Operating Manual EN

HF Inverter e@syDrive® 4330 (IP00), 4330-H (IP10)

INDUSTRIAL DRIVES

SycoTec

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Table of Contents

1 User Information

1.1 Symbols Used

Operating Manual / Unit

⚠ *DANGER*	Indicates a hazardous situation that can directly cause death or serious injury.
⚠ *WARNING*	Indicates a hazardous situation that can cause damage to property or moderate to serious injuries.
⚠ *ATTENTION*	Indicates a hazardous situation that can cause damage to property or mild to moderate injuries.
	Important information for operator and engineer
	Risk of injury due to electric shock. After electric devices have been switched off, touch voltages may occur.
	Information on protection category
	Power input
	Power output
	Material number
	Serial number
	Information on disposal
	CE mark (Communauté Européenne)

Packaging

	Fragile
	Keep dry
	Transport upright with the arrows pointing upwards.
	Stacking restrictions
	Temperature range
	Air pressure
	Humidity
	Quantity

1.2 Scope of Supply

	Material no.
HF inverter e@syDrive 4330 (IP00)*	2.003.3952
HF inverter e@syDrive 4330 (IP00) - C** (customized parameter-setting)	2.003.6383
HF inverter e@syDrive 4330-H (IP10)*	2.003.5721
HF inverter e@syDrive 4330-H (IP10) - C** (customized parameter-setting)	2.003.6378
Info sheet	2.003.6826
with QR code for download:	
– Operating Manual HF inverter e@syDrive 4330, 4330-H	2.003.6718
– Operating Manual Operating Software SycoTec Controller Host/ ZDC002 Bootloader Host	2.003.6926
– Object description UART Interface	2.003.6927

* Preset with default list of parameter settings. No spindle-profile activated. Profile have to be activated via Software.
** Customer specific parameter installed and activated.

Check that all parts are present.

The current operating manuals and descriptions can be downloaded from the SycoTec website under [Downloads - SycoTec GmbH & Co. KG](#).

1.3 Accessories

	Material no.
Connector set HF inverter e@syDrive 4330, 4330-H	2.003.6161
– Power supply connector X1	2.003.6163
– Spindle connector X2	2.003.6164
– I/O connector X3	2.003.6162
Connecting cable 4330 UART - USB	2.003.6326

1.4 Intended Use

The inverter e@syDrive 4330, 4330-H has been specially developed for driving high frequency (HF) 3-phase asynchronous motors (ASM 3-phase) and permanent-magnet synchronous motors (PMSM). They are used in spindles, for grinding, milling and drilling machines on machine tools or CAD/CAM machines, for example.
The high inverter switch frequency ensures a small current rise in motors and strong heating of the rotors is avoided. Thus, approved SycoTec spindles can be operated without a motor choke.
Accelerating to maximum speed and then braking to speed zero more than three times per minute is considered not appropriate use (braking resistor can be damaged).

Description and Features

- Operation of AC spindles and BLDC spindles.
- The inverter e@syDrive 4330, 4330-H allows speed frequencies up to 1,667 Hz / 100,000 rpm.
- Communication via digital and analogue signals.
- UART (Universal Asynchronous Receiver/Transmitter) interface for serial communications.
- Internal storage of up to 6 different motor profiles.
- On board braking resistor.
- Protection against overtemperature.

2 Safety Instructions and Warnings

These safety instructions contain important information for your safety.

Before installing and operating this device, these safety instructions and warnings must be read carefully and all of the warning signs on the device must be payed attention to.

Target group: This document is intended for machine manufacturers and persons responsible for putting into service and operating the inverter e@syDrive 4330, 4330-H.

ATTENTION
The Operating Manual must be read by the user/operator before starting up the unit for the first time in order to avoid incorrect operation and other damage. Duplication and distribution of the Operating Manual require SycoTec prior consent.

Safe operation and protection of the device can only be assured if the device is used as intended, in accordance with the instructions for use, and using only approved tools.
The following must also be observed:
- The occupational health and safety regulations
- The accident prevention regulations

Also note the following directives:
- Low-Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- RoHS Directive 2011/65/EU and Delegated Act 2015/863/EU

All specifications, information and properties of the product described in the operating instructions correspond to the status at the time of printing.
Modifications and improvements to the product as a result of new technical developments are possible.
This does not imply any right to retrofitting of existing units.

