FC8x
fcontrol 8x
Professional

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Contents

1 About this Manual

This manual will give you basic knowledge of the functions and how to use the operating software *fcontrol 8x* or a frequency converter of series FC8x. . The software serves for entering and modifying the performance parameters of the frequency converter systematically and clearly. Besides, the functions for error diagnosis and application are described. Any made setting directly affects the operation of the frequency converter. Further information concerning the hardware of the frequency converter can you find in the technical manual of the respective device.

☞   Consider strictly the Safety Instruction and Application Advice in the hardware description of the frequency converter!

First, the steps that are necessary to install and to start the software for the first time are described. In the following chapter, you will learn how to enter, modify or administer performance parameters. Finally, in the last chapters, you will learn how to activate the frequency converter and how to interpret the various status messages.

1.1 Symbols

The following table explains the symbols used in this manual for describing purposes. Technical symbols and signs are supposed to be known and therefore not explained.

Symbol	Meaning
⚠	This symbol emphasizes important notes and warning messages that must strictly be observed. Nonobservance can cause injuries of the user or damages to the device.
☞	This symbol marks additional notes when using the software.

1.2 PC Hardware

The hardware must meet the following requirements

Processor	Pentium or compatible
Operating system	Windows 98, Windows NT4.0, Windows 2000, Windows XP
Graphics card	Windows compatible, SVGA resolution, Color
Drives	CD drive
Hard disk	free memory size appr. 20 MB
Main storage	at least 20 MB

Interfaces   a free serial interface (COM1, COM2, COM3 or COM4) which is not used by another software (driver) during operation

2 Installation of the Software fcontrol 8x Professional

☞ The functions described in the following can only be started with the software variant "fcontrol 8x Professional". In the software variant "fcontrol 8x Lite" only allows reading existing parameter sets and uploading or downloading them.

2.1 Start the Installation

In order to install the software *fcontrol 8x* on your PC, take the following steps:

➪ Insert the installation CD into your CD drive and start the installation program from the CD-ROM with *Setup fcontrol8x.exe*.

The following window is opened:

➪ Select the desired language via the pull-down menu and confirm with OK. German and English are provided.

⇨ The notes for the installation are confirmed by mouse click on the button *Next*.

⇨ The following dialog box *Choose destination* allows installing the software into any directory. The default path is c:\Programs\sm_ag\fcontrol8x Professional. Click on *Next*.
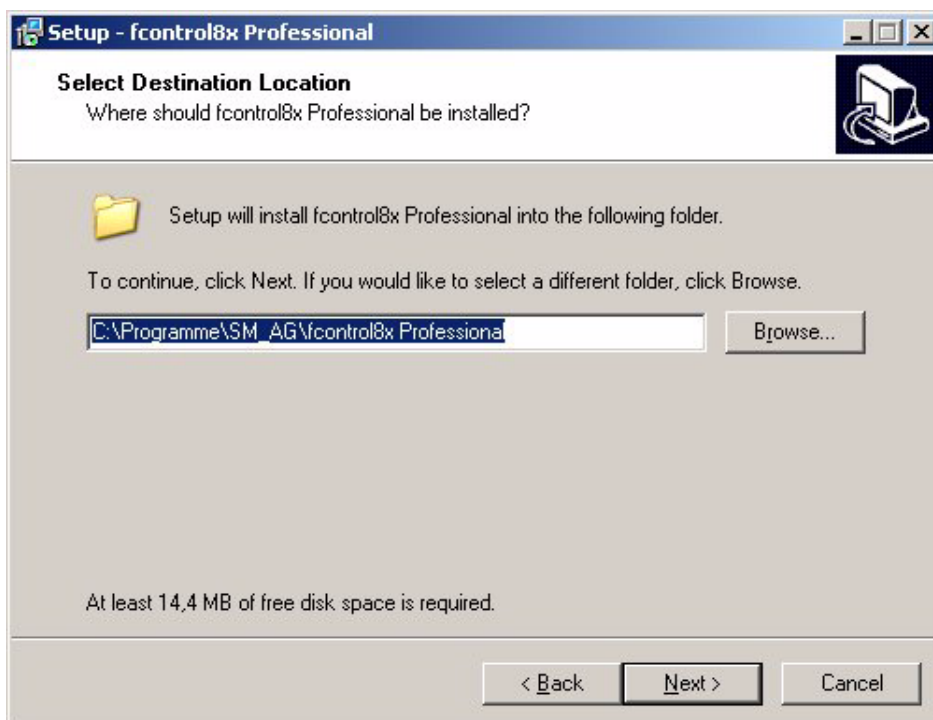
⇨ Choose a program folder in the following dialog box which will be displayed in the Windows start menu ("START" → "PROGRAMS"). The default setting is SIEB & MEYER/fcontrol8x Professional. Confirm the dialog box with *Next*.
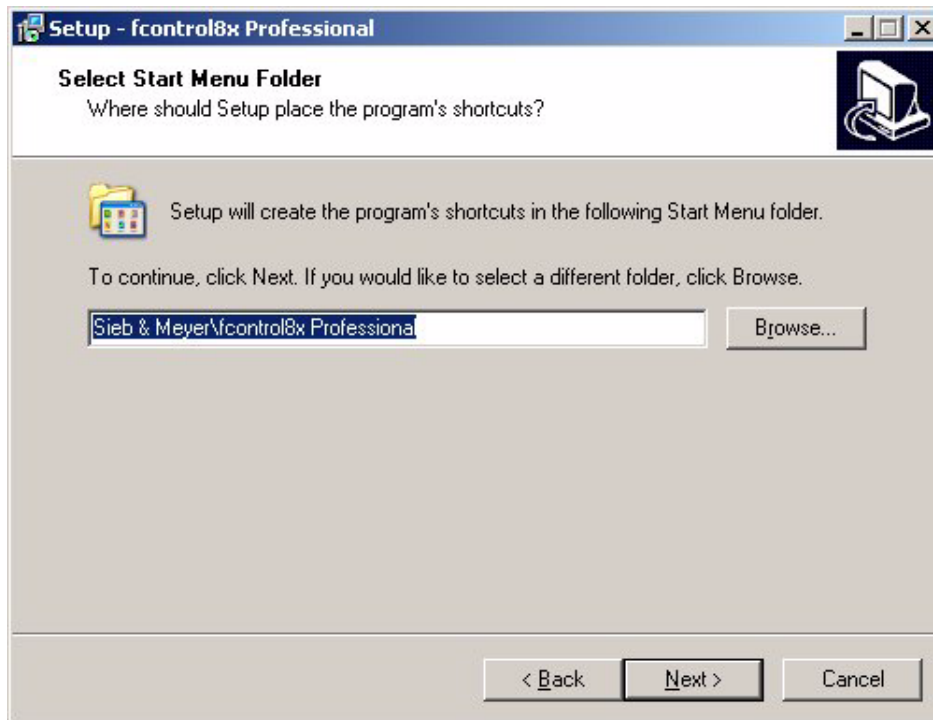
⇨   Choose in the following dialog box whether you want to create additional
     symbols on your desktop or in the quick start menu. Confirm the dialog box with
     Next.
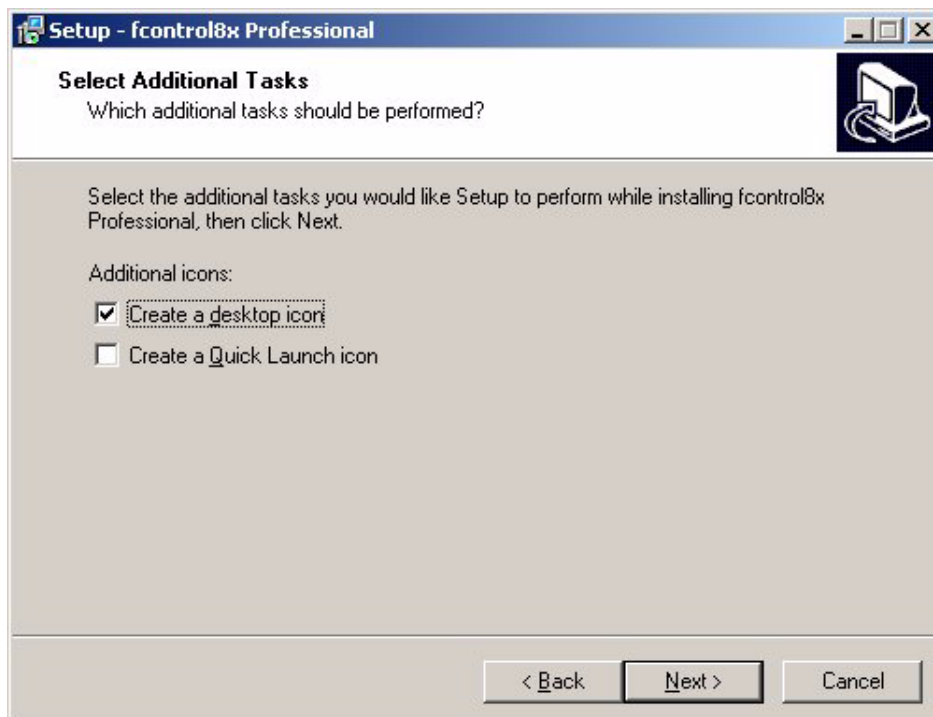
⇨   The following dialog box lists the selected folders and symbols. Click on Back, if
    you want to change settings.
    Click on *Install* to start the installation.
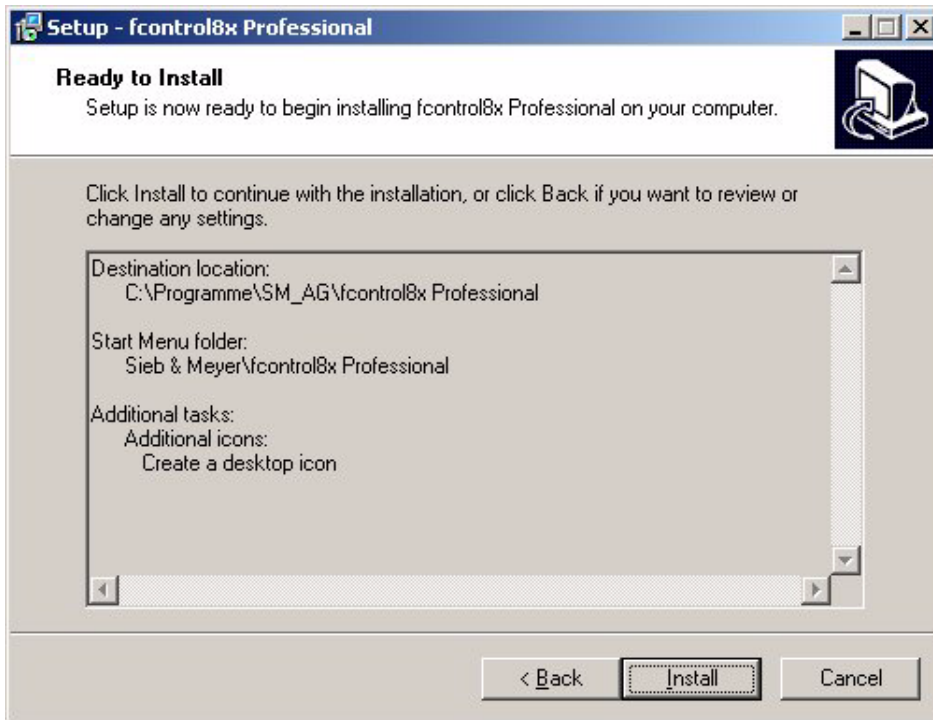
⇨   Afterwards, the copy cycle starts. All files are copied to the hard disk and
    unpacked. If the program is to be started immediately, activate the respective
    function and finish the installation process by mouse click on the tool button
    Finish.

2.2 Program Start

During the installation, the program group *SIEB & MEYER* and the subgroup *fcontrol 8x Professional* are generated in which the program *fcontrol8x Professional* is stored.

As usual under Windows, the start-up software is started by a mouse click on the icon *fcontrol8x Professional.*

2.3 Uninstall Software

In order to de-install the software *fcontrol8x Professional* take the following steps:

⇨ Click on "START" → "SETTINGS" → "CONTROL PANEL" → "SOFTWARE".

⇨ Choose the entry "fcontrol 8x" and click on the button "CHANGE/REMOVE".

Then, the software is de-installed.

3 Operation of the Software

The operation of the software *fcontrol 8x* corresponds to the Windows conventions.

3.1 User Interface

The design of the user-interface of the software is comparable to the Windows Explorer. On the left side of the window, the parameterization steps, the tools for optimum settings and the diagnosis possibilities are represented in a tree structure. After selecting a branch of the tree structure, the respective page is displayed on the right side of the window.
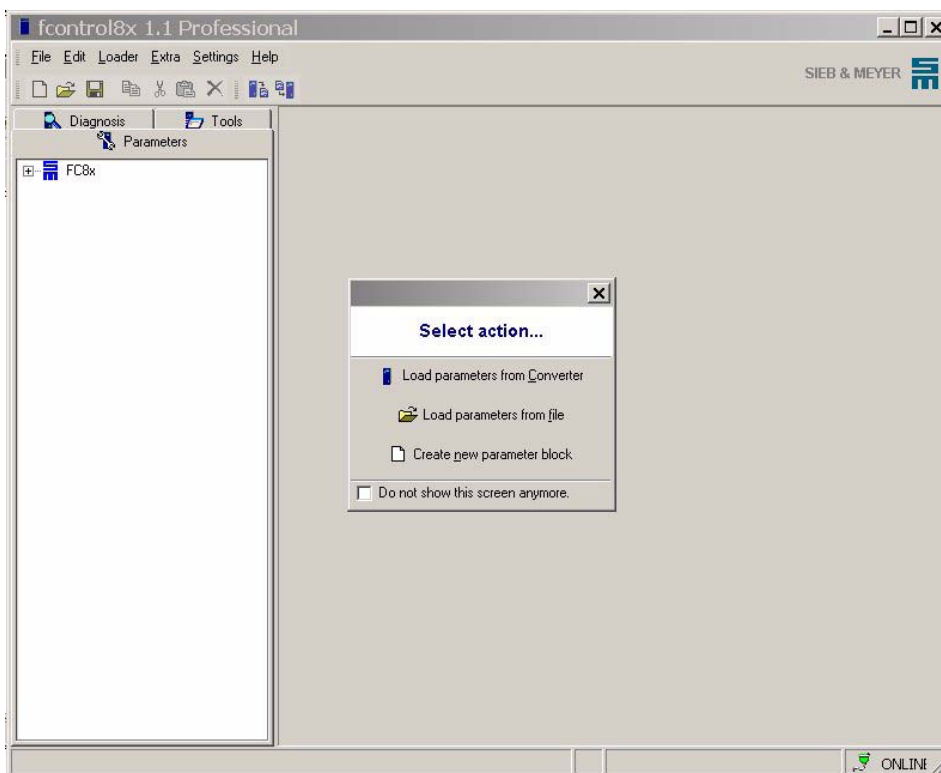
The user-interface is composed by the following components:

3.1.1 Title Bar

In the title bar, the program name and the already opened file is displayed.

3.1.2 Menu Bar
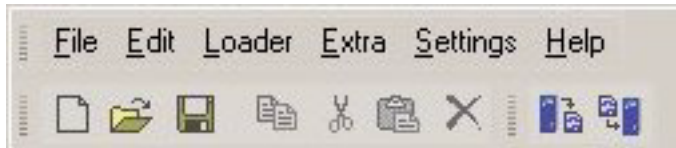
In the menu bar, you will find the program menu known from common Windows programs. The program menu contains all file operations, a loader functionality for loading parameter sets into the frequency converter, setting options of the program as well as the program help.

3.1.3 Menu "File"

A mouse click on the menu item opens a submenu with the following menu items:

▶ **New...**
   By mouse click on this menu item, the dialog box New... with the following options is opened:

   ▶ **Load parameters from SFU**
      Loads a current parameter set from the frequency converter.

   ▶ **Load parameters from file**
      Loads a parameter set from an existing configuration file (file extension ***.f8x**). The parameter file is usually stored in the directory "Installation path"\SM_Data.

   ▶ **Load empty parameter set**
      Creates a new parameter set, in which all operating parameters must be entered again.

▶ **Open...**
   Loads a parameter set from an existing parameter file (file extension ***.f8x**). The parameter file is usually stored in the directory "Installation path"\SM_Data.

▶ **Save**
   Saves the current parameter set into a named open parameter file. If the parameter set has not been stored before, a dialog box is opened which permits to enter a file name and to select the directory in which the file is to be stored. The file is usually stored in the directory "Installation path with the file extension *.f8x"\SM_Data.

▶ **Save as ...**
   Saves the current data block in a new parameter file. A dialog box is opened which permits to enter a file name and to select the directory in which the file is to be stored. The file is usually stored in the directory "Installation path with the file extension *.f8x"\SM_Data.
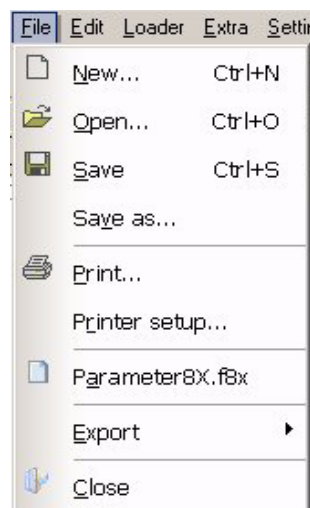
▶ **Print**
The current parameter set is printed. The dialog box Print... is opened which permits to select the parameter pages to be printed. By mouse click on the tool button *Print* a dialog box is opened which permits to select a printer.

▶ **Printer setup**
A dialog box is opened which permits to select a printer. Besides, additional settings as paper format, paper size and paper orientation can be made.

▶ **Parameter8X.f8x**
Between the menu items *Printer setup* and *Export* the parameter files stored last are indicated. The parameter file is automatically opened by mouse click on the file name allowing a rapid access to the parameter files.

▶ **Export**
Creates an HTML file via the menu items Export → HTML (**.html**), in which all performance parameters are displayed. In the following dialog box choose the directory under which the HTML file is to saved and enter a file name. The file is usually stored in the directory "Installation path"\SM_Data.

▶ **Close**
The program is closed.

3.1.3.1   Menu "Edit"

A mouse click on the menu item opens a submenu with the following menu items:

Edit	Loader	Settings	H
✂ Cut		Ctrl+X	
▤ Copy		Ctrl+C	
▤ Paste		Ctrl+V	
✕ Delete		Del	

▶ **Cut**
The marked value of a text field is cut from the text field and copied into the clipboard.

▶ **Copy**
The marked value of a text field is copied into the clipboard.

▶ **Paste**
The current content of the clipboard is pasted in an input field at the cursor position.

▶ **Delete**
The marked text of a text field is deleted.
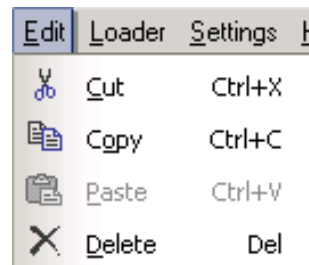
3.1.3.2 Menu "Loader"

A mouse click on the menu item opens a
submenu with the following menu items:

▶ **Read parameter from converter**
The current parameter set is loaded
from the frequency converter.

▶ **Send parameter to converter**
The current parameter set is send to the frequency converter and saved.
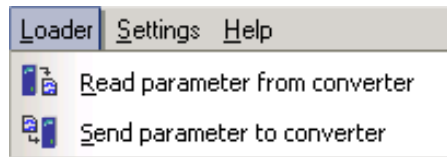
3.1.3.3 Menu "Extra"

A mouse click on the menu item opens a
submenu with the following menu items:

▶ **Protect data**
Series 0218071xxxx, 0218072xxxx
Motor parameters can be protected by a password. The minimum length of the
password is 4 characters and the maximum length is 8 characters.

