

# HDD series

Heavy Duty Damper 重型風門



# Content

## 目錄

- ▶ Designation ,Formula signs 閘門型號、定義 3
- ▶ SAFETY WARNING 注意事項 4
- ▶ Application and design 設計原理 5
- ▶ Features 特徵 6
- ▶ Standard Construction 標準結構 9
- ▶ Application 應用 10
- ▶ Performance Test 性能測試 13
- ▶ Specifications 規格說明 18







FLOWTECH CO., LTD. certifies that the HDD shown herein are 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 Programs. The AMCA Certified Ratings Seal applies to air Leakage and air performance ratings only.

陽鼎實業股份有限公司特此證明，此處所示HDD陽鼎重型風門已獲得加蓋AMCA印章的授權。所示額定值係根據AMCA出版物511所進行測試與程序確定，並符合AMCA認證額定值計畫的要求。AMCA認證額定值印章僅適用於空氣洩漏測試與壓損性能等級額定值。



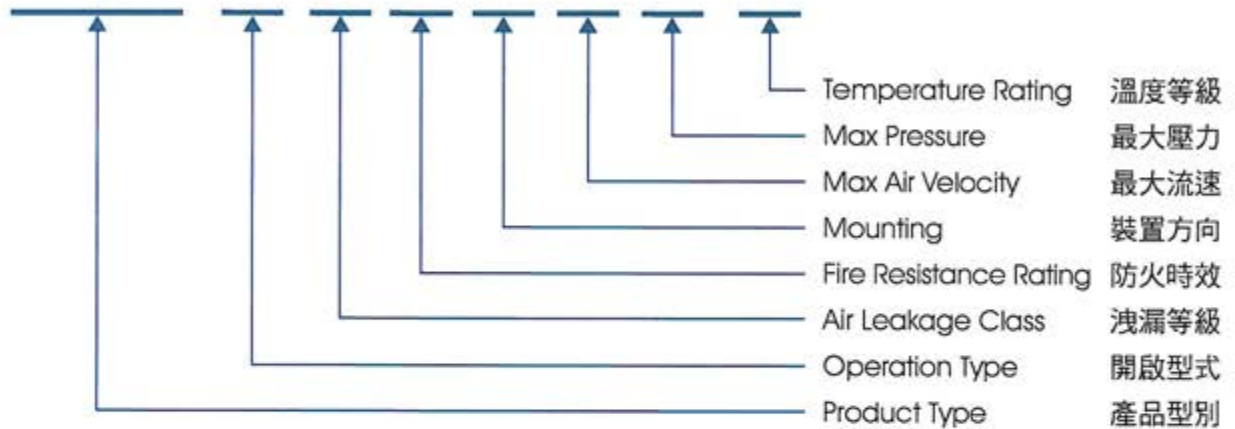
HDD-P (Parallel Blade)  
平行開啟

# HDD Series

## Heavy Duty Damper 重型風門

## Designation ,Formula signs / 閘門型號、定義

# HDD-P 1-3 V-3 D-D



Product Type 產品型別		Blade Type 開啟型式	
HDD	Heavy Duty Damper 重型風門	P	Parallel Blade 平行開啟
		O	Opposed Blade 八字對開
Air Leakage Class 洩漏等級		Fire Resistance Rating 防火時效	
0	None Air Leakage	0	None Fire Rating
1	Class I	1	1 hr
2	Class II	2	1.5hr
3	Class III	3	3hr
Mounting 裝置方向		Max Air Velocity 最大流速	
V	Vertical Mounting	1	10.2 m/s
H	Horizontal Mounting	2	15.2 m/s
		3	20.2 m/s
Max Pressure 最大壓力		Temperature Rating 溫度等級	
A	0.5kPa	A	74°C
B	1kPa	B	100°C
C	1.5kPa	C	121°C
D	2kPa	D	177°C
E	3kPa	E	233°C
F	6kPa	F	300°C

