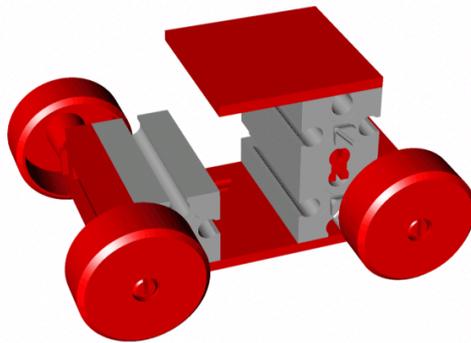


# **fischertechnik-designer**



**User's Manual**

**fischertechnik-designer**

User's Manual

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# 1.0 Software Installation

Prerequisites for the installation of the **fischertechnik-designer**:

- an IBM-compatible PC with Pentium processor with a clock frequency of at least 600 MHz, 128 MB RAM and approximately 50 MB available hard drive space
- a monitor and a video card with a resolution of at least 1024 x 768. For CRT (cathode ray tube) monitors, the refresh rate should be set at a minimum of 85 Hertz to ensure a flicker-free image. TFT flat screen monitors provide a flicker-free image at any refresh rate; therefore, setting the refresh rate is not necessary when using a TFT monitor
- Microsoft Windows, Version 2000 or XP

---

Insert the installation CD into the CD-ROM drive. Usually, the installation program on the CD will start automatically. If not, please open *My Computer* and select the CD-ROM drive. In the root directory, you will find a file named *Setup.exe*. Simply double-click on the file to start the installation.

- In the first **Welcome** window, click on *Continue*.
- Read the license agreement and agree by clicking on *Yes*.
- Now you can select the destination folder in which to install the **fischertechnik-designer**. The default is *c:\Programs\Fischertechnik Designer*. Clicking on *Browse* allows you to select a different destination. Once finished, click on *Continue*.
- The *Type of Setup* allows you to select the components to be installed. It is recommended to use the *Standard* option. Only use *Custom*, for example, if you are familiar with the software and do not wish to install all components. Confirm your selection by clicking on *Continue*.
- The program will now be installed on your computer.
- The last window will inform you that the installation is finished. Click on *Finish* to confirm.

You can now start the **fischertechnik-designer** by selecting **Start -> Programs -> fischertechnik-designer**.

## 2. Introduction

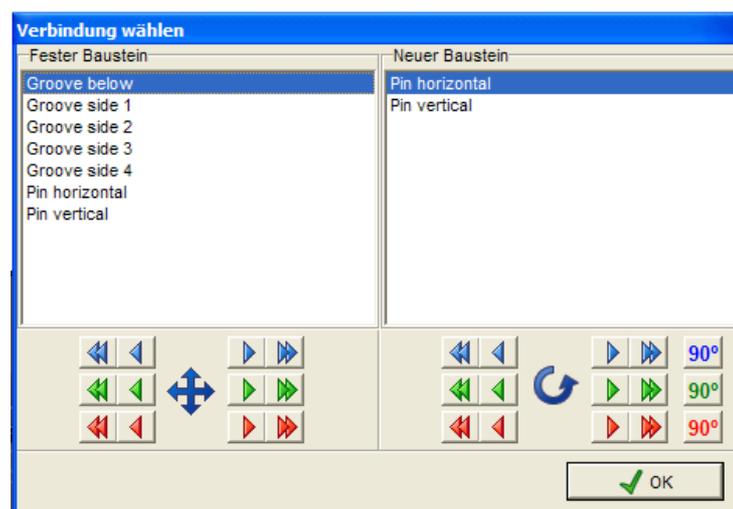
### 2.1 The Construction of fischertechnik Models

The construction of *fischertechnik* models using the *fischertechnik-designer* is child's play. This is achieved by not only providing the 3D models of the parts, but mainly by defining each part in detail. For each part, there is a complete list of all possible links (e.g., tenons, mortises, etc.). Thus, during construction, you just need to choose the two links to be used with the parts. Once you have selected the links, the parts are usually already in the correct position. Minor adjustments or movements can still be carried out afterwards without a problem.

#### General Construction Procedures:

After starting the *fischertechnik-designer*, you will first see a supporting grid in the 3D window. This grid virtually represents the tabletop on which you want to build your model. Theoretically, you can also construct your model sideways in the 3D window; however, the construction on the grid ensures an ideal camera work around the model later on.

First of all, you select the first part to be used in your model. You can look at all the parts in the parts library, sorted by category. Once you have found the part you were looking for, you can simply move it into the 3D window using the **drag&drop** function. Once "dropped" into the 3D window, you can immediately see the part there. You should now select the part and move it into the correct position using the **Coordinate Manager** (to ensure the part is in the right position towards the tabletop). You have just used the first part of your model. The next part can now be linked directly to the first part. To do so, you select the second part from the library and move it per **drag&drop** onto the first part in the 3D window. Before "dropping" a new part, the parts that are located directly under the cursor are always highlighted in purple. This allows you to control exactly which part will be linked to the new part. If there is no part under the cursor, the new part will be dropped in the center of the 3D space, just like the very first part. In this case, no link to an existing part will be established. If there is a part under the cursor and you "drop" the new part, a dialogue box will open listing all available links



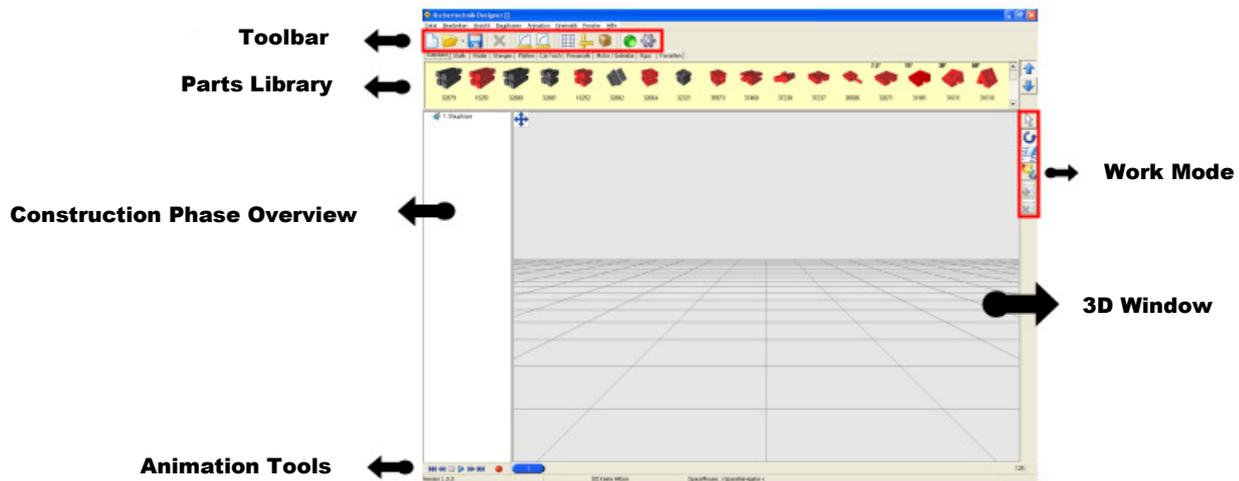
In the upper section, the dialogue box shows the links of both parts. On the left side, you will see the links of the part that is already a component of the model (fixed part). On the right side, you will see the links of the new part. You can now select links from both sides by which the parts are to be connected later on. The position of the new part can

