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Servodyn-D

Servodyn-D with analog interface Commissioning with DSS



Edition

103



BOSCH
Automation

Servodyn-D

Servodyn-D with analog interface Commissioning with DSS

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1 Safety Instructions


Please read this manual before commissioning the Servodyn-D drives with analog interface. Store this manual in a place to which all users have access at any time.

1.1 Proper use

This manual contains all information required for the proper 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 Directive (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 machine directive (98/37/EC, 98/79/EC) 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 (central association of the electrical industry) and VDMA (association of German machine and plant builders). Please refer to the following publication (in German language):

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

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 826-09-01 (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!



Danger 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 injuries**.




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 injuries, 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**

All ESD protection measures must be observed when using the modules! Prevent electrostatic discharges!

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 M Ω 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 Servodyn-D series of drives with analog interface.

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 | – | – |
| 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 – Parameter description | (replaced by 1070 066 018) | (replaced by 1070 066 038) | (replaced by 1070 066 068) | – |
| Servodyn-D with analog interface – Commissioning manual | 1070 066 014 | 1070 066 034 | – | – |
| Servodyn-D with motion control – Commissioning manual | 1070 066 015 | 1070 066 035 | – | – |
| 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 current inverter software release number can be viewed by selecting parameter S-0-0030 with the DSS-D Commissioning and Service System, or in the "Software" field of the module configuration display (DIAGNOSTICS ► MODULE CONFIGURATION).

 The current VM software release can only be read from the 7-segment display during test operation. For this purpose, turn dip switch "T" on the VM's personality module "on".

The following appears in a running, flashing display:
"Cxx.ZZ.ddmmyyyy"

Where: **xx** = software release number
ZZ = (internal)
dd = software creation day
mm = software creation month
yyyy = software creation year

 **The present manual applies to the following releases:**

VM software: 0.xxx or higher
Drive software: 0.005 or higher
DSS software: 1.01 or higher

Modifications

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



This symbol is used in illustrations to call your attention to any modifications made.

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.

SERCOS interface® is a registered trademark of Interessengemeinschaft SERCOS interface e.V.

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 damages to the machine and drives or even personal injuries!

- **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 PC's on which the Windows™ operating system has been installed.

- ☞ **The description of all individual parameters, their mode of functioning and precise programming is included in the "Servodyn-D parameter description" manual. This description forms the basis of the present manual!**

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!

- ★ Unplug all connectors/terminals from the inverter.
- ★ 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).

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 342 ... 510 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 inverter. Check connectors for proper assignment.
- ★ Turn the 24 V supply on.
The 7-segment display at the inverter must display "4". The indications "Fxx" and "Hxx" are fault messages, for more information please refer to the diagnostics manual.
Fault "H01":
The 24 V supply is outside the admissible tolerance, i.e. the supply may be overloaded.

Additional information may be contained in drive parameter S-0-0095. Establish communication between the PC and the drive to display the parameter on the DSS monitor.

Control logic for EMERGENCY-STOP braking of the motor

- ★ Check logic for proper functioning according to planning engineer's data. If a plug braking resistor is used, an auxiliary contact of the contactor must be provided to ensure that the drive cannot be enabled unless the braking resistor has been deactivated. The "Plug brake enable delay" must be disabled (=0) for this test.
The contactor is driven by output "OUT4" of the inverter.

 **In order to avoid faults and overload, a relay must be connected in series.**

Holding brake

- ★ Check holding brake for proper functioning if the motor is equipped with a holding brake.
The holding brake is released when 24VDC are connected.
The contactor is triggered by the "OUT3" output of the inverter.

 **In order to avoid faults and overload, a relay must be connected in series.**

Limit switches

- ★ Make sure that the two limit switches have been properly wired.
- ★ Make sure that the distance to go between the limit switch response and the axis' fixed stop is large enough to halt the axis before the fixed stop is reached.
- ★ Check the hardware limit switches for proper functioning.

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.

Notes:

3 DSS user interface

3.1 Establishing communication between the drive and DSS

Connection between PC and drive

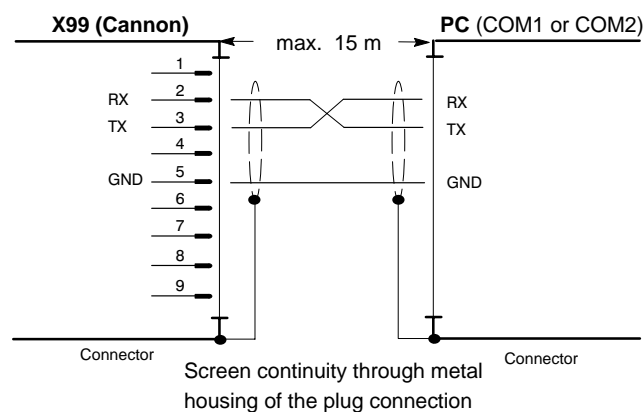
- ★ To avoid communication faults between the PC and the drive, please note the following:
 - We recommend using the pre-assembled Bosch connection cable, part no.: 1070 077 753, length 5 m
 - Distance between connection cable – power cables: at least 20 cm.
 - Do not permit inductive or capacitive coupling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

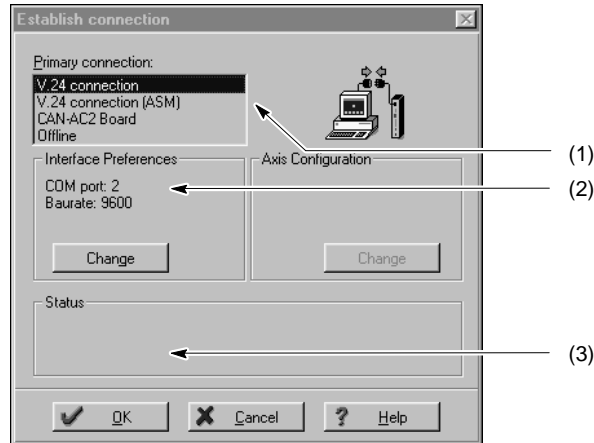


Assignment:

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

Configuring the interface

- ★ Switch on the 24V supply of the system.
If display H1 of the inverter does **not** show any of the values "0", "1", "2", "3", or "4", check the system as described in section 2.1.
- ★ 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:

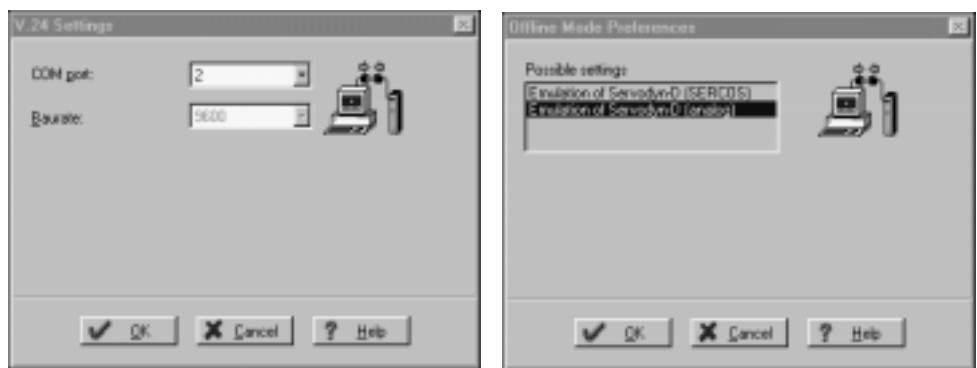


This dialog may also be invoked manually when the connection has been successfully established:

- menu sequence **OPTIONS ► PREFERENCES ► INTERFACE -or-**
- by clicking on the  command button in the DSS basic image.

- ★ in the "Primary connection" field (1): **V.24 connection**
- ☞ **If no inverter is connected, the DSS may also be operated "offline". In this case, it will simulate an inverter.**

- ★ Set the data in the "Interface Preferences" field (2) through one of the following dialogs:



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

- ★ Clicking on "OK" in this dialog will cause the DSS to try and 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 RESET or a module change

If, while DSS is running, you

- disconnect the connection cable from the inverter (e.g. for starting up a new drive), or
- press the RESET key of 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!

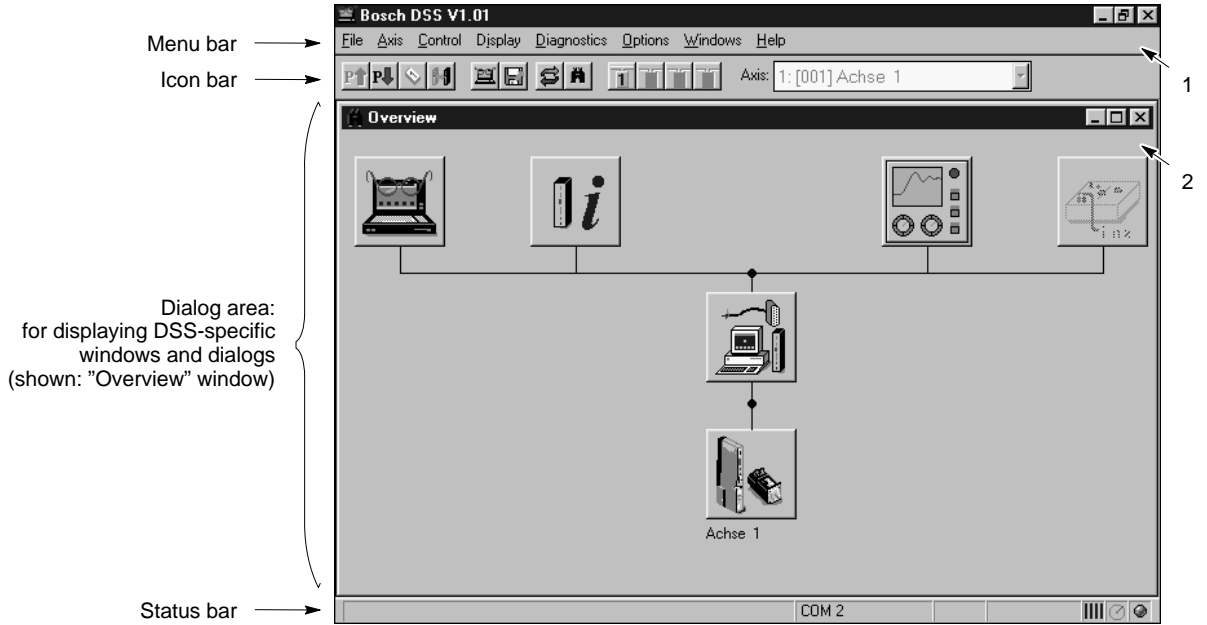
For as long as the drive is enabled, you must neither press the "Reset" key nor disconnect the cable between the DSS and the drive. First stop the movement and disable the drive.

Initiate the "Initialize module type" command:

- menu sequence
CONTROL ► RESET ► INIT. MODULE TYPE,
-or-
- click on  in the icon bar.

3.2 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.



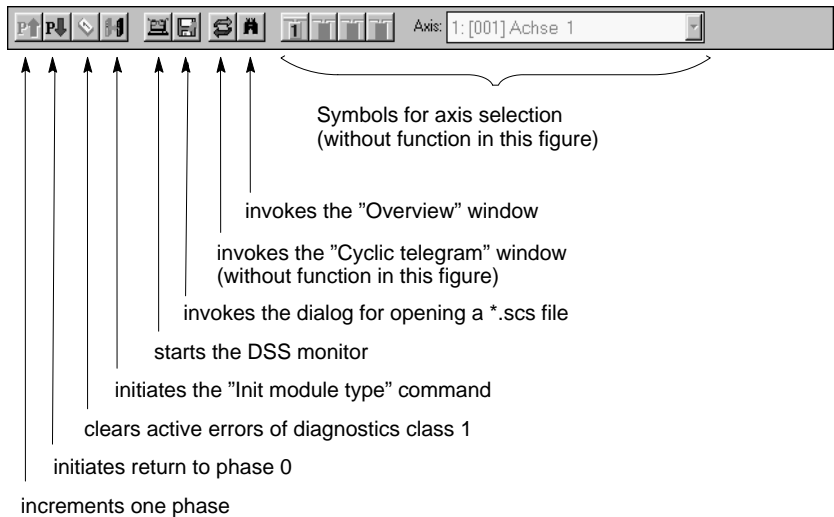
1 Changes the DSS program window and exits the program.

2 Changes a DSS-specific window

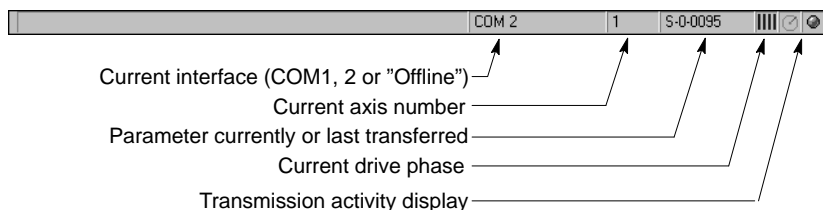
Please note that iconized window symbols may be covered by open windows. Covered windows can be displayed by selecting the "Windows" menu.

