Industrial Process Fans

Radial Material Handling Wheels

- **Models IPO, IPW, IPA**

BUILDING VALUE IN AIR.

GREENHECK

Building Value in Air.

July
2010

Industrial Duty Centrifugal Fans

GREENHECK
Building Value in Air.

Greenheck's radial wheel industrial process centrifugal fans are designed to provide reliable operation for a full range of applications from industrial process ventilation to material handling. Our products are manufactured with state of the art laser, forming, spinning and welding equipment and endure quality control testing to ensure trouble free start-up. The latest computer aided design techniques were used to develop critical components. Finite Element Analysis (FEA), for instance, ensures maximum wheel strength and reliability.

AMCA Licensed Air Performance can be found in Greenheck Fan Corporation Performance Supplement for Industrial Process Fans:

Industrial Process Fan PM
Rev. 4, October 2002

Industrial Fan Model Number Code

21 - IPA - HD

- **Fan Size** — 5 thru 41
- **Wheel Type** — IPO - Open Radial; IPW - Wool (Backplated); IPA - Air Handling
- **Construction** — SD — Standard Duty; HD — Heavy Duty

Typical Applications

Greenheck's industrial products are specified to convey or exhaust for a variety of materials and applications including:

- Dust
- Fibrous Materials
- Granular Materials
- Paper Trimmings
- Fumes
- High Temperatures
- High Pressure Applications

Standard with Greenheck Industrial Products:

- AMCA Air Certified Ratings Seal
- Concentric mount bearings with industry's highest cataloged bearing life
- Corrosion resistant, electrostatically applied baked powder coatings
- Both belt and direct drive configurations
- Three plane, six channel vibration analysis on all manufactured centrifugal models

Standard Construction Features

GREENHECK
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Greenheck industrial process fans are engineered and built for reliable operation in severe environments where high temperatures and static pressures, and material handling requirements are encountered.

Two Construction Levels

Standard Construction

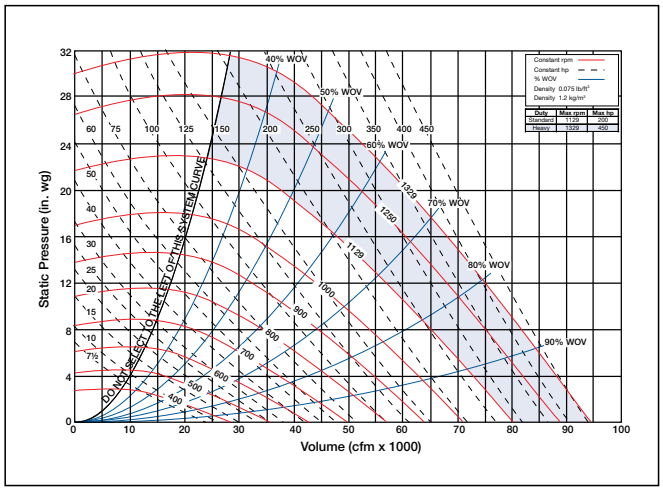
Capacities to 60,000 cfm and 22 in. static pressure

Heavy Duty Construction

Capacities to 84,000 cfm and 32 in. static pressure

Fans are offered in inlet sizes 5-41 and are available in belt drive arrangements 1, 9 and 10 and direct drive arrangements 4 and 8. All sizes and models are available in either clockwise or counterclockwise rotation and are offered in all eight standard discharge positions.

A typical fan curve is shown with shaded construction limits. Visit www.greenheck.com for complete centrifugal fan performance.



Housings

Housings are manufactured of laser cut and formed steel. Drive frames are manufactured with heavy gauge, continuously welded steel. Aluminum or stainless steel construction is optional.

Electrostatic Powder Paint

All steel surfaces are coated with industrial gray (040) Permatector™, an electrostatically applied and baked polyester urethane, as standard. For corrosive environments (i.e. outdoor, coastal, laboratory), see page 5 for information on our zinc-rich basecoat technology.

Inlet Collars

Inlet collars are standard on all industrial process fans.

Fan Shafts

Fan shafts are turned, precision ground, polished and sized so the first critical speed is at least 25% over the maximum operating speed and horsepower.

Drive Frame

The drive frame support structure for fan sizes 5-19 in arrangement 10 features an open sided box design to allow large motor frames. All arrangement 1 and 9 fans feature a fully welded A-frame design.

Motor Mounting Plates

Motor mounting plates on arrangements 9 and 10 are provided with convenient jack-screws for belt tensioning.

Optional Construction

Greenheck industrial process fans have wheels of the radial type. Of the three wheel types we offer, the IPA is the most efficient. All wheels are statically and dynamically balanced to grade G6.3 per ANSI S2.19.

	IPO	IPW	IPA
	Open Radial Material Handling Wheel	**Wool Type Material Handling Wheel**	**Industrial Air Handling Wheel**
Wheel Type			
Application*	Abrasive dust exhaust, conveying granular materials, fume exhaust, and high temperature air handling	Conveying wood shavings, yarn, and paper trimmings	Clean air, light dust, smoke and heat exhaust, corrosives, heavy fumes
Construction Options	Steel 316 Stainless Steel	Steel 316 Stainless Steel	Aluminum Steel 316 Stainless Steel

* Some material handling applications will require special non-standard wheel construction.