be controlled directly in the 3D window. Thus, you can simply try out all links until you have set the correct position. In the lower section of the dialogue box, you will find buttons which allow you to further move or rotate the part. If you, for example, attach a wheel to an axis, you can, at the same time, change its position on the axis. The colours of the coordinate system will help you in doing so, as they correspond to the colours of the buttons. You can, however, still shift or rotate the parts later on using the **Coordinate Manager**.

Once you have selected all your settings in the dialogue box, click on *OK*. Both parts are now connected and you can continue with the following parts in the same way until your model is finished.

## 2.2 The Main Window

After starting the *fischertechnik-designer*, the main window appears. It is divided into several sections:



**Toolbar:** Here the most important menu items are displayed as separate buttons.

**Parts Library:** In the library, all available parts are listed, separated by category.

**Construction Phase Overview:** This is virtually the piece list of the parts used in the model. The piece list is divided up into various construction phases.

**Work Mode:** These buttons allow you to set the mode to be used while working within the 3D window (e.g., select parts, colour parts, delete parts, etc.)

**3D Window:** The 3D window is that section of the main window in which the *fischertechnik* model is displayed.

**Animation Tools:** Using the buttons of the animation tools, you can animate the model in the simplest way.

The individual components of the main window are described in more detail in the following chapters.

## 2.3 The Toolbar

In the toolbar, the most important menu items are displayed as individual buttons. Moreover, there are additional buttons representing functions that are not listed in the menu.



### **New**

This function completely removes the current model. For security reasons, you will be required to confirm whether you really want to exercise this function.



### **Load Model**

Using this function, you can upload an existing model from a data carrier. To the right of this button, you will find a second button – with a black arrow pointing down. When you click on this button, a menu will open displaying the files that were opened last (a maximum of 8 files). Through this menu, you can directly open one of the models that were used last.



### **Save Model**

This function saves the current model to a data carrier. If a file name has not yet been assigned, a dialogue box will open first allowing you to do so.



### **Remove Part**

This function is only available after a part has been selected. Clicking on this button removes the selected part.



### **Image Quality**

These two buttons form a so-called "button pair", i.e., when you click on either one of the buttons, the other one will automatically be deactivated. In addition, the buttons remain pressed after you click on them. These two buttons allow you to set the image quality for the 3D window. Normally, you will always work with the high quality. For very large models or lower 3D performance capabilities of the PC, changing to the lower quality level may be worthwhile. In the lower quality mode, round parts look significantly more angular.



### **Grid On/Off**

Using this function, the grid in the 3D window can be turned on or off. The grid virtually represents the "tabletop" on which you build your model.



### **Coordinate System On/Off**

This function gives you the option to display a 3D coordinate system in colour.



### **Only Draw Rectangles when Moving the Camera**

When you activate this function, the 3D window no longer displays the *fischertechnik* parts when you move the camera, but only coloured rectangles. This enables you to draw those rectangles very quickly. Especially with large models, camera moves can be very time-consuming.



### **Show/Hide Collision Balls**

If you use collision balls in your model, be aware that these are not “real” *fischertechnik* parts. As you may find them optically disturbing, it is possible to hide the collision balls using this function.



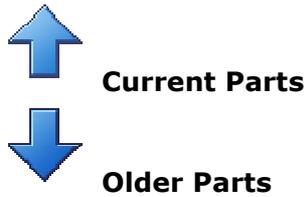
### **Start/End Kinematics Mode**

Using this button, you can both start and end the Kinematics Mode.

## 2.4 The Parts Library

The Parts Library displays all available *fischertechnik* parts, dividing them into different categories for easier retrieval. The library shows both the image and the serial number of each part. When you select a part with the left mouse button and then do not move the mouse for a short period of time, the part's description is displayed.

The complete library is not only divided into categories, but also into current parts and older parts:

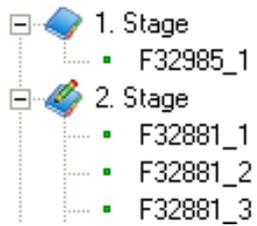


In order to use a part, it must be moved into the 3D window using the **drag&drop** function. The first part of a model is simply "dropped" into the 3D window. Additional parts can be attached to already existing parts by "dropping" the new part onto the existing one.

---

## 2.5 The Construction Phase Overview

The Construction Phase Overview lists all parts that are used in the model, sorted by construction phases:



Within the overview, you can highlight individual parts using the left mouse button. In addition, you can move parts from one phase to another by **drag&drop**. The current construction phase is marked by a book symbol with a pen.

## 2.6 The Work Mode

Within the Work Mode section, you will find several buttons to set the current work mode.



### Select Part

This work mode allows you to select individual parts in the 3D window. To do so, you must click the left mouse button directly on the part to be selected. If you want to select several parts, you must, in addition, press the **Shift** key and hold it while selecting the parts. In the 3D window, selected parts are always displayed in purple.



### Rotate/Zoom Scene

In this work mode you can use the mouse to rotate the camera around the model. In addition, you can zoom the camera or shift it parallel to the viewing window. The regular rotation around the model is achieved by holding the left mouse button. Moving the mouse horizontally results in a horizontal rotation around the model. A vertical movement of the mouse results in a vertical rotation around the model. When you click the right mouse button while moving the mouse vertically, you can set the camera zoom. Furthermore, holding the left mouse button and moving the mouse while keeping the **ALT** key pressed, you can shift the camera parallel to the viewing window. In addition to changing the camera, this work mode also allows you to select parts. To do so, you must press the **CTRL** key. Now you can select individual parts using the mouse as usual. If you want to select several parts, you must also hold the **SHIFT** key in addition to the **CTRL** key.



### Hide Part

This work mode allows you to hide individual parts. The parts will not be deleted, but only made invisible. When you apply the function **View**  **Refresh**, the parts will be visible again. Hiding parts becomes mainly important if you want to add parts to a model later on. There are sometimes too many parts in the way preventing you from positioning the new part correctly.



