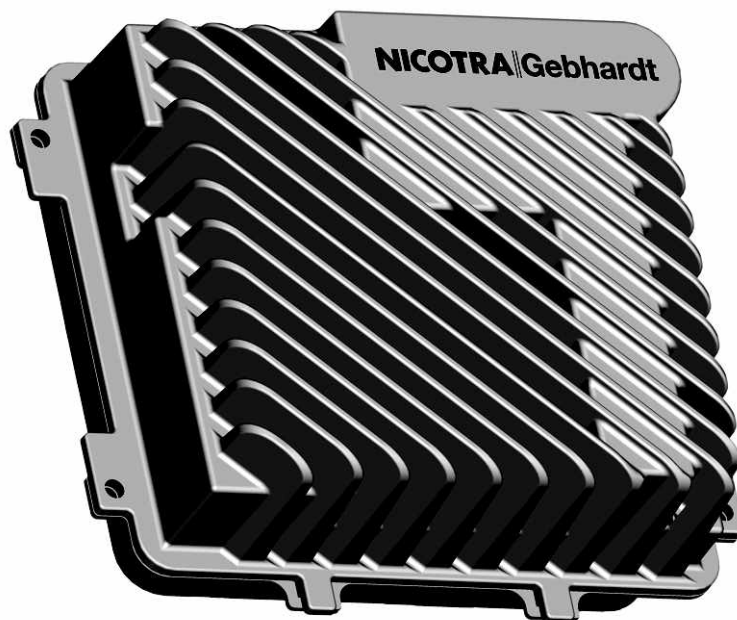


BA-EKE 2.04 – 01/2012

EKE 07-0065-5E-IM
EKE 07-0065-5E-IM S





Warning

Warning

Before installing and commissioning the EC-Controller, you must read all safety instructions and warnings carefully including all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.



NICOTRA Gebhardt reserves the right to change without notice.

Information is also available from:

Nicotra Gebhardt GmbH
Bahnhofstraße 43
08491 Netzschkau
Germany

Phone: +49 (0)3765 / 3 94 99 - 20
Fax: +49 (0)3765 / 3 94 99 - 99
E-Mail: l.goebel@nicotra-gebhardt.com

Definitions and Warnings



Warning

For the purpose of this documentation and the product warning labels, "Warning" indicates that death, severe personal injury or substantial damage to property can result if proper precautions are not taken.



Caution

For the purpose of this documentation and the product warning labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.



Note

For the purpose of this documentation, "Note" indicates important information relating to the product or highlights part of the documentation for special attention.

Qualified personnel

For the purpose of this Instruction Manual and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved.

He or she must have the following qualifications:

- Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
- Trained in the proper care and use of protective equipment in accordance with established safety procedures.
- Trained in rendering first aid.

Use for intended purpose only

The equipment may be used only for the application stated in the manual and only in conjunction with devices and components recommended and authorized by Nicotra Gebhardt GmbH.

Approvals



European Low Voltage Directive

The EC-Controller complies to the requirements of the Low Voltage Directive 2006/95 EC.

European EMC Directive

The EC-Controller is supplied exclusively in connection with products of the company Nicotra Gebhardt. The unit is fully integrated in the corresponding products or will be delivered together with the products. After correct installation it complies to the requirements of the EMC directive, according to the EMC product standard for electrical drives with variable speed EN 61800-3.

Safety Instructions

The following warnings, cautions and notes are provided for your safety and as a means of preventing damage to the product or components at the connected machines. This section lists warnings, cautions and notes, which apply generally when handling the Nicotra Gebhardt EC-Controller, classified as **General, Transport & Storage, Commissioning, Operation and Repair**.

Specific warnings, cautions and notes that apply to particular activities are listed at the beginning of the relevant chapters and are repeated or supplemented at critical points throughout these sections.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your EC-Controller and the equipment you connect to it.

General



Warnings

This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with these warnings or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.

Only suitable **qualified personnel** should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.

Children and the general public must be prevented from accessing or approaching the equipment!

Risk of electric shock!

The DC link capacitors remain charged after mains supply has been switched off. **It is not permissible to open the equipment until 10 minutes after the mains supply has been removed.**



Caution

This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.



Notes

Keep these operating instructions within easy reach of the equipment and make them available to all users. Whenever measuring or testing has to be performed on live equipment suitable electronic tools should be used.

Before installing and commissioning, please read these safety instructions and warnings carefully and all the warning labels attached to the equipment.

Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Transport & Storage



Warning

Warning

Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment.



Caution

Caution

Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures.

Commissioning



Warning

Warnings

Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material.

Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.

This equipment must be grounded.

The following terminals can carry dangerous voltages even if the *EC-Controller* is inoperative:

- the power supply terminals L1, N
- the motor terminals U, V, W
- HALL sensor terminals

Operation



Warning

Warnings

- The EC-Controller operates at high voltages.
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- The MaxSpeed Parameter must be accurately configured for motor overload protection to operate correctly.

Repair



Warning

Warnings

Repairs on equipment may only be carried out by Nicotra Gebhardt.

