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ROBO TX Controller

Pure high tech is concealed in the compact casing of the ROBO TX Controller. Programs can be loaded into this control and then these programs control motors, lamps and even entire fischertechnik robots, and this is not all:

• A USB connection and the integrated Bluetooth radio interface allow easy and fast communication between the computer and the fischertechik model.

• The large RAM memory and the additional flash memory of the ROBO TX Controller store numerous programs at the same time.

• All models of the COMPUTING series can be controlled with the Controller.

• In addition, the Controller can also communicate with other Bluetooth capable devices or with a maximum of eight additional ROBO TX Controllers.

• With the fischertechnik grooves on five sides and the compact dimensions, the ROBO TX Controller can be installed in fischertechnik systems and models and this saves space as well.

Proper Use

The Controller is only to be used for the operation and control of fischertechnik models.

Safety Instructions

• Check the battery charger regularly for damage.

• If damage is found then the battery charger is not to be used until it is completely repaired.

• Do not put wires into the electrical outlet.

• Do not attempt to charge non-rechargeable batteries!

• Remove the rechargeable batteries from the battery compartment before charging!

• Only charge rechargeable batteries under the supervision of adults!

• Insure the polarity is correct when inserting the batteries!

• Do not short circuit the connecting terminals!

• The ROBO TX Controller is only to be operated with the fischertechnik power supply such as the rechargeable battery pack 35537!

• When connecting the rechargeable battery pack to the Controller pay special attention to the following:
Connect the plus pole of the "9 V $=$ IN" connection to the plus pole (+) of the rechargeable battery pack!
Connect the minus pole of the "9 V $=$ IN" connection to the minus pole (–) of the rechargeable battery pack!

• Maximum operating temperature is 40 °C!

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This can be connected to the ROBO TX Controller

The following devices can be connected or controlled. In addition, the Controller can be expanded with additional devices.
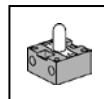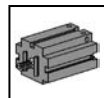
Actuators (with 9 V ⎓, 250 mA)
Electrical motors
Bulbs
Buzzers
Electromagnets
Magnetic valves (from the pneumatic construction sets)

Sensors (digital 5 kΩ, digital 10 V; analog 0–5 kΩ, analog 0–10 V)
Push button switches
Magnetic sensors (reed contacts)
Light sensors (phototransistors, photo resistor)
Heat sensors (NTC resistors)
Ultrasonic distance sensors (only the version TX Art. no. 133009 with three-wire connection)
Color sensors
Infrared sensors (trail sensors)
Potentiometers
Magnetic encoder
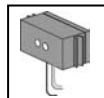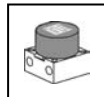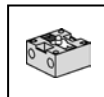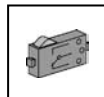
ROBO TX Controller
Up to eight additional Controllers can be connected through expansion plugs.

Camera sensor
As soon as available

Radio transmission
Using Bluetooth, a connection can be made to other Bluetooth devices such as PC, other ROBO TX Controllers and cell phones.

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What are the jack sockets, connector plugs, push buttons and switches for?

Figure see page 3.

1 USB 2.0 connection (1.1 compatible)

Makes the connection to the PC. The appropriate USB cable is included.

2 Selection button left

The display menu is controlled with this. More on this in the menu chapter

3 9 V ⎓ IN, connection rechargeable battery pack

This connection allows mobile power supply through the fischertechnik rechargeable battery pack (not included in the scope of delivery) as an alternative to the power unit.

4 Display

The display shows the status of the Controller, which programs are loaded and where you are in the menu. Functions and programs can be selected, activated and deactivated. When a program is running, you can have values of variables (variable values) or values of analog sensors displayed. A useful menu overview is shown in the chapter "Setting (menu)."

5 ON/OFF switch

Switches the power supply to the Controller on or off.

6 Selection button right

The display menu is controlled with this. More on this in the menu chapter

7 9 V ⎓ IN, DC jack socket

Here, the power unit for the Power Set or Energy Set is connected (not included in the scope of delivery). A suitable adapter is included with the Controller.

