Centrifugal Fans and Blowers

Introduction
With 50 years’ experience supplying into a wide spectrum of industrial applications, CFW is able to offer fans suitable for many different applications, including clean air, dirty air, corrosive gases, high temperature gases, as well as for abrasive, particulate, and fibrous matter conveying.

The ranges shown in this catalogue are standard pre-engineered fans which can be selected using our Fan Selection Software. In addition to this there are other ranges and custom engineered fans available which can be utilised to satisfy a particular duty or application. Our sales engineers will assist with these non-standard selections.

Aerodynamic performance testing
Fans are tested to ISO 5801 test standard in our research and development laboratory.

Quality
CFW is an ISO 9001 Quality Management System accredited company. If and when required, Quality Control Plans (QCP’s) are compiled and executed to customer specification.

Applicable standards

- **ISO 5801**  Industrial fans - Performance testing using standardised airways
- **ISO 5802**  Industrial fans - Performance testing in situ
- **ISO 12499**  Industrial fans - Mechanical safety of fans-guarding
- **EN 14461**  Industrial fans - Safety requirements
- **ISO 14694**  Industrial fans - Mechanical safety of fans-guarding
- **ISO 10816-1**  Mechanical vibration - Evaluation of machine vibration by measurement of non-rotating parts - Part 1 - General guidelines
- **ISO 10816-3**  Mechanical vibration - Evaluation of machine vibration by measurement of non-rotating parts - Part 3 - Industrial machines with nominal power above 15kW and nominal speeds between 120r/min and 15000r/min when measured in situ
- **ISO 1940**  Balance quality of rigid bodies
- **ISO 13349**  Fans - Vocabulary and definitions of categories
- **ISO 13348**  Fans - Tolerances, methods of conversion and technical data presentation
- **EN 14986**  Design of fans working in potentially explosive atmospheres
- **ISO 12759**  Fans - Efficiency classification for fans

General specification

**Bearings:** Bearing selection is based on a L10 life of 100 000 hours. Bearing, grease, and seal type is selected specific to the application in which the equipment will operate.

**Classes:** Stresses in fan components are calculated using design software. The six fan class speed maximums are specific to each fan impeller design, rather than being limited to specific impeller tip speeds. The grade of material, from commercial quality mild steel to certified structural high strength steels, and reinforcing, increases as the classes increase.

Also, according to ISO 13349, fans are categorised according to fan pressure as per the following table.
## Centrifugal Fans and Blowers Technical Data

<table>
<thead>
<tr>
<th>Fan description</th>
<th>Maximum fan pressure in kPa (standard air)</th>
<th>Code</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low pressure</td>
<td>&gt; 0 and ≤ 0.7</td>
<td>L</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>&gt; 0.7 and ≤ 1.0</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>&gt; 1 and ≤ 1.6</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>&gt; 1.6 and ≤ 2.0</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Medium pressure</td>
<td>&gt; 2.0 and ≤ 3.6</td>
<td>M</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>&gt; 3.6 and ≤ 6.3</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>&gt; 6.3 and ≤ 10</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>High pressure</td>
<td>&gt; 10 and ≤ 16</td>
<td>H</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>&gt; 16 and ≤ 22.4</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>&gt; 22.4 and ≤ 30</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

Both of the above classifications are given in the Fan selection software.

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### Fan specs
- **Fan type**: BC_HTCZ
- **Fan size**: Ø 1000
- **Fan width**: 100
- **Fan Rpm**: 2960
- **Max Rpm**: 3055
- **Outlet area**: 0.049m²
- **Tip speed**: 155 m/s
- **Exit velicity**: 32.4 m/s
- **Installation**: ISO 5801 Type D
- **Inlet coeff**: 1.00
- **Fan class**: 3 (75%) H8

### Operating specs
- **Temperature**: 20 °C
- **Barometric**: 101.3 kPa
- **Density**: 1.204 kg/m³
- **Altitude**: 0 m
- **dBA at 3m**: 87.7

### Fan performances within AN3 tolerances (ISO 13348)
Materials and methods of construction:
Various methods of construction ranging from Pittsburgh joints to fully welded and hard faced specialised steels are utilised to match the duty required from the equipment. Standard fans are manufactured to ISO 13348 AN3 manufacturing tolerances. When required, equipment is manufactured to AN1 and AN2 manufacturing tolerance.

