# Frequency Inverter

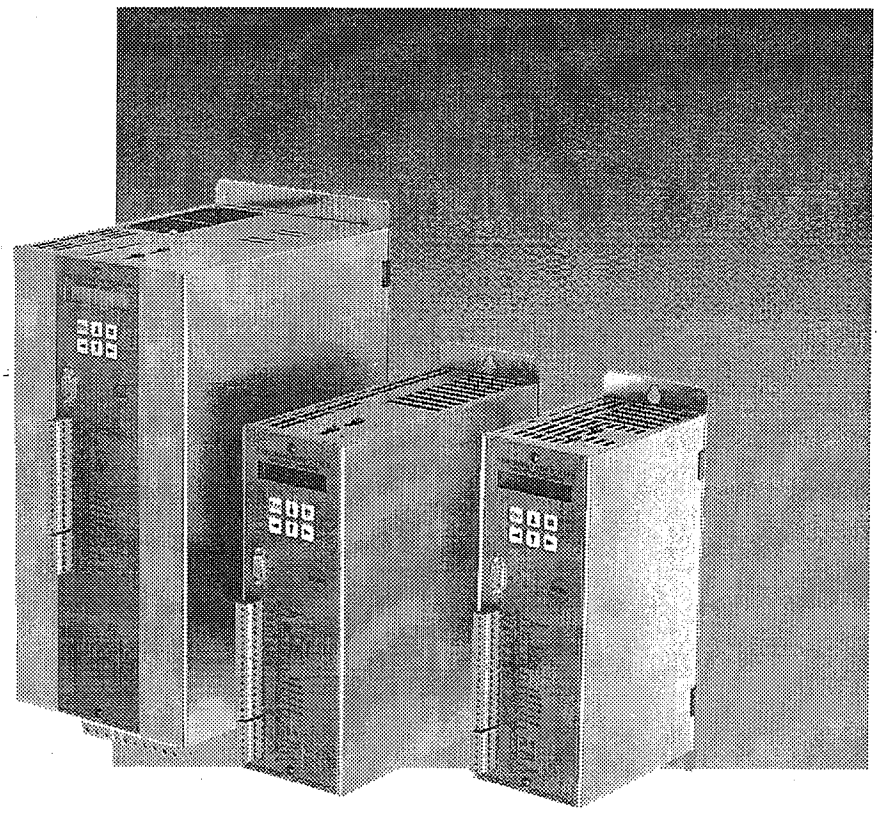
## FBS / FDS Series

Software version 4.1 / 3... series

Product manual

**Important: Please read this manual prior to commissioning and observe the instructions at all times!**

STÖBER QUALITY SYSTEM



4.1

STÖBER

# 1. Safety Instructions

STÖBER ANTRIEBSTECHNIK

# 1. Safety Instructions

## STÖBER ANTRIEBSTECHNIK

**Before installing and commissioning the frequency inverters, please read all the installation and operating instructions carefully so as to avoid problems during installation and commissioning.**

The FBS/FDS series frequency inverters constitute power electronics equipment for regulating the energy flow in high-voltage systems within the meaning of VDE 0160. They are intended for use solely to feed and control three-phase AC asynchronous motors. They may only be handled, fitted, operated and serviced in accordance with the applicable and/or legal provisions and regulations and this technical documentation.

**The operator must ensure that these regulations are strictly adhered to.**

The operator must adhere to the safety instructions and information given in other sections or paragraphs.

**Caution: High contact voltage! Danger of shocks! Danger of death!**

The operator may not open the frequency inverter for reasons of safety. The guarantee will also be invalidated if the frequency inverter is opened by the operator. The inverter drive must be properly designed and installed in order for the frequency inverter to operate properly.

**Pay particular attention to the following:**

Permissible enclosure; protective grounding; may not be operated without a properly connected PE conductor.

Disconnect the inverter from the mains supply before performing any installation work. When working on the drive, not only block the enabling function but disconnect the whole drive from the mains supply. (Note the 5 safety rules)

Allow the capacitor to discharge for > 5 minutes after disconnecting from the supply.

Do not allow instruments of any nature whatsoever to come into contact with the inside of the inverter.

When performing installation or other work in the switch cabinet, protect the unit from falling objects (e.g. pieces of wire, braids, metal objects etc.). Metal objects inside the frequency inverter can cause a short circuit.

Before commissioning the frequency inverter, remove any extra covers so as to prevent the appliance from overheating.

**STÖBER ANTRIEBSTECHNIK will accept no liability for damage arising as a result of non-observance of the instructions or the corresponding regulations.**

| Size | Size 1 / BG I | | | | Size 2 / BG II | | | Size 3 / BG III | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | FBS 3008/B | FBS 3013/B | FDS 3014/B | FDS 3024/B | FDS 3040/B | FDS 3070/B | FDS 3085/B | FDS 3110/B | FDS 3150/B | FDS 3220/B |
| Recommended motor power [1] | 0.37kW | 0.75kW | 0.75kW | 1.5kW | 2.2kW | 4.0kW | 5.5kW | 7.5kW | 11kW | 15kW |
| Rated current $I_N$ S1 duty | 3 x 2.1A | 3 x 3.5A | 3 x 2.1A | 3 x 3.5A | 3 x 5.5A | 3 x 10.0A | 3 x 12.0A | 3 x 16A | 3 x 22A | 3 x 32A |
| Supply voltage | (L1-N) 1 x 230V +20%/-50% 50/60 Hz | | (L1-L3) 3 x 400V +28%/-50% 50/60 Hz | | | | | | | |
| Line fuses | 1 x 6.0 AT | 1 x 10 AT | 3 x 6.0 AT | | 3 x 10 AT | 3 x 16 AT | 3 x 20 AT | 3 x 25 AT | 3 x 35 AT | 3 x 50 AT |
| Output voltage | 3 x 0V up to supply voltage | | | | | | | | | |
| Output frequency | 0 to 200Hz / resolution 0.01Hz | | | | | | | | | |
| Imax | 200% / 2s, 150% / 30s | | | | | | | | | |
| Switching frequency | 4kHz (adjustable up to 16kHz with derating) | | | | | | | | | |
| Braking resistor | > = 100 Ω; max 1.8KW | | > = 200 Ω; max 3.2KW | | > = 100 Ω; max 6.4KW | | | > = 30 Ω; max 21KW | | |
| RFI suppression [2] | Integral input filter for compliance with emission limits to EN 55011 (class A + B limits - residential and industrial environments) | | | | | | | | | |
| Interference immunity | EN 61000-4, -2, -4, -5 (residential and industrial environments) | | | | | | | | | |
| Permissible motor cable length (shielded) | 30m, longer cable runs with output choke | | | | | | | | | |
| Ambient temperature | 0... + 45°C | | | | | | | | | |
| Power losses | 36W | 53W | 50W | 77W | 88W | 150W | 180W | 220W | 290W | 420W |
| Enclosure | IP 20 | | | | | | | | | |
| Dimensions WxHxD (mm) | 98 x 300 x 176 | | | | 98 x 300 x 268 | | | 186 x 410 x 268 | | |
| Wire cross-section ($mm^2$) Power connections | max. 2.5 | | | | max. 4.0 | | | max. 10.0 | | |
| Weight (kg) | 3.2 | | | | 4.9 | | | 12.3 | 12.5 | 12.8 |

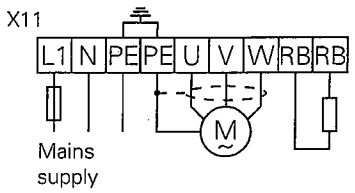
[1] Data are for rated supply voltage, switching frequency 4kHz, 4-pole asynchronous motor, shielded motor cable, 30m
[2] Switching frequency 4kHz, shielded motor cable, connected to frame at both ends

# 3. Dimension drawing
# 4. EMC compliant installation

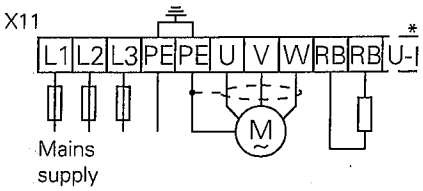


| Power stage X11 | Terminal designation FBS | Terminal designation FDS | Function / Wiring |
|---|---|---|---|
| | – | L1 | Connection to the AC supply:<br>**FBS**<br>L1 - N: 1 x 230V +20% / -50% 50/60Hz<br><br>**FDS**<br>L1 - L3: 3 x 400 V +28 % / - 50 % 50/60 Hz |
| | L1 | L2 | |
| | N | L3 | |
| | PE | | protective earth conductor mains supply |
| | PE | | protective earth conductor motor / shield motor cable |
| | U | | Motor connection U, V, W<br>Observe order |
| | V | | |
| | W | | |
| | R1 or RB | | Ext. brak. resistor connection — DC link potential (+) |
| | R2 or RB | | |
| | U- | | DC link potential (-) |

Single-phase connection **(FBS)**




Three-phase connection **(FDS)**

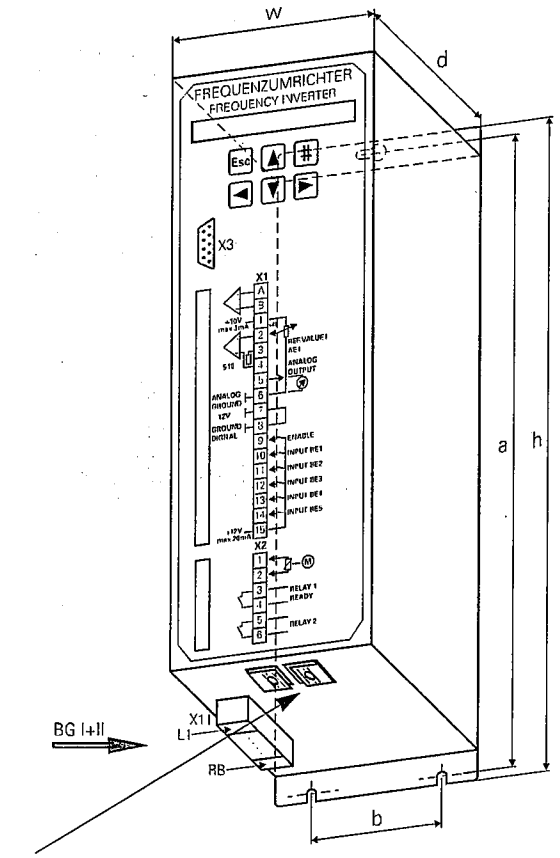



* Terminal U- as alternative to DC link connection

Note: Units with brought out DC link are available on request

| Dimensions in mm | | | Size I | Size II | Size III |
|---|---|---|---|---|---|
| Frequency inverter Base plate | Height | h | 300 | 300 | 410 |
| | Width | w | 98 | 98 | 186 |
| | Depth * | d | 176 | 268 | 268 |
| Base plate Mounting holes | vertical | a | 280 | 280 | 387 |
| | horizontal | b | 70 | 70 | 150 |
| Min. clearance to adjacent units | above / below | | min. 100 | | |
| Screws | | | M5 | | |

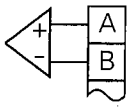
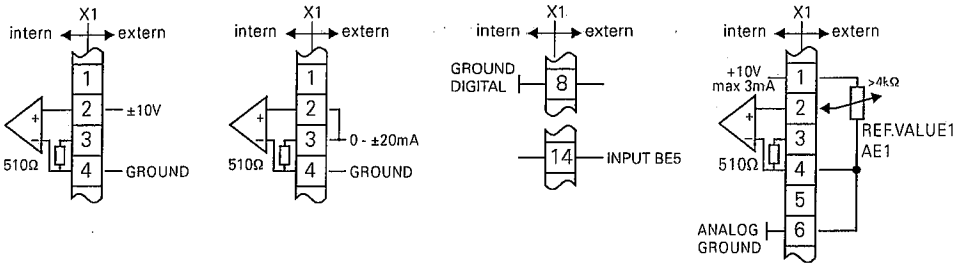
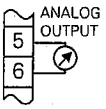
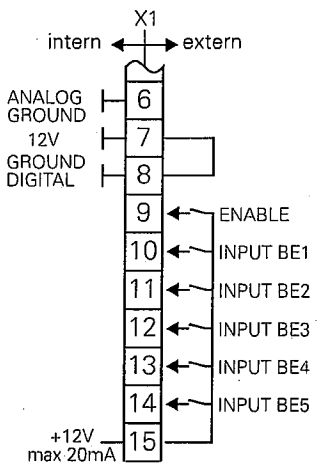
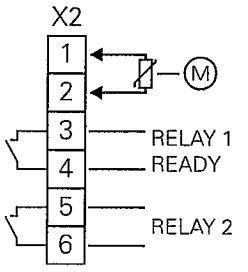
* Unit depth incl. connector




| 4. EMC-compliant installation | |
|---|---|
| Basic rules: | - Control cables and power cables (motor cable, power supply cable) must be run separately from each other.<br>- Power and motor cables must also be segregated from each other<br>- Central grounding point close by the inverter. This is where all the shields and protective earth conductors of motor and power cables are connected over as large an area as possible. |
| Ref. value lead | - Shielded<br>- Shield connected with ref. value source (PLC, controller...) ground reference at one side.<br>- Use twisted lead. |
| Motor cable | - Shielded cables to comply with cl. A+B DIN EN55011<br>- Connect shield at both ends<br>- For cable lengths > 30m always use motor choke. |

# 5. Terminal assignment

STÖBER ANTRIEBSTECHNIK

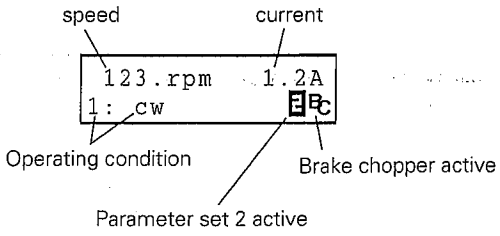
| | Term. | Function | Wiring |
|---|---|---|---|
| Control terminal block X1 | A (+) | analog input 2<br>0 - max ±10V DC | Functions programmable in **F20**  |
| | B (-) | Ri = 25kW, 10bit+Sign<br>$T_a$ = 4ms | |
| | 1 | internal supply<br>+10V ±5%, max 3mA | *external voltage* / *external current* / *external frequency* / *potentiometer*  |
| | 2 | analog inp. 1 voltg.<br>0 - max ±10VDC<br>Ri = 25kΩ, 10bit+Sign<br>$T_a$ = 4ms | |
| | 3 | analog inp. current<br>0 - ±20mA<br>Ri = 510Ω, 10bit+Sign | |
| | 4 | reference potential<br>analog input 1 | |
| | 5 | analog output<br>±10V, Ri = 1kΩ<br>10bit+Sign, $T_a$ = 32ms | Functions programmable in **F40**  |
| | 6 | analog ground | reference potential for terminals A, B and X1.1 to X1.5 |
| | 7 | ground 12V | reference potential for terminals X1.15 |
| | 8 | digital ground | reference potential for inputs X1.9 - X1.14 |
| | 9 | enable $T_a$ = 4ms | enable power stage |
| | 10 | input BE 1<br>** 8: Stop*<br>$T_a$ = 4ms | Freely programmable inputs.<br>Function is selected via parameters **F31** to **F35**.<br><br>* Inverter default setting |
| | 11 | input BE 2<br>** 6: Direction of rotation*<br>$T_a$ = 4ms | |
| | 12 | input BE 3<br>** 1: RV select0*<br>$T_a$ = 4ms | |
| | 13 | input BE 4<br>** 2: RV select1*<br>$T_a$ = 4ms | |
| | 14 | input BE 5<br>** 0: inactive*<br>$T_a$ = 4ms | |
| | 15 | internal supply<br>12V, 20mA | can be used to control binary inputs X1.9 - X1.14.<br>To do this jumper the ground reference of the digital inputs (X1.8) and the ground 12V (X1.7). |
| | | | L level:<br>< +8V<br><br>H level:<br>> +12V<br><br>voltage limits:<br>-10V<br>+32 V<br><br>immunity<br>EN 61000-4<br><br>Ri = 2.3kΩ  |
| Terminal block X2 | 1 | motor<br>- thermistors | Electrically isolated tripping unit for the protection of the motors against overheating, suitable for the connection of one to six thermistors;<br>If a motor is operated without thermistor, terminals X2.1 - X2.2 must be jumpered. |
| | 2 | | |
| | 3 | relay 1<br>max 6A / 250VAC<br>6A / 30V=ohm. load<br>1A / 30V=ind. load,<br>L/R = 40ms<br>switching time 10ms<br>$T_a$ = 32ms | Indicates that the inverter is ready for operation (= relay closed).<br><br>Function programmable in **F10**. |
| | 4 | | |
| | 5 | relay 2<br>same technical data as relay 1<br>$T_a$ = 32ms | Additional relay output.<br>Function programmable in **F00**. |
| | 6 | | |
| | | | If a not purely ohmic load is connected, the relay contacts must be provided with an appropriate protective circuit arrangement.  |