Before opening the equipment for access, disconnect the power supply and **wait for at least 10 minutes until the DC-link capacitor is completely discharged!**

Table of Contents

1	Overview	8
1.1	General Information.....	8
1.2	Features.....	8
2	Installation	9
2.1	Ambient Operating Conditions.....	9
2.2	Mechanical Dimensions.....	10
2.3	Assembling.....	11
2.4	Electrical Installation.....	12
3	Commissioning	19
3.1	Test Run.....	19
3.2	Fan Type Selection.....	20
3.3	Special Settings.....	21
3.4	Analogue Input Characteristic.....	21
3.5	Error Handling.....	22
4	Technical Data	23
4.1	Electrical Characteristics.....	23
4.2	Performance Characteristics.....	23
4.3	Mechanical Characteristics.....	23
4.4	Ambient Conditions.....	23
4.5	Modbus RTU Specification.....	24
5	Electro-Magnetic Compatibility (EMC)	27
5.1	EMC Evaluation Basics.....	27
5.2	EMC Evaluation.....	27
6	Notes	28

1 Overview

1.1 General Information

The EC-Controller EKE 07-0065-5E-IM is an inverter for controlling the speed of motor-impeller-units with Brushless-DC motors. The inverter is DSP-controlled and uses modern Insulated Gate Bipolar Transistor (IGBT) technology. This makes it reliable and versatile. The EC-Controller provides inverter and motor overload protection. The EC-Controller can be used in both stand-alone applications as well as in large fan systems using the integrated network interface (Modbus RTU) for controlling and monitoring purposes.

1.2 Features

1.2.1 Main Characteristics

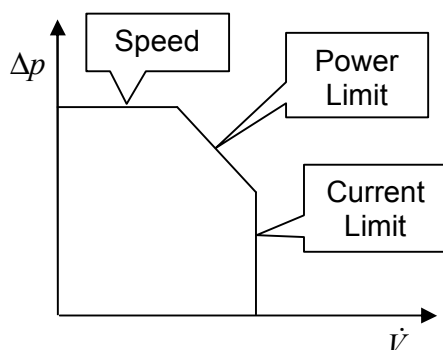
- Supply voltage 230Vac
- Integrated active Power Factor Controller
- Easy installation and commissioning
- Simple cable connection with cage clamps
- Integrated network interface (Modbus RTU)
- Integrated analogue interface (0-5V, 0-10V, ERROR dry contact)
- Available for 2 fan types:
 - DDMB (ID:152088)
 - RZP and TZP (ID:154704)

1.2.2 Performance

- Closed-loop speed control function
- Acceleration and deceleration ramp
- Storage of the last speed set value with self-acting restart after power loss
- High efficiency
- NTC bypassed during operation
- PFC disabled at stop
- 1,8 kW maximum input power
- Power Factor >95%

1.2.3 Protection

- Brownout protection
- Overload protection
- Overheat protection
- Impeller blocking protection
- Adjustable maximum speed according to the impeller size
- Safe Operating Area (speed, power and current limitation according to the selected fan type, see chapter 3.2)



2 Installation



Warning

Warnings

Work on the device/system by unqualified personnel or failure to comply with warnings can result in severe personal injury or serious damage to material.

Only suitably qualified personnel trained in the set-up, installation, commissioning and operation of the product should carry out work on the device/system.

This equipment must be grounded.

The following terminals can carry dangerous voltages even if the EC-Controller is inoperative:

- the power supply terminals L1, N
- the motor terminals U, V, W
- HALL sensor terminals

2.1 Ambient Operating Conditions

Protection Class

IP 54

Humidity Range

90% Non-condensing

Altitude

If the inverter is to be installed at an altitude > 1000m, derating is required.

Shock

Do not drop the inverter or expose it to sudden shock.

Vibration

Do not install the inverter in an area where it is likely to be exposed to constant vibration.

Installation



Warning

Warnings

The device is designed to be exposed partly to the fan air stream with maximum medium temperature of 40°C to achieve full power load at all fan sizes.

Alternatively, a forced cooling can be realized in any other way, for instance by additional blower. Otherwise, if the operating conditions cause overheating, the controller would automatically perform self-derating to operate at the allowed temperature limit, indicating warning "Temperature derating".

Do not cover the device during operation!