※ AMCA max test conditions AMCA 認證時的最大條件

※ Max Air Velocity 風速：20.2 m/s

※ Max Pressure 壓力：3kPa



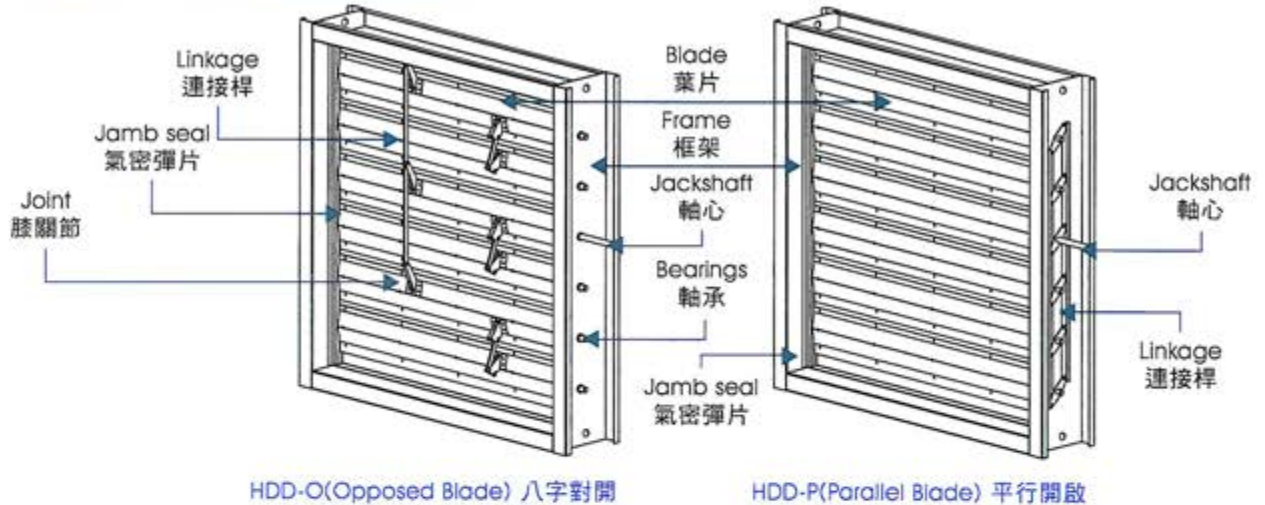
## Design Principle / 設計原理

FLOWTECH Heavy Duty Damper (HDD) is constructed by high quality galvanized steel or stainless steel moving parts. The bush is made of phosphor bronze material while the damper frames constructed of 2mm or thicker galvanized steel or SUS, 150 mm x 50mm or more cold-formed channels with full-welded corners or metallic plug joints. The single 1.5mm or thicker double-skinned airfoil blades (total 3mm or more) with special edge seals ensure low air leakage through the closed damper and handle hot gases. To minimize air leakage, stainless steel jamb seals are incorporated on the vertical frames of the dampers. The blade axles are made of 15mm diameter steel shafts and pivot on phosphor bronze bushes. Sleeves may be used if the dampers are installed within the wall or connected to the adjoining ductwork. The sleeve and retaining angles may be supplied in galvanized steel. The dampers may be powered externally by electric or pneumatic actuators. Upon customer's requests, Flowtech HDD can be ordered in full stainless steel construction. The HDD is qualified to 4,000 fpm (20.2 m/s) and 12 in. w.g. (3 kPa) and may be installed in, or adjacent to vertical walls or partitions, or horizontally in, or adjacent to floors or assemblies.