▶ **Unprotect data**
The password protection is disabled by selecting this item and entering the
password.
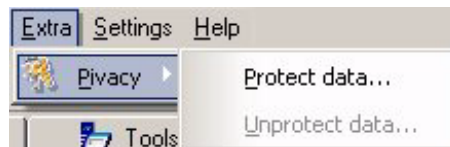
3.1.3.4 Menu "Settings"

A mouse click on the menu item opens a submenu
with the following menu items:

▶ **Language**
The language of the user interface can be
selected. German and English are provided.

▶ **Start menu**
This check box is used to set whether or not the
start menu *New...* is displayed when the software
is started.

▶ **Communication**
Setting the serial interface for the communication between the software and the
frequency converter.

3.1.3.5   Menu "Help"

A mouse click on the menu item opens a submenu with
the following menu items:
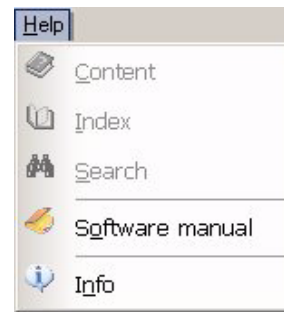
▶ **Content**
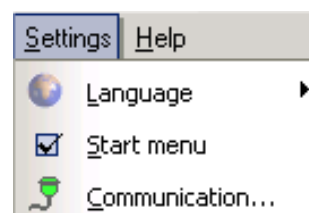 Display the content of the help.

▶ **Index**
  Displays the keyword index of the help.

▶ **Search**
  This function allows searching for terms in the texts of the help.

▶ **Software manual**

▶ **Info**
  Displays the software version and the contact address at SIEB & MEYER.

3.1.4   Tool Bar

Via the tool bar, you can get direct access to frequently used functions of the program
menu without having to use the menu bar. The symbols of the tool bar are identical
to the symbol of the corresponding menu item. If you pass along a tool button of the
tool bar with the mouse pointer, a note indicating the function of the tool button is
displayed for a short time.

▶ **New... (A)**
  By mouse click on this menu item, the dialog box New... with the following
  options is opened:

  ▶ **Load parameters from SFU**
    Loads a current parameter set from the frequency converter.

  ▶ **Load parameters from file**
    Loads a parameter set from an existing configuration file (file extension
    *.f8x). The parameter file is usually stored in the directory "Installation
    path"\SM_Data.

  ▶ **Load empty parameter set**
    Creates a new parameter set, in which all operating parameters must be
    entered again.

▶ **Open... (B)**
  Loads a parameter set from an existing parameter file (file extension ***.f8x**). The
  parameter file is usually stored in the directory "Installation path"\SM_Data.

▶ **Save (C)**
  Saves the current parameter set into a named open parameter file. If the
  parameter set has not been stored before, a dialog box is opened which permits

to enter a file name and to select the directory in which the file is to be stored. The file is usually stored in the directory "Installation path"\SM_Data with the file extension ***.f8x v**.

▶ **Copy (D)**
The marked value of a text field is copied into the clipboard.

▶ **Cut (E)**
The marked text is cut from the text field and copied into the clipboard.

▶ **Paste (F)**
The current content of the clipboard is pasted in an input field at the cursor position.

▶ **Delete (G)**
The marked text of a text field is deleted.

▶ **Read parameter from converter (H)**
The current parameter set is loaded from the frequency converter.

▶ **Send parameter to converter (I)**
The current parameter set is written into the frequency converter and saved (parameter download see page).

3.1.5   Directory Tree

Three tab pages are provided, summarizing the control functions of the frequency converter thematically. The directory tree structures the content of the selected tab page in single branches and sub-branches. You can select the following tab pages:

▶ Parameters

▶ Diagnosis

▶ Tools

The directory tree shows the branches which can be expanded or reduced. If you select a branch, the respective page is displayed on the right side of the directory tree.

3.1.5.1 Tab Page "Parameters"

Via this tab page, the different performance parameters of the frequency converter as motor parameters and configuration parameters for the analog and digital signals can be adjusted. This implies setting the motor parameters and configuring the analog and digital signals.
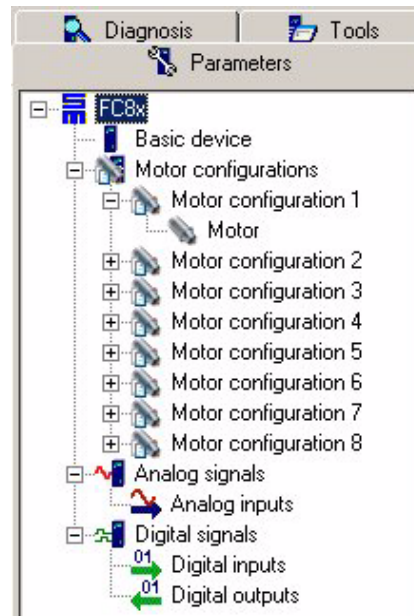
3.1.5.2 Tab Page "Diagnosis"

Via this tab page, the current status of the frequency converter is indicated. Information about the operating mode of the motor and the software version is provided. Besides, errors are displayed (if existent).

3.1.5.3 Tab Page "Tools"

Via this tab page, the motor can be activated at the frequency converter. Besides, additional motor settings can be made.
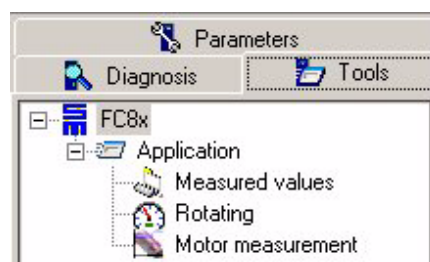
3.1.6   Display

In the display, the respective pages of the selected branch from the directory tree are displayed. Via the single pages, the frequency converter is parameterized, controlled and operated.

3.2   Status Bar

| Parameters are written into the converter. | 100% | ONLINE |
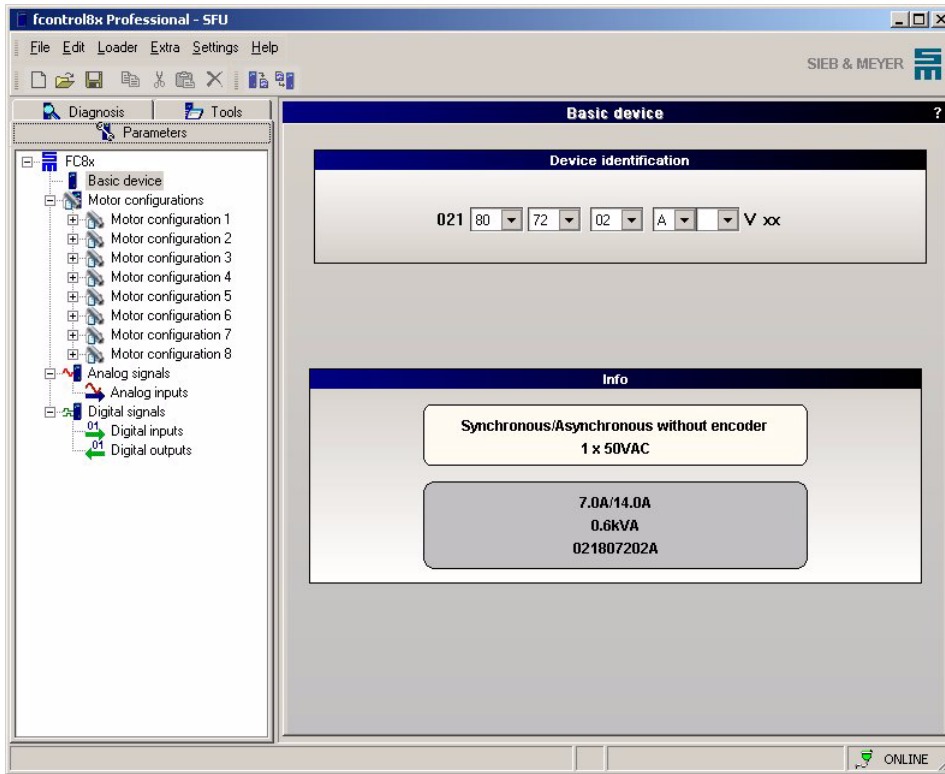
The status bar serves for giving information on the status of the program and of the
frequency converter. The status bar is divided into the following three sections:

Symbol	Meaning
😀	Execution O.K.
😐	Warning message
😞	An error has occurred

▶ **Status messages (A)**
   General status messages are displayed.

▶ **Progress bar (B)**
   The progress bar shows the current status of the download or upload.

▶ **Communication status (C)**
   The communication status shows the connection status between the PC and the
   frequency converter.

4 First Steps

4.1 Program Start

Start the software "fcontrol8x Professional" via the program group SIEB & MEYER
$\rightarrow$ fcontrol 8x. After a short time of the loading cycle, the start display with a start
dialog box for the first steps is displayed.
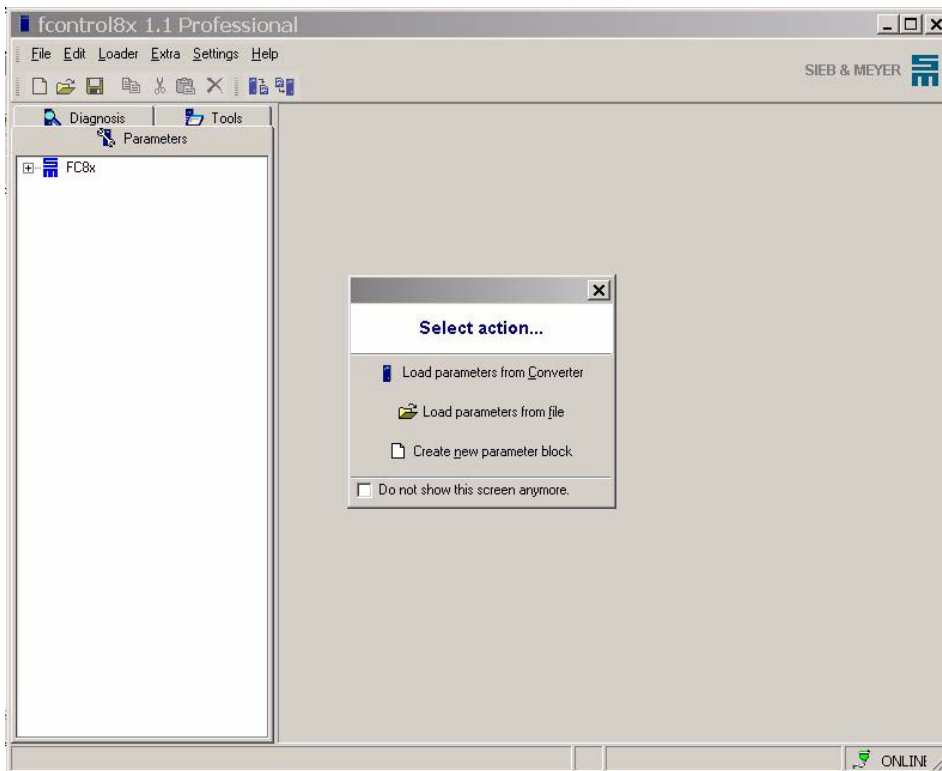
For executing its tasks after the initial operation, the frequency converter must be
configured and parameterized before. This required a parameter set which defines
the individual settings of the frequency converter. In order to modify a parameter set
via the user-interface of the software, it must either be loaded, new created or read-
out from the frequency converter.

According to this, the following options are provided:

▶ **Load parameters from SFU**
   Loads a current parameter set from the frequency converter.

▶ **Load parameters from file**
   A parameter set is loaded from an existing configuration file.

▶ **Load empty parameter set**
   Creates a new parameter set, in which all operating parameters must be entered
   again.

4.2 How to Create a Parameter Set

If a frequency converter has not been parameterized yet and a parameter file is not available, a new parameter set must be created. In the following sections, the single steps for creating a parameter set and the most important parameters for the initial operation are described. All settings described in the following can be seen in the directory tree in the tab page "Parameters".

Set Basic Device

⇨ First create a new parameter set by mouse click on the menu item "*Create new paremeter block*".

⇨ The page "Basic Device" is automatically opened. Choose the respective devicenumber of your device in the window "Device identification".

Select motor

⇨ Choose one of the eight pages "Motor configuration" in the branch "Motor configurations" of the directory tree.

⇨ Load an existing motor file which corresponds to the connected motor, or

⇨ Enter the corresponding motor data from the data sheet of the motor manufacturer on the page "Motor".

⇨ For the determination of control parameters please consider the chapter "Motor" and "Motor Measurement" (page 30, 66).

Determine the function of the analog inputs

⇨ Choose the page "Analog inputs" in the branch "Analog signals" of the directory tree.

⇨ Enter the corresponding speed reference values for filter time and minimum alteration and the voltage level for the maximum speed.

Determine the threshold value for the digital outputs

⇨ Choose the page "Digital outputs" in the branch "Digital signals" of the directory tree.

⇨ Enter the respective threshold value in the field "Fix load threshold".

Digital outputs series 0218071xxxx, 0218072xxxx

⇨ Choose the functions of the 4 digital outputs via the pull-down menus (see page 51).

Save parameter set in a file

⇨ Choose the menu item "Save" or "Save as..." in the menu file.
⇨ Choose a directory and a file name for the created parameter set to be stored.

Load a parameter set into the frequency converter

⇨ Choose the menu item "Send parameter to converter" in the menu "Loader".

Now, the parameter set is loaded into the frequency converter.

4.3 Parameter-Download

For an optimum operation of the frequency converter, the parameter set to be loaded must correspond to the connected frequency converter. For this reason, various settings are automatically checked before writing the parameter set into the frequency converter in order to protect the hardware. The results of these checks show whether the parameter settings of the basic device correspond to the connected hardware.

The download of the parameters is started by mouse click on the menu item "Send parameter to converter". Afterwards, settings concerning the logic and the output stage are checked. The checked settings are displayed in a list.
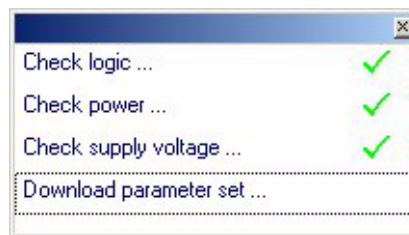
If the parameter settings do not correspond to the used hardware, a message is displayed describing the respective error.

5 Parameters

On the parameter pages that are opened via the branches in the directory tree you can set or modify the performance parameters of the frequency converter. Apart from parameterizing the motor, you can configure the analog inputs as well as digital inputs and outputs.

5.1 Basic Device

On the page "Basic device" basic settings of the frequency converter are made.
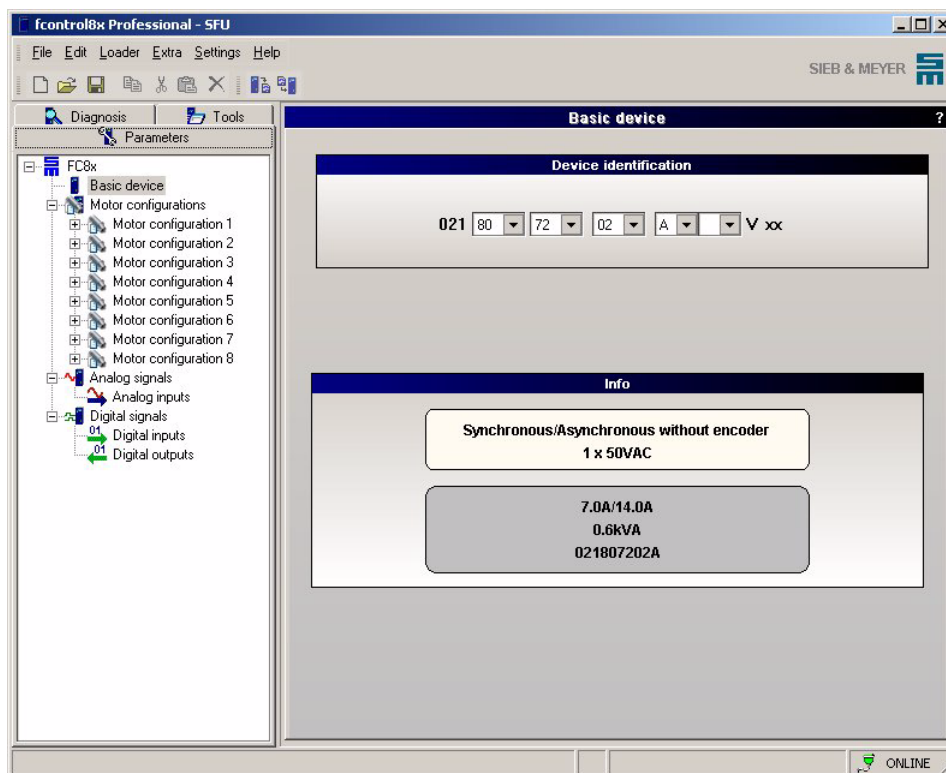
The page "Basic device" is divided into the sections "Device identification" and "Info".

Device identification
Select the basic device from the pull down menu.
In ONLINE operation the connected frequency converter is sidentifeid via the command "Read parameters from converter" and displayed in the list box "Device identification".

☞ The respective data can be found on the type plate of the frequency converter (see Technical Manual).

Info
In this section, the parameters entered before are displayed.

5.2 Motor Configuration

On the page "Motor configuration" you can select whether you want to parameterize 8 different motor configurations or 1 motor configuration with 8 different speed configurations.

When you activate the check box *8 motor configurations* the directories *Motor configuration 1* to *Motor configuration 8* will be displayed.
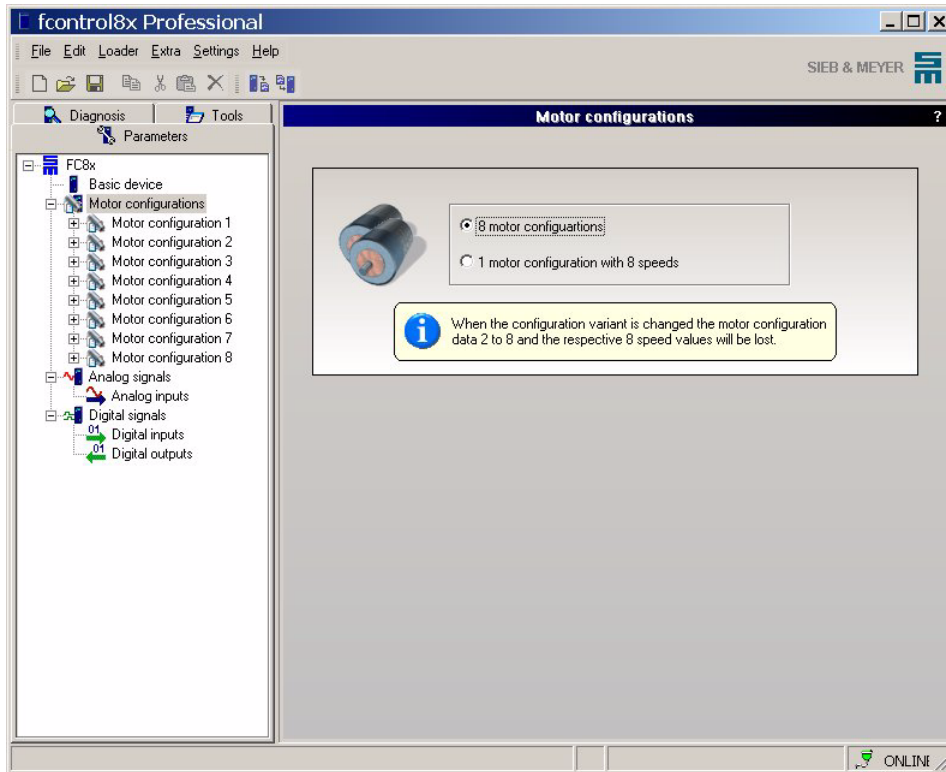
When you activate the check box *1 motor configuration with 8 speeds* the directories *Motor configuration 1* and *Speed configuration* will be displayed.