2.2 Mechanical Dimensions

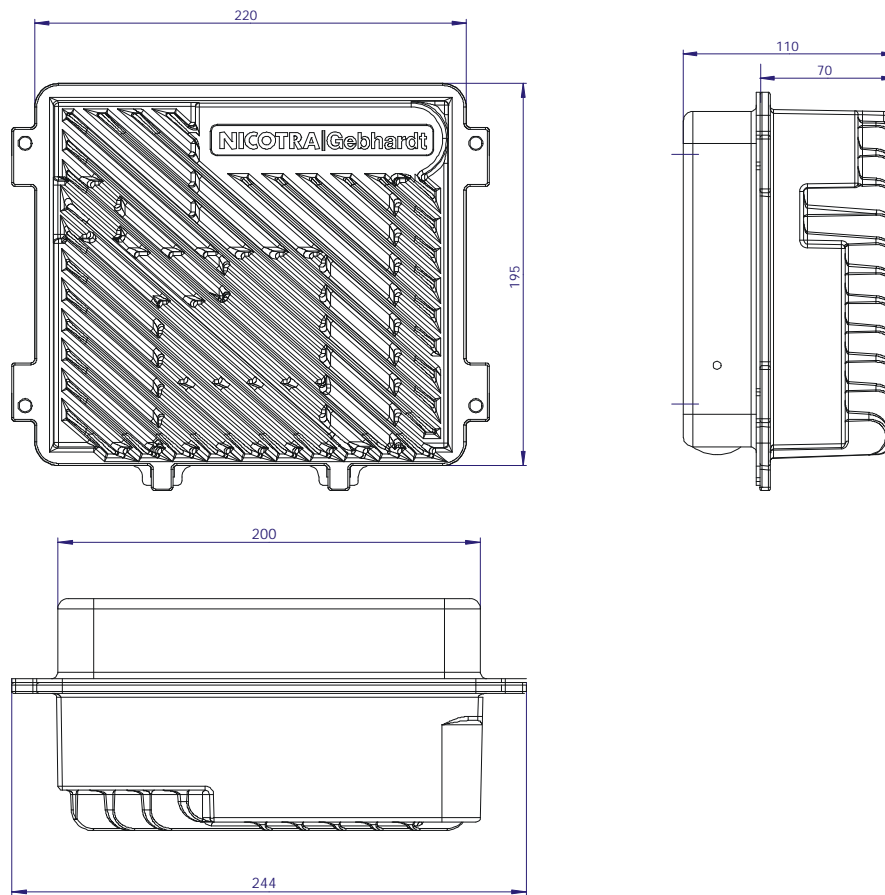


Figure 1: Mechanical dimensions

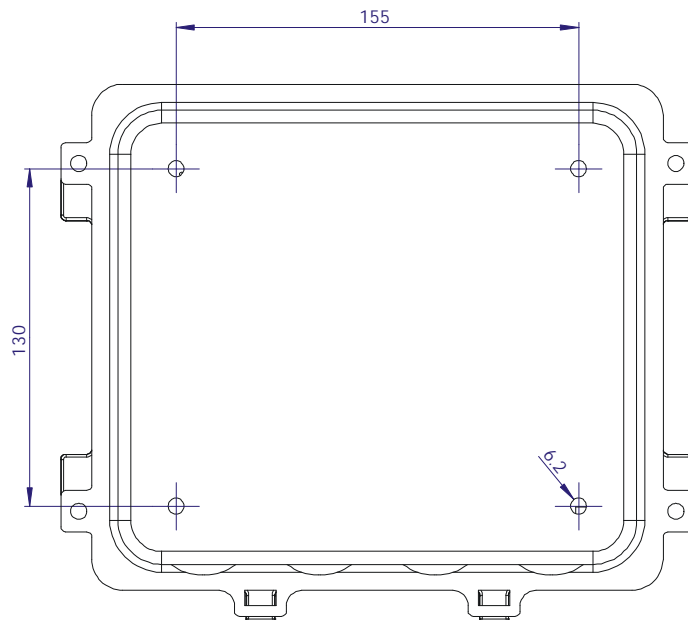


Figure 2: Drill pattern

The base part of the housing is prepared to contain up to 4 cable glands with M20 thread (not included).

If one or more cable inlets remain unused, the M20 holes should keep closed with the included plugs.

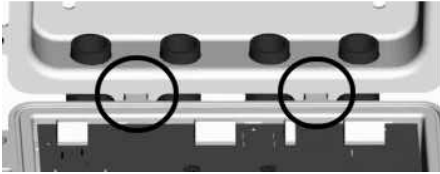
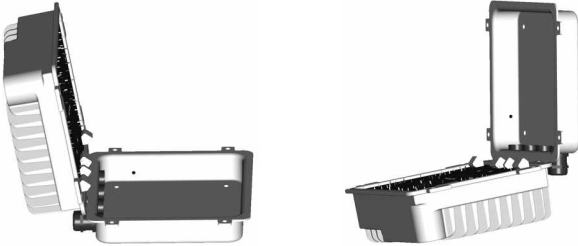

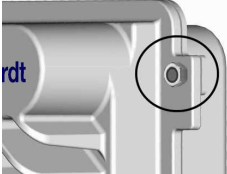
2.3 Assembling



Caution

Caution

Both housing parts are provided with special provisions to hold the heat sink part in position during cable connection. To prevent the converter from dropping down, it is recommended to follow the assembling sequence as follows.

<p>1. Mounting the base part</p>	<p>The base part of the opened inverter can be mounted to a wall or inside a switch board using the 4 screw holes shown in Figure 2. The base part must be provided with cable glands M20 (not included) according the number of inserted cables.</p>
<p>2. Insert cable</p>	<p>Insert and fix the cables using the 4 cable glands.</p>
<p>3. Fixing inverter part</p>	<p>The heat sink of the inverter part provides two pins fitting into the two apertures of the base part. Insert the pins until end stop and let the heat sink hang by its own weight.</p>  <p>Therefore the base part has to be mounted in horizontal or in vertical direction (with apertures on bottom side).</p> 
<p>4. Adjusting DIP Switches and wiring</p>	<p>With the heat sink part fixed like shown in step 3 the wiring and DIP switch adjustment can be done easily.</p> 
<p>5. Check grounding connection</p>	<p>The provided grounding wire (yellow/green) must be connected between converter PCB (connector X5) and base part for proper and save operation!</p>
<p>6. Close housing</p>	<p>Close the converter with the 4 screw nuts.</p> 

2.4 Electrical Installation



Warning

Warning

- **The inverter must always be grounded.** If the inverter is not grounded correctly, extremely dangerous conditions may arise within the inverter, which could be potentially fatal.
- **Make sure that the grounding connection between PCB and basic housing part is applied correctly!**
- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN50178), as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).
- After electrical wiring and DIP-switch setting the **housing needs to be closed before the mains is switched on.**
- All terminals and PCB parts can carry dangerous voltages even if the inverter is inoperative; **wait 10 minutes to allow the unit to discharge after switching off before the housing is being opened.**
- The following terminals can carry dangerous voltages even if the EC-Controller is inoperative:
 - the power supply terminals L1, N
 - the motor terminals U, V, W
 - HALL sensor terminals

2.4.1 Connector Terminal Overview

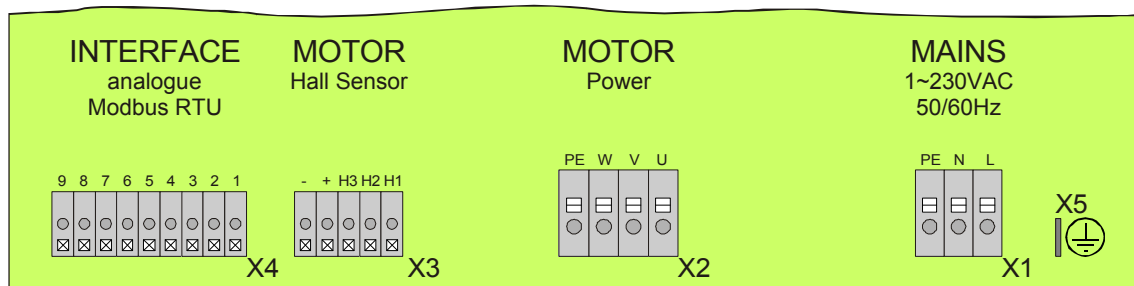


Figure 3: Connectors overview

2.4.2 DIP Switches

Switch	Picture	Function
DIP1		Fan type selection DIP1..4: Fan type 0..15
DIP2		Special function

