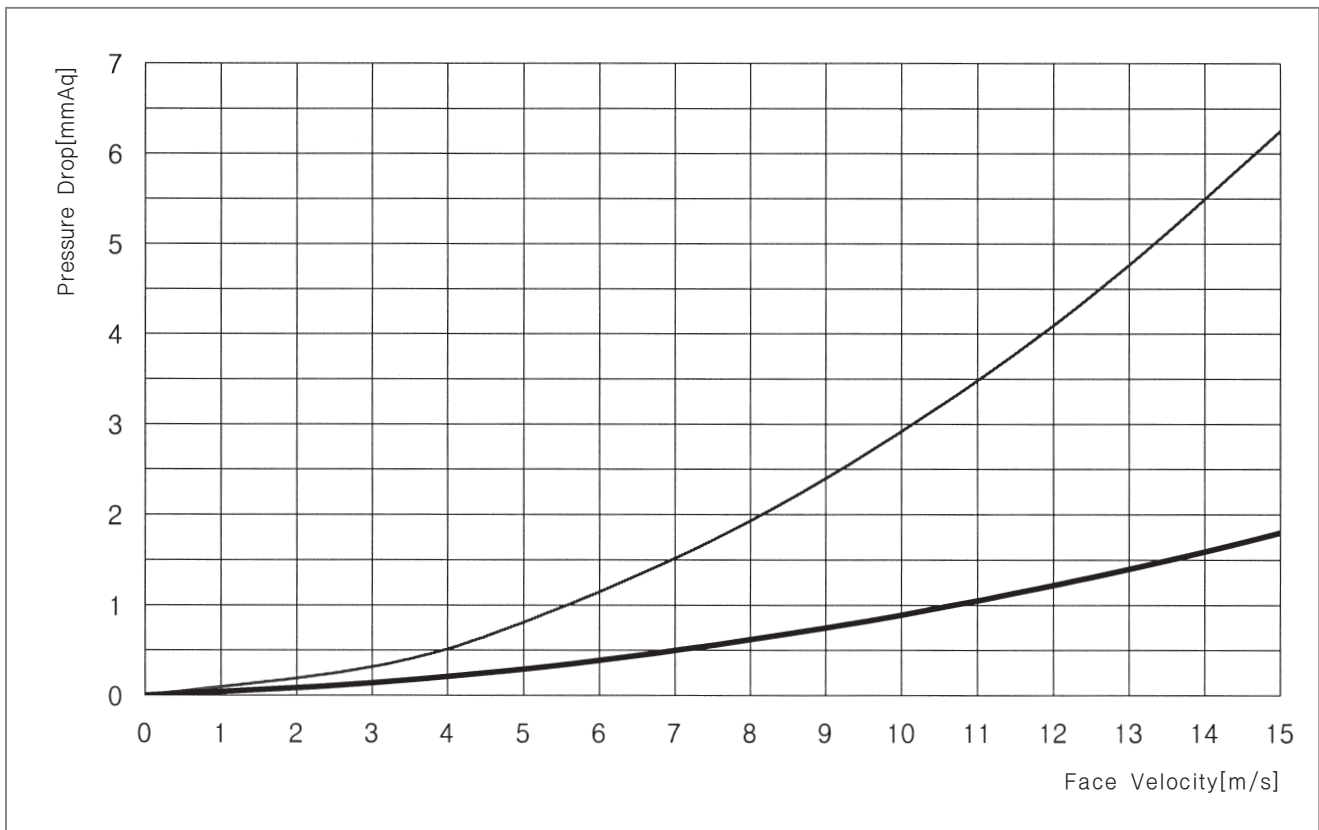
■ Shaft for Driving

- Shaft size Hexagonal shape, nominal dimension 12mm
- Protruded length
  - Standard protruded length 120mm
  - For manual and electrical actuator 120mm
  - For pneumatic actuator 150mm
 (When exceptional length is required, please contact us.)

## PRESSURE DROP OF DYKS

### ■ Articles Related to the Test

- Test Standard                      AMCA Standard 500
- Test Set-up                         Figure 5.3
- Air Flow Measurement            Figure 6.5
- Temperature when Testing       0°C ~ 49°C
- Tested Damper Size               305×305, 305×1,220, 610×610, 914×914, 1,220×305 (5 sets)



#### ○ How to use the chart

1. Read ratings on the **thick line** for the dampers of 610mm or higher
2. Read ratings on the thin line for the smaller height dampers than 610mm.

