FAS
Posi-Upgrade

FREQUENCY INVERTER POSIDRIVE® FAS 4000

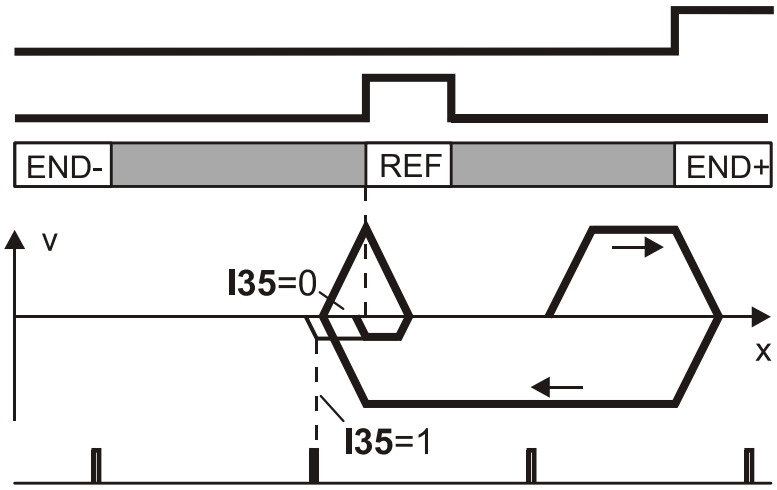
> Posi-Upgrade <

Operating instructions

It is essential to read and comply with these instructions and the Installation and Commissioning Instructions (publication no. 441581) prior to installation and commissioning.

MANAGEMENTSYSTEM

certified by DQS according to
DIN EN ISO 9001, DIN EN ISO 14001
Reg-No. 000780 UM/QM



SV. 4.5

GB **02/2004**

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1 NOTES ON SAFETY

To prevent avoidable problems from occurring during commissioning and/or operation, it is essential to read and comply with this entire instruction manual before starting installation and commissioning.

Based on DIN EN 50178 (once VDE 0160), FAS-series frequency inverters are defined as electronic power equipment (BLE) for the control of power flow in high-voltage systems. They are designed exclusively to power three-phase-current, asynchronous machines. Handling, installation, operation and maintenance must be performed in accordance with valid and/or legal regulations, applicable standards and this technical documentation.
The frequency inverter are products of the restricted sales class (in accordance with IEC 61800-3). Use of this products in residential areas may cause high-frequency interference in which case the user may be ordered to take suitable measures.

The user must ensure strict adherence to these standards.

The safety notes and specifications stated in additional sections (items) must be adhered to by the user.

Caution! High touch voltage! Danger of electric shock! Danger of death!

Never under any circumstances may the housing be left open or connections disconnected when the power is on. Disconnect the power plug of the frequency inverter and wait at least 5 minutes after the power voltage has been switched off before opening the frequency inverter to install or remove option boards. Correct configuration and installation of the inverter drive are prerequisites to correct operation of the frequency inverter. Only appropriately qualified personnel may transport, install, commission and operate this device.

Pay particular attention to the following:

- Permissible protection class: Protective ground; operation only permitted when protective conductor is correctly connected. The devices may not be operated directly on IT networks.
- Installation work may only be performed in a voltage-free state. When work has to be done on the drive, inhibit the enable and disconnect the complete drive from the power network. Adhere to the 5 safety regulations.
- Discharge time of the DC link capacitors > 5 minutes
- Do not penetrate the interior of the device with any kind of object.
- When performing installation or other work in the switching cabinet, protect the device against falling objects (e.g., pieces of wire, flexible leads, metal parts and so on). Conductive parts may cause short circuiting or device failure on the frequency inverter.
- Before commissioning, remove all extra coverings to prevent the device from overheating.

The frequency inverter must be installed in a switching cabinet which does not exceed the maximum ambient temperature (see technical data).
Only copper wiring may be used. For wire cross sections, see table 310-16 of standard NEC at 60° C or 75° C.

STÖBER ANTRIEBSTECHNIK accepts no liability for damages caused by non-adherence to the instructions or applicable regulations.

The motor must have an integral temperature monitoring device or external motor overload protection must be used.

Only suitable for use on power networks which cannot supply more than a symmetric, nominal short-circuit current of 5000 A at 240 V ac / 480 V ac.

Notes:

Subject to technical changes for improvement of the devices without prior notice. This documentation is solely a product description. It is not a promise of features in the sense of warranty rights.

2 POSI UPGRADE

Execution of **Posi Upgrade** requires a special module (blue housing). A code is downloaded to the inverter from this **Posi Upgrade module** and stored non-volatilely in the exchangeable **Paramodule**.

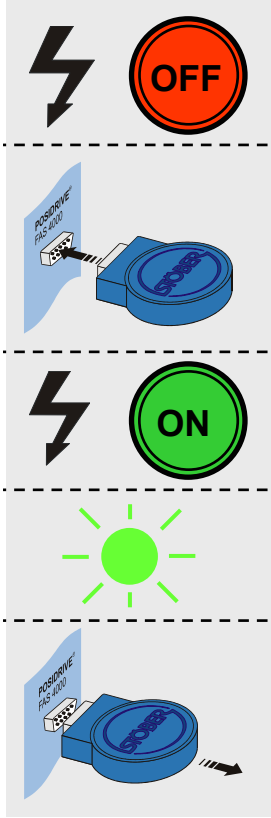
Customized to your needs

Depending on your requirements, a Posi Upgrade module with positioning code for 10, 20, 50 or 100 inverters can be delivered. Each time an upgrade is performed, the number of possible positioning upgrades is decremented by one.

Transparency

The FDS Tool software (starting with version 4.5D) can be used to read the contents of an upgrade module. Among others, a serial number list is indicated with the devices upgraded up to now and the number of positioning controller upgrades which are still possible.

Handling



Turn off the power supply.

Plug in the Posi Upgrade module.

Turn on the power supply.

Wait until the green LED is on continuously.

Disconnect Posi Upgrade module. → Finished !

To your advantage

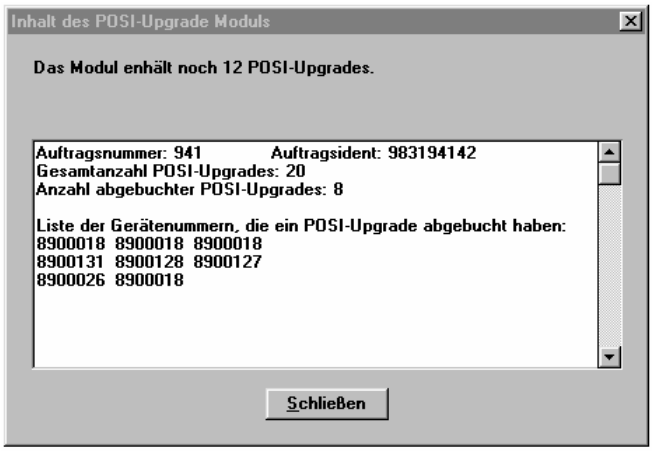
- Once performed, a Posi Upgrade is retained even when the inverter is changed. It can be moved from one inverter to the next with the red **Paramodule**. This means you don't need a new upgrade each time you exchange a device.
- A red LED during an upgrade indicates a Posi Upgrade module which is "used up." If you don't have a new Posi Upgrade module handy, you can continue a once started commissioning procedure as follows. Disconnect the Posi Upgrade module and the positioning functionality remains fully available until the next power off.
- Do something for the environment. STÖBER Antriebstechnik will reload your completely used Posi Upgrade module with the desired number of Posi Upgrades.

Possible errors

1. The green LED is flashing.
   - The positioning controller was already upgraded. The upgrade is stored non-volatilely on the plug-in Paramodule.
   - Since the Upgrade module was not inserted correctly, it was not recognized.
   - No Paramodule is installed.
   - The last "**A00** Save parameter" was interrupted when FAS power was turned off too soon. Start **A00** again and let it run to the end.
   - A Paramodule is installed whose data content does not fit the current FAS software version. "**A00** Save parameter" must be executed once for adaptation. Then turn FAS power supply OFF and ON again.
   - Black Parabox (accessory for FDS 4000) is installed. The black Parabox cannot be used with the FAS.
2. The red LED is on.
   - The upgrade code has already been used up completely. The position controller remains activated until the next time the FAS power supply is turned off. FDS Tool can be used to read the number of remaining Posi Upgrades from the Upgrade module.
   - The Upgrade module or the Paramodule was removed during the upgrade. Repeat the procedure.
   - The Upgrade module or the Paramodule is defective. It must be returned to STÖBER Antriebstechnik for replacement. The POSI Upgrade cannot be performed.
3. The FAS cannot be released. The red or green LED is continuously on. The FAS will not start up until the Upgrade Module is removed.

Reading an Upgrade Module with a PC

- Connect the Upgrade module to the serial interface (usually port COM1).
- Start FDS Tool.
- Open the "data" menu.
- Click "read parabox."
- The screen which appears shows the remaining number of Upgrades and a list of the device numbers of the already upgraded inverters. See figure below.



3 COMPARISON OF FAS AND FDS

For those who have already worked with FDS and are changing to FAS, the table below gives you an overview of the functional differences.

FDS	FAS	Commentary
Two analog inputs	One analog input	**F20** to **F25** omitted
One analog output	No analog output	**F40** to **F43** omitted
Option boards	No option boards	- Limited number of digital inputs - No evaluation of an absolute value encoder - No wire break monitoring of the encoder
Technology functions: - Winding computer - PID controller - Electronic gear	No technology functions	**G..** and **H..** parameters omitted
External encoder power supply	Internal auxiliary voltage for encoder	No extra power pack for encoder

With its reduced functionality, FAS makes commissioning easier and quicker.

The FAS with Posi Upgrade is particularly suitable for:

- Very simple positioning tasks as an independent device
- Standard positioning tasks integrated in fieldbus environment
- Complex positioning tasks integrated in fieldbus environment

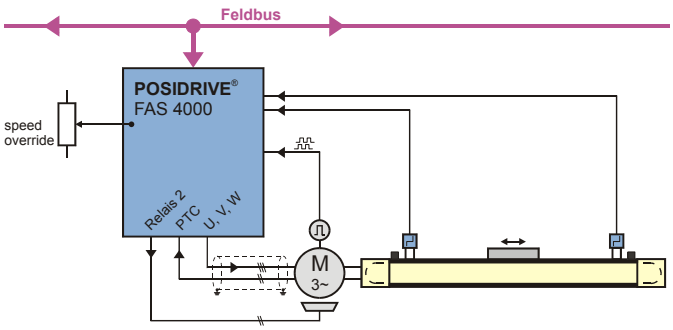
The serial interface gives the inverter flexibility. The USS protocol (developed by Siemens AG) handles communication via RS 232. A Kommubox for the PROFIBUS-DP or CAN bus can be installed for integration on a fieldbus.

4 POSITIONING CONTROL

With the Posi-Upgrade, **POSIDRIVE**® FAS 4000 frequency inverters offer integrated positioning control. A motor with a built-on incremental encoder is the prerequisite for precise and reproducible positioning. In "*Vector Control*" mode (**B20**=2), the motor provides the characteristics of an asynchronous servo drive.
Positioning can also be used without encoders in control mode SLVC (SensorLess Vector Control).

4.1 Function overview

- 8 positions can be programmed as 8 process blocks.
- Destination travel is precise to the increment.
- Continuous position control with following error monitoring
- Parameterization in units (e.g., degrees, mm)
- Resumption of interrupted process blocks possible
- Change in destination possible during traversing
- Reference point travel with several modes
- Sequence programming possible via process block chaining (e.g., "Go to pos. 1, wait 2 sec, go on to pos. 2, wait for signal and return")
- Tip mode (inching)
- Teach-In-Funktion.
- Speed override via analog input possible
- Any gear ratios are calculated with fractions without rounding errors. No drifting with continuous axes.
- Continuous referencing for continuous axes
- "Electrical cam" function switches relay 2 within programmed position range.
- Hardware and software limit switch
- Rotary attachment function
- Path specification via analog input possible
- Brake control for lifting systems



4.2 Connections – standard configuration

The standard device without option board is used for simple applications.
Applications which require more binary inputs are implemented with the **fieldbus**.

The analog input or the fieldbus can be used to adjust positioning speed steplessly. Called "**speed override**," this function is not only useful during commissioning but also for tipping mode, changes in the number of pulses of a machine, and so on.

The following functions for **binary inputs** (parameters **F31** to **F34**) are important:

- ***RV-select0 to 2:*** Binary coded position selection. Process block 1 is selected with "000," and process block 8 is selected with "111."
- ***8:halt***: Rising edge interrupts running motion with the current process block ramp. Since tip mode (i.e., inching) via binary inputs is not possible unless halt is active, halt switches between tip and automatic operation.
- ***9:quick stop:*** Rising edge interrupts positioning with maximum acceleration **I11**.
- ***16:posi.step:*** When a chain of process blocks is being used, *posi.step* starts the consecutive process blocks. A movement which is in progress is not interrupted (→ **I40**).
- ***19:posi.start:*** Starts the just selected process block. A movement which is in progress is always interrupted.
- ***20:posi.next:*** Only for chained process blocks. If programmed appropriately (cf. **J17**=3), immediately concludes the running process block, and starts the next one. A remaining path which is to be traveled after *posi.next* occurs can be defined. See chapter 4.8.
- ***17:tip+, 18:tip-:*** Tip mode (i.e., inching)
- ***21:stop+, 22:stop-:*** Limit switch
- ***23:reference input:*** Reference switch connection
- ***24:start reference:*** Starts reference point traversing
- ***25:teach-in:*** Actual position is assumed in the just selected process block.

⇨ The binary inputs can be inverted via **F51** to **F54**. Removal of the **enable** always causes a quick stop with maximum acceleration **I11**.

Analog input AE1 (par. **F25**)

- ***1:additional RV:*** Relative traversing paths are multiplied by (100% + level). Example: 0 V → no additional reference value (i.e., 100% of the traversing path).
- ***4:RV-factor:*** Relative traversing paths are multiplied by the level. Example: 0 V → no movement (i.e., 0% of the traversing path).
- ***5:override:*** The programmed positioning speed can be changed online via potentiometer ("speed override" function for CNC controllers), for example.
- ***6:posi. offset:*** An offset can be added to the current position online via AE1. Cf. parameter **I70**.

Relay outputs (par. **F00** and **F81**)

- ***3:Ref Val reached:*** Location in position window **I22**. Signal appears when drive "*in position*."
- ***8:electrical cam:*** Signal appears when the actual position is located between parameters **I60** and **I61**. Signal is used as message to other modules, for example.
- ***9:Following error:*** Signal appears when the maximum following error in **I21** is exceeded.
- ***10:Position active***: Drive is in position control waiting for *posi.start* or *posi.step*. No process block and no process block chain being processed.
- ***13:referenced:*** Drive is referenced.
- ***19:s-memory1 to 21:s-memory3:*** Output the memory locations set by the posi switching points during process-block movements (see chap. 10.12).
- ***23:RV-ackn.0 to 25:RV-ackn.2:*** Binary coded response message from the active **I82** process block. Cf. diagram in chap. 4.3.

⇨ A **fieldbus** also offers a simple and easy way to access these signals. *Status* and *control bits* (**E100** and **E101**) are just two examples. For details, see documentation of the fieldbus.

For fieldbus addressing:

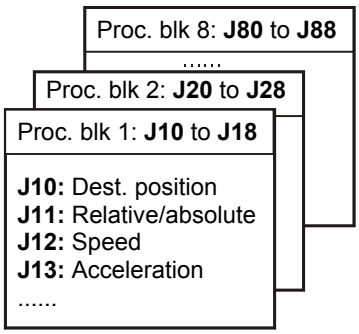
Function BE1 to 5 (F31 to F35)	Bit-No. in E101
1: Reference value-select 0	8
2: Reference value-select 1	9
3: Reference value-select 2	10
4: Motorpoti up (with **D90**=1)	14
5: Motorpoti down (with **D90**=1)	15
6: Direction of rotation	13
7: Additional enable	6
8: Halt	0
9: Quick stop	1
10: Torque select	7
11: Parameter set-select	5
12: Extern fault	2
13: Fault reset	3
16: Posi.step	17
17: Tip +	21
18: Tip -	22
19: Posi. start	16
20: Posi. next	18
21: Stop +	24
22: Stop -	25
23: Reference input	26
24: Start reference	20
32: Brake release	23

Note: Functions which are controlled via the fieldbus may not be defined in **F31** to **F35**.

Function AE1 (F25)	Bus parameter	Byte
1: Additional reference value	E104	2
2: Torque-limit	E102	2
3: Power-limit	E103	2
4: Reference value-factor	E105	2
5: Override	E106	2
6: Posi. offset	E107	4
8: rotation field magnet moment	E109	2
9: n-Max	E126	2
10: Reference value	E119	2

4.3 Destination positions and process blocks

Each position to be approached to is described by several parameters. Together these parameters make up a **process block**. 8 process blocks are available. This permits 8 different positions to be approached. Process block no. 1 is described by parameters **J10** to **J18**, while the second process block is described by parameters **J20** to **J28**, and so on.

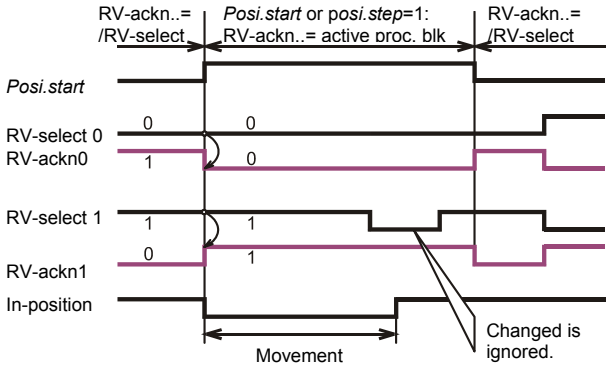


A process block can be selected as shown below.

- **J02**=1...8; The entered value corresponds to the particular process block.
  Entry of the value "0" permits selection of the process block via "reference value-select" entry.
- Via "reference value-select" inputs;
  With **J02**=0 the process block can be selected via the inputs "reference value-select 0" to "ref. val. select 2". The binary combination "000" selects process block no. 1; "111" selects process block no. 8.

The **response message** of the current process block appears:

- In parameter **I82** ("active process block")
- In the 2nd line of the operational indication when Controlbox is connected.
- Binary coded via fieldbus (status bits **E100**) *„Bit 24: RV-ackn.0“* to *„Bit 26: RV-ackn.2“*. The selected process block is shown inverted until the movement starts.
  When a process block starts, the active block is not shown inverted (binary-coded like *RV-select* signals) as long as *posi.start, posi.step* or *posi.next* is queued.
  When a process block cannot be started (e.g., see *"51:refused", chap. 9 Fault/Events*), the selected block continues to be shown inverted. This happens even when a movement is terminated.



⇨ When the position is specified directly via **fieldbus,** process block 1 (**J10**) receives special treatment.
The inverter does not acknowledge the write routine until all internal conversions have been completed and the inverter is ready to start. The parameter **E124** ("start.pos 1") is also available from the fieldbus. **J10** is written here and, after conversion, is immediately started automatically.

4.4 Absolute/relative positioning

One of 4 possible traversing methods (parameters **J11**, **J21**, **J31** and so on) can be assigned to each process block.

- Relative
- Absolute
- Continuous, positive
- Continuous, negative

A ***relative*** path always refers to the current location (chain dimensions).
An ***absolute*** position refers to a fixed reference point (i.e., machine zero point) which is determined with *reference traversing*. See chapter 4.6. For this reason, an absolute position always requires reference traversing. Any start commands given without reference traversing are answered by the inverter with "*51:refused*".

When a process block is defined as **continuous** and a start command is given, the axis moves in the specified direction until a signal arrives from the outside (e.g., *posi.next* or *posi.start*). The speed can be adjusted via an analog input. (Set the AE1 function **F20**=*5:Override* for this.)

Successful conclusion of a movement is signaled via the output signal "***reference value-reached***" (**F00**=3). This signal appears when the actual position lands in the **position window** (destination ±**I22**) for the first time. The signal is not withdrawn until the next traversing command is given.

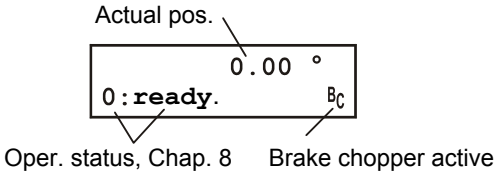
4.5 Commissioning

This section only covers the drive with encoder feedback (**B20**=2).

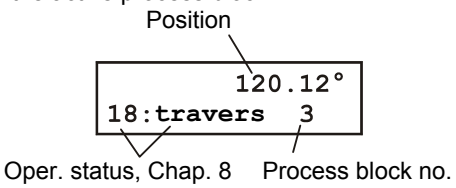
Important: Before positioning control is activated, speed control must be commissioned (chapter 9.6 of the FAS documentation, Publication no. 441 537) and, if necessary, optimized with FDS Scope.
Positioning control is activated with

C60=*2:position*

When Controlbox is connected, the first line of the display changes and now specifies the actual position.

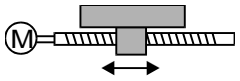
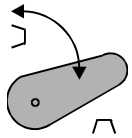


If **B20**≠2, (control mode is not Vector-control feedback) the first line continues to show speed and current. While process blocks are being processed, the lower line also indicates the number of the active process block.



Important: If you want to change the location of the decimal point in the position display via **I06** (**I06**=decimal point shift), do this at the beginning of commissioning since the significance of all positions is changed.