Table 1: DIP switch overview

2.4.3 Pin Assignment


2.4.3.1 Power Connector X1

Type	Pin	Function
Cage clamp Wire diameter maximum 2,5mm ²	L	L
	N	N
	PE	Earth (Ground)

Table 2: Power supply connector X1

2.4.3.2 Motor Power Connector X2

Type	Pin	Function	Wire Color
Cage clamp Wire diameter maximum 2,5mm ²	U	Motor phase	black
	V	Motor phase	red
	W	Motor phase	blue
	PE	Earth (Ground)	green/yellow



rotation direction:
counter clockwise
(positive sense)

Table 3: Motor power connector X2

2.4.3.3 Motor Sensor Connector X3


Type	Pin	Function	Wire Color
Cage clamp Wire diameter maximum 1,5mm ²	H1	Hall sensor	green
	H2	Hall sensor	yellow
 <p>Warning! All Hall sensor pins refer to DC-link voltage of 420Vdc!</p>	H3	Hall sensor	white
	+	Hall supply +16V	black
	-	Hall supply Ground	brown

Table 4: Motor sensor connector X3

2.4.3.4 Interface Connector X4

Type	Pin	Funktion
Cage clamp Wire diameter maximum 1,5mm ²	1	+5V
	2	Ground
	3	0..10V
	4	0..5V
	5	Net A
	6	Net B
	7	Ground
	8	Error2
	9	Error1

Table 5: Interface connector X4

2.4.4 Connecting Diagram



Warning
Do not switch the PE or N wire! Dangerous voltages may occur at the power connectors between different devices, which can result in severe personal injury or serious damage to material.



Caution
Choose fuses and power supply cable carefully with respect to the number of connected devices and the total power consumption!

2.4.4.1 Mains and Motor Connection



Warning
The device must always be grounded.
The EKE07 controller contains no internal fuse. It **must be operated with a proper external slow characteristic fuse** at the L supply wire.
Make sure that the provided grounding cable between converter PCB (X5) and base part is always mounted in proper way.
The motor connection **must not be interrupted during operation** by switches or plugs!

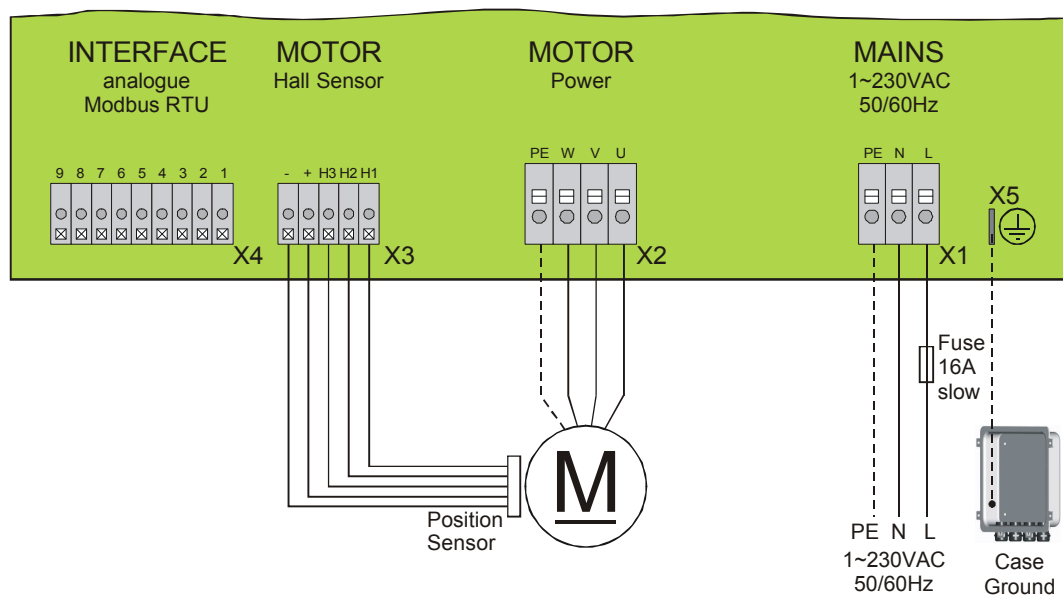


Figure 4: Mains and Motor Wiring

2.4.4.2 Analogue Interface Connection

The analogue interface can be used in three ways of providing the set point as shown in Figure 5:

- Voltage signal 0..5Vdc (continuous or PWM)
- Voltage signal 0..10Vdc (continuous or PWM)
- Potentiometer (using the +5V source)



Caution
If the analogue input is provided by external voltage, do not use voltages higher than rated at the “Technical Data” section. The input is protected against overvoltage up to 24V and reversed voltage.