陽鼎重型風門使用高品質的鍍鋅鋼或不鏽鋼材質，軸承使用不鏽鋼或銅製的套筒式軸承或一般軸承，閘門框架使用2mm厚或以上的鍍鋅鋼或不鏽鋼，高50mm寬150mm以上的C型鋼全焊接組合或栓接組合而成。翼型葉片為1.5mm厚或以上的雙層板(合計至少為3mm)，以一特殊角度組合而成，可確保風門關閉時低洩漏量並可承受熱氣。另使用不鏽鋼氣密片裝置在框架與葉片間隙使洩漏更小，葉片軸使用15mm直徑的鋼或不鏽鋼軸心並安裝在不鏽鋼或銅製的套筒式軸承及一般滾珠軸承中，或其他特殊規格軸承。為了方便安裝於牆壁或風管有時會在風門外安裝套管，套管或固定角的鉸件皆使用鍍鋅鋼，風門可使用電動式與氣動式的驅動器，另外為了配合顧客需求，陽鼎重型風門可將外露的材質全部使用不鏽鋼材質來製作。重型風門可使用在20.2m/s (4,000 fpm)與3 kPa(12 in. w.g.)條件下，可垂直安裝在牆壁毗鄰位置或區劃隔間亦可水平安裝於樓地板間之應用。