### Colour Parts

This work mode allows you to assign different colours to individual parts. You first need to select the colour to be used. To do so, you must press this button for some time. A menu will finally open providing you a range of colours to choose from. The metal colour is only important when exporting to the POV-Ray format. Clicking on the question mark, a dialogue box will open where you can select any colour you want. Once you have selected a colour, you can assign that colour to any part in the 3D window using the left mouse button.

In addition to the selection options of the work mode, there are another two buttons available for grouping parts. These two buttons have no influence on the work mode:



### **Group Parts**

This function is not available unless at least two parts have been selected. Using this function, all parts selected are being grouped. The advantage of this function is that, when selecting one part of the group, all the other parts of this group are automatically selected as well.

Note: Groups will not be saved when saving your model !



### **Ungroup Parts**

This function is not available unless all parts of a group have been selected. Using this function, the group is being removed.

## 2.7 The 3D Window

The 3D window is the central area of the *fischertechnik-designer*, presenting the *fischertechnik* model in a 3D environment. A flexible camera ensures that you can view the model from any side. You can change the background colour of the 3D window in the systems settings. A grid, which you can hide, helps you relate to a real tabletop. You should, therefore, construct the model in a way that it virtually stands on the grid. The size of the 3D window is first set to fill the screen to its maximum. In some cases it may be necessary to change the size of the 3D window (see **Menu -> View -> Set Image Size**).

---

## 2.8 The Animation Tools

The *fischertechnik-designer* enables you to move (animate) individual parts for a certain time. This principle of animation is called "Keyframe-Animation". In detail, this means that the positions of individual parts at certain times are being "recorded". The programme calculates all intermediate steps automatically. The most important tool in doing so is the time bar which can be moved horizontally. When the animation is run, the time bar moves automatically. The time bar displays the entire duration of the animation or, respectively, the movie. However, it does not operate in units of time (seconds, minutes), but in images. An animation will always run with 25 images per second. That is, if you want to record a 1-minute movie, the time bar will be set to  $60 \times 25 = 1500$  images.

### Animation Procedures:

First, you need to select one part. The selection of several parts at a time will be ignored. Now you need to set the time bar to where you want to place a key (e.g., the beginning of the movie, i.e., 1). Using the Coordinate Manager, you must move the part to its correct position. Once done, you can press the red *Record* button. Now the program knows the position of the selected part at the time desired. You can now move the time bar to a later time (e.g., 50 = 2 seconds later). Again, you will need to set the position using the Coordinate Manager and press the *Record* button afterwards. If you manually move the time bar now, you will already see the result of the animation. Clicking on *Run*, you can view the entire animation.



#### Go to Start

Clicking on this button, the time bar is set to the start (Time = 1).



#### Back

Clicking on this button sets the time bar back by exactly one image.



#### Stop Animation

This button is only active after an animation was started. Clicking on this button stops the animation.



#### Stop Animation

This button is only active after an animation was started. Clicking on this button stops the animation.

**Next**

This button advances the animation by exactly one image.

**Go to End**

This button moves the time bar to the end. The duration of the animation is set via **Animation -> Options**.

**Set Key**

Clicking on this button inserts a key for the selected part at the current time.

## 3. Menu

### 3.1 File

#### 3.1.1 New



This function deletes the current model as well as all settings pertaining to it. In addition, the camera will be returned to its original position and the grid will be turned on.

#### 3.1.2 Load Model



This function loads a new model from a data carrier. The current model and all settings will be overwritten.

#### 3.1.3 Load Additional Model



This function loads an additional model to the already existing one from a data carrier. The current model and all settings remain. All parts that are additionally loaded will be automatically selected.

#### 3.1.4 Save Model



This function saves the model with all pertinent settings to a data carrier. If you have not yet assigned a file name, a dialogue box will open first asking you to do so. Otherwise, the model will be saved automatically under the file name that is already in place.

#### 3.1.5 Save Model As ...

This function saves the model with all pertinent settings to a data carrier. A dialogue box asking you to assign a file name will open in any case – even if a file name was specified before

#### 3.1.6 Save Image As ...



This function saves the contents of the 3D window as a bitmap (.bmp) to a data carrier. The size of the image will be determined by the size of the 3D window. If you desire a different image size, you must set the size of the 3D window before saving the image (Menu: **View -> Set Image Size**).

#### 3.1.7 Export RAW File Format (\*.raw)



This function exports the 3D model displayed in the 3D window in the RAW format. However, only the parts that are visible at that time will be exported!

The file format reads as follows:

[NAME]

[X1 Y1 Z1] [X2 Y2 Z2] [X3 Y3 Z3]

...

[NAME]

[X1 Y1 Z1] [X2 Y2 Z2] [X3 Y3 Z3]

...

Note: The brackets will not be exported; instead, the individual values will be separated only by a space. One line describes all coordinates of a polygon (triangle). Colours and normal vectors will not be exported.

### 3.1.8 Export VRML File Format (\*.wrl)

This function exports the 3D model displayed in the 3D window in the VRML format (version 1.0). However, only the parts that are visible at that time will be exported! In addition, all hoses and materials will be incorporated.

### 3.1.9 Export POV-Ray Format (\*.pov)

This function exports the 3D model displayed in the 3D window in the POV-Ray format. However, only the parts that are visible at that time will be exported! In addition, all materials, lights and the position of the camera will be included. Furthermore, metal parts will be given a reflecting surface. POV-Ray is a powerful "raytracer" that can be downloaded from the Internet at no cost.

### 3.1.10 Print Parts Overview



This function allows you to print out an overview of the individual parts used in the current model. After selecting this function, a print preview screen appears first where you can set the print parameters and start the print job. The name of the model will be printed in the header. The name must be entered in the model information window before you start the print job (Menu: **View**  **Model Information**).

### 3.1.11 Print Price Calculation



This function allows you to print a price calculation for the current model. After selecting this function, a print preview screen appears first where you can set the print parameters and start the print job. The prices are always based on the current prices charged for the individual parts by "LPE Technische Medien GmbH". No price will be printed for parts that can no longer be supplied.

### 3.1.12 Systems Settings



Here you will find all those program options that can be changed by the user.

## **3D Window**

### **Background Colour**

This option allows you to change the background colour of the 3D window. In order to select the colour, you need to click on "...".

### **Smoothing the Edges**

Smoothing the edges (also called "AntiAliasing") results in a significant quality increase of the image displayed in the 3D window. Not all video cards are able to support the smoothing of edges; therefore, this function is turned off by default.

### **Display Parts from preceding Construction Phases in White Colour**

When this function is activated, all parts of preceding construction phases will be displayed in white colour as soon as you move to a higher phase. This corresponds to the users' manuals of the ***fischertechnik*** construction kits.

### **Display Parts up to the Current Construction Phase only**

When this function is activated, all parts of higher construction phases will be hidden.

### **Language**

This function allows you to set the language for all text used in the ***fischertechnik-designer***.