8 EXT 2, connection for expansions

With this connection, additional ROBO TX Controllers can be connected so the number of the inputs and outputs can be expanded. In addition, it contains an I^2C interface for future expansions.

9 Outputs M1–M4 or O1–O8

Four motors can be connected to the outputs. As an alternative, eight lamps or electromagnets, whose second pole is connected to a ground connection (⊥).

10 Inputs C1–C4

Fast counting inputs record counting pulses up to 1 kHz (1000 pulses/sec.), for example, from the encoder motor of the ROBO TX Training Lab Construction Set. Can also be used as digital inputs, for example, for push button switch.

11 9 V Out

Supplies sensors with the required operating voltage 9 V ⎓ such as color sensor, trail sensor, ultrasonic distance sensor and magnetic encoder.

12 CAMERA connection

Connection possibility for a camera module (at the time of printing being prepared).

13   Universal inputs I1–I8

These are the all-rounders among the signal inputs. They can be set with the software, ROBO Pro, for:

- Digital sensors (push button switches, reed contacts, phototransistors) – digital 5 kΩ
- Infrared trail sensors – digital 10 V
- Analog sensors 0–5 kΩ (NTC resistors, photoresistors and potentiometers)
- Analog sensors 0–10 V (color sensors) display of value in millivolts (mV)
- Ultrasonic distance sensors (only the version TX with three-wire connection)

14   EXT 1, connection for expansions

With this connection, additional ROBO TX Controllers can be connected the same as for EXT 2 and so the number of the inputs and outputs can be expanded.

Install software

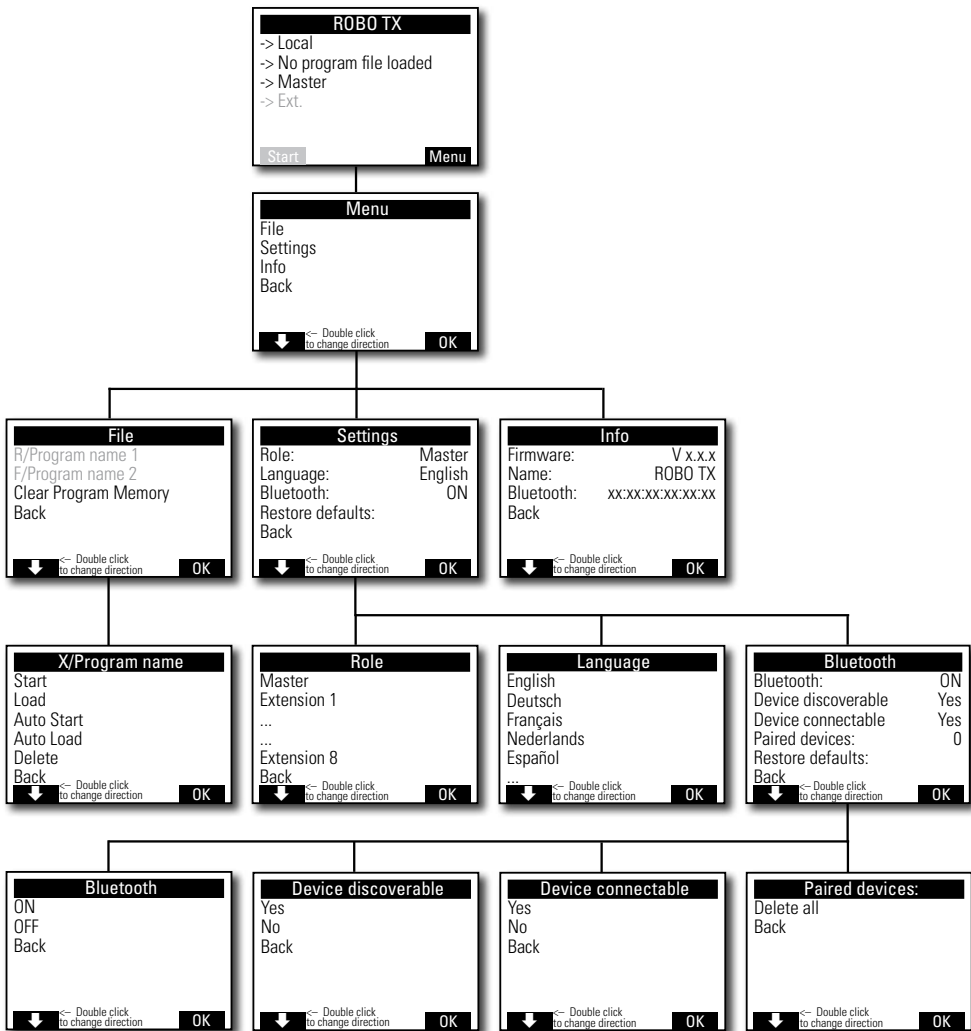Software prerequisite for the ROBO TX Controller:
ROBO Pro version 2.0 or higher

