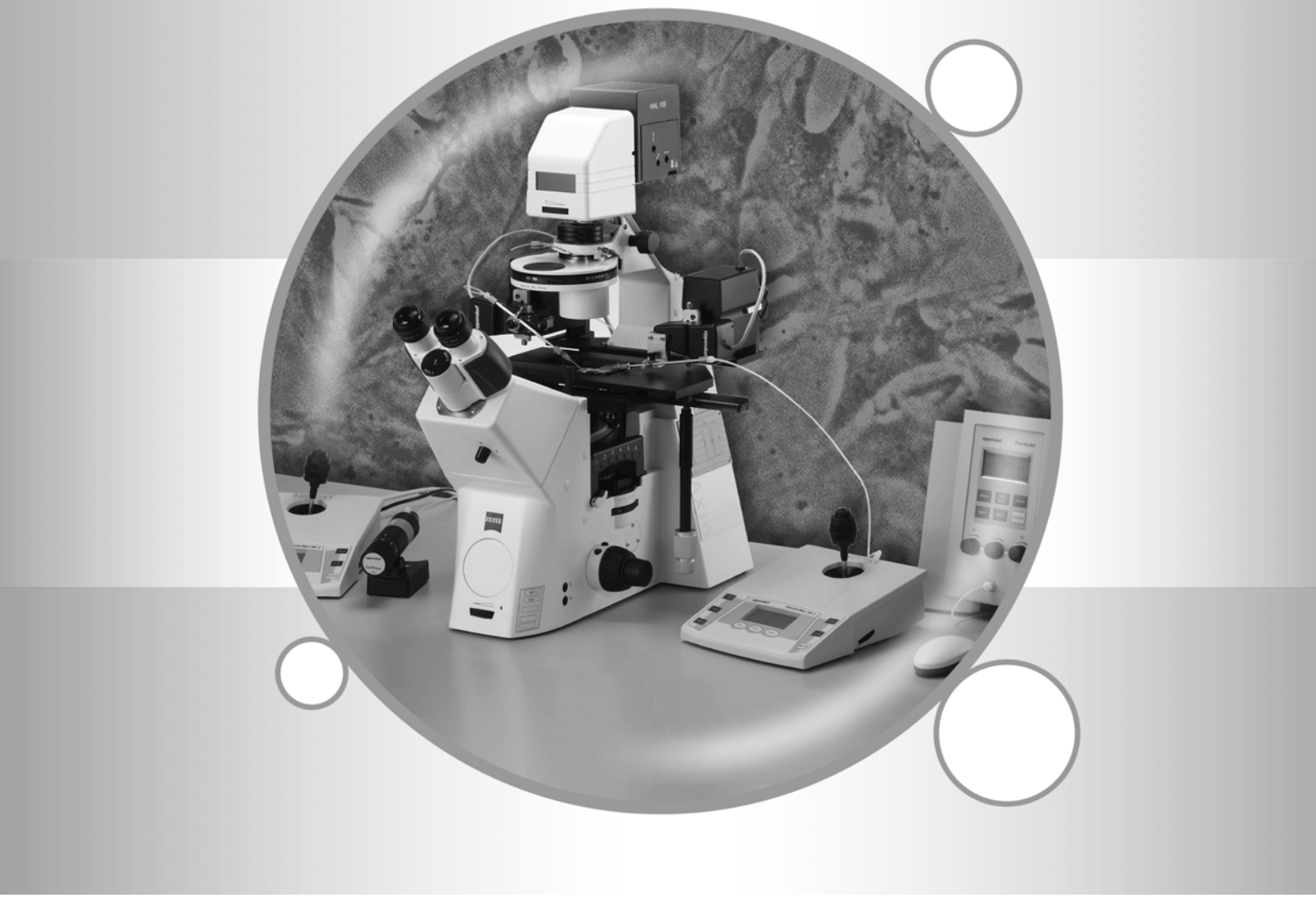


Cell Technology · PC Control

Operating manual

For FemtoJet/FemtoJet express, InjectMan NI 2, PatchMan NP 2, TransferMan NK 2

Please note: also applicable for the TransferMan 4r / InjectMan 4 and FemtoJet 4i/x

eppendorf

Table of contents

1 Introduction

This manual describes the device control for FemtoJet/FemtoJet express, InjectMan NI 2, PatchMan NP 2, TransferMan NK 2 via a PC using a terminal program.

Eppendorf does not give any support for the device control for FemtoJet/FemtoJet express, InjectMan NI 2, PatchMan NP 2, TransferMan NK 2 via a PC.

2 Installation

2.1 Connecting the device to the PC

You will need a data cable to connect the device to the PC. This type of cable has a different polarity than a serial EIA-232 (RS232) data cable. A standard data cable from an electronics shop will not work in most cases.

Use one of the following data cables. The four digits represent the first four digits of the order numbers of the corresponding devices:

Order No. (International)	Description
0013 610.525	**Data cable 0013** to connect a PC with 4308, 5181, 5183, 5186, 5188, 6131, 6132
5181 150.094	**Data cable 5181** to connect a PC with 5181, 5183, 5188
5325 620.007	**Data cable 5325** to connect a PC with 4308, 5247, 5248, 5325, 5352, 5181, 5183, 5186, 5188

- Connect the correct EIA-232 cable to the device and COM port of your computer.

2.2 Installing the terminal program

System requirements

- Processor with 90 MHz or more
- 32 MB RAM
- 100 MB free memory on your hard drive
- Microsoft Windows 3.11™ / Windows 95™ / Windows 98™ / Windows XP™ / Windows Vista™
- A terminal program, for example Microsoft HyperTerminal or TuTTY

Windows Vista™ does not include the program HyperTerminal. Alternatively, you can use the OpenSource Telnet/SSH client TuTTY.

2.2.1 Installing and starting HyperTerminal

If you have chosen HyperTerminal, you can start the program as follows:

On most Microsoft Windows systems the program HyperTerminal is already installed as standard. If you cannot access the program with the command **hypertrm** install it according to the following instructions:

http://technet.microsoft.com/de-de/library/cc737746.aspx

1. Click on the Start button on the Windows task bar.
2. Click on **Run...**.
3. Enter **hypertrm** into the entry field and click OK to confirm.
4. Continue with the operation (see *Operating HyperTerminal on p. 7)*.

2 Installation

2.2.2 Installing and starting TuTTY

TuTTY is an extension of the free Telnet and SSH program PuTTY. This operating manual does not include a detailed description of the operation of PuTTY/TuTTY. Please observe the corresponding documentation of both programs.

- PuTTY: http://www.chiark.greenend.org.uk/~sgtatham/putty/docs.html
- TuTTY: http://putty.dwalin.ru/?downloads

If you have chosen TuTTY, you can start the program as follows:

1. Download TuTTY from the following web page as a ZIP archive file:
   http://putty.dwalin.ru/?downloads
2. Unzip the ZIP archive file using a zipping program (for example WinRAR: http://www.winrar.de) and save it to a directory of your choice.
3. Start the file **tutty.exe** from the program directory.
   The TuTTY configuration window opens.
4. Continue with the operation (see *Operating TuTTY on p. 12)*.

