

Hi-Pres<sup>®</sup>

ZerAx<sup>®</sup> Premium fans

Axial Fan type AZN with increased efficiency



## The first competitively priced fan with 90 % efficiency

Most of the time, it can be difficult to get excited about ventilation because, after all, fans have been designed the same way for over 20 years. In 2008 Novenco decided to completely re-think the way fans are engineered today.

The result is ZerAx®, the new standard in axial flow fans with increased efficiency giving reduced power consumption and lower sound level. The reduced power consumption comes with an increased efficiency of almost 10 % which means that ZerAx® has a pay-back time of less than a year.

### High efficiency

The fan efficiency is as high as 90%. Motors offered in connection with ZerAx® are efficiency class 1 and 2 motors.

## What's in it for...

### The environment

ZerAx® will cause less pollution of CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub> etc.

### Shipowners

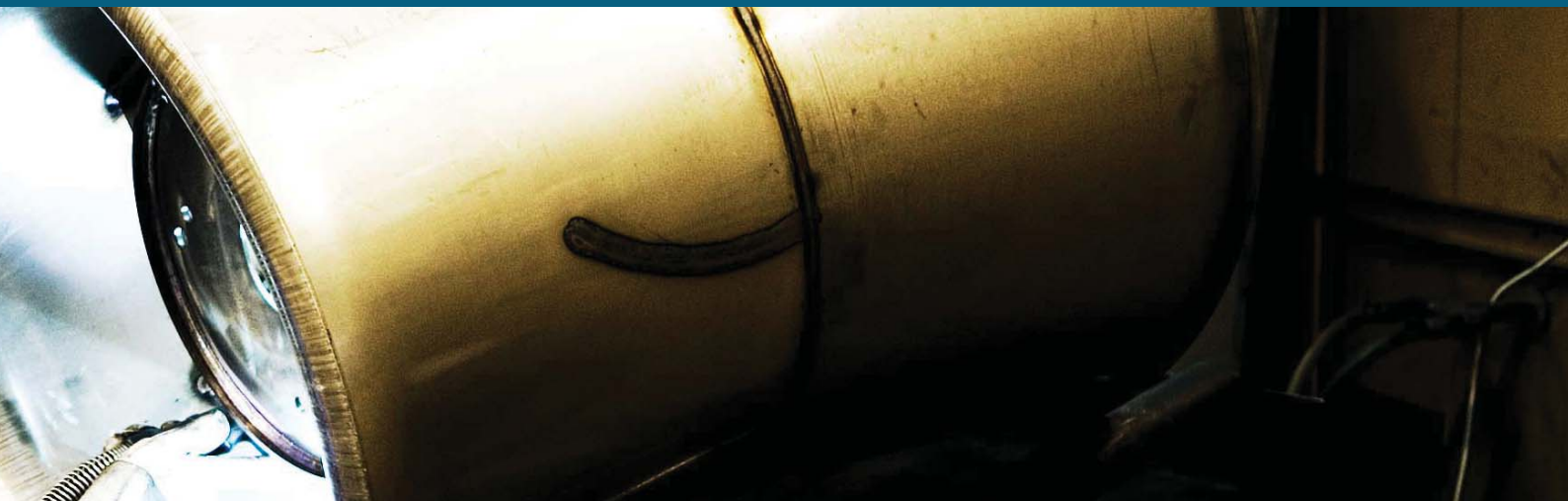
ZerAx® is with higher efficiency giving lower power consumption and saving on fuel. This high-tech product is paid back within 1 year.

### Shipyards

ZerAx® will save a lot on the electrical installation from starters, cables, distributions boards and even on the generators.

### The crew

ZerAx® will offer a lower sound level.



## How is this 90% efficiency reached?

### More aerodynamic

Using computer fluid dynamics, Novenco has re-designed key aerodynamics aspects of the fan to such a degree that the ZerAx® takes fan design to a new level for greater efficiency.

### More precise

Taking precision to the extreme – by robot-based manufacturing – we have managed to improve efficiency in several key areas of the fan to deliver outstanding performance with reduction in power consumption. As an example, the clearance between the rotor blades and the fan casing is kept to a minimum to optimize performance.

### Smarter in every detail

When we set out to design the ZerAx®, we took the entire fan engineering process outside the box. The result is an axial flow fan that breaks new ground with a host of details which improve efficiency and reduce power consumption and environmental impact.

