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




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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.
	Risk of injury due to electric shock. After electric devices have been switched off, touch voltages may occur.
	Important information for operator and engineer
	Information on protection category
	Information on disposal
	CE mark (Communauté Européenne)
	CSA/UL mark

Packaging

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

1.2 Important Definitions

PC operation:	The HF inverter is configured and, if required, operated using a standard PC.
Micro step – Start-up:	With a micro step start-up, the PMSM motor is operated as a synchronous motor with constant current. In this case, the output frequency is slowly increased from 0 Hz to the start-up frequency, after which the system switches to controlled motor running. With a micro step start-up, it is possible to start up sensor less PMSM motors with large centrifugal masses (such as vacuum pumps), which would otherwise fail to start due to the large moment of inertia.
Ready for operation:	If no error occurs after the inverter switches on, then the green LED 1 lights up. This machine state is referred to as ready for operation.

Configuration:	Configuration refers to the operating process that allows the settings of the HF inverter to be configured in relation to the motor data of the connected motor as well as the inputs and outputs. The settings of the HF inverter are configured with the help of the SycoDrive operating software, which is available free of charge from the website www.sycotec.eu . (A more detailed description of the SycoDrive operating software can be found in chapter 9.0.)
Qualified staff:	For the purposes of these instructions for use, these are persons who are familiar with and have been properly trained in the installation, assembly, commissioning and operation of the product and the possible hazards and risks associated with the electrical current.
Galvanic isolation:	Galvanic isolation ensures that two electrical circuits are physically separated from one another. This means that the two circuits have no direct connection with each other. Electrical energy is transferred from one conductor to another electro-magnetically and without contact, with the help of an inductive coupling element, for example. This also ensures that the potentials are separated from each other.

1.3 Abbreviations

A	Ampere
AC	Alternating current
AIN	Analog input
Aout	Analog output
ASM 3-phase	3-phase asynchronous motor
AWG	American Wire Gauge
°C	Degrees Celsius
CAN	Bus system (Controller Area Network)
CANH	CAN bus high-level
CANL	CAN bus low-level
CDM	Complete drive module
COM	Common connection relay
CSA	Canadian Standards Association
CUL	UL for Canada
DC	Direct current
DIN	Digital input
DIN EN	German Industrial Standards / European Standards
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
°F	Degrees Fahrenheit
FRQout	Frequency output
FW	Firmware
GB	Gigabyte
GND	Ground/earth
GR	Rectifier – Block Diagram
GS	Direct current – Block Diagram
HF	High frequency
hPa	Hectopascal
Hz	Hertz
ID	Identification
I	Input
INV	Inverter
IP	Protection category
kg	Kilogram
kOhm	Kiloohm
LED	Light-emitting diode
m	Meter
mA	Milliampere
max.	Maximal
min.	Minimal
mm	Millimeter
mm ²	Square millimeter
ms	Millisecond

NC	Normally closed contact
NN	Geographical reference height (Normal Null)
NO	Normally open contact
NTC	Negative temperature coefficient
O	Output
PAM	Pulse-amplitude modulation
PC	Personal computer
PCB	Printed-circuit board
PDO	Process data object
PDS	Power drive system
PE	Protective earth conductor
PFH _A	Propability of a Dangerous Failure per Hour
PLC	Programmable logic controller
PMSM	Permanent-magnet synchronous motor without rotor position sensor
PTC	Positive temperature coefficient
RMS	Root Mean Square
SD card	Secure digital memory card
SDO	Service data object
SN	Serial number
STO	Safe Torque Off
T	Motor temperature
U	Motor phase U
U _{eff}	RMS voltage
UL	Underwriters Laboratories (Organisation that tests and certifies products for their safety)
USB	Universal Serial Bus
V	Volt
V	Motor phase V
V/Hz	Voltage-frequency ratio
VA	Volt-ampere
W	Watt
W	Motor phase W

2 Scope of Supply and Accessories

2.1 Scope of Supply

HF Inverter e@syDrive 4624	Material no. 2.002.1053
HF Inverter e@syDrive 4624 IP00	Material no. 2.002.6308
HF Inverter e@syDrive 4624 IP00-S	Material no. 2.003.0591
HF Inverter e@syDrive 4625	Material no. 2.002.1054
HF Inverter e@syDrive 4626	Material no. 2.002.1055
Operating Manual e@syDrive 4624, 4625, 4626	Material no. 2.002.1912
Operating Manual SycoDrive Operating Software	Material no. 2.002.2669
Mini USB cable (1.8 m)	Material no. 2.002.2675
Micro SD card (2GB)	Material no. 2.002.5831



Check that all parts are present.

2.2 Accessories

The following power supply modules from SycoTec are specially designed for use with HF inverters e@syDrive 4624, 4625, 4626 and are therefore recommended:

Power supply e@syDrive 4428	Material no. 1.001.2770
Power supply e@syDrive 4429	Material no. 1.002.2515



DANGER

When using a transformer or different mains adapter, double isolation must be maintained between the secondary voltage and mains voltage. This means that the HF inverter supply voltage must be galvanically separated from the mains.

Ensure that the supply voltage is equipped with an overcurrent protection device.



Must be powered by an approved power supply.

Short Instructions for Use HF Inverter e@syDrive 4624, 4625, 4626	Material no. 2.002.1913
Object description CANopen HF Inverter e@syDrive 4624, 4625, 4626	Material no. 2.002.6929
Interface Description RS232 HF Inverter e@syDrive 4622, 4625, 4626	Material no. 2.002.9501



The latest instructions for use and descriptions can be downloaded from the SycoTec website.

3 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 paid attention to.

This document is intended for machine manufacturers and persons responsible for putting into service and operating the HF inverter.



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's 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/EG

All specifications, information and properties of the product described in the operating manual correspond to the status on going to press.

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 HF inverters e@syDrive 4624, 4625, 4626 operate 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 properly qualified personnel must commission, service and work on this device. Only qualified staff is permitted to connect up and commission the device and to rectify faults.*
- *This device must not be used as an "emergency stop mechanism" (see EN 60204).*
- *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.*



ATTENTION

For safety reasons, the HF inverter supplied has been configured to operating mode "no motor". Since it is not known which motor will be connected, an incorrect configuration could damage or destroy the motor or the HF inverter. In order to configure the HF inverter, please see chapter 8.0.

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

3.1 Appropriate Use

The SycoTec HF inverters e@syDrive 4624, 4625, 4626 have been specially developed for driving 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, for example.

They can also be used to operate motors that are made up of motor elements, and are used, for example, as drives for test stands or other physical-technical equipment (such as vacuum pumps, centrifuges, optical systems etc.).

The pulse-amplitude modulation (PAM) used ensures smooth and gentle operation of the motors.

The following types of motor can be operated:

- 3-phase asynchronous motor (ASM 3-phase)
- Parallel operation of ASM 3-phase is possible according to user's requirements (please contact SycoTec's technical support team regarding configuration of the inverter).
- Permanent-magnet synchronous motors without sensors (PMSM)

Integrated load compensation offers consistent speed regulation and – by ensuring low currents in idle operation – prevents unnecessary heating of the connected motors.

When the stop command is given, the connected motor is braked with the deceleration ramp.

A PC can be connected via the USB interface and used to operate and configure the system and to update the firmware.

The HF inverter can be operated entirely via remote control. Various inputs and outputs are freely programmable.

3.2 Installation, Commissioning and Operation

The installation must only be carried out by qualified personnel with electrotechnical training.

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

The HF 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: | 1,000 m (5,231 ft) |
| • Ambient temperature: | +5 to +40°C (41 to 104°F) according to EN 61800-2 |
| • Relative humidity: | 5 to 85% (no condensation) |

The HF 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.

For devices with a fan sufficient spaces for the suction and discharge of cooling air must be provided to ensure effective cooling.

Incorrect installation may result in damage of material and / or serious injury of persons.

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.).

The inverter supply voltage must be electrically isolated from the mains.

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

3.3 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.

It must be ensured that all the mounting screws and tools have been adequately fastened.

It must be ensured that all accesses to the voltage carrying of the system are kept closed during operation.

It must be ensured that 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.



Check electrical safety before operation.

The relevant instructions in the operating manual must be followed.

3.4 Transport, Storage, Maintenance and Disposal

The HF 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): 5 to 95% (no condensation)

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

Depending on the ambient conditions, the HF inverter must be inspected of for cleanliness and function at regular intervals.

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

The safety function STO must be checked by being triggered at regular intervals by qualified staff. This can be done, for example, by opening the safety switch with the motor running or the attempt of starting the motor with the safety switch open. If required, the test report according to DIN EN 61800-5-2 can be made available.

The safety function STO has been tested in accordance with DIN EN 61800-5-2 and compliance with the underlying standard has been confirmed and documented.

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 equipment and accessories after use**

The devices are subject to the Directive 2011/65/EG on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).

The products must be disposed of in accordance with the valid country-specific waste disposal laws.

Before disposing of the HF inverter, the battery must be removed.

The battery must be disposed of separately.

3.5 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 C2.







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 Plates








HF inverter with SN < 5,000

HF inverter type	→	Type: 4624		   Made in Germany
Material number	→	REF : 2.002.1053		
Serial number	→	SN-XXXXXX		
Input	→	 33-49V AC 1~ 50/60 Hz  46-70V DC		
Output	→	 3 x 45V 5A 4.000Hz 300VA		

← Symbols (see chapter 1.1)

HF inverter type	→	HF-Umrichter e@syDrive		   MADE IN GERMANY
Material number	→	Type 4624 IP00		
Serial number	→	REF 2.002.6308		
Input	→	 33 - 49V AC 1~ 50/60Hz  46-70V DC max. 6.8A		
Output	→	 3 x 45V S1 5A / max. 7.5A 5 - 4000Hz 300VA This drive incorporates an integral solid state overload protection		

← Symbols (see chapter 1.1)

HF inverter type	→	HF-Umrichter e@syDrive		   MADE IN GERMANY
Material number	→	Type 4624 IP00-S		
Serial number	→	REF 2.003.0611		
Input	→	 33 - 49V AC 1~ 50/60Hz  46-70V DC max. 6.8A		
Output	→	 3 x 45V S1 5A / max. 7.5A 5 - 4000Hz 300VA This drive incorporates an integral solid state overload protection		

← Symbols (see chapter 1.1)

HF inverter with SN ≥ 5,000

HF inverter type	→	HF-Umrichter e@syDrive		   MADE IN GERMANY
Material number	→	Type 4625		
Serial number	→	REF 2.002.1054		
Input	→	 33 - 49V AC 1~ 50/60Hz  46-70V DC max. 14A		
Output	→	 3 x 45V S1 10A / max. 15A 5 - 4000Hz 600VA This drive incorporates an integral solid state overload protection		

← Symbols (see chapter 1.1)

HF inverter type	→	HF-Umrichter e@syDrive		   MADE IN GERMANY
Material number	→	Type 4626		
Serial number	→	REF 2.002.1055		
Input	→	 33 - 49V AC 1~ 50/60Hz  46-70 V DC max. 19.3A		
Output	→	 3 x 45V S1 16A / max. 24A 5 - 4000Hz 1000VA This drive incorporates an integral solid state overload protection		

← Symbols (see chapter 1.1)

4.2 Performance Data

4.2.1 HF inverter e@syDrive 4624 IP20 / 4624 IP00 / 4624 IP00-S

Power unit:	
Supply voltage	33 V AC...49 V AC 1~ 50/60Hz / 46 V DC...70 V DC
Output voltage	3 x 45 V AC
Output current	S1: 5 A / max. 7,5 A (5s)
Output power	S1: 300 VA / max. 450 VA (5s)
Recovery time after overload	60s (S1 operation possible)
Output frequency	5...4,000 Hz
Efficiency	> 90%
Braking resistance (internal)	60 W

4.2.2 HF inverter e@syDrive 4625

Power unit:	
Supply voltage	33 V AC...49 V AC 1~ 50/60Hz / 46 V DC...70 V DC
Output voltage	3 x 45 V AC
Output current	S1: 10 A / max. 15 A (5s)
Output power	S1: 600 VA / max. 900 VA (5s)
Recovery time after overload	60s (S1 operation possible)
Output frequency	5...4,000 Hz
Efficiency	> 90%
Braking resistance (internal)	60 W

4.2.3 HF inverter e@syDrive 4626

Power unit:	
Supply voltage	33 V AC...49 V AC 1~ 50/60Hz / 46 V DC...70 V DC
Output voltage	3 x 45 V AC
Output current	S1: 16 A / max. 24 A (5s)
Output power	S1: 1,000 VA / max. 1,500 VA (5s)
Recovery time after overload	60s (S1 operation possible)
Output frequency	5...4,000 Hz
Efficiency	> 90%
Braking resistance (internal)	60 W



For input voltages < 49 V AC respectively 70 V DC sometimes only a limited speed and power range is possible.

