

# Heavy-Duty/Industrial Dampers

HB, HBR, HBS, HBT, HBTR, HCD, HCDR, HPR, HSV, HSVR, HTD, HTG, HTGR, and HTOD Series



 **GREENHECK**  
*Building Value in Air.*

April  
2022

Greenheck dampers bring the same quality engineering and manufacturing that has earned the company its position as an industry leader. Aggressive research and development keep Greenheck a major player in the damper industry. Greenheck has the most UL classified dampers and largest selection of AMCA licensed dampers in the industry.

## In-House Testing

State-of-the-art laboratory and testing facilities are significant factors in Greenheck’s continuing business success. Its laboratory facility exclusively devotes development and testing time for damper and louver products to the latest versions of AMCA, ANSI, ASHRAE, UL, AG-1, and other industry standards of performance.



## Quick Build Delivery - Best Available

<b>5 Day</b>	HB-110, 120, 230, 240	HCD-120, 130, 135, 140, 220, 230, 240	HPR-120, 230, 330	
<b>10 Day</b>	HB-330, HBR-050, 150	HCD-330, 430, 530	HCDR-050, 150, 152, 250, 350, 351	HBS-330, 331

Quick Build damper products come only with a mill finish. Not all actuators used with Quick Build dampers are available as part of the Quick Build program. Please contact your Greenheck representative.

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Greenheck offers an extensive line of heavy-duty and industrial grade dampers designed to provide a solution for the following applications:

## Control and Isolation

The rectangular HCD and round HCDR products are designed for control and shut-off applications.

## Bubble-Tight/Isolation

Bubble-Tight/Isolation dampers are designed for applications where leakage is critical. The low leakage models HCD-221, HCDR-351, and bubble-tight HBT/HBTR series provide the highest levels of shutoff possible.

## Backdraft

The HB family of products is designed to prevent backflow in the ventilation system. Every HB unit is fitted with counterweights for easy operation.

## Pressure Relief

The HPR family of dampers is designed to prevent overpressurization and backflow of a system. Like the HB units, the HPR dampers are fitted with counterweights for easy operation and also pressure set weights for the proper start-to-open pressure desired.

## Tunnel Transit

Greenheck's HTD products provide air control solutions in enclosed transportation systems such as road tunnels and subway systems. Through extensive product testing, Greenheck can offer solutions for systems requiring compliance to NFPA 130, NFPA 502, BS 476, NYCTA, and more.

## Blast

In the event of an explosion, the HBS reacts to the shockwave by closing the damper, helping to contain the explosion and help protect equipment and personnel downstream of the blast.

## Tornado

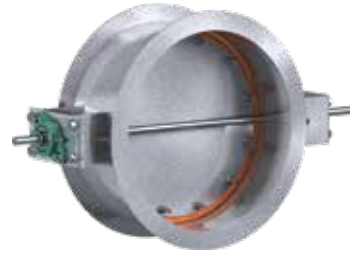
In the event of a tornado, the HTOD reacts to rapid pressure changes.

## Shock and Toxic Gas

Greenheck's HSV and HTG products are industrial shock and toxic gas dampers with a flanged frame. These dampers meet the requirements established by the U.S. Department of the Navy and comply with MIL-S-901D.

## Custom Products

Utilizing more than 65 years of heavy-duty and industrial damper engineering experience, Greenheck has designed and built custom dampers for many unique applications. Contact your local Greenheck damper expert for a custom solution.



HBTR series



HBT series



HCD series



HB/HPR series



HTD series



HBS/HTOD series

## Frame

The rectangular HCD models feature a heavy-duty frame fabricated from formed sheet metal C-channels.

Standard frame depths are 8 or 10 inches (203 or 254 mm). Material thickness can range from 14 ga. (1.9 mm) to .125 inch (3.2 mm), depending on air velocity, static pressure, damper size, and other variables unique to the application.

## Blades



3V

- Fabricated from a single thickness galvanized steel or stainless steel
- Three V-type grooves running the full length of the blade to increase strength
- ½ in. diameter pin axle (HCD-120); ¾ in. diameter axle (HCD-220)



Fabricated Airfoil

- Constructed of double-skin galvanized steel or stainless steel
- Hollow blade: HCD-130
- Insulated blade: HCD-135
- ½ in. diameter pin axle



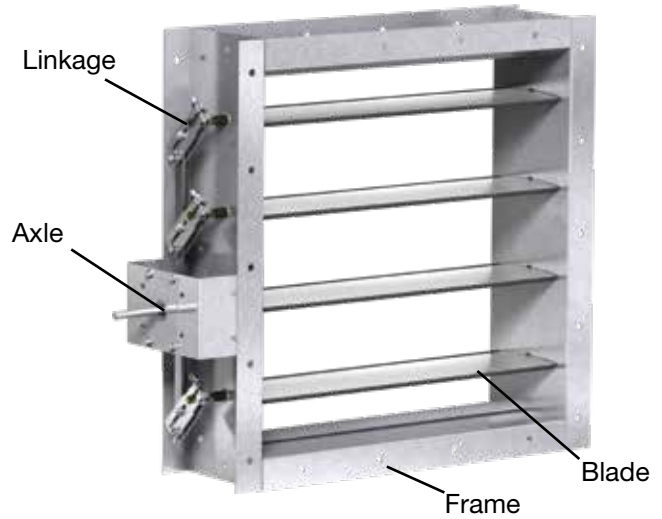
Extruded Airfoil

- Constructed of heavy-gauge extruded aluminum
- ¾ in. diameter axle (HCD-240)



Fabricated Airfoil

- Heavy-duty fabricated galvanized steel or stainless steel
- Bolted to the axle
- ¾ in. diameter axle (HCD-230 and HCD-330); 1 in. diameter axle (HCD-430 and HCD-530)



## Blade Seals

### TPE

- Mechanically fastened
- -10°F to 180°F

### EPDM

- Pressure activated adhesive
- Humid or dirty airstream applications
- -20°F to 250°F

### Silicone

- Pressure activated adhesive
- Good resistance to ozone, sunlight and oxidation
- -40°F to 400°F

### Fiberglass

- Mechanically fastened
- High temperature
- -60°F to 1000°F

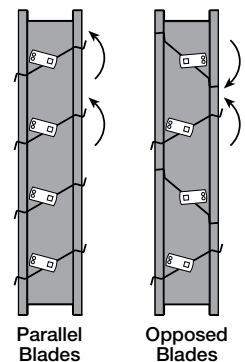
### Ceramic

- Mechanically fastened
- Extreme temperatures
- -60°F to 1200°F

## Parallel Versus Opposed Blade Operation

Greenheck control dampers are offered with either parallel or opposed blades. Each style has distinguishing characteristics regarding the type of operation required.

- **Parallel blade operation** - This configuration requires the damper blades to rotate in the same direction, parallel to one another. Parallel blade orientation is typically used when the damper operates in two positions, open or closed.
- **Opposed blade operation** - Adjacent damper blades rotate opposite one another under opposed blade configuration. Opposed blade configuration is typically used on dampers that modulate airflow.