Premium Bearings

The industrial process series of centrifugal products are manufactured with "Air Handling Quality" self-aligning ball or roller pillow block bearings. Our standard bearings use concentric lock collars (no set screws) which ensure smooth operation and provide superior grip force between the bearing collar and fan shaft. All bearings are selected for a basic rating fatigue life of L_{10} in excess of 80,000 hours. Our bearings include zerk fittings for relubrication.

	L_{10} Life	Equal to L_{50} or Average Life
Industry Standard	40,000 hrs.	200,000 hrs.
Greenheck Standard	***80,000 hrs.***	***400,000 hrs.***

L_{10} life implies 90% reliability or 10% failure rate after the stated hours.
L_{50} life implies 50% reliability or 50% failure rate after the stated hours.

Vibration Analysis

All Greenheck industrial process products endure a complete mechanical vibration test after assembly. Our custom data acquisition system uses tri-axial accelerometers to measure vibration in three planes at the design operating speed. A permanent record for each fan's performance is kept on file and is available upon request.

The standard "filter-in" vibration levels attained meet the requirements of Fan Application BV-3 as defined in AMCA Standard 204-05 "Balance Quality and Vibration Levels for Fans". The maximum allowable vibration on a belt drive industrial process fan is 0.15 in/sec peak velocity, at the fan bearings, for the specified RPM. For a direct drive fan, the maximum vibration is 0.08 in/sec peak for the specified RPM.

Protective Coatings

Greenheck offers a wide variety of protective coatings suitable for corrosive applications. All coatings are electrostatically-applied baked powders that offer a durable, long lasting finish. For more information on our complete offering of coatings, visit www.greenheck.com and navigate to Library/Application Articles. Search for Performance Coatings for Ventilation Products.

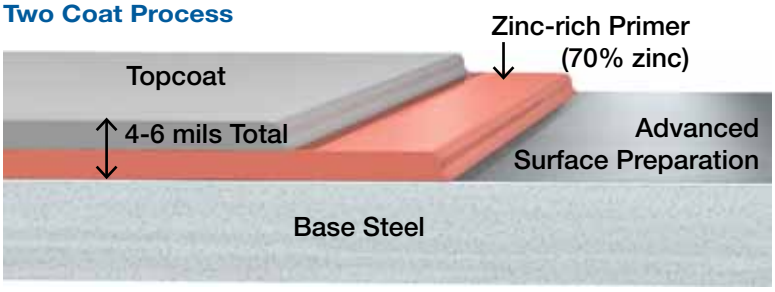
Zinc Advantage

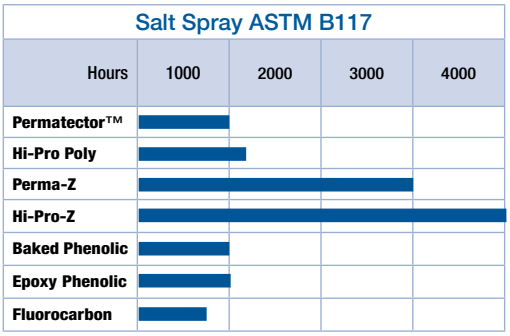
For corrosive environments (outdoor, coastal, laboratory), discover Greenheck's zinc-rich basecoat technology. Our advanced two-coat powder application includes a basecoat of zinc-rich epoxy powder and a topcoat of Greenheck's Permatector™ or Hi-Pro Polyester.

The sacrificial protection offered by the zinc-rich basecoats in Perma-Z and Hi-Pro Z result in extraordinary corrosion resistance. Test data demonstrates our two-coat paint system offers three (Perma-Z) and four (Hi-Pro Z) times the corrosion resistance of other coatings commonly available within the fan industry.

For more information about the zinc advantage, see Greenheck's Coatings for Extreme Applications catalog, available online at www.greenheck.com.

Two Coat Process





Salt Spray ASTM B117 is a comparative test that indicates the corrosion resistance of powder paint coatings.

Vibration Isolators and Structural Bases

Greenheck offers a complete package of structural steel isolation bases and vibration isolators to simplify field assembly and reduce transmitted vibrations. All structural isolation bases include a motor slide base for belt adjustments. Additionally, bases are available with height savings brackets to keep the base and fan center of gravity closer to the mounting surface.

Vibration isolator options include neoprene, free standing spring, housed spring and restrained spring isolators.