SycoTec assumes no responsibility for damage arising through:
- External influences (poor quality of the media or faulty installation, natural phenomena, etc.)
- Use of incorrect information
- Improper use
- Improperly performed repairs

DANGER
- *The inverter e@syDrive 4330, 4330-H operates dangerously rotating mechanical parts. Failure to follow the instructions provided in these instructions for use could result in serious damage to property, personal injury or death.*
- *Hazard-free operation of this device is dependent on the proper installation, handling and operation of the device.*
- *Only suitably qualified personnel may start up, maintain and work on this device. Also only qualified personnel may connect the device, put it into operation and fix faults.*
- *The device must be used only for the purpose intended by the manufacturer. Unauthorized alterations and the use of auxiliary equipment that is not recommended by the manufacturer could cause fires, electric shocks and injuries.*
- *Only combinations of parameter sets and spindles approved by SycoTec should be used. Other combinations can lead to dangerous situations when used.*

ATTENTION
General ESD measures (electrostatic discharge) should be applied when handling the inverter.

Modifications to and in the device may only be performed after prior agreement with SycoTec.

3 Installation, Commissioning and Operation

The installation must only be carried out by qualified personnel with electrotechnical training.
The commissioning must only be carried out be specialist personnel with sufficient knowledge in the fields of electrical engineering and drive technology.

The inverter and accessories must be checked for damage before commissioning.

Electrostatically sensitive components must not be touched.

The following requirements must be considered for the installation and operation of the devices:

Pollution	Clean air according to IEC 60664-1, dirt level 2
Max. operating altitude	2,000 m (6,561 ft)
Ambient temperature	+10 to +40°C (50 to 104°F) according to EN 61800-2
Relative humidity	30 to 70% (no condensation)

The inverter must be mounted in the control cabinet.
The protection against harmful gas, oil vapor and salty air must be ensured.
The ambient air must not contain aggressive, grinding, electrically conductive, highly flammable substances or dust.
A sudden change in temperature and / or humidity must be avoided.

Incorrect installation may result in damage of material and / or serious injury of persons.
People must be adequately protected from the risks of injury or other damage that may be caused by direct or indirect contact.

The applicable accident prevention regulations must be followed to avoid serious injuries when working on energized devices.

The system must be properly grounded in order to prevent serious injuries due to high currents.

The electrical installation must be carried out in according to the relevant electrical codes (appropriate wire gauges, connections of ground conductors, etc.).

Motor cables must be shielded. They must be routed separate from signal cables.
If there are long cable lengths between the inverter and the motor, there is an increased current flow due to line capacitances. This can lead to an earlier triggering of protective functions. When using a shielded motor cable longer than 5 m, additional interference suppression of the cable is required. The maximum permissible length of the motor cable is 100 m.

Signal cables must be shielded. They must be routed separately from motor cables and should not exceed a length of 20 m.
The cable shield must be connected both sides over a large area. The motor cable should be as short as possible.

The cable shields should always be connected on both sides. The connection of the cable shields, which ensures an EMC-compliant design, is described in chapter 3.4 EMC.

The inverter supply voltage must be electrically isolated from the mains (electrically protective separation must be guaranteed).
Ensure that the supply voltage must be equipped with an overcurrent protective device.

The device does not have a power switch. The device must be completely disconnected from the power supply before work is carried out on the opened device. The power supply may only be available after the work on the device has been completed.

Hazards from energy supply disruptions or other failures must be ruled out by appropriate machine control protective measures.

The cable cross sections must be selected so that the permissible current rating values are not exceeded at maximum ambient temperature.
The permissible values for the individual cable cross sections are specified by DIN VDE 0298-4 and must be complied with.

The values of a presetting performed by SycoTec must be checked by the user for correctness.

3.1 Operation

⚠ *DANGER*
During the operation of the product, there is a risk of serious injury to persons and property caused by moving of flying parts or by unauthorized use.

It must be ensured that
- All accesses to the moving parts of the system are kept closed during operation.
- All the mounting screws and tools have been adequately fastened.
- All accesses to the voltage carrying of the system are kept closed during operation.
- The products are used as intended.

A correct operation of the products must be ensured.
It must be ensured that the applicable safety regulations of the respective system are complied with.

i *Check electrical safety before operation.*

i *In case of a 48 V power supply failure, all digital outputs switch to "high" and the spindle trundles out.*

The relevant instructions in the Operating Manual must be followed.

i *The description of the operating software is described in the Operating Manual Software SycoTec Controller Host, ZDC002 Bootloader Host. The Operating Manual can be downloaded from the SycoTec homepage (Downloads - SycoTec GmbH & Co. KG).*

3.2 Transport and Storage Conditions

The inverter must not be subjected to an unacceptable load.
The following factors must be considered:
- Protection against mechanical damage during transportation, handling, etc. must be ensured!
- Protection against contamination and moisture must be ensured!
- Protection against contact with electronic components must be ensured!