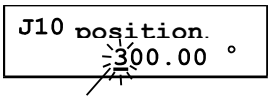
4.5.1 Limited position range

Limited position range (I00=0)	
	

Limited traversing range means that the permissible area of movement is restricted by end stops or similar. Safety requires that **limit switches** be provided. If the inverter is not equipped with a sufficient number of free inputs, the limit switches must be evaluated by a higher level controller. The primary parameters are listed below:

- **I00**=0 Limited traversing range
- **I05**: *Unit of measurement* (e.g., mm, degree (°) and inch, user)
- **I06**: Number of decimal places
- **I07**: *Distance per encoder revolution* (e.g., mm/U)
- **I10**: Maximum speed (e.g., mm/sec)
- **I11**: Maximum acceleration (e.g., mm/sec^2)
- **I12**: Tip mode speed

Important: Since some parameters in groups **I** and **J** (e.g., paths or accelerations) may assume very large values, the ◄ ► keys can be used to directly select the tens exponent to be changed. Only the individual digit flashes and not the entire number. The ▲ ▼ keys can be used to increment/decrement the value by the selected tens exponent:



Single digit flashes.
Change with ▼ ▲
Select digits with ◄ ►

⇨ Before starting initial tests, check the limit switches, and decouple the drive from the machine if necessary.

The enable can now be activated as the first test. The display shows

17: posi.active.

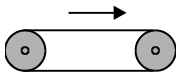
The position control loop functions, and the current position is maintained. During the next step, the drive is moved via **tip mode (i.e., inching mode)**. Set parameter **J03**=1 for this. The ◄ ► keys can be used to traverse the drive.

⇨ The speed can also be changed during traversing via analog input AE1 (**F25**=5).

The next step is the commissioning of reference traversing. See chapter 4.6. **Software limit switches I50** and **I51** can be programmed with a referenced axis (**I86**=1). The software limit switches prevent movement to positions outside **I50** and **I51**.

A short relative movement (**J11**=0) can be specified in **J10** (destination position process block 1) for testing purposes. The speed is entered in **J12**, while the ramps are entered in **J13** and **J14**. **J00**=1 can be used to start and monitor the movement. Do not forget the enable.

4.5.2 Continuous traversing range (rotary axis)

Endless traversing range (I00=1)	
	

The most important feature of a continuous traversing area is the cyclic repetition of certain positions during movement in one direction (e.g., hand on a clock).

Rotary axis function: Selection of **I00**=*1:unlimited* means that the actual position is only counted up to *circular length* **I01** (e.g., 360°). After this value, counting begins again at zero. If both directions are permitted (**I04**=0 and **I03**=1), the movement progresses from point A to point B (i.e., absolute destination specification) over the shortest path (i.e., **path optimization**).

Gear ratio: Parameters **I07** and **I08** permit precise specification of the gear ratio (i.e., based on the number of teeth). This prevents a path drift with relative positioning. Cf. examples in chapter 4.9.

Direction of rotation: If both directions are permitted (**I04**=0), the movement from A to B is performed over the shortest path when absolute destination specification is used (**I03**=1, **path optimization** active). However, with block changes on the fly, the original direction of rotation is retained. Limitation of the permissible direction of rotation **I04** affects all process blocks and manual traversing. An alternate method is to use **I03**=0 to deactivate path optimization. Remember, however, that, when you want to approach an absolute destination in the *negative* direction of rotation, you must enter the destination with a *negative sign* (in connection with the modulo calculation). Example: After you enter -270°, the drive moves to position 90° *rotating counterclockwise*.

4.6 Reference point traversing

When the position is measured with an *incremental encoder*, the actual position is not known when the power is turned on (power supply or external encoder voltage, e.g., 24 V). A defined starting position is achieved with reference point traversing. Absolute movements can only be performed in referenced status. The referenced state is signaled with **I86**=1. Reference point traversing is parameterized with **I30** to **I38**. The primary parameters are listed below.

- **I30:** Type of reference point traversing
- **I31:** Direction of reference point traversing
- **I32:** High-speed reference point traversing
- **I33:** Low-speed reference point traversing
- **I35:** Zero-pulse of the motor encoder
- **I37:** Automatic reference point traversing at power-on

There are three ways to start reference point traversing.

- Automatically (**I37**=1 or 2)
- Signal on binary input (**F31** to **F34**=24)
- Inching with **J05**=1

Reference traversing type **I30** specifies the required initiators or the functions for binary inputs. **I31** is used to determine the (search) direction when reference point traversing is started. If the reference switch (or limit switch) is active, the direction is reversed. Cf. example 2 further down. The correct value for **I31** can be tested by inching the axis (parameter **J03**), for example. The status of the binary inputs can be scanned in **E12**, **E13** and **E19**.

When only one direction of rotation (**I04**) is permitted, the drive traverses up to the *rising* edge of the reference switch in direction **I04** at speed **I33**. Referencing direction **I31** is ignored in this case.
The zero pulses of the incremental encoder are only evaluated when **I35**=1. The zero track is connected to BE3.

Usually the zero track cannot be used with continuous axes unless the mechanics have an even-number ratio.

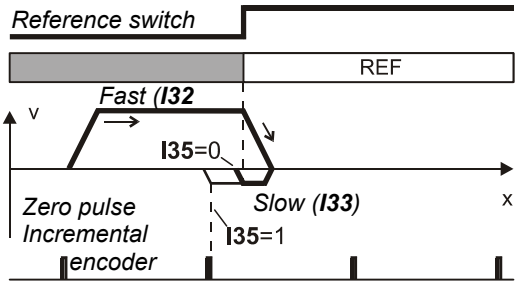
Specification of two speeds (i.e., **I32** and **I33**) is primarily an advantage for long linear axes.

The **acceleration** during reference point traversing is ½ of the maximum acceleration in **I11**. When the reference point is detected, the actual position is set to **I34** (i.e., reference position), and the drive brakes until it is at a standstill. The distance required for reversal or braking is generally

$$\text{Distance} = \frac{1\ v^2}{2\ a} \quad \text{with} \quad v\text{: speed}, \quad a\text{: Acceleration (I11/2 here).}$$

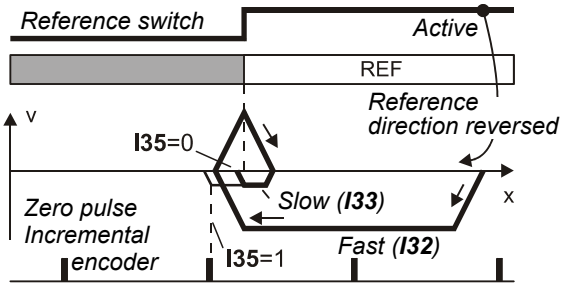
After reference point traversing has been concluded, the drive remains where it is after the required braking distance (**I33**^{2}/**I11**) and does not return to the reference position. Cf. above. The AE1 "override" function (**F25**=5) changes the speed and also the braking distance.

Example 1: I30=*0:ref.input* I31=*0:positive*



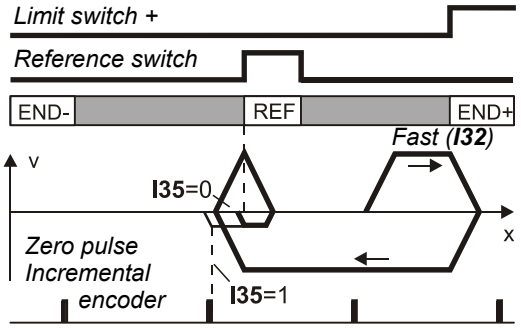
Since the reference switch divides the total traversing area into two halves, no other switches are required.

Example 2: I30=*0:ref.input*, I31=*0:positive*



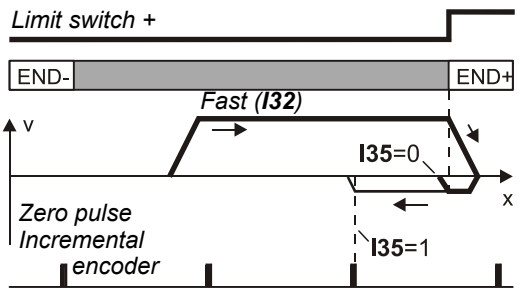
The direction defined in **I31** is reversed if the reference switch is active at the beginning.

Example 3: I30=*0:ref.input*, I31=*0:positive*



The reference switch (i.e., cam) only reacts briefly.
A *limit switch* is used for the reversal.

Example 4: I30=*1:limit.input* I31=*0:positive*

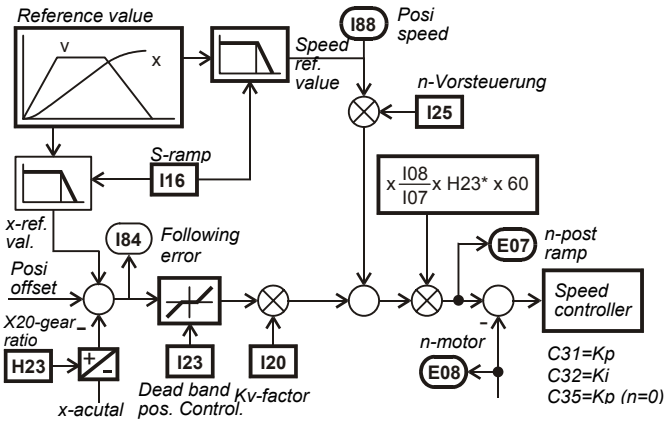


A limit switch can be used for referencing instead of a reference switch.

When the power or the external encoder voltage fails, the information on the reference position is lost. After power returns, **I37**=1 is used to automatically trigger reference point traversing with the first start command (i.e., *posi.start* or *posi.step*).
After a reference point traversing procedure has been concluded, you can automatically move to any initial position by programming parameter **I38** (*ref. block*) to the number of the parameter record to be approached.

4.7 Position controller

To minimize following error deviation (i.e., difference between reference value and actual position), the FAS uses speed precontrol (speed feed forward). The maximum permissible following error deviation specified in **I21** is continuously monitored. The position controller is running continuously during the entire movement.



The gain of position control **I20** (i.e., the "stiffness" of control) is called the "Kv factor."
The parameter **I16** (S-ramp) can be used to parameterize "joltless" traversing profiles and prevent high-frequency excitation due to a low pass. The time constant **I16** corresponds to a low-pass limit frequency of fg=2π/**I16**.

4.8 Process block chaining

The "*next block"* parameters **J16**, **J26**, **J36** and so on can be used to chain process blocks into sequences. For example, at the end of one process block, this can be used to automatically move to an additional position (i.e., next block). The following parameters apply to the 1st process block.

- **J16** next block. If **J16**=0, then no chaining.
- **J17** next start. Specifies how next block **J16** is to be started.
- **J18** delay. Applies when **J17**=*1:with delay*.

For details on **J17**, see the parameter table.

Example 1: With a rotary attachment, 60° steps are performed in a continuous cycle with 1-sec pauses in between.

Solution:
J10=60° (Path)
J11=*0:relative* (Position mode)
J16=1 (Next block no. 1)
J17=*1:with delay* (Next start with delay)
J18=1.000 sec (delay of 1 sec)

⇨ Process block no. 1 starts itself.

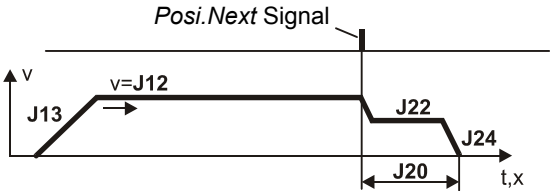
Example 2: Three fixed positions are always traversed in the same order (*pick and place*).

Solution:
J10, **J20**, **J30**=Destination specification
J11=J21=J31=*1:absolute*
J16=2, **J26**=3, **J36**=1 (chaining)
J17=J27=J37=*0:posi.step*

⇨ The movements are triggered by the rising edge of the *posi.step* signal.

Example 3: A conveyor belt is to stop after exactly 100 mm following a sensor signal.

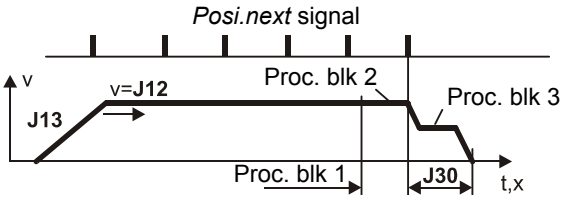
Solution:
J11=*2:endless positive*
J16=2 (Next block no. 2)
J17=*3:posi.next* (Next start)
J20=100 mm
J21=*0:relative*



⇨ The *posi.start* signal starts process block no. 1. The drive continues to run until the rising edge of the *posi.next* signal after which a branch is made to process block no. 2. When *posi.next* is connected to BE3, the reaction occurs without a delay time. If the **J17**=*3:posi.next* setting is not made, *posi.next* is ignored! Cf. example 4.

Example 4: Positioning of a shelf handling device. The exact destination position is specified by a light barrier which is triggered briefly at each shelf. Until just before the destination, the signals of the light barrier must be ignored. We will assume that the destination is located between 5.1 m and 5.4 m.

Solution:
The approximate position is traveled to with block no. 1.
J10=5.1m (Approximate position)
J11=*1:absolute*
J16=*2* (Next block no. 2)
J17=*2:no stop* (Next start)
Posi.next is activated in block 2 (**J27**).
J20=5.4 m (Maximum position)
J21=*1:absolute*
J26=*3* (Next block no. 3)
J27=*3:posi.next* (Next start)
The braking distance is defined in block 3.
J30=0.05 m (Braking distance)
J31=*0:relative*



⇨ Process block no. 1 is started with *posi.start*. Just before the probable destination and without an intermediate stop, a switch is made to process block no. 2 where the *posi.next* signal is armed. Process block no. 3 is triggered with *posi.next*, and the braking distance specified in **J30** is executed. If the *posi.next* signal fails to appear (e.g., light barrier is defective), the drive stops at position **J20**.

Tips:

- An operational status of ***17:posi.active*** indicated on the display of the Controlbox means that no process block and no chain of process blocks (i.e., sequential program) is being executed at the moment. The drive is under position control. The *posi.start* and *posi.step* signals have the same effect here.
- The inverter assumes the basic state "*17:posi.active*" when the enable is turned off and on.
- The "*17:posi.active*" state can also be output on relay 2.

4.9 Simple examples

Five digital inputs are available.
Of these five, BE4 and BE5 are needed for encoder connection. Examples of what can be done with the other three inputs are shown below.

Example 1: *Belt drive* (i.e., endless movement). Four different feed lengths are traversed relatively.

Solution: BE1: RV-select0 (**F31**=1)
BE2: RV-select1 (**F32**=2)
BE3: posi.start (**F33**=19)

BE1	BE2	Block	Process Block Parameter
0	0	1	**J10**, **J12**, **J13**, **J14**
1	0	2	**J20**, **J22**, **J23**, **J24**
0	1	3	**J30**, **J32**, **J33**, **J34**
1	1	4	**J40**, **J42**, **J43**, **J44**

⇨ The traversing method (e.g., **J11**, **J21**, **J31** and so on) remains set to "*0:relative*" for all blocks. The selected process block is indicated in **I83**.

Example 2: *Linear axis* with end stops. Two fixed positions are traversed absolutely.

Solution: BE1: RV-select0 (**F31**=1)
BE2: posi.start (**F32**=19)
BE3: ref.input (**F33**=23)

BE1	Position	Process Block Parameter
0	1	**J10**, **J12**, **J13**, **J14**
1	2	**J20**, **J22**, **J23**, **J24**

⇨ The traversing method (**J11** and **J21**) for both process blocks is "*1:absolute*." After power-on, reference point traversing is automatically executed by **I37**=1 with the first *posi.start* command. The reference switch must have the characteristics shown in example 1 of chapter 4.6.

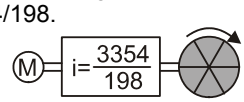
Example 3: *Belt drive* (endless movement) with stop at pulse (i.e., defined braking distance)

Solution: BE1: posi.start (**F31**=19)
BE3: posi.next (**F33**=20)
J11=*2:endless positive*
J17=*3:posi.next*
J20=*...(braking distance*

⇨ We recommend applying the *posi.next* signal to BE1 (**F33**=20) so that the delay time of 4 msec is omitted. Evaluation of *posi.next* is activated with **J17**=3.

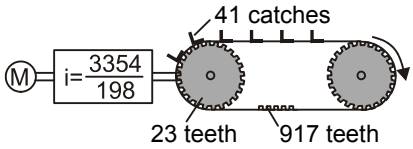
For additional details on *posi.next*, see chapter 4.8 (chaining of process blocks).

Example 4: A rotary attachment is to be positioned continuously and without drift in 60° increments. A STÖBER K302 0170 with i=16.939393... is to be used as the gearbox. The exact ratio is i=3354/198.



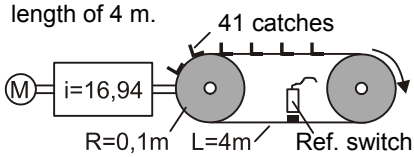
Solution: The rotary attachment rotates precisely 360° x 198 / 3354 per encoder revolution. Thus, **I07**=71280, and **I08**=3354. The path is programmed in degrees (**J10**=60°). The circular length **I01** is 360°.

Example 5: A *toothed belt drive* is to move continuously and without drift in fixed increments (41 catches per circular length). The toothed disk has 23 teeth, while the belt has 917 teeth. For gearbox, see above.



Solution: To obtain a precise solution, 1/41 of the circular length is taken as the unit of distance (**I05**=0). One unit of distance is exactly one catch. The belt drive rotates precisely 198 / 3354 x 23 x 41 / 917 units of distance per encoder revolution. Thus, **I07**=186714, and **I08**=3075618. The path is programmed in units of distance=1/41 of the circular length. The circular length **I01** is 41 units.

Example 6: A *conveyor belt drive* with slip is to move in fixed increments continuously and without drift. Exactly 41 catches are distributed over a circular length of 4 m.

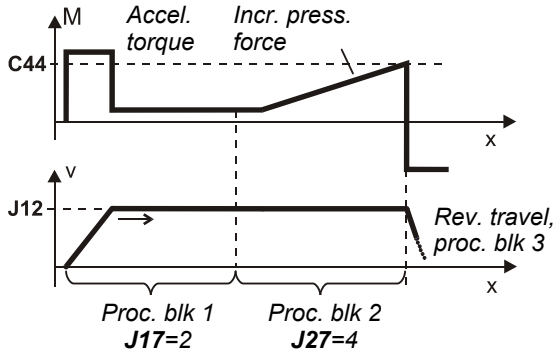


Solution: The distance per encoder revolution is $2\pi R/i$. Thus **I07**=37.09 mm/R. Drift is prevented by continuous referencing (**I36**=1) or the *posi.next* signal.

Important: The distance to be traveled (e.g., **J10**) multiplied by the number of catches (41) must precisely equal the circular length **I01**. If not, the drive will drift away even with continuous referencing. If necessary, **I01** and **I07** must be adjusted accordingly. The reference switch should be located between two catches.
Important: When continuous referencing **I36**=1 is used, **I07** must always be rounded off to the next higher number.

Example 7: *Screw/press controller*
Starting at a certain position, the torque is to be monitored. When a limit is exceeded, a return to the start position is made.

Solution: The first part of the movement is handled by process block no. 1. Without stopping, the system switches to process block no. 2 before the end position (**J16**=2) and **J17**=2). The speed remains the same (**J12**=**J22**). When the torque limit (working area) specified by **C44** is exceeded, the system switches to process block no. 3 (**J26**=3 and **J27**=4). In our example, the working area is limited by the maximum torque **C44**. See diagram on the next page.



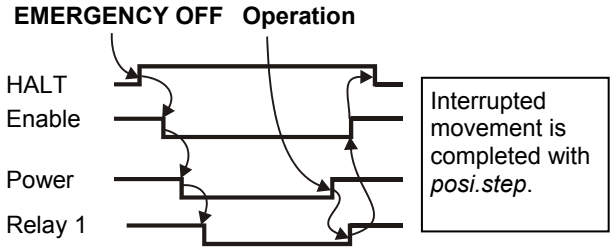
4.10 Emergency off

If the power is cut off from the inverter with the emergency off switch, all information on the position is lost. When the inverter goes on again, the power must be referenced again.

When 24 V is provided via the 24V-LC option board, a movement which is interrupted by an emergency off can be continued and completed under the following conditions.

- The HALT signal becomes active at least 4 msec before the enable is removed.
- The HALT signal remains present until power returns and the enable is mind. 4 msec active.

Another method of interrupting and continuing a process block is to use the following sequence of signals.



Parameter **I19**=1 can be used to specify that an enable-off will lead to *"23:interrupted."* The interrupted process block can then be completed with *posi.step*. With the default setting (**I19**=0), removal of the enable causes sequence control to be reset (status *"17:posi.active"*).
Process blocks with chaining "without a stop" (**J17**=2) can only be terminated (status *"17:posi.active"*).

4.11 Posi switching points

Posi switching points can be used to generate signals on the binary outputs during the movement. In contrast to the "electric cam" which is *always* active between positions **I60** and **I61**, *posi* switching points are only evaluated during the running process blocks (movement) in which they were activated (**L11**, **L12**).
There are 4 *posi* switching points - S1 to S4. Each of these switching points can be used in several process blocks. Up to two switching points can be selected in one process block. Two switching points are selected for process block no. 1 with the parameters **L11** and **L12**, as shown below.