☞ The function *Speed configuration* is not yet supported by the device.
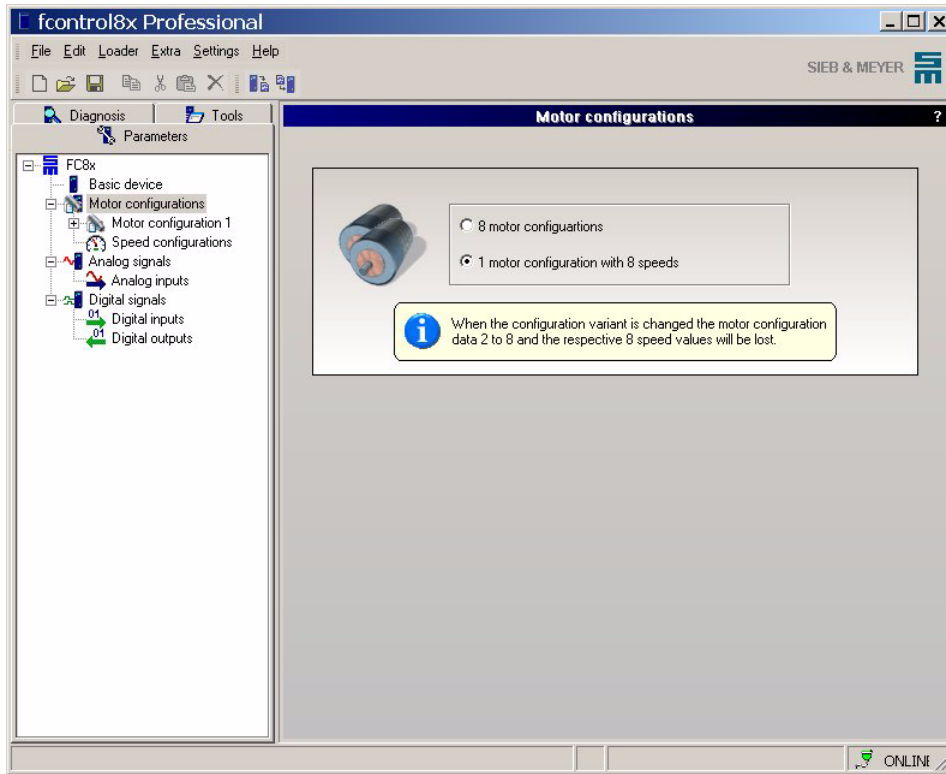
On the page "Speed configuration" you can set 8 different speeds.
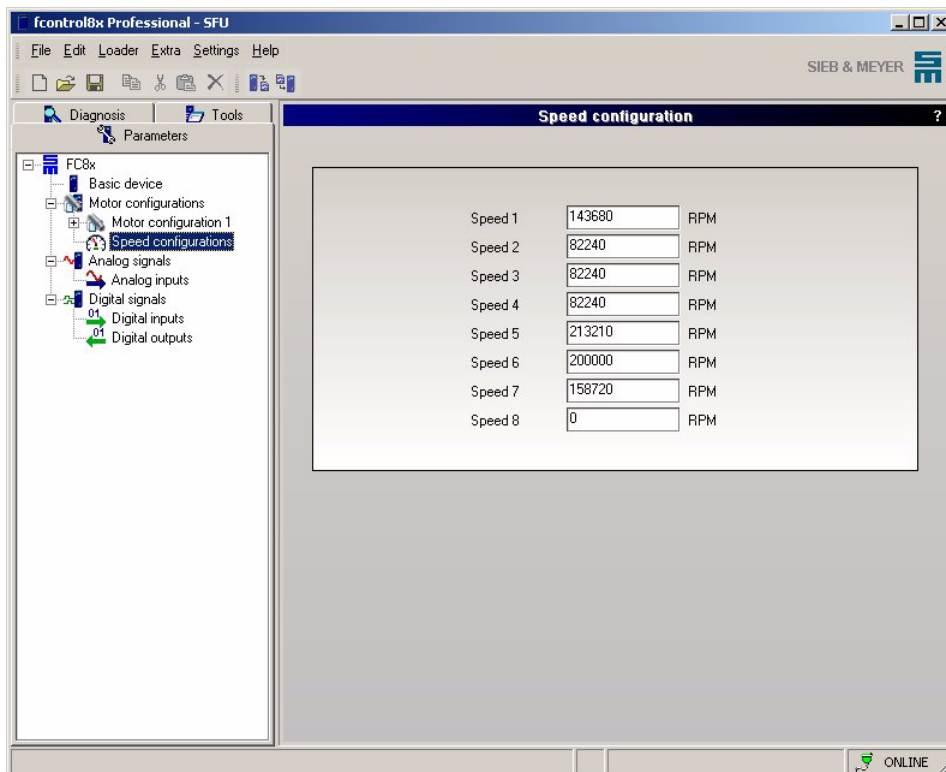
Up to 8 different motor configurations can be parameterized, e.g, if several motors are connected to the frequency converter. On the following pages, only the motor configuration 1 is documented. Concerning the following motor configurations (2-8), please proceed similarly.
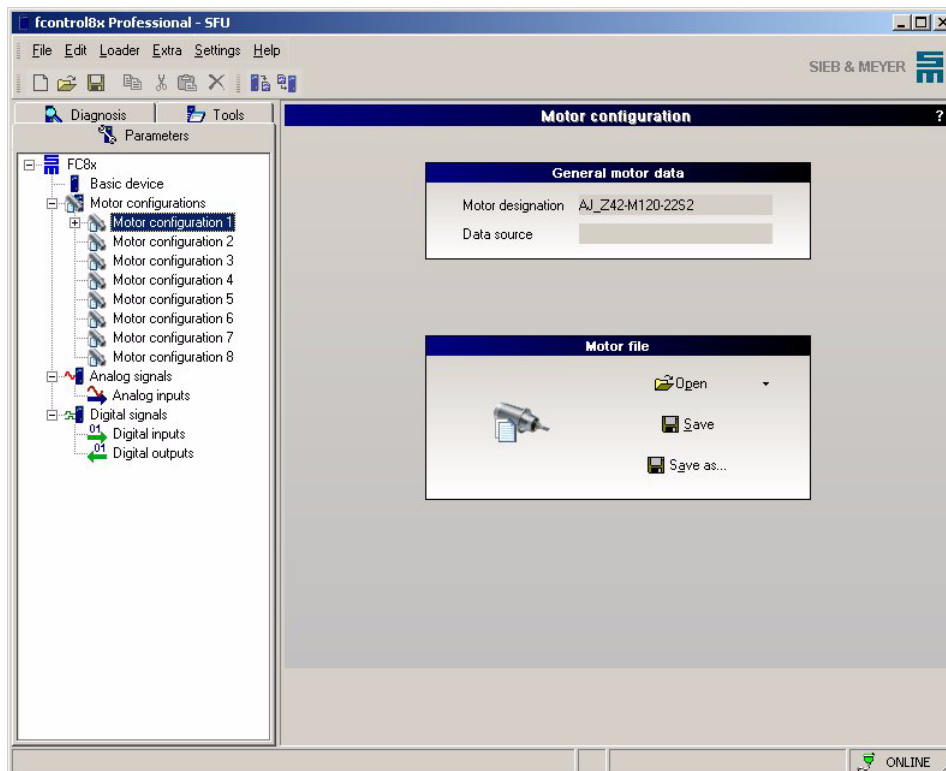
General motor data
In this window, the connected motor, the path of the current motor file and the file version are displayed.

Motor file
You can store and load the motor files via three tool buttons. The motor files have the file extension ***.m8x**.

▶ **Open**
Any motor file can be opened and loaded from a data medium.

▶ **Save**
The current motor parameters can be saved in an already opened motor file. All parameters of the file are overwritten by the current parameters. If no motor file has been opened, a dialog box is opened in which a file can be selected.

▶ **Save as...**
The current motor parameters are saved in a motor file under a new name.

☞ If the motor configurations 2 to 8 are to be used the it must be ensured that the frequency converter is wired correspondingly (connector X3-I/O-Link) .

5.2.1   Motor

On the page "Motor" either the motor parameters loaded from an existing motor file can be displayed or motor parameters can be loaded from the frequency converter. If a new motor file is to be created, you can enter the new parameters in this window or determine the motor parameters by means of the tool "Tool measurement" (see page 66).
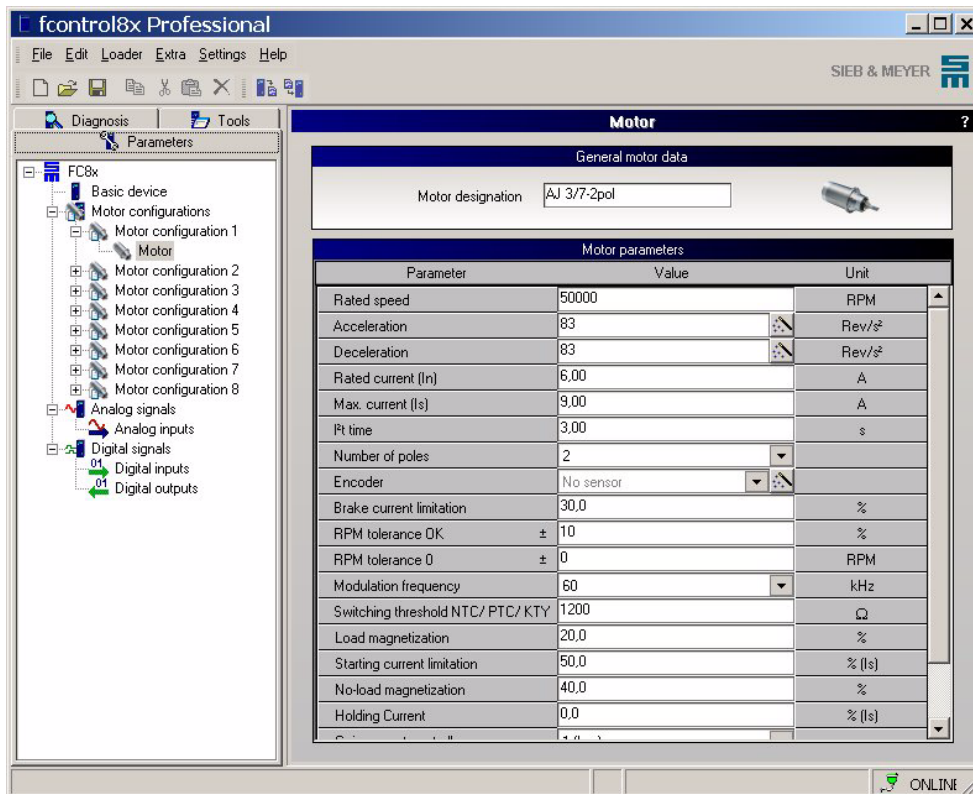
General motor data
The designation of the motor must be entered. The motor designation also serves for identifying the motor on the tab page "Tools".

Motor parameters
In this section of the window, the motor parameters required for the parameterization of the frequency converter are listed.

5.2.1.1 Synchronous/Asynchronous Motor without Sensor Series 0218071xxxx, 0218072xxxx

The motor parameters for synchronous/asynchronous motors are as follows:

Parameters	Unit	Description	Range	Typical default values
Rated speed	RPM	Rated speed of the motor	0 - 480 000	
Acceleration	Rev/s^2	Maximum acceleration of the motor. The frequency converter tries to accelerate the motor at the selected acceleration as long as the required current is smaller than/equal to the peak current. If the selected acceleration is too high the motor is automatically accelerated with the peak current, that means that the real acceleration is smaller than the selected acceleration. In order to avoid damage to the motor the maximum admissible acceleration values of the motor should also be considered (see chapter "Wizard Series 0218071xxxx, 0218072xxxx", page 40).		
Deceleration	Rev/s^2	Maximum deceleration of the motor. The frequency converter tries to decelerate the motor at the selected deceleration as long as the required current is smaller than/equal to the peak current. If the selected deceleration value us selected the motor can break down. The value should always be smaller than/equal to the maximum real acceleration (see chapter "Wizard Series 0218071xxxx, 0218072xxxx", page 40).		
Rated current (I_N)	A	Rated current of the motor (r.m.s. value)		
Max. current (I_S)	A	Peak current of the motor (r.m.s. value). Generally this value is about 1.5 to 2 times higher than the rated current.		

Parameters	Unit	Description	Range	Typical default values	
I^2t time	s	Maximum I^2t time of the motor. If the entered I^2t time of the motor exceeds the I^2t time -of the frequency converter, the I^2t time of the motor is limited internally to the maximum value and no warning message appears. Generally, the I^2t time of the frequency converter is 5 s. The maximum I^2t time of the frequency converter is calculated as follows: ^{2}t_FC_MAX = $(I_{MAX}^{FC} / I_{MAX}^{MOTOR})^2$ x 5	2 - 20	5 s	
Number of poles		Number of poles of the motor; for 6-pole motors the device must be adapted in factory.	2 / 4 / 6 / 8		
Encoder		Serves for adaptation to the used motor encoder (see wizard for the motor encoder, page 40). If the parameter "No sensor" is set, the messages "Speed Zero" and "Speed O"K as well as the indication of the speed are derived from the rotating field. The actual speed of the spindle can be different.			
RPM tolerance OK ±	%	Also refer to chapter "Digital outputs", page 51.	0 - 20	10 %	
RPM tolerance 0 ±	RPM	Also refer to chapter "Digital outputs", page 51.	0 - 1000	0 RPM	
Modulation frequency	kHz	Modulation frequency of the frequency converter. The modulation frequency should be selected in dependence from the rated speed. Higher values for the modulation frequency have the effect that the maximum output currents of the frequency converter are reduced (see hardware description of the frequency converter).	20 30 60 100	at < 40.000 RPM at < 120.000 RPM at < 200.000 RPM at > 200.000 RPM	
Switching threshold NTC/PTC/KTY	Ω	The switching threshold is entered in Ω. Positive values = PTC, negative values = NTC	100 to 10000 -100 to -10000 0 = no monitoring	PTC: 1200 Ω NTC: -1200 Ω	
				Syn.	**Asyn.**
Brake current limitation	%	Maximum brake current (0 to 100 % from I_S)	0 - 50	30 %	30 %
Load magnetization	%	Defines the static load behavior (see chapter "Motor Measurement", page 66).	0 - 100	0 %	20 %
Starting current limitation	%	Maximum acceleration current (0 to 100 % from I_S) in the controlled operation (0 to 10 % rated speed).	% (I_S)	50 %	50 %
No-load magnetization	%	Defines the no-load behavior (the no-load current) and the dynamic load behavior (see chapter "Motor Measurement", page 66).	0 - 100	20 %	40 %
Holding current	%	Current supply of the motor at speed 0 with the specified current (0 to 10 % from I_S).	% (I_S)	5 %	0 %
Gain current controller		Amplification of the current controller.	1 (low) 2 / 3 4 (high)	1 (low)	1 (low)
Time constant of magnetization		Attenuation of the magnetization controller.	Attenuated Standard Fast	Fast	Standard
Synchronous		Change-over between synchronous and asynchronous motors	On / Off	On	Off

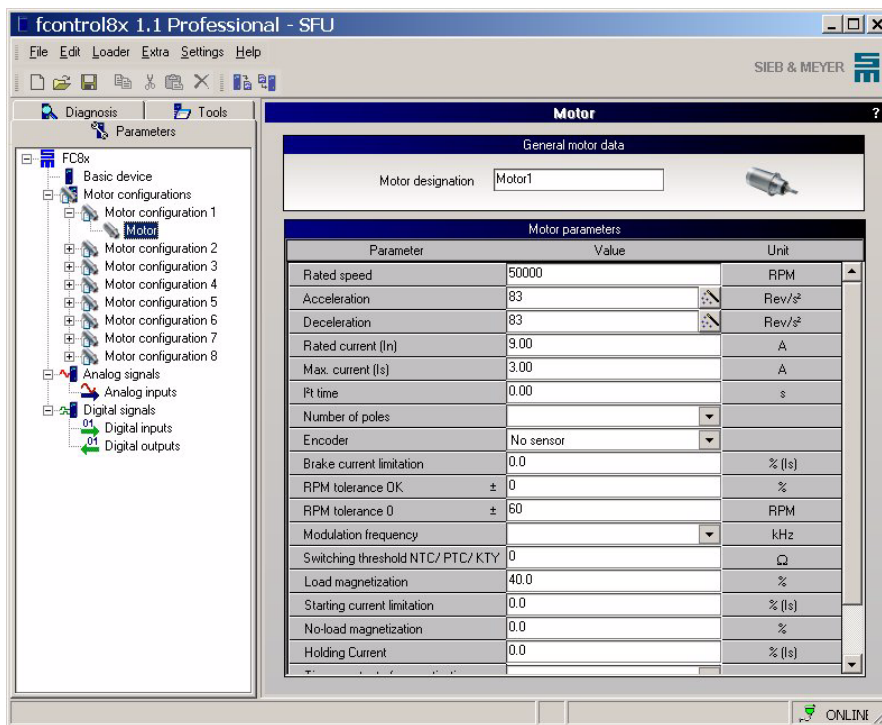## 5.2.1.2   Synchronous/Asynchronous Motor without Sensor Series 0218070xxxx

The motor parameters for synchronous/asynchronous motors are as follows:

Parameters	Unit	Description	Range	Typical default values
Rated speed	RPM	Rated speed of the motor	0 - 480 000	
Acceleration	Rev/s^2	Maximum acceleration of the motor. The frequency converter tries to accelerate the motor at the selected acceleration as long as the required current is smaller than/equal to the peak current. If the selected acceleration is too high the motor is automatically accelerated with the peak current, that means that the real acceleration is smaller than the selected acceleration. In order to avoid damage to the motor the maximum admissible acceleration values of the motor should also be considered (see chapter "Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx", page 42).		
Deceleration	Rev/s^2	Maximum deceleration of the motor. The frequency converter tries to decelerate the motor at the selected deceleration as long as the required current is smaller than/equal to the peak current. If the selected deceleration value us selected the motor can break down. The value should always be smaller than/equal to the maximum real acceleration (see chapter "Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx", page 42).		
Rated current (I$_N$)	A	Rated current of the motor (r.m.s. value)		
Max. current (I$_S$)	A	Peak current of the motor (r.m.s. value). Generally this value is about 1.5 to 2 times higher than the rated current.		

