Operating Manual EN
Frequency Inverter e@syDrive 4425, 4426

INDUSTRIAL DRIVES

SycoTec

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1.0 User Information

1.1 Symbols Used

Operating Manual / Unit

	Situations where failure to follow the instructions may lead to danger, damage to material or operating faults.
	Important information for operator and engineer
	Information on disposal
	CSA/UL test mark
	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 Important Information

Target group: This document is intended for machine manufacturers and persons responsible for putting into service and operation of the frequency inverter.

The operating manual should be read by the user 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.

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)
- use of incorrect information
- improper use
- improperly performed repairs.

Repair and maintenance work - apart from the activities described in this operating manual - may be performed only by qualified technical staff.

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

For safety reasons, the frequency 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 frequency inverter.
In order to configure the frequency inverter, please see chapter 7.0

Disposal of equipment 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 not subject to the aforementioned directive but may be disposed of through special channels within Europe.

1.3 Safety Precautions

Safe operation and protection of the device is ensured only by proper use, in accordance with the operating manual, with the tools approved for this purpose. The following should also be observed:
- the occupational safety regulations,
- the accident prevention regulations.

Before installation and commissioning of this device, please read this safety and warning information carefully and observe all warning signs mounted on the device.

- *The frequency inverter e@syDrive 4425, 4426 controls dangerously rotating mechanical parts. If this operating manual are not followed, severe damage to property, injuries and even death may result.*
- *Safe operation of this device depends on the proper installation, handling and operation of the device.*
- *Only appropriately qualified personnel may put this device into operation, maintain it and work on it. Connection, commissioning and rectification of faults may be performed only by specialists.*
- *The device has no mains switch. When working on the open device, it must be completely disconnected from the mains beforehand. The device has no mains input fuses.*
- *This device may start up automatically with certain settings after a mains failure.*
- *This device may not be used as an "emergency stop mechanism" (see EN 60204).*
- *The device may be used only for the purpose intended by the manufacturer. Unauthorized modifications and the use of additional equipment not recommended by the manufacturer can cause fires, electric shocks and injuries.*

Definitions

ASM motor
3-phase asynchronous motor
BLDC motor
3-phase brushless DC motor without position sensors. The frequency inverter performs the position synthesis by measuring the motor voltage (e.m.f.).
BLDCS motor
3-phase brushless DC motor with position sensors
EEPROM
Electrically Erasable Program Memory. In the EEPROM, all important alterable data (parameters, calibration values) of the frequency inverter e@syDrive 4425, 4426 are stored and the data remain stored even during a voltage failure.
Danger
In the context of this operating manual and of the warnings mounted on the device, this means that death, serious injury or considerable damage to property may occur if the corresponding precautions are not taken.

Note
In the context of this operating manual, a note constitutes important information which is of particular importance for the understanding and the operation of the device.
PC operation
The configuration and , as required, the operation of the frequency inverter is carried out using a standard PC
Micro step start-up
With micro step start-up, the BLDC motor is operated as a synchronous motor with constant current. The output frequency is slowly increased from 0 Hz to the start-up frequency, after which the system switches to regulated motor running. The micro step start-up permits start-up of sensor-free BLDC motor with large centrifugal masses (e.g. vacuum pumps) for which the normal start-up fails owing to the large mass moment of inertia.
Normal state
If no error occurs after switching on, the LED H4 "Operation" (green) lights up.
This machine state is called the normal state.
Configuration
Configuration is the operating procedure for setting up the frequency inverter for use, motor settings and device specific settings being implemented via the control panel. It is also possible to display different measured values.
Qualified staff
Are in the context of this operating manual persons who are familiar with the installation, assembly, commissioning and operation of the product and with the possible dangers.
Caution
In the context of the operating manual and of the warning signs mounted on the device, this means that slight injury or damage to property may occur if the corresponding precautions are not taken.
Warning
In the context of the operating manual and of the warning signs mounted on the device, this means that death, serious injury and considerable damage to property may occur if the corresponding precautions are not taken.

1.4 Purpose and Potential Applications

The SycoTec frequency inverters e@syDrive 4425, 4426, have been specially constructed for the operation of three-phase asynchronous motors (ASM) and brushless DC motors (BLDC), as used in spindles, e.g. for grinding, cutting and drilling units on machine tools.
They can also be used for operating motors which are constructed from motor elements and serve, for example, as a drive for test stands or other physical equipment (e.g. vacuum pumps, centrifuges, optical systems etc.).
Gentle operation of the motors is achieved by the pulse amplitude modulation (PAM) used.

Specifically, the following motor types can be operated:
- Asynchronous motors (ASM)
- Parallel operation of ASM is possible specific to the application (for configuration of frequency inverter please contact the SycoTec's technical support).
- Brushless DC motors without sensors (BLDC)
- Brushless DC motors with sensors (BLDCS)

An integrated load compensation offers high speed constancy and - through low idling currents - avoids unnecessary heating up of the connected motors.
At the stop command, the connected motor is braked until it stops.
The control and monitoring of the inverter are performed by several microprocessors. This ensures high reliability and flexibility.
A firmware update can be performed on a PC via a serial interface (RS 232); please contact SycoTec in this context.
The frequency inverter can be completely remote-controlled. Various inputs and outputs are freely programmable.

1.5 Specifications Frequency Inverter e@syDrive 4425

Configuration	via the serial interface using a standard PC
Operation	via an PLC-compatible remote control or using a standard PC (via the serial interface RS 232)
Display	lamps for operation (green) H4 and overload (yellow) H5
Dimensions	approx. 75 mm wide, 310 mm high, 215 mm deep, for switchgear housing (see also chapter 5.0 Assembly and Installation)
Weight	approx. 3.2 kg
Tests and standards	tested according to EN 61800-5-1 CSA to UL 508C EMC according to EN 61800-3
Protection category	IP 20 according to DIN 40050

Power Unit

Electrical connection	single-phase max. 50 V~, 50/60 Hz or max. 70 V~ / 8 A
Current consumption	8 A~
Output power	max. 350 VA continuous operation
Output voltage	3 x 45 V~ at 8 A
Output current	max. 8 A~ per phase, continuous operation
Output frequency	30 - 4,000 Hz for ASM motors (240,000 rpm) 30 - 4,000 Hz for BLDC motors (240,000 rpm)
Braking resistance	internal
Efficiency	93% (at 250 VA)

Motor Sensors

Motor temperature sensor	
PTC (cold conductor)	according to DIN 44081 and DIN 44082
Cold resistance	Rk < 550 Ω
Tripping resistance (warm)	Ra ≥ 1,350 Ω
Tripping temperature	depending on PTC, 90 - 130°C
Operating voltage	12 V, via 4,750 Ω pull-up resistance
Recommended Type KTY	semiconductor sensor KTY84, cut-out threshold configurable

Hall sensor connection, motor code:

Output voltage	12 V -10%
Output current	max. 100 mA
Signal level	active low
Switching current	Is = 15 mA
Pull-up resistance	internal 3 x R = 2,200 Ω

Remote Control (FB)

The function of the programmable inputs and outputs is described in chapter 4.4 Remote Control.

Digital Control Inputs

FB-IN1...6 X5:1...6	opto-decoupled, Re = 10 kΩ, unwired = low U_low = 0 - +5 V, U_high = +13 - +35 V, I_e = 2 mA at 24 V input protected up to max. ±35 V, minimum pulse width 60 ms
FB-24V X6:8	24V-supply voltage for the digital inputs

Relay switching Outputs

FB-Relay 1 X7:1...3	contact type: change-over contact, max. 250 V~, 1 A, max. 30 V~, 1 A min. switching current 1 mA at 24 V (10 mA at 10 V)
FB-Relay 2 X8:1...3	contact type: change-over contact, max. 250 V~, 1 A, max. 30 V~, 1 A min. switching current 1 mA at 24 V (10 mA at 10 V)

Analogue Inputs

FB-N_value X6:7	U_e = 0 - V, Re = 100 kΩ, I_e = 0,1 mA at 10 V, Unwired 0 V, input protected up to max. ±40 V
FB+10V X6:6	U_out = 10 V ±3%, I_out = max. 25 mA,
FB-Ground X6:5	Earth reference point for remote control +10V
FB-Input+ FB-Input- X6:3,4	Current input 0 - 20 mA Short-circuit-proof I_k = max. 50 mA

Frequency Output

FB-Out-Freq X6:2	Simple frequency output of the inverter, keying proportion 50% Open collector, U_max = 24 V, I_max = 30 mA
FB-Ground X6:1	Earth reference point for frequency-output

FB-voltage outputs are related to the frequency output of FB-ground.
The relay outputs are originally galvanically separated.

Ambient Conditions

Permitted in interior rooms	
Ambient operating temperature	5 - 40°C (41 - 104°F)
Relative humidity	max. 80%
Max. Altitude	2,000 m

Storage and Transport Conditions

Ambient operating temperature	-30 - 70°C (-22 - 158°F)
Relative air humidity	5 - 95%
Air pressure	700 - 1,060 hPa
Keep dry!	

We reserve the right to make technical modifications.

Power Supply e@syDrive 4428

The mains adaptor is designed for supplies to the frequency inverter e@syDrive 4425
(see operating manual of power supply e@syDrive 4428, Material no. 1.003.1905)

When using a transformer, or another power pack, the secondary voltage must be provided with insulation double that of the mains potential. This means the converter supply voltage must be galvanically separated from the mains.
When using a transformer the Standard EN 61558 for double insulation must be observed.
Current: max. 16 A (e@syDrive 4426), max. 10 A (e@syDrive 4425).

1.6 Specifications Frequency Inverter e@syDrive 4426

Configuration	via the serial interface using a standard PC
Operation	via an PLC-compatible remote control or using a standard PC (via the serial interface RS 232)
Display	lamps for operation (green) H4 and overload (yellow) H5
Dimensions	approx. 75 mm wide, 337 mm high, 215 mm deep, for switchgear housing (see also chapter 5.0. Assembly and Installation)
Weight	approx. 3.7 kg
Tests and standards	tested according to EN 61800-5-1 CSA to UL 508C EMC according to EN 61800-3
Protection category	IP 20 according to DIN 40050

Performance

Electrical connection	single-phase max. 50 V~, 50/60 Hz or max. 70 V~ / 14 A
Current consumption	14 A~
Output power max.	1,000 VA continuous operation
Output voltage	3 x 45 V~ at 16 A
Output current	max. 16 A~ pro Phase continuous operation
Output frequency	30 - 4,000 Hz for ASM-motors (240,000 rpm) 30 - 4,000 Hz for BLDC-motors (240,000 rpm)
Braking resistance	internal
Efficiency	93% (at 1,000 VA)

Motor Sensors

Motor temperature sensor	
PTC (cold conductor):	according to DIN 44081 and DIN 44082
Cold resistance:	Rk < 550 Ω
Tripping resistance (warm):	Ra ≥ 1350 Ω
Tripping temperature:	depending on PTC 90 - 130°C
Operating voltage:	12 V, via 4,750 Ω pull-up resistance
Recommended Type KTY:	semiconductor sensor KTY84, cut-out threshold configurable

Hall sensor connection, motor code:

Output voltage:	12 V -10%
Output current:	max. 100 mA
Signal level:	active low
Switching current:	I_s = 15 mA
Pull-up - resistance:	internal 3 x R = 2200 Ω

Remote Control (FB)

The function of the programmable inputs and outputs is described in chapter 4.4 Remote Control

Digital Control Inputs

FB-IN1...6	Opto-decoupled, Re = 10 kΩ, unwired = low
X5:1...6	U_low = 0 - +5 V, U_high = +13 - +35 V, I_e = 2 mA at 24 V input protected up to max. ±35 V, minimum pulse width 60 ms
FB-24V X6:8	24V-supply voltage for the digital inputs

Relay Switching Outputs

FB-Relay 1	contact type: change-over contact, max. 250 V~, 1 A, max. 30 V~, 1 A
X7:1...3	min. switching current 1 mA at 24 V (10 mA at 10 V)
FB-Relay 2	contact type: change-over contact, max. 250 V~, 1 A, max. 30 V~, 1 A
X8:1...3	min. switching current 1 mA at 24 V (10 mA at 10 V)

Analogue Inputs

FB-N_value X6:7	U_e = 0 - 10 V, Re = 100 kΩ, I_e = 0,1mA at 10 V, Unwired 0 V, Input protected up to max. ±40 V
FB+10V X6 :6	U_out = 10 V ±3%, I_out = max. 25 mA,
FB-Ground X6:5	Earth reference point for FB +10 V
FB-Input+ FB-Input- X6:3,4	Current input 0 - 20 mA Short-circuit-proof I_k = max. 50 mA

Frequency Output

FB-Out_Freq X6:2	Simple frequency output of the frequency inverter, keying proportion 50% Open collector, U_max = 24 V, I_max = 30 mA
FB-Ground X6:1	Earth reference point for frequency-output

FB-voltage outputs are related to the frequency output of FB-Ground.
The relay outputs are originally galvanically separated.

Ambient Conditions

Permitted in interior rooms	
Ambient operating temperature	5 - 40°C (41 - 104°F)
Relative humidity	max. 80%
Max. altitude	2,000 m

Storage and Transport Conditions

Ambient operating temperature	-30 - 70°C (-22 - 158°F)
Relative air humidity	5 - 95%
Air pressure	700 - 1,060 hPa
Keep dry!	

We reserve the right to make technical modifications.

Power Supply e@syDrive 4429

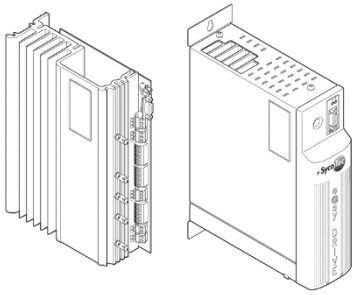
The mains adaptor is designed for supplies to the e@syDrive 4426
(see operating manual of power supply e@syDrive 4429, Material no. 1.003.1905)

When using a transformer, or another power pack, the secondary voltage must be provided with insulation double that of the mains potential. This means the converter supply voltage must be galvanically separated from the mains.
When using a transformer the Standard EN 61558 for double insulation must be observed.
Current: max. 16 A (e@syDrive 4426), max. 10 A (e@syDrive 4425).

2.0 Scope of Delivery - Accessories

2.1 Scope of Delivery

Frequency Inverter e@syDrive 4425	Material no.1.001.2769 (open version IP 00) or
Frequency Inverter e@syDrive 4426	Material no.1.002.2514 (open version IP 00)
respectively	
Frequency Inverter e@syDrive 4425	Material no.1.001.2768 (enclosed version IP 20) or
Frequency Inverter e@syDrive 4426	Material no.1.002.2513 (enclosed version IP 20)
Connecting cable (9 pin Sub-D plug)	Material no. 1.002.2025
Operating manual	Material no. 1.001.7140



Check to make sure delivery is complete.

2.2 Accessories

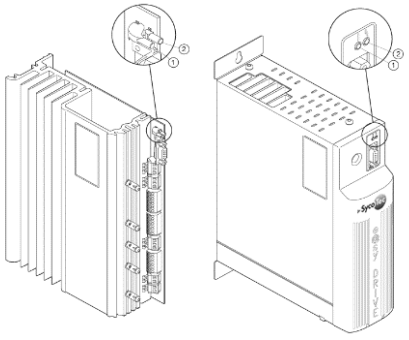
Accessories available on request:

Power Supply e@syDrive 4428 (for frequency inverter e@syDrive 4425)	Material no. 1.001.2770 (enclosed version IP 20)
Power Supply for e@syDrive 4429 (for frequency inverter e@syDrive 4426)	Material no. 1.002.2515 (enclosed version IP 20)

3.0 Operational Elements

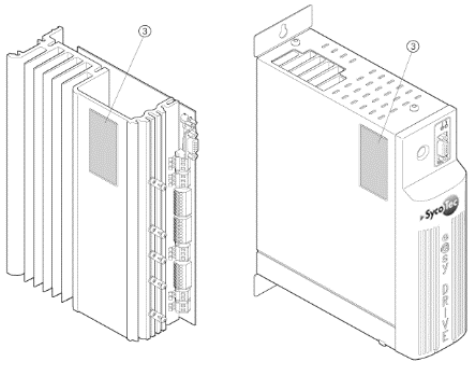
H4 LED (1) Operational (green)
H5 LED (2) Fault (yellow)

Operation of the unit is usually carried using an PLC-compatible remote control
The unit is configured exclusively by the special software using a standard PC (serial RS 232) and by means of a serial data connection (standard 9 polar sub-D cable) which communicates with the frequency inverters e@syDrive 4425, 4426.



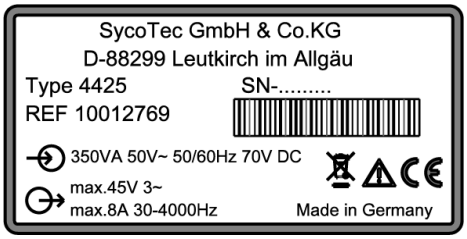
3.1 Rating Plate

Position of the rating plates (3)



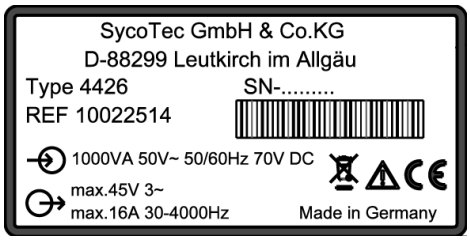
Rating Plate - Open Version (IP 00)

Frequency inverter type –
Material number –
Input power –
Output power –



– Serial number
– Symbols (see chapter 1.1)

Frequency inverter type –
Material number –
Input power –
Output power –



– Serial number
– Symbols (see chapter 1.1)

Rating Plate - Enclosed Version (IP 20)

Frequency inverter type –
Material number –
Input power –
Output power –

– Serial number
– Symbols (see chapter 1.1)

Frequency inverter type –
Material number –
Input power –
Output power –

– Serial number
– Symbols (see chapter 1.1)

4.0 Description of Function

The minimal output frequency is 30 Hz (1,800 rpm)
The maximum output frequency is 4000 Hz (240,000 rpm) for ASM-motors and for DC-motors.
The maximum output power is 350 VA (e@syDrive 4425) and 1,000 VA (e@syDrive 4426).

The frequency inverter type e@syDrive 4425, 4426 is suitable for the variable-frequency control of various motors, especially with high frequencies of up to 4,000 Hz corresponding 240,000 rpm. The output voltage is set via a pulse amplitude modulation (PAM) with 120° blocks.