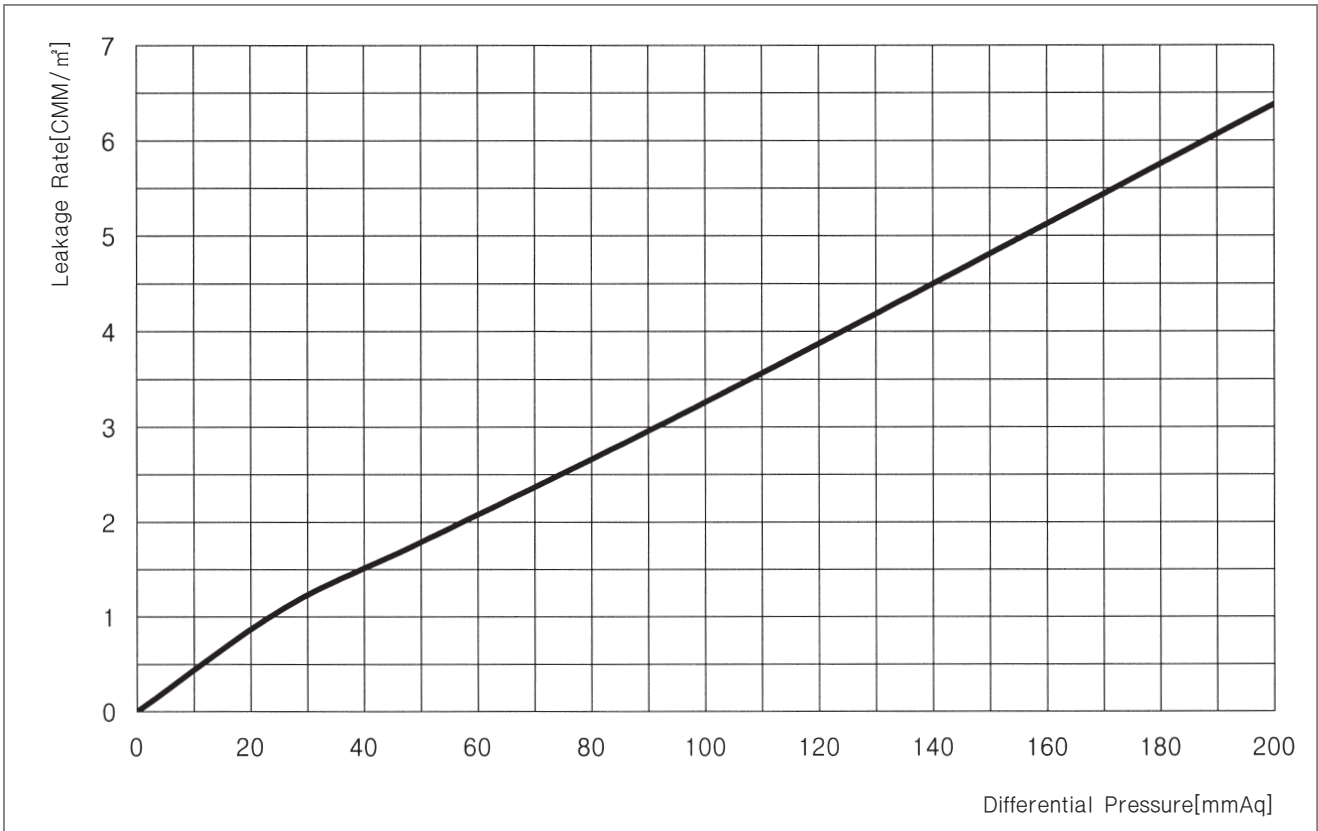
### ■ The Trend of Pressure Drop Across the Damper

- Dampers with higher face velocity have bigger pressure drop.
- Dampers with larger face area at a certain velocity have smaller pressure drop.
- Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.

