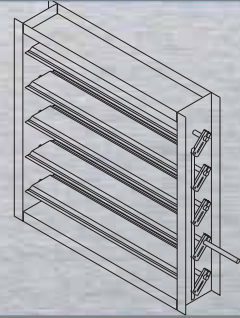


Heavy-Duty/Industrial Dampers

HB, HBTR, HPR, HCD, HCDR, HSD, and HTD Series



 **GREENHECK**
Building Value in Air.

January
2014

The Greenheck Difference



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

In-House Testing

State-of-the-art laboratory and testing facilities have always been important to Greenheck’s continuing business success. A laboratory facility devoted exclusively to development and testing of damper and louver related products for testing to the latest versions of AMCA, ANSI, ASHRAE, BS476, UL, AG-1 and other industry standards of performance.



Quick Build Delivery - Best Available

5 Day	HB-110, 120, 230, 240, 330	HCD-120, 130, 135, 140, 220, 230, 240	HPR-120, 230, 330
10 Day	HCDR-150, 250, 350, 351		

Mill finish only. Not all actuators are available on a quick build.

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Enjoy Greenheck’s extraordinary service, before, during and after the sale.

Greenheck offers added value to our wide selection of top performing, energy-efficient products by providing several unique Greenheck service programs.

- Our Quick Delivery Program ensures shipment of our in-stock products within 24 hours of placing your order. Our Quick Build made-to-order products can be produced in 1-3-5-10- or 15-day production cycles, depending upon their complexity.
- Greenheck’s free Computer Aided Product Selection program (CAPS), rated by many as the best in the industry, helps you conveniently and efficiently select the right products for the challenge at hand.
- Greenheck has been Green for a long time! Our energy-saving products and ongoing corporate commitment to sustainability can help you qualify for LEED credits.
- Our 3D service allows you to download at no charge lightweight, easy-to-use AutoDesk Revit™ 3D drawings for many of our ventilation products.

Find out more about these special Greenheck services at greenheck.com

Damper Applications

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. With ten HCD models and five HCDR models to choose from, these product families offer a wide variety of configurations, options, accessories, and actuators.

Isolation dampers are designed for applications where leakage is critical. The low leakage model HCDR-351 and bubble-tight HBTR series provide the highest levels of shut off possible.

Backdraft

The HB family of products, with six standard models, are designed to prevent air from moving in the wrong direction through a system. Every HB is outfitted with a set of counterweights designed to allow airflow in the desired direction.

Pressure Relief

The HPR family of dampers are designed to prevent an over pressurization of a system. When ordering an HPR, a start-to-open pressure can be specified. When the system pressure exceeds what was specified, the damper will begin to open and relieve the pressure. Like the HB, the HPR is outfitted with counterweights and the damper prevents airflow in the opposite direction.

Tunnel Transit

Greenheck's HTD products are designed to 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.

Smoke

Designed specifically for smoke control systems, the HSD-401 is a UL 555S listed heavy-duty smoke damper.

Blast/Tornado

Designed for the most extreme operating conditions, the HBS and HTOD product family is designed to remain open under normal operating conditions to allow normal airflow. In the event of an explosion, the HBS is designed to react to the shockwave and close, helping to contain the explosion. In the event of a tornado, the HTOD is designed to react to rapid pressure changes.

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. If you're having trouble finding a solution to your damper application, contact your local Greenheck damper expert for a custom solution.



HCD series



HBTR series



HB/HPR series



HSD series



HBS/HTOD series



HTD series

Control Dampers - HCD Series



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). Each frame is available in a variety of materials, including galvanized steel, carbon steel, galvalume steel, 304 stainless steel, 316 stainless steel, and aluminum. Material thickness can range from 14 ga. (1.9mm) to 3/8 inch (9.5mm), depending on air velocity, static pressure, damper size, and other variables unique to the application.

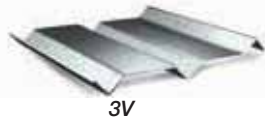


The mounting flanges can be ordered with bolt holes, customized to match your requirements. The linkage and actuators are conveniently located outside of the airstream for easy maintenance and protection from the airstream. This series offers a variety of blades and other options.

For maximum corrosion resistance, Greenheck offers a wide variety of professionally applied finishes: Hi-Pro Polyester, Epoxy, Industrial Epoxy, Permator, High-Temperature Aluminum and High Temperature Silver.

HCD-120

Features a single thickness blade with three "V" shaped forms along the length of the blade. This cross section lends itself to the name nickname "3V blade". The axles are a 3/8 in. (9.5mm) square pin axle that are fastened to the damper blade using blade brackets.



HCD-130/135

The HCD-130's airfoil blade is fabricated from two sheet metal skins for strength. The HCD-130's blade is hollow, while the HCD-135's blade is filled with insulation to reduce heat transfer through the blade. A 3/8 in. (9.5mm) square pin axle is secured between the two skins using a blade bracket.



HCD-140

The extruded aluminum blade in the HCD-140 is engineered for maximum strength with minimum weight. A 3/8 in. (9.5mm) square pin axle is press fit into the blade.



Extruded Airfoil

HCD-220

Like the HCD-120, this model uses the 3V blade. Designed for higher pressures and velocities, the HCD-220 features 3/4 in. (19mm) round stub axles that are bolted to the blade.

HCD-230

One of the most versatile dampers in the HCD family, the HCD-230 features a heavy duty fabricated airfoil blade that is bolted to the 3/4 in. (19mm) diameter stub axles.