**Note:** $T_a$ = sampling time

## 6 OPERATION AND PROGRAMMING

### 6.1 STATUS INDICATION

The status indication in the inverter display has the following structure:

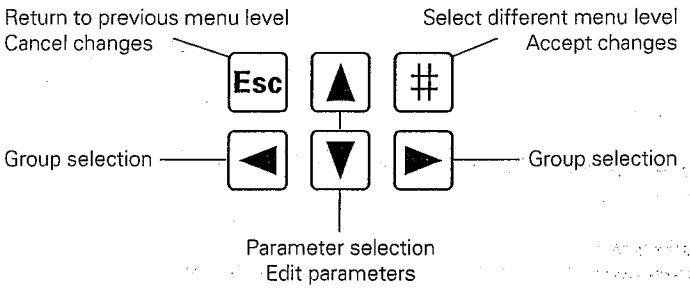



All possible operating conditions are listed on page 24. When the character 2 lights up, the inverter is operating with parameter set no. 2. If parameter set 1 is active (default setting) there is no special indication in the display. If the brake chopper is active, the **bC** character will appear in the display.

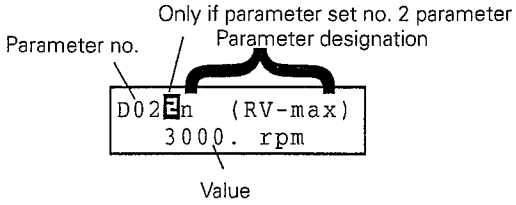
The speed indication can be converted to the gear output by setting parameter **C51** accordingly (indication gain, default setting=1.0). In the V/f control mode (**B20**=0) and the sensorless vector mode (**B20**=1) the speed displayed is the post-ramp ref. value, if vector control with speed feedback is activated (**B20**=2), then the actual speed value is displayed.

The first line of the status indication can be customized: A function which is selected through **C50** (e.g. power) is divided by **C51** and given the unit defined in **C53** (e.g. "items/min"). The items must be specified with FDS-Tool. The number of digits after the decimal point is specified in **C52**.

### 6.2 PARAMETER SETTING

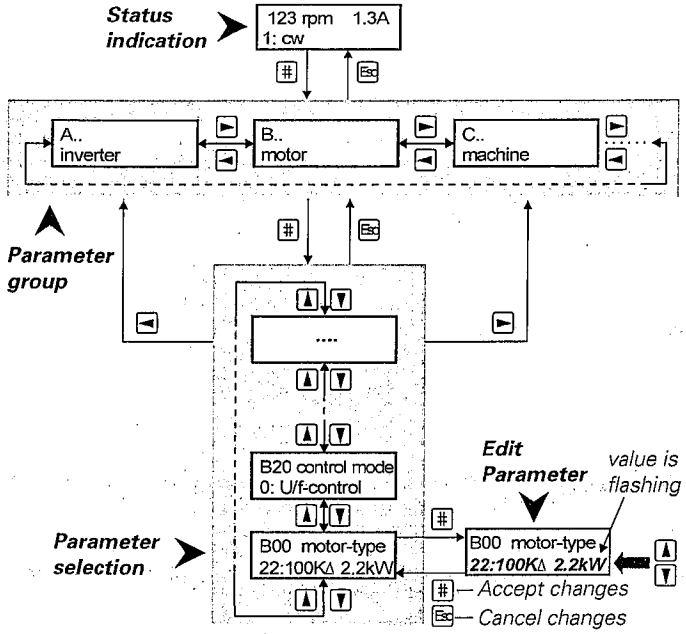



To set the parameters press the # key (Enter). The menu consists of 6 **groups**, which are identified by the letters A...F. Use the ◄ ► arrow keys to select a group, then press the # key to access the parameters of the group selected.
The parameter designation is made up of the letter identifying the group and a number such as **A10** or **D02**.




Use the ▲ and ▼ keys to select a parameter. If you wish to edit a parameter setting, press the # key again. The set parameter value will be flashing and can then be edited using the ▲ and ▼ keys. The changes will become effective immediately. Press the # key to confirm or Esc to cancel your entry. Pressing the Esc key will take you back from the parameter selection to the group letter level. To return to the status indication, press the ESC key a second time.

**Remember to save any changes to the parameter settings with *A00=1 (Save parameters)* before you power down the inverter.**




After power-up the inverter will only display the most important parameters required for commissioning. If your drive application requires more complex parameter settings, you may activate the *extended menu level* by setting **A10** =1.

Both in the standard and in the extended menus parameters which do not make sense for a particular set-up are removed (= not displayed).

**Example:** If a predefined STÖBER motor (e.g. 100k2.2kW) is selected in parameter **B00** (motor-type), parameters **B10...B16** (poles ... cos PHI) are not active.

Approx. 50s after a key operation the inverter will automatically return to the status indication. To inhibit this automatic return function, set **A15**=0 (auto return inactive).

### 6.3 PASSWORD

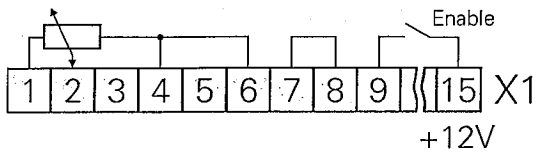
All parameter settings can be protected against unauthorized access. To do this, you must enter a password (max. four-digit number, not equal to 0) in parameter **A14** and save it with **A00**=1. If **A14**=0, the password protection is not active.

To change a parameter setting in a password-protected inverter, you will first have to enter the correct password in **A13**.

## 7. COMMISSIONING

Make sure that the power connections (supply and motor) are wired correctly in accordance with the table on page 3. Prior to commissioning the following connections must be made:

- Reference value entry via potentiometer (X1.2 - X1.4), see wiring diagram on page 4.
- Enable (terminal X1.9)
- PTC thermistor (terminals X2.1 and X2.2)




If no thermistor is connected, X2.1 and X2.2 must be jumpered.
The internal 12V voltage on X1.15 can be used as supply voltage for the control signals. In this case, X1.7 and X1.8 must be jumpered. Motor and inverter must be matched to each other. Select the corresponding motor type in parameter **B00** (see 7.2).

## 7.1 IMPORTANT PARAMETERS

When connected to the supply, the status indication will indicate the operating condition of the inverter *0: Ready for operation*. If instead *13: operation inhibit* is indicated, the enable must be removed. The following parameters must then be entered:

- **A20:** (braking resistor type) if installed
- **B00:** (motor-type, as per rating plate) see Sec. 7.2
- **B20:** (control mode) may usually be left at *1: sensorlVector*. The speed accuracy and dynamic response is better in sensorless vector mode than with the classical *V/f-control* (**B20**=0). Vector control with speed feedback see Sec. 8.6.
- **C00:** (min speed rpm), **C01** (max speed rpm)
- **D00, D01:** acceleration and deceleration ramp
- **D02:** Speed if reference value 100% (10V on AE1)

**A02**=1 will start the "Check entry" routine and report any contradictory parameter settings.

☞ Remember to save the parameter settings with **A00**=1 before you power down the inverter!

## 7.2 MOTOR TYPE

Most 4-pole STÖBER motors can be specified directly in parameter **B00:**

**Example:**
For the drive *C602N0620MR1* ***D100K4*** *TF* (motor 100K, 4-pole) either *17: 100KY2.2KW* or *18: 100K2.2kW*) is entered in **B00** depending on the type of connection (star, delta).

☞ If a specific motor-type is entered no further settings (breakpoint, rated current, etc.) need to be entered.

For Stöber motors up to frame size 112 (4kW) the following applies:
When star-connected (Y), the rated voltage is reached at 50Hz, when delta-connected (Δ) at 87 Hz. When star-connected, the full motor torque is available up to 50Hz, when delta-connected up to 87Hz. Motors from frame size 132 are delta-connected, the full motor torque is available up to 50 Hz (if connected directly to the supply 3 x 400V / 50 Hz).

In the case of motors which are not predefined (third-party motors or if the poles is other than four), then **B00** must be set to *0: user defined*. Parameters **B10 .. B16** must then be set manually in accordance with the motor rating plate data. The V/f characteristic curve, i.e. the relationship of voltage and frequency is determined by parameters **B14** (V-nominal) and **B15** (f-nominal). Further specification of the breakpoint is not required. The voltage increases beyond **B14** up to the available supply voltage (or **A36**) as the frequency rises.
Then the motor must be sized. Set **B41**=1 to do this:

1. Set **B41**=1. The default setting 0% is displayed.
2. Activate the enable to initiate the measurement.
3. When 100% is reached, remove the enable. The measurement is completed.

☞ Remember to save the parameter settings with **A00**=1 before you power down the inverter!

## 7.3 REFERENCE VALUE ENTRY VIA KEYPAD

For correct functioning during commissioning is suffices to connect the enable input X1.9 and the terminals for the temperature sensor X2.1 and X2.2. The speed entry is via the keypad. Set **A50**=1 (installation active) and enter the desired speed in **A51**.

## 7.4 ANALOG / FREQUENCY REFERENCE VALUE

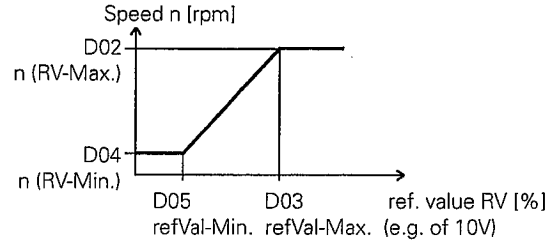
Speed entry via the reference value on the analog input AE1 (e.g. via potentiometer, see page 4) is possible immediately with the default settings. The following parameters are of further interest in this context

| | |
|---|---|
| • **D02**: n (RV-Max.) | speed at max. reference value (10V, 20mA or fmax) |
| • **E10**: AE1-level | indication in % of the final value (final value = 10V or 20mA) |

In the extended menu (**A10**=1) the following parameters are additionally available:

| | |
|---|---|
| • **D03**: refVal-Max. | max. reference value in % of the final value (final value 10V, 20mA or fmax). If e.g. **D03**=50%, the speed set in **D02** is reached at 5V or 10mA. |
| • **D04:** n (RV-Min.) | speed at min. reference value |
| • **D05:** refVal-Min. | min. ref. value in % of the final value |
| • **D06:** refVal-offset | offset on AE1 in % of the final value |

Parameters **D02** to **DO5** may be used to define the relationship between the analog reference value (as a rule the voltage) and the speed in the shape of a *reference value characteristic*:




Possible reference values are the voltage (100%=10V), the current (100%=20mA) or the frequency (fmax=100%= par. **F37**). The **frequency reference value** is activated by setting **F35**=14, the frequency signal must be present on BE5. It is not possible to use the frequency reference value and the speed feedback together at the same time. The ramps for the analog and frequency reference values are specified by **D00** and **D01**. **D92**=1 negates the reference value. If **D07**=1, the controller enable is dependent on the reference value.

## 7.5 FIXED REF. VALUES (DIGITAL REF. VALUES)

Up to 7 fix reference values (FRV) can be defined. reference value selection is binary-coded via the binary inputs. The default setting assigns inputs BE3 and BE4 for the selection of three fix ref. values.

| BE4 | BE3 | Reference value | **E60** | Ramps |
|---|---|---|---|---|
| L | L | analog/frequency | 0 | **D00, D01** |
| L | H | fix reference value1, **D12** | 1 | **D10, D11** |
| H | L | fix reference value2, **D22** | 2 | **D20, D21** |
| H | H | fix reference value3, **D32** | 3 | **D30, D31** |

The speed in **D12**, **D22** etc, is entered in motor rpm. The input signals are routed to a reference value selector where they are binary decoded. Parameter **E60** will show the result of the binary decoding (0 to 7).

☞ If the result of the binary decoding is 0 (**E60**=0, i.e. L level on all inputs of the RV selector) the analog / frequency ref. value is applied.

The binary inputs can be freely assigned to the input signals of the ref. value selector. The default setting is **F33**=1 (BE3-function = refVal.-*select0*) and **F34**=2 (BE4-function = ref*Val.-select1*).
RefVal.-*select0* and refVal.-*select1* correspond to bits 0 and 1 of the binary reference value selector. If no binary input is assigned to one of the three refVal.-*select* signals the signal is considered low. To use all seven fix reference values, input BE5 could be programmed to **F35**=3 (*refVal.-select2*) for example. **D92**=1 will negate all reference values, i.e. reverse the direction of rotation.

## 7.6 BRAKE CONTROL

Relay 2 is used for brake control if **F00**=1.
**F01** and **F02** define the speed limit for opening and closing the brake.
Relay 2 allows the brake to be switched directly in the AC circuit (max. 6A/250VAC)

## 7.7 PARAMETER UPLOAD AND DOWNLOAD

Parabox or the FDS tool PC software can be used to download all parameter settings to other inverters without data loss and time-consuming repeated parameterization.

**Writing data to Parabox (upload):**
- Plug Parabox into the X3 type D connector of the first unit.
- Set **A03**=1 to upload the parameter settings to Parabox.

**Reading data from Parabox (download)**
- Plug Parabox into the new unit.
- Set **A01**=1 to download the parameter settings from Parabox to save them permanently (safe against power failure) in the new inverter.


**A40**=1 will download the parameters to the inverter without saving them.

Parabox can be reformatted as required with the ***FDS Tool*** user software.

**3.X > 4.X:** When reading from or writing to Parabox, the current software status is checked and if required (following a prompt from FDS Tool to confirm) reformatted.