**LEAKAGE PERFORMANCE OF DYKS**

■ Articles Related to the Test

- Test Standard AMCA Standard 500
- Test Set-up Figure 5.5
- Air Flow Measurement Figure 6.5
- Torque Applied to Dampers Data are based on a torque of 17.65Nm/m<sup>2</sup>(13.01in-lb/ft<sup>2</sup>) applied to close and seat the damper during the test  
Minimum torque : 20.59Nm/m<sup>2</sup>(15.18in-lb/ft<sup>2</sup>)
- Temperature when Testing 0°C ~ 49°C
- Tested Damper Size 305x305, 305x1,220, 610x610,  
914x914, 1,220x305, 2,997x914 (6 sets)
- Ratings Selected Maximum value of two times leakage tests in each direction of air flow and back pressure



\* Air volumes are based on the density of 1.2Kg/m<sup>3</sup>

■ The Trend of Leakage Rate Across the Damper

- Higher pressure difference across the damper gives more air leakage.
- Smaller damper at certain pressure difference across the damper has more air leakage per unit area.



APPLICATION

- For General use of Volume Control

FEATURES OF DYVS

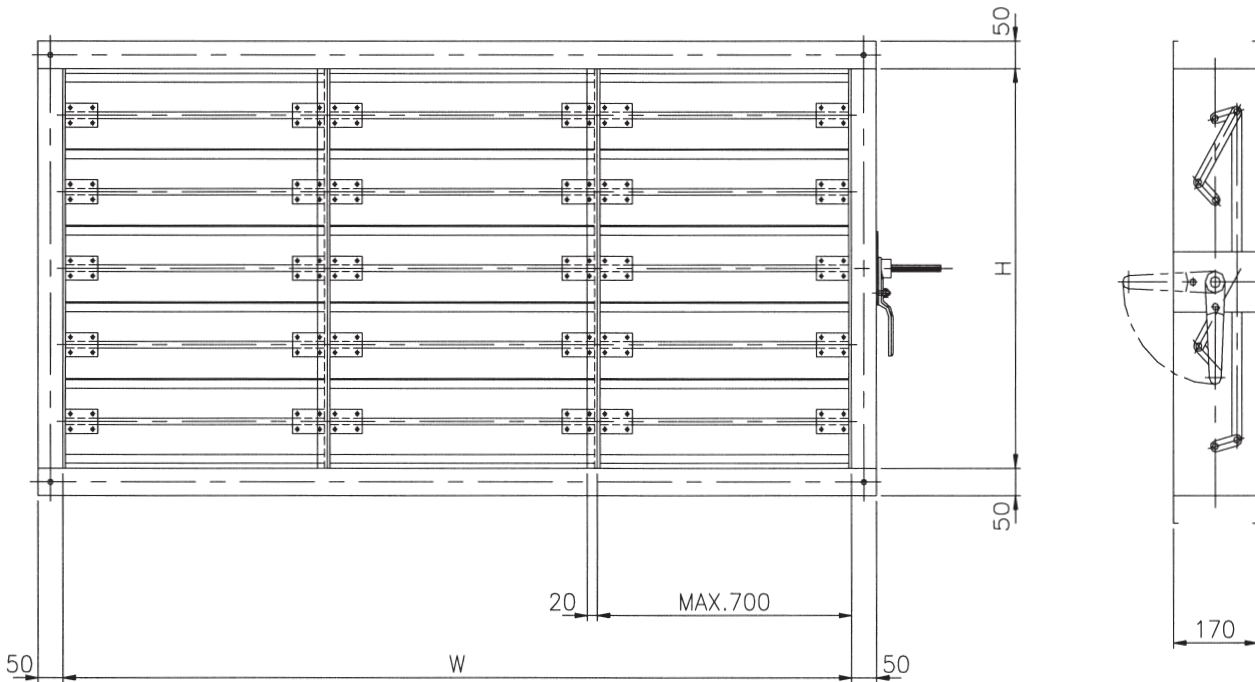
- Low Driving Torque  
All the materials used for link are non-corrosive.  
This gives smooth operation after long period of use.
- Continuous Activity for Better Quality  
Lots of tests by our own test facility gives plentiful information to improve the quality and performance.