Fabricated Airfoil

HCD-240

The engineered extruded aluminum blade in the HCD-240 provides a high strength to weight ratio and also allows for use in applications where spark resistance is required. The 3/4 in. (19mm) diameter stub axles are bolted to the inside of the blades.

HCD-330

Offering the same airfoil blade and 3/4 in. (19mm) stub axle as the HCD-230, this model's frame and blade is fabricated from thicker materials, making it capable of operating at higher pressures and velocities.

HCD-430

This model offers 1 in. (25mm) diameter stub axles and fabricated airfoil blades.

HCD-530

Offering the same airfoil blade and 1 in. (25mm) diameter stub axle as the HCD-430, the HCD-530's frame and blades are fabricated from thicker materials, making it capable of operation at the highest pressures and velocities of any HCD model.

Control Dampers - HCD Series



The following table allows for a quick selection of a HCD based on maximum pressure and velocity.

Greenheck offers HCD's capable of operation above 45 in. wg (11.2 kPa) and 6000 ft/min. (30.5 m/s). Consult your Greenheck damper expert for help with selecting a damper in this performance range.

		HCD-120	HCD-130	HCD-135	HCD-140	HCD-220	HCD-230	HCD-240	HCD-330	HCD-430	HCD-530
Pressure in. wg (kPa)	Maximum	8.5 (2.1)	8.5 (2.1)	8.5 (2.1)	6 (1.5)	15 (3.7)	15 (3.7)	15 (3.7)	25 (6.2)	35 (8.7)	45 (11.2)
	Velocity ft/min. (m/s)	3000 (15.2)	4000 (20.3)	4000 (20.3)	6000 (30.5)	4000 (20.3)	5000 (25.4)	5000 (25.4)	5000 (25.4)	6000 (30.5)	6000 (30.5)
Maximum Temperature °F (°C)	Standard	200 (93)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)	250 (121)
	Optional	400 (204)	400 (204)	-	-	600 (315)	600 (315)	-	600 (315)	600 (315)	600 (315)
Blade Profile	3V	Galvanized Steel	●	-	-	-	●	-	-	-	-
		304SS	○	-	-	-	○	-	-	-	-
		316SS	○	-	-	-	○	-	-	-	-
	Airfoil	Galvanized Steel	-	●	-	-	-	●	-	●	●
		Aluminum	-	-	-	●	-	-	●	-	-
		Galvanized Insulated	-	-	●	-	-	-	-	-	-
		304SS	-	○	-	-	-	○	-	○	○
		304SS Insulated	-	-	○	-	-	-	-	-	-
		316SS	-	○	-	-	-	○	-	○	○
		316SS Insulated	-	-	○	-	-	-	-	-	-

● = Standard, ○ = Optional

Seals

The following table summarizes the availability of jamb, blade and axle seals on the HCD's. For specific information on seal options, reference the Options and Accessories section beginning on page 15.

		HCD-120	HCD-130	HCD-135	HCD-140	HCD-220	HCD-230	HCD-240	HCD-330	HCD-430	HCD-530
Blade Seals	None	●	●	-	-	●	●	-	●	●	●
	TPE	○	-	-	-	-	-	-	-	-	-
	EPDM	○	○	○	○	○	○	○	○	○	○
	Silicone	○	○	●	●	○	○	●	○	○	○
	Fiberglass Tadpole	-	-	-	-	-	-	-	-	-	○
Jamb Seals	None	●	●	-	-	●	●	-	●	●	●
	301SS	○	○	●	●	○	○	●	○	○	○
	316SS	○	○	○	○	○	○	○	○	○	○
Axle Seal	None	●	●	●	●	●	●	●	●	●	●
	O-ring	-	-	-	-	○	○	○	○	○	○
	Double Gland Stuffing Box	-	-	-	-	○	○	○	○	○	○

● = Standard, ○ = Optional

Bearings

The following table summarizes the availability of bearings on the HCD's. For specific information on bearings or types of placement, reference the Options and Accessories section beginning on page 15.

	HCD-120	HCD-130	HCD-135	HCD-140	HCD-220	HCD-230	HCD-240	HCD-330	HCD-430	HCD-530
Stainless Steel Sleeve	●	●	●	●	●	●	●	○	-	-
Bronze Sleeve (External)	-	-	-	-	○	○	○	●	●	●
Bronze Sleeve (Outboard)	-	-	-	-	○	○	○	○	○	○
Relubricable Ball (External)	-	-	-	-	○	○	○	○	○	○
Relubricable Ball (Outboard)	-	-	-	-	○	○	○	○	○	○

● = Standard, ○ = Optional

Control Dampers - HCD Series



Materials and Coatings

There is a variety of materials available for the frame including galvanized steel, carbon steel, galvalume steel, 304 stainless steel, 316 stainless steel, and aluminum. Material thickness can range from 14 ga. (1.9mm) to 3/8 inch (9.5mm), depending on air velocity, static pressure, damper size, and any other variables unique to the application.

Greenheck carries an extensive range of high quality coatings to meet the demands of all commercial and industrial applications.

The following table summarizes the material and paint coatings available on the HCD series.