4.2.4 Nominal and Overload Conditions

The following table describes the maximum permissible nominal and overload conditions for AC and DC power supply:

	Input		Motor	
	Apparent power [VA]	Current [I_{eff}]	Active power [W]	Phase voltage [V_{eff}]
AC - nominal load	1000	21	750	43
DC - nominal load	1000	14	1000	45 (max. 49)
DC - overload (5s)	1500	21	1500	45 (max. 49)

With AC voltage supply of the inverter, the maximum active motor power is due to the distortion reactive power occurring in the rectifier lower than with DC supply.

With AC power supply, an 5s overload operation is technically not possible: Due to the distortion reactive power the permissible input current would be massively exceeded. Even if the overload situation would be applied only for a limited time, there would be irreversible damage to the components, which would shorten the life of the inverters.

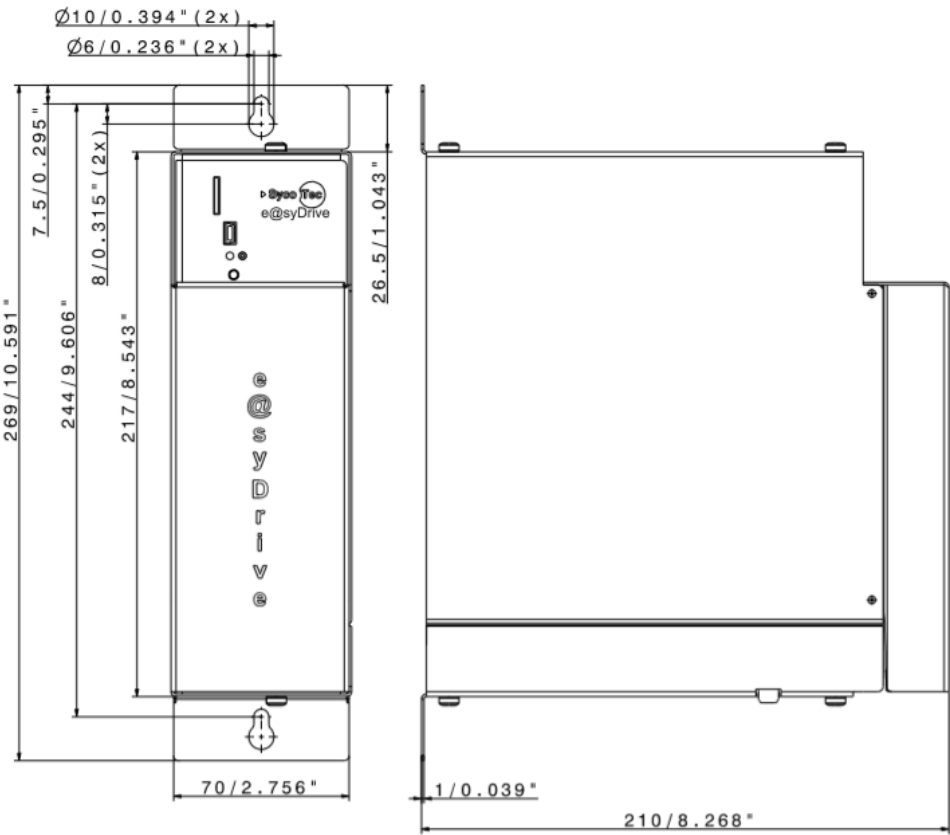


ATTENTION

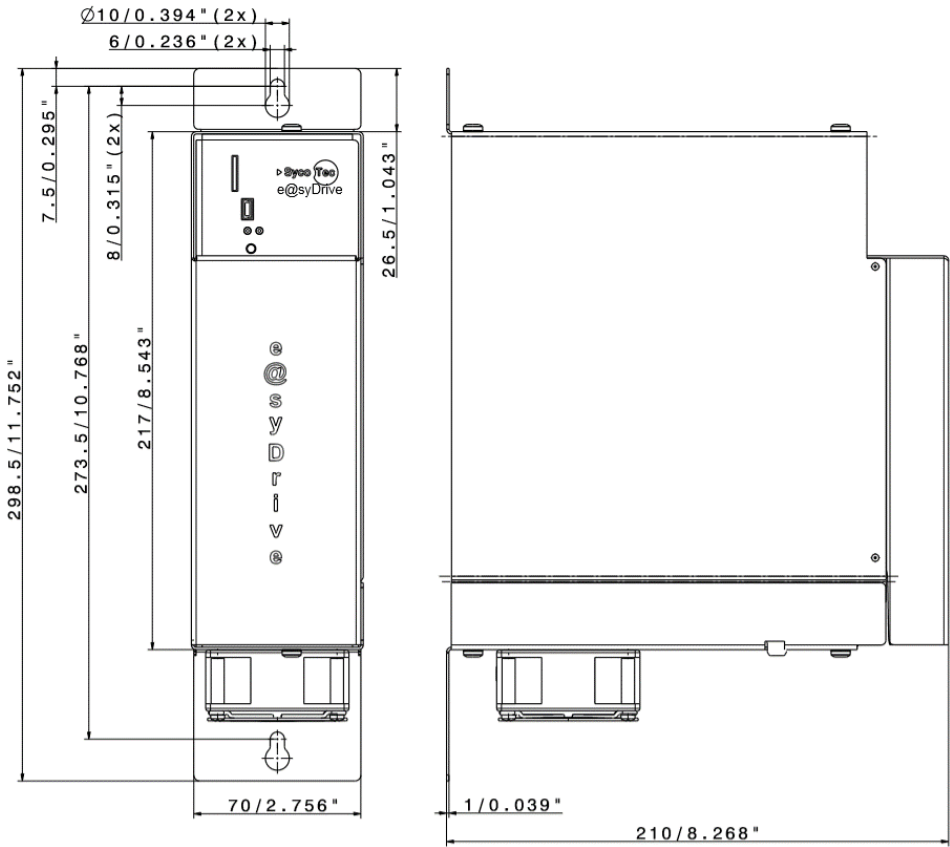
With AC voltage supply, the inverter must not be operated in overload.

4.3 Inverter Dimensions

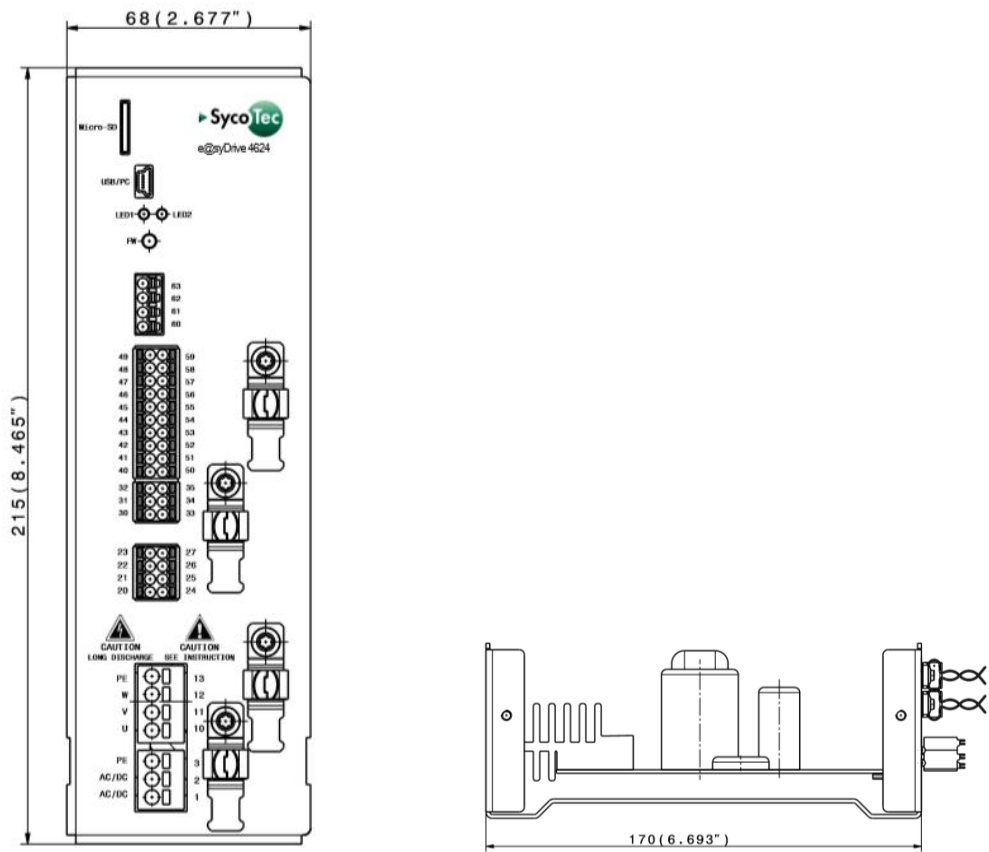
4.3.1 HF inverter e@syDrive 4624 IP20



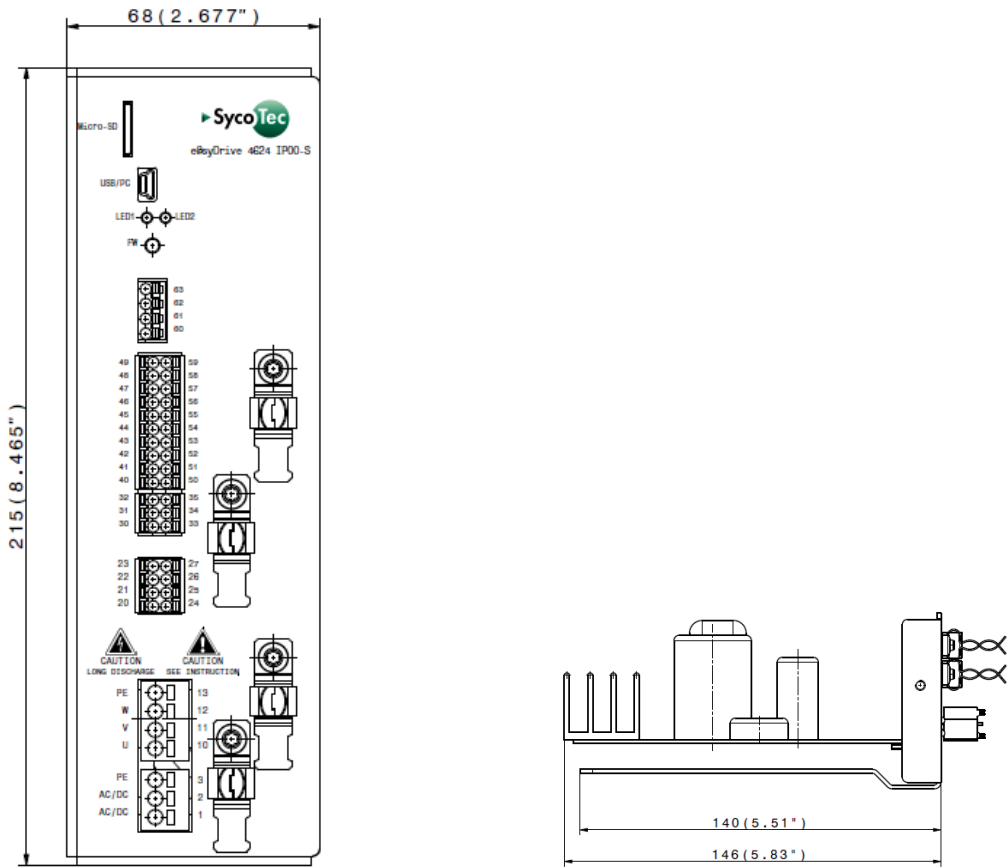
4.3.2 HF inverter e@syDrive 4625 and 4626



4.3.3 HF inverter e@syDrive 4624 IP00



4.3.4 HF inverter e@syDrive 4624 IP00-S



4.4 General

4.4.1 Configuration

The HF inverters e@syDrive 4624, 4625, 4626 are equipped with a standard mini USB (Universal Serial Bus) port. The HF inverter can be connected to a PC using a USB connection cable (with one USB Type A plug and one USB Mini-B plug).

