

Pure competence in air.

# RETROFITTING OF AHUs HIGH EFFICIENCY FOR EXISTING AHU SYSTEMS

Building & Industry

**NOVENCO** 

SCHAKO Group



# PROGRAMME

## PROGRAMME

The NOVENO® Retrofit programme for AHUs use the ZerAx® AZL fans to reduce power consumption and lower sound levels. The fan design is innovative and the high fan efficiencies promote big economic savings while the work environment improves.

With this retrofit solutions NOVENCO Building & Industry offers to reduce energy use in existing installations by replacing old fans with much more efficient and energy saving fans. Furthermore, and perhaps more importantly, the environmental impact is diminished and CO<sub>2</sub> emissions are significantly reduced.

## APPLICATIONS

For retrofitting of existing AHUs and for installation in new units.

## RANGE

Fans with integrated inlet cones for building in to air handling units.

## FAN SPECIFICATIONS

**Casing thicknesses:** 2 or 3 mm

**Hub sizes:** Ø160 or Ø350 mm

**Impeller diameters:** Between Ø250 and Ø500 mm for Ø160 mm hubs, between Ø500 and Ø1000 mm for Ø350 mm hubs

**Blade angles:** Between 25° and 75°, depending on the design pressure

**Air flow rates and pressure:** 0.1 to 34 m<sup>3</sup>/s and up to 3200 Pa

**Efficiencies:** Up to 92%, disregarding motors

**Reverse operation:** Max. RPMs for very short periods. Airflow is approx. 50% and pressure is 25% of normal operation.

## MOTORS

**Terminal boxes:** Boxes of steel or plastic mounted on fan casing

**Dimension standard:** IEC-72

**Electrical standard:** IEC-34

**Enclosure:** IP54, IP55, IP56 or IP65

**Insulation:** Class F or H

**Balancing:** IEC 60034-14

**Flanges:** B5 or B14

**Voltages:** Between 3x220 V and 3x690 V; f.x. 3x400 V, 50 Hz

**Efficiency classes:** IE1- IE5

**Speed control:** Direct or frequency drive

**Mounting:** Enclosed in motor mount or outside the mount through a long hub.

## MATERIALS

**Blades:** Aluminium

**Hub:** Aluminium

**Hub cover:** Aluminium

**Inner hub:** Cast steel galvanised

**Inner tube:** AluZink

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

**Guide vanes and motor mount:** Sea-water resistant aluminium

## CLASSIFICATIONS

**Flange standard:** Eurovent 1/2

**Technical capacity:** BS 848-1:2007, EN ISO 1940-1:2003 and EN ISO 5801:2008

**Environment:** DS/EN ISO 12944-2, corrosion categories C3 as standard, C4 or C5 as option

**Temperature range, standard:**

-20 to 50 °C

**Temperature range, max.:**

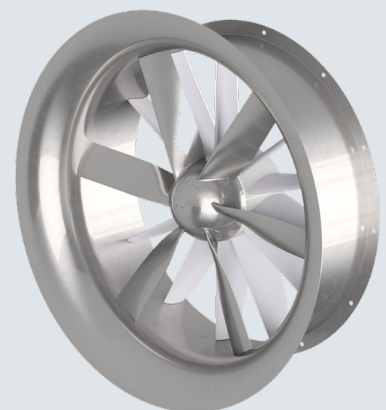
-40 to 120 °C

**Calculation software:**

AirBox program is certified by TÜV

## ACCESSORIES

- Fan casing extension
- Hub cover
- Inlet wire guard
- Outlet wire guard
- Acoustic diffusers type YAD with cores or type YAZ with or without cores
- Short diffuser
- Long diffuser
- Silencer type YAH with or without core
- Painted for C4/5 environments
- Support frame for horizontal mount
- Plate for vertical mounting
- Flexible connection
- Counter flange
- Duct spigots
- Measuring pipe
- Damper type SBC
- Thermal motor protection
- Space heater for motor
- Kit for lubrication of motor
- Low temperature motor option
- Frequency converter for motor



# DESCRIPTION

The ZerAx® fans build on NOVENCO's renowned NovAx™ design. Almost all aspects of the design are improved with this next generation fan. The materials and the use thereof have been refined, and the design is made contemporary. The efficiencies are improved to groundbreaking new levels for axial fans, thus lowering the overall power consumption and noise. All of this makes the ZerAx® fans best in class and ready to comply with future environmental legislation.