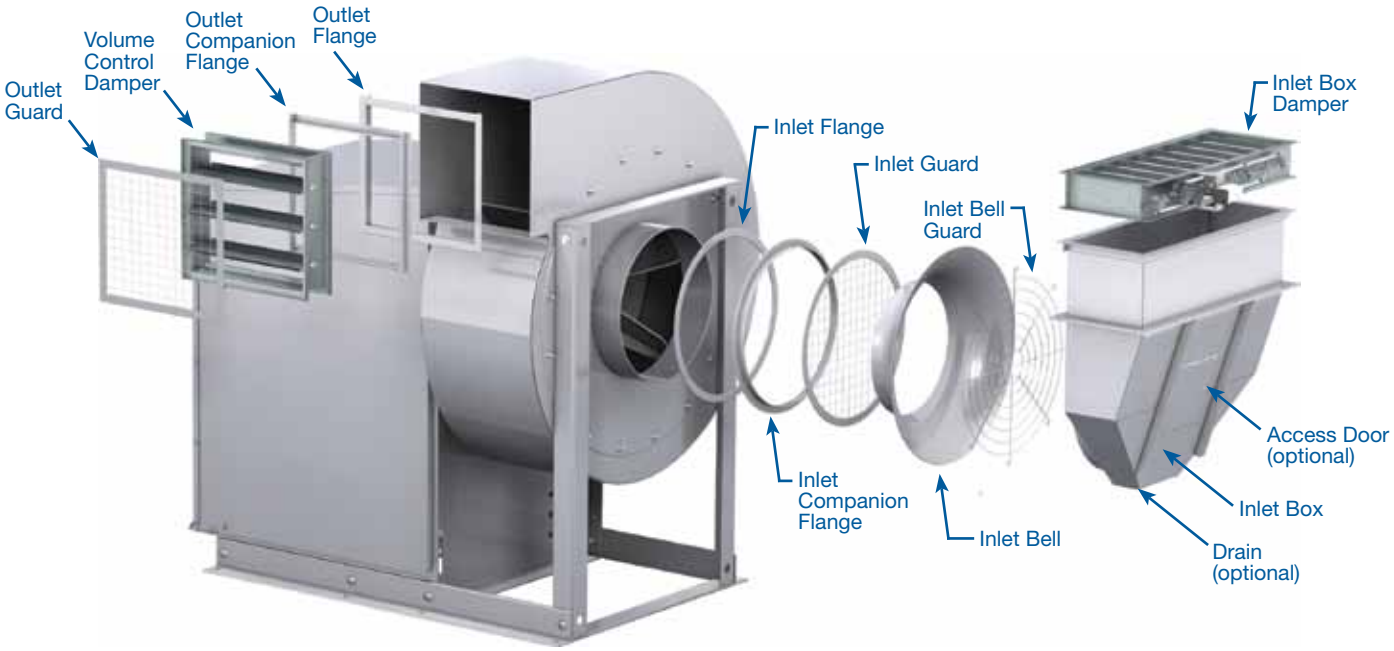
Motors

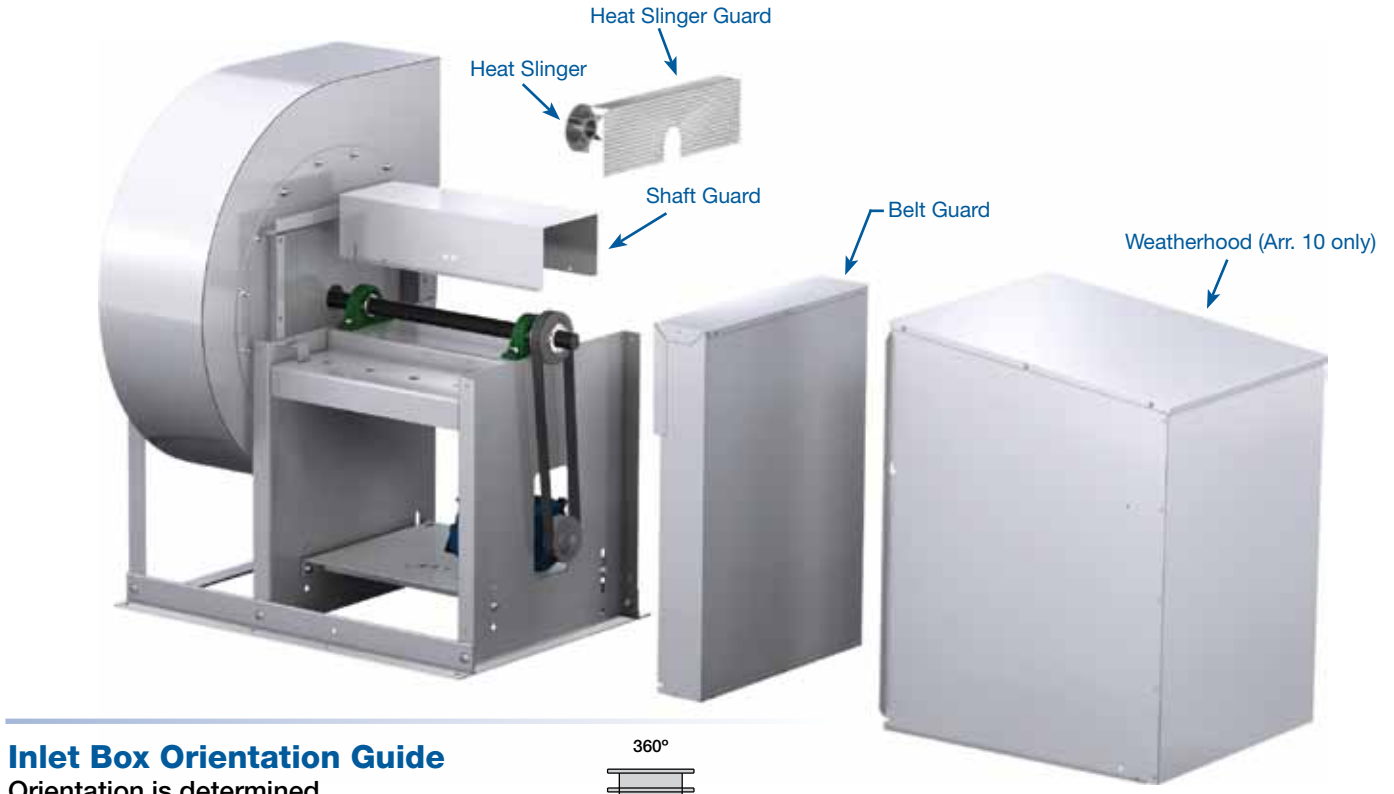
Greenheck offers a wide variety of 50 and 60 Hz motors suitable for clean air to severe duty chemical exhaust applications. Our basic motors meet the efficiency guidelines determined by EPACT, but can be upgraded to meet NEMA Premium efficiencies. Variable Frequency Drive (VFD) compatible motors are available for most motor duties and configurations.