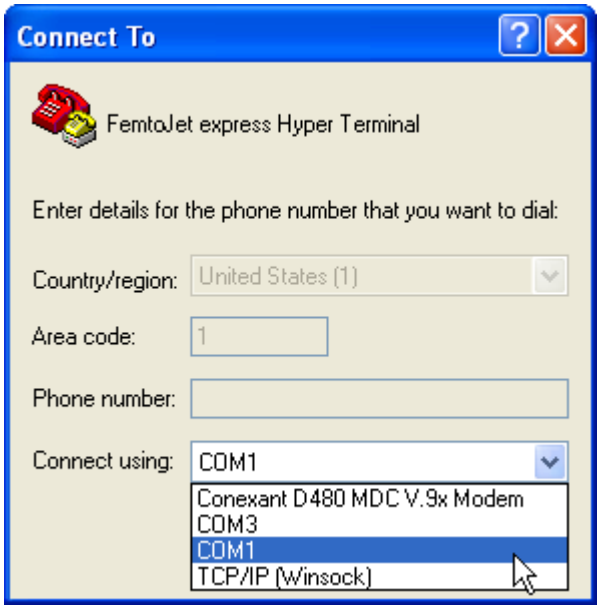
3 Operation

3.1 Operating HyperTerminal

1. Start HyperTerminal (see *Installing and starting HyperTerminal on p. 5)*.

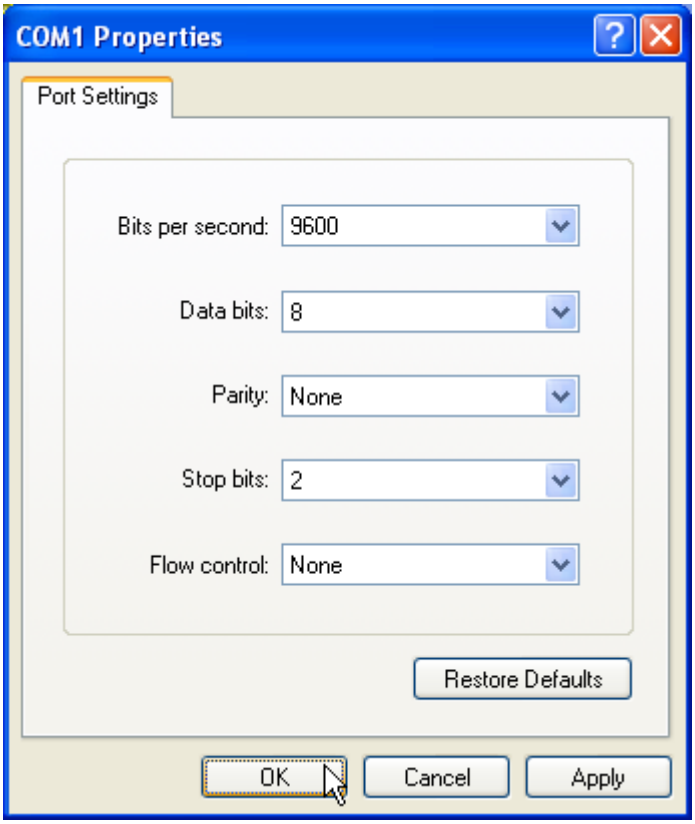
After the initial start of HyperTerminal you will also find the program in the Windows start menu under **Accessories** > **Communication**.

2. Enter a user-defined name for the new connection and click on the OK button.

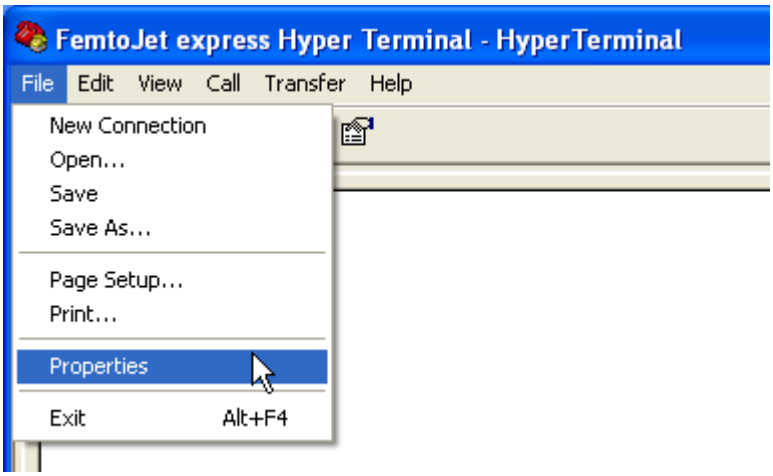


3. Select the COM port to which the device is connected under **Establish connection via:**. If your computer has several COM ports, you need to find out which is the correct one by trial and error. Click OK to confirm.

3 Operation

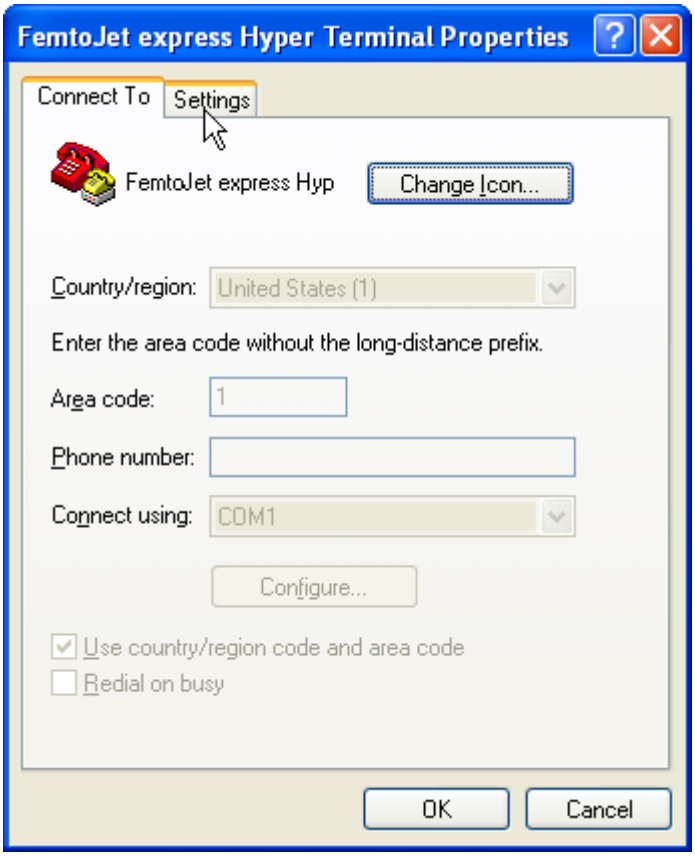


4. Set the transfer parameter for your device according to the technical data (see *Transmission parameters on p. 32)* and click OK to confirm the settings.