Parameters	Unit	Description	Range	Typical default values	
I^2t time	s	Maximum I^2t time of the motor. If the entered I^2t time of the motor exceeds the I^2t time -of the frequency converter, the I^2t time of the motor is limited internally to the maximum value and no warning message appears. Generally, the I^2t time of the frequency converter is 5 s. The maximum I^2t time of the frequency converter is calculated as follows: ^{2}t_FC_MAX = $(I_{MAX}{}^{FC}/I_{MAX}{}^{MOTOR})^2$ x 5	2 - 20	5 s	
Number of poles		Number of poles of the motor; for 6-pole motors the device must be adapted in factory.	2 / 4 / 6 / 8		
Encoder		This parameter serves for adapting the motor to the used motor encoder (Connection example with the correct parameter see page 45). If the parameter "No sensor" is set, the messages "Speed Zero" and "Speed O"K as well as the indication of the speed are derived from the rotating field. The actual speed of the spindle can be different.			
RPM tolerance OK ±	%	Also refer to chapter "Digital outputs", page 55.	0 - 20	10 %	
RPM tolerance 0 ±	RPM	Also refer to chapter "Digital outputs", page 55.	0 - 1000	0 RPM	
Modulation frequency	kHz	Modulation frequency of the frequency converter. The modulation frequency should be selected in dependence from the rated speed. Higher values for the modulation frequency have the effect that the maximum output currents of the frequency converter are reduced (see hardware description of the frequency converter).	10 18 30 60	at < 20.000 RPM at < 40.000 RPM at < 120.000 RPM at > 120.000 RPM	
Switching threshold NTC/PTC/KTY	Ω	The switching threshold is entered in Ω. Positive values = PTC, negative values = NTC	100 to 10000 -100 to -10000 0 = no monitoring	PTC: 1200 Ω NTC: -1200 Ω	
				Syn.	**Asyn.**
Brake current limitation	%	Maximum brake current (0 to 100 % from I_S)	0 - 50	30 %	30 %
Load magnetization	%	Defines the static load behavior (see chapter "Motor Measurement", page 66).	0 - 100	0 %	20 %
Starting current limitation	%	Maximum acceleration current (0 to 100 % from I_S) in the controlled operation (0 to 10 % rated speed).	% (I_S)	50 %	50 %
No-load magnetization	%	Defines the no-load behavior (the no-load current) and the dynamic load behavior (see chapter "Motor Measurement", page 66).	0 - 100	20 %	40 %
Holding current	%	Current supply of the motor at speed 0 with the specified current (0 to 10 % from I_S).	% (I_S)	5 %	0 %
Time constant of magnetization		Attenuation of the magnetization controller.	Attenuated Standard Fast	Fast	Standard
Gain current controller		Amplification of the current controller.	1 (low) 2 / 3 4 (high)	1 (low)	1 (low)
Synchronous		Change-over between synchronous and asynchronous motors	On / Off	On	Off

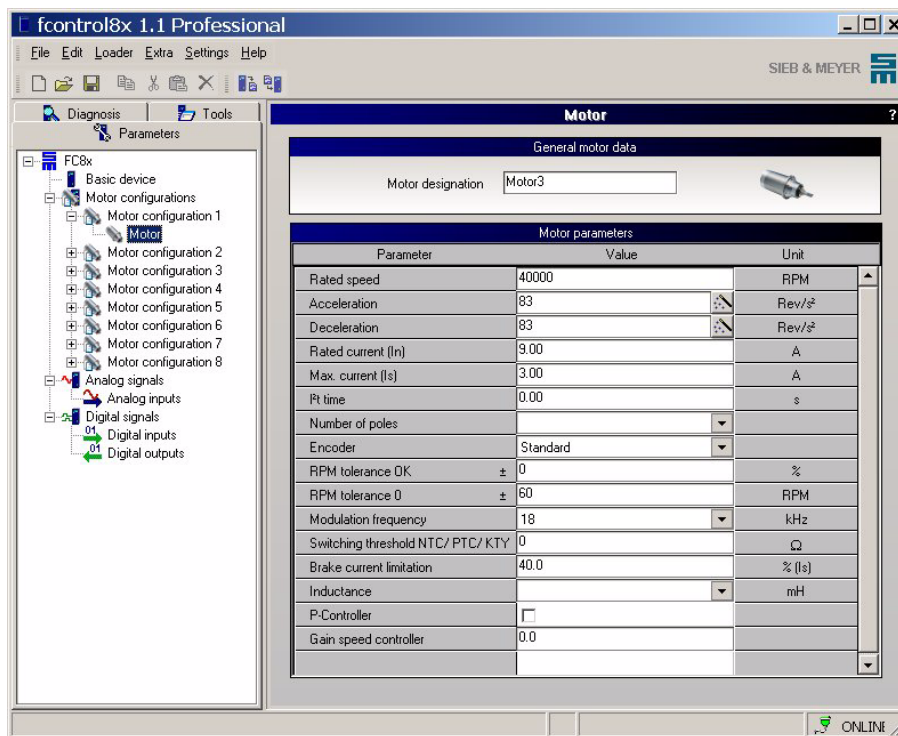## 5.2.1.3 Asynchronous Motor without Sensor, Magnetization Control Series 0218050xxxx
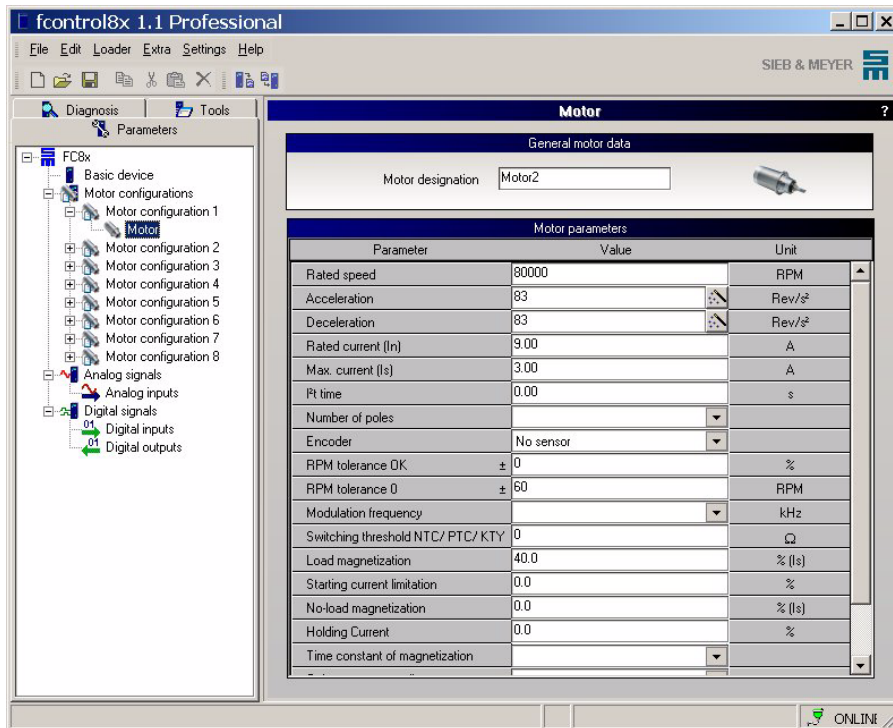
The motor parameters for asynchronous motors are as follows:

Parameters	Unit	Description	Range	Typical default values
Rated speed	RPM	Rated speed of the motor	0 - 480 000	
Acceleration	Rev/s^2	Maximum acceleration of the motor. The frequency converter tries to accelerate the motor at the selected acceleration as long as the required current is smaller than/equal to the peak current. If the selected acceleration is too high the motor is automatically accelerated with the peak current, that means that the real acceleration is smaller than the selected acceleration. In order to avoid damage to the motor the maximum admissible acceleration values of the motor should also be considered (see chapter "Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx", page 42).		
Deceleration	Rev/s^2	Maximum deceleration of the motor. The frequency converter tries to decelerate the motor at the selected deceleration as long as the required current is smaller than/equal to the peak current. If the selected deceleration value us selected the motor can break down. The value should always be smaller than/equal to the maximum real acceleration (see chapter "Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx", page 42).		
Rated current (I_N)	A	Rated current of the motor (r.m.s. value)		
Max. current (I_S)	A	Peak current of the motor (r.m.s. value). Generally this value is about 1.5 to 2 times higher than the rated current.		

Parameters	Unit	Description	Range	Typical default values
I^2t time	s	Maximum I^2t time of the motor. If the entered I^2t time of the motor exceeds the I^2t time -of the frequency converter, the I^2t time of the motor is limited internally to the maximum value and no warning message appears. Generally, the I^2t time of the frequency converter is 5 s. The maximum I^2t time of the frequency converter is calculated as follows: ^{2}t_FC_MAX = $(I_{MAX}^{FC} / I_{MAX}^{MOTOR})^2$ x 5	2 - 20	5 s
Number of poles		Number of poles of the motor; for 6-pole motors the device must be adapted in factory.	2 / 4 / 6 / 8	
Encoder		This parameter serves for adapting the motor to the used motor sensor/encoder (Connection example with the correct parameter see page 45). If the parameter "No sensor" is set, the messages "Speed Zero" and "Speed O"K as well as the indication of the speed are derived from the rotating field. The actual speed of the spindle can be different.		
RPM tolerance OK ±	%	Also refer to chapter "Digital outputs", page 55.	0 - 20	10 %
RPM tolerance 0 ±	RPM	Also refer to chapter "Digital outputs", page 55.	0 - 1000	0 RPM
Modulation frequency	kHz	Modulation frequency of the frequency converter. The modulation frequency should be selected in dependence from the rated speed. Higher values for the modulation frequency have the effect that the maximum output currents of the frequency converter are reduced (see hardware description of the frequency converter).	10 18 30 60	at < 20.000 RPM at < 40.000 RPM at < 120.000 RPM at > 120.000 RPM
Switching threshold NTC/PTC/KTY	Ω	The switching threshold is entered in Ω. Positive values = PTC, negative values = NTC	100 to 10000 -100 to -10000 0 = no monitoring	PTC: 1200 Ω NTC: -1200 Ω
Load magnetization	%	Defines the static load behavior (see chapter "Motor Measurement", page 66).	0 - 100	50 %
Starting current limitation	%	Maximum acceleration current (0 to 100 % from I_S) in the controlled operation (0 to 10 % rated speed).	% (I_S)	50 %
No-load magnetization	%	Defines the no-load behavior (the no-load current) and the dynamic load behavior (see chapter "Motor Measurement", page 66).	0 - 100	50 %
Holding current	%	Current supply of the motor at speed 0 with the specified current (0 to 10 % from I_S).	% (I_S)	0 %
Time constant of magnetization		Attenuation of the magnetization controller.	Standard Attenuated	Standard
Gain current controller		Amplification of the current controller.	1 (low) 2 / 3 4 (high)	1 (low)

5.2.1.4 Synchronous Motor with Hall Effect Sensor Series 0218030xxxx

The motor parameters for synchronous motors are as follows:

Parameters	Unit	Description	Range	Typical default values
Rated speed	RPM	Rated speed of the motor	0 - 480 000	
Acceleration	Rev/s^2	Maximum acceleration of the motor. The frequency converter tries to accelerate the motor at the selected acceleration as long as the required current is smaller than/equal to the peak current. If the selected acceleration is too high the motor is automatically accelerated with the peak current, that means that the real acceleration is smaller than the selected acceleration. In order to avoid damage to the motor the maximum admissible acceleration values of the motor should also be considered (see chapter "Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx", page 42).		
Deceleration	Rev/s^2	Maximum deceleration of the motor. The frequency converter tries to decelerate the motor at the selected deceleration as long as the required current is smaller than/equal to the peak current. If the selected deceleration value us selected the motor can break down. The value should always be smaller than/equal to the maximum real acceleration (see chapter "Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx", page 42).		
Rated current (I_N)	A	Rated current of the motor (r.m.s. value)		
Max. current (I_S)	A	Peak current of the motor (r.m.s. value). Generally this value is about 1.5 to 2 times higher than the rated current.		

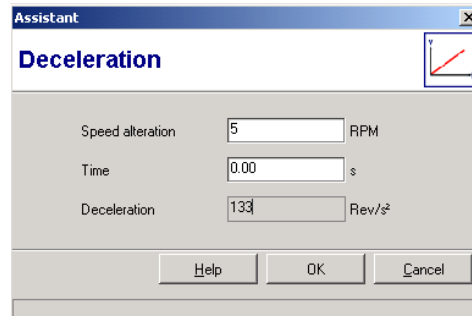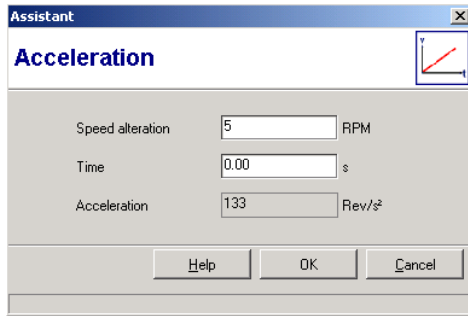| Parameters	Unit	Description	Range	Typical default values
I^2t time	s	Maximum I^2t time of the motor. If the entered I^2t time of the motor exceeds the I^2t time -of the frequency converter, the I^2t time of the motor is limited internally to the maximum value and no warning message appears. Generally, the I^2t time of the frequency converter is 5 s. The maximum I^2t time of the frequency converter is calculated as follows: $^2t\_FC\_MAX = (I_{MAX}{}^{FC}/I_{MAX}{}^{MOTOR})^2 \times 5$	2 - 20	5 s
Number of poles		Number of poles of the motor; for 6-pole motors the device must be adapted in factory.	2 / 4 / 6 / 8	
Encoder		Serves for adaptation of the phase shift of the sensor/ encoder (see also hardware description section "X4 - Sensor", in the chapter "Motor Measurement", page 66).	Standard Displacement	
RPM tolerance OK ±	%	Also refer to chapter "Digital outputs", page 55.	0 - 20	10 %
RPM tolerance 0 ±	RPM	Also refer to chapter "Digital outputs", page 55.	0 - 1000	0 RPM
Modulation frequency	kHz	Modulation frequency of the frequency converter. The modulation frequency should be selected in dependence from the rated speed. Higher values for the modulation frequency have the effect that the maximum output currents of the frequency converter are reduced (see hardware description of the frequency converter).	10 18 30 60	at < 20.000 RPM at < 40.000 RPM at < 120.000 RPM at > 120.000 RPM
Switching threshold NTC/PTC/KTY	Ω	The switching threshold is entered in Ω. Positive values = PTC, negative values = NTC	100 to 10000 -100 to -10000 0 = no monitoring	PTC: 1200 Ω NTC: -1200 Ω
Brake current limitation	%	Maximum brake current (0 to 100 % from I_S)	% (I_S)	50 %
Inductance	mH	Inductance of the connected motor (incl. motor choke).	0,1 / 0,2 / 0,5 1,0 / 5,0 / 10,0	
P-Controller		Only P-controller as speed controller (not selected as default).	On / Off	Off
Gain speed controller	%	Gain of the P-controller	0 - 100	100 %

5.2.1.5   Wizard Series 0218071xxxx, 0218072xxxx

Wizard for Acceleration and Deceleration

Via this assistant, the motor parameters "Acceleration" and "Deceleration" are calculated.

A mouse click on the button opens the following dialog boxes:

▶ **Speed alteration**
Enter the speed value which is to be reached in the specified time. The speed value (rpm) is limited to the maximum value and is initialized with this maximum value.

▶ **Time**
Enter the time in which the speed is to be changed. The time is indicated in seconds and is limited to 25 s.

▶ **Acceleration**
The calculated value is displayed in this field.

▶ **OK**
By mouse click on this tool button the calculated values are applied.

▶ **Cancel**
By mouse click on this tool button the entered values are deleted.

Wizard for the Motor Sensor/Encoder

This wizard is used for defining the parameters for the motor sensor/encoder.
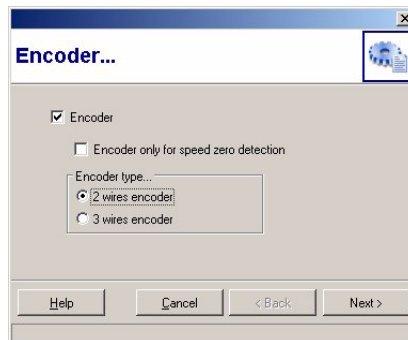
A mouse click on the button opens the following dialog box:

▶ **Encoder**
Activate the check box, if a motor encoder is to be evaluated.

▶ **Encoder only for speed zero detection**
Activate the check box, if the motor sensor/encoder is to be evaluated only for speed zero detection (e.g.: because interferences occur in higher speed ranges).
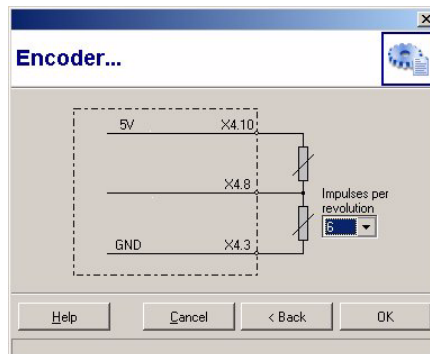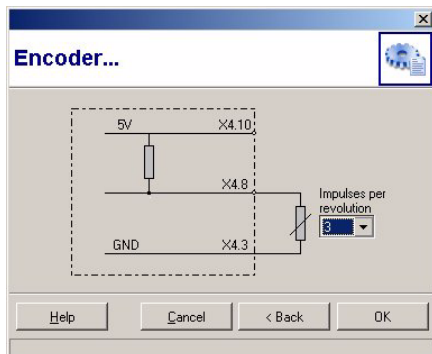

▶ **Encoder type...**
Select an *2 wires encoder* or an *3 wires encoder*.

▶ **Next**
A mouse click on the button opens the following dialog box:

▶ **Pulses per revolution**
Number of transmitted pulses per shaft revolution.

5.2.1.6   Wizard Series 0218030xxxx, 0218050xxxx, 0218070xxxx

Wizard for Acceleration and Deceleration

Via this assistant, the motor parameters "Acceleration" and "Deceleration" are calculated.

A mouse click on the button opens the following dialog boxes:

▶ **Speed alteration**
Enter the speed value which is to be reached in the specified time. The speed value (rpm) is limited to the maximum value and is initialized with this maximum value.

▶ **Time**
Enter the time in which the speed is to be changed. The time is indicated in seconds and is limited to 25 s.

▶ **Acceleration**
The calculated value is displayed in this field.

▶ **OK**
By mouse click on this tool button the calculated values are applied.

▶ **Cancel**
By mouse click on this tool button the entered values are deleted.

5.2.2 Connection Examples of the Speed sensor Series 0218071xxxx, 0218072xxxx

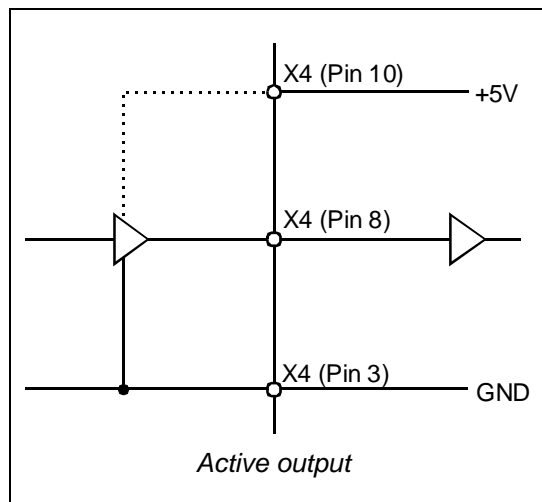**Connection example of the speed sensor with Open-Collector output**

Parameter: 2-wire x times Hall effect sensor

Open Collector
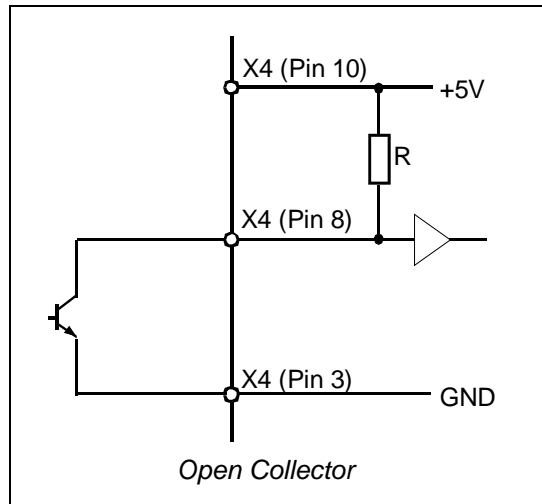
▶ Internal pull-up resistor is activated.
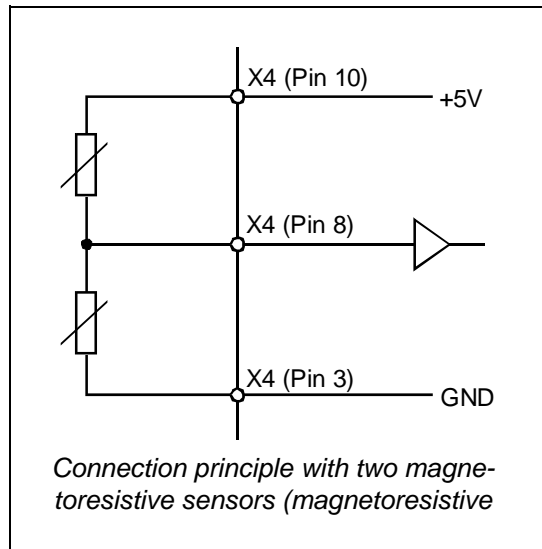
Connection example of the speed sensor with active amplification

Parameter: 3-wire x times Hall effect sensor

Active output

▶ Internal pull-up resistor is deactivated.

Connection example of a 3 wires speed sensor as magnetoresistive sensor or Hall effect sensor

Parameter: 3-wire x times Hall effect sensor

X4 (Pin 10) — +5V

X4 (Pin 8)

X4 (Pin 3) — GND

*Connection principle with two magne-
toresistive sensors (magnetoresistive*

▶ Internal pull-up resistor is deactivated.

