Axial WingFan Impellers

Diameter 378 - 1.146 mm

Series S Sickle profile

S2Z + S4Z + S6Z

all applications of the ventilation-, heating- and cooling industries
e.g.: ventilation fans, cooling towers, condensers, air conditioning plants, cooling installations, also for coolers of construction - and harvesting machines

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During the development of WingFan S2Z + S4Z + S6Z series of impellers, one of the main objectives was to reduce noise levels. An impressive 2 to 4 dBA noise level reduction was achieved.
The wide sickle shaped profiles ensure stable pressure curves, high efficiency and low absorbed power.
A given air capacity can often be obtained with a lower number of sickle blades than conventional airfoil blades and therefore at lower cost.
These new products have the following advantages:

- **Extremely low noise levels**
- **Lower absorbed power**
- **Improved efficiency**

The Blades

The blades of the S4Z and S6Z are geometrically scaled-up versions of the S2Z blade mounted by means of a common blade root design (Patent No. 2439767). Impeller diameters range from 378 to 1146 mm with eight possible pitch angles ranging from 30° to 50° to meet your specific application requirements.
The patent has established this design as the worldwide standard. The blades are available for both directions of rotation (S6Z only for clockwise rotation).
They are fixed in the hub by means of a steel pin, ensuring a preset blade angle that cannot move or change under load. The blades are made from high strength injection molded thermal plastics offering:

- **High strength to weight ratio**
- **Resistance to corrosion***
- **Optimized impeller design for your specific application**

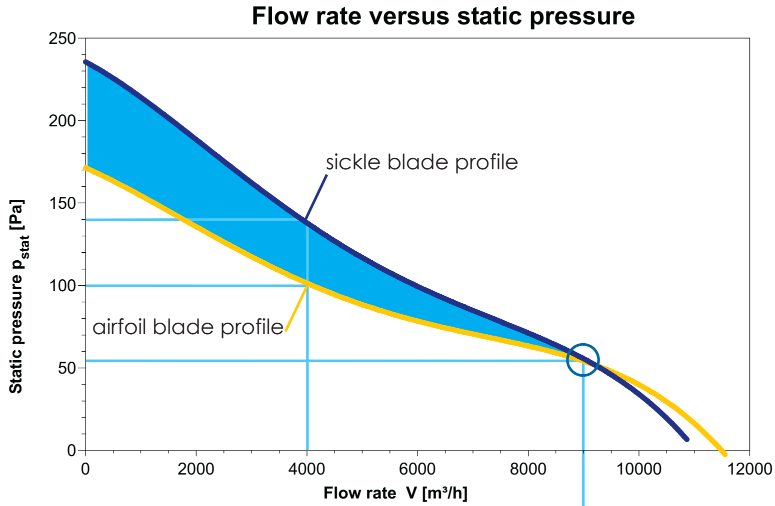
Blade Materials

Symbol	Material description	Temperature Range	Characteristic	Application Suitability
PA	Glass fiber reinforced polyamid (nylon 6, black)	-40°C to 110°C	Heat ageing stabilized	Standard Duty
PAG	Glass fiber reinforced polyamid (nylon 6, beige)	-40°C to 110°C	Heat ageing stabilized	Heavy Duty
PAGST	Glass fiber reinforced polyamid (nylon 6, black)	-40°C to 110°C	Extremely vibration resistant, high impact strength	For duty where extreme vibrations may occur
PACAS**	Carbon fibre reinforced Polyamid (nylon 6, slate grey)	-35°C to 100°C	Electrically conductive, flame-retardant modified	For duty where explosions may occur

* For heavily corrosive atmospheres, the aluminium hubs could be supplied with a protective coating and stainless stell bolts and nuts.
** For Europe pay attention to regulations ATEX 100 and VDMA 24169. Hubs also available with 3 layers of conductive paint.