In the handbook for the ROBO Pro software, the following, among other things, are described in detail:
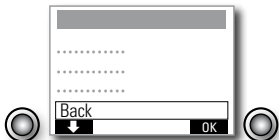
- The installation of the ROBO Pro software on the PC.
- The installation of the USB driver for the ROBO TX Controller for the Windows operating systems.

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Setting (menu)
Menu overview

```
        ROBO TX
-> Local
-> No program file loaded
-> Master
-> Ext.

 Start              Menu
```

```
         Menu
File
Settings
Info
Back

  ↓ <— Double click
    to change direction    OK
```

```
         File
R/Program name 1
F/Program name 2
Clear Program Memory
Back

  ↓ <— Double click
    to change direction  OK
```

```
       Settings
Role:           Master
Language:      English
Bluetooth:         ON
Restore defaults:
Back

  ↓ <— Double click
    to change direction  OK
```

```
         Info
Firmware:        V x.x.x
Name:          ROBO TX
Bluetooth:  xx:xx:xx:xx:xx:xx
Back

  ↓ <— Double click
    to change direction  OK
```

```
    X/Program name
Start
Load
Auto Start
Auto Load
Delete
Back ↓ <— Double click
    to change direction  OK
```

```
         Role
Master
Extension 1
...
...
Extension 8
Back ↓ <— Double click
    to change direction  OK
```

```
       Language
English
Deutsch
Français
Nederlands
Español
... ↓ <— Double click
    to change direction  OK
```

```
       Bluetooth
Bluetooth:           ON
Device discoverable  Yes
Device connectable   Yes
Paired devices:       0
Restore defaults:
Back ↓ <— Double click
    to change direction  OK
```

```
       Bluetooth
ON
OFF
Back

  ↓ <— Double click
    to change direction  OK
```

```
  Device discoverable
Yes
No
Back

  ↓ <— Double click
    to change direction  OK
```

```
  Device connectable
Yes
No
Back

  ↓ <— Double click
    to change direction  OK
```

```
   Paired devices:
Delete all
Back

  ↓ <— Double click
    to change direction  OK
```

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Menu in detail

Navigation using selection buttons

- If you press the left selection push button switch, a selection frame moves from the one line to the next. By double clicking, the direction of movement of the selection frame is changed. In the status window, the left selection push button switch has a start and stop function.
- If you press the right selection push button switch, the previous selection is confirmed. In this way, you move to the next menu or activate or deactivate certain functions. In the status window, you can always move to the main menu using the right selection push button switch.
- If you select "Back", you always return to the previous menu.

First, you must set the desired country language. English is the factory setting, which is the setting when you receive it. Menu/Settings/Language/ select desired language and confirm with OK

Note! The symbol „/" is used to separate texts, which can appear as an alternative in the same line.