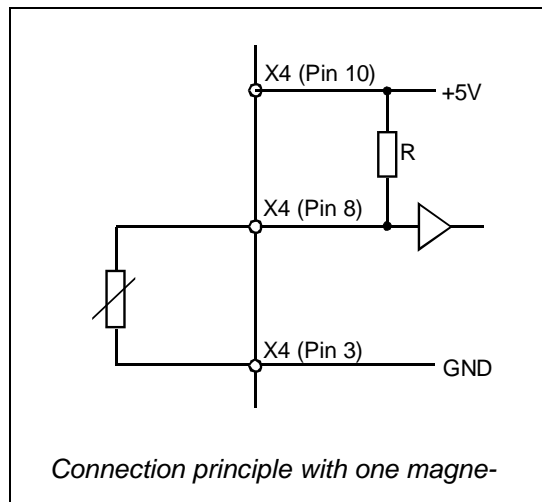### Connection example of a 2 wires speed sensor as magnetoresistive sensor or Hall effect sensor

Parameter: 2-wire x times Hall effect sensor

X4 (Pin 10) — +5V

R

X4 (Pin 8)

X4 (Pin 3) — GND

Connection principle with one magne-

▶ Internal pull-up resistor is activated.

Speed sensor as NAMUR sensor

3-wire x times Hall effect sensor

NAMUR sensor
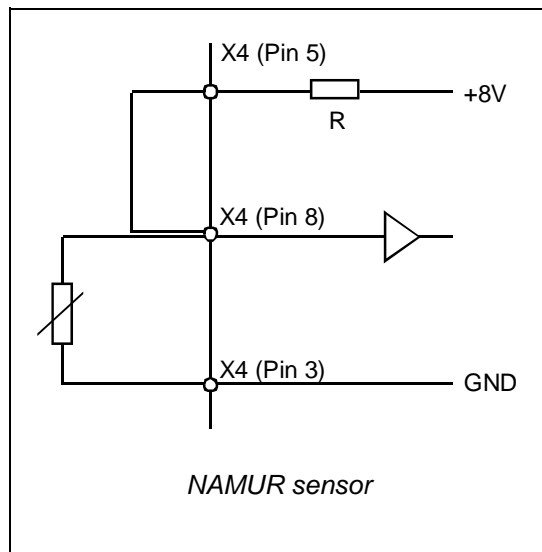
▶ Internal pull-up resistor is deactivated.

5.2.3 Connection Example of the Speed Sensor (Asynchronous Motor) Series 0218030xxxx, 0218050xxxx, 0218070xxxx

Connection example of the speed sensor with Open-Collector output

Parameter: 2-wire x times Hall effect sensor

Open Collector

Connection example of the speed sensor with active amplification

Parameter: 3-wire x times Hall effect sensor

Active output

Connection example of a 3 wires speed sensor as magnetoresistive sensor or Hall effect sensor

Parameter: 3-wire x times Hall effect sensor

Connection principle with two magne-toresistive sensors (magnetoresistive

Connection example of a 2 wires speed sensor as magnetoresistive sensor or Hall effect sensor

Parameter: 2-wire x times Hall effect sensor

Connection principle with one magne-
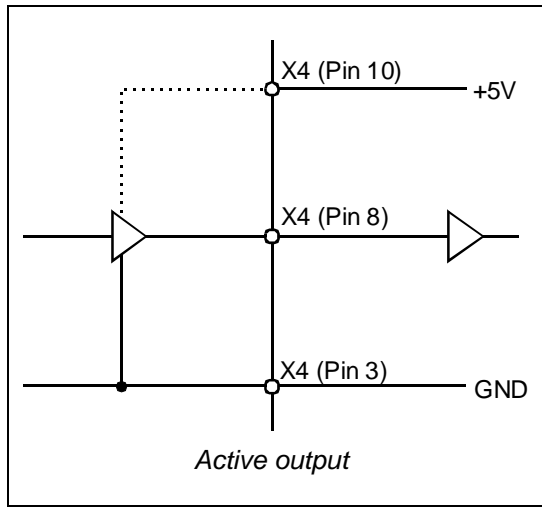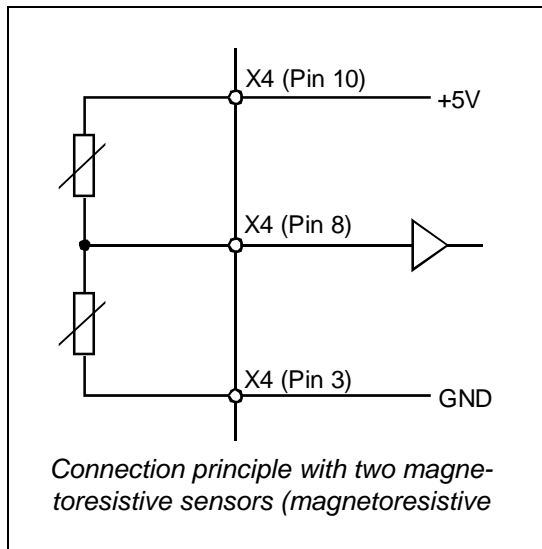
5.3 Analog Signals

5.3.1 Analog inputs

On the page "Analog signals", the speed parameters loaded from an already created parameter file are displayed. If a new parameter set is to be created, the speed value must be entered on this page.
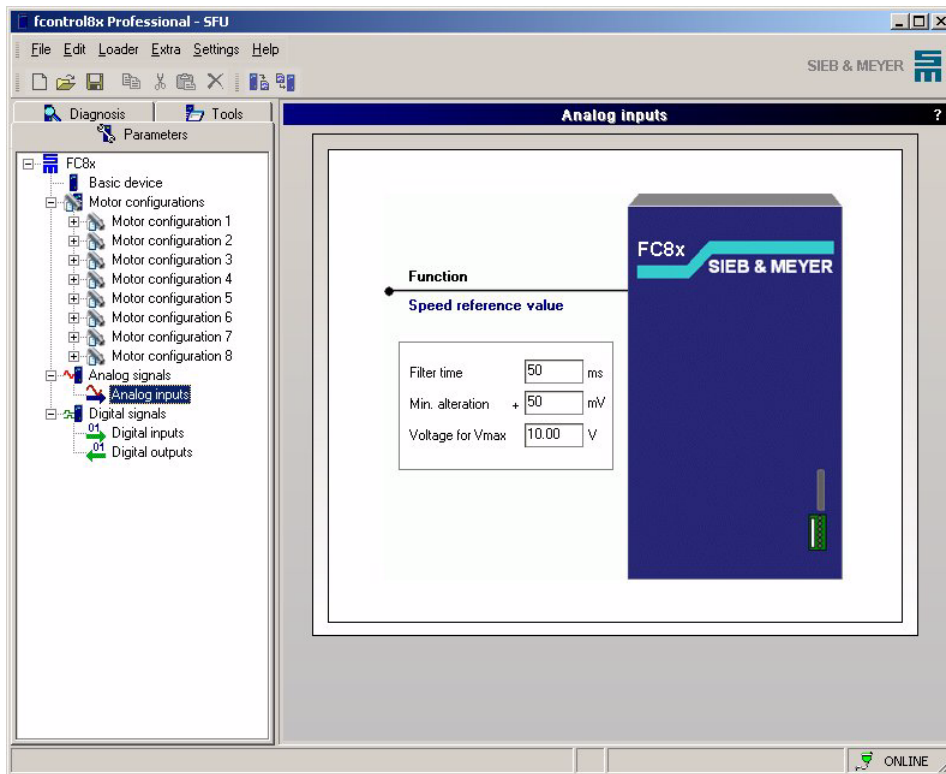
The analog filter for the ref. value

The resistance to interference of the ref. value input can be increased by the filter for the ref. value. It consists of two parts:

▶ **Filter time**
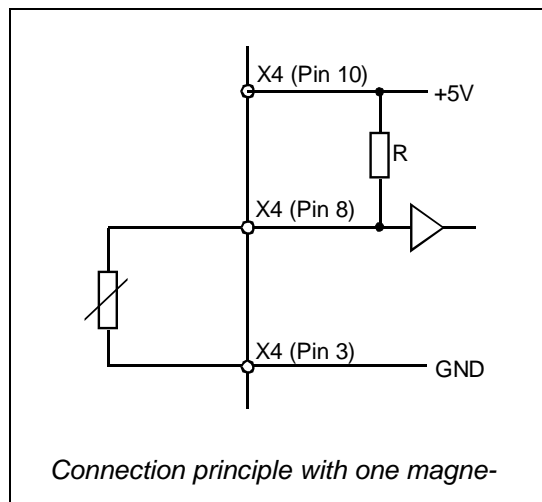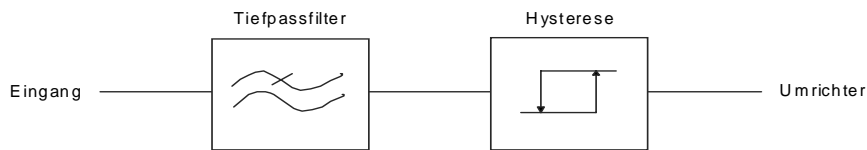Interference pulses of short duration and higher frequency fractions can be eliminated by the low-pass filter. . The higher the filter time, the lower the low-end frequency of the filter. However, in case of higher filter times, the frequency converter reacts with a time lag. The filter behaves like a low-pass of first level. The filter time is indicated in milliseconds (ms) and can vary between steps of 100 ms and 1000 ms.

▶ **Min. alteration**
The hysteresis allows suppression of very slow reference value variations with small amplitude. The applied reference value is tested for minimum alterations. If the reference value changes less than the specified minimum alteration value, the frequency of the output rotating field will not be modified. The higher the specified alteration value, the more the ref. value must change for the frequency converter to adapt its output rotating field correspondingly. The threshold value of the hysteresis can be varied between 50 mV and 1000 mV. The resolution is 40 mV.
Generally, a high filter time with a high hysteresis threshold is unfavourable.

☞ The hysteresis can cause an incorrect transfer of the reference values. The filter time causes a transfer delay.

▶ **Voltage for Vmax**
Value for the input voltage when the maximum speed applies. The voltage can be entered between 5 V and 10 V.

5.4 Digital Signals Series 0218071xxxx, 0218072xxxx

5.4.1 Digital Inputs

On this page, the functions of the inputs are displayed. The frequency converter is provided with 8 digital inputs. Different functions can be assigned to the pins via the pull-down menus. When creating a new parameter file the assignments in the hardware description are automatically loaded.
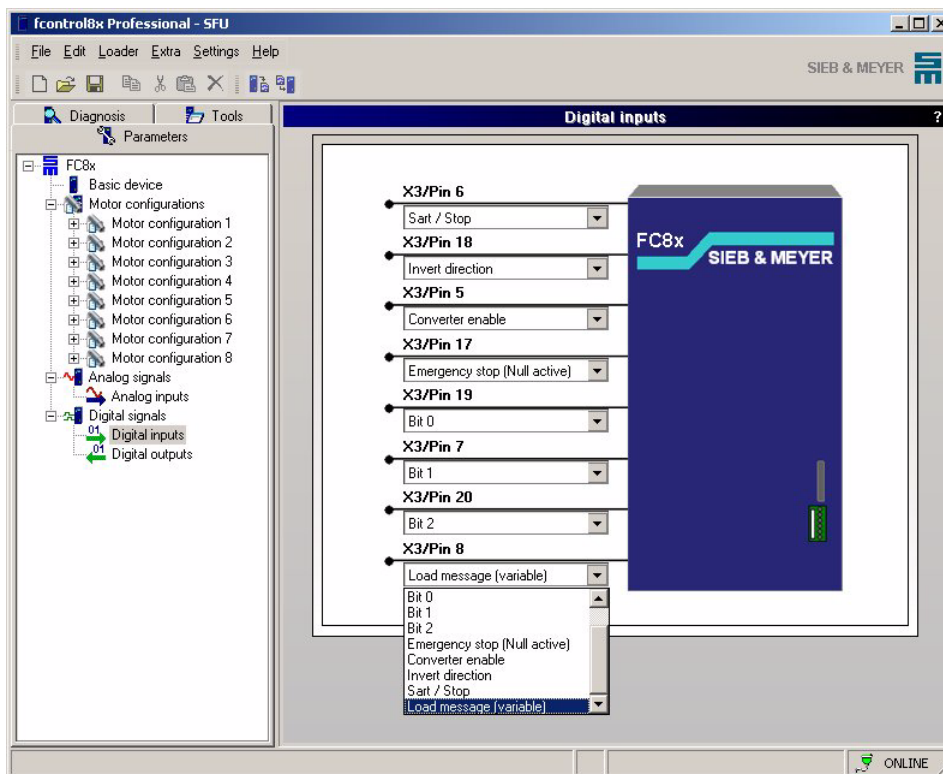
The functions of the digital inputs are the following:

▶   **Start / Stop**
    This function starts the frequency converter and accelerates it to the reference speed value.

▶   **Invert direction**
    This function allows inverting the sense of rotation of the motor.
    If this input is not active, the motor turns in the preferred direction. If this input is activated, and the input *Controller on* reseted and setted, the direction of rotation of the motor is reversed.

▶   **Controller on**
    This function activates the output stage of the frequency converter.

▶   **Emergency stop (zero active)**
    This function triggers an emergency stop, that means that the frequency converter decelerates the motor at the value set in the motor parameter block, until "Speed zero" is reached.

▶   **Bit 0 (curve 0)**
    Curve 0 to curve 2 are used for binary selection of the motor configuration.

▶ **Bit 1 (curve 1)**
Curve 0 to curve 2 are used for binary selection of the motor configuration.

▶ **Bit 2 (curve 2)**
Curve 0 to curve 2 are used for binary selection of the motor configuration.

▶ **Variable load threshold**

☞ This function is not yet supported by the device.

5.4.2 Digital outputs

On this page, the functions of the outputs are displayed. The frequency converter provides 4 digital outputs. Different functions can be assigned to the pins via the pull-down menus. When creating a new parameter file the assignments in the hardware description are automatically loaded.
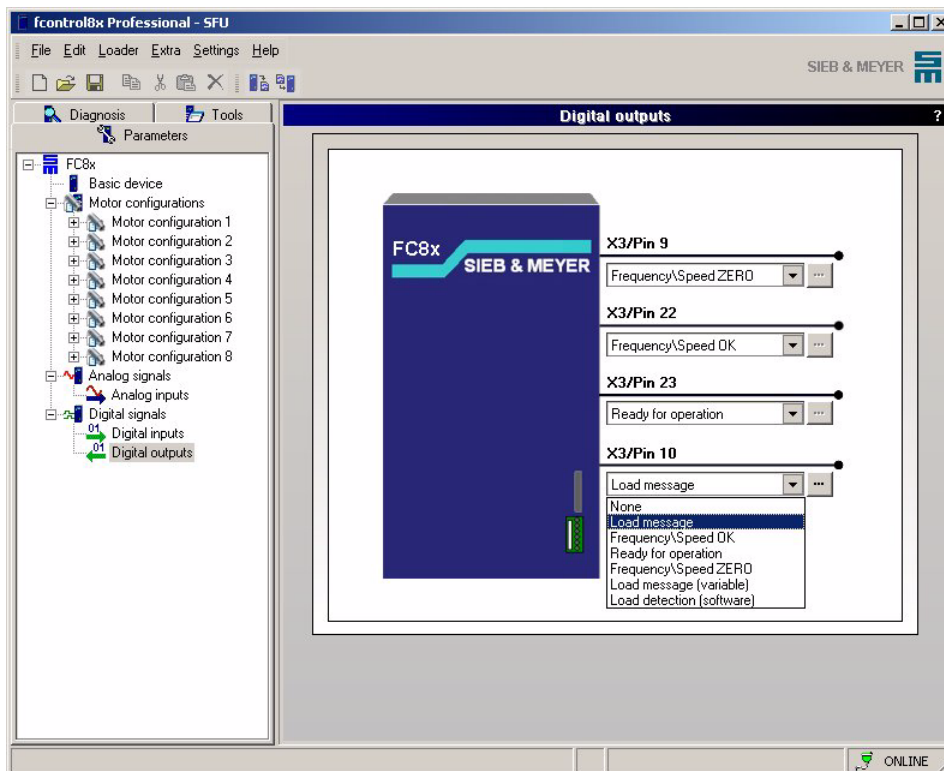
The functions of the digital inputs are the following:

▶ **Freq.\speed 0**
"Speed 0" is signaled, if the actual motor speed falls below the preset reference value. The threshold for the message "Speed ZERO" can be varied.

▶ **Freq.\speed OK**
"Speed OK" is signaled, if the actual speed of the motor is within the tolerance preset by the reference value. The threshold for the message "Speed OK" can be varied. If a value is entered into the field "Threshold" (100% = rated current (I_N)), the message "Freq./speed OK" is reset.

▶ **Ready for operation (controller on)**
This function can be used function can be used to check, whether or not the controller is active.

▶ **Fix load threshold**
If the phase current consumed by the motor exceeds a preset reference value, the output "Fix load threshold" will be active. The reference value can be varied. The reference values can be entered as percentage values in the field "Threshold" (100% = rated current (I_N)).

☞ Short peak loads can be eliminated via the filter time.

☞ During (and 1 s after) the acceleration and deceleration ramp as well as after a modification of the reference value the function is deactivated.

▶ **Last message / load detection (hardware)**
If the actual motor current (di/dt) exceeds the set sensibility, the output "Load message" is closed for about 200 ms. This function is only supported at the output 1. The pin assignment is firmly defined. The sensibility can be set in 8 steps:1 = low sensibility

8 = high sensibility

☞ During (and 1 s after) the acceleration and deceleration ramp as well as after a modification of the reference value the function is deactivated.

▶ **No**
The digital output is deactivated.

☞ These functions are not yet supported by the device:

▶ **Load message / variable load threshold**
If the phase current consumed by the motor exceeds a preset reference value, the output "Load message" will be active.
With the function **Variable load threshold** the reference value is overwritten with the last phase current**.**
When the frequency converter is turned on the active reference value is defined via the parameter *Base current*. This reference values applies as long as it is overwritten.

☞ Short peak loads can be eliminated via the filter time.

☞ During (and 1 s after) the acceleration and deceleration ramp as well as after a modification of the reference value the function is deactivated.

▶ **Last message / load detection (software)**
If the motor current exceeds the set sensibility, the output "Load message" is closed for about 200 ms. The sensibility is defined with the following parameters:
di = current in A
dt = time alteration in ms

☞ During (and 1 s after) the acceleration and deceleration ramp as well as after a modification of the reference value the function is deactivated.