The following storage conditions must be met, if necessary by appropriate measures:

Pollution	Clean air according to IEC 60664-1, dirt level 2
Storage temperature	-25 to +55°C (-14 to 104°F) according to EN 61800-2
Relative humidity (storage location)	30 to 70% (no condensation)

A sudden change in temperature and/or humidity must be avoided.

Depending on the ambient conditions, the inverter must be inspected of for cleanliness and function at regular intervals. Fan should be checked for cleanliness and cleaned if necessary.

3.3 Cleaning, Maintenance and Disposal

Before starting cleaning and maintenance work, the inverter must be shut down, disconnect from the power supply and secured against restarting.

Repair and maintenance work, apart from the activities described in this Operating Manual, must be performed only by qualified staff.

ATTENTION
- *In the event of modifications by third parties, the licenses become null and void.*
- *Use only SycoTec original parts and spare parts.*

Disposal of devices and accessories after use
Based on EU directive (WEEE 2012/19/EU) on waste electrical and electronic equipment, we hereby inform you that this product is subject to the aforementioned directive and must be disposed of through special channels within Europe.

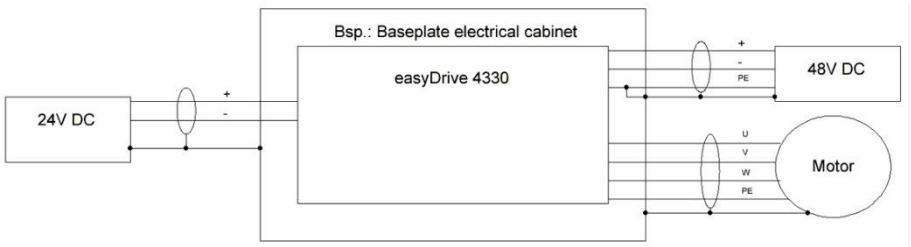
3.4 EMC

Compliance with the limits required for the EMC is the responsibility of the system or machine manufacturer.
In an EMC-compliant equipment configuration, operation is possible in an industrial environment.

The EU directives for electromagnetic compatibility must be considered for commissioning the products!
Particular attention must be paid to the appropriate grounding, wiring and shielding of the products.

In accordance with the EMC product standard DIN EN 61800-3:2004 + A1:2012 the devices comply with the limits of category C3.

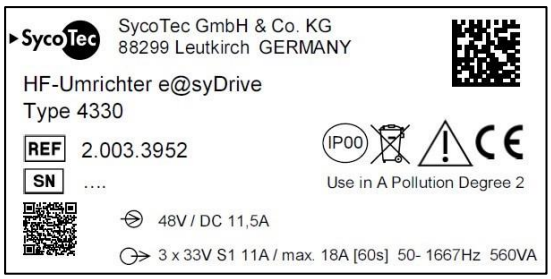
The EMC measurement was carried out with the following setup. For a different set-up, it cannot be guaranteed that the EMC limits can be complied with.



The devices must not be connected directly to low voltage supply networks.
If the devices are to be connected to a low-voltage supply network, appropriate interference suppression measures must be taken.

