

Centrifugal fans type CAL-DSR

Installation and maintenance

Centrifugal fans type CAL

Installation and maintenance

1. Handling

- 1.1 Vertical transport

2. Storage

3. Installation

- 3.1 Installation
 3.2 Duct connections
 3.3 Security
 3.4 Electric connection

4. Start-up

- 4.1 Before start-up
 4.2 Fans with inlet guide vane
 4.3 Motors with Y/ Δ start
 4.4 Frequency-controlled motors
 4.5 Start-up procedure
 4.6 Repeat inspection
 4.7 Calculation of air volumes

5. Maintenance

- 5.1 Cleaning and inspection
 5.2 Dismounting of impeller from the inlet side
 5.3 Mounting of impeller from the inlet side
 5.4 Dismounting of motor with impeller from the motor side
 5.5 Mounting of motor with impeller from the motor side
 5.6 Shaft seal

6. Sound

7. Inspection and test

8. Safety

9. Spare parts

10. Patents, trademarks and copyright

11. Quality and environment

12. Warranty

13. Declaration of conformity

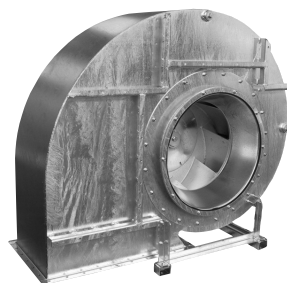


Fig. 1

1. Handling

1.1 Vertical transport

Four-point suspension is recommended for hoisting.

Fans are lifted in the supports located in the inlet side of the fan housing and in the motor bracket on the opposite side.



Fig. 2

2. Storage

Fans are supplied on pallets or skids which allow fork-lift transport. Fans can withstand outdoor storage for up to one month provided the packaging is intact.

If the fans are stored indoors under well-ventilated conditions with no risk of condensation, the storage period may be extended to six months. The storage place must not be exposed to vibrations, which may damage the bearings.

If the storage period exceeds three months, it is recommended to turn the impeller regularly by hand.

3. Installation

3.1 Installation

Fans must be installed on a horizontal, firm and level surface with an oscillation frequency that is at least 20% higher than the highest fan rotational frequency.

Fans are normally mounted on vibration dampers screwed onto the surface. Vibration dampers are normally not supplied with the unit.

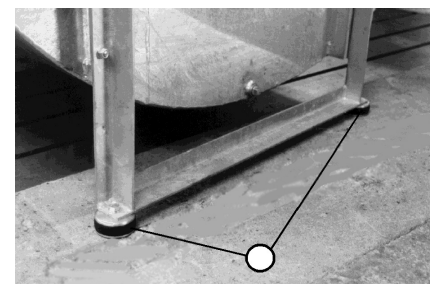


Fig. 3

Avoid subjecting the fan to mechanical stress during installation – especially when installing the fan without vibration dampers and with fixed connections.

3.2 Duct connections

Ducts are normally connected by means of flexible connections.

Prior to connecting the ducts, check that:

- all movable parts can move freely.
- the distance between impeller and inlet cone is equally large everywhere.
- fan and duct connections are clean and free of foreign objects.

Flexible connections must be loosely stretched, and duct connections must be centred in the fan inlet and outlet openings and supported to prevent them from 'hanging' in the flexible connections.

3.3 Security

Electrical connections must be made by an authorised electrician. The fan

must be equipped with a safety cut-out switch that must be disconnected before work on the fan is commenced.

Contact guard: Free inlet and outlet openings must be guarded by protective grilles.

	Motor size 160-280			Motor size 250-315	
	100%	85%	70%	100%	70%
630	274	-	257	291.5	
710	333	-	313	352.5	
800	461	453	436	483	
900	578	559	536	603	
1000	680	656	629	708	
1120	1047	1021		1078	988
1250	1188	1154		1223	1114

Table 1 – Total weight excl. motor [kg]

	Impeller weight		
	100%	85%	70%
630	67	-	61
710	86	-	77
800	109	101	97
900	138	127	123
1000	166	158	151
1120	212	204	195
1250	258	248	238

Table 2 – Impeller weight [kg]

3.4 Electric connection

Connection to the mains is done directly in the terminal box mounted on the outside of the fan casing. Connect the motor cables according to the connection diagram on the inside of the box lid.