▶ **Last message / load detection (software)**
If the motor current exceeds the set sensibility, the output "Load message" is closed for about 200 ms. The sensibility is defined with the following parameters:
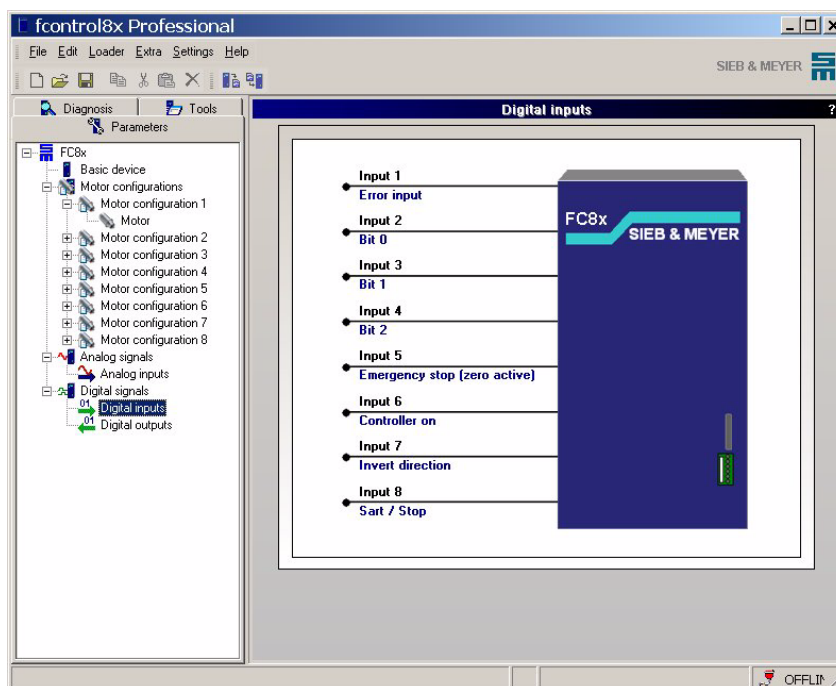di = current in A
dt = time alteration in ms

5.5 Digital Signals Series 0218030xxxx, 0218050xxxx, 0218070xxxx

5.5.1 Digital Inputs

On this page, the functions of the inputs are displayed. The frequency converter is provided with 8 digital inputs which cannot be modified.
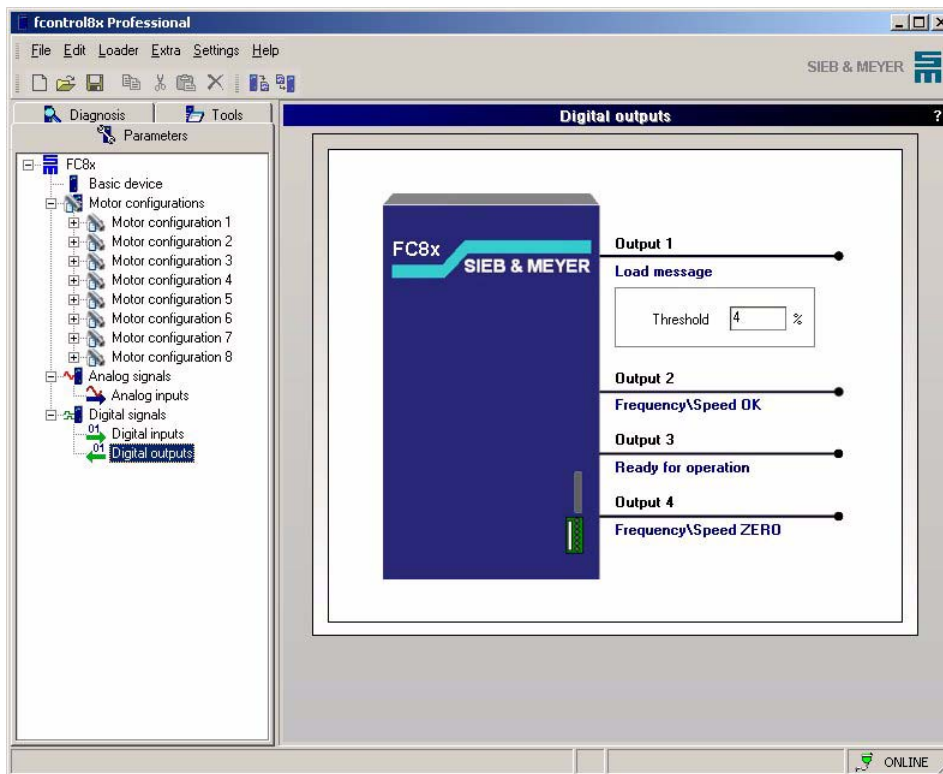

The functions of the digital inputs are the following:

▶ **Start**
This function starts the frequency converter and accelerates it to the reference speed value.

▶ **Invert direction**
This function allows inverting the sense of rotation of the motor.
If this input is not active, the motor turns in the preferred direction. If this input is activated, and the input *Controller on* reseted and setted, the direction of rotation of the motor is reversed.

▶ **Controller on**
This function activates the output stage of the frequency converter.

▶ **Emergency stop (zero active)**
This function triggers an emergency stop, that means that the frequency converter decelerates the motor at the value set in the motor parameter block, until "Speed zero" is reached.

▶ **Characteristic curve 0 (bit 0)**
Curve 0 to curve 2 are used for binary selection of the motor configuration.

▶ **Characteristic curve 1 (bit 1)**
Curve 0 to curve 2 are used for binary selection of the motor configuration.

▶ **Characteristic curve 2 (bit 2)**
Curve 0 to curve 2 are used for binary selection of the motor configuration.

5.5.2   Digital outputs

On this page, the functions of the outputs are displayed. The frequency converter is provided with 4 digital outputs which cannot be modified.

The functions of the digital inputs are the following:

Fix load threshold
If the phase current consumed by the motor exceeds a preset reference value, the output "Load message" will be active. The reference value can be varied.
The reference values can be entered as percentage values in the field "Threshold" (100% U rated current (I_N).

☞	During (and 1 s after) the acceleration and deceleration ramp as well as after a modification of the reference value the function is deactivated.

▶ **Freq.\speed OK**
"Speed reached" is signaled, if the actual speed of the motor is within the tolerance preset by the reference value. The threshold for the message "Speed OK" can be varied.

▶ **Ready for operation (controller on)**
This function can be used function can be used to check, whether or not the controller is active.

▶ **Freq.\speed 0**
"Speed 0" is signaled, if the actual motor speed falls below the preset reference value. The threshold for the message "Speed ZERO" can be varied.

6 Diagnosis

On the diagnosis pages, which are opened via the branches in the directory tree, you can observe the current status of the frequency converter. Information on measured values to the motor status as well as possible errors (if existent) and the software version is provided.

6.1 Measured values

On the page "Measured values" you can observe the status of the motor by means of a progress bar or a curve display. Besides, the respective unit to the motor parameter is indicated.
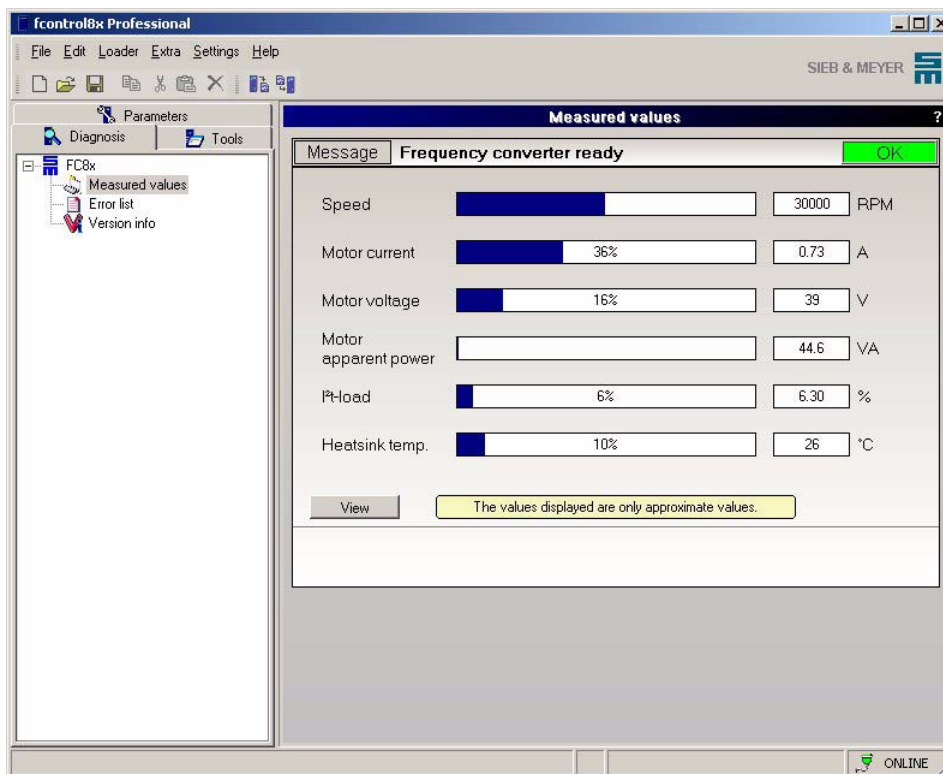
▶ **Message**
This field displays the current status of the frequency converter.

▶ **OK / Error**
It is displayed via the field OK (green) / Error (red) whether the frequency converter is ready for operation or an error has occurred. The respective status message is indicated on the right side of the field "Message".

The following motor parameters are measured:

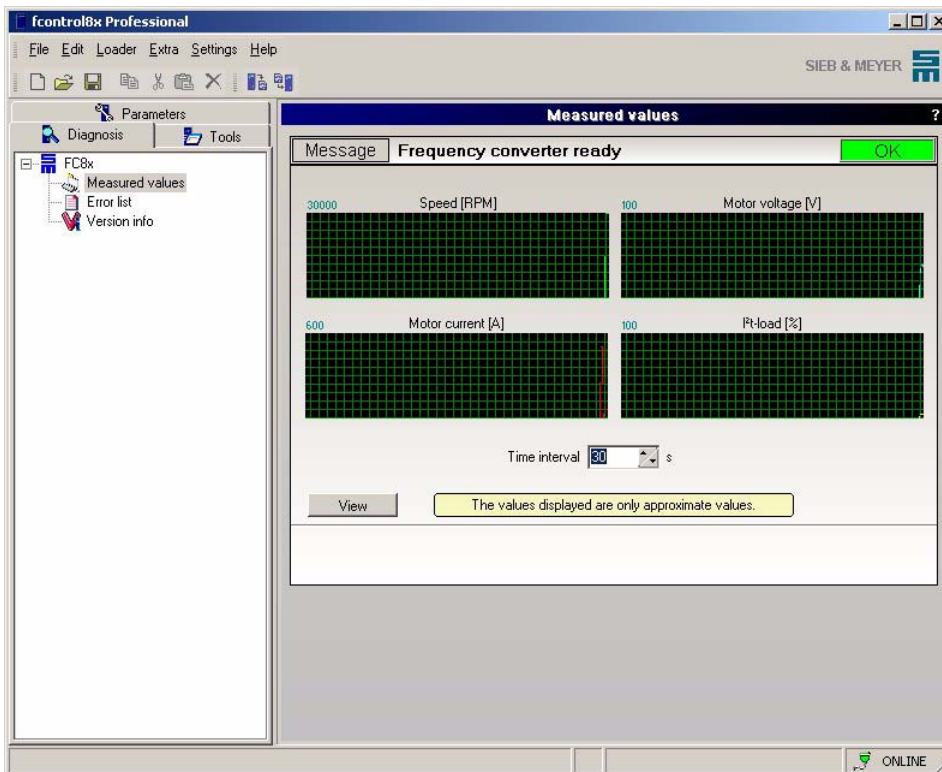| Parameters	Unit
Speed	RPM
Motor current	O
Motor voltage	V
Apparent power	VA
I^{2}t-load	%
Heatsink temperature	°C

☞ The displayed values are recommended values.

View
depending on the set time interval the motor parameters "Speed", "Motor current", "Motor voltage" and "I2t-load" are displayed as curves.


☞ The displayed values are recommended values.

6.2 Error list

On the page "Error list" errors are displayed that have been occurred during the operation of the frequency converter. The error list is read-out from the frequency converter. Each error message is indicated in another line. The first error entry always refers to the error occurred last. Detailed information on how to eliminate or search an error can be read in the technical manual of the frequency converter. The fields "Device data" and "SFU information" permit precise identification of the frequency converter and the software.
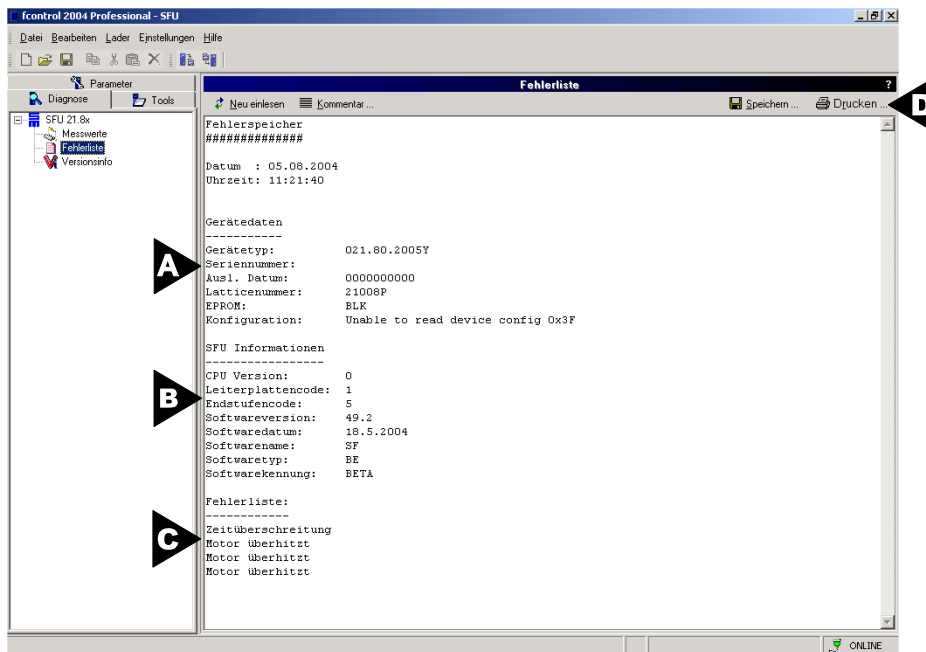
A Device data
B SFU information
C Error messages
D Tool bar
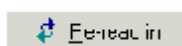
	Re-read in
Re-read in	Reads the error list again from the frequency converter.
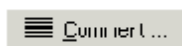
	Comment...
Comment ...	Opens a dialog box in which a comment can be entered, if the list is to be printed or saved.
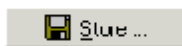
	Save...
Store ...	Opens a dialog box for saving the error list. The file is automatically saved with the extension ***.txt**.

	Print
Print ...	Prints the error list. A dialog box is opened which permits to select a printer. Besides, additional print settings can be made.

6.3 Version info

On the page "Version info" information concerning the used hardware and software are given.
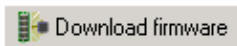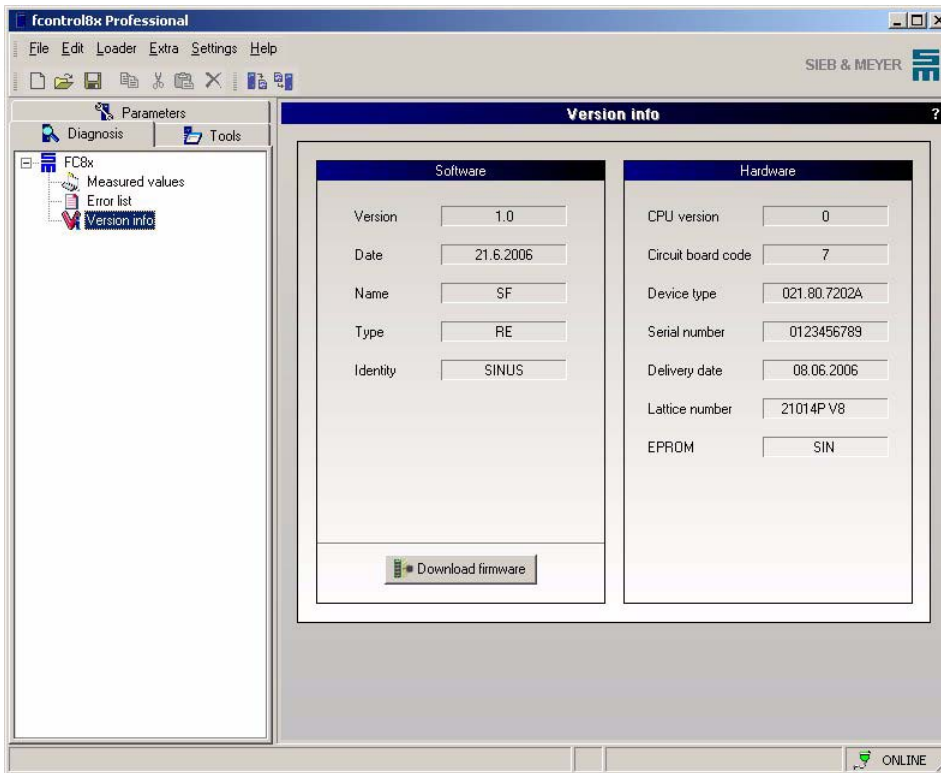
	Download firmware
Download firmware	Loads a new firmware into the frequency converter.

⇨ Click on the button *Download firmware.*

⇨ A dialog box is opened. Choose a firmware file.

⇨ Confirm with *OK*.

⇨ The new firmware is written into the frequency converter.

☞	You can get the current firmware from SIEB & MEYER AG on request.

7　　　Tools

On the pages "Tools", which are opened via the branches in the directory tree, you can set the motor for operation with the frequency converter and make additional settings for the type of control.

☞　　　Please be **careful** when entering data or modifying the parameters. Incorrect entries can cause damage to the frequency converter or motor.

7.1　　　Application

The motor is set for operation on the page "Control source of tools". In the pull-down menu you can choose between 2 options:

▶　　**fcontrol8x**: the frequency converter is controlled via the software,

▶　　**External input**: the frequency converter is controlled via the external inputs.
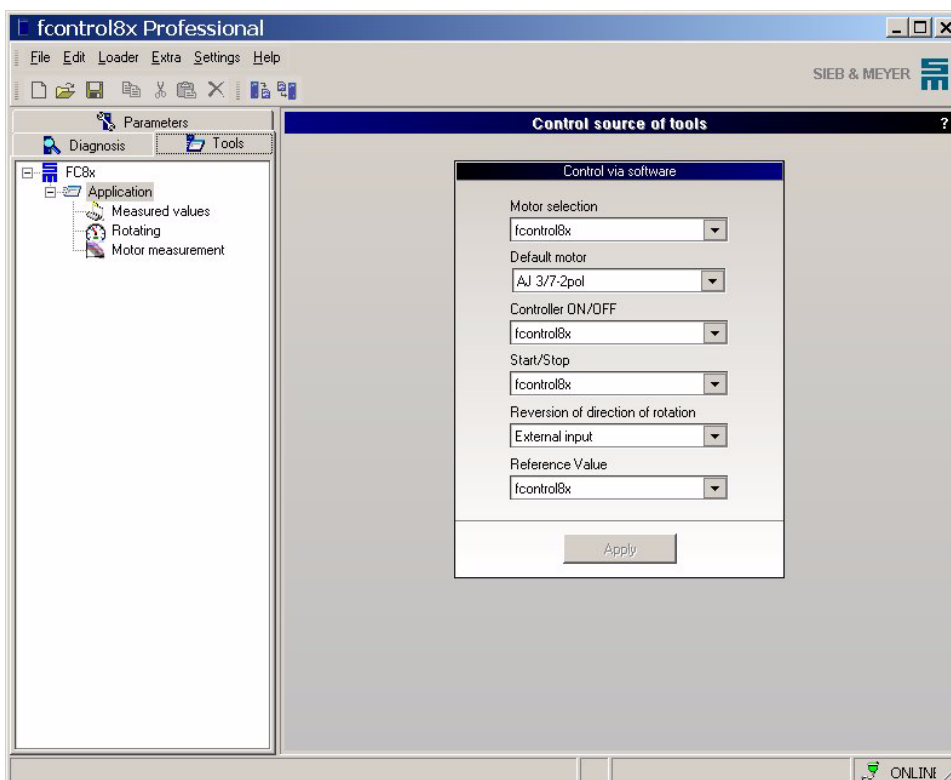
The list box "Default motor" displays the motor set or saved during the last operation via the software.

By mouse click on the tool button *Apply* new settings can be stored.