# Selection Chart - HCD Series

		HCD-120	HCD-130	HCD-130-LE	HCD-135	HCD-220	HCD-230	HCD-230-LE	HCD-240	HCD-324	HCD-330	HCD-430	HCD-524	HCD-530
Pressure in. wg (kPa)	Maximum	8.5 (2.1)	8.5 (2.1)	8.5 (2.1)	8.5 (2.1)	15 (3.7)	15 (3.7)	15 (3.7)	15 (3.7)	25 (6.2)	25 (6.2)	35 (8.7)	45 (11.2)	45 (11.2)
	Velocity ft/min. (m/s)	3000 (15.2)	4000 (20.3)	4000 (20.3)	4000 (20.3)	4000 (20.3)	5000 (25.4)	5000 (25.4)	5000 (25.4)	5000 (25.4)	5000 (25.4)	6000 (30.5)	6000 (30.5)	6000 (30.5)
Maximum Temperature °F (°C)	Standard	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	600 (315)	250 (121)	250 (121)	600 (315)	250 (121)
	Optional	400 (204)	400 (204)	400 (204)	-	600 (315)	600 (315)	600 (315)	-	1000 (538)	600 (315)	600 (315)	1000 (538)	600 (315)
Blade Profile	3V	●	-	-	-	●	-	-	-	-	-	-	-	-
	Airfoil	-	●	●	Insulated	-	●	●	●	High Temp	●	●	High Temp	●
Blade Material	Galvanized	●	●	●	●	●	●	●	-	-	●	●	-	●
	Aluminum	-	-	-	-	-	-	-	●	-	-	-	-	-
	304SS	○	○	○	○	○	○	○	-	○	○	○	○	○
	316SS	○	○	○	○	○	○	○	-	○	○	○	○	○
	Painted	-	-	-	-	-	-	-	-	●	-	-	●	-
Frame	Galvanized	●	●	●	●	●	●	●	●	-	●	●	-	●
	304SS	○	○	○	○	○	○	○	○	○	○	○	○	○
	316SS	○	○	○	○	○	○	○	○	○	○	○	○	○
	Carbon Steel	-	-	-	-	○	○	-	○	-	○	○	-	○
	Aluminum .125 in. (3.2 mm)	-	-	-	-	-	-	-	○	-	-	-	-	-
	Painted	-	-	-	-	-	-	-	-	●	-	-	●	-
Frame Gauge	14	●	●	●	●	●	●	●	●	-	●	-	-	-
	12	○	○	○	○	○	○	○	○	-	○	-	-	-
	10	○	○	○	○	○	○	○	○	●	○	●	●	●
	7	-	-	-	-	-	-	-	-	○	-	-	○	-
Blade Seals	None	●	●	●	-	●	●	●	-	●	●	●	●	●
	EPDM	○	○	○	○	○	○	○	○	-	○	○	-	○
	Silicone	○	○	○	●	○	○	○	●	-	○	○	-	○
	Fiberglass	-	-	-	-	-	-	-	-	○	-	-	○	-
	Ceramic	-	-	-	-	-	-	-	-	○	-	-	○	-
Jamb Seals	None	●	●	●	-	●	●	●	○	●	●	●	●	●
	301SS	○	○	○	●	-	-	-	-	-	-	-	-	-
	316SS	○	○	○	○	○	○	○	○	●	-	○	-	○
	Fiberglass	-	-	-	-	-	-	-	-	○	-	-	○	-
	Ceramic	-	-	-	-	-	-	-	-	○	-	-	○	-
Axle Seals	None	●	●	●	●	●	●	●	●	-	●	●	-	●
	O-ring	-	-	-	-	○	○	○	○	-	○	○	-	○
	Double Gland	-	-	-	-	○	○	○	○	●	○	○	●	○
	Outboard Double Gland	-	-	-	-	-	-	-	-	○	-	-	○	-
Axle Bearings	Stainless Steel Sleeve	●	●	●	●	●	●	●	●	-	○	-	-	-
	External Bronze	-	-	-	-	○	○	○	○	-	●	●	-	●
	Outboard Bronze	-	-	-	-	○	○	○	○	-	○	○	-	○
	External Ball	-	-	-	-	○	○	○	○	-	○	○	-	○
	Outboard Ball	-	-	-	-	○	○	○	○	●	○	○	●	○
	Outboard Carbon	-	-	-	-	-	-	-	-	○	-	-	○	-

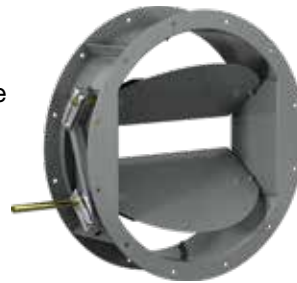
● = Standard, ○ = Optional

# Round Control Dampers - HCDR Series

## Round Control

To complement Greenheck's rectangular heavy-duty control dampers, the HCDR models offer an extensive range of round dampers for industrial use.

Solid flanges are welded around the circular frame, providing a rigid base to support the butterfly-style blade. For larger diameters, blades are reinforced with structural supports to ensure years of operation at elevated pressures and velocities.



HCDR-152



HCDR-050, 150,  
250, 350, 450

		HCDR-050	HCDR-150	HCDR-152	HCDR-250	HCDR-350	HCDR-450
Pressure in. wg (kPa)	Maximum	6 (1.5)	6 (1.5)	6 (1.5)	13.5 (3.4)	20 (5)	30 (7)
	Velocity ft/min. (m/s)	3000 (15.2)	4000 (20.3)	4000 (20.3)	5150 (26.2)	6400 (32.5)	7000 (36)
Maximum Temperature °F (°C)	Standard	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)
	Optional	-	400 (204)	400 (204)	600 (315)	1000 (538)	400 (204)
Frame and Blade Material	Painted	○	●	●	●	●	●
	Galvanized	●	-	-	-	-	-
	304SS	○	○	○	○	○	○
	316SS	○	○	○	○	○	○
Blade Seals	None	●	●	●	●	●	●
	EPDM	○	○	○	○	○	○
	Silicone	-	○	○	○	○	○
	Ceramic	-	-	-	○	○	-
	Fiberglass	-	-	-	○	○	-
Blade Type	Single Butterfly	●	●	-	●	●	●
	Two-Blade Fabricated Airfoil	-	-	●	-	-	-
Axle Seals	None	●	●	●	●	●	●
	O-ring	-	○	○	○	○	○
	Double Gland	-	-	-	○	○	○
	Outboard Double Gland	-	-	-	-	○	-
Axle Bearings	Stainless Steel Sleeve	●	●	●	-	-	-
	External Bronze	-	○	○	●	●	●
	Outboard Bronze	-	-	-	○	○	○
	External Ball	-	-	-	○	○	○
	Outboard Ball	-	-	-	○	○	○
	Outboard Carbon	-	-	-	○	○	-
Special Features	Mounting Holes	○	○	○	○	○	○
	Rolled Bar Stop	-	○	○	○	○	○
	Pin Stop	○	○	○	○	○	○
Paint Finishes	None	●	○	○	○	○	○
	Hi-Pro Polyester	○	●	●	●	●	●
	Industrial Epoxy	-	○	○	○	○	○
	High Temperature Silver	-	○	○	○	○	○
	High Temperature Flame Control	-	○	○	○	○	○

● = Standard, ○ = Optional

# Isolation Dampers - HCD-221, HCDR-351, HBT, and HBTR Series

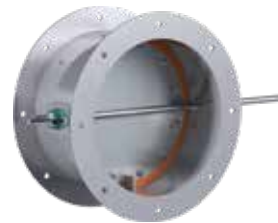
## Low Leakage - HCD-221 and HCDR-351

HCD-221 and HCDR-351 are isolation dampers that provide tight shutoff with very low leakage in HVAC or process control systems. Optional features allow the HCDR-351 the capability of being tailored to your application.

