

Licence agreement terms & conditions:

for

the use of FPS F5 software from Schunk GmbH & Co. KG, Bahnhofstraße 106-134, 74348 Lauffen / Neckar

1 Subject of the contract

The subject of this contract is the computer software stored on data media (disk or CD-ROM), the description of the program and operating instructions and any associated written material (hereinafter called software).

The user is aware that although the programs are developed in keeping with the latest technological advances, faultless functionality in all applications and combinations cannot be guaranteed. The subject of this contract is therefore solely software which can be used fundamentally in the sense of the program description and operating instructions.

2 Scope of use

By using the data medium the user recognises these terms and conditions and acquires the irrevocable, but non-transferable and non-exclusive right to use the software for his own – personal or work – purposes – running on a computer system.

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Copies of the software may be made for back up and archive purposes only.

No other use is permitted.

3 Special restrictions

Specifically, the user is not permitted to give or make the software available to a third party without prior written permission from Schunk. Furthermore it is expressly prohibited to change, translate, further develop, decompile or disassemble the software without prior written permission from Schunk.

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Schunk reserves the right to bring an action at law for damages.

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Schunk guarantees only that the software shall be suitable for the described purpose at the point of transfer of the software. This guarantee extends to the fault-free condition of the data medium on which the software is provided.

If there is a fault with the data medium or software, the user must inform Schunk of this immediately. Whether the software is replaced or repaired shall be at Schunk's discretion. However, Schunk shall inform the user within 14 days from notification of the fault in the data medium or software if it is intended to make a replacement.

No additional liability shall be accepted in view of the fact that the software and data medium are provided free of charge. In particular, there shall be no guarantee that the software fulfils the requirements and purposes of the user or that it is compatible with other programs chosen by the user.

7 Exclusion of claims for damages

Schunk shall not be liable for damaged or faulty software or data media. In particular, liability for consequential damages as a result of a fault, regardless of its type or on whatever legal basis is excluded. Liability for intent remains. Insofar as the user is **fully qualified in business**, the liability for gross negligence is excluded, however.

8 Support

It is entirely at Schunk's discretion whether or not Schunk shall undertake to make software updates. The laws governing guarantee and liability apply to updates accordingly.

9 General terms and conditions

Exclusively the laws of the Federal Republic of Germany shall apply to this agreement. The place of jurisdiction is Heilbronn. Changes and amendments to this licence agreement without exception shall require a special agreement signed by Schunk and the user which makes reference to these terms and conditions.

General:

The FPS software comprises two programs:

1 Gateway

As soon as Gateway has been launched it monitors the serial port (com port) specified in the INI file and incoming queries from the internet. Signals coming into the COM-port from FPS F5 are converted by Gateway into a TCP/IP protocol and are thus available for use by the network to which the PC is connected.

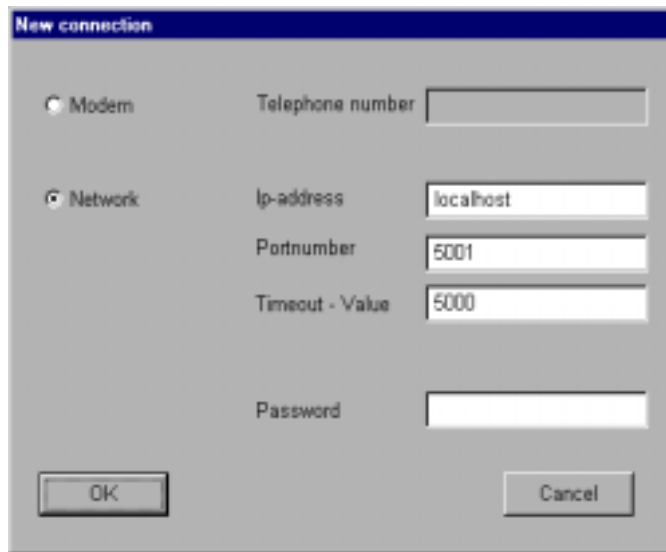
When a query comes from the internet, Gateway checks the password (if specified in the INI file) and permits connection to FPS. Port 5000-5002 is used for this purpose. If all other ports are blocked for access, the PC is thus protected against unwanted access from the network.

2 FPS controller

The FPS controller visualises the FPS F5 which is connected . It is based on the DLL supplied. This means that all commands can also be linked into other software.

It does not make any difference whether the connection occurs directly via the COM port, the internet or a modem. What is important, however, is that Gateway is started up first.

Log in screen



The image shows a 'New connection' dialog box with a blue title bar. It contains two radio buttons: 'Modem' and 'Network'. The 'Network' option is selected. To the right of the radio buttons are four text input fields: 'Telephone number' (empty), 'Ip-address' (containing 'localhost'), 'Portnumber' (containing '5001'), and 'Timeout - Value' (containing '5000'). Below these fields is a 'Password' label and an empty text input field. At the bottom of the dialog are two buttons: 'OK' and 'Cancel'.

The log in screen opens automatically when the program is launched.

The log in screen is used for identification purposes. If the password variable in the INI file is set to yes, a check is made against the password specified in the INI file.

There are several ways in which FPS can be connected :

- modem and telephone number
- internet with the internet address of the computer used to start up Gateway and to which FPS F5 is connected and the FPS F5 port number. (see also INI file)
- direct connection to the com port = network and IP address 127.0.0.1

Display

All screens have the same basic features.