Volume Control Dampers

Volume control dampers are available for model IPA centrifugal fan configurations. Control dampers are available in painted steel, aluminum, or stainless steel. Options include manual quadrants (manual operation), electric actuators, or pneumatic actuators.

Industrial Control Dampers HCD

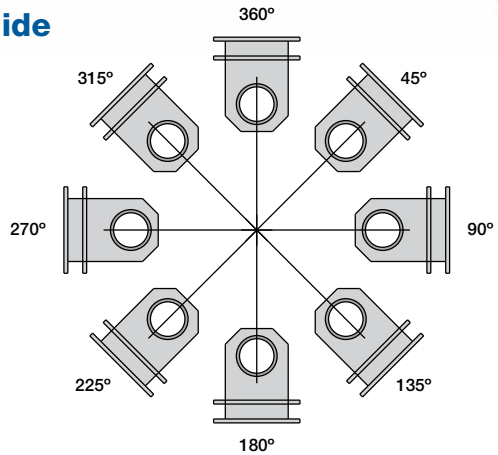


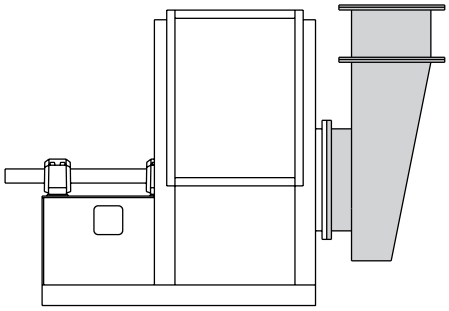


Inlet Box Orientation Guide

Orientation is determined from the drive side of the fan. Positions start at 360° (see figure) and rotate clockwise in 45° increments.

135°, 180°, and 225° positions have special design considerations in regard to structural clearances, bases and dampers. Consult factory with your application requirements.





Weatherhoods (for Arr. 10 only)*
Vented steel weatherhoods protect the motor and drive components from rain, moisture, dust, and dirt. Weatherhoods meet OSHA guidelines and are easily removed for service access.

Belt Guard*
Belt guards are designed to allow easy access to the belts and pulleys for service. All belt guards include tachometer openings to monitor the fan speed as well as an access panel for testing belt tension. Belt guards meet OSHA guidelines.

Shaft Guard*
Shaft guards are designed to cover shafts and bearings on arrangements 1, 8, 9, or 10 configuration. Extended lube lines are optional for bearing lubrication without removal of the guard. Shaft guards meet OSHA guidelines.

Inlet and Outlet Guards*
Removable inlet and outlet guards provide protection for personnel and equipment in non-ducted installations. Inlet and outlet guards meet OSHA guidelines.

Inlet and Outlet Flanges*
Punched and unpunched inlet flanges are available on all fan sizes and constructions. Punched or unpunched outlet flanges are optional for fan sizes 5-19. Unpunched outlet flanges are standard on fan sizes 21-41; punched outlet flanges are optional for these sizes. While punched flanges are optional, they are required for the attachment of control dampers, inlet bells, or inlet boxes.

Inlet Box*
An inlet box is used to minimize entry losses when a 90° turn is required at the fan inlet. Inlet boxes are available with dampers, access doors and drains.

Access Doors*
Bolted or hinged (quick-opening) access doors provide access for cleaning or inspection. Access doors are standard on downblast discharge fans.

Companion Flanges*
Punched companion inlet and outlet flanges are available for all fan sizes.

Drain Connection*
A one-inch (25 mm) threaded drain connection is located at the bottom of the fan housing to drain water that may accumulate.

Heat Slingers
The heat slinger is an aluminum cooling disc mounted on the fan shaft between the inboard bearing and the blower housing to dissipate heat conducted along the fan shaft. Heat slingers are not available for Arrangement 4 fans.