Icon bar

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

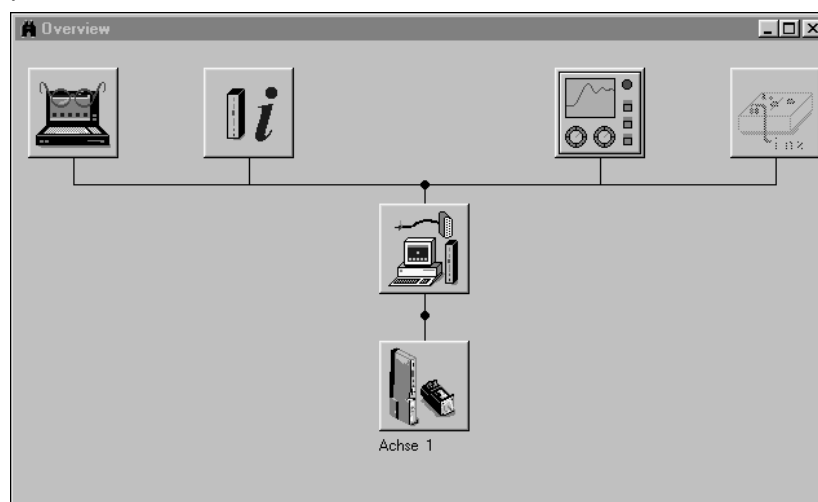


Status bar









”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 on-line) - Load file (edit parameter off-line) - DSS expert - DSS post office (not with analog interface) |
|  | (Global information) | ➔ | <ul style="list-style-type: none"> - Module configuration - Module status display - I/O signals - Cyclic telegram (no function with analog interface) - Watch parameter numbers |
|  | (Oscilloscope, no function with analog interface) | | |
|  | (Setpoint generation, only for user group of ”Service Level 2”) | ➔ | <ul style="list-style-type: none"> - Setpoint box - Setpoint generator |
|  | (Interface) | ➔ | <ul style="list-style-type: none"> - starts the ”Establish connection” dialog |
|  | (Axis x) | ➔ | <ul style="list-style-type: none"> - calls up predefined parameter lists |

3.3 DSS monitor


The DSS monitor offers direct **Online access** to all parameters stored in the drive.

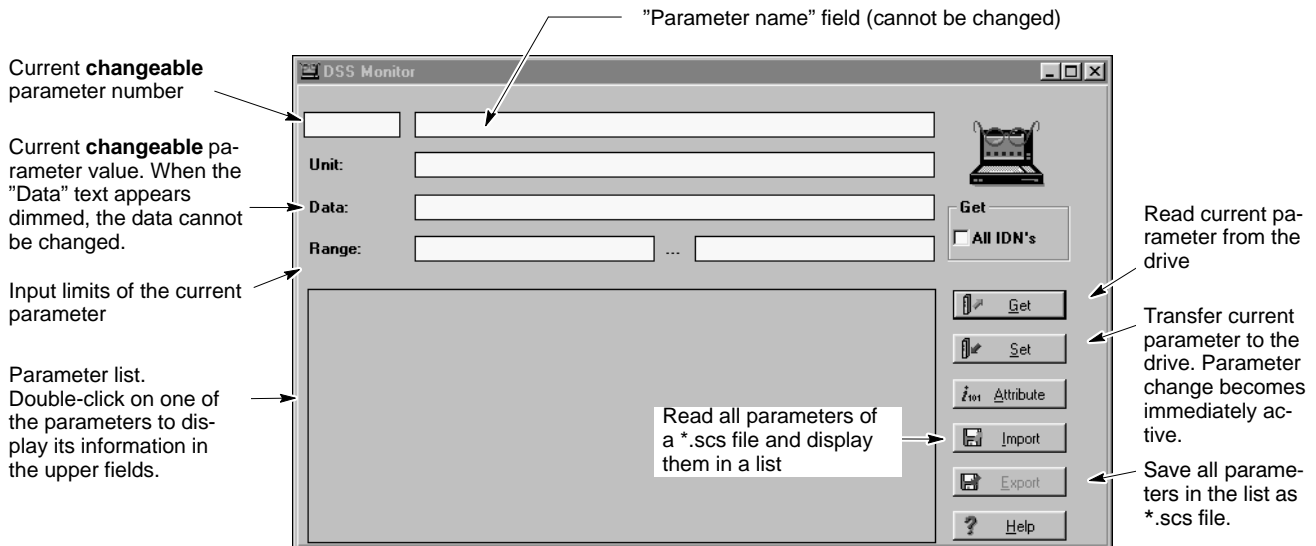
You may:

- edit parameters
- save a list of several parameters as initialization file (*.scs) of the drive. For each drive, several *.scs files can be created, e.g. for certain drive functions or commissioning steps
- transmit *.scs files to the drive (cf. page 4–20)

★ Start the "Monitor"

- menu sequence DISPLAY ► MONITOR, or

- by clicking on the  command button in the icon bar or in the DSS basic image



Single parameter

1. Click on the "Parameter number" field
2. Enter the parameter number to be edited.
The following syntax options may be used:
 - complete, e.g. "S-0-0040" or "P-0-0100"
 - simplified, e.g. "s40" or "p100"
 - only the number of S parameters, e.g. "40" instead of "S-0-0040".
3. Press <RETURN> or click on the "Get" button to read the parameter from the drive.
If the parameter has not been defined in the drive, a fault message will be displayed.
4. Modified parameters can be transferred back to the drive with "Set" where they will become immediately active.
For this purpose, you should switch the drive to a phase in which the current parameter can be changed. This information is found in the "Changeable" field of the attributes bar for the parameter in question as described in the "Servodyn-D parameter description" manual.
For changing phases, refer to section 3.6.1, page 3–12.

Once they have been transferred, the parameters will remain active only until you switch off the drive or press the RESET button on the inverter.

If the parameters should be permanently active in the drive, you have to perform the "Save main memory" command (cf. section 3.6.2).

All imported parameters are combined in a parameter list which can be saved in a *.scs file using the "Export" command.

To delete parameters from the list: click on the list line in question and press key.

Parameter lists

By clicking on the "Import" command button, all parameters of a *.scs file are displayed in list format on the screen.



More parameter lists can be opened by clicking on the command button.

The following predefined subject areas are available:

- Controllers (speed, position or current)
- Amplifier
- Motor or
- Encoder.

Current parameter

Current **changeable** parameter value. When the "Data" text appears dimmed, the data cannot be changed.

Input limits of the current parameter

List of all parameters of the subject area in ascending order. Double-click on one of the parameters to display its information in the upper fields.

If active: Clicking on "Get" command button will read all parameters of the list from the drive.

Transfer current parameter to the drive. Parameter change becomes immediately active.

Save all parameters in the list as *.scs file.

| ID | Code | Name | Value | Unit |
|----|----------|---------------------------|-----------|--------------------|
| 1 | S-0-0036 | Velocity Command Value | 8.9930 | RPM |
| 1 | S-0-0037 | Additive Velocity Comm... | 0.0000 | RPM |
| 1 | S-0-0040 | Velocity Actual Value | 9.7583 | RPM |
| 1 | S-0-0043 | Velocity Polarity Para... | ... | |
| 1 | S-0-0091 | Bipolar Velocity Limit... | 2000.0000 | RPM |
| 1 | S-0-0100 | Velocity Loop Proporti... | 49.9 | |
| 1 | S-0-0101 | Velocity Loop Integral... | 10.0 | ms |
| 1 | S-0-0138 | Bipolar Acceleration | 2999.804 | rad/s ² |
| 1 | S-0-0157 | Velocity Window | 14.9998 | RPM |
| 1 | S-0-0330 | Message 'nactual = nco... | ... | |
| 1 | S-0-0331 | Message 'nactual = 0' | ... | |
| 1 | P-0-0013 | Actual Value Smoothing... | 250.0 | |

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. When they have been changed, the parameters can be transferred back to the drive individually with "Set" where they will become immediately active if the drive has been switched to the appropriate phase (cf. above).

Transmitting a complete parameter list to the drive

To transfer a parameter list to the drive, you first have to save the list in a *.scs file (cf. above).

Then, this initialization file can be transmitted to the drive (cf. section 4.4 on page 4–20 ff.).

3.4 Selecting the language

The DSS user interface and the parameter and diagnostics texts from the drive have to be changed over separately in order to obtain a uniform language representation in the DSS.

Language of user interface

- ★ Select: OPTIONS ► PREFERENCES ► PROGRAM

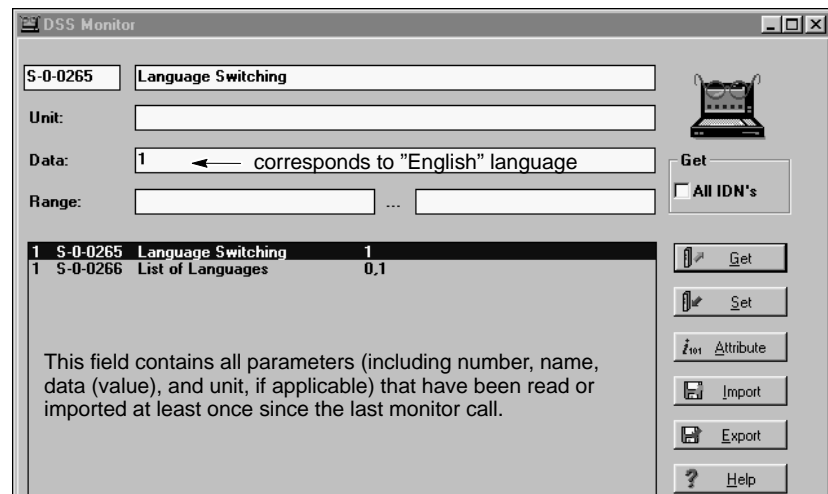


- ★ To activate the new language, you have to reboot.

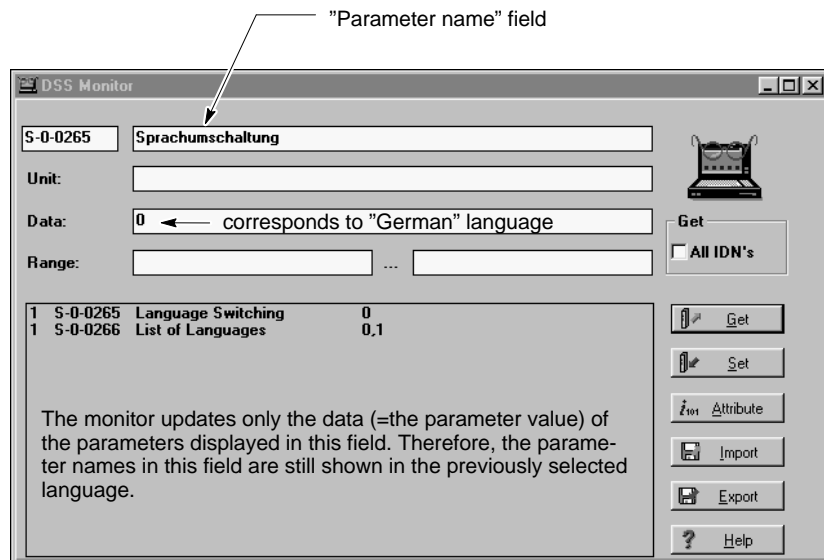
Language of the drive

The language of the drive is defined in parameter S-0-0265 via the DSS monitor. The languages listed in S-0-0266 may be selected:

- 0 : German
- 1 : English.



- ★ Enter the numerical value of the desired language in the "Data" field. Pressing <Return> or clicking on "Set" will immediately change over the language. This becomes obvious by the text in the "Parameter name" field.



The new setting will only remain active until you switch off the drive or press the RESET button on the inverter.

To switch the drive permanently to the new language, you have to perform the "Save main memory" command, cf. section 3.6.2.

3.5 Changing the user group (password)

The DSS makes a distinction between different user groups in order to protect several program functions against unauthorized interventions:

| Function | User group | | |
|--|-----------------------------|--------------------|--------------------|
| | Customer (always active) | Service Level 1 | Service Level 2 |
| Standard functions | • | • | • |
| Predefined parameter lists on special issues | | • | • |
| Setpoint box (cf. section 6.2.1) | | | • |
| Setpoint generator (cf. section 6.2.2) | | | • |

The "Service" user group is password-protected. The corresponding passwords are available on request.