## Bubble-Tight - HBT and HBTR Series

The HBT-221 and HBTR series are bubble-tight dampers designed for isolation applications. Bubble-tight means the damper has the lowest possible leakage rating: zero. The silicone blade seal and double gland axle seals provide bubble-tight performance.

Every bubble-tight damper is leakage tested in accordance with AMCA 500-D Figure 5.8 before it leaves the factory to ensure bubble-tight performance.



HCDR-351



HBT-221



HBTR-151

		HCDR-351	HCD-221	HBT-221	HBTR-151	HBTR-451	HBTR-551
Pressure in. wg (kPa)	Maximum	20 (5)	10 (2.5)	10 (2.5)	10 (2.5)	30 (7.5)	30 (7.5)
Velocity ft/min. (m/s)	Maximum	6500 (33)	4000 (20.3)	4000 (20.3)	3900 (19.8)	6500 (33)	6500 (33)
Leakage cfm/ft <sup>2</sup> (cmh/m <sup>2</sup> )	Maximum	Less than 1.5 at 10 in. wg (27.4 at 2.5 kPa)	Less than 1 at 1 in. wg (18.3 at .25 kPa)	0	0	0	0
Temperature °F (°C)	Maximum	400 (204)	400 (204)	250(121)	250 (121)	250 (121)	250 (121)
Frame	Galvanized	-	●	-	-	-	-
	Painted	●	-	●	●	●	●
	304SS	○	○	○	○	○	○
	316SS	○	○	○	○	○	○
Blade Material	Galvanized	-	●	-	-	-	-
	Painted	●	-	●	●	●	●
	304SS	○	○	○	○	○	○
	316SS	○	○	○	○	○	○
Blade Seals	EPDM	○	○	-	-	-	-
	Silicone	●	●	●	-	-	-
	Silicone Rubber	-	-	-	●	●	●
Axle Seal	O-ring	●	●	-	-	-	-
	Double Gland	○	○	●	●	●	●
Axle Bearings	Stainless Steel Sleeve	-	●	-	-	-	-
	External Bronze	●	○	-	-	-	-
	Outboard Bronze	○	○	-	-	-	-
	External Ball	○	○	-	-	-	-
	Outboard Ball	○	○	●	●	●	●
Special Features	Mounting Holes	○	○	○	○	○	○
Paint Finishes	None	○	●	○	-	-	-
	Hi-Pro Polyester	●	○	●	●	●	●
	Industrial Epoxy	○	○	○	○	○	○
	Hi Temperature Silver	○	-	-	-	-	-
	Hi Temperature Flame Control	○	-	-	-	-	-

● = Standard, ○ = Optional

# Backdraft Dampers - HB series

Heavy-Duty/Industrial backdraft dampers prevent backflow at static pressures up to 20 in. wg (5 kPa) and velocities up to 6400 ft/min. (32.5 m/s).

All of Greenheck's heavy-duty backdraft dampers (HB series) use an edge-pivoting blade. Standard construction is the fabricated 2V blade, which is strengthened by two longitudinal Vs, designed for a tight seal when closed and low pressure drop when open. To complete Greenheck's model line, a fabricated or extruded aluminum airfoil blade is available for better performance at higher velocities and pressures.

For round duct applications, the HBR series uses a single round blade with a true round flanged frame.

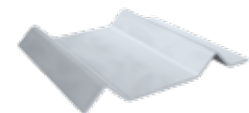
Counterbalance weights are mounted externally for easy adjustment and balancing in the field. The wide mounting flange can be ordered with bolt holes customized to match your requirements. A variety of options are available.

## Blades



Aluminum

- Constructed of heavy-gauge extruded aluminum
- Lower resistance to airflow and increased strength



Galvanized Steel 2V

- Fabricated from a single thickness galvanized steel or stainless steel
- Two V-type grooves running the full length of the blade to increase strength



Galvanized Steel Airfoil

- Fabricated double thickness galvanized steel or stainless steel
- Lower resistance to airflow and increased strength
- High velocity and pressure applications



Aluminum Airfoil

- Constructed of heavy-gauge extruded aluminum
- Lower resistance to airflow and increased strength
- High velocity and pressure applications



HBR-050



HB-110



HB-230



HB-240



# Quick Selection Chart for HB Series

		HBR-050	HBR-150	HB-110	HB-120	HB-230	HB-240	HB-330
Back Pressure in. wg (kPa)	Maximum	6 (1.5)	6 (1.5)	5 (1.2)	8.5 (2.1)	13.5 (3.4)	13.5 (3.4)	20 (5)
	Velocity ft/min. (m/s)	3000 (15.2)	4000 (20.3)	3900 (20)	5150 (26)	5150 (26)	5150 (26)	6400 (33)
Temperature °F (°C)	Minimum	-20° (-29°)	-20° (-29°)	-20° (-29°)	-20° (-29°)	-20° (-29°)	-40° (-40°)	-40° (-40°)
	Maximum	250° (121°)	250° (121°)	180° (82°)	250° (121°)	250° (121°)	250° (121°)	250° (121°)
Frame Material	Aluminum	-	-	○	-	-	○	-
	Galvanized	●	-	●	●	●	●	●
	304SS	○	○	○	○	○	○	○
	316SS	○	○	○	○	○	○	○
	Painted	○	●	○	○	○	○	○
Blade Profile	Aluminum Single Thickness	-	-	●	-	-	-	-
	Galvanized 2V	-	-	-	●	-	-	-
	304SS 2V	-	-	-	○	-	-	-
	316SS 2V	-	-	-	○	-	-	-
	Galvanized Airfoil	-	-	-	-	●	-	●
	Aluminum Airfoil	-	-	-	-	-	●	-
	304SS Airfoil	-	-	-	-	○	-	○
	316SS Airfoil	-	-	-	-	○	-	○
	Galvanized Round	●	-	-	-	-	-	-
	Painted	○	●	○	○	○	○	○
	304SS Round	○	○	-	-	-	-	-
316SS Round	○	○	-	-	-	-	-	
Blade Seals	None	●	●	○	○	○	○	○
	Vinyl	-	-	●	-	-	-	-
	TPE	-	-	-	●	-	-	-
	EPDM	-	○	-	-	○	○	○
	Silicone	-	○	-	-	●	●	●
Axle Bearings	Acetal w/stainless steel ball	-	-	○	○	-	-	-
	Galvanized Ball	●	-	●	●	●	●	-
	Stainless Steel Sleeve	-	●	-	-	-	-	-
	External Bronze	-	○	-	-	-	-	-
	External Ball	-	○	-	-	○	○	●
	External Galvanized Ball	-	-	-	-	-	○	-
Special Features	Spark A Resistance	-	-	-	-	-	○	-
	Spark B and C Resistance	-	-	-	-	-	○	-
	Mounting Holes	○	○	○	○	○	○	○
	Pin Stop	●	●	-	-	-	-	-
	Rolled Bar Stop	-	○	-	-	-	-	-
Paint Finishes	None	-	-	●	●	●	●	●
	Hi Pro Polyester	○	●	○	○	○	○	○
	Industrial Epoxy	-	-	○	○	○	○	○