In the retrofit program, the ZerAx® ensures high levels of performance at minimum costs when built into air handling units.

## DESIGN

Central to the design is the from aluminium cast and assembled hub parts, impeller and blades. The impeller is fitted in an inner tube, in which cast profiled guide vanes are mounted on the motor mount.

The installation of the impeller arrangement and motor in the fan casing is done with high precision to achieve the extreme efficiencies and very little blade clearances.

## MATERIALS

The materials and characteristics of the surface textures are key to the performance. Focus is on low weight through the use of light and strong materials. Most parts are of aluminium and optimised to withstand high strains.

To save further weight, the fan casings are kept short and parts are cast and machined with high precision.

## GROUNDBREAKING EFFICIENCIES

Isolated measurements of the fan efficiencies document efficiencies above 90%. To complement these the ZerAx fans are offered with motors in efficiency classes IE1- IE5. The ZerAx® fans are built to withstand operation in reverse for shorter periods.

## CLASSIFICATIONS

The ZerAx® design has been tested and specifications verified according to the standards EN ISO 5801 and AMCA 300 and BS 848 by the largest laboratory in Northern Europe.

## OPTIMUM BLADE ANGLES

The fan performance depends on speed and blade angle. The optimum blade angles are found with the AirBox program and input to the production. Angles lie between 25° and 75° in 5° increments for Ø350 hubs and in 1° increments for Ø160 and Ø560 hubs.

## AIRBOX CALCULATION PROGRAM

The AirBox program is NOVENCO's calculation and configuration tool. Input to the program are requirements for airflow 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. NOVENCO AirBox is available on [www.novenco-building.com](http://www.novenco-building.com) in the Download section. It is certified by TÜV Süd in Germany, requires registration, checks automatically for updates and is for free.



# ZERAX® AZL FOR AHUs

The ZerAx® AZL fans are strong and durable with form factors that in many cases result in smaller space requirements when replacing existing fans in AHUs. In new AHU designs, the compact form factor means that these can be smaller, less noisy and lighter. Hence, saving materials and space as well as maximising the comfort level with less noise compared to other fans.

## STANDARD RANGE

Part of the AZL fan range is defined as Standard Range, which comprises seven installation sizes with Ø160 mm hubs and impeller diameters from Ø250 to Ø500 mm, and seven installation sizes with Ø350 mm hubs and impeller diameters from Ø500 to Ø1000 mm. Airflow rates are from 0.75 to 20 m<sup>3</sup>/s, pressures increase up to 2400 Pa and efficiencies go above 91%.

## CONSTRUCTION

The fan casings are cylindrical with connection flanges for outlet and with integrated inlet cones.

The motor mounts are aerodynamically designed for optimum airflows.

The impeller units are mounted directly on the motor shafts.

The flange pitch diameter, number of holes and hole sizes are as standard in accordance with Eurovent 1/2.

The motors are flange motors, mounted on the outlet side and fitted with electric cables that pass out through the fan casings to terminal boxes.