The HF inverters e@syDrive 4624, 4625, 4626 also have a micro SD card slot. Parameters can be saved to a micro SD card and then read out again from the card. This makes it possible to copy an existing configuration to another HF inverter, for example. In addition the micro SD card can be used as a fault memory and perform a firmware update.

i Further information are available in operating manual "Operating Software SycoDrive", which can be downloaded from the SycoTec GmbH & Co. KG website.

In addition, the HF inverters have a CAN fieldbus interface, which can be used to network and control the inverters.

- General:
 - CANopen communication protocol with device profile "CiA 402 electrical drives"
 - Electronic data sheet with communication objects in EDS file
- Access to inverter parameters with CANopen service data objects (SDO)

(Further information can be found in chapter 4.5.)

4.4.2 FW button

i The FW button may only be used on explicit instructions by SycoTec and according to the appropriate specifications.

4.4.3 Operation

The HF inverter can be controlled in different ways:

- With a remote control unit that is linked to the integrated digital inputs of the inverter.
- Using a PLC that is linked to the integrated digital inputs of the inverter.
- Using a PC that is directly connected via the mini USB connection.
- CAN fieldbus controls with CANopen process data objects (PDO)

(Further information can be found in chapter 4.5.)

4.4.4 Display

The operating status of the inverter can be indicated with the help of two visible LEDs.

- LED 1 red: Fault
- LED 2 green: Operation

Green – LED 2	Red – LED 1	Meaning
OFF	OFF	Inverter is switched off
ON	OFF	Inverter ready for operation
Flashing	OFF	Motor runs
ON / flashing	Flashing	Warning, warning code < 6 (flashes with the number of the warning code)
ON / flashing	ON	Warning, warning code > 6
OFF	Flashing	Error, error code < 6 (flashes with the number of the error code)
OFF	ON	Error, error code > 6
Flashes 2 times	OFF	Parameters transferred successfully from micro SD card
Flashes 2 times	Flashes 2 times	Fault when transferring parameters from micro SD card
Flashes 3 times	OFF	Parameters transferred successfully to micro SD card
Flashes 3 times	Flashes 3 times	Fault when transferring parameters to micro SD card

4.4.5 Standards

EN 61800–5–1 Adjustable speed electrical power drive systems –
Part 5-1: Safety requirements - Electrical, thermal and energy



For a CDM or PDS, further tests for compliance with the standard may be required.

EN 61800–5–2 Adjustable speed electrical power drive systems –
Part 5-2: Safety requirements - Functional

EN 61800-3 Adjustable speed electrical power drive systems –
Part 3: EMC requirements and specific test methods

EN 60529 Degrees of protection provided by enclosures (IP Code)

HF Inverter with SN $\geq 5,000$

CSA C22.2 274-17 Adjustable speed drives

UL 61800-5-1 Adjustable Speed Electrical Power Drive Systems
Part 5-1: Safety Requirements – Electrical, Thermal and Energy

4.4.6 Overload situation

Load class 2 according to DIN EN 60146-1-1
150% overload for 5s

4.4.7 Protection category

HF inverter e@syDrive 4624	IP 20 nach DIN EN 60529
HF inverter e@syDrive 4624 IP00	IP 00 nach DIN EN 60529
HF inverter e@syDrive 4624 IP00-S	IP 00 nach DIN EN 60529
HF inverter e@syDrive 4625	IP 20 nach DIN EN 60529
HF inverter e@syDrive 4626	IP 20 nach DIN EN 60529

4.4.8 Appliance class

Class III in accordance with DIN EN 61800-5-1

4.4.9 Weight

HF inverter e@syDrive 4624	2,4 kg
HF inverter e@syDrive 4624 IP00	1,5 kg
HF inverter e@syDrive 4624 IP00-S	1,1 kg
HF inverter e@syDrive 4625	2,6 kg
HF inverter e@syDrive 4626	2,7 kg

4.4.10 Ambient conditions

Permitted in interior spaces:

Ambient temperature:	5... 40°C (41...104°F)
Relative humidity:	5...85% without condensation (EN 61800-2)
Max. operating altitude:	1,000 m above NN

4.4.11 Storage and transport conditions

Ambient temperature:	-25...55°C (-13...104°F) (EN 61800-2)
Relative air humidity:	5...95%
Air pressure:	700...1,060 hPa



ATTENTION
Keep dry!

We reserve the right to make technical modifications.

4.5 Description of Functions

Output frequency: min. 5 Hz / max. 4,000 Hz

Output power:

S1: 300 VA / max. 450 VA e@syDrive 4624 IP20, e@syDrive 4624 IP00, e@syDrive 4624 IP00-S

S1: 600 VA / max. 900 VA e@syDrive 4625

S1: 1,000 VA / max. 1,500 VA e@syDrive 4626

The HF inverters e@syDrive 4624, 4625, 4626 are suitable for actuating various types of motor, particularly those with high frequencies up to 4,000 Hz, by means of variable frequency control. The output voltage is set via pulse-amplitude modulation (PAM).

4.5.1 3-phase asynchronous motor (ASM 3-phase)

3-phase asynchronous motors (ASM 3-phase) are operated via V/Hz controls. Output voltage via pulse amplitude modulation with block commutation.

The motor voltage is determined from the voltage/frequency table (V/Hz table).

IR compensation and load compensation processes are available in order to balance out no-load losses and changes in rotational speed under load.



Further information on each of the compensation processes are available in the operating manual "Operating Software SycoDrive".

4.5.2 Permanent-magnet synchronous motor without sensors (PMSM)

PMSM motors have a permanent magnet rotor and a three-phase stationary winding. The winding is designed as an air gap winding with return yoke, but a slotted design similar to that of an ASM 3-phase motor is also possible.

Actuation of the motor depends on the rotor position 120° block commutation. The HF inverter determines the rotor position by measuring the induced voltage. No position sensors are required.

In order for the e.m.f. voltage to be determined, the motor inductance should not be too high.

4.5.3 Selection of target value

● SycoDrive

To control the target value using the operating software on the PC, go on the "STARTPAGE" to the category "Basic Parameters" and under "Input for rated frequency" select "Serial interface". Then transfer the setting to the HF inverter with "Save on inverter". This deactivates the target value settings at the analog inputs.



If the parameters are not transferred to the HF inverter, then the settings will not take effect. Please check the value to which the "Input for start:" parameter is set.

● Analog input AIN

Alternatively, the "Input for rated frequency" can be set to "Analog input". The analog input can then be configured in the "INPUTS/OUTPUTS" category under "Analog input". Here, you can specify whether the analog input should be evaluated by means of a voltage between 0 and 10 V or a current between 0 and 20 mA. According to the evaluated voltage or current, the "Minimum frequency" and "Maximum frequency" can be scaled.



Please make sure that the scaled "Maximum frequency" at the analog input does not exceed the maximum frequency set in the "MOTOR DATA".

● Digital inputs / Fixed frequencies

Alternatively, the "Input for rated frequency" can be set to "Digital inputs". The digital inputs can then be configured in the "INPUTS/OUTPUTS" category under "Digital inputs".

The selection is made with control inputs DIN5 and DIN6. Up to four fixed frequencies can be used. The following table shows the assignment of the input combinations to the fixed frequencies.

DIN5	DIN6	Active target value
0	0	FF1
0	1	FF2
1	0	FF3
1	1	FF4

0 = low voltage (0 V), 1 = high voltage (24 V)

● CAN

The "Input for rated frequency" can also be set to "CAN". The "CAN node ID" can then be configured in the "INPUTS/OUTPUTS" category under "CAN".

4.5.4 Start/Stop

● SycoDrive

In order to control the Start/Stop command using the operating software on the PC, go on the "STARTPAGE" to "Basic parameters", then "Input for start:" and select "Serial interface". Then transfer the setting to the HF inverter with "Save on inverter". This deactivates the digital inputs. The control commands are then given via the "Start", "Stop" and "Reset" buttons in the SycoDrive operating software .

● Digital inputs

Alternatively, "Input for start" can be set to "Digital inputs". This activates the digital inputs and the "Start", "Stop" and "Reset" buttons in the GUI are deactivated.

(Further information on the digital inputs can be found in chapter 6.7).



"Start" can only be used on the digital inputs when the PLC input is disabled.

● PLC input signal

If the "Input for start:" is set to "Digital inputs", then starting is also possible via the PLC input.

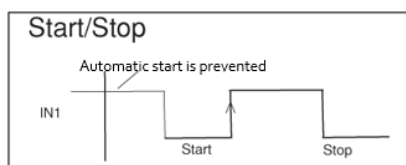


- *"Start" can only be used on the PLC input if it is disabled in the digital inputs.*
- *If the parameters are not transferred to the HF inverter, then the settings will not take effect.*



ATTENTION

Automatic start-up after a mains failure where a start signal is present at DIN1 or at the PLC input is prevented. A positive edge is required at the start input.



● CAN

The "Input for start" can also be set to "CAN". The "CAN node ID" can then be configured in the "INPUTS/OUTPUTS" category under "CAN".