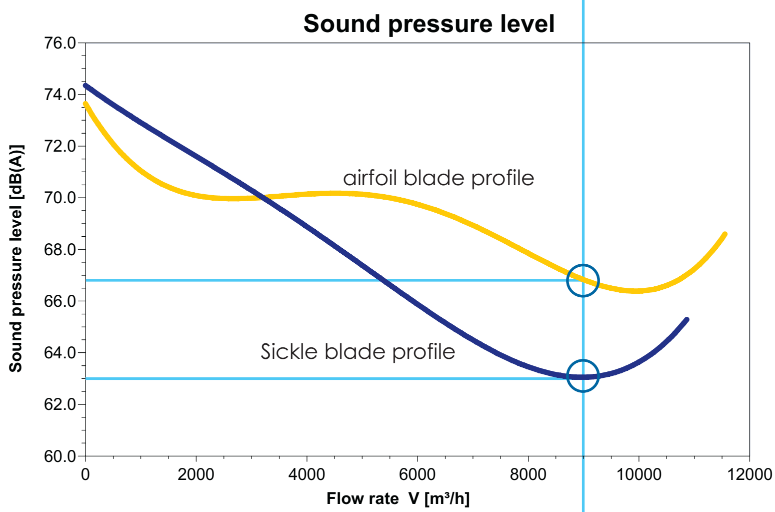
Performance comparison of the new sickle blade profiles

In order to illustrate the advantages of the wide sickle blade profile in comparison to the conventional airfoil profile, a common working point is used. The assembly and installation of the two compared impellers with a diameter of 700 mm - at a rotational speed of 710 rpm - are identical. The test for both impellers demonstrated the following advantages for the sickle blade profile:



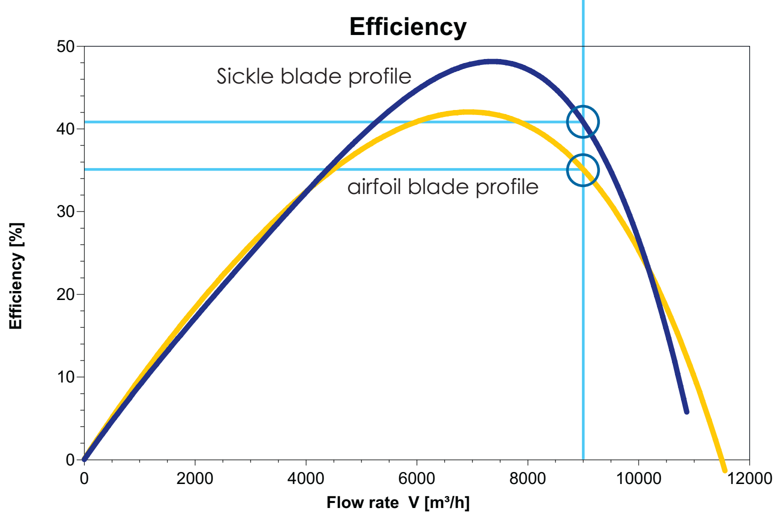
Better under Pressure

At an identical flow rate, the sickle blade profile generates a remarkably higher pressure.
The diagram illustrates this at a flow rate of 4.000 m³/h.
At this flow rate the airfoil profile generates 100 Pa and the sickle blade profile 140 Pa.
The **increase in static pressure** is **40 %**.



Up to 4 dB(A) quieter

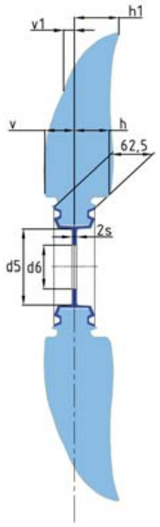
At the compared working point, both profiles show an identical flow rate of V=9.000 m³/h and an identical static pressure of 55 Pa.
The sickle blade profile has a sound pressure level of 63 dB(A) (compared with 67 dB(A) of the airfoil profile). An impressive difference of 4 dB(A), which means the sickle blade profile is **more than 50 % quieter**.