## 3.2 Edit

### 3.2.1 Delete



This function deletes the currently selected part from the model. Other selected parts will not be affected. Once deleted, a part cannot be undeleted.

### 3.2.2. Select All



This function selects all parts displayed in the 3D window..

### 3.2.3 Deselect All



This function cancels all selections made within the 3D window.

### 3.2.4 Part as Camera Focus



This function allows you to define the part currently selected as the focus of the camera. The camera focus is exactly that spot within the model at which the camera is pointing and around which it rotates. After the program is started, this spot is located exactly at the point of origin. This function is useful when, during construction, you concentrate on a spot within the model that is far from the origin. In this case, simply select a part near the section you want to work on and then activate this function.

*Background Information:*

*The camera in the 3D window has several features, one of them being the position (x, y, z) that describes the spot within the 3D area at which the camera is located. Furthermore, each camera has a focal length and 2 vectors describing the direction in which the camera is pointing. It is exactly these 2 vectors that are determined and set by the function described above.*

### 3.2.5 Rotate Camera by 180 Degrees



This function rotates the camera by 180 degrees, i.e., it turns the entire model upside down. This is often necessary to reveal areas located under the model in construction manuals. This function is frequently exercised when dealing with models of automobiles. When you run this function for a second time, the camera will return to its original position.

### 3.2.6 Aligning Part(s)



Using this function allows you to align 2 or more parts to each other. In this case, the position and direction of the part first selected are copied to all other selected parts. Afterwards, all selected parts are virtually sitting on top of each other. This function may, for example, be helpful when working with animations.

### 3.2.7 Create Cable



This function allows you to connect two pins (see image below) by a coloured cable. A cable is being created by means of a hose. Later on, you can further process the cable using the Hose Manager. In order to be able to run this function, you must first select two pins. The colour of the pins does not matter. After activating this function, a window will open in which you can specify various parameters for the cable. You can, for example, set the cable colour (red or green) and the distance to the pin. It would be best to try out the distance controller. At the same time, you will see in the 3D window how the cable will look later on.



Pins 31336 and 31337

## 3.3 View

### 3.3.1 Refresh

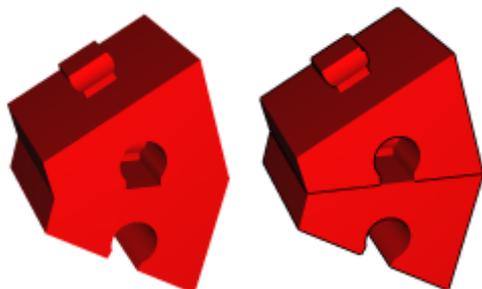


This function redraws all parts displayed in the 3D window. It is important to run this function after you have temporarily hidden individual parts. Those parts will then become visible again.

### 3.3.2 Drawing Part Edges



This function allows you to turn on or off the drawing of part edges. Drawing those edges is useful as you can better distinguish the parts from each other:



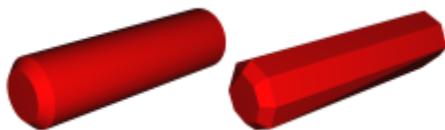
*Parts without and with edges drawn*

Note: Edges are drawn with the help of a so-called "shader". Not all video cards are able to process those "shaders". In those cases, you must always work without drawing edges.

### 3.3.3 High or Low Quality



The parts of the *fischertechnik-designer* are available in 2 different resolutions. The high quality offers the best depiction of the parts whereas the low quality is suited for computers with a rather slow video performance..



*Comparison between high and low quality*

### 3.3.4 Model-Information



This function allows you to store basic information about the current model, such as the name of the model, the name of the person who created the original model (e.g. *fischertechnik*) and the name of the author who designed the model using the *fischertechnik-designer*. All this information will be written to the file at the time the model is saved. Additionally, the name of the model will be reflected in the header of printed material (parts overview and price calculation).

### 3.3.5 Set Image Size



This function allows you to set the size of the 3D window. You can either choose from several predefined settings or manually enter your own dimensions. If you choose the latter, the fields for manual entry will display the optimal dimensions, i.e., if you previously selected, for example, a smaller section of the image, the predefined manual setting allows you to restore the original state.

The image size is used in the function **Save Image As...** as well as in the creation of an animation file..

## 3.4 Construction Phases

### 3.4.1 New Construction Phase



This function allows you to start a new construction phase within the current model. The number of the new phase will automatically be assigned. The new construction phase becomes the current phase, i.e., from that point on, all new parts will be added to this phase.

### 3.4.2 Change Construction Phase

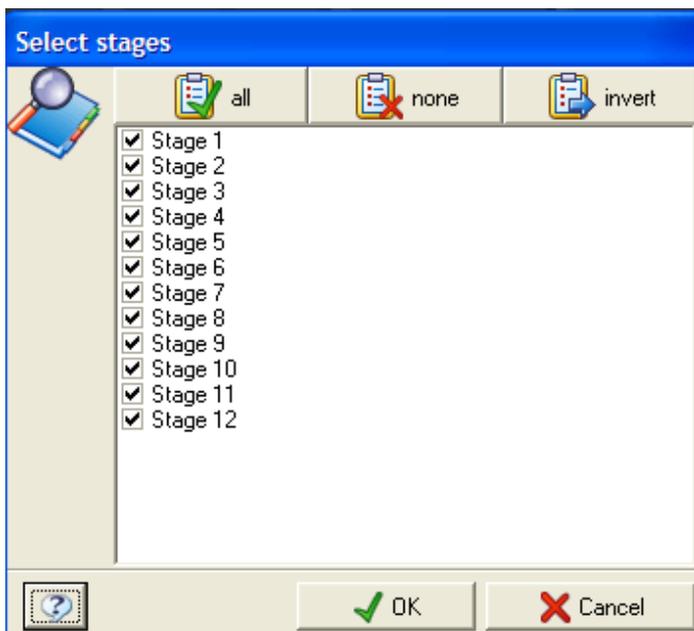


This function allows you to designate a construction phase as the current phase. You first need to select a phase in the construction phase window. Once you activate this function, the selected phase becomes the current construction phase, i.e., all new parts will then be added to this new phase.

### 3.4.3 Show/Hide Construction Phases



This function allows you to show or hide individual construction phases. First, a window will open displaying all construction phases that already contain parts:



When you leave the window clicking on *OK*, all construction phases that received a checkmark become visible.



#### All

Clicking on this button marks all construction phases displayed in the window.



### None

Clicking on this button removes all checkmarks from the construction phases displayed in the window.



