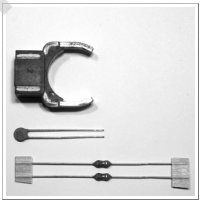
Anleitung | Manual | Mode d´emploi | Handleiding

Motorumbauset

Motor modification set
Set de modification du moteur
Motor ombouwset

Set 1
Art. 70-04110-01

Set 2
Art. 70-04210-01



Set 3
Art. 70-04310-01

tams elektronik

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The asterisks **

This manual mentions the following company:

Gebr. MÄRKLIN** & Cie. GmbH | Postfach 8 60 | D-73008 Göppingen

1. Getting started

How to use this manual

This manual gives step-by-step instructions for safe and correct connecting of the motor modification set. Before you start, we advise you to read the whole manual, particularly the chapter on safety instructions and the checklist for trouble shooting. You will then know where to take care and how to prevent mistakes which take a lot of effort to correct.

Keep this manual safely so that you can solve problems in the future. If you pass the set on to another person, please pass on the manual with it.

Intended use

The set is designed for modifying model railroad locomotives with alternating current (a.c.) motor according to the instructions in this manual. Any other use is inappropriate and invalidates any guarantees.

The motor modification set should not be mounted by children under the age of 14.

Reading, understanding and following the instructions in this manual are mandatory for the user.

Checking the package contents

Please make sure that your package contains:

- one permanent magnet
  PM-1 (for large flat circle-shaped commutator motor) or
  PM-2 (for small flat circle-shaped commutator motor) or
  PM-3 (for drum-shaped commutator motor);
- two mini chokes 3,3 µH;
- one capacitor 1,5 or 1,8 nF;
- this manual.

Required materials

For mounting and connecting the module you need:

- an electronic soldering iron (max. 30 Watt) or a regulated soldering iron with a fine tip and a soldering iron stand,
- a tip-cleaning sponge,
- a heat-resistant mat,
- a small side cutter, wire stripper and a pair of tweezers,
- electronic tin solder (0,5 mm diameter).

2. Safety instructions

Mechanical hazards

Cut wires can have sharp ends and can cause serious injuries. Watch out for sharp edges when you pick up the PCB.

Visibly damaged parts can cause unpredictable danger. Do not use damaged parts: recycle and replace them with new ones.

Electrical hazards

- Touching powered, live components,
- touching conducting components which are live due to malfunction,
- short circuits and connecting the circuit to another voltage than specified,
- impermissibly high humidity and condensation build up

can cause serious injury due to electrical shock. Take the following precautions to prevent this danger:

- Never perform wiring on a powered module.
- Assembling and mounting the kit should only be done in closed, clean, dry rooms. Beware of humidity.
- Only use low power for this module as described in this manual and only use certified transformers.
- Connect transformers and soldering irons only in approved mains sockets installed by an authorised electrician.
- Observe cable diameter requirements.
- After condensation build up, allow a minimum of 2 hours for dispersion.
- Use only original spare parts if you have to repair the kit or the ready-built module.

Fire risk

Touching flammable material with a hot soldering iron can cause fire, which can result in injury or death through burns or suffocation. Connect your soldering iron or soldering station only when actually needed. Always keep the soldering iron away from inflammable materials. Use a suitable soldering iron stand. Never leave a hot soldering iron or station unattended.

Thermal danger

A hot soldering iron or liquid solder accidentally touching your skin can cause skin burns. As a precaution:

- use a heat-resistant mat during soldering,
- always put the hot soldering iron in the soldering iron stand,
- point the soldering iron tip carefully when soldering, and
- remove liquid solder with a thick wet rag or wet sponge from the soldering tip.

Dangerous environments

A working area that is too small or cramped is unsuitable and can cause accidents, fires and injury. Prevent this by working in a clean, dry room with enough freedom of movement.

Other dangers

Children can cause any of the accidents mentioned above because they are inattentive and not responsible enough. Children under the age of 14 should not be allowed to work with this kit or the ready-built module.

⚠ **Caution:** Little children can swallow small components with sharp edges, with fatal results! Do not allow components to reach small children.

In schools, training centres, clubs and workshops, assembly must be supervised by qualified personnel. In industrial institutions, health and safety regulations applying to electronic work must be adhered to.

3. Safe and correct soldering

⚠ Caution:

Incorrect soldering can cause dangers through fires and heat. Avoid these dangers by reading and following the directions given in the chapter **Safety instructions**.