A 4.1 Three-phase Asynchronous Motor (ASM)

Three-phase asynchronous motors (ASM) are controlled by means of pulse amplitude modulation (PAM). The voltage/frequency table serves as a basis for determining the motor voltage. Various control procedures are available – controlling method IR and load compensation are provided.

4.2 Brushless DC-Motor Without Sensors (BLDC)

Brushless DC motors have a permanent magnet rotor and a fixed three-phase winding. The winding is preferably designed as an air-gap winding with yoke, but a slotted version similar to an ASM motor is also possible.
The motor is controlled as a function of the rotor position. The rotor position is simulated by the frequency inverter by measuring the e.m.f. voltage from the three part-windings. No position sensors are required. In order to permit measurement of the e.m.f. voltage, the motor inductance may not be too large.

4.3 Brushless DC-Motor With Position Sensors (BLDCS)

The design of this motor is identical to that of the BLDC motor described above. For position detection, however, 3 additional Hall sensors are installed in the motor.

4.4 Remote Control

The voltages at the remote control plug may be max. 60 V DC or. 25 V AC according to SELV (EN50178). Exceptions are the relay connections, which are approved for max. 250 V AC.
All connections are potentially isolated from the control and with respect to the protective conductor.
The remote control provides a large number of programmable inputs and outputs:

6 digital inputs
PLC-compatible (24 V). The inputs IN1...IN6 are programmable with the parameters ***P110-input IN1...P115-input IN6*** (see chapter 4.5).

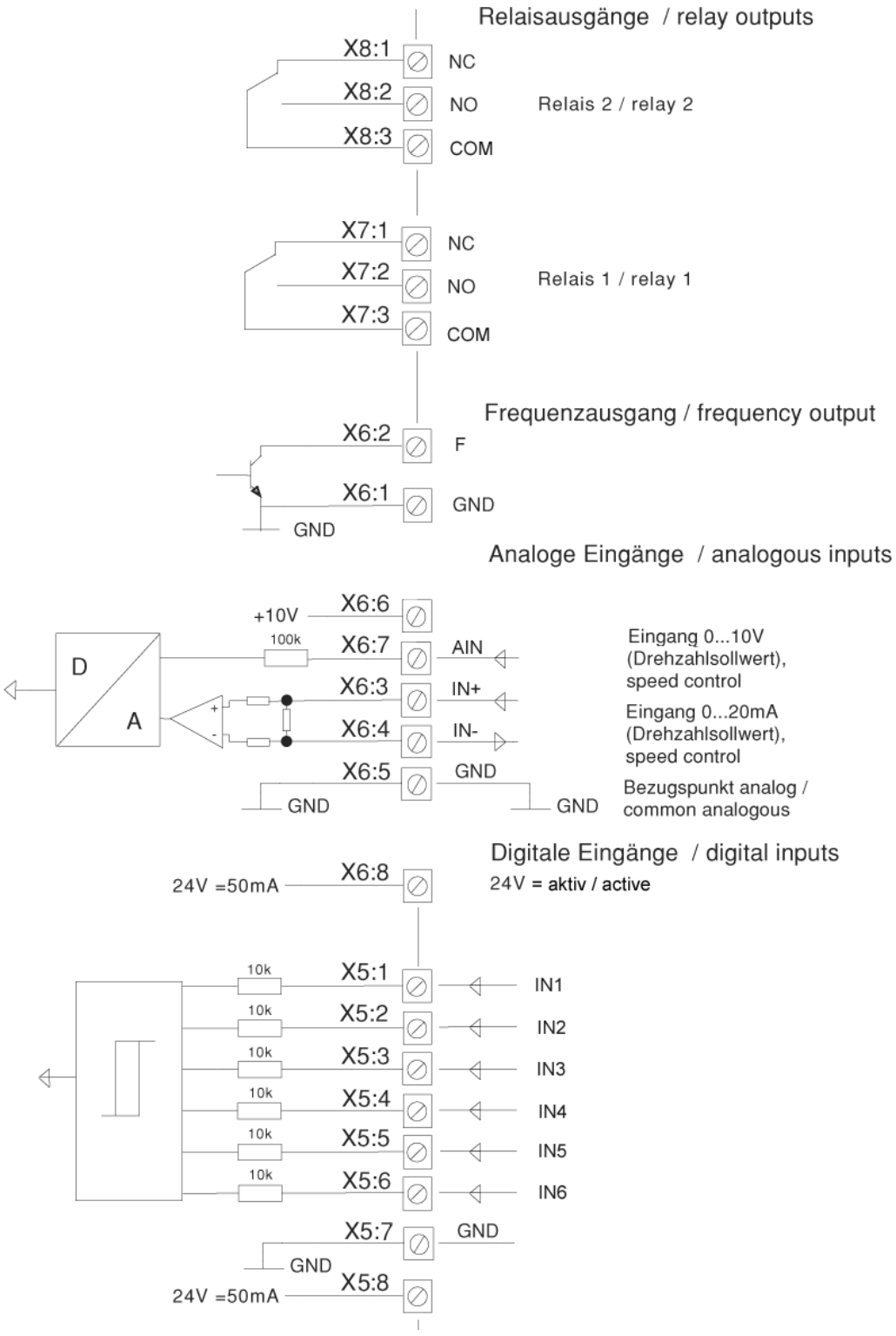
2 relay outputs
(potential-free max. 250 V~, 30 V- / 1 A) for outputting various status signals (see parameters ***P120-relay REL1...P121-relay REL2***).

2 analogue inputs
FB-N_soll (0...10 V) or FB-Input+, FB-Input- (0 - 20 mA) for the functions of speed setpoint default.
The programming is performed with the parameters ***P129-choose analog AIN***

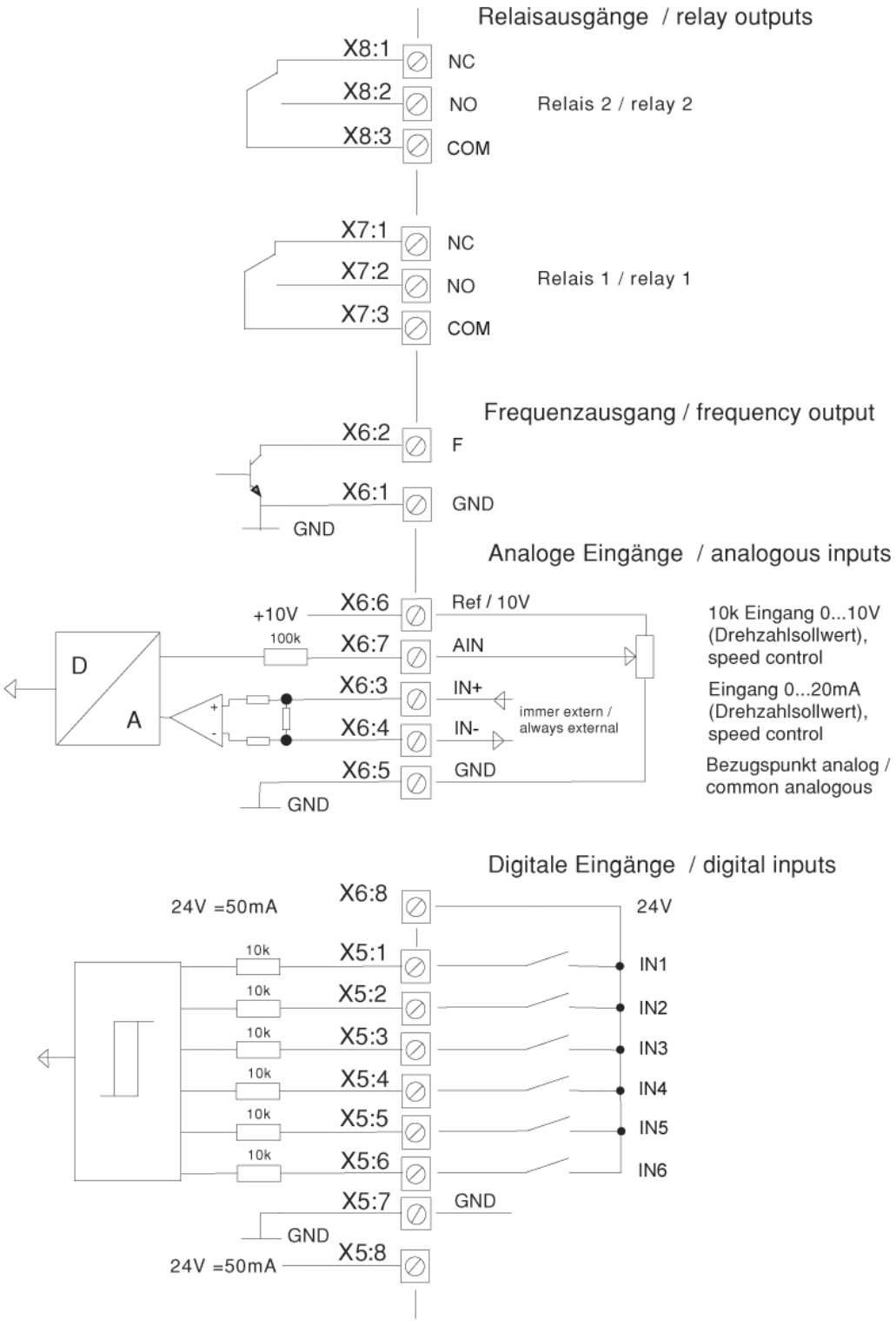
1 frequency output
(open collector, max 24 V) with one times the frequency inverter output frequency.

2 auxiliary voltages
+24 V (max. 100 mA) for wiring of the digital inputs IN1...IN6 and of the relay outputs REL1...REL2
+10 V (max. 25 mA) as auxiliary supply for external potentiometer to the analogue input AIN1

Remote Control - Control With External Voltage Supply



Remote Control - Control Without External Voltage Supply



4.5 Motor Codes Via Inputs IN2...IN6 to X5:

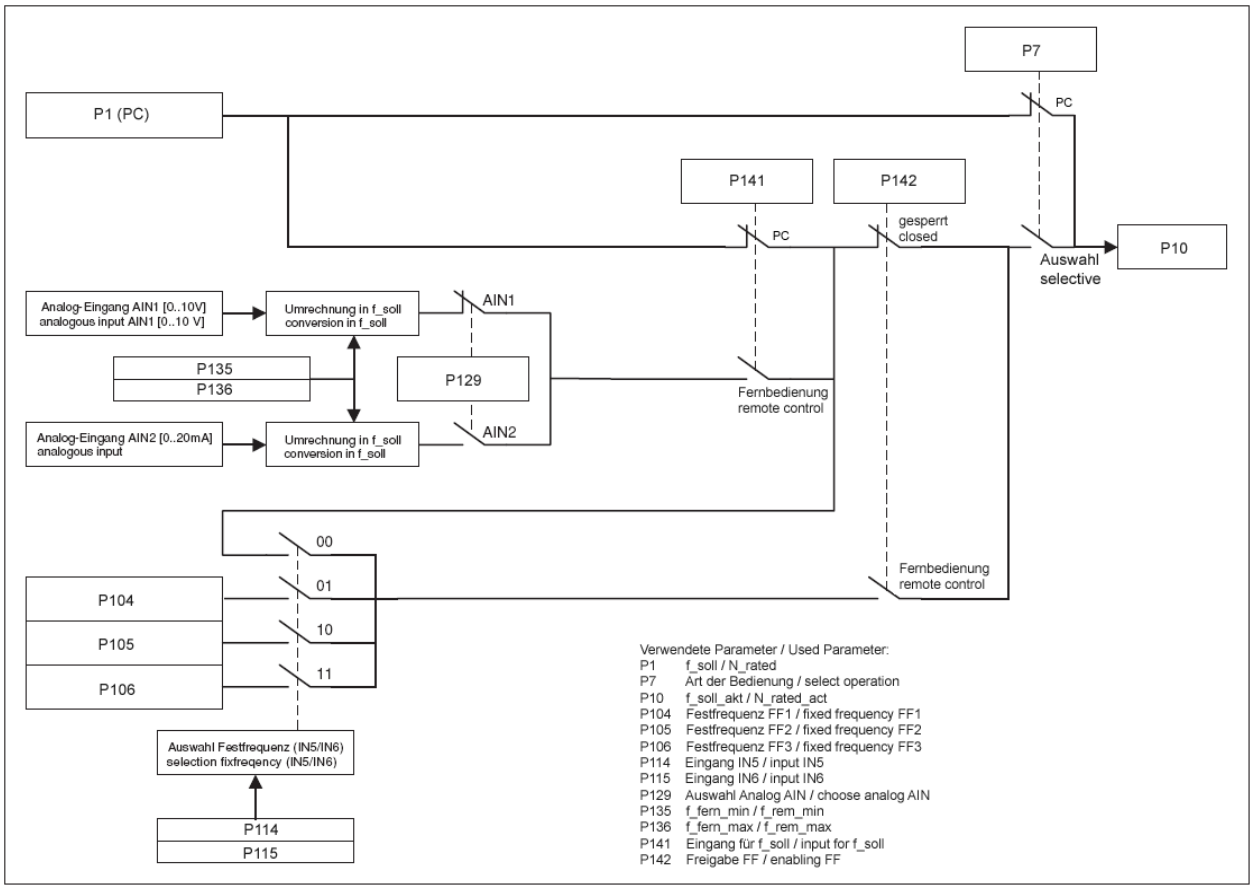
In order to use IN2...IN6 for the motor codes, code ***P102 motor coding*** must be assigned to the number of the motor to be used (1 - 32). Additionally, the required inputs are to be set to motor code with parameters ***P111–input IN2*** up to ***P115–input IN6***

Bit4 IN2	**Bit3 IN6**	**Bit2 IN5**	**Bit1 IN4**	**Bit0 IN3**	**Code Value in *P20***	**Assigned Motor Parameter Memory**
L	L	L	L	L	1	M1
L	L	L	L	H	2	M2
L	L	L	H	L	3	M3
L	L	L	H	H	4	M4
L	L	H	L	L	5	M5
L	L	H	L	H	6	M6
L	L	H	H	L	7	M7
L	L	H	H	H	8	M8
L	H	L	L	L	9	M9
L	H	L	L	H	10	M10
L	H	L	H	L	11	M11
L	H	L	H	H	12	M12
L	H	H	L	L	13	M13
L	H	H	L	H	14	M14
L	H	H	H	L	15	M15
L	H	H	H	H	16	M16
H	L	L	L	L	17	M17
H	L	L	L	H	18	M18
H	L	L	H	L	19	M19
H	L	L	H	H	20	M20
H	L	H	L	L	21	M21
H	L	H	L	H	22	M22
H	L	H	H	L	23	M23
H	L	H	H	H	24	M24
H	H	L	L	L	25	M25
H	H	L	L	H	26	M26
H	H	L	H	L	27	M27
H	H	L	H	H	28	M28
H	H	H	L	L	29	M29
H	H	H	L	H	30	M30
H	H	H	H	L	31	M31
H	H	H	H	H	32	M32

L = low voltage 0..5 V (contact open), H = high voltage, 24 V (contact closed)

4.6 Setpoint Value Selection

The frequency setpoint value (speed setpoint value) can be predetermined by various sources, and the mode of operation is shown in the following figure.

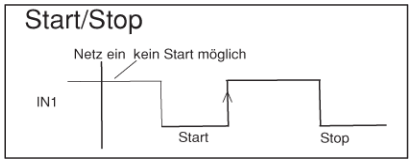


Picture: setpoint value selection

In order to use the setpoint value of the PC in ***P1-N_rated***, the "PC application" is set to ***P7-select operation***. This enables the functions start/stop and assigned frequency to be controlled via the PC.

Following a power failure, an automatic start by the installed start signal at IN1 is prevented. A flank at the start entry is necessary.

*When starting via the PC, **FB IN1 (P110)** must be placed at "Off".*



Alternatively, you can adjust ***P7-select operation*** to "selection"; ***P141-input for f_soll*** to "PC application" ; and ***P142-enabling FF*** to "blocked".

In order to use the setpoint value from analogue input AIN1 or AIN2, set ***P7-select operation*** to "selection"; ***P141-input for f_soll*** to "remote control"; ***P142-enabling FF*** to "blocked" ; and ***P129-choose analog AIN*** to the desired analogue input. The scale of the analogue inputs is carried out via ***P135-f_rem_min*** and ***P136-f_rem_max***.

To use the fixed value (fixed frequency) in ***P104*** to ***P106***, set ***P7-select operation*** to "selection", as well as ***P142-enabling FF*** to "remote control". Selection is effected from control inputs IN5 and IN6.
If both inputs are on 0 V, then the setpoint value from ***P1–N_rated*** or from analogue input AIN1/AIN2 is used – depending on the condition of ***P141-input for f_soll***. This allows the use of up to four fixed frequencies. The following table illustrates the assignment of the input combinations.

input IN5	**input IN6**	**active setpoint value**
L	L	***P1–N_rated*** or AIN1[(1)]
L	H	***P104-FF1***
H	L	***P105-FF2***
H	H	***P106-FFF3***

L = low voltage (0 V), H = high voltage (24 V)

[(1)] Note: with this combination the setpoint value in ***P141-input for f_soll*** is selected, i.e. ***P1–N_rated*** or from analogue input AIN1 or AIN2 (dependent on ***P129***).