**4.X > 3.X:** The parameter "Parabox" in the "Options" menu item (FDS Tool) allows you to reformat from 4.X to 3.X. Parabox can also be used as a fault memory. If Parabox is plugged in at the time a fault occurs, the complete data record (parameter settings, status at the time of the fault event) is automatically transferred to the Parabox.

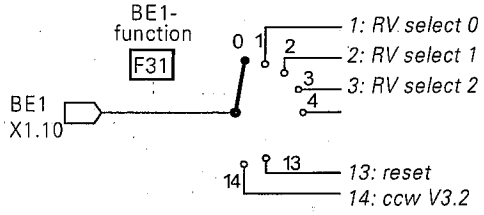
# 8 SPECIAL FUNCTIONS

## 8.1 BINARY INPUTS BE1 ... BE5

In accordance with the default setting the freely programmable binary inputs have the following meaning:

- BE1 = *8: halt*
- BE2 = *6: direction of rotation* (counterclockwise/clockwise)
- BE3 = *1: RV select0* (bit 0 fix reference value decoding)
- BE4 = *2: RV select1* (bit 1 fix reference value decoding)
- BE5 = *0: inactive*

The function of the binary inputs is determined via parameters **F31** to **F35** in the extended menu (**A10**=1).




If several inputs are routed to one function, the signals are OR related. Functions without connection to a BE input are assigned an Low level signal internally. The direction of rotation inputs of older FDS inverters (up to software version V.3.2.) are emulated with **F31=F32**=14 (ccw on BE1, cw on BE2). **F31=F32**=14 also allows a fail-safe (low active) stop to be implemented.

## 8.2 TORQUE LIMITS

The motor torque can be limited in several ways:
- **C03** (Max. torque 1) is the currently set torque-limit in % of the motor torque-nominal in the default setting.
- Switching between two torque-limits **C03** (Max. torque 1) and **C04** (Max. torque 2) is possible via a binary input (assign the BE-function *10: torque select* via one of the parameters **F31** ... **F35**).
- For starting mode **C20**=2 (cycle characteristic) the unit will automatically switch between **C03** (Max. torque 1) and **C04** (Max. torque 2). M-max1 is used for constant travel, M-max2 for the acceleration/deceleration phases.
- The torque may also be limited via the analog input AE2. To do this, set parameter **F20**=2. 10V correspond to 100% of the motor torque-nominal, other scaling factors can be set in **F22** (AE2-gain).
- M-Max always applies in the event of a quick stop.

The effective torque-limit at any time is the minimum of the different limit values and can be read out in parameter **E62**.

☞ The torque-limit is the most precise in the speed feedback mode. For frequencies > 5Hz the accuracy is 5% of the torque-nominal. In the classical V/f-control mode (parameter B20=0) the torque calculation at low speeds and small loads is not very accurate. In the *Sensorless Vector Control* mode (**B20**=1, default setting) the results are better than in V/f-control.

In particular in the *Sensorless Vector Control* mode the precision of the torque calculation is increased if the inertia ratio **C30** (J-mach/J-motor) is estimated and set accordingly. If the driven inertia is small or if the gear ratio is high, **C30**=0 applies (default setting).

☞ In asynchronous motors, the relationship between the current and the torque is not easy to determine. An FDS inverter can calculate the torque form the available measured data. For this reason the maximum torque and not the maximum current is specified. The maximum available torque is always limited by the maximum inverter current.

## 8.3 OPERATING RANGE

The *operating range* is defined by the following parameters:

- **C41 C42**: n-Min, n-Max, permissible speed range
- **C43, C44**: M-Min, M-Max permissible torque range
- **C45, C46**: P-Min, P-Max permissible active power range

Relay 2 can be used to signal if the set values are exceeded, to do this set **F00**=6.

If only one or two of these range monitoring options shall be used, then the limits of the ranges which are not used must be set to their limit value (e.g. **C43**=0% and **C44**=400% if no torque monitoring is required).

## 8.4 PARAMETER SET SELECTION

The FDS inverter supports two independent parameter sets. Selection is

- external via a binary input (**A41**=0) or
- internal via keypad (**A41**=1 or 2).

To select the parameter sets via a binary input one of the parameters **F31** ... **F35** must be set to *11: paraSet-select*.
Selection is only possible if the enable terminal is low.
The parameters in both parameter sets can be displayed and programmed independent of the parameter set active at the time. **A11** (paraSet Edit) selects the parameter set (1 or 2) to be edited. When parameter set 2 (**A11**=2) is active, a **2** will be displayed next to the parameter number. Certain parameters such as e.g. control input (**A30**) are only available once. In this case no **2** will be displayed next to the parameter number. This applies to all parameters of group A, and to the display parameters of group **E** (Torque, utilization, etc.).

Parameter sets can be copied via **A42** and **A43** (copy paraSet). **A42**: copy paraSet 1>2 to 1:*active*, will overwrite parameter set 2 with the values of parameter set 1.

☞ Generally, parameter set 1 should be set up first. The parameters are then copied to parameter set 2 by setting **A42**=1 (active). You may then change to parameter set 2 by entering **A11**=2 and change the required values there. Finally, all parameter settings should be saved with **A00**=1.

## 8.5 MOTOR POTENTIOMETER

The "motor potentiometer function" allows the motor speed to be steplessly increased or decreased via two external keys:

- Two binary inputs are programmed to *4: motorpoti* UP and *5: motorpoti* DOWN via **F31...F35**.
- The motor potentiometer function is activated with **D90**=1.

When the keys are pressed, the speed is changed in accordance with the ramp settings in **D00** and **D01**. When the motor potentiometer function is active (**D90**=1), most parameters of group **D**.. reference value are inactive.

## 8.6 SPEED FEEDBACK

FDS inverters support an incremental encoder speed feedback as standard (24V). In control mode **B20**=2 (vector control with 2-channel feedback) precise and highly dynamic speed and torque control is possible.

To commission the speed feedback option proceed as follows:

- **Wiring**: incremental encoder signals A and B are connected to the binary inputs BE4 and BE5. The supply for the encoder (+24V) must be provided externally. We recommend to connect the encoder via standard series terminals.

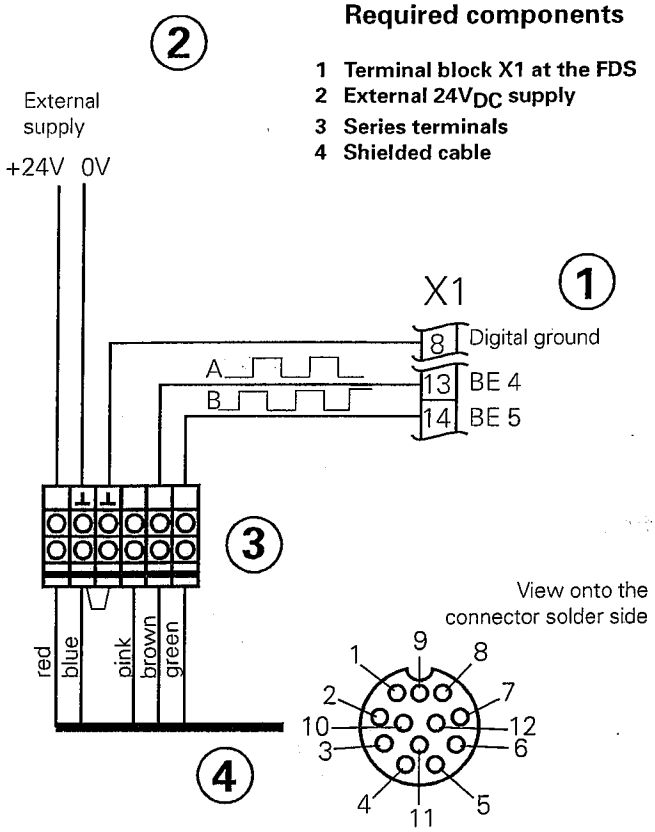
| Encoder pin | Stöber cable colour | Encoder signal | Connection to | FI terminal |
|---|---|---|---|---|
| 3 | pink | N | not required | — |
| 5 | brown | A | input BE4 | X 1.13 |
| 8 | green | B | input BE5 | X 1.14 |
| 9 | — | shield | analog ground | shield terminal |
| 12 | red | $+V_B$ | external 24V | — |
| 10 | blue | 0V | external 0V | X1.8 |

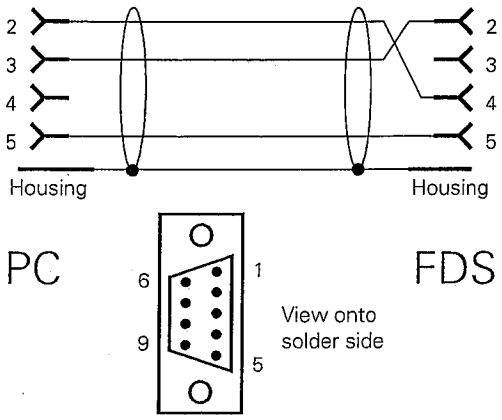
- Settings **F34**=14 and **F35**=14 will program binary inputs BE4 and BE5 for speed feedback (before, activate extended menu with **A10**=1).
- If required, the encoder ppr can be changed in **F36** (default setting 1024 ppr).
- The dynamic response of the speed control loop depends mainly on the setting of parameters **C31** (speed controller Kp) and **C32** (speed controller Ki). They determine the proportional and integral gain of the speed controller. Too high a gain will cause the motor to oscillate. Too low a gain will reduce its dynamic response. Generally, the default setting will suit most applications. If necessary though, adjust **C31** first, **C32** can be left as is in most cases.
- **Checking the setup:** In *V/f mode* or *sensorless vector mode* (**B20**= or 1) allow the motor to rotate and remember the speed (with sign). The actual speed can be checked in parameter **E15** (encoder speed) The speed should be similar to that in the status indication and in particular the sign should be the same.
  **Incorrect sign**: Either reverse signals A and B on BE4 and BE5 or change over two motor phases.
  **0 rpm indication in E15**: Is $V_B$=24V connected to the encoder with the right polarity? Is the ground connection correct? Any other wiring errors? Are **F34** and **F35** programmed correctly? Signals A and B can be checked individually. To do this, stop the motor and take a look at parameter **E13**. Even the slightest motor rotation (e.g. manually by turning the fan wheel) must cause a change in the level of BE4 and BE5.
- Stop the motor, select control mode **B20**=2 (vector control).
- Allow the motor to rotate. If there are any problems, repeat the above procedure.
- Save parameter with **A00**=1.

☞ If the sign of the speed feedback is incorrect, and in the case of an open circuit, the motor will continue to rotate slowly.

**Required components**

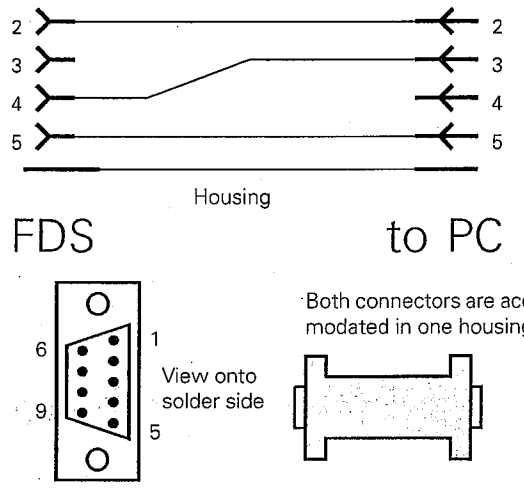
1 **Terminal block X1 at the FDS**
2 **External 24V$_{DC}$ supply**
3 **Series terminals**
4 **Shielded cable**




**Serial G3 cable**
Connects the serial interface of the PC (notebook) and the serial X3 interface of the FDS. Only for use with 3...series FDS units (6 keys)!

Must NOT be replaced by standard serial connecting cable!




**Adapter: G1 cable (old) to FDS 3rd generation (new)**
Adapter for the connection of the old serial FDS cable G1 (SV 3.X) and the X3 serial interface of the new 3...series FDS (6 keys)!

## 8.7 FAULT RESET

A table of possible faults is given on page 25.
Faults are reset with:

- **Enable:** Signal transition form L to H level on the enable input and then back again to L level. Always available.
- [#] **key** (only if **A31**=1)
- **auto-reset** (only if **A32=1**)

The last 10 faults can be read out via parameters **E40** and **E41** (value 1 = last fault). The inverter can be programmed to respond to certain events in a defined way (fault, warning, message, none) with FDS Tool, see page 25.

## 8.8 MOTOR STARTING

- Automatic starting of the motor after power-up is prevented by **A34**=0 (auto-start inactive) in the default setting (see message 12: *power-up inhibit*)
- **C20**=1 (load start) as well as **C21** and **C22** can be used to specify a tolerated overload of the drive during starting.
- **C20**=2 (cycle characteristic) achieves an optimized acceleration behaviour in the *sensorless vector control* mode (**B20**=1), (also see parameter **C30** and Sec. 8.2) in this context.

## 8.9 CONTROL VIA PC

With the ***FDS Tool*** the frequency inverter can be controlled via PC. The inverter is connected to the PC via the type D connector X3 (RS-232-C interface) and the FDS cable G3 (cat. no. 27352) or the FDS cable G1 (cat. no. 27352) and an adapter (cat. no. 41489).
With its integrated **FDS-Scope** feature FDS Tool allows the user to monitor eight different inverter variables and optimize the drive to the application requirements.

## 9 REPLACING THE INVERTER, SOFTWARE 3.X

Frequency inverters of the **1**040...**1**200 and **2**008...**2**070 series (software 3.x / 3 keys) can easily be replaced with frequency inverters of the **3**008...**3**220 series (software 4.x / 6 keys). When replacing an inverter please observe the following:

### 9.1 POWER TERMINAL X11

The connections of the power terminals are identical. When upgrading from series **2**... to series **3**... the complete power terminal can be replugged. When upgrading from the **1**... series to the **3**... series, the power terminal must be rewired as the connectors are different.

### 9.2 CONTROL TERMINAL BLOCK X1/X2

- **Analog input**

When the internal voltage supply (X1.15) is used, a connection must be provided between digital ground (X1.18) and 12V ground. On FDS1030 - FDS1085 inverters the 12V ground is on terminal X1.6, on all other inverters on terminal 1.7 (see Terminal Assignment page 4).

- **Direction of rotation**

To ensure compatibility with inverters of the **1**.../**2**... series, the following parameter settings must be made for the direction of rotation:
BE1: **F31**=14 (ccw V3.2)
BE2: **F32**=14 (cw V3.2)

- **Quick stop**

Activating parameter **F38** will achieve compatibility with the 3.X software in respect of quick stop. **F38**=1: *active* means that quick stop is triggered when BE1=LOW and BE2=LOW or when the enable is removed (also reference value enable **D07** or additional enable via BE, **F33**...**F35**=7). The drive is decelerated with the decel. quick ramp set in **D81**. Parameter **F38**=14 is only available if **F31**=14 (BE1) and **F32**=14 (BE2) are parameterized.
The functions "direction of rotation", "halt" and "quick stop" must not be routed to other BEs!