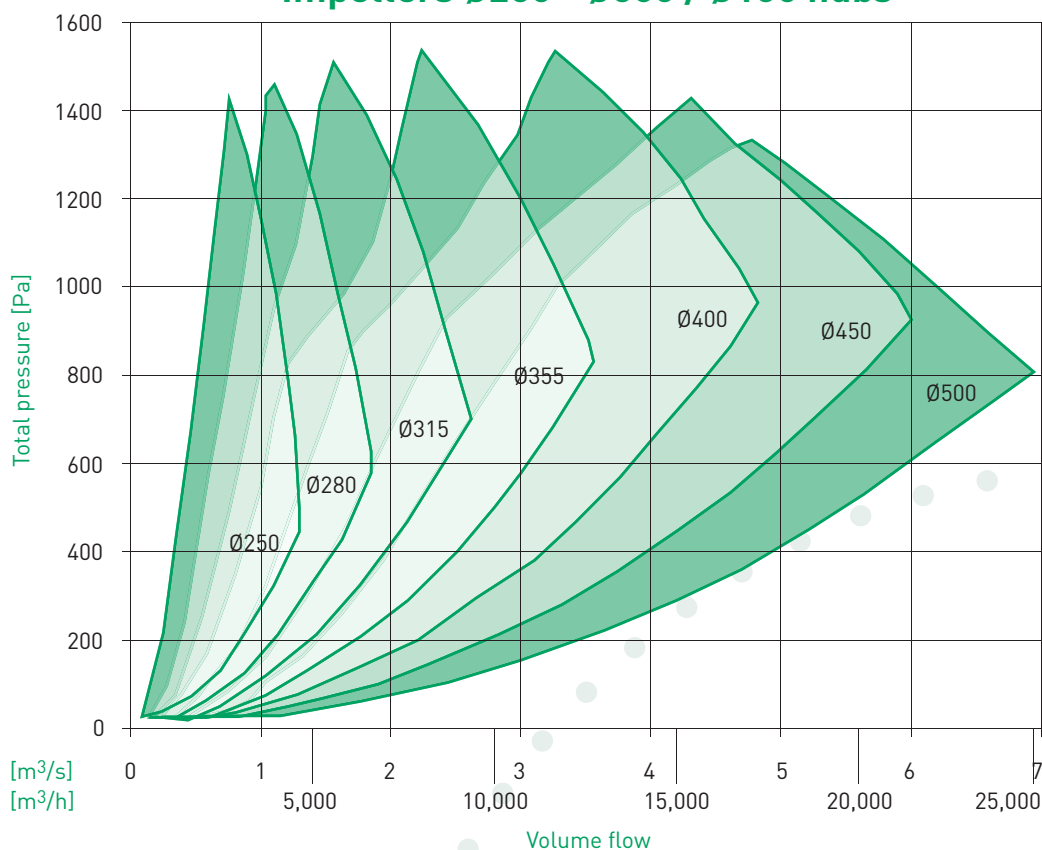
# WORK AREAS

The work areas are for variable speed fans, i.e. with frequency drives, in which the blade angles are varied to outline the work area of each fan.

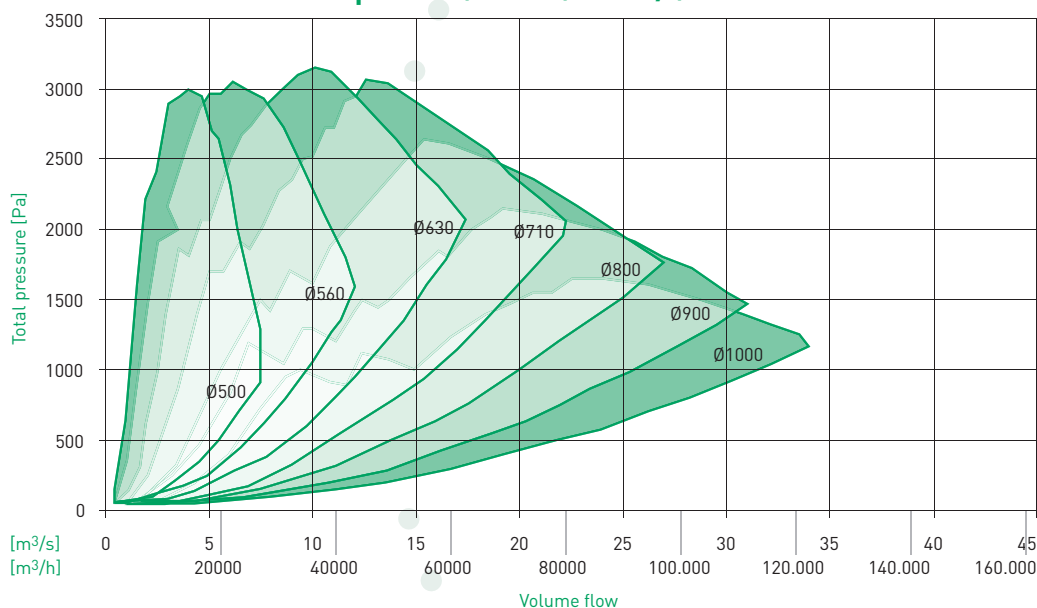
The capacities are based on fan installation in accordance with BS 848 1980, installation type D, i.e. duct connection for inlet and outlet. The air density is  $\rho = 1.20 \text{ kg/m}^3$ .