## Standard Construction / 標準結構



HDD-O (Opposed Blade) 八字對開

HDD-P (Parallel Blade) 平行開啟

**Frame** : 150mm×50mm x2mm (6"× 2"x14ga) or more galvanized steel or SUS made.

**Blades** : single 130mm×1.5mm (5.1"× 17 ga) or more total 142mm×3mm (5.6"× 12 ga) or more galvanized steel or SUS

**Jackshaft** :  $\varnothing$  0.6" (15mm) or more steel or SUS Round shaft.

**Linkage** : HDD-P install in axis.  
HDD-O install in blades.

**Bearings** : SUS or copper alloy, sleeve-type or bearing.

**Seals** : Silicone blade edge seals and flexible metal mount.

**Minimum Size** : 24"× 24" (610mm×610mm)

**Maximum Size** : 48"× 48" (1220mm×1220mm)

**Multiple Size** : 94"× 94" (2440mm×2440mm)

**外 框** : 採150mm×50mm x2mm (6"× 2"x14ga) 以上的鍍鋅鋼或不鏽鋼的帽型溝槽。

**葉 片** : 由單層130mm×1.5mm (5.1"× 17ga) 兩片結合142mm×3mm (5.6"× 12ga) 以上鍍鋅鋼或不鏽鋼的雙層翼截形葉片。

**中 心 軸** :  $\varnothing$  0.6" (15mm) 以上的鋼或不鏽鋼圓軸。

**連 接 桿** : HDD-P 平行開啟型安裝於側邊框架。  
HDD-O 八字對開型安裝於葉片。

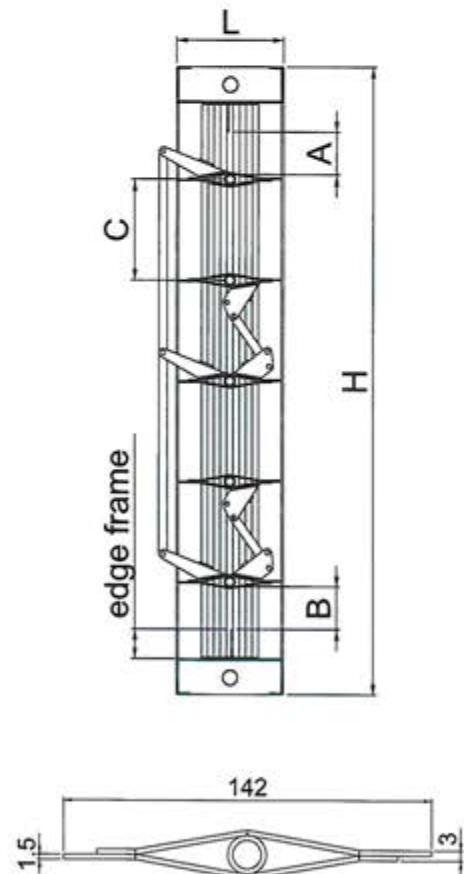
**軸 承** : 材質可為不鏽鋼或銅製的套筒式軸承，或一般軸承。

**氣 密** : 使用矽膠材質氣密條固定於葉片邊上並採彈簧片於葉片側邊與外框密合。

**最小尺寸** : 24"×24" (610mm×610mm)

**最大尺寸** : 48"×48" (1220mm×1220mm)

**最大組合尺寸** : 94"×94" (2440mm×2440mm)



雙層翼截型葉片 Airfoil blades  
此為最小規格 minimum size



## Application / 應用

Flowtech HDD are designed for vehicular and service tunnels, particularly for subways with long tunnels where mechanical ventilation becomes essential to supplement the natural ventilation from the piston effect of moving trains within tunnel. This is to ensure that environmental pollutant levels within subway tunnels and stations are maintained at acceptable levels. In addition, the dampers play a vital role in controlling the direction of airflow and migration of smoke within the tunnels during an emergency the ventilation activation as a result of fire within tunnel. The emergency ventilation allows rapid removal of smoke and heat within the tunnel to permit safe evacuation of the train occupants and the entry of fire fight personnel to the scene of fire.

陽鼎重型風門是針對交通工具及公路隧道的設計，尤其在地下鐵的長隧道，通風系統變得格外重要，因為火車在隧道內的運行可藉由活塞作用來保持隧道通風，如此才可保持地下鐵隧道和車站內的污染物指數在規定範圍內。另外風門在隧道發生火災或緊急狀況時，因為它能控制氣流與濃煙在隧道內的流竄，並掌握隧道內的火勢與熱氣的迅速移除，進一步保護隧道內的乘客安全撤離以及消防人員進入火場滅火的安全。

Figure 1 shows a typical application of the HDD in a subway tunnel with combined natural and forced ventilation. During normal operation, heavy duty damper 1 may be closed and heavy duty damper 2 is opened to allow the exhaust of contaminated air through the ventilated shafts. If necessary, for figure 2, heavy duty damper 1 will be opened to allow additional reverse flow fan.

圖1為典型重型風門在隧道內之應用其結合活塞作用的自然通風與風機運轉的強制通風。在正常操作情況下，若風門1關閉而讓風門2開啟，藉此讓汙染物經由通風豎井排出，如果必要的话，如圖2，讓風門1開啟後風機反轉使得外在新鮮空氣注入隧道內。

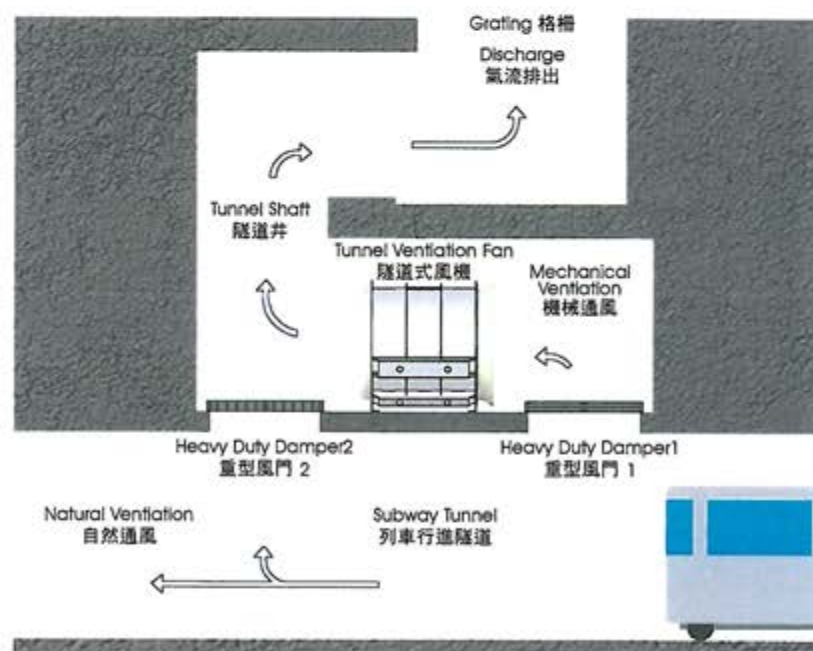


Figure 1 圖1

During emergency, when forced ventilation is required, heavy duty damper 2 will be closed and heavy duty damper 1 will be opened to remove the smoke and heat, or the supply of fresh air to the tunnel, depending on the locations of the stalled train and fire. The dampers on the ventilation shaft nearest to the stalled train will be opened for the supply of fresh air and those on the ventilation shafts on the opposite end of the stalled train will be opened for smoke removal.