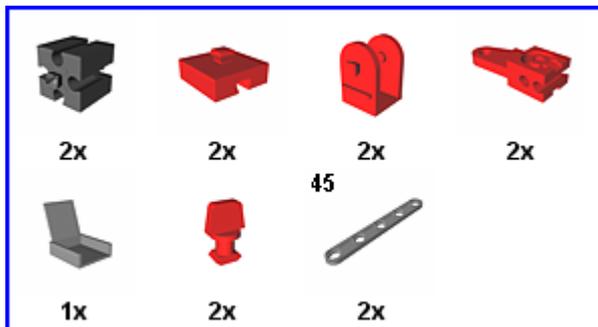
### Reverse

Clicking on this button removes all checkmarks from phases that were previously checked and, in turn, marks all phases that were not previously selected..

### 3.4.4 Display Parts of a Construction Phase



This function allows you to display all parts used in the current construction phase. It produces an image similar to those that you find in the **fischertechnik** construction manuals:



*Sample view of parts used in a construction phase*

You will see an image of each part with the number of parts used below. Once this image has been produced, it can be saved as a bitmap (\*.bmp) on a data carrier.

### Parts per Line

This parameter determines how many parts can be displayed in one line. In the example above, 4 parts are displayed per line. The image height is automatically calculated.

### Draw Frame

When you select this parameter, a blue rectangle is drawn around the image (see above).

## 3.5 Animation

### 3.5.1 Create Animation (\*.avi)



This function allows you to create a movie file in the AVI format from the animation data of the current model. You can freely select the Codec needed in the AVI file. As soon as you click on *OK*, a Windows systems window opens displaying the settings of all Codecs registered with the operating system. The image width and height depend on the settings of the image dimensions of the 3D window. If you prefer a different image size, you must set it before under **View -> Set Image Size**.

The calculation of the AVI file may take some time. You will, therefore, see a progress bar while the creation is ongoing.

#### File Name

The file name determines the name of the AVI file. If you wish, you can click on the (...) button next to it to start a file selection dialogue.

#### Start Media Player upon Completion

If you place a checkmark here, the AVI file will be opened in the Windows Media Player upon completion.

### 3.5.2 Options



In this dialogue, you will set the parameters for the current animation.

#### Duration

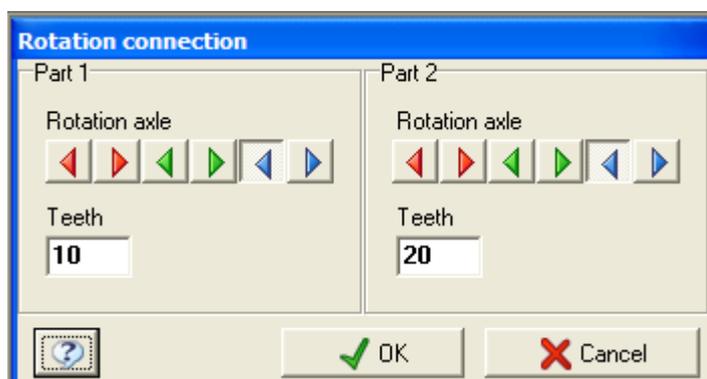
This function allows you to set the duration of the animation in terms of images. An animation is usually created with 25 images per second, i.e., a setting of 125 images corresponds to a movie duration of 5 seconds.

## 3.6 Kinematics

### 3.6.1 Rotation-Binding



A rotation binding links two parts in such a way that the rotation of one part results in the rotation of the other part. Gear wheels are a typical example of such a binding (see image below). In order to create a rotation binding, you first need to select two parts. Make sure you select the driving gear wheel first. Once you activate this function, the 3D window temporarily displays only the two parts selected, already rotating around an axis. This pre-setting is embedded in the parts and should generally fit. In addition, the number of teeth and, therefore, the transmission ratio are already set.



*Function Settings*



*Example of a rotation binding*

#### Rotation Axis

For each part, 6 buttons are available to set the rotation axis. Those buttons are marked in colour and correspond to the colours of the coordinate axes. As the rotation axis is, in general, correctly preset, you just need to specify the counter-clockwise or the clockwise rotation.

In the example above, the small gear wheel turns right resulting in the big wheel turning left. You can experiment with the buttons without a problem until you achieve the result desired.

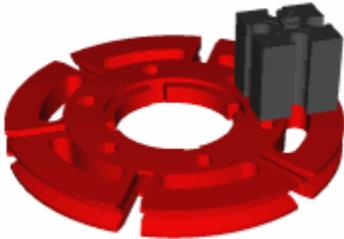
#### Transmission (Teeth)

In this field you can specify the number of teeth. This setting, too, is already gathered from the parts and does not need to be changed.



### 3.6.2 Firm Binding

The firm binding links two parts in such a way that a movement of one part causes the same movement on the other part. This type of binding is used very frequently. You can firmly link not only 2 parts, but as many as you like. To do so, you must first select the driving (rotating) part. All other parts are selected thereafter. After activating this function, the display shows you how many bindings were created.



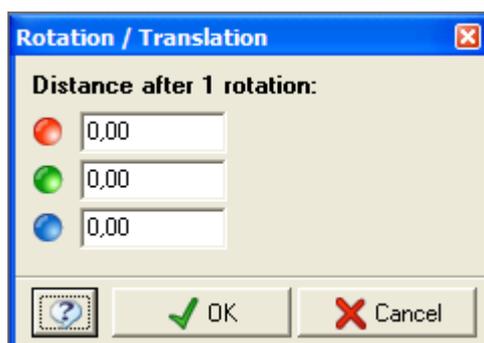
*Example of a firm binding:*

*When the red part rotates, the black part rotates along with it. It will never leave its own position on the red part.*

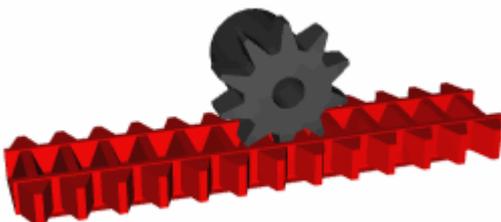
### 3.6.3 Rotation/Translation Binding

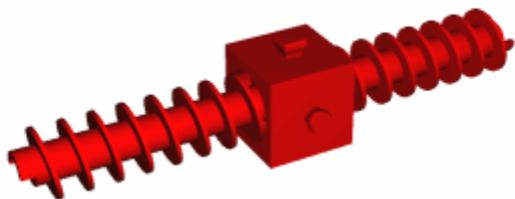


A rotation/translation binding links two parts in such a way that the rotation of one part results in a translation of the other part (see example below). You must first select the driving (rotating) part, then the part that is being driven. After activating this function, you need to set the advance of the part driven. Before you do so, you need to have a look at the axis on which the translation takes place. In the example with the worm gear below, the advance on the green axis is by 9 mm.



