



D-SERIES

SPECIFICALLY DESIGNED FOR OPERATION AT PEAK EFFICIENCY, HOWDEN D-SERIES FANS DELIVER **OPTIMUM AERODYNAMIC PERFORMANCE** WITH EXCEPTIONALLY **LOW POWER CONSUMPTION**.

CRITICAL APPLICATIONS SUCH AS AIR-COOLED CONDENSERS AND FIELD ERECTED COOLING TOWERS DEMAND THE BEST POSSIBLE COOLING PERFORMANCE. HOWDEN D-SERIES FANS DELIVER HIGH OPERATING EFFICIENCIES WHILE OFFERING LOW POWER CONSUMPTION.

The efficiency benefits of the D-Series go beyond the inherent high efficiency of the fan itself. Taking a systems approach to design, the D-Series optimises the interaction between the fan and the application, to raise the performance of the whole cooling operation and deliver significant reductions in running costs.

HOWDEN D-SERIES FANS ARE AVAILABLE IN THREE DIFFERENT BLADE PROFILES

- **DNF:** Classic fan featuring Howden Aerotip technology.
- **DLF:** Low-Noise
- **DVF:** Extra Low-Noise.

STANDARD FEATURES

- D-Series fans have a straight aerofoil FRP blade design for clockwise rotation in the horizontal plane.
- With an operating temperature range of -20°C to $+65^{\circ}\text{C}$ (-4°F to $+149^{\circ}\text{F}$), D-Series fans are suitable for a wide spectrum of operating conditions. With modifications, the range can be extended to 120°C .
- D-Series fans are available in a range of diameters from 7,925 mm to 10,973 (26 ft to 36 ft).
- The fan hub is manufactured from steel and coated with polyurethane, with aluminum blade supports and stainless steel U-bolts, nuts and washers.

OPTIONAL FEATURES

- Leading edge protection for use in wet cooling applications.
- Cast iron, polyurethane coated coupling flanges to mate drive shafts featuring either a cylindrical bore or a tapered bushing connection.
- Materials and coatings can be upgraded for sea water cooling tower applications.

ADVANTAGES

- D-Series fans perform at high efficiency, resulting in reduced power consumption.
- Howden Aerotip technology, used in the DNF blade, enhances the aerodynamic performance of the fan and significantly reduces the pressure pulse transmitted to the fan ring.
- The FRP blade material offers superior damping of mechanical vibrations and good chemical resistance.
- The D-Series blades have an integral shaft. This eliminates concentrations of stress at mechanical joints.
- Howden's reliable fan selection data minimises the need to adjust the blade pitch during commissioning.
- The D-Series is designed for simple field assembly and comes with clear technical documentation.



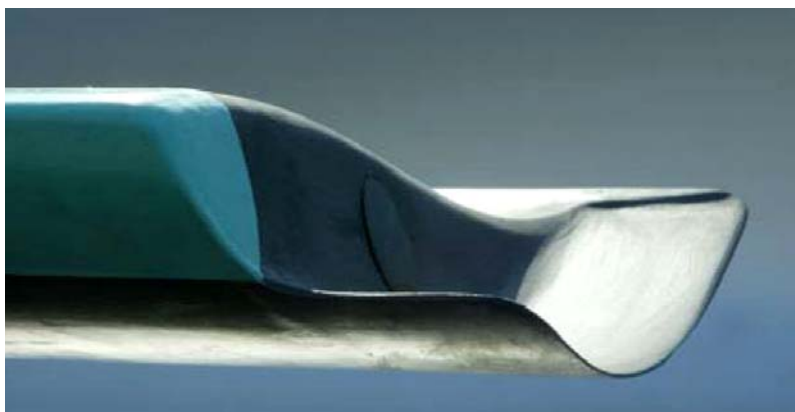
A new generation of propeller blades. The energy economy concept.

Designed in response To new market needs

In the past 20 years we have built some tens of thousands of blades for air coolers and cooling towers: the VSH „S” type and later the generally known „T” type. You find them all over the world in widely differing installation: blades that enhance the reputation of our company by their technical merit and operational reliability.