Please refer to NOVENCO AirBox for final dimensioning, calculation of blade angles, choice of motor, power consumption, sound calculation etc.

## Impellers Ø250 - Ø500 / Ø160 hubs



## Impellers Ø500 - Ø1000 / Ø350 hubs



WORK AREA CURVES



# DETAILS



SUPPORT FRAME

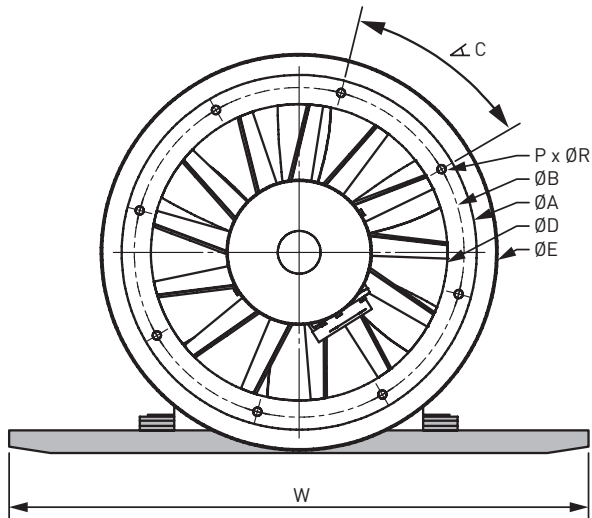


EASY ACCESSIBLE TERMINAL BOX AND FLEX

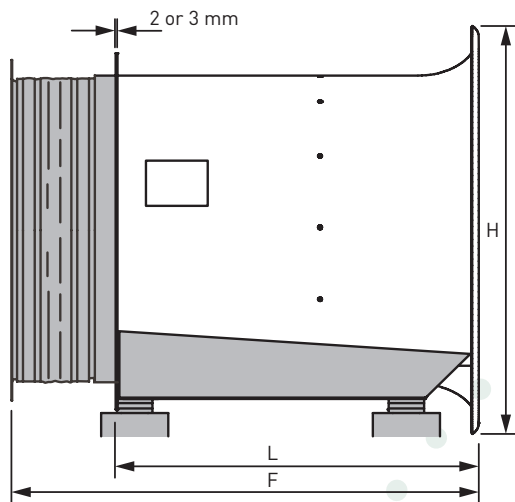


MINIMUM BLADE CLEARANCE

# DIMENSIONS



4



4

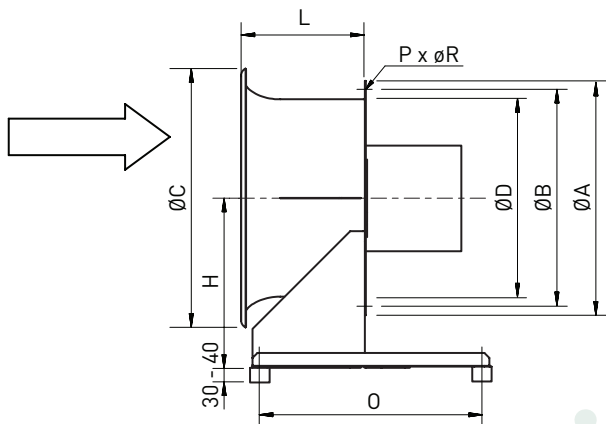
Hub sizes [mm]	ØD [mm]	ØB [mm]	ØA [mm]	ØE [mm]	C [°]	P	ØR [mm]	L [mm]	Max weights [kg] <sup>1</sup>
Ø160	250	280	310	335	90	4	10	225	7
Ø160	280	320	350	375	90	8	10	231	9.5
Ø160	315	355	385	422	45	8	10	238	10.5
Ø160	355	395	425	475	45	8	10	246	12.5
Ø160	400	450	480	536	45	8	12	255	13.5
Ø160	450	500	530	602	45	8	12	265	15
Ø160	500	560	590	669	30	12	12	275	16
Ø350	500	560	590	669	30	12	12	460	36.5
Ø350	560	620	650	753	30	12	12	485	61
Ø350	630	690	720	842	30	12	12	485	72
Ø350	710	770	800	948	22.5	16	12	515	58
Ø350	800	860	890	1068	22.5	16	12	515	97
Ø350	900	970	1000	1202	22.5	16	15	555	115
Ø350	1000	1070	1100	1338	22.5	16	15	555	130

<sup>1</sup> Exclude motor.<sup>2</sup> Depends on motor sizes. Values are for max. sizes.<sup>3</sup> Refer to technical specifications for ZerAx Standard Range for specific values. Values are max. values.<sup>4</sup> Features unique to the bracket mounted AZL in the Standard Range are shaded.

