

Operating Instructions

Direct driven centrifugal fans

(Translation of the original)

EN

BA-CFD_RZA 6.6 – 02/2014

		RZA

NICOTRA||Gebhardt

fan|tastic solutions

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1. Revision index

Revision	Date
BA-RZA 6.4 – 10/2011	10/2011
BA-RZA 6.5 – 01/2013	01/2013
BA-RZA 6.6 – 02/2014	02/2014

2. Important information

Nicotra Gebhardt Fans are “state of the art” design and comply with the requirements for health and safety of the EU Machinery Directive.

Nicotra Gebhardt fans offer a high level of operational safety and a high standard of quality which is guaranteed through a certified Quality Management System (EN ISO 9001).

All fans are tested before leaving the factory and are provided with a test seal.

However, all fans can be dangerous:

- if they are not installed, operated and maintained by trained personnel;
- if they are not used for approved applications;

this can endanger the life and limbs of personnel, cause material damage to buildings and equipment, and affect the life of the product.



Attention!

These Operating Instructions must be read and observed by all personnel engaged in works involving fans.

The Operating Instructions

- describe the approved applications for the fans and protect against misuse
- contain safety notes which must be closely observed
- warn of dangers which can exist even with correct applications
- give important information on safety and the economic use of the fan whilst ensuring the full benefits of the product are available
- are to be complemented with the trade and national Standards, Regulations and Directives.

Nicotra Gebhardt accepts no responsibility for damage or breakdowns that can be traced back to non-compliance with the Operating Instructions.

The manufacturer's guarantee does not apply following unauthorised conversions and alterations to the fan.

No responsibility is accepted for resultant damage!

3. Safety Notes



CAUTION

This symbol identifies all safety information concerning danger to life and limbs of personnel.

This symbol draws attention to the information in the Operating Instructions which must be complied with in order to ensure correct working procedures, as well as preventing fan damage and destruction.

4. Technical description

4.1 Product description RZA

The rotavent series of centrifugal fans, with double inlet and low-slip direct drive integral motors in the fan airstream, are suitable for the transport of dust-free air and other non-aggressive gases or vapours.

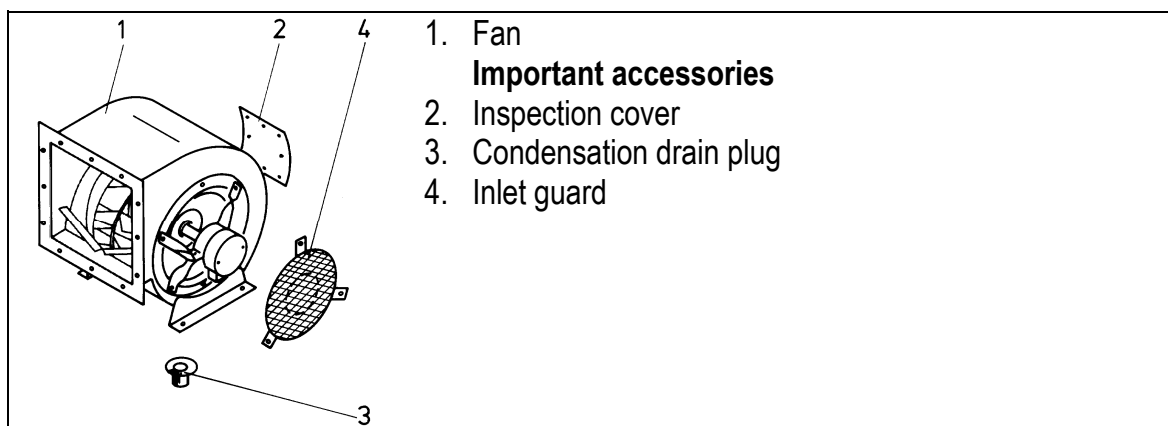
The scroll casing, which is not gas-tight, is made of galvanised sheet steel and is provided with flange connections at the outlet.

The powder-coated centrifugal impeller with backward curved hollow profile blades is attached directly to the rotor of the integral motor.

The integral motors are designated as having protection class IP 54 and heat class F.