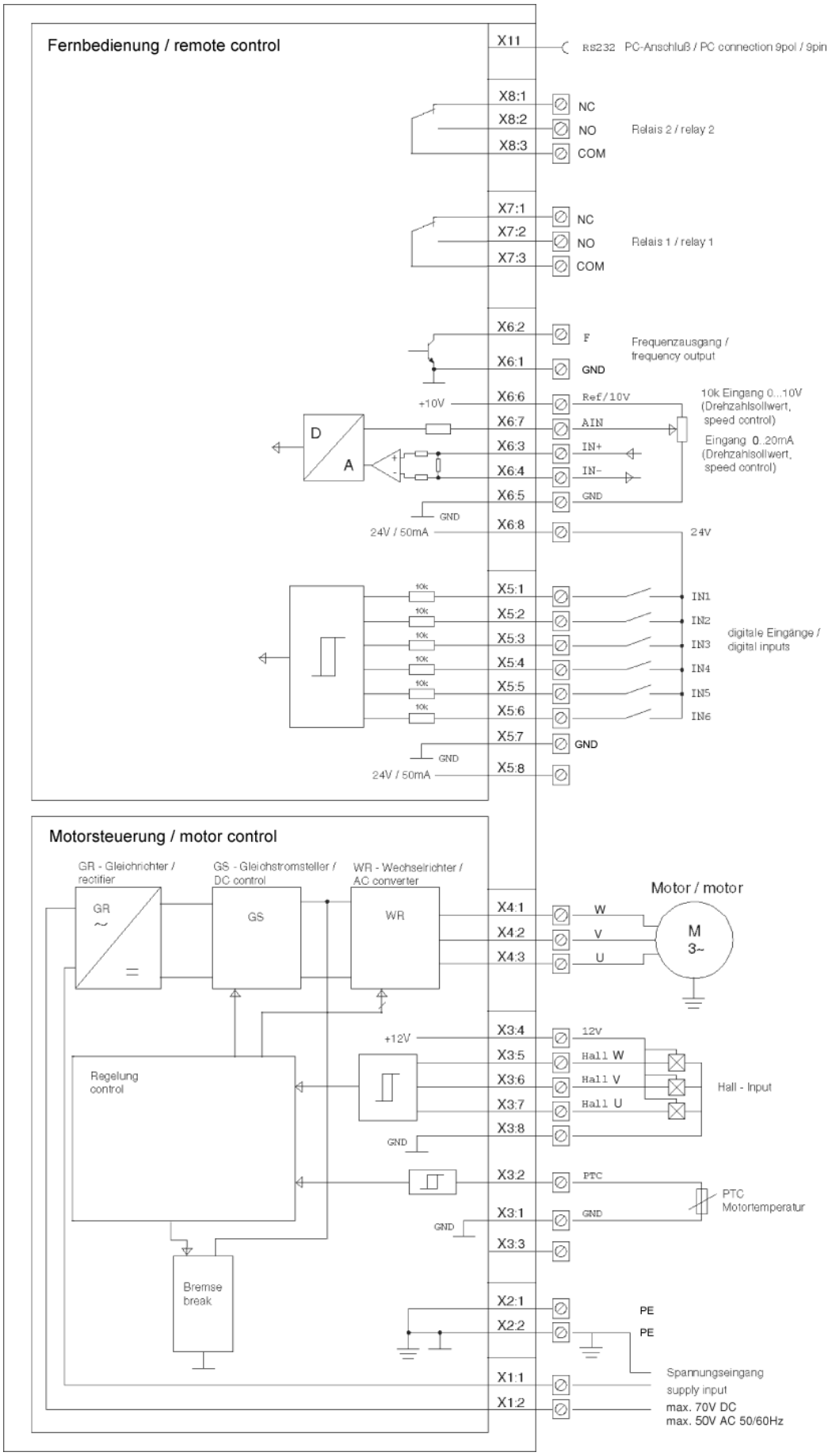
4.7 Emergency Motor Stop At Power Failure

With parameter ***P58-emerg. stop***, the frequency inverter can be set so that a running motor is automatically braked in the event of failure or if the mains voltage falls below ones threshold value. The frequency inverter supplies itself from the motor voltage still present, and braking is performed with maximum power of the brake resistance. The motor generally cannot be braked to a complete stop since the motor voltage is no longer sufficient for supplying the frequency inverter.
If an emergency stop occurs as a result of a brief drop in mains voltage, the motor is braked to a stop. In order to start the motor again, the operator must first input a stop command followed by a start command.

4.8 Counter-clockwise Operation

In standard operation, the frequency inverter operates clockwise. With one of the parameters ***P111-input IN2*** to ***P113-input IN4***, a digital input can be configured for counter-clockwise operation. If the corresponding input is supplied with voltage, the direction of rotation changes to ***counter-clockwise***. If the direction of rotation is switched while the motor is running, the motor is first braked before it is powered up again in the altered direction of rotation.

4.9 Wiring Diagram



5.0 Assembly and Installation

⚠ *Before the installation and commissioning of this device, please read the safety and warning information in chapter 1.0 carefully.*

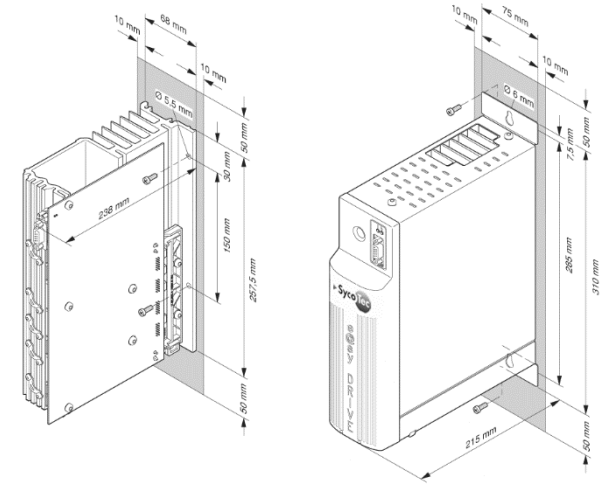
5.1 Assembly

The frequency inverter e@syDrive 4425, 4426 is designed for mounting in a cabinet:
use 2 screws (5mm) for mounting on switch board.
Ensure proper electrical connection to protective conductor.

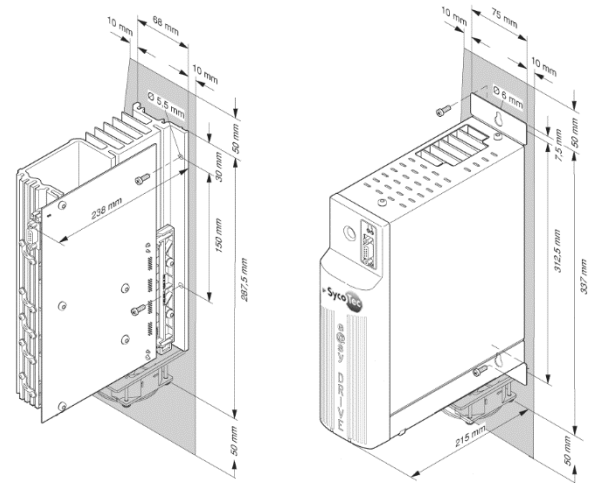
Information for cooling

ⓘ *The frequency inverter is cooled by an integral fan. To ensure effective cooling, at least the following clearances must be maintained around the frequency inverter:*
End surfaces: 50 mm / Longitudinal: 10 mm

Installation of Frequency Inverter e@syDrive 4425



Installation of Frequency Inverter e@syDrive 4426



5.2 Electrical Installation

⚠ *When installing the frequency inverter, the applicable safety regulations must be observed. Cut-out devices for preventing unexpected start-up must be provided. A device for the electrical isolation of the frequency inverter must be provided unless a mains cable with a plug is used. The power supply must be provided with 16A power cut-outs with tripping characteristic B.*

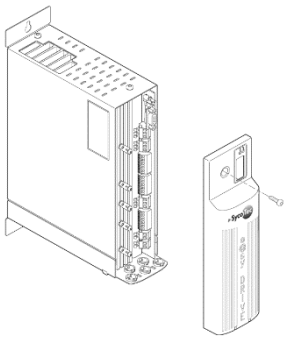
5.3 Wiring Guidelines for Compliance with the EMC Standards

The inverter was tested according to EMC product standard EN 61800-3 (variable-speed electrical drives).

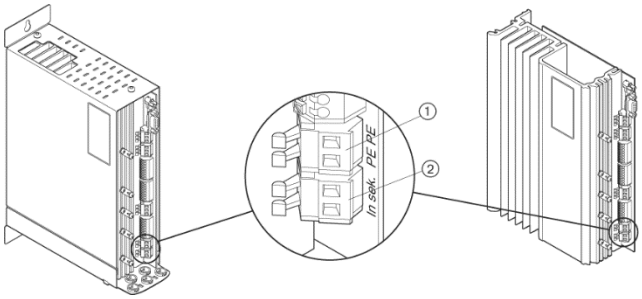
⚠
- *The above-mentioned EMC product standard can be complied with only by means of shielded motor and control cables. It should be ensured that the cable shields rest over a large area of the inverter housing and are surrounded by the cable clips. A shielded mains cable is not required.*
- *The control cables must be laid separately from (not parallel with) mains and motor cables. Shielded cables and metalized plug housings should be used.*
- *All devices in the mounting cabinet should be connected over a large area to a common earthing point via short earthing cables.*
- *On installation of the inverter, valid safety provisions may on no account be infringed.*

5.4 Electrical Connections

Access to the electrical connections
Connection area for frequency inverter e@syDrive 4425, 4426



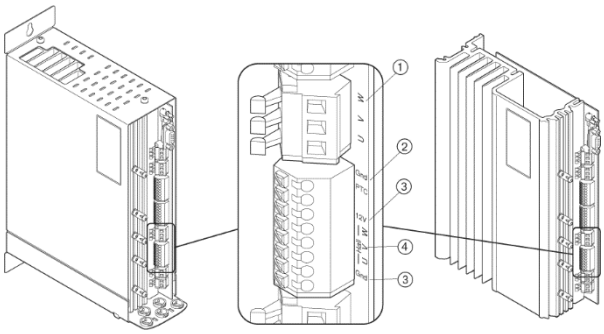
i *For frequency inverter e@syDrive 4425, 4426 the supply cable is connected to "In sek." (2) and "PE" (1). The cable shield is to be neatly clamped under the traction relief.*
When the enclosed version is selected, ensure that both covers are conductively well connected together (either via the switchbox or other appropriate means).



Motor Connections

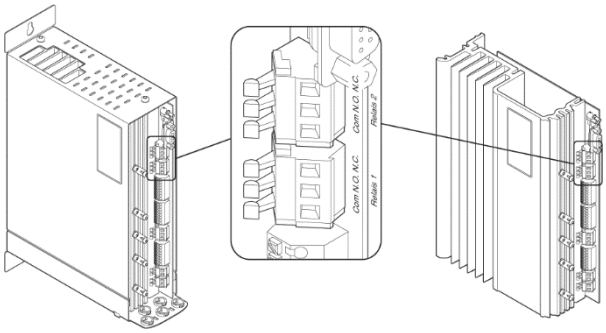
The motor is connected to "U, V, W" (1).
It is possible to connect position sensors to hall "U, V, W" (4), and their electrical supply to "12 V" or "GND" (3).
A motor-temperature sensor is attached to "PTC" and "GND" (2).

Plug type: spring-clip (max. 2.5 mm^2 / AWG 12)

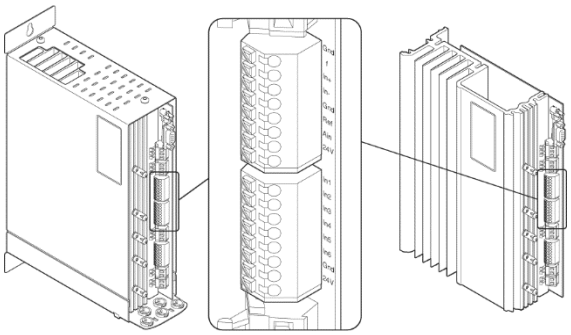


X4: Connection Remote Control

Connection of digital outputs (Relays)

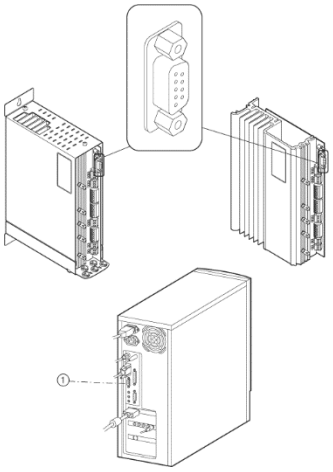


Connection of digital inputs, analogue inputs and frequency outputs



X5: Connection PC For Configuration

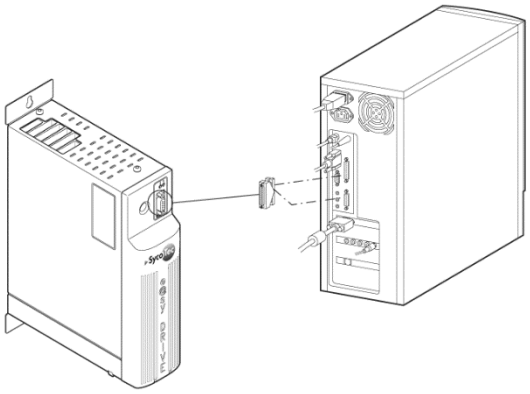
Plug e@syDrive: 9-pin socket Sub-D (1) connecting cable (material no. 1.002.2025)



6.0 Description of the Operating Software e@syDrive 4425, 4426

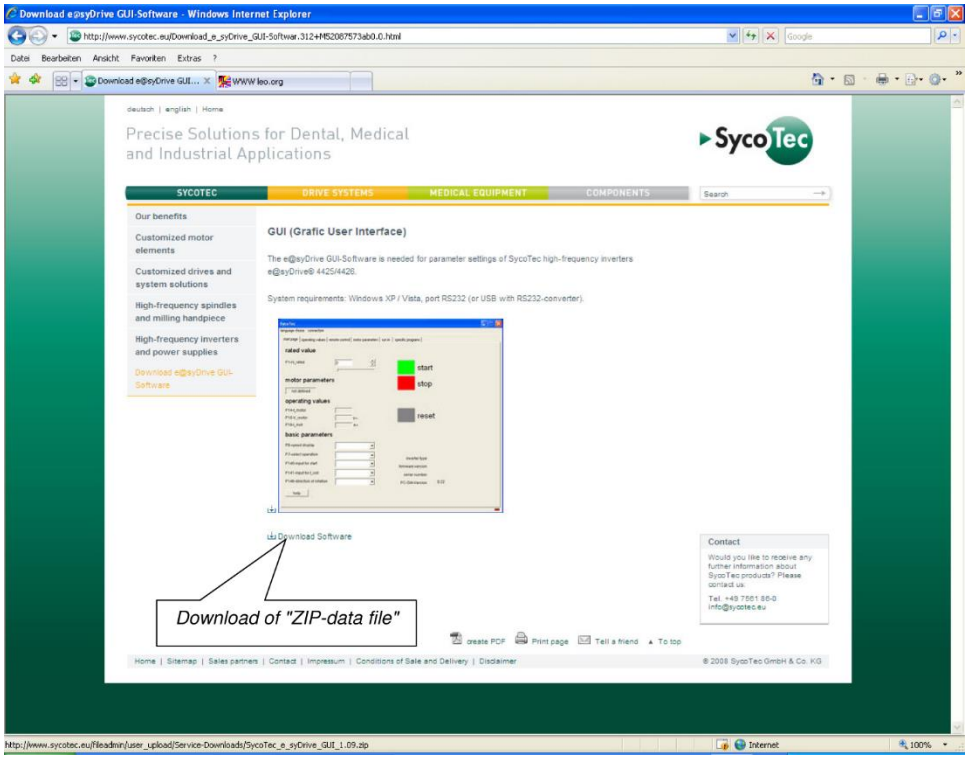
Apart from the two LED's "H4 Operation" and "H5 Fault", the frequency inverter e@syDrive 4425, 4426 contains neither operating nor display elements. The complete operation and configuration is regulated with the help of a PC.

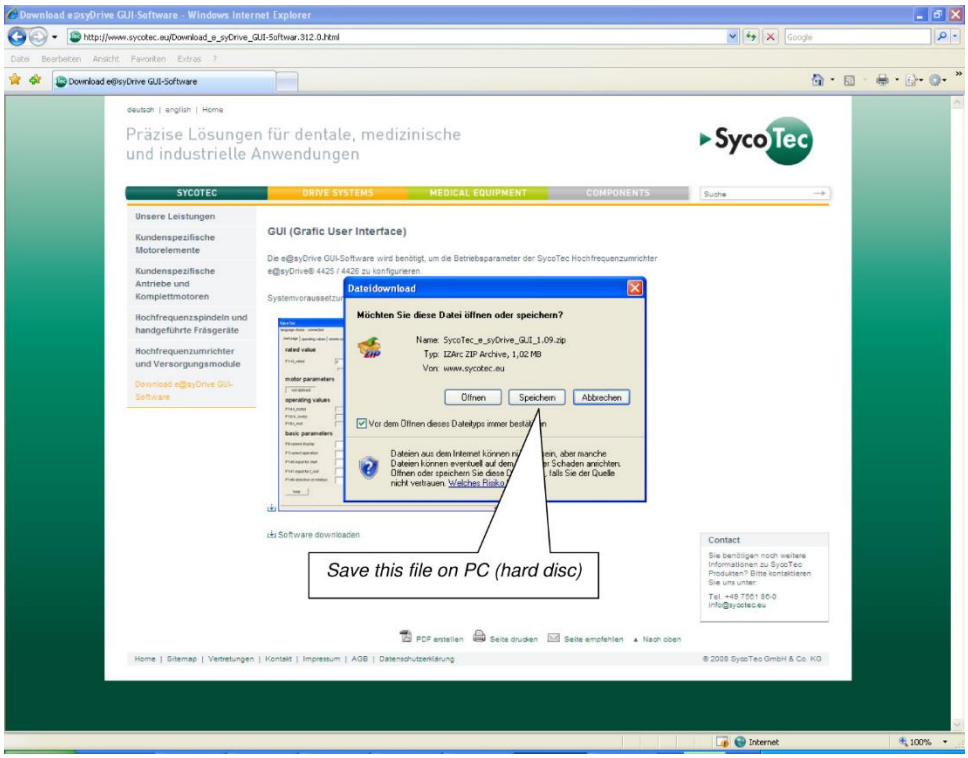
Connecting the frequency inverter e@syDrive 4425, 4426 with the serial interface (COM interface) of the PC.