Stainless Steel Shafts
Stainless steel fan shafts are available on fan sizes 5-41 for applications where standard carbon steel shafts may exhibit excessive corrosion or heat stress.

Shaft Seals
A felt, neoprene, or ceramic shaft seal with an aluminum rub ring is available for operation at high temperatures or for exhausting contaminated air. Stuffing boxes are available upon request. Not a gas-tight seal.

Extended Lubrication Lines
Industrial process fans are available with flexible nylon tubing extending from the bearings to conveniently located grease fittings mounted on the fan drive frame (or on the fan housing if a weatherhood is supplied).

Disconnect Switches
Greenheck offers a wide selection of NEMA rated fusible or non-fusible disconnect switches. Switches can be factory mounted or shipped loose for field installation.

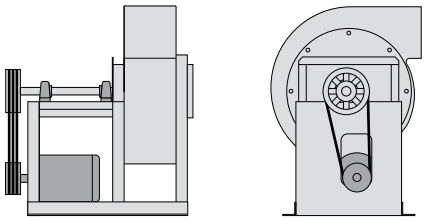
These accessories are also available in Aluminum or Stainless Steel construction.

Arrangement 10* — Belt Drive

Models IPO, IPW, IPA *Sizes 5-19*

- Compact design providing space savings.
- Bearings are located out of the airstream.
- Motor is mounted beneath the drive frame.
- Available with a heat fan package up to 500°F (260°C).
- Special coatings are available.

**Only arrangement available with a weatherhood.*

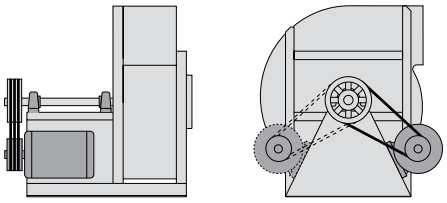


Standard Duty

Arrangement 9 — Belt Drive

Models IPO, IPW, IPA *Sizes 5-41*

- Easy access to motors mounted on drive frame.
- Bearings are located out of the airstream.
- Available with larger motors than arrangement 10.
- Standard motor position is on the right side of the drive frame.
- Recommend belt guard and shaft guard.
- Available with a heat fan package to 500°F (260°C).
- Special coatings are available.

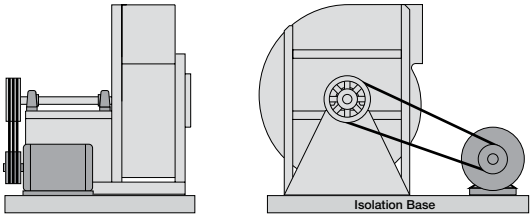


Standard and Heavy Duty

Arrangement 1 — Belt Drive

Models IPO, IPW, IPA *Sizes 5-41*

- Bearings are located out of the airstream.
- Recommended for large frame motors, easiest motor access.
- Motor is mounted on a common isolation base with fan.
- Choice of motor positions W, X, Y or Z (see page 9).
- Recommend belt guard and shaft guard.
- Recommended for high temperatures or contaminated air.
- Available with heat fan packages to 800°F (427°C).

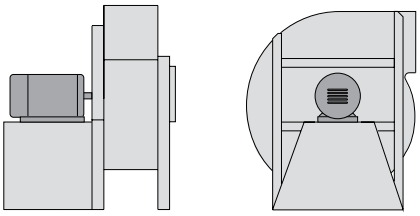


Standard and Heavy Duty

Arrangement 4 — Direct Drive

Models IPW, IPA *Sizes 5-19*

- Available with wheel and housing modifications for specific performance.
- Provides compact design with low maintenance.
- Limited to standard motor speeds, but are available with variable frequency drive compatible motors.
- Suitable for clean or contaminated air applications.
- Heat fan packages are not available.

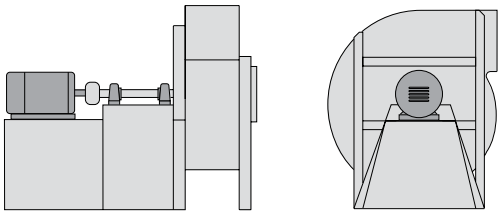


Standard and Heavy Duty

Arrangement 8 — Direct Drive

Models IPO, IPW, IPA *Sizes 5-41*

- Direct drive coupled to fan shaft.
- Bearings are located out of the airstream.
- Available with wheel and housing modifications for specific performance.
- Limited to standard motor speeds, but are available with variable frequency drive compatible motors.
- Suitable for high temperatures or contaminated air.
- Recommend shaft guard.
- Available with heat fan packages to 800°F (427°C).
- Special coatings are available.