Protective finishes:
**Standard CFW blue**
- Blast clean to ISO-SA2.5 (40 – 70µm)
- Single coat Sigmafast two component high build zinc phosphate polyurethane primer/finish (80 - 120µm)

**High temperature application**
- Blast clean to ISO-SA2.5 (40 - 70µm)
- Prime coat – Sigmarine 28 (40 - 75µm)
- Top coat – Sigmatherm 350 (25 - 30µm)

In addition to the above, various other specialised finishes can be applied, including hot dip galvanising to SANS 121 (ISO 1461), marine specification epoxy, acid resistant epoxy, as well as special coatings to customer specification.

Balancing: Balancing of rotating parts is carried out in accordance to ISO 14694 and ISO 1940-1 to balance quality grade G6.3, applicable to fan application category BV-3.

Vibration: Vibration levels are tested at our works to the following limits. In addition a coast-down vibration analysis can be carried out if required.

### Vibration Levels Limits

<table>
<thead>
<tr>
<th>Fan application category</th>
<th>Rigidly mounted mm/s</th>
<th>Flexibly mounted mm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak</td>
<td>r.m.s.</td>
</tr>
<tr>
<td>BV-1</td>
<td>12.7</td>
<td>9.0</td>
</tr>
<tr>
<td>BV-2</td>
<td>5.1</td>
<td>3.5</td>
</tr>
<tr>
<td>BV-3</td>
<td>3.8</td>
<td>2.8</td>
</tr>
<tr>
<td>BV-4</td>
<td>2.5</td>
<td>1.8</td>
</tr>
<tr>
<td>BV-5</td>
<td>2.0</td>
<td>1.4</td>
</tr>
</tbody>
</table>

### Fan Application Categories

<table>
<thead>
<tr>
<th>Application</th>
<th>Examples</th>
<th>Limits of driver Power (kW)</th>
<th>Fan application Category BV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Ceiling fans, attic fans, window AC</td>
<td>≤ 0.15</td>
<td>BV-1 BV-2</td>
</tr>
<tr>
<td>HVAC &amp; agricultural</td>
<td>Building ventilation and air conditioning, commercial systems.</td>
<td>≤ 3.7</td>
<td>BV-2 BV-3</td>
</tr>
<tr>
<td>Industrial process, power generation</td>
<td>Baghouse, scrubber, mine, conveying, boilers, combustion air, pollution control, wind tunnels.</td>
<td>≤ 300</td>
<td>BV-3 BV-3 See ISO 10816-3</td>
</tr>
<tr>
<td>Transportation &amp; marine</td>
<td>Locomotives, trucks, automobiles.</td>
<td>≤ 15</td>
<td>BV-3 BV-4</td>
</tr>
<tr>
<td>Transit/tunnel</td>
<td>Subway emergency ventilation, tunnel fans, garage ventilation, tunnel jet fans.</td>
<td>≤ 75</td>
<td>BV-3 BV-4</td>
</tr>
<tr>
<td>Petrochemical process</td>
<td>Hazardous gases, process fans.</td>
<td>≤ 37</td>
<td>BV-3 BV-4</td>
</tr>
<tr>
<td>Computer chip manufacture</td>
<td>Clean rooms.</td>
<td>None</td>
<td>BV-5</td>
</tr>
</tbody>
</table>
**Motors:** A wide range of electric motors is outsourced to suit customer requirements. In special applications fans can be fitted with compressed air driven motors, or internal combustion engines.

**Temperature:** Suitably constructed fans are available for handling hot gases up to 550 °C. Arrangements 1; 2; 4 (with extension shaft); 8; 9; 10; and 12 are applicable for this application.

**Factory testing:** CFW has dedicated factory test bays which incorporate reinforced concrete inertia test beds. All fans undergo a rigorous testing procedure before despatch. This documented inspection includes but is not limited to the following:

- Balancing
- Vibration
- Bearing temperature monitored over time period
- Protective coatings
- Guarding
- Safety caution decal

**Documentation pack:**
- Material certificates
- All component manufacturing RCS
- Welding RCS
- Protective finish RCS
- Bearing locking RCS
- Bearing temperature RCS
- Motor certificates
- NDT reports
- Balancing printout
- Vibration monitoring RCS
- Laser alignment printout
- Quality control plan
Fan drive arrangements in accordance with ISO 13349