- ★ For making changes, select the menu sequence:
OPTIONS ► PREFERENCES ► USER



← current user group
← character inputs are displayed as "***"

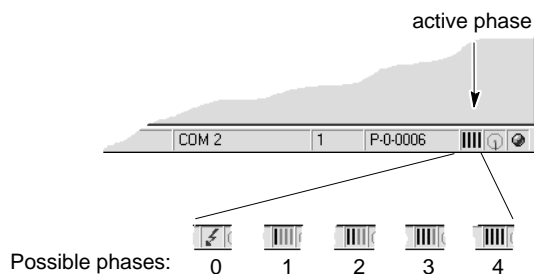


CAUTION
Unauthorized access to protected functions possible!
 If you have changed the user group to "Service" you should complete the necessary operations and restart the DSS or reset the system to the "Customer" group (password: koenig).
 Otherwise, all protected functions can be accessed until the DSS program is exited!

3.6 Important drive commands


3.6.1 Changing phases

When a drive is switched on, it first passes 3 initialization phases until normal operation is reached in phase 4.




Various parameters can only be changed in certain initialization phases. Therefore, during commissioning, you first have to switch the drive to the required phase before changing such parameters. If you forget changing phases, an error message of the type "Data of parameter x-0-xxxx is write protected at this time!" will usually be output.

Changing to the higher next phase:

- menu sequence
CONTROL ► PHASE ► INCREMENT, or
- click on  in the icon bar.


Changing back to phase 0:

- menu sequence
CONTROL ► PHASE ► DECREMENT, or
- click on  in the icon bar.

3.6.2 Save main memory

When the inverter has been switched on or the "Reset" button has been pressed the original data will be active again.

Therefore, any parameters that have been modified first have to be permanently saved with the "Save main memory" command. By issuing this command, the drive will copy the data from the RAM to the FEPRAM.

-  **The "Save main memory" command is no alternative for a backup!** For example, parameters that have been set and optimized during initial commissioning can be used for another drive only (series commissioning), if a backup was made (refer to section 4.3 on page 4-19).



CAUTION

FEPRAM will be deleted!

All data contained in the FEPRAM will be replaced with the data currently stored in the RAM by the "Save main memory" command. This process cannot be reversed.

If you are not sure whether you still need the old FEPRAM data, please contact your systems administrator before executing this command.



CAUTION

Current operating mode will also be saved!

Exit the active setpoint box, if any, or the setpoint generator before triggering "Save main memory". Otherwise, the setpoints will not be active at SW+/SW-!

- ★ Change the drive to phase 4.
- ★ Select the menu sequence:
CONTROL ► MAIN MEMORY ► SAVE

3.6.3 Load main memory

This command loads all data stored in the FEPRAM to the drive RAM. When the inverter has been switched on, or if the "Reset" button at the inverter has been depressed, the drive automatically copies all data contained in the FEPRAM to the RAM.



CAUTION

The main memory of the drive is overwritten!


All data in the RAM will be replaced with the parameters contained in the FEPRAM by the "Load main memory" command. This process cannot be reversed.

If you are not sure whether you still need the old RAM data, please contact your systems administrator before executing this command.

- ★ Change the drive to phase 2.
- ★ Select the menu sequence:
CONTROL ► MAIN MEMORY ► LOAD

3.6.4 Resetting errors (class 1)

If errors of diagnostics class 1 have occurred, the drive will be interlocked (optimum shut-down with subsequent torque removal). To enable the drive again, proceed as follows:

- ★ Open the logbook for class 1 errors (cf. section 7.1) which contains a list of codes of the pending errors.
- ★ Locate the cause of the error and eliminate all errors.
- ★ Initiate the "Reset class 1 error" command:
 - menu sequence
CONTROL ► RESET ► RESET CLASS 1 ERROR, or
 - click on  in the icon bar.

4 Initial commissioning

- ★ Make sure that all works described in section 2 have been properly executed.
- ★ **Backup** the parameters currently stored in the FEPRM. Afterwards, you may restore the original status of all values whenever you like.
Select the menu sequence:
FILE ► IDN BACKUP
Enter a file name for the original data, e.g. "ORG_PAR.SCS". The drive is changed to phase 4, reads all parameters contained in the FEPRM, and saves them in the previously specified file.

4.1 Setting of basic parameters

The factory settings of the drive parameters have been selected so as to enable you to drive the motor **for test purposes** without changing the parameters (e.g. using the SW+/SW- setpoint input, the setpoint box or setpoint generator).

In order to adjust the drive exactly to your application, a few basic parameters have to be changed.

The parameters of other functions described in section 4.2 can be set according to need.

- ★ Enter the parameter numbers described below into the monitor, change their values according to your need, and then click on the "Set" command button.
- ☞ **Please note that the current drive phase may have to be changed before a parameter can be adjusted (for changing phases, refer to page 3-12).**

 For a detailed description of the following parameters, please refer to the "Servodyn-D parameter manual"

| Function | Relevant parameters | Default value | Your value |
|--|--|--|------------|
| Drive operating mode: Defines the principal behavior of the drive. | S-0-0032 Main operating mode S-0-0033 Secondary mode 1 S-0-0034 Secondary mode 2 S-0-0034 Secondary mode 3 (all changeable in phase 2) | "Speed control" in main mode with setpoint at SW+/SW-) 0b1000.0000.0000.0010 0b0000.0000.0000.0010 0b0000.0000.0000.0010 0b0000.0000.0000.0010 | |
| Operating frequency of the power output stage: A low operating frequency increases the available electrical output power. It must be set according to the selected motor/module combination: 4 or 8 kHz. Changes do not become active unless the power supply and 24 VDC supply have been switched off and on! | P-0-0001 Operating frequency of the power output stage (changeable in phase 2/3/4) | 8000 Hz | |
| Maximum speed limit value: Maximum speed in both directions of rotation. If the setpoint is higher than the value entered in this parameter, the drive will set the message $n_{set} > n_{limit}$ (S-0-0013, bit 5). | S-0-0091 Bipolar speed limit value (changeable in phase 3/4) | 2000 rpm (weighting iaw S-0-0044) | |
| Maximum torque limit value: Maximum admissible torque, symmetrical for both directions | S-0-0092 Bipolar torque limit value (changeable in phase 3/4) | 300 % (weighting iaw S-0-0086) | |
| Maximum acceleration: Maximum acceleration capacity, symmetrical for both directions | S-0-0138 Acceleration bipolar (changeable in phase 3/4) | 3000 rad/s ² (weighting iaw S-0-0160) | |
| Standardization of the setpoint input: Specifies the speed of the drive with an input voltage of 10 V at SW+/SW-. For example, if the input voltage is 8V, the effective value is calculated as: $P-0-0103 = n_N * 10 \text{ V} / 8 \text{ V}$ (alternatively: calibration via DSS, page 4-5) | P-0-0103 ADC adjustment: maximum speed (changeable in phase 2/3/4) | n_N of the motor (weighting iaw S-0-0044) | |
| Standardization of the setpoint input for torque control: Specifies the torque of the drive with an input voltage of 10 V at SW+/SW-. For example, if the input voltage is 8V, the effective value is calculated as: $P-0-0104 = M_N * 10 \text{ V} / 8 \text{ V}$ (alternatively: calibration via DSS, page 4-5) | P-0-0104 ADC adjustment: maximum torque (changeable in phase 2/3/4) | M_N of the motor (weighting iaw S-0-0086) | |
| Behavior after "Drive off" or a fault: You may choose between: <ul style="list-style-type: none"> • "Halting in shortest possible time" (S-0-0138) • "Halting with ramp" (S-0-0260) • "Controlled halting by master" The torque will remain active for the duration of the "Waiting time drive off" (S-0-0207). | P-0-0004 Halting mode with drive off (changeable in phase 2) | 0b0000.0000.0000.0000 (= in shortest possible time) | |

| Function | Relevant parameters | Default value | Your value |
|---|--|--|------------|
| <p>Behavior after removal of the external drive enable signal: You may choose between:</p> <ul style="list-style-type: none"> • "Halting without setpoint control" • "Effect depends on P-0-0004" (the torque will remain active for the duration of the "Waiting time drive off" (S-0-0207)). | <p>P-0-0125 Control word, external enable (changeable in phase 2)</p> | <p>0b0000.0000.0000.0000 (= effect depends on P-0-0004)</p> | |
| <p>Holding brake: "Waiting time drive on" accounts for the time required for releasing the brake, thus preventing excessive wear:</p> <ul style="list-style-type: none"> • The "Drive on" and "Drive enable" signals will first activate the torque, depending on P-0-0505 (Plug brake enable delay). • The drive will not follow the setpoint input before the "Waiting time drive on" has elapsed. <p>"Waiting time drive off" prevents the axis from jerking caused by the removal of the torque while the holding brake has not yet engaged.</p> | <p>S-0-0206 Waiting time drive on (changeable in phase 3/4)</p> <p>S-0-0207 Waiting time drive off (changeable in phase 3/4)</p> | <p>0 ms</p> <p>0 ms</p> | |
| <p>Plug brake: When the "Drive on" and "Drive enable" signals have been set, the torque will not become active unless P-0-0505 has elapsed. This is to prevent that the motor power is connected although the braking resistors are still active on the motor line because of hardware-related delays when deactivating the braking resistors.</p> | <p>P-0-0505 Plug brake enable delay (changeable in phase 2/3/4)</p> | <p>0 ms</p> | |

★ You should now test whether the movement behavior of the drive and the signal sequence meet your requirements.
 If this is the case, please execute the "Save main memory" command (cf. section 3.6.2).

☞ **Without "Save main memory", the modified parameters will only remain active until you switch off the drive or press the RESET button on the inverter.**

★ For data protection, you should save all EPROM parameters in a *.scs file using the "IDN Backup" function.

The default directory for data backup can be generally changed in the "Work directory" window of the "Program settings" dialog:

Menu sequence: OPTIONS ► PREFERENCES ► PROGRAM



4.2 Enhanced programming

4.2.1 Setpoint calibration at SW+/SW-

With this procedure, you specify the reference between the speed or the torque of the drive and the voltage setpoint available at setpoint input SW+/SW- (resolution: 16 bits).

For this purpose, the setpoint voltage for the desired zero and maximum values must be available at the input terminals of the drive.



CAUTION

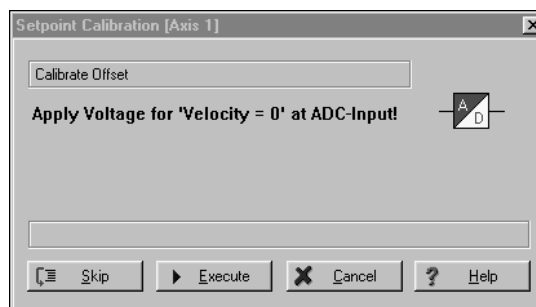
Damages to the setpoint input possible through excessive input voltages!

The maximum input voltage of ± 10 V must not be exceeded.

- ★ Switch the power supply of the drive on.
- ★ Make sure that 0V are initially present at the setpoint input.
- ★ Issue drive enable.
The drive follows the setpoint input. The torque is active.

Setpoint calibration for SW+/SW- = 0V

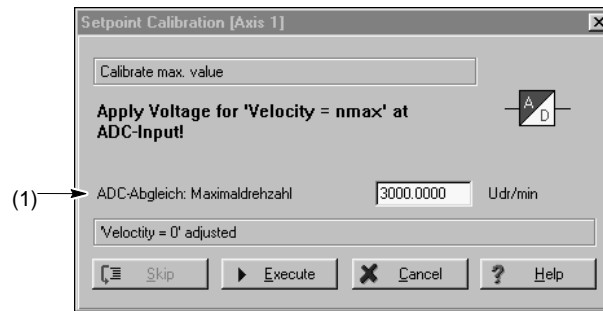
- ★ Select the menu sequence:
OPTIONS ► ANALOG I/O ► SETPOINT CALIBRATION



- ★ If the setpoint "0" is to be output for the currently active input voltage:
Select "Execute" command button.
The calibration is immediately activated. In "Speed control" operating mode, the motor shaft will no longer rotate now. If the motor is still drifting, deactivate the low-pass filter P-0-0107 (cf. page 4-5).
- Please note that the drive can be halted exactly only if a higher-level position control is active!**

The DSS will automatically switch to the "Calibrate max. value" dialog:

Setpoint calibration for SW+/SW- = maximum voltage



- ★ Since the maximum value has already been defined in the basic parameter settings (P-0-0103 or P-0-0104, cf. page 4-2), you may cancel the setpoint calibration at this point. Otherwise, the values that have been previously input will be overwritten.
 - ★ Execute the command "Save main memory" (cf. section 3.6.2).
- Alternatively:**
- ★ For changes, enter the maximum setpoint in field (1).
 - ★ Apply the voltage for the previously defined maximum setpoint at the setpoint input.
 - ★ Click on "Execute" command button.
The calibration becomes immediately active. In "Speed control" mode, the motor shaft will rotate at the speed specified in (1).
 - ★ Brake the motor by a suitable setpoint input and remove the drive enable signal. Turn the power supply off.
 - ★ Execute the "Save main memory" command (cf. section 3.6.2).

Setting the low-pass filter between the ADC and the control unit (ADC adjustment: filter time)

In order to limit slope of the setpoint input at the SW+/SW- input, a low-pass filter may be configured between the ADC of the setpoint input and the downstream higher-level control units.