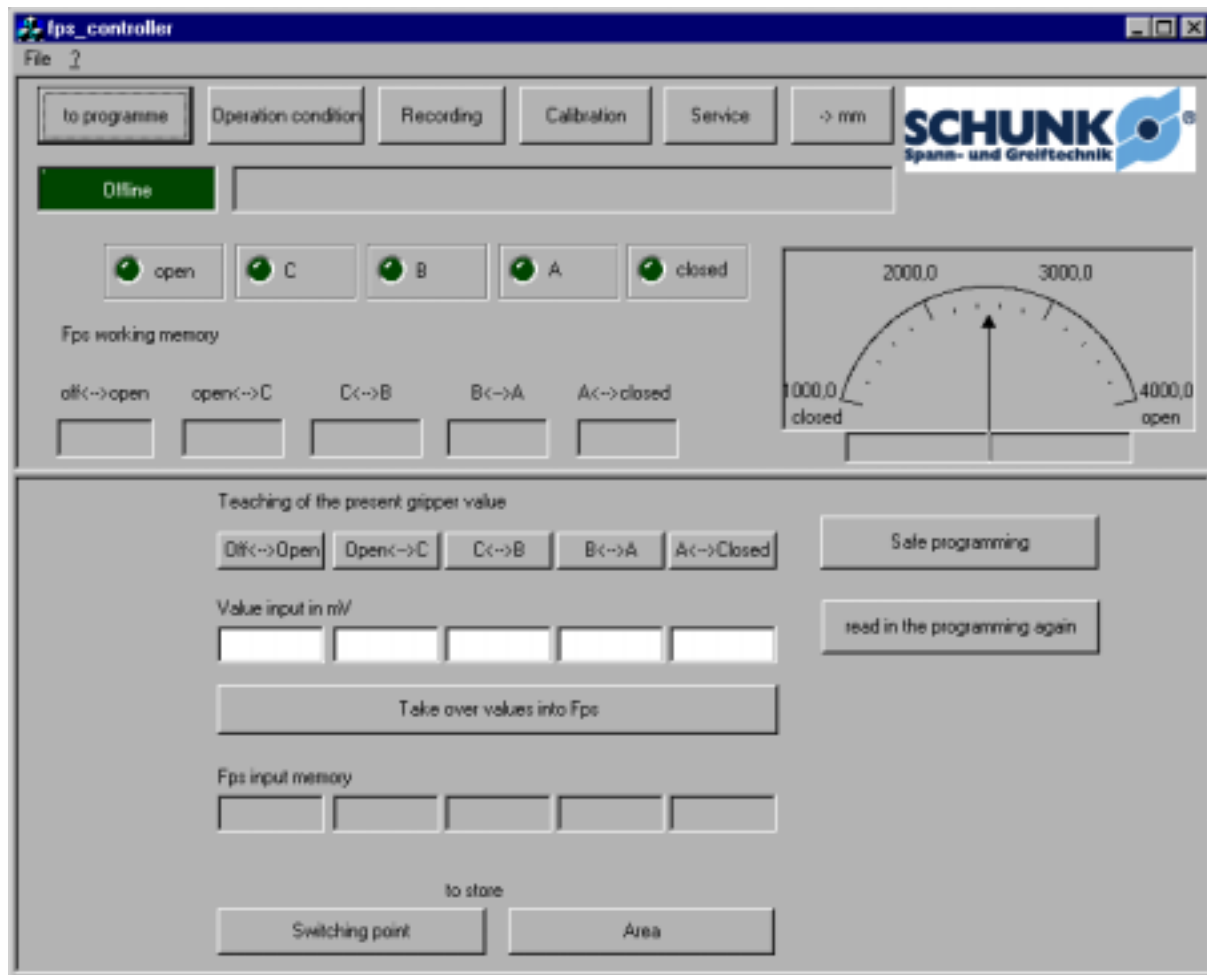
Menu bar to end program and access help.

Function bar to select functions in the bottom half of the screen.

Status bar to display connection status, type and selected unit.

Display of digital output for FPS – F5, current pointer position (value and pointer position) and values of saved switching points.

What is displayed in the bottom half of the screen depends upon the button selected from the function tool bar.