The Status Window

▪ Line 1: Local / Online

Local: No exchange of data with the PC (as master*) or no connection to the master (as extension*)

Online: Master* exchanges data with the PC or extension* is connected with the master*.

▪ Line 2: No program file loaded/loaded: *Program name*/ started: *Program name*

Shows, if a program file is loaded and if yes then the condition it is in.

▪ Line 3: Master*/Extension* 1–8

Shows, for which function the Controller was set, master* or extension*. Changes are possible in the menu "Role".
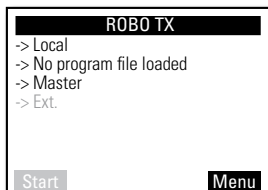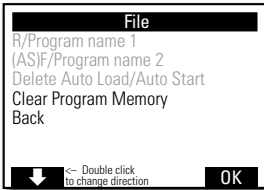
---

* Master: The Controller, which is set as the master, receives control commands directly from the PC and passes these on to the extensions. Extension: The Controller, which is set as the extension, receives control commands only through the master.

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§ Line 4: Ext.

It shows, which extensions are connected, for example,

1, 2, ... 8 (is only shown when extensions are connected).

§ Bottom line: Start/Stop

Starts or stops a program. The Start/Stop field is only shown
if a program file was transferred by downloading from the PC
to the Controller or was loaded from the flash memory to the
program memory.

```
         Menu
File
Settings
Info
Back


   ⬇  ← Double click
        to change direction    OK
```
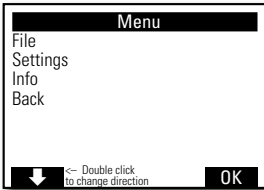
The Main Menu

§ Line 1: File

Leads to the menu, File Selection.

§ Line 2: Settings

Leads to the menu, Settings.

§ Line 3: Info

Leads to the display, Info.

```
          File
R/Program name 1
(AS)F/Program name 2
Delete Auto Load/Auto Start
Clear Program Memory
Back


   ⬇  ← Double click
        to change direction    OK
```
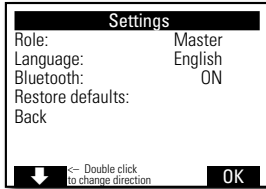
The File Selection

If program files have been transferred by downloading from
the PC to the Controller then they are listed here. They can
then be selected, be given start functions or deleted (see
menu X/Program name).

R/means: File is in the RAM.

F/means: File is in the flash memory.

If (AL) or (AS) is in front of the file, then for this file Auto Load
or Auto Start is activated, for example, (AS)F/ROB3.

§ Clear Program Memory

Selection "Clear Program Memory" | confirm with OK.
The file, which is loaded into the program memory, is re-
moved. Program files in the flash memory are retained.

```
          Settings
Role:              Master
Language:          English
Bluetooth:             ON
Restore defaults:
Back


   ↓  ← Double click
      to change direction    OK
```

The Settings

▪ Line 1: Role: Master/Extension

Leads to the menu, Role. There an assignment is made to make the Controller function as a Master* or Extension*.
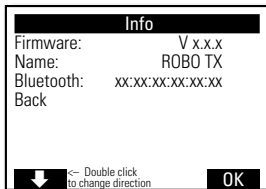
▪ Line 2: Language: German/English/. . .

Leads to the menu, Languages.

▪ Line 3: Bluetooth:

Leads to the menu, Bluetooth.

▪ Line 4: Restore defaults:

Restores the original factory settings.

```
            Info
Firmware:          V x.x.x
Name:             ROBO TX
Bluetooth:  xx:xx:xx:xx:xx:xx
Back



   ↓  ← Double click
      to change direction    OK
```
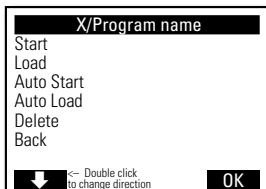
The Info Window

▪ Line 1: Firmware:

Shows the version number of the firmware**.

▪ Line 2: Name:

The name of the device is shown, for example, ROBO TX 622.