		HCD-120	HCD-130	HCD-135	HCD-140	HCD-220	HCD-230	HCD-240	HCD-330	HCD-430	HCD-530
Frame	Galvanized	●	●	●	●	●	●	●	●	●	●
	Painted Steel	○	○	○	○	○	○	○	○	○	○
	304SS	○	○	○	○	○	○	○	○	○	○
	316SS	○	○	○	○	○	○	○	○	○	○
Frame Depth	8 in.	●	●	●	●	●	●	●	●	-	-
	10 in.	○	○	○	○	○	○	○	○	●	●
Frame Gauge	14	●	●	●	●	●	●	●	●	-	-
	12	○	○	○	○	○	○	○	○	-	-
	10	○	○	○	○	○	○	○	○	●	●
Special Features	Spark A Resistance	-	-	-	-	-	-	○	-	-	-
	Spark B and C	-	-	-	○	-	-	○	-	-	-
	Bolt Holes	○	○	○	○	○	○	○	○	○	○
Paint Finishes	Epoxy	○	○	○	○	○	○	○	○	○	○
	Hi-Pro Polyester	○	○	○	○	○	○	○	○	○	○
	High Temperature Aluminum	-	-	-	-	○	○	-	○	○	○
	High Temperature Silver	○	○	-	○	○	○	○	○	○	○
	Industrial Epoxy	○	○	○	○	○	○	○	○	○	○
	Permatector™	○	○	○	○	○	○	○	○	○	○

● = Standard, ○ = Optional

Blower Outlet Application

The Industrial control damper mounted on a centrifugal fan (shown at right) is designed to control airflow and provide shut off on inlet or outlet of industrial fans in HVAC or industrial control systems. On this particular fan, the damper was mounted perpendicular to fan shaft to better distribute the high velocity at fan scroll perimeter.



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. The four standard models are HCDR-050, HCDR-150, HCDR-250, and HCDR-350. For multi-blade round dampers, consult the factory. A variety of options are available.



**HCDR-050, 150,
250, 350**

		HCDR-050	HCDR-150	HCDR-250	HCDR-350
Pressure in. wg (kPa)	Maximum	6 (1.5)	6 (1.5)	13.5 (3.4)	20 (5)
	Velocity ft/min. (m/s)	4000 (20.3)	4000 (20.3)	5150 (26.2)	6400 (32.5)
Maximum Temperature °F (°C)	Standard	250 (121)	250 (121)	250 (121)	250 (121)
	Optional	-	400 (204)	600 (315)	1000* (538)
Frame and Blade Material	Painted Steel	○	●	●	●
	Galvanized Steel	●	-	-	-
	304SS	○	○	○	○
	316SS	○	○	○	○
Blade Seals	EPDM	○	○	○	○
	Silicone	-	○	○	○
	Ceramic	-	-	○	○
	Fiberglass	-	-	○	○
Axle Seals	O-ring	-	○	○	○
	Double Gland Stuffing Box	-	-	○	○
	Outboard Double Gland	-	-	-	○
Axle Bearings	SS Sleeve	●	●	-	-
	Bronze Sleeve (External)	-	○	●	●
	Bronze Sleeve (Outboard)	-	-	○	○
	Relubricable Ball (External)	-	-	○	○
	Relubricable Ball (Outboard)	-	-	○	○
	Outboard Carbon	-	-	○	○
Special Features	Bolt Holes	○	○	○	○
	Bar Stops	○	○	○	○
Paint Finishes	Epoxy	-	○	○	○
	Hi-Pro Polyester	○	○	○	○
	Industrial Epoxy	-	○	○	○
	High Temperature Silver	-	○	○	○
	High Temperature Aluminum	-	○	○	○
	Permatector™	○	●	●	●

● = Standard, ○ = Optional

* Special design required for temperatures over 600°F (315°C), consult factory.

Isolation Dampers - HCDR-351 and HBTR Series



Low Leakage - HCDR-351

HCDR-351 is an isolation damper that provides tight shutoff with very low leakage in HVAC or process control systems. Optional features make the HCDR-351 capable to tailor to your application.

Bubble-tight - HBTR-151 and HBTR-451

The HBTR-151 and HBTR-451 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.

The HBTR-151 provides bubble-tight performance at 10 in. wg (2.5 kPa).

The HBTR-451 provides bubble-tight performance at 30 in. wg (7.5 kPa) differential pressure.



HCDR-351

HBTR-151

		HCDR-351	HBTR-151	HBTR-451
Pressure in. wg (kPa)	Maximum	20 (5)	10 (2.5)	30 (7.5)
Velocity ft./min. (m/s)	Maximum	6500 (33)	3900 (19.8)	6500 (33)
Maximum Temperature °F (°C)	Standard	250 (121)	250 (121)	250 (121)
	Optional	400 (204)	-	-
Frame	Painted Steel	●	●	●
	304SS	○	○	○
	316SS	○	○	○
Blade Material	Painted Steel	●	●	●
	304SS	○	○	○
	316SS	○	○	○
Blade Seals	EPDM	●	-	-
	Silicone	○	●	●
Axle Seal	O-ring	●	-	-
	Double Gland Stuffing Box	○	●	●
Axle Bearings	Bronze Sleeve (External)	●	-	-
	Bronze Sleeve (Outboard)	○	-	-
	Relubricable Ball (External)	○	-	-
	Relubricable Ball (Outboard)	○	●	●
Special Features	Bolt Holes	○	○	○
	External Stop	○	-	-
Paint Finishes	Epoxy	○	○	○
	Hi-Pro Polyester	○	○	○
	Industrial Epoxy	○	○	○
	High Temperature Silver	○	-	-
	High Temperature Aluminum	○	-	-
	Permatector™	●	●	●

● = Standard, ○ = Optional

Backdraft Dampers - HB series



Heavy duty/Industrial backdraft dampers are designed to 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 "V"s, 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.



HBR-050



HB-110

HBR-050

HBR-050 features a painted steel single round blade.

HB-110

HB-110 features aluminum 2V blade with galvanized frame. This model is Spark B and C resistant. HB-110 is rated for Fan Class I.