The programming function

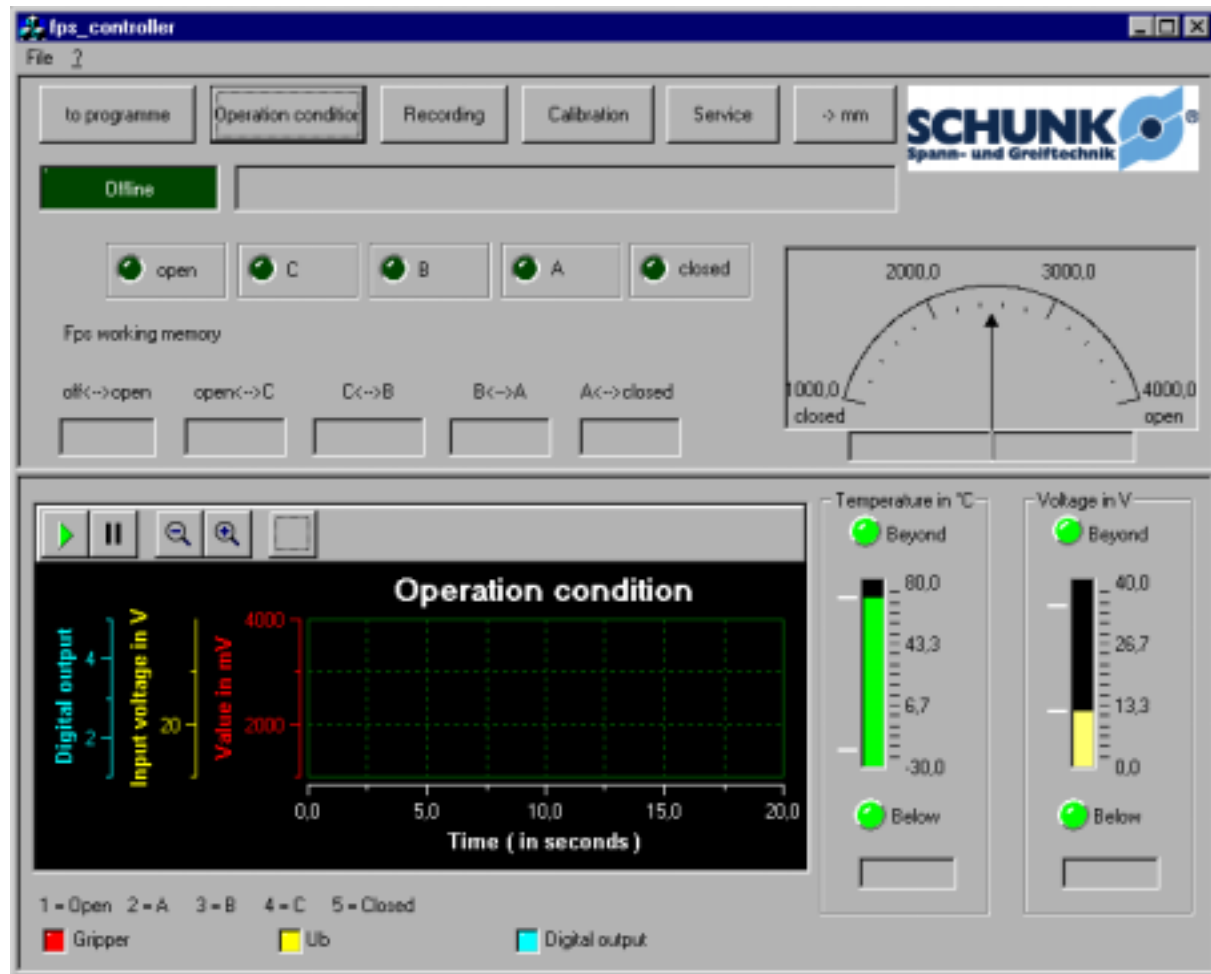
- When one of the five "teaching present gripper value" buttons is activated, the position current at the time of pressing the buttons is input into the field directly below.
- If the input values are known, they can be typed into the five input fields directly using the keyboard's
- Activate the "copy values to FPS" button to copy the five values entered to the FPS input memory. These values are then saved in FPS, but not yet active as new switching points. If a field does not contain a value (blank field), the **current** value in the FPS input memory is saved unchanged. It is possible to change just one value, if desired.

- When the "store > switching point" button is activated, the values in the FPS input memory are written directly to the FPS working memory. From this point on, FPS F5 works with these new switching points.
- If the "store > area" button is activated, the values in the FPS input memory are written to the FPS working memory such that the switching point is always precisely halfway between two values in the FPS input memory. This means that the optimum differentiation can be made between previously taught in workpieces. From this point on, FPS F5 works with these new switching points.

The operating status function

This function is used to display the current operating status. The current internal temperature of the electronic processor is displayed. If the temperature exceeds the maximum or falls below the minimum value, the corresponding LED lights up in red and remains red even if the system is rebooted. The same happens for the power supply display.

Furthermore, the voltage, position values and status of the digital output **declining** over time are also displayed. The chart is updated once every second to avoid overloading the system.



