

Servodyn-D

Frequency Inverters DM..8001 (ASM) Parameter and Commissioning Manual

Edition

101



BOSCH
Automation

Servodyn-D

Frequency Inverters DM..8001 (ASM) Parameter and Commissioning Manual

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1 Safety Instructions


Please read this manual before commissioning the modular DM..8001 frequency inverters of the Servodyn-D series. Store this manual in a place to which all users have access at any time.

1.1 Intended use

This manual contains information required for the intended use of this product.

The drive inverters described

- have been developed, manufactured, tested and documented in compliance with the safety standards. These products pose no danger to persons or property if they are used in accordance with the handling stipulations and safety notes prescribed for their configuration, mounting, and proper operation.
- comply with the requirements of
 - the EMC Directives (89/336/EEC, 93/68/EEC and 93/44/EEC)
 - the EMC product standard EN 61800-3
 - the Low-Voltage Directive (73/23/EEC)
 - the harmonized standards EN 50178 (VDE 0160) and EN 60146-1-1 (VDE 0558-11)
- are designed for operation in industrial environments (emission class A), i.e.
 - no direct connection to public low-voltage power supply,
 - connection to the medium- or high-voltage system via a transformer.In residential environments, in trade and commerce as well as small enterprises class A equipment may only be used if it does not inadmissibly interfere with other equipment.

 **This is a class A device which may cause radio interference in residential environments. In this case, the operator may be required to take suitable countermeasures and to bear the cost of the same.**

Before putting the drive inverters into operation, ensure that the machine which the inverters are to be installed in meets the stipulations of the machinery directive (98/37/EEC, 98/79/EEC) and the EMC directive (89/336/EEC).

The faultless, safe functioning of the product requires proper transport, storage, erection and installation as well as careful operation.

1.2 Qualified personnel

The requirements as to qualified personnel depend on the qualification profiles described by ZVEI (Zentralverband Elektrotechnik und Elektronikindustrie – German Electrical and Electronic Manufacturers' Association) and the VDMA (Verband deutscher Maschinen- und Anlagenbau – German Engineering Federation) in:

Weiterbildung in der Automatisierungstechnik
edited by: ZVEI and VDMA
MaschinenbauVerlag
Postfach 71 08 64
60498 Frankfurt/Germany

The present manual is designed for **drive technicians**. They need special knowledge on commissioning and optimization.

Programming, start and operation as well as the modification of program parameters is reserved to properly trained personnel! This personnel must be able to judge potential hazards arising from programming, program changes and in general from the mechanical, electrical, or electronic equipment.

Interventions in the hardware and software of our products, unless described otherwise in this manual, are reserved to our specialized personnel.

Tampering with the hardware or software, ignoring warning signs attached to the components, or non-compliance with the warning notes given in this manual may result in serious bodily injury or material damage.

Only electrotechnicians as recognized under IEC 60947-1 (modified) who are familiar with the contents of this manual may install and service the products described.

Such personnel are

- those who, being well trained and experienced in their field and familiar with the relevant norms, are able to analyze the jobs being carried out and recognize any hazards which may have arisen.
- those who have acquired the same amount of expert knowledge through years of experience that would normally be acquired through formal technical training.

With regard to the foregoing, please note our comprehensive range of training courses. Our training center will be pleased to provide you with further information,
telephone: (+49) 6062 78-258.

1.3 Safety markings on products



Warning of dangerous electrical voltage!



Electrostatically sensitive components!



Warning of hazardous light emissions (optical fibre cable emitters)!



Lug for connecting PE conductor only!



Connection of shield conductor only

1.4 Safety instructions in this manual



DANGEROUS ELECTRICAL VOLTAGE

This symbol is used to warn of a **dangerous electrical voltage**. The failure to observe the instructions in this manual in whole or in part may result in **personal injury**.




DANGER

This symbol is used wherever insufficient or lacking compliance with instructions may result in **personal injury**.



CAUTION

This symbol is used wherever insufficient or lacking compliance with instructions may result in **damage to equipment or data files**.

 This symbol is used to draw the user's attention to special circumstances.

★ This symbol is used if user activities are required.

1.5 Safety instructions concerning the product described

**DANGER**

Danger of life through inadequate EMERGENCY-STOP devices!
EMERGENCY-STOP devices must be active and within reach in all system modes. Releasing an EMERGENCY-STOP device must not result in an uncontrolled restart of the system!
First check the EMERGENCY-STOP circuit, then switch the system on!

**DANGER**

Danger for persons and equipment!
Test every new program before starting up a system!

**DANGER**

Retrofits or modifications may adversely affect the safety of the products described!
The consequences may include severe injury, damage to equipment, or environmental hazards. Possible retrofits or modifications to the system using third-party equipment therefore have to be approved by Bosch.

**DANGER**

Health hazards through destroyed electrical components!
Do not destroy any built-in components. Dispose of destroyed components in a proper manner.

**DANGER**

Please note your local, system-specific regulations and requirements as well as the proper use of tools, hoisting and transport equipment as well as the applicable standards, regulations, and accident prevention regulations.

**DANGEROUS ELECTRICAL VOLTAGE**

Unless described otherwise, maintenance works must be performed on inactive systems! The system must be protected against unauthorized or accidental reclosing.

Measuring or test activities on the live system are reserved to qualified electrical personnel!

**DANGEROUS ELECTRICAL VOLTAGE**

Lethal voltages of up to 375 V DC against ground on all power connections and DC link connections!

The drives must not be switched on unless all covers have been fitted! When the drive has been disconnected from mains, wait for up to 5 minutes until the system is de-energized before removing any covers.

The drive must always be examined for safe isolation from supply!

**CAUTION**

Use only spare parts approved by Bosch!

**CAUTION**

Observe all precautions for ESD protection when handling modules and components! Avoid electrostatic discharge!

The following protective measures must be observed for modules and components sensitive to electrostatic discharge (ESD)!

- Personnel responsible for storage, transport, and handling must have training in ESD protection.
- ESD-sensitive components must be stored and transported in the prescribed protective packaging.
- ESD-sensitive components may only be handled at special ESD-workplaces.
- Personnel, working surfaces, as well as all equipment and tools which may come into contact with ESD-sensitive components must have the same potential (e.g. by grounding).
- Wear an approved grounding bracelet. The grounding bracelet must be connected with the working surface through a cable with an integrated 1 MΩ resistor.
- ESD-sensitive components may by no means come into contact with chargeable objects, including most plastic materials.
- When ESD-sensitive components are installed in or removed from equipment, the equipment must be de-energized.

1.6 Documentation, software release and trademarks

Documentation

The present manual provides information on the commissioning of the DM..8001 (ASM) frequency inverters of the Servodyn-D series.

Overview of available manuals:

| Manuals | Part no. | | | |
|--|--------------|--------------|--------------|--------------|
| | German | English | French | Italian |
| Configuration – Manual for overview and rating | 1070 066 009 | 1070 066 029 | 1070 066 059 | 1070 066 049 |
| Servo motors SF, SR | 1070 066 004 | 1070 066 024 | 1070 066 048 | 1070 066 046 |
| Asynchronous motors DU | 1070 066 007 | 1070 066 027 | – | – |
| Interface conditions | 1070 066 010 | 1070 066 030 | 1070 066 060 | 1070 066 050 |
| Interface conditions – Stand alone version | 1070 066 016 | 1070 066 036 | 1070 066 066 | 1070 066 056 |
| Servodyn-D, all interfaces – Parameter manual | 1070 066 018 | 1070 066 038 | 1070 066 068 | 1070 066 058 |
| Servodyn-D with SERCOS interface – Parameter and commissioning manual | 1070 066 011 | 1070 066 031 | – | 1070 066 051 |
| Servodyn-D with analog interface – Commissioning manual | 1070 066 014 | 1070 066 034 | – | – |
| Servodyn-D with CANrho interface – Commissioning manual | 1070 066 017 | 1070 066 037 | – | – |
| Servodyn-D with motion control – Commissioning manual | 1070 066 015 | 1070 066 035 | – | – |
| Frequency inverters DM..8001 (ASM) Parameter and commissioning manual | 1070 066 008 | 1070 066 028 | – | 1070 066 053 |
| Diagnostics, maintenance | 1070 066 012 | 1070 066 032 | 1070 066 062 | 1070 066 052 |
| Redundant safety monitoring RSU | 1070 066 006 | 1070 066 026 | 1070 066 081 | 1070 066 082 |
| EMC manual | 1070 066 072 | 1070 066 074 | 1070 066 075 | 1070 066 076 |
| External load switching module | 1070 066 077 | 1070 066 080 | – | – |

 **In this manual the floppy disk drive is always drive A, the hard disk drive is always drive C:.**

Special keys or key combinations are shown enclosed in pointed brackets:

- Special keys: e.g. <Enter>, <PgUp>,
- Key combinations (pressed simultaneously): e.g. <Ctrl> + <PgUp>

Release

 **The present manual applies to the following releases:**
DM/DS software: 01.2 (ASM) or higher
DSS software: 2.01 or higher

Modifications

Modifications in the present manual as compared to the previous edition are marked by black vertical bars in the margin.

Trademarks

All trademarks of software installed on Bosch products upon delivery are the property of the respective manufacturer.

Upon delivery, all installed software is copyright-protected. The software may only be reproduced with the approval of Bosch or in accordance with the license agreement of the respective manufacturer.

MS-DOS® and Windows™ are registered trademarks of Microsoft Corporation.

2 Prerequisites for Commissioning

The installation and operation of the DSS requires general knowledge of the Windows user interface (e.g. start/exit programs, open/save files, change program windows, etc.).

In the present manual, we suppose that this knowledge is available.



CAUTION

Commissioning by insufficiently qualified personnel may cause severe damage to the machine and drives or even personal injury!

- **Commissioning is therefore reserved to appropriately trained technical personnel!**
- **In the case of multi-axis systems, you should always commission a single drive at a time.**
- **The motor must be properly fastened or flanged. If this is not yet possible, you must fix the motor, e.g. with the help of suitable screw clamps, so as to ensure that it cannot move even with maximum acceleration of the motor shaft.**

Our service department will in any case be available for assistance. On request, we also provide training for your personnel. For more information, please contact us (phone (+49) 6062 78-0).

You should always use the DSS in order to adjust a drive to your application, test it or optimize it.

The DSS is designed for PCs on which the Windows™ operating system has been installed.

2.1 Checking the hardware

- ★ First make sure that the system is switched off and de-energized.
- ★ Check the nameplates and the engineering documents for the proper inverter type and the correct motor installed.
Do not continue the commissioning procedure unless the correct hardware has been installed!
- ★ Follow the instructions below step by step.

Wiring



CAUTION
Never unplug or plug connectors/terminals on live systems!

- ★ Check the complete wiring of the drive on the basis of the information provided in the "Servodyn-D interface conditions" manual and the "EMC manual" (including resistance measurement).
- ★ Unplug all connectors from all drive inverters.

Power supply

- ★ Turn the 24 V supply on. Measure the voltage of the 24V supply at the connector.
It must be between 20.8 ... 28.8 V.
- ★ Turn the power supply on and measure the voltage.
It must be between 360...506 V.
- ★ **Turn the power supply and the 24 V supply off.**
Do not proceed unless all connectors/terminals are de-energized.
- ★ Plug in all connectors/terminals at the inverters. Check connectors for proper assignment.
- ★ Turn the 24 V supply on.
When switched on, first, the selected parameter list will be displayed for a moment, then the following display will appear:

| | |
|--|------------------------------|
| | Computer has been booted |
| | TEMP, no temperature warning |
| | STA, no fault |
| | |

EMERGENCY-STOP circuit

- ★ Check for proper functioning according to planning engineer's data.

Finish checking

- ★ Switch off all voltages.
- ★ If all checks were completed successfully, proceed to the next section. Otherwise, all faults that have occurred must be eliminated.

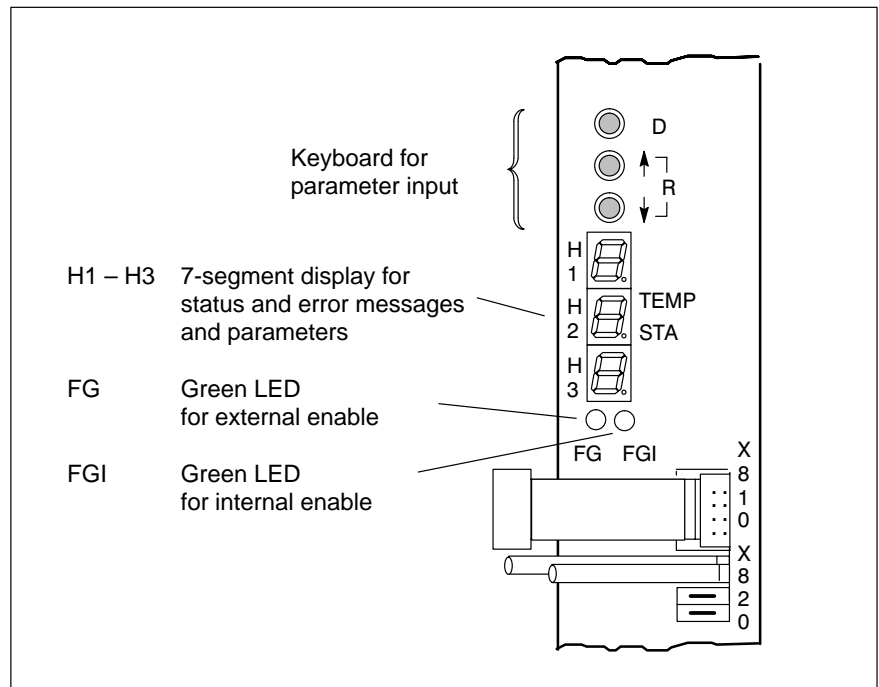
3 Operation at the Inverter

3.1 Operator interface

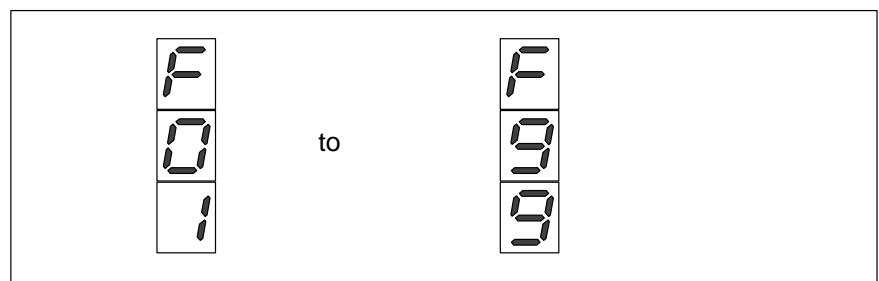
Every DM..8001 (ASM) frequency inverter is equipped with:

- a keypad with three keys, and
- a three-digit 7-segment display.
- an RS 232 interface for connecting a PC, to be operated via the DSS Diagnostics and Service System.