HB-120

HB-120 features galvanized steel 2V blade. This model is rated for Fan Class I and II.



HB-120

HB-230

HB-230 features airfoil blades for added strength. This model is rated for Fan Class II and III.

HB-240

HB-240 features an extruded aluminum airfoil blade engineered for maximum strength with minimum weight. This model is Spark B and C resistant with the option of upgrading to Spark A resistance. HB-240 is rated for Fan Class II and III.



HB-230

HB-330

HB-330 features a galvanized steel fabricated airfoil blade. This model is rated for Fan Class III.

Blade Styles



Aluminum



Galvanized Steel 2V



Galvanized Steel Airfoil



Aluminum Airfoil

Backdraft Dampers - HB Series



The following table provides a quick selection guide based on velocity and pressure.

		HBR-050	HB-110	HB-120	HB-230	HB-240	HB-330
Back Pressure in. wg (kPa)	Maximum	6 (1.5)	5 (1.2)	8.5 (2.1)	13.5 (3.4)	13.5 (3.4)	20 (5)
	Start - Open Pressure* in. wg (kPa)	0.12 (0.03)	.02 (0.005)	.045 (.11)	.04 (.01)	.04 (.01)	.25 (.06)
Velocity ft./min. (m/s)	Maximum	4000 (20.3)	3900 (20)	5150 (26)	5150 (26)	5150 (26)	6400 (33)
	Minimum	-20° (-29°)	-20° (-29°)	-20° (-29°)	-40° (-40°)	-40° (-40°)	-40° (-40°)
Temperature °F (°C)	Maximum	250° (121°)	200° (93°)	250° (121°)	250° (121°)	250° (121°)	250° (121°)
	Frame Material	Aluminum	○	-	-	○	-
Frame Material	Galvanized Steel	-	●	●	●	●	●
	304SS	○	○	○	○	○	○
	316SS	○	○	○	○	○	○
	Painted Steel	●	-	○	○	-	○
	Blade Profile	Aluminum Single Thick-ness	-	●	-	-	-
Blade Profile	Galvanized Steel 2V	-	-	●	-	-	-
	304SS 2V	-	-	○	-	-	-
	316SS 2V	-	-	○	-	-	-
	Galvanized Steel Airfoil	-	-	-	●	-	●
	Aluminum Airfoil	-	-	-	-	●	-
	304SS Airfoil	-	-	-	○	○	○
	316SS Airfoil	-	-	-	○	○	○
	Painted Round	●	-	-	-	-	-
Bearings	Acetal w/ stainless steel ball	-	○	○	-	-	-
	Galvanized Ball	●	●	●	●	●	-
	Relubricable Ball	-	-	-	○	○	●
Special Features	Spark A	-	-	-	-	○	-
	Spark B and C	-	●	-	-	●	-
	Fan Class	-	I	I, II	II, III	II, III	III
	Mounting Holes	○	○	○	○	○	○
Paint Finishes	Epoxy	-	○	○	○	○	○
	Hi Pro Polyester	○	○	○	○	○	○
	Industrial Epoxy	-	○	○	○	○	○
	Permatector™	●	○	○	-	-	-

● = Standard, ○ = Optional

* Note: The start-open is the pressure at which damper blades just begin to rotate, blades are not full open at this point. Damper size and bearing selection may cause start-open pressure to vary from this value.

Pressure Relief Dampers - HPR Series



A pressure relief damper is a backdraft damper with an adjustable start-open pressure. This damper is capable of maintaining a relatively constant pressure at various airflows and which 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. They are designed to handle velocities up to 6400 ft/min. (32.5 m/s).



HPR-230

Pressure relief dampers are 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 so as 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 clean room 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.

HPR-330

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



Galvanized Steel Airfoil

		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 Maximum	-20° (-29°) 250° (121°)	-40° (-40°) 250° (121°)
Frame	Galvanized Steel	●	●	●
	304SS	○	○	○
	316SS	○	○	○
Blade Profile	Galvanized Steel 2V	●	-	-
	304SS 2V	○	-	-
	316SS 2V	○	-	-
	Galvanized Steel Airfoil	-	●	●
	304SS Airfoil	-	○	○
	316SS Airfoil	-	○	○
Axle Bearings	Galvanized Steel Ball	●	●	-
	Relubricable Ball	-	○	●
Blade Seals	TPE	●	-	-
	Silicone	-	●	●
	None	○	○	○
Special Features	Mounting Holes	○	○	○

● = Standard, ○ = Optional

Tunnel Ventilation Dampers - HTD Series



Road and underground metro tunnels are some of the most difficult 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, were 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 safe egress of train/automobile passengers to an escape tunnel, while blowing fire and smoke 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, channel style frame as the HCD line of products. Three blade profiles are offered: the HTD-630 and HTD-636 is designed with a 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 2 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 bearing on a HTD damper is 316 stainless sleeve type, requiring no lubrication or maintenance throughout its useful life. 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.