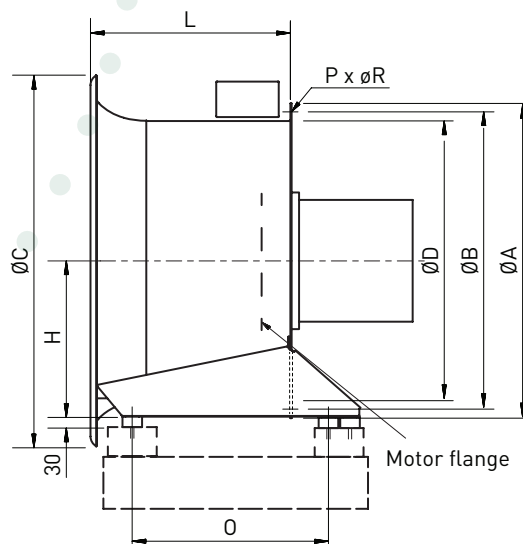
Hub sizes [mm]	ØD [mm]	Motor sizes	F <sup>2</sup> [mm]	F std. <sup>3</sup> [mm]
Ø160	250	80	461	461
Ø160	280	80	467	467
Ø160	315	80	474	517
Ø160	315	90	521	517
Ø160	315	100	558	517
Ø160	355	80	482	562
Ø160	355	90	529	562
Ø160	355	100	566	562
Ø160	400	80	491	588
Ø160	400	90	538	588
Ø160	400	100	575	588
Ø160	400	112	619	588
Ø160	450	80	501	598
Ø160	450	90	548	598
Ø160	450	100	585	598
Ø160	450	112	629	598
Ø160	500	80	511	608
Ø160	500	90	558	608
Ø160	500	100	595	608
Ø160	500	1125	639	608
Ø350	500	90	610	608
Ø350	500	100	610	608
Ø350	500	112	610	608
Ø350	500	132	673	608
Ø350	500	160	930	608
Ø350	500	180	990	608
Ø350	560/630	90	630	1030
Ø350	560/630	100	630	1030
Ø350	560/630	112	630	1030
Ø350	560/630	132	698	1030
Ø350	560/630	160	955	1030
Ø350	560/630	180	1015	1030
Ø350	710/800	90	650	1068
Ø350	710/800	100	650	1068
Ø350	710/800	112	650	1068
Ø350	710/800	132	728	1068
Ø350	710/800	160	985	1068
Ø350	710/800	180	1045	1068
Ø350	900/1000	90	690	1108
Ø350	900/1000	100	690	1108
Ø350	900/1000	112	690	1108
Ø350	900/1000	132	768	1108
Ø350	900/1000	160	1025	1108
Ø350	900/1000	180	1085	1108

<sup>1</sup> Depends on motor size. Values are for max. sizes.

