

# Polyaire Plastic Damper Product Improvements

## Folded Steel Blade Motorised/Manual Dampers

### *Retail Product Brief*



**Motorised**



**Manual  
Locking  
Blade**

## Folded Steel Blade Motorised/Manual Dampers

Retail Product Brief

5/8/2005

### I. Motorised Dampers



Comparison between the Existing and New Motorised Damper		
	Polyaire Motorised Damper	
	Version 1	Version 2 (High Torque)
<b>Construction</b>	Plastic Damper Case Plastic Cam Plastic Blade and Shaft Crimped Foam	Plastic Damper Case Metal Cam Folded Metal Blade and Shaft Glued Foam
<b>Rated Torque</b>	1Nm	2.5Nm
<b>Motor</b>	50TYZ rated to 1Nm 50KTYZ rated to 3Nm	50KTYZ rated to 3Nm
<b>Voltage</b>	240VAV, 24VAC	240VAV, 24VAC
<b>Damper Motor Colour</b>	White, Blue, Green, Yellow	White, Blue, Green, Yellow

In certain applications, (for example, air velocity at 1500L/s with a 400mm barrel,) the load on the blade can be more than 1Nm. So version 1 with 1Nm of torque cannot provide the required torque, and very often the plastic shaft can be snapped as well.

**The New Motorised Metal Blade Damper** provides not only a large torque, but also the following advantages over the existing motorised damper:

- 1) Everything in the drive line is metal and has been rated to 2.5Nm.
- 2) Metal circular clip on the bottom end of the metal shaft supports the blade and prevents it from popping out of the barrel due to deformation of the plastic barrel, caused by load or excess heat.
- 3) Glued foam on the blade will not easily separate from the blade, so it will last longer, whereas existing crimped foam can easily fall off the blade and blow down the duct.

The folded metal blade will not deform under high air velocities  
- greatly reducing the load on the motor.

## Folded Steel Blade Motorised/Manual Dampers

Retail Product Brief

5/8/2005

### MOTORISED DAMPERS - RESEARCH

Here is a brief synopsis of the research done by Hong Du (Polyaire Senior Engineer) for the Marketing Department.

#### COMPARATIVE TESTING ON MOTORIZED DAMPERS 14/3/05

We conducted several tests over the last week. The results are summarised as follows:

Three blade styles were tested

- 1: The existing design plastic blade
- 2: The new Flat Metal Blade
- 3: The new Flat Blade further modified with longitudinal folds

##### 1) Existing plastic blade

Air velocity  $V = 7.5\text{m/s}$ , volume = 940 L/s  
400 mm damper  
Torque on the shaft = 1.1 Nm  
Blade was heavily deformed under the air flow.



**Conclusions:** The old damper motor has the torque rating of 1 Nm maximum, whereas the load on the shaft is more than 1 Nm. The elastic deformation of the blade under the air flow led to an excess load on the shaft and motor. This load will cause the failure of the plastic cam, shaft and motor in the old plastic blade design. This may explain why we had so many faulty products before.

##### 2) Metal blade WITHOUT fold (Flat Blade)

Air velocity  $V = 7.5\text{m/s}$ , volume = 940 L/s  
400mm damper  
Torque on the shaft = 2.5 Nm  
Metal blade was heavily deformed under the air flow.



**Conclusions:** Surprisingly, the flat metal blade has less rigidity than the plastic blade. Due to this, it has larger deformation than the plastic blade. As a result, the load on the shaft and motor is greater than the plastic blade.

##### 3) Metal blade WITH fold

Air velocity  $V = 11\text{m/s}$ , volume = 1380 L/s  
(Note: Air Velocity and Litres per second in this test is increased by over 40% and approximates the full load from a large A/C unit)  
400mm damper  
Torque on the shaft = 0.65 Nm



#### CONCLUSION:

**The Folded Metal Blade had no deformation under the air flow.**

It is obvious that the folding process greatly strengthened the blade and prevents distortion, even under extreme load. Rigidity of the blade plays an important role in creating load on the shaft and motor.