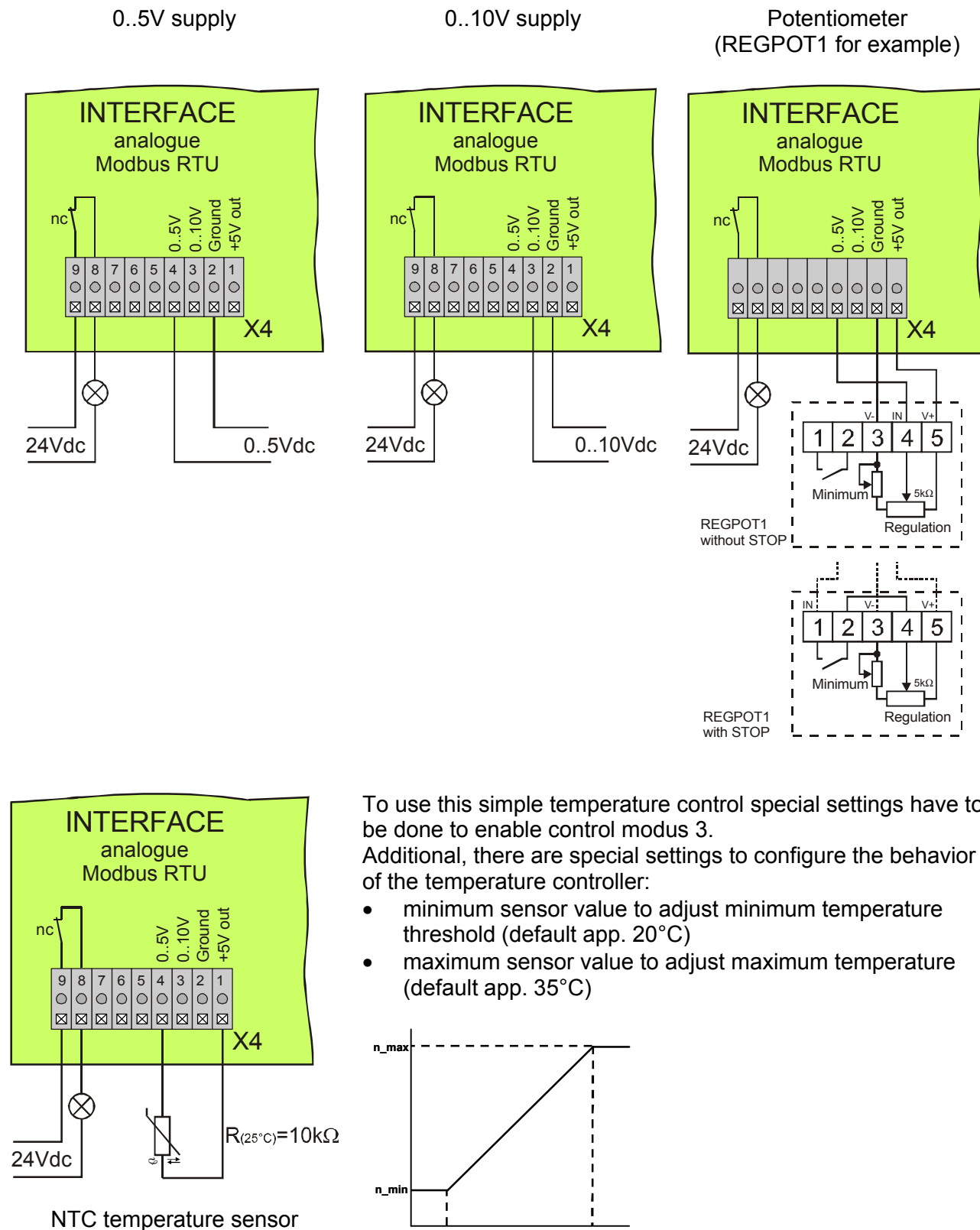


Figure 5: Analogue interface connection

2.4.4.3 Modbus Interface Connection

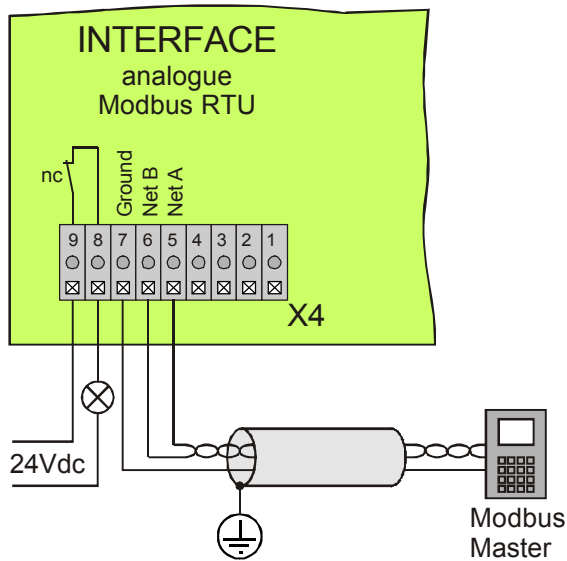


Figure 6: Modbus interface connection



Note

The use of Modbus for monitoring is also available when the operation mode is set to “analogue setpoint”.

2.4.4.4 Error Contact

The error signal is provided by a “normally closed” dry contact (see Figure 5 and chapter “Technical Data” for details).



Caution

Caution

The error contact is an isolated solid state relays (Photo-MOS), rated at maximum 30V. Higher voltages could destroy the error output.

2.4.5 Wiring Guidelines

In standard case the fan will be delivered with an unshielded motor cable commonly used for power and sensor wiring of the motor.

It would be possible to extend the motor cable within some limits. Therefore the fan has to be equipped with an optional metal junction box and the original motor cable has to be cut by the customer and connected to the 3rd party cables.

2.4.5.1 Installation with Original Motor Cable

Using the original motor cable is intended for standard applications, where the location conditions allow the mechanical assembling of the controller EKE07 close to the fan.

