

**Editorial**

Hi Fans,

After 10 months military service I am now back full-time with the fischertechnik FAN CLUB and very pleased to be able to present you with this issue, FAN CLUB NEWS 02/1999.

It concentrates mainly on the technical details of this year's innovations. For instance, we are explaining the details that make the "PNEUMATIC ROBOTS" so special. And; so that you can turn the right light on your models with "Lights" in future, we are explaining everything about this Set.

fischertechnik now has a new robot for professional industrial applications in its range, and we would like to introduce it to you with an exhibition report from SPS Drives in Nuremberg.

Then we have evaluated the results from questionnaire which, for simplicity's sake, we only sent to our German members in the last issue. We were delighted by the high level of response. You will find the results on Page 2.

As well as this there is of course the "Letter Box" as well. Many, many thanks to all those who have sent in photos of their fischertechnik models and other contributions recently. As you know, it is not possible to print all of them, but we are always very grateful for every one we receive.

As an additional highlight, in this Millennium issue we are organising a competition! Details are in the "Letter Box". We have decided to fold this issue of FAN CLUB NEWS crossways. For this reason you will find the FAN CLUB construction instructions on pages 7 and 8 this time.

So, now then, we would like to wish you lots of fun with the last issue of FAN CLUB NEWS in this millennium.

Yours

Eric

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**Page 2**

**Results obtained from questionnaire**

We would first like to thank all those who sent their questionnaires back. This will be a big help to us in bringing the NEWS even closer into line with your interests - even if it does seem that you like it the way it is. Just to make this point first.

1,066 FAN CLUB members replied - this is far above the average for questionnaire-campaigns of this kind.

We first wanted to know from you how you like the present newspaper format. Of the 1,066 members who sent in their questionnaires, 616 said they liked it, 446 would prefer DIN A4 or A5. 4 members did not express a view either way. So that means we ought to keep the present format.

The next question was the subject-matter you like best. A clear first place went to the section entitled "New", with 33.5% of the replies, followed by "Latest" (21.4%), "Letter Box" (18.9%), "Young People Research" (16.6%) and the other headings (8.7%). 0.9% of FAN CLUB NEWS readers gave no answer.

Then we wanted to know how you rated the articles in NEWS 01/1999. The results here differed only marginally. The "New" section headed the list with 36.9%, followed by "Latest" (19.1%), "Letter Box" (17.9%), "Young People Research" (9.5%), and the other headings (13.6%). Here, 3% of members gave no answer.

The fourth question related to the style in which we write NEWS. 781 readers, or 73.3%, consider it "fab!". 12% would like it to be more scientific, 6.4% find it too dry, and 3.4% say it is already too scientific. 3.9% say our style is sloppy, and 1 % of members did not venture an opinion.

Lastly, we asked what you would like to improve or add. 45% of members would not want to improve anything, but 5% wanted more information in NEWS and another 5% want it to appear more often. As FAN CLUB NEWS in its present format is very complex, we could imagine that instead of sending out two 8-page issues a year we could send out four 4-page issues starting next year. We will have more to say on this point early next year. There were other suggestions, but each of them only made up an insignificant percentage.

The additions members would like to make are more general building instructions, a separate section on "Tips and tricks", a "Computing" section, and more competitions. We hope to be able to take up all these suggestions. 39.4% of members did not suggest any additions, and consider FAN CLUB NEWS to be complete as it is.

All in all, it is fair to say that with FAN CLUB NEWS in its present form we are on the right course, and that you are enjoying it. This means that it will continue to appear in its present format, either twice or four times a year - but please give us a little time to think about that. We aim in any case to respond to your improvement suggestions and to make NEWS even more interesting to you.

Having said all that, many thanks again for filling in the questionnaire.

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#### The new "3-D Robot" from fischertechnik

There was a huge crowd in front of the fischertechnik stand at the SPS/IPC/ORIVES trade fair, which took place from 23<sup>rd</sup> to 25<sup>th</sup> November 1999 at the Nuremberg Exhibition Centre. This trade fair covers every possible aspect of "automation technology" and, in particular, industrial control systems.

fischertechnik has been finding uses for many years in the field of industrial model-building. Before an engineering company sells (for instance) a high-rack storage system, an industrial model-building company builds a model of it out of fischertechnik parts and checks whether the "real-life" installation really will work the way it is meant to.

Together with the firm of thomasoft, which like Staudinger builds industrial models, we appeared as exhibitors at this fair for the third time in a row. The "3-D Robot" gave its first performance, along with four new industrial models.