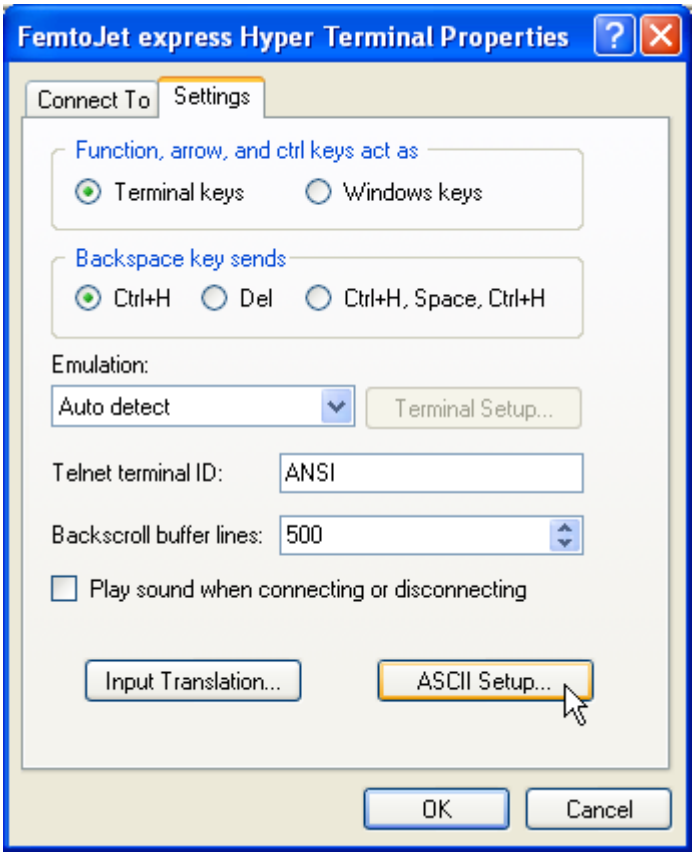
5. Click on **File/Properties**.

3 Operation



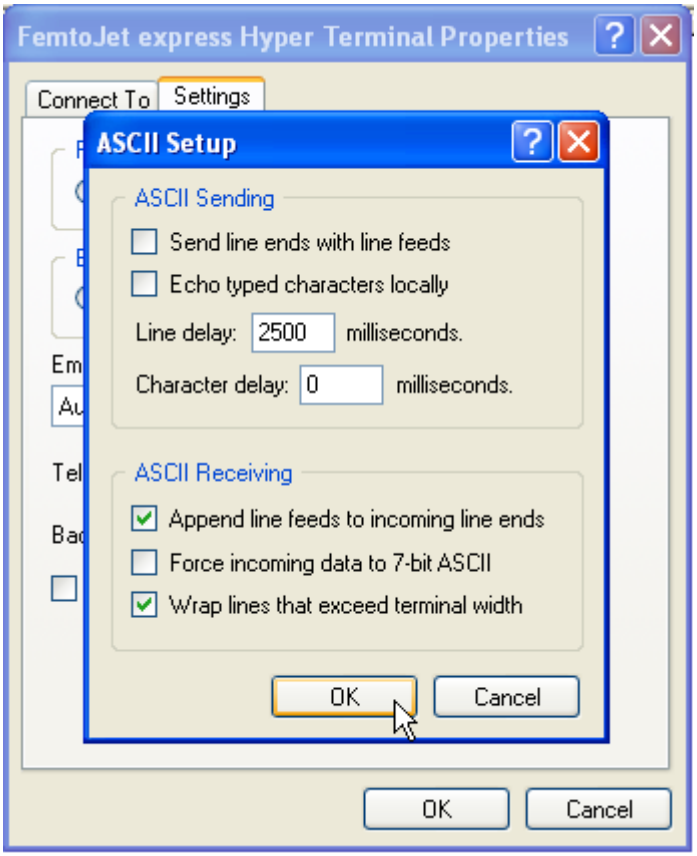
6. Click on the **Settings** tab.

3 Operation



7. Select your settings as indicated in the screenshot and click on the **ASCII Setup...** button.

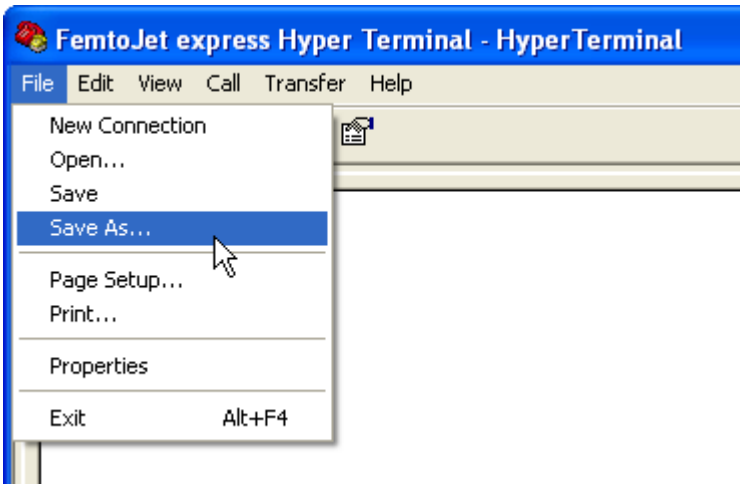
3 Operation



8. Select your settings as indicated in the screenshot and click on the OK button.
9. Read the "Commands" chapter to learn how commands are set up and how you can enter them.(see p. 13).

3.2 HyperTerminal: Saving connection setting

You can save the connection settings you made:

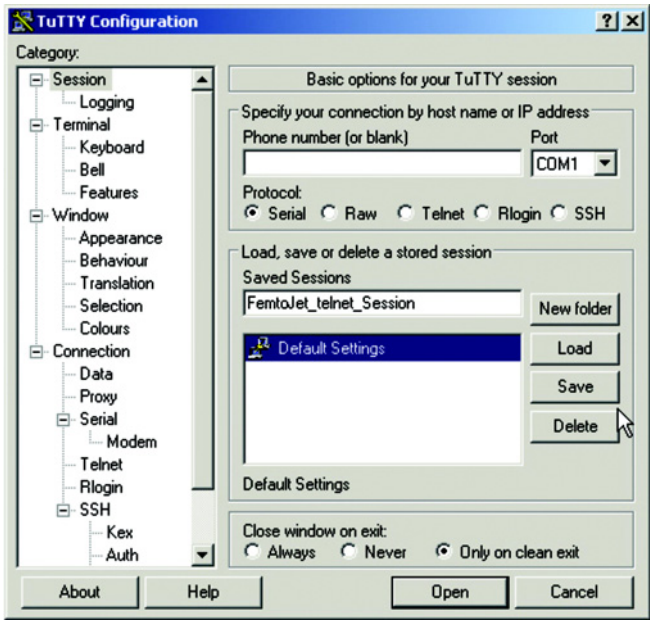


- On the menu bar click on **File** > **Save as...** and save your connection settings as a file.

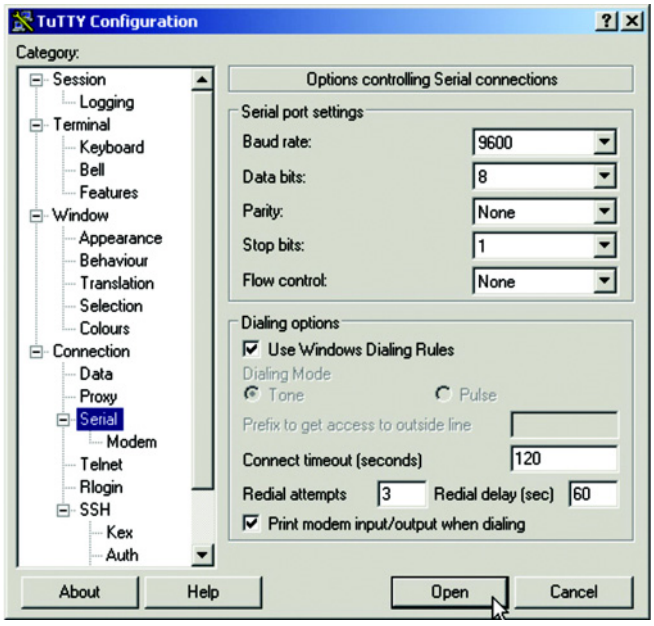
3 Operation

3.3 Operating TuTTY

1. Start TuTTY (see *Installing and starting TuTTY on p. 6)*.
   The TuTTY configuration window opens.
2. Select **Serial** as the protocol and select the COM port to which the device is connected.