7.1.1 Measured values

On the page "Measured values" you can observe the status of the motor by means of a progress bar or a curve display. Besides, the respective unit to the motor parameter is indicated.
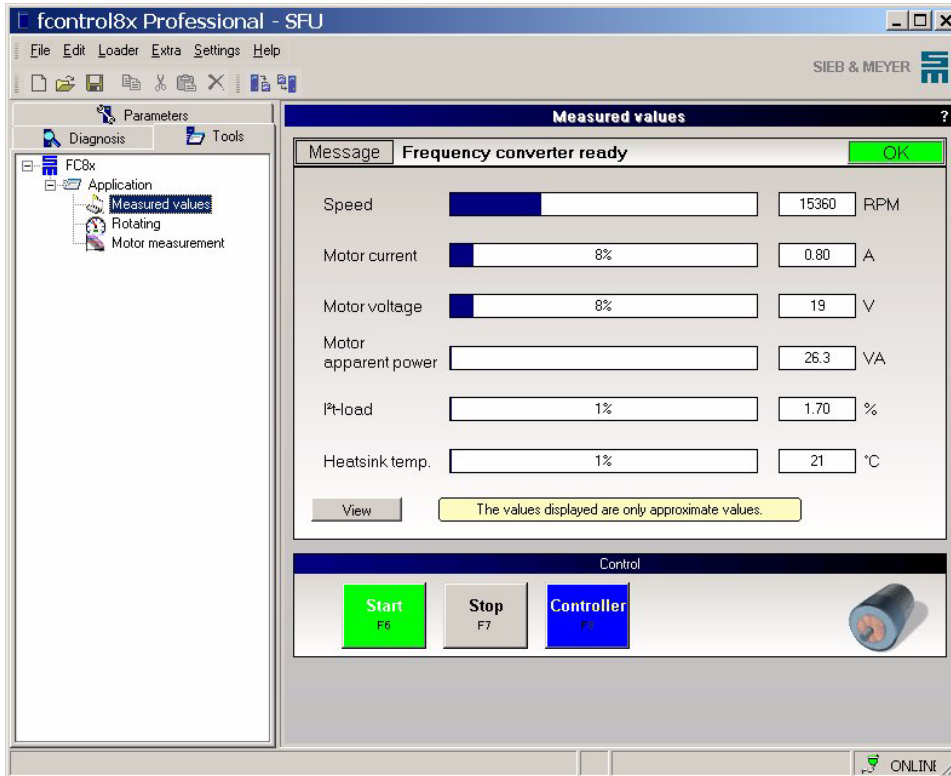
▶ **Message**
This field displays the current status of the frequency converter.

▶ **OK / Error**
It is displayed via the field OK (green) / Error (red) whether the frequency converter is ready for operation or an error has occurred. The respective status message is indicated on the right side of the field "Message".

▶ **Parameter**   **Unit**
   - Speed   RPM
   - Motor current   A
   - Motor voltage   V
   - Apparent power   VA
   - I2t-load   %
   - Heat sink temperature °C

☞   The displayed values are recommended values.

View

depending on the set time interval the motor parameters "Speed", "Motor current", "Motor voltage" and "I2t-load" are displayed as curves.
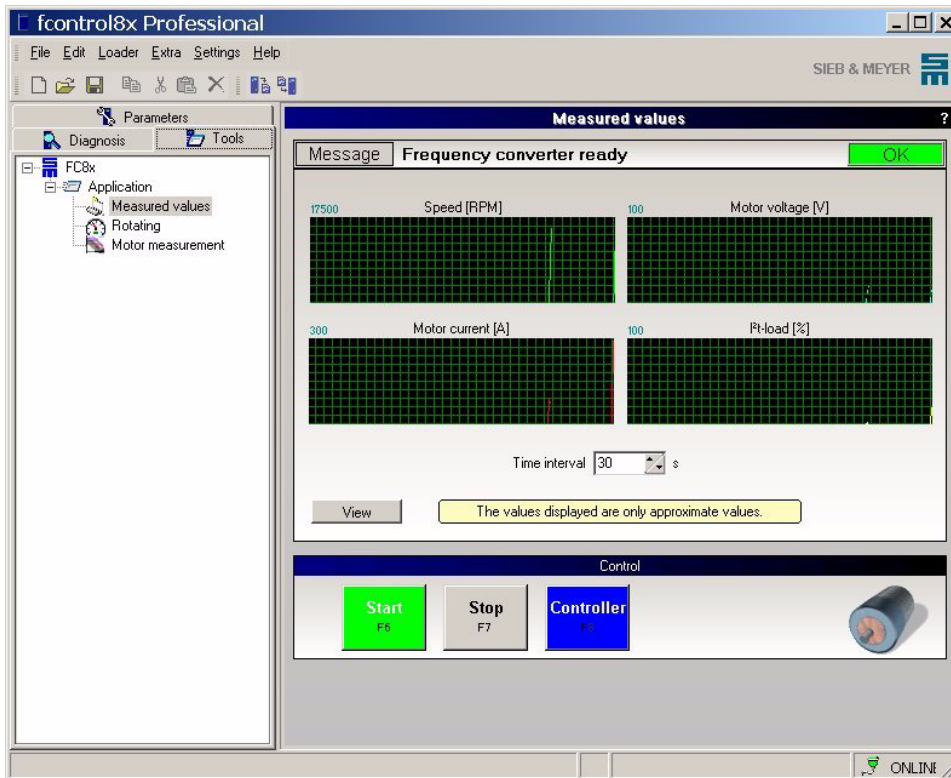
☞ The displayed values are recommended values.

Control

Via the window section "Control", the frequency converter can be controlled.

▶ **Start (F6)**

The frequency converter is started and the motor is accelerated to the desired speed or moved to the desired position.

▶ **Stop (F7)**

The motor is decelerated to speed zero.

▶ **Controller (F8)**

The output stage of the frequency converter is activated/deactivated. If the controller is deactivated when the motor runs, the motor is decelerated to speed zero.

7.1.2   Rotating

Via the page "Rotating", the motor can be set into operation for the first time without being controlled by the software. Via this page, some functions can be tested.
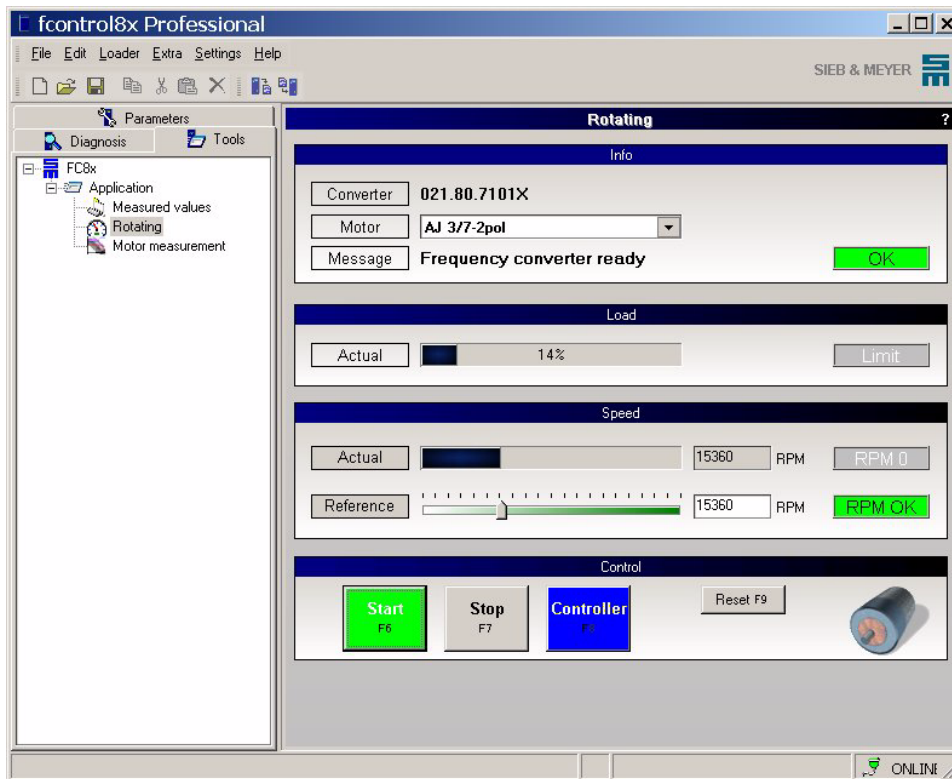
Info
In the window "Info", general information concerning the motor as well as the status of the connected device is indicated.

▶ **Converter**
On the right side of this field, the frequency converter type is displayed.

▶ **Motor**
The motor configuration (up to 8) can be selected via the list box.

▶ **Message**
This field displays the current status of the frequency converter.

▶ **OK / Error**
It is displayed via the field OK (green) / Error (red) whether the frequency converter is ready for operation or an error has occurred. The respective status message is indicated on the right side of the field "Message".

Load
The current load of the motor is indicated in the window section "Load".

▶ **Actual**
Via the percentage bar, the current load of the motor is displayed. A load of 100 % corresponds to the motor peak current (I_S).

▶ **Limit**
If the signal button "Limit" is displayed in red, the motor is operated with full load.

Speed

The current speed of the motor is displayed the window section "Speed".

▶ **Actual**
Via the percentage bar, the current speed of the motor is displayed.

▶ **R/min 0**
If the display is green, the motor stands still.

▶ **reference**
The speed of the motor can be modified by moving the adjusting button or by entering the value directly in the text field on the right side of the adjusting button.

▶ **R/min OK**
If the display is green, the motor hat reached the reference speed.

Control

Via the window section "Control", the frequency converter can be controlled.

▶ **Start (F6)**
The frequency converter is started and the motor is accelerated to the desired speed or moved to the desired position.

▶ **Stop (F7)**
The motor is decelerated to speed zero.

▶ **Controller (F8)**
The output stage of the frequency converter is activated/deactivated. If the controller is deactivated when the motor runs, the motor is decelerated to speed zero.

▶ **Reset (F9)**
An existing error message is reset.

7.1.2.1   Change direction

Stop F7	⇨ Stop the spindle.
Controller F8	⇨ Deactivate the controller.
	⇨ Activate the input "Reversion of rotation" at the device.
Controller F8	⇨ Activate the controller. The settings are applied.
Start F6	⇨ Start the spindle. The direction of rotation has changed.
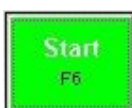
7.1.3   Motor Measurement

Via the page "Motor measurement", motor parameters can be adapted in an
optimum way to the motor by appropriate measurements. Measurements are taken
via the tab pages "Profile" and "Curves". The measured parameters vary depen-
dently from the use of an asynchronous or a synchronous motor. The following
section explains the steps for both types of motors.

Tab page "Profile"
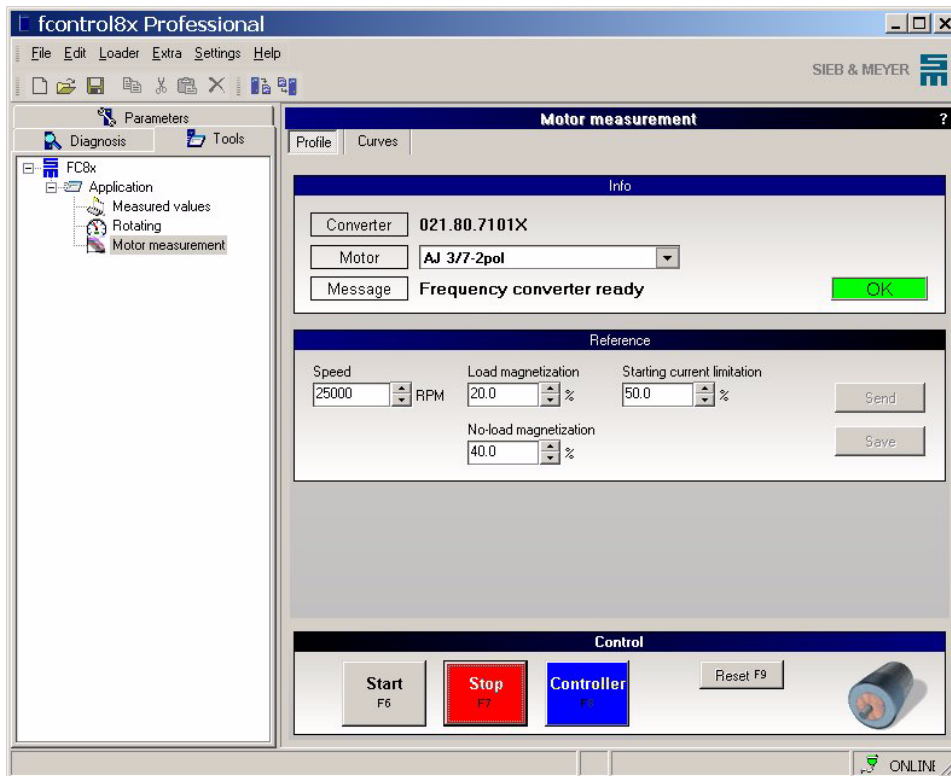
In the window "Info", general information concerning the motor as well as the status
of the connected device is indicated.

▶ **Converter**
On the right side of this field, the frequency converter type is displayed.

▶ **Motor**
The motor configuration (up to 8) can be selected via the list box.

▶ **Message**
This field displays the current status of the frequency converter.

▶ **OK / Error**
It is displayed via the field OK (green) / Error (red) whether the frequency
converter is ready for operation or an error has occurred. The respective status
message is indicated on the right side of the field "Message".

Reference

Select the reference value for the speed and the parameter values to be measured in the window "Reference".

▶ **Send**
The entered values are sent to the frequency converter. If the values are <u>not</u> saved, they are saved only in the frequency converter and will be lost when it is turned off.

▶ **Save**
The loaded values are saved permanently in the frequency converter.

Control

Via the window section "Control", the frequency converter can be controlled.

▶ **Start (F6)**
The frequency converter is started and the motor is accelerated to the desired speed or moved to the desired position.

▶ **Stop (F7)**
The motor is decelerated to speed zero.

▶ **Controller (F8)**
The output stage of the frequency converter is activated/deactivated. If the controller is deactivated while the motor is running, the motor cannot be controlled anymore by the frequency converter and coasts to standstill uncontrolled.

▶ **Reset (F9)**
An existing error message is reset.

Tab page "Curves"
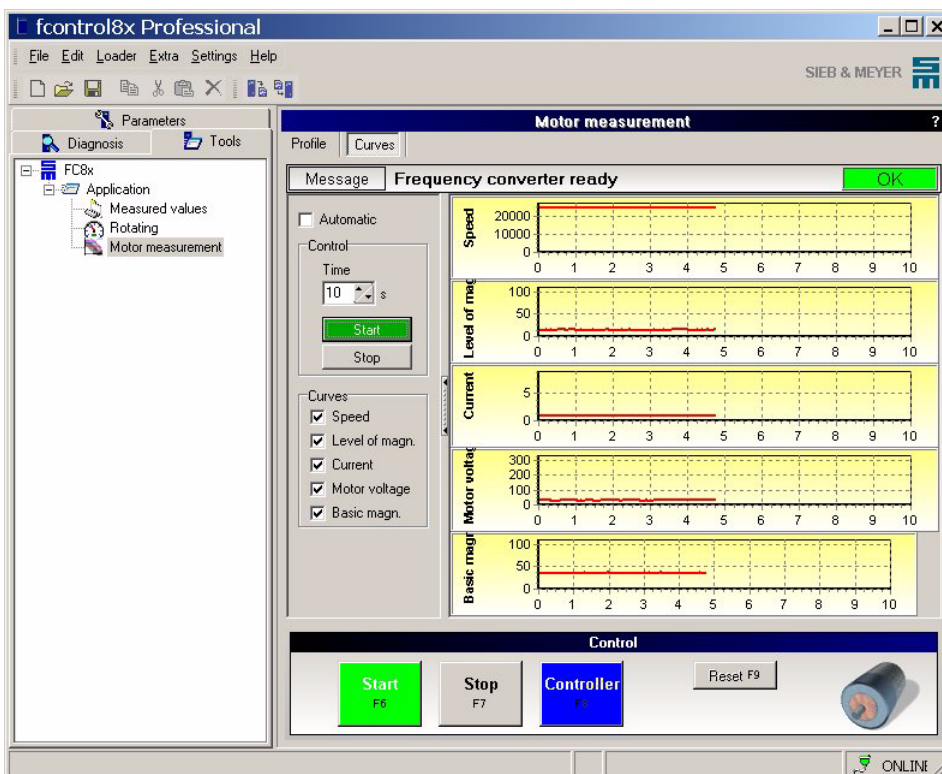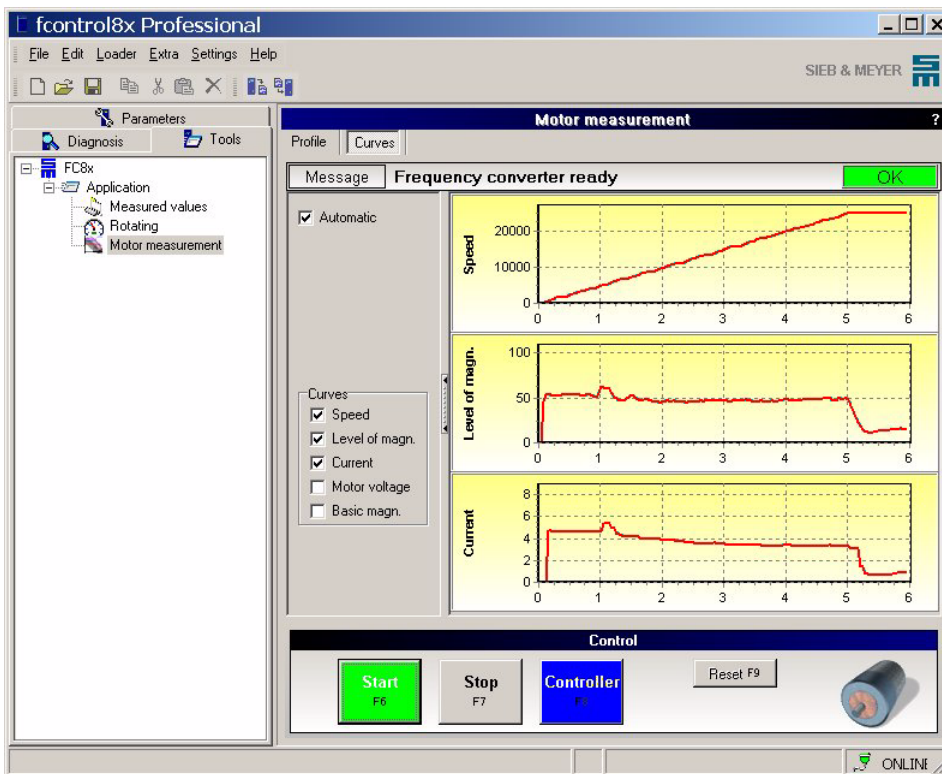
▶ **Automatically**
activated: When the motor is started a curve is automatically recorded. The time when the curve is recorded corresponds to the parameterized time for acceleration.

Deactivated: The recording of the curve can be started and stopped manually.
The curve is recorded continuously. When the curve fills the complete window,
a new curve is recorded in a new window. The time axis can be parameterized.

▶   **Curves Series 0218071xxxx, 0218072xxxx**
Activate the check box to record the curve.

7.1.3.1 Asynchronous Motor (without Sensor, Magnetization Control) Series 0218050xxxx

Step 1: Testing the basic function without process load

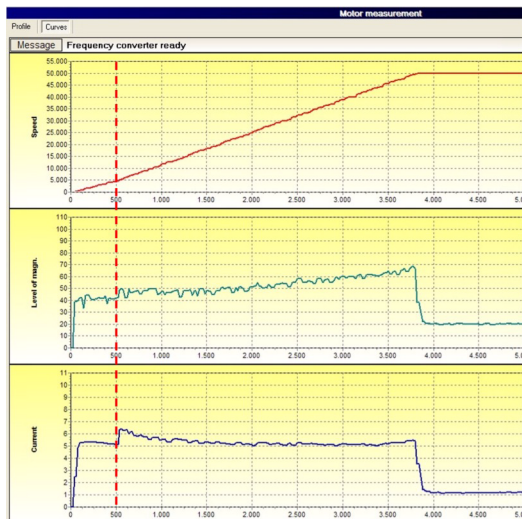⇨ If no specific spindle parameters are provided, you should use the following standard parameters (see also motor parameters):

- ▶ Speed: about   50% of the rated speed
- ▶ Starting current limitation: 50 %
- ▶ Load magnetization: 50 %
- ▶ Idle magnetization: 50 %

⇨ Start the motor and check, whether the direction of rotation and the starting behavior are correct.

Starting current to small, because it is smaller than (<) acceleration current.
Increase of the value for the starting current limitation.

Starting current OK, because it is larger than (>) the acceleration current.

☞ In order to change the direction of rotation, exchange the motor phases (change the wiring), or the wiring of the input "invert direction of rotation" at connector X3-I/O-Link. (see chapter "Change direction", page 65).