Parameter		Possible Selection Values
L11	Switch A	"*0:inactive*", *"1:switch S1"*,
L12	Switch B	

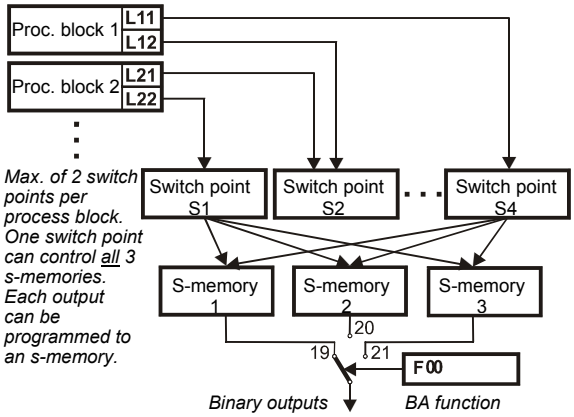
The characteristics of the switching points are specified in group **N..** . For instance, the first switching point (S1) is described with **N10** ... **N14**.

Parameter		Possible Selection Values
N10	s1-position	Example: *113.00 mm*
N11	s1-method	*"0:absolute"*, *"1:rel,to start"* or *"2:rel.to end"*
N12	s1-memory1	Selection for each: "*0:inactive*" , "*1:set*", "*2:clear*", "*3:toggle"**
N13	s1-memory2	
N14	s1-memory3	

* Toggle = change state each time level changes (i.e., "L" -> "H" -> "L" -> "H" and so on)

Definition of the switching-point position can be absolute (e.g., 1250.0 mm) or relative to the beginning or end of the running process block (**N10**, **N11**).

The switching points have no direct effect on the outputs. Instead, up to 3 **switch memories** can be set, cleared or toggled in each switching point. The relay 2 can be programmed to one of these three switch memories. **F80**=*20:s-memory2* outputs switch memory 2 to relay 2.



Example 1: In process block 2, binary output 2 (relay 2) is to be set 150 mm before the target position, and reset when the target position is reached.

Solution: Two switch points (S1 and S2) are required. Switch point S1 activates switch memory 1 (s-memory1). Switch point S2 deactivates the same memory.

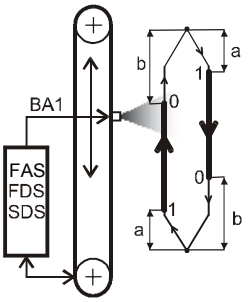
Switch Point S1	Switch Point S2
N10=*150 mm* **N11**=*2:rel.to endpos* **N12**=*1:set* (s-memory1)	**N20**=0 mm **N21**=*2:rel.to endpos* **N22**=*2:clear* (s-memory1)

Switching points S1 and S2 are assigned to process block 2 in group **L..** .

L21 = switch S1, **L22** = switch S2

Relay 2 is assigned to s-memory1 with **F00**=19.

Example 2: A paint pistol is moving back and forth between two points and is to be turned on and off by the inverter with relay 2. Since the pistol's reactions are slow, it must be turned on (after the start of the process block) in advance at distance ***a*** and turned off at distance ***b*** before the end of the process block.



Solution: Two process blocks (position up, position down) and two switch points are required. The first switch point activates switch memory 1 ("s-memory1"). The second switch point deactivates the same memory.

Switch Point S1	Switch Point S2
N10=***a*** (distance ***a***) **N11**=*1:rel.to start* **N12**=*1:set* s-memory1	**N20**=***b*** (distance ***b***) **N21**=*2:rel.to endpos* **N22**=*2:clear (s-memory1)*

The same switching points are parameterized in both process blocks.

Process Block 1	Process Block 2
L11 = Switch point S1 **L12** = Switch point S2	**L21** = Switch point S1 **L22** = Switch point S2

Output BA1 is assigned to *s-memory-1* with **F80**=19.

A.. Inverter		
Para. No.	*Description*	
A00 1)	**Save parameter:** *0: inactive;* *1:* The parameters of both parameter records are saved in non-volatile memory. Saving is triggered when the value changes from 0 to 1. "**A02** *check parameter*" is then performed automatically.	
A01•	**Read parabox & save:** Read parameters from Parabox or Controlbox and save in non-volatile memory. First select desired data record (1 to 7), and then press [#]. "**A02** check parameter" is started automatically. When read errors occur, all parameters are rejected, and the settings last saved with **A00** are restored. *0: inactive;* *1 to 7;* **Controlbox** (number of the data record)	
A02 1)	**Check parameter:** Parameterization is checked for correctness. For possible results, see chap. 7. *0: inactive;* *1: active;* Parameters of the parameter record to be edited (see **A11**) are checked for the following. - Adherence to the value range - (n-Max ÷ 60) x encoder incr. < 80 kHz. [(**C01** ÷ 60) x **F36** < 80 kHz] - Correct programming of the binary inputs (**F31** to **F35**) - If control mode "vector-controlled with 2-track feedback" has been selected with **B20**=2, BE4 must be programmed to encoder signal A (**F34**=14) and BE5 must be programmed to encoder signal B (**F35**=15).	
A03 1)	**Write to parabox:** Write data of the inverter to external data medium (Controlbox) *0: inactive;* *1 to 7;* The parameters of both parameter records are copied from the inverter to Controlbox. For handling, see **A01**.	
A04•1)	**Default settings:** All parameters are reset to their default settings. *0: inactive;* *1: active;* The procedure is triggered when the value changes from 0 to 1.	
A10	**Menu level:** Specifies the parameters which can be accessed by the user *0: standard;* Parameters which can be accessed are highlighted in gray. All parameters remain in effect including those in the *"1:extended"* menu level. *1: extended;* Access to all parameters *2: service*; Access to rarely used service parameters. Small print (e.g., **A37**).	
A11	**Parameter set edit:** Specifies the parameter record to be edited. The parameter record to be edited (**A11**) and the active parameter record (status indication) do not have to be identical. For example, parameter record 1 can be edited while the inverter continues operation with parameter record 2. See also chapter 9.4 (FAS-Installation instr., publication no. 441581). *1: parameter set 1;* Parameter record 1 is edited. *2: parameter set 2;* Parameter record 2 is edited.	
A12	**Language:** When the language is changed, FDS-Tool-specific texts **U22**, **U32**, **U42** and **U52** are reset to the default setting. This also applies to **C53**. *0: deutsch;* *1: english;* *2: french;*	
A13	**Set password:** Password is requested. If a password is defined in **A14**, this must be entered here before parameters can be changed. See chapter 7.3 (FAS-Installation instr., publication no. 441581). If parameterized with FDS Tool, no password required.	
A14	**Edit password:** Definition and modification of the password. 0 means that no password has been set. All other values are valid passwords. See chapter 7.3 (FAS-Installation instr., publication no. 441581). A defined password can only be read out via FDS Tool and only entered with Controlbox.	
A15	**Auto-return:** Permits automatic return from the menu to the status indication. In edit mode (i.e., the edited parameter is flashing), there is no automatic return to the status indication. *0: inactive;* *1: active;* If 50 seconds pass without a key being pressed, the display jumps back to the status indication.	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

A.. Inverter		
Para. No.	*Description*	
A20	**Braking resistor type:** Specification of the braking resistor type *0: inactive;* Braking transistor is deactivated. Too much braking energy causes fault *"36:overcurrent"* *1: user defined;* For resistor values, see **A 21**, **A22** and **A23**. Entering **A20=1** and **A22=0** automatically extends the braking ramps when DC link voltage is too high. *2: 300Ohm0.15kW* *3: 200Ohm0.15kW* *4: 100Ohm0.15kW* *5: 100Ohm0.6kW* **A20** 1 to 5: This information is used to create a thermal model which determines the maximum permissible power which can be dissipated with the braking resistor. This protects the braking resistance from thermal overload. A thermal overload causes the fault "*42:Temp.BrakeRes"*	
A21	**Brake resistor resist.:** Only with **A20**=1 (user defined), resistance value of the braking resistor used *Value range in Ω:* Depends on type, up to 600	
A22	**Braking resistor rating:** Only with **A20**=1 (user defined), capacity of the braking resistor used. Entering **A22**=0 KW automatically extends the ramps when DC link voltage is too high (if no braking resistor is connected, the fault *"36:Highvoltage"* is avoided). *Value range in kW:* 0 to ..., depends on type	
A23	**Braking resistor therm.:** Only with **A20**=1 (set as desired), thermal time constant of the braking resistor *Value range in sec:* 0.1 to 40 to 100	
A30•	**Operation input:** Specifies the origin of the control signals (i.e., enable, direction of rotation and reference value) *0: control interface (X1);* Control signals (e.g., enable and so on) are generated via the X1 terminals. All binary inputs must be programmed accordingly. Fieldbus operation without *Drivecom* profile. *1: serial (X3);* Control signals (e.g., enable and so on) are generated from the PC (FDS Tool software). The inverter is connected to the PC via sub D plug connector X3 (RS 232-C interface). See chap. 9.9 (FAS-Installation instr., publ. no. 441581). Remote control via the PC requires that the enable input (X1.6) be high. *2: fieldbus;* The inverter is put into a drive-compatible mode for operation with communication. The device is either controlled exclusively via the bus (the BEs should be set to *"0:inactive"* or in mixed operation). Signals from the BEs (e.g., halt and limit switch (stop+, stop -) take priority over the fieldbus signals. If the control is performed only via the fieldbus, the input functions (i.e., **F25**, and **F31** to **F35**) must be set to *"0:inactive."* Control of the drive via fieldbus requires that the enable input (X1.6) be high.	
A31	**Esc-reset:** Use the Esc key on Controlbox to acknowledge faults while they are being indicated. *0: inactive;* *1: active;* Faults can be acknowledged with Esc on Controlbox.	
A32	**Auto-reset:** Faults which occur are acknowledged automatically. *0: inactive;* *1: active;* The inverter acknowledges some faults automatically. See chapter 14 (FAS-Installation instr., publication no. 441581). Faults can be automatically acknowledged three times within a time period of 15 minutes (default setting). A fourth fault is not acknowledged automatically. Instead, relay 1 opens, and the fault must be acknowledged in some other way (i.e., enable, binary input **F31** to **F35**=13, or Esc key on Controlbox **A31**). The time period for automatic acknowledgment can be parameterized from 1 to 255 min.	
A33	**Time auto-reset:** Time period for automatic acknowledgment. See **A32**. *Value range in min:* 1 to 15 to 255	
A34	**Auto-start:** Before you activate auto-start **A34**=1, check to determine whether safety requirements permit an automatic restart. Use only permitted when the standards or regulations pertaining to the system or machine are adhered to. *0: inactive;* After power-on, the enable must change from L level to H level to enable the drive (→ message *"12:inhibited"*). This prevents the motor from starting up unintentionally (i.e., machine safety). *1: active;* When auto-start is active, the drive can start running immediately (if enabled) after the power is turned on.	
A35	**Low voltage limit:** If the inverter is enabled and the DC-link voltage is less than the value set here, the inverter assumes fault *"46:low voltage. "* With three-phase devices, **A35** should be approximately 85% of the network voltage so that any failures in a phase can be compensated for. *Value range in V:* depends on type	
A36	**Mains voltage:** Maximum voltage provided to the motor by the inverter. Usually the power voltage. Starting at this voltage, the motor runs in the field weakening range. This specification is important for optimum adjustment in control modes "sensorless vector-control" (**B20**=1) and "vector-control" (**B20**=2). *Value range in V:* depends on type	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

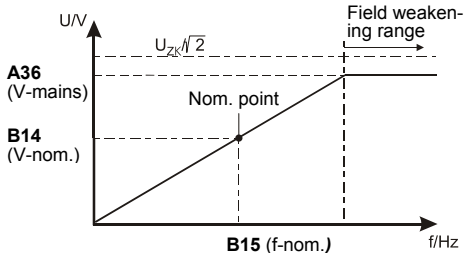
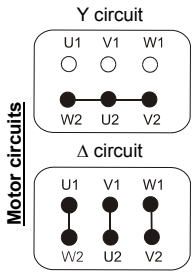
A.. Inverter		
Para. No.	*Description*	
A37	**Reset memorized values:** The six different following error counters **E33** to **E38** (e.g., maximum current, maximum temperature and so on) are reset.	
A40•[1)]	**Read parabox:** Read parameters from a Controlbox *without* automatic storage. *0: inactive;* *1 to 7: active;* For how it works, compare **A01**.	
A41•[1)]	**Select parameter set:** Two parameter records are available. These can be selected via the binary inputs or directly via **A41**. The selected parameter record does not become active until the enable has been removed and after a maximum of 300 msec have passed. Some parameters retain their validity in both parameter record 1 and parameter record 2. Parameters which can be programmed separately in parameter record 2 are indicated by a ² between the coordinate and parameter name. See chap. 7.3.1(FAS-Installation instr., publ. no. 441581)). *0: external;* The active parameter record is selected via binary inputs BE1 to BE5. At least one of the parameters **F30** to **F34** must be set to 11 (parameter set-select) in both parameter records. Parameter record 1 is active when a LOW signal is present on BE. Parameter rec. 2 is active when a HIGH signal is present on BE. *1: parameter set 1;* The inverter uses parameter record 1. External selection is not possible. *2: parameter set 2;* The inverter uses parameter record 2. External selection is not possible. **Caution:** Parameter **A41** is only provided for testing purposes. It is not saved with **A00**=1. Use a BE or the **E101** parameter (bus access) if you want to switch parameter records during operation.	
A42	**Copy parameter set 1>2:** Copies parameter record 1 to parameter record 2. The old values of parameter record 2 are overwritten. The procedure is started when the value changes from 0 to 1. The result is always "*0:error free.*" The new parameter assignment must be stored in non-volatile memory with **A00**. *0: error free;*	
A43•[1)]	**Copy parameter set 2>1:** Same as **A42** except parameter record 2 is copied to parameter record 1 *0: error free;*	
A50	**Tip:** Permits commissioning with minimum circuiting of the control terminal as long as **A51** is entered. *0: inactive;* Normal operation *1: active;* The controller only requires a high signal on the "enable" input. All other binary control signals have no function when **C60**<2. The ◄ and ► keys on Controlbox can be used to accelerate the drive counterclockwise or clockwise to the speed set in **A51**. Since an enable is generated which has a higher priority than the additional enable, operation remains possible even when additional-enable = low via fieldbus.	
A51	**Tip reference value:** Reference value for speed for commissioning without external circuiting of the control inputs. The "enable" input must be high! The current actual speed is shown on the right of the display. When **A50**=1 and **A51** is in input mode (value flashing), **A51** becomes active as continuous reference value. For behavior of enable and BEs, see **A50**. *Value range in rpm:* -12000[P] ... 300[P] ... 12000[P]	√
A55	**Key hand function:** Can be used to disable the MANUAL key on Controlbox for turning local operation on/off. For additional information, see Controlbox documentation (publ. no.: 441479). *0: inactive;* key has no function. *1: local;* key activates local operation. Device enabling is then handled exclusively by the keys "green I" I and "red 0" 0 . The ◄ and ► keys can be used to move backward and forward in the status display. Active local operation and active enable are indicated by LEDs on Controlbox. The reference speed results from **A51** for speed mode. **CAUTION:** When local operation is disabled with the key (LED goes off), the drive immediately switches back to the queued control signals (i.e., danger of unintentional startup!).	
A80	**Serial address:** Only when **A10**=2. Address for communication via X3 with FDS Tool and with master via USS protocol (cf. documentation "USS link for **POSIDRIVE**® and **POSIDYN**®", publ. no.: 441564) *Value range:* 0 to 31	
A82	**CAN-baudrate:** Sets the baud rate for the Kommubox CAN bus. Compare CAN bus documentation (publ. no.: 441562). *0: 10 kBit/s* *3: 100 kBit/s* *6: 500 kBit/s* *1: 20 kBit/s* *4: 125 kBit/s* *7: 800 kBit/s* *2: 50 kBit/s* *5: 250 kBit/s* *8: 1000 kBit/s*	
A83	**Busaddress:** Specifies the device address for use with the fieldbus (i.e., Kommubox). For permissible value range, see documentation of the applicable Kommubox. **A83** has no effect on device programming via PC with FDS Tool or via the RS 232 interface with the USS protocol. *Value range:* 0 to 125	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
² Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

A.. Inverter

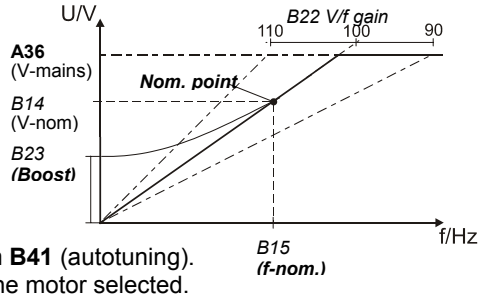
Para. No.	Description	
A84	**Profibus baudrate:** When the FAS is used with the PROFIBUS-DP Kommubox, the baud rate found on the bus is <u>*indicated*</u> (!) here. Compare PROFIBUS-DP documentation (publ. no.: 441535). *0: not found* *3: 45,45kBit/s* *6: 500 kBit/s* *9: 6000kBit/s* *1: 9.6kBit/s* *4: 93,75kBit/s* *7: 1500kBit/s* *10: 12000kBit/s* *2: 19.2kBit/s* *5: 187,5kBit/s* *8: 3000kBit/s*	

B.. Motor

Para No.	Description	
B00•	**Motor-type:** Motor selection from the motor data base. The STÖBER system motor used is specified with **B00**=1 to 20. **B00**=0 (user defined) is used for special windings or motors of other manufacturers. *0: user defined;* Number of poles, P, I, n. V, f and cos PHI must be specified in **B10** to **B16**. It is essential to perform and store **B41** (auto-tuning). Auto-tuning of the motor determines the winding resistors. This is required for optimum adjustment between inverter and motor. *1: 63K Y 0.12kW* *6: 71K D 0.25kW* *11: 80L Y 0.75kW* *16: 90L D 1.5kW* *2: 63K D 0.12kW* *7: 71L Y 0.37kW* *12: 80L D 0.75kW* *17: 100K Y 2.2kW* *3: 63M Y 0.18kW* *8: 71L D 0.37kW* *13: 90S Y 1.1kW* *18: 100K D 2.2kW* *4: 63M D 0.18kW* *9: 80K Y 0.55kW* *14: 90S D 1.1kW* *19: 100L Y 3kW* *5: 71K Y 0.25kW* *10: 80K D 0.55kW* *15: 90L Y 1.5kW* *20: 100L D 3kW* All necessary data are stored for these types of motors in a data base. This permits optimum adjustment between motor and inverter. Parameters **B10** to **B16** are not shown. An "*" on the display (Controlbox) means that at least one of the parameters (**B53**, **B64** and **B65**) differs from the default setting of the STÖBER motor database.	√
B10•	**Poles:** Calculated from the nominal speed of the motor p=2 (f x 60/n_{Nom}). Internally, the controller works with frequencies. Correct speed indication requires entry of the number of poles. *Value range:* 2 to <u>4</u> to 16	√
B11•	**P-nominal:** Nominal power as per nameplate *Value range in kW:* 0.12 ... (<u>depends on type</u>)	√
B12	**I-nominal:** Nominal current as per nameplate. Remember type of connection (Y/Δ) of the motor must correspond to **B14**. *Value range in A:*0 ... (<u>depends on type</u>)	√
B13	**n-nominal:** Nominal speed as per nameplate *Value range in rpm:* 0 to (<u>depends on type</u>) to 12000[P] ([P] Depends on pole number **B10**; f_{max} = 400 Hz)	√
B14• *B15•*	**V-nominal:** Nominal voltage as per nameplate. Remember type of connection (Y/Δ) of the motor must correspond to **B12**. *Value range in V:* 0 to (<u>depends on type</u>) to 480 **f-nominal:** Nominal frequency of the motor as per nameplate. The slope of the V/f curve and thus the characteristics of the drive are specified with parameters **B14** and **B15**. The V/f curve determines the frequency (**F15**: f-nominal) at which the motor is operated with the nominal voltage (**B14**: V-nominal). Voltage and frequency can be increased linearly to more than the nominal point. The upper voltage limit is the power voltage which is present. STÖBER system motors up to model 112 offer the capability of star/delta operation. Operation with 400 V Δ makes it possible to increase power by the factor √3 and provide an expanded speed range with constant torque. With this type of connection, the motor has increased current requirements. The following must be ensured: – The frequency inverter is designed for this power (PΔ = √3 x PY). – **B12** (I-nominal) is parameterized to the appropriate nominal motor current (IΔ_{Nom} = √3 x IY_{Nom}). *Value range in Hz:* 10 to <u>50</u> to 330  	√ √
B16	**cos PHI:** The cos Phi of the nameplate of the motor is required for control. *Value range:* 0.50 to (<u>depends on type</u>) to 1	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