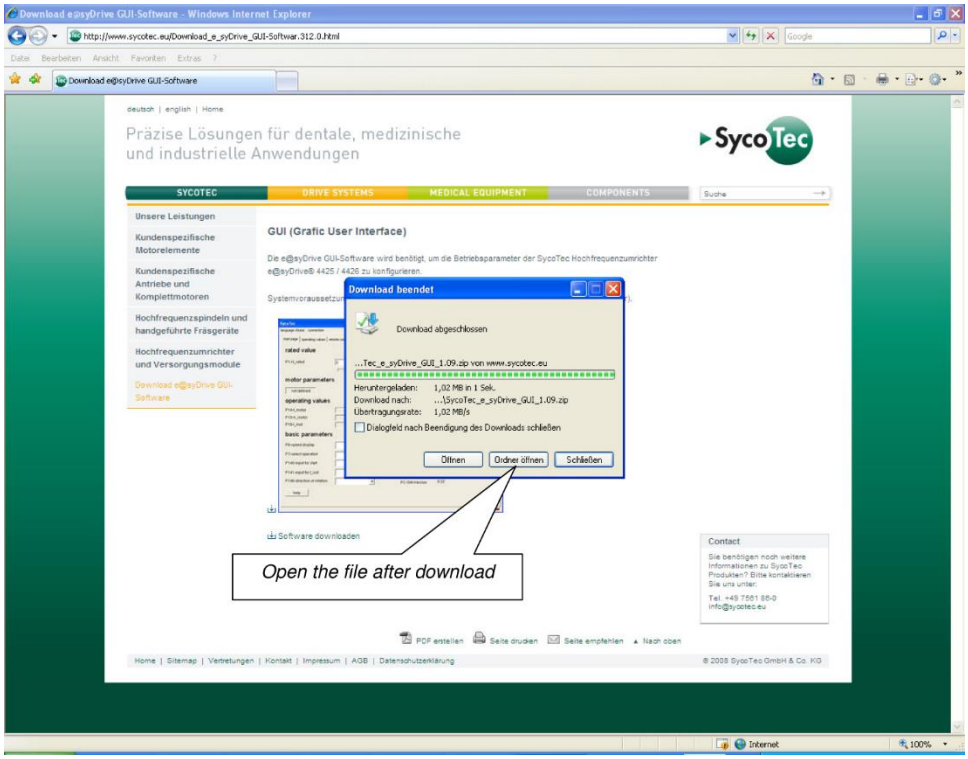


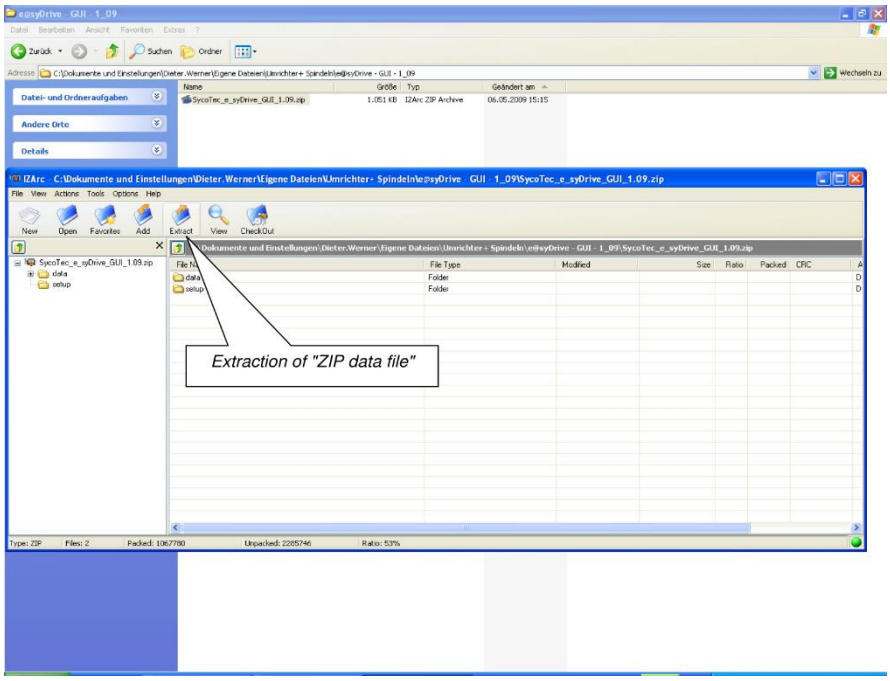
Download of operating software from the SycoTec homepage:

www.sycotec.eu -> High-frequency inverters -> Download e@syDrive GUI-Software

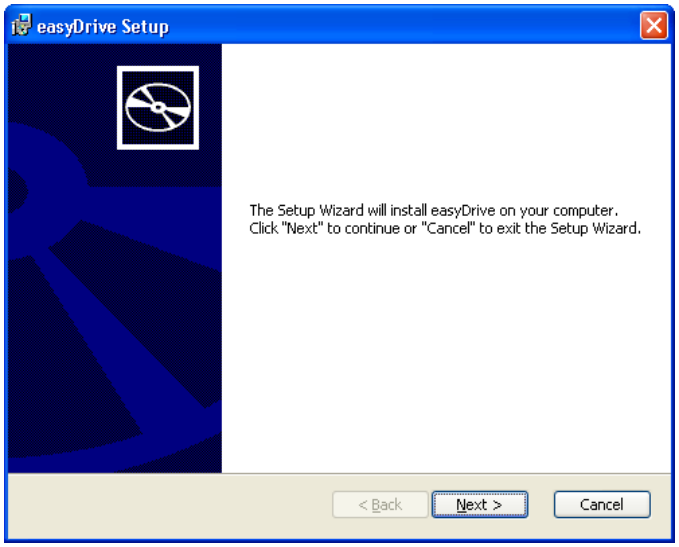


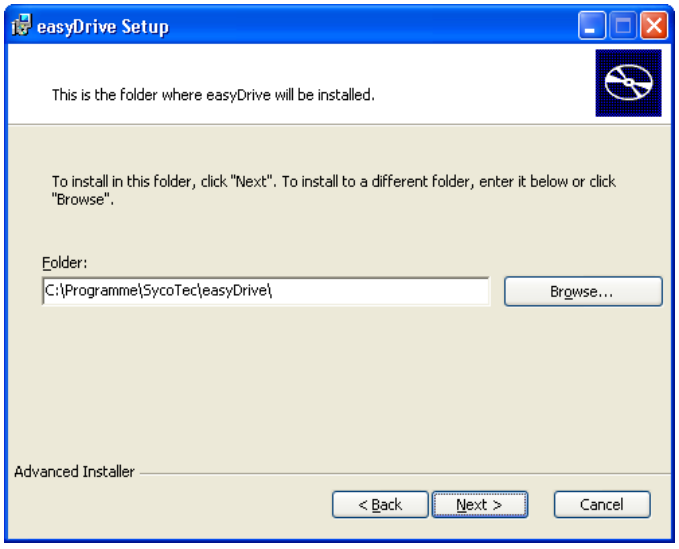

Download e@syDrive GUI-Software - Windows Internet Explorer
Präzise Lösungen für dentale, medizinische und industrielle Anwendungen
GUI (Grafic User Interface)
Dateidownload
Möchten Sie diese Datei öffnen oder speichern?
Name: SycoTec_e_syDrive_GUI_1.09.zip
Typ: IZArc ZIP Archive, 1,02 MB
Von: www.sycotec.eu
Öffnen
Speichern
Abbrechen
Save this file on PC (hard disc)

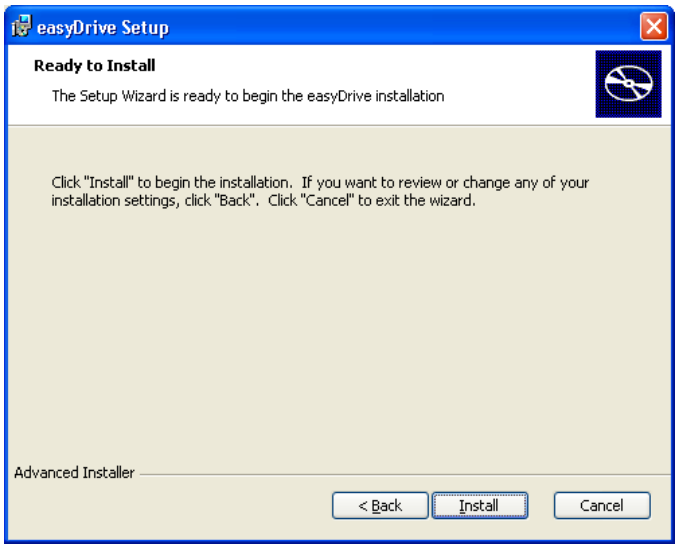

Download e@syDrive GUI-Software - Windows Internet Explorer
Präzise Lösungen für dentale, medizinische und industrielle Anwendungen
GUI (Grafic User Interface)
Download beendet
Download abgeschlossen
Heruntergeladen: 1,02 MB in 1 Sek.
Download nach: ...\SycoTec_e_syDrive_GUI_1.09.zip
Übertragungsrate: 1,02 MB/s
Dialogfeld nach Beendigung des Downloads schließen
Öffnen
Ordner öffnen
Schließen
Open the file after download

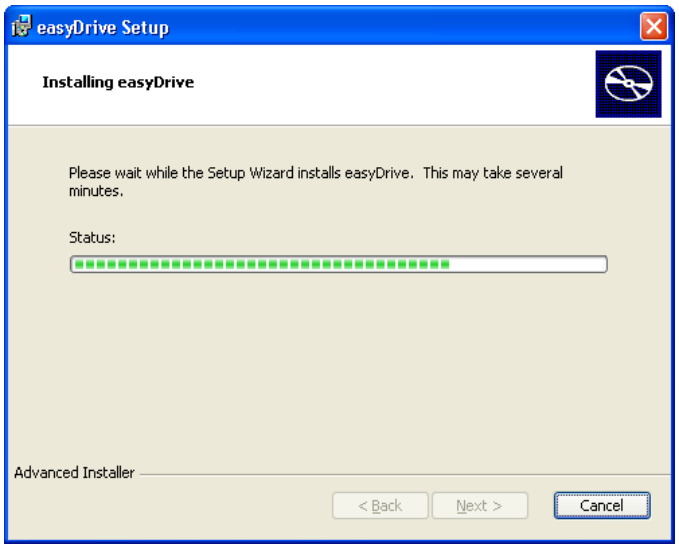


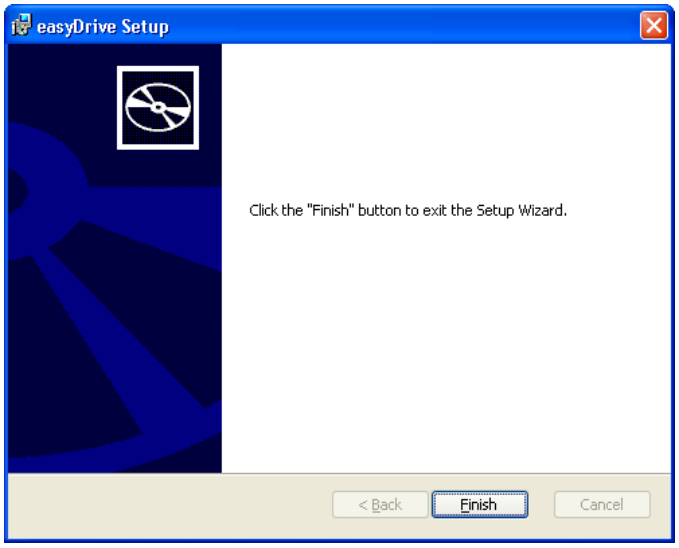
Installation of the operating software (via data file: easyDrive_GUI_Installer.msi)





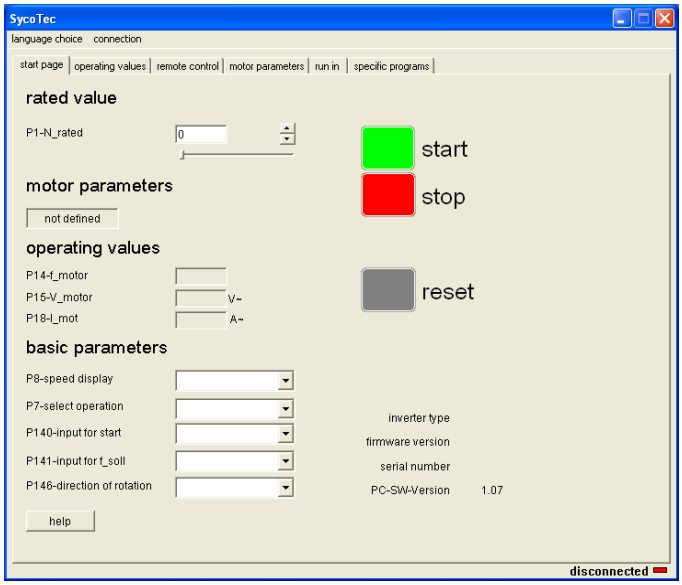

easyDrive Setup
Ready to Install
The Setup Wizard is ready to begin the easyDrive installation
Click "Install" to begin the installation. If you want to review or change any of your installation settings, click "Back". Click "Cancel" to exit the wizard.
Advanced Installer
< Back
Install
Cancel


easyDrive Setup
Installing easyDrive
Please wait while the Setup Wizard installs easyDrive. This may take several minutes.
Status:
Advanced Installer
< Back
Next >
Cancel


easyDrive Setup
Click the "Finish" button to exit the Setup Wizard.
< Back
Finish
Cancel

Start-up of this program via SycoTec_easyDrive.exe

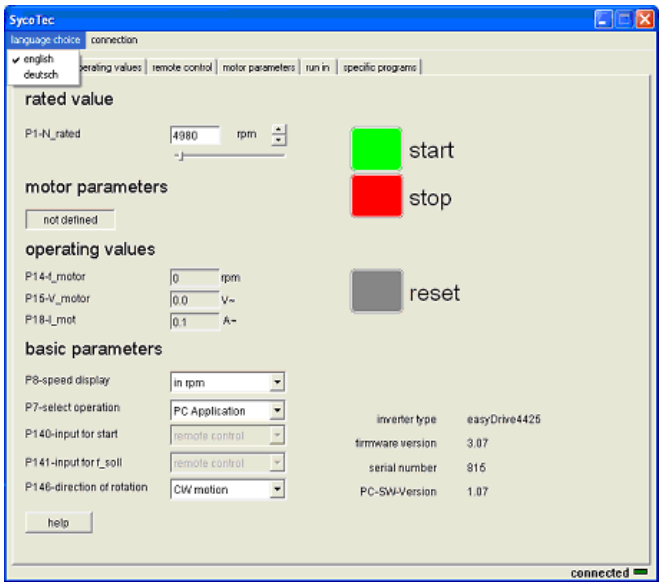
Screen display is shown in English language after the first start-up:



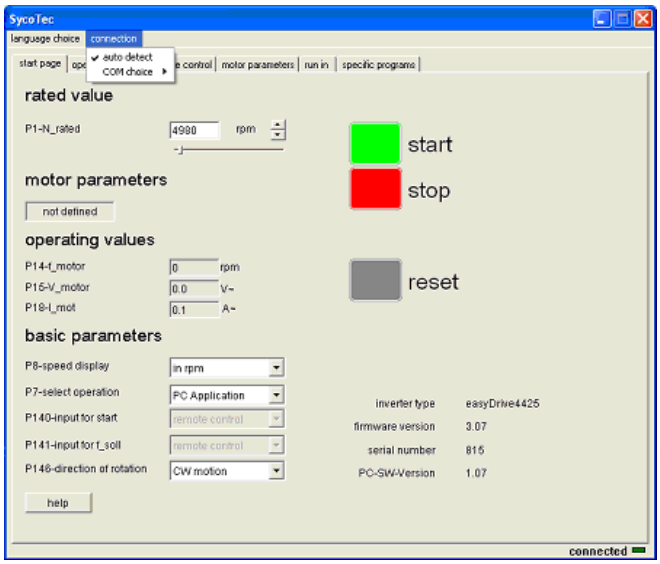
7.0 Operating Software

7.1 Operating Language

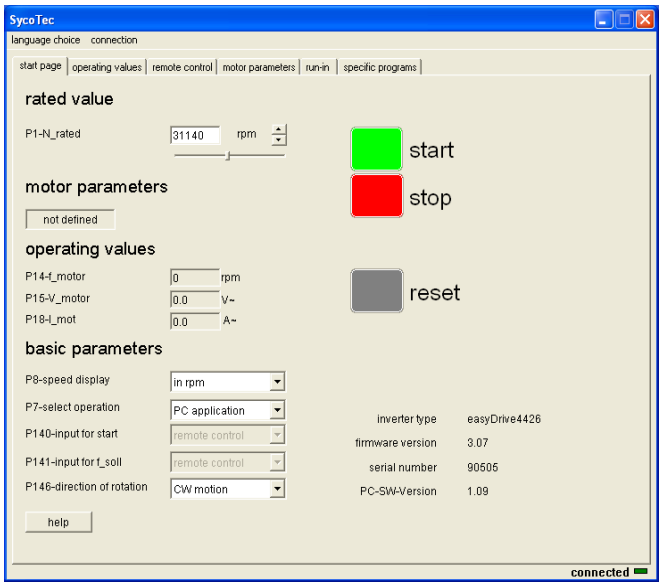
The menu "language choice" offers command to select the installed languages.



Generate the corresponding connection by "auto detect" via flag "connection"
In exceptional cases it is also possible via manual choice "COM choice".



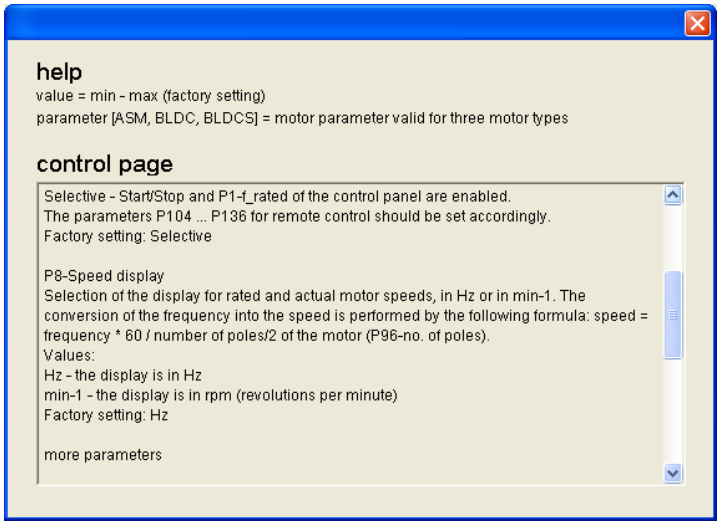
7.2 Basic Parameters



The start page provides the most important operating and display values.
The individual parameters are fully described in chapter 8.6.