The limit frequency of this filter is set in parameter P-0-0107:

- ★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V. The drive follows the setpoint input. The torque is active.
- ★ Use the DSS monitor to enter and test parameter P-0-0107.
- ★ Brake the motor by entering a suitable setpoint and remove the drive enable signal. Turn the power supply off.
- ★ Execute the "Save main memory" command (cf. section 3.6.2).

4.2.2 Encoder simulation

The encoder simulation function may be used to dispense with an external encoder for the axis.

The position data of the motor encoder is available at X81 as standard incremental signals if this function is active. Suitable CNC measuring system inputs with limit frequencies ≥ 50 kHz can be directly connected to this terminal.

Initialization


- ★ Load parameters P-0-0110 to P-0-0118 into the monitor.
- ★ In order to visualize the current counter status of the encoder simulation, display P-0-0112 cyclically in a separate window (cf. section 7.4, page 7–5 ff.)
- ★ Check whether the counter status in P-0-0112 changes when the motor shaft rotates.
If it does not, the encoder simulation function may be turned off.
In order to **turn the simulation on**, specify phase 2, set bit 0 in P-0-0110 to the value "1" (e.g. "0b0000.0000.0000.0001") and press <Return>. Specify phase 4 again.
- ★ Check whether the **counting direction of the simulation** is correctly set according to your requirements.
You may change the counting direction by setting bit 2 in P-0-0110:
Bit 2=0: ascending with clockwise rotation
(e.g. "0b0000.0000.0000.0001")
Bit 2=1: descending with clockwise rotation
(e.g. "0b0000.0000.0000.0101").
For this purpose, you have to specify phase 2, change the value, press <Return> and change back to phase 4.
- ★ Check whether the desired **type of encoder** has been set.
You may change the type of encoder by setting bit 1 in P-0-0110:
Bit 1=0: single-turn encoder (e.g. "0b0000.0000.0000.0001")
Bit 1=1: multi-turn encoder with absolute value transmission
(e.g. "0b0000.0000.0000.0011").
For this purpose, you have to specify phase 2, change the value, press <Return> and change back to phase 4.
- ★ Check whether the **number of divisions** of the encoder simulation (P-0-0111) meets your requirements.
When setting the number of divisions, you should note that P-0-0111, P-0-0118 and S-0-0091 are interrelated. For more information on this feature, please refer to the parameter manual.

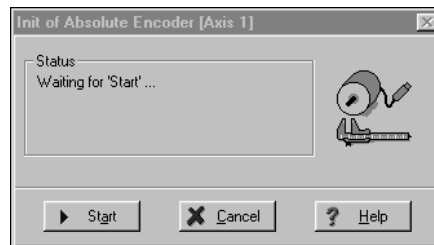
For single-turn encoders (default), the configuration of the encoder simulation has been completed at this point:
- ★ Execute the "Save main memory" command (cf. section 3.6.2).

4.2.3 Initializing absolute encoders

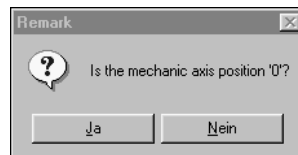
This function can only be performed for motors equipped with multi-turn encoders (rating plate information on encoder: EQN 1325).

- ★ Set P-0-0006 (Position encoder type – motor encoder) to the value 1 (= absolute encoder function active).
In this case, the software supports you with the determination of the absolute dimension offset (S-0-0177).
- ★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V. The drive is standing, the torque is active.
- ★ Move the axis to the mechanical zero position.

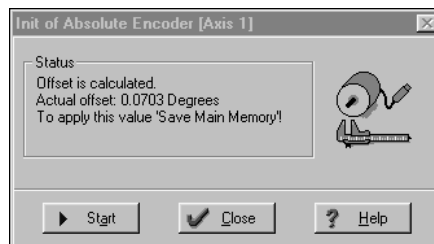
- ★ In the DSS basic image, click on the  button and select ENCODER ► INIT. ABSOLUTE ENCODER



- ★ Click on "Start"



- ★ Click on "No" to abort the function.
Clicking on "Yes" will start the measurement.
After the measurement, the system will display the current offset:



- ★ Close the dialog.
- ★ Execute the "Save main memory" command (cf. section 3.6.2).
- ★ Remove the drive enable signal. When the power supply has been turned off and on again, the drive will output the absolute dimension offset at X81 (encoder simulation connector).

Absolute value transmission

In addition, it is possible to transmit the absolute motor encoder position to the higher-level control unit when the system has been turned on. For this purpose, the drive transmits a number of impulses – which corresponds to the current counter status (P-0-0112) – to the measuring system input of the CNC.


- ★ Set bit 1 in P-0-0110 as follows: "1" (= multi-turn encoder with absolute value transmission).
- ★ Assign a free digital input to parameter P-0-0116 (start absolute value transmission, cf. section 4.2.5 on page 4–10 ff). With this signal, the CNC requests the drive to transmit its absolute position.
- ★ Assign a free digital output to parameter P-0-0117 (absolute value transmission finished, cf. section 4.2.5 on page 4–10 ff). With this signal, the drive indicates the end of the transmission to the CNC.
- ★ Remember to assign both signals in the PLC adjustment.
- ★ Use parameters P-0-0113 to P-0-0115 in order to change the zero position of encoder simulation. For more information, please refer to the parameter manual.
As a default, the zero position of the encoder simulation is located at the encoder's zero point.
- ★ Remove the drive enable signal. Turn the power supply off.
- ★ Execute the "Save main memory" command (cf. section 3.6.2).

4.2.4 Analog inputs A_IN2 and A_IN3

In addition to the regular setpoint input at SW+/SW–, up to two additional external analog control variables (± 10 V) can be specified as setpoints for the drive with the help of two analog-to-digital converters (resolution: 12 bits).

For this purpose, the voltage values supplied to inputs A_IN2+/A_IN2– and A_IN3+/A_IN3– are initially digitized and then entered as values into existing parameter numbers. In this way, the

- speed setpoint additive (S-0-0037) and
- torque setpoint additive (S-0-0081) can be influenced if drives with an analog interface are used.

 **P-0-2016 to P-0-2018 are relevant for setting the parameters of these additional analog inputs. For more information on the effect of these parameters, please refer to the "Servodyn-D parameter manual".**

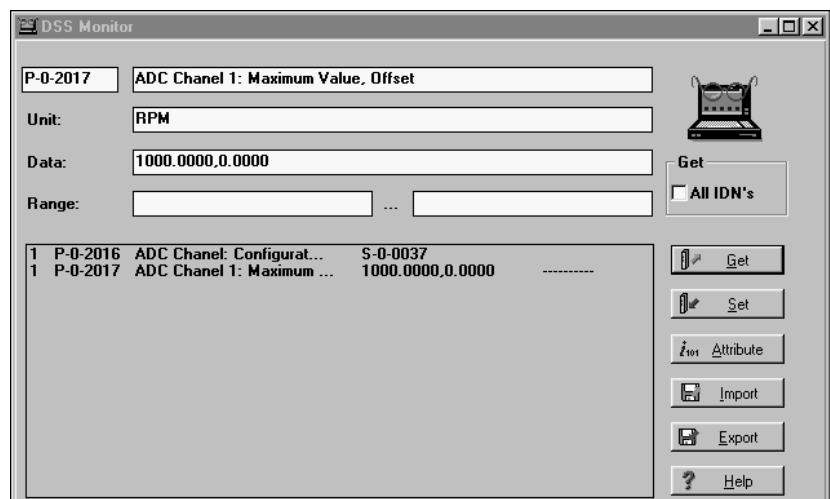
- ★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V. The drive follows the setpoint input. The torque is active.
- ★ Load parameters P-0-2016 to P-0-2018 into the monitor and set the appropriate parameters.

Examples on parameter settings

Input A_IN2+/A_IN2– is to act as an additive speed setpoint (S-0-0037) with an analog voltage ± 10 V:

at + 10V input voltage: additive speed setpoint of 1000 rpm
at 0 V input voltage: no additive speed setpoint

- Enter the value "S37" for P-0-2016.
- Switch the drive to phase 3 and click on "Set".
- Enter the values 1000 and 0, separated by a comma, for P-0-2017, and click on "Set".



- ★ Then switch the drive to phase 4 and check the function
- ★ Remove the drive enable signal. Turn off the power supply.
- ★ Execute the "Save main memory" command (cf. section 3.6.2).

4.2.5 Digital inputs and outputs (IN x, OUT x)

For connecting external I/O peripherals,

- 10 digital inputs (IN1 to IN10) and
 - 10 digital outputs (OUT1 to OUT10)
- are available at the drive.

 **The digital I/O's require a power supply to X06. For technical data of the inputs and outputs, refer to "Interface conditions" manual.**

The parameters which may be assigned to the outputs are shown by the "D → M" entry in the "Real-time bit" column of the attributes bar in the "Parameter description" manual.

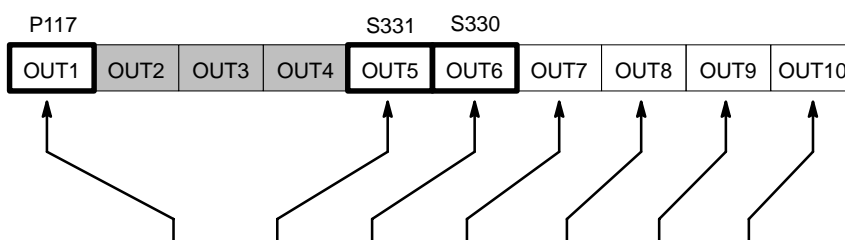
Parameters that may be changed via an input are marked by the "M → D" entry in the "Real-time bit" column of the attributes bar.

 **Outputs OUT2 to OUT4 cannot be influenced!**
They are permanently assigned to the following functions:

OUT2: Temperature warning
OUT3: Control of a holding brake
OUT4: Control of a plug brake

- ★ In order to set the parameters of the digital inputs or outputs, switch the drive to phase 2.
- ★ Load parameters P-0-2000 (inputs) and P-0-2002 (outputs) into the monitor.
- ★ Assign the value of P-0-2000 and P-0-2002 to a list containing the desired parameter numbers. The order of the parameter numbers is used to specify which parameter corresponds to which input/output. Separate the individual parameter numbers by commas.
- ★ When designing the list in P-0-2002 (outputs), please note the following assignments:

- Parameters can be set for output Output has been assigned parameter x ex works.
 Output is permanently assigned, no parameters can be set.

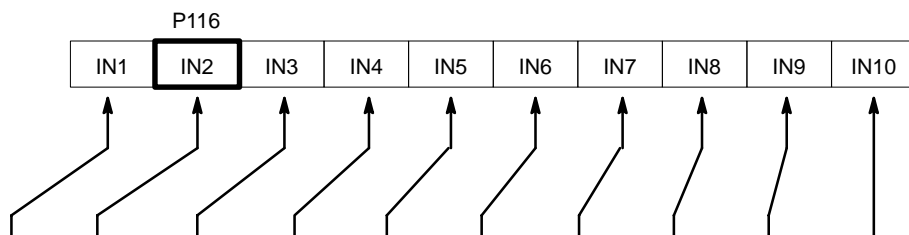


P-0-2002=<1. Par>,<2. Par>,<3. Par>,<4. Par>,<5. Par>,<6. Par>,<7. Par>

P-0-2002=P-0-0117,S-0-0331,S-0-0330

★ When designing the list in P-0-2000 (inputs), please note the following assignments:

Parameters can be set for input Input has been assigned parameter ^x ex works.



P-0-2000=<1.Par>,<2.Par>,<3.Par>,<4.Par>,<5.Par>,<6.Par>,<7.Par>,<8.Par>,<9.Par>,<10.Par>
 P-0-2000=S-0-0000,P-0-0116

Gaps in the signal configuration should be filled with S-0-0000.

Example 1:

If only IN5 is to be assigned, program P-0-2000 as follows:
 P-0-2000=0,0,0,0,<Par.>

Example 2:

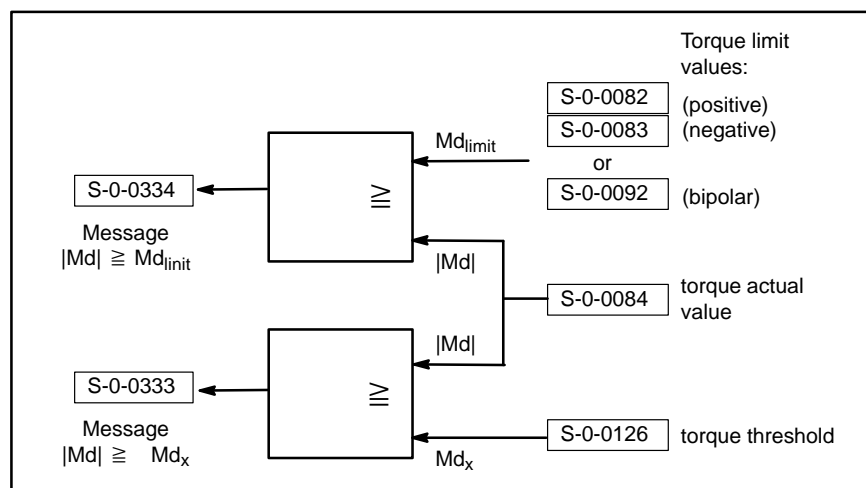
If only OUT5 is to be assigned, program P-0-2002 as follows:
 P-0-2002=0,<Par.>

★ Execute the "Save main memory" command (cf. section 3.6.2).