- **Fix reference values**

In inverters of the **1**.../**2**... series the combination BE1=Low and BE2=Low corresponds to the fix reference value1. If FRV1=0rpm (default setting), then the inverter will adopt the value of the analog reference value entry. In inverters of the 3... series the combination Low/Low (FRVO) is reserved ***exclusively*** for the reference value entry via the analog input, see **E60**.

**Solutions**

4 real fix reference values

Program BE5 as RV selector 2 (**F35**=1) and connect with +12V (terminal X1.15).
Then select 4 fix reference values via BE3 and BE4 (**F33**=1 and **F34**=2).

| BE5 | BE4 | BE3 | FRV | Parameter 1.../2... series | FRV no. |
|---|---|---|---|---|---|
| H | L | L | 4 | **D42** | 1 |
| H | L | H | 5 | **D52** | 2 |
| H | H | L | 6 | **D62** | 3 |
| H | H | H | 7 | **D72** | 4 |

### 9.3 FREQUENCY BREAKPOINT

The breakpoint parameter as known in the past no longer exists. If the connected motor is a STÖBER system motor, it can be selected accordingly in **B00**, i.e. its breakpoint is already defined.
All other motors are defined with the **B10...B16** rated data.
The beginning of the field-weakening range is determined in parameter **A36** (mains voltage)

# 10. Parameter description
# A.. Inverter

STÖBER ANTRIEBSTECHNIK

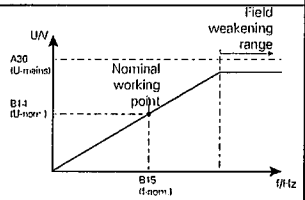
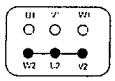
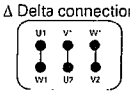
| A.. INVERTER | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| A00 1) | **Save parameters:**<br>*0: inactive*<br>*1:* saves the parameter settings to non-volatile memory. To save, change the setting from 0 to 1. Always both parameter sets will be saved. | |
| A01• | **Read Parabox & save:**<br>*0: inactive*<br>*1:* reads the parameter settings from Parabox and saves them to non-volatile memory. Automatically carries out (**A02**) "Check parameter". To activate, change the setting from 0 to 1. If the parameters could not be read correctly, the parameters will not be saved. | |
| A02 1) | **Check parameters:**<br>*0: inactive*<br>*1:* checks the parameters of the edited parameter set (see **A11**) for:<br>- correct value range<br>- (nmax / 60 x encoder ppr < 51.2kHz; [(**C01**/60) x **F36** < 51.2kHz)]<br>- correct programming of the binary inputs (**F31**...**F35**)<br>- if **B20**=2, i.e. "vector control with 2-channel feedback" control mode is selected, BE4 must be programmed to encoder signal A (**F34**=14) and BE5 to encoder signal B (**F35**=15). | |
| A03 1) | **Write to Parabox:**<br>*0: inactive*<br>*1:* copies the parameters of both parameter sets (see **A11**) from the inverter to Parabox. To activate change the setting from 0 to 1. | |
| A04• 1) | **Default settings:**<br>*0: inactive*<br>*1:* all parameters are reset to their factory setting. To activate change the setting from 0 to 1. | |
| A10 | **Menu level:** Determines the parameters accessible to the user.<br>*0: Standard;* accessible parameters are shaded in grey in the parameter table (see back cover). All parameters remain effective, including those which belong to the "extended" menu level.<br>*1: Extended;* access to all parameters. | |
| A11 | **ParaSetEdit:** Selects the parameter you wish to edit. The parameter set to be edited (**A11**) and the active parameter set (status indication) need not be the same (you may, for example, edit parameter set 1 while the inverter is operating with the settings of parameter set 2). Also see Sec. 8.4.<br>*1: ParaSet 1;* Parameter set 1 is edited<br>*2: ParaSet 2;* Parameter set 2 is edited. | |
| A12 | **Language:** Changes the language setting. Texts **U22**, **U32**, **U42**, **U52** will be reset to the default settings of the selected language. (These texts can only be edited with FDS Tool).<br>*0: deutsch*<br>*1: english* | |
| A13 | **Set password:** Prompts the user for a password. If a password is set in A14 this password must be entered here before you can edit the parameter settings. See section 6.3. | |
| A14 | **Edit Password:** Allows the user to define and edit the password. 0 means "No password set", all other values would be valid password entries. See section 6.3. A defined password can only be read out with FDS Tool. | |
| A15 | **Auto return:** It is not possible to auto-return to the status indication from the entry mode (the editable parameter is flashing).<br>*0: inactive*<br>*1: active;* if no change in the parameter group/parameter selection is entered for 50 s, the display will return to the status indication. | |
| • | : To change these parameters the signal level on the "enable" terminal must be 0V. | |
| italics | : Depending on the active parameter settings, these parameters are not displayed. | |
| 1) | : See result table page 23. | |
| | : These parameters are included in the "standard" menu level. | |
| * | : Parameters identified with "✓" can be parameterized independently of each other in parameter sets 1 and 2. | |

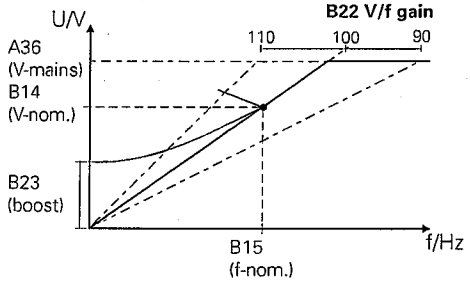
| A.. INVERTER | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| A20 | **Braking resistor type:** Selects the fitted braking resistor.<br>0: inactive; the thermal utilization of the inverter ($i^2t$ model) is not monitored, the brake transistors is nevertheless controlled.<br>*1: user defined;* resistance values see **A21,A22,A23**<br>*2: 300Ohm 0.15kW*<br>*3: 200Ohm 0.15kW*<br>*4: 100Ohm 0.15kW*<br>*5: 100Ohm 0.6kW*<br>*6: 30Ohm 0.15kW*<br>*7: 30Ohm 0.6kW*<br>} **A20** 1:...7: These data are used for a thermal model, which determines the maximum permissible regenerative power that may be dissipated via the braking resistor, thus protecting the braking resistor from thermal overload. In the event of thermal overload, the fault message *"42: temp.R-brake"* is displayed. | |
| A21 | **Braking resistor resistance:** Only if **A20**=1 (user defined), resistance value of the fitted braking resistor. | |
| A22 | **Braking resistor rating:** Only if **A20**=1 (user defined), regenerative power rating of the fitted braking resistor. | |
| A23 | **Braking resistor therm. time constant:** Only if **A20**=1 (user defined) thermal time constant of the braking resistor. | |
| A30• | **Operation input:** Determines the source for the control signals (enable, reference value).<br>*0: control terminal (X1);* The control signals (enable, ...) are generated on terminals X1.9... 14. **F30** ... **F34** must be programmed accordingly.<br>*1: serial (X3);* The control signals (enable, ...) are generated from the PC (FDS Tool) software. The inverter is connected to the PC via the type D connector X3 (RS-232-C interface). For remote inverter control from the PC the enable terminal on the inverter must be HIGH. | |
| A31 | **#-Reset:** Reset faults by pressing the "#" key.<br>*0: inactive*<br>*1: active;* Faults can be reset with the "#" key. This reset is only possible when the status indication is shown in the display. You may leave the status indication without resetting with the ▼ key, move around in the menu and edit any parameter. | |
| A32 | **Auto-Reset:** Faults are reset automatically<br>*0: inactive*<br>*1: active;* The inverter will reset some faults automatically (see Sec. 13, Faults).<br>Faults are auto-reset three times within a period of 15 minutes (default setting), the fourth fault that occurs within this time is not reset any more. Relay 1 drops out, the fault must be reset in another way (enable, binary input **F31**...**F35** =13, "#" key **A31**). The auto-reset counter is then reset again. After three unsuccessful reset attempts the inverter ignore the auto-reset and trips. The auto-reset time can be set from 0 to 255 min. in parameter **A33**. | |
| A33 | **Time auto reset:** time for which auto-resets are carried out (see **A32**). | |
| A34 | **Auto-start:**<br>*0: inactive;* after power-up the signal level on the enable terminal must go from low to high before the inverter will start up. (-> message *"12: power-up inhibit"*).<br>*1: active;* If auto-start is active, the inverter will automatically start up when the unit is powered up and an enable signal is present. | |
| A35 | **Low voltage limit:** If the Dc link voltage falls below the level set in this parameter, the inverter will trip on *"46: low voltage"*. The minimum voltage limit for single-phase units is 150V, for three-phase units 250V. | |
| A36 | **Mains voltage:** Maximum voltage which the inverter feeds to the motor, usually the supply voltage. From this voltage onward the motor will operate in the field-weakening range. This information is important for optimized operation in the sensorless vector (**B20**=1) and vector control modes (**B20**=2). | |
| A40•1) | **Read Parabox:** *0: inactive*<br>*1: active;* Parameters are read from Parabox "Check parameter" (**A02**) is carried out automatically. Changing the setting from 0 ->1 will start the read process. | |
| A41 | **Select paraset:** Two parameter sets are available. These can either by selected via the binary inputs or directly via **A41**. The selected parameter set will only become active when the enable is removed. Some parameters will retain their settings in parameter set 1 and 2. Parameters which can be programmed separately in parameter set are indicated by a E (between the coordinate and the parameter designation (see Sec. 6.1)).<br>*0: external;* The active parameter set is selected via binary inputs BE1 .. BE5. For external selection to be active at least one parameter must be **F30** ..**F34** = 11 (ParaSet-select) in both parameter sets. Parameter set 1 will be active if the binary input is low, parameter set 2 if the signal level on the BE is high.<br>*1: ParaSet 1;* The inverter uses parameter set 1. External selection of the parameter is not possible.<br>*2: ParaSet 2;* External selection of the parameter is not possible. | |

# 10. Parameter description
# A.. Inverter - B.. Motor



| A.. INVERTER | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| A42 | **Copy para set 1>2:** Copies parameter set 1 to parameter set 2. The old values in parameter set 2 are overwritten.<br>To start copying press the ▲ key.<br>*0: inactive*<br>*1: active* | |
| A43•[1] | **Copy para set 2>1:** same as **A42**. Copies parameter set 2 to parameter set 1 .<br>*0: inactive*<br>*1: active* | |
| A50 | **Installation:** Allows the inverter to be commissioned with minimum wiring.<br>*0: inactive*<br>*1: active*; the controller requires only a high signal on the "enable" input, all other inputs on the control terminal block are without function. The drive is accelerated to the speed set in **A51**. | |
| A51 | **Installation reference value:** Speed reference value for commissioning without external wiring of the control inputs (except for enable = high). For safety reasons, the effective speed limits are limited to nmax/8 and nmin/8.<br>If this parameter is exited, reference value 0 is entered. | |

| B.. MOTOR | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| B00• | **Motor-type:** Motor selection from motor database. **B00**=1 ..27 will specify the STÖBER system motor fitted.<br>**B00** = 0 (user defined) is usually only used for other motors.<br>*0: user defined*; poles, P, I, n, V, f and power factor must be entered in **B10** ... **B16.** It is important that the **B41,** motor autosize is carried out and the result saved!<br>Sizing the motor will determine the winding resistances. This information is necessary to ensure the best possible matching of inverter and motor.<br>*1: 63K Y 0.12kW* *11: 80L Y 0.75kW* *17: 100K Y 2.2kW* *23: 132S D 5.5kW*<br>*2: 63K D 0.12kW* *12: 80L D 0.75kW* *18: 100K D 2.2kW* *24: 132M D 7.5kW*<br>*3: 63M Y 0.18kW* *13: 90S Y 1.1kW* *19: 100L Y 3kW* *25: 132L D 9.2kW*<br>*4: 63M D 0.18kW* *14: 90S D 1.1kW* *20: 100L D 3kW* *26: 169M D 11kW*<br>*5: 71K Y 0.25kW* *15: 90L Y 1.5kW* *21: 112M Y 4kW* *27: 160L D 15kW*<br>*6: 71K D 0.25kW* *16: 90L D 1.5kW* *22: 112M D 4kW*<br>*7: 71L Y 0.37kW*<br>*8: 71L D 0.37kW* The required data of these motor-types are stored in a database.<br>*9: 80K Y 0.55kW* This allows optimizing the inverter to the motor.<br>*10: 80K D 0.55kW* Parameters **B10** .. **B16** are not displayed. | ✓ |
| B10• | **Poles:** Determined from motor rated speed = $2 \cdot (f \cdot 60/n_{rated})$. The controller uses frequencies for internal processing. The poles is required for correct speed indication. | ✓ |
| B11• | **P-nominal:** Rated power as per the rating plate data. | ✓ |
| B12• | **I-nominal:** Rated current as per the rating plate data, note motor-type of connection (Y/Δ), must correspond to **B14**. | ✓ |
| B13• | **n-nominal:** Rated speed as per the rating plate data. | ✓ |
| B14•<br>B15• | **V-nominal:** Rated voltage as per the rating plate data, note motor type of connection (Y/Δ), must correspond to **B12**.<br>**f-nominal:** Motor rated frequency as per the rating plate data. Parameters **B14** and **B15** determine the gradient of the V/f characteristic and consequently the characteristics of the motor. The V/f determines at which frequency (**B15**: f-nominal) the motor is operated with rated voltage (**B14**: V-nominal) Voltage and frequency can be increased beyond the nominal working point in a linear function. The upper voltage limit is set by the applied AC supply voltage. STÖBER system motors up to frame size 112 can be operated both star- and delta-connected.<br>Operation at 400V and delta-connection of the motor increases the power output by √3 and also extends the constant-torque speed range. With this type of connection the motor draws a higher current. It is therefore important to ensure that the inverter is rated for the resultant power (PΔ = √3·PY).<br>- **B12** (I-nominal) is parameterized for the corresponding motor rated current ($I\Delta_{nominal} = \sqrt{3} \cdot IY_{nominal}$).<br>  <br>Motor connection types<br>Star connection<br>  <br>Δ Delta connection<br>  | ✓<br>✓ |