4 Technical Data

4.1 Type plate

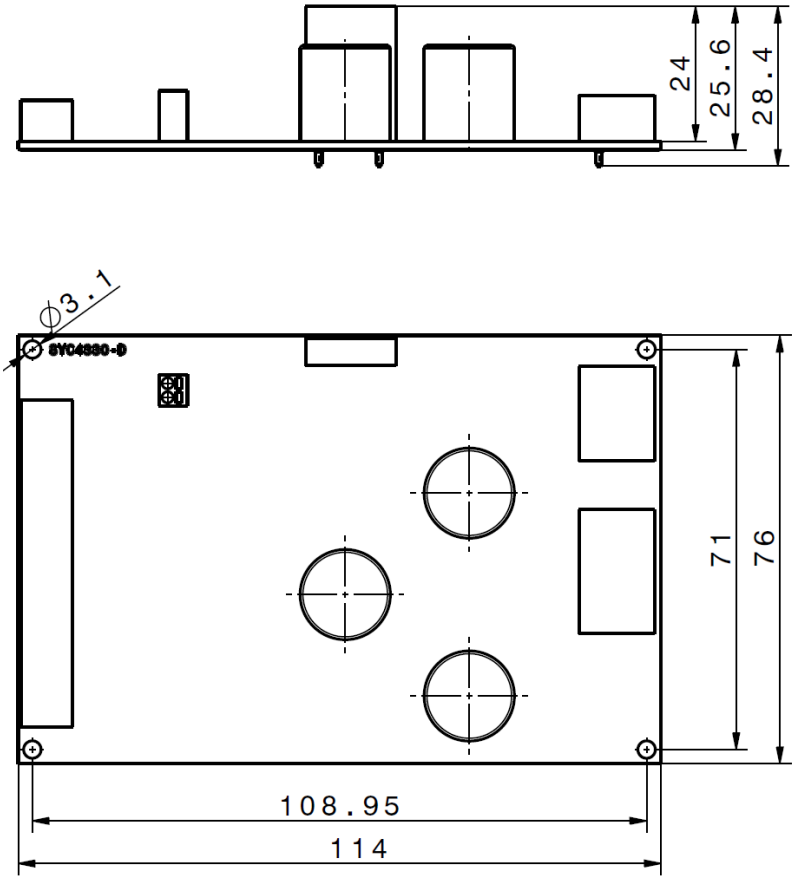


Used symbols see chapter 1.1

4.2 Performance data – Inverter e@syDrive 4330

Input voltage	48 V DC	
Logic supply	24 V DC (0.5 A)	
Output voltage	33 V AC	
Output current	S1: 11 A	Max. 18 A / 60 s
Output power	S1: 560 W	Max. 880 W
Output frequency	Min. 50 Hz	Max. 1,667 Hz
Weight	85 g	
Motor type	3 phase asynchronous motor 3 phase BLDC motor	
Internal memory	6 motor settings	
Braking resistor	Integrated	
Protection category	IP 00 / class III according DIN EN 61800-5-1	
Interfaces	1x Analogue input (0 – 10 V) 2x Digital input (24 V DC) 3x Digital output (24 V DC) 1x Temperature sensor (KTY / PTC) 1x UART interface	

4.2.1 Dimensions – Inverter e@syDrive 4330

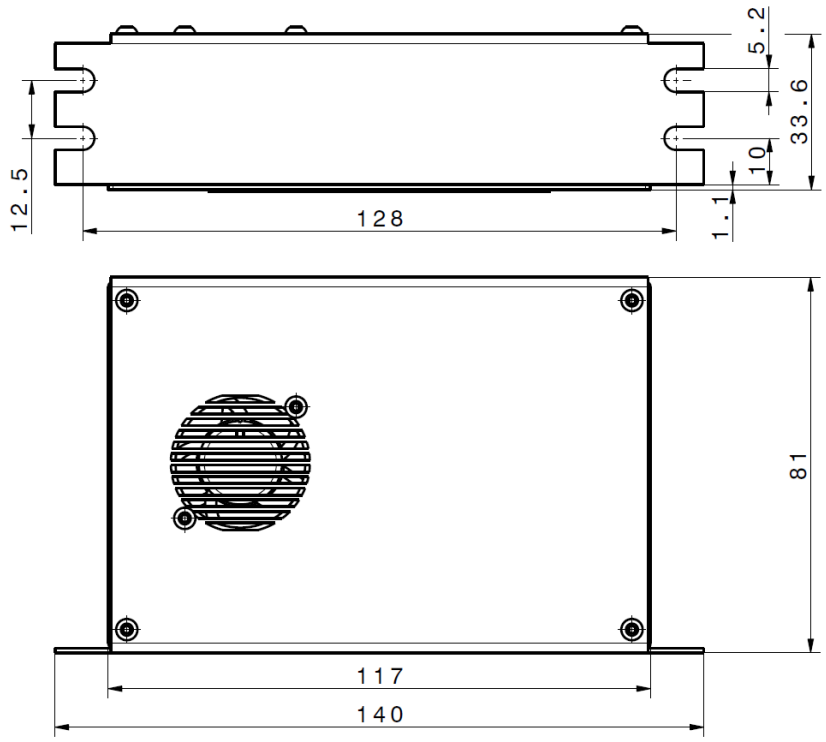


Technical modifications reserved.