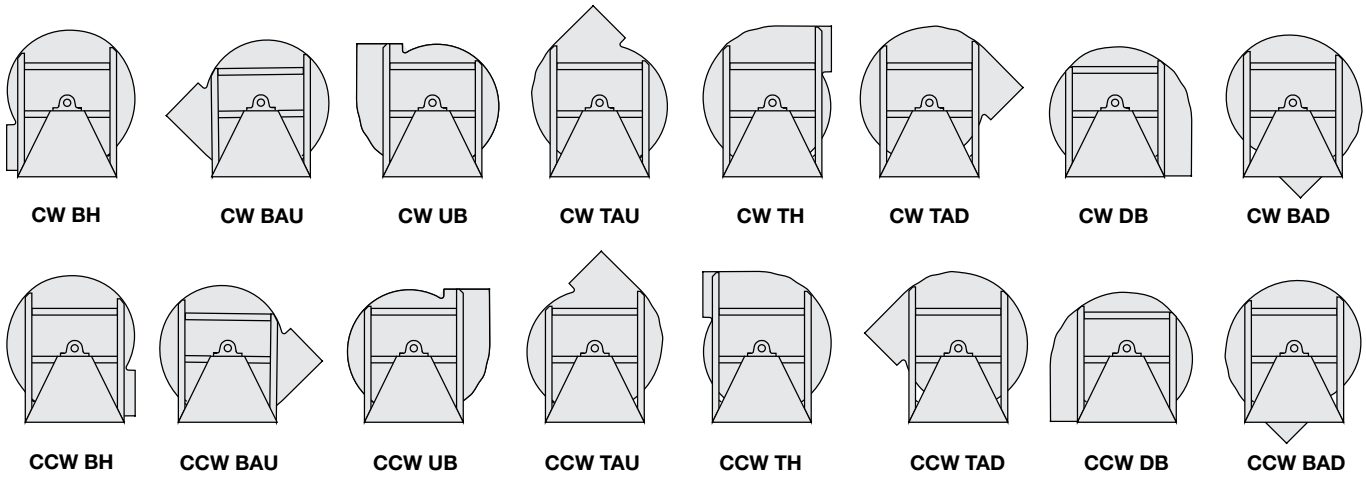
Standard and Heavy Duty

Discharge Positions and Rotatable Housings

All industrial process fans are available with clockwise (CW) or counterclockwise (CCW) rotation in all standard discharge positions. Fans sizes 5-19 feature rotatable housings as standard.

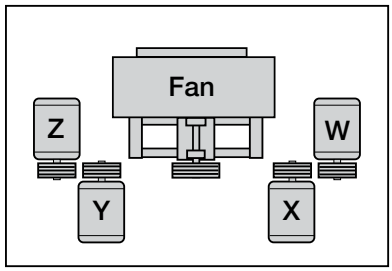
Rotatable housings are standard on IPO fan sizes 19 and less and can also be reversed in the field to obtain either a clockwise or counterclockwise rotation.

NOTE: *Wheel must be turned around on shaft.*



NOTE: *Top Angular Down (TAD) and Bottom Angular Down (BAD) discharge positions are only available with special construction to prevent interference between the drive frame and fan discharge.*

Motor Positions — Arrangement 1 Fans



Motor position and fan rotation is determined from drive side

Fan arrangement 1 requires a structural steel base or structural platform to support the fan and motor. The motor can be located in any of four positions around the fan shaft to ensure proper alignment. Motor positions W and Z tend to make a longer footprint from end to end. Positions X and Y tend to make a shorter but wider footprint.

Alternative Materials

Greenheck offers some industrial process fans in aluminum or stainless steel construction as an alternative to coated steel. Available constructions are shown in the table below.

Aluminum construction provides advantages for applications with high moisture and various chemicals. Aluminum is suitable up to 250°F (121°C) and reduces the weight of the fan if there are building structural concerns.

Stainless steel (316L) construction is used for environments subject to continuous high heat up to 1000°F (538°C) or severe corrosives.

Both aluminum or stainless steel construction can be applied to the entire fan (housing, wheel, inlet cone and drive frame) or the airstream components (housing, wheel and inlet cone) on available models.

Spark Resistant Construction

Greenheck centrifugal fans are available with spark resistant designs suitable for applications that involve flammable particles, fumes or vapors. Spark resistant construction options adhere to guidelines defined within AMCA Standard 99-0401-86.

Spark A	All parts in contact with the airstream are constructed of nonferrous material (usually aluminum).
Spark B	The fan wheel is constructed of a nonferrous material (usually aluminum). A nonferrous (aluminum) rub ring surrounds the fan shaft where it passes through the fan housing.
Spark C	The inlet cone is constructed of nonferrous material (usually aluminum). A nonferrous (aluminum) rub ring surrounds the fan shaft where it passes through the fan housing.

Model IPO
Arrangement 10

Construction	Model	Construction	Size	Arrangement
Steel	IPA, IPW, IPO	Standard/Heavy	5-41	1, 4, 8, 9, 10
Aluminum, entire	IPA	Standard	5-19	1, 9, 10
Aluminum, airstream	IPA	Standard	5-19	1, 9, 10
316 Stainless, entire	IPA, IPW, IPO	Standard/Heavy	5-19	1, 9, 10
316 Stainless, airstream	IPA, IPW, IPO	Standard/Heavy	5-19	1, 9, 10
Spark A	IPA	Standard	5-19	1, 9, 10
Spark B	IPA	Standard	5-19	1, 9, 10
Spark C	IPA, IPW, IPO	Standard	5-41	1, 9, 10

Consult factory for sizes and options beyond what is cataloged.