Refer also to the motor name plate as well as the order specification.

Important: The installation and connection to the supply network must be done by authorised personnel and be in accordance with current legislation.

Fans fitted with frequency drives must be installed in accordance with the EU standard for electromagnetic compatibility (EMC). The shielding and connection to ground eliminate interference and protect the motor

bearings and windings. Refer to the motor documentation for methods to avoid impairment of the mains power quality. Prescribed methods may involve installation of a rectifier, filters etc.

4. Start-up

4.1 Before start-up

Check that:

- electrical connections fulfil applicable requirements.
- all contact guards are installed as prescribed.
- fans mounted on vibration dampers can move without affecting flexible and electrical connections.
- impeller rotation direction complies with the arrow plate (check by briefly starting the fan).

4.2 Fans with inlet guide vane

The motion area of the servomotor must not exceed that of the inlet guide vane.

4.3 Motors with Y / Δ start

The relay must be set to the calculated start time.

4.4 Frequency-controlled motors

If a frequency converter is to be used to control motor rotational speed, please check the following.

- Cables between motor and frequency converter must be shielded.
- The max. rotational speed set on the frequency converter must conform with the max. rotational fan speed so that it cannot be exceeded.

4.5 Start-up procedure

- Start fan
- Check that there are no abnormal mechanical noises or pulsations.
- Check the vibration level. It must not exceed 7 mm/s, RMS, measured on bearing housings.

4.6 Repeat inspection

After thirty minutes of operation, check that the fan operates normally.

- Motor does not get warm.
- Vibration speed does not exceed 7 mm/s.
- There are no abnormal noises.
- Power consumption is acceptable.

4.7 Calculation of air volumes

The volume flow through the fan is calculated with the following formula and coefficients.

$$V = D^3 \times n \times (a + b \times P'^2 + c \times P'^4 + d \times P'^6 + e \times P'^8 + f \times P'^{10} + g \times P'^{12})$$

Where

V : Volume flow [m³/s]

D : Nominal impeller diameter [m]

n : RPM

P : Static pressure over fan [Pa]

r : Air density [kg/m³]

$$V' : V' = \frac{V}{\frac{D}{n}}$$

$$P' : P' = \frac{P}{\frac{D^2}{n^2 \times 1.2 \rho}}$$

Duct on pressure and suction side ^a				
	100%	85%	70%	50%
a	7,774E-01	6,562E-01	5,703E-01	4,301E-01
b	-1,749E-03	8,990E-03	-5,222E-03	-1,268E-02
c	-2,328E-03	-4,929E-03	-1,822E-03	5,243E-04
d	2,144E-04	4,961E-04	2,262E-04	-4,248E-07
e	-9,398E-06	-2,360E-05	-1,194E-05	-1,785E-06
f	2,048E-07	5,394E-07	2,934E-07	7,694E-08
g	-1,806E-09	-4,786E-09	-2,776E-09	-9,860E-10

Table 3. Calculation coefficients

- a. Static pressure on suction side 1xD from fan and on pressure side 2-3xD from fan

Free inlet and duct on pressure side ^a				
	100%	85%	70%	50%
a	7,444E-01	6,057E-01	4,688E-01	4,197E-01
b	-1,929E-02	1,469E-02	4,031E-02	-1,469E-02
c	-4,011E-04	-7,327E-03	-1,186E-02	9,475E-04
d	1,534E-04	8,136E-04	1,230E-03	-4,052E-05
e	-1,026E-05	-4,171E-05	-6,162E-05	-5,829E-08
f	2,791E-07	1,009E-06	1,480E-06	4,534E-08
g	-2,803E-09	-9,358E-09	-1,370E-08	-8,196E-10

Table 4. Calculation coefficients

- a. Static pressure on suction side (velocity = 0) and in duct 2-3xD from fan

5. Maintenance

5.1 Cleaning and inspection

The fans should be inspected and cleaned once a year. In environments with large dust concentrations shorter intervals are recommended. It is important that the impeller be cleaned as coatings on the blades may cause imbalance and thus vibrations subjecting the bearings to unnecessary stress. The impeller is cleaned by dismounting it from the motor side. See sections “5.4 Dismounting of motor with impeller from the motor side” and “5.5

Mounting of motor with impeller from motor side”.