STANDARD CONSTRUCTION

- Frame Channel shaped broken gal'v steel plate
- Blade Roll formed gal'v steel plate
- Link Stainless steel 304 and Aluminum
- Shaft Stainless steel 304, aluminum and zinc material
- Bearing POM (Polyacetal-Polyoxymethylene) material bushing



STANDARD DIMENSIONS



- Intermediate support frame will be placed at every maximum width of 700mm for strength.
- 50mm frame height for flange is standard. Please contact us for different height.

### ■ Standard Manufacturing Size

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	140 × Number of Blade + 30	2,270mm	170mm
Width (W)	170mm ~ 3,200mm	3,200mm	200mm

- The largest face area of this damper is 4.5m<sup>2</sup> per set.
- For larger dampers than upper standard size, please contact us.

### ■ Standard Height per Number of Blades (H mm)

No. of Blade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Height (H)	170	310	450	590	730	870	1,010	1,150	1,290	1,430	1,570	1,710	1,850	1,990	2,130	2,270

### ■ Shaft for Driving

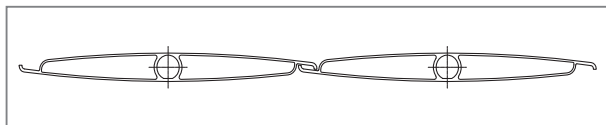
- Shaft size Hexagonal shape, Nominal Dimension 12mm
  - Protruded length
    - Standard protruded Length 100mm
    - For Manual and Electrical Actuator 120mm
    - For Pneumatic Actuator 150 mm
- (When exceptional length is required, please contact us.)

## APPLICATION

- For General Use of Volume Control
- For Air Handlers and for Duct

## FEATURES OF DYKS

- **Airfoil Shaped Blade for Low Leakage and Sound**  
Airfoil shaped blade apparently reduces the pressure drop and sound level across the damper.



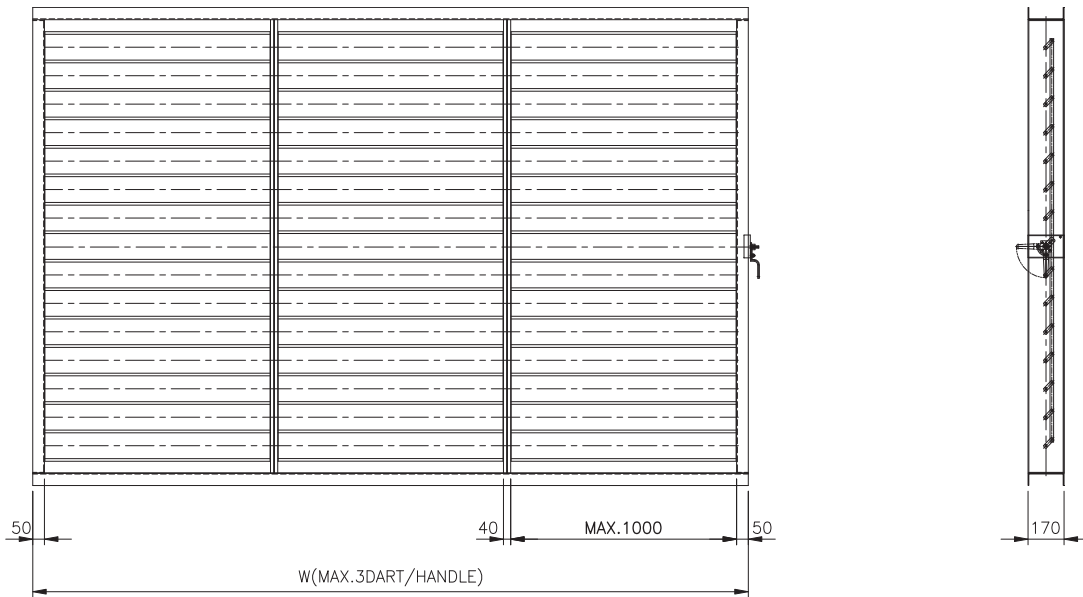
- **Round Shaped Stainless Steel Jamb Seal**  
Stainless steel material jamb seal is shaped round and has good elasticity. This gives smooth sliding and good contact between the blades and jamb seal.  
Low leakage rate is obtained by this good contact.
- **Good Persistence by Using Anti-corrosive Materials**  
Stainless steel, aluminum and PVC materials only are used to give good operation and to prevent corrosion after time elapsed.
- **Max. Temperature 200°C**  
(For higher temperature please contact us.)
- **Max. Pressure**  
150mmAq When damper shut-off  
(For higher pressure please contact us.)