*Function Settings*



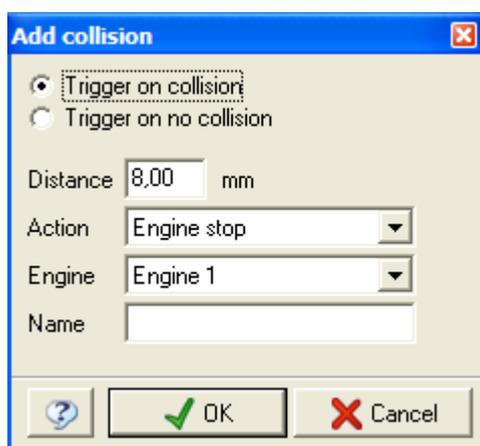


Examples of a rotation/translation binding

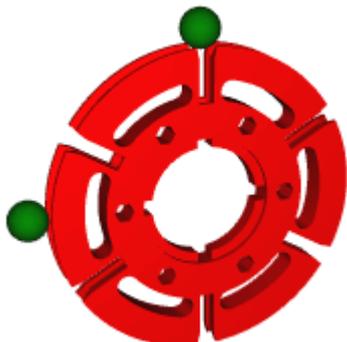


### 3.6.4 Add Collision

Collisions can release various actions. A collision is usually created by using special collision balls in a model (see example below) which you can hide later. Collision balls are just regular construction parts that can be used anywhere. If those collision balls come into contact with each other later on, special actions can be carried out.



Function Settings



Example of a collision:

*First, a firm binding is created between the red wheel and the collision ball on top. When the red wheel turns, this collision ball turns as well. After a three-quarter clockwise rotation, the two collision balls cause a collision as they touch each other.*

#### Release

Using the two radio buttons displayed in the top of the dialogue box above, you can choose whether an action is to be released each time the two collision balls come into contact with each other or each time they do not touch anymore.

#### Distance

The distance describes exactly when a collision is supposed to be carried out. If you use the collision balls, this distance is always 8 mm since the balls have a radius of 4 mm. When you place two balls directly next to each other, you will get a distance of 8

mm. An action is released each time the distance is shorter than 8 mm. In that case, the two balls collide.

### Action

In this field you select what action is to take place:

- *Motor Stop*: This will stop the selected motor
- *Motor Rotation Counter-Clockwise*: The selected motor is set to rotate counter-clockwise
- *Motor Rotation Clockwise*: The selected motor is set to rotate clockwise
- *Reverse Motor*: The selected motor is changed from counter-clockwise to clockwise rotation (or vice versa)
- *Logic Manager*: Selecting this option, the action is handed over to the Logic Manager. In a branch element within the Logic Manager, the state of the collision can be queried.

### Motor

In this field you can select the motor which is to be affected by the action. This option is not available when you select the "Logic Manager" in the "Action" field.

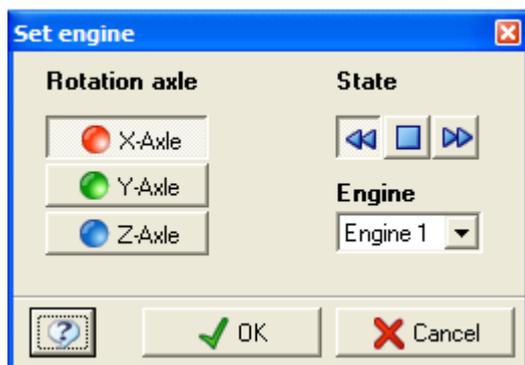
### Name

This entry option is only available if you select "Logic Manager" in the "Action" field. In order for a branch element to be able to query a collision, the collision must be assigned a unique name. You can specify any name for the collision in this field.

### 3.6.5 Set Motor



Using this function, you can define the motors. Any part used in the model can function as a motor. Ideal parts would be axes, manual cranks or gear wheels. First, you need to select the part that is to act as a motor. After activating this function, a window will open with the parameters to be set. In the background of the 3D window, only the selected part is displayed which already carries out the movement corresponding to the settings in the window.



*Function Settings*

### Rotation Axis

Using these three buttons, you can determine the axis around which the motor is to rotate. That axis is already embedded in the part and will, therefore, be correctly displayed.

### Status

The status determines the condition of the motor directly after the start of the kinematics mode. The arrow pointing to the right causes the motor to carry out the clockwise rotation. The arrow pointing to the left starts the counter-clockwise rotation. The button in between stops the motor from running for the moment. This is

usually advantageous when working with the Logic Manager because the rotation of the motor is controlled in that mode.

**Motor**

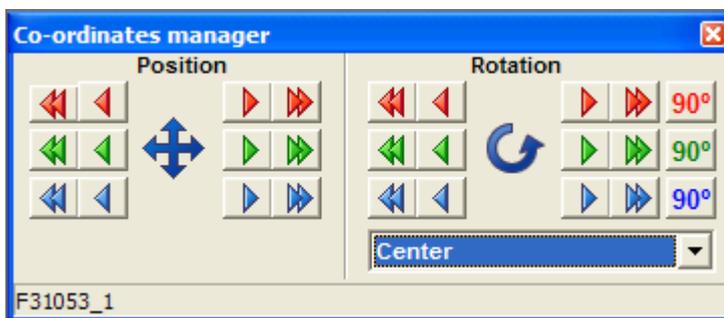
In this field you will select the number of the motor. There is currently a maximum of 8 motors available.

## 3.7 Windows

### 3.7.1 Coordinate Manager



The Coordinate Manager is certainly the most important manager of the *fischertechnik-designer*. It allows you to rotate and move both individual parts and entire groups of parts. First, you select a part and then open the Coordinate Manager. The status bar will always reflect the name of the selected part. With the help of the individual buttons, you can now move the part along its coloured axes or have it rotate around those. In addition, you can also choose the pivot point to control your rotation. Normally, the rotation always takes place around the centre of the part. If you wish to rotate around a different spot, you can use any of the connection points of the part selected.



#### Position

- Moves the part along its red axis by 0,5 mm
- Moves the part along its red axis by 5,0 mm
- Moves the part along its green axis by 0,5 mm
- Moves the part along its green axis by 5,0 mm
- Moves the part along its blue axis by 0,5 mm
- Moves the part along its blue axis by 5,0 mm

#### Rotation

- Rotates the part around its red axis by 1 degree
- Rotates the part around its red axis by 10 degrees
- Rotates the part around its green axis by 1 degree
- Rotates the part around its green axis by 10 degrees
- Rotates the part around its blue axis by 1 degree
- Rotates the part around its blue axis by 10 degrees

In addition, clicking on the 90° button allows you to rotate parts by 90 degrees.

### 3.7.2 Hose Manager



The hose manager enables you to comfortably arrange pneumatic hoses, tackles and cables. A hose consists of a multitude of supporting points connected through a Bezier algorithm so that the hose does not appear angular. Since placing the supporting points within a single 3D window is too difficult, you will, for the first time,

get a four-sided view. This means you will view the model from 3 different perspectives (side view, front view, top view) as well as in the regular 3D window.