5.2 Dismounting of impeller from the inlet side

Fig. 4. First, dismount the duct from the fan inlet side. Then remove duct connection (pos. 1), inlet cone (pos. 3) and intermediary flange (pos. 5) by loosening and unscrewing the nuts (pos. 6). Then remove the screw (pos. 12) and motor disc (pos. 10) holding the impeller. Detach the impeller using a puller secured in the two threaded puller holes in the impeller hub.

5.3 Mounting of impeller from the inlet side

Fig. 4. Place the impeller (pos. 9) on the shaft, mount pos. 10-12, and tighten the screw (pos. 12). Mount duct connection (pos. 1), inlet cone (pos. 3) and intermediary flange (pos. 5). Remember to check that the distance between inlet cone (pos. 3) and impeller (pos. 9) is equally large everywhere, and that the seal (pos. 8) still is elastic. Finish by tightening screws (pos. 6).

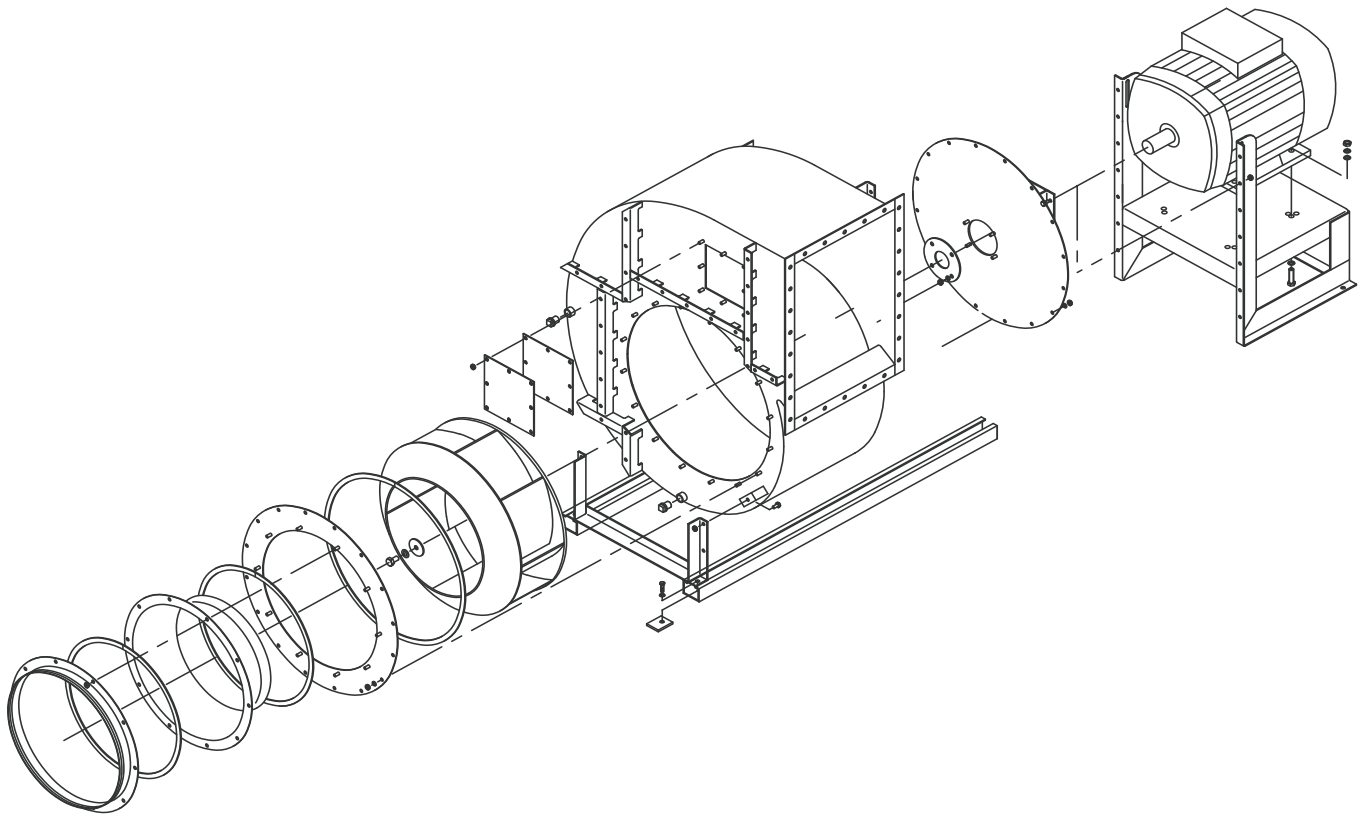


Fig. 4

5.4 Dismounting of motor with impeller from the motor side

Before the fan is dismounted, it must be ensured that it cannot be started unintentionally. This is done by securing the service switch with a key.

1. When dismounting the rotor, first remove the bolts and nuts attaching the sealing plate and the motor bracket to the fan housing. See fig. 5 and 6. The bolts attaching the motor