4.3 Performance data – Inverter e@syDrive 4330-H

Input voltage	48 V DC	
Logic supply	24 V DC (0.5 A)	
Output voltage	33 V AC	
Output current	S1: 13 A	Max. 18 A / 60 s
Output power	S1: 660 W	Max. 880 W
Output frequency	Min. 50 Hz	Max. 1,667 Hz
Weight	380 g	
Motor type	3 phase asynchronous motor 3 phase BLDC motor	
Internal memory	6 motor settings	
Braking resistor	Integrated	
Protection category	IP 10 / class III according DIN EN 61800-5-1	
Interfaces	1x Analogue input (0 – 10 V) 2x Digital input (24 V DC) 3x Digital output (24 V DC) 1x Temperature sensor (KTY / PTC) 1x UART interface	

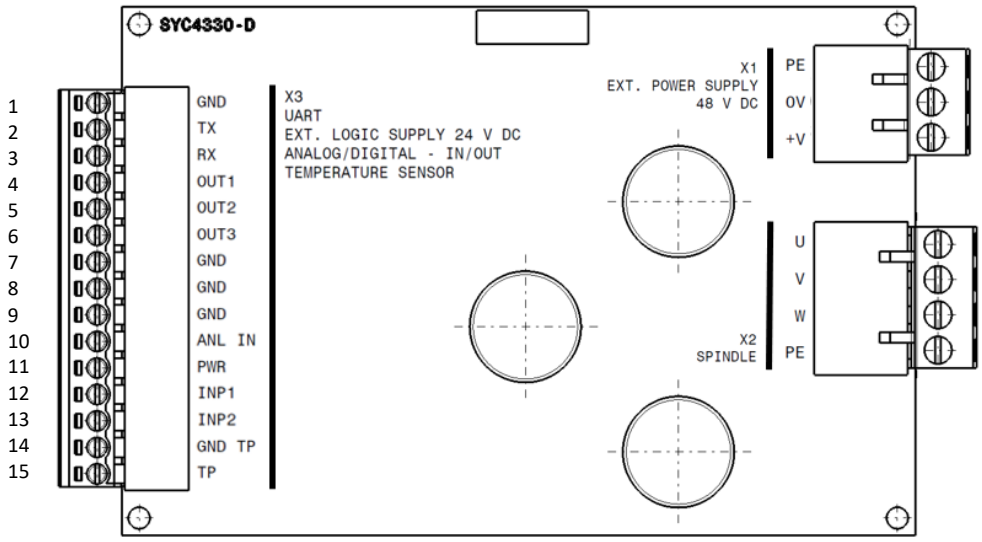
4.3.1 Dimensions – Inverter e@syDrive 4330-H



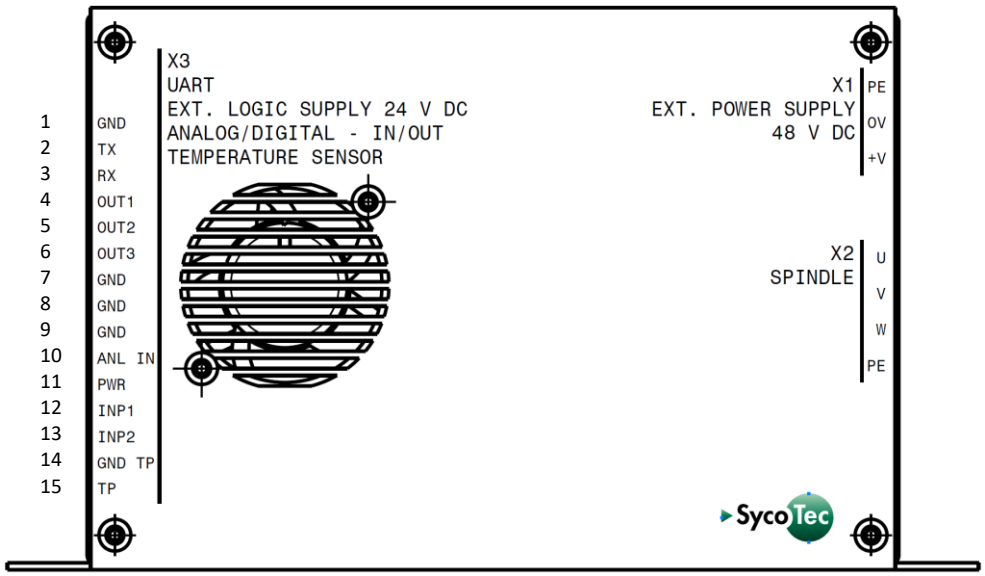
Technical modifications reserved.

5 Connection, Plugs and Pin Assignments

5.1 Inverter e@syDrive 4330



5.2 Inverter e@syDrive 4330-H



5.3 Power Supply Connection X1 (Connector TBP01P1-508-03BE)

PIN	Description
PE	Protective Earth
0V	GND – Return of Power Supply
+V	+ Power Supply, 48 V

Connecting cable from power supply - 1.5 mm² with a maximum length of 2 m.
The Protective earth has to be connected.