Using this operator interface, every inverter can be optimized and commissioned for the specific motor and the machine environment. It also serves to call up a large number of status information.

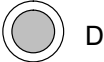


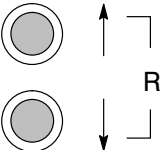


In the event of a fault, an 'F' display is shown in the range:

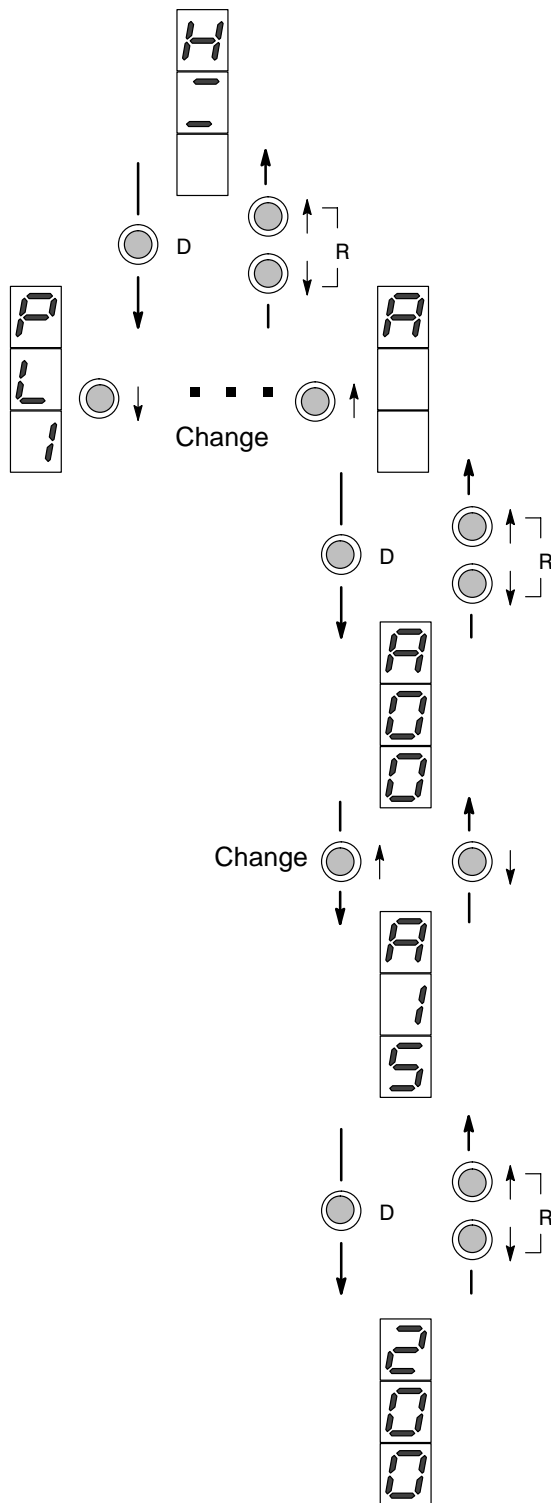


3.2 Functions of the keypad

The 3 keys of the keypad provide for 4 functions. They ensure complete handling and optimization of the module:

| | | |
|----------------|---|--|
| Display |  | <p>The 'Display' key serves to jump to the lower next display level.</p> <p>This key has storage functions for parameter values, it must be depressed before returning to a higher level. After successful storage, all decimal points of the display that are not used will flash until return to a higher level.</p> |
| Up |  | <p>The 'Up' key serves to change the range or values in ascending order within a display level.</p> <ul style="list-style-type: none"> • Single steps in jogging operation • At increasing speed if the key is constantly depressed • Some modifications in single steps while the inverter is running in order to avoid dangers |
| Down |  | <p>The 'Down' key serves to change the range or values in descending order within a display level.</p> <ul style="list-style-type: none"> • Single steps in jogging operation • At increasing speed if the key is constantly depressed • Some modifications in single steps while the inverter is running in order to avoid dangers |
| Return |  | <p>For the 'Return' function, both keys are depressed simultaneously.</p> <p>The 'Return' function serves to return to the higher next display level.</p> |

3.3 Displaying operating data



Basic display

Computer booted, temperature display, status display (see Section 2.1)

Depress "D" key.

Select display functions

Operating data A or parameter list PL1...PL8.

Depress "D" key.

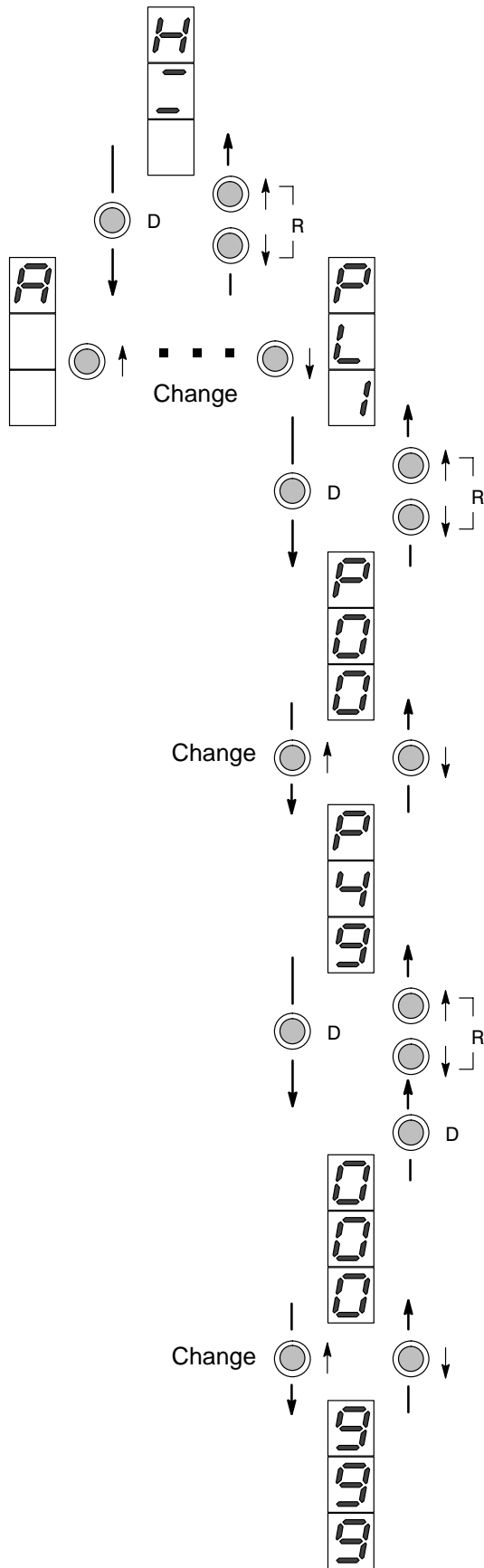
Select element

Select the desired display from the A00 ... A15 area, using the '↑' or '↓' keys.

Depress "D" key.
Return to previous level with "Return" keys.

Read current values

3.4 Changing parameters



Basic display

Computer booted, temperature display, status display (see Section 2.1)

Do not activate enable signal!

Depress "D" key.

Select display functions

Status displays A or

parameter list PL1...PL8.

Only the list predefined on terminal block X06.5-7 may be selected.

Depress "D" key.

Select parameter

Select the desired parameter from the P00 ... P49 area using the '↑' or '↓' keys.

Depress "D" key.

Save new value entries with the 'D' key when returning (all unassigned decimal points of the display are flashing). Then return with the "Return" keys.

☞ **Before values can be changed, the write protection must be disabled by pressing the boot key, cf. page 5-1.**

Change value

The display shows the value set in the factory or another value that has been input.

The parameter is changed to the desired values using the '↑' or '↓' keys.

☞ **The display flashes when the admissible value range is left.**

4 DSS User Interface

As an alternative to operation at the inverter itself, the more convenient DSS-D Diagnostics and Service system may be used on a connected PC.

4.1 Establishing communication between the drive and DSS

Connection between PC and drive

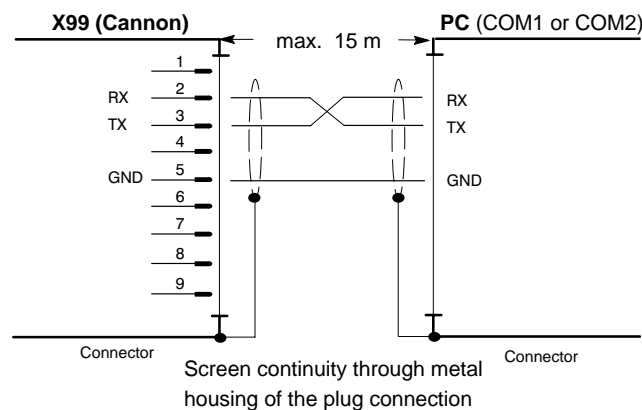
- ★ To avoid communication faults between the PC and the drive, please note the following:
 - We recommend using the pre-assembled Bosch connection cable, part no.: 1070 077 753, length 5 m
 - Distance between connection cable – power cables: at least 20 cm.
 - Do not permit inductive or capacitive coupling with live components.

☞ **If communication faults still occur, an annular core on the connection lead may be helpful. Use the folding ferrite coil, part no. 1070 918 766.**

- ★ Connect X99 to COM1 or COM2 of your PC.
- ★ Write down the port you used (COM1 or COM2).

Cannon connector, 9-pole.

Type: RS-232
 Cable length: max. 15 m
 Cable type: screened, min. core cross-section 0.14 mm²
 Transmission rate: 9600 bps
 Parameters: even parity, 8 data bits, 2 stop bits
 Handshake: software handshake (X_{ON} , X_{OFF})

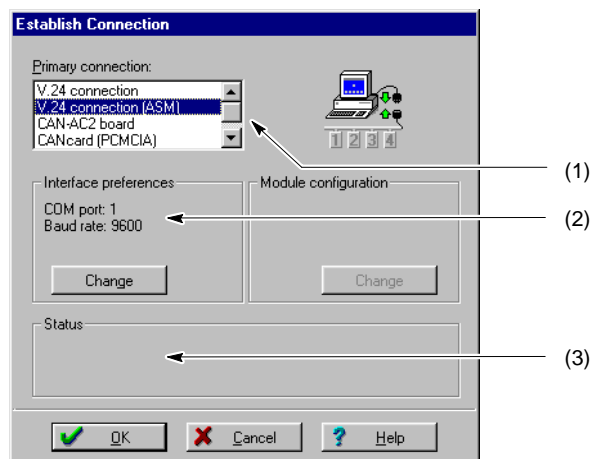


Assignment:


RX Receive Data
 TX Transmit Data; data transmission to DSS
 GND Signal Ground

Configuring the interface

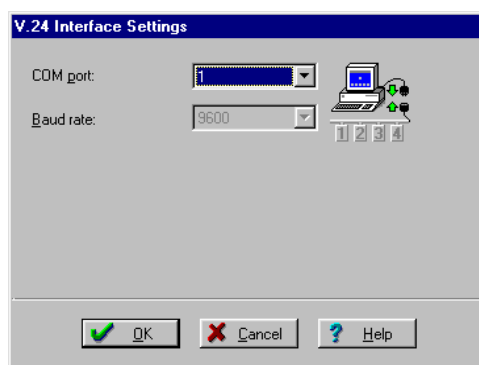
- ★ Switch on the 24V supply of the system.
- ★ Switch on the PC. Wait until the operating system has been fully booted and start the "DSS" commissioning and service system. The "Establish connection" dialog is automatically displayed:



This dialog may also be invoked manually when the connection has been successfully established:

- menu sequence EXTRAS ► INTERFACE SELECT
- OR-
- by clicking on the  command button ► INTERFACE SELECT in the DSS basic image.

- ★ in the "Primary connection" field (1): **V.24 connection (ASM)**
- ★ Set the data in the "Interface Preferences" field (2) through the following dialog:



Click on "OK" to return to the "Establish connection" dialog.

- ★ Clicking on "OK" in this dialog will cause the DSS to try to establish the desired connection.
 - In the event of a fault, the "Status" field (3) will contain more information. Check the connection between the PC and the drive and then click on the "Retry" command button.
 - If the connection can be established, the DSS will read information from the drive and then display the DSS basic image.

Reinitializing DSS after module change or after parameter changes on the module

If, while DSS is running, you

- disconnect the connection cable from the inverter (e.g. for starting up a new drive), or
- want to change parameters via the keyboard on the currently connected inverter,

you then have to re-initialize the DSS. This is the only way to ensure that the DSS does not work with invalid or outdated data.




CAUTION

Uncontrolled motor movements are possible!

For as long as the drive is enabled, you must neither press the "RESET" key nor disconnect the cable between the DSS and the drive.

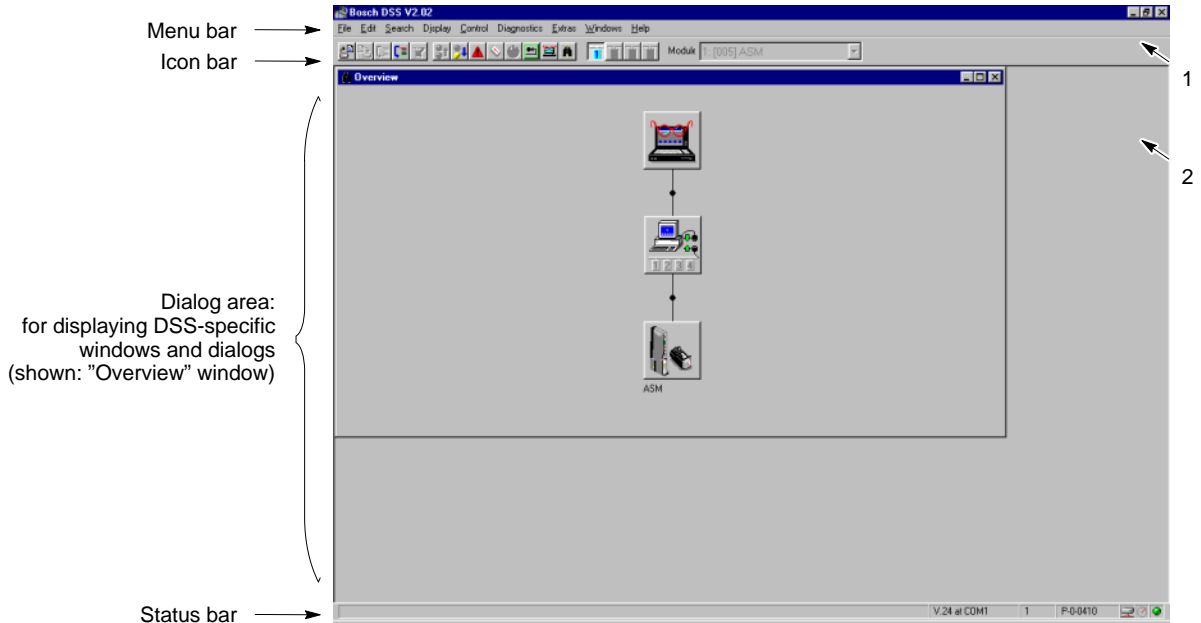
First stop the movement and disable the drive.