| B.. MOTOR | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| B16• | **cos PHI:** Power factor as per the motor rating plate, required for motor control. | ✓ |
| B20• | **Control mode:** Determines the type of motor control. The control mode also determines the type of encoder system used (BE 4/5 (**F34 / F35**) must be parameterized in accordance with this!).<br>*0: V/f-control;* in V/f-control voltage and frequency are changed in proportion to each other so that the motor flux remains constant. Classical frequency inverter control mode.<br>*1: sensorlvector;* vector control without feedback. Provides considerably better speed accuracy and dynamic performance<br>*2: vect.feedback;* vector control with feedback. See Sec. 8.6 The inverter evaluates the feedback signals via the binary inputs BE4 / BE5. The following settings must be made for this: **F34**=14 and **F35**=15 | ✓ |
| B21 | **V/f characteristic:** Effective independent of the control mode set in **B20**.<br>*0: linear;* the voltage / frequency characteristic is linear. Suitable for all applications.<br>*1: square;* square voltage / frequency characteristic, for use in fan and pump applications. | ✓ |
| B22<br>*B23* | **V/f gain:** Correction factor for the gradient of the V/f characteristic.<br>The gradient for V/f factor=100 % is determined with V-nominal (**B14**) and f-nominal (**B15**).<br>**Boost:** Only effective if **B20**=0 (V/f-control).<br>The term Boost describes an increase in the voltage in the lower speed range, providing a higher starting torque for the motor. With a Boost setting of 100% the motor current flowing at 0Hz.<br>To determine the required Boost voltage the stator resistance of the motor must be known.<br>If **B00**=0 (user defined), it is most important that B41 (autotuning) is carried out!<br>If **B00**=1 ...27 the stator resistance of the motor is determined by the motor selected.<br>  | ✓ |
| B24• | **Switching frequency:** Changing the switching frequency reduces the noise emission of the drive. An increase in the switching frequency entails higher losses, though. Therefore, if the switching frequency is increased, the permissible motor I-nominal (**B12**) must be reduced. With a switching frequency setting of 16 kHz the permissible motor I-nominal is only 37% of the inverter I-nominal. | ✓ |
| B30 | **Additional motor operating:** Only if **B20**=0 (V/f-control). For group drives.<br>Allows a further motor to be connected to the enabled inverter. The motor voltage is briefly reduced to avoid an overcurrent trip of the drive.<br>*0: inactive*<br>*1: active* | |
| B31 | **Oscillation damping:** Currently not available yet. | |
| B40•1) | **Phase test:**<br>*0: inactive*<br>*1: active;* tests the symmetry of the motor in steps of 60°. The following points are checked:<br>- connection of phases U, V, W.<br>- symmetry of the winding resistances of phases U, V, W. If the winding resistance differs by ±10%, the inverter signals *"19: symmetry"*.<br>- type of motor connection. If a STÖBER system motor is selected in parameter **B00**=1...27, the type of connection of the selected STÖBER system motor (star / delta) is compared to that of the connected motor. Any difference is signaled as *"20: motor connection"*.<br>To start this function the signal level on the enable input (X1.9) must go from low to high.<br>To exit the parameter the enable input must go low again. | |
| B41•1) | **Autotuning:** *1: inactive;* The winding resistances of the motor are measured. To start this function the signal level on the enable input (X1.9) must go from low to high.<br>To exit the parameter the enable input must go low again.<br>**B00**=0; It is important that the motor autosize function is carried out! Important for optimizing the inverter to the motor<br>**B00**=1 ... 27, Motor autosize is not required. | |
| •<br>italics<br>1)<br>*<br>*: Parameters identified with "✓" can be parameterized independently of each other in parameter sets 1 and 2. | : To change these parameters the signal level on the "enable" terminal must be 0V.<br>: Depending on the active parameter settings, these parameters are not displayed.<br>: See result table page 23.<br>: These parameters are included in the "standard" menu level. | |

| C.. MACHINE | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| C00 | **Min. speed rpm:** Minimum permissible speed. Relates to the motor shaft speed. Reference values which are lower than n-Min. are ignored and increased to n-Min. | ✓ |
| C01 | **Max. speed rpm:** Maximum permissible speed. Relates to the motor shaft speed. Reference values which are higher than n-Max. are ignored and limited to n-Max. | ✓ |
| C02• | **Perm. direction of rotation:** Determines the permissible directions of rotation. The direction of rotation can be specified via the binary inputs (parameters **F31**...**F35**).<br>*0: clockwise & counterclockwise*<br>*1: clockwise*<br>*2: counterclockwise* | ✓ |
| C03 | **Max. torque 1:** Maximum torque set by the user. The default setting is 150%. The active torque limit is the minimum of Max. torque 1 (**C03**), Max Torque 2 (**C04**) and, if **F20**=2, the level on analog input 2. If the permissible motor torque is exceeded, the controller will signal *"47: drive overload"*. | |
| C04 | **Max. torque 2:** Additional maximum torque. The active torque limit is the minimum of Max. torque 1 (C03), Max. torque 2 (**C04**) and, if **F20**=2, the level on analog input 2. It is always higher than **C03** (Max. torque 1). Switching between the two torque limits is via a binary input (**F3**..= *10: torque select*) or automatically if intermittent duty starting mode is set (**C20**=2).<br>When a quick stop is carried out, Max. torque 2 is always active. | |
| C10 | **Skip speed 1:** Prevents prolonged operation of the drive in a frequency range that produces mechanical resonances The drive will go through the specified speed range plus a tolerance band of ± 0.4 Hz with the decel. quick-ramp (**D81**). The four skip speeds can be specified next to each other. | ✓ |
| C11 | **Skip speed 2:** see **C10** | ✓ |
| C12 | **Skip speed 3:** see **C10** | ✓ |
| C13 | **Skip speed 4:** see **C10** | ✓ |
| C20• | **Startup mode:** Determines the starting mode of the drive.<br>*0: standard;* default setting, independent of the control mode (**B20**).<br>*1: load start;* only if **B20**=1 (sensorless vector control). For machines with increased breakaway torque. For a time span of t-load start (**C22**) the motor torque is increased to M-load start (**C21**). When this time has elapsed, the inverter continues to operate with the standard ramp.<br>*2: cycle caracteristic;* effective independent of the control mode (**B20**).<br>- automatic switchover between the specified torque limits Max. torque 1 (**C03**) and Max. torque 2 (**C04**).<br>Max. torque 1 applies during constant travel, Max. torque 2 during the acceleration phase.<br>- if **B20**=1 (sensorless vector control) torque feedforward is used, i.e. the inverter calculates the required torque from the specified motor-type (**B00**) and the ratio of the mach/motor moments of inertia (**C30**). This torque is then injected to the drive.<br>*3: capturing;* only if **B20**=1. A rotating motor is connected to the inverter. The inverter determines the actual speed of the motor, synchronizes and specifies the corresponding reference value. | |
| C21 | **M-load start:** Only if **C20**=1, determines the torque for load start. | ✓ |
| C22 | **t-load start:** Only if **C20**=1, determines the time span for load start with the torque defined in **C21** | ✓ |
| C30 | **J-mach/J-motor:** Ratio of the load moment of inertia and the motor moment of inertia. This factor is effective for all control modes and important for the best possible matching of inverter and motor (dynamic performance). An entry is not compulsory. | ✓ |
| C31 | **Speed controller Kp:** Only if **B20**=2 (vector control with feedback). Proportional gain of the speed controller. | ✓ |
| C32 | **Speed controller Ki:** Only if **B20**=2 (vector control with feedback). Integral gain of the speed controller. | ✓ |
| C40 | **RV window:** If **F00**=3 (relay 2 as signal relay for "refVal-reached" or **F00**=2 (relay 2 as signal contact for "standstill") the system recognizes "ref. value reached" if the ref. value is within a ref. value window of ± **C40** and relay 2 closes. | ✓ |
| C41 | **Op. range speed min:** Parameters **C41** ... **C46** can be used to specify an operating range. Operating outside the set range can be Signaled with relay 2 (**F00**=6). All range monitoring takes place at the same time. If range monitoring ist not required, the min parameters shout be set to the lower limit values and the max parameters to the upper limit values, see also Sec. 8.3. The monitoring of the operating ranges is suppressed when no current is applied to the motor and during acceleration and deceleration phases. | |
| C42 | **Operation range speed max:** see **C41** | ✓ |
| C43 | **Operation range M-min:** see **C41** | ✓ |
| C44 | **Operation range M-max:** see **C41** | ✓ |
| C45 | **Operation range P-min:** see **C41** | ✓ |

| C.. MACHINE | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| C46 | **Operation range P-max:** see **C41** | ✓ |
| C50 | **Display function:** The first line of the status display can be set up as required in parameters **C50**...**C53** (see Sec. 6.1). The entry may be a figure (up to 8 digits) or any unit (up to 8 characters). Display value = raw value/display factor<br>*0: n2 & I-motor;*<br>*1: E00 I-motor;* the inverter indicates the actual motor current in Ampere (raw value)<br>*2: E01 P-motor/%;* the inverter indicates the actual active power in per cent of the motor rated power (raw value)<br>*3: E02 M-motor/%;* the inverter indicates the actual motor torque in per cent of the motor rated torque (raw value)<br>*4: E08 n-motor;* the inverter indicates the actual speed in rpm. In V/f mode (**B20**=0) and sensorless VC (**B20**=1) the indication is the frequency output of the inverter (= motor speed). Only in VC mode with feedback (**B20**=2) does the indication reflect the proper actual speed. | ✓ |
| C51 | **Display factor:** The raw value (**C50**) is divided by the factor entered here. | ✓ |
| C52 | **Display decimals** Places after the decimal point for the value in the status indication. | ✓ |
| C53 | **Display text:** Text for a customer-specific unit in the operating display (e.g. "items/hour"). Maximum 8 digits. Needs to be entered with FDS Tool. | ✓ |
| **D.. REFERENCE VALUE** | | Par. set* |
| Par. No. | Description | |
| D00 | **Reference value accel:** Acceleration ramp for analog reference values. Only of importance if the reference value is entered via the terminal terminal block X1 and the motor potentiometer<br>- voltage, current via analog input 1(X1.2 - 4)<br>- frequency via binary input BE5 (X1.8 - 14)<br>- motor potentiometer via binary inputs (**D90**=1). | |
| D01 | **Reference value decel:** deceleration ramp for analog reference values. Only of importance if the reference value is entered via the terminal block X1 and the motor potentiometer<br>- voltage, current via analog input 1(X1.2 - 4)<br>- frequency via binary input BE5 (X1.8 - 14)<br>- motor potentiometer via binary inputs (**D90**=1). | |
| *D02* | **Speed (ref. value-Max.):** Parameters **D02**...**D05** are used to determine the relationship between analog reference value and speed by way of a reference value characteristic. **D02**: Speed which is reached at maximum reference value (**D03**). | ✓ |
| *D03•* | **Reference value-Max.:** The speed (max. reference value) (**D02**) is assigned to this reference value. Per cent of the analog reference value (10V=100%) at which the maximum speed (**D02**) is reached. | ✓ |
| *D04* | **Speed (ref. value-Min.):** Speed which is reached at minimum reference value (**D05**). | ✓ |
| *D05•* | **Reference value-Min.:** The speed (min. reference value) (**D04**) is assigned to this reference value. Per cent of the analog reference value (10V=100%) at which the minimum speed (**D04**) is reached. | ✓ |
| *D06•* | **Reference value offset:** Corrects an offset on analog input 1 (X1.2-4). When reference value = 0, the motor should not rotate. If it nevertheless rotates, enter this value as offset with inverted sign (e.g.: Parameter **E10** indicates 1.3%, then **D06** must be set to -1.3%). The value range is ±100%. When the reference value offset is entered, the present value of the analog input is displayed as well. | |
| *D07•* | **Reference value enable:** If the minimum reference value (**D05**) is set higher than 1%, the reference value output can be used to derive an enable signal.<br>*0: inactive*<br>*1: active;* an additional enable signal is derived from the reference value on analog input 1.<br>Reference value enable high: the output is greater or equal to the reference value min.(**D05**).<br>Reference value enable low: the output is smaller or equal to the reference value min. (**D05**). | |
| *D08* | **Monitor Reference Value:** Monitors the reference value output, monitors for open circuit. The reference value monitoring only works if the reference value min. entered in **D05** is greater or equal to 5% (**D05**>= 5 %).<br>*0: inactive*<br>*1: active;* if the reference value output is smaller by 5% than the permissible reference value min. (**D05**), the inverter signals "RV wire brk". | ✓ |
| •<br>italics<br>1)<br>*<br>*<br>* | : To change these parameters the signal level on the "enable" terminal must be 0V.<br>: Depending on the active parameter settings, these parameters are not displayed.<br>: See result table page 23.<br>: These parameters are included in the "standard" menu level.<br>: Parameters identified with "✓" can be parameterized independently of each other in parameter sets 1 and 2. | |

## D.. REFERENCE VALUE

| Par. No. | Description | Par. set* |
|---|---|---|
| D10 | **Accel1:** Up to 7 fix reference values/ramp sets can be defined for every parameter set. The selection is via the binary inputs. To do this, at least one binary input must be programmed for reference value select (e.g. **F31** = *1: RV-select0*). The reference value selector assigns the fix reference values or ramp sets to the signals of the binary inputs. The result of the binary coding is shown in **E60** (0...7). The ramp sets (Accel 1...7 / Decel 1...7) are only active in conjunction with the assigned fix reference values 1...7. Accel1: acceleration time for ramp set 1 related to 150 Hz. | ✓ |
| D11 | **Decel1:** deceleration time for ramp set 1 related to 150Hz | ✓ |
| D12 | **Fix reference value1:** selected in parallel to ramp set 1 (Accel1 / Decel1) via the binary inputs | ✓ |
| D20 | **Accel2:** acceleration time for ramp set 2 related to 150Hz | ✓ |
| D21 | **Decel2:** deceleration time for ramp set 2 related to 150Hz | ✓ |
| D22 | **Fix reference value2:** selected in parallel to ramp set 2 (Accel 2 / Decel2) via binary inputs | ✓ |
| D30 | **Accel3:** acceleration time for ramp set 3 related to 150Hz | ✓ |
| D31 | **Decel3:** deceleration time for ramp set 3 related to 150Hz | ✓ |
| D32 | **Fix reference value3:** see **D12** | ✓ |
| D40 | **Accel4:** acceleration time for ramp set 4 related to 150Hz | ✓ |
| D41 | **Decel4:** deceleration time for ramp set 4 related to 150Hz | ✓ |
| D42 | **Fix reference value4:** see **D12** | ✓ |
| D50 | **Accel5:** acceleration time for ramp set 5 related to 150Hz | ✓ |
| D51 | **Decel5:** deceleration time for ramp set 5 related to 150Hz | ✓ |
| D52 | **Fix reference value5:** see **D12** | ✓ |
| D60 | **Accel6:** acceleration time for ramp set 6 related to 150Hz | ✓ |
| D61 | **Decel6:** deceleration time for ramp set 6 related to 150Hz | ✓ |
| D62 | **Fix reference value6:** see **D12** | ✓ |
| D70 | **Accel7:** acceleration time for ramp set 7 related to 150Hz | ✓ |
| D71 | **Decel7:** deceleration time for ramp set 7 related to 150Hz | ✓ |
| D72 | **Fix reference value7:** see **D12** | ✓ |

| No. | Accel | Decel | Reference value |
|---|---|---|---|
| 0 | **D00** | **D01** | analog, freq, |
| 1 | **D10** | **D11** | fix ref. value 1 |
| 2 | **D20** | **D21** | fix ref. value 2 |
| ⋮ | ⋮ | ⋮ | ⋮ |
| 7 | **D70** | **D71** | fix ref. value 7 |

| | | |
|---|---|---|
| D80 | **Ramp shape:**<br>*0: linear*<br>*1: 'S' ramp;* smoother acceleration/deceleration at each end of the ramp | ✓ |
| D81 | **Decel. quick:** Effective if a binary input is programmed for quick stop (**F3..** = 9) or if parameter **F38**=1 quick stop V3.2). When quick stop is triggered via the BE, the drive is decelerated with the deceleration ramp set here. | |
| D90• | **Reference value source:**<br>*0: standard reference value*<br>*1: motor potentiometer;* if parameters **F31**...**F35** are programmed accordingly, a "motor potentiometer" can be simulated with the help of two binary inputs. To do this, one binary input must be programmed to *"4: motorpoti UP"*, and another one to *"5: motorpoti DOWN"* (e.g. **F34**=4 and **F35**=5).<br>The speed is changed with ramps **D00** and **D01**. | ✓ |
| D91 | **Motorpoti-function:** Only if **D90** = 1<br>*0: non-volatile;* the approached reference value is retained if the enable is removed and after power-down/power-up.<br>*1: volatile;* the ref. value is set to 0 when the enable input goes low or when the drive is disconnected from the supply. | ✓ |
| D92 | **Negate reference value:**<br>*0: inactive;*<br>*1: active;* negates the reference value channel. Corresponds to a reversal of the direction of rotation and is independent of the selected reference value input. | ✓ |

| BE4 | BE5 | Mot. poti |
|---|---|---|
| L | L | const. |
| H | L | greater |
| L | H | smaller |
| H | L | 0 |