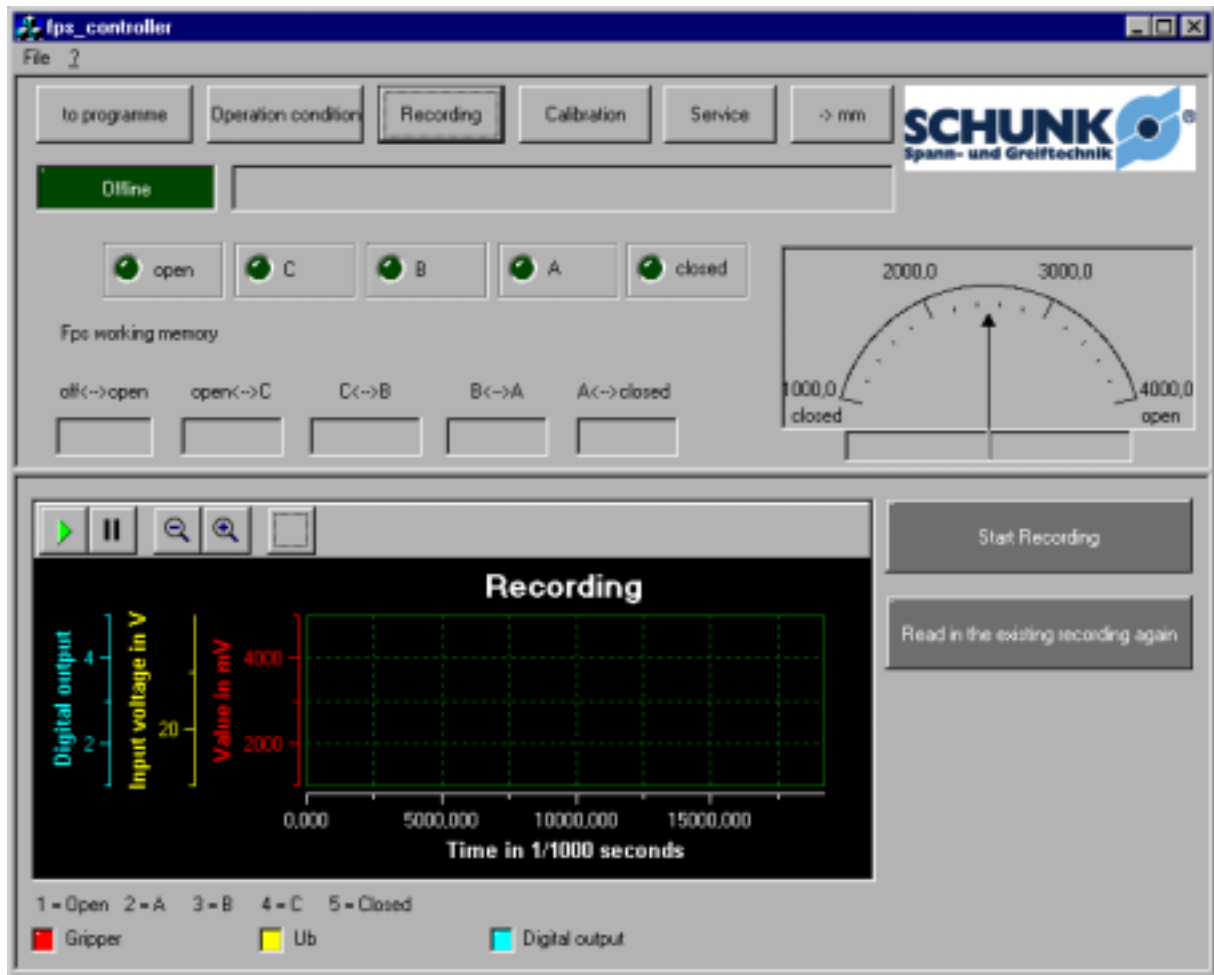
The recording function can be used to obtain more detailed information.

Click on the magnifying glass button to zoom in on the chart. Click on the window button anywhere on the screen to zoom in on part of the window.

The recording function

This window displays the last recorded values for switching outputs, input voltage and position value saved in FPS.

To create a new snapshot, activate the "start recording" button. The system then saves the status over the next 15 seconds once every millisecond, compresses the data and copies it immediately to the PC. This process can take several minutes.

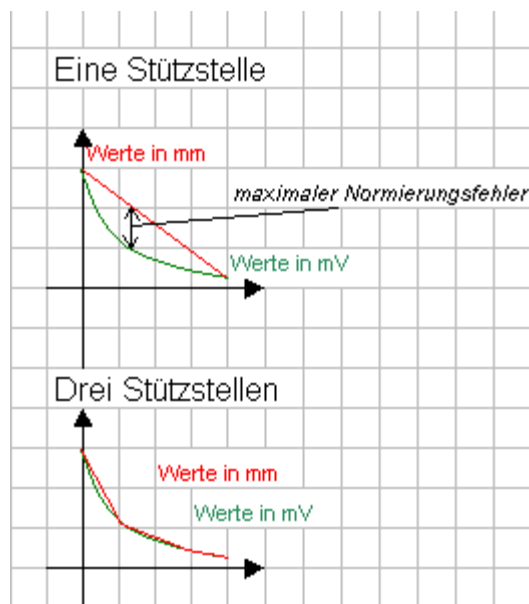


Note : The snapshot can be taken even if no PC is connected up. To do this press the SAVE button on the FPS during normal operation.

The calibration function

The system works by converting the magnetic field into analogue voltage and digitalising this voltage. Generally speaking, it is not possible to assign these values directly to the user's products. To be able to assign them directly, the readings (in mV) have to be converted into gripper opening widths in mm. Assignment is done once by inputting the **intersection** points which are stored in FPS F5 so that they are available at any time for any connected software.