遇到緊急狀況需要強制通風時，風門2關閉而風門1開啟，讓濃煙與熱氣移除，或提供新鮮空氣進入隧道，藉此將火車與火場區劃隔離，在不同區劃下可讓新鮮空氣加注到車廂位置附近，且排除濃煙所在區域。

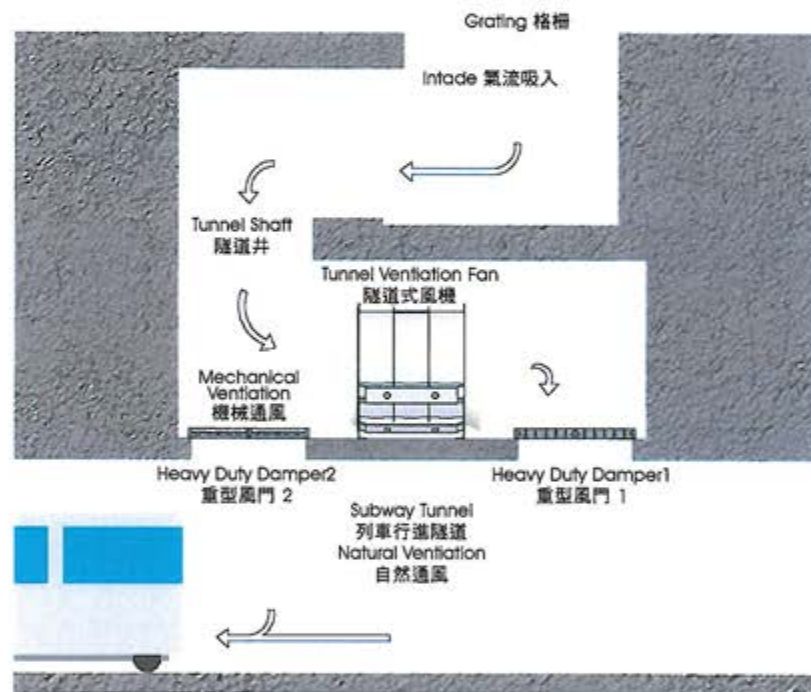


Figure 2 圖2



When interlocked with the tunnel ventilation system and integrated into the automation system for central control and monitoring, Flowtech HDD with externally-powered electric or pneumatic actuators serve as live support system for the subway tunnels. As all the tunnel ventilation dampers may serve the smoke extract function, the dampers and their actuators must be able to operate at elevated temperatures and have a safety feature that allow them to assume the fail-safe position during power interruption.

當中央控制端與監視系統連接隧道通風系統與自動控制系統時，陽鼎重型風門藉外部電源供應的電動式驅動器，或藉氣壓動作的氣動式驅動器在隧道通風系統中獨立運作，風門與驅動器必須承受在高溫的狀態下依舊能運作，並且能在電源中斷的情況下，仍然能使用故障安全防護裝置以保護人員的安全。

Standard Flowtech HDD are able to provide ventilation rate of 99.86 % (i.e. a leakage rate of  $14 \times 10^{-3} \text{ m}^3/\text{s}/\text{m}^2$ ), based on duct design velocity of 10.2m/s at 1000 pascals pressure differential across the closed damper or 99.99% (i.e. a leakage rate of  $8 \times 10^{-4} \text{ m}^3/\text{s}/\text{m}^2$ ), based on duct design velocity of 10.2 m/s at 100 pascals pressure differential across the closed damper. Please consult our factory or your nearest Flowtech representative for more information.