● = Standard, ○ = Optional

# Pressure Relief Dampers - HPR Series

A pressure relief damper is a backdraft damper with adjustable start-open pressure. This damper is capable of maintaining a relatively constant pressure at various airflows and closes upon a decrease in differential pressure. Pressure relief



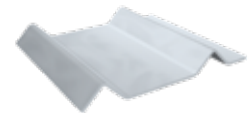
dampers do not immediately open fully upon reaching their start-open pressure. They maintain tight leakage to approximately 60% of the start-open pressure and have a relatively flat flow control somewhat above the start-open pressure. Counterbalance weights are mounted externally for easy adjustment and balancing in the field. HPR series dampers are flange frame mounted. These dampers handle velocities up to 6400 ft/min. (32.5 m/s).

A pressure relief damper is generally used as a safety or controlling device. In a duct section, it would be mounted on the duct to either relieve an unexpected overpressure or to relieve negative pressure downstream of a rapidly closing fire damper. It can also be used as a control device, such as opening to admit additional air when used in parallel to a direct-fired gas burner or to admit additional air into fume exhaust to maintain 3000 ft/min. (15.2 m/s) exhaust velocity.

Additional material and coatings selections are available in aluminum and stainless steel for corrosive or cleanroom applications.

## HPR-120

HPR-120 features galvanized steel 2V blade.



Galvanized Steel 2V

## HPR-230

HPR-230 features dual skin airfoil blades for added strength.



Galvanized Steel Airfoil

## HPR-330

HPR-330 features fabricated airfoil blades, same as the HPR-230.

		HPR-120	HPR-230	HPR-330
Back Pressure in. wg (kPa)	Maximum	5 - 8.5 (1.2 - 2)	6 - 13.5 (1.5 - 3.4)	13.5 - 20 (3.4 - 5)
Pressure Relief - in. wg (kPa)		.1 - 2 (.02 - .5)	.25 - 4 (.06 - 1)	.50 - 6 (.12 - 1.5)
Velocity ft/min. (m/s)	Maximum	5150 (26)	5150 (26)	6400 (33)
Temperature °F (°C)	Minimum	-20° (-29°)	-40° (-40°)	-40° (-40°)
	Maximum	250° (121°)	250° (121°)	250° (121°)
Frame	Galvanized	●	●	●
	304SS	○	○	○
	316SS	○	○	○
	Painted	○	○	○
Blade Profile	Galvanized 2V	●	-	-
	304SS 2V	○	-	-
	316SS 2V	○	-	-
	Galvanized Airfoil	-	●	●
	304SS Airfoil	-	○	○
	316SS Airfoil	-	○	○
Axle Bearings	Galvanized Ball	●	●	-
	External Ball	-	○	●
Blade Seals	TPE	●	-	-
	Silicone	-	●	●
	EPDM	-	○	○
	None	○	○	○
Special Features	Mounting Holes	○	○	○
	Paint	○	○	○

● = Standard, ○ = Optional

# Shock and Toxic Gas Dampers - HSV and HTG Series

Heavy-duty shock and toxic gas dampers meet the requirements of the United States Department of the Navy; MIL-S-901D Shock Tests, High Impact Shipboard Machinery, Equipment, and Systems (4130 Ser 501/1942); and Test Category: Medium Weight, Shock Grade A.

## HSV-230

HSV-230 is a rectangular heavy-duty industrial shock damper with a flanged frame.

## HSVR-250

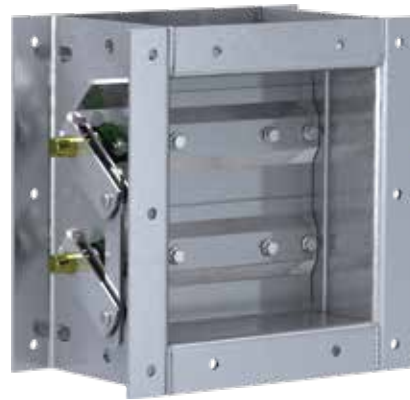
HSVR-250 is a round heavy-duty industrial shock damper with a flanged frame.

## HTG-230

HTG-230 is a rectangular heavy-duty industrial toxic gas damper with a flanged frame.

## HTGR-250

HTGR-250 is a round heavy-duty industrial toxic gas damper with a flanged frame.



HSV-230/HTG-230



HSVR-250/HTGR-250

		HSV-230	HTG-230	HSVR-250	HTGR-250
Pressure in. wg (kPa)	Maximum	15 (3.7)	15 (3.7)	13.5 (3.4)	13.5 (3.4)
Velocity ft/min. (m/s)	Maximum	5000 (25.4)	5000 (25.4)	4000 (20.3)	4000 (20.3)
Temperature °F (°C)		-60 to 250 (-51 to 121) Consult Greenheck for other temperatures.			
Frame Material	Galvanized	●	○	●	○
	304SS	○	○	○	○
	316SS	○	●	○	●
Blade Material	Galvanized	●	○	●	○
	304SS	○	○	○	○
	316SS	○	●	○	●
Axle Material	Plated Steel	●	○	●	○
	303SS	○	○	○	○
	316SS	○	●	○	●
Axle Bearing	External Bronze	●	●	●	●
Blade Seals	None	○	○	○	○
	EPDM	●	●	●	●
	Silicone	○	○	○	○
Jamb Seal	316SS	●	●	-	-
	None	○	○	-	-
Actuators	Manual Quadrant	●	●	●	●
	Schischek InMax-15-SF-S7	○	○	○	○
Special Features	Mounting Holes	●	●	●	●

● = Standard, ○ = Optional

Road and underground metro tunnels are some of the most challenging environments in the world. High humidity, dust-laden air, and limited access can make the installation and operation of ventilation systems problematic. However, these issues become insignificant in the event of an emergency. The dampers and fans that make up the ventilation system must operate when lives are on the line. Greenheck's tunnel-specific dampers, the HTD series, are designed to meet these challenges.

## Applications

Dampers in subway tunnels and transit systems serve three primary functions, depending on design of the ventilation system.

- **Pressure Equalization** - Dampers mounted in the side of the tunnel vent pressurized air in front of a train and reintroduce air as it passes. In single trackways, this air movement can be substantial.
- **Portal Intake and Exhaust** - Dampers at tunnel ends control air intake and emergency smoke exhaust in long tunnels without intermediate air supplies.
- **Emergency Fire/Smoke Control** - Dampers are spaced along the tunnel and can be remotely controlled to pressurize a tunnel section. This allows the safe egress of train/automobile passengers to an escape tunnel, while blowing fire and smoke away from the area. This damper also creates negative pressure in the area of the fire to vent smoke and gases.