4.2.6 Torque monitoring

Every drive is equipped with 2 monitoring features each of which can be configured independently.

Every monitoring feature compares the current torque value with its specific limit values and stores the result of the comparison in a separate parameter. Since both parameters have been implemented as real-time bits (signal status bits), they can be assigned to the hardware outputs of the drive (cf. page 4-10) and evaluated by the PLC and/or CNC.



If one of the monitoring features responds (= contents of S-0-0333 or S-0-0334 becomes HIGH), the drive internally responds by setting certain bits in parameter S-0-0013 (diagnostics class 3).

☞ **Further reactions (such as reduction of torque or speed, retract movements, EMERGENCY-STOP) have to be initiated externally by the higher-level control unit!**

- ★ Adjust the limit values for torque monitoring to your requirements.
- ★ Assign appropriate hardware outputs of the drive to parameters S-0-0333 and S-0-0334 in order to facilitate the evaluation.
- ★ Execute the "Save main memory" command (cf. section 3.6.2).

4.2.7 Torque reduction by changing over the parameter set

During operation, the drive can be changed over to a maximum of 4 different torque limit values via two digital input signals. If torque limits have been appropriately selected, this feature can be used to implement an internal adjustment of the max. active torque.


| Input signal | | active torque limit value |
|--------------|-------|---------------------------|
| No. 1 | No. 0 | |
| 0 V | 0 V | S-0-0092 |
| 0 V | +24 V | S-1-0092 |
| +24 V | 0 V | S-2-0092 |
| +24 V | +24 V | S-3-0092 |

In order to use this function, you have to

- use P-0-2000 to assign 2 unused digital inputs to parameter S-0-0217 (parameter set selection)
- enter the desired torque limit values into parameters S-0-0092 to S-3-0092.
- drive the two digital inputs externally (e.g. by a PLC).

★ Load parameter numbers S-0-0092, S-1-0092, S-2-0092, S-3-0092 and P-0-2000 into the monitor.


★ Assign suitable values to parameters S-0-0092, S-1-0092, S-2-0092 and S-3-0092 and transmit them to the drive.

 **We recommend assigning ascending torque limit values to S-0-0092 to S-3-0092. By this method, you ensure that no excessive torque is activate in the event of a cable break.**

★ Switch the drive to phase 2.

★ Assign the value "S-0-0217" to two unused list positions of parameter list P-0-2000.

The order of the parameter numbers is used to specify which parameter corresponds to which input. Gaps in the assignment should be filled with S-0-0000 (cf. page 4-11).

 **As a standard, P-0-0116 (start absolute value transmission) is allocated to IN2. If you use the encoder simulation, P-0-0116 must not be deleted from the list.**

The first entry of "S-0-0217" assigns the input signal no. 0 to the appropriate input, the second entry of "S-0-0217" allocates input signal no. 1 (cf. figure above).

Transmit the values to the drive.

★ Switch the drive to phase 4.

★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V. The drive follows the setpoint input. The torque is active.

- ★ Test the function.
When both inputs are driven, the drive may only output the maximum torque set with the above parameters.
To display the statuses at the digital inputs, you may call up the "Display I/O signals" function with the menu sequence DIAGNOSE ► I/O SIGNALS.
To display the current torque output, you should cyclically display S-0-0084 (torque actual value) in a separate window (cf. section 7.4, page 7-5 ff.).
- ★ Remove the drive enable signal. Turn the power supply of the drive off.
- ★ Execute the command "Save main memory" (cf. section 3.6.2).

Example 1 on parameter setting

A 4-step torque reduction with the following maximum torques is to be implemented via digital inputs **IN5** and **IN6**:

| Input signal | | active torque limit value (weighting in percent) |
|--------------|-------|---|
| No. 1 | No. 0 | |
| 0 V | 0 V | 10% of M_{\max} |
| 0 V | +24 V | 25% of M_{\max} |
| +24 V | 0 V | 50% of M_{\max} |
| +24 V | +24 V | 100% of M_{\max} |

Required parameters:

S-0-0092: 10
 S-1-0092: 25
 S-2-0092: 50
 S-3-0092: 100
 P-0-2000: S-0-0000,P-0-0116,S-0-0000,S-0-0000,**S-0-0217**,**S-0-0217**...

Example 2 on parameter setting

A 2-step torque reduction with the following maximum torques is to be implemented via digital input **IN1** alone:

| Input signal No. 0 | active torque limit value (weighting in percent) |
|-----------------------|---|
| 0 V | 10% of M_{\max} |
| +24 V | 100% of M_{\max} |

Required parameters:

S-0-0092: 10
 S-1-0092: 100
 P-0-2000: **S-0-0217**,P-0-0116...

4.2.8 Mode change-over

The operating mode affects the basic behavior of the drive, e.g. whether the drive interprets a setpoint as a speed or torque value. For this purpose, S-0-0032 ... S-0-0035 may be used in the drive in order to specify up to 4 different operating modes:

| Input signals | | activate |
|---------------|-------|------------------|
| No. 1 | No. 0 | |
| 0 V | 0 V | Main mode |
| 0 V | +24 V | Secondary mode 1 |
| +24 V | 0 V | Secondary mode 2 |
| +24 V | +24 V | Secondary mode 3 |

During operation, for example, you may thus change over between speed control and torque control.



CAUTION

The motors may accelerate up to their mechanical destruction within milliseconds!
You should apply utmost care when using the torque control operating mode!

Default setting:

- Main mode (S-0-0032): Speed control (setpoint input at SW+/SW-)
- Secondary mode 1 (S-0-0033): Speed control
- Secondary mode 2 (S-0-0034): Speed control
- Secondary mode 3 (S-0-0035): Speed control

```
S-0-0032= 0b1000000000000010 ; [] Main mode
S-0-0033= 0b0000000000000010 ; [] Secondary mode 1
S-0-0034= 0b0000000000000010 ; [] Secondary mode 2
S-0-0035= 0b0000000000000010 ; [] Secondary mode 3
```

Bit 15 must be set to "1" in order to use input SW+/SW- for setpoint input!

In order to utilize this function, you have to

- use P-0-2000 to assign 1 or 2 unused digital inputs to parameter P-0-0127 (operating mode control word)
- configure the desired operating modes via parameters S-0-0032, S-0-0033, S-0-0034, and S-0-0035
- drive the two digital inputs externally (e.g. by a PLC).

Example on parameter settings

Digital input **IN1** shall be used to change over between speed control and torque control:

| Input signal No. 0 | activates |
|-----------------------|------------------|
| 0 V | Main mode |
| +24 V | Secondary mode 1 |

Required parameters:


P-0-2000: **P-0-0127**,P-0-0116...

4.2.9 Weighting and data reference

The weighting and data reference specify:

- the internal calculation by the drive
- the units of measure to be used for the axis
- whether velocity data is referred to the motor shaft or the axis
- the units of measure in which the analog signals of the OM4 option module are output

Default settings

 The following default settings normally do not have to be changed.

| | | | | |
|------------------|--------------------|----------|---------|--------------------------------|
| Weighting: | rotary | | | |
| Unit of measure: | Position data | S-0-0076 | Degrees | Bits 0..4 have to be identical |
| | Velocities | S-0-0044 | rpm | |
| | Acceleration | S-0-0160 | rad/sec | |
| | Torque/force data | S-0-0086 | % | |
| Data reference: | to the motor shaft | | | |

```
S-0-0076= 0b000000000000000010 ; [] Type of weighting for position data
S-0-0044= 0b000000000000000010 ; [] Type of weighting for velocity data
S-0-0160= 0b000000000000000010 ; [] Type of weighting for acceleration data
S-0-0086= 0b000000000000000000 ; [] Type of weighting for torque/force data
```

Translatory weighting

For linear axes, the weighting has to be changed over from "rotary" to "translatory".

In this case, the following inputs have to be made:

- ★ "Translatory" weighting
Data reference "at the load"
- ★ The input and output speeds of an interconnected gearbox, if any.
Only integer numbers may be entered.
Example:
The transmission ratio $\ddot{U} = 1:128.18$ is given
Eliminate the decimal places (e.g. by multiplication with 100)
→ $100 : 12818 = 50 : 6409$
→ S-0-0121 = 50; S-0-0122 = 6409
- ★ Feedrate constant by which the rotary motor movement is converted into a translatory axis movement.

Default:

no gearbox (S-0-0121 = 1; S-0-0122 = 1)

Feedrate constant of 1 mm/rev.

```
S-0-0121= 1 ; [input rev.] load gearbox input revolutions
S-0-0122= 1 ; [output rev.] load gearbox output revolutions
S-0-0123= 1.0000 ; [mm/rev.] feedrate constant
```

- ★ Check the values of the following parameters:
 - S-x-0091: Bipolar speed limit value
 - S-x-0092: Bipolar torque limit value
 - S-0-0138: Acceleration bipolar
 - P-0-0103: ADC adjustment: maximum speed (at speed setpoint)
or:
P-0-0104: ADC adjustment: maximum torque (at torque setpoint)

4.2.10 Option OM4: Analog outputs

In connection with the OM4 optional module, the parameters of 4 analog measuring outputs can be set online.

Thus, current values of max. 4 parameters can be converted simultaneously to analog output signals (0...+10 V) and evaluated externally (e.g. by means of a storage oscilloscope for control unit optimization).

Parameter values that have been assigned to outputs 1 and 2, are read in 1 ms cycles.

Parameter values that have been assigned to outputs 3 and 4, are read in 0.5 ms cycles.

Each output converts the respective parameter value via a linear characteristic into a 0...+10 V analog voltage.

- ★ Select the menu sequence:

- OPTIONS ► ANALOG I/O ► ANALOG OUTPUTS

Turns the related output on or off

"IDN" fields (P-0-2010): determine the parameter value to be output at the corresponding output

"Max. value" fields (P-0-2012 to P-0-2015): define for which value +10 V are output

"Offset" fields (P-0-2012 to P-0-2015): define for which value 0V are output

- ★ Adjust the individual fields to your requirements.
After having changed a field, the new value will be immediately transmitted to and activated in the connected drive when the field is exited (e.g. with the <Tab> key).
If this is not desired, you have to cancel the dialog before leaving a field by clicking on "X" in the title bar.
- ★ Close the dialog and perform the "Save main memory" command (cf. section 3.6.2).
- ☞ **For more information on the parameters outlined above, please refer to the "Servodyn-D parameter manual".**

4.3 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 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 is switched to phase 4, then reads all parameters stored in the FEPRM and saves them in the previously specified file. An exception are driver files and the data of the electronic rating plate.
- ★ Create a suitable directory structure on the hard disk drive of your PC to which you can copy all parameter files of the drive.
For example, you could establish a hierarchy that adequately represents individual machine types including their feed, auxiliary and spindle axes.
- ★ Copy all files to a removable data carrier. Store this data carrier in a safe place.

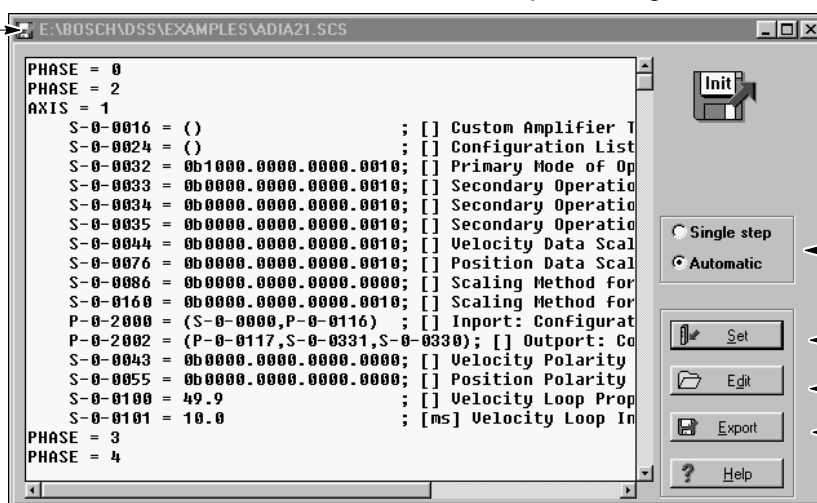
4.4 Editing *.scs files

*.scs files can be edited and saved in the integrated offline editor. After having been edited offline, the complete file may be transmitted to the drive.