bracket to the guide rails should only be loosened – not removed. See fig. 7.

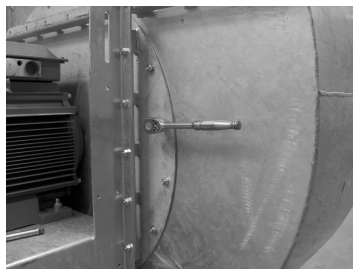


Fig. 5



Fig. 6

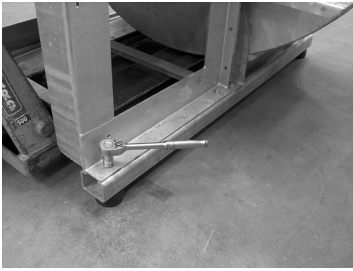


Fig. 7

2. Place a pallet truck or similar support under the motor bracket. See fig. 8. Attach a bench screw to the front support to prevent the motor bracket and rotor from falling backwards when they are retracted from the fan housing. See fig. 9. Support the rear, if necessary, to keep the motor bracket horizontal.

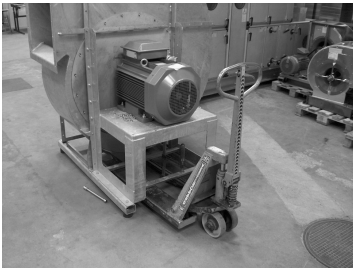


Fig. 8

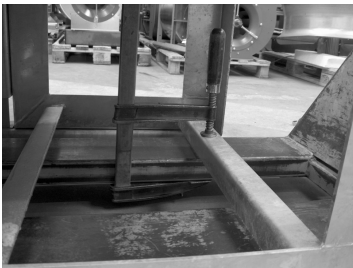


Fig. 9

3. Pull rotor and motor bracket out of the fan housing. It may be necessary to use a crowbar to loosen the sealing plate from the housing. See fig. 10 and 11. Check that the pallet truck is set to the correct height. When retracting the rotor, it is recommended to stop 100 mm before the motor bracket slides

off the guide rails. See fig. 12.



Fig. 10

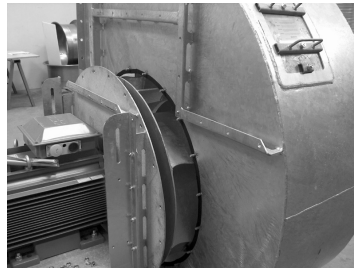


Fig. 11

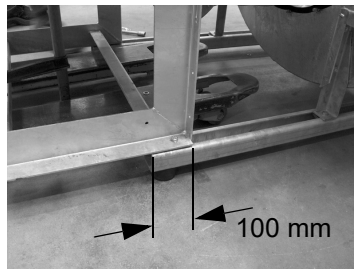


Fig. 12

4. Clean the rotor carefully as dirt and coatings causes imbalance. Also check that the sealing plate rubber seal is intact. If the seal is damaged, it must be replaced.