### Testing and documentation

The ZerAx® has been tested according to EN ISO 5801 and AMCA 210 and BS 848 by the largest laboratory in Northern Europe to ensure that all specifications are fully accurate.

## Axial fan for duct installation type AZN

### Design

The AZN fan for duct installation is the first in the ZerAx® series of axial flow fans.

The AZN range comprises standard fans in 9 installation sizes with rotor diameters from Ø500 to Ø1250 mm. The hub diameter is Ø350 mm for all sizes.

Air flow rates run from 0.1 to 40 m<sup>3</sup>/s and pressure increases up to 3600 Pa. The direction of air flow for AZN fans is rotor - motor.

In the AZN, the complete rotor arrangement is installed together with the motor in the fan casing. The AZN is for duct installation with connection flanges at both ends. The flange pitch diameter, number of holes and hole size are standard in accordance with EUROVENT 1/2.

Central in the AZN is the rotor assembled from aluminium cast hub parts and blades. The rotor construction is fitted in an inner tube which has cast profiled guide vanes mounted on the motor mount.

The motor mount is aerodynamically designed to optimize air flow.

Both the motor mount and the fan casing are of pre galvanized steel or hot-dip galvanized steel.

The rotor unit is mounted directly on the spindle of the motor. The motor is a flange motor, mounted on the outlet side, and fitted with an electrical cable that passes out through the fan casing to a junction box for electrical connection.

The fans are supplied with 50 or 60 Hz motors as standard, but can also be supplied with special motors. Speed control is either through direct start or through a frequency converter.

Key to the performance of the ZerAx® is the choice of material and the characteristics of the surface textures.

The focus is on keeping the weight down, i.e. using light and strong materials. Most parts are made of aluminium and optimized to withstand high strains.

To save further on weight, the fan casing is shortened and parts are cast and machined with low tolerances.

### Materials

Blades: Sea water resistant aluminium

Hub: Sea water resistant aluminium

Hub cap: Sea water resistant aluminium

Inner hub: Cast steel

Inner tube: AluZink

Fan casing: AluZink for light motors and hot-dip galvanized steel for heavy motors

Guide vanes: Sea water resistant aluminium

### Classifications

Flange standards: EUROVENT 1/2

Technical capacity: BS 848-1:2007 and EN ISO 5801:2008

Environment: DS/EN ISO 12944-2, corrosion category C3

Temperature range standard: -20 to 50 °C

Temperature range, max: -40 to 120 °C

### AirBox calculation program

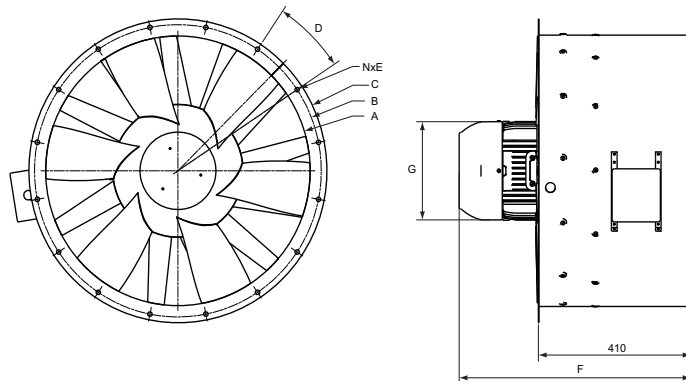
The ZerAx® fans are calculated using Novenco AirBox. Input to the program are the requirements for air flow and pressure as well as specific characteristics of the operating environment. Further requirements for the fan, motor and accessories are also input and form the basis for calculation of possible solutions.

The precise angles are found with the Novenco AirBox calculation program and curves and data sheets are ready for printing.

Novenco AirBox is available on [www.novenco-group.com](http://www.novenco-group.com) in the download section. It requires registration, checks automatically for updates and is free of charge.