This 3-axis robot can be supplied either with the tried-and-trusted 9V system or (from Spring 2000 onwards) in a 24V version, and consists entirely of standard fischertechnik components. The 9V version is controlled by the Intelligent Interface, Article no. 30402, and the LLWin 2.1, Article no. 30407 software. As an alternative, the robot can be controlled by any suitable industrial control system (programmable logic control or PLC unit with field bus), such as those widely used in manufacturing and research, provided it has at least 8 inputs / outputs and can handle pulses of at least 10 milliseconds.

The model, which is mounted on a strong wooden base, has a gripping claw and its driven by four motors. Two of them are the new Power Motors, for rotating, raising and lowering, and the other two are the tried-and-trusted Mini (or "S") motors for gripping and running forwards and backwards. Its main characteristics are its generous room for maneuver: Axis 1 rotates through 180°, Axis 2 can run 10 cm forwards and backwards, and Axis 3 can raise and lower through no less than 16 cm!

Another sensational aspect is the price: between DM 798 and DM 999 (plus VAT), according to whether the Intelligent Interface is included, for the completely assembled and wired-up "3-D Robot". This low-price alternative to the complex industrial model can be ordered straight away from fischertechnik (but the 24V-version cannot be delivered until the 24V versions of the Mini Motors and Power Motors are available, which will be in about April 2000). More information is available at [www.fischertechnik.de](http://www.fischertechnik.de)

By the way, the "3-D Robot" is ideally suitable for all lecturers in technical colleges and trainers in charge of apprentices, and even for the laboratories at universities and colleges of advanced technology - they will then have a reliable, easily understandable working model available to them at all times for visualizing processes and automation procedures which they can "pull out of the drawer" quickly.

#### Solar project at the Johann-Peter-Hebel primary school in Teningen

From 24<sup>th</sup> to 26<sup>th</sup> July 1999, ten pupils in the first and second forms (aged about 6 or 7) were able to take part in a special kind of project entitled "Solar? - What's That?". It was started at the Johann-Peter-Hebel primary school in Teningen (in the far south-west corner of Germany). Here is a report from Patrick Wernscheidt:

"Days in advance, when about 120 schoolchildren from the first and second forms were able to register for the eight projects on offer: the Solar Project was bursting at the seams: 80 (!) children wanted to join in!

Before the construction kits provided by fischertechnik were opened, it was necessary to go through a little "boring theory" and discuss questions about solar energy, renewable forms of energy, and electric power.

After that, everything was built that the Solar kit was capable of, from lighthouses and a helicopter to a roundabout - - everything was there.

At the end of the three days, all the projects were displayed in the entrance hall of the school, and there again the project burst at the seams. Parents evaluated the project results and asked questions which the children on the projects were able to answer in detail.

In a speech of welcome the headmistress, Ms Kiefer-Kliengenberg, thanked fischertechnik for kindly donating three solar and two universal construction kits and expressed the hope that "further and perhaps closer collaboration between the school and fischertechnik" would be possible. The teachers also saw that fischertechnik is a highly educational play-and-learning instrument.

It only remains to thank all those very warmly who made this project possible."

We were very glad to see that these project days had been such a success.

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## Pages 4/5

1

Marcel Bosch from Veghel, in Holland, built this extraordinarily musical robot. It plays the organ - very well indeed, in fact. And as if that weren't enough it announces the songs that it is going to play. The model is controlled by a Commodore 128 computer with Marcel's own Interface.

2

Simon Muley is 7 years old and has written to tell us that he always looks at the models built by the other FC members with great interest. A few weeks ago he was in hospital following an appendix operation, and while he was there he built this terrific robot.

3

This crane-lift was designed and built by Johannes Meyer, 12. A platform on which four cars can be loaded is lowered to the ground, and the cars drive out automatically. The motor then switches off on its own.

4

The 12-year-old Christoph Kleinherz is a great fischertechnik fan. His kit dates back to 1979! He built this trailer all by himself.

5

This chain-excavator, built by Clemens Horch (11 years old), really comes alive at night. A light-sensor enables it to switch itself on in the dark. It can also travel in all directions. A pneumatic cylinder raises, lowers, extends, and bends the excavator arm, and the shovel can also tilt. Terrific!

6

Allow us to present: "Jonas' Garage". This photo comes from Jonas Ketterer, 9 years.

7

This marvellous Bobcat excavator was built by Nils Zumholz (7 years). He and his father had a good look at a "real-life" Bobcat excavator. He writes: "I think it will be quite a long time before I take it to pieces again. I use the Bobcat to clear away my fischertechnik parts."

8

Mr Pettera has sent us photos of his models again, such as this production line for lorry. The chassis runs through 9 stations.

9

Here is another super design: a drink-dispensing machine from Bjarn Rudolph (17 years). The start is set off when an "active" bottle is touched and the glass is on the transport carriage.