Improved efficiency

In the compared working point the sickle blade profiles are not only considerably quieter than the airfoil blades, but they show a remarkable increase in efficiency.
In the working point illustrated in the diagram **the efficiency increases from 35 % to 41%.**

Flange Mount Version



Hub size *	Impeller Diameter D min - max S2Z	min - max S4Z	min - max S6Z	Hub Spigot hole min d6	max d6	face dia max d5	Thick-ness s
5	378 - 498	530 - 718	702 - 972	12	55	76	3,5
7	412 - 536	560 - 748	732 - 1.002	24	80	115	3,5
8	478 - 615	621 - 813	790 - 1.060	15	165	190	3,5
9	422 - 550	570 - 760	738 - 1.008	25	95	131	3,5
12	491 - 630	633 - 828	802 - 1.072	25	170	208	4
16	575 - 725	712 - 922	876 - 1.146	40	240	302	4

* Maximum number of blades in the hub

Leading / Trailing Edge

v (+/- 2)

Series	30°	32,5°	35°	37,5°	40°	42,5°	45°	50°
S2 Z	22	24	27	28	29	30	34	37
S4 Z	33	35	38	41	45	47	51	57
S6 Z	47	51	55	61	65	70	76	86

h (+/- 2)

Series	30°	32,5°	35°	37,5°	40°	42,5°	45°	50°
S2 Z	31	33	36	37	39	40	43	44
S4 Z	52	54	57	59	62	65	68	72
S6 Z	76	78	83	86	90	94	98	105

v_1 (+/- 6)

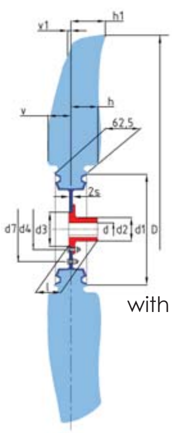
Series	30°	32,5°	35°	37,5°	40°	42,5°	45°	50°
S2 Z	-21	-11	0	4	8	16	22	31
S4 Z	-28	-21	-11	-2	13	23	31	48
S6 Z	-33	-20	-5	11	26	40	58	84

h_1 (+/- 6)

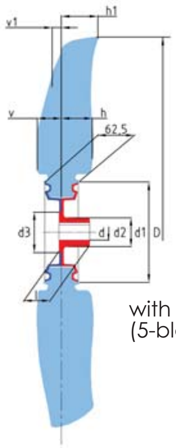
Series	30°	32,5°	35°	37,5°	40°	42,5°	45°	50°
S2 Z	44	43	45	45	45	44	43	43
S4 Z	66	69	70	68	68	66	69	66
S6 Z	106	106	108	105	104	103	102	99

The measurements v_1 and h_1 are valid for the maximum impeller diameter. For smaller impeller diameters and for the S6Z-series the information is available on request.

Shaft Mount Version



with flange hub



with hub flange (5-blade)

Hub size *	IMPELLER Diameter D min - max S2Z	min - max S4Z	min - max S6Z	HUB shaft size min d	max d	flange hub length l	∅ d2	∅ outside d1	Thickness s	Spigot hole dia d3	Bolt pattern inner d4	outer d7
5	378 - 498	530 - 718	702 - 972	12,00 14,00	25,40 34,00	42 62	44 52	145	3,5	55	-	-
7	412 - 536	560 - 748	732 - 1.002	10,00 12,70 22,00 22,00 34,00	17,00 22,23 25,40 31,75 42,00	31 42 52 62 82	28 40 45 51 73	186	3,5	74,75	5 x M6 on BCD 90	-
8	478 - 615	621 - 813	790 - 1.060	10,00 12,70 22,00 22,00 34,00 41,00	17,00 22,23 25,40 31,75 42,00 50,80	31 42 52 62 82 112	28 40 45 51 73 90	266	3,5	74,75	5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 9 x M8 on BCD 110	8 x M6 on BCD 176
9	422 - 550	570 - 760	738 - 1.008	10,00 12,70 22,00 22,00 34,00 41,00	17,00 22,23 25,40 31,75 42,00 50,80	31 42 52 62 82 112	28 40 45 51 73 90	200	3,5	74,75	5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 9 x M8 on BCD 110	-
12	491 - 630	633 - 828	802 - 1.072	10,00 12,70 22,00 22,00 34,00 41,00	17,00 22,23 25,40 31,75 42,00 50,80	31 42 52 62 82 112	28 40 45 51 73 90	280	4	74,75	5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 9 x M8 on BCD 110	12 x M6 on BCD 185
16	575 - 725	712 - 922	876 - 1.146	10,00 12,70 22,00 22,00 34,00 41,00	17,00 22,23 25,40 31,75 42,00 50,80	31 42 52 62 82 112	28 40 45 51 73 90	375	4	74,75	5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 5 x M6 on BCD 90 9 x M8 on BCD 110	16 x M6 on BCD 280