To prevent overloading, Positive Temperature Coefficient (PTC) are inserted in the windings of the motors. In conjunction with PTC release equipment or a frequency inverter with PTC connection, effective motor protection is guaranteed.

If the motor is to be set up outdoors or if very damp air is to be moved, then a condensation drain plug - available as an accessory - should be inserted in the lowest point of the casing.



The fans are intended for incorporation into equipment and do not have either their own contact protection nor an earthed metal casing fitted as standard. The appropriate protective measures against contact must be taken in accordance with DIN EN ISO 12100 and earthing in accordance with DIN VDE 0100.

4.2 Technical Data

Technical data and the permissible limits are to be taken from the type plate, the technical datasheets or the appropriate technical catalogue and must be adhered to.

4.3 Authorised use

The fans are intended for the transport of dust-free air and other non-aggressive gases or vapours.

Permissible transport media temperatures:

Model	Temperature
RZA	-20°C ... +40°C



Any installation deviating from the above will be considered unauthorised. Nicotra Gebhardt will not be responsible for any injury to personnel and/or material damage resulting from any deviations from the above.

CAUTION

Wherever control engineering devices featuring electronic components (e.g. frequency inverters) are used, the recommendations of the device manufacturer, as well as our wiring instructions and recommendations for cables and connections (see Section 5.4), must be observed in order to prevent electromagnetic faults (EMC).

4.4 Improper use

Examples of an improper installation include:

- media with unacceptably high or low temperatures
- aggressive media.
- very dusty media.

The results would be:

bearing- and corrosion damage, loss of balance, vibration, deformation, abrasion damage.

Unauthorised operation

- No operation above the indicated rpm (see type plate, data sheet)!
- No operation at rpm ranges with increased vibration (resonance)!
- No operation at rpm ranges out of permitted fan curve area (stability of flow pattern)!
- No operation if fan becomes polluted!



Injury to personnel and material damage can result from impeller breakage, shaft breakage, fatigue failure and fire from spark creation.

5. Transport

5.1 Transport damage

Deliveries are to be immediately checked as being intact and complete in the presence of the carrier. In the event of transport damage, the attached instruction leaflet is to be observed.

CAUTION

Fans must be carefully transported!

Improper transport, e.g. unsupported, tilted positioning, can lead to:

- the impeller becoming jammed
- the shaft becoming deformed
- bearing damage

5.2 Transport safety

- The transport material is to be selected according to the weight and packaging of the fan (type plate, data sheet).
- Ensure that loading is carried out in accordance with the instructions.
- Four-point lifting is to be provided when transporting by crane (2 slings)

The attachment points are:

- packaging
- fan casing (slings)

The attachment points are not:

- motor supports
- inlet and outlet flanges

5.3 Intermediate storage

For intermediate storage of the fans the following points must be observed:

- The fan should be stored in its transport packaging; this can be added to in accordance with external influences.
- The place of storage must be dry and dust free and must not have high humidity (<70%)
- max. permissible storage temperature: -25°C to +40°C.

6. Mounting / Installation

6.1 Safety notes



- Mounting may only be carried out by trained personnel in accordance with these Operating Instructions and with regard to the regulations in force.
- Safety devices that have been removed for mounting work must be replaced immediately afterwards, and before the electrical connection is made.
- The fans must be mounted such that secure fixing is guaranteed at all times during operation.
- Fans must be fixed to plinths or base frames.

CAUTION

Supporting the weight at other points leads to fan damage and is dangerous.

6.2 Installation site

- The installation site must be suitable for each fan with regard to type, composition, ambient temperature and ambient medium (points 3.2, 3.3 and 3.4 should be observed).
- The supporting construction must be level and have sufficient bearing strength
- When installing outdoors or if very damp air is to be moved, a condensation drain plug - available as an accessory - should be inserted in the lowest point in the casing.

6.3 Installing / Fixing

- The fan or base frame must be fixed without stresses to the supporting structure.
- In the case of the RZA series and for packaging reasons, the feet are mounted as standard with the 90 casing position.
- Set up the feet in the desired position before final fixing.

CAUTION

Stresses can lead to bearing damage and fatigue failures. They also affect the functioning of the fan.