The following terms of conditions should be followed for proper and save operation of the fan (see Figure 7):

1. Fan and controller should both be mounted on the same electrical conducting wall or chassis (ground plane).
2. Keep all cables close to the fan or ground plane.
3. Keep the motor cable as short as possible.
4. Motor cable should be separated from other cables (mains supply, control) to prevent EMI from cross-talking between motor cable and the other cables.
5. Do not run motor cable in parallel to other cables, these cables should cross under right angle.

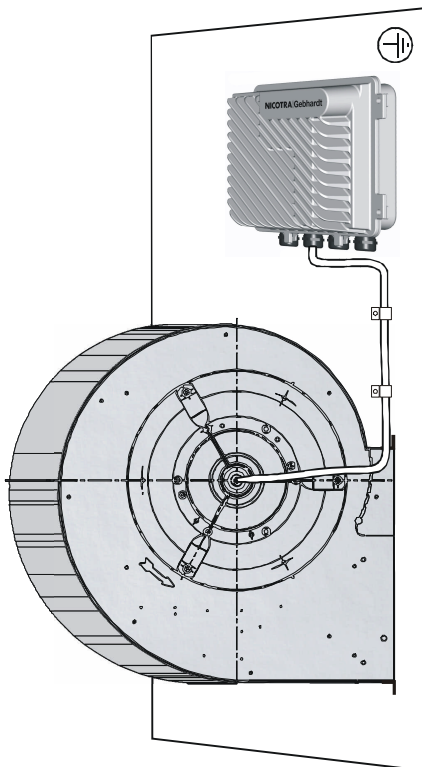


Figure 7: Installation using original motor cable

2.4.5.2 Installation with Extended Motor Cables



Warning

Risk of electrical shock!

All motor wires will carry high voltages when the controller is powered.

Especially also the 5 sensor wires are referenced to internal DC-link voltage.

In applications where the motor cable is not long enough, the motor cable can be extended under the following conditions (see Figure 8):

1. Use optional metal junction box mounted directly to the motor shaft (therefore the fan has to be ordered with the available junction box option).
2. Use separate cables for motor power (phase U, V, W and PE) and HALL sensor connection, splitted inside the junction box.
3. Keep the motor cable as short as possible, **up to 5 m maximum**.
4. Use **shielded** cables.
5. Fan and controller should both be mounted on the same electrical conducting wall or chassis (ground plane).
6. Keep all cables close to the fan or ground plane.
7. Motor cable should be separated from other cables (mains supply, control) to prevent EMI from cross-talking between motor cable and the other cables.
8. Do not run motor cable in parallel to other cables, these cables should cross under right angle.

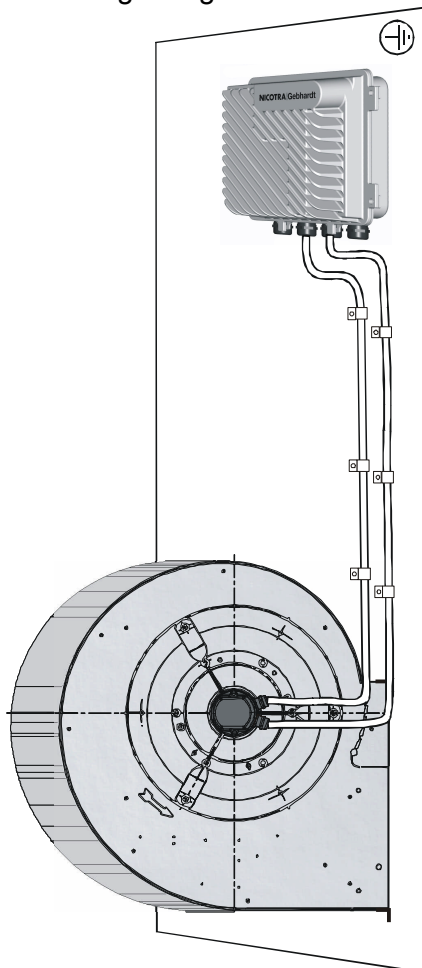


Figure 8: Installation using extended cables and junction box

3 Commissioning



Warning

Warning

Certain inverter parameter settings may cause the motor to start automatically after mains connection.

The type setting must be done correctly to protect motor from overload.

3.1 Test Run

The inverter uses safety limits usable for all different fans defined by factory default setting.

If motor and mains are connected correctly, a simple test run can be started by connecting +5V output to 0..5V input (PIN 4 to PIN 1 at X4)

All DIP switches for fan type selection should be OFF for the test run.

Close device before switch on power supply!

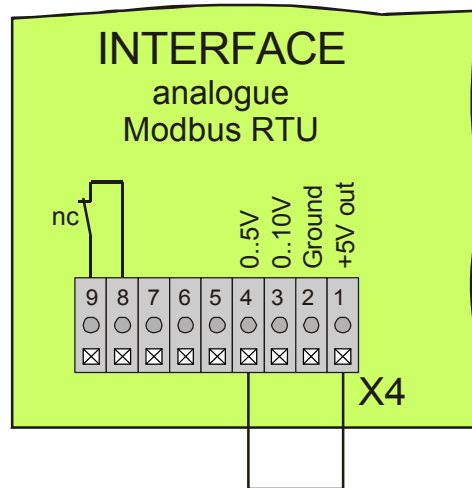


Figure 9: Enable test run

3.2 Fan Type Selection

The correct fan type must be selected by switch group DIP1 according to the connected fan indicated at its label.



Warning

Warning

Choose the correct fan type with care, otherwise overload or damage of motor and controller can result.