## STANDARD CONSTRUCTION

- |                    |  |                       |                                 |
|--------------------|--|-----------------------|---------------------------------|
| ■ <b>Frame</b>     | Channel shaped extruded aluminum             | ■ <b>Corner piece</b> | Aluminum or Injection molded PC |
| ■ <b>Blade</b>     | Double skin airfoil shaped extruded aluminum | ■ <b>Finish</b>       | Aluminum material anodized      |
| ■ <b>Link</b>      | Stainless steel and aluminum                 |                       |                                 |
| ■ <b>Shaft</b>     | Stainless steel, aluminum and zinc material  |                       |                                 |
| ■ <b>Bearing</b>   | POM or STS                                   |                       |                                 |
| ■ <b>Jamb seal</b> | Stainless steel spring plate                 |                       |                                 |



STANDARD DIMENSIONS



- Intermediate support frame will be placed at every maximum width of 1,000mm for strength.
- 50mm frame height for flange is standard. Please contact us for different heights.

■ Standard Manufacturing Size

Description	Standard Dimensions	Max. Size	Min. Size
Height (H)	150 × Number of Blade + 30	2,430mm	180mm
Width (W)	180mm ~ 2,997mm	2,997mm	180mm

- The largest face area of this damper is 6.0 m<sup>2</sup> per set.
- For larger dampers than upper standard size, please contact us.

■ Standard Height per Number of Blades (H mm)

No. of Blade	1	2	3	4	5	6	7	8
Height (H)	180	330	480	630	780	930	1,080	1,230
No. of Blade	9	10	11	12	13	14	15	16
Height (H)	1,380	1,530	1,680	1,830	1,980	2,130	2,280	2,430

- For non-standard heights we use one or two eccentric blade(s) to avoid big air blockage.

■ Two or more damper handles are used on followings cases.

- In case that the face area of damper is larger than 3.5m<sup>2</sup>
- In case that the width of damper is longer than 2,997mm
- In case that damper has three or more intermediate supports