- No forces should be transferred from other parts of the plant.
- Use flexible connecting supports for duct connection.
- Ensure even spring of the vibration dampers.

6.4 Electrical connections

6.4.1 Safety notes



The rotor is fitted under electrically isolated conditions i.e. without earthing. Before coming into contact with the impeller the fan has to be switched off the power or from the inverter.

The spiral casing has not been earthed at the factory!

The customer must take appropriate steps in accordance with DIN VDE 0100!

- The electrical installation of the fan and components must only be carried out by trained specialists in accordance with these Operating Instructions and with regard to the effective regulations, as well as the Operating Instructions of the frequency inverter.
- The following Standards and guidelines are to be observed:
 - IEC 60364-1 / DIN VDE 0100; DIN EN 60204-1; EN 61800-3
 - the regulations of the local Electricity Supply Company
- Equipment in accordance with EN 60204-1 is to be installed as protection during unexpected events (e.g. an isolation switch for inspections).

6.4.2 Motors

The specially developed low-slip integral motors are designated as having protection class IP54 and heat class F. They are optimised to a high rate of efficiency, with speed that can be adjusted between 0 and 100% via the frequency inverter.

The motors are fitted with an easily accessible metal clamping box.

The motors meet the interference immunity requirements of EN 50082-2. Operation with a frequency inverter can, depending on the inverter design (different types feature different interference suppression measures), result in varying interference emissions. When operating with motor / frequency inverter, the EMC instructions of the frequency inverter manufacturer (see Operating Instructions) must be observed in order to meet the permissible limit as per EN 50081-1. The motors are designed for S1 continual operation. With more than three starts per hour the suitability of the motor is to be confirmed by Nicotra Gebhardt.

6.4.3 Motor protection**CAUTION**

To prevent overloading, PTC are inserted in the windings of the motors. In conjunction with PTC release equipment or a frequency inverter with PTC connection, effective motor protection is guaranteed.

6.4.4 Motor connections**CAUTION**

The motors ex works are in star connection (Y). When operating with a frequency inverter, the links must be placed in delta connection (Δ) (see wiring diagram).

The fans are supplied in a ready-to-install state, and are fitted with an easily accessible metal terminal box.

Each fan comes supplied with a terminal board wiring diagram (in the lid of the terminal box), showing the correct connection.

The following information must be observed when operating with a frequency inverter.

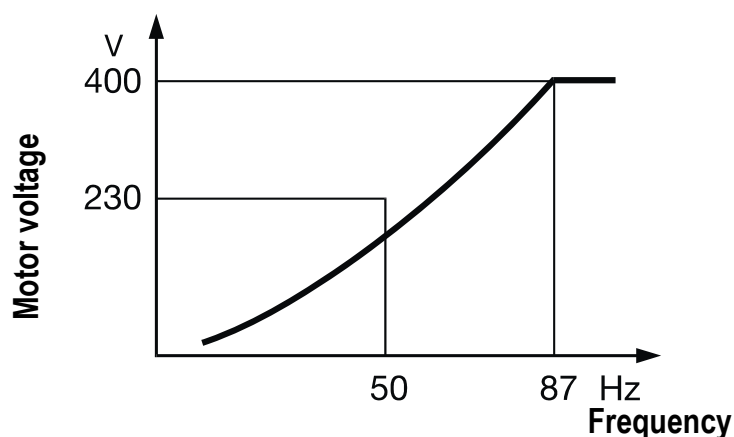
6.4.5 Operation with frequency inverter

When connecting the frequency inverter, please observe the Operating Instructions of the frequency inverter which is being used.

If frequency inverters are used on site, it must be ensured that the voltage steepness complies with the directives of the IEC TS 60034-17 :2002 + corrigendum 2003 (maximum stress limit of the permitted pulse voltage). Depending on the frequency inverter being used and the line length between the frequency inverter and integral motor, additional devices (e.g. motor throttle, active sinus filter) must be provided to enable the specified permissible limits to be met. Non-observance of this can lead to destruction of the motor!