With folded metal blade, our damper motor should be able to work effectively even in some of the worst conditions. This conclusion is drawn from the fact that our new motor is rated 2.5 Nm and the greatly reduced torque (only 0.65 Nm) required to turn the folded metal blade against the air flow indicates that the motor will be operating well below its peak and hence, should be reliable and provide long use.

## Folded Steel Blade Motorised/Manual Dampers

Retail Product Brief

5/8/2005

### MOTORISED DAMPERS - RESEARCH

#### **MOTOR DURABILITY TEST**

The new Polyaire metal component motor was thoroughly tested by placing the motor under a controlled load of both 3Nm and 2.5Nm and operating the motor against this measured load.

#### **Tests under room condition with 3NM and 2.5NM load**

Results:

- 1) 1 motor failed with 3NM load after more than 1680 times  
(Gear in motor damaged due to constant load on the teeth of the gear)
- 2) 1 motor still works with 2.5NM load after 7680 times

Assuming that the damper is used 4 times a day (2 on and 2 off actions) and that Domestic A/C units are used from 20% to 35% of the year

20% = 73 days x 4 = 292 actions per year = **Over 26 years use and still running**

35% = 128 days x 4 = 512 actions per year = **15 years and still running**

## Folded Steel Blade Motorised/Manual Dampers

Retail Product Brief

5/8/2005

### 2. Manual Dampers



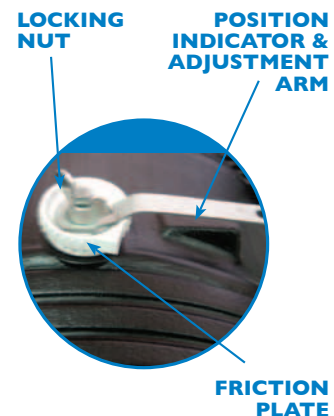
Comparison between the Existing and New Manual Damper		
	Polyaire Manual Damper	
	Version 1	Version 2 (High Torque)
<b>Construction</b>	Plastic Damper Case Plastic Blade and Shaft Crimped Foam	Plastic Damper Case Folded Metal Blade and Shaft Glued Foam
<b>Outside blade position indicator</b>	None	Metal indicator and adjustment bar
<b>Locking Mechanism</b>	Plastic wing nut on plastic threaded shaft with plastic friction	Steel wing nut on squared steel shaft with plastic friction pad
<b>Rated Torque</b>	1Nm	2.5Nm

#### The Polyaire Improvements

The advent of folded metal blades in the Polyaire Motorized Damper range gives us the opportunity to utilize these in the manual dampers as well.

While the new design is not a big step over the original design it possesses the following factors that increase both its usability and reliability.

1. Folded Metal blade (for strength and reliability)
2. Metal Shaft (for strength and reliability)
3. Metal Locking Nut (for strength and reliability)
4. Prominent blade position indicator arm for ease of use (Able to be seen from some distance in low light)
5. Metal Locking Washer at base (for strength and reliability)
6. Ability to adjust damper from outside the system



## Folded Steel Blade Motorised/Manual Dampers

Retail Product Brief

5/8/2005

### MANUAL DAMPERS - RESEARCH

Here is a brief synopsis of the research done by Hong Du (Polyaire Senior Engineer) for the Marketing Department.

24/3/05

**Tests on manual dampers** were conducted today. The results are listed as follows:

Air flow = 1190L/s,

Velocity = 24m/s,

D250 manual damper fitted with folded metal blade.

4 positions of the damper blades were tested under the above conditions, and the blade did not show any movement and obvious deformation under the load once fastening the wing nut to lock up.

#### Conclusion

From the test, we can draw the conclusion that the proposed manual damper with folded metal blade works well under high velocity air flow and should be suitable for the majority of uses. The locking mechanism, while basic, is effective and easy to use. The indicator lever is easy to see at a distance.

### OTHER MAJOR FEATURES

- Positive locking barbs that grab and hold the flex for easy taping
- Tough Plastic Barrel construction to protect the metal damper blade and resist installation bumps and drops
- Folded Metal Blade for extra strength
- Outside insulation that won't break down into the duct