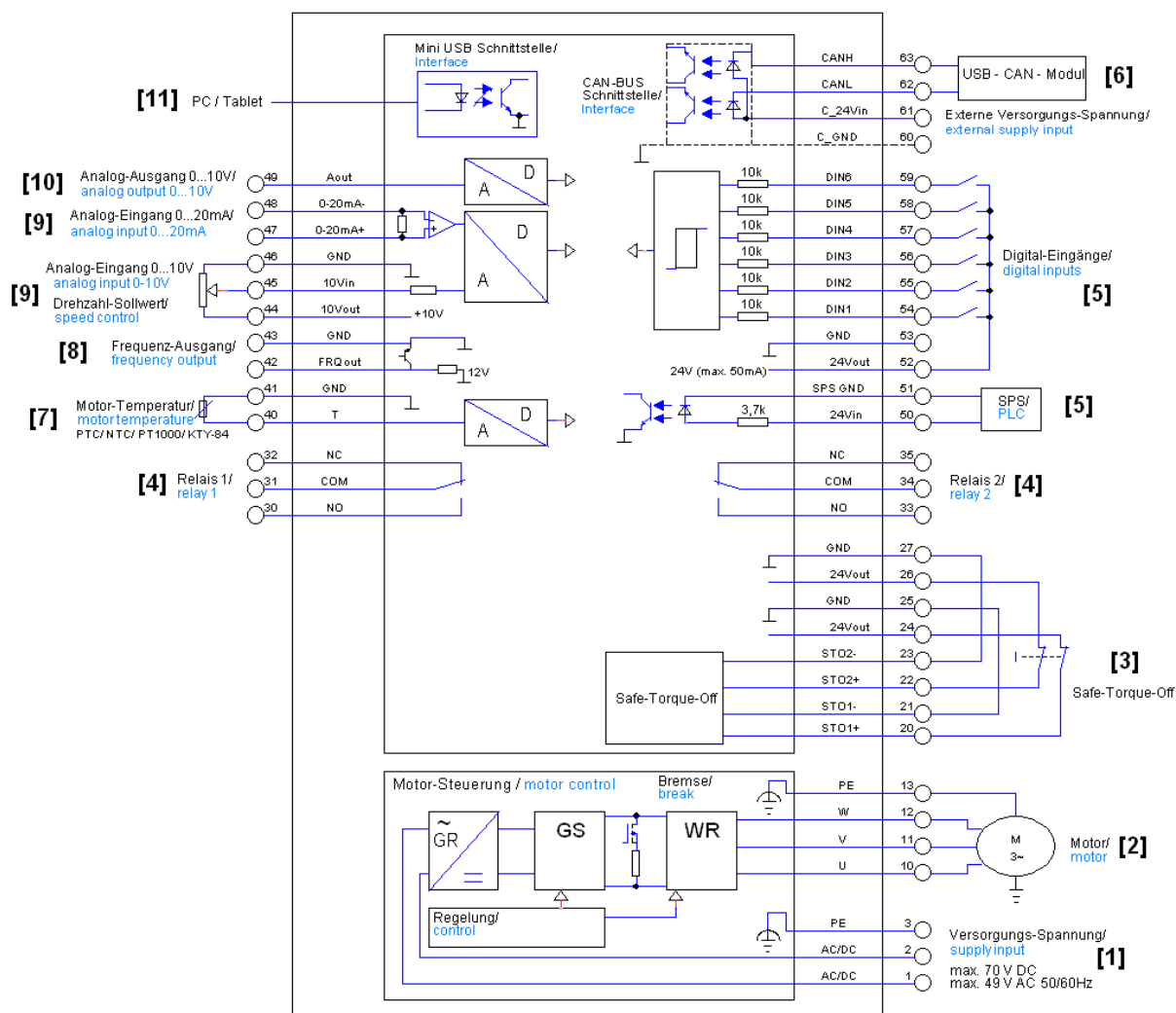


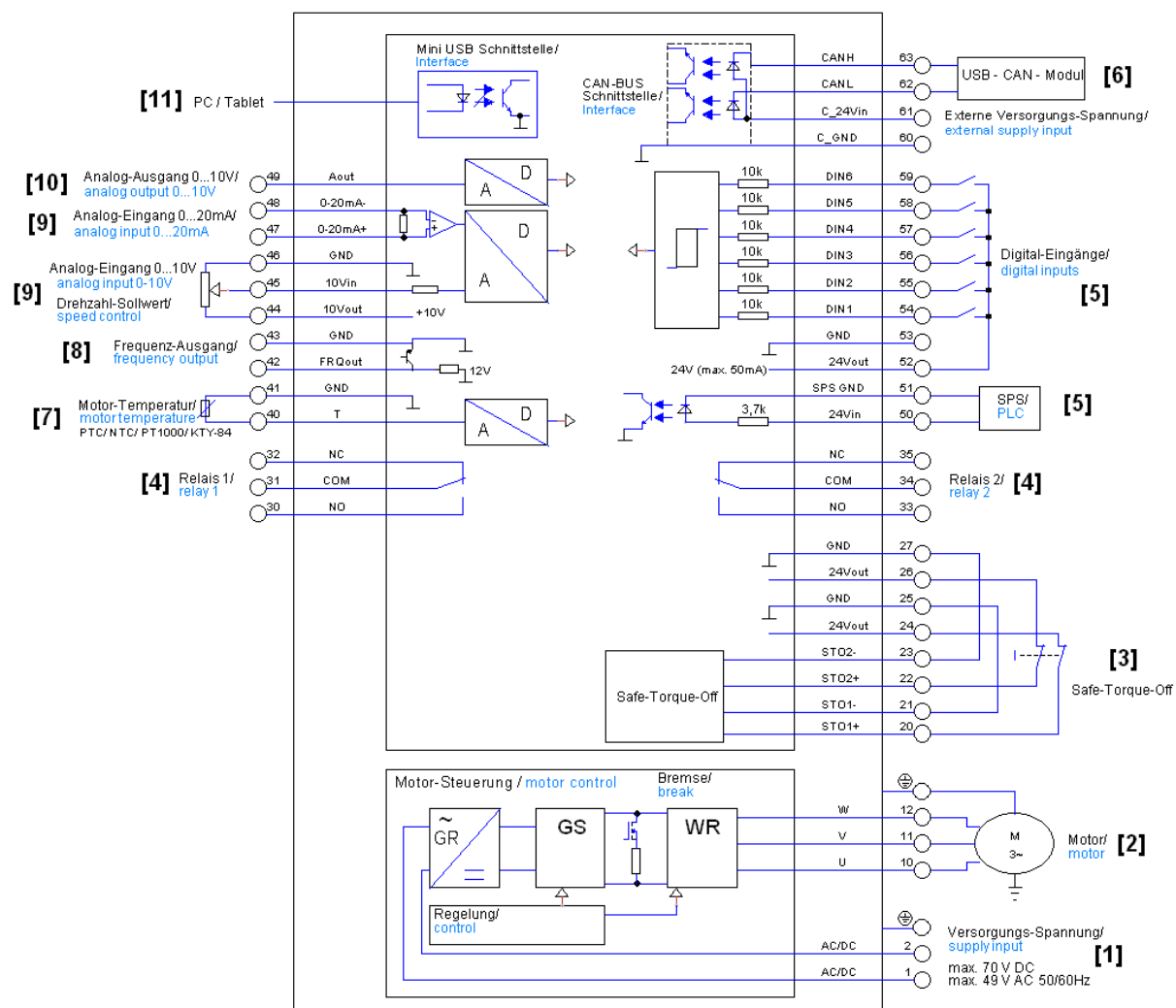
If the HF inverter stops with an error, a start is only possible again if the button "Save on inverter" of the software SycoDrive has been activated before (only for the combination "Input for start" via Digital inputs and "Inputs for rated frequency" via SycoDrive),

4.5.5 Block diagram

- (1) Supply input (max. 70 V DC/49 V AC) [1...3]
- (2) Motor (U, V, W) [10...13]
- (3) Safe torque off [20...27]
- (4) Relays [30...35]
- (5) Digital inputs / PLC [50...59]
- (6) CAN interface [60...63]
- (7) Motor temperature sensor [40...41]
- (8) Frequency output [42...43]
- (9) Analog inputs (0...10 V / 0...20 mA) [44...48]
- (10) Analog output (0...10 V) [49]
- (11) Mini USB connection

HF inverter with SN < 5,000



HF inverter with SN $\geq 5,000$ 

5 Mounting and Installation



ATTENTION

Before installing and commissioning this device, the safety instructions and warnings under chapter 3.0 must be read carefully.

When mounting the HF inverters e@syDrive 4624, 4625, 4626 in the control cabinet, the following must be observed:

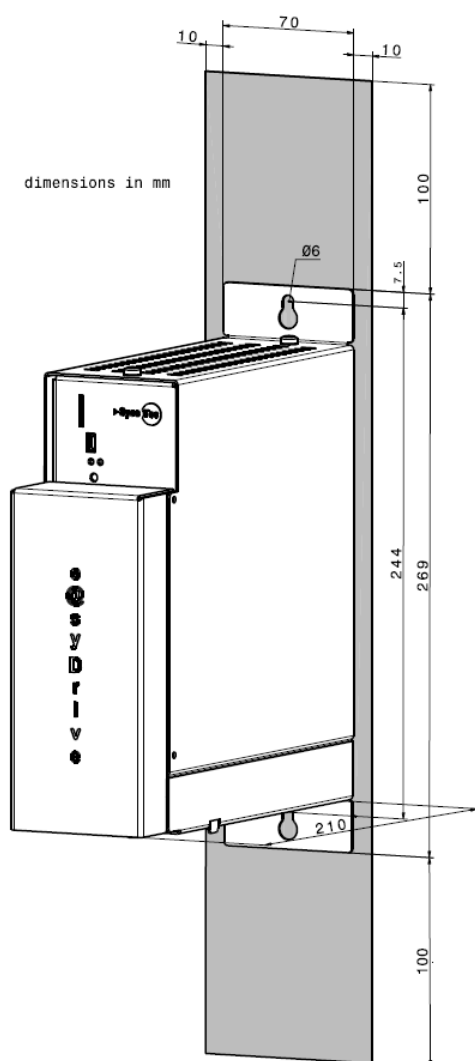
- Vertical position.
- Fasten the mounting plate to the back wall of the control cabinet using 2 screws (M5).
- Strength class of fastening screws at least 8.8.
- Minimum engagement depth for steel sheet 8 mm and for aluminum sheet 15 mm.
- Ensure that a flat, good electrical contact is established with the mounting plate!

Instructions regarding cooling

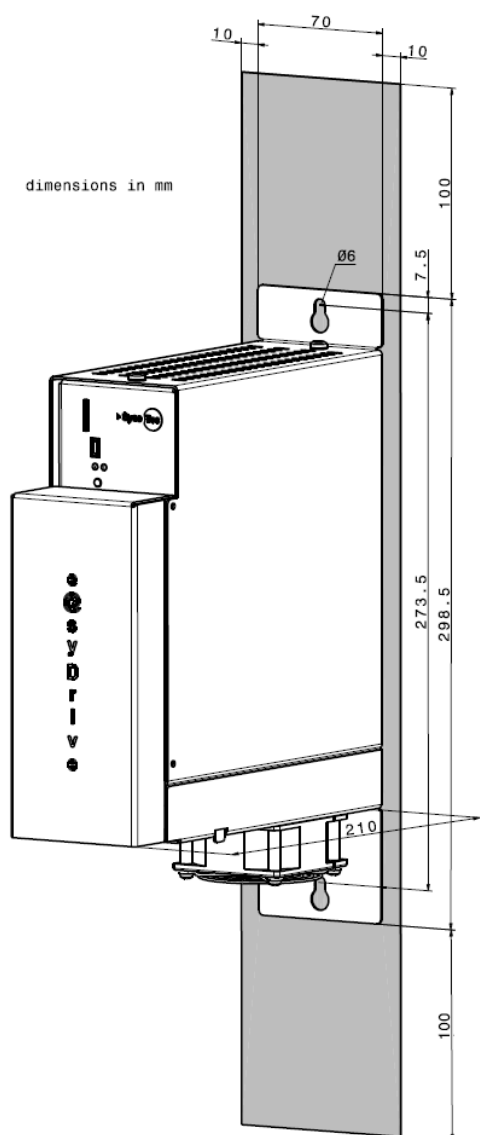


- An enclosure of minimum of 18,000 cm³ internal volume must be used if provided.
- To ensure effective cooling, the following space must remain free around the HF inverter as a minimum requirement: At the ends: 100 mm / long sides: 10 mm