Tunnel Ventilation Dampers - HTD Series



		HTD-630	HTD-636	HTD-640
Pressure in. wg (kPa)	Maximum	24 (6)	24 (6)	24 (6)
Velocity ft./min. (m/s)	Maximum	4000 (20.3)	4000 (20.3)	4000 (20.3)
Leakage		8 cfm/sq. ft. @ 4 in. wg (128cmh/sq. m @ 1 kPa)	8 cfm/sq. ft. @ 4 in. wg (128cmh/sq. m @ 1 kPa)	8 cfm/sq. ft. @ 4 in. wg (128cmh/sq. m @ 1 kPa)
Blade Deflection	Standard	L/180	L/180	L/180
	Optional	L/360	-	L/360
Frame	Galvanized Steel	●	●	●
	304SS	○	○	○
	316SS	○	○	○
Frame Gauge	14 ga. (2mm)	○	○	○
	12 ga. (2.7mm)	●	●	●
	10 ga. (3.5mm)	○	○	○
	1/4 in. (6mm)	○	○	○
Frame Depth	8 in. (203mm)	○	-	○
	10 in. (254mm)	○	-	○
	12 in. (305mm)	●	●	●
Blade Profile	Fabricated Airfoil	●	-	-
	Extruded Airfoil	-	-	●
	Fire Rated Airfoil	-	●	-
Blade Material	Galvanized Steel	●	●	-
	Aluminum	-	-	●
	304SS	○	○	-
	316SS	○	○	-
Blade Thickness	16 ga. (1.5mm)	○	●	-
	0.081 in. (2mm)	-	-	●
	14 ga. (2mm)	○	○	-
	12 ga. (2.7mm)	●	○	-
	10 ga. (3.5mm)	○	○	-
Blade Seals	Silicone	●	●	●
	Stainless Steel	○	-	-
Jamb Seals	Stainless Steel	●	●	●

● = Standard, ○ = Optional

Test Certifications and Requirements

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

NFPA 502 - Is the National Fire Protection Agency standard for fire protection and fire life safety requirements for limited access highways, road tunnels, bridges, elevated highways, depressed highways, and roadways that are located beneath air-tight structures.

This standard establishes minimum requirements for each of the identified facilities. Greenheck's tunnel transit dampers and actuators are designed to 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 fire test chamber and burned up to 2 hours or 4 hours of operation. The test report, provided by a testing authority such as Warrington Fire, signifies that the damper can resist a fire up to the hours indicated.

Smoke and Blast Dampers



Smoke - HSD series

For applications where UL 555S leakage is required, look to Greenheck's HSD-401 damper for an industrial solution. Each damper is constructed with the same flange mount frame as the HCD series, allowing for easy mounting to a fan outlet. Blades are extruded aluminum, and the damper is driven by a UL 555S qualified actuator.



HSD-401

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.



HBS-330

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.



HTOD-330

	HSD-401	HBS-330	HBS-331	HTOD-330	HTOD-331
Maximum Pressure	6 in. wg (1.5 kPa)	12.6 psi (88 kPa)	12.6 psi (88 kPa)	3 (21)	3 (21)
Maximum Velocity ft/min. (m/s)	3000 (15.2)	6400 (32.5)	6400 (32.5)	6400 (32.5)	6400 (32.5)
Minimum Temperature °F (°C)	-40° (-40°)	-40° (-40°)	-40° (-40°)	-40° (-40°)	40° (-40°)
Maximum Temperature °F (°C)	250° (121°)	250° (121°)	250° (121°)	250° (121°)	250° (121°)
UL555S Leakage Class	I	N/A	N/A	N/A	N/A
Impulse	N/A	28 - 89 psi·msec (195 - 622 kPa·msec)	28 - 89 psi·msec (195 - 622 kPa·msec)	N/A	N/A
Pressure Rise or Decrease	N/A	89 psi/msec	89 psi/msec	3 psi/seconds	3 psi/seconds

N/A = Not Applicable

Construction Features and Options



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

With type 316 stainless steel balls, polymer raceways and cages, the acetal bearing offers excellent corrosion and chemical resistance for applications up to 180°F (82°C).



Galvanized Ball Bearing

This ball bearing features a flanged housing, fabricated from galvanized steel, that is press fit into the damper frame. Hardened, low-carbon steel balls offer dependable operation for this general purpose bearing at temperatures up to 500°F (260°C).



Stainless Steel Ball Bearing

This bearing features a type 316 stainless steel ball and raceway. The cage is fabricated from Acetal. The bearing assembly is housed inside of a type 316 stainless steel flange that is bolted externally to the damper frame. This construction provides excellent corrosion and chemical resistance for applications up to 180°F (82°C).



Stainless Steel Sleeve Bearing

Fabricated from 316SS and impregnated with an oil lubricant, the stainless steel sleeve bearing offers low maintenance and excellent corrosion resistance.



This bushing style bearing is press fit into the damper frame and is recommended for applications with continuous operating temperature of 400°F (204°C) or less.

Bronze Bearing

This self aligning bearing features an oil-impregnated bronze sleeve with a spherical design that is contained inside a galvanized housing. This general purpose bearing has maximum operating temperature of 400°F (204°C).



Relubricable Ball Bearing

Ideal for heavy duty and industrial applications, the relubricable ball bearing features a flanged cast iron housing that is bolted externally to the damper frame. Capable of high radial loads, this bearing can be applied in applications with high pressures or velocities. Seals protect the bearings' balls from the environment, making this bearing a better choice for application in dirty environments. External grease zerks allow for easy relubrication of the bearing.