# DIMENSIONS SUPPORT FRAMES



SUPPORT FRAME FOR AZL WITH Ø160 HUBS



SUPPORT FRAME FOR AZL WITH Ø350 HUBS

Installation sizes (impeller diameters) <sup>3</sup>														
Mounting supports <sup>2</sup>	Hub Ø160							Hub Ø350						
	Ø250	Ø280	Ø315	Ø355	Ø400	Ø450	Ø500	Ø500	Ø560	Ø630	Ø710	Ø800	Ø900	Ø1000
	ØA	310	350	385	425	480	530	590	650	720	800	890	1000	1100
	ØB	280	320	355	395	450	500	560	620	690	770	860	970	1070
	ØC	333	373	420	473	545	600	675	753	842	948	1068	1202	1338
	ØD	250	280	315	355	400	450	500	560	630	710	800	900	1000
	O <sup>4</sup>	290	290	290	290	290	290	340	340	340	380	380	430	430
										691.5	702.5	701.5	712.5	691.5
	P	4	8	8	8	8	8	12	12	12	12	16	16	16
	ØR	10	10	10	10	12	12	12	12	12	12	12	15	15
	H	303	318	348	373	348	368	388	300.5	301	400.5	400.7	450.9	501
											401	401	451	501
	L	225	231	238	246	255	265	275	460	485	485	515	515	555
											485.5	516	516	556
Weight <sup>1</sup>		7	9	10	12	13	15	16	36	43	50	58	70	80
									52	61	72	84	97	115

**1** Weights include fan and casing, but exclude motors. For hub sizes Ø350 top values are for fans with 2 mm casings and bottom values are for 3 mm casings. Refer to NOVENCO AirBox for weights of specific configurations.

**2** The width and design of the mounting support construction depend on hub size.

**3** The flange standards are according to Eurovent 1/2.

**4** For hub size Ø350 the top values are for motor sizes ≤132 and bottom values for motor sizes >132.

Dimensions are in mm. Weights are in kg.



# ACCESSORIES

## ACCESSORIES FOR ANY PURPOSE

The ZerAx® is offered with a wide choice of accessories that make it possible to customise fan solutions for virtually all installation conditions. Refer to the AirBox program for configurations and possible combinations.

Features
Acoustic diffuser type YAD with core
Acoustic diffuser type YAZ with or without core
Fan casing extension <sup>1</sup>
Hub cover 2
Inlet wire guard
Outlet wire guard
Long diffuser
Short diffuser
Painted impeller for C4/5 environments
Silencer type YAH with or without core
Thermal motor protection
Space heater for motor
Kit for lubrication of motor
Low temperature motor option
Frequency converter for motor
Mounting
Support frame for horizontal mount
Vertical mounting plate
Connection
Counter flange
Duct spigots
Flexible connection (PERL / Maritex)
Measuring pipe
External
Damper type SBA-SBC



WIRE GUARDS FOR INLET AND OUTLET



DUCT SPIGOTS

**1** The fan casing extension is made of 2 mm Aluzink and is usually selected for fans where the motors cannot be encased otherwise. It is also referred to as an extension duct.

**2** The hub cover prevents water, ice, dirt and bacteria to enter into hub cavities and result in impeller imbalance.

# REFERENCES

## CARLSBERG, DENMARK

Carlsberg Group has stated as a goal that energy consumption must be optimised in order to reduce CO<sub>2</sub> emissions and reduce the energy consumption costs.

By replacing old fans that were installed in the 1970s with new ZerAx® fans, the energy consumption has been reduced by 52% at their brewery in Fredericia, Denmark.