1. Open the desired *.scs file:
 - with menu sequence FILE ► OPEN ► DSS FILE, or
 - by clicking on  in the icon bar, or
 - by clicking on the  button in the DSS basic image and then selecting "Load file"

Confirm "OK" in the "Open" dialog to start the loading dialog.

Path and file name of the initialization file selected



Single step:

The DSS prompts you before every line (instruction) to confirm transmission.

Automatic:


The complete file is transmitted

Start transmission

Edit initialization file

Save file

2. Click on the "Edit" command button in order to edit the file as in a conventional text editor.

 **For more information on the structure and syntax of *.scs files, please refer to the DSS help system which you may call up with HELP ► CONTENTS in the "DSS files" paragraph of the "Syntax" chapter.**

3. Save any modifications with "Export". The previous file will be overwritten.

The modified file will not become active in the drive unless you transmit it to the drive by clicking on the "Set" command button.

Automatic: The whole file displayed is transmitted to the drive's RAM.

Single step: The displayed file is transmitted to the drive's RAM line by line.

After transmission, the 7-segment display on the axis module shows the value "4". Now the drive uses this data.

5 Series commissioning

During series commissioning, all data backed up from the FEPRM after initial commissioning of a drive are loaded to and saved in all other drives.

If your application involves drives with different settings, initial commissioning has to be performed separately for every single setting.



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

5.1 Loading files

★ Make sure that all required *.scs files are available for the drive currently connected to the DSS.

- all *.scs files created during basic parameter setting with the help of the DSS monitor, cf. page 4-2
- the *.scs file generated with "IDN backup" (cf. page 4-19)
- the *.scs file, if any, that was created with the help of the block diagram during control unit optimization (cf. section 6.1.2 on page 6-3)

★ Transmit the files to the drive in the same order in which they were created:

1. Open the desired *.scs file:
 - with the menu sequence FILE ► OPEN ► DSS FILE, or
 - by clicking on  in the icon bar, or
 - by clicking on the  command button in the DSS basic image and then selecting "Load file".


Confirm "OK" in the "Open" dialog to start the loading dialog.

Path and file name of the initialization file selected

→ E:\BOSCH\DSS\EXAMPLES\ADIA21.SCS

```

PHASE = 0
PHASE = 2
AXIS = 1
S-0-0016 = ( ) ; [] Custom Amplifier T
S-0-0024 = ( ) ; [] Configuration List
S-0-0032 = 0b1000.0000.0000.0010; [] Primary Mode of Op
S-0-0033 = 0b0000.0000.0000.0010; [] Secondary Operatio
S-0-0034 = 0b0000.0000.0000.0010; [] Secondary Operatio
S-0-0035 = 0b0000.0000.0000.0010; [] Secondary Operatio
S-0-0044 = 0b0000.0000.0000.0010; [] Velocity Data Scal
S-0-0076 = 0b0000.0000.0000.0010; [] Position Data Scal
S-0-0086 = 0b0000.0000.0000.0000; [] Scaling Method for
S-0-0160 = 0b0000.0000.0000.0010; [] Scaling Method for
P-0-2000 = (S-0-0000,P-0-0116) ; [] Inport: Configurat
P-0-2002 = (P-0-0117,S-0-0331,S-0-0330); [] Output: Co
S-0-0043 = 0b0000.0000.0000.0000; [] Velocity Polarity
S-0-0055 = 0b0000.0000.0000.0000; [] Position Polarity
S-0-0100 = 49.9 ; [] Velocity Loop Prop
S-0-0101 = 10.0 ; [ms] Velocity Loop In
PHASE = 3
PHASE = 4
                
```



Single step

Automatic


Single step:
The DSS prompts you before every line (instruction) to confirm transmission.

Automatic:
The complete file is transmitted


Start transmission

2. Click on the "Set" command button.
 - "Automatic" radio button active: The whole file displayed is loaded to the drive's RAM.
 - "Single step" radio button active: The displayed file is loaded to the drive's RAM line by line.

After transmission, the 7-segment display on the axis module shows the value "4". Now the drive uses this data.

- ★ Close the loading dialog and transmit the remaining data.
-  **It is also possible to combine several *.scs files with the "INCLUDE" command.**
For more information on the syntax and possible commands of *.scs files, please refer to the DSS help system which you may call up with HELP ► CONTENTS in the "DSS files" paragraph of the "Syntax" chapter.
- ★ If necessary, perform a setpoint calibration (cf. section 4.2.1) and execute the "Save main memory" command (cf. section 3.6.2).

5.2 Couple next drive

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

6 Test and optimization

6.1 Optimizing the control unit

As a rule, the drive performance is satisfactory when the basic parameters and the additional parameters have been set, i.e. it is not necessary to make more adjustments at the control unit.

If necessary, however, the speed controller and the filter can be modified within the servo system.

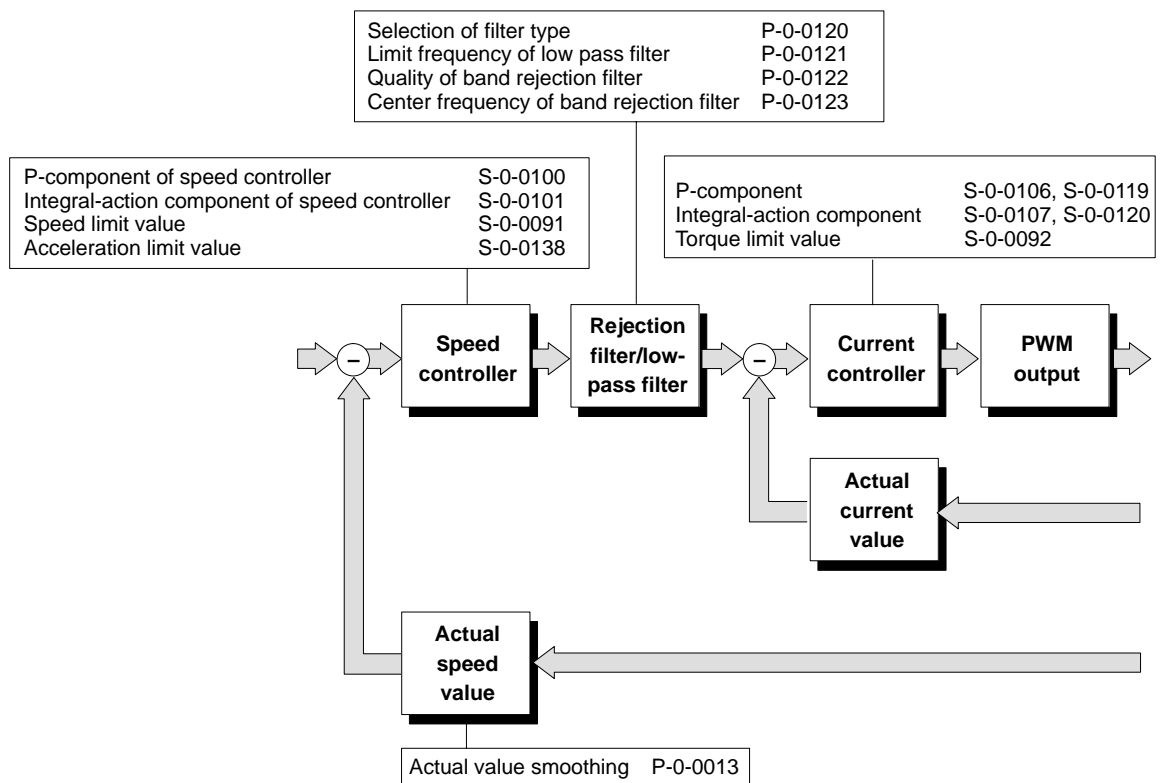
☞ In order to visualize the effects of optimization on the control loop, a storage oscilloscope and the OM4 option module with suitably parameterized measuring outputs (cf. section 4.2.10, page 4–18) are absolutely necessary.



CAUTION


Any interventions in the parameters of the control units are reserved to persons with profound knowledge of the individual control unit parameters and experience in the optimization of servo loops!

The following block diagram is designed to give you an overview of the parameters of the servo loop:

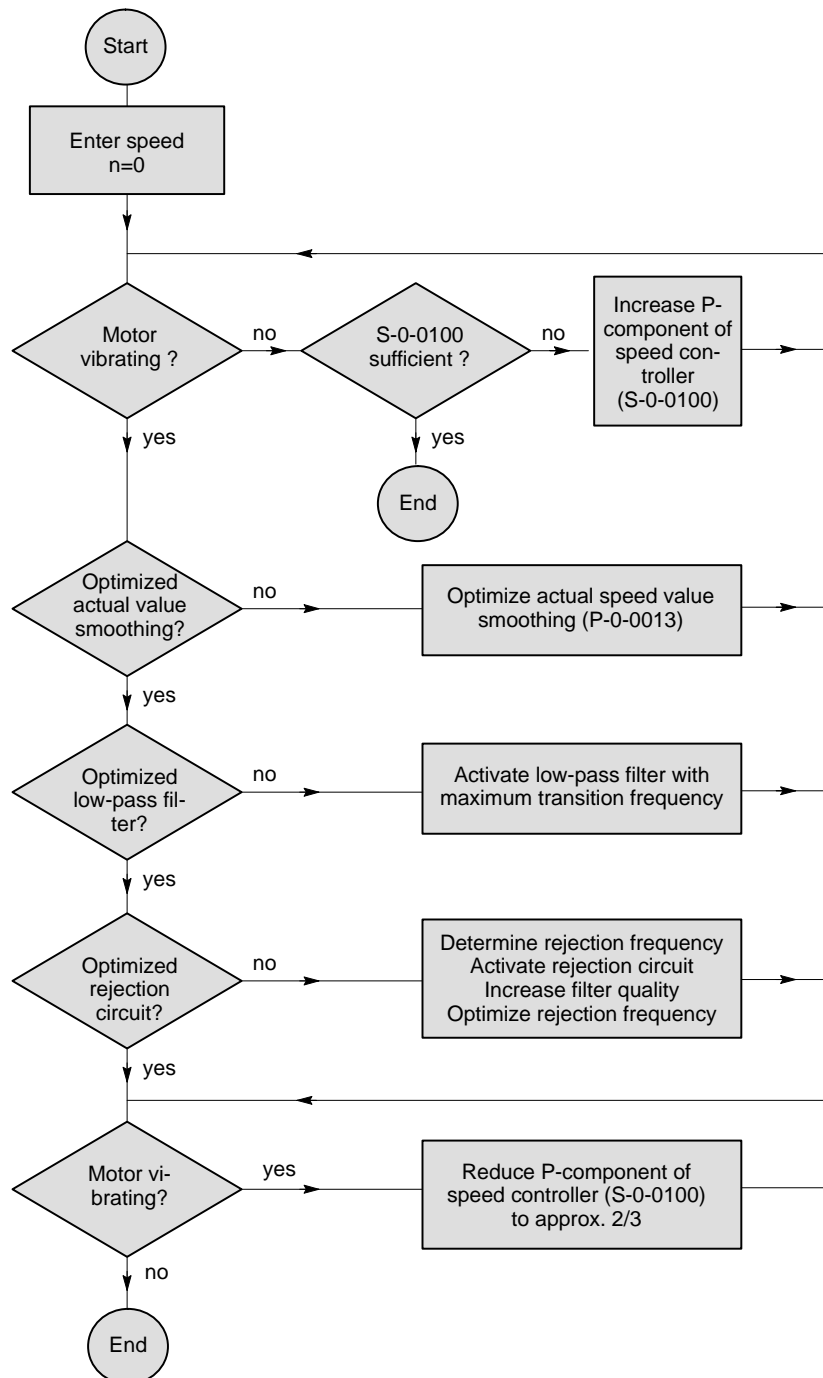


☞ The parameters of the current controller are critical for the drive behavior. They must not be changed without having consulted Bosch.

6.1.1 Optimization steps

 In order to visualize the effects of optimization on the control loop, a storage oscilloscope and the OM4 option module with suitably parameterized measuring outputs (cf. section 4.2.10, page 4–18) are absolutely necessary.

- ★ You should not optimize any settings unless the load is connected and the position control loop is open (disconnect external control unit from setpoint input).
- ★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V.
- ★ Start with the default value of S-0-0100 (approx. "50").