B.. Motor

Para No.	Description	
B20•	**Control mode:** Specifies the type of motor control. *0: V/f-control;* V/f control changes voltage and frequency proportionally to each other so that machine flow remains constant. Utilized, for example, when reluctance motors or several motors are used with one inverter. *1: sensorless vector-control (SLVC);* Vector control without feedback. Much better speed accuracy and dynamics. **B31**, **B32** and **C30** can be used to manipulate dynamic reactions. *2: vector-control feedback;* Vector control with feedback. The signals of the speed feedback are evaluated by the inverter via binary inputs BE4/BE5. **F34**=14 and **F35**=15 must be parameterized. For commissioning, see chap. 9.6 (FAS-Installation instr., publication no. 441581).	√
B21•	**V/f-characteristic:** Effective regardless of the control mode selected in **B20**. *0: linear;* Voltage/frequency characteristic is linear. Suitable for all applications. *1: square;* Square characteristic for use with fans and pumps	√
B22 *B23*	**V/f-gain:** Offset factor for the slope of the V/f curve The slope for V/f-gain=100% is specified by V-nom. (**B14**) and f-nom. (**B15**). *Value range in %:* 90 to 100 to 110 **Boost:** Only effective when **B20**=0 (V/f-control) Boost means an increase in voltage in the lower speed range which provides more startup torque. With a boost of 100%, nominal motor current begins flowing at 0 Hz. Determination of required boost voltage requires that the stator resistance of the motor be known. If **B00**=0 (user defined), it is essential to perform **B41** (autotuning). If **B00**=1 to 20, the stator resistance of the motor is specified by the motor selected. *Value range in %:* 0 to 10 to 400 	√ √
B24•	**Switching frequency:** The noise emission of the drive is reduced by changing the switching frequency. However, since increasing the switching frequency also increases loss, permissible nominal motor current (**B12**) must be reduced if the switching frequency is increased. At a switching frequency of 16 kHz and V_{Mains} = 400 V, the inverter is able to supply a continuous current of 46% of its nominal current. At 8 kHz, it can supply 75%. For applications starting with 200 Hz, the switching frequency must be set to 8 kHz. The switching frequency is automatically reduced based on the thermal model (**E22**). *Value range in kHz:* 4 to 16 (adjustable in 2 kHz increments)	√
B25•	**Halt flux:** Only if **B20**≠0. **B25** specifies whether the motor remains powered during halt and quick stop when the brakes have been applied. After a HALT, the motor remains fully powered for the time **B27**. Output signal "*22:ready for reference value*" indicates that the magnetic field is being generated. *0: inactive;* When the brakes are applied (*halt*, *quick stop*), power is withdrawn from the motor, and the motor is demagnetized. The advantage of this is improvement of thermal motor balance since the motor has time to cool off during the pauses. The disadvantage of this is the increased time required for remagnetization (i.e., rotor time constant, approx. 0.5 sec). The inverter automatically determines how much time is required and adds this to brake release time **F06**. ***1: active;*** Default setting. Magnetization current flows through the motor and speeds up reaction to brake release. Disadvantage: The motor heats up, and the magnetization current can be up to 40% of the nominal current depending on the size of the motor. ***2: 75%;*** Current reduced to 75%. Otherwise same as **B25**=0. ***3: 50%;*** ***4: 25%;***	√
B27	**Time halt flux:** When a reduction of halt flux **B25** occurs, the full magnetization current is still retained for time **B27** when the brakes are applied and the power pack is active (e.g., HALT signal). *Value range in sec:* 0 to 255	√
B30	**Addit.motor-operation:** Only if **B20**=0 (V/f-control). For multiple-motor operation. Permits an additional motor to be connected to the enabled inverter. Motor voltage is briefly reduced to prevent overcurrent switchoff. *0: inactive*; *1: active;*	√
B31	**Oscillation damping:** When idling, large motors may tend to sympathetic vibration. Increasing the parameter **B31** damps these oscillations when **B20**=*2:SLVC*. Values from 60 to 100% are suitable for difficult drives. With **B20**=*2:Vector Control*, **B31** limits the possibility, during generator operation, of using the increase in the rise of DC link voltage to increase magnetization and thus braking torque. This can have a positive effect on smoothness of running when the drive is alternating between motor and generator operation at a constant higher speed. *Value range in %:* 0 to 30 to 100	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

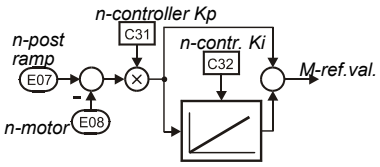
B.. Motor

Para No.	*Description*	
B32	**SLVC-dynamics: B32** can be used to manipulate the speed at which SLVC reacts to changes in load. **B32**=100% means greatest dynamics. *Value range in %:* 0 to 70 to 100	√
B40•[1)]	***Phase test*:** *0: inactive;* *1: active;* Tests motor symmetry in increments of 60°. The following points are checked: - Connection of phases U, V and W - Symmetry of the winding resistance of the phases U, V and W. If a winding resistor deviates by ±10%, the inverter reports "*19:symmetry*". - Type of connection of the motor. If a STÖBER system motor has been selected with parameter **B00**=1 to 20, the type of connection of the selected STÖBER system motor (i.e., star/delta) is compared with that of the connected motor. Deviations are reported with "*20:motorConnect.*" **The function is started when the level on the input enable (X1.6) changes from low to high.** Exiting the parameter requires another low signal on the enable.	
B41•[1)]	**Autotuning:** *0: inactive;* *1: active;* Stator resistance **B53** is measured. The function is started when the level on the input enable (X1.6) changes from low to high. Exiting the parameter requires another low signal on the enable. **A00**=1 is used to save the measuring results in non-volatile memory. **B00**=0, Be sure to autotune motor. Important for optimum adjustment of inverter and motor. **B00**=1 ... 20, autotuning of the motor is not required.	
B53	**R1-motor:** Stator resistance of the motor winding, $R1=R_{u-v}/2$. Usually only entered for non STÖBER motors or autotuning with **B41**. In the Y circuit, **B53** directly corresponds to the branch resistance. In the Δ circuit, 1/3 of the branch resistance must be entered. With STÖBER motors, **B53** should usually not be changed. Value is adjusted with **B41** (autotuning). An "*" indicates deviation from the STÖBER motor data base. *Value range in Ω:* 0.01 to depends on type to 327.67	√
B64	**Ki-IQ (moment):** Only when **B20**=2. Integral gain of the torque controller. *Value range in %:* 0 to depends on type to 400	√
B65	**Kp-IQ (moment):** Only when **B20**=2. Proportional gain of the torque controller. *Value range in %:* 0 to depends on type to 400	√

C.. Machine

Para. No.	*Description*	
C00	**n-Min:** Minimum permissible speed. The speed is related to the motor shaft speed. Reference values less than n-Min are ignored and raised to n-Min. *Value range in rpm:* 0 to **C01**	√
C01	**n-Max:** Maximum permissible speed. The speed is related to the motor shaft speed. Reference values over n-Max are ignored and limited to n-Max. *Value range in rpm:* **C00** to 3000[P] to 12000[P] ([P] = depends on poles **B10**; f_{max} = 400 Hz)	√
C02•	**Perm. direction of rotat.:** Determines the permissible direction of rotation. The direction of rotation can be specified via the binary inputs. *0: clockwise & counter-clockwise;* *1: clockwise;* *2: counter-clockwise;*	√
C03	**M-Max 1:** Maximum torque in % of nominal motor torque. The active torque limit can be further reduced with an analog input (see **F25**=2). If the maximum torque is exceeded, the controller responds with the message "*47:drive overload.*" See also remarks for **C04**. *Value range in %:* 0 to 150 to 400%* * Value is limited by the maximum inverter current.	√
C04	**M-Max 2:** Additional torque limit. You can switch between **C03** and **C04** with a binary input (**F3..**=*10:torque select*) or automatically when startup mode= cycle characteristic (**C20**=2). See chap. 9.2 (FAS-Installation instr., publication no. 441581). **Remarks:** Since **C04** is always active for a **quick stop**, **C04** ≥ **C03** should usually apply! *Value range in %:* 0 to 150 to 400%* * Value is limited by the maximum inverter current.	√
C10	**Skip speed 1:** Prevents prolonged use of the drive in a frequency range which produces mechanical resonance. The drive goes through the entered speeds and tolerance band of ±0.4 Hz with the decel-quick ramp (**D81**). The four "skip speeds" can be specified next to each other. *Value range in rpm:* 0 to 12000[P] ([P] depends on poles **B10**; f_{max} = 400 Hz)	√
C11	**Skip speed 2:** See **C10**. *Value range in rpm:* 0 to 12000[P]	√

[P] Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

C.. Machine		
Para. No.	*Description*	
C12	**Skip speed 3:** See **C10**. *Value range in rpm:* 0 to 12000 P	√
C13	**Skip speed 4:** See **C10**. *Value range in rpm:* 0 to 12000 P	√
C20•	**Startup mode:** Determines the startup behavior of the drive *0: standard;* Default setting. Separate from control mode (**B20**). *1: load start;* Only if **B20**=1 (sensorless VC). For machines with increased breakaway torque. The motor torque is increased to M-load start (**C21**) during the time t-load start (**C22**). After expiration of this time, the inverter uses the standard ramp again. 2: *cycle characteristic;* Effective separately from the control mode (**B20**). - Automatic switch between the specified torque limits M-Max 1 (**C03**) and M-Max 2 (**C04**). M-Max 1 applies during constant travel. M-Max 2 applies during the acceleration phase. - If **B20**=1 (sensorless vector control), a torque precontrol procedure is performed (i.e., the inverter calculates the required torque from the motor type specified (**B00**) and the ratio of load/motor inertia (**C30**). This calculated torque is then given to the drive. *3: capturing;* Only if **B20**=1. A rotating motor is connected to the inverter. The inverter determines the actual speed of the motor, synchronizes itself, and specifies the appropriate reference value.	√
C21	**M-load start:** Only if **C20**=1 (load start). Specification of the torque for the load start. *Value range in %:* 0 to 100 to 400	√
C22	**t-load start:** Only if **C20**=1. Time for the load start with the torque defined in **C21**. *Value range in sec:* 0 to 5 to 9.9	√
C30	**J-mach/J-motor:** Ratio of the inertia of load to motor. This factor is effective for all control modes and is important for optimization between inverter and motor (i.e., dynamics). Entry is not mandatory. *Value range:* 0 to 1000	√
C31	**n-controller Kp:** Only if **B20**=2 (vector control with feedback). Proportional gain of the speed controller. *Value range in %:* 0 to 60 to 400 	√
C32	**n-controller Ki:** Only if **B20**=2. Integral gain of the speed controller. Reduce **C32** when overswinging occurs in the target position. *Value range in %:* 0 to 30 to 400	√
C35	**n-control. Kp standstill:** **C31** and **C32** are multiplied by **C35** as soon as the motor speed drops below **C40**. *Value range in %:* 5 to 100	√
C40	**n-window:** If **F00**=3 (relay 2 as signal relay for "*3:reference value-reached*") or **F00**=2 (relay 2 as signal contact for speed "*2:standstill*"), the reference value is considered achieved in a window of reference value ±**C40**, and relay 2 closes. A halting brake is not activated as long as [n] > **C40**. *Value range in rpm:* 0 to 30 to 300 P	√
C41	**Operating range n-Min:** Parameters **C41** to **C46** can be used to specify an operating area. An output (**F00**=6) can be used to signal that these values have been exceeded. All area monitoring procedures are performed at the same time. If area monitoring is not required, the minimum parameters must be set to the lower-limit values, and the maximum parameters must be set to the upper-limit values. Cf. chapter 9.3 (FAS-Installation instr., publication no. 441581). When **C49**=0, operating-range monitoring is suppressed when the motor is not powered and during acceleration/braking procedures. When **C48**=1, amount generation is activated. *Value range in rpm:* 0 to **C42**	√
C42	**Operating range n-Max:** See **C41**. *Value range in rpm:* **C41** to 6000 P to 12000 P (P depends on poles **B10**; f_{max} = 400 Hz)	√
C43	**Operating range M-Min:** See **C41**. *Value range in %:* 0 to **C44**	√
C44	**Operating range M-Max:** See **C41**. *Value range in %:* **C43** to 400	√
C45	**Operating range X-Min.:** See **C41**. Monitors range defined in **C47**. *Value range in %:* -400 to 0 to **C46**	√
C46	**Operating range X-Max.:** See **C41**. Monitors range defined in **C47**. *Value range in %:* **C45** to 400	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

C.. Machine		
Para. No.	*Description*	
C47	**Operating range C45/C46:** Defines the range to be monitored. *0: E01 P-motor;* *5: E22 i2t-device;* *8: E62 actual M-Max;* *1: E02 M-motor;* *6: E23 i2t-motor;* *10: E71 AE1-scaled;* *2: E10 AE1-level;* *7: E24 i2t-braking resistor;* *13: E14 BE5-frequency RV;* *14: E08 n-motor;* (% ref. to **C01**)	√
C48	**Operating range of amount C47:** *0: absolute;* First, the amount is generated from the signal selected in **C47**. Example: **C47**=AE1; **C45**=30%; **C46**=80%. The operating range is -80% to -30% and +30% to +80%. *1: range;* The signal selected in **C47** must be located in range **C45** to **C46**. Example: **C47**=AE1, **C45**= -30%, **C46**= +10%. The operating range is -30% to +10%.	√
C49	**Operating range accel&ena:** *0: inactive;* During acceleration or deactivated enable, the "operating range" signal for the binary outputs is set to "0"=ok. The three ranges are only monitored during stationary operation (compatible with device software V 4.3). *1: active;* The operating range is always monitored..	√
C50	**Display function:** Parameters **C50** to **C53** can be used to design the first line of the display as desired. See chapter 7.3.1, FAS-Installation instr., publication no. 441581). Eight characters are available for a number, and 8 characters are available for any unit. Display value=raw value/display factor. *0: n2 & I-motor;* *1: E00 I-motor;* The inverter supplies the actual motor current in amperes as the raw value. 2: E01 P-motor; The inverter supplies as the raw value the actual active power as a percentage of the nominal motor power. *3: E02 M-motor;* As the raw value, the inverter supplies the actual motor torque as a percentage of the nominal motor torque. *4: E08 n-motor;* The inverter supplies the actual speed in rpm as the raw value. If V/f control (**B20**=0) and sensorless vector control (**B20**=1), the frequency (i.e., motor speed) output by the inverter is indicated. Only with vector control with feedback (**B20**=2) is the real actual speed indicated.	√
C51	**Display factor:** Raw value (**C50**) is divided by the value entered here. *Value range:* -1000 to 1 to 1000	√
C52	**Display decimals:** Number of positions after the decimal point for the value in the display. *Value range:* 0 to 5	√
C53	**Display text:** Only if **C60**≠2 (run mode≠position) and if **C50**>0. Text for customer-specific unit of measure in the operating display (e.g., "units/hour"). Maximum of 8 positions. Can only be entered with FDS Tool.	√
C60•	**Run mode** *1: speed;* Reference value for speed, conventional operating mode. *2: position;* Position control activated. When enable signal on X1.6, the position controller is turned on, and the current position is maintained. Full functionality of the position controller is only available with incremental encoders (**B20**=2). If **C60**=2, group "**D.** reference value") is completely faded out. When the mode is switched from speed to position, the reference position is lost.	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

D.. Reference Value		
Para. No.	*Description*	
D00	**Reference value accel:** Acceleration ramp for the analog reference value input. Is only used for specification of reference value via terminal strip X1 and motor potentiometer. - Voltage, current via analog input 1 (X1.2 – X1.4). - Frequency via binary input BE5 (X1.5 – X1.11). - Motor potentiometer via the binary inputs (**D90**=1) *Value range in sec/150 Hz * **D98**:* 0 to 3 to 3000	√
D01	**Reference value decel:** Deceleration ramp for the analog reference value input. Is only used for specification of reference value via terminal strip X1 and motor potentiometer. - Voltage, current via analog input 1 (X1.2 – X1.4). - Frequency via binary input BE5 (X1.5 – X1.11). - Motor potentiometer via the binary inputs (**D90**=1) *Value range in sec/150 Hz * **D98**:* 0 to 3 to 3000	√
D02[2)]	**Speed (max. ref. value):** Parameters **D02** to **D05** can be used to specify as desired the relationship between analog reference value and speed with a reference value characteristic curve. **D02**: Speed achieved with the maximum reference value (**D03**). With **C01**<**D02**, "*7:n>nmax*" is indicated when **C01** is exceeded. *Value range in rpm:* 0 to 3000[P] to 12000[P] ([P] Depends on pole number **B10**; f_{max} = 400 Hz)	√
D03[2)]	**Reference value-Max.:** Reference value to which the speed (max. RV) (**D02**) is assigned. Percentage of the analog reference value (10 V=100%) at which the maximum speed (**D02**) is achieved. *Value range in %:* **D05** to 100	√
D04[2)]	**Speed (min. ref. value):** Speed achieved with minimum reference value (**D05**). *Value range in rpm:* 0 to 12000[P] ([P] Depends on pole number **B10**; f_{max} = 400 Hz)	√
D05[2)]	**Reference value-Min.:** Reference value to which the speed (min. RV) (**D04**) is assigned. Percentage of the analog reference value (10 V=100%) at which the minimum speed (**D04**) is achieved. *Value range in %:* 0 to **D03**	√
D06[2)]	**Reference value offset:** Corrects an offset on analog input 1 (X1.2 to 4). When the ref. value is 0, the motor may not be permitted to rotate. If a revolution occurs anyway, this value must be entered with reversed sign as the offset (e.g., if param. **E10** shows 1.3%, **D06** must be parameterized to -1.3%). The value range is ±100%. While the ref. value offset is being entered, the current value of the analog input is shown at the same time (only when Controlbox is connected). *Value range in %:* -100 to 0 to 100	√
D07•[2)]	**Reference value enable:** When the minimum reference value (**D05**) is set to a value greater than 1%, an enable can be derived from the reference value output. *0: inactive;* *1: active;* An additional enable is derived from the reference value on analog input 1. If the reference value enable is high, the output is greater than or equal to the minimum reference value (**D05**). If the reference value enable is low, the output is less than the minimum reference value (**D05**).	√
D08[2)]	**Monitor reference value:** Monitors reference value output. Monitors for wire break. Ref. value monitoring will only function if the minimum reference value specified in **D05** is greater than or equal to 5% (**D05** ≥ 5%). *0: inactive;* *1: active;* If the reference value output is 5% less than the minimum permissible reference value (**D05**), the inverter shows "*43:RV wire brk.*"	√
D09[2)]	**Fix reference value no.:** Selection of a fixed reference value *0:* external selection via binary inputs and BE functions *RV-select 0 to 2* *1 to 7:* fixed selection of fixed reference value. BE inputs are ignored.	√
D10[2)]	**Accel 1:** Up to 7 fixed reference values/ramp records can be defined per parameter record. Selection is made via the binary inputs. At least one binary input must be programmed to reference value selector (e.g., **F31**=*1:RV-select0*). The reference value selector is used to assign the fixed reference values or ramp records to the signals of the binary inputs. The result of the binary coding is shown in **E60** (0 to 7). The ramp records accel 1 to 7 / decel 1 to 7) are only active in connection with the assigned fixed reference values 1 to 7. Accel 1: Acceleration time for ramp record 1 as related to 150 Hz. *Value range in sec/150 Hz * **D98**:* 0 to 6 to 3000	√
D11[2)]	**Decel 1:** Deceleration time for ramp record 1 as related to 150 Hz. *Value range in sec/150 Hz * **D98**:* 0 to 6 to 3000	√
D12[2)]	**Fix reference value 1:** Selection is made parallel to ramp record 1. (Accel 1 / decel 1) via the binary inputs *Value range in rpm:* -12000[P] to 750[P] to 12000[P]	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

D.. Reference Value

Para. No.	Description	
D20[2)]	**Accel 2:** Acceleration time for ramp rec. 2 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 9 to 3000	√
D21[2)]	**Decel 2:** Deceleration time for ramp rec. 2 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 9 to 3000	√
D22[2)]	**Fix reference value 2:** Selection is made parallel to ramp rec. 2. (Accel 2/decel 2) via the binary inputs *Value range in rpm:* -12000 to 1500 to 12000	√
D30[2)]	**Accel 3:** Acceleration time for ramp rec. 3 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 12 to 3000	√
D31[2)]	**Decel 3:** Deceleration time for ramp rec. 3 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 12 to 3000	√
D32[2)]	**Fix reference value 3:** See **D12**. *Value range in rpm:* -12000[P] to 3000[P] to 12000[P]	√
D40[2)]	**Accel 4:** Acceleration time for ramp record 4 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 0.5 to 3000	√
D41[2)]	**Decel 4:** Deceleration time for ramp record 4 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 0.5 to 3000	√
D42[2)]	**Fix reference value 4:** See **D12**. *Value range in rpm:* -12000[P] to 500[P] to 12000[P]	√
D50[2)]	**Accel 5:** Acceleration time for ramp record 5 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 1 to 3000	√
D51[2)]	**Decel 5:** Deceleration time for ramp record 5 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 1 to 3000	√
D52[2)]	**Fix reference value 5:** See **D12**. *Value range in rpm:* -12000[P] to 1000[P] to 12000[P]	√
D60[2)]	**Accel 6:** Acceleration time for ramp record 6 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 2 to 3000	√
D61[2)]	**Decel 6:** Deceleration time for ramp record 6 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 2 to 300	√
D62[2)]	**Fix reference value 6:** See **D12**. *Value range in rpm:* -12000[P] to 2000[P] to 12000[P]	√
D70[2)]	**Accel 7:** Acceleration time for ramp record 7 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 2.5 to 3000	√
D71[2)]	**Decel 7:** Deceleration time for ramp record 7 as related to 150 Hz. *Value range in sec/150 Hz* * ***D98****:* 0 to 2.5 to 3000	√
D72[2)]	**Fix reference value 7:** See **D12**. *Value range in rpm:* -12000[P] to 2500[P] to 12000[P]	√
D80	**Ramp shape:** *0: linear;* *1: ´S´ ramp;* Smoother acceleration/deceleration.	√
D81	**Decel-quick:** Quick stop ramp. Effective if a binary input is programmed to quick stop (**F3..**=9) or parameter **F38**>0. When a quick stop is triggered by the binary inputs, the drive is decelerated with the deceleration ramp set here. In position mode (**C60**=2), quick stop is performed on ramp **I11**. *Value range in sec/150 Hz* * ***D98****:* 0 to 0.2 to 3000	√
D90•	**Reference value source:** See block circuit diagram in chap. 16 (FAS-Installation instr., publication no. 441581). *0: standard reference value;* *1: motor potentiometer;* Two binary inputs can be used to simulate a "motor potentiometer." This requires that one binary input be programmed to *"4:motorpoti up"* and another binary input to *"5:motorpoti dwn"* (e.g., **F34**=4 and **F35**=5). Only ramps **D00** and **D01** can change the speed. *2: motor potentiometer+reference value;* The reference value for speed of the motor potentiometer function is added to the "standard" reference value (i.e., analog input, fixed reference values). When **D90**=1, only the motor potentiometer reference value is used. The ramps selected with the binary inputs are used, and the motor potentiometer reference value changes with RV-accel/RV-decel (i.e., **D00** and **D01**).	√