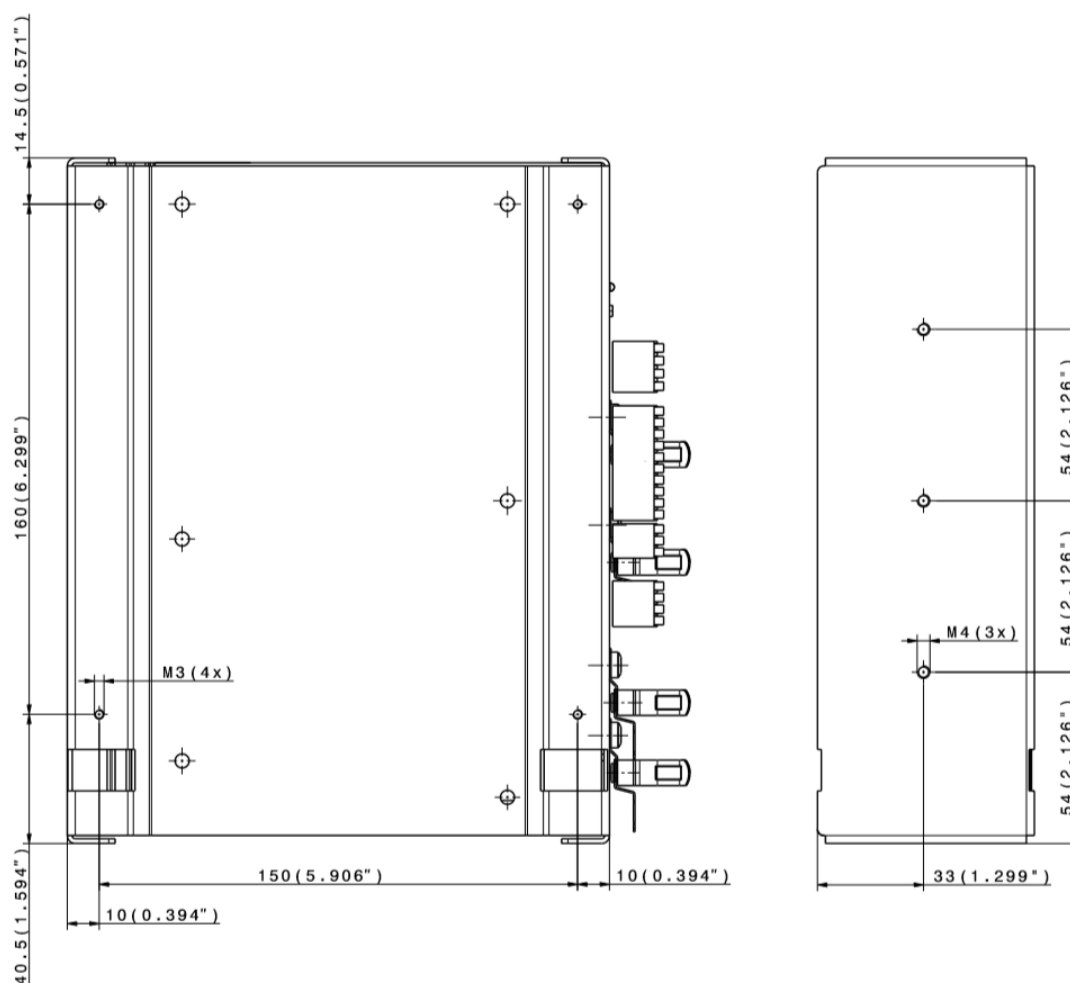
5.1 Mounting HF Inverter e@syDrive 4624 IP20



5.2 Mounting HF Inverter e@syDrive 4625 and 4626



5.3 Mounting HF Inverter e@syDrive 4624 IP00/ e@syDrive 4624 IP00-S



DANGER

It must be ensured that the fixing screws do not stand out from the board carrier.

6 Connector Pin Assignment

6.1 Electrical Installation



DANGER

- *The relevant safety regulations must be observed when installing the HF inverters.*
- *Switch-off devices must be used in order to prevent an unexpected start-up.*
- *If no mains cable with plug is used, then a device to disconnect the HF inverter from the power supply must be used.*
- *The power supply module must be protected with 16 A circuit breakers, characteristic B.*

Wiring guidelines for compliance with the EMC standards

HF inverters e@syDrive 4624, 4625, 4626 have been checked in accordance with EMC product standard EN 61800-3 (Adjustable speed electrical power drive systems).



DANGER

- *Compliance with the above-mentioned EMC product standard can only be ensured with shielded motor cables and control cables. Ensure that the cable shields lie flat against the inverter housing over a larger area and are enclosed by the cable clips. A shielded mains cable is not necessary.*
- *The control cables must be routed separately from (and not parallel to) the mains cables and motor cables. Shielded cables and metalized connector casings must be used.*
- *The control cables must not exceed a length of 3 m.*
- *All devices in the mounting cabinet must be connected to a common earthing point via short earthing cables with large connection surfaces.*
- *Under no circumstances may relevant safety regulations be contravened when installing the HF inverter.*

Access to the electrical connections

The electrical connections are protected by a protective cover. In order to access the electrical connections, press against the sides of the protective cover with your thumbs and index fingers. This bends the metal sides of the cover slightly inwards so that the cover comes loose from the outer housing of the inverter.



The cover can then be removed and the electrical connections can be used.



Installation electrical connections

Securing the cable in the spring clamp:

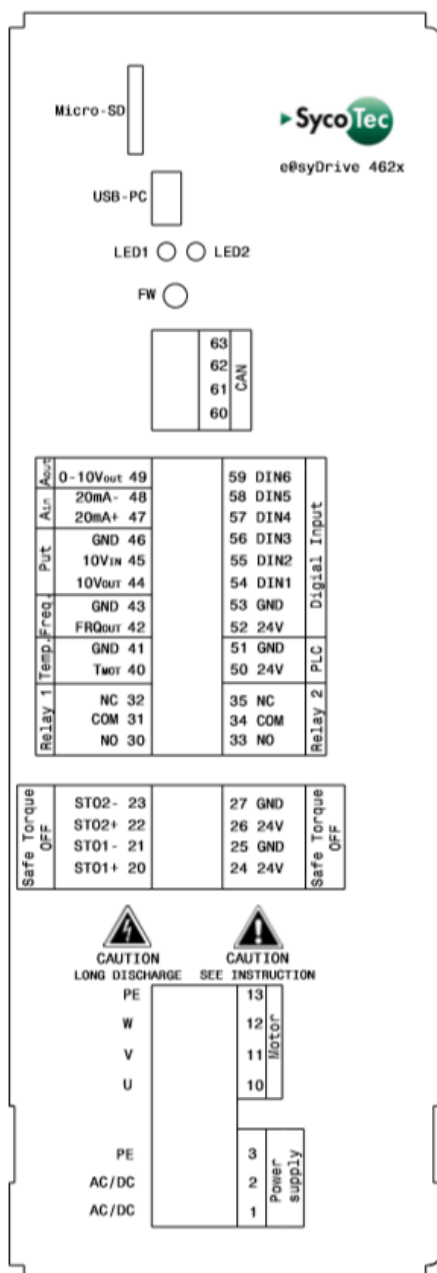
1. Strip the cable.
2. Insert the screwdriver into the rectangular hole or press the actuation lever with the screwdriver.
3. Insert the cable into the round clamp opening.
4. Pull out the screwdriver.

Removing the cable from the spring clamp:

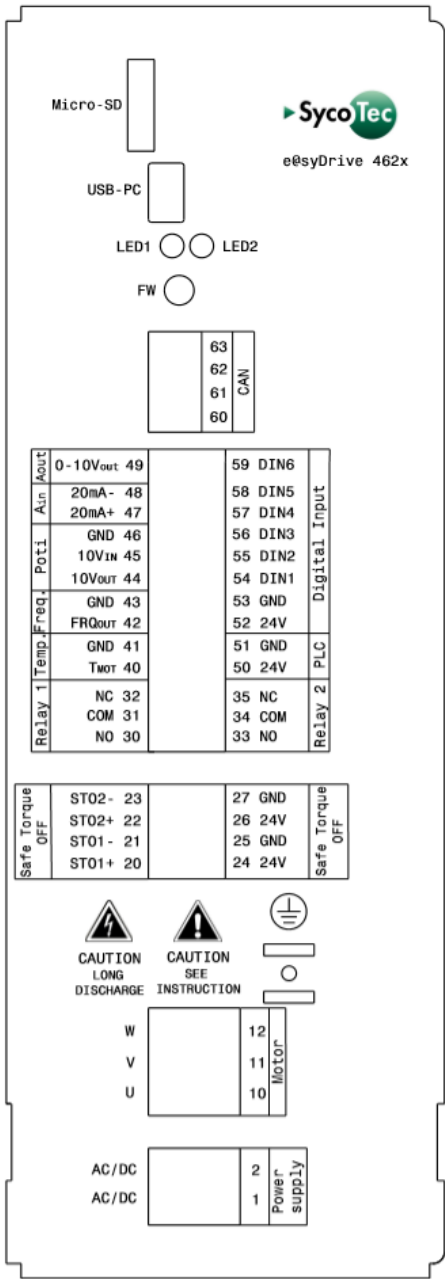
1. Insert the screwdriver into the rectangular hole or press the actuation lever with the screwdriver.
2. Pull out the cable.

6.2 Connectors

HF inverter with SN < 5,000



HF inverter with SN ≥ 5,000



Data of the PCB terminal blocks

Mains connection (inverter with SN $\geq 5,000$) – Terminal 1...2: SPT 2,5/2-H-5,0-EX (Phoenix)

Technical Data	
General	
Connection method	Push-in spring connection
Nominal voltage (Ex)	176 V
Nominal current (Ex)	23 A
Nominal cross section	2.5 mm ²

(For more information see the data sheet of the PCB terminal block.)

Motor connection (inverter with SN $\geq 5,000$) – Terminal 10...12: SPT 2,5/3-H-5,0-EX (Phoenix)

Technical Data	
General	
Connection method	Push-in spring connection
Nominal voltage (Ex)	176 V
Nominal current (Ex)	23 A
Nominal cross section	2.5 mm ²

(For more information see the data sheet of the PCB terminal block.)

Mains connection (inverter with SN $< 5,000$) – Terminal 1...3: SPT 2,5/3-H-5,0-EX (Phoenix)

Technical Data	
General	
Connection method	Push-in spring connection
Nominal voltage (Ex)	176 V
Nominal current (Ex)	23 A
Nominal cross section	2.5 mm ²

(For more information see the data sheet of the PCB terminal block.)

Motor connection (inverter with SN $< 5,000$) – Terminal 10...13: SPT 2,5/4-H-5,0-EX (Phoenix)

Technical Data	
General	
Connection method	Push-in spring connection
Nominal voltage (Ex)	176 V
Nominal current (Ex)	23 A
Nominal cross section	2.5 mm ²

(For more information see the data sheet of the PCB terminal block.)