Initialize DSS:

- menu sequence
CONTROL ► RESET DSS,
-or-
- click on  in the icon bar.

4.2 DSS basic image

The layout of the DSS user interface has been optimized for a screen resolution of 640 x 480 pixels in connection with a 14" color monitor. You should not use screen resolutions of more than 800 x 600 pixels unless you have at least a 17" monitor.



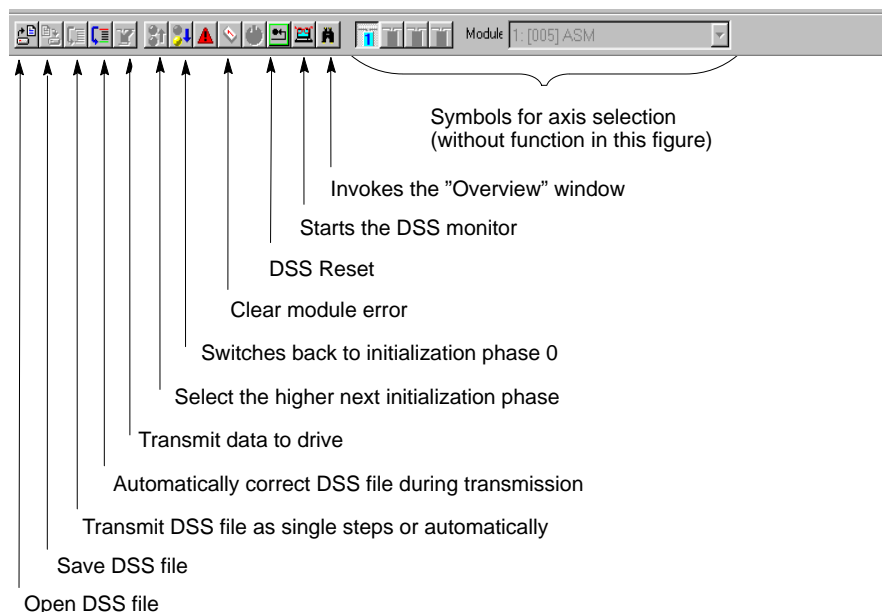
1 Changes the DSS program window and exits the program.

2 Changes a DSS-specific window

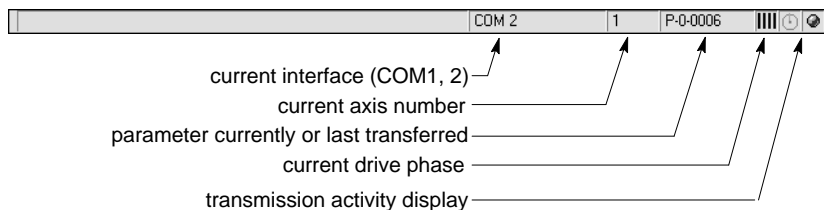
Please note that iconized window symbols may be covered by open windows. Covered windows can be displayed by selecting the "Windows" menu.

Icon bar

The meaning of the command buttons is also displayed when the mouse pointer is on the command button.

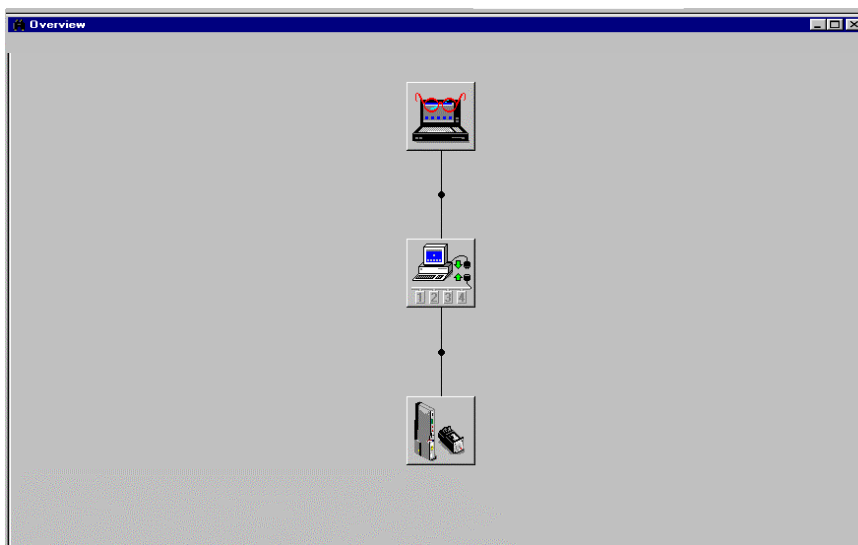


Status bar






"Overview" window

The "Overview" window shows a single-line diagram of the entire system. The meaning of the command buttons is also displayed when the mouse pointer is on the command button.



Command buttons and available functions

Selecting command buttons that have several functions will open up a pull-up menu.


- | | | | |
|---|--------------------|---|--|
|  | (Parameterization) | ➔ | <ul style="list-style-type: none"> - Monitor (edit parameter directly) - DSS file (edit parameter file) |
|  | (Interface) | ➔ | <ul style="list-style-type: none"> - Increment initialization phase (not applicable in this case) - Decrement initialization phase (not applicable in this case) - Select interface - DSS Home position |
|  | (Axis x) | ➔ | <ul style="list-style-type: none"> - Clear module error (not applicable in this case) - Load RAM (not applicable in this case) - Save RAM (not applicable in this case) - Select mode (not applicable in this case) - Module status display |

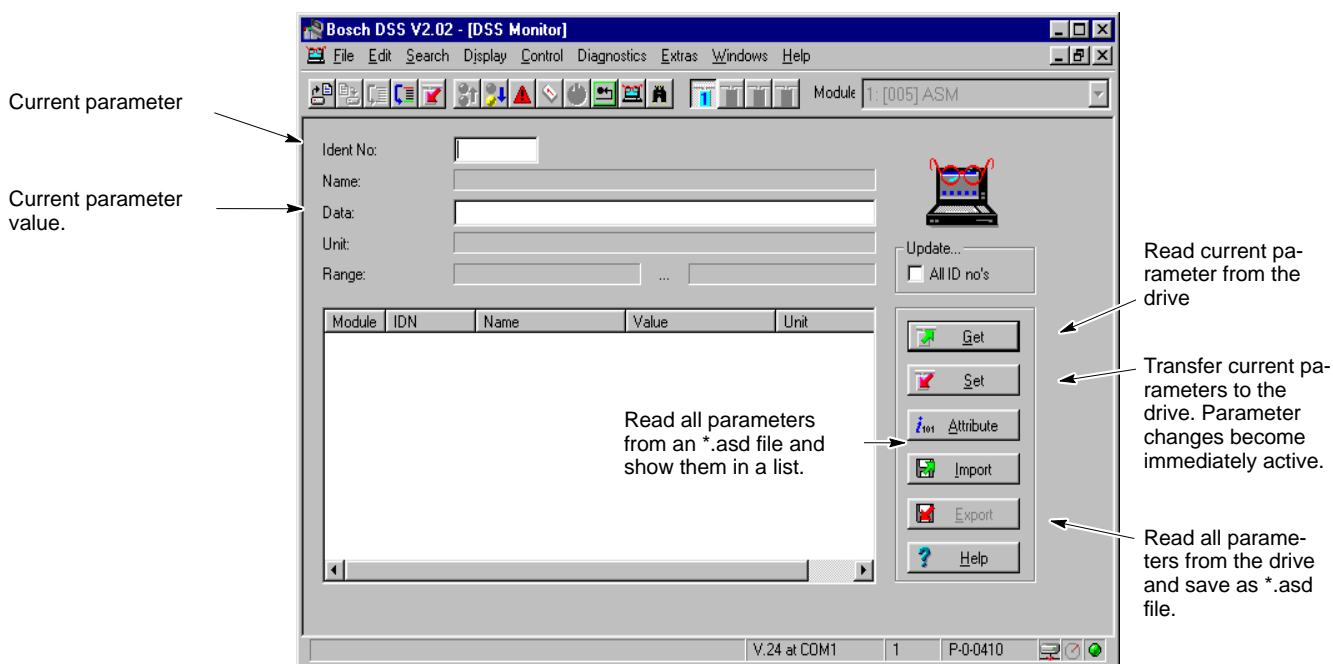
4.3 DSS monitor

The DSS monitor offers direct access to all parameters stored in the drive. You may:

- edit parameters
- save a list of several parameters as parameter file (*.asd).
- transmit parameters to the drive.

 **If parameters are changed directly on the inverter keyboard while the DSS is active, the DSS must first be reset afterwards. Click on .**

- ★ Start the "Monitor"
 - menu sequence DISPLAY ► MONITOR, or
 - by clicking on the  command button.



Single parameter

1. Click on the "Ident No." field
2. Enter the parameter number to be edited.

Structure of the parameter number:

A-[Parameter set]number

The following syntax options may be used:

- complete, e.g. "A-0-0012"
- simplified, e.g. "a12", "a-12", "a-0-12" or "12", if "Ident number prefix automatic" has been activated in the menu EXTRAS ► SETTINGS ► GENERAL (= default setting).

☞ **Representation of parameters:**

| | In the DSS | At the inverter |
|--------------------------|-----------------------|-----------------|
| Configuration parameters | A-0-0000...A-0-0049 | P00...P49 |
| Status displays | A-0-1000 ... A-0-1015 | A00 ... A15 |

3. Press <enter> or click on "Get" button to read the parameter from the drive.

If a parameter has been selected which has not been defined for the drive, an error will be displayed.

4. Modified parameters are transferred back to the drive with "Set". First, the write protection has to be disabled by pressing the boot key (cf. page 5-1). The modified parameters will immediately take effect in the drive and will remain stored until the next change.

Even though only some parameters have been changed, all parameters in all parameter lists will be replaced.

During the write process, the 7-segment display on the inverter shows



(serial transmission).

Parameter list

★ In order to display a list of all parameters available in the frequency inverter, first enter any desired parameter in the "Ident. number" field and then click on the "Export" button offered afterwards.

- Select a directory from the new window and enter a file name with the extension ".asd".
- Hitting "OK" will read all parameters from all 8 parameter lists stored in the drive. During this process, the 7-segment display on the inverter

shows



(serial transmission).

- ★ By clicking on the "Import" command button, all parameters of this *.asd file are displayed in list format on the screen and can be modified in the "Data" field.

The screenshot shows the Bosch DSS V2.02 - [DSS Monitor] window. The interface includes a menu bar (File, Edit, Search, Display, Control, Diagnostics, Extras, Windows, Help), a toolbar, and a main workspace. The workspace is divided into several sections:

- Parameter Fields:** Ident No. (A-0-0011), Name (Beschleunigungsrampe (einstufig oder 2.Stufe)), Data (5.0), Unit (sec), and Range.
- Parameter List:** A table with columns: Module, IDN, Name, Value, Unit.

| Module | IDN | Name | Value | Unit |
|--------|----------|----------------------------------|-------|------|
| 1 | A-0-0000 | Taktfrequenz | 5.3 | kHz |
| 1 | A-0-0001 | Bereich Ausgangsfre... | 0.7 | kHz |
| 1 | A-0-0002 | Max. Ausgangsfrequ... | 500.0 | Hz |
| 1 | A-0-0003 | Min. Ausgangsfrequ... | 0.0 | Hz |
| 1 | A-0-0004 | Motorbemessungss... | 10.0 | A |
| 1 | A-0-0005 | Motorbemessungsl... | 4.8 | kW |
| 1 | A-0-0006 | Motorbemessungssp... | 380.0 | V |
| 1 | A-0-0007 | Motorbemessungsfre... | 300.0 | Hz |
| 1 | A-0-0008 | U/f-Kennlinientyp | 0 | |
| 1 | A-0-0009 | I ² R-Kompensation | 5.0 | % |
| 1 | A-0-0010 | I ² R-Abloesefrequenz | 0.0 | Hz |
| 1 | A-0-0011 | Beschleunigungsram... | 5.0 | sec |
- Control Buttons:** Update... (with checkbox for All ID no's), Get, Set, Attribute, Import, Export, Help.

Annotations on the left side of the screenshot:

- Current parameter (points to the Ident No. field)
- Current parameter value. (points to the Data field)
- List of all parameters from all parameter lists in ascending order. Double-click on one of the parameters to display its information in the upper fields.

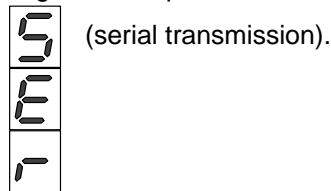
Annotations on the right side of the screenshot:

- If active, clicking on "Get" will update all parameters in the DSS.
- Transfer current parameters to the drive. Parameters become immediately active.
- Read all parameters from the drive and save them as an *.asd file.

1. To edit the parameters, double-click on the desired parameter in the list. It will then be read again from the drive and written to the upper fields as current value.

☞ **Double-clicking in step 1 has the same function as selecting the parameter and clicking on the "Get" command button. To read all parameters in the list again, mark the "All IDN's" checkbox and confirm by clicking on "Get".**

2. Modified parameters are transferred back to the drive with "Set" where they will become immediately active. Even though only some parameters have been changed, all parameters in all parameter lists will be replaced. During the write process, the 7-segment display on the inverter shows



4.4 Module status display

The display will show **dynamic** information on

- Current BTB1 warning: diagnostics message in plain text
- actual values of max. 12 parameters
- Last error after BTB2 was switched off.