3. Enter a name into the **Saved Sessions** text field and press the **Save** button.
4. From the **Category** tree select the **Connection/Serial** node.



5. Adjust the transmission parameters for your device according to the technical data (see *Transmission parameters on p. 32)* and confirm the setting with the **Open** button.
   Your settings are now saved and can be accessed again the next time you start TuTTY.
6. For information on the setup of commands and how to enter them see the "Commands" chapter (see p. 13).

3 Operation

3.4 Commands

This chapter describes how to enter commands and how the commands are set up.

3.4.1 Commands and answers

The commands and answers are always set up according to the same pattern. Commands always start with "C0" and answers always start with "A0". These are always followed by two digits.

- C0xx: Command
- A0xx: Answer

The drain command for the FemtoJet express appears as follows:

```
C046
```

3.4.2 Parameter

Some commands expect parameters. These are then added to the command following an "=" symbol. The FemtoJet express command for the output of two acoustic signals appears as follows:

```
C003=2
```

3.4.3 Position and speed parameters

Some micromanipulator commands expect the entry of positions that are to be controlled by the micromanipulator. An individual speed can also be defined for each axis movement. These commands use the GOTO command as operator instead of the "=" symbol.

One micrometer equals 25.6 microsteps. One microstep equals about 40 nanometers.

px py pz	Position of the x/y/z-axis in microsteps	-640 000 to + 640 000
px py pz	Position of the x/y/z-axis in micrometers	-25 000 to +25 000
vx vy vz	Speed of the x/y/z-axis in microsteps/s	0 to 192 000
vx vy vz	Speed of the x/y/z-axis in micrometers/s	0 to 7 500

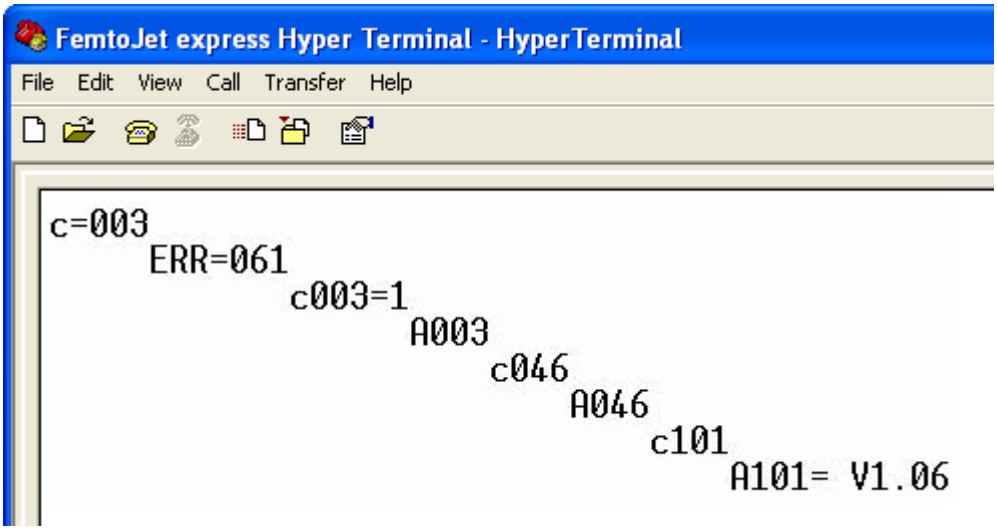
In the case of a micromanipulator, this type of command could appear as follows:

```
C006 GOTO p5 p3 p0 v5 v5 v0
```

3.4.4 Entering commands

Every entered symbol is sent to the device. Therefore, the correction of mistyped symbols can lead to error messages.

3 Operation



- Select a command from the chapters "FemtoJet / FemtoJet express Commands" (see p. 24) or "InjectMan NI 2 / PatchMan NP 2 / TransferMan NK 2 Commands" (see p. 26). Enter this command and confirm it with the Enter key.

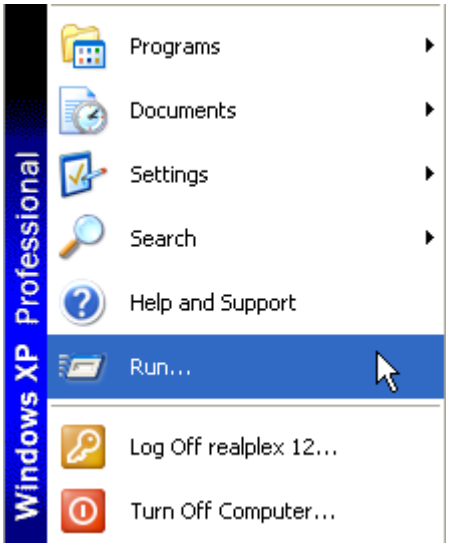
  The answer (return value) for the command appears in the same window below the command.

3.5 Carrying out command sequences

You can send complete command sequences that were previously defined in a text file to the device.