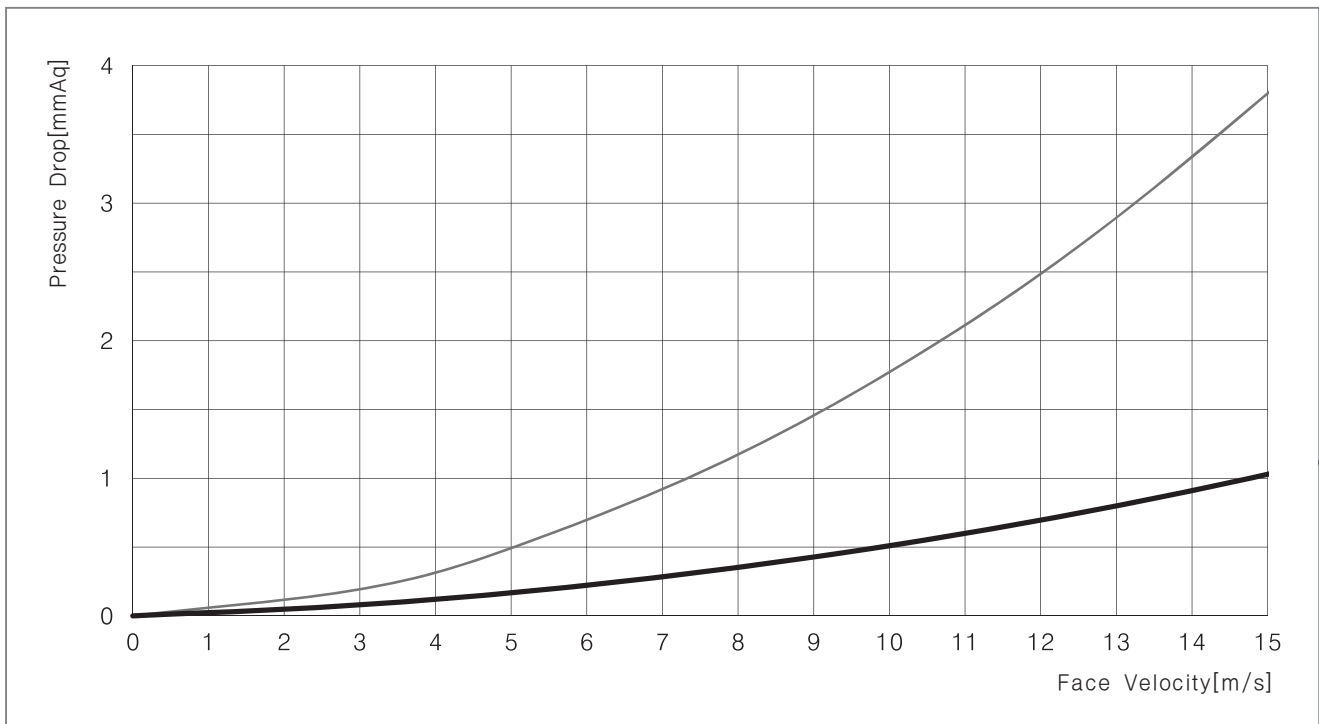
■ Shaft for Driving

- Shaft size Hexagonal shape, nominal dimension 12 mm
- Protruded length
  - Standard protruded length 120mm
  - For manual and electrical actuator 120mm
  - For pneumatic actuator 150mm
 (When exceptional length is required, please contact us.)

## PRESSURE DROP OF DYKS

### ■ Articles Related to the Test

- Test Standard                      AMCA Standard 500
- Test Set-up                         Figure 5.3
- Air Flow Measurement            Figure 6.5
- Temperature when Testing       0°C ~ 49°C
- Tested Damper Size               305×305, 305×1248, 610×610, 914×914, 1248×305 (5 set)



#### ○ How to use the chart

1. Read ratings on the **thick line** for the dampers of 610 mm or higher.
2. Read ratings on the thin line for the smaller height dampers than 610mm.

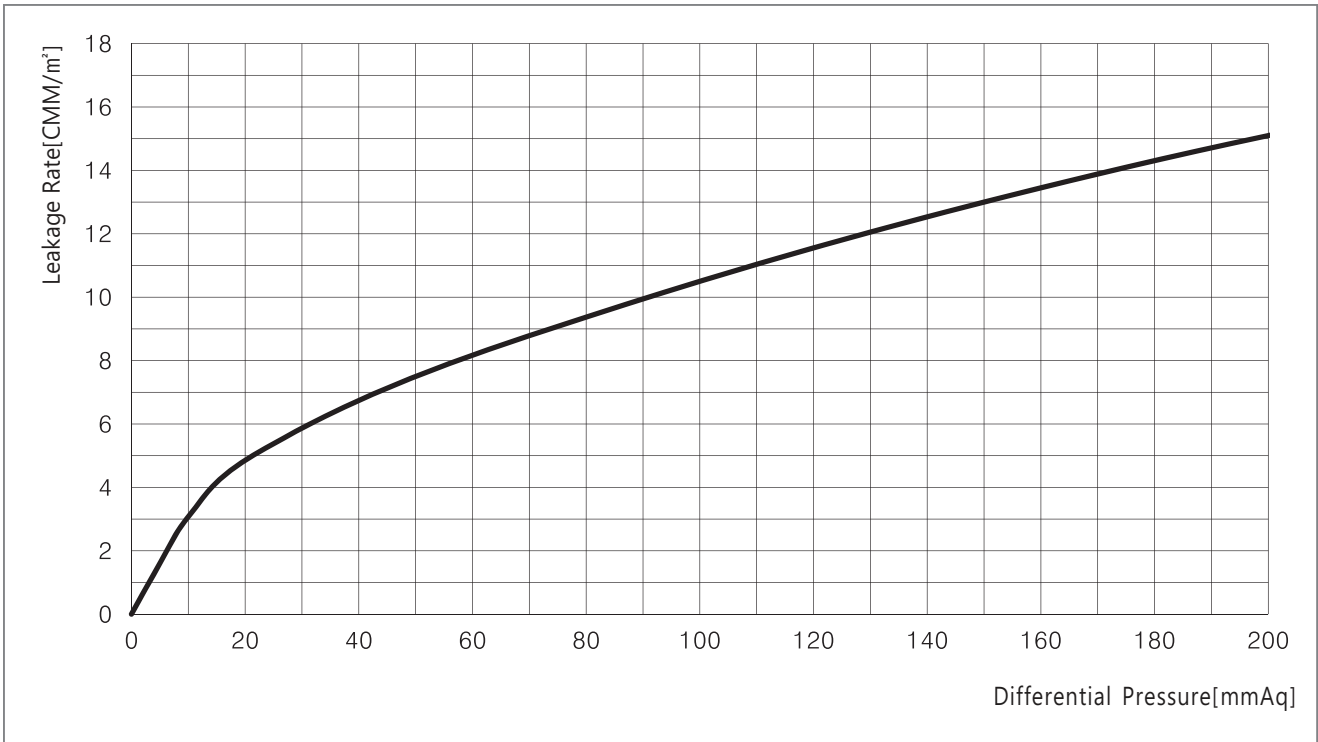
### ■ The Trend of Pressure Drop Across the Damper