No.	Accel	Decel	Reference Value
0	**D00**	**D01**	Analog, freq.,...
1	**D10**	**D11**	Fixed RV 1
2	**D20**	**D21**	Fixed RV 2
:	:	:	:
7	**D70**	**D71**	Fixed RV 7

BE4	BE5	Motor poti. ref. value
L	L	Constant
H	L	Larger
L	H	Smaller
H	H	0

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• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

D.. Reference Value

Para. No.	Description	
D91	**Motorpoti function:** Only if **D90**≠0 (reference value source≠standard RV) *0: non-volatile;* The reference value which was approached is retained both when the enable is removed and when the power is turned off/on. *1: volatile;* The reference value is set to 0 when the enable becomes low or the power for the drive is turned off.	√
D92	**Negate reference value:** See block circuit diagram in chap. 16. *0: inactive;* *1: active;* The reference value channel is negated. Corresponds to a reverse in direction of rotation. Not related to the selected reference value.	√
D93	**RV-generator:** For commissioning and optimizing the speed controller. *0: inactive;* Normal reference value selection. *1: active;* ±**A51** is specified cyclically as reference value. The time can be set in **D94**.	
D94	**Ref. val. generator time:** After this period of time, the sign of the reference value changes when **D93**=*1:active*. *Value range in msec:* 0 to 500 to 32767	√
D98	**Ramp factor:** If **D98**<0 and speed mode (**C60**=1), all ramps (e.g., **D00**) are shortened by one or two powers of ten. This makes very sensitive setting of short ramps possible. -2: *0.01 All ramp times shortened by factor of 100. -1: *0.1 All ramp times shortened by factor of 10. 0: *1 Factory setting. Ramps unchanged.	√

E.. Display Values

Para. No.	Description	
E00	**I-motor:** Indicates the active motor current in amperes.	
E01	**P-motor:** Indicates the current power of the motor in kW and as a relative percentage in relation to nominal motor power.	
E02	**M-motor:** Indicates the current motor torque in Nm and as a relative percentage in relation to nominal motor torque (only on display of Controlbox).	
E03	**DC-link-voltage:** Indicates the current DC-link voltage. Value range for single-phase inverters: 0 to 500 V, Value range for three-phase inverters: 0 to 800 V	
E04	**V-motor:** Indicates the current motor voltage. Value range for single-phase inverters: 0 to 230 V, Value range for three-phase inverters: 0 to 480 V	
E05	**f1-motor:** Indicates the current motor frequency in Hz.	
E06	**n-reference value:** Only if **C60**=1 (speed). Indicates the current ref. val. for speed in relation to the motor shaft.	
E07	**n-post-ramp:** Only if **C60**=1. Indicates the current speed in relation to the motor shaft after the ramp generator.	
E08	**n-motor:** Indicates the current motor speed.	
E09	**Rotor position:** Only if **B20**=*2:vect.feedback*. Accumulates the increments of the motor encoder. Digits in front of the decimal point indicate whole revolutions. The three positions after the decimal point are fractions of one motor revolution. This position is available in all run modes.	
E10	**AE1-level:** Level of the signal present on analog input (AE) 1 (X1.2 to 4). ±10 V is 100%.	
E12	**ENA-BE1-BE2-level:** Level of the enable inputs (X1.6), binary input 1 (X1.7) and binary input 2 (X1.8). Low level is represented by 0, and high level is represented by 1.	
E13	**BE3-BE4-BE5-level:** Level of binary inputs 3, 4 and 5 (X1.9 to X1.11). Low level is represented by 0, and high level is represented by 1.	
E14	**BE5-frequence ref. value:** If binary input 5 is parameterized to frequency reference value specification (**F35**=14), reference value output can be monitored here. 0% corresponds to a frequency specification of 100 Hz on BE5. 100% corresponds to the maximum permissible frequency reference value as entered under **F37**.	
E15	**n-encoder:** If speed feedback is connected to BE4 and BE5 and BE5 is not parameterized to the frequency reference value, the actual encoder speed can be monitored here. The display is not related to the control mode set under **B20**.	
E17	**Relay 1:** Status of relay 1 (ready for operation). *0: open;* For meaning, see parameter **F10**. *1: closed;* Ready for operation.	

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• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

E.. Display Values		
Para. No.	*Description*	
E18	**Relay 1:** Status of relay 2. The function of relay 2 is specified with parameter **F00**. *0: open;* *1: closed;*	
E19	**BE15...BE1 & enable:** The status of the binary inputs including ASi-Kommubox is shown as a binary word.	
E20	**Device utilization:** Indicates the current load of the inverter in %. 100% corresponds to the nominal capacity of the inverter.	
E21	**Motor utilization:** Indicates the current load of the motor in %. Reference value is the nominal motor current specified under **B12**.	
E22	**i2t-device:** Level of the thermal device model (i.e., i2t model). If utilization is 100%, the fault message *"39:tempDev.i2t"* appears.	
E23	**i2t-motor:** Level of the thermal motor model (i.e., i2t model). 100% corresponds to full utilization. The thermal model is based on the design data specified under group **B** (motor) (e.g., continuous operation (S1 operation)).	
E24	**i2t-braking resistor:** Level of the thermal braking resistor model (i.e., i2t model). 100% corresponds to full utilization. The data of the braking resistor are specified with **A20** to **A23**.	
E25	**Temperature device:** Current device temperature in °C. Is set to +25 °C when the FAS is powered by a 24 V LC option board when the power (230 V or 400 V) is not present.	
E27	**BA15..1&Rel1:** Status of all binary outputs as binary word. BA15 to BA1 are indicated from left to right. Relay 1 is indicated to the far right.	
E29	**n-ref. value raw:** Speed reference value before the offset ref. values and the reference value limitation. This is the master reference value for the winder and the free-wheeling reference value for synchronous running.	
E30	**Run time:** Indicates the current run time. Run time means that the inverter is connected to the power supply.	
E31	**Enable time:** Indicates the active time. Active time means that the motor is powered.	
E32	**Energy counter:** Indicates the total power consumption in kWh.	
E33	**Vi-max-memorized value:** The DC-link voltage is monitored continuously. The largest value measured is saved here in non-volatile memory. This value can be reset with **A37**→1.	
E34	**I-max-memorized value:** The motor current is continuously monitored. The largest value measured is stored here in non-volatile memory. This value can be reset with **A37**→1.	
E35	**Tmin-memorized value:** The temperature of the inverter is continuously monitored. The smallest value measured is stored here in non-volatile memory. This value can be reset with **A37**→1.	
E36	**Tmax-memorized value:** The temperature of the inverter is continuously monitored. The greatest value measured is stored here in non-volatile memory. This value can be reset with **A37**→1.	
E37	**Pmin-memorized value:** The active power of the drive is continuously monitored. The smallest value measured is stored here in non-volatile memory. This value can be reset with **A37**→1.	
E38	**Pmax-memorized value:** The active power of the drive is continuously monitored. The largest value measured is stored here in non-volatile memory. This value can be reset with **A37**→1.	
E40	**Fault type:** This parameter allows you to make a selection from archived faults. The inverter stores the last 10 faults in the order in which they occurred. When read out with Controlbox, the number from the fault memory is indicated at the top right. 1 indicates the latest fault, and 10 indicates the oldest fault. The type of fault is shown in plain text in the bottom line. Proceed as follows to select which of the 10 faults will be indicated. Press the # key. The number (1 to 10) of the indicated fault flashes in the top line. The type of fault is indicated in plain text in the bottom line (e.g., *"31:short/ground"*). The arrow keys can then be used to select the desired fault number.	
E41	**Fault time:** The run time at the time of the selected fault is indicated. Selection is the same as for **E40**.	
E42	**Fault count:** Number of faults of the type of fault selected. Proceed as follows to select the type of fault. Press the # key. A fault code and the fault appear in plain text (e.g., "*31:short/ground*") in the bottom line. The arrow keys can then be used to select the desired type of fault. The number of faults of this event is shown in the top line (0 to 65,535).	
E45	**Control word:** Control of *Drivecom* device state machine during fieldbus operation with Kommubox.	
E46	**Status word:** Status of the device during fieldbus operation with Kommubox. See fieldbus documentation.	
E47	**n-field-bus:** Reference value speed during fieldbus operation with Kommubox.	
E50	**Device:** Indication of the exact device type (e.g., FAS 4014).	
E51	**Software-version:** Software version of the inverter (e.g., V4.5).	
E52	**Device-number:** Number of the device from a manufactured series. Same as the number on the nameplate.	
E53	**Variant-number**	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

E.. Display Values

Para. No.	*Description*
E54	**Option-board:** Indication of the option board detected during initialization. *20: none;* No option board or external 24 V power supply missing. *21: 24V-LC;*
E55	**Identity-number** Can be assigned by the user as desired from 0 to 65535. Can only be write-accessed with FDS Tool or fieldbus.
E56	**Parameter set ident. 1:** Indicates whether parameters in parameter record 1 were changed. Can be used to detect unauthorized manipulation of parameters. The parameter record ID does not change when the actions "**B40** phase test", "**B41** autotuning" and "**J04** Teach-in" are executed. *0:* all values are default settings (**A04**=1). *1:* Specified value during initialization by FDS Tool *2 to 253:* Customer specification/configuration with FDS Tool. Status without change. *254:* When parameters are changed via fieldbus or via the USS protocol, **E56** and **E57** = 254 are set. *255:* At least one parameter value was changed with the keyboard (Controlbox).
E57	**Parameter set ident. 2:** Same as **E56** but for parameter set 2.
E58	**Kommubox:** Type of Kommubox for fieldbus communication which is installed on X3 and was automatically detected.
E59	**FAS with POSI-Upgrade:** Shows the current status of the Posi-Upgrade. *0: inactive;* *1: passive;* *2: active;*
E60	**Reference value selector:** Indicates the result of the binary coding of the fixed reference values. Selection is binary via inputs BE1 to BE5. At least one binary input must be parameterized for the reference value selector (**F3..**=1 to 3). The result of the binary coding is indicated with the digits 0 to 7. A fixed reference value/ramp record is assigned to this result. A fixed reference value can also be specified directly with **D09**. However, **E60** is not affected by **D09**.

RV select 2	1	0	**E60**	**Reference Value**
0	0	0	0	Analog, freq,..
0	0	1	1	Fix. ref. val. 1
0	1	0	2	Fix. ref. val. 2
0	1	1	3	Fix. ref. val. 3
1	0	0	4	Fix. ref. val. 4
1	0	1	5	Fix. ref. val. 5
1	1	0	6	Fix. ref. val. 6
1	1	1	7	Fix. ref. val. 7

E61	**Additional ref. value:** Current additional reference value to be added to the reference value being used. Can come from AE1 (**F25**=1) or the fieldbus. See block circuit diagram in chap. 16 (FAS-Installation instr., publication no. 441581).
E62	**Actual M-max:** Currently effective M-Max as a minimum from M-Max 1 (**C03**), M-Max 2 (**C04**), and the torque resulting from the level on AE1, if the AE1 function is parameterized for torque limit (**F25**=2) or power limit (**F25**=3) or is from the fieldbus.
E71	**AE1 scaled:** AE1 signal after offset and factor. **E71**= (**E10** + **F26**) * **F27**. Cf. block circuit diagram in chap. 16 (FAS-Installation instr., publication no. 441581).
E80	**Operating condition:** Indicates the current operating state as shown by the operational display. Cf. chapter 8 (operating states). Useful for fieldbus poling or serial remote control.
E81	**Event level:** Indicates whether a current event is present. The type of event is indicated in **E82**. Useful for fieldbus poling or serial remote control. *0: inactive;* No event is present. *1: message;* *2: warning;* *3: fault;*
E82	**Event name:** Indicates the current event/fault. Cf. chap. 14 (FAS-Installation instr., publication no. 441581). Useful for fieldbus poling or serial remote control.
E83	**Warning time:** The time remaining until the fault is triggered is indicated for the active warnings. This time can be changed via FDS Tool. Useful for fieldbus poling or serial remote control.
E84	**Active parameter set:** Indicates the current parameter record. Cf. chapter 9.4 (FAS-Installation instruction, publication no. 441581). Useful for fieldbus poling or serial remote control. *1: parameter set 1;* *2: parameter set 2;*
E100...	Parameters **E100** and above are used to control and parameterize the inverters by fieldbus. For details, see the documentation of your fieldbus system.
E130	**Posi-Upgrade job number:**

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
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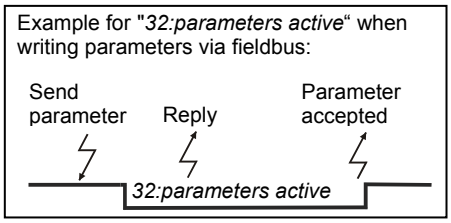
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*.
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

F.. Control Interface

Para. No.	Description	
F00	**Relay2-function:** Functions of relay 2 (X2.3 - 2.4). *0: inactive;* ***1: brake**;* Used to control a brake. See **F01**, **F02** and **F06** and **F07**. See also chap. 8.6 (FAS-Installation instruction, publication no. 441581). ***2: standstill**;* Output active (relay closes) when speed 0 rpm ±**C40** is reached. ***3: reference value-reached**;* When **C60**=1 (speed mode): output is active when speed reference value is within ±**C40**. When **C60**=2 (run "position" mode), *refVal-reached* means "in position." The signal appears when reference value specification is concluded (i.e., end of ramp) and the actual position is located within target window ±**I22**. The signal is not withdrawn until the next start command. When enable-off occurs, "*RefVal-reached*" is reset when window **I22** is exited or **I21** (following error) is exceeded. "*RefVal-reached*" then remains low. This function cannot be used with process block changes via chaining "no stop" (**J17**=2). ***4: torque-limit**;* Relay closes when the active torque limit is reached. See **E62**. ***5: warning**;* Relay closes when a warning occurs. ***6: operation range**;* Relay closes when the defined operational range (**C41** to **C46**) is exited. ***7: active parameter set**;* Only works when **F00**=7 is parameterized in both parameter records. Low signal (i.e., relay open) means that parameter record 1 is active. High signal (i.e., relay closed) means that parameter record 2 is active. The signal arrives before the new parameter record takes effect and can be used, for example, for contacter control for a two-motor drive. Cf. chap. 9.4 (FAS-Installation instruction, publication no. 441581). ***8: electronic cam 1**;* Only applicable when **C60**=2 (run mode "position"). Signal appears when the actual position is located between the boundaries **I60** and **I61**. Useful for starting actions on other drives or modules. ***9: following error**;* Only applicable when **C60**=2. Maximum following error **I21** was exceeded. The reaction to a following error (e.g., fault, warning, and so on) can be parameterized via FDS Tool. ***10: posi.active**;* Only applicable when **C60**=2. Signal only appears when positioning control is in the basic status *"17:posi.active"* (i.e., no process block and no chaining being processed). This can be used to signal the end of a chaining sequence, for example. *11: inactive;* *12: inactive;* ***13: referenced**;* Only if **C60**=2 (position control). Output is high while the drive is being referenced (i.e., reference point traversing has been successfully concluded). ***14: clockwise**;* Speed n>0. For zero crossing, hysteresis with **C40**. ***15: fault**;* A fault has occurred. ***16: inhibited**;* See run mode "*12:inhibited*" in chap. 8. ***17: BE1**;* Route binary input to binary output. In addition to galvanic isolation, also used to read binary inputs via ASi bus. ***18: BE2**;* Cf. selection "*17:BE1.*" ***19: Switch-memory 1**;* Output switch memory S1. Each of the "posi switching points" defined in Group **N**.. can be used to control 3 switch memories (S1, S2 and S3) simultaneously. ***20: Switch-memory 2**;* Output switch memory S2. ***21: Switch-memory 3**;* Output switch memory S3. ***22: ready for reference value**;* The drive is powered. Magnetization is established. Reference value can be specified. ***23: reference value-ackn.0**;* In position run mode: When no *posi.start*, *posi.step* or *posi.next* signal is queued, the *RV-select* signals are output **inverted** (monitoring with wire break detection). Otherwise active process block **I82** is output. See time diagram in chap. 10.3 (FAS-Installation instruction, publication no. 441581). ***24: reference value-ackn.1**;* See "*23:reference value-ackn.0*." ***25: reference value-ackn.2**;* See "*23:reference value-ackn.0*." *26: inactive;* *27: inactive;* ***28: BE3**;* Cf. selection *"17:BE1*." ***29: BE4**;* ***30: BE5**;* ***32: parameters active**;* Low signal means internal parameter conversions not completed. Useful for the handshake with a higher level controller when converting parameter records, and similar.  	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.

• The power pack must be turned off before these parameters can be changed.

Italics These parameters are sometimes not shown depending on which parameters are set.

1) See result table in chap. 9. 2) Only available when **D90**≠1

Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*

Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

F.. Control Interface

Para. No.	Description	
F01	**Brake release:** Only if **F00**=1 (brake) and **B20**≠2 (control mode≠ vector-control with feedback), otherwise **F06**. If the reference value exceeds the set speed value, the brake releases (relay 2=closes). *Value range in rpm:* 0 to 300*	√
F02	**Brake set:** Only if **F00**=1 (brake) and **B20**≠2 (control mode≠ vector-control with feedback), otherwise **F07**. When the drive is halted to a standstill by a "halt" or a "quick stop" command, the brake is applied when the set speed value is passed below (relay 2=opens). *Value range in rpm:* 0 to 300*	√
F03	**Relay 2 t-on:** Only if **F00**>0. Causes a delay in switch-on of relay 2. Can be combined with all functions of relay 2. The related function must be present for at least t-on so that the relay switches. *Value range in sec:* 0 to 5.024	√
F04	**Relay 2 t-off:** Only if **F00**>0. Causes a delay in switch-off of relay 2. Can be combined with all functions of relay 2. *Value range in sec:* 0 to 5.024	√
F05	**Relay 2 invert:** Only if **F00**>0. Permits the relay-2 signal to be inverted. Inversion occurs after the function switch-on/switch-off delay (**F04/F03**). Can be combined with all functions of relay 2. *Value range:* 0 to 1	√
F06	**t-brake release:** Only if **F00**=1 (brake) and **B20**=2 (vector-control with feedback). Defines the amount of time the brake is released. **F06** must be selected approximately 30 msec greater than the time t_1 in section M of the STÖBER MGS catalog. When the enable is granted or the halt/quick stop signal is removed, startup is delayed by the time **F06**. See also **B25**. *Value range in sec:* 0 to 5.024	√
F07	**t-brake set:** Only if **F00**=1 (brake) and **B20**=2 (vector-control with feedback). Defines the time the brake is applied. **F07** must be selected approximately 30 msec greater than the time t_1 (MGS catalog). When the enable and halt/quick stop is removed, the drive still remains under control for the time **F07**. Time $t_1 \Rightarrow$ scanning time t_{21} ⚠ **t_{21} varies with switching on AC or DC side!** ⚠ *Value range in sec:* 0 to 5.024	√
F10	**Relay 1-function:** Relay 1 is closed when the inverter is ready for operation. The opening of the relay can be controlled by scanning the status of relay 1 via parameter **E17**. ***0: fault;*** Relay is open when a fault occurs. ***1: fault and warning;*** Relay open when a fault or warning occurs. ***2: fault and warning and message;*** Relay open when a fault, warning or message occurs. If auto-reset (**A32**=1) is active, the switching of the relay is suppressed until all auto-acknowledgment attempts have been exhausted.	√
F19	**Quick stop end:** Only if **C60**=1. **F19** is available starting with SV 4.5E. It specifies when the quick stop ramp can be concluded. ***0: Standstill;*** With the rising edge of the quick stop signal (or removal of the enable for **F38**>0), the drive brakes down to standstill ("zero reached" message) even when the quick stop signal (or enable off) was only briefly queued. ***1: No stop;*** When the quick stop signal disappears or the enable returns, the drive immediately accelerates again to the current reference value.	√
F25•	**AE1-function:** Function of analog input 1 (X1.2 – X1.3). *0: inactive;* ***1: additional reference value;*** Additional reference value input. Takes effect regardless of which operation input is selected. Is added to the running reference value (**A30**). 100% control of AE1 is 100 Hz (3000 rpm for 4-pole motor). Can be scaled with **F26** and **F27**. ***2: torque-limit;*** Additional torque limit. ((10 V + **F26**) x **F27**) =nominal motor torque. Active torque limit is the minimum from M-Max 1 (**C03**), M-Max 2 (**C04**) and the level on analog input 1. ***3: power-limit;*** External power limit whereby 10 V=nominal motor power. ***4: reference value-factor;*** The main reference value on AE1 is multiplied by the RV-factor (10 V=100%). ***5: override;*** In positioning mode (**C60**=2), the current positioning speed is changed via AE1 during traversing. 0 V=standstill! 10 V=programmed speed if **F22**=100%. ***6: posi.offset;*** Only effective in positioning mode (**C60**=2). An offset based on the voltage on AE1 is overlaid on the current reference value position. The ratio of path/voltage is specified with **I70**. *7: inactive;* ***8: rotation field magnet moment***; Torque control for rotation field magnets. V/f-control (**B20**=0) is used. The speed is set to the nominal value via the fixed reference value, for example. **F20**=8 can be used to affect the motor voltage via AE1. Since torque corresponds to the square of the motor voltage, this voltage is weighted with the root of the AE1 signal.	√