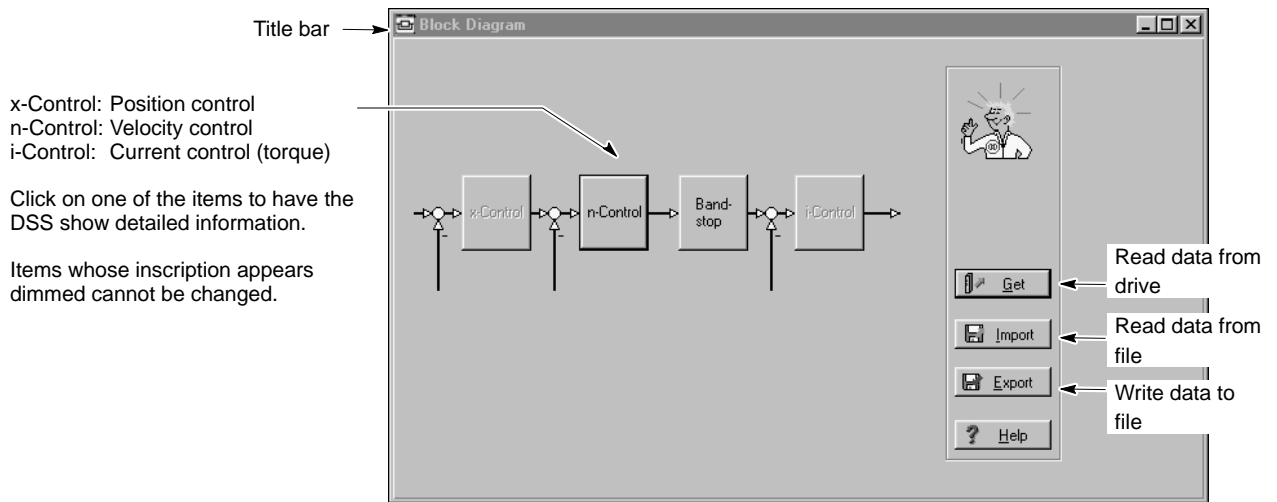
- ★ Finally, execute the "Save main memory" command (cf. section 3.6.2).

6.1.2 DSS tools

- ★ In order to change the parameters, you should use the DSS monitor or

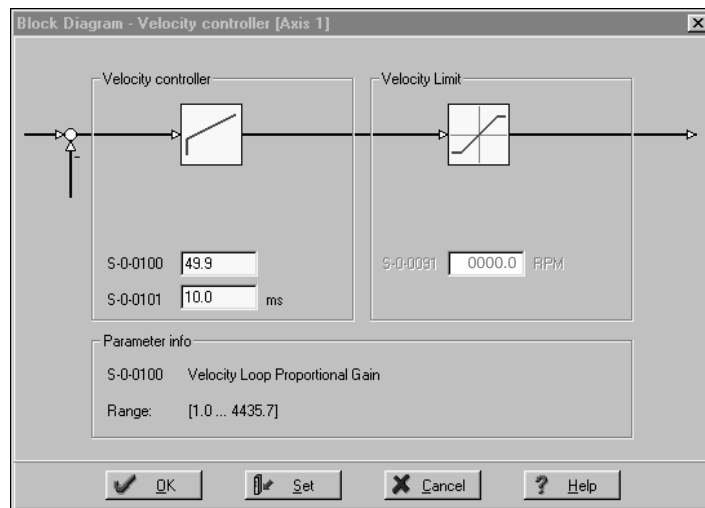
Block diagram

- ★ Select the menu sequence
 - DISPLAY ► CONTROL ► BLOCK DIAGRAM, or
 - click on the  command button in the DSS basic image and then select "Control – Block diagram".



- Get:** The DSS reads all relevant parameters from the drive.
- Import:** The DSS reads all relevant parameters from a file. If the specified file does not contain all required parameters, the DSS will first use the current parameter values or system default values. In addition to the "Block diagram" text, the path and name of the specified file will be displayed in the title bar.
- Export:** If **only** the "Block diagram" text is displayed in the title bar, you may save the current settings in a new file. If the path and name of a file is displayed in the title bar **in addition**, the DSS will save the current settings in this file and replace the previous values.

Detailed information velocity controller

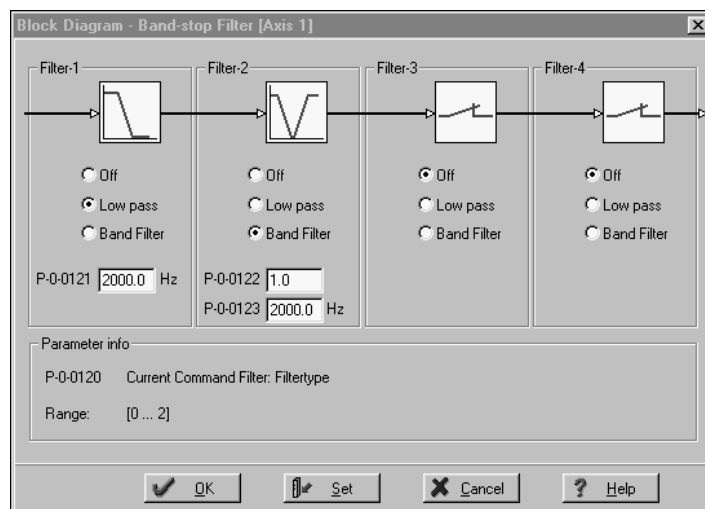


- ★ Click on the input field to be changed and enter the desired values. The "Parameter-Info" field then shows the parameter name and the admissible input range.

Set: transfers current values to the drive. They will become immediately active.

OK: as "Set". The dialog is closed.

Detailed information band stop



Up to 4 filters connected in series can be activated. Depending on the selected filter type, input fields are displayed for configuration.

- ★ Click on the radio buttons in order to define the filter type or deactivate individual filters.
- ★ Click on the input field to be modified, and enter the desired values. The "Parameter info" field now shows the parameter name and the admissible input range.


Set: transfers the current values to the drive. They will become immediately active.

OK: as "Set". The dialog is closed.

6.2 Tools for setpoint input

In order to optimize the drive behavior in the dynamic range, setpoints may be specified internally via

- setpoint box (for specifying individual setpoints)
- setpoint generator (for specifying a setpoint profile)

 For reasons of safety, these tools are password-protected. You need the password for "Service Level 2" which you may obtain on request.



CAUTION

Possibility of uncontrolled motor movements !


- Make sure that no persons or equipment can be endangered.
- Make sure that the EMERGENCY-STOP button may be quickly operated in case of danger.

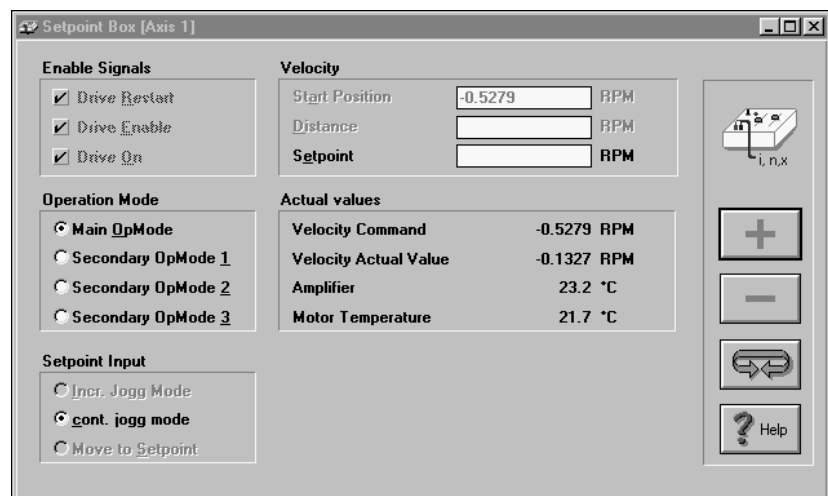
6.2.1 Setpoint box

The setpoint box is used to input **individual setpoints** into the drive for testing purposes:

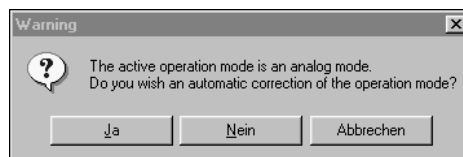
- ★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V. The drive will follow the setpoint input. The torque is active.

Starting the setpoint box

- ★ Select the menu sequence:
 - CONTROL ► SETPOINT BOX, or
 - click on the  command button in the DSS basic image and then select "Setpoint box".



To change over the setpoint input from "SW+/SW-" to "Setpoint box", bit 15 of the operating mode parameter S-0-0032 is temporarily set to 0. This change-over is to be confirmed:




"Yes" The analog interface SW+/SW- is deactivated. When the setpoint box has been exited, the value of bit 15 is automatically reset to "1".

"No" No setpoint box operation.

 **In order to avoid that this change is permanently memorized, you must not execute the "Save main memory" function while the setpoint box is active.**

Therefore, you should close the setpoint box before executing "Save main memory" and check whether all values of the operating mode parameters S-0-0032 to S-0-0035 are set to the correct values!

Setpoint input

- ★ Enter the setpoint in the "Setpoint" field.
- ★ Click on the "+" or "-" command buttons in order to traverse the drive in positive or negative direction. For as long as the left mouse button (or the space bar) is depressed, the setpoint is applied to the drive.
-  **The parameter values displayed cyclically in the "Actual values" field can be changed. For a description, refer to page 7-3.**

Closing the setpoint box

- ★ Remove the drive enable signal. Turn the power supply off.
- ★ Click on "X" in the upper right corner of the title bar.



CAUTION


Unauthorized access to protected functions possible!
When the work has been concluded, restart the DSS or reset the "Customer" group (password: koenig).
Otherwise, anyone may access all protected functions until the DSS program is exited.

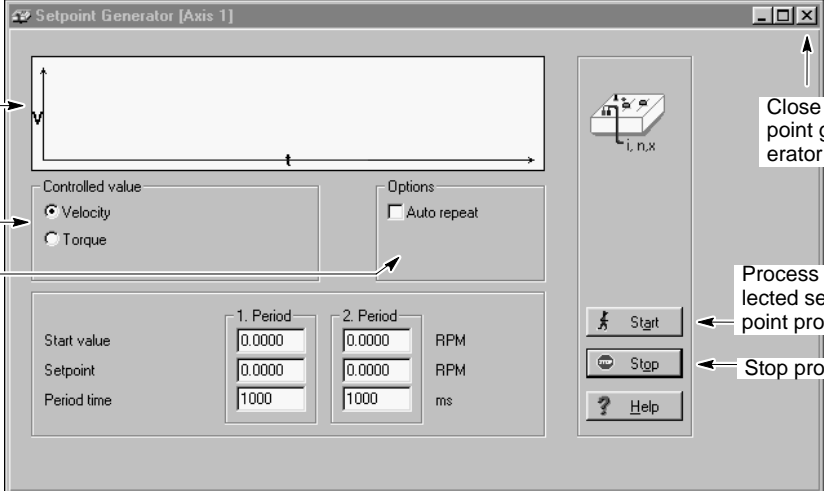
6.2.2 Setpoint generator

The setpoint generator is used to specify a **definable setpoint profile** for test purposes for the drive:

- ★ Turn the power supply of the drive on. Enable the drive with a setpoint of 0 V. The drive follows the setpoint input. The torque is active.

Starting the setpoint generator

- ★ Select the menu sequence:
 - CONTROL ► SETPOINT GENERATOR, or
 - click on the  command button in the DSS basic image and then select "Setpoint generator".



Field 1:
Characteristic of setpoint as a function of time

Only velocity control possible

When checkbox is marked, the selected setpoint profile is repeated cyclically

Close setpoint generator

Process selected setpoint profile

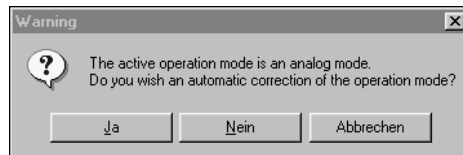
Stop process

Setting the setpoint profile

- ★ Two cycles can be specified in the "1. Period" and "2. Period" fields which are automatically processed one by one. Enter the desired starting and final values in the "Start value" and "Setpoint" input fields and the duration of the period (in ms) in the "Period time" input field. An input of "0" in the "Period time" field will deactivate the corresponding period.
- ★ After the input, field 1 automatically shows the related setpoint characteristic.
- ★ "Auto Repeat" in the "Options" field will repeat the setpoints periodically. Otherwise, they will be processed only once.

Processing the setpoint profile

- ★ Click on the "Start" command button in order to activate the drive.
To change over the setpoint input from "SW+/SW-" to "Setpoint generator", bit 15 of the operating mode parameter S-0-0032 is temporarily set to 0. This change-over is to be confirmed:



"Yes" The analog interface SW+/SW- is deactivated.
When the setpoint generator has been exited, the value of bit 15 is automatically reset to "1".

"No" No setpoint generator operation.

- ☞ **In order to avoid that this change is permanently memorized, you must not execute the "Save main memory" function while the setpoint generator is active.
Therefore, you should close the setpoint generator before executing "Save main memory" and check whether all values of the operating mode parameters S-0-0032 to S-0-0035 are set to the correct values!**

- ★ Clicking on the "Stop" command button will immediately stop the process.

Closing the setpoint generator

- ★ Remove the drive enable signal. Turn off the power supply.
- ★ Click on the "X" in the upper right corner of the title bar.