- Use a small soldering iron with max. 30 Watt or a regulated soldering iron.
- Only use electronic tin solder with flux.
- When soldering electronic circuits never use soldering-water or soldering grease. They contain acids that can corrode components and copper tracks.
- Solder quickly: holding the iron on the joints longer than necessary can destroy components and can damage copper tracks or soldering eyes.
- Apply the soldering tip to the soldering spot in such a way that the part and the soldering eye are heated at the same time. Simultaneously add solder (not too much). As soon as the solder becomes liquid take it away. Hold the soldering tip at the spot for a few seconds so that the solder flows into the joint, then remove the soldering iron.
- Do not move the component for about 5 seconds after soldering.
- To make a good soldering joint you must use a clean and unoxidised soldering tip. Clean the soldering tip with a damp piece of cloth, a damp sponge or a piece of silicon cloth.
- After soldering, check the PCB tracks for solder bridges and short circuits created by accident. This would cause faulty operation or, in the worst case, damage. You can remove excess solder by putting a clean soldering tip on the spot. The solder will become liquid again and flow from the soldering spot to the soldering tip.

4. Operation overview

Locomotive decoders designed to control alternating current (a.c.) motors are – in contrast to decoders for direct current (d.c.) motors – not load regulated (except few versions). In order to control a.c. motors with a load regulated decoder (for d.c. motors) you can exchange the field coil for a permanent magnet, thus converting the a.c. motor into a d.c. motor.

The motor modification set contains a permanent magnet, suitable for use with one of the different motor types (large or small flat circle-shaped commutator motor or drum-shaped commutator motor), depending on the version (PM-1, PM-2 or PM-3). Note: With some locomotive models rotors and engine plates have been mounted not fitting to any of the three versions of the permanent magnet.

As a matter of principle interference voltages occur with all locomotive motors transmitting the voltage from the turning rotator via brushes. In order not to disturb broadcast and TV reception, factory-made there are suppression devices mounted at the locomotive motor.

The interference voltages (the so-called "brush-sparking") rise with increasing abrasion. They can disturb the data transfer to the locomotive decoder (and thus affect the driving characteristics). It is even possible that the emerging current-peaks damage components on the decoder. For that reason it is generally recommended to mount suppression devices in addition to those mounted by the locomotive manufacturer when mounting a permanent magnet into a priority locomotive model.

5. Technical specifications

	Set 1 / PM-1	Set 2 / PM-2	Set 3 / PM-3
diameter	24,5 mm	18 mm	18 mm
weight	141 g	52 g	55 g
for motor type	large flat circle-shaped commutator motor	small flat circle-shaped commutator motor	drum-shaped commutator motor
for rotor*	217450	200680	231440
for engine plate*	211990, 216730, 228500	204900	231350

* The item-numbers for rotors and engine plates refer to Märklin** products.

6. Converting the motor

Preliminary work

- Desolder the connection from the field coil to the engine plate (directly on the engine plate).
- If present: desolder the noise suppression choke. Tip: You can solder this choke into the input lead from the slider to the locomotive decoder and thus improve the noise suppression.
- If present: desolder the noise suppression capacitors, discluding the one at the motor (between the motor connections).
- Take out the brushes. When doing so lift the pressure springs **cautiously** to the side!
- Release both screws at the engine plate and take out the engine plate.
- Take out the rotator **cautiously**! Tip: Use this opportunity to overhaul the motor.
- Take out the field coil. It will not be needed any more.

Note: Rotor and field coil are held to their position by the engine plate.

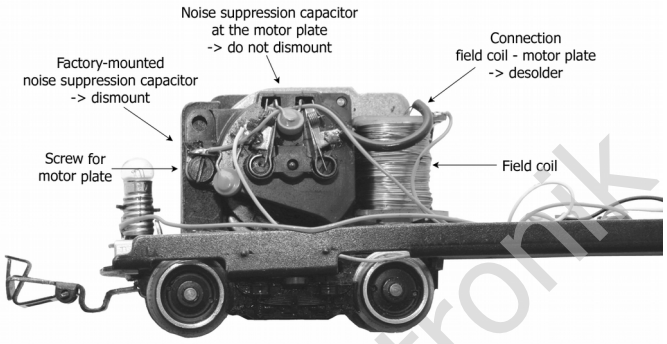

Fig 1: Flat circle-shaped commutator motor with field coil (before modification). The noise suppression choke mounted by the locomotive manufacturer cannot be seen, it has to be dismounted.