## Construction

Greenheck's HTD series dampers begin with the same flange mount and channel style frame as the HCD line of products. Three blade profiles are offered: the HTD-630 is a fabricated airfoil blade, the HTD-636 is a fire-rated fabricated airfoil blade, and the HTD-640 uses an extruded aluminum blade. Several materials can be used to meet the requirements of each environment including galvanized steel, 304 or 316 stainless steel, or aluminum.

## Reliability

In compliance with NFPA 130 and 502, HTD models are tested in Greenheck's test facility for operation up to two hours at 482°F (250°C). HTD-636 has been tested in accordance to British Standard 476 for two hours at Warrington Fire. Our engineering staff has the experience to perform any additional test as required including the cyclic pressure test, mimicking the piston effect caused by passing trains.

## Maintainability

HTD dampers are designed to keep maintenance procedures simple and low frequency. The bearings on an HTD damper include low maintenance oil-impregnated, self-aligning, and self-lubricating options. Blades are designed for L/180 or L/360 deflection as required by specifications. Each axle is bolted to the damper blade allowing for easy removal if repair is needed.



HTD-640

# Tunnel Ventilation Dampers - HTD Series

		HTD-621	HTD-630	HTD-636	HTD-640
Pressure in. wg (kPa)	Maximum	24 (6)	24 (6)	24 (6)	24 (6)
Velocity ft/min. (m/s)	Maximum	4000 (20.3)	4000 (20.3)	4000 (20.3)	4000 (20.3)
Leakage cfm/ft <sup>2</sup> (cmh/m <sup>2</sup> )		Less than 4 at 12 in. wg (Less than 73 at 3 kPa)	8 at 4 in. wg (146 at 1 kPa)	8 at 4 in. wg (146 at 1 kPa)	Meets UL Class I at 12 in. wg (3 kPa)
Blade Deflection	Standard	L/180	L/180	L/180	L/180
	Optional	L/360	L/360	L/360	L/360
Frame	Galvanized	●	●	●	●
	304SS	○	○	○	○
	316SS	○	○	○	○
	9.5 in. (.4mm) Extruded Aluminum	-	-	-	○
Frame Gauge	14 ga. (2 mm)	○	●	○	○
	12 ga. (2.7 mm)	●	○	●	●
	10 ga. (3.5 mm)	○	○	○	○
	1/4 in. (6 mm)	○	○	○	○
	7 ga./188 in. (4.8 mm)	○	○	○	○
Frame Depth	8 in. (203 mm)	○	○	-	○
	10 in. (254 mm)	○	○	-	○
	12 in. (305 mm)	●	●	●	●
Blade Profile	Airfoil	-	Double Skin	Fire-Rated Double Skin	Extruded
	Double Skin w/Perimeter Seal	●	-	-	-
Blade Material	Galvanized	●	●	●	-
	Aluminum	-	-	-	●
	304SS	○	○	○	-
	316SS	○	○	○	-
Blade Thickness	16 ga. (1.5 mm)	○	○	-	-
	0.081 in. (2 mm)	-	-	-	●
	14 ga. (2 mm)	○	●	●	-
	12 ga. (2.7 mm)	●	○	○	-
	10 ga. (3.5 mm)	○	○	○	-
Blade Seals	Silicone	●	●	●	●
	Stainless Steel	-	○	-	-
Jamb Seals	316SS	-	●	●	●

● = Standard, ○ = Optional

## Test Certifications and Requirements

**NFPA 130** - The National Fire Protection Agency standard covers fire protection requirements for underground, surface, and elevated fixed guideway transit and passenger rail systems. This standard includes trainways, vehicles, vehicle maintenance, storage areas, and areas regarding life safety. Greenheck's tunnel transit dampers and actuators meet the rigorous requirements of NFPA 130.

**NFPA 502** - The National Fire Protection Agency standard covers fire protection and fire life safety requirements for limited access highways, road tunnels, bridges, elevated highways, depressed highways, and roadways located beneath airtight structures.

This standard establishes minimum requirements for each of the identified facilities. Greenheck's tunnel transit dampers and actuators meet the rigorous requirements of NFPA 502.

**BS 476 Part 20** - British Standard, BS 476 Part 20, is a fire test method for building materials and structures that has been historically used throughout the world to evaluate the fire-resistant performance of a damper in the event of a fire. The damper is mounted to the fire test chamber and burned up to two hours or four hours of operation. The test report, provided by a testing authority such as Warrington Fire, signifies that the damper can resist fire up to the hours indicated.

## Blast Dampers - HBS Series

Blast dampers are designed to protect against blasts and rapid pressure changes.

HBS-330 will close in the same direction as normal flow.

HBS-331 will close in the opposite direction as normal flow.

## Tornado Dampers - HTOD Series

Tornado dampers are designed to protect against tornadoes and instantaneous pressure changes.

HTOD-330 will close in the same direction as normal flow.

HTOD-331 will close in the opposite direction as normal flow.



HBS-330/430



HTOD-330

	HBS-330	HBS-331	HBS-430	HBS-431	HTOD-330	HTOD-331
Maximum Pressure	5.77 psi (40 kPa)	5.77 psi (88 kPa)	15 psi (103 kPa)	15 psi (103 kPa)	3 psi (20.7 kPa)	3 psi (20.7 kPa)
Maximum Velocity ft/min. (m/s)	6400 (32.5)	6400 (32.5)	4000 (20.3)	4000 (20.3)	6400 (32.5)	6400 (32.5)
Minimum Temperature °F (°C)	-40° (-40°)	-40° (-40°)	-40° (-40°)	-40° (-40°)	-40° (-40°)	-40° (-40°)
Maximum Temperature °F (°C)	250° (121°)	250° (121°)	250° (121°)	250° (121°)	250° (121°)	250° (121°)
Pressure Rise or Decrease	N/A	N/A	N/A	N/A	3 psi	3 psi

N/A = Not Applicable

## Bearings

Capable of operation in extreme temperatures, high pressure, high velocities and chemical or corrosive environments, Greenheck's bearing offering provides solutions for the most demanding applications.

### Acetal Bearing

- 316 stainless steel balls
- Polymer raceways and cages
- Offers excellent corrosion and chemical resistance for applications up to 180°F (82°C)



### Galvanized Ball Bearing

- Flanged housing, fabricated from galvanized steel
- Press fit into the damper frame
- Hardened, low-carbon steel balls
- Offers dependable operation for general purpose at temperatures up to 500°F (260°C)



### Stainless Steel Ball Bearing

- 316 stainless steel ball and raceway
- Cage is fabricated from acetal
- Housed inside of a 316 stainless steel flange that is bolted externally to the damper frame
- Offers excellent corrosion and chemical resistance for applications up to 180°F (82°C)



### Stainless Steel Sleeve Bearing

- Fabricated from 316SS
- Impregnated with an oil lubricant
- Bushing style bearing is press fit into the damper frame
- Offers low maintenance and excellent corrosion resistance and is recommended for applications with a continuous operating temperature of 400°F (204°C) or less



### Bronze Bearing

- Self-aligning spherical design bearing
- Contained inside a galvanized housing
- Oil-impregnated bronze sleeve
- Offers dependable operation for general purpose applications up to 400°F (204°C)



### Relubricable Ball Bearing

- Ideal for Heavy-Duty and industrial applications with high pressures or velocities
- Relubricable ball bearing features a flanged cast iron housing
- External grease zerks allow for easy relubrication of the bearing
- Bolted externally to the damper frame
- Capable of high radial loads
- Offers excellent operation in dirty applications; seals protect the bearings' balls from the environment



### Carbon Sleeve Bearings

- Designed for the most demanding industrial applications
- Carbon sleeve bearing is self-aligning and self-lubricating
- Flange mounted externally to the damper frame
- Sleeve portion is fabricated from carbon graphite
- Offers continuous operation at 1000°F (538°C)



### Custom Bearings

If an application requires a bearing other than the standard, Greenheck can easily provide a damper customized to specific bearing needs. See the temperature chart below for bearing options.