▪ Line 3: Bluetooth:

Definite Bluetooth identification code of the device (Bluetooth standard).

```
       X/Program name
Start
Load
Auto Start
Auto Load
Delete
Back
   ↓  ← Double click
      to change direction    OK
```

X/Program name

▪ Line 1: Start

The selected program is started.

▪ Line 2: Load

The selected program is loaded into the program memory and can be started by pressing a button.

▪ Line 3: Auto Start

As soon as the power supply for the Controller is turned on, the selected program is started automatically.
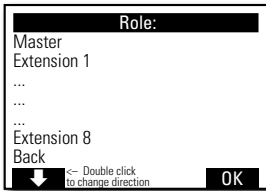
▪ Line 4: Auto Load

As soon as the power supply is turned on, the selected program is loaded automatically into the program memory and can be started by pressing a button.

▪ Line 5: Delete

Selected program is deleted, but first a question is asked to provide confirmation.
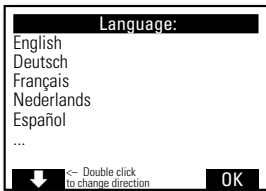
* Master: The Controller, which is set as the master, receives control commands directly from the PC and passes these on to the extensions. Extension: The Controller, which is set as the extension, receives control commands only through the master.
** The firmware is the operating software for the Controller.

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```
              Role:
Master
Extension 1
...
...
...
Extension 8
Back
   ←— Double click
      to change direction        OK
```
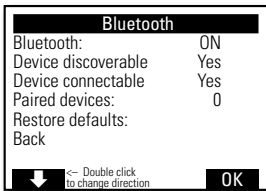
The Role

Here, the Controller is assigned the role as master or as an extension 1 ... 8. Just select and confirm with OK. More on the subject in the chapter, "Expansions".

```
           Language:
English
Deutsch
Français
Nederlands
Español
...

   ←— Double click
      to change direction        OK
```

The Languages

Here, the language used in the display can be changed. Just select and confirm with OK.