6.4.6 Parameters of the MM420 frequency inverter**CAUTION**

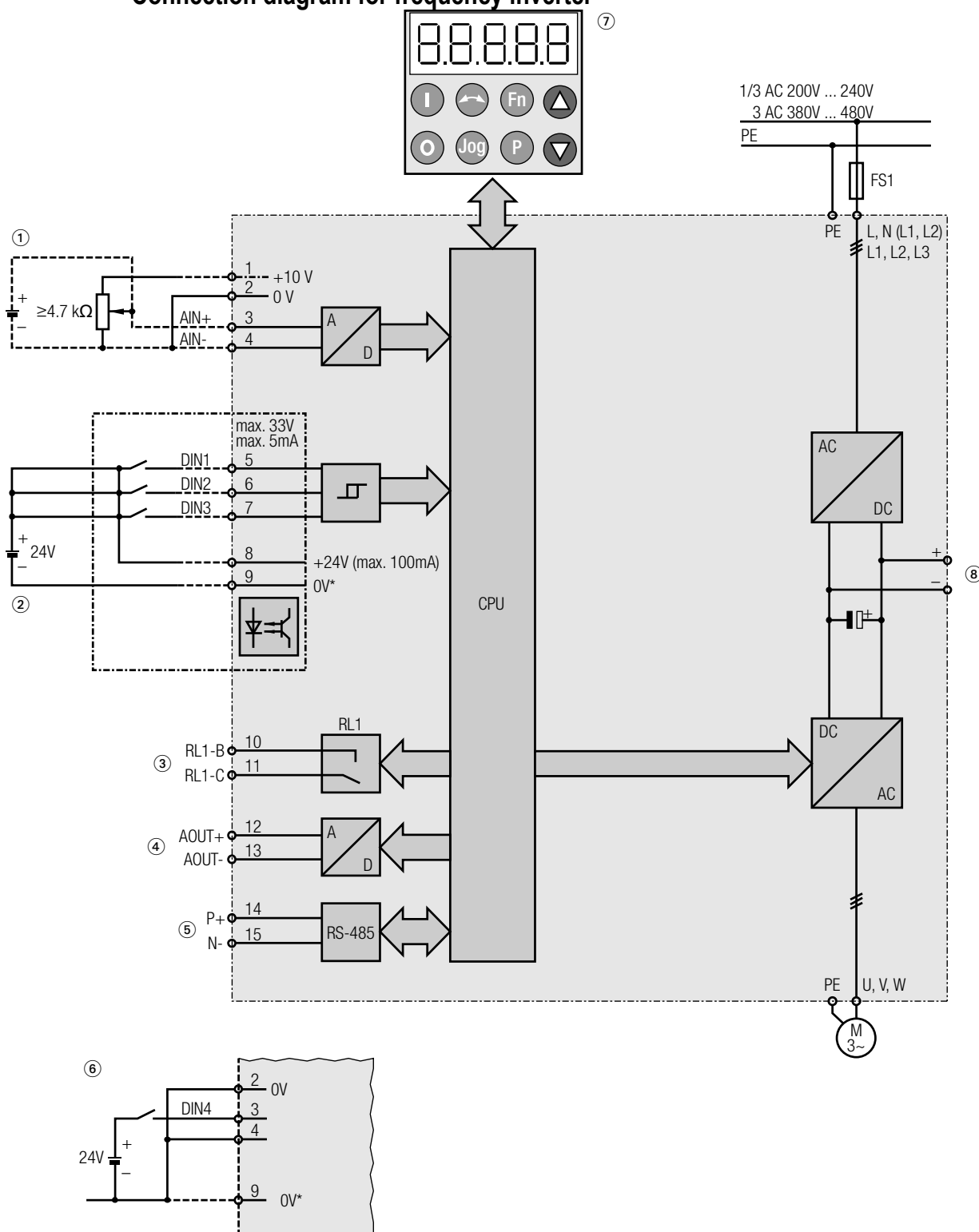
When operating with a frequency inverter with rated voltage of 400V, the effective cut-off frequency must be set to 87Hz. The motor must then be in a delta connection (Δ). The output voltage of the frequency inverter in relation to the frequency is illustrated for a quadratic voltage / frequency specification in the diagram opposite.