### Bearing Placement

#### External Bearing

- External mount directly to the damper's frame
- Recommended for temperatures 400°F (204°C) or less
- Heat conducts through the damper frame and into the bearing, with elevated airstream temperatures
- In extreme temperatures, lubricants inside of the bearing can leak causing the bearing to seize



#### Outboard Bearing

- Recommended for temperatures above 400°F (204°C)
- Bearings located away from the hot damper frame



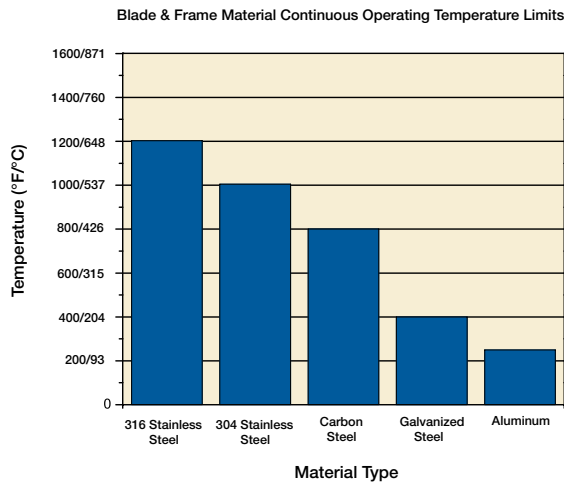
Bearing Type	Minimum Airstream Temperature °F (°C)	Maximum Airstream Temperature °F (°C)**
Acetal	-40° (-40°)	180° (82°)
Galvanized Ball Bearing	-40° (-40°)	500° (260°)
Stainless Steel Ball Bearing	-40° (-40°)	250° (121°)
Stainless Sleeve Bearing	-40° (-40°)	400° (204°)
Bronze Bearing	-40° (-40°)	600° (316°)
Relubricable Ball Bearing	-40° (-40°)	600° (316°)
Carbon Sleeve Bearings	-40° (-40°)	700° (371°)

\*Consult the factory for higher temperatures.

\*\*Temperature ratings are based on appropriate shaft seal and bearing location arrangement.

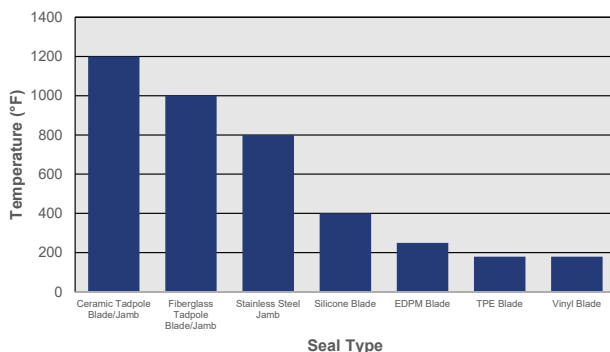
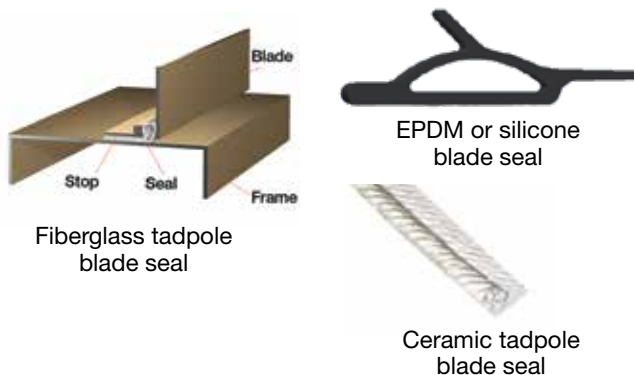
## Blade and Frame Material

Greenheck's HCD series and HCDR series are limited to 1000°F (538°C). Temperatures above this limit require special consideration, please consult the factory. The chart below displays these limits.



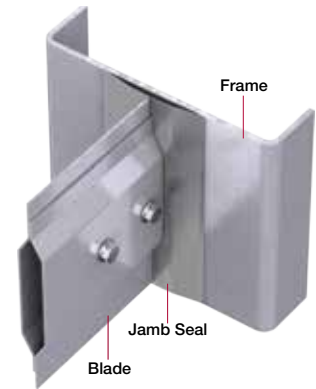
## Blade Seals

Greenheck offers several options for low leakage performance. EPDM, silicone, fiberglass tadpole, or ceramic tadpole blade seals are available. At temperatures above 400°F (204°C), fiberglass or ceramic blade seals are required. Reference the chart below for the temperature limitations.



## Jamb Seals

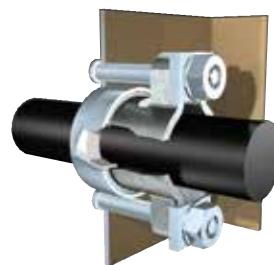
Stainless steel jamb seals are constructed of flexible compression type material to prevent air from leaking between the ends of each blade and frame. The chart at the bottom left shows the continuous operating temperature limitations of blade and jamb seal.



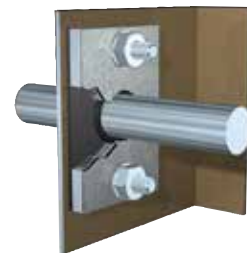
## Axle Seals

Two axle seal options are available to ensure that the medium in the duct stays in place. An o-ring seal is ideal for clean air applications. The double-gland stuffing box uses a packing gland impregnated with Teflon® or carbon/graphite for a superior seal. The double-gland stuffing box is recommended for clean air, contaminated air and high temperature.

At temperatures above 400°F (204°C), double gland axle seals are required. The double gland axle seals reduce leakage where the axle penetrates the damper frame. Leakage around the axle tends to jet out toward the bearing and can overheat if not controlled. Double gland axle seals reduce but may not eliminate this leakage.



Double gland stuffing box



O-ring axle seal

## Paint Finishes

Greenheck offers a wide variety of standard paint finishes and colors:

- Hi-Pro Polyester
- Industrial Epoxy
- Hi Temperature Silver
- Hi Temperature Flame Control

Contact the factory for a special finish.



## Limit Switches

Limit switches are available on many actuators and can be installed separately to provide positive blade indication. Limit switch packages are offered with NEMA 4, 4X, 7, or 9 housings for hazardous environments.