5.4 Spindle Connection X2 (Connector TBP01P1-508-04BE)

PIN	Description
U	Motor Phase U
V	Motor Phase V
W	Motor Phase W
PE	Protective Earth + Motor shield

SycoTec cables are recommended.
The Protective earth has to be connected.
The motor shield must be connected to PE.

5.5 I-O Connection X3 (Connector Würth WR-TBL 691361300015)

PIN	Function	Description
1	GND	Ground UART
2	TX	TX – UART
3	RX	RX – UART
4	OUT 1	Digital output 1: Failure (24 V signal)
5	OUT 2	Digital output 2: Speed zero (24 V signal)
6	OUT 3	Digital output 3: Speed reached (24 V signal)
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	ANL IN	Analogue input: Speed control (0 – 10 V)
11	PWR	+ Power Supply, 24 V
12	INP1	Digital input 1: Start (24V) / Stop (0 V)
13	INP2	Digital input 2: Failure reset (24 V signal)
14	GND TP	Ground Motor Temperature Sensor
15	TP	Temperature Sensor

Wiring control circuit - 0.75 mm² with a maximum length of 2m.

6 Functions, Setup and Operation

6.1 Power Supply Connection X1

Power supply must be specified as follows:

U = 46…49 V

PIN	Description
PE	Protection Earth
0V	GND – Return of Power Supply
+V	+ Power Supply, 48 V

For proper function we recommend power supply:
https://www.meanwell-web.com/en-gb/ac-dc-slim-single-output-enclosed-power-supply-uhp--500--48
or equivalent.

6.2 Spindle Connection X2

Connect the spindle wires according to the following schematic:

PIN	Description
U	Motor Phase U
V	Motor Phase V
W	Motor Phase W
PE	Protective Earth + Motor shield

6.3 Logic supply

For the logic supply of the inverter e@syDrive 4330, 4330-H, the following must be observed:

Voltage: 12 – 28 V
Current: max. 500 mA

PIN	Function	Description
8	GND	Ground
11	PWR	+ Power Supply, 24 V

6.4 Digital Input

The digital input can be activated with voltages up to a maximum of ± 28 V DC. The following also applies:

U_low = 0…+1,6 V
U_high = 1,7…+28 V
I_e = 10 mA with 24 V

6.5 Start / Stop

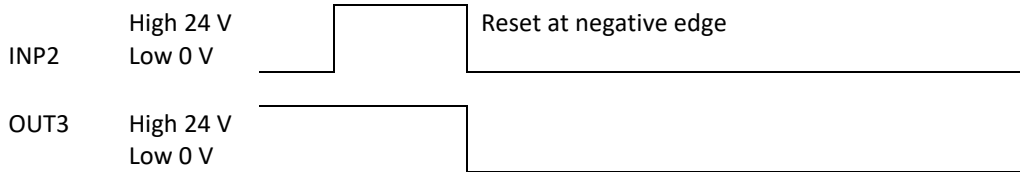
PIN	Function	Description
12	INP1	Digital input 1: Start (24 V) / Stop (0 V)

Spindle start with signal high → 24 V
Spindle stop with signal low → 0 V
Functionality can be inverted via software

6.6 Reset

PIN	Function	Description
13	INP2	Digital input 2: Failure reset (24 V signal)

Failure reset with signal pulse high – low (see schematic)
Functionality can be inverted via software



6.7 Analogue input / Target value of rotational speed

Target value of rotational speed is set via analogue input AIN 0…10 V.
The analogue input is used for the rotational speed target value setting. The voltage range is 0 to 10 V.

PIN	Function	Description
9	GND	Ground
10	ANL IN	Analogue input: Speed control (0 – 10 V)

0 – 10 V/ 0 - Max: The scaling for the analogue value is depending on the parameter setting. Default value is max speed of spindle. Scaling can be adjusted via software.

Example: Motor 33-AC-02 (Spindle 4033 AC)	
Max Speed	100,000 rpm
ANL IN = 0 V	0 rpm
ANL IN = 5 V	50,000 rpm
ANL IN = 10 V	100,000 rpm

6.8 Digital outputs

The 3 outputs are pre-set for the following functions. Functions cannot be changed. Its possible to invert output signals via software.