RZA 11-		0225	0250	0280	0315	0355	0400	0450	0500	0560
Nr.	Funktion	MM420 3AC 400V 0.75kW EMV B ID.-Nr. 119908	MM420 3AC 400V 1.10kW EMV B ID.-Nr. 119909	MM420 3AC 400V 1.50kW EMV B ID.-Nr. 119910	MM420 3AC 400V 2.20kW EMV B ID.-Nr. 119911	MM420 3AC 400V 4.00kW EMV B ID.-Nr. 119913	MM420 3AC 400V 5.50kW EMV B ID.-Nr. 119914	MM420 3AC 400V 7.50kW EMV B ID.-Nr. 119915	MM420 3AC 400V 7.50kW EMV B ID.-Nr. 119915	MM420 3AC 400V 11.0kW EMV B ID.-Nr. 119916
10	Quick Start	1	1	1	1	1	1	1	1	1
304	Nominal Motor Voltage	400	400	400	400	400	400	400	400	400
305	Current A	1,6	2,5	3,7	5,3	7,9	12,0	15,8	15,9	21,2
307	Nom. Motor Power kW	0,60	0,95	1,50	2,20	3,60	4,40	5,20	5,90	11,00
310	Nom. Motor Freq. Hz	87	87	87	87	87	87	87	87	87
311	Speed 1/min	2510	2520	2540	2530	2530	2540	2520	1700	1660
700	Command Source	1-Console, 2-Jumperboard								
1000	Source of Nominal Frequency	1-Keybaord set point, 2-Analog input, 3-Fixed frequency, 12-Analog input+Keyboard								
1080	Min. Frequency Hz	0	0	0	0	0	0	0	0	0
1082	Max. Frequency Hz	110	110	100	95	90	80	70	90	87
1120	Start Lookup Time sec.	> 30	> 30	> 30	> 30	> 30	> 30	> 30	> 30	> 30
1121	Response Time sec.	> 30	> 30	> 30	> 30	> 30	> 30	> 30	> 30	> 30
3900	End Commissioning	1	1	1	1	1	1	1	1	1
	①									
3	Access Level	2	2	2	2	2	2	2	2	2
701-3	Motor Protection	after connecting 5, 6 or 7, the parameter of P0701, P0702 or P0703 must be 29								
1300	Voltage/Frequency Curve Square	2	2	2	2	2	2	2	2	2
2000	Reference Frequency	110	110	100	95	90	80	70	90	87

Note ① For secure operation of our RZA-Fans with Micromaster*, there are following Settings required after quick start.
Also note next pages!

Connection diagram for frequency inverter



* (potential separation)

- ① Power supply and analogue input Input voltage: 0V to +10V, scalable
- ② Power supply
- ③ Output relay contact AC 250V, max. 2A (inductive load) DC 30V, max. 5A (ohmic load)
- ④ Analogue output 0mA to 20 mA
- ⑤ If a communications module is connected then the serial interface is ineffective!
- ⑥ To get an additional digital input (DIN4), the circuit must be changed as shown in fig. ⑥
- ⑦ Control panel (accessory)
- ⑧ Intermediate circuit connection

6.4.7 Wiring instructions for type MM420 frequency inverter

To ensure that the directives of the IEC TS 60034-17:2002 + corrigendum 2003 (maximum stress limit of the permitted pulse voltage) are complied with, the following instructions must be adhered to under all circumstances.

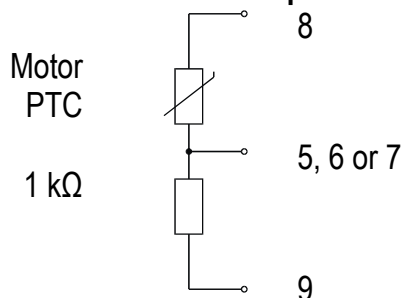
- Keep the cables short!
- Apply cable screening over a large surface area.
- Keep the number of contact points between the inverter and fan to a minimum, preferably direct from the frequency inverter to the motor terminal box!
- Caution when using bypass operation! Dynamic transient phenomena may arise here. If absolutely necessary, only switch off if currentless, i.e. first revoke the release of the inverter and then open the motor cables! (See also point 4 –relays are also additional connecting points)