The more intersection points input, the smaller the error resulting from scaling :



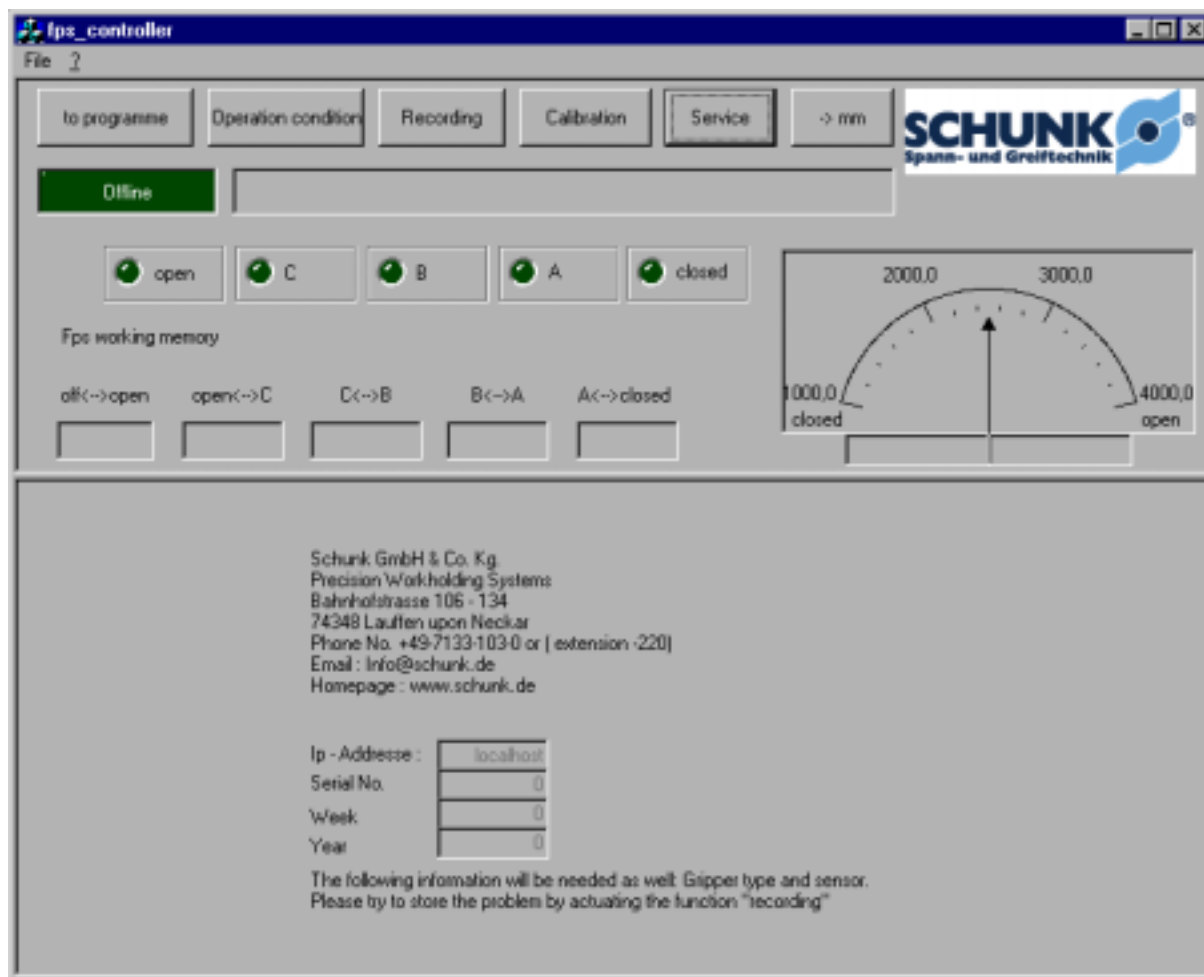
The more intersection points input, the smaller the scaling error!

We recommend scaling units of 0.5 mm or smaller.

The window for inputting intersection points :

For entry please note : In order to achieve proper function of the trouble shooting interface, the mV-values with the fulcrums must be sorted in increment. The opened position has to be given at the fulcrum 1, the closed position should be the highest fulcrum. The fields fulcrum-number may be selected by the keys "forward" and "back".

Scaling process :



Once you have mounted the sensor and magnets on the gripper and connected up the electronic processor you can start assigning voltage values to the gripper stroke. First input the number of intersection points. We recommend scaling units of 0.5 mm or smaller. The number of intersection points is calculated using the following formula : $Number\ of\ intersection\ points = \{(gripper\ stroke / step\ size) + 2\}$. Input starts with the "gripper completely open" position. This corresponds to intersection point 1. Open the gripper completely, then input the opening width in mm, then press the "teach" button. Now press the "forward" button to locate the gripper in the next position (closing), enter the new opening width and again press the "teach" button. Alternatively, reduce the mm value by one step size and jump to the next place by pressing the "step" button (please note, however, that any existing value for the intersection point in question will be overwritten), then close the gripper one step further and press the "teach" button. Once the system has been taught all intersection points from "gripper open" to "gripper closed", all that remains is to press the "save calibration data in the FPS" button. Use the "back" and "forward" buttons at any time to check the values entered for intersection points without making any changes.

The service function

This window displays all information you should have to hand to obtain speedy support from Schunk.

Gateway initialisation file

The initialisation file contains all sorts of information which can affect the program start up. The file is read once in when the program is launched. Most of the inputs are written during program run time to give you the optimum settings immediately when restarting.

Before the program started up for the first time you should enter a password, specify whether or not the program should run in password protected mode, the number of the places used for FPS on your PC and the allocation of com ports. All the other settings are valid for most systems.

Initialisation file

Initialisation file for the FPS controller

The initialisation file contains all sorts of information which can affect the program start up. The file is read once in when the program is launched. Most of the inputs are written during program run time to give you the optimum settings immediately when restarting.