A total saving of 161 tons of CO<sub>2</sub> per year and an ROI on the replacement of the entire system for only 2.2 years.



## TV STATION, DENMARK

The Danish tv station serves the public with around the clock news. A broke down fan which supplies fresh air to the news studio was replaced with new ZerAx® fan.

An unique solution with a special piece of duct work was designed to fit the new and shorter fan directly into the existing installation.

The ZerAx® fan saves the environment for 14 tons CO<sub>2</sub> per year. The energy saving amounts to a total of almost 27,000 kWh per year.



## SIMA POWER STATION, NORWAY

The second largest hydro-electric power station in Norway, the Sima Power Station replaced the old fans with 9 ZerAx® fans as part of a comprehensive energy-retrofit project.

The fans ventilate all tunnels and working areas inside the mountain, and help remove the heat generated by the power house with transformer and within the generator areas.

The replacement of the old fans with the ZerAx® fans resulted in at least 30% reduction in energy consumption.



## IMPORTANT

This document is provided 'as is'.

NOVENCO reserves the right to changes without further notice due to continuous product development.

The fan is designed for continuous operation. The following kinds of operation may cause fatigue break in the impeller and endanger people.

- Operation in stall area
- Operation with pulsating counter pressure – called pump mode
- Daily operation with exceedingly starting and stopping

If in doubt, NOVENCO should be contacted to assess the suitability of the fans.

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The ZerAx® manufacturing processes, technologies and designs are patented by NOVENCO A/S. **Pending patents** include Brazil no. BR-11-2012-008607-3, BR-11-

2012-008543-3, BR-11-2012-008545-0, BR-11-2014-002282-8 and BR-11-2014-002426-0; Canada no. 2.777.140, 2.843.131 and 2.843.132; China no. 2012280037965.7; EU no. 10778838.2, 12740606.4 and 12740612.2; India no. 4140/CHENP/2012, 4077/CHENP/2012, 4073/CHENP/2012, 821/CHENP/2014 and 825/CHENP/2014; PCT no. EP2012/064908 and EP2012/064928; South Korea no. 10-2012-7012252, 10-2012-7012154, 10-2012-7012155, 10-2014-7005746 and 10-2014-7003829; and US no. 14/234.654. **Pending designs** include US no. 29/541.418 and 29/541.422.

**Granted patents** include Canada no. 2.777.141 and 2.777.144; China no. ZL2010800458842, ZL2010800460965, ZL2010800464275 and ZL2012800387210; EU no. 2488759 and 2488761; and US no. 8.967.983, 9.200.641, 9.273.696 B2 and 9,683,577. **Granted designs** include Brazil no. BR-30-2012-003932-0; Canada no. 146333; China no. 1514732, 1517779, 1515003, 1555664 and 2312963; EU no. 001622945-0001 to 001622945-0009 and 001985391- 0001; India no. 246293; South Korea no. 30-0735804; and US no. D665895S, D683840S, D692119S, D704323S, D712023S, D743018S, D755363S and D756500S.

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## QUALITY AND ENVIRONMENT

NOVENCO Building & Industry A/S is certified in accordance with ISO 9001 and 14001.

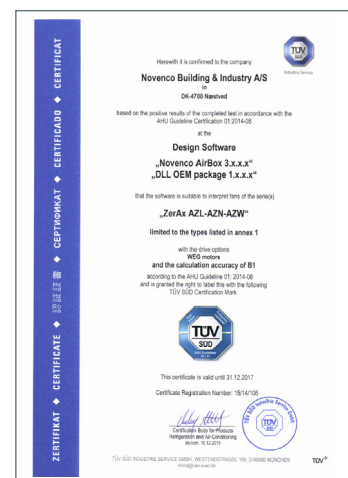


All NOVENCO Building & Industry's products are designed, developed and manufactured in Denmark.



## AIRBOX TÜV CERTIFICATE

NOVENCO Building & Industry A/S is certified in accordance with ISO 9001 and 14001.



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