CAUTION

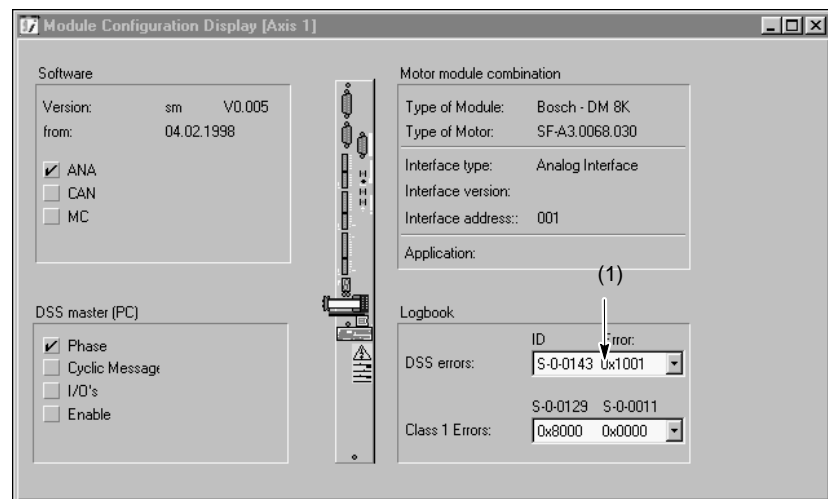
Unauthorized access to protected functions possible!
When the work has been concluded, restart the DSS or reset the "Customer" group (password: koenig).
Otherwise, anyone may access all protected functions until the DSS program is exited.

7 Diagnoses

7.1 Drive configuration / logbook

You will be shown **static** information on:

- software version (firmware version)
 - module and motor type
 - current DSS operation mode
 - application
 - interface type and version
 - DSS errors
 - Diagnostics class 1 errors
- ★ Select the menu sequence:
- DIAGNOSES ► MODULE CONFIGURATION, or
 - click on the  command button in the DSS basic image and then select "Module configuration".
- ★ Do not perform any operations (mouse click, keyboard entry, etc.) before the module configuration display appears (approx. 15 seconds). The DSS will only read the necessary information from the drive when the module configuration display is called up.



Logbooks

DSS errors: communication errors between the DSS and the drive. The error list containing max. 16 entries shows the parameter number where the error occurred and the corresponding error code. To display the error in plain text, click on (1) and then press <F1>.

Diagnostics Class 1 errors:

The error list containing max. 16 entries shows the contents of parameter S-0-0129 (Manufacturer's diagnostics class 1) and S-0-0011 (Diagnostics class 1) as hexadecimal values. Every high bit is assigned a certain error (cf. "Servodyn-D parameter description" manual).

7.2 Drive status


The display will show **dynamic** information on

- drive status: diagnostics message in plain text
- values of max. 4 parameters (e.g. actual values)
- condition of the 8 least significant bits of parameter P-0-2003
- status of "Drive ON", "Drive enable", and "Drive start"
- current operation mode
- Changes in "diagnostics class 1" to "diagnostics class 3" parameters (S-0-0011 to S-0-0013)

Displaying cyclic data

★ Select the menu sequence:

- DIAGNOSES ► MODULE STATUS DISPLAY, or

- click on the  command button in the DSS basic image and then select "Module Status Display".

Drive status in plain text as per S-0-0095.

Display of max. 4 parameters.

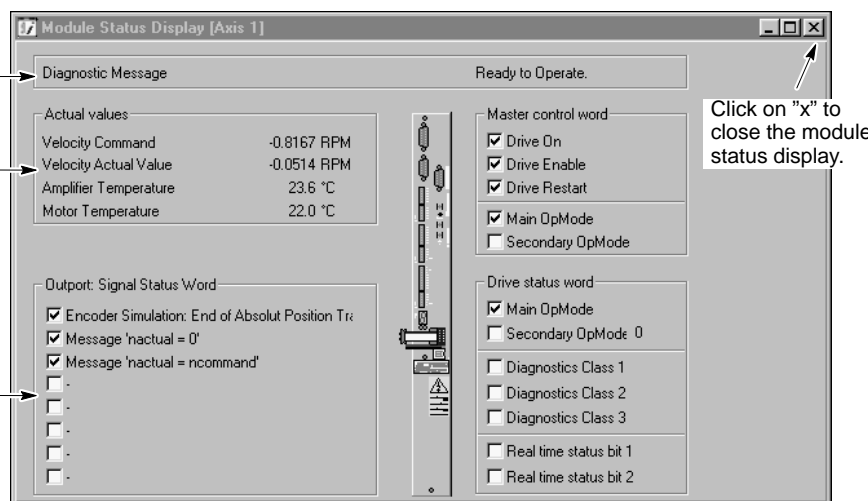
For configuration, cf. page 7-3.

For displaying parameters in separate windows, refer to section 7.4 page 7-5.

Display of max. 8 digital outputs (P-0-2003).

For configuration, cf. P-0-2002 and section 4.2.5, page 4-10.

Also refer to section 7.3.

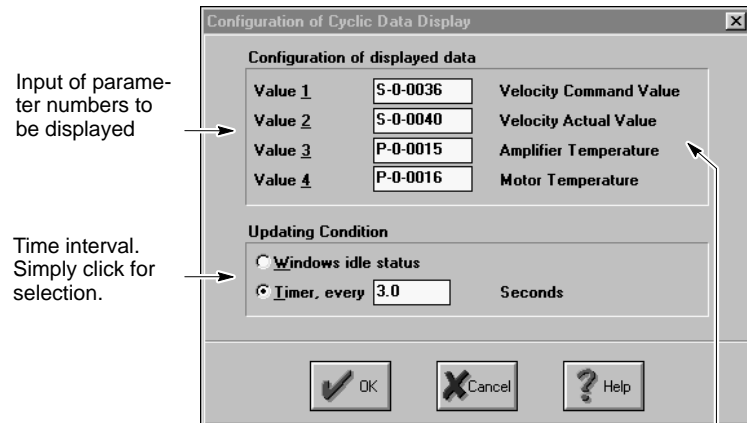


For updating frequency of the data, refer to page 7-3.

Configuring cyclic data

- ★ In order to determine the parameter number and updating frequency of the cyclic display in the "Actual values" range of the module status display, select the menu sequence:

OPTIONS ► PREFERENCES ► CYCLIC DATA DISPLAY



Parameter names are displayed in the currently selected language (cf. section 3.5)

- ★ Enter the parameter numbers to be cyclically displayed in fields "Value 1" to "Value 4".
Although you may enter any available parameter in the fields, only those parameters make sense whose value changes with time.
- ☞ **These parameters also appear in the "Actual values" window of the setpoint box (section 6.2.1).**
- ★ Click on the desired updating conditions:
 - **Windows idle status:**
fastest possible updating method. Whenever the operating system is not busy performing other tasks, the data will be updated.
 - **Timer, every xx seconds:**
fixed time interval for updating (default: 3 seconds).



CAUTION

The PC may respond very slowly to user activities!

The "Windows idle status" setting provides the fastest updates, however, it may lead to quite "tough" response times, especially if slow computers are used.

You should only use this updating condition if frequent updates of the display are absolutely necessary.

- ★ Clicking on "OK" will activate all changes immediately.
- ☞ **For displaying these or any other parameters cyclically in separate windows, refer to section 7.4, page 7-5.**

7.3 I/O signals


The DSS shows you

- the signals assigned to the digital inputs and outputs of the inverter, and
- the current status of these signals.

For the assignment of individual signals to the digital inputs and outputs of the inverter, please refer to section 4.2.5 on page 4–10.

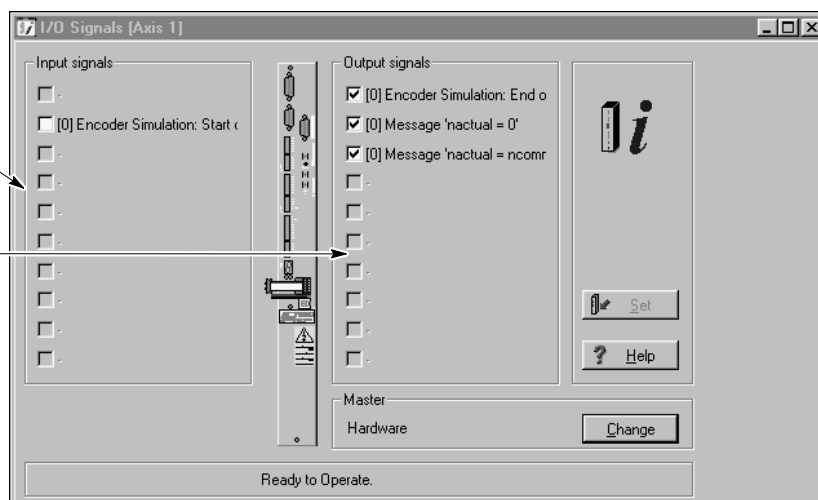
★ Select the menu sequence:

- DIAGNOSES ► I/O SIGNALS, or

- click on the  command button in the DSS basic image and then select "I/O Signals".

Display of all input signals configured in P-0-2000.
The current status of the signals is derived from P-0-2001.

Display of all output signals configured in P-0-2002.
The current status of the signals is derived from P-0-2003.




A HIGH level is indicated by the "✓" character in the checkbox. Dimmed checkboxes indicate that the corresponding bit has not been assigned to a signal in P-0-2001.

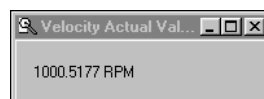
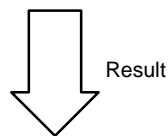
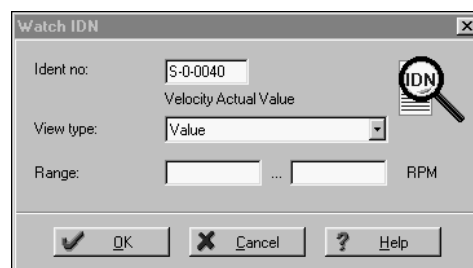
The data display is updated in the intervals set for the "Module status display" (cf. page 7–3).

7.4 Separate window for cyclic display

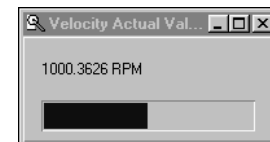
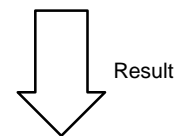
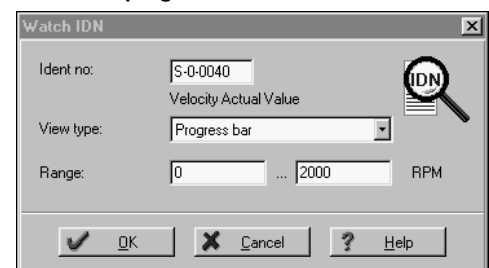
The DSS can display any parameters dynamically in separate windows. In addition to a pure text format, you may also choose a progress bar for display.

- ★ Select the menu sequence:
 - DIAGNOSES ► WATCH IDN, or
 - click on the  command button in the DSS basic image and then select "Watch IDN".

Display as value ...



Display as value and as progress bar ...



- ★ Enter the parameter to be displayed in the "Ident no." field.
- ★ Select "Value" or "Progress bar" as View type, and the desired upper and lower limits for the "Progress bar" option.
- ★ Clicking on "OK" will close the DSS dialog and display the parameter cyclically in a separate window.

The data display is updated in the intervals set for the "Module status display" (cf. page 7-3).

- ☞ **Parameter values (e.g. setpoints and/or actual values) can also be output via max. 4 analog outputs (cf. section 4.2.10). Thus, it is possible to visualize the drive responses, e.g., using a storage oscilloscope.**

7.5 Updating the parameter values of a *.scs file

An existing *.scs file can be taken as a basis for a template file in which the parameter values are replaced with current values and then saved in a new file. In terms of function, this process can be compared to "filling in" a template.

The system will not add any additional parameters to the target file or change the sequence of the parameters stored.

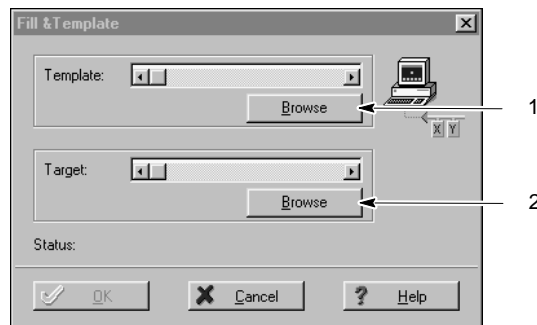
This function can be used to

- document the parameters of a drive (e.g. by printing an OEM-specific updated template file containing all parameters used)
- find out the differences between parameters of different drives.

★ First, you should create a complete *.scs file as a template and save this file. The system will only record the values of those parameters which are contained in this template.

★ Select the menu sequence:

FILE ► FILL & TEMPLATE



- ★ Click on "1" in order to select the template file. Only the parameters contained in this file will be read from the drive.
- ★ Click on "2" to enter the path and name of the target file.
- ★ Click on "OK" to generate the target file.

A Appendix

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