Data of the PCB connectors

Safe Torque Off – Terminal 20...27: DFMC 1,5/4-ST-3,5 (Phoenix)

Technical Data		
General		
Connection method	Push-in spring connection	
Nominal voltage (III/2)	160 V	
Nominal current	8 A	
Nominal cross section	1.5 mm²	
Connection data		
Conductor cross section solid min.	0.2 mm²	
Conductor cross section solid max.	1.5 mm²	
Conductor cross section flexible min.	0.2 mm²	
Conductor cross section flexible max.	1.5 mm²	
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.25 mm²	
Conductor cross section flexible, with ferrule without plastic sleeve max.	1.5 mm²	
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm²	
Conductor cross section flexible, with ferrule with plastic sleeve max.	0.75 mm²	
Conductor cross section AWG min.	24	
Conductor cross section AWG max.	16	
Minimum AWG according to UL/CUL	16	
Maximum AWG according to UL/CUL	24	
Specifications for ferrules		
Ferrules without insulating collar, according to DIN 46228-1	Cross section: 0.25 mm²;	Length: 5...7 mm
	Cross section: 0.34 mm²;	Length: 7 mm
	Cross section: 0.5 mm²;	Length: 8...10 mm
	Cross section: 0.75 mm²;	Length: 8...10 mm
	Cross section: 1 mm²;	Length: 8...10 mm
	Cross section: 1.5 mm²;	Length: 10 mm
Ferrules with insulating collar, according to DIN 46228-4	Cross section: 0.14 mm²;	Length: 8 mm
	Cross section: 0.25 mm²;	Length: 8...10 mm
	Cross section: 0.34 mm²;	Length: 8...10 mm
	Cross section: 0.5 mm²;	Length: 8...10 mm
	Cross section: 0.75 mm²;	Length: 8...10 mm

(For more information see the data sheet of the PCB terminal block.)

Relay 1 and Relay 2 – Terminal 30...35: DFMC 1,5/3-ST-3,5 (Phoenix)

Technical Data		
General		
Connection method	Push-in spring connection	
Nominal voltage (III/2)	160 V	
Nominal current	8 A	
Nominal cross section	1,5 mm²	
Connection data		
Conductor cross section solid min.	0,2 mm²	
Conductor cross section solid max.	1,5 mm²	
Conductor cross section flexible min.	0,2 mm²	
Conductor cross section flexible max.	1,5 mm²	
Conductor cross section flexible, with ferrule without plastic sleeve min.	0,25 mm²	
Conductor cross section flexible, with ferrule without plastic sleeve max.	1,5 mm²	
Conductor cross section flexible, with ferrule with plastic sleeve min.	0,25 mm²	
Conductor cross section flexible, with ferrule with plastic sleeve max.	0,75 mm²	
Conductor cross section AWG min.	24	
Conductor cross section AWG max.	16	
Minimum AWG according to UL/CUL	16	
Maximum AWG according to UL/CUL	24	
Specifications for ferrules		
Ferrules without insulating collar, according to DIN 46228-1	Cross section: 0.25 mm²;	Length: 5...7 mm
	Cross section: 0.34 mm²;	Length: 7 mm
	Cross section: 0.5 mm²;	Length: 8...10 mm
	Cross section: 0.75 mm²;	Length: 8...10 mm
	Cross section: 1 mm²;	Length: 8...10 mm
	Cross section: 1.5 mm²;	Length: 10 mm
Ferrules with insulating collar, according to DIN 46228-4	Cross section: 0.14 mm²;	Length: 8 mm
	Cross section: 0.25 mm²;	Length: 8...10 mm
	Cross section: 0.34 mm²;	Length: 8...10 mm
	Cross section: 0.5 mm²;	Length: 8...10 mm
	Cross section: 0.75 mm²;	Length: 8...10 mm

(For more information see the data sheet of the PCB connector.)

Temperature sensor, analog and digital inputs and outputs – Terminal 40...41:
DFMC 1,5/10-ST-3,5 (Phoenix)

Technical Data	
General	
Connection method	Push-in spring connection
Nominal voltage (III/2)	160 V
Nominal current	8 A
Nominal cross section	1.5 mm ²
Connection data	
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	1.5 mm ²
Conductor cross section flexible min.	0.2 mm ²
Conductor cross section flexible max.	1.5 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve max.	1.5 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve max.	0.75 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Minimum AWG according to UL/CUL	16
Maximum AWG according to UL/CUL	24

(For more information see the data sheet of the PCB terminal block.)

CAN bus connection – Terminal 60...63: FMC 1,5/4-ST-3,5 (Phoenix)

Technical Data	
General	
Connection method	Push-in spring connection
Nominal voltage (III/2)	160 V
Nominal current	8 A
Nominal cross section	1,5 mm ²
Connection data	
Conductor cross section solid min.	0,2 mm ²
Conductor cross section solid max.	1,5 mm ²
Conductor cross section flexible min.	0,2 mm ²
Conductor cross section flexible max.	1,5 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve min.	0,25 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve max.	1,5 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0,25 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve max.	0,75 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Minimum AWG according to UL/CUL	24
Maximum AWG according to UL/CUL	16
Specifications for ferrules	
Ferrules without insulating collar, according to DIN 46228-1	Cross section: 0.25 mm ² ; Length: 5...7 mm
	Cross section: 0.34 mm ² ; Length: 7 mm
	Cross section: 0.5 mm ² ; Length: 8...10 mm
	Cross section: 0.75 mm ² ; Length: 8...10 mm
	Cross section: 1 mm ² ; Length: 8...10 mm
	Cross section: 1.5 mm ² ; Length: 10 mm
Ferrules with insulating collar, according to DIN 46228-4	Cross section: 0.14 mm ² ; Length: 8 mm
	Cross section: 0.34 mm ² ; Length: 8...10 mm
	Cross section: 0.5 mm ² ; Length: 8...10 mm
	Cross section: 0.75 mm ² ; Length: 8...10 mm

(For more information see the data sheet of the PCB terminal block.)

6.3 Terminal 1...3

Mains connection – Terminal 1...3

There is a rectifier at the mains input of the HF inverter. The HF inverter can be operated with a direct voltage or alternating voltage. The mains connection is single phase. The voltage supply is connected to Terminal 1 (AC/DC) and Terminal 2 (AC/DC) and the protective earth is connected to Terminal 3 (PE). When operating the HF inverters e@syDrive 4624, 4625, 4626, the following must be observed:

**WARNING**

Alternating current: max. 49 V AC

Direct current: max. 70 V DC


**ATTENTION**

With AC voltage supply, the inverter must not be operated in overload.

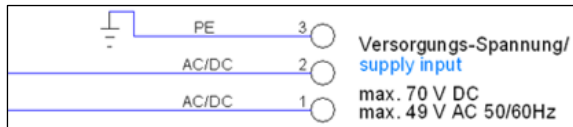


- For input voltages < 49 V AC / 70 V DC sometimes only a limited speed range is possible.
- When using a transformer, a Neozed 16 A fuse can be used.

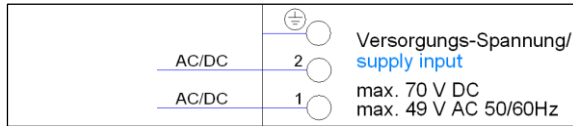
3-pin PCB terminal block (2.5 mm²), SPT 2,5/3-H-5,0-EX (Phoenix)

Pin	Name	I/O	Meaning
1	AC/DC	I	Main Supply
2	AC/DC	I	Main supply
3	PE / 		Protective conductor

Connection example (inverter with SN < 5,000):



Connection example (inverter with SN ≥ 5,000):



6.4 Terminal 10...13

Motor connection – Terminal 10...13

Before connecting or disconnecting the motor, make sure that the HF inverter is disconnected from the power supply. When connecting the motor to U, V, W and PE, ensure that the cable shield is clamped properly under the strain relief, creating a secure contact to the housing of the HF inverter.



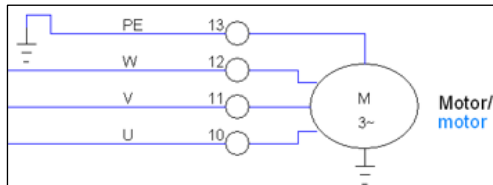
WARNING

Please make sure that there is a good connection between the protective earth conductor and the PE terminal.

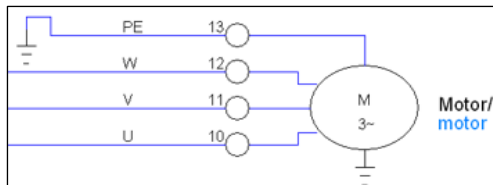
4-pin PCB terminal block (2.5 mm²), SPT 2,5/4-H-5,0-EX (Phoenix)

Pin	Name	I/O	Meaning
10	U	O	Motor phase U
11	V	O	Motor phase V
12	W	O	Motor phase W
13	PE /		Protective conductor

Connection example (HF inverter with SN < 5,000):



Connection example (HF inverter with SN ≥ 5,000):



6.5 Terminal 20...27

Safe Torque Off – Terminal 20...27

The HF inverters are equipped with a function that allows the energy supply to the motor (torque) to be safely (in accordance with SIL 2) switched off with immediate effect.

After the safety circuit is interrupted by a protective device, a stop command is initiated. The restoration of the safety circuit by the resetting of the protective device interrupts the stop command. As an additional precaution, a manual reset function (reset) is required.

The safety function corresponds to a start inhibit function in accordance with EN 61800-5-2 and an uncontrolled stop according to EN 60204-1, stop category 0.

The safety function can be used when the shutdown of the power to prevent an unexpected startup is required.

The following parameters are achieved with the scope of the STO function according to EN 61800-5-2:

- $PFH_A = 2.75 \cdot 10^{-8} \text{ 1/h}$
- SIL 2
- Typical value reaction time: 30 ms

The safety function STO is implemented by 2 independent redundant digital input interfaces (galvanically isolated, reference potential 0V, overvoltage and undervoltage monitoring). It is recommended to use these inputs for the realization of a STO function according to ISO 61800-5-2.

The output stage is enabled only if STO1+ (20) and STO2+ (22) are connected to 24V $\pm 20\%$ (19.2-28.8 V) and STO1- (21) and STO2- (23) are connected to GND) otherwise, a hardware shut-down of the PAM and motor output stage driver takes place immediately.

**DANGER**

- *In circumstances where external influences (e.g. falling loads) are present, further measures (e.g. mechanical brakes) may be required to prevent hazards.*
- *Electronic equipment and contactors do not provide adequate protection against electric shock and additional galvanic isolation may be required.*

**WARNING**

The 24V outputs are not suited to supply external safety circuits! If you use an external safety circuit, you must bridge the STO (see connection example).



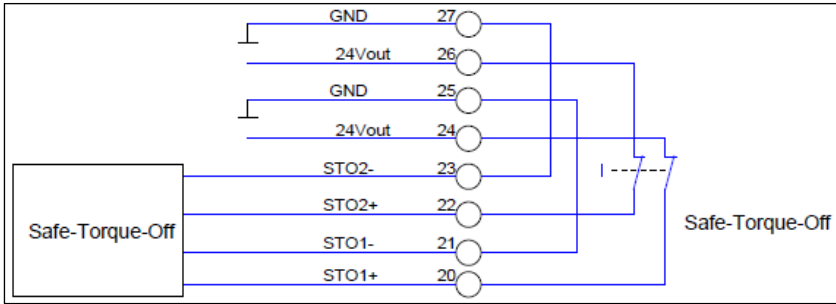
The STO can be supplied with an external 24 V DC voltage supply.