```
           Bluetooth
Bluetooth:               ON
Device discoverable      Yes
Device connectable       Yes
Paired devices:          0
Restore defaults:
Back
   ←— Double click
      to change direction        OK
```

Bluetooth

If one of the lines 1 to 5 is selected, a menu opens up, in which the particular functions can be switched on or off or changed.

▪ Line 1: Bluetooth:

The Bluetooth function is switched on or off here.

▪ Line 2: Device discoverable

If the function is switched on, then other Bluetooth devices can identify the ROBO TX Controller.

▪ Line 3: Device connectable

If the function is switched on then the ROBO TX Controller allows other devices to make a Bluetooth connection with the Controller.

▪ Line 4: Paired devices:

Shows how many devices are connected with the Controller over Bluetooth.

▪ Line 5: Restore defaults:

Restores the original factory settings.

Switch on

When connecting the Controller for the first time to the PC, the driver for the USB interface must be installed in the PC. The details are described in the handbook, "ROBO Pro Software."
1. Connect the USB cable to the PC.
2. Insert the power unit into the electrical outlet or connect the rechargeable battery pack.
3. Insert the small plug of the power unit into the 9 V ⎓ IN input jack socket (7) of the Controller (if necessary an adapter is included with the Controller).
4. Switch on the Controller with the ON/OFF switch (5).
5. A welcome text appears for a short time with the version number of the firmware. After this, the status window is shown. This is the starting point for the navigation in the Controller menu (see chapter, "Menu in Detail").

Select and Start Program

1. First, a program must be transferred by downloading from the PC to the ROBO TX Controller. A test of the connection and the precise actions for the downloading of the program are described in the handbook, "ROBO Pro Software."

After the download:
2. The program starts automatically in the basic setting.
3. The sequence is stopped by pressing the left selection button (2).

Changes to the start behavior can be assigned individually to any program file, for example, Auto Start or Auto Load. This is possible in the menu, X/*Program name*:
Menu | Settings | File | R/*Program name* or F/*Program name* | . . .
Details about the particular functions are found in the chapter, "Menu in Detail".

Switching Off

Slide the ON/OFF switch (5) to the OFF position and then unplug the power unit from the electrical outlet.

Expansions

Additional ROBO TX controllers or a camera can be connected using special connections.
Additional ROBO TX Controllers
The number of inputs and outputs is expanded with additional controllers. They are connected with the special connections EXT 1 and EXT 2.
1. Provide the power supply using the power unit or the rechargeable battery pack.
2. Assign the function as extension 1, 2, . . . or 8 to the new controller:
   Menu | Settings | Role | Extension 1, 2, . . . or 8 | OK

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3. Connect the controllers with each other using the ribbon cable, which is included. It doesn't make any difference which connection, EXT 1 or EXT 2, is used to do this .
4. The new extension is shown in the last line of the status window for the Controller.

Camera sensor
Being prepared at the time of the printing.

I²C Interface
This standard interface is to be used for future expansions, for example, for special sensors.

Bluetooth Connections
Bluetooth connection between ROBO TX Controller PC
This Bluetooth connection replaces the USB connection cable with a wireless radio connection. With this, the ROBO TX Controller can receive and transmit information in the online mode, which means the program runs on the PC and there is a continual exchange of data between the PC and the ROBO TX Controller. Using this blue connection, programs can also be downloaded to the controller and these programs can then be processed independent of the PC.

Prerequisites
Bluetooth capable PC or commercially available USB Bluetooth stick with Windows compatible Bluetooth radio chip. Windows XP with service pack 2 or Windows Vista.

A list is published by fischertechnik with successfully tested USB Bluetooth sticks, which can function together with the ROBO TX Controller without any problems. New sticks are continually appearing on the market and others are then no longer available. In order to continually offer current information, this service is available on our Web site at

www.fischertechnik.de – Computing – Downloads – ROBO TX Controller

There, there is also a detailed description of how the Bluetooth connection between the PC and ROBO TX Controller is installed with Windows.

For Bluetooth professionals, who don't need any further instructions:
The ROBO TX Controller uses the number sequence 1234 as the main key.

Information About the Range
The range is about 10 meters and is dependent on the quality of the USB Bluetooth stick and the ambient conditions (interference from other devices, obstacles in the area).

Bluetooth Connection Between Different ROBO TX Controllers
In the download mode, a ROBO TX Controller can exchange data with up to seven other ROBO TX Controllers. When this is done, each device can establish a Bluetooth connection with every other participant and transmit and receive data over this connection.
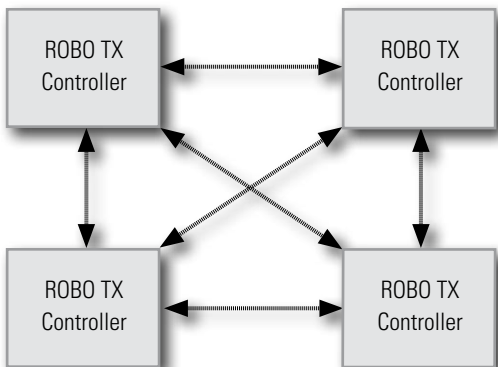