# 10. Parameter table
# E.. Displays

STÖBER ANTRIEBSTECHNIK

| E.. DISPLAYS | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| E00 | **I-Motor:** indicates the active motor current in Ampere. | |
| E01 | **P-Motor:** indicates the active power of the motor in kW and in per cent of the motor rated value. | |
| E02 | **M-Motor:** indicates the motor rated torque in Nm and in per cent of the motor rated torque. | |
| E03 | **DC-link-voltage:** indicates the DC-link-voltage.<br>Value range for single-phase inverters: 0...500V, for three-phase inverters 0...800V. | |
| E04 | **V-Motor:** indicates the motor.<br>0.....230V for single-phase inverters<br>0.....480V for three-phase inverters | |
| E05 | **f1-Motor:** indicates the current motor frequency in Hz. | |
| E06 | **Speed reference value:** indicates the speed reference value related to the motor shaft. | |
| E07 | **Post-ramp speed:** Indicates the speed related to the motor shaft after the ramp. Reflects the actual speed characteristic in consideration of the selected ramp. | |
| E08 | **n-Motor:** Indicates the motor speed. | |
| E10 | **AE1-Level:** Signal level on analog input 1 (X1 .2 -4). ±10V correspond to ± 100%. | |
| E11 | **AE2-Level:** Signal level on analog input 2 (X1 .A-B). ±10V correspond to ± 100% | |
| E12 | **ENA-BE1-BE2:** Level on the enable input (X1 .9), binary input 1 (X1 .10) and binary input 2 (X1 . 11).<br>Low level is indicated by 0, high level by 1. | |
| E13 | **BE3-BE4-BE5:** Level on the binary inputs 3, 4, 5 (X1 . 12 - X1 . 14). Low level is indicated by 0, high level 1. | |
| E14 | **BE5 frequency reference value:** If binary input BE5 is programmed for frequency reference value input (**F35**=14), the reference value output can be monitored here. 0% correspond to a frequency input of 100Hz on BE5. 100% correspond to the maximum permissible frequency reference value specified in **F37**. | |
| E15 | **n-encoder:** If a speed feedback is connected to BE4 and BE5 and BE5 is not programmed for frequency reference value, the encoder speed can be monitored here. The indication works independent of the reference value set in **B20**. | |
| E16 | **Analog output:** Signal level on the analog output (X1 .5-6). ± 10V correspond to ± 100V%. | |
| E17 | **Relay 1:** Operating condition of relay 1 (ready for operation)<br>*0: open*; See parameter **F10** for details.<br>*1: closed* = ready for operation | |
| E18 | **Relay 2:** Operating condition of relay 2. The function of relay 2 is determined in parameter **F00**.<br>*0: open*<br>*1: closed* | |
| E20 | **Device utilization:** Indicates the inverter utilization in per cent. 100% correspond the inter rated power. | |
| E21 | **Motor utilization:** Indicates the motor utilization in per cent. Reference value is the motor rated current set in **B12**. | |
| E22 | **I2t-device:** Level of the inverter thermal model (I2t model). 100% correspond to full utilization. | |
| E23 | **I2t-motor:** Level of the motor thermal model (I2t model). 100% correspond to full utilization. The thermal model is based on the design data entered in group B (motor) i.e. continuous duty (S1 duty). | |
| E24 | **I2t-braking resistor:** Level of the braking resistor thermal model (i2t model). 100% correspond to full utilization. | |
| E30 | **Run time:** Indicates the inverter run time. Run time means the time the inverter is connected to the AC supply. | |
| E31 | **Enabled time:** Indicates the active time. Active time means current is applied to the motor. | |
| E32 | **Energy count:** Indicates the total power consumption in kWh. | |
| E33 | **DC-link-voltage-max-memo:** The DC-link-voltage is constantly monitored. The highest measured value is stored to this non-volatile memory. This value cannot be reset. | |
| E34 | **I-max-memo:** The motor current is constantly monitored. The highest measured value is stored to this non-volatile memory. This value cannot be reset. | |

| E.. DISPLAYS | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| E35 | **Tmin-memo:** The inverter temperature is constantly monitored. The smallest measured value is stored to this non-volatile memory. This value cannot be reset. | |
| E36 | **Tmax-memo:** The inverter temperature is constantly monitored. The highest measured value is stored to this non-volatile memory. This value cannot be reset. | |
| E37 | **Pmin-memo:** The drive active power is constantly monitored. The smallest measured value is stored to this non-volatile memory. This value cannot be reset. | |
| E38 | **Pmax-memo:** The active power of the drive is constantly monitored. The highest measured value is stored to this non-volatile memory. This value cannot be reset. | |
| E40 | **Fault type:** This parameter allows you to select a certain number of archived faults. The inverter stores the last 10 fault events in the order of their occurrence. The fault memory number is shown in the top right corner. 1 is the latest, 10 the oldest fault event. The fault type is indicated in plain text in the bottom line.<br>To select the fault you wish to read out from memory, proceed as follows:<br>Press the "#" button in the top and the number of the fault displayed (1...10) will flash in the top line.<br>The type of fault is indicated in plain text in the bottom line (e.g. *31: short/ground)* Use the arrow keys to select the fault number you wish to read out. | |
| E41 | **Fault time:** The duration of the selected fault is indicated. | |
| E42 | **Fault count:** Number of fault events of a selected fault type.<br>To select the fault type proceed as follows:<br>Press the "#" key, the fault code and the fault will appear in the bottom line in plain text (e.g. *31: short/ground).*<br>Use the arrow keys to select the desired fault type. The number of fault events of this type is indicated in the top line (0 - 656635). | |
| E50 | **Device** | |
| E51 | **Software-version:** Inverter software version | |
| E52 | **Device-number** | |
| E53 | **Variant-number** | |
| E54 | **Option board** | |
| E55 | **Ident-number** | |
| E56 | **Parameter set Identification 1:** Indicates whether any parameters were changed in parameter set 1.<br>*0:* all values correspond to the default settings.<br>*1:* Parameter reset to default value with FDS Tool.<br>*2..254:* configured with FDS Tool.<br>*255:* minimum 1 value was edited from the keypad. | |
| E57 | **Parameter set Identification 2:** Indicates whether any parameters were changed in parameter set 2.<br>*0:* all values correspond to the default settings.<br>*1:* Parameter reset to default value with FDS Tool.<br>*2..254:* configured with FDS Tool.<br>*255:* minimum 1 value was edited from the keypad. | |
| E60 | **Reference value selector:** Shows the result of the binary coding of the fix reference values. The selection is made via binary inputs BE1...BE5. Min. one binary input must be parameterized as reference value selector. (**F3..** =1..3). The result of the binary coding is indicated by figures 0...7. A fix reference value/ramp set is assigned to this result. | |

| RV Select 2 | 1 | 0 | Set point | **E60** |
|---|---|---|---|---|
| 0 | 0 | 0 | Analog, freq,.. | 0 |
| 0 | 0 | 1 | Fixed ref. value 1 | 1 |
| 0 | 1 | 0 | Fixed ref. value 2 | 2 |
| 0 | 1 | 1 | Fixed ref. value 3 | 3 |
| 1 | 0 | 0 | Fixed ref. value 4 | 4 |
| 1 | 0 | 1 | Fixed ref. value 5 | 5 |
| 1 | 1 | 0 | Fixed ref. value 6 | 6 |
| 1 | 1 | 1 | Fixed ref. value 7 | 7 |

| | | |
|---|---|---|
| E61 | **additional reference value:** Only if analog reference value 2 is programmed as correction reference value (**F20**=1). Speed correction in rpm in consideration of **F21**, **F22** and the voltage of the signal on analog input 2 (X1 .A-B). In the default setting ±10V correspond to ± 3000 rpm. | |
| E62 | **Active M-max:** Active M-max as minimum of max. torque 1 (**C03**), max. torque 2 (**C04**) and the torque, resulting from the level on AE2 if the AE2 is programmed to torque-limit (**F20**=2) or power-limit (**F20**=3). | |

| F.. TERMINALS | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| F00 | **Relay 2 function:** Functions of relay 2 (X2.5 - 2.6).<br>*0: inactive*<br>*1: brake;* controls the brake, see **F01**, **F02**.<br>*2: standstill;* relay closes when speed 0 rpm ±**C40**<br>*3: refVal-reached;* signal contact for at speed, relay closes when reference value ± ref. value window (**C40**) reached.<br>*4: torque-limit;* relay closes when the active torque-limit is reached (see **E62**).<br>*5: warning;* relay closes when a warning is signaled.<br>*6: operat.range;* relay closes when the drive leaves the defined operating range (**C41**...**C46**).<br>*7: act. ParaSet;* only works if in both parameter sets **F00**=7 is set. Low signal (relay open) = parameter set 1 is active. High signal (relay closed) = parameter set 2 is active. | |
| F01 | **Brake release:** Only if **F00**=1.<br>If the reference value exceeds the set speed value, the brake releases (relay 2 closes). | ✓ |
| F02 | **Brake set:** Only if **F00**=1.<br>If the drive is stopped via a "halt" or "quick stop" signal, the brake is applied when the actual speed falls below the set speed value (relay 2 = opens). | ✓ |
| F03 | **Relay 2 t-on:** Causes a pickup delay on relay 2. Can be combined with all functions of relay 2. | ✓ |
| F04 | **Relay 2 t-off:** Causes a release delay of relay 2. Can be combined with all functions of relay 2. | ✓ |
| F05 | **Relay 2 invert:** Inverts the relay 2 signal. For the timing period to remain unchanged, the functions of pickup and release delay are changed over as well (**F04/F03**). Can be combined with all functions of relay 2. | ✓ |
| F10 | **Relay 1 function:** Relay 1 is closed when the inverter is ready for operation. Opening the relay can be controlled as follows: (status inquiry relay 1 via parameter (**E17**)<br>*0: fault;*<br>*1: fault & warning:* relay open when a fault or warning is present.<br>*2: fault & warning & message:* relay open, when fault, warning or message is present. If auto-reset is active (**A32**=1), the switching of the relay is delayed until the number of permissible auto-reset attempts is exhausted. | ✓ |
| F20 | **AE2-function:** Function 2 of analog input (X1 .A - B).<br>*0: inactive*<br>*1: additional reference value;* additional reference value input, effective independent of the selected control input (**A30**). ± 10V = ± 3000 rpm.<br>*2: torque-limit;* additional torque-limit. 10V = motor rated torque. Active torque-limit, minimum from max torque 1 (**C03**), max torque 2 (**C04**) and the level on analog input 2.<br>*3: power-limit;* external power-limit; 10V = motor rated power. | ✓ |
| F21 | **AE2-offset:** An offset on analog input 2 (X1 .A - B) can be corrected. To do this, jumper terminals X1.A and X1.B. Monitor the level on AE2 and enter in parameter **F21** with inverted sign (e.g. parameter **E11** indicates 1.3%, then **F21** must be programmed to -1.3%). The permissible value range is: ± 100%. | ✓ |
| F22 | **AE2-gain:** The signal on analog input 2 is added to the AE2 offset (**F21**) and multiplied by this factor, e.g. **F20**=1 and **F22**=50%, from this it follows that 10V on AE2=1500 rpm correction. | ✓ |
| F31• | **BE1-function:** The binary inputs **BE1**...**BE5** are freely programmable. Selection points 0...11 are identical for all binary inputs. In the case of a double assignment these are evaluated via an OR connection.<br>*0: inactive;*<br>*1: RV select0;* selects fixed ref. value/ramp set. The binary input signals are assigned fixed ref. value/ramp set (**D10**...**D72**) via the ref. value selector.<br>*2: RV select1;* see above<br>*3: RV select2;* see above<br>*4: motorpoti UP;* if **D90**=1, a motor potentiometer can be simulated by means of two binary inputs. To do this, a BE must be programmed for *"4: motorpoti UP"* and a second one for *"5: motorpoti DOWN"*. See also s. **D90**.<br>*5: motorpoti DOWN;* see above.<br>*6: direction of rotation;* specification of the direction of rotation. High signal = counterclockwise, Low signal = clockwise when looking at the motor shaft. The specified direction of rotation must correspond to the permissible direction of rotation (**C02**). | |