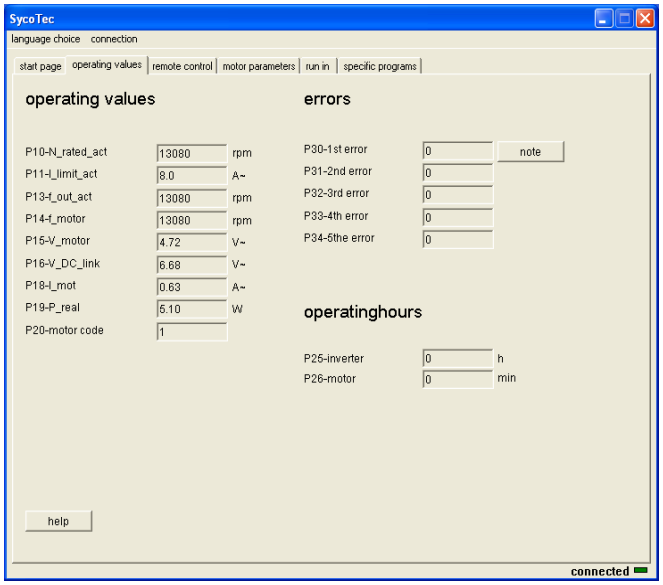
Additional operating windows:
- 7.3 Help data file
- 7.4 Operation values
- 7.5 Remote control
- 7.6 Motor parameters
- 7.7 V/Hz-Table
- 7.8 Motor control parameters
- 7.9 Spindle start-up
- 7.10 Special programs

7.3 Help Data File



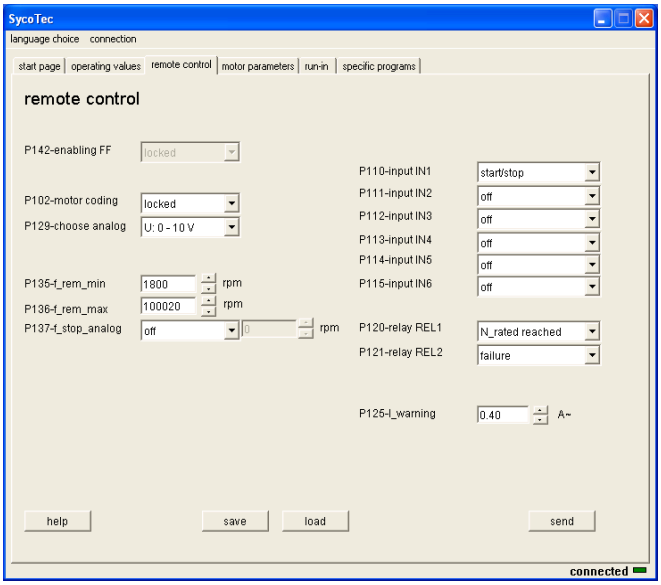
For each page there is a help data file, which is activated by clicking on the [help] button.
To go back to the previous page, click on [back].

7.4 Window - Operating Values



On this page, the most important operational values are available online (with approx. 1 Hz) – accumulated faults, running times, as well as customer-specified nominal values. Via the “Information” button, a description of the fault can be called up.

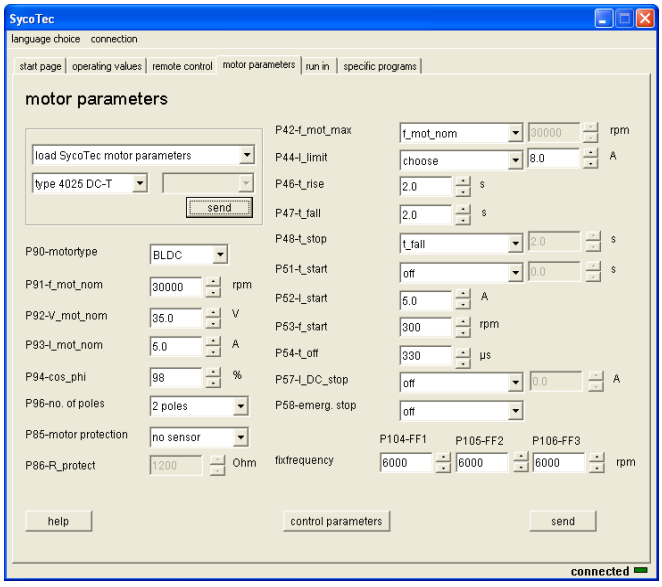
7.5 Window – Remote Control

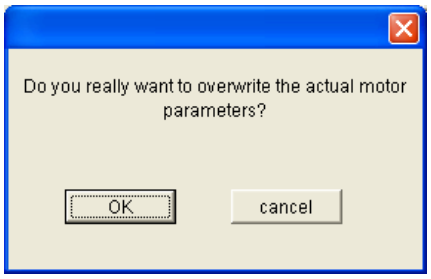


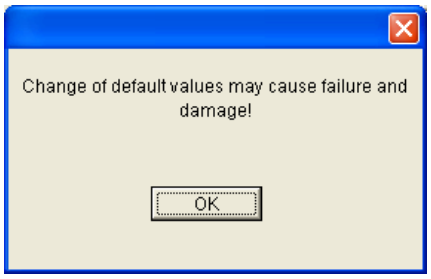
In this window the PLC-compatible remote control interface can be configured.

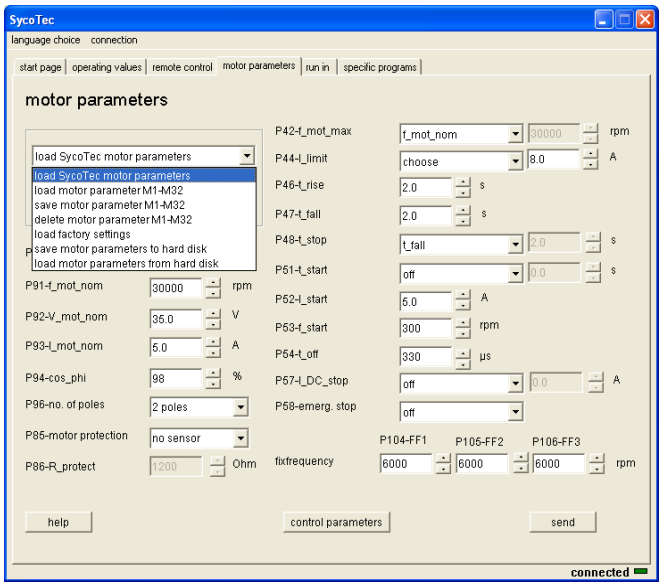
7.6 Window - Motor Parameters

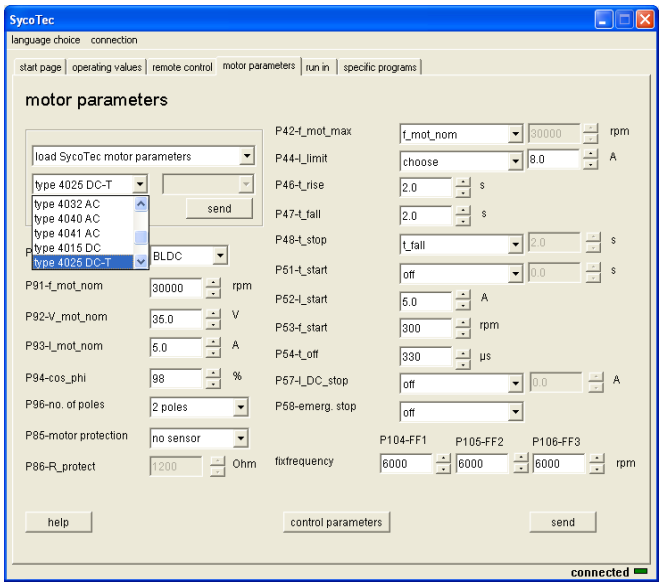
The displayed parameters will change according to the choice of motor connected (parameters for ***P90 motortype***).









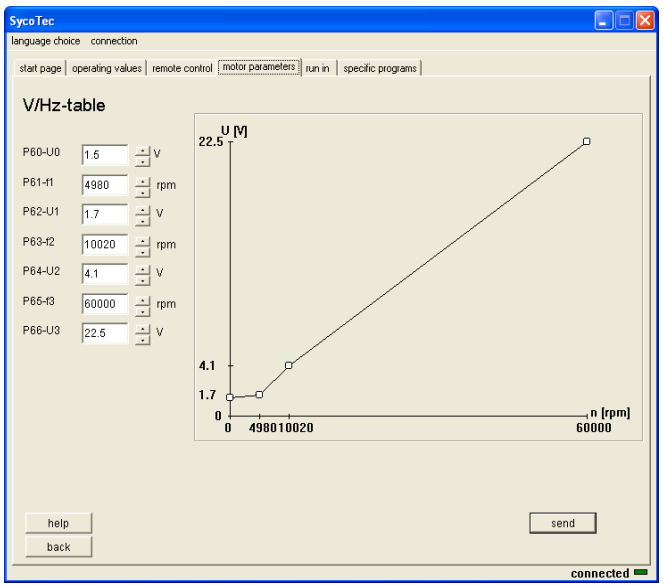


In accordance with chapter 8.0 Configuration, 32 motor parameter sets can be stored in memory (M1...M32).

The following functions can be called up:
Motor parameters M1...M32 load
Motor parameters M1 - M32 store
Motor parameters M1 - M32 delete
Load factory setting
Load motor parameters

7.7 Window - V/Hz-Table

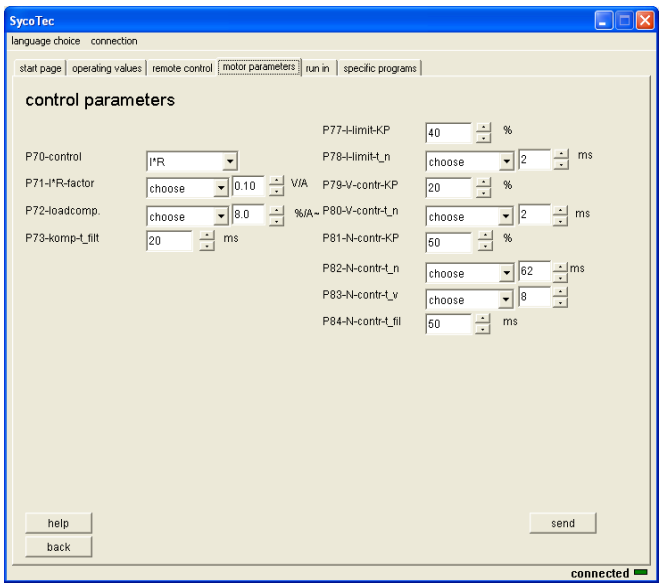
When an asynchronous motor is configured , the details can be entered in the V/Hz-Table window and visually controlled.



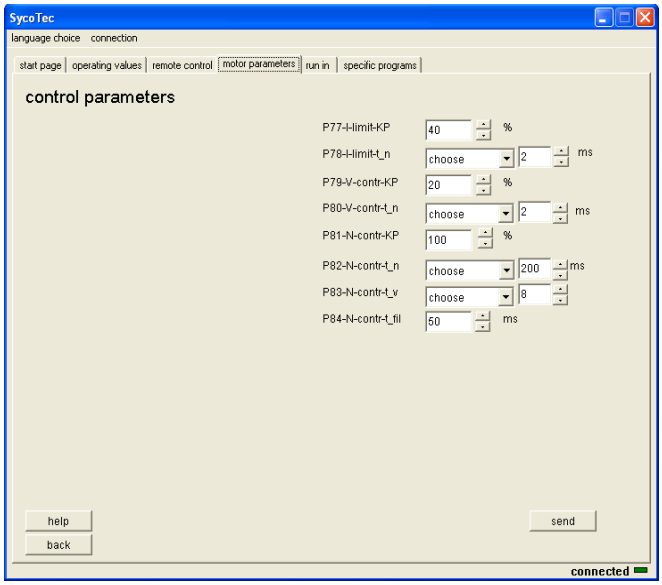
7.8 Window - Motor Control Parameters

The motor control parameters are available in a window underlay:

AC-Motor

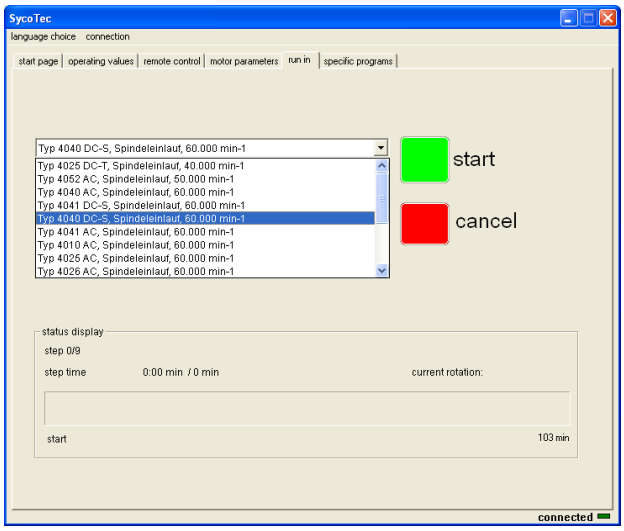


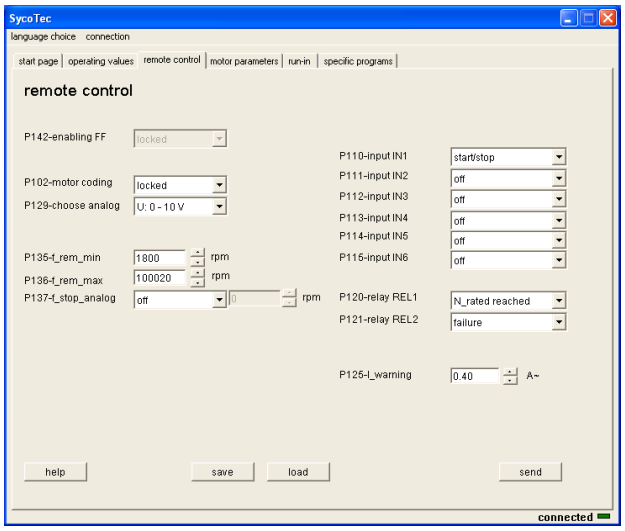
DC-Motor



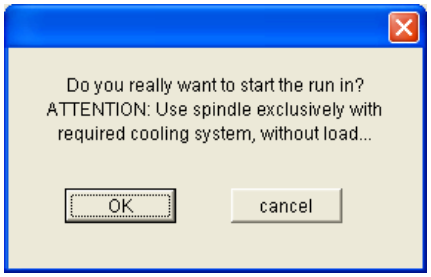
7.9 Window - Spindle Run-in

The spindle run-in is only possible if following conditions are complied:
- *Spindle is stopped*
- ***P7 select operation*** *on "PC application"*
- ***P110 Input IN1*** *on "start/stop"*
- *IN1 is connected with +24V (X6:8 to X5:1)*

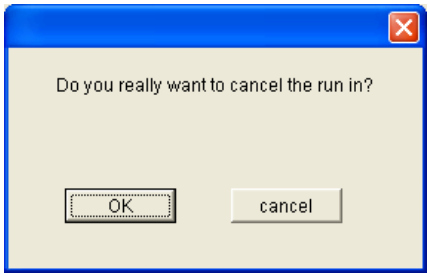




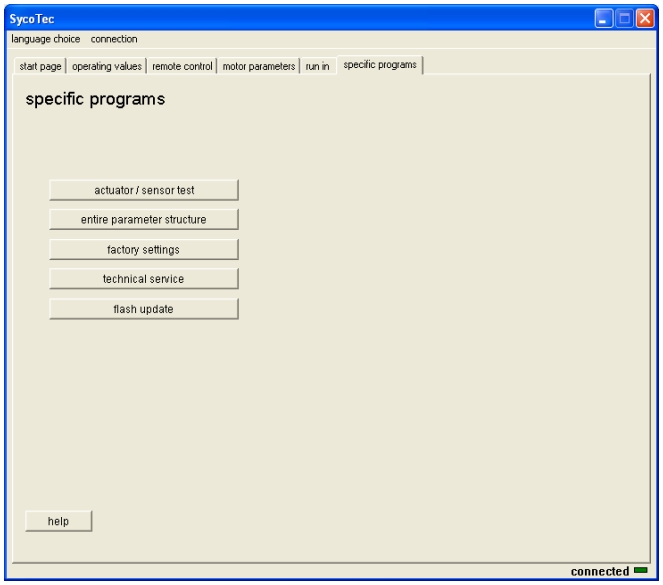
Start of the spindle run-in program



Cancel of the spindle run-in program



7.10 Window - Specific Programs



Test of the remote control interface
Re-setting parameters to factory settings
ASS (After Sales Service) functions

8.0 Configuration

All inverter relevant data are accessible in the form of parameters ***P1*** - ***P150***.
The configuration is carried out exclusively via the PC operating software.

Basic parameters

Higher parameters, upon which further adjustments are dependent (***P1 / P7 / P8***) (speed values, display adjustments, operating language, mode of operation, ...)

Display values

Pure display values which cannot be changed (***P10*** - ***P34***) (voltage, current and frequency values)

Motor operating parameters

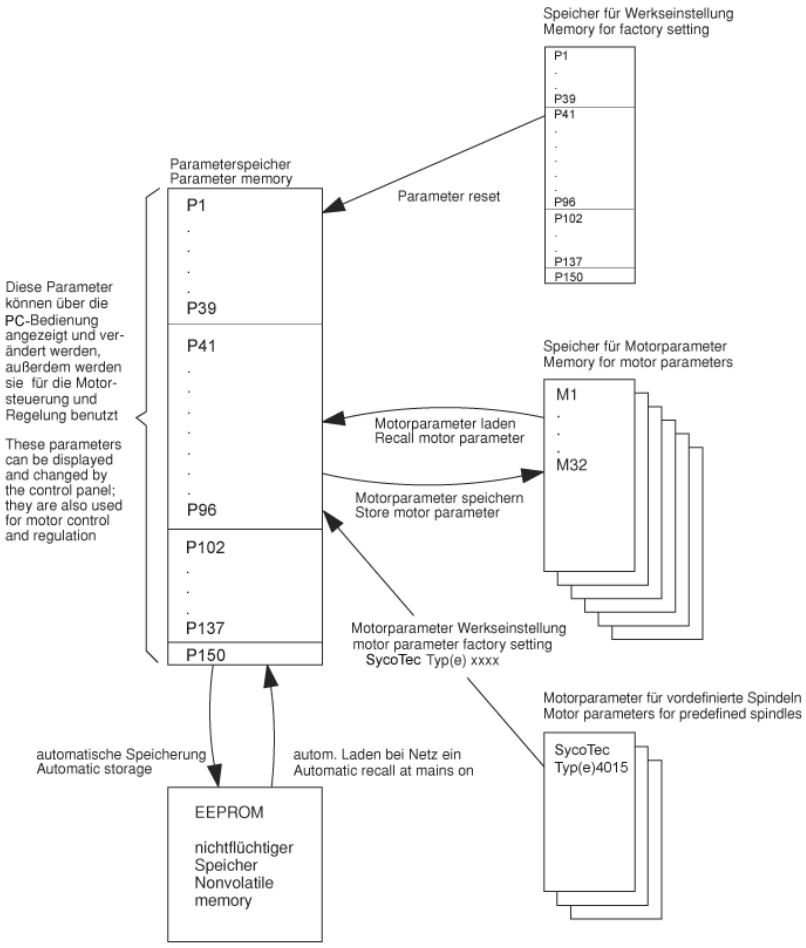
Motor specific parameters for adapting the motor to the frequency inverters (***P41*** - ***P96***)

Device parameters

Inverter specific parameters which can be changed (***P102*** - ***P150***) (remote control)

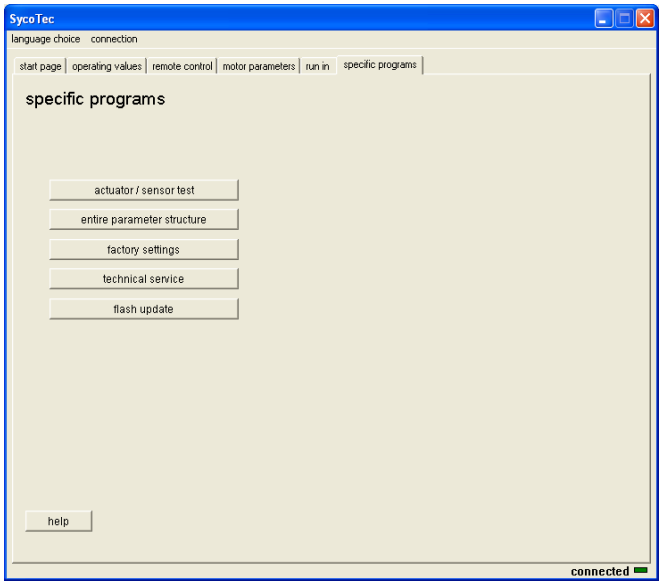
If a parameter cannot be changed (e.g. pure display values), the value appears into grey background. This also applies to parameters which can be changed only when the motor is not running.