標準的陽鼎重型風門必須能保證99.86%的通風遮蔽率(洩漏值為 $14 \times 10^{-3} \text{ cmm}$ )，基本設定為管內風速10.2m/s、壓力為1000 pascals至風門關閉為止，或者是99.99%的通風遮蔽率(洩漏值為 $8 \times 10^{-4} \text{ cmm}$ )，基本設定為管內風速10.2 m/s、壓力為100 pascals至風門關閉為止。詳細資訊請和我們的製造工廠聯絡或是與就近的陽鼎代理商聯繫。

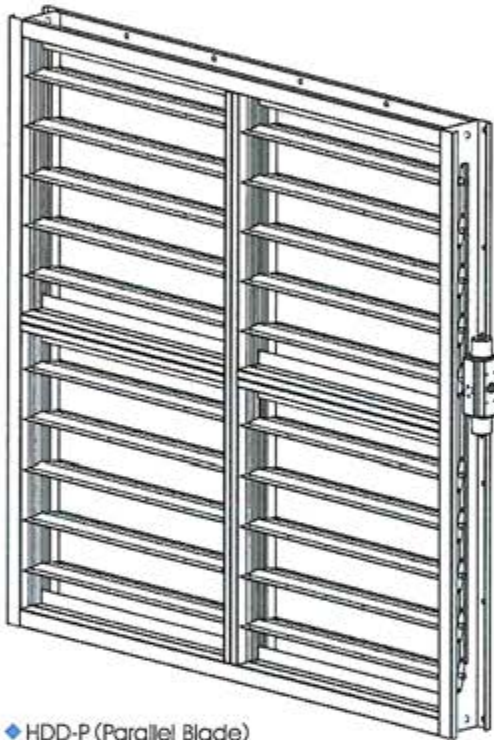


## Specifications for Heavy Duty Dampers / 重型風門規格說明

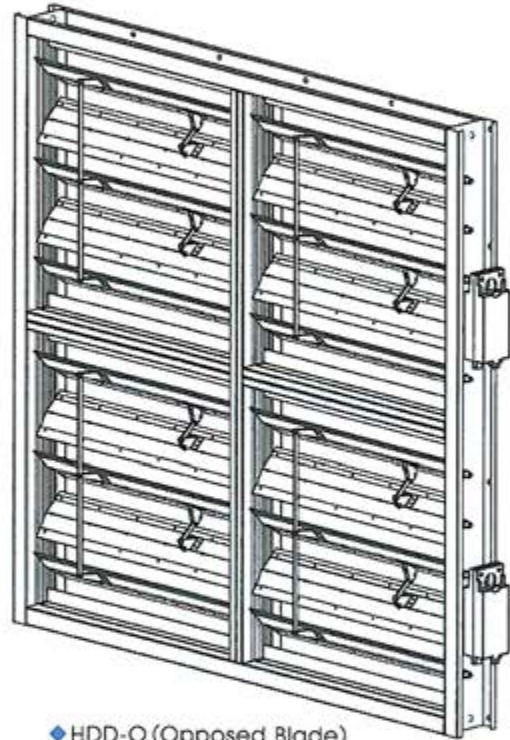
### ◆ Damper Type 風門型式

All dampers shall be rectangular with multiple blades. They shall be suitable for vertical and horizontal installations, but shall always be installed with blades horizontally. All dampers can be made into Parallel Blade or Opposed Blade.

所有風門型式皆為矩形多葉式，可適用於垂直式及水平式安裝，但通常以葉片水平放置安裝為主，所有風門也可製作成平行方式開啟與八字對開方式開啟。



◆ HDD-P (Parallel Blade)  
平行開啟



◆ HDD-O (Opposed Blade)  
八字對開

### ◆ Damper Modules 風門模組

Each damper shall be constructed of one or more modules. Each module shall not be greater than 2440 mm in any dimensions, and shall be a complete factory-assembled unit contained in a steel channel frame. Each damper of more than one module shall be assembled on site by bolting each module onto a steel framework. It shall be possible to remove and install any module without having to remove other adjacent modules.

每一具風門皆由多個風門模組構成。每一個模組尺寸皆不能大於2440mm，材質也必須符合工廠鋼材用料，每個風門模組組件都以螺絲接合於風門外框。每個組件與架構都可拆解與組裝而不需換下其他零組件。



- **Multiple Module Assembly 多模組組件**

While planning for the design of damper assemblies and installation method for large dampers, the pressure and the temperature under which the dampers will be exposed to must be taken into consideration. The typical multiple-modules arrangement for other specification, please contact our factory or your nearest Flowtech representative.