| F. TERMINALS | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| | *7: additional enable;* BE assumes the function of an additional enable, i.e. a fault may also be reset via the additional enable. The drive is only enabled if the "enable" input (X1.9) and the binary input are high.<br>*8: halt;* If the BE is high, the present ref. value is ignored and the drive decelerated to zero speed (0 rpm) with the selected deceleration ramp. Analog ref. value entry / motor potentiometer: ramp reference value deceleration (**DO1**) Fix reference values: the deceleration ramp (**D12**...**D72**) associated with the fix reference value.<br>*9: quick stop;* If the BE is high, the present reference value is ignored and the drive decelerated to zero speed (0 rpm) with the selected decel. quick ramp (**D81**). To initiate quick stop a short high pulse on the BE suffices. Quick stop can only be cancelled by removing the enable.<br>*10: torque select;* switches over between the torque limits max torque 1 (**C03**) and max torque 2 (**C04**).<br>LOW signal = max torque 1<br>HIGH signal = max torque2<br>*11: ParaSet-select.; parameter set selection via BE is only possible if* **A41**=0. In this case this BE must be set to 11 in both parameter sets.<br>LOW signal: parameter set 1 is selected.<br>HIGH signal: parameter set 2 is selected.<br>The selected parameter set becomes active only after the enable has been removed.<br>*12: ext. fault;* allows the user to evaluate fault signals from peripherals. The inverter evaluates a rising edge on the BE and trips on *"44: ext. fault"*. If several BEs are programmed to ext. fault, the rising edge can only be evaluated if the other BEs, which are programmed to *"12: ext. fault"*, are low.<br>*13: reset;* A fault can be canceled with a rising edge, provided the fault condition is no longer present. If several BEs are programmed to Reset, the rising edge can only be evaluated if the other BEs, which are programmed to *"13: reset"*, are low.<br>*14: ccw V3.2;* By programming **F31**=14 and **F32**=14 the direction of rotation entry can be emulated by inverters with software version 3.2.<br>BE1 BE2 command<br>0 0 halt if **F38** = 0, quick stop if **F38** = 1<br>0 1 clockwise<br>1 0 counterclockwise<br>1 1 halt<br>The functions "direction of rotation", "halt" and "quick stop" must not be routed to other BEs in this case. | |
| F32• | **BE2-function:** 0-13 see **F31**,<br>14: *cw. V3.2* | ✓ |
| F33• | **BE3-function:** 0-13 see **F31**,<br>*14: encoder signal 0;* only if **B20**=2 (vector control with feedback).<br>The "zero signal" (once per revolution) of the connected incremental encoder. This signal is not compulsory for the "vector control with feedback" function. | ✓ |
| F34• | **BE4-function:** 0-13 see **F31**,<br>*14: encoder signal A;* Only if **B20**=2 (vector control with feedback).<br>The "A signal" of the connected incremental encoder. This signal is compulsory for the "vector control with feedback" function. | ✓ |
| F35• | **BE5-function:** 0-13 see **F31**<br>*14: frequency ref. value;* The inverter is parameterized for frequency reference value entry, also see wiring page 4. Analog input 1 (X1.2-4) is ignored. 100Hz frequency input correspond to a reference value output of 0%. 100% reference value output correspond to maximum frequency entered in **F37.** The frequency ref. value is the processed internally by means of the reference value characteristic (**D02**...**D05**) and the ramp generator (**D10 / D11**).<br>*15: encodersignal B;* Only if **B20**=2 (vector control with feedback). The "B" signal of the connected incremental encoder. This signal is compulsory for the "vector control with feedback" function. | ✓ |
| F36• | **Encoder-inc.:** If an incremental encoder is used for speed feedback, enter the encoder's ppr here. | ✓ |
| • | : To change these parameters the signal level on the "enable" terminal must be 0V. | |
| italics | : Depending on the active parameter settings, these parameters are not displayed. | |
| 1) | : See result table page 23. | |
| | : These parameters are included in the "standard" menu level. | |
| * | : Parameters identified with "✓" can be parameterized independently of each other in parameter sets 1 and 2. | |

| F.. TERMINALS | | Par. set* |
|---|---|---|
| Par. No. | Description | |
| *F37* | **fmax frequency ref. value:** Only if binary input 5 is programmed to frequency reference value (**F35**=14). Maximum permissible frequency. This maximum frequency corresponds to a reference value output of 100%. The fix minimum frequency of 100 Hz corresponds to a reference value output of 0%. | ✓ |
| F38 | **Quick stop V3.2:** The parameter is only available if **F31** = 14 (BE1) and **F32** = 14 (BE2) are parameterized.<br>*0: inactive;* The direction of rotation is specified via binary inputs BE1 and BE2. It is not possible to trigger a quick stop via the inputs for the direction of rotation or the enable. A quick stop can only be triggered if in addition a BE is parameterized for *"9: quick stop"*.<br>*1: active;* By activating parameter **F38** compatibility with software version 3.X is achieved for the quick stop. Quick stop is triggered if BE1 = LOW and BE2 = LOW or by removing the enable (also reference value enable **D07** or additional enable via BE, **F33**..**F35** = 7). The drive is decelerated with the quidk stop ramp set in **D81**. The functions "direction of rotation", "halt" and "quick stop" must not be routed to other BEs! | |
| F40 | **Analog output-function:** Functions of the analog output X1.5 - 1.6. On the terminals a voltage of ± 10V is available. The resolution is 19.5 mV, the sampling time 32ms.<br>*0: inactive*<br>*1: E00 I-motor;* indication of motor apparent current 10V = Inverter I-nominal<br>*2: E01 P-motor;* indication of motor active power 10V = motor P-nominal (**B11**).<br>*3: E02 M-motor;* indication of motor torque 10V = motor rated torque<br>*4: E08 n-motor;* (**C01**) | |
| *F41* | **Analog output-offset:** Offset of the analog output X1.5-1.6 | |
| *F42* | **Analog output-gain:** The value set in parameter **F40** is offset with the setting in (**F41**) and multiplied with the factor: **F40**=1 and **F42** = 50%. From this it follows: that 5V on the analog output = inverter I-nominal. | |

| | |
|---|---|
| • | : To change these parameters the signal level on the "enable" terminal must be 0V. |
| italics | : Depending on the active parameter settings, these parameters are not displayed. |
| 1) | : See result table page 23. |
| | : These parameters are included in the "standard" menu level. |
| * | : Parameters identified with "✓" can be parameterized independently of each other in parameter sets 1 and 2. |

# 11. Result table



**Result table**
The result of actions such as, e.g. save parameters (**A00** = 1) is indicated in the display. Possible results are:

| | |
|---|---|
| 0: error free | The data was transferred without any faults. |
| 1: error! | General fault |
| 2: wrong box | Parabox has incompatible software version (V2.0 to 3.2) |
| 3: invalid data | Parabox contain invalid data. Rewrite Parabox and repeat. |
| 4: identification | Confirm with # key |
| 5: OK (adjusted) | Parabox and controller software versions are different in some parameters. Confirm with # key. The message has no influence on the controllers functionality. |
| 6: OK (adjusted) | Parabox and controller software versions are different in some parameters. Confirm with # key. The message has no influence on the controllers functionality. |
| 9: BE encodersignal | If control mode "vector control with 2-channel feedback" is selected in **B20** = 2, then the following settings must be made: **F34** = 14 **F35** = 15 |
| 10: Limit | Entered value outside value range. |
| 11: f(BE) > 51.2 kHz | Max. frequency on BE exceeds the permissible limit of 51.2 kHz. (nmax/60) encoder ppr > 51.2 kHz or (**C01**/60) **F36** > 51.2 kHz. |
| 13: BE cw/ccw | By programming **F31** = 14 **F32** = 14 the direction of rotation specification can be emulated by inverters with software version 3.2. In this case, the functions "direction of rotation", "halt", "quick stop" must not be routed to other BEs. |
| 14: Cancelled | Actions **A40/A41** could not be carried out correctly. |
| 15: R1 too high | The stator resistance measured by the "motor sizing" function (**B41**) was too high. |
| 16: Phase fault: U | Fault in phase U. |
| 17: Phase fault: V | Fault in phase V. |
| 18: Phase fault: W | Fault in phase W. |
| 19: Symmetry | Fault in the symmetry of phases U, V, W. One winding resistance |
| 20: motor connection | The motor connection (start/delta) of the STÖBER system motor selected in parameter **B00** = 1...27 differs from the motor connection of the connected motor. |

## Operating conditions

| | |
|---|---|
| 0: ready | Inverter is ready for operation |
| 1: clockwise | Stationary positive speed |
| 2: counterclk | Stationary negative speed |
| 3: accelerat. | Acceleration ongoing |
| 4: decelerat. | Deceleration ongoing |
| 5: halt | Halt command present |
| 6: n < n-min | Ref. value < nmin (**C00**) |
| 7: n > n-max | Ref. value > nmax (**C01**) |
| 8: ill. direct. | Specified direction of rotation is contrary to permissible direction of rotation (**C02**) |
| 9: load start | Load start mode is active |
| 10: capturing | Capturing-function is active |
| 11: quick stop | Quick stop is carried out |
| 12: inhibit | Inverter is waiting for a high to low signal transition on the "Enable" input (X 1.9) |
| 13: serial (X3) | Parameter setting **A30** = 1. Inverter is controlled from the PC via the serial interface. |
| 14: enabled | Only in conjunction with DRIVECOM profile. Bus connection. |
| 15: self-test | Inverter carries out a self-test |
| 16: fault | Inverter power stage is inhibited. |

## Faults

**The inverter is unable to perform the drive task and is inhibited. An entry in the fault memory is made (E40/41) and relay 1 (ready for operation) releases. If Parabox is plugged into the inverter at the time of the fault event, the fault information is automatically written to Parabox.**

| | | Auto-reset | FDS Tool* |
|---|---|---|---|
| 31: short/ground | The hardware overcurrent monitoring is active.<br>• The motor draws too high a current from the inverter (interwinding fault, overload) | | |
| 32: short/ground internal | An internal check is carried out when the inverter is enabled.<br>If a short-circuit is detected, the unit will trip.<br>• Internal unit fault, e.g. defective IGBT modules. | | |
| 33: overcurrent | • Acceleration times too high (ramps, D..)<br>• Check torque limits **C03/C04,**<br>- which torque limits are active (see Sec. 8.2)<br>- reduce torque limits **C03/C04** set at maximum value by approx. 10%.<br>• Optimize parameter **C30** (ratio of the moments of inertia) | | |
| 34: hardware fault | Non-volatile memory (NOVRAM) is defective. | | |
| 35: watchdog | Watches the microprocessor utilization and function. | | |

* These parameters can be programmed via FDS Tool to signal a message, warning or fault.

**Faults**

**Faults The inverter is unable to perform the drive task and is inhibited. An entry in the fault memory is made (E40/41) and relay 1 (ready for operation) releases. If Parabox is plugged into the inverter at the time of the fault event, the fault information is automatically written to Parabox.**

| | | Auto -reset | FDS Tool* |
|---|---|---|---|
| 36: high voltage | DC-link-voltage too high.<br>• Supply voltage too high<br>• Drive regeneration when braking (no braking resistor connected, brake chopper defective)<br>• Braking resistor resistance value too low (overcurrent protection) | ✓ | |
| 38: tempDev.Sens | The temperature measured by the temperature sensor is above the acceptable limit.<br>• Ambient / control cabinet temperature too high. | | |
| 39: tempDev. i²t | The i²t model calculated for the inverter reaches 100% thermal utilization.<br>• Inverter overload<br>• Ambient / control cabinet temperature too high. | | |
| 40: Invalid data | Data in non-volatile memory are incomplete.<br>Reset non-volatile memory with the "save parameters" parameter (**A00**).<br>This will activate the default settings. | | |
| 41: temp.MotorTMS | Overtemperature signaled by the PTC thermistor fitted in the motor.<br>Connection to terminal X2.1-2.<br>• Motor may be overloaded. If necessary fit a forced cooling fan.<br>• PTC thermistor not connected (if not fitted, jumper -> X2.1-X2.2) | | |
| 42: tempBrakeRes | The i²t model calculated for the braking resistor reaches 100% thermal utilization. | | |
| 43: RV wire brk | Only if the ref. value is calculated by way of the ref. value characteristic. (Ref. value entry via analog input 1 or frequency ref. value) and the ref. value monitoring is activated (**D08**=1).<br>• The ref. value output is 5% lower than the permissible minimum ref. value (**D05**). | | |
| 44: ext. fault | Overload in active heaving starting mode<br>• Check **C21/C22** parameter settings. | ✓ | |
| 45: oTempMot. i²t | • Motor overload<br>• Insufficient cooling | | ✓ |
| 46: low voltage | DC-link-voltage is below the limit set in **A35.**<br>• Supply voltage dips<br>• Acceleration times too short (ramps, D..) | ✓ | ✓ |
| 47: drive overload | The maximum permissible torque for steady-state operation is exceeded.<br>The permissible torque is limited by parameters **C03/C04** and the torque-limit, which can be applied via analog input 2 (see Sec. 8.2). | ✓ | ✓ |
| 48: accel overload | Same as 47, however when accelerating. For "intermittent duty" mode (**C20**=2) the permissible value for the acceleration phase is (**C04**). | ✓ | ✓ |
| 49: Decel overload | Same as 47, however when decelerating. | ✓ | ✓ |
| 50: operating area | The unit is outside the operating range defined in **C41...46.** | ✓ | ✓ |
| 51: motor stalled | The slip frequency has reached its limit value, the motor is stalling. | ✓ | |
| 52: communication | Communications breakdown between the inverter and FDS Tool when the motor is controlled from the PC. | | |

* These parameters can be programmed via FDS Tool to signal a message, warning or fault.

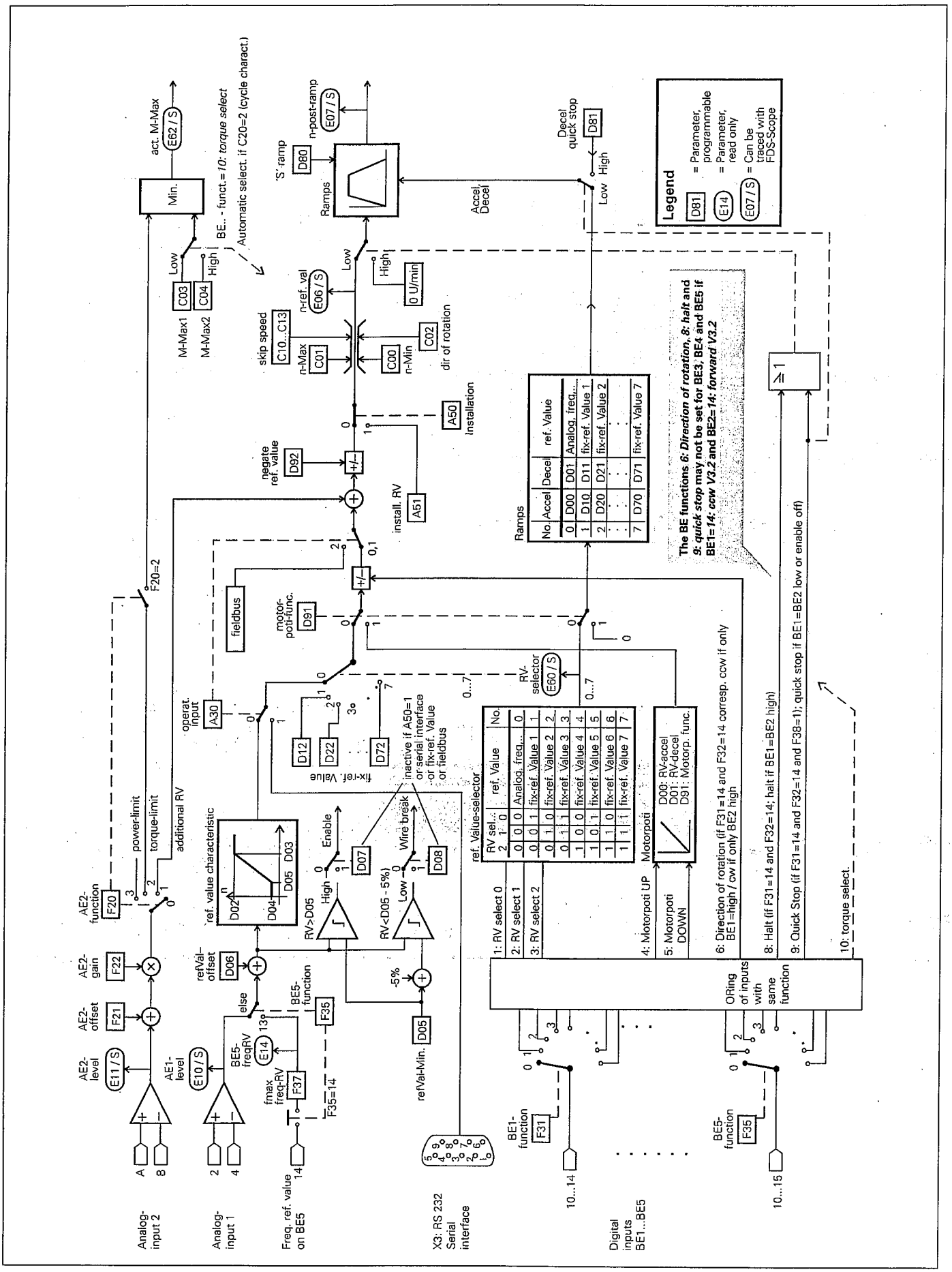
**Resetting faults:**

- **Enable:** Change signal level on the enable input from low to high and back to low again. Always available.
- [#] **key** (only when **A31**=1)
- Auto-reset (only when **A32**=1)

The last ten fault events can be read out via parameters **E40** and **E41** (value 1= last fault). The inverter response to certain events (fault, warning, message or none) can be freely programmed in FDS Tool.