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

F.. Control Interface

Para. No.	Description	
F25• Continuation	***9: n-Max;*** Limitation of the maximum speed via external voltage. ***10: reference value;*** Reference value for speed or torque (AE1 is typically parameterized to "*10:reference value*"). *11: to 14: inactive;*	√
F26	**AE1-offset:** An offset on analog input 1 (X1.2 – X1.3) can be corrected. To do this, jumper terminals X1.2 and X1.3. Then observe the AE1 level in parameter **E10**, and enter it with the reverse sign in parameter **F26**. For example, if parameter **E10** indicates 1.3%, **F26** must be parameterized to -1.3%. *Value range in %:* -400 to 0 to 400	√
F27	**AE1-gain:** The signal present on analog input 1 is added to the AE1 offset (**F26**) and then multiplied by this factor. Depending on **F25**, **F27** is scaled as shown below. **F25=** 1 ⇒ 10 V = **F27** x 100 Hz (3000 rpm)* **F25=** 2 ⇒ 10 V = **F27** x nominal motor torque **F25=** 3 ⇒ 10 V = **F27** x nominal motor power **F25=** 4 ⇒ 10 V = **F27** x multiplication with 1.0 **F25=** 6 ⇒ 10 V = **F27** x path in **I70** **F25=** 8 ⇒ 10 V = **F27** x nominal motor voltage **F25=** 9 ⇒ 10 V = **F27** x 100 Hz (3000 rpm)* **F25=**10 ⇒ 10 V = **F27** x 100% input of ref. val. curve **Example:** If **F25**=1 and **F27**=50%, the offset is 1500 rpm with 10 V and AE1. *Value range in %:* -400 to 100 to 400 * With 4-pole motor: 100 Hz is 3000 rpm. With other motors: Speed must be converted. **B10**=2 → 100 Hz = 6000 rpm **B10**=6 → 100 Hz = 2000 rpm	√
F30	**BE-logic:** Logical link when several BEs are programmed for the same function *0: OR;* *1: AND;;*	√
F31•	**BE1-function:** All binary inputs can be programmed as desired. Selection points 0 to 13 and those greater than 16 are identical for all binary inputs. If the same function is used by several BEs, **F30** can be used to program a logical link. Inversion can be performed with **F51** to **F55**. *0: inactive;* ***1: reference value-select 0;*** Binary coded selection of fixed reference values. The result of the reference value selection is indicated in **E60**. ***2: reference value-select 1;*** See above. ***3: reference value-select 2;*** See above. ***4: motorpoti up;*** If **D90**=1, two binary inputs can be used to simulate a motor potentiometer. One BE must be programmed as "*4:Motorpoti up*," and another BE must be programmed as "*5:Motorpoti dwn.*" See also **D90**. ***5: motorpoti down;*** Same as "*4:Motorpoti up*." ***6: direction of rotation;*** Negation of the current reference value. ***7: additional enable;*** BE provides the function of an additional enable (i.e., a fault can also be acknowledged via this additional enable). The drive is not enabled unless a high signal is present on the "enable" input (X1.6) and the binary input. ***8: halt;*** With high signal, drive is slowed with the selected deceleration ramp. If **F00**=1, the brake is then applied. Ramps: Analog RV specification/motor potentiometer: **D01**; fixed reference values: **D12** to **D72**; Positioning: process block ramp. ***9: quick stop;*** When a rising edge occurs, the drive is slowed with the selected decel-quick ramp (**D81**). The brake is then applied if **F00**=1. A brief high pulse (≥4 msec) on the binary input is sufficient to trigger the quick stop. A drop in quick stop is impossible until speed **C40** is passed below. Cf. also **F38**. **Caution**: Torque limit **C04** is always active for quick stop. ***10: torque select;*** Switches between the torque limits M-Max 1 (**C03**) and M-Max 2 (**C04**). Low signal=M-Max 1. High signal = M-Max 2. ***11: parameter set-select;*** A parameter record can only be selected via BE if **A41**=0. This means that this binary input must be set to *11* in both parameter records. A low signal means that parameter record 1 is selected. A high signal means that parameter record 2 is selected. The selected parameter record does not become active until the enable is removed. Cf. chap. 9.4 (FAS-Installation instr., publication no. 441581). ***12: extern fault;*** Permits fault messages of the periphery to be evaluated. The inverter evaluates a rising edge on the binary input and assumes *"44:ext.fault."* If several binary inputs are programmed for external fault, the rising edge can only be evaluated when a low signal is present on the other binary inputs programmed for *"12:ext.fault."* ***13: fault reset;*** A fault which is no longer queued can be acknowledged with a rising edge. If several binary inputs are programmed for acknowledgment, the rising edge can only be evaluated when a low signal is present on the other binary inputs programmed with *"13:faultReset."*	√ √

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

F.. Control Interface

Para. No.	Description	
F31• Continuation	***14: counter-clockwise V3.2;*** By programming **F31**=14 and **F32**=14, the direction of rotation specification can be simulated by inverters with the V3.2 software. In this case, the functions "*direction of rotation*," "*halt*," and "*quick stop*" may not be assigned to other binary inputs. BE1 BE2 Command 0 0 Quick stop (if **F38**≠0) or halt (**F38**=0) 0 1 Clockwise rotation 1 0 Counterclockwise rotation 1 1 Halt *15: inactive*; ***16: posi.step;*** 1 pulse (t ≥ 4 msec) stars the movement without interrupting the positioning procedure in progress. Primarily used for manual next-block procedures with process-block chaining. Cf. **J17**=0 and **J01**. ***17: tip +;*** Manual traversing in the positive direction (**tipping**). Selection "*8:halt*" must be active. In speed operating mode (**C60**=1), the operational state "*22:tip"* appears on Controlbox and the motor stops as called for in "*8:halt*" (n=0). ***18: tip -;*** Manual traversing in the negative direction. ***19: posi.start;*** 1 pulse (t ≥ 4 msec) starts the movement. Terminates any positioning procedure in progress, and proceeds to the new destination (i.e., changing destination on the fly). Process block selection via BEs (RV-select) or **J02**. ***20: posi.next;*** (With chained process blocks) 1 pulse (t ≥ 4 msec) interrupts the running process block and starts the next one. *Important:* A braking path can be defined there, for example. Evaluation of *posi.next* must be programmed specifically to the process blocks. Cf. **J17**=*3:posi.next*. Otherwise the drive will not react to *posi.next*! If *posi.next* is parameterized to BE3, the signal is recorded without a time delay (i.e., high repetition accuracy). ***21: stop +;*** Limit switch at the positive end of the traversing area. ***22: stop -;*** Limit switch at the negative end of the traversing area In speed mode, the dir. of rotation is disabled. ***23: reference input;*** Input for reference switch (**I30**=0). ***24: start reference;*** Change in edge from low to high starts reference point traversing. See also **I37**=0. ***25: teach-in;*** With a rising edge, the target position of the currently selected process block is overwritten with the present actual position and stored in non-volatile memory. See also **J04**. *26: to 31: inactive;* ***32: brake release;*** Manual brake control via a BE (higher priority than the internal brake function).	
F32•	**BE2-function:** 0 to 13 and starting with 15, see **F31**. *14:clockwise V3.2*; Value range: 0 to 6 to 32	√
F33•	**BE3-function:** 0 to 13 and starting with 15, see **F31**. ***14: encoderSignal 0;*** Only if **B20**=2 (vector-control with feedback). The "zero signal" (= track "C," one pulse per rotation) of the incremental encoder. This signal is not required for the function of "vector control with feedback." With certain positioning functions (e.g., *Posi:next*) BE3 is without delay. *Value range:* 0 to 1 to 32	√
F34•	**BE4-function:** 0 to 13 and starting with 15, see **F31**. ***14: encoderSignal A;*** Only if **B20**=2 (vector-control with feedback). The "A signal" of the incremental encoder. *Value range:* 0 to 2 to 32	√
F35•	**BE5-function:** 0 to 13 and starting with 16, see **F31**. ***14: frequency-RV;*** The inverter is parameterized to the frequency reference value specification. Analog input 1 (X1.2 to 4) is ignored. The maximum frequency entered under **F37** corresponds to a reference value output of 100%. Frequencies under 1 Hz are interpreted as 0% output. The frequency RV is further processed internally with the reference value characteristic (**D02** to **D05**) and the ramp generator (**D00**/**D01**). ***15: encoderSignal B;*** Only if **B20**=2 (vector control with feedback). This is the "B signal" of the incremental encoder. This signal is a mandatory requirement for the function "vector control with feedback." *Value range:* 0 to 32	√
F36•	**BE-increments:** When an incremental encoder is used on BE4 and BE5, the number of increments per revolution must be entered here. If the incremental encoder is not mounted on the motor shaft, the step-down ratios may have to be considered. *Value range in I/R:* 30 to 1024 to 4096	√
F37•	**Fmax frequency-ref. value:** Only if binary input 5 is parameterized to frequency reference value (**F35=**14). Maximum permissible frequency. Frequency **F37** corresponds to a reference value output of 100%. The fixed minimum frequency of 100 Hz corresponds to a reference value output of 0%. *Value range in kHz:* 3 to 51.2	√

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• The power pack must be turned off before these parameters can be changed.

Italics These parameters are sometimes not shown depending on which parameters are set.

1) See result table in chap. 9. 2) Only available when **D90**≠1

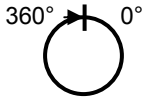
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*

Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

F.. Control Interface

Para. No.	Description	
F38	**Quick stop: F38** controls the automatic triggering of quick stop under certain operating conditions (brake on quick stop ramp **D81**). *0: inactive;* Quick stop can only be triggered by the BE function *"9:Quick stop."* ***1: enable and clockwise/counter-clockwise**;* Important for use of two direction-of-rotation inputs (i.e., clockwise and counterclockwise) on BE1 and BE2. Quick stop is triggered when BE1 is low and BE2 is low or when the enable is removed (also reference value enable **D07** or additional enable via BE). ***2: fault and enable**;* In addition to the BE function *"9:Quick stop,"* removal of the enable and "non-dangerous" faults (e.g., *"46:Low voltage"*) causes the quick stop.	√
F51 ... F55•	**BE1-invert** to **BE5-invert** *0: inactive;* No inversion. *1: active;* Input is inverted. Useful for the HALT signal or limit switch, for example.	√

I.. Posi. Machine

Para. No.	Description	
Parameter record switchover cannot be used for the parameters of groups **I**, **J** and **L**. To save memory space, they are only present once.		
I00	**Position range:** *0: limited;* The area of movement is limited by end stops or similar mechanisms. Software limit switches **I50** and **I51** are active. *1: unlimited;* Unlimited movement (e.g., roller feed, rotary attachment or belt drive). No physical end positions. The position values repeat themselves cyclically with the circular length **I01** (e.g., with a rotary attachment, you start at 0° again after reaching 360°). When absolute positioning is used, the shortest path is selected unless only one dir. of rotation is permitted. If a new destination is selected with *Posi.Start* while a movement is in progress, the old direction of rotation is retained. This function is known as the "**rotary axis function**."	
I01	**Circular length:** Only if **I00**=1 (continuous axis). Maximum value for the actual position starting at which the position is counted from zero again (e.g., 360 degrees, modulo function). *Value range in I05:* 0 to 360 to 31 bits (=2^{31} encoder increments after quadruple evaluation) 	
I03	**Direction optimization:** Only if **I00**=1. Activate/deactivate automatic direction optimization for absolute process blocks ("rotary axis" function). In contrast to the permissible direction of revolution **I04**>0, manual traversing is always permitted in both directions. Cf. chap. 4.5.2. *0: inactive;* The direction of rotation depends on the sign of the destination position (e.g., **J10**). When the circular length is **I01**=360°, the same position is approached with **J10**=90° and **J20**= -270° as with 90°. In the latter case, however, the direction of rotation is negative. *1: active;* Absolute process blocks are approached over the shortest path.	
I04	**Move direction:** Only if **I00**=1. For continuous axes with only one physically permissible direction of movement. Movements in the wrong direction are answered with the message "*51:Refused.*" Reference point traversing is performed completely with the speed **I33**. A reverse in direction does not occur. *0: positive & negative;* Both directions are permitted. *1: positive;* Only the positive direction is permitted. (Also applies to manual traversing.) *2: negative;*	
I05	**Measure unit selection:** The unit of measure does not yet mean a conversion. The numerical relationship between the physical mechanics and the indicated position is provided by **I07** and **I08**. *0: user (**I09**);* The unit (4 characters) can be programmed as desired with FDS Tool. See also **I09**. *1: increments;* Encoder increment based on quadruple evaluation (i.e., quadrature pulses). *2: °;* Degrees *3: millimetre;* *4: Inch;*	
I06	**Decimal digits:** Number of decimal positions for the display and the entry of position reference values, speeds, accelerations and **I07**. **Important:** Since a change in **I06** will cause a shift in the decimal point and thus a change in the affected values, **I06** should be programmed at the very beginning of commissioning. **Example:** If **I06** is reduced from 2 to 1, values such as *12.27 mm* are changed to *122.7 mm*. The reason for this lies in the error-free rounding used by the positioning software. *Value range:* 0 to 2 to 3	

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• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

I.. Posi. Machine

Para. No.	*Description*	
I07	**Way/revolution numerator:** For consideration of the gear ratio between machine and encoder. The number of decimal positions corresponds to **I06**. The posi. direction of rotation can be changed with negative values in **I07**. **Example:** With a gear ratio of i=12.43 and an angle specification on the drive shaft, then **I07**=360°/12.43 R=28.96°/R. For higher requirements, precision can be increased to almost any amount with **I08**. **Example:** 12.34567 mm/R corresponds to **I07**=12345.67 and **I08**=1000. Cf. also chap. 4.9. *Value range in I05:* -31 bits to 360 to 31 bits	
I08	**Way/revolution denomin.:** Counter **I07** is divided by denominator **I08**. A mathematically precise gear ratio can thus also be calculated as a fraction (e.g., toothed gearing and toothed belt transmission). Important for external encoders that are not mounted on the motor shaft: One "encoder revolution" must be related to one motor revolution. *Value range in R:* 1 to 31 bits	
I09	**Measurement unit:** Only if **I05**=0 (user unit). Indication of the unit of measure defined as desired by the user with FDS Tool. Up to 4 characters can be used.	
I10	**Max. speed:** Unit/sec. Works simultaneously with the maximum motor speed in **C01**. The actual speed limit corresponds to the lower of the two parameters. When a higher feed speed is specified, the value is limited to **I10** or **C01** without causing the following error. *Value range in I05/sec:* 0 to 10 to 31 bits	
I11	**Max. acceleration:** Units/sec^2. With quick stop, the drive decelerates with **I11**. The acceleration for manual (**I12**) and reference point traversing (**I33**, chap. 4.6) is also derived from **I11** (i.e., each is ½ of **I11**). *Value range in I05/sec^2:* 0 to 10 to 31 bits	
I12	**Tip speed:** Units/sec. Speed during manual operation (**J03**). As with all speeds, it can be changed via analog input (**F20**=*5:Override*). Acceleration during manual operation is ½ of **I11**. *Value range in I05/sec:* 0 to 180 to 31 bits	
I15	**Accel-override:** Permits modification of the set ramps via AE1 (**F20**=*5:Override*). *0: inactive;* Ramps are not changed by override. Standard setting. *1: active;* Ramps are changed by override. Only recommended in exceptional cases (e.g., process block chaining without stop to generate simple n(x) speed profiles. **Caution:** The override value affects acceleration to the power of two. Danger of overload when override > 100%. During ramps, changes in accel-override are only adjusted slowly in a background task. When Accel-Override (**I15**=1) is activated, the override value should not be decreased to 0%. This would make the ramp infinitely long and the drive would never stop!	
I16	**S-ramp:** Reverse limitation through square sinus ramp. The generated acceleration profile is smoothed with the specified time constant. Positioning takes a little longer. *Value range in msec:* 0 to 32767	
I19	**ENA-interrupting:** In the default setting, removal of the enable causes the position controller to be reset (status "*17:posi.active*"). Particularly during continuous positioning, it is important that interrupted process blocks can be concluded after emergency off or similar. **I19** offers particularly simple process block interruption. See also chap. 4.10. *0: inactive;* Enable-off resets the positioning controller. *1: active;* Enable-off while process block is running causes status "*23:interrupted*." The interrupted process block is completed with *Posi.step*. Not possible for process blocks which are chained *without* Stop (**J17**=2).	
I20	**Kv-factor:** Gain of position controller (only P characteristic) with unit of 1/sec. The Kv factor is also known as the speed gain. In actual practice, the Kv factor is sometimes specified with the unit m/min/mm which is exactly 0.06 x **120**. See also block circuit diagram in chap. 4.7. *Value range in 1/sec:* 0 to 30 to 100	
I21	**Max. following error:** The output function (**F00**=*9:follow.error*) is activated when the following error defined in **I21** is exceeded. The Windows program FDS Tool can then be used to specify as desired the reaction to the exceeded following error as a fault (default setting), warning or message. *Value range in I05:* 0 to 90 to 31 bits	
I22	**Target window:** Window for the output signal "reference value reached" (**F00**=*3:RefVal-reached*). **I22** must be greater than **I23**!. *Value range in I05:* 0 to 5 to 31 bits	
I23	**Dead band pos. control.** "Dead zone" of the position controller. Useful to prevent idle-state oscillation particularly when an external position encoder is used and there is reversal play in the mechanics. Cf. chap. 4.7. **Caution: I23** Dead band must be smaller than target window **I22**! *Value range in I05:* 0 to 31 bits	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

I.. Posi. Machine		
Para. No.	*Description*	
I25	**Speed feed forward:** Switches the calculated speed profile to the output of the position controller (chap. 4.7). If there is overswinging in the destination position, **I25** and **C32** must be reduced. *Value range in %:* 0 to 80 to 100	
I30	**Reference mode:** For details on reference point traversing, see chapter 4.6. ***0: reference input;*** When searching for the reference point, the reference input is the determining factor (i.e., the BE function *"23:Reference input"* must be parameterized). ***1: stop input;*** The function of the reference input is fully covered by the stop switch (i.e., BE function *"21:Stop +"* or *"22:Stop -"* must be parameterized). When the starting direction is positive (**I31**=0), positive *"Stop +"* is required. Triggering the wrong stop switch causes a fault. ***2: encoder signal 0;*** Only of interest for drives without a gearbox. Used to align the motor shaft to a defined position. ***3: define home;*** BE function *"24:Start ref."* or "**J05** → 1" immediately sets the actual position to **I34** without performing an additional movement. For example, this can be used to set the actual position to zero at all times (enable must be active). ***4: posi.start;*** Each *posi.start* signal causes reference position **I34** to be set. This can be used, for example, to indicate the actual distance as the current position with relative positioning and offset of the traversing path via analog signal (*"1:additional reference value"* and *"4:reference value-faktor"*).	
I31	**Reference direction:** Initial direction to take when searching for the reference point. Cf. chapter 4.6. If only one direction is permitted (**I04**>0), the reference traversing direction depends on **I04** and not **I31**. *0: positive;* *1: negative;*	
I32	**Reference speed fast:** Speed for the first phase of reference point traversing (i.e., determining the rough area). Omitted when only one direction of rotation (**I04**) is permitted. Only the slow speed (**I33**) is then used for this type of reference point traversing. *Value range in I05/sec:* 0 to 90 to 31 bits	
I33	**Reference speed slow:** Speed for the final phase of reference point traversing. Switching between **I32** and **I33** is automatic. Cf. figures in chapter 4.6 The acceleration during reference point traversing is **I11**/2. *Value range in I05/sec:* 0 to 4.5 to 31 bits	
I34	**Reference position:** Value which is loaded to the reference point (e.g., provided by the reference switch or the stop switch) as the actual position. The drive stops after reference point traversing. The position is determined by brake ramp **I11**/2. Cf. chapter 4.6. *Value range in I05:* -31 bits to 0 to 31 bits	
I35	**Ref.encoder signal 0:** Only if **I36**=0 and **I30**≠2. Referencing to zero pulse of an incremental encoder. *0: inactive;* Zero pulse is not evaluated. Referencing to the edge of the stop or reference switch. Important for continuous axes with transmissions, for example. Also useful when there are not enough binary inputs and demands on accuracy are not high. *1: Motor-Encoder;*	
I36	**Continuous reference:** Only for continuous axes (**I31**=1). Used for fully automatic compensation of slip or inexact gear ratio. After the reference points are traversed for the first time, actual position **I80** is always overwritten with reference position **I34** each time the reference switch is passed over in direction **I31** (but only in this direction!). Since the path which is still to be traversed is corrected, the axis is able to perform any number of relative movements in one direction without drifting, even when drives have slip. If the reference switch is connected to BE3, the signal is processed immediately. **Remember:** When **I36**=1, the other edge of the reference switch is evaluated than for **I36**=0 during reference point traversing. Circular length **I01** must be as close as possible to the path between two reference signals (e.g., after one belt rotation, the same position must be indicated). Check actual position **I80** during a rotation with **I36**=0, and adjust **I07** if necessary. The distance per rotation **I07** must always be rounded to the next higher number to prevent undesired counterclockwise offsets. The reference switch should not be triggered during a deceleration ramp since a negative offset would cause a counterclockwise movement. **Important**: Target window **I22** must be greater than the maximum physical inaccuracy! *0: inactive;* *1: active;*	
I37	**Power-on reference:** Automatic reference point traversing after power-on. *0: inactive;* *1: posi.start;* After power-on, the inverter assumes operating mode *"24:ref.wait."* The first *posi.start* or *posi.stop* signal starts the reference point traversing procedure. *2: automatic;* Reference point traversing is started automatically as soon as the enable appears.	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