The glass travels to the first position. The water is pressed out of a bottle with the aid of a mini-compressor which generates pressure. The dosage can be regulated. The glass travels on to the next station, where for instance lemon or berry juice is added. The mixture is stirred, and the glass is brought back to the initial position and a green light comes on to show that the customer can now drink it. Cheers!

10

This fantastic loop-the-loop railway was built by Thomas Falkenberg from 3,700 parts, and covers a ground area of 2 square metres. The carriage is pulled to the top by a chain driven by an S-motor, where it is unhooked and runs at break-neck speed up hill and down dale along a stretch of 10 metres (!). The tough little fischertechnik-men inside enjoy it hugely.

11

Karl Spix developed this brilliant shovel-wheel excavator of the kind used for open-cast coal mining. It is remote-controlled in all functions by the IR CONTROL SET. It is of course chain-driven, but even the shovel wheel (which is not made of fischertechnik parts), the conveyor belt, and the ejector arm all function properly. A technical design just like real life - and fischertechnik makes it possible.

12

Ferrari-Fan Robert Reiter would like to be a Formula 1 designer, and has built a scale replica of Michael Schumacher's racing car. He is bound to win the 2000 World Championship!

### "Snow Plough" competition

Dear Members, the results gained from the questionnaire give us good reason to organise a competition, as so many of you have asked to have more of them.

This one is suitable for the time of year: "Snow Plough". But do not limit yourselves to the conventional snow plough give your imagination a free rein, and design any kind of vehicle for removing snow. And now - off we go to our fischertechnik kit!

There are of course prizes to be won: fischertechnik parts that you can choose for yourselves.

1<sup>st</sup> Prize: Voucher for DM 150.00

2<sup>nd</sup> Prize: Voucher for DM 100.00

3<sup>rd</sup> Prize: Voucher for DM 75.00

4<sup>th</sup> Prize: Voucher for DM 50.00

5<sup>th</sup> Prize: Voucher for DM 25.00

Now some instructions on how the competition is being organized.

Build your snow-removal vehicle and take clear photos of it. (The pictures will have to be scanned ready for printing and publication, so it will not be possible to use graphics files such as JPGs, only proper photographs.)

Please send us the photos - not the models - with a brief description, so that a panel of judges can decide which models win. Winning models will be published in FAN CLUB NEWS. Have fun with your designs! - and the best of luck from the fischertechnik team.

Closing date for entries is 29<sup>th</sup> February 2000. The judges' decisions are final, and there shall be no recourse to the courts.

## Page 6

### Pneumatic NEWS

A short history lesson

Thousands of years ago, people were already using air to help them for instance by using bellows to help start a fire.

A Greek inventor called Ktesibios built the first air-gun in about 260 BC. To this end he used not only a stretched cord but also air compressed in a cylinder, which greatly increased the range of his gun. So it is no wonder that the Greek word "pneuma", which means "air", has given its name to the technology we now call "pneumatics".

At the start of the industrial age, in the 19<sup>th</sup> century, machinery driven by compressed air came into widespread use particularly in road-building and mining. Modern industry would be impossible to imagine without pneumatics; these machines and robots can be found everywhere, for instance assembling individual parts and sorting and packing goods.

### "Pneumatic Robots" from fischertechnik

As (nearly) everything you see in "real-life" technology can be copied with fischertechnik, it is of course possible to drive fischertechnik models pneumatically as well. For this purpose there are already pneumatic cylinders, manual valves, and a mini-compressor.

As if that were not enough, it is now even possible to program and control these machines from a PC. Electromagnetic (solenoid) valves connected to the fischertechnik interface ensure that pneumatic cylinders can be actuated by a computer program written with LLWin software.

In this way, the two fascinating subjects of pneumatics and computing are combined in the "Pneumatic Robots" kit, which opens up whole new possibilities in building pneumatically controlled fischertechnik models.

#### The pneumatic components and their functions

##### The compressor

The compressor is assembled from fischertechnik components. It supplies the necessary compressed air with which the cylinder can be run out and in again. As the compressor is the same in all models, it only needs to be built once, as shown in the instructions.

##### Function:

The compressor cylinder is driven by a fischertechnik motor. When the piston rises, air is drawn in from outside through the back-pressure valve, and when it is lowered the air is compressed and stored in the compressed-air tank. The back-pressure valve now ensures that the compressed air cannot flow back out. The compressed-air tank ensures that there is always sufficient compressed air available for actuating the pneumatic cylinder. The pressure generated by the compressor is about 0.5 bar above atmospheric pressure. The piston of the compressor cylinder must always be able to move easily. If necessary, it can be lubricated very sparingly with a little drop of acid-free oil, such as silicon oil.

If the compressor is to be out of use for any length of time, we recommend that the drive bell should be removed as it may go slack over time and would then tend to slip.