Position	DIP1	Fan Type Setting <i>Controller ID:152088</i>	Fan Type Setting <i>Controller ID:154704</i>
0		Test run (factory default with reduced limits)	
1		DDMB 7/7	TZP 04-0215-EC
2		DDMB 9/7	...
3		DDMB 9/7T	...
4		DDMB 9/9	RZP 11-200-EC
5		DDMB 9/9T	RZP 11-225-EC
6		DDMB 10/8	RZP 11-250-EC
7		DDMB 10/10	RZP 11-280-EC
8		DDMB 10/10 high power	RZP 11-315-EC
9		DDMB 12/9	...
10		DDMB 12/12	...
11	

Table 6: DIP1 setting for FAN type selection

3.3 Special Settings


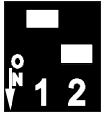
Position	DIP2	Fan Type
1		Reset to factory default setting Must be OFF for normal operation!
2		Special limitation mode

Table 7: DIP2 setting for special function selection



Note

All DIP switch settings come to effect not before power-on reset.

3.4 Analogue Input Characteristic

Analogue Input		Motor Operation	Remark
0-5 V	0-10 V		
0-0,25 V	0-0,5 V	Stop	
0,25-5 V	0,5-10 V	Run at set speed according to analogue value	Down limited to minimum speed
5 V	10 V	Run at maximum speed	

Table 8: Analogue input characteristic

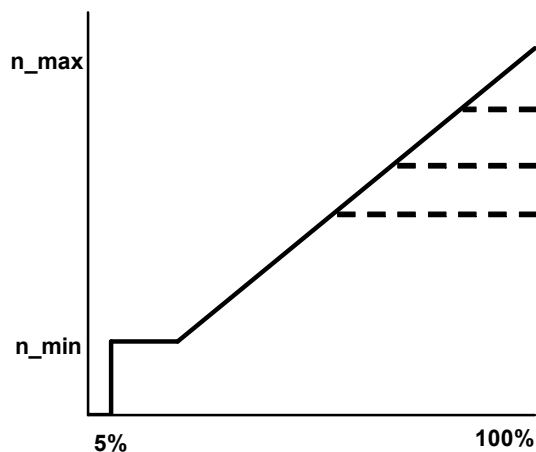


Figure 10: Analogue input characteristic



Note

The maximum speed may be further limited by the internal protective limitation features, according to the fan type and the fan duty point.

3.5 Error Handling

Code	Name	Latch ¹	Stop ²	Entering Condition
Errors				
1	Motor error	X	X	Motor not connected or rotor position sensor defective
2	Motor error	X	X	Rotor position sensor defective
4	DC-link LOW error	X	X	Internal power supply defective
8	Mains brownout error		X	Mains voltage low
16	EEPROM error			Internal memory error
32	DC-link HIGH error	X	X	Internal power supply defective
64	Overtemperature error		X	Overload
128	Communication error			Control board defective
1024	Rotor blocked	X	X	Fan blocked
Status Information				
256	Current limit			Controller operates at current limit
512	Power limit			Controller operates at power limit
4096	Temperature derating			Controller operates at temperature limit
16384	Speed limit			Motor can not reach set speed

Table 9: Error description

¹ Latched error codes keep valid even when the motor is stopped. The driver must be reset or restarted. Unlatched errors will disappear automatically after the error condition is no longer valid and the motor will resume to operate without interaction.

² Motor and fan are stopped.

4 Technical Data

4.1 Electrical Characteristics

	Value	Unit	Comments
Nominal operating voltage	230 (+/-10%)	V	
Input frequency	50/60	Hz	
Rated input power	1800	W	
Rated input current	7,8	A	cos φ =0,97
Efficiency	>93	%	at rated power
Power factor (cos φ)	>0,95		at rated power
Total harmonic distortion current (THDC)	<10	%	at rated power
Recommended fuse	16	A	slow characteristic

4.2 Performance Characteristics

	Value	Unit	Comments
Speed control accuracy	< +/-2	rpm	
Set point resolution	1	rpm	
Pulse frequency	15,6	kHz	
Output frequency range	0..112,5 0..185	Hz	max. fan speed 2250 rpm (DDMB – ID:152088) max. fan speed 3700 rpm (RZP, TZP – ID:154704)
Overtemperature treshold	95	°C	referenced to internal power device
Overtemperature hysteresis	30	K	
Derating treshold	85	°C	referenced to internal power device
Serial Interface	Modbus RTU (RS485)		see chapter 4.5 for details
Protection features	SOA–speed/power/current limitation, DC-Link voltage low, overload, temperature, impeller lock-up, brownout		
Analogue Input	0..5V (continuous or PWM) 0..10V (continuous or PWM) +5V DC Supply		
Dry Contact Error Output	maximum 30V, 250mA		

4.3 Mechanical Characteristics

	Value	Unit	Comments
Dimensions (w x h x d)	219 x 105 x 220	mm	
Weight	4,2	kg	
Minimum motor power wire gauge	0,75	mm ²	
Minimum motor sensor wire gauge	0,25	mm ²	
Maximum common motor cable length	1,25	m	original common motor cable (unshielded)
Maximum extended cable length	5	m	power and sensor cable separated into 2 shielded cables (order fan with junction box option)
Cable gland holes	4 x M20		
Power supply connector	Cage Clamp, maximum 2,5mm ²		
Communication connector	Cage Clamp, maximum 1,5mm ²		
Motor power connector	Cage Clamp, maximum 2,5mm ²		
Motor sensor connector	Cage Clamp, maximum 1,5mm ²		

4.4 Ambient Conditions

	Value	Unit	Comments
Storage temperature	-40..+70	°C	
Operating temperature	-10..+40	°C	
Operating altitude	<1000 (<3000)	m (ft)	above sea level ³
Protection level	IP54		

³ Altitude derating of maximum operating temperature: -2°C per 300m (1000ft) over 1000m (3000ft)