The impeller is dismantled and reassembled as described in section "5.6 Shaft seal" under "Dismounting" and "Mounting" respectively.

5.5 Mounting of motor with impeller from motor side

1. Push the palletizer with motor bracket towards the fan housing. Correct the nuts so that they may slide in the rails. See fig. 13. When the motor bracket is approx. 20 mm from the fan housing, align it so that the bolts are opposite the holes. Use, for example, a conical arbor. See fig. 14. Then push the parts completely together.

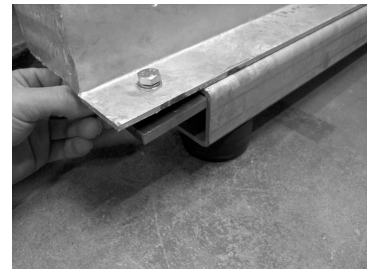


Fig. 13



Fig. 14

2. Mount the bolts from the fan housing supports for the motor bracket. See fig. 15. Then insert all sealing plate nuts. Tighten the sealing plate nuts to a torque of 25 Nm. See fig. 16. Finally, fasten the bolts in the bottom of the motor bracket to the guide rails. See fig. 7.



Fig. 15



Fig. 16

3. Check that the rotor can run freely. This is done by opening the inspection hatch and turning the rotor by hand. See fig. 17. If there are no abnormal noises, close the inspection hatch again, and test the fan. Follow the procedure described in section "4.5 Start-up procedure".



Fig. 17

5.6 Shaft seal

The fans are mounted with a shaft seal between shaft and fan housing. There are two main types of seals: split seal and double lip seal. In the following only the double lip seal is described. The seal is made up of several components. See fig. 18 and 19. The individual components are sealed by means of seals. Between shaft and fan housing sealing is performed using a double lip seal and an oil thrower. The seal is clamped between the abutting surface of the motor shaft and the impeller.

Dismounting

The impeller (pos. 7) is detached as described under "5.2 Dismounting of impeller from the inlet side" or "5.4 Dismounting of motor with impeller from the motor side". Pull the oil thrower (pos. 6) and the seals (pos. 13) off the shaft (pos. 1). See fig. 18. Loosen the four tailstock screws (pos. 9) in the gland seal (pos. 2), and pull the gland seal (pos. 2) off the

shaft (pos. 1). The gland seal (pos. 12) can now be retracted from the seal cover (pos. 4).

Mounting

All seals must be replaced upon mounting. See fig. 18 and 19. Lubricate the gland seal (pos. 2) on the inside with a thin oil and push it over the shaft (pos. 1). Fill up two-thirds of the cavity in the gland seal (pos. 12) with SKF LGEP 2 or similar grease. Press the double lip seal (pos. 12) into the sealing cover (pos. 4).

Note

1. The gland seal (pos. 12) must point in the right direction.

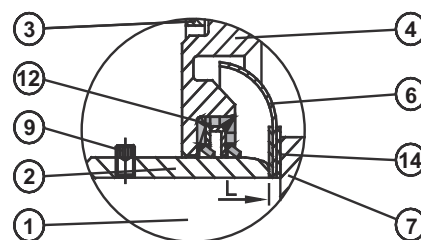


Fig. 18

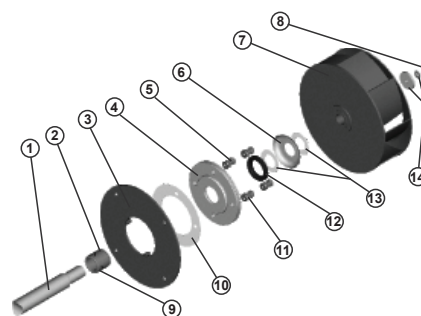


Fig. 19

2. If the sealing cover (pos. 4) was dismantled, the gland seal (pos. 12) must be centred around the shaft (pos. 1).

Press the oil thrower (pos. 6) and seals (pos. 13) over the shaft (pos. 1), and mount the impeller and fasten it by means of the washers (pos. 14) and the screw (pos. 8). Tighten the tailstock screws (pos. 9) on the gland seal (pos. 2). Finish assembling the fan inlet, or mount the motor with impeller as described under "5.3 Mounting of impeller from the inlet side" and "5.5 Mounting of motor with impeller from motor side" respectively.

