

The image features a dark blue background with a white wind turbine blade on the right side, showing orange and white stripes at the tip. The Aerodyn logo is in the top right corner, consisting of the word 'aerodyn' in a stylized, italicized font with a registered trademark symbol. White curved lines sweep across the top of the image.

*aerodyn*<sup>®</sup>

## **aerodynBlade**

The blade license concept for the world market

experience. innovation. success.



## The aerodynBlade concept. The easiest way to your own blade production

The rapid global growth of the wind energy market continues unchanged. The emergence of more and more new markets increases the demand for locally produced components in order to implement the biggest possible part of the value chain in the country concerned. In this context, the rotor blades are of central interest as they are among the key parts of a wind turbine and have a considerable share (approximately 15 to 20%) in its total costs.

On the basis of its experience with over 50 different rotor blade designs in the power range of 5 kW to 5 MW, aerodyn has developed aerodynBlade, the rotor blade series which meets the high standards of global production. The blades are suitable for operation on different turbine types and under different environmental conditions.

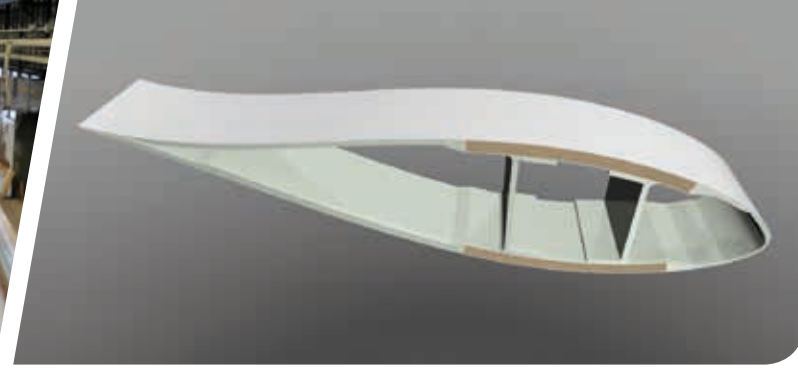
In addition to the blade technology, aerodyn also offers support and know-how for production workshop layout, production tooling design, definition of production processes, manufacturing documentation and QM documentation for the complete manufacturing process. In combination with our prototype and series production supervision, we guarantee full support to build up your own blade production facility in the shortest possible time.

Most blade types have been awarded the A-Design Assessment of DNV-GL and are in series production at various blade manufacturers around the world. Many successful blade tests run with our customers have proven the robustness and efficiency of our designs. This forms the basis for your success on the blade market.

Given the wide variety of available blade models for onshore and offshore turbines, our customers can meet all the market demands in a very flexible and efficient way. On demand, aerodyn can also modify the blade structure to optimize the blades for one specific turbine application. In addition the blade structure can also be adapted to specific material properties to customize and optimize the blade structure even more and thus increase profitability for our customers.

For details on license conditions, please contact our head office in Rendsburg.





## Concept and scope of supply

### Structural concept

The structural concept which aerodyn has chosen for the aerodynBlade rotor blade family is reliable and has been tested successfully for years. The blade structure consists of main spar caps on both the suction and the pressure side of the blade which are connected to each other by two shear webs and as a result bear the main loads of the rotor blade. An additional trailing edge UD bears part of the edgewise loads which occur in the rotor blade. aerodynBlade is connected to the blade bearing by means of a T-bolt connection. This type of bolted connection is extremely fault-tolerant and process-reliable, features which have been proven a thousand times.

### Manufacturing method

The spar caps and shear webs are reproduced in separate moulds in order to keep the occupancy time of the main mould short. All components of the rotor blade are manufactured using the Resin Infusion Molding (RIM) method with widely available glass/epoxy material, which provides the best compromise between material properties and manufacturing costs. A large number of qualified glass/epoxy material combinations from various suppliers assure a secure and flexible supply chain. The qualification processes for blade materials established at aerodyn make the involvement of further local material suppliers possible to optimize the supply chain for each customer and to fulfill the growing demand for local content.

### Scope of supply

The scope of supply includes 3D plug and mould geometry for mould production, blade lamination plans, lightning protection design, material specifications, blade specification and blade test specification. If requested by the customer, aerodyn can extend the scope of delivery to blade master plug and mould design, design for blade handling tools, manufacturing manuals and QM documentation. With our wide experience of more than 50 different rotor blade designs we can offer you a customized package which best fits your requirements.

All aerodynBlade models have A-Design Assessment of DNV-GL which is transferred to the customer after a successful static blade test.

### Production support

In addition to the documentation of the rotor blade, aerodyn also supplies extensive on-site support to the licensee during the manufacturing of the prototype blade and during serial production. Within the scope of the license agreement, aerodyn analyzes on the basis of supplied blade loads the usability of the rotor blades on different wind turbines, thus ensuring the operational capability of the blades on these turbines.