##### The electro-magnetic valve

In a pneumatic system, a valve has the job of controlling the flow of air to the pneumatic cylinder in such a way that it runs either in or out. A valve can be actuated either by hand, pneumatically, or, as in the case of the fischertechnik valve, electro-magnetically.

##### Technical data:

3/2-way valve

9VDC/130mA

It is not necessary to ensure the correct polarity when the valve is being connected to the source of power.

##### The fischertechnik valve works this way:

(Be careful, this explanation may sound very technical.)

When power flows through the coil (1), a magnetic field is created that pulls the core (2) downwards. The valve is opened and air flows from Connection "P" through Connection "A" to the cylinder. If no power is flowing, the core is pressed upwards by the spring (3) and the valve is closed.

In the closed position, Connection "A" is connected with the air outlet "R", through which air can escape outwards from the cylinder. The purpose of that is explained in the next section. By the way, the connections:

P = compressed air connection

A = cylinder connection

R = escape

are always designated this way in pneumatics. Those most interested in technology, may like to know that the valve used here is of the "3/2-way valve" type, which means that it has three connections - P, A, and R - and two switch positions, open and closed.

##### Actuating a pneumatic cylinder

The fischertechnik pneumatic cylinders can be actuated with compressed air, and run in or out. This kind of cylinder is called a "double-action cylinder".

There are also cylinders that only work pneumatically in the one direction. They are returned to the start position by a spring. They are called "single-action cylinders". The compressor cylinder is an example of this type.

In order to be able to operate a fischertechnik cylinder in both directions, two of the valves included in the kit will be needed:

To run the cylinder out, Valve V1 must be open (the coil is supplied with current) and Valve V2 closed (no current flowing).

To run the cylinder back in, Valve V2 has to be open and Valve V1 closed.

The illustration also makes it clear why the escape outlet "R" is needed on the valve. Without it, the cylinder would not be able to move because it would have the same pressure on both sides of the piston and the air would not be able to escape.

Controlling the valves with an interface and LLWin 2.1 software

Each valve is connected to an M1-M4 motor output of the fischertechnik interface.

If a cylinder is to run out, Valve 1 (motor output M1) is switched on for 1 to 2 seconds and then off again. To run the cylinder in, Valve 2 has to be switched on and then off again after 1 to 2 seconds. In the LLWin software, the sequence looks like this:

### **The new LIGHTS - Set in detail**

Following a number of requests, fischertechnik this year is once again offering a new LIGHTS set with a new, hi-tech flasher unit.

The LIGHTS set consists of the new flasher unit, 4 lamps with lamp flaps of various colours, cable, and shoe connectors.

The new flasher unit measures about 30 x 15 x 16 mm, and has only two connecting cables, yellow and blue. Ultramodern technology inside the component means that no additional connections are needed for the power supply! The component is simply clamped onto the power supply to the lamp, and that is enough to make it flash (see Fig. 1). If the two cables on the flasher unit are connected the wrong way round, the light will stay on all the time. Instead of changing the wiring round, the polarity can be reversed with a polarity switch (part no. 36708). The flasher unit will be available singly under the Part no. 35604 from the summer of 2000 onwards in the spare-parts service.

It is protected against overload (such as when more than 8 lamps are connected to it) and short-circuits. If there is an overload, the unit will automatically switch the lamps off or else they will only flash feebly. The right source of energy is the Power Block (30263), the Accumulator Set (34969), or the Energy Set (30182).

Fig. 2: The flasher unit is so efficient that it can handle up to 8 lamps. These are connected in parallel to the first one.

Fig. 3: As the flasher frequency differs from one flasher unit to another, it is possible to achieve interesting lighting effects by using two of them.

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### **Page 7 assembly manual FAN-CLUB-model No. 15**

This time we developed the "Heavy Load Truck" for you. This model consists of the kits "Cars & Trucks" (Part No. 34950) as well as "King of the Road" (Part No. 30201). Except these kits no further items are necessary. As you can see in the figure, this "Heavy Load Truck" is also suitable to transport our new "Helicopter" (Part No. 34989).

Very much fun you will have with this Truck, if it is equipped with motor and remote control. To drive we recommend the new "Power Motor Set" (Part No. 34965). For steering we advise the well-known S-Motor from the "Mini Motor Set" (Part No. 30342) and for remote controlling our "IR control set" (Part No. 30344).

And as ideal power supply you can use the fischertechnik Accu battery pack from the new "Accu set" (Part No. 34969). You will find detailed information in the "Cars & Trucks" manual (starting from page 16) about how to build in the electronic components mentioned above.

Beyond that you can equip the heavy transporter with signal lights and headlights. We recommend the new "Lights" set (Part No. 34970) with its electronics for continuous and signal light for this purpose. Have much fun with constructing.