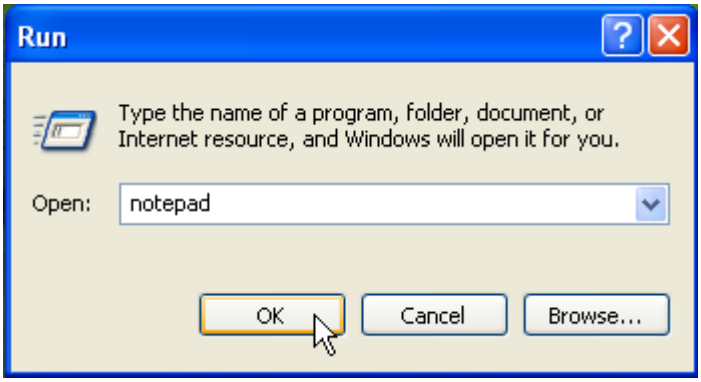
3.5.1 Creating a command sequence

1. Click on the Start button.

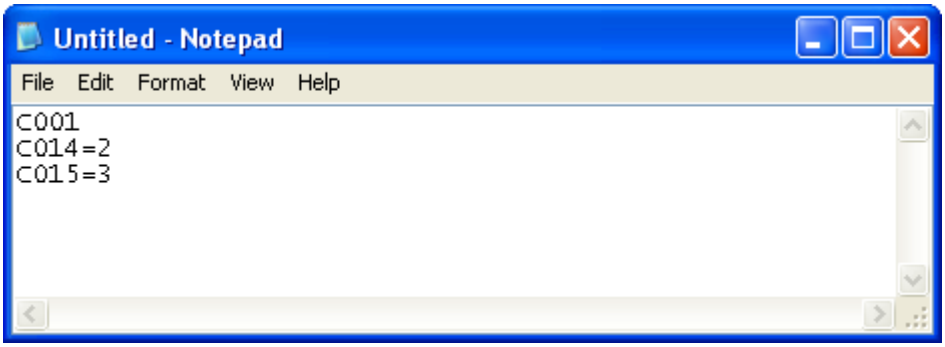


2. Click on **Run...**.

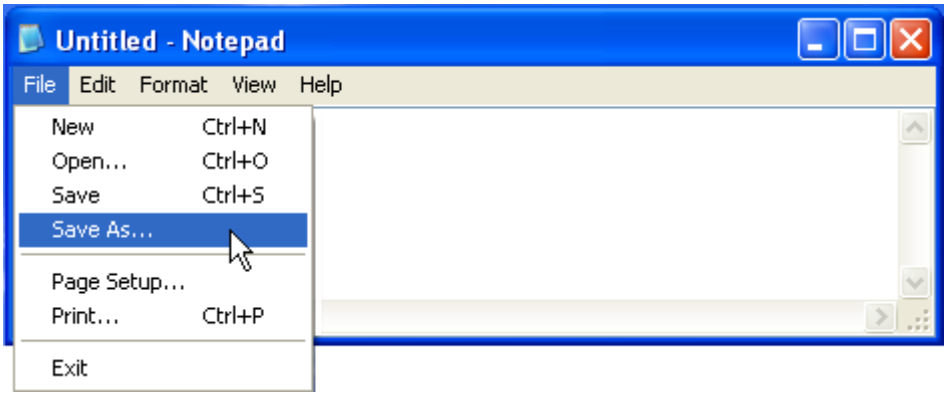
3 Operation



3. Enter **notepad** in the text field and click on the OK button.

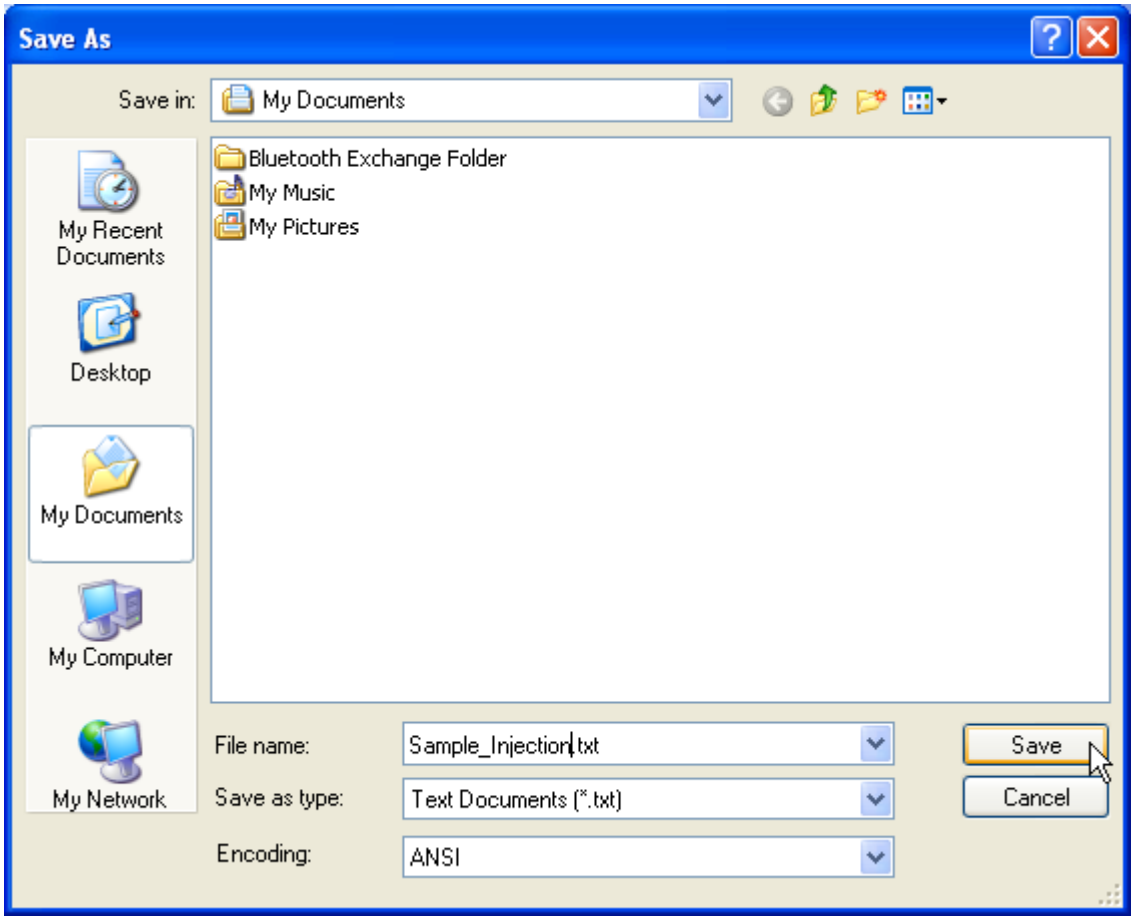


4. Enter your command sequence in the text field. Separate commands with a line break (Enter key).



5. Click on **File/Save As...**

3 Operation

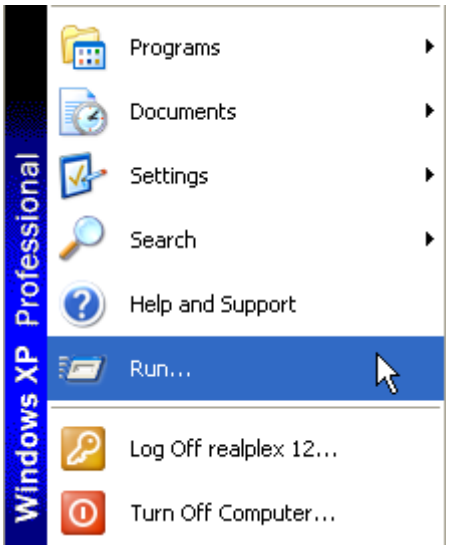


6. Save the file in any folder with any name you would like.

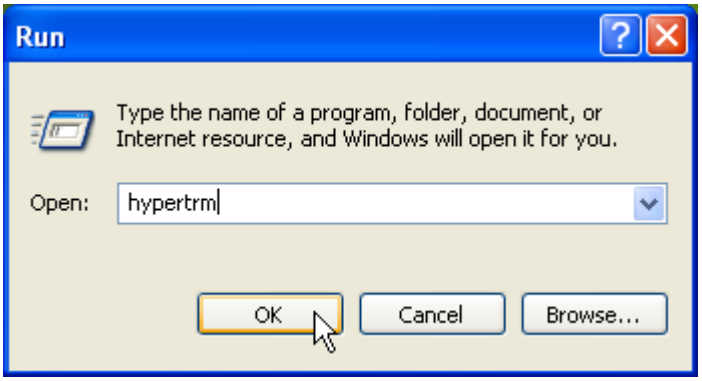
3 Operation

3.5.2 Calling a command sequence

1. Click on the Start button.



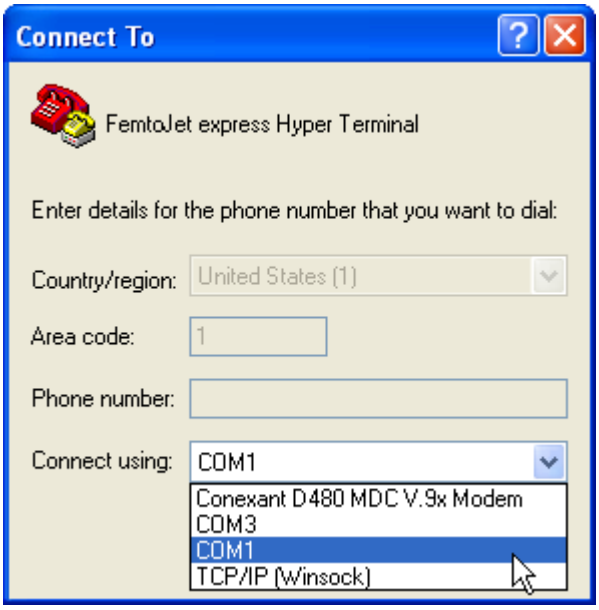
2. Click on **Run...**.