* Maximum number of blades in the hub

subject to technical alterations

Mounting Arrangement

WingFan impellers are suitable for all known methods of mounting. Examples include:

- Flanged mount
- Shaft mount (parallel or tapered)
- Mounting with taperlock bushings

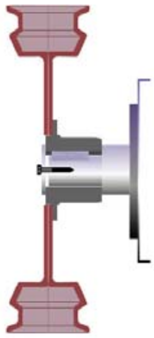
WingFan would be pleased to offer special fitting solutions to your specific application requirements.

Flange Mount Version

The impeller is supplied with a spigot hole and bolt pattern according to user specifications. The impeller is centred on the spigot hole and fixed with suitable bolts.

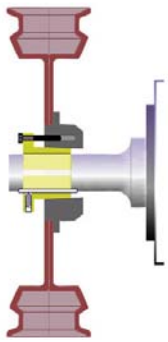
Shaft Mount Version

The boss face butts against the shaft shoulder and is located by either an axial bolt in the shaft end or with a radial grub screw. The drive torque is transmitted using a woodruff key.



Taperlock Version

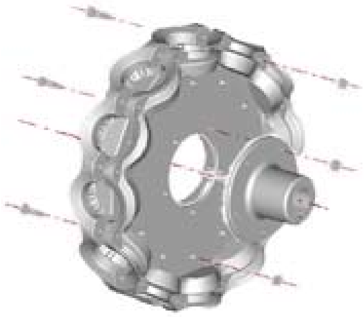
With the taperlock version, the axial positioning of the impeller on the shaft is determined by the keyed taperlock bushing. A woodruff key transmits the drive torque from the shaft to the impeller.



The Hubs

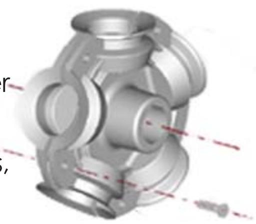
The Z-Series impeller utilizes six hub sizes ranging from 5-bladed to 16-bladed. The hubs are made from pressure die cast aluminum, inherently corrosion resistant and providing high strength for their low mass. They can be fitted with less than the maximum number of blades (i.e. a 16-cavity hub can be fitted with just four blades instead of the usual eight blades while the remaining cavities are plugged with spacers. The impeller configuration changes from 8-16 to 4-16).

Hub Design



The Z-hubs consist of two identical flange halves and an optional center boss.

Only the five blade hubs have an integral cast center boss on one flange half eliminating the need for a bolted center boss. For flange mounted applications, an optional flanged half hub is utilized.



A large assortment of flanged bosses is available for nearly all applications. Forged and heat treated flanged hubs are available for hydraulic drives with their small diameter shafts (parallel and tapered).

The bore diameter, key and, if required, grub screw are supplied to user specified requirements. Unique or special hubs can be machined from solid bar stock.

Applications

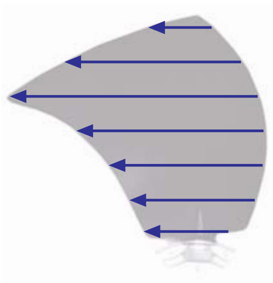
The sickle shaped blades have been developed to improve the impellers' acoustic and aerodynamic performance. The focus of this development was driven by the necessity to comply with more stringent noise emission regulations. This series is particularly suitable for ventilation, heating and cooling applications (i.e. ventilation fans, dry cooling towers, condensers and cooling installations but also for coolers of construction and harvesting machines).

Powerful and Economic

The market's increasing demand for lower noise at higher pressure and air flow led to the development of the sickle blade profile.

With increasing rotational speed the noise level rises by a factor of five. Subsequently, each reduction of the rotational speed lessens the noise.
The objective of the sickle blade impeller design is to provide a given air capacity at the lowest possible rotational speed. This objective is accomplished by the broad impeller blades and the sickle shape.

Compared to conventional blades with an airfoil profile, the shape of the sickle blade itself, leads to a further noise reduction.



Although the impeller is only one component, the noise reduction is evident in the entire system. The lower rotational speed of the impeller accompanied by the lower RPM of the drive motor, whether it be electrical, hydraulic, air or diesel engine driven, achieves a significant overall noise level of the system.