If a parameter is not used, depending on the mode or other parameters, it is faded out. It is thus not displayed and also cannot be changed.



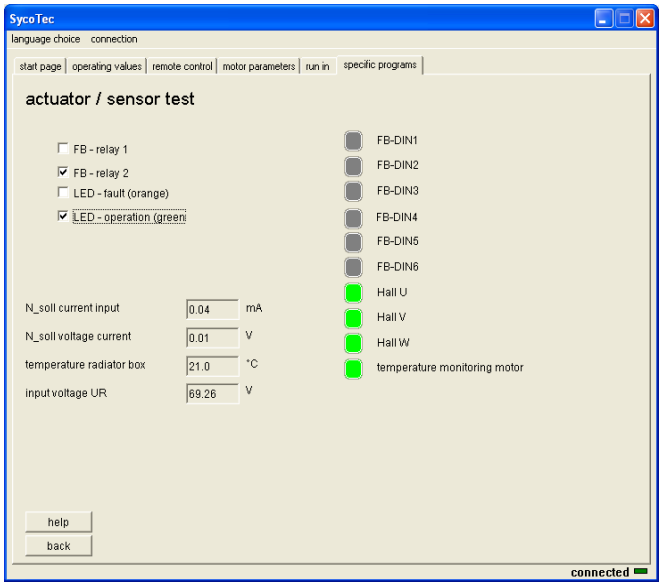
8.1 Specific Programs

Under special functions, it is possible to establish the default state and to select various utility and test programs which serve as troubleshooting programs and repair aids for the customer and the after sales service (ASS).



8.2 Actuator / Sensor Test

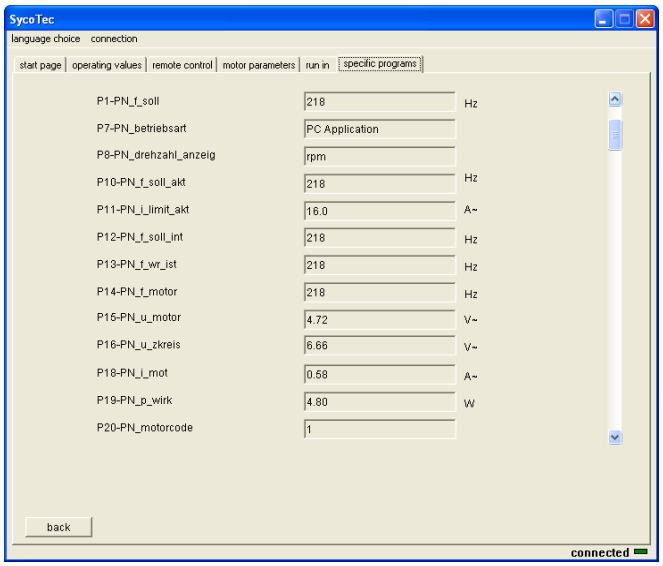
This test serves to check the function of the remote control and the internal signal.
Switch the frequency inverter to mode “no motor“. Click to delete the warning.
Sensors of temperature radiator box and input voltage UR provide additional information on the condition of the frequency inverter.



After calling-up this window “no motor” is configured!

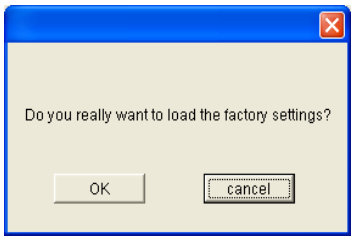
8.3 Complete Parameter Structure

The parameter structure portrays all the properties of the frequency inverter.
This reproduction is helpful for configuration and optimizing procedures.



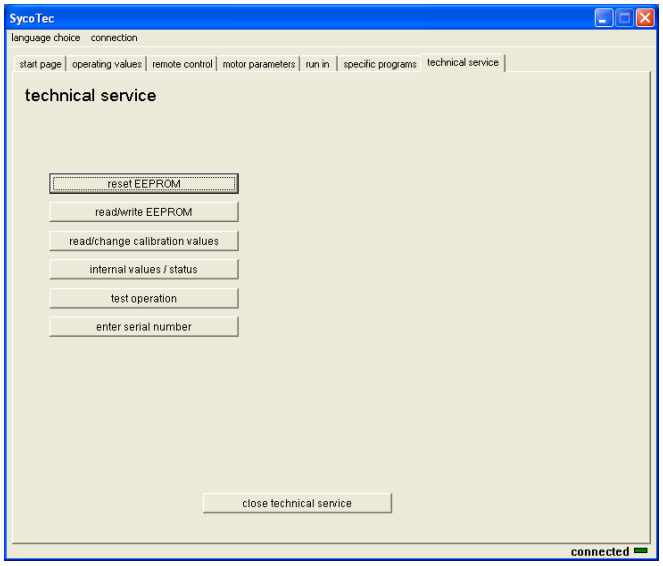
8.4 Factory Setting

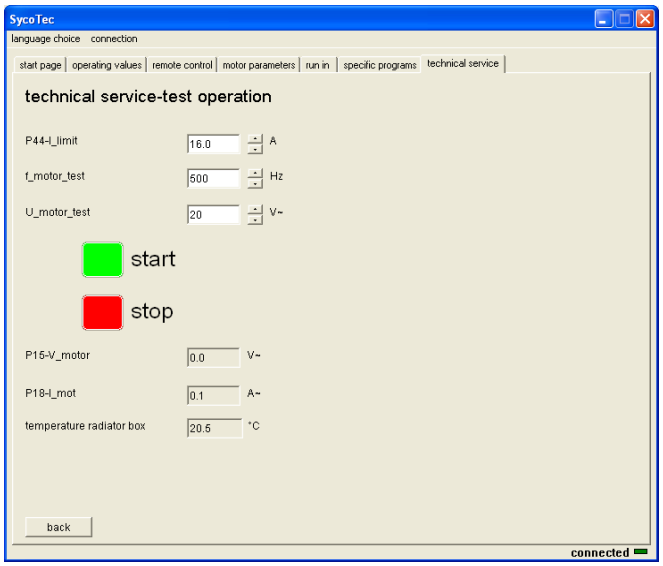
This function adjusts all parameters ***P1 ... P150*** to the original factory settings. After confirming the security question with [OK], the procedure is implemented.
Motor parameters stored in memory M1 - M32 are not affected.



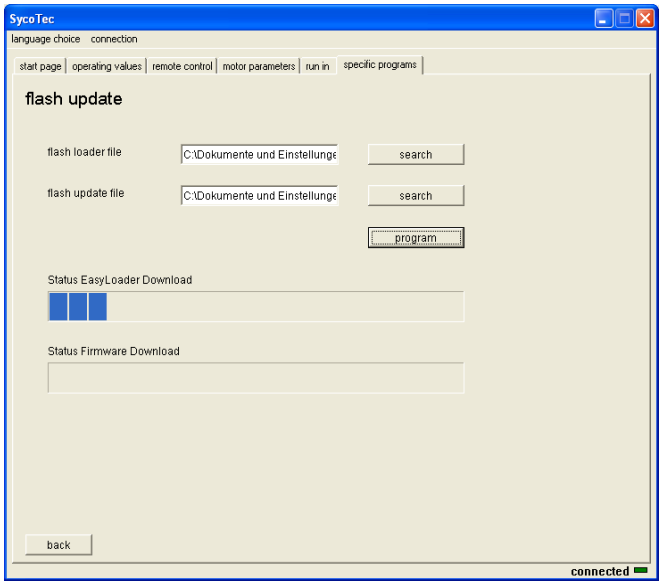
8.5 Technical Service

Various test programs for the after sales service of SycoTec are accommodated in this section.



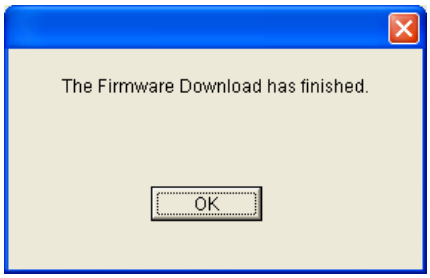


8.6 Flash Update



This procedure takes a few minutes - please do not interrupt!

After successful download following message appears on the screen:



8.7 Parameter List

This list includes all displayable and alterable parameters.

In the column "Change/Display", the following abbreviations are used:
N = not alterable
S = alterable only when motor not running
I = always alterable, even when motor running
M = display and alterability dependent on ***P90-motortype***
* = display dependent on other parameters

Par. No.	Indication in display	Description	Value range, physical value	Unit	Factory setting	Change/ Display
		Basic parameters				
P1	***N_rated***	Frequency set-value	30 - 4000	Hz	50	I
****P7***	***select operation***	Selection operation	PC application, selection	-	selective	S
P8	***speed display***	Selection Speed display	in Hz, in rpm	-	in Hz	I
		Display values				
P10	***N_rated_act***	Current frequency set point value	0...4000	Hz	-	N
P11	***I_limit_act***	Current current limit	0.5...16	A~	-	N
P13	***f_out_act***	Actual inverter frequency	0...4000	Hz	-	N
P14	***f_motor***	Actual motor frequency	0...4000	Hz	-	N
P15	***V_motor***	Output voltage	0...40	V~	-	N
P16	***V_DC_link***	Intermediate circuit voltage	0...75	V-	-	N
P18	***I_mot***	Real motor power	0...10	A~	-	N
P19	***P_real***	Real power	0...400	W	-	N
P20	***motor code***	Motor coding and motor memory	1...32	-	-	N
P25	***inverter***	Operating hours counter inverter	0...65000	h	0	N
P26	***motor***	Operating hours counter motor	0...65000	min	0	N
P30	***1st error***	Last error	-	-	0	N
P31	***2nd error***	Penultimate error	-	-	0	N
P32	***3rd error***	Third-last error	-	-	0	N
P33	***4th error***	Fourth-last error	-	-	0	N
P34	***5th error***	Fifth-last error	-	-	0	N
P36	***Inverter***	Inverter type	-	-	-	N
P37	***SW panel***	Firmware version of panel	-	-	-	N
P39	***Serialno***.	Serial number of Inverter	**-**	**-**	**-**	N
		Motor parameters / Motor operating values				
P41	***f_mot_min***	Min. motor frequency	30...100...4000	Hz	50	S M
P42	***f_mot_max***	Max. motor frequency	f_mot_nom, 100...4000	Hz	P91	S
P44	***I_limit***	Current limitation (phase current)	0.5...16	A~	1.5*P93	I
P46	***t_rise***	Ramp time for run-up	0.5...400	s	5	I
P47	***t_fall***	Ramp time for fall-down	0.5...400	s	5	I
P48	***t_stop***	Ramp time for stop	DC-brake,t_down,0.5..400	s	P47	I
****P50***	***motor start***	Start option, catch circuit	Off, main-on, always	-	always	I M
P51	***t_start***	Start time for micro step operation	without ramp, 0,5...100	s	without ramp	I M
P52	***I_start***	Start-up current micro step oper. BLDC	0,1...16	A~	0.1	I M *
P53	***f_start***	Start-up frequency micro step operation	1...30	Hz	8	S M
P54	***t_off***	Inverter switch-off time, start-up	200...1000	µs	330	S M
P55	***t_DC_brake***	DC brake time DC brake	Off, 0.1...120	s	off	I M
P56	***I_DC_brake***	DC brake current DC brake	0,1...10	A-	1	I M *
P57	***I_DC_stop***	DC stop current (at stop)	Off, 0.1...3	A-	off	I
P58	***emerg. stop***	Select emergency stop at mains failure	inactive, on at mains failure	-	inactive	I

Par. No.	Indication in display	Description	Value range, physical value	Unit	Factory setting	Change/ Display
		V/Hz characteristic (ASM motor)				
P60	***U0***	Start-up voltage at f=0	3% U_nom, 1...50	V~	3% U_nom	I M
P61	***f1***	1st characteristic point frequency	f_nom, 30...4000	Hz	f_nom	I M
P62	***U1***	1st characteristic point voltage	U_nom , 1...50	V~	U_nom	I M
P63	***f2***	2nd characteristic point frequency	f_nom, 30...4000	Hz	f_nom	I M
P64	***U2***	2nd characteristic point voltage	U_nom, 1...50	V~	U_nom	I M
P65	***f3***	3rd characteristic point frequency	f_nom, 30...4000	Hz	f_nom	I M
P66	***U3***	3rd characteristic point voltage	U_nom, 1...50	V~	U_nom	I M
		Control				
P70	***control***	Control principle speed control	V/Hz, I*R	-	V/Hz-Tab.	I M
P71	***I*R-factor***	I*R compensation gain factor	Off, 0, 1...10	V/A	off	I M *
P72	***loadcomp.***	Load compensation gain factor of,	0.1...40	%/A~	off	I M *
P73	***komp-t_filt***	I*R and load compensation. Filter time	1...1000	ms	20	I M *
P77	***I-limtr-KP***	Current limitation P-component	2...200	%	40	I
P78	***I-limtr-t_n***	Current limitation I-component reset time	1...999, without I-part	ms	2	I
P79	***V-contr-KP***	Voltage control V_WR P-component	5...100	%	20	I
P80	***V-contr-t_n***	Voltage control I-component reset time	5...999, without I-part	ms	2	I
P81	***N-contr-KP***	Speed control P-component	5...500	%	50	I
P82	***N-contr-t_n***	Speed control I-component reset time	5...999	ms	250	I
P83	***N-contr-t_v***	Speed control D-component	1...300	ms	30	I
P84	***N-contr-t_fil***	Speed control filter D-component	1...300	ms	200	I
		Monitoring				
P85	***motor protection***	Monitoring motor temperature	Off, PTC, KTY	-	PTC	I
P86	***R_protect***	Resistance value for sensor KTY	500...4000	W	1200	I *
		Rated motor data (according to rating plate)				
P90	***motortype***	Motor design	No, ASM, BLDC, BLDCS	-	no motor	S
P91	***f_mot_nom***	Rated motor frequency	30...4000	Hz	100	S
P92	***V_mot_nom***	Rated motor voltage	0...50	V~	6	S
P93	***I_mot_nom***	Rated motor current	0.5...16	A~	1.0	S
P94	***cos_phi***	Cosine phi at nominal load	20...100	%	85	S
P96	***no. of poles***	Number of poles	2, 4, 6, 8	-	2	S
		Device parameters / Ext. brake resistance				
P102	***motor coding***	Motor coding, number of motors	Off, 2...32 motors	-	off	S
		Fixed frequency				
P104	***FF1***	Fixed frequency FF1 (select with IN3,IN4)	30...4000	Hz	100	I
P105	***FF2***	Fixed frequency FF2	30...4000	Hz	100	I
P106	***FF3***	Fixed frequency FF3	30...4000	Hz	100	I
		Remote Control				
P110	***input IN1***	Function digital input IN1	Off, start/stop, stop	-	off	S
P111	***input IN2***	Function digital input IN2	Off, Start pulse, reset, left, motor code		off	S
P112	***input IN3***	Function digital input IN3	Off, reset, left, motor code	-	off	S
P113	***input IN4***	Function digital input IN4	Off, reset, left, motor code	-	off	S
P114	***input IN5***	Function digital input IN5	Off, reset, left, motor code, FF	-	off	S
P115	***input IN6***	Function digital input IN6	Off, reset, left, motor code, FF	-	off	S
P120	***relay REL1***	Function relay output REL1	Off, various status signals	-	f_rated	I
P121	***relay REL2***	Function relay output REL2	Off, various status signals	-	overload	I
P125	***I_warning***	Var. current limit for relay output	0.4...12	A~	0.4	I
P129	***choose analog AIN***	Source for analogue input AIN1	U(0...10 V), I(0...20 mA)	-	V(0...10 V)	S
P135	***f_rem_min***	Min. rated freq. of analogue input	0...4000	Hz	30	I
P136	***f_rem_max***	Max. rated freq. of analogue input	0...4000	Hz	4000	I
P137	***f_stop_analog***	Stop via analogue signal	Off,1...4000	Hz	Aus	I
P140	***input for start***	Input motor start	PC, remote control	-	AIN1	I
P141	***input for f_soll***	Input frequency setpoint	PC, AIN	-	AIN1	I
P142	***enabling FF***	Release fixed frequency	stopped, on	-	stopped	I
P146	***direction of rotation***	Direction of rotation	right, left, remote control	-	right hand	I
P150		End	End mark-	-		

8.8 Basic Parameters

P1 N_rated
Rated frequency value (speed pre-selection) for the motor (input on control panel).
By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display. The number of motor poles ***P96-no. of poles*** is taken into account. Here, only values between the min. frequency ***P41-f_mot_min*** and the max. frequency ***P42-f_mot_max*** can be set.
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: 83 Hz

P7 select operation
Selection of the source from which the inverter is to be operated with start/stop, setpoint speed value and torque limitation. The digital and analogue output values are always output independently of the setting.
Values: PC application - Operation occurs via the PC-software
Selection - The inputs for start/stop, speed value and current limitations can be selectively chosen separate over parameters ***P140...P142***
Factory setting: Selection

P8 speed display
Selection of the display for rated and actual motor speeds, in Hz or in rpm, the conversion of the frequency into the speed is performed by the following formula:
Speed = frequency*60/number of poles/2 of the motor (***P96-no. of poles***).
Values: in Hz - the display is in Hz
in rpm - the display is in rpm (revolutions per minute)
Factory setting: in Hz

8.9 Display Values

P10 N_rated_act (display value)
The valid rated speed value can originate from various sources depending on configuration (PC, remote control analogue input, remote control fixed frequency input). The currently valid value, i.e. the value transmitted to the motor control, is displayed for the user via parameter ***P10***.
By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display, the number of motor poles ***P96-no. of poles*** being taken into account.