3. Enter **hypertrm** in the text field and click on the OK button.

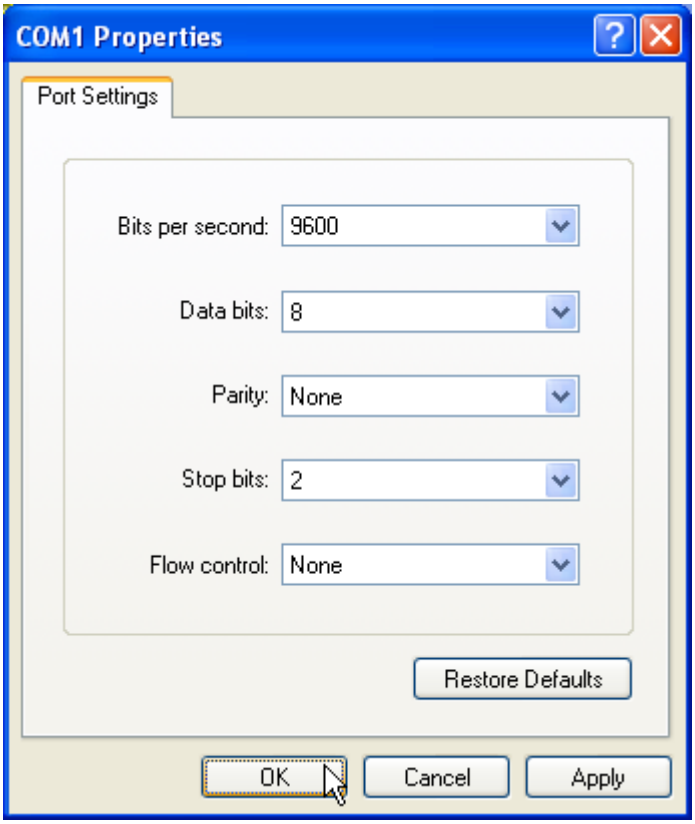
3 Operation

4. Enter a user-defined name for the new connection and click on the OK button.

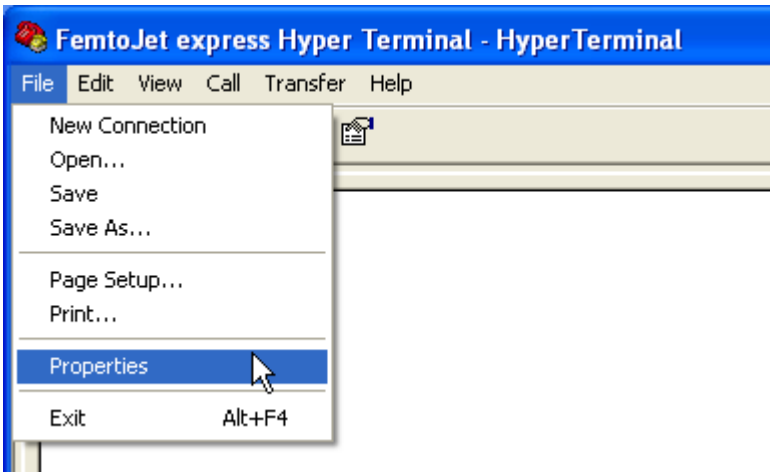


5. Select the COM port to which the device is connected and click on the OK button..

3 Operation

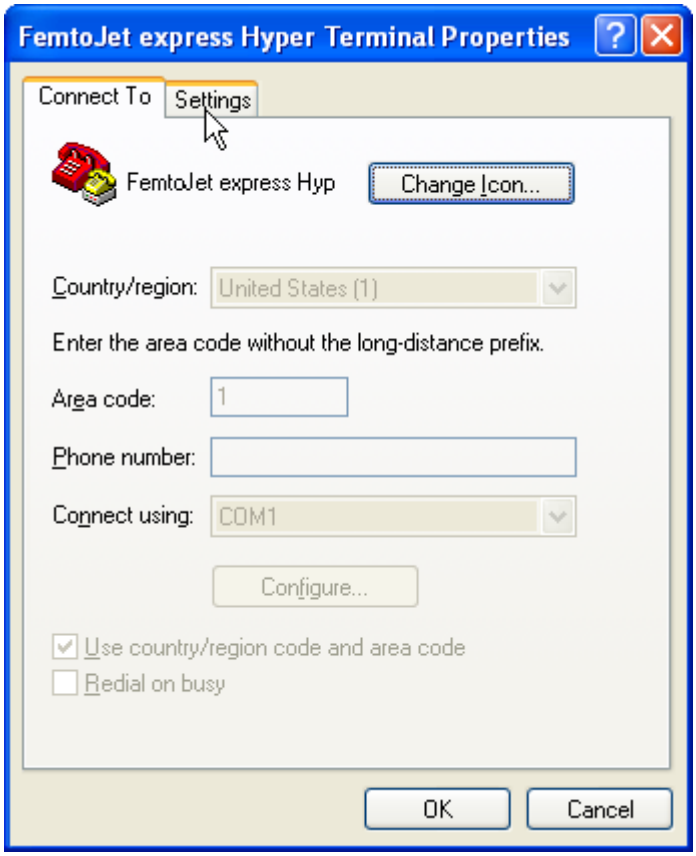


6. Set the transfer parameters according to the technical data of your device (see p. 32) and click on the OK button.



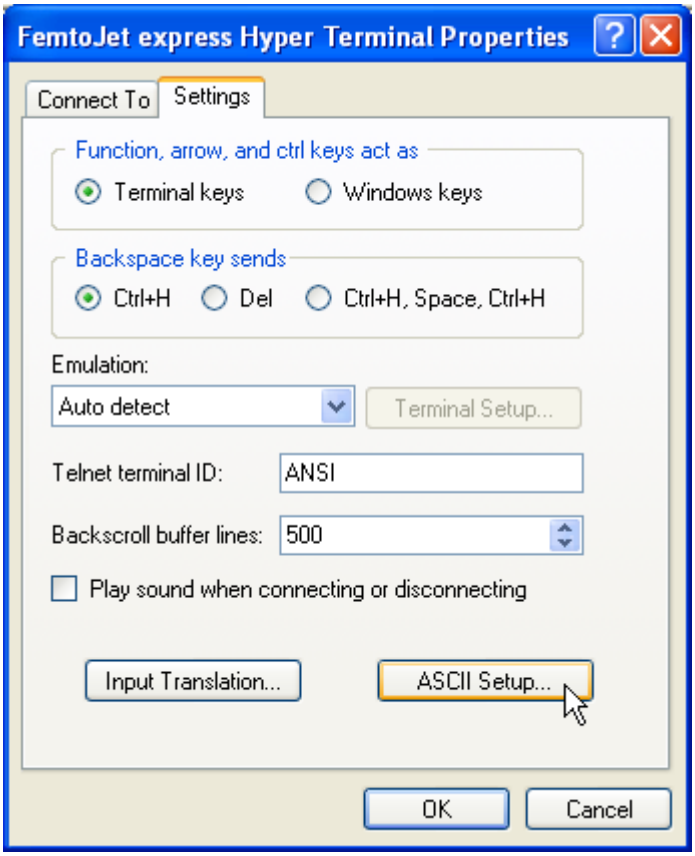
7. Click on **File/Properties**.