PIN	Function	Description
4	OUT 1	Digital output 1: Failure Failure = 24 V No failure = 0 V
5	OUT 2	Digital output 2: Speed zero Speed = 0 rpm = 24 V Speed ≠ 0 rpm = 0 V
6	OUT 3	Digital output 3: Speed reached Actual speed = set speed = 24 V Actual speed ≠ set speed = 0 V

Output voltage 24 V (= voltage supply logic)
Max. 150 mA

6.9 UART connector

The UART connector is used to parameterize the inverter by means of a PC.
There is also the possibility to control the spindle via control-commands.
The interface description describes the UART commands and the responses of the inverter.
The interface description can be downloaded from the SycoTec homepage (Downloads - SycoTec GmbH & Co. KG).
To connect PC and inverter, please use USB connecting cable 2.003.6326.

PIN		USB cable	
1	GND	GND	Black
2	TX	RX	Yellow
3	RX	TX	Orange

6.10 Motor temperature sensor

The motor temperature sensor can be connected.

PIN	Function	Description
14	GND TP	Ground Motor Temperature Sensor
15	TP	Temperature Sensor

Possible sensor types: KTY, PTC, PT1000 (min./max. resistance values can be set).

Software also allows to disable temperature sensor.
Default parameter setting fit to equivalent spindle specification.
If the resistance value set in the software is exceeded, the inverter switches off the motor.

6.11 Status Report

If the inverter is supplied with a voltage, then the Status LED (power) lights up continuously, the inverter is ready for operation.

During operation, the green LED lights up continuously.

If an error (fault) occurs, the Warning LED flashes in different patterns, depending on the type of error see chapter 6.12, and the motor is stopped.

6.12 Description of LEDs – Error messages

The LEDs indicate the current status of the inverter:

LED green – Power	LED red – Fault	Meaning
ON	OFF	Inverter ready for operation, operation with no error
ON	ON	Error (error code can be read via Software)

Error message:

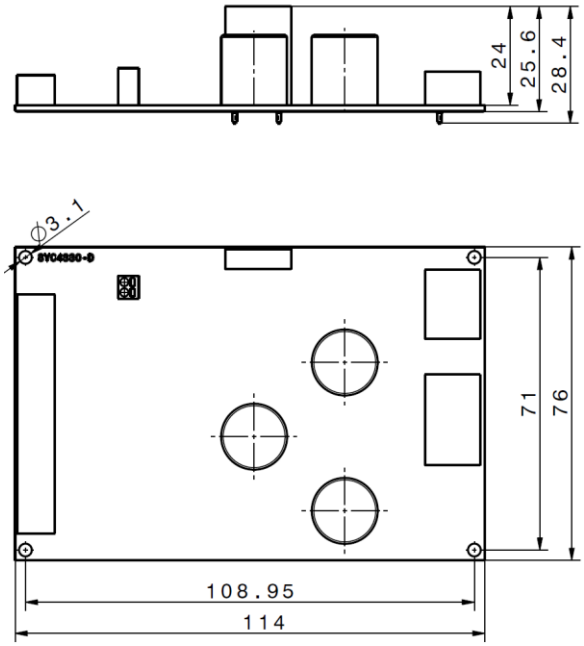
Quantity of flashes (LED red)	Meaning of the fault
1	Motor failed to start
2	Motor stalled
3	Motor could not reach startup speed
4	Fault max. motor current
5	Fault max. motor power
6	Fault min. supply voltage
7	Fault max. supply voltage
8	Fault controller board temperature
9	Reserved
10	Fault max. motor temperature
11	UART timeout fault
12	Motor connect fault

If an error occurs, the motor stops and does not start again until the error is eliminated and the inverter is reset.

7 Mounting

7.1 Mounting inverter e@syDrive 4330

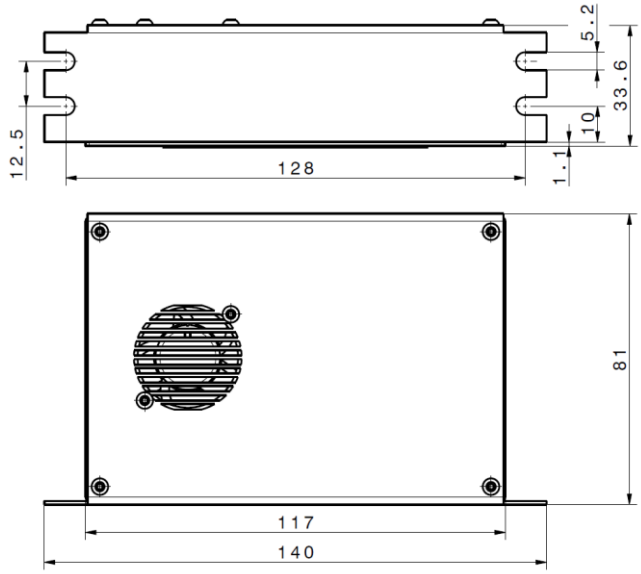
The inverter must be fixed with 4x M3 screws.