<table>
<thead>
<tr>
<th>Arrangement No.</th>
<th>Description</th>
<th>Schematic drawing</th>
<th>Arrangement No.</th>
<th>Description</th>
<th>Schematic drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single-inlet fan for belt drive. Impeller overhung on shaft running in two plummer block, pillow block, or a double bearing block supported by a pedestal.</td>
<td><img src="image1" alt="Schematic drawing" /></td>
<td>6</td>
<td>Double-inlet fan for belt drive. Impeller mounted on shaft running in bearings on each side of the fan casing, and supported by the fan casing.</td>
<td><img src="image2" alt="Schematic drawing" /></td>
</tr>
<tr>
<td>2</td>
<td>Single-inlet fan for belt drive. Impeller overhung on shaft running in bearings supported by a bracket attached to the fan casing.</td>
<td><img src="image3" alt="Schematic drawing" /></td>
<td>7</td>
<td>Single-inlet fan for coupling drive. Generally as per arrangement 3 but with a pedestal for the driving motor.</td>
<td><img src="image4" alt="Schematic drawing" /></td>
</tr>
<tr>
<td>3</td>
<td>Single-inlet fan for belt drive. Impeller mounted on shaft running in bearings on each side of the fan casing, and supported by the fan casing.</td>
<td><img src="image5" alt="Schematic drawing" /></td>
<td>8</td>
<td>Single-inlet fan for coupling drive. Generally as per arrangement 1 plus an extended pedestal for the driving motor.</td>
<td><img src="image6" alt="Schematic drawing" /></td>
</tr>
<tr>
<td>4</td>
<td>Single-inlet fan for direct drive. Impeller overhung on motor shaft. No bearings on fan. Motor supported on a pedestal.</td>
<td><img src="image7" alt="Schematic drawing" /></td>
<td>9</td>
<td>Single-inlet fan for belt drive. Generally as per arrangement 1 but with the motor mounted on the outside of the bearing pedestal.</td>
<td><img src="image8" alt="Schematic drawing" /></td>
</tr>
<tr>
<td>5</td>
<td>Single-inlet fan for direct drive. Impeller overhung on motor shaft. No bearings on fan. Motor attached to the casing side by its flanged end-shield.</td>
<td><img src="image9" alt="Schematic drawing" /></td>
<td>10</td>
<td>Single-inlet fan for belt drive. Generally as per arrangement 1 but with the motor mounted on the inside the bearing pedestal.</td>
<td><img src="image10" alt="Schematic drawing" /></td>
</tr>
<tr>
<td>Arrangement No.</td>
<td>Description</td>
<td>Schematic drawing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
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</tr>
<tr>
<td>11</td>
<td>Single-inlet fan for belt drive. Generally as per arrangement 3 but with the fan and motor supported by a common base frame.</td>
<td><img src="image1" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Single-inlet fan for belt drive. Generally as per arrangement 1 but with the fan and motor supported by a common base frame.</td>
<td><img src="image2" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Single-inlet fan for belt drive. Generally as per arrangement 1 but with the motor fixed underneath the bearing pedestal.</td>
<td><img src="image3" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Single-inlet fan for belt drive. Generally as per arrangement 3 but with the motor supported by the fan scroll.</td>
<td><img src="image4" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Single-inlet fan for direct drive. Driving motor in-set within the impeller and fan casing.</td>
<td><img src="image5" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Double-inlet fan for direct drive. Driving motor in-set within the impeller and fan casing.</td>
<td><img src="image6" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Double-inlet fan for coupling drive. Generally as per arrangement 6 but with a pedestal for the driving motor.</td>
<td><img src="image7" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Double-inlet fan for belt drive. Generally as per arrangement 6 but with the fan and motor supported by a common base frame.</td>
<td><img src="image8" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Double-inlet fan for belt drive. Generally as per arrangement 6 but with the motor supported by the fan scroll.</td>
<td><img src="image9" alt="Schematic drawing" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Arrangements 1, 3, 6, 7, 8, & 17 may also be provided with the bearings mounted on pedestals for base set independent of the fan housing.
Rotation and angle of discharge, and motor position

ISO 13349 – Recommended positions for the outlet of a centrifugal fan

Examples:
- Outlet: LG 315°, RD 0°
- Inspection Door: LG 135°, RD 225°
- Inlet Box: LG 45°, RD 0°
- Motor: LG 0°, RD 135°

ISO 13349 – Conventional designation of the angular position of component parts of a centrifugal fan with volute casing.

Key: U – Below fan bearing level, V – Above fan bearing level

ISO 13349 – Conventional designation of the alternative positions in plan view of a motor for a belt driven fan
Accessories
Standard accessories include:
- Base frames
- Motors
- Motor slide rails
- Couplings
- V-Belt drives
- Drive guards
- Flexible connectors
- Matching flanges
- Anti-vibration mountings
- Inlet screens
- Inspection doors
- Split casings
- Casing drain sockets
- Inlet vane control
- Volume control and shut-off dampers
- Inlet boxes
- Discharge evase’s
- Spark proof construction
- Shaft seals
- Vibration and temperature sensors
- High temperature construction
- Cladding for noise breakout and temperature
- Noise attenuation
- Shaft brakes
- Spare parts for critical machinery.

Energy saving inlet vane control