3 Operation



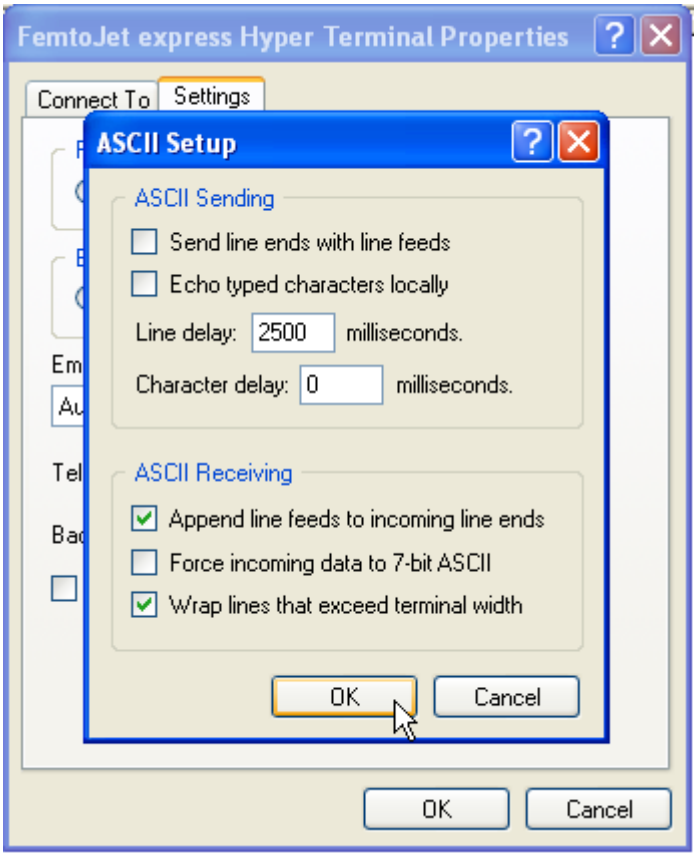
8. Click on the "Settings" tab in the new window.

3 Operation



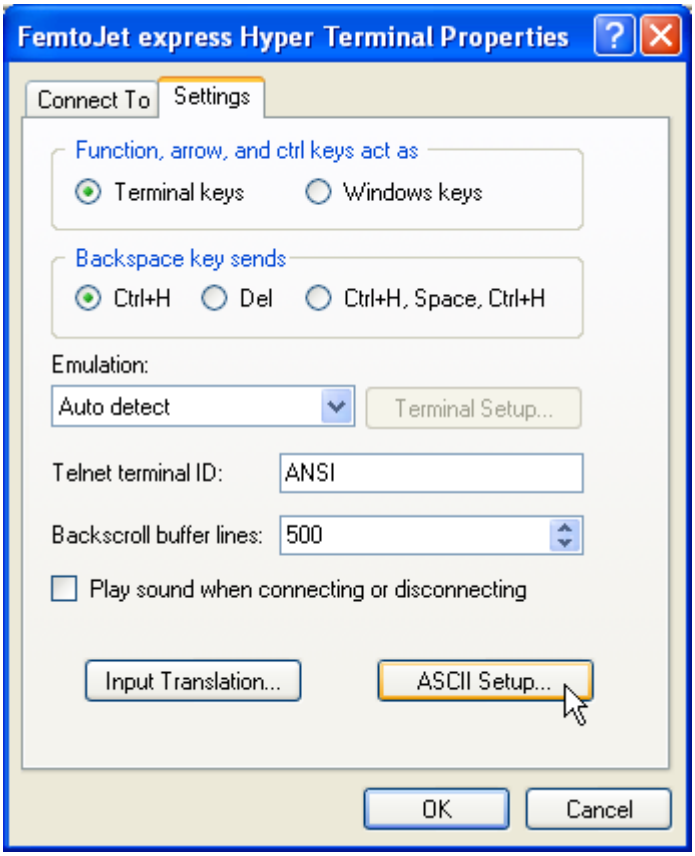
9. Click on the ASCII Setup... button.

3 Operation

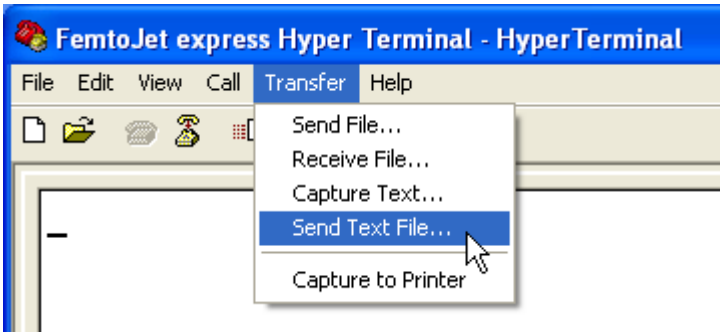


10. Activate the checkboxes as shown in the screenshot and enter 2500 milliseconds as the line delay. Confirm your settings by clicking on the OK button.

3 Operation



11. Click on the OK button in the Settings window as well.



12. Click on **Transfer/Send Text File...** and select your saved text file to start the transfer.

3 Operation

3.6 FemtoJet / FemtoJet express commands

3.6.1 Commands for entering parameters

Command for entering parameters	Command	Parameter	Answer	Meaning of the answer
Short acoustic signal	C003	1 - 254	A003	Acoustic signals transmitted
Long acoustic signal	C004	1 - 254	A004	Acoustic signals transmitted
Automatic injection Inject with injection time t_i in 1/10 seconds. If "0" is entered as a parameter the injection time t set in the FemtoJet, $_i$ will be used	C010	0; 1 - 999	A010	Injection time t_i in 1/10 seconds 0: Injection time as set for the FemtoJet/FemtoJet
Set counter n to 0	C012	none	A012	Counter n set to 0
Carry out clean process Clean with clean time in 1/10 seconds	C013	1 - 100	A013	Clean complete
Activate or deactivate standby	C014	none	A014	Standby activated or deactivated
Activate or deactivate acoustic signals	C040	0 = off 1 = on	A040	Acoustic signals activated or deactivated
Set pressure unit	C041	0 = hPa 1 = PSI	A041	Pressure unit is reset
Set **injection time t_i** Injection time t_i in 1/10 seconds	C042	1 - 999	A042	Injection time t_i set
Set **compensation pressure p_c** Set compensation pressure in hPa. Even if the pressure unit of the FemtoJet is set to PSI, the pressure value can only be transferred in hPa. 1 Pa = 1.4504 · 10^{-4} PSI	C043	0; 5 - 6 000	A043	Compensation pressure p_c is set
Set **injection pressure p_i** Set compensation pressure in hPa. Even if the pressure unit of the FemtoJet is set to PSI, the pressure value can only be transferred in hPa. 1 Pa = 1.4504 · 10^{-4} PSI	C044	0; 5 - 6 000	A044	Injection pressure p_i is set
Set background lighting	C045	0 = off 1 = on	A045	Background lighting activated or deactivated
Drainage	C046	none	A046	Drainage is being carried out

3 Operation

3.6.2 Commands for parameter queries

Command for parameter queries	Command	Answer	Meaning of the answer
Query program version	C101	A101 = x.xx	Version number
Query status of the acoustic signals	C150	A150=0 or A150=1	0 = off 1 = on
Query pressure unit	C151	A151=0 or A151=1	0 = hPa 1 = PSI
Query injection time t_i	C152	A152=xxx	Injection time t_i in 1/10 seconds
Query compensation pressure p_c	C153	A153=xxxx	Compensation pressure p_c in hPa
Query injection pressure p_i	C154	A154=xxxx	Compensation pressure p_c in hPa/PSI
Query background lighting	C155	A155=0 or A155=1	0 = off 1 = on