針對重型風門進行多模組風門組裝時，它的壓力及耐溫需求必須特別慎重的考量，典型的多模組方式與詳細資訊請和我們的製造工廠聯絡或是與就近的陽鼎代理商聯繫。

- **Damper Frame 風門框架**

The frame of modular damper shall be constructed of minimum 2 mm or more thick hot-dipped galvanized steel cold-formed channel sections or SUS, full-welded or skip welding at each corner. The depth of channel shall be such that the blades will not protrude outside the frame when they are fully-opened. Lifting lugs shall be provided on the frame of each module.

標準型風門外框最小板厚為2mm以上，鋼板材質為高品質的鍍鋅鋼或不鏽鋼，每個接點為全焊接或跳焊，在風門開啟狀態下葉片不會露出框架。每具閘門都備有吊勾。

- **Damper Blades 風門葉片**

Damper blades shall be of double-skinned airfoil cross-section. The width in the direction of airflow shall not exceed 200mm. The length shall not exceed 1200mm. Blades shall not extend beyond the damper frame when in the open position. Blade axles shall pivot on self-lubrication copper alloy sleeve-type, SUS sleeve-type or bearing, fixed to the vertical module frames. The gaps between the ends of the blades and the module frame shall be sealed by spring stainless steel jamb seals.

風門葉片為雙層板翼形截面，葉片截面寬度不超過200mm，葉片長度不超過1200mm，在風門完全開啟時，葉片不會超過風門框架的範圍。葉片軸安裝於不鏽鋼或銅製的套筒式軸承，或一般軸承亦可，並固定於垂直的風門框架上。葉片與框架間縫隙安裝不鏽鋼氣密彈片減少風門洩漏。

- **Dampers Actuators 驅動器**

Damper actuators shall be pneumatically or electrically operated, and mounted on the outside of the module frame. But the actuators installation can be suited to the environment where it is installed. Please consult our factory or your nearest Flowtech representative for inquiry.

風門驅動器是藉由氣動或電力來操作，並且安裝於風門框架外。但驅動器的安裝可視使用環境而定，有此需求，請和我們的製造工廠聯絡或是與就近的陽鼎代理商聯繫。

#### • Electric Type 電動型式

Electric actuators shall be drive by motor designed for DC24V or AC110/220V, 50/60 Hz supply.Can also choose non-Spring return damper actuator to modulation control,but this option does not provide the fail-safe feature during power interruption.

電動式驅動器動力是使用交流直流24V或交流110/220 V、50/60 Hz，亦可以選擇比例式驅動器讓風門做風量調節使用，但沒有故障安全防護裝置，於電力中斷時無法復歸。

#### • Pneumatic Type 氣動型式

The pneumatic option consists of double-acting actuator or single acting pneumatic actuator with spring return.Single acting pneumatic actuator provides a fail-safe feature in which it will return the damper to the safety position during power interruption. Double-acting pneumatic actuator may be used, but this option does not provide the fail-safe feature during power interruption.Pneumatic actuators shall operate with 6 to 8 bar clean supply air. The motor IP rating shall be suited to the environment where it is installed. Actuator shall be designed with sufficient margin of torque to operate under all the specified conditions. please inform the damper of the installation environment.

氣動式驅動器有分為彈簧復歸型氣動驅動器與雙邊進氣型氣動式驅動器可供選擇。當電源被切斷時，彈簧復歸型氣動驅動器具有故障安全防護裝置可使驅動器復歸到安全位置，但雙邊進氣型氣動式驅動器沒有故障安全防護裝置，於電力中斷時無法正確復歸。氣動式驅動器則是使用6~8 bar的壓力驅動，選用等級將視使用環境而定，請詳細告知閘門安裝環境。

#### • Performance Rating 性能等級

When fully opened, pressure loss through the damper shall not exceed 38 pascals at the air velocity of 10.2m/s.

