ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Industrie Service

Herewith it is confirmed to the company

Novenco Building & Industry A/S

in

DK-4700 Næstved

based on the positive results of the completed test at the

Design Software
„Novenco AirBox 3.x.x.x“
„DLL OEM package 1.x.x.x“

that the software is suitable to configure fans of the model ranges

„ZerAx AZL-AZN-AZW“

with the calculation accuracy of B1
under consideration of annex 1 to 3

according to the **RLT-RICHTLINIE Zertifizierung:2017-11**
and is granted the right to label these with the following
TÜV SÜD Certification Mark.

This certificate is valid until 2022-09-30

Certificate Registration Number: 15/14/106 (Revision 01)

TÜV SÜD Industrie Service GmbH

Certification Body for Products
Refrigeration and Air-Conditioning
Munich, 2020-09-25

This certificate is only valid in connection with the following annex, consisting of 3 pages.

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List of the certified fan types ZerAx AZL-AZN-AZW					
Fan size	**Hub size**	**Min. blade angle**	**Max. blade angle**	**Min. motor size**	**Max. motor size**
355	160 mm	40°	65°	71	100
400	160 mm	43°	68°	71	112
450	160 mm	47°	72°	71	112
500	160 mm	50°	75°	71	112
500	350 mm	25°	60°	90	180
560	350 mm	25°	65°	90	180
630	350 mm	30°	70°	90	180
710	350 mm	35°	70°	90	180

Remark:

The calculation accuracy is only valid for the recommended operating range of the respective fan. Outside of the recommended range the calculation accuracy can be less.

The calculation accuracy in the certificate is only valid for fans in the table above in conjunction with or without short diffusers and WEG motors.

The following specific values of the software were verified

ZerAx AZL-AZN-AZW			
Definition according to the standard DIN EN ISO 5801	**Definition used in „Air Box“**	**symbol**	**unit**
volume flow rate	**Volume flow**	**qV**	**[m³/s]**
fan static pressure	**External static pressure**	**dP_{sF}**	**[Pa]**
rotational speed of the impeller	**Speed**	**n**	**[rpm]**
fan shaft power	**Power**	**Pe**	**[kW]**
static fan efficiency	**Overall Static Efficiency**	**η_{se}**	**[%]**

Table of calculation accuracy

	Deviations of the classes		
Value	**B0**	**B1**	**B2**
Volume flow	± 1 %	± 2.5 %	± 5 %
Pressure increase	± 1 %	± 2.5 %	± 5 %
Power input	+ 2 %	+ 3 %	+ 8 %
Efficiency	- 1 %	- 2 %	- 5 %

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Regarding to the RLT-RICHTLINIE Zertifizierung:2017-11, the correction values listed below must be included into the air handling unit design/selection software.

Installation losses of the fan types ZerAx AZL-AZN-AZW

As the verification of all installation loses **wasn't** part of the certification of the fan design software, the following standard correction values have to be applied.

Suction situation:

$a < 0.5 \times d_{nenn}$	=> not permissible
$a \geq 0.5 \times d_{nenn}$	=> no effect
Suction protection	=> $k_7 = 0.5 \times p_{dyn}$

Blow out situation:

Blow out in chamber without or with diffuser (with $L_{Diffusor} < 4 \times d_{nenn}$)	=> k_8 = part of the certification
Blow out in chamber with diffuser (with $L_{Diffusor} \geq 4 \times d_{nenn}$)	=> $k_8 = 0.3 \times pdyn$
Blow out in channel	=> $k_8 = 0$

Installation losses = $(k_7 + k_8) \times p_{dyn}$

With:

a	Distance to the closest installed part/wall in [mm]
d_{nenn}	Diameter of the wheel in [mm]
k	Correction value
p_{dyn}	Dynamic pressure on the fan in [Pa]

Installation losses of fan walls of the fan types ZerAx AZL-AZN-AZW

As the verification of the installation losses of fan walls **wasn't** part of the certification of the fan design software, the following standard correction values have to be applied.

Suction situation:

$a < 0.5 \times d_{nenn}$	=> not permissible
$a \geq 0.5 \times d_{nenn}$	=> no effect
Suction protection	=> $k_1 = 0.5 \times p_{dyn}$

Blow out situation:

$a \geq 0.6 \times d_{nenn}$	=> $k_2 = 0.1 \times \Delta p_{dyn}$
$a \geq 0.2 \times d_{nenn}$	=> $k_2 = \left(-6.8\left(\frac{a}{d_{nenn}}\right)^3 + 16.9\left(\frac{a}{d_{nenn}}\right)^2 - 13.9\left(\frac{a}{d_{nenn}}\right) + 3.82\right) \cdot p_{dyn}$
$a < 0.2 \times d_{nenn}$	=> not permissible

Installation losses = $(k_1 + k_2) \times \Delta_{dyn}$

With:

a	Distance to the closest installed part/wall in [mm]
d_{nenn}	Diameter of the wheel in [mm]
k	Correction value
p_{dyn}	Dynamic pressure on the fan in [Pa]

Efficiency of the control equipment of the fans type ZerAx AZL-AZN-AZW [f_R]:

The measurements carried out to certify the design software of the fan models listed in annex 1 include **not** the efficiency of the control device. For fan and motor combinations listed in annex 1 the correction factor of the control device shall be applied to **$f_R = 0.97$**.

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Nominal motor efficiency for fans - type ZerAx AZL-AZN-AZW [f_M]:
The measurements carried out to certify the design software of the fan models listed in annex 1 were carried out with fan and motor combinations. For fan and motor combinations listed in annex 1 the correction factor of the nominal efficiency $\mathbf{f_M = 1.00}$ shall be not applied.

Part load efficiency for fans - type ZerAx AZL-AZN-AZW [f_{TL}]:
The measurements carried out to certify the design software of the fan models listed in annex 1 were carried out in part load. For fan and motor combinations listed in annex 1 the correction factor of the part load $\mathbf{f_{TL} = 1.00}$ shall be not applied.

Accuracy class for fans - type ZerAx AZL-AZN-AZW [f_G]:
Due to the accuracy class specified by the manufacturer, the correction class shall be applied to $\mathbf{f_G = 1.05}$.

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