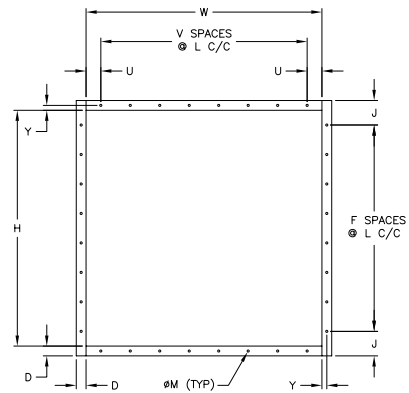


Limit Switch

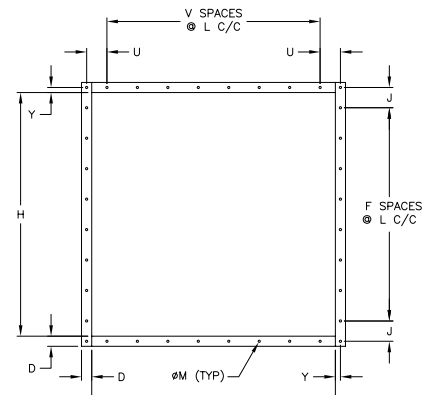
## Mounting Holes

Mounting holes can be added as an option to the damper flanges for ease of installation.

- Standard - Hole pattern uses equal spacing on all flanges.
- Corner Holes - This mounting pattern places holes directly on the four corners of the damper flanges. Holes between these are then equally spaced by the entered mounting hole spacing.



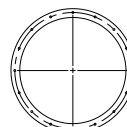
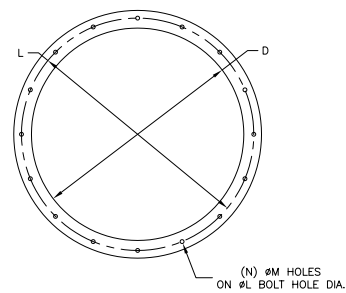
Standard Mounting Hole Pattern



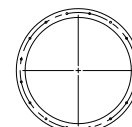
Standard Mounting Hole Pattern with Corner Holes



Proximity Switch



Parallel on Centerline



Straddle on Centerline

Greenheck's actuator offering includes hundreds of models from dozens of manufacturers. An extensive selection of actuator types, enclosures, power supply, controls, and operation provides thousands of actuator variations.

## Manual Operators

- ✓ Manual quadrant
- ✓ Chainwheel
  - 10 feet is standard
- ✓ Handwheel

## Electric Actuator Checklist

- ✓ Power supply
  - 24 VDC, 24 VAC, 120 VAC, and 230 VAC
  - Frequency: 50Hz or 60Hz
- ✓ Operation
  - Spring return (spring will drive damper to original starting point)
  - Power open or power close
- ✓ Operating mode
  - Two-position (damper position is either open or closed)
  - Modulating (damper position determined by modulating control signal)
  - Floating (damper can be stopped anywhere between open and closed)
- ✓ Control signal (for modulating only)
  - 2-10 VDC or 4-20 mAdc
- ✓ Fail direction (for spring return only)
  - Open or closed
- ✓ NEMA enclosure
  - 1, 3, 4, 4X, 7, or 9 (specify one per application)
- ✓ Accessories
  - Auxiliary switches

## Pneumatic Actuator Checklist

- ✓ Power supply
  - 80 psi
- ✓ Operation
  - Spring return (spring will drive damper to original starting point)
  - Power open or power close
- ✓ Operating mode
  - Two-position (damper position is open or closed)
  - Modulating (damper position determined by modulating pressure signal)
- ✓ Fail direction (for spring return only)
  - Open or closed
- ✓ Control signal (for modulating only)
  - 3-15 psi
  - 4-20 mAdc
- ✓ Accessories
  - Solenoid valve
  - Positioner



Manual Quadrant



Electric



Pneumatic

Many accessories are available with each actuator selection.

## Limit Switches

Limit switches are available to provide feedback and positive blade indication. Some actuators have the limit switches incorporated within the actuator, providing conformity between the actuator and position display.



Limit Switch

## Manual Override

Actuators can be fitted with a manual override in case of a loss of power or air pressure. The override allows the damper to open or close using a handwheel or manual quadrant in an emergency.



Electric Actuator with Manual Override

## Heater and Thermostat

A heater and thermostat can regulate the actuator temperature and prevent condensation from forming on the electrical components.

## Pneumatic Accessories

Greenheck offers several options to control pneumatic actuators. For two-position operation, a solenoid valve (3-way or 4-way, depending on actuator operation) can be mounted directly to the actuator in various voltages. Modulating pneumatic actuators use a positioner with a 3-15 psi control signal to control blade position. A pneumatic positioner can also be fitted with an I/P converter, allowing a 2-10 Vdc or 4-20 mAdc control signal input.



Position Indicator

## Enclosure

Consider the actuator's enclosure rating when selecting an electric actuator, especially if installing it in a wet, dirty or hazardous location. NEMA provides standards for different types of enclosures. Consult the latest edition of NEMA Standard 250 to determine the appropriate enclosure for your application.

- **NEMA 1** - General purpose enclosure appropriate for indoor applications where there is exposure to dust.
- **NEMA 4** - Appropriate for outdoor applications, this enclosure protects against dirt, dust, direct splashing, and a hose down.
- **NEMA 4X** - This enclosure provides the same protection against dirt, dust and moisture as the NEMA 4, but also provides added protection against corrosive agents.
- **NEMA 7** - The enclosure is for hazardous locations per NFPA 70, Class 1, Groups A, B, C, or D.<sup>1</sup>
- **NEMA 9** - This enclosure prevents the ignition of combustible dust.

Less common enclosure ratings including ATEX, IEC and other NEMA enclosures are available.

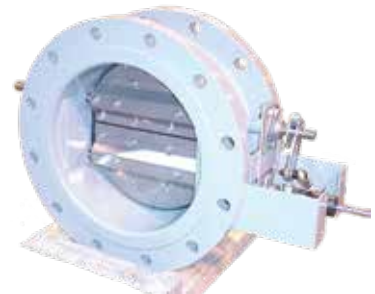
<sup>1</sup>NEMA 250-2003

From wastewater treatment plants to boiler stacks, Greenheck heavy-duty and industrial dampers are found in applications throughout the world. Building owners and engineers rely on Greenheck to provide not only a product but also the knowledge and experience to solve today's industrial challenges. Below are examples of how Greenheck has delivered value to our customers through our industrial solutions.

**Scrubber System** – Greenheck developed this damper to resist hazardous particles inside an air scrubber. To give the product proper corrosion resistance, both the inside and outside of each type of 316 stainless steel airfoil blade were coated with Teflon® S. The frame, axles, linkage, and all hardware were also made of type 316 stainless steel. O-ring axle seals were used to prevent leakage out of the duct and into the atmosphere.



**Nuclear Waste Site** – To meet the mounting requirements at a nuclear waste site, 150-pound weld flanges (per ANSI B16.5) were integrated into the frame of this isolation damper. In addition, two opposed blades were used to prevent the blade from extending beyond the edge of the frame when the damper was opened.



**Dust Collection System** – At 110 inches (2794 mm) diameter, this damper was built for a massive industrial dust collection system. Greenheck engineered the blade to withstand static pressure differences over 20 in. wg (5 kPa) when closed. A single actuator was used to drive the damper, providing over 11,000 in. lbs. (1243 N•m) of torque.