★ Select the menu sequence:

- DIAGNOSES ► MODULE STATUS DISPLAY

Drive warning in plain text. →

Display of max. 12 actual values. →

Last error after BTB2 was switched off. →

| Actual values | |
|-------------------------|---------|
| Ist-Ausgangsfrequenz | 0.0 Hz |
| Soll-Ausgangsfrequenz | 0.0 Hz |
| Gesamtstrom | 0.0 A |
| Wirkstrom | 0.0 A |
| Blindstrom | 0.0 A |
| Motorspannung | 0.0 V |
| Zwischenkreisspannung | 668.8 V |
| Gesamtleistung | 0.0 kVA |
| Wellenleistung (Option) | 0.0 kW |
| Auslastung (Option) | 0.0 % |
| Kühlkörpertemperatur | 22.5 °C |
| Aktuelle Stromgrenze | 31.8 A |

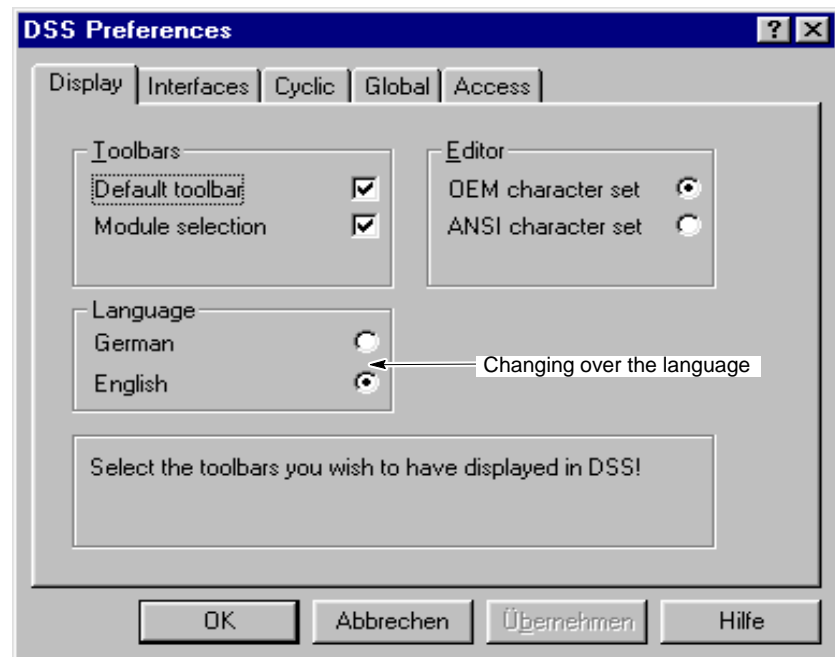
V.24 at COM1 1 A-0-1111

4.5 Selecting the language

The DSS user interface language may be changed over, but not the parameter and status texts.

Language of user interface

- ★ Select: EXTRAS ► PREFERENCES



- ★ To activate the new language, you have to reboot.

4.6 Save all parameter settings (data backup)

It is urgently recommended to backup all relevant data when the parameters for a drive have been set.

This data backup will be required to

- efficiently perform series commissioning
- restore a precisely defined drive status (e.g. after a parameter loss, a firmware update or hardware replacement)
- document all parameters used for a drive.

- ★ Make sure that **no** drive enable command has been given.
- ★ Select the menu sequence:
FILE ► IDN BACKUP
Enter a new file name. The drive reads all parameters from all parameter lists and saves them in the previously specified file.
- ★ Create a suitable directory structure on the hard disk drive of your PC to which you can copy all parameter files of the drive.
- ★ Copy all files to a removable data carrier. Store this data carrier in a safe place.

Notes:

5 Commissioning

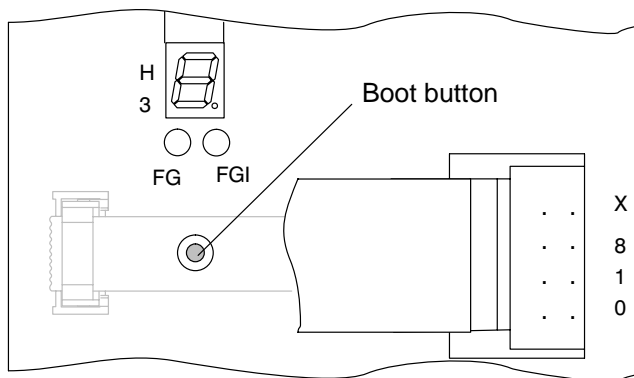


DANGEROUS ELECTRICAL VOLTAGE

Do not switch on the mains power unless the power supply has been connected and tested in accordance with section 2.

When the unit has been switched on, all parameters are write protected. With the DSS and directly at the inverter, the parameters can only be viewed.

- ★ In order to commission the system, you have to disable the write protection: When the inverter has booted (7-segment display = "H"), press the boot key in the housing recess below the two LEDs with a pointed object. For this purpose, carefully press down the signal cross-link X810 which covers the button.



Since the boot button is hidden in normal operation, the parameters are protected against unauthorized tampering.

- ☞ **The following general rules apply to programming the frequency inverter with the DSS-D:**
All values shown by alphanumerical characters on the drive are stored as simple numerical values in the DSS-D. When entering the values, just leave out the letters, e.g. output frequency up to 400 Hz (= E0.2) → DSS input "0.2".

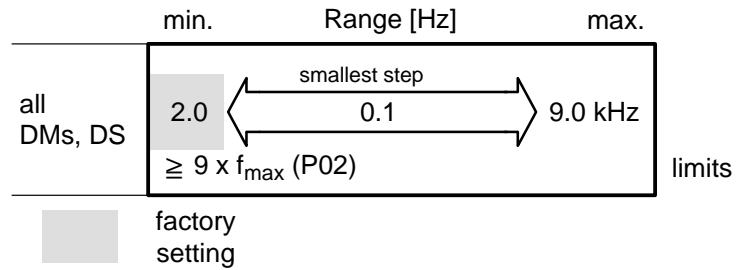
The values to be input in the DSS are shown in brackets next to the parameter description.

5.1 Parameters

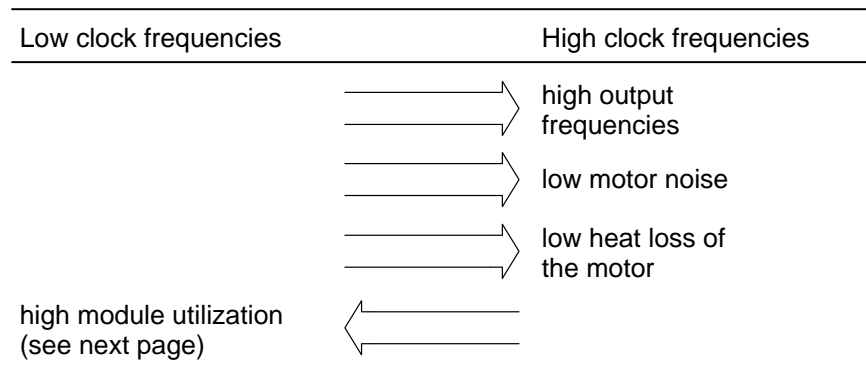
5.1.1 Clock frequency

The clock frequency can be adjusted in order to operate high-frequency spindles and to reduce noise and motor losses.

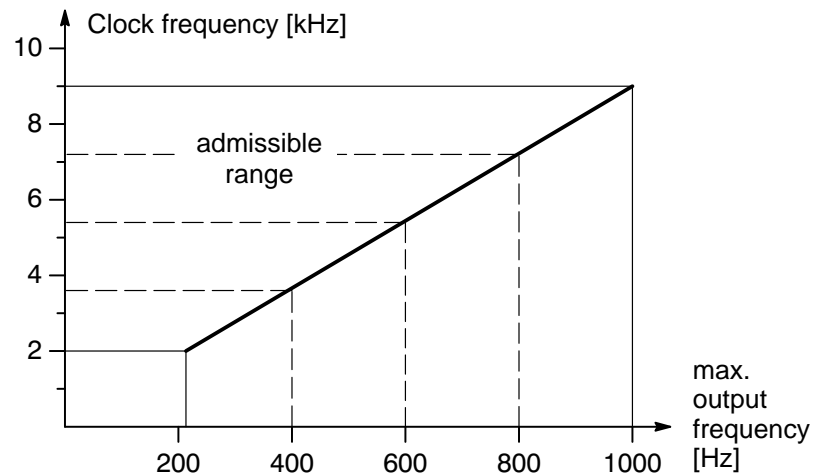
P00 (A-0-0000) Clock frequency



Please note the following dependencies:



The clock frequency must be $> 9 \times f_{\max}$

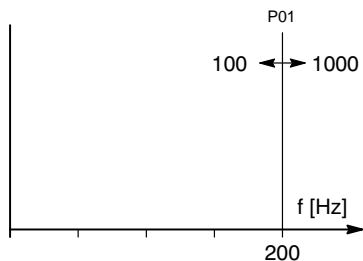


5.1.2 Output frequency

P01 (A-0-0001)

Setting the output frequency range

Selection of the working range which must comprise all further frequency settings.



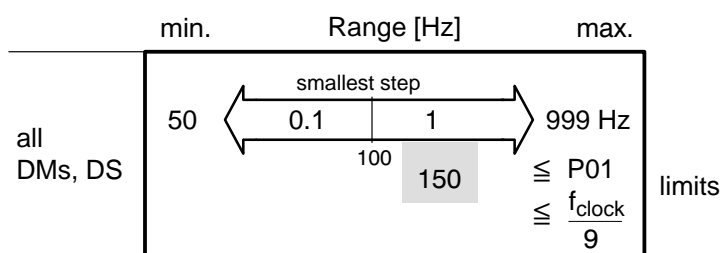
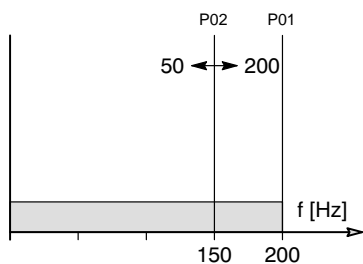
| | | | | | | | | | | |
|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|---------------|
| all DMs, DS | up to 100 | up to 200 | up to 300 | up to 400 | up to 500 | up to 600 | up to 700 | up to 800 | up to 900 | up to 1000 Hz |
| | E0.1 (0.1) | E0.2 (0.2) | E0.3 (0.3) | E0.4 (0.4) | E0.5 (0.5) | E0.6 (0.6) | E0.7 (0.7) | E0.8 (0.8) | E0.9 (0.9) | E1.0 (1.0) |

factory setting

P02 (A-0-0002)

Maximum output frequency

Selection of the precise maximum admissible output frequency

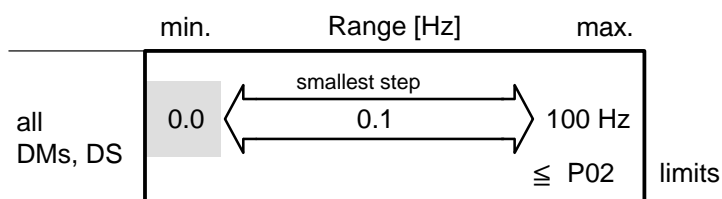
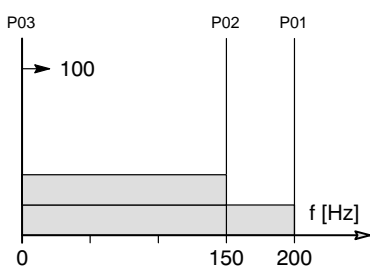


factory setting

P03 (A-0-0003)

Minimum output frequency

Selection of the lowest admissible output frequency



factory setting


If P02 is subsequently set to values lower than P03, P03 is changed accordingly, assuming the same value.

5.1.3 Data on the motor rating plate

The motor rating plate data must be entered as a standard.

P04 (A-0-0004) Rated motor current I_N

| | min. | Range [A] | max. |
|-------------|------|-----------|--------|
| DM 4K | 0.9 | 0.1 | 9.5 A |
| DM 8K | 0.9 | 0.1 | 9.5 A |
| DM/DS 15K | 1.5 | 0.5 | 15.9 A |
| DM 30K/A | 3.1 | 0.5 | 31.8 A |
| DM/DS 45K/A | 4.7 | 0.5 | 47.7 A |
| DM 85B | 9.5 | 0.5 | 95.4 A |
| DM140D | 12.7 | 0.5 | 127 A |

 factory setting




DANGER

Zero speed monitoring and the motor protection function are subject to the rated motor current.

Please make sure that the data has been entered correctly.

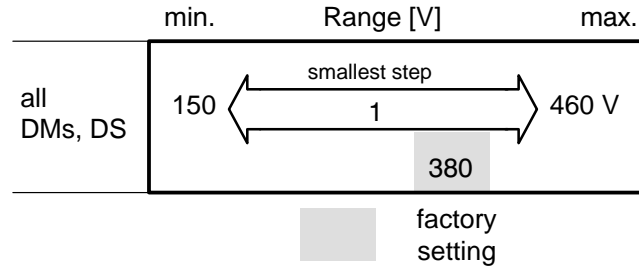
P05 (A-0-0005) Rated motor power P_N

| | min. | Range [kW] | max. |
|-------------|------|------------|---------|
| DM 4K | 0.2 | 0.1 | 5.0 kW |
| DM 8K | 0.2 | 0.1 | 5.0 kW |
| DM/DS 15K | 0.3 | 0.1 | 8.3 kW |
| DM 30K/A | 0.7 | 0.1 | 16.6 kW |
| DM/DS 45K/A | 1.1 | 0.1 | 25.0 kW |
| DM 85B | 2.3 | 0.1 | 50.0 kW |
| DM140D | 3.1 | 0.1 | 66.6 kW |

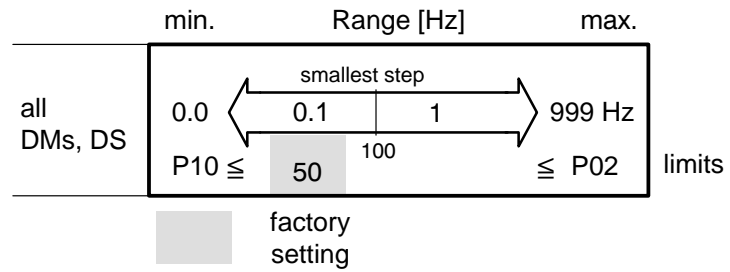
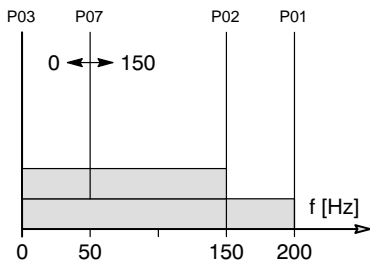
 factory setting

P06 (A-0-0006) Rated motor voltage V_N

The rated motor voltage V_N corresponds to the maximum output voltage V_{max} (rms) of the inverter.
The output voltage cannot exceed the line voltage.



P07 (A-0-0007) Rated motor frequency f_N

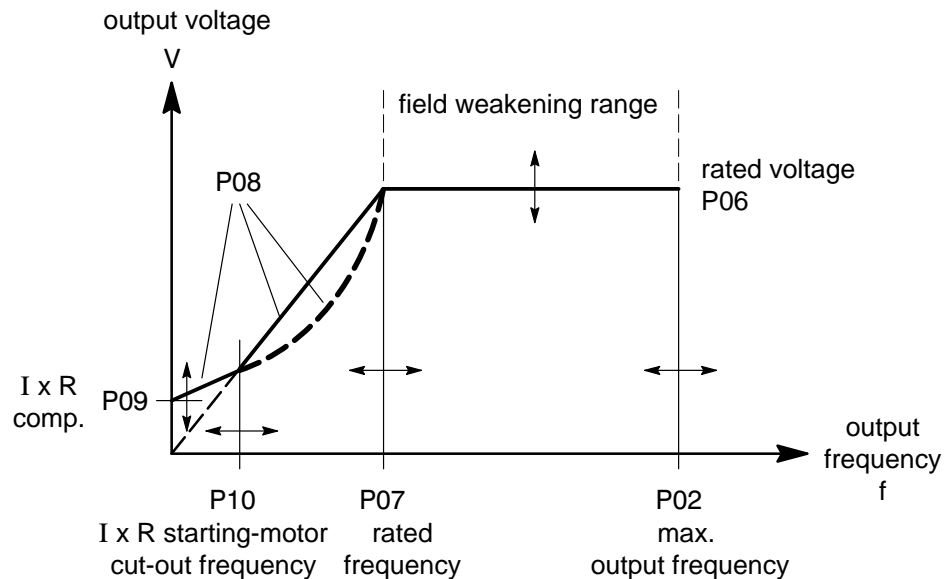



5.1.4 V/f characteristic

The V/f characteristic serves to adjust the frequency inverter to the motor.