Also be sure to observe the following wiring requirements:

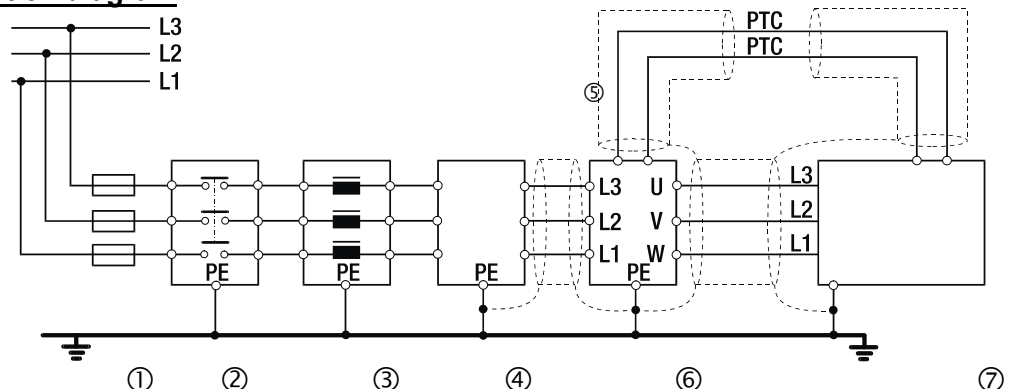
- Screened cables in accordance with **EMC guidelines** must be used between the filter and frequency inverter and between the frequency inverter and motor.
- The protective earth conductors must be fitted in addition to the screened cables.
- Cables longer than 20m require a motor inductor between the frequency inverter and motor (available on request).
- Control cables and motor cables must be installed separately and, where necessary, be crossed at 90°.
- The screened cables must be applied on both sides.
- A large area of the screened motor cable is to be attached to the motor's terminal box using a metal connection.

6.4.8 Motor protection with frequency inverter

For operation with the motor protection function using PTC, it is necessary to install a 1k Ω resistor on site. This is to be connected in accordance with the wiring diagram and, together with the PTC, serves as a voltage distributor

Control Clamps**6.4.9 Connection diagram**

- ① Power fuse
- ② Circuit-breaker
- ③ Power inductor
- ④ Filter (class B only)
- ⑤ Screen
- ⑥ Frequency inverter
- ⑦ Motor



Recommendation for cable and PG connection

Recommended minimum cable and gland size in the following table on the basis of the delivery range from Lapp-Kabel company, Stuttgart.

Necessary cable size has to be finally determined in consideration of different factors it side (i.e. Cable length, way of laying ...)

RZA 11-	Connecting cable FI Motor ÖLFLEX®	Connecting cable Mains FI Min. Ø	Connecting cable FI PTC ÖLFLEX®
0225-4D	4 x	100 CY	100 CY
		4 x 1,0 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 1,0 mm ²	2 x 0,5 mm ²
0250-4D	4 x	100 CY	100 CY
		4 x 1,0 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 1,0 mm ²	2 x 0,5 mm ²
0280-4D	4 x	100 CY	100 CY
		4 x 1,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 1,5 mm ²	2 x 0,5 mm ²
0315-4D	4 x	100 CY	100 CY
		4 x 1,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 1,5 mm ²	2 x 0,5 mm ²
0355-4D	4 x	100 CY	100 CY
		4 x 1,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 1,5 mm ²	2 x 0,5 mm ²
0400-4D	4 x	100 CY	100 CY
		4 x 2,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 2,5 mm ²	2 x 0,5 mm ²
0450-4D	4 x	100 CY	100 CY
		4 x 2,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 2,5 mm ²	2 x 0,5 mm ²
0500-6D	4 x	100 CY	100 CY
		4 x 2,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 2,5 mm ²	2 x 0,5 mm ²
0560-6D	4 x	100 CY	100 CY
		4 x 2,5 mm ²	2 x 0,5 mm ²
	7 x	100 CY	100 CY
		7 x 2,5 mm ²	2 x 0,5 mm ²

ÖLFLEX™ is a registered trademark of Lapp-Kabel, Stuttgart

The connection box has 2 cable passage holes provided with a thread M 20x1.5. They are provided for the main and the PTC lead (both shielded). The union pieces have to be provided with enough contact surface for the cable shielding

7. Commissioning

7.1 Safety checking



- Check that all mechanical and electrical safety devices have been fitted and connected.
- According to the type of installation of the fan, the inlet and discharge openings as well as the drive shafts must be fitted with protection devices in accordance with DIN EN ISO 13857. The appropriate protection guards are available and should be ordered as extras.
- If the surface temperature of accessible fan parts exceeds +70°C (DIN EN ISO 13732-1), isolating protection devices must be fitted.