I.. Posi. Machine		
Para. No.	*Description*	
I38	**Reference block:** Number of the process block (i.e., 1 to 8) which is to be automatically started at the end of reference point traversing. This can be used to put the drive into a defined position after the reference points have been traversed. Speed and acceleration are taken by process block **I38**. 0: standstill. No automatic start. *1 to 8:* Number of the process block to be executed.	
I40	**Posi.-step memory:** Helpful during relative positioning of continuous axes. *0: inactive; Posi.step* signals during a movement are ignored. *1: no stop; Posi.step* signals which arrive during a movement cause the current destination position to be changed immediately. The process block specified by the reference block or, if no reference block is defined, the currently selected process block takes over. Example: Two additional *posi.step* signals arrive during a relative movement of 100 mm. The drive then moves precisely 300 mm without stopping.	
I50	**Software-stop -:** Only if **I00**=0 (limited position range). Effective only when axis is referenced. Positioning control rejects traversing jobs outside the software limit switches (message *"51:Refused"*). Manual-traversing and continuous process blocks are stopped at the software stops. Caution: Software stops do nothing to compensate when the permissible position range is exceeded due to a change on the fly to a process block with slower ramps! *Value range in I05:* -31 bits to 10000000 to 31 bits	
I51	**Software-stop +:** Only if **I00**=0 (limited position range). Effective only when axis is referenced. *Value range in I05:* -31 bits to 10000000 to 31 bits	
I60	**Electronic cam 1 begin:** In the positioning area between **I60** and **I61**, the *el.cam* signal (relay 2, **F00**=8) becomes high. "Electronic cam" only functions in the referenced state. *Value range in I05:* -31 bits to 0 to 31 bits	
I61	**Electronic cam 1 end:** See **I60**. *Value range in I05:* -31 bits to 100 to 31 bits	
I70	**Position-offset:** A correction path corresponding to the voltage on AE2 can be added to the current reference value position (**F20**=6). 10 V corresponds to the path specified in **I70**. Useful, for example, for creating complicated x(t) profiles which are generated by a PC as voltage. After activation of the inverter (i.e., enable), the current offset value is approached at the manual speed **I12**. The reference value from AE2 is then supplied without restrictions, and the AE2 low pass can be used for smoothing. *Value range in I05:* 0 to 31 bits	
I80	**Actual position:** Read only. Indication of the actual position. *Value range in I05:* ±31 bits	
I81	**Target position:** Read only. Indication of the current reference value position. *Value range in I05:* ±31 bits	
I82	**Active process block:** Read only. Indication of the currently active block during block processing (traverse, wait) and during standstill at a process block position. The approached process block is indicated in **I82** as long as the "RV reached" signal (i.e., in position) is present. When the drive in not in a process block position (e.g., after power on, manual traversing or termination of a movement), **I82**=0 applies. When **I82**>0, the signals "*23: reference value-ackn.0"* to *"25: reference value-ackn.2"* can indicate the active process block in binary coded format ("000" for process block 1 - i.e., **I82**=1). Cf. chap. 4.3.	
I83	**Selected process block:** Read only. Indication of the block selected via binary inputs or **J02**. This process block would be executed with the *posi.start* signal. Cf. also chap. 4.3 and **F00**=23.	
I84	**Following error:** Read only. Indication of the current position deviation. Cf. **I21** and **F00**=9. *Value range in I05:* ±31 bits	
I85	**In position:** Read only. Indication of output signal **F00**=*3:refVal-reached*. *0: inactive;* Drive moving or destination position not reached. *1: active;* See output signal **F00**=*3:refVal-reached* and **I22** target window.	
I86	**Referenced:** Read only. Indication of output signal "*13:referenced."* For reference point traversing, see chap. 4.6. *0: inactive;* Drive not referenced. No absolute positioning possible. *1: active;* Drive referenced	
I87	**Electronic cam 1:** Read only. Indication of output signal *"8:electronic cam 1."* *0: inactive;* Current position is outside **I60** and **I61**. *1: active;* Current position is within **I60** and **I61**.	
I88	**Speed:** Read only. Indication of the current actual value of the positioning speed with unit. Cf. chap. 4.7. *Value range in I05/sec:* ±31 bits	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

J.. Posi. Command (Process Blocks)		
Para. No.	*Description*	
J00	**Posi.start:** 0→1. Starts the currently selected process block. The block is selected via binary inputs (*RV-select 0* to *2*) or **J02**. Since posi.start interrupts positioning procedures in progress, it has the highest priority. The **J00** parameter corresponds to the BE function *posi.start*.	
J01	**Posi.step:** 0→1. With process block chaining, *posi.step* is used to start the next programmed block when this is not started automatically (e.g., via **J17**=*1:with delay*). This is done without regard to the RV-select inputs, for example. In operating state *"17:posi.active,"* (standstill, no process block being processed -> **I82**=0), *posi.step* starts the currently selected process block the same as *posi.start* (see above). *Posi.step* never interrupts a running movement (exception: **I40**=1). Delays between process blocks (**J18**) are prematurely concluded by *posi.step*. If a movement is interrupted with halt or quick stop (operating state *"23:interrupt."*), *posi.step* completes the interrupted process block.	
J02	**Process block number:** Selection of the process block which can be started at all times with *posi.start*. *0:* external selection via binary inputs and the BE functions **F31**=*RV-select 0* to *2*. See also **I83**. *1* to *8:* fixed selection of the process block. RV-select signals are ignored.	
J03	**Tip-mode:** Manual operation via the device keyboard. See also **F31**=17 and **F31**=18. *0: inactive;* *1: active;* The drive can be positioned with the ◄ and ► keys.	
J04	**Teach-in:** 0→1 starts the action (i.e., triggered manually). The current actual position is used as the destination of the currently selected process block and stored non-volatilely. **Example:** Normally, the desired position is approached manually and then accepted with teach-in. See also **F31**=25.	
J05	**Start reference:** 0→1 starts the action (i.e., triggered manually). Reference point traversing can also be started via a binary input or automatically after power-on. See **I37** and chapter 4.6 and **F31**=24.	
J10	**Position:** Position specification. The value can also be changed during traversing, but the change does not take effect until the next *posi.start* command (if internal conversion has been concluded). Cf. **F00**=32. *Value range in I05:* -31 bits to 0 to 31 bits	
J11	**Position mode:** There are 4 modes. Cf. chapter 4.4. *0: relative;* *1: absolute;* *2: endless positive;* With "continuous" position modes, destination position **J10** can be disregarded. *3: endless negative;*	
J12	**Speed:** Unit/sec. Caution: If you enter a value greater than the maximum speed **I10** in **J12**, the actual traveling speed is limited to **I10**. *Value range in I05/sec:* 0 to 1000 to 31 bits	
J13	**Accel:** Acceleration unit/sec^2. **Caution**: If the values **J13** and **J14** exceed the maximum acceleration **I11**, acceleration during movement is limited to **I11**. Software version 4.5: If the direction of rotation must be changed during a change in process blocks on the fly, the entire reversal procedure is performed with the Accel ramp (**J13**). *Value range in I05/sec^2:* 0 to 1000 to 31 bits	
J14	**Decel:** Deceleration, unit/sec^2. *Value range in I05/sec^2:* 0 to 1000 to 31 bits	
J15	**Repeat number:** Only available if **J11**=*0:relative*. If necessary, a relative movement can be repeated several times based on the value **J15**. With **J17**=0, *posi.step* is waited for after each partial movement. With **J17**=1, the partial movements are run through automatically. Delay **J18** is inserted between the movements. **J15**=0 means no repetition (i.e., one single movement). *Value range:* 0 to 254	
J16	**Next block:** Chaining of process blocks. Specification of a process block to which a jump is to be made at the end of the movement or after a *posi.next* signal. *0:* stop; No process block chaining. *1 to 8:* Number of the next process block. Cf. chapter 4.8.	
J17	**Next start:** Only if **J15**≠0 or **J16**≠0. **J17** defines when and how the branch is made to next block **J16**. ***0: posi.step;*** Continued movement via posi.step function (rising edge). Cf. **J01**. ***1: with delay;*** Automatic continued movement after delay **J18** expires. In contrast to **J17**=2, an intermediate stop is also always performed with **J18**=0. Delays between process blocks (**J18**) are prematurely concluded by *posi.step*.	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

J.. Posi. Command (Process Blocks)

Para. No.	Description	
J17 Continuation	***2: no stop;*** When the reference position reaches the target position **J10**, the speed is adjusted without halting (on-the-fly process block change without intermediate stop!). Drive travels to **J10** without braking and then changes to process block **J16**. Also useful for generating n(x) speed profiles with support points in up to 8 positions. Cf. **I15** (no *"refVal-reached"* signal (**F00**=3) is output here. Cf. chapter 4.8, example 4. When process blocks are terminated with HALT of enable off, resumption of the terminated movement is not possible with *Posi.Step*. ***3: Posi.next;*** The block change is performed on the fly with the *posi.next* function. If **J17**≠3, *posi.next* has no effect. See also example 3 in chap. 4.8. If the next block is relative, it refers to the actual position at the time the process block changed. ***4: Operation range;*** The block change is performed on the fly when the operating range (**C41** to **C46**) is exited. Compare example 7 (press/screw) in chapter 4.9. If the next block is relative, it refers to the actual position at the time the process block changed. When a block change is performed on the fly without intermediate stop (**J17**=2, 3, 4), no refVal-reached signal (in position) is generated.	
J18	**Delay:** Parameter only available if **J15**≠0 or **J16**≠0 and **J17**=1. Otherwise not shown. Delay before the repetition of relative movements (**J15**≠0) or before automatic change to the next record (**J17**=*1:with delay*). After expiration of the delay time, movement is automatically resumed. A delay can be terminated (i.e., shortened) with the *posi.step* signal (rising edge). *Value range in sec:* 0 to 65.535	

⇨ The process block no. 2 - no. 8 are identical. Process block no. 2 is at **J20** - **J28**, process block no. 3 at **J30** - **J38** etc.

L.. Posi. Command 2 (Expanded Process Block Parameters)

Para. No.	Description	
L10	**Brake:** Definition for process block no. 1. Only if **F00**=1. Process block-related brake control (e.g., for lifting systems). After reaching destination position **J10**, you can apply the brake controlled via relay 2. *0: inactive;* Destination position is held by the motor (i.e., position control). Brake is only applied when enable, halt, quick stop or fault is missing. *1: active;* After the destination position is reached, the brake is automatically applied. The next start command is delayed by the time **F06** (brake release). With **B25**=0 and applied brake, power can be disconnected from the motor so that it can cool off while waiting, for example.	
L11	**Switch A:** Selection of the first switching point for process block no. 1. Up to two switching points ("switch A" and "switch B") can be used in each process block. Each of the four switching points defined in group **N**.. can be used in various process blocks. Cf. chap. 4.12. *0: inactive;* *1: switch S1;* *2: switch S2;* *3: switch S3;* *4: switch S4;*	
L12	**Switch B:** Selection of the second switching point for process block no. 1. Cf. **L11**. *Value range:* 0 to 4	

⇨ Extended process block parameter are identical for all process blocks. Process block no. 1 is located at **L10** ... **L12**, process block no. 2 at **L20** ... **L22**, and so on.

M.. Menu Skip (Menu jump destinations)

Para. No.	Description	
M50	**F1-jump to:** Parameter provided by the F1 function key for editing. Depending on the device function, some parameters may not be shown and cannot be selected. *Value range:* **A00** to **E50** to **N44**	
M51	**F1-lower limit:** *Value range:* Depends on the parameter selected in **M50**	
M52	**F1-upper limit:** *Value range:* Depends on the parameter selected in **M50**	

⇨ The jump destinations F2 to F4 are designed identically. Jump destination F2 is in **M60** to **M62**, and so on.

If several jump destinations (**M50**; **M60**; **M70** or **M80**) are parameterized to the same coordinates (e.g., **J10**), the lower, upper limit of the lowest jump destination takes effect.

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.

• The power pack must be turned off before these parameters can be changed.

Italics These parameters are sometimes not shown depending on which parameters are set.

1) See result table in chap. 9. 2) Only available when **D90**≠1

Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*

Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

N.. Posi. Switches	**For description, see chap.**	2
Para. No.	*Description*	
N10	**S1-position:** Position of switching point S1. With relative specifications (**N11**>0), the absolute value is generated internally. *Value range in I05:* -31 bits to 0 to 31 bits	
N11	**S1-method:** Reference of position **N10** *0: absolute*; Switching point is triggered when position **N10** is traveled over. *1: rel.to start;* Switching point is triggered after a distance of (**N10**) (absolute value) after the starting point. *2: rel.to endpos;* Switching point is triggered at a distance of (**N10**) before the destination position.	
N12	**S1-memory1:** When switch S1 is approached, switch memory 1 can be affected. *0: inactive;* *1: set;* Switch memory 1 is set to high. *2: clear;* Switch memory 1 is set to low. *3: toggle;* Switch memory 1 is inverted (Low → High → Low → ...).	
N13	**S1-memory2:** Behavior of switch memory 2. Cf. **N12**. *Value range:* 0 ... 3	
N14	**S1-memory3:** Behavior of switch memory 3. Cf. **N12**. *Value range:* 0 ... 3	

⇨ Posi switching points S2 to S4 are set up identically. Switching point S2 is located at **N20** to **N24**, and so on.

U.. Protective Functions		2
Para. No.	*Description*	
U00	**Level low voltage:** Is activated when the value **U00** set in **A35** is passed below. *2: warning;* After expiration of the tolerance time in **U01**, the device assumes fault mode (for E46, see chap. 17). *3: fault;* The device assumes malfunction mode (for E46, see chap. 17) immediately after the value in **A35** is passed below.	
U01	**Time low voltage:** Can only be set with **U00**=2:*warning*. Defines the time during which triggering of undervoltage monitoring is tolerated. After expiration of this time, the device assumes fault mode. *Value range in s:* 1 to 2 to 10	
U10	**Level temp. limit mot. i2t:** Parallel to the monitoring of the positor line in the motor, the FAS simulates the motor temperature via an i²t model. The percentage of load of the motor is indicated in parameter **E23**. If the value in **E23** is greater than 100%, **U10** is triggered. *0: off;* Device does not react when **U10** is triggered. *1: message;* Triggering of **U10** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time in **U11**, the device assumes fault mode (for E45, see chap. 17).	
U11	**Time temp. limit mot. i2t:** Can only be set with **U10**=2:*warning*. Defines the time during which the triggering of i²t monitoring is tolerated. After expiration of the set time, the device assumes fault mode. *Value range in s:* 1 to 30 to 120	
U20	**Level drive overload:** If the calculated torque in static operation exceeds the current M-Max in **E62**, **U20** is triggered. *0: off;* Device does not react when **U10** is triggered. *1: message;* Triggering of **U20** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time in **U21**, the device assumes fault mode (for E47, see chap. 17). *3: fault;* The device immediately assumes fault mode (for E47, see chap. 17) after **U20** is triggered.	
U21	**Time drive overload:** Can only be set with **U20**=2:*warning*. Defines the time during which triggering of undervoltage monitoring is tolerated. After expiration of this time, the device assumes fault mode. *Value range in s:* 1 to 10 to 120	
U22	**Text drive overload:** The entry "drive overload" can be varied to suit user-specific requirements. *Value range:* 0 to “drive overload” to 11	
U30	**Level acceleration overload:** If the calculated torque exceeds the current M-Max in **E62** during the acceleration ramp, **U30** is triggered. *0:off;* Device does not react when **U30** is triggered. *1: message;* Triggering of **U30** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time in **U31**, the device assumes fault mode (for E48, see chap. 17). *3: fault;* The device immediately assumes fault mode (for E48, see chap. 17) after **U30** is triggered.	
U31	**Time acceleration overload:** Can only be set with **U30**=2:*warning*. Defines the time during which drive overload during acceleration is tolerated. After expiration of the set time, the device assumes fault mode. *Value range in s:* 1 to 5 to 10	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
2 Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

U.. Protective Functions		2
Para. No.	*Description*	
U32	**Text acceleration overload:** The entry "acceleration overload" can be varied to suit user-specific requirements. *Value range:* 0 to ”acceleration overload” to 11	
U40	**Level break overload:** If the calculated torque exceeds the current M-Max in **E62** during the deceleration ramp, **U40** is triggered. *0: off;* Device does not react when **U40** is triggered. *1: message;* Triggering of **U40** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time in **U41**, the device assumes fault mode (for E49, see chap. 17). *3: fault;* The device immediately assumes fault mode (for E49, see chap. 17) after **U40** is triggered.	
U41	**Time break overload:** Can only be set with **U40**=2:*warning*. Defines the time during which an overload of the drive during deceleration is tolerated. After expiration of the set time, the device assumes fault mode. *Value range in s:* 1 to 5 to 10	
U42	**Text break overload:** The entry "break overload" can be varied to suit user-specific requirements. *Value range:* 0 to ”break overload ” to 11	
U50	**Level operating range:** If one or more of the parameters **C41** to **C46** are violated, **U50** is triggered. *0: off;* Device does not react when **U50** is triggered. *1: message;* Triggering of **U50** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time in **U51**, the device assumes fault mode (for E50, see chap. 17). *3: fault;* The device immediately assumes fault mode (for E50, see chap. 17) after **U50** is triggered.	
U51	**Time operating range:** Can only be set with **U50**=2:*warning*. Defines the time tolerated outside the work area. After expiration of the set time, the device assumes fault mode. *Value range in s:* 1 to 10 to 120	
U52	**Text operating range:** The entry ”operating range” can be varied to suit user-specific requirements. *Value range:* 0 to ”operating range” to 11	
U60	**Level following error:** If the value in **I84** exceeds the value of **I21**, **U60** is triggered. *0: off;* Device does not react when **U60** is triggered. *1: message;* Triggering of **U6** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time in **U61**, the device assumes fault mode (for E54, see chap. 17). *3: fault;* The device immediately assumes fault mode (for E54, see chap. 17) after **U60** is triggered.	
U61	**Time following error:** Can only be set with **U60**=2:*warning*. Defines the time during which the value in **I21** is exceeded. After expiration of the set time, the devices assumes fault mode. *Value range in ms:* 0 to 500 to 32767	
U70	**Level posi. Refused:** If the target position is located outside software stops **I50** and **51** or an absolute process block is started in an unreferenced state (**I86**=0), **U70** is triggered. *0: off;* Device does not react when **U70** is triggered. *1: message;* Triggering of **U7** is only indicated. The device continues to be ready for operation. *2: warning;* After expiration of the tolerance time of 1 sec, the device assumes fault mode (for E51, see chap. 17). *3: fault;* The device immediately assumes fault mode (for E51, see chap. 17) after **U70** is triggered.	

P Speed depends on pole number **B10**; f_{max} = 400 Hz. With a 4-pole motor, this is 12000 rpm at 400 Hz.
• The power pack must be turned off before these parameters can be changed.
Italics These parameters are sometimes not shown depending on which parameters are set.
1) See result table in chap. 9. 2) Only available when **D90**≠1
Parameters which are included in the *normal* menu scope (**A10**=0). For other parameters, select **A10**=*1:extended* or **A10**=*2:service*
2 Parameters marked with a "√" can be parameterized separately from each other in parameter record 1 and 2.