But technological requirements and the specific needs of our clients change. So we have carefully analysed the current queries of our clients.

The outcome of that analysis, together with our latest views on aerodynamics form the base of our Energy Economy Concept. After completion of the drawing-board, test laboratory and manufacturing stages a new range of VSH cooling blades with Fibreglass Reinforced Polyester (FRP) material is now in being, the „D” type.



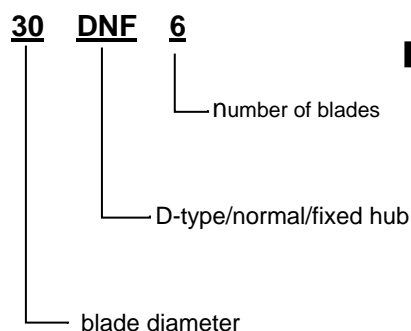
Design

The VSH D-type industrial blade is specially designed for cooling towers and air-cooled heat exchangers. The fan will operate in both the horizontal and vertical plane and is consequently fit for any application in the fields mentioned.

Performance

Volume flow from 40 up to 1200 m³/s.
Static pressure up to 280 Pa.
Operating temperature from – 20° up to 120°C.

Model designation



These are the advantages of the Energy Economy Concept for manufacture of cooling towers and Air – cooled heat exchangers:

■ Energy economy

Under most circumstances in actual practice „D” type blades operate in a more favourable part of their performance characteristic. The efficiencies are generally higher, allowing a lower power to be installed. An improved flow characteristic of the outlet flow ensures an optimum distribution of the air across the heat exchangers or cooling towers, giving an added benefit to the system.

■ Lower weight

„D” type fans have a considerably lower mass thanks to which drives and support frames can be made lighter, simpler and, therefore, cheaper.

■ Limited noise level

The aerodynamic shape of the FRP blades, together with the lower tip speed, ensure a limited noise level. In most cases, the standard construction will be sufficient. In those cases where special noise requirements are imposed, we recommend the use of our Low-Noise version of the D-range : type DLF.

■ Better performance

Users of D-type blade can benefit from better efficiency by lower power consumption, and limited noise level. By using modern and efficient production techniques, VSH are able to offer D-type blades with all new features without additional costs.

Standard materials

Blades

Light-weight, airfoil-shaped blades are fabricated totally of Fibreglass Reinforced Polyester (FRP), Including the blade roots laminated as integral parts of the blades. An additional protection against Water droplet erosion can be provided.

■ Hubs

The hub consists of a steel plate And is coated to resist rust and corrosion. Blades are accurately positioned and clamped on the hub plate by means of aluminium retention clamps and steel U-bolts.

In special cases involving aggressive media or low temperatures, suitable non-standard materials can be offered, Details on request.

Blade-Hub connection

The picture shows the connection of the hub and blades.

A marking is defined in such a way, that there is no doubt about the Position of the blades on the hub. The blade angle is manually adjustable at standstill.



Thoroughly tested

Operating conditions, performance and efficiency of the VSH,,D"-type blades have been thoroughly tested and measured in test arrangements, i.a. to Amca 210-74.

An entirely new test rig allowed both induced and forced draught characteristics to be accurately determined.

Range of application

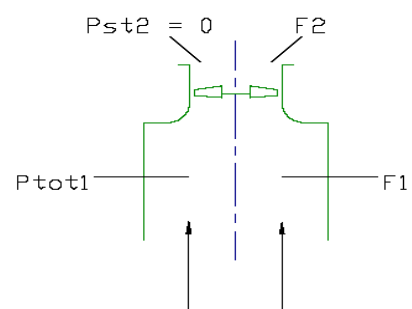
The D-type has been developed for a large volume flow at low speed.

Performance curves

The typical performance characteristic, given, shows high efficiency which means lower energy costs.

Operating conditions

The most performance are based on induced draught installation, having inlet configurations according to be figure below. In the case of alternative inlet configurations, corrections may be necessary to the basic curve. Details of standard corrections available on request.