8-pin PCB connector (1.5 mm²), suitable for mating connector DFMC 1,5/4-ST-3,5 (Phoenix)

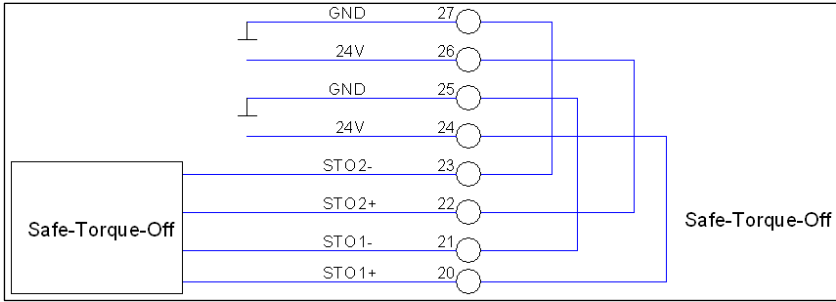
Pin	Name	I/O	Meaning
20	STO1+	I	Enabling of safety circuit (19.2-28.8 V)
21	STO1-	I	Ground reference point for STO1+
22	STO2+	I	Enabling of safety circuit (19.2-28.8 V)
23	STO2-	I	Ground reference point for STO2+
24	24V	A	Logic voltage 24 V
25	GND	I/O	Reference potential
26	24V	A	Logic voltage 24 V
27	GND	I/O	Reference potential

Connection example:

STO with safety circuit:



STO bridged:



6.6 Terminal 30...35

Relay 1 and Relay 2 – Terminal 30...35

The two relay outputs Relay 1 and Relay 2 are potential-free and can be used only for the output of various HF inverter states.

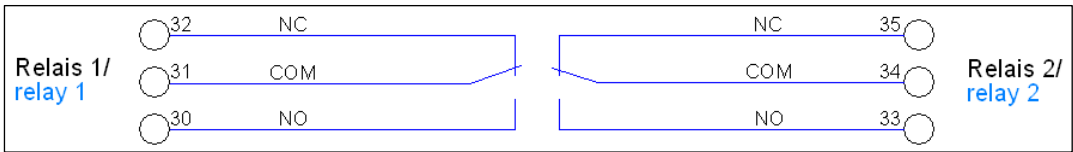
Relay 1 and Relay 2

Type of contact:	Changeover contact
Max. voltage:	48 V AC / 30 V DC
Max. current:	1 A
Min. switching current:	1 mA with 24 V / 10 mA with 10 V
Function:	Configurable using operating software SycoDrive

6-pin PCB connector (1.5 mm²), suitable for mating connector DFMC 1,5/3-ST-3,5 (Phoenix)

Pin	Name	I/O	Meaning	Meaning
30	NO	O	Normally open Relay 1	Motor runs
31	COM		Common Relay	
32	NC	O	Normally closed Relay 1	Motor runs
33	NO	O	Normally open Relay 2	Failure
34	COM		Common Relay	
35	NC	O	Normally closed Relay 2	Failure

Connection example:



Information on configuring the relay contacts are available in the operating manual "Operating Software SycoDrive".

6.7 Terminal 40...59

20-pin PCB connector (1.5 mm²), suitable for mating connector DFMC 1,5/10-ST-3,5 (Phoenix)

Motor temperature sensor – Terminal 40...41

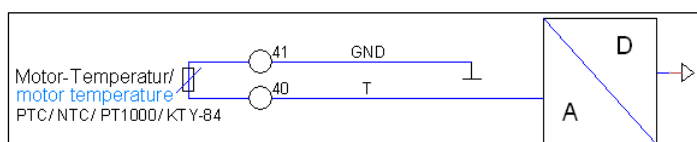
Various types of motor temperature sensor can be connected. According to the temperature sensor connected, a temperature sensor can be selected in the SycoDrive operating software and the relevant threshold values can be configured.

The following motor temperature sensors can be connected:

Temperature sensors	KTY84	NTC	PTC	PT1000
Standard setting	1,025 Ohm	1,234 Ohm	1,330 Ohm	1,385 Ohm
Range of values	500...4,000 Ohm			

Pin	Name	I/O	Meaning
41	GND	I/O	Ground
40	T	I	Motor temperature sensor

Connection example:



i Information on configuring the temperature sensors are available in the operating manual "Operating Software SycoDrive".

Frequency output – Terminal 42...43

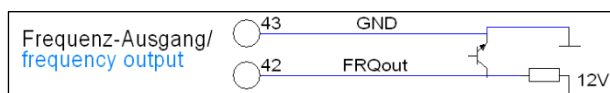
Terminal 42: Output frequency of the inverter, 50% duty cycle
Open collector, U_{max} = 24 V, I_{max} = 30 mA

Terminal 43: Ground reference point for frequency output

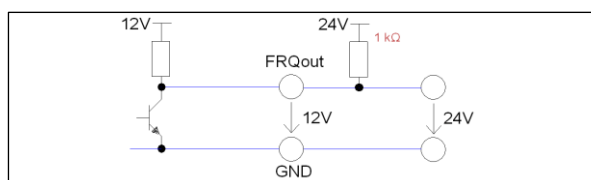
The output voltage without an externally applied voltage is 12 V

Pin	Name	I/O	Meaning
42	FRQout	O	Output frequency
43	GND	I/O	Ground

Connection example:



Connection example for increased output signal:



An external voltage of 24 V can be connected to the frequency output via a pull-up resistor to increase the signal from 12 V to 24 V.

Analog input 0...10 V – Terminal 44...46

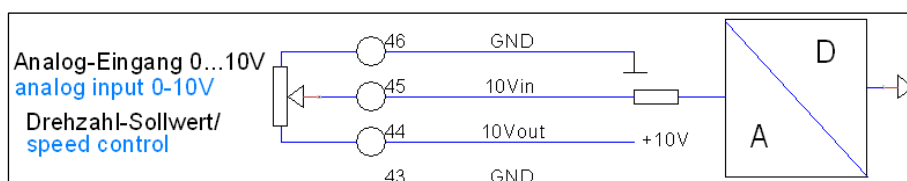
The analog input can be used for the rotational speed target value setting. The voltage range, in this case, is 0 to 10 V and the resolution is 16 bit.

The speed range for the analog input is limited by parameters P135 "Minimum frequency" (AIN) und P136 "Maximum frequency" (AIN) of the SycoDrive operating software.

The HF inverter provides a voltage of 10 V DC (+/- 3%) and a maximum of 2mA at Terminal 44. A potentiometer can be connected, for example. In this case, a 4.7 kOhm or 10 kOhm potentiometer is recommended. Potentiometers between 4.7 and 100 kOhm are acceptable.

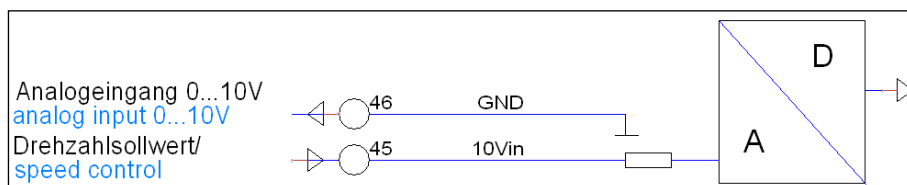
Pin	Name	I/O	Meaning
44	10Vout	O	10 V auxiliary voltage
45	10Vin	I	Speed reference value
46	GND	I/O	Ground

Connection example:



Alternatively, an external DC voltage supply can be used and connected to Terminals 45 and 46.

Connection example:



Information on setting the values are available in the operating manual "Operating Software SycoDrive".

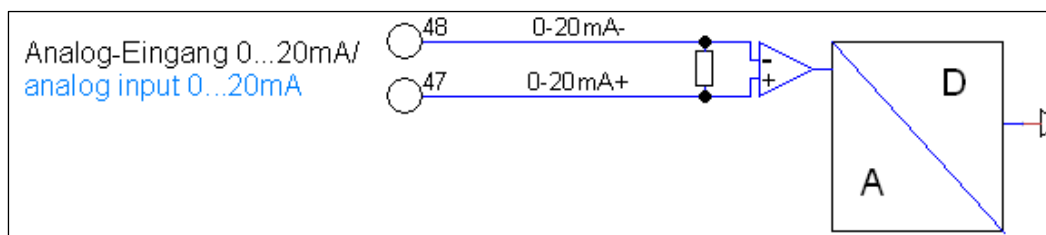
Analog input 0...20 mA – Terminal 47...48

The analog input can be used for the rotational speed target value setting. The current range, in this case, is 0 to 20 mA and the resolution is 16 bit.

The speed range for the analog input is limited by parameters P135 "Minimum frequency" (AIN) und P136 "Maximum frequency" (AIN) of the SycoDrive operating software.

Pin	Name	I/O	Meaning
47	0-20mA+	I	Speed reference value
48	0-20mA-	I	Reference point of Pin 47 (0-20mA+)

Connection example:

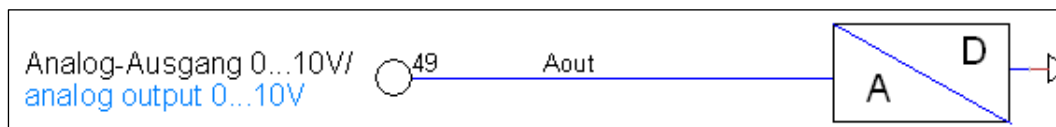


Analog output 0...10 V – Terminal 49

The rated motor current can be read out via the analog output. The motor rated current set via SycoDrive corresponds to 10 V at the analog output.

Pin	Name	I/O	Meaning
49	Aout	O	Active rated current
41, 43, 46, 53	GND	I/O	Ground

Connection example:



Digital PLC input – Terminal 50...51

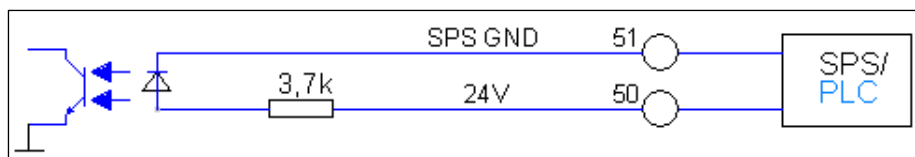
The digital PLC input is an additional galvanically isolated digital input. If an external voltage of 24 V DC (15-30V) is connected, from a PLC for example, then the input can be used as Start/Stop.

Pin	Name	I/O	Meaning
50	24V	I	24 V input voltage PLC
51	PLC / GND	I/O	Reference potential



"Start" can only be used on the PLC input if it is disabled in the digital inputs.

Connection example:



Digital inputs – Terminal 52...59

There are 6 digital inputs DIN1...DIN6, each of which can be configured using the SycoDrive operating software. The input resistance is 10 kOhm. The minimum pulse width is 60 ms. The digital inputs can be activated with voltages up to a maximum of ± 30 V DC. The following also applies:

$U_{low} = 0...+5$ V

$U_{high} = 19...+30$ V

$I_e = 2$ mA with 24 V

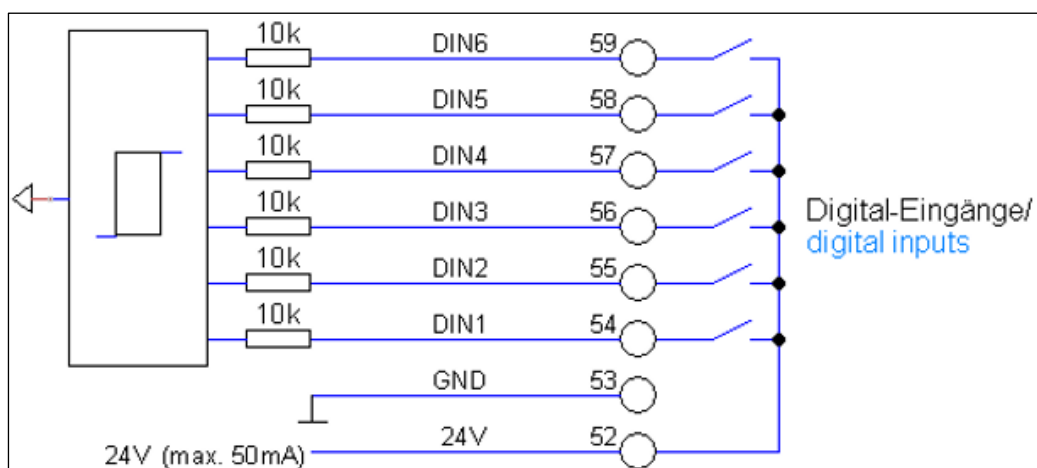
The HF inverter provides an internal 24 V DC ($\pm 5\%$) voltage supply for the digital input circuits. This is short-circuit proof and can be loaded with 50 mA, maximum.