6. Parameter Table

Parameter		DS	Entry
A.. Inverter			
A00	Save parameter [%]		
A01	Read parabox & save [%]		
A02	Check parameter [%]		
A03	Write to parabox [%]		
A04	Default settings [%]		
A10	Menu level	0	
A11	Parameter set edit		
A12	Language	0	
A13	Set password		
A14	Edit password		
A15	Auto-return	1	
A20	Braking resistor type	0	
A21	Brak. resistor resist. [Ω]	600	
A22	Brak. resistor rating [kW]	*	
A23	Brak. resistor therm [sec]	40	
A30	Operation input	0	
A31	Esc-reset	1	
A32	Auto-reset	0	
A33	Time auto-reset [min]	15	
A34	Auto-start	0	
A35	Low voltage limit [V]	1~120 3~350	
A36	Mains voltage [V]	1~230 3~400	
A37	Reset memorized values		
A40	Read parabox [%]		
A41	Select parameter set		
A42	Copy para set 1>2 [%]		
A43	Copy para set 2>1 [%]		
A50	Installation		
A51	Install. ref. value [rpm]	300	
A55	Tip function key	1	
A80	Serial Address	0	
A82	CAN-baudrate	1	
A83	Busaddress	0	
A84	Profibus baudrate		
B.. Motor			
B00	Motor-type		
B10	Poles	4	
B11	P-nominal [kW]	*	
B12	I-nominal [A]	*	
B13	n-nominal [rpm]	*	
B14	V-nominal [V]	*	
B15	f-nomial [Hz]	50	
B16	cos PHI	*	
B20	Control mode	1	
B21	V/f-characteristic	0	
B22	V/f-gain [%]	100	
B23	Boost [%]	10	
B24	Switching freq. [kHz]	4	
B25	Halt flux	1	
B27	Time halt flux [sec]	0	
B30	Add. motor-operation	0	
B31	Oscillation damping [%]	30	
B32	SLVC-dynamics [%]	70	
B40	Phase test [%]		
B41	Autotuning [%]		
B53	R1-motor [Ω]	*	
B64	Ki-IQ (moment) [%]	*	

Parameter		DS	Entry
B65	Kp-IQ (moment) [%]	*	
C.. Machine			
C00	n-Min [rpm]	0	
C01	n-Max [rpm]	3000	
C02	Perm. dir. of rotation	0	
C03	M-Max 1 [%]	150	
C04	M-Max 2 [%]	150	
C10	Skip speed 1 [rpm]	0	
C11	Skip speed 2 [rpm]	0	
C12	Skip speed 3 [rpm]	0	
C13	Skip speed 4 [rpm]	0	
C20	Startup mode	0	
C21	M-load start [%]	100	
C22	t-load start [s]	5	
C30	J-mach/J-motor	0	
C31	n-controller Kp [%]	60	
C32	n-controller Ki [%]	30	
C35	n-control. Kp standstill [%]	100	
C40	n-window [rpm]	30	
C41	Oper. range n-Min [rpm]	0	
C42	Oper. range n-Max [rpm]	6000	
C43	Operat. range M-Min [%]	0	
C44	Operat. range M-Max [%]	400	
C45	Operat. range P-Min [%]	0	
C46	Operat. range P-Max [%]	400	
C47	Operat. range C45/C46	0	
C48	Operat. range C47 abs	0	
C49	Operat. range accel&ena	0	
C50	Display function	0	
C51	Display factor	1	
C52	Display decimals	0	
C53	Display text		
C60	Run mode	1	
D.. Reference Value			
D00	RV accel [sec/150Hz*D98]	3	
D01	RV decel [sec/150Hz*D98]	3	
D02	Speed (max. RV) [rpm]	3000	
D03	Ref. value-Max. [%]	100	
D04	Speed (min. RV) [rpm]	0	
D05	Ref. value-Min [%]	1	
D06	Ref. value offset [%]	0	
D07	Ref. value enable	0	
D08	Monitor ref. value	0	
D09	Fix reference value no.	0	
D10	Accel 1 [sec/150Hz * D98]	6	
D11	Decel 1 [sec/150Hz * D98]	6	
D12	Fix ref. value 1 [rpm]	750	
D20	Accel 2 [sec/150Hz * D98]	9	
D21	Decel 2 [sec/150Hz * D98]	9	
D22	Fix ref. value 2 [rpm]	1500	
D30	Accel 3 [sec/150Hz * D98]	12	
D31	Decel 3 [sec/150Hz * D98]	12	
D32	Fix ref. value 3 [rpm]	3000	
D40	Accel 4 [sec/150Hz * D98]	0,5	
D41	Decel 4 [sec/150Hz * D98]	0,5	
D42	Fix ref. value 4 [rpm]	500	
D50	Accel 5 [sec/150Hz * D98]	1	
D51	Decel 5 [sec/150Hz * D98]	1	
D52	Fix ref. value 5 [rpm]	1000	

Parameter		DS	Entry
D60	Accel 6 [sec/150Hz * D98]	2	
D61	Decel 6 [sec/150Hz * D98]	2	
D62	Fix ref. value 6 [rpm]	2000	
D70	Accel 7 [sec/150Hz * D98]	2,5	
D71	Decel 7 [sec/150Hz * D98]	2,5	
D72	Fix ref. value 7 [rpm]	2500	
D80	Ramp shape	0	
D81	Decel-quick[sec/150Hz*D98]	0,2	
D90	Reference value source	0	
D91	Motorpoti function	0	
D92	Negate reference value	0	
D93	RV-generator	0	
D94	Ref. val. generator time [msec]	500	
D98	Ramp factor	0	
E.. Display Values			
E00	I-motor [A]		
E01	P-motor [kW]		
E02	M-motor [Nm]		
E03	DC-link-voltage [V]		
E04	V-motor [V]		
E05	f1-motor [Hz]		
E06	n-reference value [rpm]		
E07	n-post-ramp [rpm]		
E08	n-motor [rpm]		
E09	Rotor position [U]		
E10	AE1-level [%]		
E12	ENA-BE1-BE2-level		
E13	BE3-BE4-BE5-level		
E14	BE5-freq. ref. value [%]		
E15	n-encoder [rpm]		
E17	Relay 1		
E18	Relay 2		
E19	BE15...BE1 & enable		
E20	Device utilization [%]		
E21	Motor utilization [%]		
E22	i2t-device [%]		
E23	i2t-motor [%]		
E24	i2t-braking resistor [%]		
E25	Device temperature [°C]		
E27	BA15...BA1 & Relais 1		
E29	n-ref. value raw [rpm]		
E30	Run time [h,m,sec]		
E31	Enable time [h,m,sec]		
E32	Energy counter [kW]		
E33	Vi-max-memo value [V]		
E34	I-max-memo value [A]		
E35	Tmin-memo value [°C]		
E36	Tmax-memo value [°C]		
E37	Pmin-memo value [kW]		
E38	Pmax-memo value [kW]		
E40	Fault type		
E41	Fault time		
E42	Fault count		
E45	Control word		
E46	Status word		
E47	n-field-bus [rpm]		
E50	Device		
E51	Software-version		
E52	Device-number		

Parameter		*DS*	*Entry*
E53	Variant-number		
E54	Option-board		
E55	Identity-number		
E56	Parameter set ident. 1		
E57	Parameter set ident. 2		
E58	Kommubox		
E59	FAS with Posi-Upgrade	0	
E60	Reference value selector		
E61	Additional ref. value [rpm]		
E62	Actual M-max [%]		
E71	AE1 scaled [%]		
E80	Operating condition		
E81	Event level		
E82	Event name		
E83	Warning time		
E84	Active parameter set		
E130	Posi-Upgrade orderconf		
F.. Control Interface			
F00	Relay2-function	0	
F01	Brake release [rpm]	0	
F02	Brake set [rpm]	0	
F03	Relay2 t-on [sec]	0	
F04	Relay2 t-off [sec]	0	
F05	Relay2 invert	0	
F06	t-brake release [sec]	0	
F07	t-brake set [sec]	0	
F10	Relay1-function	0	
F19	Quick stop end	0	
F25	AE1-function	10	
F26	AE1-offset [%]	0	
F27	AE1-gain [%]	100	
F30	BE-logic	0	
F31	BE1-function	8	
F32	BE2-function	6	
F33	BE3-function	1	
F34	BE4-function	2	
F35	BE5-function	0	
F36	BE4/BE5-increment [I/R]	1024	
F37	fmax freq.-ref. val. [kHz]	51,2	
F38	Quick stop	0	
F51	BE1-invert	0	
F52	BE2-invert	0	
F53	BE3-invert	0	
F54	BE4-invert	0	
F55	BE5-invert	0	
I.. Posi. Machine			
I00	Position range	1	
I01	Circular length [I05]	360	
I03	Direction optimization	1	
I04	Move direction	0	
I05	Measure unit selection	2	
I06	Decimal digits	2	
I07	Way/rev. numerator [I05]	360	
I08	Way/rev. denomin. [R]	1	
I09	Measurement unit		
I10	Max. speed [I05/sec]	10	
I11	Max. accel. [I05/sec²]	10	
I12	Tip speed [I05/sec]	180	
I15	Accel-override	0	

Parameter		*DS*	*Entry*
I16	S-ramp [msec]	0	
I19	ENA-interrupting	0	
I20	Kv-factor [1/sec]	30	
I21	Max. following error [I05]	90	
I22	Target window [I05]	5	
I23	Dead band pos. control [I05]	0	
I25	Speed feed forward [%]	80	
I30	Reference mode	0	
I31	Reference direction	0	
I32	Ref. speed fast [I05/sec]	90	
I33	Ref. speed slow [I05/sec]	4,5	
I34	Reference position [I05]	0	
I35	Ref. encoder signal 0	0	
I36	Continuous reference	0	
I37	Power-on reference	0	
I38	Reference block	0	
I40	Posi.-step memory	0	
I50	Software-stop - [I05]	-10000000	
I51	Software-stop + [I05]	10000000	
I60	Electr. cam begin [I05]	0	
I61	Electronic cam end [I05]	100	
I70	Position-offset [I05]	0	
I80	Actual position [I05]		
I81	Target position [I05]		
I82	Active process block		
I83	Selected process block		
I84	Following error [I05]		
I85	In position		
I86	Referenced		
I87	Electronic cam 1		
I88	Speed [I05/sec]		
J.. Posi. Command (Process Blocks)			
J00	Posi.start		
J01	Posi.step		
J02	Process block number	0	
J03	Tip-mode		
J04	Teach-in		
J05	Start reference		

= Standard menu level. Cf. para **A10**
Extemded menu level: **A10**=1

DS = Default setting

* = Depends on type

Parameter		*DS*	*Entry Process Block 1 - 8*							
			Block 1	**Block 2**	**Block 3**	**Block 4**	**Block 5**	**Block 6**	**Block 7**	**Block 8**
			J10 to J18	*J20 to J28*	*J30 to J38*	*J40 to J48*	*J50 to J58*	*J60 to J68*	*J70 to J78*	*J80 to J88*
J..0	Position [I05]	0								
J..1	Position mode	0								
J..2	Speed [I05/sec]	1000								
J..3	Accel [I05/sec^2]	1000								
J..4	Decel [I05/sec^2]	1000								
J..5	Repeat number	0								
J..6	Next block	0								
J..7	Next start	0								
J..8	Delay [sec]	0								

Parameter		*DS*	*Entry*							
L.. Posi. Command 2 (Expanded Process Block Parameters)										
			L10 to L12	*L20 to L22*	*L30 to L32*	*L40 to L42*	*L50 to L52*	*L60 to L62*	*L70 to L72*	*L80 to L82*
L..0	Brake	0								
L..1	Switch A	0								
L..2	Switch B	0								

Parameter		*DS*	*Entry*			
M.. Menu Skip (Menu jump destinations)						
			Jump to F1 *M50 to M52*	**Jump to F2** *M60 to M62*	**Jump to F3** *M70 to M72*	**Jump to F4** *M80 to M82*
M50	F1-jump to	E50				
M51	F1-lower limit					
M52	F1-upper limit					

Parameter		*DS*	*Entry*			
N.. Posi. Switches						
			Switch S1 *N10 to N14*	**Switch S2** *N20 to N24*	**Switch S3** *N30 to N34*	**Switch S4** *N40 to N44*
N..0	S..-position [I05]	0				
N..1	S..-method	0				
N..2	S..-memory1	0				
N..3	S..-memory 2	0				
N..4	S..-memory 3	0				

Parameter		*DS*	*Entry*
U.. Protective Functions			
U00	Level low voltage	3	
U01	Time low voltage	2	
U10	Level temp. limit mot. i2t	1	
U11	Time temp. limit mot. i2t	30	
U20	Level drive overload	1	
U21	Time drive overload	10	
U22	Text drive overload	drive overload	
U30	Level acceleration overload	1	
U31	Time acceleration overload	5	
U32	Text acceleration overload	acceleration overload	
U40	Level break overload	1	
U41	Time break overload	5	
U42	Text break overload	break overload	
U50	Level operating range	1	
U51	Time operating range	10	
U52	Text operating range	operating	
U60	Level following error	3	
U61	Time following error	500	
U70	Level Posi.refused	1	

= Standard menu level. Cf. para **A10**
Extemded menu level: **A10**=1

DS = Default setting

* = Depends on type

Result Table The result of actions (e.g., save parameter (**A00**=1)) is indicated on the display. Possible results are listed below.	
0: Error free	The data were transferred correctly.
1: Error!	General error (e.g., while saving to the device without Paramodule)
3: Invalid data	"Controlbox data record" contains invalid data. Write Controlbox again, and repeat the procedure.
5: OK (adjusted)	Software version of "Controlbox data record" and inverter differ in several parameters. Confirm with the [#] key. Message does not affect functionality of the inverter.
6: OK (adjusted)	Software version of "Controlbox data record" and inverter differ in several parameters. Confirm with the [#] key. Message does not affect functionality of the inverter.
9: BE encoder signal	**F34**=14 and **F35**=15 must be set when control mode „vector control with 2-channel feedback“ has been selected with **B20**=2.
10: Limit	Value outside the value range
11: f(BE) > 80 kHz	Only if **B20**=2 and **B26**=0. Maximum frequency on BE exceeds permissible limit value of 80 kHz. (n-Max/60) x incremental encoder > 80 kHz, or (**C01**/60) x **F36** > 80 kHz.
13: BE cw/ccw	Programming **F31**=14 and **F32**=14 can be used to simulate the specification of the direction of rotation of inverters with software 3.2. The functions "direction of rotation," "halt," and "quick stop" may not be assigned to other BEs.
14: Canceled	• Action canceled (e.g., due to removal of enable). • The current exceeded the permissible maximum value (e.g., short circuit or ground fault) during "autotuning" or "phase test" (**B40**, **B41**).
15: R1 too high	A stator resistance measured during "autotuning" (**B41**) was too high. Motor is circuited incorrectly. Motor cable is defective.
16: Phase fault U	Error in phase U
17: Phase fault V	Error in phase V
18: Phase fault W	Error in phase W
19: Symmetry	Error in symmetry of phases U, V and W. Deviation of a winding resistor by ±10%.

Operating States The operating state is indicated in the display and can be queried under **E80** during fieldbus access.	
0: Ready	Inverter is ready.
1: Clockwise	Fixed positive speed
2: Counter-clockwise	Fixed negative speed
3: Acceleration	Acceleration procedure in progress (Accel)
4: Deceleration	Deceleration procedure in progress (Decel)
5: Halt	Halt command present
6: n < n-Min	Reference value < n-Min (**C00**)
7: n > n-Max	Reference value greater than minimum of **C01** and **E126** (via analog input or fieldbus)
8: Illegal direction	Specified direction of rotation is not the permissible direction of rotation (**C02**).
9: Load start	Load start is active (**C21**, **C22**).
10: Capturing	Capturing is active.
11: Quick stop	Quick stop is being performed.
12: Inhibited	This state prevents the drive from starting up unintentionally. Effective for: • Drive is turned on (power on) with enable=high (only if A34=0). • A fault is acknowledged with a low-high change in enable. • Opened load relay (no power and DC link below 130 V) • When the option board powers the basic device externally with 24 V (no network voltage) • When **A30**=*2:fieldbus* and the fieldbus sends an "inhibit voltage" control command, or the enable terminal becomes low, or a quick stop is concluded
13: Serial (X3)	Parameter **A30**=1 parameterized. Inverter is controlled by the PC via serial interface.
14: Enabled	Only available with DRIVECOM profile. Bus connection.
15: Self test	A self test is being performed on the inverter. During startup with ext. 24 V, "*15:Self test*" is indicated until power-on.
16: Fault	The inverter's power pack is disabled.
17: Posi.active	Position control is active. Waiting for a start command. Basic state of positioning control.
18: Moving *no.*	Processing a traversing job. Drive is moving. *No.* is the current process block (**I82**).
19: Delay *no.*	For process block chaining with defined delay or for repetition of relative movements. During a stop between two sequential jobs, the signal "in position" is generated, but the display shows "delay."
20: Wait *no.*	For process block chaining with defined manual start (i.e., wait for *posi.step* signal)
21: Referencing	During reference point traversing
22: Tip	During manual traversing
23: Interrupted	After an interrupted process block (i.e., halt or quick stop) with the option of continuing with the *posi.step* signal. *Posi.step* is then used to move to the original destination position regardless of whether the drive has been moved in the meantime. See chap. 10.10.
24: Reference wait	Wait for *posi.start* or *posi.step* signal to trigger reference point traversing after power on (**I37**=1).
25: Stop input	Drive is positioned on stop input.
26: Parameter inhibit	During data transmission from PC to inverter, software on the PC deactivates the enable.

Faults / Events

When faults occur, the inverter is no longer able to control the drive and is disabled. An entry is made in the fault memory (**E40**/**E41**), and relay 1 (ready for operation) releases. If installed when the fault occurs, the Parabox is written automatically. Certain events (cf. last column of the table below) can be declared via FDS Tool as faults, messages, warnings or not effective.

		Auto Reset	FDS-Tool*
31: Short/ground	The hardware overcurrent switch-off is active. • Motor requires too much current from the inverter (e.g., interwinding fault or overload).		
32: Short/gr. int.	When the inverter is enabled, an internal check is performed. A short circuit triggers a fault. • An internal device fault has occurred (e.g., IGBT modules are defective).		
33: Overcurrent	• Acceleration times too short. Lengthen ramps in group **D**. • Check torque limits **C03** / **C04**. - Which torque limits are in effect? See chapter 9.2 (FAS-Installation instr., publication no. 441581). - Reduce torque limits **C03/C04** set to maximum value by approx. 10 %. • Optimize parameter **C30** (ratio of the moments of inertia). • With vector control (**B20**=2): encoder not connected correctly	√	
34: Hardw. fault	The non-volatile data memory (NOVRAM) is defective or software version is time-limited.		
35: Watchdog	Monitors the load and functions of the microprocessor This malfunction may also be caused by EMC problems (e.g., shield of the motor cable or PE conductor not connected at all or connected incorrectly).	√	
36: High voltage	DC-link voltage too high • Power too high • Reverse powering of the drive while braking (no brake resistor connected, brake chopper deactivated with **A20**=0:*inactive* or defective) • Braking resistor with too low resistance value (overcurrent protection).	√	
38: tempDev.sens	The temperature **E25** measured by the device sensor is greater than the limit value. • Temperature of environment/switching cabinet is too high.		
39: TempDev.i^2t	The i^2t model calculated for the inverter is 100% of the thermal load. • Inverter is overloaded (e.g., because motor is jammed or timing is too high). • Timing frequency **B24** is too high.		
40: Invalid data	The data in non-volatile memory are incomplete (power was turned off during "**A00** save values"). Load data record again to the device, or check the parameters in the menu and execute **A00** again.		
41: Temp.motorTMP	Excessive temperature indicated by the motor temperature sensor. Connection terminal X2.5 to X2.6. • Motor is overloaded. Use external ventilation • Temperature sensor not connected (if not present, jumper -> X2.5 to X2.6)		
42: Temp.brakeRes	The i^2t model for the braking resistor reaches 100% thermal load.		√
43: RV wire brk	Only if the reference value is calculated with the reference value characteristic (reference value specification via analog input 1 or frequency reference value), and reference value monitoring is activated (**D08**=1). • The reference value output is 5% less than the minimum permissible reference value (**D05**).		√
44: Ext.fault	Can be triggered by binary input or fieldbus (**F31**=12)		
45: OTempMot.i^2t	Motor overloaded		√
46: Low voltage	DC-link voltage is below the limit value set in **A35**. • Drops in the power supply • Failure of a phase with 3~ connection • Fault is also triggered when option board is used (24 V external supply) when the power supply drops while the enable is active. • Acceleration times are too short (ramps, **D ..**).	√	√
47: Device overl.	The maximum torque permitted for static operation has been exceeded. The permissible torque is limited by parameters **C03** and **C04** and the possible torque limitation via analog input. See **F25**=2 and chap. 9.2 (FAS-Installation instr., publication no. 441581).	√	√

* Events can be programmed with FDS Tool as messages, warnings or faults, or can be completely deactivated.

Faults / Events

When faults occur, the inverter is no longer able to control the drive and is disabled. An entry is made in the fault memory (**E40**/**E41**), and relay 1 (ready for operation) releases. If installed when the fault occurs, the Parabox is written automatically. Certain events (cf. last column of the table below) can be declared via FDS Tool as faults, messages, warnings or not effective.

		Auto Reset	FDS-Tool*
48: Accel.overl.	Same as *"47:Device overload"* except for an acceleration procedure. M-Max 2 (**C04**) is permitted for the acceleration procedure with "cycle characteristic" startup (**C20**=2).	√	√
49: Decel.overl.	Same as *"47:Device overload"* except there is a deceleration procedure	√	√
50: Operat.area	The operating area defined under **C41** to **C46** has been exited. See also chap. 9.3 (FAS-Installation instr., publication no. 441581).	√	√
51: Refused	Only for positioning (**C60**=2). *Posi.start* or *posi.step* was not accepted and the RV-reached signal ("in position") is reset. • Destination position is located outside software limit switches **I50** and **I51**. • In non-referenced status (**I86**=0), no absolute positions (e.g., **J11**=1) are traveled to. • The direction of rotation in the current process block is not the same as the permissible direction **I04**.	√	√
52: Communication	• Fault during communication between inverter and FDS Tool during remote control via PC • Communication fault during fieldbus operation (Kommubox)	√	
53: Stop input	An end switch connected via BE input has been triggered.		
54: Follow. error	The maximum following error (i.e., deviation between actual position and reference value position) permitted by **I21** has been exceeded. Possible causes: Motor overload, too much acceleration or blockage		√
55: OptionBoard	Failure of the 24 V LC option board (not a malfunction if enable is deactivated). Only the failure of an already initialized module can be detected.		

√ The events checked in the "FDS Tool" column can be parameterized with FDS Tool as messages, warnings or faults in the group **U..** protective functions.

Acknowledgment of faults:

- **Enable:** Change from low to high level on the enable input.
  Always available.
- Esc **-key** of the controlbox
  (only if **A31**=1).
- **Auto-reset** (only if **A32**=1).
- **Binary input** (**F31** to **F35**=13).

⚠ **Caution!** Drive starts up immediately!

Parameters **E40** and **E41** can be used to scan the last 10 faults (i.e., value 1 is the last fault). FDS Tool can then be used to indicate under "**S..** fault memory" many details on the last faults which occurred.

Additional information under:
http://www.stoeber.de

Posi Upgrade Module

The Posi Upgrade module makes it possible to upgrade to a complete single-axis positioning control. Particularly when used with a fieldbus, this controller shows off its full range of powerful features.

- Destination travel to precise increment in VC mode
- Continuous position control with following error monitoring (VC)
- In control mode SLVC: Position control can also be used without encoder.
- Positions in 8 process blocks can be programmed.
- Rotary axis function of gear transmission with specification of both axle numbers
- Parameterization with units specified (e.g., in degrees and mm)
- Reference traversing with several modes
- Manual operation (inching)
- Teach in function
- Speed override via analog input
- Hardware and software proximity switch

STÖBER . . . The Drive for Your Automation

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