Before commissioning, the following checks must be carried out:

- The ducts and the fan must be checked for foreign bodies (tools, small components, building debris, etc.)
- The free running of the impeller must be checked by hand.
- The power setting, voltage and frequency for the mains connections must be checked against the fan or motor type plate.
- Connected control devices must be checked for functioning.
- Inspection openings (if they exist) must be closed.

CAUTION



Operation with a frequency inverter is only permissible in compliance with the directives of the IEC TS 60034-17:2002 + corrigendum 2003 (maximum stress limit of the permitted pulse voltage).

The fan may only be commissioned if all the safety devices have been fitted. Ensure that the impeller has been secured acc. to DIN EN ISO 13857! The suitability of protection devices and their fixtures to the fan have to be evaluated within the complete security concept of the installation.

7.2 Test run

The fan should be switched on briefly to check that the direction of rotation of the impeller agrees with that indicated by the arrow.

In the event of the motor running in the wrong direction, the poles are to be changed over whilst observing the electrical safety instructions.

7.3 Check the current consumption

CAUTION

Upon reaching the operating speed of the fan, immediately measure the current consumption and compare it with the nominal current on the motor or fan type plate. In the event of a substantial overcurrent, switch off immediately

7.4 Check for quiet operation

CAUTION

Check for quiet operation of the fan.

There should be no unusual rocking or vibration. Check for untypical bearing noises.

8. Servicing / maintenance

8.1 Safety notes



Before working on the fan it is imperative to ensure:

- The drive motor is separated from the mains on all poles. In the case of trouble the rotor could be under current!
- The impeller has come to rest.
- The surface temperature has been checked to prevent burning.
- There is no possibility of an uncontrolled running of the fan during the maintenance work (e.g. through an isolating switch).
- Any debris or dangerous materials which have arrived in the fan with the transported medium must be removed using a suitable method.

Fan operation may resume after the safety checks of Section 6 “Commissioning / Safety checks” have been carried out.

Only limited work may be carried out whilst in the operating condition and in observance of the safety and accident prevention regulations: e.g. measurement of vibration.



CAUTION

Non-observance of these points endangers life and limb for the maintenance personnel.

If the state of the fan does not allow adapted action for repair it has to be put out of order immediately and to be replaced if required!

8.2 Maintenance intervals

After having passed the period during which the grease keeps its lubrication capacity (30.000 h for standard applications) bearing are to be changed.

During periods of longer lasting stand stills the fan may be operated shortly in regular intervals. This is to prevent the bearings from mechanical load and to avoid ingress of humidity. If fans have been held on stock for a longer period the bearings of fan and motor have to be checked prior to installation.



The maintenance instructions of the motor supplier as well as the instructions for the switches and control units have to be respected.

The fan has to be checked regularly whether vibrations may occur. The maximum vibration speed in radial direction must not exceed 4,5 mm/s to be monitored at the bearing or bearing housing of the fan or motor. For fans of an impeller diameter up to 315 mm a vibration speed of up to 7,1 mm/s is acceptable.

A deposit of dust and solids can cause unbalancing and consecutive damages.

In order to prevent this danger regular inspection and cleaning operations are to be scheduled.

If due to the type of media conveyed one can expect wear or dirt accumulation on the housing (corrosion, abrasion, caked material) then regular inspection and cleaning must be carried out.

The intervals will vary according to operating conditions and should be set by the operator.

CAUTION

No high pressure cleaners (steam rod cleaners) are to be used.

8.3 Inlet and discharge accessories

Flexible sleeving (compensators) between the fan and plant parts are to be checked at regular intervals.