Procedure:

First, you will need to create a new hose by clicking on the button with the green "plus" sign. A menu will open listing the various types of hoses. After a hose (e.g., pneumatic hose) has been selected, the hose manager will automatically switch to the mode that allows you to add supporting points. You will now select a type of view and, clicking the left mouse button, insert new supporting points. Once you insert the second point, the hose already becomes visible.



### Help

Activates the help function for the item selected.



### Back

Terminates the Hose Manager.



Using these 5 buttons, you can switch between the individual views:

1. 4-sided view
2. 3D window
3. Side view
4. Top view
5. Front view

*Note: You can easily switch between the individual views using keys 1...5 on your keyboard.*



### Switch Front-Rear

Clicking on this button allows you to switch the camera from front view to rear view (and vice versa) within the 3 viewing options. This way, you can view the model both from the front and the rear.



### Rotate/Zoom Scene

Clicking on this button activates the rotation mode which allows you to change the individual cameras of the various views. Within the 3D window, the rotation mode is permanently active. Here, keeping the left mouse button pressed, you can rotate the camera around the model. Keeping the right mouse button pressed and moving up or down will zoom the camera. This works similar in the 3 other viewing options except that the model is not rotated but the section is shifted.



### Move Supporting Points

In this mode, you can individually move the supporting points of a hose within the viewing window. In doing so, the individual supporting points are represented by

white balls. After you have selected a ball using the left mouse button, you can move that supporting point. During the movement, the selected supporting point is displayed in black.



### **Insert Supporting Points**

Using this mode, you can insert additional supporting points into the hose. First, you need to select a hose. Then you can insert a new supporting point within a viewing window using the left mouse button. To create a visible hose, you must insert at least 2 supporting points.



### **Grid On/Off**

This function allows you to turn an initially invisible grid on or again off. When it is turned on, the supporting points can no longer be placed randomly, but they are bound to a predefined grid. If you press this button a little longer, a menu will open from which you can select the graduation. The values that are available range from 0,25 to 10 mm.



### **Insert New Hose**

This function allows you to create a new hose. After you have selected this function, a menu will open displaying the various types of hoses. You can choose from pneumatic hoses (blue), tackles (white), and red or green cables.



### **Delete Hose/Supporting Point**

This function allows you to delete hoses as well as individual supporting points. To do so, you first need to highlight either a hose or a supporting point.



### **Move Supporting Point Up**

A hose always consists of a series of sequentially numbered supporting points. This function allows you to move a highlighted supporting point further towards the beginning of the chain (respectively, further up). You will need to apply this function to insert an additional supporting point within the chain.



### **Move Supporting Point Down**

This function allows you to move a supporting point further towards the end of the chain (respectively, further down).

## **3.7.3 Time Manager**



The Time Manager allows you to edit the time keys of an animation later on. After the Manager has been activated, all animated parts are listed one below the other, along with a time bar. On the time bar, each time key is displayed with a blue circle. You can select the individual time keys using the left mouse button. Keeping the left mouse button pressed, you can move the selected key within the time bar. The right mouse button allows you to open a menu where you can delete the key you just selected.



### Help

Activates the help function for the item selected.



### Back

Terminates the Time Manager.



### Zoom In

This function enlarges the view of the time bar..



### Zoom Out

This function reduces the view of the time bar.

## 3.7.4 Light Manager



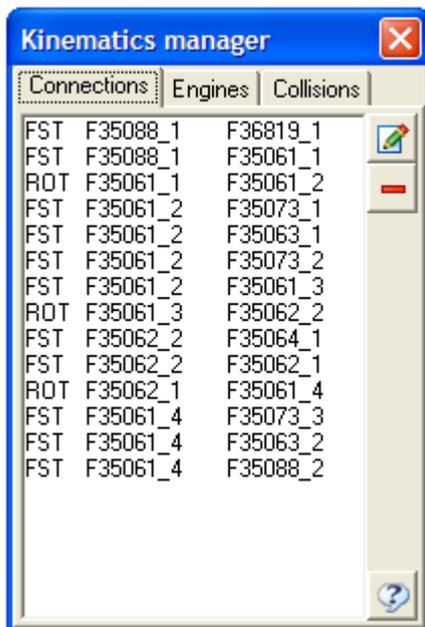
In the *fischertechnik-designer*, a total of 8 light sources are positioned around the current model. The Light Manager allows you to turn those light sources on or off. The 2<sup>nd</sup> light source has a special function as its position always equals the position of the camera, resulting in a balanced lighting of the model. All other light sources are turned off by default and are usually not required. The only time you will use those other light sources is when you export the 3D data in the POV-Ray format (see **File**  **Export**  **POV-Ray Format**). With this function, the active light sources and their positions are exported as well. This allows you to create better shadowing effects.



## 3.7.5 Kinematics Manager



The Kinematics Manager allows you to edit or delete all existing bindings, motors and collisions. The dialogue window is divided up into three tabs – one for the bindings, one for the motors and one for the collisions. To the right, you will find two buttons, one for editing and one for deleting.



### Bindings

The first tab lists all bindings of the current model. The list is made up of 3 columns. The first column displays the type of binding:

*FST* => *firm binding*

*ROT* => *rotation binding*

*RTR* => *rotation/ translation binding*

The other two columns show the names of the parts involved. When you select a binding using the mouse, the two parts involved are displayed as selected in the 3D window. The *Edit* button on top allows you to edit the selected binding (except for the firm binding since it has no parameters). Using the button below, you can delete the selected binding.

### Motors

The second tab lists the motors (a maximum of 8). The *Edit* button on top allows you to edit the selected motor. Using the button below, you can delete the motor.

### Collisions

The third tab lists the collisions of the current model. The list is divided into 3 columns. The first two columns display the parts involved. The third column reflects the number of the motor that reacts in case of collision. When you select a collision using the mouse, the two parts involved are displayed as selected in the 3D window. The *Edit* button on top allows you to edit the selected collision. Using the button below, you can delete the selected collision.

### 3.7.6 Logic Manager



In the kinematics mode, the Logic Manager allows you to realize process controls. The setup of the Logic Manager resembles LLWin or rather RoboPro, so users who are familiar with one of these programmes do not need any training. Basically, the Logic Manager works in two different modes. The buttons on the right enable you to switch between the two modes.



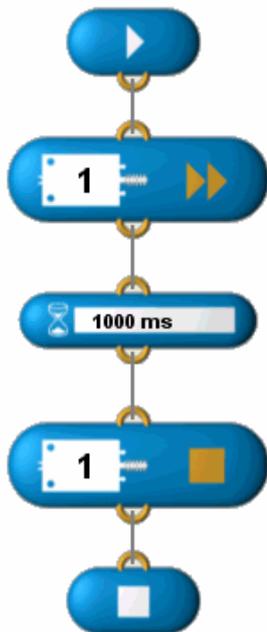
### Block Mode

This mode allows you to add or delete new function blocks. Those function blocks are shown on the left and can be simply moved into the work window by **Drag&Drop**. Using the left mouse button, you can move the blocks within the window. When you click the right mouse button on a block, a menu will open where you can delete the entire block or the closest link. A double-click on a function block allows you to set its parameters (see below).