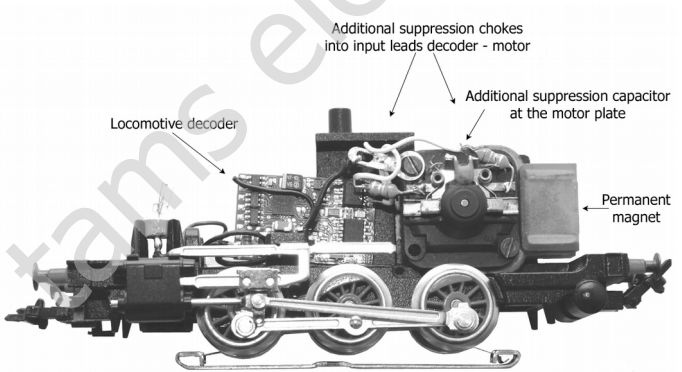

Fig. 2: Drum-shaped commutator motor with permanent magnet (after modification). The noise suppression capacitors mounted by the locomotive manufacturer have been dismounted already.

Mounting the permanent magnet

- Install the permanent magnet instead of the field coil. **Attention:** Do not apply force when installing the magnet. If necessary check if you have to turn the magnet or if you have chosen the wrong type (e.g. instead of a magnet for a small flat circle-shaped commutator motor a magnet for a drum-shaped commutator motor).
- Insert the rotor, attach the engine plate and fix it with both screws. This fixes the permanent magnet, too. **Attention:** Do not tighten the screws too firmly! The engine plate made of plastic could be damaged and / or the engine running could be obstructed.
- Insert the brushes and put the pressure springs **cautiously** onto the brushes.

Mounting additional suppression devices

- Solder the additional suppression chokes (included in the package) into the two input leads from the decoder to the motor.
- Solder the additional suppression capacitor (included in the package) on to the engine plate. If a capacitor soldered in by the locomotive manufacturer is present, solder the additional capacitor in parallel to it.

Attention:

When the motor is not supressed sufficiently, the interference signals affect the data transfer to the decoder. This affects the locomotive´s driving characteristics (e.g. rocking or bucking). It is even possible that the emerging current-peaks damage components on the decoder.

When brushes, the rotor or the motor are intensely worn, mounting additional suppression devices is not sufficient to absorb the occuring interference signals. In these cases you have to exchange the components in question.

Testing

Before mounting a locomotive decoder, you should always check with your hand if the wheels turn easily. If not, maybe the screws at the engine plate have been tightened too firmly or the rotor has been incorrectly mounted.

⚠ Attention:

With stiff wheels the motor current will be increased. A too high motor current can cause (irreparable) damages at the locomotive decoder!

7. Help with technical problems

Hotline: If problems with your motor modification set occur, our hotline is pleased to help you (mail address on the cover page).

Sending in defective parts: You can send in defective parts for checking (address on the cover page). In case of guarantee the replacement is free of charge for you.

Please do not send in modules for checking charged to us. In case of warranty we will reimburse the forwarding expenses up to the flat rate we charge according to our valid price list for the delivery of the product. With replacement deliveries not covered by guarantee you have to bear the expenses for sending back and forth.

8. Guarantee bond

For this product we issue voluntarily a guarantee of 2 years from the date of purchase by the first customer, but in maximum 3 years after the end of series production. The first customer is the consumer first purchasing the product from us, a dealer or another natural or juristic person reselling or mounting the product on the basis of self-employment. The guarantee exists supplementary to the legal warranty of merchantability due to the consumer by the seller.

The warranty includes the free correction of faults which can be proved to be due to material failure or factory flaw. With kits we guarantee the completeness and quality of the components as well as the function of the parts according to the parameters in not mounted state. We guarantee the adherence to the technical specifications when the kit has been assembled and the ready-built circuit connected according to the manual and when start and mode of operation follow the instructions.

We retain the right to repair, make improvements, to deliver spares or to return the purchase price. Other claims are excluded. Claims for secondary damages or product liability consist only according to legal requirements.

Condition for this guarantee to be valid, is the adherence to the manual. In addition, the guarantee claim is excluded in the following cases:

- if arbitrary changes in the circuit are made,
- if repair attempts have failed with a ready-built module or device,
- if damaged by other persons,
- if damaged by faulty operation or by careless use or abuse.

9. EU declaration of conformity

CE This product conforms with the EC-directive mentioned below and is therefore CE certified.

2011/65/EG on the restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS). Underlying standard: EN 50581.

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