Operating the FPS F5 without software

Neither the RS232 interface nor the software is required to have the functionality of our FPS A5 system:

A *Operating principles*

The FPS sensor system consists of a magnetic sensitive sensor and an electronic processor. A permanent magnet which moves parallel to the sensor is fitted to the base jaw of a gripper. The magnet's position determines the output voltage of the sensor. This voltage is amplified in the electronic processor and divided into five reference points. These reference points are saved using buttons or controls.

When a set position is achieved (eg an appropriate component is gripped), the related digital output is switched on. The five digital outputs are pnp switching and short-circuit protected. Only one output is active at any given time. As soon as the next position is reached, the previous output is switched off.

B *Set up and switching ranges for the two FPS operating modes*

The FPS has two different operating modes - »SAFE« (corresponds to "range" in the software) and »EXACT« (corresponds to "switching point" in the software).

The standard working method, which is the factory set up, is the »SAFE« mode. The working method in »EXACT« mode corresponds to the first generation of FPS units.

When the electronic processor with 12 pole circular connector (power supply and outputs) is connected up to the power supply for the first time, FPS switches into the »SAFE« mode – both green LEDs for »closed« and »open« will flash for two seconds.

Explanation of switching principles in »SAFE« and »EXACT« operating modes

Example:

Gripper with 10 mm stroke.

The switching positions to be programmed are »closed«, »workpiece A = 4 mm«, »workpiece B = 8 mm«, »workpiece C = 5 mm«, »OPEN«.

Switching points in »SAFE« mode:

Once all five positions have been saved in this operating mode (see section 5), the switching points are set a safe value, ie half way between the switching points. If you reprogram one or more switching points, they are calculated using the unchanged switching points.

Switching ranges: »closed« less than 2 mm
»workpiece A« 2.0 -4.5 mm
»workpiece B« 4.5 -6.5 mm
»workpiece C« 6.5 -9.0 mm
»open« greater than 9 mm

Switching points in »EXACT« mode:

Switching ranges: »closed« less than 0 mm
»workpiece A« 0 -4 mm
»workpiece B« 5 -8 mm
»workpiece C« 4 - 5 mm
»open« greater than 8 mm

Changing the operating mode

The FPS power supply must be disconnected before changing from one operating mode to the other! (To do this, remove the 12 pole plug from the electronic processor.) Hold down the »save« function key and reconnect the power supply. Release the »save« button – the FPS will indicate the operating mode by means of flashing LEDs for two seconds.

In »SAFE« mode, the green LEDs »closed« and »open« flash,

In »EXACT« mode, the yellow LEDs »A«, »B« and »C« flash.

The selected operating mode remains set.

C *Mounting sensors on the gripper*

The method of fitting sensors and the magnet to the gripper is described in separate instructions. When locating the sensor in the mount, ensure that the active surface of the sensor is towards the magnet.

D *Connecting the sensor and electronic processor*

The sensor and electronic processor are connected using a 3 pole plug connection size M 4 attached by means of screws. The connection point for the power supply, the RS232 interface and outputs are on the opposite side of the electronic processor to the sensor connection point. The plug is a 12 pole circular connector type Binder 723 (coupler socket).

There is a connection diagram at the end of this document.

The connection points marked »open«, »closed«, »A«, »B« and »C« correspond to the five switching outputs. The »plus« connection point must be connected to the plus pole of the power supply, the »minus« point to the minus point of the power supply (mass potential). The »n. c.« connections are not used.

To connect up the electronic processor, plug the sensor and output connectors together and secure them using the screws. If the power supply is between 10 and 30 V direct current, one of the diodes for the output signal must light up. If this does not happen, either the power supply polarity is incorrect (reverse voltage protection active!) or an output has short circuited and the short circuit protection device has switched the outputs off and thus deactivated the output diode. If this is the case, please remove the output connector and rectify the short circuit problem.

Alternatively, the switching points might have been programmed in such a way that the gripper has moved beyond the stored shut <-->open switching points. To test this, close the gripper tightly. An LED should light up now.

E Setting the »open, closed, A, B and C« positions

Once the sensors and magnet have been fitted on the gripper, the positions must be saved using either the buttons on the unit or input via the processor.

Saving positions

- 1 Press the »selection« button or activate the input signal »selection«, and the LEDS for the selected operating mode will flash for two seconds (see section 2). The output to be stored will flash.
- 2 Move the gripper fingers to the position required.
- 3 Using the »save« button or activating the input signal »save«, store the position required. Once this input has been saved, the next output is activated automatically.
- 4 To save all the positions, carry on with instruction 2 until all the positions have been stored. Once all the positions have been stored, no outputs will flash and the unit is ready for use.

If just one position's setting needs to be changed, press the »selection« button or activate the »selection« input signal until the output required starts to flash. Carry on with instruction 2 to store the information.

F *Instructions for use*

It is not recommended that the sensor be used close to a strong magnetic field or to allow large ferromagnetic materials to come close to or touch the sensor or magnet even for a short while. Gripping such materials does not present a problem as the distance between them and the sensor is sufficiently large ($> 10 - 20$ mm). It is also recommended that the sensors and magnet not be allowed to become contaminated with ferromagnetic particles and dust.