Carbon Sleeve Bearings

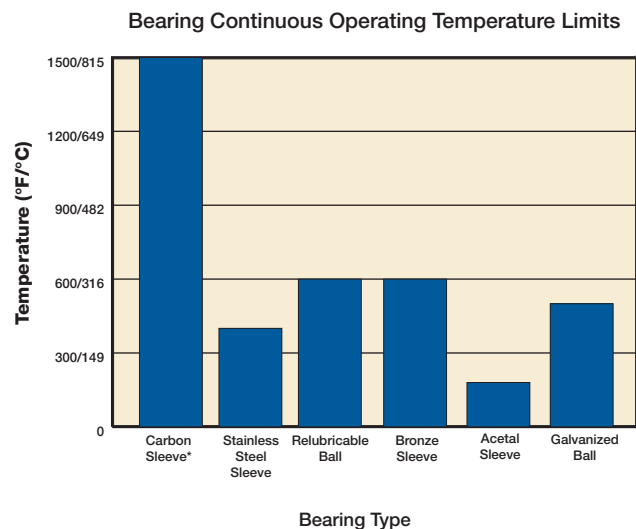
Designed for the most demanding industrial applications, the carbon sleeve bearing is self-aligning and self-lubricating. The sleeve portion of the bearing is fabricated from carbon graphite, allowing this bearing to operate continuously at 1000°F (538°C). The bearing is flange mounted externally to the damper frame.



Custom Bearings

If an application requires a bearing other than the standard, Greenheck can easily provide a damper customized to specific bearing needs.

See temperature chart below for the bearings.



* High temperature applications require bearings to be mounted in the outboard configuration with a double gland stuffing box.

Construction Features and Options



Bearing Placement

External Bearing

An external bearing placement mounts the bearing directly to the damper's frame and is recommended for temperatures 400°F (204°C) or less. In applications with elevated airstream temperatures, the heat conducts through the damper frame and into the bearing. If the maximum rated temperature of the bearing is exceeded, the lubricants inside of the bearing can leak causing the bearing to seize.



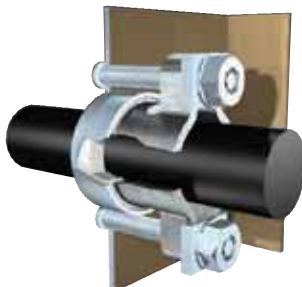
Outboard Bearing

For temperatures above 400°F (204°C), outboard bearing placement locates the bearings away from the hot damper frame.



Axle Seals

To ensure that the medium in the duct stays there, two axle seal options are available. 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.



Double gland stuffing box



O-ring axle seal

Blade Seals

Greenheck offers several options for low leakage performance. EPDM, silicone, fiberglass tadpole or mechanically fastened blade seals are available.



Fiberglass tadpole blade seal



EPDM or silicone blade seal

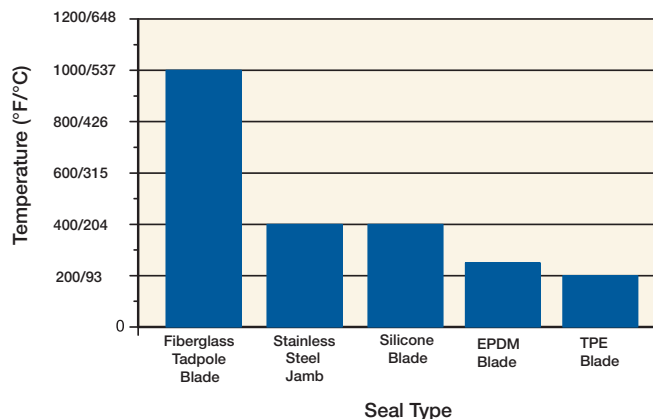


Mechanically fastened blade seal

Jamb Seals

Stainless steel jamb seals are used to prevent air from leaking between the ends of each blade and frame.

Blade & Jamb Seal Continuous Operating Temperature Limits



Actuators

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.



Actuator Operation

Actuator operation identifies how an actuator's internal mechanisms are actuating the damper. It is important to understand actuator operation when selecting actuators, especially for critical or life safety applications. Actuator operation can be simplified into two general categories:

- **Spring Return** - Spring return actuators include an internal spring that can drive the damper to a fail-safe position if power is lost. The actuator can be configured to drive the damper closed to isolate a space, or to open the damper to allow for ventilation of a space. Spring return actuators are common in critical or life safety applications.
- **Power Open/Power Closed** - When fail-safe function is not required, a power open/power closed actuator is recommended. The actuator's motor is used to drive the damper open and closed. If power is lost, the actuator will remain in its current position.



Electric Spring Return



Operating Mode

Operating mode identifies how the actuator will control the damper. There are two basic types of actuator operating mode:

- **Two Position** - For shut-off applications where the damper is required to be either fully open or fully closed, a two position actuator is recommended.
- **Modulating** - If the damper is required to be positioned in an intermediate position between fully open and fully closed, a modulating actuator is recommended. Modulating actuators require an input signal from an outside source such as a building management system. The actuator will respond to the signal and move the damper to a correlating position. Modulating actuators are common in applications where the damper is being used to control the volume of air traveling through the dampers.

Electric Actuators

An electric actuator uses an electric motor to rotate and position the dampers. When selecting an electric actuator, it is important to know the type of actuator enclosure required as well as what type of power supply is available to power the actuator. Voltage, frequency and phase are critical aspects of the power supply.

Voltage

Actuators are available in voltages ranging from 12 to 500 volt. Common standard voltages include 24, 115, 230, 460. Other special voltages are available.

Frequency

Actuators are available with both AC and DC power supplies. When selecting an AC actuator, the phase must also be known. In North America, 60 Hz is the most common frequency. In other parts of the world, 50 Hz may be used.

Phase

Single phase electric actuators are the most common. Many actuators are also available in three phase power.