### Dimension AZN for duct installation

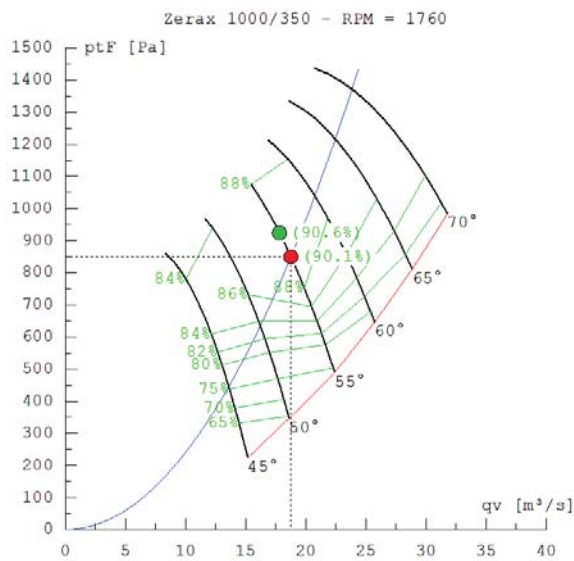


ØA [mm]	ØB [mm]	ØC [mm]	D [mm]	N [mm]	E [mm]
500	560	590	30	12	12
560	620	650	30	12	12
630	690	720	30	12	12
710	770	800	22.5	16	12
800	860	890	22.5	16	12
900	970	1000	22.5	16	15
1000	1070	1100	22.5	16	15
1120	1190	1220	18	20	15
1250	1320	1350	18	20	15

Motor frame	F [mm]	G [mm]
90S	452	179
90L	477	
100L	514	199
112M	531	222
132S	585	270
132M	623	
160M	832	312
160L	876	
180M	898	358
180L	936	

Casing (thickness 2 or 4 mm) depending on the motor size - look it up in Novenco AirBox.

### AZN CURVE



Exampel of curve output from Airbox

## Frequency converter for optimum capacity control

The great advantage of fan frequency regulation is that it is energy efficient. Energy consumption is reduced dramatically compared to the standard on most ships where there is no regulation.

There are many advantages to be gained from using frequency converters:

- |  |   |   |
|--|---|---|
| Precise regulation of flow rate                                | ⇒ | No over capacity  |
| Rapid adjustment of fan speeds to varying operating conditions | ⇒ | Better condition onboard  |
| Lower speeds   | ⇒ | Lower power consumptions. 20% lower speed result in almost 50% saving of energy |
| Lower speeds   | ⇒ | Lower sound levels  |
| No need to continually stop and restart fans                   | ⇒ | Less maintenance  |

It is quite easy to reduce the speed by 20% for systems serving Engine Rooms, Machinery Rooms, Cooling Container Holds, Cargo Holds for Ro-RO and PCTC, Car Decks on ferries, etc. Furthermore, lowering speed by frequency control to for instance 50%, saves much more energy than switching off half the number of the fans because energy consumption is in 3rd power of the speed reduction.

### Frequency converters





## If you want something more effective, it has to be fully tailor-made



Increased efficiency, reduced power consumption, lessened environmental impact – the ZerAx® gives benefits that used to be available only with tailor-made axial flow fans. Now, Novenco delivers standard design that is always customized to your needs, at only a fraction of the cost of a fully tailor-made solution.

## Unbeatable business cases

### Newbuildings

Take the world's largest ro-ro vessel. With 70 axial flow fans and 120 days of operation per year, ZerAx® will save the ship owner € 51.000 per year (assuming \$75 per barrel of heavy fuel oil). That is approx. 20% of the fan price which makes the pay-back time lower than a year even at a 20% price difference compared to the best competing fan.

### Retrofit

The pay-back time can be higher because the fan must also be installed on the vessel. However, there are fans used in the market which has an efficiency 30-40% lower than the ZerAx®. The pay-back time will be from 2.5 years down to less than 1 year depending on the fans already installed and in the world the ZerAx® is to be installed.

### Important

This document is provided 'as is'. Novenco reserves the right to changes without further notice due to continuous product development.

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### Patents and trademarks

Novenco® is a registered trademark of Novenco A/S.

The ZerAx® trademark and the ZerAx® design are registered to Novenco A/S.

The ZerAx® manufacturing processes and technologies are patent pending. Pat. no. PA200901117, PA200901118, PA200901119.

Other trademarks appearing in this document are the property of their respective owners.

### Quality and environment

Novenco® is certified in accordance with ISO 9001 and 14001.





Novenco develops and manufactures air conditioning, ventilation and refrigeration systems marketed and distributed worldwide through subsidiaries and agents.

The company was founded in Denmark in 1947 and has become one of the world's leading suppliers in this market area.

The HI-PRES Marine and Offshore division is part of the Novenco group.

We are widely acknowledged as a professional supplier of high quality energy-efficient marine and Offshore HVAC/R systems.