To achieve the accuracy specified in the catalogue, the sensors (workpiece positions) should be set when the system has reached its operating temperature.

The FPS – F5 is earthed at the bottom. You should earth the FPS at this point to eliminate small interfering signals on the mass cable. If the FPS – F5 is fixed to a painted metal surface, remove the paint where the earth connection is to be made in order to create a good connection. If there is a large amount of interference, find and remove the source.

G *Technical data*

Voltage : 10 – 30 VDC residual ripple $< 15\%$ polarity protected

Power consumption in unloaded position: type 10 mA (one LED on)

Outputs: 5 switching outputs user-programmable via 2 internal buttons or control cables for positions »open«, »closed«, 3 intermediate positions, max 200 mA switching current per output, short circuit protected, voltage drop max 1.5 V, PNP-switching

Connection: 12 pole circular connector (type Binder, series 723 watertight) suitable for connecting cables with a diameter of 6 to 8 mm, recommended cable section 0.14 mm² (max 0.25 mm²)

Display: 3 yellow LEDs for adjustable output signals (A, B, C), 2 green LEDs for output signals (open, closed)

Temperature range: -25°C to 70°C

Transducer: 12 bit dual slope with dynamic signal fade-out

Measuring range: 5 to 30 mm with Schunk magnet (NdFeB magnet dimensions 6 x 25 mm x L) with various lengths L depending on partial measuring range

Repetitive accuracy: approximately 0.5 per cent of overall gripper stroke, all data relating to Schunk components and specifications

Resolution: approximately 10 per cent of overall gripper stroke, all data relating to Schunk components and specifications The resolution is the value of the difference in stroke between signal 1 and signal 2. This means, for example, for a resolution of 10 per cent, using the example of a PGN 160 with 16 mm stroke, a difference of 1.6 mm.

The value is determined by all system factors (magnet lengths, sensors, distance between magnet and sensor and electronics). Depending on the system, this value can be lower than 1 per cent. Please ask, if necessary.

Protection class: as per DIN 40050: IP 65 with plug-in connectors and closed cover

Material: poly-A PA 6, cable PU, resistant against coolant and lubrication materials

Programmable inputs (select / save) : Input voltage 10 - 30 V DC.

Type 7 k_Ω input resistance

1 million program cycles

Application:

As with the existing FPS – A 5 system, further development has made it possible to query five different positions with just one sensor. The FPS system recognises the limit positions »open« and »closed« and three intermediate positions which can be user-defined.

Brief description:

When the select button is pressed, save mode is activated. For a visual check, the »open« position LED will flash. The select button can be pressed repeatedly to get from one output to the next. When the output required is reached (one of five positions) the »store« button is used to save the selected output. At the same time, the LED for the next output starts flashing to indicate that store mode is still active. When the last output has been stored, the electronic system automatically switches to operating mode. The LED lights up permanently.

Notes on resolution:

The resolution is the value of the difference in stroke between signal 1 and signal 2. This means, for example, for a resolution of 10 per cent, using the example of PGN 160 with 16 mm stroke, a difference of 1.6 mm.

The value is determined by all system factors (magnet lengths, sensors, distance between magnet and sensor and electronics).

Lower resolutions available on request.

Notes on use:

It is not recommended that the sensor be used close to a strong magnetic field. Do not allow large ferromagnetic materials to come close to or touch the sensor or magnet even for a short while. It is also recommended that the sensors and magnet not be allowed to become contaminated with ferromagnetic particles and dust. Gripping such materials does not present a problem as the distance between them and the sensor is sufficiently large (> 10 -20 mm). To achieve the accuracy specified in the catalogue, the sensors (workpiece positions) should be set when the system has reached its operating temperature.

Standard gripper version with FPS query

In principle, all grippers with a jaw stroke ≤ 30 mm can be retrofitted with a flexible position sensor.

The following grippers are available fitted with FPS:

PGN/PGN Plus series – stroke 1 (except PGN 300/1)

MPG series RH 918 Series PZN – stroke 1

PGN+PGH 30 series PGF series

PGH + PFH 30 KGG 80, 140

PZB 100 and 160 series PSH

PFH 30

For dimensions of gripper with sensor and order number, see "gripper systems, pneumatic" catalogue.

Example order:

The order numbers for specific components are needed to order a gripper with FPS. The order numbers for components and drawing together with interfering edge of fitted sensor can be seen on the page in the catalogue for a given gripper type,

eg KGG 80 fitted with FPS:

The following information is required when ordering:

Article number 340,310 gripper KGG 80, can be fitted with FPS

Article number 301,731 Mounting kit AS-KGG 80

Article number 301,705 Sensor, type FPS-S 13

Article number 301 800 Processor electronics, type FPS-A 5

Mounting options

FPS (start up) on a PC

The simplest option for starting up and checking FPS parameters on site, is to connect the device directly to your lap top.

To do this, use the adapter cable supplied: Open the FPS using a small screwdriver, insert the cable into the three plug points under the lid and close the lid to fix the cable in place. Now insert the adapter into your PC's interface.

Connect the FPS power supply.

Start Gateway.

Start the FPS controller.

Click on network and enter 127.0.0.1 for the IP address. Confirm the input with OK.

After a few seconds, the controller window should be displayed on screen with a status of on line.