Actuators



Enclosure

The actuator's enclosure rating should be considered when selecting an electric actuator, especially if it will be installed in a wet, dirty or hazardous location. NEMA provides standards for different types of enclosures. The following provides general information about a few NEMA enclosure types. Please 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 provides protection from 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 designed for hazardous locations per NFPA 70, Class 1, Groups A, B, C, or D.¹

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

¹Reference Standards Publication, NEMA 250-2008, Enclosures for Electrical Equipment (1000V Maximum), Published by: National Electrical Manufacturers Association, Copyright 2008, Section 2 Enclosure Types

Pneumatic Actuators



NEMA 4X Housing*



NEMA 7 Housing*

*Enclosures typical for commercial actuators.



Example of an actuator that is NEMA 4/4X rated.

Using compressed air, rather than electricity to actuate the damper, pneumatic actuators offer an alternative to electric actuators. Pneumatic actuators are commonly used in facilities where compressed air is readily available. For large dampers or high pressure and velocity application that require a high torque actuator, a pneumatic actuator can offer a lower initial cost and more compact package design when compared to an electric actuator.



Pneumatic

Manual Operators

Manual damper operators use human power to open, close and position a damper. The manual operator provides mechanical advantage to make positioning of the damper easier. Two different types of manual operators are available:

- **Manual Quadrant** - A manual quadrant is a lever arm that is secured to the damper's drive axle. The damper can be positioned using the lever and locked into position using the factory-provided wing nut. The quadrant can also be locked into position with a bolt or lock.



Manual Quadrant

- **Worm Gear** - A worm gear provides significant mechanical advantage, reducing the effort required to operate the damper. The worm drive is self-locking preventing unintentional change in blade position. The worm gear can be operated via a hand wheel or chain wheel. The hand wheel allows the damper to be operated by hand turning a wheel that is mounted directly to the worm drive. The chain wheel operates the damper by pulling a chain that is fed through a pulley mounted to the worm gear. The worm gear is recommended for any manual damper application requiring more than 600 in. lbs. of torque.



Worm Gear

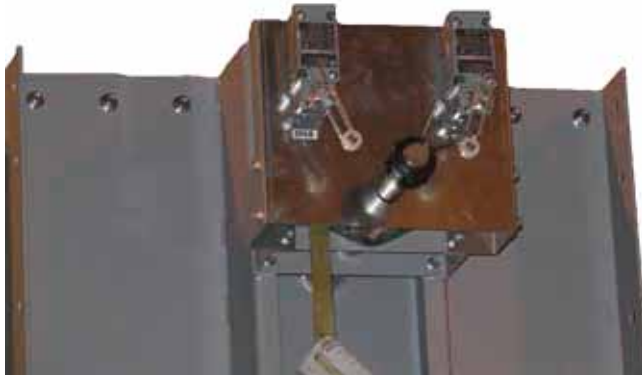
Actuator Accessories



Many accessories are available in addition to each actuator selection. Below are several options Greenheck provides.

Limit Switches

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



Limit Switch

Manual Override

In case of a loss of power or air pressure, actuators can be fitted with a manual override. In an emergency, the override will allow the damper to be opened or closed through the use of a hand wheel or manual quadrant.



Electric Actuator with Manual Override

Heater and Thermostat

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

Pneumatic Accessories

Several options are available from Greenheck 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

Transformers

Although most actuators are available in an array of voltages, those not found can be supplied through the use of a transformer. Transformers can often be supplied with housings to match the actuator housing.

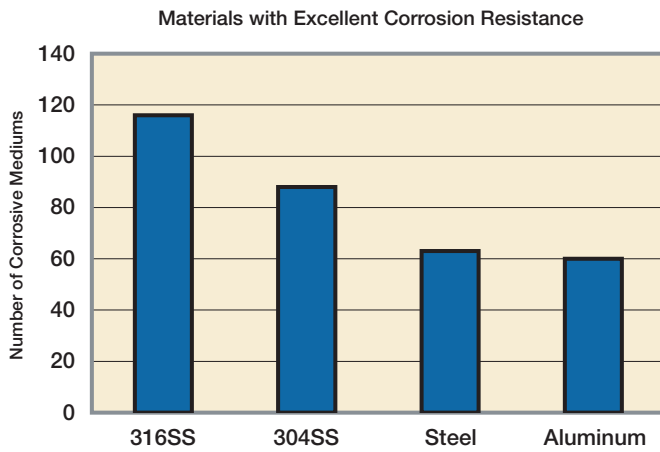
Special Applications - Severe Environment



Greenheck was 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

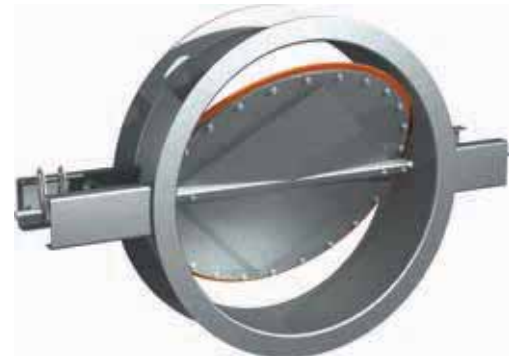
When tested against 140 different corrosive mediums, 316 stainless steel received an excellent rating for over 115 of those mediums.