3 Operation

3.7 InjectMan NI 2 / PatchMan NP 2 / TransferMan NK 2 commands

Function of the command	Command	Parameter	Answer	Meaning of the answer
Query program version	C001	none	A001 version number	Version answer
Reset the complete device This command can only be carried out if remote control is active.	C002	none	A002	Reset will be carried out momentarily
Reset motor control Motor control is reset to default. This means that all motor movement is stopped and the current coordinates are set to 0,0,0. Each drive can have an offset of up to 10 µm. This command can be carried out at any time.	C003	none	A003	Motor control was reset
Switch to remote control All current movements are stopped and local operation via joystick and keypad is enabled. The feedback occurs as soon as all motors have stopped and the positioning via joystick can be carried out. This command can be carried out at any time.	C004	none	A004	Ready for remote control commands
Switch to manual control All current movements are stopped and local operation via joystick and keypad is enabled. The feedback occurs as soon as all motors have come stopped and the positioning via joystick can be carried out. This command can be carried out at any time.	C005	none	A005	Ready for manual control
GOTO position in microsteps The manipulator moves to the preset position at the preset speed in all 3 axes. If no movement shall take place on one axix, the speed value 0 is transmitted. The feedback occurs as soon as all motors have stopped and the final position is reached or the limit switch has responded. The answer will include the position of the limit switches. If positioning was successful, the value will be 0. All values are given in microsteps. This command can only be carried out if remote control is active.	C006	px py pz vx vy vz	A006 final position	All motors have stopped

3 Operation

Function of the command	Command	Parameter	Answer	Meaning of the answer
GOTO position in micrometers The manipulator moves to the preset position at the preset speed on all 3 axes. If no movement shall take place on one axix, the speed value 0 is transmitted. The feedback occurs as soon as all motors have stopped and the final position is reached or the limit switch has responded. The answer will include the position of the limit switches. If positioning was successful, the value will be 0. All values are given in micrometers. This command can only be carried out if remote control is active.	C007	px py pz vx vy vz	A007	All motors have stopped
STOP The current movement will be stopped. The feedback occurs as soon as all motors are at a standstill. This command can only be carried out if remote control is active.	C008	none	A008	All motors have stopped
Position query in microsteps Regardless of the ongoing movement, the current position on all three axes as well as the position of the 6 limit switches will be reported in microsteps. An ongoing movement will not be stopped. This command can be carried out at any time.	C009	none	A009	Position reply in microsteps with limit switches
Position query in micrometers Regardless of the ongoing movement, the current position on all three axes as well as the position of the 6 limit switches will be reported in micrometers. An ongoing movement will not be stopped. This command can be carried out at any time.	C010	none	A010	Position reply in micrometers with limit switches

3 Operation

Function of the command	Command	Parameter	Answer	Meaning of the answer
GOTO position in microsteps without "complete" message The manipulator moves to the preset position at the preset speed o all 3 axes. If no movement shall take place on one axix, the speed value 0 is transmitted. The feedback occurs as soon as the command has been evaluated completely and the next one is ready to be sent out. The final position, however, has not been reached yet. All values in microsteps. This command can only be carried out if remote control is active.	C011	px py pz vx vy vz	A011	Ready for next command
GOTO position in micrometers without "complete" message The manipulator moves to the preset position at the preset speed o all 3 axes. If no movement shall take place on one axix, the speed value 0 is transmitted. The feedback occurs as soon as the command has been evaluated completely and the next one is ready to be sent out. The final position, however, has not been reached yet. All values in micrometers. This command can only be carried out if remote control is active.	C012	px py pz vx vy vz	A012	Ready for next command
Wait until all motors have stopped The manipulator waits until all motors have stopped, i.e. the final position has been reached, before giving an answer. If this command is issued when the motors have stopped already, the reply follows immediately.	C013	none	A013	All motors have stopped
Trigger short acoustic signals The number of short (100 ms) acoustic signals specified in the parameter is issued.	C014	Number of acoustic signals	A014	All acoustic signals were issued
Trigger long acoustic signals The number of long (1 second) acoustic signals specified in the parameter is issued.	C015	Number of acoustic signals	A015	All acoustic signals were issued
STORE Memory Position The current position of the manipulator is saved under the storage position number specified in the parameter. The stored information is lost when the device is switched off or set to standby. The storage positions 1, 2 and 3 correspond to the storage positions that can be accessed via the keyboard.	C016	Storage position	A016	Ready for next command

3 Operation

Function of the command	Command	Parameter	Answer	Meaning of the answer
GOTO Memory Position On all three axes and with the GOTO speed that has been saved internally, the manipulator moves to the position saved in this storage position . The feedback occurs as soon as all motors have stopped moving and the final position is reached or the limit switch has responded. The answer includes the position of the limit switches. If the positioning was successful, it has the value 0. This command can only be carried out if remote control is active.	C017	Storage position	A017 Px Py Pz	Ready for next command

4 Troubleshooting

4.1 Error messages

4.1.1 FemtoJet / FemtoJet express error messages

Error number in case of incorrect command setup	Reason	Correction
E060	The first character is not a c or C	▸ Check entry parameter. ▸ Change entry.
E061	The 2nd to 4th character is not a figure	
E062	The 5th character is not =.	
E063	The parameter is not within the permissible range	
E064	The command is unknown.	

4 Troubleshooting

4.1.2 InjectMan NI 2 / PatchMan NP 2 / TransferMan NK 2 error messages

Error number in case of incorrect command setup	Reason	Correction
E060	The first character is not a c or C	▸ Check entry parameter. ▸ Change entry.
E061	The 2nd to 4th character is not a figure	
E062	The 5th character is not =.	
E064	The command is unknown.	
E065	The command includes an incorrect number of parameters.	
E066	A parameter has an impermissible value.	
E070	**Software version 1.00-1.04**: The remote control is not active. **Software version >1.04**: Incorrect number of parameters	
E071	Parameter 1 is not within the permissible range	
E072	Parameter 2 is not within the permissible range	
E073	Parameter 3 is not within the permissible range	
E074	Parameter 4 is not within the permissible range	
E075	Parameter 5 is not within the permissible range	
E076	Parameter 6 is not within the permissible range	
E077	The first character is not a c or C	
E078	The 2nd to 4th character is not a figure	
E079	The command is unknown.	
E086	Remote control via the serial interface is not active	
E087	The device is not in routine condition	

5 Technical data

5.1 Transmission parameters

To be able to access the device correctly via the COM interface, you must choose the correct transmission parameter.

5.1.1 FemtoJet / FemtoJet express

FemoJet 4i/x

Baudrate (bits per second):	9 600 Bits/s 9600 Bits/s
Data bits:	8
Parity:	none
Stop bits:	2
Flow control:	none
Start bit:	1

5.1.2 InjectMan NI 2 / PatchMan NP 2 / TransferMan NK 2

Transferman 4r/InjectMan 4

Baudrate (bits per second):	19 200 Bits/s 57600 Bits/s
Data bits:	8
Parity:	none
Stop bits:	1
Flow control:	none
Local echo:	active
Line feed:	active
Local echo:	active
Line delay:	With manual entry of individual commands: 0 With batch processing: 2 500 ms
Append line feeds:	active

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