**Underground Mining** – This job required dampers to withstand snow and temperatures down to -40°F/C. Greenheck furnished HCD-240s with a Jamesbury actuator and custom-designed covers for the jamb and actuator to withstand the elements. Knockouts were provided on the actuator cover to make the pneumatic hookup access easier at the jobsite. Customer-specified bolt hole patterns were provided on the frame.



**Furnace Exhaust** – Greenheck developed a special high-temperature damper, capable of continuous operation at 1200°F (649°C). The special high-temperature blade was designed to minimize warping through efficient heat transfer across its profile. To meet the leakage requirements, Greenheck used a ceramic blade and jamb seal to provide tight shutoff when closed.



**Rolling Mill Exhaust** – Greenheck developed this damper to be placed in the exhaust system of a rolling mill. It features a fully seal-welded frame and axle seals, which work to achieve a leakproof design of the mist carried away by the exhaust duct system. A central bearing lubrication station was provided for easy access to the greasable bearings located behind the linkage pinch guards.



**High-Temperature Exhaust** – Several high-temperature (1200°F+) round 316 stainless steel control dampers were designed for use in multiple branches of an exhaust system. Isolation of individual branches was required, so high-temperature seals were added to minimize leakage. Outboard pedestal axle seals were provided to allow for insulation to be placed around the damper without burying the components causing overheating of those components.



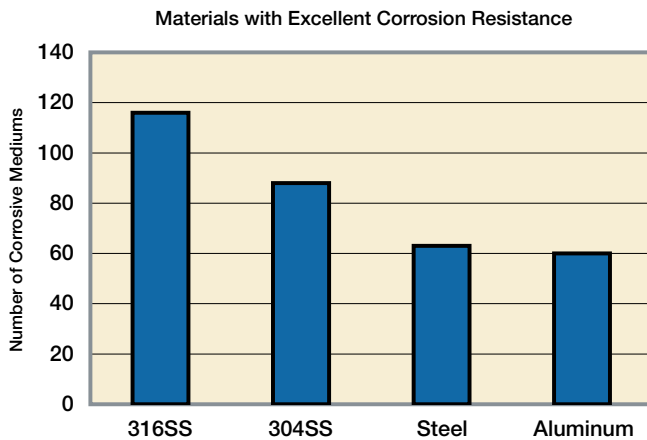
**Hospital System** – Greenheck had the challenge of designing large bubble-tight dampers for a hospital system where low leakage was critical to contain potential contaminants. The eight 28 inch x 78 inch dampers needed to recirculate air in an exhaust fan section while maintaining zero leakage. The dampers required special actuator mounting with the ability to install the actuators on the face of the dampers. All eight bubble-tight dampers were tested before shipment per AMCA 500 & ASME AG-1 Class 0A. Testing certificates were shipped with the dampers.



Greenheck is the first manufacturer to have a complete line of dampers made from all 316 stainless steel material as a standard product offering. This line of severe environment dampers offers an excellent corrosion-resistant option for a variety of applications:

- Paper Mills
- Wastewater Treatment Plants
- Natatoriums
- Laboratories
- Coastal Locations
- Maritime
- Computer Clean Rooms

When tested against 140 different corrosive mediums, 316 stainless steel received an excellent rating for over 115 of those mediums.



## Models Available with 316SS Option

Backdraft dampers: HB-120, 230, 240, and 330

Bubble-tight dampers: HBTR-151, 451, 551, and HBT-221

Industrial control dampers: HCD-120, 130, 220, 221 230, 330, 430, 530, HCDR-150, 250, 350, 351, and 450.

## Spark Resistant Construction

AMCA Standard 99-0401 defines fan material performance requirements for operation in hazardous environments. Greenheck dampers meet the spirit of this standard as follows:

Class A - All materials in the airstream must be nonferrous. Greenheck modifies the damper models HCD-240 and HB-240 with aluminum frames, axles, fasteners, and externally mounted bearings.

Class B or C - Damper blades must be nonferrous. Greenheck damper models HCD-240 and HB-240 use extruded aluminum blades and meet the criteria.



## Operating Parameters

- ✓ Pressure
- ✓ Flow rate (volumetric or velocity)
- ✓ Temperature (minimum and maximum)
- ✓ Medium (clean air, dirty air, other)

## Performance Requirements

- ✓ Leakage
- ✓ Pressure drop

## Construction Requirements

- ✓ Material (galvanized, 304 stainless steel, 316 stainless steel, aluminum)
- ✓ Coating (Hi-Pro Polyester, High Temperature Silver, other)
- ✓ Blade type (V-type, fabricated airfoil, extruded airfoil)
- ✓ Bearings (stainless sleeve, bronze, ball, high temperature)
- ✓ Seals (blade, jamb, axle)
- ✓ Mounting holes

## Actuator Requirements

- ✓ Type (electric, pneumatic or manual)
- ✓ Function (two-position or modulating)
- ✓ Operation (spring return or power open/power close)
- ✓ Accessories (manual override, limit switch)
- ✓ Special request (explosion-proof housings, 250°C for 1 hour rating)



## Model Definition - Damper Model Number Code

**HCD- 130**

1
2
3
4

1	Product Type
HB	Heavy-Duty Backdraft
HBR	Heavy-Duty Round Backdraft
HBS	Heavy-Duty Blast Damper
HBT	Heavy-Duty Bubble-tight Damper
HBTR	Heavy-Duty Round Bubble-tight Damper
HCD	Heavy-Duty Control Damper
HCDR	Heavy-Duty Round Control Damper
HPR	Heavy-Duty Pressure Relief Damper
HSV	Heavy-Duty Shock Damper
HSVR	Heavy-Duty Round Shock Damper
HTD	Heavy-Duty Tunnel Ventilation Damper
HTG	Heavy-Duty Toxic Gas Damper
HTGR	Heavy-Duty Round Toxic Gas Damper
HTOD	Heavy-Duty Tornado Damper
2	Pressure Class*
0	Up to 6 in. wg
1	Class I (up to 8 1/2 in. wg)
2	Class II (up to 15 in. wg)
3	Class III (up to 25 in. wg)
4	Class IV (up to 35 in. wg)
5	Class V (up to 45 in. wg)
6	Tunnel Transit
* The classes listed above are based on AMCA performance class operating limits for centrifugal fans (AMCA Std 99-2408).	
3	Blade Style
2	Single Thickness Blade
3	Steel Airfoil
4	Extruded Aluminum
5	Round Butterfly
4	Specials
0	Standard
1	Isolation Damper
2	Round Multiblade Damper
4	High Temp Damper
5	Insulated Blade Damper
6	BS 476 Certified Blade (HTD only)

# Dampers for Fans

## Blower Outlet Application

Centrifugal fans are offered with optional HB series backdraft dampers. These dampers allow air to flow when the fan is on, but will close by gravity when the fan is off. This action prevents wind from back spinning the fan wheel and prevents damage to the fan during start up. HB units are designed as “easy open” to operate as efficiently as possible.



## Fan Isolation Application

The isolation damper is used with a manual quadrant or electric actuator to control direction, limit and/or isolate the airflow as desired.



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