FPS direct to control station via RS232

Connect the FPS to the power supply and to a serial interface on your control station or to a secondary control device using the plug supplied and a cable. The control device must have a Windows system installed. If required, we can support a Linux system for an additional charge.

Install the API supplied on your system.

Link the required commands into YOUR software as per the examples described in the documentation.

FPS to modem and remote PC to modem

Connect the FPS power supply.

Initialise the modem to factory set up at &f -->Enter

Use the following five commands to initialise :

atx0 --> Enter

at&d0 --> Enter

ats0=1 --> Enter

ats23=27 Enter (Baudrate = 9600 bps)

at &w --> Enter (Save)

your modem should reply OK to all commands.

These commands are suitable for most modem types. Please see your modem manual if there are any problems to see what commands you should be entering.

Now plug the modem into the telephone socket and the adapter cable into your modem. Some modems require a 9 pole to 25 pole adapter. Alternatively, you can create your own cable in accordance with the plan in the section on hardware.)

At this point, your partner on the PC should also connect the modem to the telephone point and PC, launch the Gateway program and then the FPS controller.

In the log in screen, click on "modem" and then enter the telephone number of the FPS modem in the appropriate field. (If you need an exchange line, first enter "0" and then the telephone number.)

The IP-address must be 127.0.0.1

You should see the on line symbol on your PC after a few seconds.

FPS to PC via internet and remote maintenance PC via internet

Connect the FPS to a serial port on a PC, start up Gateway and go on line. Open the DOS window and enter "IPCONFIG", ore "route print" then press enter to confirm and see your IP address.

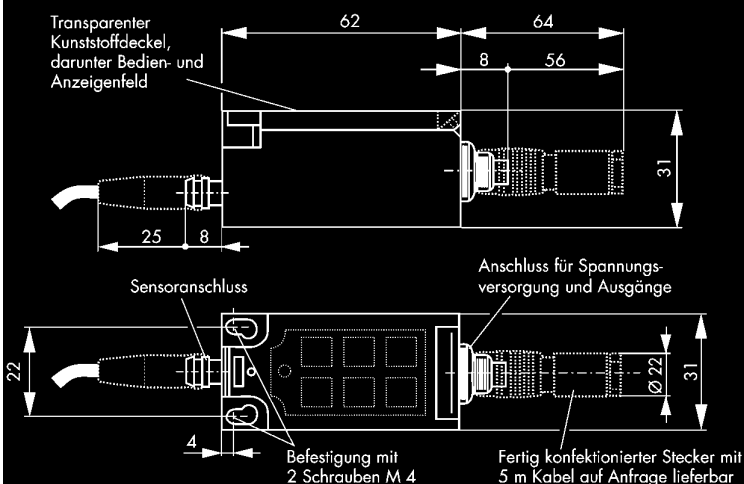
Write the IP- Adress 0.0.0.0 in the TCPIP_RS232_gw.INI -File

Go on line with the other PC and start up the FPS controller. Enter the IP address and password, if required.
Click on OK to confirm.
The controller and on line signal will be displayed after a little while.
If using an intranet, ensure that the firewall does not prohibit contact. If this happens, the administrator must give access to port 5000 – 5002. This can be the case for some company networks.

Hardware and cable plans



Maße für FPS-F 5 (Auswerteelektronik)

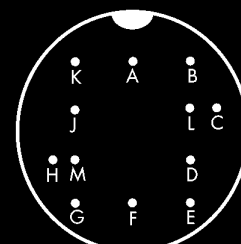


Steckerbelegung FPS-F 5

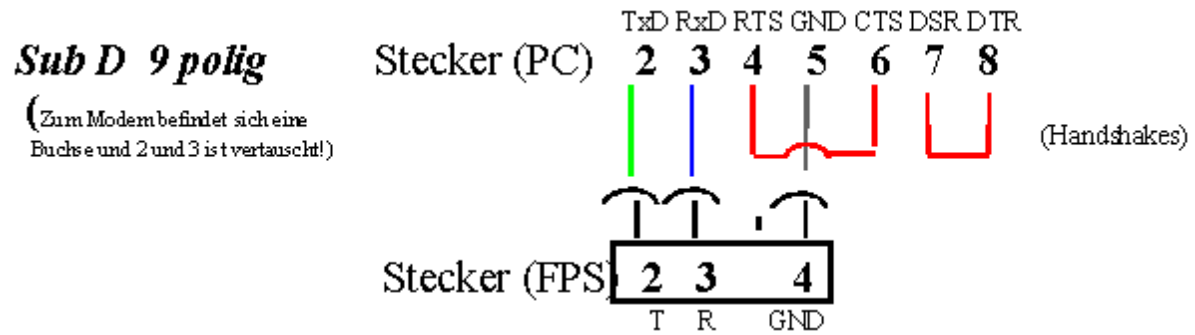
(Ansicht Kontaktseite Buchse/Lötseite Stecker 12-polig)

A	plus	E	»E«	J	minus
B	Tx	F	»A«	K	n. c.
C	»offen«	G	»Zu«	L	»select«
D	»C«	H	Rx	M	»store«

n. c. $\triangleq$ nicht belegt



Cable plan for the adapter to the RS232 interface underneath the lid :



(There is a socket to the modem, rather than a plug, and pins 2 and 3 are the other way around!)