- Dampers with higher face velocity have bigger pressure drop.
- Dampers with larger face area at a certain velocity have smaller pressure drop.
- Bigger difference between width and height makes bigger pressure drop in the dampers with same face velocity and area.

LEAKAGE PERFORMANCE OF DYKS

Articles Related to the Test

- Test Standard AMCA Standard 500
- Test Set-up Figure 5.5
- Air Flow Measurement Figure 5.5
- Torque Applied to Dampers Data are based on a torque of 15.88Nm/m<sup>2</sup> (11.71in-lb/ft<sup>2</sup>) applied to close and seat the damper during the test  
Minimum torque : 16.67Nm/ m<sup>2</sup> (12.29in-lb/ft<sup>2</sup>)
- Temperature when Testing 0°C ~ 49°C
- Tested Damper Size 305x305, 305x1,248, 610x610,  
914x914, 1,248x305, 2,997x914 (6 sets)
- Ratings Selected Maximum value of two times leakage tests in each direction of air flow and back pressure



\* Air volumes are based on the density of 1.2Kg/m<sup>3</sup>

The Trend of Leakage Rate Across the Damper

- o Higher pressure difference across the damper gives more air leakage.
- o Smaller damper at certain pressure difference across the damper has more air leakage per unit area.

### APPLICATION

- For Air Volume Control in Low System Pressure

### FEATURES OF DYR

- Low Driving Torque  
All the materials used for link are non-corrosive.  
This gives smooth operation after long period of use.

### STANDARD CONSTRUCTION

- Frame Painted steel or gal'v steel or stainless steel 304
- Blade Painted steel or gal'v steel or stainless steel 304
- Shaft Steel or stainless steel 304
- Bearing Brass material bushing

### STANDARD DIMENSIONS

- $\phi 100 \sim \phi 500$



## ROUND DAMPER [FOR HEAVY DUTY] [DYRH]

### APPLICATION

- For Air Volume Control in Heavy Duty System Pressure

### FEATURES OF DYRH

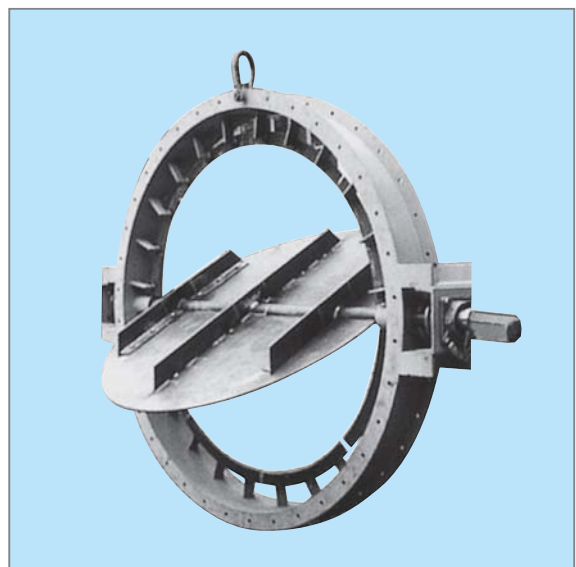
- Low Driving Torque  
All the materials used for link are non-corrosive.  
This gives smooth operation after long period of use.