# Technical data

	ae 1.5-37.5	ae 1.5-40.3	ae 1.5-42.3	ae 1.5-45.0	ae 2.0-42.2	ae 2.0-45.3	ae 2.0-50.0	ae2.0-58.3	ae 2.5-46.9	ae 2.5-50.3	ae 2.5-53.7	ae 2.5-58.0	ae 3.0-53.7	ae 3.0-57.7	ae 5.0-63.5	ae 5.0-68.0
<b>General Data</b>																
Blade length (m)	37.5	40.3	42.3	45.0	42.2	45.3	50.0	58.3	46.9	50.3	53.7	58.0	53.7	57.7	63.525	68.025
Type Class (-)	TC 2A+	TC 2A	TC 3A	TC 3B	TC 2A+	TC 3A	TC3A	TC3B	TC 2A+	TC 2A	TC 3A	TC 3B	TC 2A+	TC 3A	TC 1B	TC 2B
Prebending at tip (m)	1.351	1.67	2.20	2.67	1.519	1.878	2.600	4.000	1.688	2.087	2.1	3.0	2.1	2.6	2.31	2.85
Maximum chord (m)	3.183	3.183	3.180	3.010	3.583	3.583	3.530	3.878	3.980	3.980	4.350	3.830	4.350	4.350	5.117	5.117
<b>Operation Parameter</b>																
Rated power (kW)	1500	1500	1500	1500	2000	2000	2000	2000	2500	2500	2500	2500	3000	3000	5000	5000
Rotor diameter (m)	77	82.6	86.6	92	86.8	93	102.4	119	96.3	103.2	110	118	110	118	130	139
Nominal speed (rpm)	19.8	18.5	17.6	16.6	17.0	15.4	14.9	13.7	14.8	14.8	13.0	12.9	13.0	12.1	12.5	11.75
Nominal tip speed (m/s)	80	80	80	80	77	75	80	85.0	75	80	75	80	75	75	85	85
<b>Aerodynamic Parameter</b>																
Tip speed ratio (-)	9.0	9.5	9.8	10.0	9.0	9.5	9.5	10.2	9.0	9.5	9.0	9.5	9.0	9.3	8.7	9.2
Power coefficient (-)	0.485	0.489	0.483	0.474	0.481	0.484	0.479	0.465	0.480	0.483	0.480	0.470	0.482	0.482	0.480	0.480
<b>Blade Connection</b>																
BCD blade root (mm)	1800	1800	1800	1800	2110	2110	2110	2110	2300	2300	2300	2300	2300	2300	3200	3200
Number, size of tension bolts	54 x M30	54 x M30	54 x M30 64 x M30	54 x M30 64 x M30	60 x M36 64 x M30 80 x M30	60 x M36 64 x M30 80 x M30	60 x M36 64 x M30 80 x M30	60 x M36	64 x M36	64 x M36	72 x M36	64 x M36 72 x M36	72 x M36	64 x M36 72 x M36	90 x M42	90 x M42
<b>Mass and Frequencies</b>																
Mass (excl. T-Bolts) (kg)	5800	5943	6287	7107	8670	8734	10000	10400	11455	11642	11664	11952	13878	14624	21373	26780
Mass T-Bolts (kg)	180	180	180/220	180/220	251/291/340	251/291/340	251/291/340	380	371	371	403	371/403	425	396/425	744	744
CoG (m)	11.61	12.15	13.11	14.55	12.69	13.88	15.11	18.07	15.30	15.89	17.00	17.79	17.35	18.66	19.9	22.16
First/Second flap-wise frequency (Hz)	0.94/2.65	0.78/2.16	0.77/2.16	0.67/1.86	0.91/2.60	0.73/1.97	0.66/1.92	0.56/1.61	0.76/2.26	0.64/1.81	0.63/1.93	0.59/1.73	0.65/1.91	0.56/1.61	0.65/1.74	0.52/1.38
First/Second edge-wise frequency (Hz)	1.70/5.10	1.49/4.34	1.26/3.93	1.02/3.18	1.58/4.93	1.32/3.86	1.16/3.70	0.88/2.64	1.32/4.34	1.18/3.60	1.06/3.69	0.86/2.72	1.07/3.54	0.93/3.00	1.03/3.14	0.96/2.75





The Aerodyn logo is rendered in a white, italicized, sans-serif font. A thin white diagonal line cuts through the 'y' and extends upwards and to the right, ending near the top right corner of the page. The registered trademark symbol (®) is positioned to the upper right of the 'n'.

*aerodyn*<sup>®</sup>