HCD



HCDR



HBTR-451



HB-230

Industrial Control Dampers

- 316 stainless steel
 - Optional on HBTR-451, HCD-120, 130, 220, 230, 330, 430, 530, HCDR-150, 250, 350, and 351
- Pressure rating up to 45 in. wg (11.2 kPa)
- Velocity up to 6000 ft/min. (30.5 m/s)

Industrial Backdraft Dampers

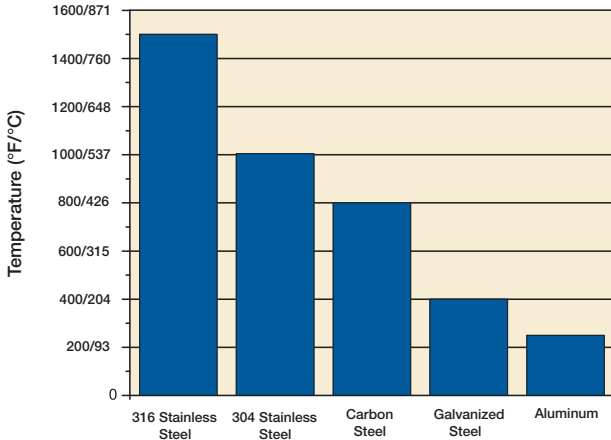
- Model HB-120 and HB-230
- 316 stainless steel option
- Pressure up to 13.5 in. wg (3.4 kPa)
- Velocity up to 5150 ft/min. (26 m/s)
- Temperature -40°F to 250°F (-40°C to 121°C)

Special Applications - High Temperature



Greenheck's HCD and HCDR series are limited to 600°F (315°C). Temperatures above this limit require special consideration, please consult the factory. The chart below displays these limits.

Blade & Frame Material Continuous Operating Temperature Limits



Bearings

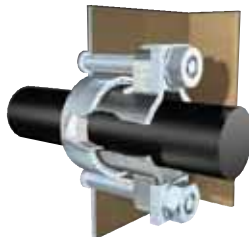
For applications with temperatures above 600°F (315°C), high temperature carbon graphite sleeve bearings are recommended.



Carbon Sleeve Bearing

Axle Seals

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 it is not controlled. Double gland axle seals reduce but may not eliminate this leakage.



Double gland stuffing box

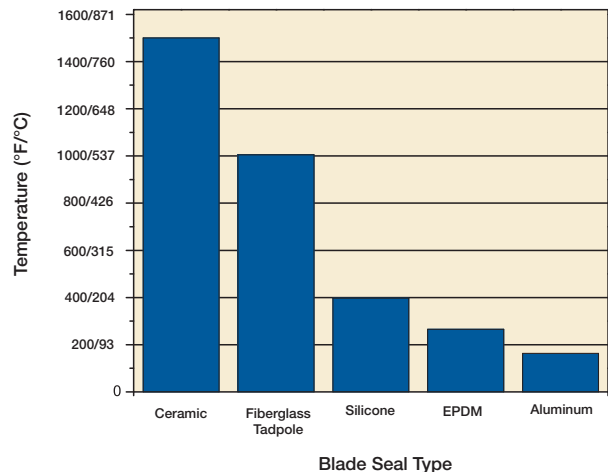
Blade Seals

At temperatures above 400°F (204°C), fiberglass or ceramic blade seals are required. Reference the chart below for the temperature limitations.



Fiberglass tadpole blade seal

Blade Seal Continuous Operating Temperature Limits



Spark Resistance 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 non-ferrous. 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 non-ferrous. Greenheck damper models HCD-140, HCD-240, HB-110 and HB-240 use extruded aluminum blades and meet the criteria.

Custom Design Dampers



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 of an air scrubber. To give the product the 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, while 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 that were able to withstand snow and temperatures down to -40°F/C. Greenheck furnished HCD-240's with a Jamesbury actuator and custom-designed covers for the jamb and actuator to withstand the elements. To make the pneumatic hookup access easier at the jobsite, knockouts were provided on the actuator covers. Customer-specified bolt hole patterns were provided on the frame.



Furnace Exhaust – Greenheck accepted this challenge by developing a special high temperature damper, capable of continuous operation of 1500°F (816°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.



Heavy Duty/Industrial Specification Checklist



Specification Checklist

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 (Epoxy, Hi-Pro Polyester, Teflon®-S, 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 switches)
- ✓ 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
HBTR	Heavy Duty Bubble-tight Damper
HCD	Heavy Duty Control Damper
HCDR	Heavy Duty Round Control Damper
HPR	Heavy Duty Pressure Relief Damper
HSD	Heavy Duty Smoke Damper
HTD	Heavy Duty Tunnel Ventilation 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	Steel 2V or 3V
3	Steel Airfoil
4	Extruded Aluminum
5	Round Butterfly
4	Specials
0	Standard
1	Isolation Dampers
5	Insulated Blade Damper
6	BS 476 Certified Blade (HTD only)

More Industrial Dampers for Fans

Inlet Vane

The Inlet Vane Damper (shown at right) is typically mounted to the inlet flange of an industrial fan to control the amount of airflow entering the fan. The parallel blade action of an Inlet Vane Damper directs the airflow into the fan to modify the fan performance.



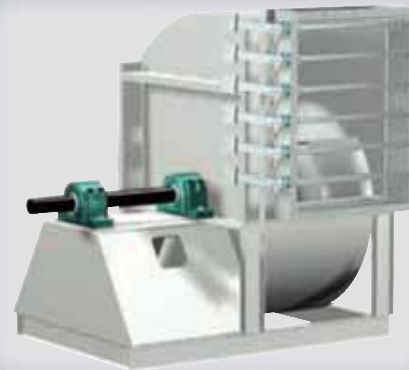
Fan Isolation Application

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



Blower Outlet Application

Industrial backdraft dampers are used on blower outlets for automatic isolation. They allow air to pass in one direction and restrict flow in the opposite direction. Each damper is factory adjusted for its intended flow direction. Multiple nested counterbalance arms and weights are adjusted to reduce load on bearings and linkage. Industrial backdraft dampers are recommended for clean air applications.



Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.



Prepared to Support
Green Building Efforts