The shape of the characteristic is determined by the input of the rated motor data. Furthermore, the type of characteristic and the information on I x R compensation must be selected.


- Up to the **rated motor frequency** the power output rises. Above the rated frequency it remains constant while there is a $1/f$ falling torque characteristic.
- The maximum output voltage corresponding to the **rated motor voltage** is adjusted independent of braking or acceleration processes of other axes connected to the link. Thus, the motor power is optimally used.
- In the case of **linear-type characteristics with torque boost** the motor shows an improved starting behavior. The output voltage is raised depending on the motor load.
- Using the **I x R compensation**, the starting behavior of the motor is further improved if the torque boost is insufficient or has not been activated. This improvement is achieved by raising the output frequency in the lower speed range up to the I x R starting-motor cut-out frequency.



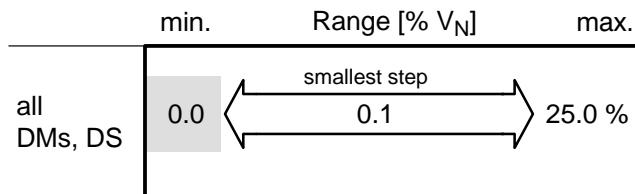
 **A standard characteristic for a standard motor has been set in the factory.**


P08 (A-0-0008) Type of characteristic

| | | | | | |
|----------------|------------|-----------------------------|------------|------------------------------|--------------------------|
| all DMs, DS | linear | linear with torque boost | square-law | linear, I x R with accel. | VF3 with torque boost |
| | VF0 (0) | VF1 (1) | VF2 (2) | VF3 (3) | VF4 (4) |

 factory setting

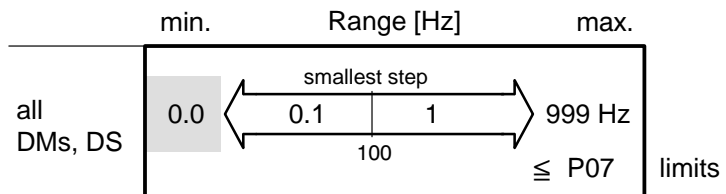
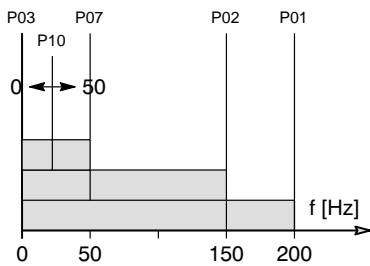
P09 (A-0-0009) I x R compensation




 factory setting

P10 (A-0-0010) I x R motor-starting cut-out frequency

The I x R compensation is effective until the motor-starting cut-out frequency is reached.

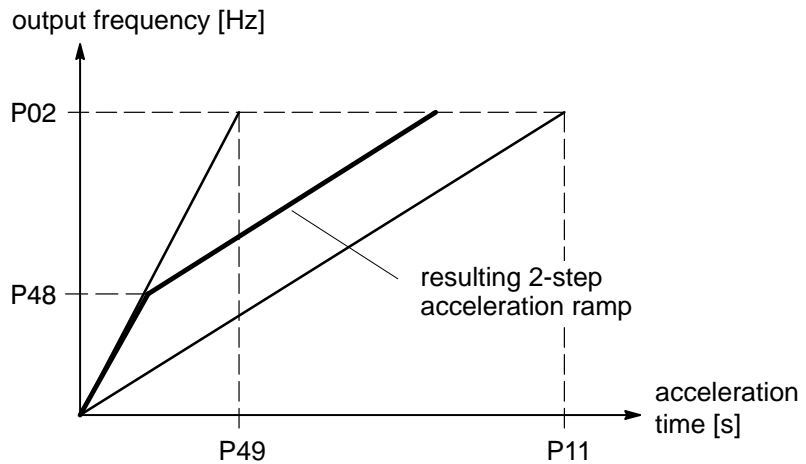


 factory setting

5.1.5 Setpoint ramps

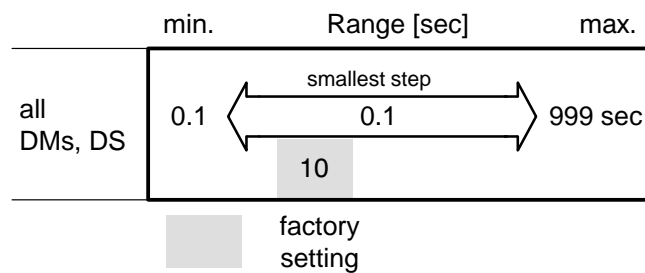
The following parameters are available for the external and internal setpoints:

- simple braking ramp P12
- simple acceleration ramp P11 (P48 = 0 Hz)
- 2-step acceleration ramp P11, P48, P49

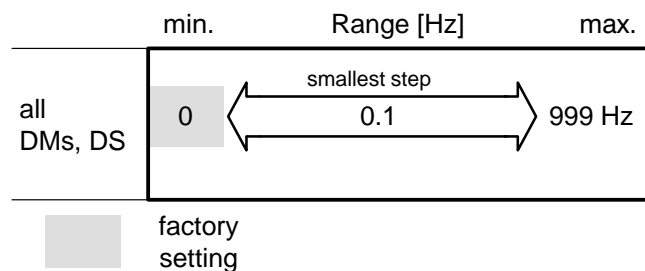


P11 (A-0-0011) Acceleration ramp

- **Simple** acceleration ramp:
Acceleration from zero to the maximum output frequency (P02).
- **2-step** acceleration ramp:
Acceleration time above the frequency break point P48 (cf. figure).

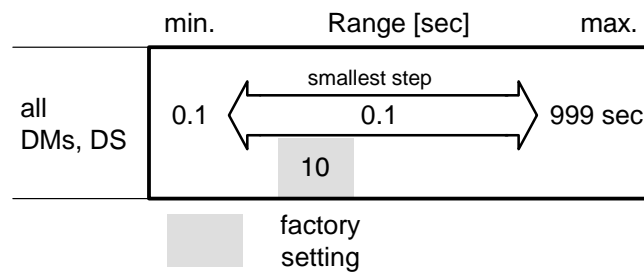


P48 (A-0-0048) Frequency break point – 2-step acceleration ramp



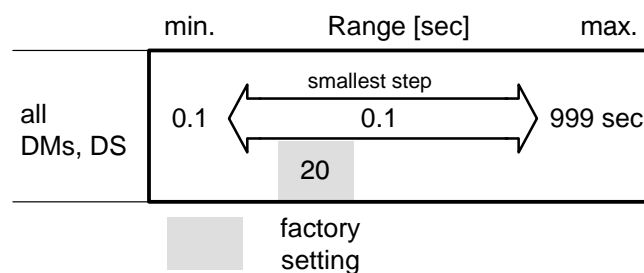
With P48 = 0 only simple acceleration ramp (P49 not active).

P49 (A-0-0049) Acceleration ramp up to frequency break point



P12 (A-0-0012) Braking ramp

The braking time to be adjusted refers to braking from the maximum output frequency (P02) to $f = 0$.



CAUTION

The selected braking and acceleration time values become longer if the inverter has reached the current limit (P17, P18). This is to prevent further current increase.

5.1.6 Setpoint adjustment

P13 (A-0-0013) Setpoint source

The frequency setpoint can be input using an external analog voltage or current signal or internally. The specified direction of rotation applies to properly connected motors when looking towards the shaft end.

If an external voltage signal is used, 7 different setpoint smoothing options (t_{sm}) may be selected.

 **Before selecting one of the following possibilities, the external enable signal FG must be deactivated.**

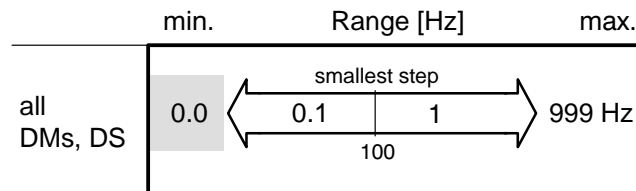
| | | | | | | | | | |
|----------------|---------------------------|---------------------|--------------------|---------------------------|----------------------------|--------------------------|--------------------------|---------------------------|---------------------------|
| all DMs, DS | analog $t_{sm}=3.5$ ms | P14 ccw rotation | P14 cw rotation | analog $t_{sm}=6.5$ ms | analog $t_{sm}=12.5$ ms | analog $t_{sm}=25$ ms | analog $t_{sm}=50$ ms | analog $t_{sm}=100$ ms | analog $t_{sm}=200$ ms |
| | EF1 (1) | EF2 (2) | EF3 (3) | EF4 (4) | EF5 (5) | EF6 (6) | EF7 (7) | EF8 (8) | EF9 (9) |

 factory
setting


analog: $\pm 5...13$ VDC at X23.5/6 or
0...20 mA at X23.5/7 (X23.5/6 bridged)

P14 (A-0-0014) Keyboard setpoint

The internal frequency setpoint is set with the \uparrow or \downarrow keys.



 factory
setting

 **When P13 is changed over to 'EF1' the keyboard setpoint is automatically reset to '0'.**

P15 (A-0-0015) Adjustment $f = f_{max}$ (Adjustment to maximum setpoint)

Setpoint input X 23.5/6 can be adjusted in the range of $\pm 5... \pm 13$ V, setpoint input X 23.5/7 can be adjusted in the range of 10...27 mA.

It is also possible to set a unipolar setpoint range:
 e.g., 0 ... +10 V with $f = f_{max}$ adjustment to +10 V
 $f = 0$ adjustment to +5 V

The $f=f_{max}$ adjustment and the $f=0$ adjustment can be made in any order.

| | | | |
|----------------|----------------|---|---------------------|
| all DMs, DS | normal display | short-time during f_{max} adjustment | automatic return |
| | Eu0 (0) | Eu1 (1) | |

factory adjustment to ± 10 V

Procedure:

- Switch line voltage on.
- Do not activate enable signal !
- Enter the analog value of the **maximum output frequency** at the setpoint connector.
- Select P15.
- Select 'Eu1' using the \uparrow or \downarrow keys. When adjustment is done, the display returns to 'Eu0'.
- Store the f_{max} adjustment by depressing the 'D' key. Another adjustment may be carried out.

P16 (A-0-0016) $f = 0$ adjustment (offset adjustment)

| | | | |
|----------------|----------------|---------------------------------------|---------------------|
| all DMs, DS | normal display | short-time during $f=0$ adjustment | automatic return |
| | Eo0 (0) | Eo1 (1) | |

Procedure:

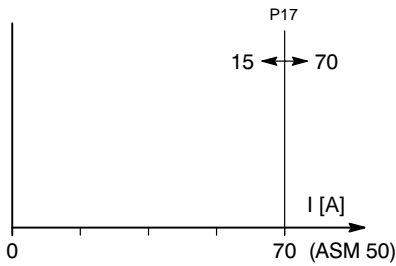
- Switch line voltage on.
- Do not activate enable signal !
- Enter the analog value for the **output frequency of 0 Hz** at the setpoint connector.
- Select P16.
- Select 'Eo1' using the \uparrow or \downarrow keys. When adjustment is done, the display returns to 'Eo0'.
- Store the $f=0$ adjustment by depressing the 'D' key. Another adjustment may be carried out.

5.1.7 Current limit

The admissible maximum current can be lower than the value selected via this parameter depending on the clock frequency and the heat sink temperature.

The actual value is displayed via A11 'Actual current limit'.

P17 (A-0-0017) I_{max} reduction in general

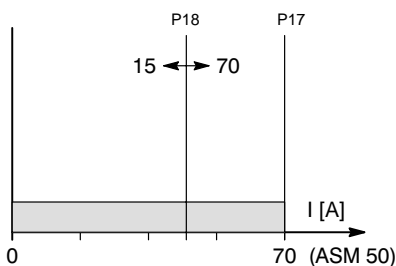


| | min. | Range [A] | max. |
|-------------|------|-----------|--------|
| DM 4K | 0.9 | 0.1 | 9.5 A |
| DM 8K | 0.9 | 0.1 | 9.5 A |
| DM/DS 15K | 1.5 | 0.5 | 15.9 A |
| DM 30K/A | 3.1 | 0.5 | 31.8 A |
| DM/DS 45K/A | 4.7 | 0.5 | 47.7 A |
| DM 85B | 9.5 | 0.5 | 95.4 A |
| DM140D | 12.7 | 0.5 | 127 A |

factory setting

P18 (A-0-0018) I_{max} reduction with I_{red} signal

Limitation with 24V signal at terminal strip X13.4 (I_{RED}).



| | min. | Range [A] | max. |
|-------------|------|-----------|--------|
| DM 4K | 0.9 | 0.1 | 9.5 A |
| DM 8K | 0.9 | 0.1 | 9.5 A |
| DM/DS 15K | 1.5 | 0.5 | 15.9 A |
| DM 30K/A | 3.1 | 0.5 | 31.8 A |
| DM/DS 45K/A | 4.7 | 0.5 | 47.7 A |
| DM 85B | 9.5 | 0.5 | 95.4 A |
| DM140D | 12.7 | 0.5 | 127 A |

≤ P17 limits

factory setting

☞ Setting P17 subsequently to a value lower than P18 will render P18 ineffective (P18 display flashing).


5.1.8 Emergency braking

When the external enable signal FG has been deactivated, the drive is braked with the braking ramp selected via P12 until the output frequency $f = 0$ is reached.

The braking ramp is extended if there is danger of exceeding I_{max} .

P19 (A-0-0019) Activate emergency braking

| | | |
|----------------|------------|-------------------|
| all DMs, DS | Coasting | emergency braking |
| | br0 (0) | br1 (1) |

 factory setting


5.1.9 Zero speed monitoring


With the help of the zero speed monitoring function, the frequency inverter detects that the motor has stopped even without an additional motor encoder.

For further information, see Section 5.2.2 .

P20 (A-0-0020) Zero speed monitoring

| | | |
|----------------|------------|------------|
| all DMs, DS | off | on |
| | bu0 (0) | bu1 (1) |

 factory setting

 **The display flashes and 'bu1' cannot be turned on if the FG enable signal had previously been active. In this case, toggle the line voltage off/on, then select 'bu1'.**



DANGER
Zero speed monitoring is only ensured if the motor is in zero speed condition when the monitoring function is activated!

5.1.10 Direct current braking

The frequency inverter generates a direct current in the motor windings in order to prevent uncontrolled deceleration and to build up a holding torque at zero speed.