Construction Options

High Temperature Process Construction

The industrial process fan models are available in a wide variety of configurations to meet continuous high temperature exhaust requirements. Our high temperature process packages include a heat slinger, high temperature fan bearing grease, and high temperature paint for steel housed fans.

Temperature Option	Model	Arrangement	Material
251–500°F (121–260°C)	IPO, IPW, IPA	1, 8, 9, 10	Steel, 316 Stainless Steel
501–800°F (261–427°C)	IPO, IPW, IPA	1, 8	Steel, 316 Stainless Steel
801–1000°F (427–538°C)	IPO, IPW, IPA	1	316 Stainless Steel

NOTE: Consult factory for temperatures greater than 800°F (427°C) and stainless steel construction. Aluminum construction is suitable up to 250°F (121°C)

IPO - Open Radial Wheel

Fan Size	Scroll Gauges				Gauges		Shaft Diameter		Wheel Weight		Fan Weights				
	Standard		Heavy		Fan Blades				Std. Duty	Heavy Duty	Arr. 10	Arr. 9		Arr. 1	
	Side	Wrap	Side	Wrap	Std.	Heavy	Std.	Heavy				Std.	Heavy	Std.	Heavy
5	12	12	—	—	10	—	1	—	7	—	92	85	—	66	—
7	12	12	—	—	10	—	1 7/16	—	16	—	145	149	—	116	—
9	12	12	—	—	10	—	1 7/16	—	20	—	197	203	—	160	—
11	10	10	3/16	3/16	3/16	1/4	1 11/16	1 15/16	31	49	311	306	381	268	337
13	10	10	3/16	3/16	3/16	1/4	1 15/16	2 3/16	51	61	503	515	599	491	575
15	10	10	3/16	3/16	1/4	1/4	2 3/16	2 7/16	75	75	594	607	697	583	671
17	10	10	3/16	3/16	1/4	1/4	2 3/16	2 11/16	90	106	762	777	924	734	879
19	10	10	3/16	3/16	1/4	5/16	2 7/16	2 15/16	107	156	968	957	1166	909	1117
21	10	10	3/16	3/16	5/16	5/16	2 7/16	2 15/16	188	262	—	1075	1340	1075	1340
23	3/16	3/16	1/4	3/16	5/16	5/16	2 11/16	3 7/16	229	293	—	1380	1600	1380	1600
26	3/16	3/16	1/4	3/16	5/16	3/8	2 15/16	3 7/16	343	587	—	1955	2325	1955	2325
29	3/16	3/16	1/4	1/4	5/16	3/8	3 7/16	3 15/16	402	697	—	2298	3016	2298	3016
33	3/16	3/16	1/4	1/4	5/16	3/8	3 7/16	3 15/16	536	916	—	2789	3623	2789	3623
37	1/4	3/16	1/4	1/4	3/8	3/8	3 15/16	4 15/16	785	1251	—	3599	4814	3599	4814
41	1/4	3/16	1/4	1/4	3/8	3/8	3 15/16	4 15/16	914	1449	—	4114	5492	4114	5492

IPW - Wool Type Wheel

Fan Size	Scroll Gauges				Gauges			Shaft Diameter		Wheel Weight		Fan Weights				
	Standard		Heavy		Fan Blades		Backs			Std. Duty	Heavy Duty	Arr. 10	Arr. 9		Arr. 1	
	Side	Wrap	Side	Wrap	Std.	Heavy	Std.	Std.	Heavy				Std.	Heavy	Std.	Heavy
5	12	12	—	—	10	—	3/16	1	—	10	—	94	88	—	69	—
7	12	12	—	—	3/16	—	3/16	1 7/16	—	24	—	152	157	—	123	—
9	12	12	—	—	3/16	—	3/16	1 7/16	—	35	—	211	217	—	174	—
11	10	10	3/16	3/16	3/16	1/4	1/4	1 11/16	1 15/16	52	70	331	326	396	287	336
13	10	10	3/16	3/16	3/16	1/4	1/4	1 15/16	2 3/16	80	90	530	542	626	518	601
15	10	10	3/16	3/16	1/4	1/4	5/16	2 3/16	2 7/16	123	123	638	651	740	627	714
17	10	10	3/16	3/16	1/4	1/4	5/16	2 3/16	2 11/16	152	169	820	834	980	791	936
19	10	10	3/16	3/16	1/4	5/16	5/16	2 7/16	2 15/16	184	234	1040	1028	1236	981	1187
21	10	10	3/16	3/16	5/16	5/16	3/8	2 7/16	2 15/16	283	360	—	1163	1428	1163	1428
23	3/16	3/16	1/4	3/16	5/16	5/16	3/8	2 11/16	3 7/16	343	409	—	1485	1701	1485	1701
26	3/16	3/16	1/4	3/16	5/16	3/8	3/8	2 15/16	3 7/16	490	579	—	2089	2299	2089	2299
29	3/16	3/16	1/4	1/4	5/16	3/8	3/8	3 7/16	3 15/16	584	684	—	2460	2977	2460	2977
33	3/16	3/16	1/4	1/4	3/8	1/2	1/2	3 7/16	3 15/16	931	1125	—	3161	3802	3161	3802
37	1/4	3/16	1/4	1/4	3/8	1/2	1/2	3 15/16	4 15/16	1186	1516	—	3966	5026	3966	5026
41	1/4	3/16	1/4	1/4	3/8	1/2	1/2	3 15/16	4 15/16	1403	1770	—	4565	5754	4565	5754