Parts List

Exploded view and part list

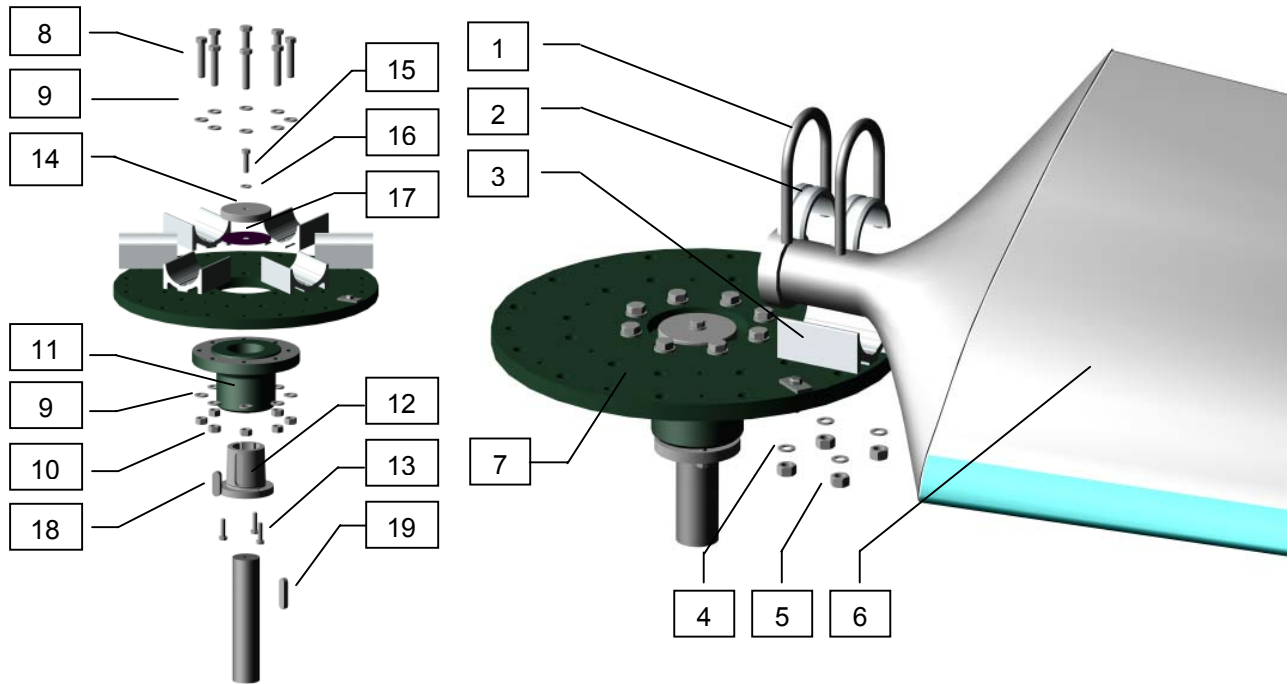


Figure 3

Figure 4

Item	Description	Material (standard construction)	Quantity
1	U-bolt M24	Stainless steel AISI 304	2 / blade
2	Upper clamping piece D=145	Aluminium	2 / blade
3	Lower clamping piece D=145	Aluminium	1 / blade
4	Washer d 24	Stainless steel AISI 304	4 / blade
5	Nut M24	Stainless steel AISI 304	4 / blade
6	Blade	Fibreglass reinforced polyester	-
7	Hub plate	Polyurethane coated mild Steel	1
8	Coupling flange bolt M30	Steel class 8.8 electro-galvanised	8
9	Washer d 30	Electro-galvanised	16
10	Nut M30	Electro-galvanised	8
11	Coupling flange 250Z-U1	Nodular cast iron polyurethane coated	1
12	Split tapered bushing	Manufacturers standard	1
13	Cap screw	Manufacturers standard	3
14	Retaining plate	Polyurethane coated mild steel	1 (optional)
15	Central bolt M16 or M20 or M24	Steel class 8.8 electro-galvanised	1 (optional)
16	Washer	Electro-galvanised	1 (optional)
17	Gasket	Rubber	1 (optional)
18	Key	-	1 (optional)
19	Key	Not supplied by Howden	

Table 2