6. Sound

The sound generated by the fans depends on installation and operating conditions, and general data on sound generation is therefore unavailable.

Refer to the AirBox calculation program for specific emissions and to the product catalogue for more general data.

7. Inspection and test

It is recommended to test and inspect the CAL fans at regular intervals with regard to operability and operating conditions.

Extent of inspection

- Measure power consumption
- Check torques for fixing bolts and correct if necessary
- Cleaning
 - inside with pressure air
 - outside with water
- Visual inspection of impeller, fan casing, and electric connection

Enter all values and observations in a log.

8. Safety

The CAL centrifugal fans must be installed according to Novenco Building & Industry A/S', the current and the local safety regulations. At a minimum these include EN 13850. It is recommended to review and revise safety procedures regularly.

Safety check

- Test if safety procedures and the installation work correctly.
- Check if safety regulations have been changed and if the installation needs revising.
- Consider taking additional measures to improve the safety of the installation. For example, by mounting wire guards on inlet and outlet.

9. Spare parts

Contact Novenco Building & Industry A/S for information about and ordering of spare parts.

10. Patents, trademarks and copyright

Novenco®, ZerAx®, 诺文科 and 诺克 are registered trademarks of Novenco A/S.

AirBox™ and NovAx™ are trademarks of Novenco Building & Industry A/S.

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

Copyright (c) 2002 - 2017,
Novenco Building & Industry A/S.
All rights are reserved.

11. Quality and environment

Novenco Building & Industry A/S is ISO 9001 and ISO 14001 certified.

This means that all fans are inspected and tested, before leaving the production.

12. Warranty

Novenco Building & Industry A/S provides according to law a standard 12 months warranty from the product is sent from the factory. The warranty covers materials and manufacturing defects. Wear parts are not covered.

Extended warranty can be agreed upon.

13. Declaration of conformity

EU Declaration of Conformity. Machinery Directive 2006/42/EU annex II, A

Novenco Building & Industry A/S
Industrivej 22
4700 Naestved
Denmark

hereby declares that centrifugal fans type CAL have been manufactured in accordance to and comply with the European Council's directives 2006/42/EU regarding mutual approximation of the machinery laws (the Machinery Directive) of the member states.

Directives

- Machinery 2006/42/EU
- ECO design 2009/125/EU
- ECO energy labelling 2010/30/EU
- EMC 2014/30/EU
- LVD 2014/35/EU

Applied standards and regulations

EU 4/2014:

ECO design requirements for electric motors

EU 327/2011:

Fans driven by motors with electric power between 125 W and 500 kW

EN ISO 12100:2011

Safety of machinery

- General principles for design
- Risk assessment and risk reduction

EN ISO 13857:

Safety of machinery - Safety distances

EN 60204-1:

Safety of machinery - Electrical equipment of machines Part 1: General Requirements

EN 61000-6-2:

EMC - Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-3:

EMC - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

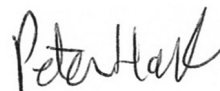
EN 61800-3, class C2:

Adjustable speed electrical power

drive systems, EMC requirements and specific test methods

It is conditioned for the validity of the warranty that Novenco Building & Industry A/S' instructions for installation and maintenance have been followed.


Naestved, 1.4.2017



Peter Holt

Technical director

Novenco Building & Industry A/S

A decorative graphic consisting of a large dotted circle and a solid circle. The dotted circle is centered in the upper half of the page, and the solid circle is centered in the lower half. They overlap in the middle of the page.

info@novenco-building.com
+45 70 77 88 99
novenco-building.com