CAUTION

Frequent direct current braking may overheat the motor.
The electronic bimetal function (P43 – P45) protects the motor.

P21 (A-0-0021) Activation of the direct current brake

| | off | on | on without $f_{act}=0$ braking |
|------------------|------------|--|--|
| all DMs, DS | dc0 (0) | dc1 (1) | dc2 (2) |
| FG active | – | DC braking: – if $f_{act} = 0$ or – with DCB signal* if $f_{act} < f_{start}$ P24 | DC braking only with: – DCB signal* if $f_{act} < f_{start}$ P24 |
| deactivate FG | – | DC braking: – if P19 = br1 – if $f_{act} < f_{start}$ P24 – for P23 braking time | |

 factory setting


* DCB signal = 24 V signal at X06.8

P22 (A-0-0022) Braking current

The amount of the braking force or the holding torque at zero speed is determined by the braking current. If the braking current is higher, the motor heats up faster.

Typical setting range: \leq rated motor current.


| | min. | Range [A] | max. |
|-------------|------|-----------|--------|
| DM 4K | 0.9 | 0.1 | 6.7 A |
| DM 8K | 0.9 | 0.1 | 6.7 A |
| DM/DS 15K | 1.5 | 0.5 | 11.2 A |
| DM 30K/A | 3.1 | 0.5 | 22.5 A |
| DM/DS 45K/A | 4.7 | 0.5 | 33.8 A |
| DM 85B | 9.5 | 0.5 | 67.7 A |
| DM140D | 12.7 | 0.5 | 90.3 A |

 factory setting

P23 (A-0-0023) Braking/stopping time

The braking/stopping time refers to DC braking when the enable signal has been deactivated (see page 5-14).


| | min. | Range [sec] | max. |
|-------------|------|---------------------------------|---------|
| all DMs, DS | 0.1 | 0.1 1 100 smallest step | 999 sec |

 factory setting

P24 (A-0-0024) Direct current brake starting frequency (f_{start})

The direct current brake is activated if $f_{act} < f_{start}$, depending on P21.


| | min. | Range [Hz] | max. |
|-------------|------|---------------------------------|--------|
| all DMs, DS | 0.0 | 0.1 1 100 smallest step | 999 Hz |

 factory setting

5.1.11 Suppression of resonant frequencies


The suppression of resonant frequencies serves to suppress mechanical resonant sounds of the machine and thus to achieve smooth machine operation.

A maximum of 3 frequency ranges can be suppressed. The center frequencies and bandwidths of the desired ranges must be entered in order to be able to pass these ranges as fast as possible using the selected acceleration and braking ramps.

 The f_{max} and $f=0$ limit values are used by the drive even if they are within the suppressed range.

P25 (A-0-0025) Activate resonant frequency suppression

| | | |
|-------------|---------|---------|
| | off | on |
| all DMs, DS | Er0 (0) | Er1 (1) |

 factory setting

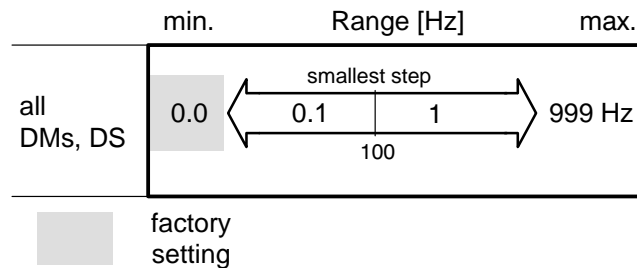
P26 (A-0-0026) Center frequency 1

Example:

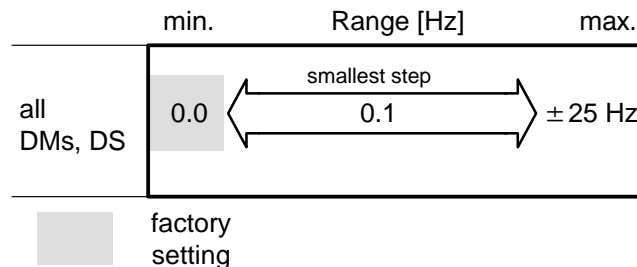
Resonant frequencies occur in the 60–65 Hz range.

Setting:

1. P25 = Er1
2. P26 = 62.5 Hz
3. P27 = 2.5 Hz



P27 (A-0-0027) Frequency band 1



P28 (A-0-0028) Center frequency 2 } Setting as above
 P29 (A-0-0029) Frequency band 2 }

P30 (A-0-0030) Center frequency 3 } Setting as above
 P31 (A-0-0031) Frequency band 3 }

5.1.12 Slip compensation

The slip compensation serves to compensate for the speed drop between no-load speed and load speed (= slip). Slip compensation is maintained within a large speed range independent of load or the direction of rotation.

Calculate setting value

Enter the rated motor slip as a % value.

It is calculated from the motor rating plate data according to the following formula:

$$s_N = 1 - \frac{n_N}{n_0} \quad [\%] \quad \text{with } n_0 = 60 \cdot \frac{f_N}{p}$$

$$s_N = 1 - \frac{n_N \cdot p}{60 \cdot f_N}$$

s_N = rated motor slip [%]
 n_N = rated speed [min⁻¹]
 n_0 = no-load speed [min⁻¹]
 f_N = rated motor frequency [Hz]
 p = number of pole pairs

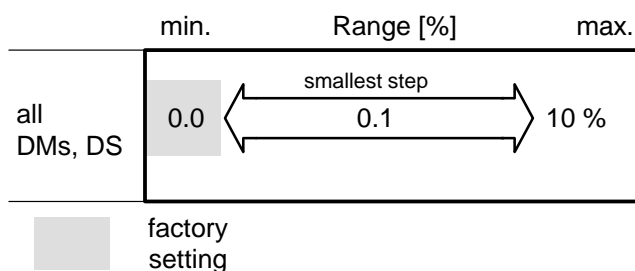
Optimize setting value

The calculated setting value is falsified by slight deviations of the actual motor data from the rating plate data.

For very precise applications, the setting value can therefore be corrected as follows after commissioning pursuant to Section 5.2:

- First set desired operating speed in no-load operation after commissioning.
- Apply a load to the motor.
- Correct speed drop of the motor via P32:

P32 (A-0-0032) Slip compensation



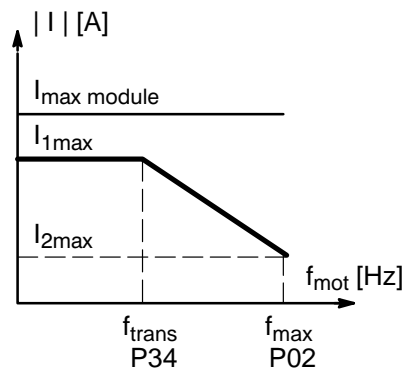
5.1.13 Stalling warning

The stalling warning serves to recognize the danger of overload on an asynchronous motor. Before the motor is electrically stalled and stops, the frequency inverter outputs the “ I_{limit} ” 24 V signal at X13.3 as a stalling warning.

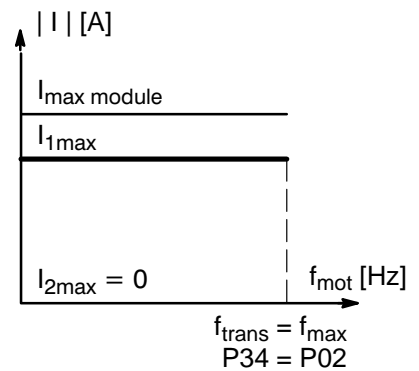
By evaluating this signal, the motor can be operated up to the critical output frequency f_{limit} . f_{limit} is in the field-weakening range, above this frequency, the motor cannot be overloaded, and useful operation is no longer possible.

For the stalling warning, a maximum admissible current limit below the module peak current is determined. This limit curve is designed to emulate the motor characteristic. It can be determined, e.g., by measuring the motor at different speeds on a test bench.

a) Asynchronous motors with field weakening



b) Asynchronous motors without field weakening



P33 (A-0-0033) Activate stalling warning

| | | |
|-------------|---------|---------|
| all DMs, DS | off | on |
| | UE0 (0) | UE1 (1) |

factory setting


P34 (A-0-0034) f_{trans} transition frequency

Starting point of the speed-dependent decrease of the current limit. The optimum value is determined by the specific application. The rated frequency entered via P07 can be selected as an approximate value:



P35 (A-0-0035) I_{1max} current limit up to f_{trans} transition frequency


| | min. | Range [A] | max. | |
|-------------|------|-----------|------------|--------|
| DM 4K | 0.9 | 0.1 | 9.5 A | |
| DM 8K | 0.9 | 0.1 | 9.5 A | |
| DM/DS 15K | 1.5 | 0.5 | 15.9 A | |
| DM 30K/A | 3.1 | 0.5 | 31.8 A | |
| DM/DS 45K/A | 4.7 | 0.5 | 47.7 A | |
| DM 85B | 9.5 | 0.5 | 95.4 A | |
| DM140D | 12.7 | 0.5 | 127 A | |
| | | | \leq P17 | limits |

 factory setting

P36 (A-0-0036) I_{2max} current limit for f_{max} maximum frequency

Final point of the speed-dependent linear fall of the limit curve:

| | min. | Range [A] | max. | |
|-------------|------|-----------|------------|--------|
| DM 4K | 0.9 | 0.1 | 9.5 A | |
| DM 8K | 0.9 | 0.1 | 9.5 A | |
| DM/DS 15K | 1.5 | 0.5 | 15.9 A | |
| DM 30K/A | 3.1 | 0.5 | 31.8 A | |
| DM/DS 45K/A | 4.7 | 0.5 | 47.7 A | |
| DM 85B | 9.5 | 0.5 | 95.4 A | |
| DM140D | 12.7 | 0.5 | 127 A | |
| | | | \leq P17 | limits |

 factory setting

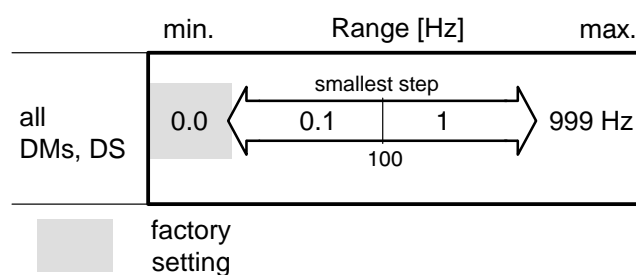
 **Using the factory setting, the ' I_{limit} ' message is signaled when the maximum module current is exceeded.**

5.1.14 Frequency warnings

Three 24V outputs are available at terminal strip X34 for monitoring the output frequency:

- **$f_{act} < f_x$**
Provides for the definition of a reference frequency f_x . The module monitors the actual output frequency f_{act} for falling below this value.
- **$f_{act} = f_{set}$**
Monitors whether the actual output frequency f_{act} matches the frequency setpoint f_{set} for $f = 0$.
- **$n = 0$**
When the external enable signal has been deactivated, the inverter recognizes when the motor has reached $n = 0 \text{ min}^{-1}$ and stops for approx. 1.5 sec
This output can only be selected, if $P20 = bu1$.
For messages, see Section 5.2.2 .

P38 (A-0-0038) Reference frequency for " $f_{act} < f_x$ "



5.1.15 Analog outputs

Analog outputs X23.8 and X23.9 can be assigned the current operating data.

 **For proper output signals, the rated motor power (P05) must be input.**

Level: 0 ... +10 V,
Current and power signals can be adjusted within the following ranges (P41, P42):

| Assignment | 10 V \triangle ... [] = factory setting | | | | | |
|------------------------------------|---|----------------------|--------------------|-------------------------------|---------------------|---------------------|
| | DM..4K DM..8K | DM..15K DS..15K | DM..30K DM..30A | DM..45K DM..45A DS..45K | DM..85B | DM..140D |
| Actual output frequency (AA0) [Hz] | max. output frequency (P02) | | | | | |
| Total current, rms (AA1) [A] | Standardization via P41: | | | | | |
| Active current, rms (AA2) [A] | 0.9...15 [9.5] | 1.5...25 [15.9] | 3.1...50 [31.8] | 4.7...75 [47.7] | 9.5...150 [95.4] | 12.7...200 [127] |
| Reactive current, rms (AA3) [A] | | | | | | |
| Motor voltage (AA4) [V] | 1000 V | | | | | |
| Link voltage (AA5) [V] | | | | | | |
| Total power (AA6) [kVA] | Standardization via P42: | | | | | |
| Shaft output (AA7) [kW] | 0.4...7.5 [7.5] | 0.7...12.5 [12.5] | 1.5...25 [25] | 2.3...37.5 [37.5] | 4.6...75 [75] | 6.2...100 [100] |
| Utilization (AA8) [%] | 200 % | | | | | |
| Heat sink temperature (AA9) [°C] | 100 °C | | | | | |

P39 (A-0-0039) Assignment of analog output X6.8

| | | | | | | | | | | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| all | AA0 | AA1 | AA2 | AA3 | AA4 | AA5 | AA6 | AA7 | AA8 | AA9 |
| DMs, DS | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |

 factory setting

P40 (A-0-0040) Assignment of analog output X6.7


| | | | | | | | | | | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| all | AA0 | AA1 | AA2 | AA3 | AA4 | AA5 | AA6 | AA7 | AA8 | AA9 |
| DMs, DS | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |

 factory setting

P41 (A-0-0041) Current standardization

for total current (AA1), active current (AA2) and reactive current (AA3)


| | min. | Range [A] | max. | |
|-------------|------|-------------|--------|--------------|
| DM 4K | 0.9 | 0.5 9.5 | 15.0 A | |
| DM 8K | 0.9 | 0.5 9.5 | 15.0 A | |
| DM/DS 15K | 1.5 | 0.5 15.9 | 25.0 A | |
| DM 30K/A | 3.1 | 0.5 31.8 | 50.0 A | |
| DM/DS 45K/A | 4.7 | 0.5 47.7 | 75.0 A | |
| DM 85B | 9.5 | 1.0 95.4 | 150 A | |
| DM140D | 12.7 | 1.0 127 | 200 A | ≤ P17 limits |

 factory setting

P42 (A-0-0042) Power standardization

for total power (AA6) and shaft output (AA7)

| | min. | Range [kW] | max. | |
|-------------|------|------------|---------|--------------|
| DM 4K | 0.4 | 0.1 | 7.5 kW | |
| DM 8K | 0.4 | 0.1 | 7.5 kW | |
| DM/DS 15K | 0.7 | 0.1 | 12.5 kW | |
| DM 30K/A | 105 | 0.2 | 25.0 kW | |
| DM/DS 45K/A | 2.3 | 0.5 | 37.5 kW | |
| DM 85B | 4.6 | 0.5 | 75.0 kW | |
| DM140D | 6.2 | 0.5 | 100 kW | ≤ P17 limits |

 factory setting

5.1.16 Motor protection function

On the DM..8001 (ASM) you may alternatively choose between two motor protection functions:

- Connection of a temperature sensor integrated in the motor winding head.
- Activation of the electronic bimetal function which provides for thermal motor protection without an integrated temperature sensor.