# 14. Block circuit diagram reference value processing





# 15. Parameter table
# A.. Inverter - D.. Reference value



| Parameter | | Value range | | | Entry |
|---|---|---|---|---|---|
| **A.. Inverter** | | | | | |
| A00 | Save parameters | 0 | ... | 1 | |
| A01 | Read Parabox & save | 0 | ... | 1 | |
| A02 | Check parameters | 0 | ... | 1 | |
| A03 | Write to Parabox | 0 | ... | 1 | |
| A04 | Default settings | 0 | ... | 1 | |
| A10 | Menu level | 0 | ... | 1 | |
| A11 | ParaSetEdit | 1 | ... | 2 | |
| A12 | Language | | 0 ... | 1 | |
| A13 | Set Password | 0 | ... | 9999 | |
| A14 | Enter Password | 0 | ... | 9999 | |
| A15 | Auto return | 0 ... | 1 | | |
| A20 | Braking resistor type | | 0 ... | dep. on type | |
| A21 | Braking resistor resistance [Ω] | dep. on type ... | 600 | | |
| A22 | Braking resistor rating [kW] | | 0 ... | dep. on type | |
| A23 | Braking resistor therm. time constant [s] | 0.1 ... | 1 | ... 10 | |
| A30 | Operation input | 0 ... | 1 | | |
| A31 | #-Reset | | 0 ... | 1 | |
| A32 | Auto-Reset | | 0 ... | 1 | |
| A33 | Time auto reset [min] | 1 ... | 15 | ... 255 | |
| A34 | Auto-start | | 0 ... | 1 | |
| A35 | Low voltage limit [V] | | dep. on type | | |
| A36 | Mains voltage [V] | | dep. on type | | |
| A40 | Read Parabox | 0 | ... | 1 | |
| A41 | Select paraset | 0 | ... | 2 | |
| A42 | Copy para set 1>2 | 0 | ... | 1 | |
| A43 | Copy para set 2>1 | 0 | ... | 1 | |
| A50 | Installation | 0 | ... | 1 | |
| A51 | Installation reference value | nmin/8 | ... | nmax/8 | |

| Parameter | | Value range | | | Entry |
|---|---|---|---|---|---|
| **B.. Motor** | | | | | |
| B00 | Motor-type | 0 | ... dep. on type | | |
| B10 | Poles | 2 | 4 | ... 16 | |
| B11 | P-nominal [KW] | 0.12 | ... dep. on type | | |
| B12 | I-nominal [A] | 0 | ... dep. on type | | |
| B13 | n-nominal [rpm] | 0 | ... dep. on type | ... 6000 | |
| B14 | V-nominal [V] | 0 | ... dep. on type | ... 480 | |
| B15 | f-nominal [kHz] | 10 | 50 | ... 330 | |
| B16 | cos PHI | 0.50 | ... dep. on type | ... 1 | |
| B20 | Control mode | | 0 ... | 2 | |
| B21 | V/f characteristic | | 0 ... | 1 | |
| B22 | V/f gain [%] | 90 ... | 100 | ... 110 | |
| B23 | Boost [%] | 0 ... | 10 | ... 400 | |
| B24 | Switching frequency [kHz] | | 4 ... | 16 | |
| B30 | Addit. motor operating | | 0 ... | 1 | |
| B31 | Oscillation damping | | 0 ... | 1 | |
| B40 | Phase test | 0 | ... | 1 | |
| B41 | Autotuning | 0 | ... | 1 | |

1) Maximum value depends on selected motor/inverter combination.

| Parameter | | Value range | | | Entry |
|---|---|---|---|---|---|
| **C.. Machine** | | | | | |
| C00 | Min. speed rpm | | 0 ... | C01 | |
| C01 | Max. speed rpm | C02 ... | 3000 | ... 6000 | |
| C02 | Perm. direction of rotation | | 0 ... | 2 | |
| C03 | Max. torque 1 [%] | 0 ... | 150 | ... C04 | |
| C04 | Max. torque 2 [%] | C03 ... | 150 | ... 400[1)] | |
| C10 | Skip speed 1 [rpm] | | 0 ... | 6000 | |
| C11 | Skip speed 2 [rpm] | | 0 ... | 6000 | |
| C12 | Skip speed 3 [rpm] | | 0 ... | 6000 | |
| C13 | Skip speed 4 [rpm] | | 0 ... | 6000 | |
| C20 | Startup mode | | 0 ... | 3 | |
| C21 | M-load start (torque) [%] | 0 ... | 100 | ... 400 | |
| C22 | t-load start (time) [s] | 0 ... | 5 | ... 9.9 | |
| C30 | J-mach / J-motor | | 0 ... | 1000 | |
| C31 | Speed controller Kp [%] | 0 ... | 80 | ... 400 | |
| C32 | Speed controller Ki [%] | 0 ... | 100 | ... 400 | |
| C40 | RV window [rpm] | 0 ... | 30 | ... 300 | |
| C41 | Op. range speed min [rpm] | | 0 ... | C42 | |
| C42 | Op. range speed max [rpm] | C41 ... | 6000 | | |
| C43 | Op. range M-min [%] | | 0 ... | C44 | |
| C44 | Op. range M-max [%] | C43 ... | 400 | | |
| C45 | Op. range P-min [%] | 0 ... | 400 | ... C46 | |
| C46 | Op. range P-max [%] | C45 ... | 400 | | |
| C50 | Display function | | 0 ... | 4 | |
| C51 | Display factor | -1000... | 1 | ... 1000 | |
| C52 | Display decimals | | 0 ... | 5 | |
| C53 | Display text | | | | — |

| Parameter | | Value range | | | Entry |
|---|---|---|---|---|---|
| **D.. Reference value** | | | | | |
| D00 | Ref. value accel [s/150Hz] | 0.1 ... | 3 | ... 3000 | |
| D01 | Ref. value decel [s/150Hz] | 0.1 ... | 3 | ... 3000 | |
| D02 | Speed (ref. value Max) [rpm] | 0 ... | 3000 | ... 6000 | |
| D03 | Reference value-Max. [%] | D05 ... | 100 | | |
| D04 | Speed (ref. value-Min) [rpm] | | 0 ... | 6000 | |
| D05 | Reference value-Min. [%] | 0 ... | 1 | ... D03 | |
| D06 | Reference value offset [%] | -100 ... | 0 | ... 100 | |
| D07 | Reference value enable | | 0 ... | 1 | |
| D08 | Monitor Reference value | | 0 ... | 1 | |
| D10 | Accel1 [s/150Hz] | 0.1 ... | 6 | ... 3000 | |
| D11 | Decel1 [s/150Hz] | 0.1 ... | 6 | ... 3000 | |
| D12 | Fix reference value1 [rpm] | -6000 ... | 750 | ... 6000 | |
| D20 | Accel2 [s/150Hz] | 0.1 ... | 9 | ... 3000 | |
| D21 | Decel2 [s/150Hz] | 0.1 ... | 9 | ... 3000 | |
| D22 | Fix reference value2 [rpm] | -6000 ... | 1500 | ... 6000 | |
| D30 | Accel3 [s/150Hz] | 0.1 ... | 12 | ... 3000 | |
| D31 | Decel3 [s/150Hz] | 0.1 ... | 12 | ... 3000 | |
| D32 | Fix reference value3 [rpm] | -6000 ... | 3000 | ... 6000 | |
| D40 | Accel4 [s/150Hz] | 0.1 ... | 0.5 | ... 3000 | |
| D41 | Decel4 [s/150Hz] | 0.1 ... | 0.5 | ... 3000 | |
| D42 | Fix reference value4 [rpm] | -6000... | 500 | ... 6000 | |
| D50 | Accel5 [s/150Hz] | 0.1 ... | 1 | ... 3000 | |
| D51 | Decel5 [s/150Hz] | 0.1 ... | 1 | ... 3000 | |
| D52 | Fix reference value5 [rpm] | -6000... | 1000 | ... 6000 | |
| D60 | Accel6 [s/150Hz] | 0.1 ... | 2 | ... 3000 | |
| D61 | Decel6 [s/150Hz] | 0.1 ... | 2 | ... 3000 | |

# 15. Parameter table
# D.. Reference value - F.. Terminals



| Parameter | | Value range | | | Entry |
|---|---|---|---|---|---|
| D62 | Fix reference value6 [rpm] | -6000... | 2000 | ... 6000 | |
| D70 | Accel7 [s/150Hz] | 0.1 ... | 2.5 | ... 3000 | |
| D71 | Decel7 [s/150Hz] | 0.1 ... | 2.5 | ... 3000 | |
| D72 | Fix reference value7 [rpm] | -6000... | 2500 | ... 6000 | |
| D80 | Ramp shape | | 0 | ... 1 | |
| D81 | Decel. quick [s/150Hz] | 0.1 ... | 0.2 | ... 3000 | |
| D90 | Reference value source | | 0 | ... 1 | |
| D91 | Motorpoti-function | | 0 | ... 1 | |
| D92 | Negate reference value | | 0 | ... 1 | |

## E.. Displays

| | | | | | |
|---|---|---|---|---|---|
| E00 | I-Motor [A] | 0 | ... | dep. on type | ---- |
| E01 | P-Motor [KW] | 0 | ... | dep. on type | ---- |
| E02 | M-Motor [Nm] | -400 | ... | 400 | ---- |
| E03 | DC link voltage [V] | 0 | ... | dep. on type | ---- |
| E04 | V-Motor [V] | 0 | ... | dep. on type | ---- |
| E05 | f1-Motor [Hz] | -200 | ... | 200 | ---- |
| E06 | Speed reference value [rpm] | -6000 | ... | 6000 | ---- |
| E07 | Post-ramp speed [rpm] | -6000 | ... | 6000 | ---- |
| E08 | n-Motor [rpm] | -6000 | ... | 6000 | ---- |
| E10 | AE1-level [%] | -100 | ... | 100 | ---- |
| E11 | AE2-level [%] | -100 | ... | 100 | ---- |
| E12 | ENA-BE1-BE2 | 0/0/0 | ... | 1/1/1 | ---- |
| E13 | BE3-BE4-BE5 | 0/0/0 | ... | 1/1/1 | ---- |
| E14 | BE5 freq. ref. value [%] | 0 | ... | 400 | ---- |
| E15 | n-encoder [rpm | -6000 | ... | 6000 | ---- |
| E16 | Analog output [%] | -400 | ... | 400 | ---- |
| E17 | Relay 1 | 0 | ... | 1 | ---- |
| E18 | Relay 2 | 0 | ... | 1 | ---- |
| E20 | Device utilization [%] | 0 | ... | 400 | ---- |
| E21 | Motor utilization [%] | 0 | ... | 400 | ---- |
| E22 | I2t-device [%] | 0 | ... | 100 | ---- |
| E23 | I2t-motor [%] | 0 | ... | 100 | ---- |
| E24 | I2t-braking resistor [%] | 0 | ... | 400 | ---- |
| E30 | Run time [h, ', ''] | 0 | ... | 65535h59 | ---- |
| E31 | Enabled time [h, ', ''] | 0 | ... | 65535h59 | ---- |
| E32 | Energy count [KWh] | 0 | ... | 4294967.2 | ---- |
| E33 | DC link volt.-max-memo [V] | 0 | ... | 3276 | ---- |
| E34 | I-max-memo [A] | 0 | ... | dep. on type | ---- |
| E35 | Tmin-memo [°C] | -128 | ... | 127 | ---- |
| E36 | Tmax-memo [°C] | -128 | ... | 127 | ---- |
| E37 | Pmin-memo [KW] | -327,68 | ... | 327,67 | ---- |
| E38 | Pmax-memo [KW] | -327,68 | ... | 327,67 | ---- |
| E40 | Fault type | 1 | ... | 10 | |
| E41 | Fault time | 1 | ... | 10 | |
| E42 | Fault count | 1 | ... | 22 | |
| E50 | Device | | | | ---- |
| E51 | Software-version | | | | ---- |
| E52 | Device-number | 0 | ... | 42949672 | ---- |
| E53 | Variant-number | 0 | ... | 42949672 | ---- |
| E54 | Option board | 0 | ... | 255 | ---- |
| E55 | Ident-number | 0 | ... | 65535 | ---- |
| E56 | Parameter Set Identifik. 1 | | 0 | ... 254 | ---- |
| E57 | Parameter Set Identifik. 2 | | 0 | ... 254 | ---- |

| Parameter | | Value range | | | Entry |
|---|---|---|---|---|---|
| E60 | Reference value selector | 0 | ... | 7 | ---- |
| E61 | additional ref. value [rpm] | -6000 | ... | 6000 | ---- |
| E62 | Active M-max [%] | -400 | ... | 400 | ---- |

## F.. Terminals

| | | | | | |
|---|---|---|---|---|---|
| F00 | Relay 2 function | | 0 | ... 5 | |
| F01 | Brake release [rpm] | | 0 | ... 300 | |
| F02 | Brake set [rpm] | | 0 | ... 300 | |
| F03 | Relay 2 t-on [s] | | 0 | ... 5.024 | |
| F04 | Relay 2 t-off [s] | | 0 | ... 5.024 | |
| F05 | Relay 2 t invert | | 0 | ... 1 | |
| F10 | Relay 1 function | | 0 | ... 2 | |
| F20 | AE2-function | | 0 | ... 3 | |
| F21 | AE2-offset [%] | -100 ... | 0 | ... 100 | |
| F22 | AE2-gain [%] | -400 ... | 100 | ... 400 | |
| F31 | BE1-function | 0 ... | 8 | ... 14 | |
| F32 | BE2-function | 0 ... | 6 | ... 14 | |
| F33 | BE3-function | 0 ... | 1 | ... 14 | |
| F34 | BE4-function | 0 ... | 2 | ... 14 | |
| F35 | BE5-function | | 0 | ... 15 | |
| F36 | Encoder-inc. [ppr] | 30 ... | 1024 | ... 4096 | |
| F37 | fmax - frequency reference value [kHz] | 3 ... | 51.2 | | |
| F38 | Quick stop V3.2 | | 0 | ... 1 | |
| F40 | Analog output-function | | 0 | ... 4 | |
| F41 | Analog output-offset [%] | -10 ... | 0 | ... 10 | |
| F42 | Analog output-gain [%] | -400 ... | 0 | ... 400 | |

= Standard menu access, see parameter **A10**

= Extended menu access **A10=1**

Comment: __ = default setting

Note

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