4.5 Modbus RTU Specification

4.5.1 Protocol

Interface	Modbus RTU with RS485
Supported baud rates	9600, 19200, 38400, 57600 baud
Supported parities	none, even, odd
Data bits	8
Stop bits	1
Address range	1..247 (programmable via Modbus)
Supported function codes	03 – Read output register
	04 – Read input register
	06 – Write single output register
	16 – Write multiple output register

Table 10: General Modbus protocol parameters

4.5.2 Register

No.	Description	Range		Default setting
Input Registers (Function code: 04) read only				
		ID:152088	ID:154704	
30001	Error code / status			
30002	Operation mode	0 = Modbus 1 = Analogue 2 = Pressure Control	0 = Modbus 1 = Analogue 2 = Pressure Control 3 = Temperature Control	1
30003	Fan type	0 = Test 1 = DDMB 7/7 2 = DDMB 9/7 3 = DDMB 9/7T 4 = DDMB 9/9 5 = DDMB 9/9T 6 = DDMB 10/8 7 = DDMB 10/10 8 = DDMB 10/10_hp 9 = DDMB 12/9 10 = DDMB 12/12 11 = free 12 = free 13 = free 14 = free 15 = free	0 = Test 1 = TZP 04-0215-EC 2 = free 3 = free 4 = RZP 11-0200-EC 5 = RZP 11-0225-EC 6 = RZP 11-0250-EC 7 = RZP 11-0280-EC 8 = RZP 11-0315-EC 9 = free 10 = free 11 = free 12 = free 13 = free 14 = free 15 = free	Depends on DIP switch setting! The fan type is coded binary: 0000 = 0 0001 = 1 0010 = 2 0011 = 3 0100 = 4
30004	Current speed	0..2500 rpm	0..3700 rpm	-
30005	Current power	0..2000 W		-
30006	Speed setpoint	0..2500 rpm	0..3700 rpm	0
30007	Speed limit	0..2500 rpm	0..3700 rpm	Depends on fan type
30008	Power limit	0..2000 W		Depends on fan type
30009	Limit of motor current	0..8000 mA		Depends on fan type
30010	Temperature power module			-
30011	DC link voltage	0..500 V		-
30012	DC link current	0..8000 mA		-
30013	Supply voltage	0..500 V		-
30014	Motor current	0..8000 mA		-
30015	Current field angle	0..359		Depends on fan type
30016	Current EMF factor			-
30017	Current voltage ratio	0..1000 ‰		-
30018	proportional part	0..100		0
30019	Integrating part	1..30		0
30020	Sampling rate	5..30		0
30021	Controller Setpoint	0..65535		0
30022	K-Factor	0..1000		Depends on fan type
30023	Sensor Range	1000..5000		1000
30024	0-point adjustment	0..1000		0
30025	Max-point adjustment	500..1000		1000
30026	Sensor Value	0..Sensor Range		-
30027	Firmwareversion	1.1.2	2.0.1	-

No.	Description	Range		Default setting
Output Registers (Function code: 03, 06, 16) read / write				
		<i>ID:152088</i>	<i>ID:154704</i>	
40001	Reset	11		0
40002	Operation mode	0 = Modbus 1 = Analogue 2 = Pressure Control	0 = Modbus 1 = Analogue 2 = Pressure Control 3 = Temperature Control	1
40003	Modbus speed setpoint	0..2500 rpm	0..3700 rpm	0
40004	New Modbus address	1..247		153
40005	New baud rate	9600 baud 19200 baud 38400 baud 57600 baud		57600
40006	New parity	none even odd		even
40007	Password	0..65535		3701
40008	Field angle (read only)	0..359		Depends on fan type
40009	Speed limit (read only)	0..2500 rpm	0..3700 rpm	Depends on fan type
40010	Power limit (read only)	0..2000 W		Depends on fan type
40011	Motor current limit (read only)	0..8000 mA		Depends on fan type
40012	Set new Fanlimit Address	0..65535		0
40013	Set new Fanlimit Value	0..65535		0
40014	proportional part	0..100		1
40015	Integrating part	0..30		1
40016	Sampling rate	5..30		5
40017	Controller Setpoint	0..65535		0
40018	Sensor Range	1000..5000		1000
40019	0-point adjustment	0..1000		0
40020	Max-point adjustment	500..1000		1000

Table 11: Modbus registers

5 Electro-Magnetic Compatibility (EMC)

5.1 EMC Evaluation Basics

All manufacturers / assemblers of electrical apparatus which “performs a complete intrinsic function and is placed on the market as a single unit intended for the end user” must comply with the EMC directive 2004/108/EG.

The EC-Controller is supplied exclusively in connection with products of the company Nicotra Gebhardt. The unit is fully integrated in the corresponding products or will be delivered together with the products. After correct installation it complies to the requirements of the EMC directive 2004/108/EG, according to the EMC product standard for electrical drives with variable speed EN 61800-3.

5.2 EMC Evaluation

5.2.1 Electromagnetic Interference and Immunity

The equipment has been evaluated using a construction according to Figure 7 and Figure 8.

With the construction according to Figure 7 the equipment has been able to meet the quasi-peak requirements of Category 2.

The limits for radiated interference of Category 1 have been exceeded in a small frequency range (about 120MHz)

**Note**

In a residual environment the product can cause high frequency radiation, which makes it necessary to implement suitable counter measures.

With the construction according to Figure 8 the equipment has been able to meet the quasi-peak requirements of Category 1.

5.2.2 Compliance with Harmonics Regulations

From 1st January 2001 all electrical apparatus covered by the EMC Directive will have to comply with EN 61000-3-2 "Limits for harmonic current emissions (equipment input $\leq 16A$ per phase)". Due to the integrated PFC (Power Factor Controller) the EC-Controller complies with the harmonics emissions specification EN 61000-3-2. The specification of THD values complies with the EMC Product Standard for Power Drive Systems EN 68100-3.

6 Notes