It is not possible to monitor several motors operated simultaneously at one inverter!

Temperature sensor

A PTC temperature sensor or switch may be connected to terminal strip X23.1/2 (cf. "Interface conditions" manual). This component needs no parameter settings.

Bimetallic function

As in the case of a bimetallic relay, the following parameters must be entered:

- Rated motor current (P04)
- Release current constant (P44)
- Release time (P45)

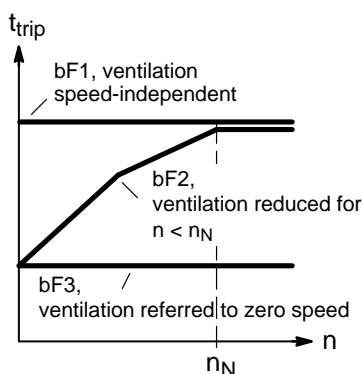
For safety reasons, the last thermal load value of the motor remains stored when the inverter is switched off. It will be taken as the initial value when switched on again.

When the inverter has been switched off, it should be switched on again while the motor is cooling down to keep identical values for the motor temperature and the bimetal model. Do not activate enable signal!

If the inverter remains switched off while the motor cools totally down, the bimetal model can be reset to zero:

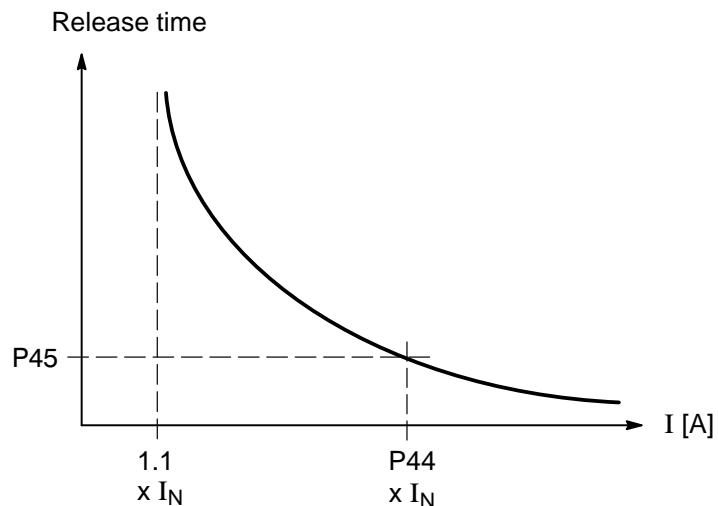
- by deactivating the bimetal function via P43 **and** subsequent mains off, or
- by selecting another parameter list using interface signals PL_A, PL_B, PL_C.

P43 (A-0-0043) Activate bimetal function



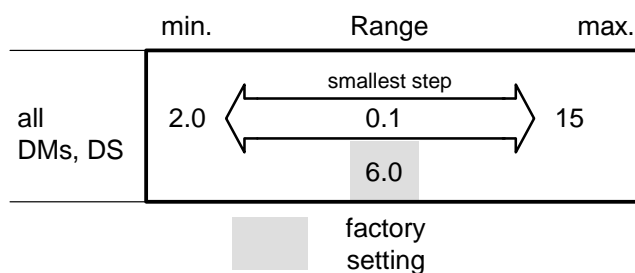
| | | | | |
|-------------|---------|---|--|--|
| all DMs, DS | off | on, n-independent, e.g. externally ventilated motor | on, $<n_N$ reduced, e.g. internally ventilated motor | on, $n=0$ n-related, e.g. fan switched off |
| | bF0 (0) | bF1 (1) | bF2 (2) | bF3 (3) |

factory setting

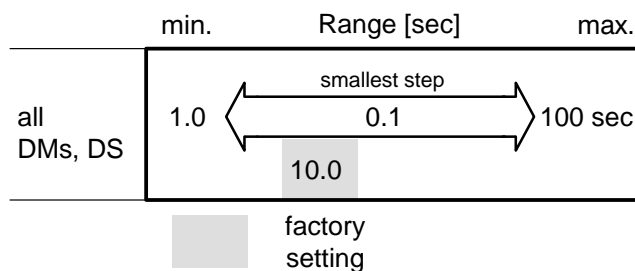


P44 (A-0-0044) Release current constant

The value to be adjusted must be obtained from the motor manufacturer. It is referred to speed-independent ventilation ('bF1' characteristic).



P45 (A-0-0045) Release time



5.1.17 D.C. link control in the event of a power failure

If no line voltage is present, the frequency inverter maintains the d.c. link by using the kinetic motor energy, thus providing for safe braking up to motor zero speed. The time required for braking only depends on the external moment of inertia.

- **Power failure, power interruption or EMERGENCY-STOP**
The braking operation starts as soon as the voltage drops below the undervoltage limit. If the line power returns during the braking phase, the inverter accelerates in a controlled restart operation in accordance with the acceleration ramp setting.
- **Braking with setpoint control**
The braking operation starts when the d.c. link voltage exceeds 700 V. Depending on the external moment of inertia, the inverter extends the braking ramp selected in P12 and maintains the d.c. link voltage at 700 V.

P47 (A-0-0047) D.C. link control in the event of a power failure

| | | | | |
|----------------|------------|---|---|--|
| all DMs, DS | Off | On, power failure and EMER- GENCY-STOP | On, setpoint-con- trolled braking | On, power failure, EMERGENCY- STOP and braking |
| | bc0 (0) | bc1 (1) | bc2 (2) | bc3 (3) |

factory setting for ASM

5.1.18 Default setting

The factory settings quoted for every parameter are replaced by individual optimization without getting lost.

Using P46, all parameters of the current list can be reset to the factory settings. The values that have been optimized for specific needs are deleted.



CAUTION

Loss of data!

The optimization data of the current parameter list get lost when selecting 'Default setting'.

P46 (A-0-0046) Load default setting

The default setting is only loaded into the selected parameter list.

| | | | |
|----------------|----------------|-------------------------------------|---------------------|
| all DMs, DS | normal display | default setting (+ mains off/on) | automatic return |
| | LP0 (0) | LP1 (1) | |

For loading the default setting:

1. Select 'LP1' (existing values still remain active)
2. Switch mains voltage off and on again.
The default setting is active, the display shows 'LP0' again.

5.2 Commissioning

- All parameters have been checked and all necessary adjustments have been made according to Section 5.1.
- Set setpoint selection to '0'.
- Activate enable signal. The basic operating display is shown. For a description, see Section 2.1.
- Carefully increase setpoint. The motor speed must increase accordingly.
- If the motor has been properly connected, a positive setpoint will cause the motor to rotate clockwise (when looking at the motor shaft).
- Slowly increase setpoint up to maximum value. Check the maximum admissible speed for clockwise and counter-clockwise rotation. The direction of rotation is changed by reversing the polarity of the setpoint cables connected to X6.5 and X6.6.

5.2.1 Subsequent optimization during operation

During operation, the drive behavior can be further improved. When the enable signal FG has been activated, the following parameters can be subsequently optimized:

| | |
|-----------|--------------------------------|
| P09, P10 | I x R compensation |
| P11 | Acceleration time |
| P12 | Braking time |
| P14 | Keyboard setpoint |
| P22 – P24 | Direct current braking |
| P32 | Slip compensation |
| P33 – P36 | Stalling warning |
| P37, P38 | Frequency monitoring functions |
| P39 – P42 | Analog outputs |
| P48, P49 | 2-step acceleration ramp |

 **For safety reasons, some of these values can only be changed step by step.**

5.2.2 Operation with zero-speed control

Zero-speed control may serve as a protective function which can also be used if two identical motors are operated by one inverter.

For activating zero-speed control, activate parameter P20.
If the FG enable signal had been activated before, first cycle power to the unit, then activate P20.



DANGER

Zero-speed control is guaranteed only if the motor is standing when monitoring is switched on!

The following messages are output in connection with zero-speed control.

| External enable signal FG | Motor status | Messages | |
|---------------------------|---------------------------------|-----------|----------------|
| | | FGI relay | X34.3 n = 0 |
| on | running or standing (operation) | | 0 V |
| off | decelerating | | 0 V |
| | standing | | 24 V |

5.3 Multiple-motor drive

Several asynchronous motors with the same rated frequency and identical rated voltages can be operated simultaneously at one inverter. The motor power may be different.

Please note:

- The total motor power connected must not exceed the maximum output power of the inverter.
- Higher acceleration and braking times are to be expected.
- It is possible to start additional motors during operation.
If the module peak current is thereby exceeded, the messages limit current (I_{limit}), overcurrent (F22) or driver fault (F20) may be signaled.

Adjustments

The following settings must be checked:

- I x R compensation P09, P10
Overexcitation or underexcitation of the motors during operation should be avoided.
- acceleration and braking times P11, P48, P49, P12
- direct current brake P21 – P24
A test should be carried out whether DC braking makes sense with the multiple-motor drive connected.

Restictions

The following inverter functions cannot be used with multiple-motor drives:


- type of characteristic with torque boost P08
- slip compensation P32
- stalling warning P33
- bimetal function P43

 **These functions must remain disabled.**

Notes:

6 Series Commissioning

During series commissioning, all data backed up with 'IDN Backup' (cf. page 4–11) after initial commissioning of a drive are loaded to and saved in all other drives.

 **If your application involves drives with different settings, parameters may be changed directly in the parameter file. Please observe the syntax requirements when making changes.**

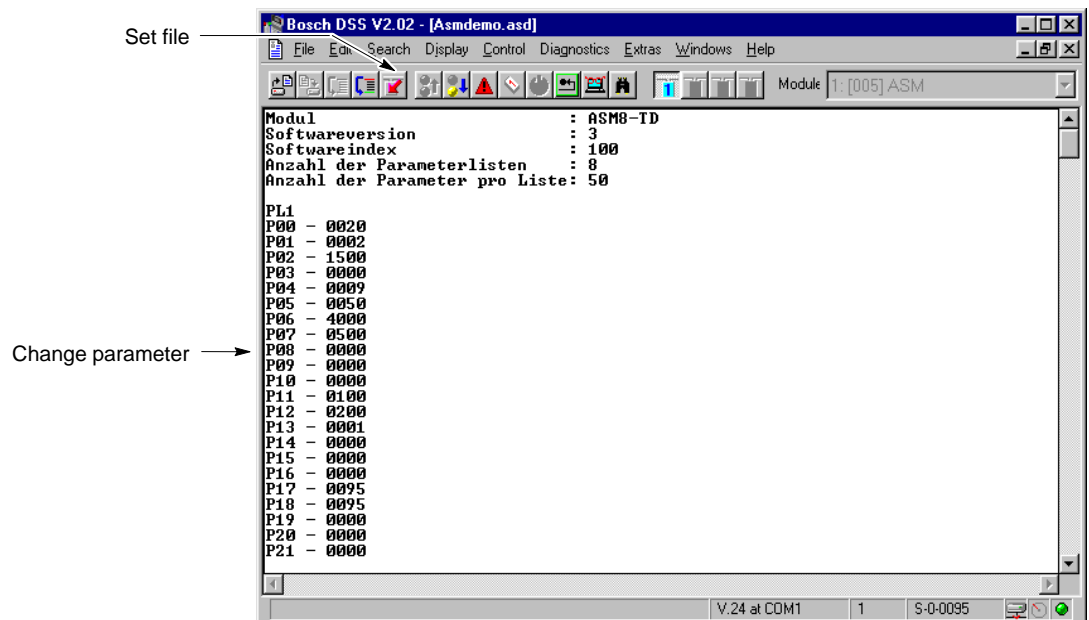
★ Make sure that all of the hardware checks described in section 2 have been properly carried out.

6.1 Edit and load *.asd file

The *.asd file can **only** be opened **in the main menu** in order to be edited with a file editor.

1. Select menu sequence FILE ► OPEN ► ASM FILE


The editor is started by hitting "OK" in the Open dialog:



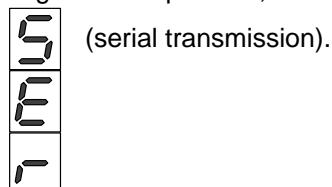
2. Change the desired parameters in the actual file. Please observe the syntax requirements when making changes.

3. The modified file may be transmitted to the drive, however, it has to be **saved** beforehand.

Select the menu sequence: FILE ► SAVE


-  **If the error "Module1: Date of Axx currently write-protected" is displayed during transmission, the write protection was not disabled by pressing the boot button (cf. page 5-1).**

4. Click on the "Set" command button. (cf. figure above).
During the write process, the 7-segment display on the inverter shows



- ★ Close the editor.
- ★ If necessary, perform a setpoint calibration (see page 5-11).


6.2 Couple next drive

- ★ Remove the connection line from X99 and plug it to X99 of the next module to be commissioned.
- ★ Initialize the new module:
 - with menu sequence
CONTROL ► RESET DSS,
-or-
 - by clicking on  in the icon bar.

7 Firmware Update

New drives are always equipped with the most current firmware release. A firmware update is not necessary in this case.


For existing plants, a firmware update may be necessary in special cases. Your Bosch Service team will be pleased to advise you.

 **The drive's FEPRM will be cleared in the course of a firmware update! Therefore, you should make sure that a back-up of all relevant data of the drive has been made (cf. section 4.6) before carrying out a firmware update!**

★ In order to perform a firmware update, please proceed step by step according to the following description.

7.1 Ensuring prerequisites

- ★ Link the drive in question to the PC and establish communication between the drive and the DSS. Please note the information provided in section 4.1.
- ★ Make sure that a data medium containing the new firmware is available. The label will contain the release number and date of the firmware.
- ★ Make a safety backup of the original data. In the course of the update process, you should only use this backup copy!

 **You may copy the original data to the DSS directory "c:\Bosch\DSS\Firmware\" for backup purposes. If this directory already contains data, these may be replaced.**

The system should now be in the following condition:

- 24 supply is switched on. The power has not been connected, the system has not been enabled.
- The display on the module shows "H".
- The PC screen shows the DSS basic image.