IPA - Air Handling Wheel

Fan Size	Scroll Gauges				Gauges				Shaft Diameter		Wheel Weight		Fan Weights				
	Standard		Heavy		Fan Blades		Backs	Cones			Std. Duty	Heavy Duty	Arr. 10	Arr. 9		Arr. 1	
	Side	Wrap	Side	Wrap	Std.	Heavy	Std.		Std.	Heavy				Std.	Heavy	Std.	Heavy
5	12	12	—	—	10	—	3/16	10	1	—	15	—	100	93	—	75	—
7	12	12	—	—	10	—	3/16	10	1 7/16	—	22	—	151	156	—	122	—
9	12	12	—	—	3/16	—	3/16	10	1 7/16	—	35	—	212	218	—	175	—
11	10	10	3/16	3/16	3/16	3/16	1/4	10	1 11/16	1 15/16	62	64	342	337	392	298	352
13	10	10	3/16	3/16	3/16	3/16	1/4	3/16	1 15/16	2 3/16	98	98	551	562	636	539	611
15	10	10	3/16	3/16	3/16	3/16	5/16	3/16	2 3/16	2 7/16	131	131	649	662	751	638	725
17	10	10	3/16	3/16	3/16	1/4	5/16	3/16	2 3/16	2 11/16	191	207	862	877	1022	834	977
19	10	10	3/16	3/16	3/16	1/4	5/16	3/16	2 7/16	2 15/16	223	243	1083	1072	1249	1024	1200
21	10	10	3/16	3/16	3/16	1/4	3/8	3/16	2 7/16	2 15/16	280	305	—	1165	1378	1165	1378
23	3/16	3/16	1/4	3/16	3/16	1/4	3/8	3/16	2 11/16	3 7/16	325	355	—	1472	1651	1472	1651
26	3/16	3/16	1/4	3/16	3/16	1/4	3/8	3/16	2 15/16	3 7/16	409	448	—	2016	2175	2016	2175
29	3/16	3/16	1/4	1/4	1/4	1/4	3/8	3/16	3 7/16	3 15/16	544	544	—	2430	2846	2430	2846
33	3/16	3/16	1/4	1/4	1/4	1/4	1/2	3/16	3 7/16	3 15/16	781	781	—	3024	3469	3024	3469
37	1/4	3/16	1/4	1/4	1/4	1/4	1/2	3/16	3 15/16	4 15/16	961	961	—	3754	4480	3754	4480
41	1/4	3/16	1/4	1/4	1/4	1/4	1/2	3/16	3 15/16	4 15/16	1227	1227	—	4407	5223	4407	5223

Weights, shown in pounds, are for steel fans and do not include motors, drives or accessories.
Fan weights may vary up to 5% based on the discharge position.

Specifications and Selection Support

Typical Specifications

Process or material handling fans shall be of the heavy duty type with inlet diameters and outlet areas manufactured in accordance with standards adopted by AMCA for industrial process fans.

Fan housings shall be of continuously-welded plate to assure no air leakage. The housing and bearing support shall be constructed of welded steel members to support the shaft and bearings.

The fan wheel shall be fully welded and of either the open material handling, backplate material handling or air handling type. Wheels shall be statically and dynamically balanced to balance grade G6.3 per ANSI S2.19.

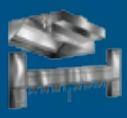
Turned, precision ground and polished steel shafts shall be sized so the first critical speed is at least 25% over the maximum operating speed for each construction class. Close tolerances shall be maintained where the shaft passes through the bearing.

Bearings shall be heavy duty grease lubricated, ball or roller pillow block type. Bearings shall be selected for a basic rating fatigue life L_{10} of 80,000 hours at maximum operating speed and horsepower for each construction level.

Each assembled fan shall be test run at the factory at the specified fan RPM and vibration signatures shall be taken on each bearing in the horizontal, vertical, and axial direction. The maximum allowable fan vibration shall be 0.15 in/sec peak velocity, filter in measured at the fan RPM.

Fans shall be licensed to bear the AMCA Seal for Air Performance.

Industrial process fans shall be model IPO (open material handling), IPW (wool, backplate material handling) or IPA (air handling) as manufactured by Greenheck of Schofield, Wisconsin, USA and shall be supplied as shown on the plans and in the fan schedule.



Computer Aided Product Selection — CAPS

All Greenheck products are supported by the industry's best product literature, electronic media, and Computer Aided Product Selection program, CAPS. Online, you can also find electronic copies of our product literature as well as storage, installation and maintenance information in our Installation and Operation Manuals.

And, of course, you can always count on the personal service and expertise of our national and international representative organization. To locate your nearest Greenheck representative call 715-359-6171 or visit our website at www.greenheck.com

Our Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the shipment date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs.

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

U.S. GREEN BUILDING COUNCIL MEMBER

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