CAUTION

Unsealed sleeving leads to breakdowns and danger from escaping transported medium and must be replaced.

8.4 Spare parts

The RZA centrifugal fan is a proven, maintenance-free and long-lasting product of the highest quality.

In the unlikely event of appliance failure, please contact our Customer Service Department or return the complete fan to us.

For economic reasons, only complete fans can be replaced.

CAUTION

Nicotra Gebhardt accepts no responsibility for damage resulting from the use of non-Nicotra Gebhardt parts.

9. Faults

Deviations from normal operating conditions always lead to functional breakdowns and should be looked for immediately by maintenance personnel.



Recurring faults can result in the destruction of the fan and give rise to damage in plant parts and injuries to personnel.

In the event that maintenance personnel cannot eliminate the fault, please contact our Customer Service Department.

10. Service

We offer to all our partners the following services:

- **Mobile Customer Service**
- **Spare Parts Service**

Telephone +49 (0)7942 101 384

Telefax +49 (0)7942 101 385

E-Mail: info@nicotra-gebhardt.com

www.nicotra-gebhardt.com

Translation of the original

EC-Declaration of Conformity

We hereby declare that the product named below, based on the efficiency grade of the respective fan type and the measurement and efficiency category specified in the technical documentation, complies with the ecodesign requirements set by Commission Regulation (EU) No 327/2011, according to Annex I, Section 2.

Designation: **Centrifugal fan with backward curved blades (with scroll)**
Fan type: **RZA**
Serial no: See type plate
Year of manufacturing: See type plate

Relevant EC Directives:
EC-Directive for the setting of ecodesign requirements for energy-related products (2009/125/EC)

Waldenburg, 2nd January, 2013

Head of Production



i.V. W. Weckler

Research & Development Director



i.V. Dr. J. Anschütz

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fan|tastic solutions

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74638 Waldenburg, Germany
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Translation of the original

EC-Declaration of incorporation

The manufacturer: **Nicotra Gebhardt GmbH**
Gebhardtstrasse 19-25, 74638 Waldenburg, Germany

herewith declares, that the following product:

Product designation: Centrifugal fan, direct driven

Type nomination: **RZA**

Serial n°: see type plate

Year of production: see type plate

qualifies as a partly-completed machine, according to Article 2, clause “g” and does comply to the following basic requirements of the Machine Directive **(2006/42/EC)**: Annex I, Article **1.1.2; 1.3.7, 1.5.1**

This partly-completed machine must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machine Directive (2006/42/EC).

The following harmonised standards ¹⁾ have been applied:

EN ISO 12100 Safety of machines – General design principles

EN ISO 13857 Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs

EN 60204-1 Safety of machines - Electrical equipment of machines, Part 1: General requirements

Applied, national standards and technical specifications ²⁾ particularly:

VDMA 24167 Fans – Safety requirements

The manufacturer is committing himself to make the special documents of partly-completed machine available to any state authority if required.

Waldenburg, 2nd January, 2013

Responsible for the documentation: Michael Hampel

Head of Production

Research and Development Director



i.V. W. Weckler

i.V. Dr. J. Anschütz

1) The complete listing of applied standards and technical specifications see manufacturer's documentation

2) As far as harmonised standards are not existing

3)

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EC-Declaration of conformity

to

EC- Directive of Electromagnetic Compatibility (2004/108/EG)

Herewith we declare that the machinery designated below, on the basis of its design and construction in the form brought onto the market by us is in accordance with the relevant safety and health requirements of the EC Council Directive as mentioned below.

If alterations are made to the machinery without prior consultations with us, this declaration becomes invalid.

Product designation: Centrifugal fan, direct driven

Type nomination: **RZA**

Serial n°: See type plate

Year of production: See type plate

Relevant EC-Council Directive:

EC-Directive of Electromagnetic Compatibility (2004/108/EC)

Applied harmonized standards, in particular:

EN 60204-1, EN 61800-3

Waldenburg, 2nd January, 2013

Head of Production



i.V. W. Weckler

Research and Development Director



i.V. Dr. J. Anschütz

For the complete List of applied standards and technical specifications see the manufacturer's documentation.

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