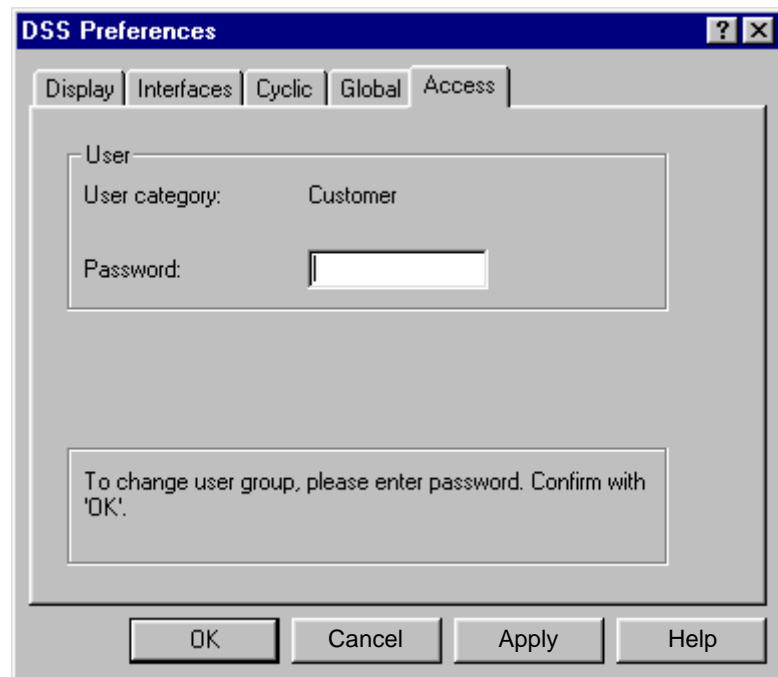
7.2 Selecting the download dialog

★ Proceed as follows:

1. Change the user group to "Bosch-Service (Level-2)".

Select the menu sequence:

EXTRAS ► DSS PREFERENCES ► ACCESS

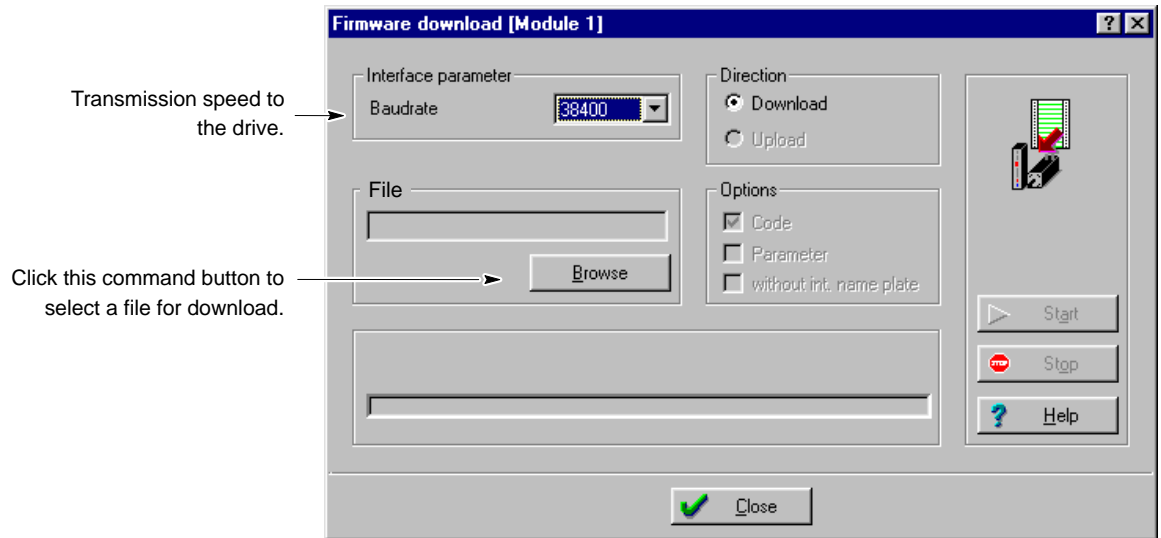


The user group is changed by hitting "OK" as soon as the relevant password has been entered.

You may obtain the password on request from Bosch Automationstechnik, Erbach:

- Tel.: +49 (0)6062-78-0
- Email: AT-Support-Drives@bosch.com

2. Select the menu sequence:
EXTRAS ► FIRMWARE DOWNLOAD ► SERVODYN-D (ASM)



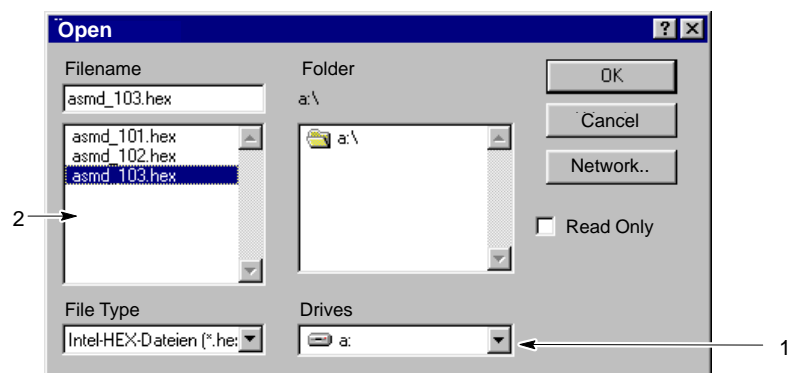
In the event of transmission problems:

- Select the lower next baudrate
- Use the shortest possible transmission cable (RS-232)
- If long transmission cables are used, an annular core may improve transmission.

7.3 Selecting file to be downloaded

★ Proceed as follows:

1. Insert the floppy disk containing the new firmware into the PC's drive "A".
2. Click on "Browse" command button (cf. Figure above).
The "Open" dialog is displayed:

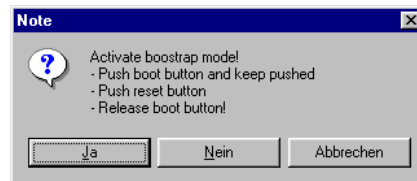


3. Click on (1) and select drive "a".
4. Click on the "asmd_ xxx . hex" file in the area (2). The DSS will now display the name of this file in the "File name" field.
5. Click on "OK" command button.
The "Open" dialog is closed. The system returns to the "Firmware download" dialog and shows the path and name of the selected file in the "File" field.

7.4 Starting the download

★ Proceed as follows:

1. Click on the "Start" command button in the "Firmware download" dialog. Then, the system checks whether the hex file necessary for the download is available. If this check was successful, you will be requested in an information dialog to activate the "Bootstrap mode" on the drive.



2. Activate the bootstrap mode on the drive. You need 2 pointed objects for this purpose, because the required buttons are operated through holes on the front panel of the inverter:
 - Press boot button below the two LEDs (FG and FGI) **and hold it down**. For this purpose, carefully press down the signal cross-link X810, which covers up the button.
 - Press RESET key (below X99) and release it. Then, within 2 seconds:
 - Release boot button and hit "Yes" command button in the information dialog.


If error messages are displayed, the required activities may not have been completed within the 2 sec timeout.

In this case, acknowledge the error messages by hitting "Ok".



The system will open an information dialog in which you are requested to RESET the drive and call up the "Init module type" function.


Follow the instructions displayed and then confirm the information dialog by hitting "Ok".

Repeat this procedure from point 1.

 **If no communication can be established even after several attempts, reduce the data transmission speed to the lower next level.**

If the bootstrap mode was successfully activated, the download to the inverter will be started. The 7-segment display shows:

 (deleting the existing firmware), then  (loading)

 **If the power supply of the devices involved, or the link between them, is interrupted while the firmware is deleted or programmed, the drive inverter will no longer have a firmware suitable for communication!**

In this case, restart the DSS in offline mode and select EXTRAS ► FIRMWARE DOWNLOAD ► SERVODYN-D (ASM).

Restart the download process as described above. In the course of this process, the window for establishing connection is displayed.

3. When this process has been completed, press the RESET button (below X99) or toggle the 24V supply to the drive off/on. Now the drive will be rebooted.



7.5 Restoring the drive data

1. Click on the "Bosch DSS" command button in the task bar of the operating system. The screen shows the DSS basic image.
2. Select the following menu from the DSS basic image:
CONTROL ► DSS RESET
3. Restore the required parameter settings from your backup file to the drive.
This process has been described in connection with series commissioning in section 6.1.
The firmware update has now been completed.

Notes:


8 Displays on the Module

8.1 Status / warning displays


| LED | Status | Measures |
|---|---|----------|
|  FG | Axis enable external if <ul style="list-style-type: none"> • 24 V at X06.3/4 (FG) present | – |
|  FGI | Enable internal if <ul style="list-style-type: none"> • 24 V at X06.3 (FG) present • Central enable by VM present • no faults | – |




3-digit 7-segment display

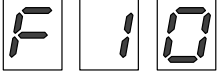










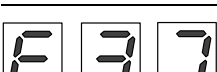
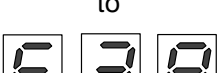
| | | |
|--|--|--|
|  <p>Computer booted TEMP STA</p> | <p>Operating display:</p> <ul style="list-style-type: none"> • STA is present if: <ul style="list-style-type: none"> – computer has been booted – no faults <p>Temperature status:</p> <ul style="list-style-type: none"> • TEMP is present if: <ul style="list-style-type: none"> – Temperature of the heat sink or the motor (with active bimetal function) is within the permitted range • TEMP relay is closed | <p>–</p> <p>If no display (temp. exceeded):</p> <ul style="list-style-type: none"> • Check air supply, fan • Reduce clock frequency or load • Select motor with higher rating • Verify bimetal setting |
|--|--|--|


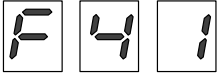

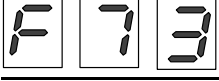
More operating data can be read from the 7-segment display. For operation, refer to section 3.3.

|  | Read from DSS | Unit | Description | |
|---|---------------|------|-------------------------------------|---|
| A00 | A-0-1000 | Hz | Actual output frequency f_{act} | Current motor frequency |
| A01 | A-0-1001 | Hz | Setpoint output frequency f_{set} | Specified output frequency |
| A02 | A-0-1002 | A | Total current | rms value of the total current |
| A03 | A-0-1003 | A | Active current | rms value of the active current |
| A04 | A-0-1004 | A | Reactive current | rms value of the reactive current |
| A05 | A-0-1005 | V | Motor voltage | rms value of the current motor voltage |
| A06 | A-0-1006 | V | Link voltage | Current value of the link voltage. (Display = 350 V for voltage values \leq 350 V) |
| A07 | A-0-1007 | kVA | Total power | Current total power |
| A08 | A-0-1008 | kW | Shaft output | Current mechanical shaft output of the motor |

|  | Read from DSS | Unit | Description | |
|---|---------------|------|-----------------------------------|--|
| A09 | A-0-1009 | % | Utilization | Current utilization of the motor, for $f < f_N$ with respect to the motor torque M_N for $f > f_N$ with respect to the motor power P_N Accuracy: depending on the motor, for $n > 0.1 n_N$ approx. 5% of the final value |
| A10 | A-0-1010 | °C | Heat sink temperature | Current heat sink temperature. With increased heat sink temperature: Warning 'U01', TEMP relay is opened. |
| A11 | A-0-1011 | A | Present current limit | The currently active current limit is adjusted depending on the selected settings and the current heat sink temperature. |
| A12 | A-0-1012 | | TEMP warning | WARNING after deactivation of TEMP relay: |
| | | | U00 | no warning |
| | | | U01 | heat sink temperature too high |
| | | | U02 | motor temperature too high. Only if bimetal function P43–P45 is active. |
| | | | U03 | heat sink and motor temperature too high. |
| A13 | A-0-1013 | | Last fault after STA deactivation | After restart, the last error present before STA was deactivated is displayed. |
| A14 | A-0-1014 | | Software version | Number left of point = software status Number right of point = software scope. Please quote in all communication. |
| A15 | A-0-1015 | | Software index | Index of operating software release, please quote in all communication. |

8.1.1 Fault messages

| Displays in vertical arrangement on the module | Fault | Measures |
|---|--|--|
| | Drive was switched off. | |
|  | Power supply unit fault Internal or external 24 V supply voltages beyond the admissible range | <ul style="list-style-type: none"> • Check module cross-link • Replace module |
|  | Overvoltage / Driver fault Power output stage was switched off because of a fault in the power supply unit | <ul style="list-style-type: none"> • Check output stage • Replace module |
|  | Short-circuit or ground fault in the load circuit Motor or motor cable defective | <ul style="list-style-type: none"> • Measure motor and motor cable • Check output stage |
|  | Overcurrent Admissible module peak current exceeded for > 2 sec | <ul style="list-style-type: none"> • Reduce load • Flatten braking & acceleration ramps • Check application |
|  | Overvoltage in link $U_{Ink} > 860 \text{ V}$, unless F20 | <ul style="list-style-type: none"> • Check mains voltage • Reduce braking power |
|  | Motor connection Motor not properly connected | <ul style="list-style-type: none"> • Check motor connection |
|  | Heat sink overtemperature | <ul style="list-style-type: none"> • Check air supply • Check fan |
|  | Motor overtemperature Electronic bimetal function signals motor overload | <ul style="list-style-type: none"> • Check bimetal setting • Check motor rating |
|  | Motor overtemperature PTC connection signals motor overload | <ul style="list-style-type: none"> • Check motor rating |
|  | Signal cross link (computer driver) hardware fault | <ul style="list-style-type: none"> • Replace module |
|  | Signal cross link (computer driver) runtime error | <ul style="list-style-type: none"> • Replace module |
|  <p style="text-align: center;">to</p>  | Driver fault Invalid driver parameters | <ul style="list-style-type: none"> • Replace module |

| Displays in vertical arrangement on the module | Fault | Measures |
|--|---|--|
|  | Drive was switched off. | |
|  | Error in RAM memory EEPROM cannot be read/written | <ul style="list-style-type: none"> • Replace module |
|  to  | Real-time error Processor error | <ul style="list-style-type: none"> • Restart module • Replace module |

A Appendix

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Bosch-Automationstechnik

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Industriehydraulik
Postfach 30 02 40
D-70442 Stuttgart
Fax (07 11) 8 11-18 57

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Mobilhydraulik
Postfach 30 02 40
D-70442 Stuttgart
Fax (07 11) 8 11-17 98

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Pneumatik
Postfach 30 02 40
D-70442 Stuttgart
Fax (07 11) 8 11-2 45 30

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Montagetechnik
Postfach 30 02 07
D-70442 Stuttgart
Fax (07 11) 8 11-77 77

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Antriebs- und Steuerungstechnik
Postfach 11 62
D-64701 Erbach
Fax (0 60 62) 78-4 28

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Schraub- und Einpress-Systeme
Postfach 11 61
D-71534 Murrhardt
Fax (0 71 92) 22-1 81

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Entgrattechnik
Postfach 30 02 07
D-70442 Stuttgart
Fax (07 11) 8 11-3 34 75

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
didactic
Berliner Straße 25
D-64701 Erbach
Fax (0 60 62) 78-8 33

Österreich

Robert Bosch AG
Geschäftsbereich
Automationstechnik
Hüttenbrennergasse 5
A-1030 Wien
Fax (01) 7 97 22-60 96

Schweiz

Robert Bosch AG
Geschäftsbereich
Automationstechnik
Industriestr. 31
CH-8112 Otelfingen
Fax (01) 8 47 14 99

Technische Änderungen vorbehalten

Ihr Ansprechpartner

BOSCH



Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Antriebs- und Steuerungstechnik
Postfach 11 62
D-64701 Erbach
Fax (0 60 62) 78-4 28