ATTENTION
Bottom surface must be protected against short circuit! (No contact to electrically conductive materials.)
→ Recommendation: mount inverter onto distance-pins > = 5 mm length.

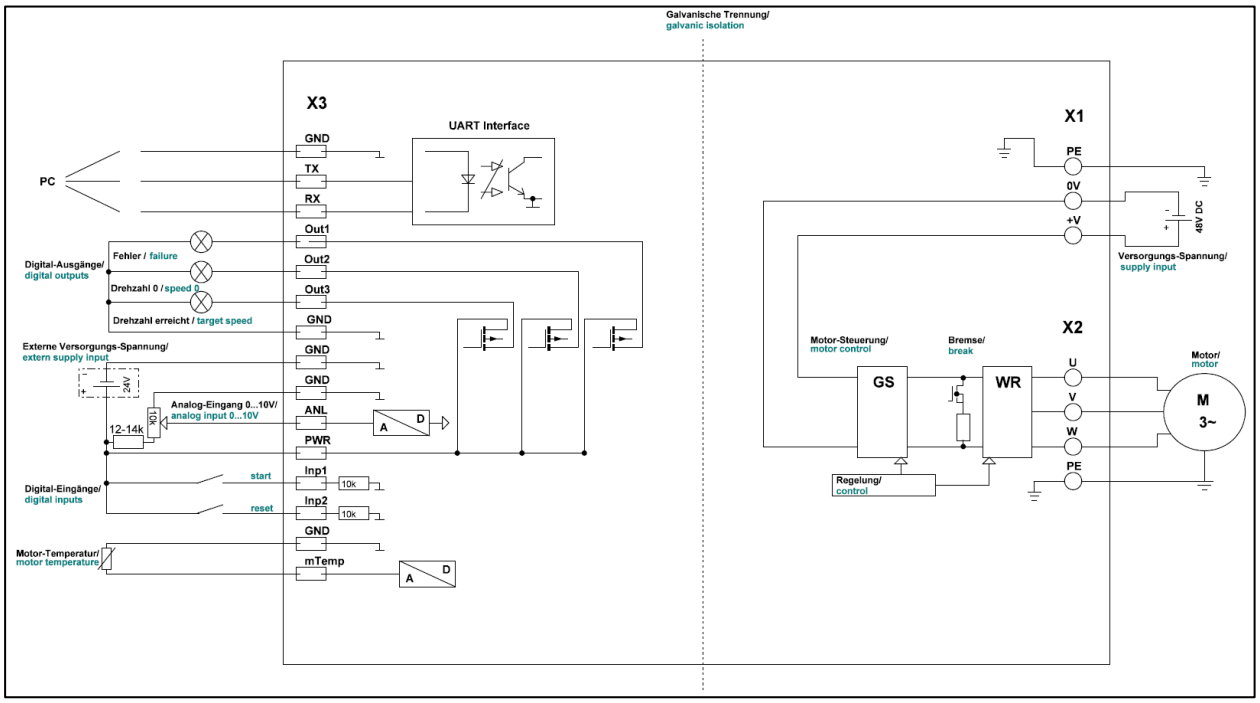
7.2 Mounting inverter e@syDrive 4330-H

The inverter can be fixed with up to 4 Screws. Use either M4 or M5 screws.



ATTENTION
Sufficient air supply should be ensured for maximum performance of the inverter.
The fan should not be covered.

8 Connection Example



Warranty Conditions

Under current SycoTec delivery and payment conditions, SycoTec undertakes warranty for satisfactory function and freedom from faults in material and manufacture for a period of 12 months from the date of sale certified by the vendor.
In the event of justifiable complaints, SycoTec shall supply spare parts or carry out repairs free of charge under warranty. SycoTec accepts no liability for defects and their consequences which have arisen or could have arisen as a result of natural wear and tear, improper handling, cleaning or maintenance, non-compliance with the maintenance, operating or connecting instructions, corrosion, impurities in the air supply or chemical or electrical influences which are unusual or not admissible in accordance with SycoTec's standards. The warranty claims shall become null and void if defects or their consequences can be attributed to interventions in or modifications to the product. Warranty claims can only be validated if they are notified immediately in writing to SycoTec.
A copy invoice or delivery note clearly showing the manufacture number shall be attached if products are returned.

CE Declaration of Conformity

The CE Declaration of conformity may be requested or downloaded from www.sycotec.eu

2.003.6718 – 2023-09

(EN = original)

INDUSTRIAL DRIVES

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