### STANDARD CONSTRUCTION

- Frame Painted steel or gal'v steel or stainless steel 304
- Blade Painted steel or gal'v steel or stainless steel 304
- Shaft Stainless steel 304
- Bearing Brass material bushing or ball bearing

### STANDARD DIMENSIONS

- $\phi 200 \sim \phi 2,000$



## AMCA CERTIFIED RATINGS PROGRAM

(Extracted from : AMCA PUBLICATION 511)

■ **Name of Program** : CRP (CERTIFIED RATINGS PROGRAM FOR AIR CONTROL DEVICES)

■ **The Purpose of This Program**

The purpose of this AMCA Certified Ratings Program is to give the buyer, specifier and user assurance that published ratings of air control devices are reliable and accurate. At the same time the program assures manufacturers that the competitive ratings are based on standard test methods and procedures and are subject to check by an impartial authority.

■ **Product Line License Procedure**

1. Testing of Product(s) to be Licensed
  - At AMCA Lab. or an AMCA Accredited Lab.
  - Test product size : Refer to AMCA Publication 511
2. Application for a Product Line License
  - Submittal of license agreement with signature
  - Submittal of CRP-5 Form after completion
3. Data Submittal
  - Submittal of data with photo of test and drawings
4. Review of Submitted Data by AMCA Staff
  - AMCA Staff will review that submittal is in conformance.
  - If all the tests were not run in AMCA's lab. or an independent lab. to perform tests for AMCA, precertification test is required and this will be informed by AMCA.
5. Submittal of Proposed Catalogue Data and Review by AMCA Staff
6. Issuance of Notice of Acceptability for License
  - If submitted data is in conformance to the requirements of the Certified Ratings Program, the AMCA staff will send a "Notice of Acceptability"
7. Submittal of the Catalogue Proof Copy
8. Review of the Proof Copy by AMCA Staff
  - If proof copy is in conformance to the requirements of the Certified Ratings Program, the AMCA staff will notify the applicant of proof copy's acceptability.
9. Submittal of finished Catalogue
  - Applicant shall submit finished catalogue prior to release to the public.
10. AMCA Staff Review and Issuance of the License Appendix
  - AMCA Staff will review and if it is unchanged from the proof copy, the AMCA staff shall immediately issue an appendix to the License Agreement for the product line.

■ **Maintaining of Certified Ratings License**

1. Catalogues Change
 

If, at any time, the catalogue(s) containing Certified Ratings are changed, or revised in any way, the licensee shall submit a proof copy or the new catalogue to AMCA. When all requirement have been satisfactorily met, AMCA staff shall advise the licensee that the proof copy is acceptable. And applicant shall submit finished catalogue prior to release to the public.
2. Design Change
 

Any change to the geometric details with respect to all air passages shall be considered to be a new product.
3. Check Test or Licensed Product Line
 

Each licensed product line will be subjected to a check test within 36 months of license issue and thereafter under a continuing license to insure that the air performance of the as-manufactured unit remains consistent with the ratings originally certified.

■ **AMCA CRP SEAL**



[For Air Performance and Leakage]



[For Air Performance]



[For Air Leakage]



**MEMO**

# MEMO



## PRODUCTS

### **UNITS**

- AIR HANDLER
- BUILT-UP AIR HANDLER
- VENTILATOR
- ICE MAKER SYSTEM
  - ICE MAKER, STORAGE, CONVEYOR
- FAN FILTER UNIT

### **DAMPERS**

- LOW LEAKAGE DAMPER
- BACK DRAFT DAMPER
- HEAVY DUTY DAMPER
  - FOR SUBWAY, POWER PLANT, TUNNEL
- VOLUME CONTROL DAMPER
  - STEEL, AL
- ROUND DAMPER
- OTHER SPECIAL DAMPER

### **SUB-ASS'Y & ACCESSORIES**

- STEAM INJECTION HUMIDIFIER
- AUTO ROLL AIR FILTER
- ELIMINATOR
- LOUVER
- TURNING VANE
- ACCESS DOOR
- FILTER HOLDING FRAME



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