P11 I_limit_act (display value)
The valid torque limitation may originate from ***P44-I_limit***. The currently valid value is displayed for the user via the parameter ***P11***.

P13 f_out_act (display value)
f_out_act the current output frequency of the inverter (inverter frequency).

P14 f_motor (display value)
f_motor is the current motor frequency ,is the same as the output frequency (***P13-f_out_act***).
By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display, the number of motor poles ***P96-no. of poles*** being taken into account.

P15 V_motor (display value)
V_motor is the current motor voltage between two phases.

P16 V_DC_link (display value)
V_DC_link is the current intermediate circuit voltage.

P18 I_mot (display value)
I_mot is the current real motor current in a phase.

P19 P_real (display value)
P_real is the current inverter output power, corresponding to the real power consumed by the motor.

P20 motor code (display value)
The currently used motor parameter memory M1...M32 is displayed. f the parameters from the memory have been changed, the display of the memory is not present.

P25 inverter (display value)
inverter shows the total operating hours of the device in hours.
The value is read in from the EEPROM.

P26 motor (display value)
motor shows the operating hours of the motor.
The value is read in from the EEPROM.

P30 1st error (display value)
1st error shows the error number of the last error which occurred.
The value is read in from the EEPROM.

P31 2nd error (display value)
2nd error shows the error number of the penultimate error which occurred.
The value is read in from the EEPROM.

P32 3rd error (display value)
3rd error shows the error number of the third-last error which occurred.
The value is read in from the EEPROM.

P33 4th error (display value)
4th error shows the error number of the fourth-last error which occurred.
The value is read in from the EEPROM.

P34 5th error (display value)
5th error shows the error number of the fifth-last error which occurred.
The value is read in from the EEPROM.

P36 Inverter (display value)
Inverter shows the frequency inverter type (e.g. e@syDrive "4425").

P37 SW panel (display value)
SW panel shows the version and the date of the operating firmware.

P39 Serialno. (display value)
Serialno. shows the serial-number of the frequency inverter.

8.10 Motor Operating Values

These parameter values are displayed depending on the chosen motor type. The assignment to the individual motor types is shown in square brackets.

P41 f_mot_min [ASM, -, -]
Absolutely minimum inverter frequency, set internally to 0 in the case of BLDC and BLDCS motors.
In ASM motor, serves for establishing the lower limit of the inverter frequency.
Minimum value: 30 Hz
Maximum value: 100 Hz
Factory setting: 50 Hz

P42 f_mot_max [ASM, BLDC, BLDCS]
Absolutely maximum inverter frequency. The output frequency of the inverter is limited to this value to protect the motor.
This value is set to the maximum rated frequency in the case of ASM motors; in the case of BLDC and BLDCS motors, this value should be set about 10% higher than the maximum rated frequency. In addition, this parameter must be set larger than ***P41-f_mot_min***
Specific values: ***f_mot_nom***
- ***f_mot_max*** is taken from the nominal motor frequency ***P91-f_mot_nom***
Minimum value: 101 Hz
Maximum value: 4,000 Hz
Factory setting: ***f_mot_nom*** (see ***P91***)

P44 I_limit [ASM, BLDC, BLDCS]
Limitation of phase current for normal motor running. The inverter limits the output current to ***I_limit***.
The stop current (***P57-I_DC_stop***) and, in the case of the BLDC motor, the start-up current (***P52-I_start***) are unaffected by this.
Specific values: ***1.5*I_nom***
- ***I_limit*** is set to 1.5 times the nominal motor current from ***P93-I_mot_nom***.
Minimum value: 0.5 A
Maximum value: 16 A
Factory setting: ***1.5*I_nom*** (see ***P93-I_mot_nom***)

P46 t_rise [ASM, BLDC, BLDCS]
Rise time of frequency 0 to ***P42-f_mot_max***
The rise time is effective at motor start and in the case of changes of nominal frequency. If the rise time is set too small, the motor current increases up to the current limit ***P44-I_limit***, thus automatically increasing the rise time.
Minimum value: 0.5 sec
Maximum value: 400 sec
Factory setting: 5 sec

P47 t_fall [ASM, BLDC, BLDCS]
Delay from ***P42-f_mot_max*** to frequency 0.
The delay is effective in the case of changes of nominal frequency and in the case of a motor stop only if ***P48-t_stop*** is set to ***t_fall***.
Minimum value: 0.5 sec
Maximum value: 400 sec
Factory setting: 5 sec

P48 t_stop [ASM, BLDC, BLDCS]
Stop delay time from ***P42-f_mot_max*** to frequency 0. The inverter reduces its frequency after the specified ramp, and the motor operates as a generator. The rotational energy is converted into heat in the brake resistance.
The stop time is effective only at a motor stop, after which DC braking is also performed (see ***P55-t_DC_brake*** and ***P56-I_DC_brake***).
If ***t_stop*** is set too short, the inverter limits the generator current to the value of ***P44-I_limit*** and the actual stop time of the motor automatically increases but vibrations may occur during the braking process.
Specific values: DC-brake [ASM, -, -]
- At stop, the system switches directly to DC brake, there is no generator braking and the total rotational energy is converted into heat in the rotor.

t_fall
- ***t_stop*** is set internally as the delay (***P47-t_fall***).

Minimum value: 0.5 sec
Maximum value: 400 sec
Factory setting: ***t_fall*** (see ***P47-t_fall***)

P50 Motor start [ASM]
Motor start influences the start behaviour of the ASM motors. The catch circuit prevents an overcurrent if the inverter is switched to the running motor. The inverter starts at the maximum motor frequency ***P42-f_mot_max*** and reduces its frequency until the inverter frequency has adapted to the motor frequency. This process takes not more than 1 second.
Values: Normal
-Normal motor start from the frequency ***P41-f_mot_min***, no catch circuit.
Catch at power on
- The catch circuit is active only when the inverter knows nothing about the actual motor speed, for example after power on and reset, unless a speed sensor is used. If the motor was braked via the generator brake, the next motor start takes place without a catch circuit. If the motor is braked only via the DC brake (***P48-t_stop*** = DC-brake), the catch circuit is active at every motor start.

Always catch
- Catch circuit active at every motor start

Factory setting: Normal

P51 t_start [-, BLDC, -]
Start-up time for micro step start-up in BLDC motor from 0 Hz to ***P53-f_start***.
With ***t_start*** > 0.5 sec; ***P52-I_start*** and ***P53-f_start*** must also be input.
In the case of the micro step start-up, the BLDC motor is operated as a synchronous motor with constant current (***P52-I_start***) . The output frequency is slowly increased from 0 to the start frequency (***P53-f_start***), after which the system switches to controlled motor running with e.m.f. measurement. In the case of small centrifugal masses, the start ramp can be switched off or shorter times set. In the case of larger centrifugal masses, longer times should be set.
Specific values: without ramp - micro step start-up ramp switched off
Minimum value: 0.5 sec - start up with micro step start-up ramp
Maximum value: 100 sec
Factory setting: Off

P52 I_start [-, BLDC, -]
Start-up current for micro step start-up, can be selected only if ***P51-t_start*** > 0. Low currents should be set for a soft and quiet start and higher currents for fast start and larger centrifugal masses.
Minimum value: 0.1 A
Maximum value: 16 A
Factory setting: 10 A

P53 f_start [-, BLDC, -]
Start-up frequency for micro step start-up. If ***P51-t_start*** is set to "without ramp", the motor start begins at the frequency ***f_start***; if a ramp time is set in ***P51-t_start***, the start-up begins at frequency 0 and is slowly increased up to ***f_start***. On reaching the start frequency, the micro step start-up is terminated. If the motor does not start up reliably, ***f_start*** should be increased.
Minimum value: 1 Hz
Maximum value: 30 Hz
Factory setting: 8 Hz

P54 t_off [-, BLDC, -]
Switch-off time of the inverter.
In the micro step start-up, the inverter is repeatedly switched off briefly in a cyclic manner in order to measure the e.m.f. voltage of the BLDC motor; this is used for detecting the position of the rotor at low speeds. In the case of larger inductances of the motor winding, longer times should be set.
Setting rule: If the BLDC motor starts up poorly or synchronizes poorly with the motor, longer times should be set; it may also be necessary to increase the start-up frequency in ***P53-f_start***.
Minimum value: 200 µs
Maximum value: 1,000 µs
Factory setting: 330 µs

P55 t_DC_brake [ASM, -, -]
Time for DC brake in ASM motor,
0 = no DC brake. If this parameter is set to values ∃ 0, ***P56-I_DC_brake*** should also be set.
Specific values: DC-brake off - There is no DC braking
Minimum value: 0.1 sec
Maximum value: 120 sec
Factory setting: DC-brake off

P56 I_DC_brake [ASM, -, -]
Current for DC brake in ASM motor, displayed only if ***P55-t_DC_brake*** is not set to off.
Minimum value: 0.1 A
Maximum value: 10 A
Factory setting: 1 A

P57 I_DC_stop [ASM, BLDC, BLDCS]
Stop current, this current flows in the stopped motor through 2 phases; the 3rd motor phase is current less and the motor is thus braked (ASM motor) or is kept in a defined position (BLDC or BLDCS motor).
Specific values: Off - With stopped motor, no stop current is output
Minimum value: 0.1 A
Maximum value: 3 A
Factory setting: Off

P58 emerg. stop [ASM, BLDC, BLDCS]
Parameter influences the behaviour on mains failure.
Values: Inactive
- At mains failure, the motor runs out freely and there is no braking.

On at mains off
- The motor is braked with maximum power of the brake resistance as long as the inverter can still supply itself from the motor voltage.

Factory setting: Inactive

8.11 Motor V/Hz Characteristic

The voltage/frequency table describes the key points of the motor voltage at specific frequencies for the ASM motor.
With the factory setting, characteristic points KP1...KP3 are set to the nominal frequency and the nominal voltage of the motor.

⚠ *With input from the table, the following must be noted:*

- *The frequencies must be equal or must increase in the sequence f1, f2 and f3 (**P61-f1** ≤ **P63-f2** ≤ **P65-f3**)*
- *For identical frequencies, the voltage too must be identical (if e.g. **P61-f1** = **P63-f2**, **P62-U1** must also be equal to **P64-U2**)*
- *If one of the above-mentioned conditions is infringed, a brief warning message is obtained and the value input continues and can be terminated with the ← key.*
- *In the case of nominal frequencies which are higher than the highest frequency in the table, **P66-U3** is assumed as the voltage.*
- *In the event of input difficulties, make the input in the sequence **P66...P60**.*

P60 U0 [ASM, - -]
V/HZ-characteristic: Start-up voltage at frequency zero.
The minimum frequency to be output by the inverter is specified in ***P41-f_mot_min***, and the output voltage at this frequency is calculated using the V/HZ characteristics.

Specific values:	***3%_V_nom***
	- The start-up voltage at f = 0 is set internally to the value of 3% of the rated motor voltage from ***P92-V_mot_nom***.
Minimum value:	1 V
Maximum value:	50 V
Factory setting:	***3%_V_nom***

P61 f1 [ASM, - -]
V/Hz-characteristic: Frequency of characteristic point KP1

Specific values:	***f_nom***
	- The value of the nominal motor frequency from ***P91-f_mot_nom*** is used
Minimum value:	30 Hz
Maximum value:	4,000 Hz
Factory setting:	***f_nom***

P62 U1 [ASM, - -]
V/Hz-characteristic: Voltage of characteristic point 1

Specific values:	***V_nom***
	- The value of the rated motor voltage from ***P92-V_mot_nom*** is used
Minimum value:	1 V
Maximum value:	60 V
Factory setting:	***V_nom***

P63 f2 [ASM, - -]
V/Hz-characteristic: Frequency of characteristic point KP2

Specific values:	***f_nom***
	- The value of the nominal motor frequency from ***P91-f_mot_nom*** is used
Minimum value:	30 Hz
Maximum value:	4,000 Hz
Factory setting:	***f_nom***

P64 U2 [ASM, - -]
Specific values: ***V_nom***
- The value of the rated motor voltage from ***P92-V_mot_nom*** is used
Minimum value: 1 V
Maximum value: 60 V
Factory setting: ***V_nom***

P65 f3 [ASM, - -]
V/Hz-characteristic: Frequency of characteristic point KP3
Specific values: ***f_nom***
- The value of the rated motor frequency from ***P91-f_mot_nom*** is used
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: ***f_nom***

P66 U3 [ASM, - -]
V/Hz-characterstic: Voltage of characteristic point KP3
Specific values: ***V_nom***
- The value of the rated motor voltage from ***P92-V_mot_nom*** is used
Minimum value: 1 V
Maximum value: 60 V
Factory setting: ***V_nom***

8.12 Control

P70 control [ASM, -, -]
Selection of the speed control for ASM motors
Values: V/Hz table
- Voltage control via V/Hz table, no rise
- I*R-load-comp
- I*R and load compensation, the motor voltage is adapted as a function of the load. The parameters ***P71-I*R-factor***, ***P72-loadcomp.*** and ***P73-komp-t_filt*** should be set.

Factory setting: V/Hz table

P71 I*R-factor [ASM, -, -]
Factor of the I*R compensation, the inverter output voltage is adapted as a function of the motor load. The aim of the I*R compensation is to keep the magnetic flux in the motor constant. The I*R compensation is effective in particular at low speeds or low voltages, and the speeds decrease less sharply under load.
The I*R factor corresponds to the ohmic resistance of the motor, measured between two motor cables.
ΔU = ***P71-I*R-factor*** * (***P18-I_mot*** - (***P93-I_mot_nom*** * ***P94-cos_phi***)
V_mot = U_table + ΔU
U_table corresponds to the V/Hz table voltage, calculated from the values ***P60...P66***
Specific values: Off - I*R compensation switched off
Minimum value: 0.1 V/A (slight rise)
Maximum value: 10 V/A
Factory setting: Off

P72 loadcomp. [ASM, -, -]
Factor of the load compensation, the inverter output voltage is adapted as a function of the motor load. With the load compensation, it is possible to ensure that the motor consumes only little current during idling (little heating up) but that the magnetization current is appropriately increased under load. This makes it possible to reduce the heating up of the motor, and the speed decrease in the load is smaller. The load compensation is applied in particular at medium and high speeds or voltages and supplements the I*R compensation.
ΔU = U_table * ***P72-loadcomp.*** * (***P18-I_mot*** - (***P93-I_mot_nom*** * ***P94-cos_phi***)
V_mot = U table + ΔU
U_table corresponds to the V/Hz table voltage, calculated from the values P60...P66
Specific values: Off - Load compensation switched off
Minimum value: 0.1%/A (slight rise)
Maximum value: 40%/A (very sharp rise)
Factory setting: Off

P73 komp-t_filt [ASM, -, -]
Filter time of the I*R and load compensation.
This makes it possible to influence the rapidity of the I*R and load compensation. If the motor tends to vibrate under load, higher values should be set.
Minimum value: 1 ms
Maximum value: 1,000 ms
Factory setting: 20 ms

P77 I-limtr-KP [ASM, BLDC, BLDCS]
Only in special cases should this parameter be changed from the factory setting.
P77-I-limtr-KP influences the control (PI) for the motor current limitation, it being possible to set the gain (proportional part) here.
Minimum value: 2%
Maximum value: 200%
Factory setting: 40%

P78 I-limtr-t_n [ASM, BLDC, BLDCS]
Only in special cases should this parameter be changed from the factory setting.
P78-I-limtr-t_n influences the control (PI) for the motor current limitation, it being possible to set the reset time (I-part) here. Longer times make the control slower. If the times are too short, the current control tends to oscillate.
Specific values: Without I-part - I-part is switched off
Minimum value: 1 ms
Maximum value: 999 ms
Factory setting: 2 ms

P79 V-contr-KP [ASM, BLDC, BLDCS]
Only in special cases should this parameter be changed from the factory setting.
P79-V-contr-KP influences the control (PI) for the internal intermediate circuit voltage, it being possible to set the gain (proportional part) here. The motor voltage is generated from the intermediate circuit voltage by the inverter.
Minimum value: 5%
Maximum value: 100%
Factory setting: 20%

P80 V-contr-t_n [ASM, BLDC, BLDCS]
Only in special cases should this parameter be changed from the factory setting.
P80-V-contr-t_n influences the control (PI) for the internal intermediate circuit voltage, it being possible to set the reset time (integral part) here. Longer times make the control slower.
Specific values: Without I-part - I-part is switched off
Minimum value: 1 ms
Maximum value: 1,000 ms
Factory setting: 2 ms

P81 N-contr-KP [ASM, BLDC, BLDCS]
This parameter influences the control (PID) for the motor speed (proportional part).
Minimum value: 5%
Maximum value: 500%
Factory setting: 50%

P82 N-contr-t_n [ASM, BLDC, BLDCS]
This parameter influences the control (PID) for the motor speed, it being possible to set the reset time (integral part) here. Shorter times make the control faster and longer times make it slower.
Specific values: Without I-part - I-part is switched off
Minimum value: 5 ms
Maximum value: 999 ms
Factory setting: 200 ms

P83 N-contr-t_v [ASM, BLDC, BLDCS]
This parameter influences the control (PID) for the motor speed, it being possible to set the derivative time (D-part) here. Longer times make the control faster and shorter times make it slower.
Specific values: Without D-part - D-part switched off
Minimum value: 1 ms
Maximum value: 300 ms
Factory setting: 8 ms

P84 N-contr-t_fil [ASM, BLDC, BLDCS]
This parameter influences the control (PID) for the motor speed, it being possible to set the filter before the D-part here. The filter makes the D-part smoother and slightly slower. In the case of longer times, the tendency of the D-part to oscillate is damped.
Minimum value: 1 ms
Maximum value: 300 ms
Factory setting: 50 ms

8.13 Monitoring

P85 motor protection [ASM, BLDC, BLDCS]
The temperature of the motor can be monitored with various sensors, and the sensor type should be set here.
Values: ***no sensor***
- There is no temperature monitoring of the motors

PTC
- Positive temperature coefficient sensor (according to DIN 44081) with fixed switching thresh olds, the cut-out temperature is determined by the sensor itself.