### Connection Mode

In this mode, you can link function blocks among each other. First, you need to click the left mouse button on a connector of a function block. Holding the left mouse button, you will now select the second connector and then release the mouse button. Generally, connections can only be established from exits to entries.



*Example of a logic procedure*

The example, above, shows a simple logic procedure which first starts motor 1 in the clockwise direction. The programme waits for 1 second (= 1000 milliseconds) and then stops the motor. The last step ends the programme.



### Start Block

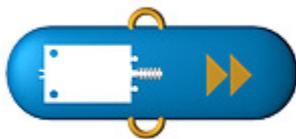
The Start Block always starts a new process. More than one process can exist at any time without a problem. Therefore, it is, for example, possible to realize totally independent processes. The additional realization of a flashing light process is a

typical example. The number of possible processes that can run at the same time is limited only by your PC's computing power. The Start Block has no parameters.



**End Block**

The End Block terminates a process. This does not mean, however, that the kinematics mode is terminated as well. The End Block is not absolutely necessary as many processes run endlessly and would never reach the End Block. The End Block has no parameters.



**Motor Block**

Using a Motor Block, you can start or stop one of the 8 motors (and select their rotating direction). The parameters allow you to choose from the following settings:

**Motor No.:** Selection of the motor (1-8)

**Direction:** Determines the state of the motor (counter-clockwise rotation, stop, or clockwise rotation)



**Collision Query**

This block represents a branch operation. This means that the programme may continue at two different spots, as determined by a collision. If the selected collision takes place, the programme will continue at the connector with the green dot. Otherwise, it will continue at the connector with the red dot. Within the parameters, you can select the name of the collision which must have been defined earlier (see menu: **Kinematics -> Insert Collision**).



**Pause Block**

The Pause Block allows you to interrupt the programme for a set period of time. Once that period is over, the programme continues. You can set the time within the parameters. The entry has to be in milliseconds. (1 second has 1000 milliseconds.)



**Part Colouring Block**

This block allows you to set the colour of a construction part. In general, this function is only used for flashing light controls. To simulate the flashing light, the colour of a part keeps alternating (e.g. from light blue to dark blue). You first need to enter into the parameters the name of the part to be coloured. You will find that name in the Construction Phase Overview. The colour to be set is presented in a rectangle. To

select a colour, you need to click on this rectangle using the left mouse button. Then you can choose a new colour.



### Joystick Query

This block also represents a branch operation. This time, a connected joystick determines in which direction a programme will continue. This block allows you to query the direction as well as the fire buttons of a joystick. Therefore, in the parameters, you can set the joystick query:

**Axis X+:** Joystick is being moved to the right ?

**Axis X-:** Joystick is being moved to the left ?

**Axis Y+:** Joystick is being moved up ?

**Axis Y-:** Joystick is being moved down ?

**Button 1 :** Fire Button 1 on the joystick is being activated ?

**Button 2 :** Fire Button 2 on the joystick is being activated ?

**Button 3 :** Fire Button 3 on the joystick is being activated ?

**Button 4 :** Fire Button 4 on the joystick is being activated ?



### "Set Variable" Block

This block allows you to assign a particular value (number) to one of the variables. The Logic Manager is able to work with 99 variables that are available in all parallel processes. These variables can be changed and queried by other blocks. This way it is possible, for example, to have a certain process run exactly 5 times (loop). In the parameters, you first select the variable. Values between 1 and 99 will be accepted. Then you need to enter the value to be assigned to the variable.



### "Change Variable" Block

This block allows you to increase or decrease a variable's value. You first need to enter the variable in the parameters. Values between 1 and 99 will be accepted. Then you need to enter the value by which the variable is to be increased or decreased. For increases, you must enter positive values, for decreases negative values.



### Query Variable

This branch operation block allows you to query the value of a variable. First, you need to enter the number of the variable in the parameters. Values between 1 and 99 will be accepted. Then you need to select a query condition. The following are available:

- "=": Variable is equal to the following value ?
- "<": Variable is less than the following value ?
- ">": Variable is greater than the following value ?
- "<=": Variable is less than or equal to the following value ?
- ">=": Variable is greater than or equal to the following value ?
- "<>": Variable is unequal to the following value ?

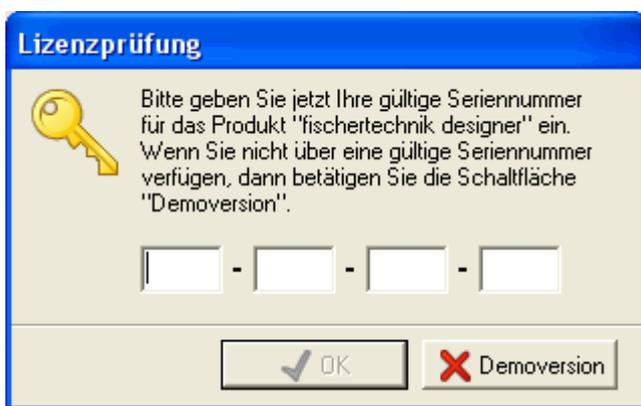
Finally, you still need to enter the value to be used in the query condition. If the condition is met, the programme will continue at the green connector; if not, it will continue at the red connector.

## 3.8 Help

### 3.8.1 Registration



This dialogue box will open as soon as you start the **fischertechnik-designer** for the first time. In this screen, you need to enter the serial number that comes with the software. It consists of a 16-digit character string composed of capital letters and numbers. If you just want to try a demonstration release of the **fischertechnik-designer** (and, therefore, do not have a serial number), click on *Demo Version*. In the demonstration release, a maximum of 10 parts can be used and you will not be able to obtain additional parts via the Internet. Apart from that, all functions that the full version offers are available to you for an unlimited period of time.



### 3.8.2 Internet Update (Parts)

This function allows you to conveniently download new parts for the **fischertechnik-designer** via the Internet. As soon as you activate this function, a connection to the server [www.fischertechnik-designer.de](http://www.fischertechnik-designer.de) will be established and a list of new available files will be created. In general, one part requires several files; therefore, in most cases, the number of files to be downloaded is significantly larger than the number of new parts.



#### Download

This button starts the downloading of new files. At the end of the downloading process, a message appears informing you that the programme must be restarted in order to be able to use the new parts.



#### Back

Clicking on this button closes the dialogue box.



#### Help

Activates the help function for the item selected.