ROBO Pro contains special program elements for the establishing and breaking down of connections and for transmitting and receiving information.
Additional information about this operating mode is found in the online help for the ROBO Pro software version 2.0 or higher.

Bluetooth Connection Between ROBO TX Controller and Other Devices, for example, Cell Phone
Basically, the ROBO TX Controller can communicate with other Bluetooth devices, for example, suitable cell phones. To do this, the particular device must have special communication software, which is adapted for the ROBO TX Controller. Since continual changes can also be expected in this area, current information and links are also available at

www.fischertechnik.de – Computing – Downloads – ROBO TX Controller.

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Faults
Electromagnetic Interference
If the Controller is affected by external electromagnetic influences, it can still be used for the purpose intended after the end of the interference. It is possible that the power supply will have to be interrupted for a short time and the Controller restarted.

Error messages (from the Controller or ROBO Pro software)

Fault	Cause	Elimination
Program version error	An attempt was made to load or start a ROBO Pro program, which belongs to an older firmware version and therefore is no longer compatible.	Load program with newest ROBO Pro version onto the ROBO TX Controller again.
Program error 1	ROBO Pro error message: The number of processes in the ROBO Pro program is greater than the maximum possible number.	Under the tab, "Roles" of the ROBO Pro program increase the "minimum number of processes."
Program error 2	ROBO Pro error message: The minimum memory per process is too small.	a) Under the tab, "Roles" of the ROBO Pro program increase the "minimum memory per process (download)". b) A variable or a subprogram calls itself endlessly (recursion) and causes the memory to overflow. Change the program so that the recursion no longer occurs.
Program file open failure	The program file could not be opened because it was deleted in the flash memory.	Load the program file onto the ROBO TX Controller again.
Program file read failure	Program file could not be read because it is too big and does not fit in the program memory.	Program file must be reprogrammed so that it needs less space in the memory.

Technical Data

Dimensions and Weight

90 x 90 x 15 mm (W x D x H)

90 g

Memory and Processor

8 MB RAM, 2 MB flash

32-bit ARM 9 processor (200 MHz) programable with ROBO Pro software or C compiler

(not included)

Power Supply (not included)

With rechargeable battery set (8.4 V, 1500 mAh) or

power set (9 V, 1000 mA)

Interfaces

USB 2.0 (1.1 compatible), max. 12 MB, mini-USB jack socket

Bluetooth radio interface (2.4 GHz, range about 10 m)

2 expansion connections: RS 485; I^{2}C (only EXT 2)

PIN Assignment EXT 1

6	5
4	3
2	1

6: Not connected   5: Not connected

4: RS485-B   3: RS485-A

2: Not connected   1: GND

PIN Assignment EXT 2

6	5
4	3
2	1

6: I^{2}C Clock   5: I^{2}C Data

4: RS485-B   3: RS485-A

2: 5 V DC Out   1: GND

Signal inputs and outputs

8 Universal inputs: Digital, analog 0 – 9 V DC, analog 0 – 5 kΩ

4 fast counting inputs: Digital, frequency up to 1 kHz

4 motor outputs 9 V, 250mA: Speed infinitely variable, short circuit proof, alternatively 8 individual outputs

Display

128 x 64 pixel, monochrome

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Proper Disposal

Information About Environmental Protection

Do not put the electrical and electronic components of this construction set such as motors, lamps and sensors in the household waste. At the end of their service life, turn them in at a collection point for the recycling of electrical and electronic devices. The symbol on the product, packaging or the instructions shows this.

Warranty

The fischertechnik GmbH provides a warranty for the freedom from defects of the Controller according to the particular state of the technology. The right is reserved to make changes to the design or model, which neither impair the functioning or the value of the device, and does not entitle the customer to make a complaint.

Obvious defects must be asserted in writing within 14 days after the delivery otherwise warranty claims due to obvious defects are excluded.

No warranty claim exists due to an insignificant deficiency of the Controller. In other respects, the customer may only demand subsequent performance, which means subsequent improvement or replacement delivery. The customer is entitled, according to his choice, to withdraw from the contract or to demand reduction of the purchase price if the subsequent performance fails or in particular it is impossible or we are not successful in doing this in a reasonable time frame or we reject such or it is delayed by us and we are culpable for such delay. The warranty period is 24 months after delivery. We are not responsible for defects of the Controller, which are due to improper handling, normal wear or improper or negligent handling and the same applies to the consequences of improper changes, which are made without our approval, or repair work without our approval done by the customer or a third party. The warranty is governed by German law.

Liability

Liability on the part of fischertechnik GmbH for damages, which resulted from the fact that the device was not used in accordance with instructions, is excluded.