KTY
- Analogue semiconductor sensor, the switching threshold can be set with ***P86-R_protect***

Factory setting: ***no sensor***

P86 R_protect [ASM, BLDC, BLDCS]
Resistance value of the KTY sensor at the cut-out point, selectable only if ***P85-motor protection*** is set to KTY.
Minimum value: 500 Ω
Maximum value: 4,000 Ω
Factory setting: 1,200 Ω

8.14 Rated Motor Data

*In this section, the nominal data of the connected motor should be input, this **MUST do before** adjustment the other motor parameter.*

The nominal data are shown on the rating plate or the data sheet.

P90 motortype [ASM, BLDC, BLDCS]
Input of motor design.
Values: ***no motor*** - no motor defined
ASM - three-phase asynchronous motor
BLDC - brushless DC motor without sensors
BLDCS - brushless DC motor with sensors (not in series version)
Test operation
Factory setting: ***no motor***

P91 f_mot_nom [ASM, BLDC, BLDCS]
Nominal motor frequency according to rating plate in Hertz.
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: 100 Hz

P92 V_mot_nom [ASM, BLDC, BLDCS]
Rated motor voltage according to rating plate.
Minimum value: 0 V
Maximum value: 50 V
Factory setting: 6 V

P93 I_mot_nom [ASM, BLDC, BLDCS]
Rated motor current (apparent current in one phase) according to rating plate.
Minimum value: 0.5 A
Maximum value: 10 A
Factory setting: 1.0 A

P94 cos_phi [ASM, BLDC, BLDCS]
Motor power factor cos phi according to rating plate.
Minimum value: 20%
Maximum value: 100%
Factory setting: 85%

P96 no. of poles [ASM, BLDC, BLDCS]
Number of poles in the motor. This parameter is used for speed display in rpm.

Note that the number of poles and not the number of pole pairs should be input here.

Minimum value: 2 poles
Maximum value: 8 poles
Factory setting: 2 poles

8.15 Device Parameters, Remote Control

P102 motor coding
By means of this parameter, the motor coding is switched on and the number of motors used is input (see chapter 4.5 Motor coding).
Only the actually selected motor parameters sets M1...M32 will be analyzed.

P104 FF1
Value of the fixed frequency FF1 which can be selected via the remote control.
By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display, the number of motor poles ***P96-no. of poles*** being taken into account.
Minimum value: 50 Hz
Maximum value: 4,000 Hz
Factory setting: 100 Hz

P105 FF2
Value of fixed frequency FF 2
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: 100 Hz

P106 FF3
Value of fixed frequency FF3
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: 100 Hz

P110 input IN1
Function of the digital input IN1

Values:	Description
Off	Input has no function
/Stop	(24 V = Start release, 0 V = Stop, for Start is ***P111-input IN2*** to be configured to start impulse
Start/Stop	24 V = Start, 0 V = Stop

P111 input IN2
Function of the digital input IN2

Values:	Description:
Off	Input has no function
Counter-clockwise	CCW rotation (24 V = CCW)
Reset	Reset (pulse at 24 V = trigger reset)
Start impulse	An impulse of +24 V starts the inverter, after which the input can return to 0 V, whereby the inverter remains in the start condition. To stop, configure input IN1 with ***P110-input IN1*** to "Stop", and bring it to 0 V
Motor coding	Frees up the input for the motor coding, the input has the value Bit4

P112 input IN3
Function of the digital input IN3

Values:	Description:
Off	Input has no function
Counter-clockwise	CCW rotation (24 V = CCW)
Reset	Reset (pulse at 24 V = trigger reset)
Motor coding	Frees up the input for the motor coding, the input has the value Bit0

P113 input IN4

Function of the digital input IN4

Values:	Description:
Off	Input has no function
Counter-clockwise	CCW rotation (24 V = CCW)
Reset	Reset (pulse at 24 V = trigger reset)
Motor coding	Frees up the input for the motor coding, the input has the value Bit1

P114 input IN5

Function of the digital input IN5

Values:	Description:
Off	Input has no function
Counter-clockwise	CCW rotation (24 V = CCW)
Reset	Reset (pulse at 24 V = trigger reset)
Motor coding	Frees up the input for the motor coding, the input has the value Bit2
Fixed frequency	Frees up the input for the choice of the fixed frequency, the input has the value Bit1

P115 input IN6

Function of the digital input IN6

Values:	Description:
Off	Input has no function
Counter-clockwise	CCW rotation (24 V = CCW)
Reset	Reset (pulse at 24 V = trigger reset)
Motor coding	Frees up the input for the motor coding, the input has the value Bit3
Fixed frequency	Frees up the input for the choice of the fixed frequency, the input has the value Bit0

P120 relay REL1

Output value of relay REL1

Values:

Off:
- No function, relay is in opened state.

Operation:
- The inverter is ready for operation, the motor can be started.

Warning:
- The inverter is in warning state, the motor can be started.

Failure:
- The inverter is in the error state, the motor cannot be started and a reset is required.

Overload:
- The motor current has reached the current limit. (***P44-I_limit***, -10% hysteresis).

N_rated reached:
- The actual speed of the motor has reached the rated speed (***P14-f_motor*** = ***P10-N_rated_act***, ±10% hysteresis).

Current limit:
- The real motor current is higher than the current warning threshold (***P18-I_mot*** >= ***P125-I_warning***, 10% hysteresis).

Motor temperature:
- The temperature sensor in the motor indicates that the temperature is too high (see ***P85-motorprotection*** and ***P86-R_protect***).

Motor stands:
- The motor is stationary, depending on motor type. The ASM motor: if a speed sensor is present, this signal becomes active after the end of the braking process, consisting of generator brake and DC brake (see ***P48-t_stop*** and ***P55-t_DC_brake***). After the inverter has been switched on or after a reset, the motor stands signal is inactive.
  BLDC motor: The signal becomes active if the actual motor stoppage is detected from the e.m.f. voltage.

Motor runs:
- This is the inverted motor stands signal.

Factory setting: ***N_rated reached***

P121 relay REL2
Output value of relay REL2.
Values: - see parameter ***P120-relay REL1***
Factory setting: overload

P125 I_warning
Value of the variable current limit for the relay output, this can be used for detecting a specific motor load, a relay output (***P120-relay REL1... P121*** - ***Relais REL2***) must be configured with the current limit function for this purpose. The value has no effect on the current limitation.
Minimum value: 0.4 A
Maximum value: 8 A
Factory setting: 0.4 A

P129 choose analog AIN
Selection of the source for AIN1
Value: U(0 - 10 V)
- PLC-compatible 0 - 10 V
I(0 - 20 mA)
- PLC-compatible 0 - 20 mA

Factory setting: U(0 - 10 V)

P135 f_rem_min
Minimum rated frequency for analogue rated frequency default AIN1 at V_e = 0 V respect. I_e = 0 mA. This parameter is evaluated only if ***P129-Auswahl Analog AIN*** is configured for rated frequency.
By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display, the number of poles of the motor ***P96-no. of poles*** being taken into account.
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: 30 Hz

P136 f_rem_max
Maximum rated frequency for analogue rated frequency default AIN1 at V_e = 10 V respect. I_e = 20 mA. This parameter is evaluated only if ***P129-Auswahl Analog AIN*** is configured for rated frequency.
By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display, the number of poles of the motor ***P96-no. of poles*** being taken into account.
Minimum value: 30 Hz
Maximum value: 4,000 Hz
Factory setting: 4,000 Hz

P137 f_stop_analog
Stop frequency from analogue rated frequency signal; this makes it possible to achieve an automatic motor stop with counter-clockwise rotation of the nominal value potentiometer or analogue voltage 0 V. The motor is automatically stopped if the rated frequency default at analogue input AIN1 falls below the value of this parameter. By means of parameter ***P8-speed display***, this parameter can be changed from frequency display to speed display, the number of poles of the motor ***P96-no. of poles*** being taken into account. In this context, also see the parameter ***P135-f_rem_min*** and ***P136-f_rem_max***.

Special values:	Off - no automatic stop f_mot_min - the value from ***P41-f_mot_min*** is used
Minimum value:	30 Hz
Maximum value:	4,000 Hz
Factory setting:	Off

P140 input for start
With this, the input for the motor start is determined. This parameter is displayed and evaluated only when P7- Operational Mode is set to Selection.

Value:	PC application	- Start/stop is implemented via the control panel (start, nominal values)
	Remote control	- Start/stop is implemented via inputs IN1 and IN2 of the remote control, see ***P110-input IN1*** and ***P111-input IN2***.
Factory setting:	Remote control	

P141 input for f_soll
With this, the input for the frequency nominal value is determined. This parameter is displayed and evaluated only when ***P7-select operation*** is set to "Selection". Via ***P142-enabling FF***, alternative fixed frequency nominal values - so-called fixed frequencies - can be activated. The method is clearly described in chapter 4.6

Value:	PC application	- The value of the control panel in ***P1–N_rated*** is used as the frequency value
	AIN	- The frequency value is calculated from the voltage at the analogue input AIN. The frequency limits are set via parameters ***P135-f_rem_min*** and ***P136-f_rem_max***. The calculated value can be seen in ***P10-N_rated _act***.
Factory setting:	AIN	

P142 enabling FF
With this, the fixed frequencies are made available. This parameter is displayed and evaluated only when ***P7-select operation*** is set to "Selection". The method is clearly described in chapter 4.6.

Value:	Blocked	- The fixed frequencies are blocked. The nominal value load is effected from the input indicated in ***P141-input for f_soll***.
	On	- The fixed frequencies are available. The choice of which frequency is to be used as the nominal value is implemented via the digital inputs IN5 und IN6. The fixed frequencies themselves are stored in the parameters ***P104-FF1*** to ***P106-FF3***. The current value can be seen in ***P10-N_rated_act***.
Factory setting:	Blocked	

P146 direction of rotation
Here the rotational direction of the motor is determined. Alternatively, a digital control input for switching the direction of rotation can be used.

Value:	Clockwise	- Rotation to the right
	Counter-clockwise	- Rotation to the left
	Remote control	- The direction of rotation is provided by a control input of the remote control. So that the input can function as a switchover, one of the parameters from ***P111-input IN2*** to ***P115-input IN6*** has to be set to counter-clockwise.
Factory setting:	Clockwise rotation	

P150 End (Display value)
Last parameter number, serving as the end mark.

9.0 Malfunctions / Troubleshooting

If the LED H5 (yellow) flashes as a warning, the motor can continue to run. If a fault is detected, LED H5 will flash and the motor will be stopped.
Applicable to both types of errors:

** The number of flashes corresponds to the warning or fault number.*
(This applies only to fault/warning numbers up to 9).

To release the error condition, a reset must be triggered (either via the PC or a remote control reset), With a reset, a complete initialization of the unit will be set in motion. If the error continues to exist, the error display will re-appear.

The last five error messages are stored in the parameters ***P30-1st error*** to ***P34-5th error***. Warning messages are not taken into account here – thereby allowing the fault history to be tracked.

9.1 Hold Function

At the time of occurrence of the error, all display values are stored.
As long as the error condition exists, all values from the Hold memory will be displayed in the window display values (see chapter 7.1).
A fault symbol appears in the PC.
The Hold function allows, retrospectively, the determination of the operating point which led to the error condition being triggered.

After resetting, the Hold display and all values in the Hold memory are deleted
=> new start of unit and operating.

9.2 Faults and Warnings

*01 E - Motor current too high, Inverter limit exceeded
*02 W - No motor in parameter - ***P90-motortype*** configured
*03 E - Earth leakage in motor or supply wire
*04 E - Inverter cooling-chamber temperature too high
*05 E - Fault in rectifier during self-test
*06 E - Rectifier overload

10 W - Current limitation active - Warning
11 WE - Motor temperature too high
12 E - Motor current in generator drive too high, inverter limit exceeded
13 E - Rectifier intermediate circuit voltage V_WR too high
14 WE - Input supply voltage too low
15 E - Input supply voltage too high
16 E - Peak current fault in rectifier
17 E - Peak current fault in DC-converter
18 E - Nominal speed limit active
19 W - Emergency motor-stop active, mains voltage insufficient
20 W - Remote control analogue input AIN voltage greater than 11V or 0.22A
22 W - Remote control voltage output FB-+24V short-circuit (voltage less than 18V)
23 W - Remote control voltage output FB-+7V short-circuit (voltage less than 5.5V)
24 W - Invalid code for motor coding
25 W - Motor coding changed while motor running
26 W - Unused motor parameter memory for motor coding
42 E - Flash program memory faulty
43 E - EEPROM faulty in self-test (data memory)
45 W - Watchdog reset on motor control
47 E - Motor type from P90-motortype (still) not supported
52 E - Fault in DC-converter during self-test
53 E - Short circuit or earth leakage in DC-converter
55 W - Offset in current measuring cicuit (I_wr) too large in self-test
56 W - Offset in current measuring cicuit (I_wr_neg) too large in self-test
57 W - Actual motor speed too high
58 W - BLDC-Motor does not start
63 W - Error while loading a parameter from the EEPROM data memory
64 W - Error while loading a calibration value from EEPROM data memory

9.3 Description of All Errors and Warnings

W = Warning message, frequency inverter still ready for operation
E= Error message, serious fault, frequency inverter not ready for operation, a reset must be triggered

F = Fault / **C** = Cause / **R** = Remedy

F • 1 E Warning. Motor current has reached the current limit (*P44-I_limit*)
C • Motor too highly loaded, rise time ***P46-t_rise*** too short, start-up current ***P52-I_start*** too large
R • Reduce load, adapt parameter

F • 2 W No motor defined
C • Parameter ***P90-motortype*** set to "no motor"
R • Set parameter ***P90-motortype***, presumably the frequency inverter is still not configured

F • 3 E Earth leakage in motor
C • Short circuit in motor or supply wire
R • Change or repair the motor. Check supply wire

F • 4 E Temperature monitoring Inverter
C • Frequency inverter overloaded, cooling unsufficient
R • Reduce load, check output currents

F • 5 E Fault in rectifier during self-test
C • Performance-component failure
R • Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 6 E Rectifier overload
C • Performance-component failure. Fault in motor, or motor supply wire
R • Exchange motor or supply wire. Switch on and off several times. If the fault still exists, send in frequency inverter for repair.
F • 10 W Inverter output current - too large
C • Motor current too high, overload
R • Reduce load, check parameter ***P44-I_limit***

F • 11 E Temperature monitoring Motor
C • Motor too hot, possibly sensor cable broken
R • Cool motor reduce load, test sensor and check ***P85-motor protection*** and ***P86-R_protect***

F • 12 E Inverter overcurrent protection - Generator operation
C • Generator current too high
R • Increase ramp times ***P47-t_fall*** or ***P48-t_stop***, if necessary activate catch circuit (***P50-motor start***)

F • 13 E Voltage monitoring - Intermediate circuit voltage
C • ASM motor fall time too short
R • Adapt parameter ***P47-t_fall***

F • 14 E Monitoring - Mains undervoltage
C • Mains voltage too low
R • Test mains voltage, test mains connection

F • 15 E Monitoring - Mains overvoltage
C • Mains voltage too high
R • Test mains voltage, test mains connection

F • 16 E Overcurrent protection in inverter (peak current)
C • Inverter overloaded, motor short-circuit or earth fault
R • Reduce load, check motor and supply cable for short-circuit and earth fault

F • 17 E Peak current fault in DC-converter
C • Performance-component failure
R • Check wiring. Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 18 E Nominal speed limit active
The internal nominal speed of the motor control is limited to the maximum inverter frequency ***P42-f_mot_max***
C • ***P1-N_rated*** or rated value of analogue input too high
R • Check rated parameter value ***P1-N_rated***, frequency limits for rated value for remote control ***P135-f_rem_min*** and ***P136-f_rem max*** and fixed frequencies ***P104...P106***, for checking the current rated value ***P10-N_rated_act***

F • 19 W Motor emergency stop is activated
C • Mains voltage interruption or mains input voltage too low.
R • Stop motor and start again on control panel, check parameter ***P58-emerg. stop***, check mains voltage

F • 20 W Input voltage at AIN is higher than 11 volt
C • Input voltage too high
R • Reduce voltage, check wiring

F • 22 W Remote control voltage output FP-+24V short-circuit (voltage less than 18V)
C • Performance-component failure
R • Check wiring. Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 23 W Remote control voltage output FP-+7V short-circuit (voltage less than 5.5V)
C • Performance-component failure
R • Check wiring. Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 24 W Inadmissible code for motor coding
C • Motor coding input set to a higher code number than motors configured in ***P102-motor coding***, e.g. coding input is 4 and only 3 motors configured in ***P102***
R • Check signal values at X7 (also see ***P20-motor code***) or parameter ***P102-motor coding***

F • 25 W Motor coding changed while motor running
C • Motor coding input at X7 changed while motor running
R • Check signal values at X7, they may not change while the motor is running (also see ***P20-motor code***)

F • 26 W Unused motor parameter memory for motor coding
C • The value at motor coding input X7 indicates an empty parameter memory ***M1...M32***
R • Check signal values at X7 (also see ***P20-motor code***) or store parameter for corresponding motor

F • 42 E Flash program memory faulty
C • Hardware failure
R • Switch on and off several times. If the fault still exists, send in frequency inverter for repair: motor can still be operated.

F • 43 E EEPROM faulty in self-test (data memory)
C • Hardware failure
R • Switch on and off several times. If the fault still exists, send in frequency inverter for repair: motor can still be operated.

F • 45 W Watchdog reset on motor control
C • Strong EMC interference on motor control circuit board
R • Warning indication is automatically reset after 10 seconds and motor continues to run

F • 47 E Motor type from P90-motortype not supported
C • Parameter ***P90-motortype*** configured incorrectly
R • **Check the software and firmware versions.** Set parameter ***P90-motortype***.

F • 52 E Fault in DC-converter during self-test
C • Performance-component failure
R • Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 53 E Short circuit or earth leakage in DC-converter
C • Performance-component failure
R • Check wiring. Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 55 W Offset in current measuring circuit (I_wr) too large in self-test
C • Internal failure
R • Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 56 W Offset in current measuring circuit (I_wr_neg) too large in self-test
C • Internal failure
R • Switch on and off several times. If the fault still exists, send in frequency inverter for repair.

F • 57 W Actual motor speed too high
C • Actual speed lies 10% over nominal speed. Motor cannot follow the nominal speed. Motor externally driven
R • Set the nominal speed at a lower level

F • 58 E BLDC motor does not start
C • Despite several attempts, the motor does not start
R • Check motor and supply lines. Adjust ***P46-t_rise***, ***P51-t_start***, ***P52-I_start***

F • 63 W Fault while loading the parameter from the EEPROM data bank
C • Reading/writing fault in EEPROM
R • Reset EEPROM via special programs/factory setting

F • 64 W Fault while loading the calibration value from the EEPROM data bank
C • Reading/writing fault in EEPROM
R • Reset EEPROM via special programs/factory setting

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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