Direction of Rotation

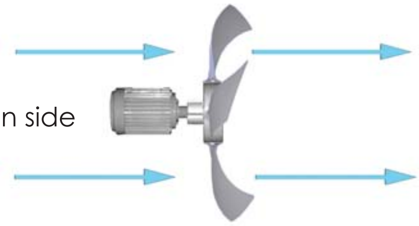
clockwise (RH)

To determine the direction of rotation, the air must blow into the face of the observer. If the rotation is clockwise, then the direction of rotation is right handed – if counter clockwise, then left handed.

counter clockwise (LH)

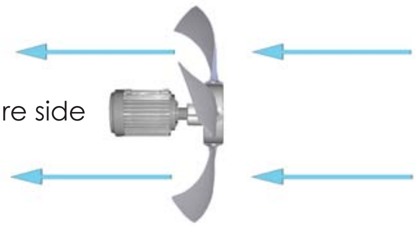
Assembly Form A (Air is sucked across the motor)

Suction side



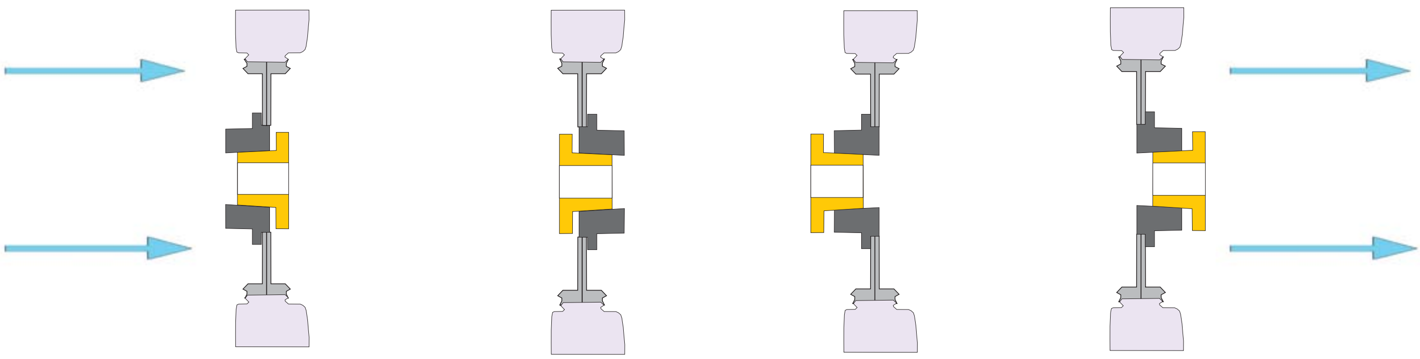
Assembly Form B (Air is blown over the motor)

Pressure side



The assembly form is an indication of how the impeller should be fitted to the motor shaft. If the air is sucked across the motor (the drive motor is upstream of the impeller), this is described as "Assembly form A".
If the drive motor is on the pressure side of the impeller (or downstream of the impeller), then we have "Assembly form B".
It is important to specify form A or form B in order to assemble the impeller and flanged hub (or the boss in case of the hub with a cast on boss) for the correct air flow condition.

Assembly Form When Using a Taperlock Bushing



Assembly form AS: Flanged hub suction side, Taperlock bushing pressure side

Assembly form BS: Flanged hub pressure side, Taperlock bushing suction side

Assembly form AR: Flanged hub suction side, Taperlock bushing suction side

Assembly form BR: Flanged hub pressure side, Taperlock bushing pressure side

Ordering code*

790 / 6 -12 / S4ZL / 37,5 / PAG / 28 / 8 / BS / JA

- Impeller diameter
- Number of blades
- Hub size
- Impeller series
- Direction of rotation L=counter clockwise, R=clockwise facing the air stream
- Blade angle or pitch angle
- Blade material
- Bore diameter
- Key width
- Type of mounting (A or B)
- Taper lock version

*For flange mounted impellers, the following information is required:

- Spigot hole diameter
- The number and size of bolt holes including bolt circle dimension (BCD).
- Additional information may be found at the website www.wingfan.com

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