Pin	Name	I/O	Meaning
52	24 V	O	24 V auxiliary voltage
53	GND	I/O	Ground
54	DIN1	I	Start/Stop
55	DIN2	I	Reset
56	DIN3	I	Speed direction
57	DIN4	I	Off
58	DIN5	I	Parameter import
59	DIN6	I	Parameter export



"Start" can only be used on the digital inputs when the PLC input is disabled.

Connection example:



ATTENTION

The digital inputs DIN1...DIN6 are not galvanically isolated!



Information on configuring the digital inputs are available in the operating manual "Operating Software SycoDrive".

6.8 Terminal 60...63

CAN bus connection – Terminal 60...63

- Voltage supply
 - An external 24 V DC voltage supply is required. This is connected between C_24V (61) and C_GND (60).
 - The voltage range is 18...30 V.
- High Speed CAN in accordance with ISO 11898 with a bit rate of 250 kbit/s.
- A terminating resistance is not included. If required, this (120 Ohm) must be connected externally in parallel between CAN_H (63) and CAN_L (62).
- The maximum input voltage for CAN_H and CAN_L is +16V DC.
- CANopen communication protocol with device profile CiA 402.
- CAN-ID must be configured using the SycoDrive operating software.

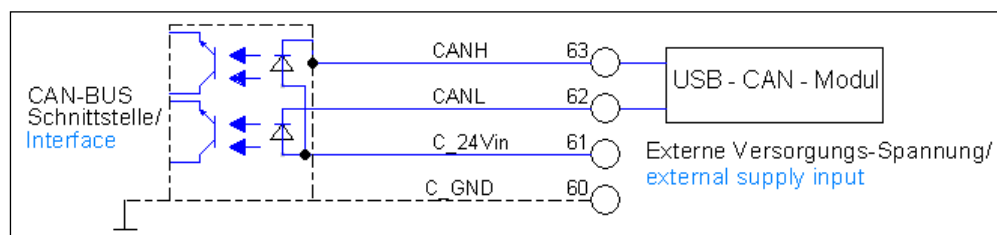


See also Object description CANopen HF inverter e@syDrive 4624, 4625, 4626.

4-pin PCB connector (1.5 mm²), suitable for mating connector FMC 1,5/4-ST-3,5 (Phoenix)

Pin	Name	I/O	Meaning
60	C_GND	I/O	Ground
61	C_24V	I	24 V voltage to be supplied
62	CANL	I/O	Signal line CAN_L
63	CANH	I/O	Signal line CAN_H

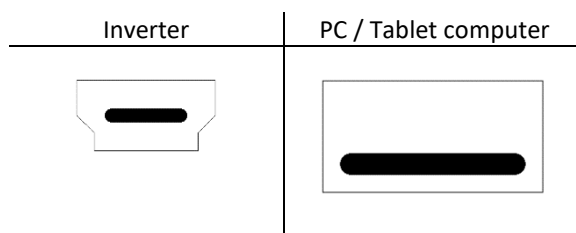
Connection example:



6.9 Mini USB connector

4-pin mini USB connector

The Mini USB connector is used to parameterize the HF inverter by means of a PC.



The virtual COM port is shown in the device manager as "USB Serial Port".

If the driver is not installed automatically, then a current driver can be downloaded from the following manufacturer's website and installed:

<http://www.ftdichip.com/Drivers/VCP.htm>

The SycoDrive operating software finds the COM port automatically and creates a connection between the PC and the HF inverter.



Further information are available in the operating manual "Operating Software SycoDrive".



*A tablet / smartphone without additional power supply is not suitable for permanent display of the operating values, as no power supply is provided by the HF inverter.
Suitable devices must be used.*

6.10 Micro SD card

The micro SD card must be formatted as follows in order for the card to be recognized:

- FAT32

Tested with Intenso MicroSDHC card 4 GB



Only use the Micro SD Card provided, as a different Micro SD card may not be readable by the HF inverter.

The micro SD card is available for the following functions:

- Reading out the error memory of the HF inverter,
- Parameter import,
- Parameter export,
- Firmware update.



For more information, refer to the operating manual "Operating Software SycoDrive".

7 Switch-on Sequence

For safety reasons, it is not possible to switch on the inverter and simultaneously indicate the start command and the setpoint.

A deliberate command must be executed to start the motor!

Note the following switch-on sequence:

1. Switch on the HF inverter
2. Wait during the initialization process until the HF inverter is ready for operation
3. Set the setpoint
4. Give the start command



ATTENTION

Do not switch off the inverter during operation.

8 Status Report / Malfunctions / Error Correction

8.1 Status Report

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

When the motor starts, the Status LED (green) starts to flash. As soon as the motor stops again, the Status LED (green) lights up continuously.

If a warning occurs, then the Warning LED (red) flashes or lights. The motor can continue to run; the status LED (green) indicates the behavior of the motor.

If an error is identified, then the Warning LED (red) flashes or lights and the motor is stopped.

The following applies for both types of error:

i *The number of flashing cycles corresponds to the warning number or error number.
(This applies only for warnings/errors up to number 6).*

In order to clear an error status, a reset must be initiated (via SycoDrive or digital input). A reset will trigger a complete initialization of the device. If the error still persists, then the error message will appear again immediately.

Up to five warning and error messages are displayed in the SycoDrive operating software under Diagnostics -> Error messages, in parameters Fault 1 to Fault 5. If the warning condition is no longer present, the warning is automatically reset after one minute.

With a micro SD card, you can transfer a motor parameter set to the inverter.

The Status LED (green) will flash two times to show that the parameter set has been successfully transferred. The Status LED (green) and the warning LED (red) will flash simultaneously two times to show that a fault occurred during the parameter transfer.

Another option is to transfer a motor parameter set to the micro SD card. The Status LED (green) will flash three times to show that the parameter set has been successfully transferred. The Status LED (green) and the warning LED (red) will flash simultaneously three times to show that a fault occurred during the parameter transfer.

8.2 Description of LEDs

The LEDs indicate the current status of the HF inverter:

Green – LED 2	Red – LED 1	Meaning
OFF	OFF	Inverter is switched off
ON	OFF	Inverter ready for operation
Flashing	OFF	Motor runs
ON / flashing	Flashing	Warning, warning code < 6 (flashes with the number of the warning code)
ON / flashing	ON	Warning, warning code > 6
OFF	Flashing	Error, error code < 6 (flashes with the number of the error code)
OFF	ON	Error, error code > 6
Flashes 2 times	OFF	Parameters transferred successfully from micro SD card
Flashes 2 times	Flashes 2 times	Fault when transferring parameters from micro SD card
Flashes 3 times	OFF	Parameters transferred successfully to micro SD card
Flashes 3 times	Flashes 3 times	Fault when transferring parameters to micro SD card

8.3 Warnings

With a warning message the HF inverter is still ready for operation.
The warning message can be reset via RESET during operation.

Warning	Fault	Cause	Correction
1	Motor current has exceeded the current limit	Motor too highly loaded, parameters "Acceleration ramp" too short and/or "Startup current" too large.	Reduce load, adapt parameters, if possible.
8	I ² t threshold exceeded	I ² t load too high.	Reduce load, check the parameters "I ² t time" and "I ² t threshold".
18	Nominal speed limit active	Parameter "Rated speed" or rated value of analogue input too high.	Check Parameter value "Rated speed", limits for rated value for remote control ("Minimum speed" and "Maximum speed" AIN) and Fixed frequencies 1 to 4; for checking use the current Rated speed.
22	10 V Output voltage out of range	The 10V output voltage for AIN is not in an acceptable range ($\pm 3\%$).	Check wiring; maybe there is a short circuit.
23	Short circuit at 24 V output	Short circuit at the 24 V output.	Check wiring.
24	Error at parameter import or export	No/bad SD card or parameter file on SD card is incomplete or does not exist.	Use a complete parameter file (parameter import) and an intact SD card.
26	Unused motor parameter memory for motor coding	Value at motor coding input (DIN3 to DIN6) indicates an empty parameter memory M1...M16.	Check signal values at DIN3 to DIN6 (also see parameter "Motor code") or store a parameter set for the corresponding motor.
27	Generator Operation	Motor runs at inverter stop.	Wait until motor stands still.
28	Comparator error in self-test	Internal failure.	If the fault still exists after switching off and on again, send in inverter for repair. An DASM motor can still be operated, but not a PMSM motor.
45	Watchdog reset on motor control	Strong EMC interference on motor control board.	Restart motor.
54	Brake-chopper defective, or braking resistance interrupted during self-test	Performance-component failure.	Switch on and off several times. If the fault still exists, send in inverter for repair. Motor can still be operated.
55	Offset in current measuring circuit too large in self-test	Internal failure.	Switch on and off several times. If the fault still exists, send in inverter for repair.
57	Actual motor speed too high	Actual speed is 10 % over nominal speed. Motor cannot follow the nominal speed. Motor externally driven.	Set the nominal speed at a lower level.

8.4 Errors

With an error message / serious fault the HF inverter is not ready for operation; a reset must be initiated.

Error	Fault	Cause	Correction
2	STO interrupted	STO port is open.	Check the STO port.
3	Earth leakage in motor	Short circuit in motor or supply wire.	Change or repair the motor. Check supply wire.
4	Heat sink temperature too high (inverter)	Inverter overloaded, cooling insufficient.	Reduce load, check output currents.
5	Fault in inverter during self-test	Performance-component failure.	Switch on and off several times. If the fault still exists, send in inverter for repair.
6	Overcurrent detection in inverter	Performance-component failure. Fault in motor or motor supply wire.	Exchange motor or supply wire. Switch on and off several times. If the fault still exists, send in inverter for repair.
7	I ² t shutdown	I ² t load too high, therefore motor was switched off.	Cool motor, reduce load. Check the parameters "I ² t time" and "I ² t threshold".
9	No motor type specified	Parameter "Motor type" is set to "no motor"	Check parameter "Motor type".
11	Temperature monitoring (motor)	Motor too hot, possibly sensor cable broken.	Cool motor, reduce load. Test sensor and check the parameters "Temperature monitoring" and "Resistance value".
14	Monitoring - Mains undervoltage	Mains voltage too low.	Test mains voltage, test mains connection.
15	DC-link voltage too high	Mains voltage too high or motor deceleration ramp too low.	Test mains voltage and mains connection, check parameter "Deceleration ramp".
17	Motor connection broken	No motor connected or a motor phase is interrupted.	Check motor connection, adapt parameter "Motor type".
29	Error during parameter import and/or export	Misconfigured digital inputs DIN5 and DIN6.	Check signal values at DIN5 and DIN6 as well as their configuration.
53	Short circuit or earth leakage in the DC-inverter	Performance-component failure.	Check wiring. Switch on and off several times. If the fault still exists, send in inverter for repair.
58	PMSM motor does not start	Despite several attempts, the motor does not start.	Check motor and supply lines. Adjust parameters "Acceleration ramp", "Startup time" and "Startup current", if possible.

9 Operating Software and Programming

The HF inverters e@syDrive 4624, 4625, 4626 are programmed using the SycoDrive operating software. The operating software and the Operating Manual SycoDrive will therefore be needed. These are included in the scope of supply or can be downloaded free of charge from the website www.sycotec.eu.



The configuration of the HF inverters via the software is possible from a supply voltage of 10 V DC.

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

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(DE = original)

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