當風門完全開啟時，壓損在10.2m/s的風速下低於38Pa。

When fully closed, leakage through any damper shall not exceed 0.05 m<sup>3</sup>/s per m<sup>2</sup> of face area at 1kPa differential pressure in either direction.

當風門完全關閉時，在1kPa的壓力下洩漏量不得超過0.05 cms。

When fully closed, the dampers shall withstand a maximum differential pressure of 6kPa in either direction without any permanent deformation or damage. Maximum blade deflection at this pressure shall not exceed 1 /180 of blade span.

當風門完全關閉時必須承受最大6kPa的壓力而葉片沒有任何永久變形與損壞，葉片在這種壓力下最大變形量不會超過總葉片長度的1/180



#### • **Dampers Operation 操作**

The dampers shall be controlled to move to either fully-closed or fully-opened positions. Intermediate positions are not required. When the actuator was selected in different types, pneumatic actuator is time taken to move to the fail-safe positions shall not exceed 30 seconds, while the electric actuator no more than 60 seconds.

風門的控制動作只有全開與全閉，沒有半開或半閉的狀態，當驅動器在不同類型被選用，氣動式驅動器故障安全裝置啟動至定位的時間不超過30秒，而電動式驅動器則不超過60秒。

#### • **Temperature Resistance 耐溫**

Each damper, shall be able to withstand a maximum temperature of 300°C for up to 60 minims without permanent distortion or buckling, and without damage to bearings or seals.

風門有經過溫度300°C/60分鐘的耐溫測試，而在此狀態下不會對風門結構造成變形或對軸承及氣密狀態造成損害。

#### • **Support Steelwork 支撐鋼構**

Supporting steel framework shall be supplied by the contractor and shall be designed to support the damper modules:

- to provide sealing against leakage
- to accommodate irregularities in the structural opening in which the damper is fitted
- to provide temperature resistance to the same standard as that of the overall damper.

支撐的鋼構框架及設計支撐的風門模組必須依照客戶需求提供。

- 提供氣密片阻絕洩漏
- 風門安裝固定之後必須開設維修孔方便進行維修
- 全部模組必須擁有相同的耐溫等級。

#### • **Suggested Specification 建議事項**

Furnish and install Damper as hereinafter specified where shown on plans or as described in schedules. Damper components (Frame and blades) shall be factory assembled by the Damper manufacturer. Damper sizes too large for shipping shall be built up by the contractor from factory assembled Damper sections to provide overall sizes required.

閘門提供安裝說明，方便確認及進行閘門安裝，閘門零件(框架及葉片)皆在閘門製作工廠內組裝完成，不會有半成品至現場組裝，若有超出標準尺寸的閘門需求，會由工廠端與客戶確認契約，若尺寸太大無法運送，將採多具閘門組裝方式進行，以達成客戶需求。

FLOWTECH



陽鼎實業股份有限公司  
FLOWTECH CO., LTD.

## THE FLOWTECH GROUP

---

- **TAIPEI 台北總公司**  
19F-5, No. 1, Baosheng Rd., Yonghe dist. New Taipei City 234, Taiwan  
234 新北市永和區保生路1號19樓之5  
Tel: +886 2-2232-8066 Fax: +886 2-2231-0285-6  
E-mail: ydc28066@ms36.hinet.net , flow.tech@msa.hinet.net  
<http://www.flowtech.com.tw/>
- **Factory 冬山廠**  
No. 658, Meilin Rd., De-an Village Dongshan Shiang,  
Yilan County Taiwan 269  
269 宜蘭縣冬山鄉得安村梅林路658 號  
Tel: +886-3-9612-449 Fax: +886-3-9614-413
- **Lab 實驗室**  
No. 102, Neihu 1st Rd., Dongshan Township,  
Yilan County, Taiwan 269  
269 宜蘭縣冬山鄉內湖一路102號  
Tel: +886-3-9612-449 Fax: +886-3-9614-413

CNo. : CAT - HDD - March 2013

AGENT(經銷商):