⇨ When the direction of rotation and the starting current are OK, increase the speed to the rated speed and restart the motor. Then, check whether the motor runs without problems under load (load test).

Example: Acceleration curves with the different operating ranges:

A: 0...10% of the rated speed, controlled speed range, starting current limitation active

B: controlled speed range without field weakening

C: controlled speed range with field weakening, that means the motor runs at the voltage limit
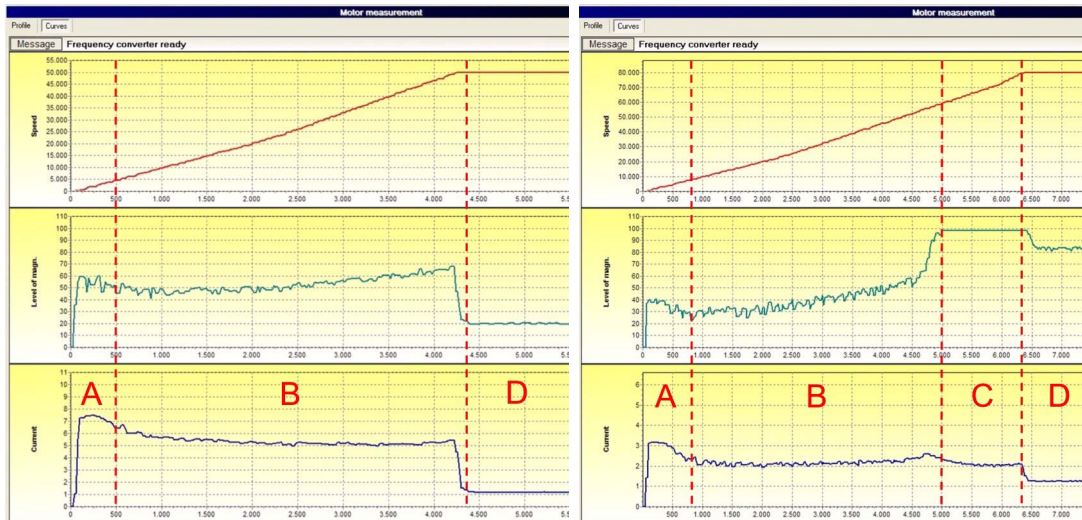
D: controlled stationary speed range, that means open-circuit operation

Motor without field weakening

Motor with field weakening

Step 2: Optimizing the parameters (option)

Further optimization of the parameters can be necessary under the following circumstances:

[1] Reduction of the motor current in the stationary range (D), because the spindle is almost operated in open-circuit operation.

⇨ Reduce the parameters "Load magnetization" and "Idle magnetization" step by step as long as a trouble-free acceleration and the max. sudden load variation are possible.
"Idle magnetization" ≥ **"Load magnetization"**

[2] Increase of the motor torque necessary/desired (the no-load current plays a secondary role).

⇨ Increase the parameter "Idle magnetization" step by step.
"Idle magnetization" ≥ **"Load magnetization"**
"Idle magnetization" + "Load magnetization" = max. 100%
A check is possible by means of
▶ a performance measurement
▶ a real load test
▶ reducing the acceleration time

7.1.3.2 Synchronous/Asynchronous Motor without Sensor Series 0218070xxxx, 0218071xxxx, 0218072xxxx

Asynchronous motors

Step 1: Testing the basic function without process load

⇨ If no specific spindle parameters are provided, you should use the following standard parameters (see also motor parameters):

- ▶ Speed: about   50% of the rated speed
- ▶ Starting current limitation: 20 %
- ▶ Load magnetization: 50 %
- ▶Idle magnetization: 40 %

⇨ Start the motor and check, whether the direction of rotation and the starting behavior are correct.

Starting current to small, because it is smaller than (<) acceleration current.
Increase of the value for the starting current limitation.

Starting current OK, because it is larger than (>) the acceleration current.

☞ In order to change the direction of rotation, exchange the motor phases (change the wiring), or the wiring of the input "invert direction of rotation" at connector X3-I/O-Link. (see chapter "Change direction", page 65).

⇨ When the direction of rotation and the starting current are OK, increase the speed to the rated speed and restart the motor. Then, check whether the motor runs without problems under load (load test).

Example: Acceleration curves with the different operating ranges:

A: 0...10% of the rated speed, controlled speed range, starting current limitation active

B: controlled speed range without field weakening

C: controlled speed range with field weakening, that means the motor runs at the voltage limit

D: controlled stationary speed range, that means open-circuit operation

Motor without field weakening

Step 2: Optimizing the parameters (option)

Further optimization of the parameters can be necessary under the following circumstances:

[1] Reduction of the motor current in the stationary range (D), because the spindle is almost operated in open-circuit operation.

⇨ Reduce the parameters "Load magnetization" and "Idle magnetization" step by step as long as a trouble-free acceleration and the max. sudden load variation are possible.
"Idle magnetization" ≥ **"Load magnetization"**

[2] Increase of the motor torque necessary/desired (the no-load current plays a secondary role).

⇨ Increase the parameter "Idle magnetization" step by step.
"Idle magnetization" ≥ **"Load magnetization"**
A check can be done by means of
▶ a performance measurement
▶ a real load test
▶ reducing the acceleration time

Synchronous motors

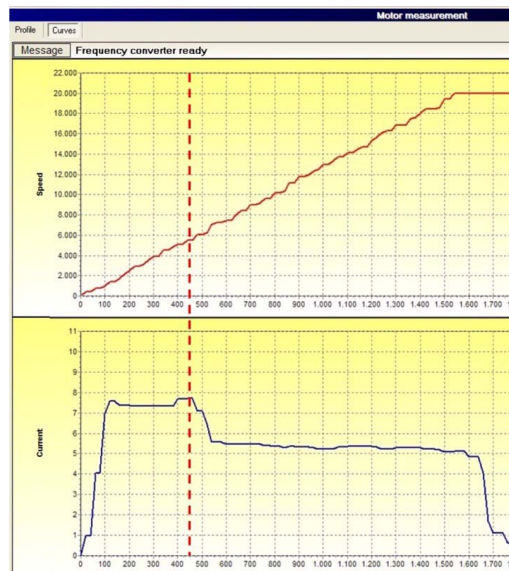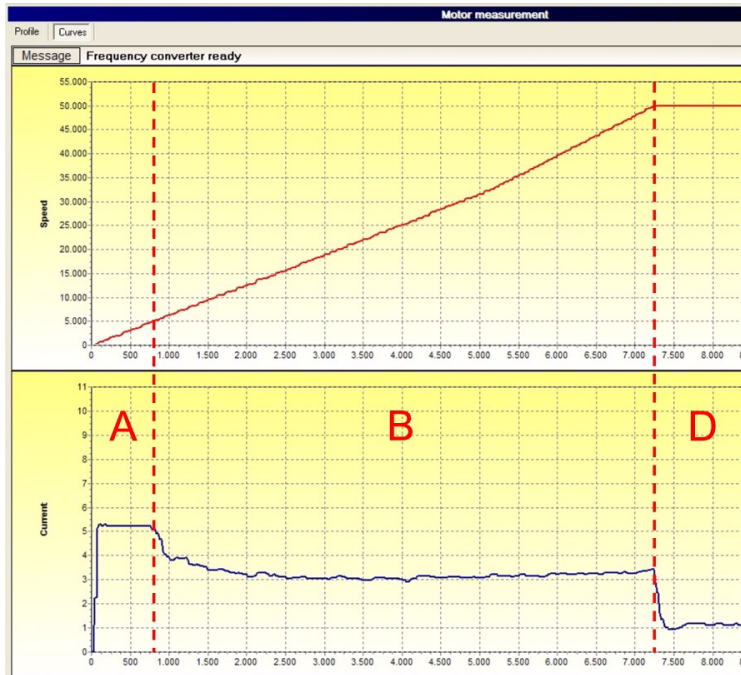### Step 1: Testing the basic function without process load

⇨ If no specific spindle parameters are provided, you should use the following standard parameters (see also motor parameters):

- ▶ Speed: about   50% of the rated speed
- ▶ Starting current limitation: 50 %
- ▶ Load magnetization: 0 %
- ▶Idle magnetization: 20 %

⇨ Start the motor and check, whether the direction of rotation and the starting behavior are correct. If the starting current is smaller than (<) the acceleration current, the motor stops. Increase the value for the starting current limitation.

☞ In order to change the direction of rotation, exchange the motor phases (change the wiring), or the wiring of the input "invert direction of rotation" at connector X3-I/O-Link. (see chapter "Change direction",).

⇨ When the direction of rotation and the starting current are OK, increase the speed to the rated speed and restart the motor. Then, check whether the motor runs without problems under load (load test).

Example: Acceleration curves with the different operating ranges:

s   200 ms synchronizing current in the range of the starting current limitation

A: 0...10% of the rated speed, controlled speed range, starting current limitation active

B: controlled speed range

D: controlled stationary speed range, that means open-circuit operation
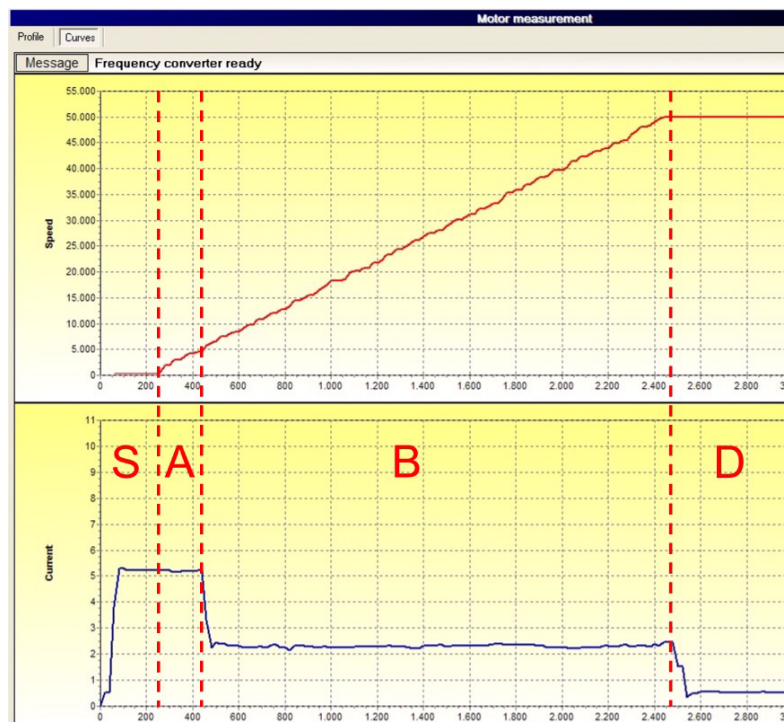
Step 2: Optimizing the parameters (option)

Further optimization of the parameters can be necessary/desired under the following circumstances:

[1] The motor stops at the acceleration with the desired acceleration time.
⇨ Increase the idle magnetization step by step.

[2] Optimization of the current consumption for a specific load desired.
⇨ Reduce / increase the parameter "Idle magnetization" step by step.
A check can be done by means of
▶ a performance measurement
▶ a real load test
▶ reducing the acceleration time

7.1.3.3 Synchronous Motor with Hall Effect Sensor Series 0218030xxxx

Step 1: Finding the correct sensor/encoder and motor connection and testing the basic function

⇨ If no specific spindle parameters are provided, you should use the following standard parameters (see also motor parameters):
  ▶ Speed: about 50% of the rated speed
  ▶ Inductance: Selection accordingly to the actual motor inductance including the inductance of the external motor choke. For star connection of the motor the values are related to the branch inductance (phase-phase inductance / 2)
  ▶ Gain speed controller   100

⇨ If not already done, connect the supply cable, the motor cable and the sensor/encoder cable accordingly to the SIEB & MEYER device description and the motor data sheet. If the motor and sensor/encoder wires are not labeled, you should label them with U/V/W and A/B/C.

⇨ Adjust the sensor/encoder in the motor parameters to "Standard" and load the parameter file into the frequency converter.

⇨ Start the tool "Rotating" in the menu "Tools". Set the reference speed to 0 and activate the controlled. Turn the motor shaft by hand in the reference direction. During this process nor error message will occur from the sensor/encoder for three combinations of the sensor/encoder wiring.

⇨ For facilitation/documentation use the following tables 1) and 2) with the 6 possible combinations.

⇨ Repeat the process with the sensor/encoder setting "Offset".

Table 1: X4-Sensor/Encoder (with Encoder Setting "Standard")

		Combination of the sensor/encoder wires					
Pin	**Function**	**1**	**2**	**3**	**4**	**5**	**6**
1	PTC/NTC (Ground)						
2	PTC/NTC (+)						
3	GND						
4	-						
5	-						
6	Sensor A	O	O	B	B	C	C
7	Sensor B	B	C	C	O	O	B
8	Sensor C	C	B	O	C	B	O
9	12 V						
10	5 V						
No error message from sensor							

Table 2: X4-Sensor/Encoder (with Encoder Setting "Offset")

Pin	Function	Variant of the sensor/encoder wires					
		1	2	3	4	5	6
1	PTC/NTC (Ground)						
2	PTC/NTC (+)						
3	GND						
4	-						
5	-						
6	Sensor A	O	O	B	B	C	C
7	Sensor B	B	C	C	O	O	B
8	Sensor C	C	B	O	C	B	O
9	12 V						
10	5 V						
No error message from sensor							

➪ Select **one** of the three sensor/encoder wired which have been detected as possible. For facilitation/documentation use the following tables 3) and 4) in order to determine the combination of motor phases from the 6 possible combinations that is suitable for the selected sensor/encoder combination. First, take the following steps for the setting "Standard".

➪ Start the tool "Rotating" in the menu "Tools". Set the reference speed for example to the rated speed, activate the controller and start the ramp. If the motor turns trouble-free, determine the motor current via the tool "Motor measuring". Otherwise, change the motor phases accordingly to the table until the motor turns trouble-free.

➪ Repeat the process with the sensor/encoder setting "Offset".

Table 3: Combination with the sensor/encoder setting "Standard"

X4-Sensor/Encoder

Pin	Correct combination of the sensor/sensor wires
6	sensor/encoder wires
7	sensor/encoder wires
8	sensor/encoder wires

X5-Motor

,

Pin	Function							Motor phase current at rated speed in A_{eff}
	Motor phase U	U	U	W	W	V	V	
	Motor phase V	V	W	U	V	W	U	
	Motor phase W	W	V	V	U	U	W	
	ground							
System works without errors								

Table 4: Combination with the sensor/encoder setting "Offset"

X4-Sensor/Encoder

Pin	Correct combination of the sensor/encoder wires
6	sensor/encoder wires
7	sensor/encoder wires
8	sensor/encoder wires

X5-Motor

,

| Pin	Function							Motor phase current at rated speed in A_{eff}
	Motor phase U	U	U	W	W	V	V	
	Motor phase V	V	W	U	V	W	U	
	Motor phase W	W	V	V	U	U	W	
	ground							
System works without errors								

⇨ The combination (encoder setting/encoder wiring/order of motor phases) with the lowest current consumption is used!

Step 2: Optimizing the parameters (option)

Further optimization of the parameters can be necessary/desired under the following circumstances: For this purpose use the tool "Motor measurement".

Tab pages "Profile" and "Curves"
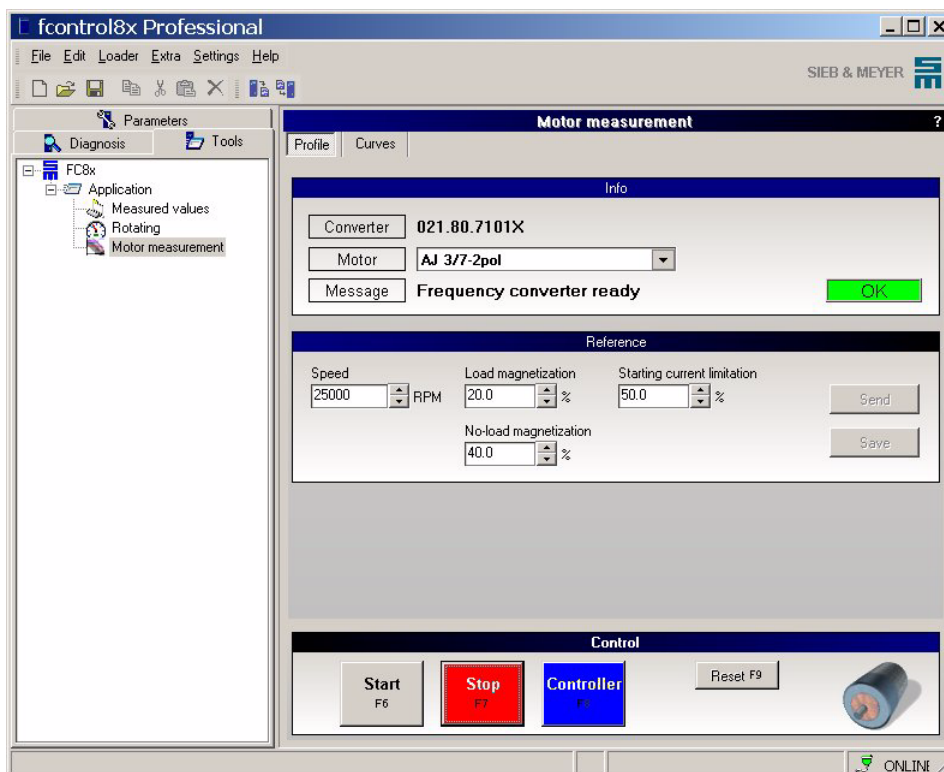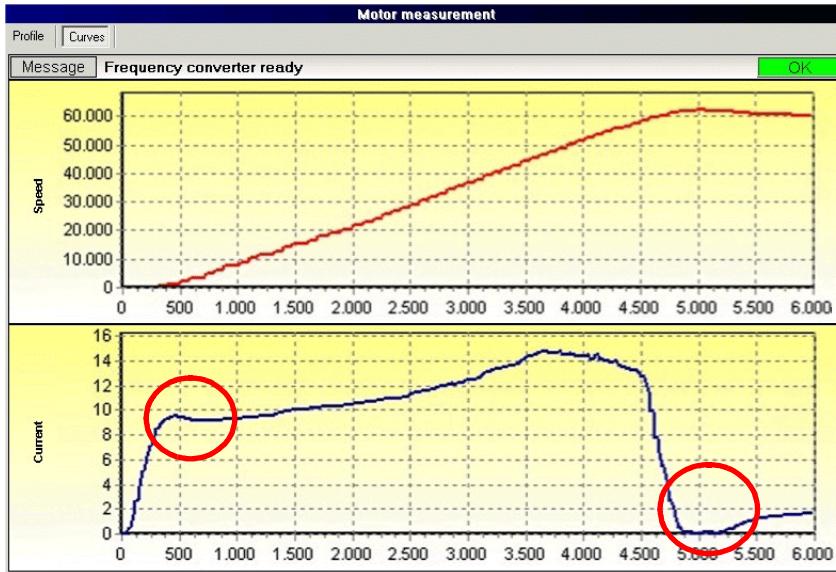
Analyze the recorded curves accordingly to the following criteria:

➪ Only one overshoot should occur when the acceleration ramp is started or stopped.

▶ If a back-swing occurs enter the value for the rated speed again on the tab page "Profile" in the field "Speed" and repeat the following steps.. Reduce the value "Gain speed controller" by 10.

▶ The optimum values for this operating point are reached when only one overshoot occurs during start and stop of the acceleration ramp.

The step response for the parameters "Speed" and "Current" is now detected and the course is displayed in a graph. The optimum adjustment of the motor parameters can be determined by the displayed characteristic curves.

☞ The time display is no real time display, the values are recommended values.

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8   Appendix: Revisions

This appendix describes revisions in comparison to the last revision of the manual.

FC 8x fcontrol 8x
021-FC-bed-FControl8x/R002-SM-EN/BLA/KM/SLI/SÜ
January 8, 2007

The documentation was adapted to the current version of the software "fcontrol8x1.1Professional".