

# KSM-4

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Loop Module  
for digital model railroad layouts

Manual



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**Printing the manual**

The formatting is optimised for double-sided printing. The standard page size is DIN A5. If you prefer a larger display, printing on DIN A4 is recommended.

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## 1. Getting started

The instructions will help you step by step with the safe and proper installation and use of your loop module. Before you start to put the loop module into operation, read this manual completely, especially the safety instructions and the section on possible errors and their elimination. You will then know what you have to pay attention to and thus avoid errors that sometimes can only be rectified with a lot of effort.

Keep the instructions in a safe place so that you can restore functionality later in the event of any malfunctions. If you pass the loop module on to another person, also give the instructions with it.

### 1.1. Contents of the package

- 1 ready-built and tested circuit board KSM-4 (item no. 49-01146-01) or 1 loop module KSM-4 in housing (item no. 49-01147-01)
- 2 push-buttons

### 1.2. Accessories

#### **Connection cables**

The use of stranded wire is recommended for making the connections. Stranded wires consist of several thin individual wires and are therefore more flexible than rigid wires with the same copper cross-section. Recommended cross-sections:

- Connection of the rails:  $\geq 0.75 \text{ mm}^2$
- Connection of the points:  $\geq 0.25 \text{ mm}$
- Connection of the push-buttons:  $\geq 0.10 \text{ mm}$

### 1.3. Intended use

The loop module is intended for use in model railway layouts as specified in the instructions. Any other use is not in accordance with the intended use and will result in the loss of the warranty claim. Intended use also includes reading, understanding and following all parts of the instructions. The loop module is not intended to be used by children under the age of 14.

## 1.4. Safety instructions

**Note:**

The loop module contains integrated circuits (ICs). These are sensitive to electrostatic charging. Therefore, do not touch these components until you have "discharged" yourself. For this purpose, e.g. a grip on a radiator is sufficient.

Improper use and non-observance of the instructions can lead to incalculable hazards. Prevent these dangers by carrying out the following measures:

- Only use the loop module in closed, clean and dry rooms. Avoid moisture and splash water in the environment. After condensation has formed, wait two hours for acclimatisation before use.
- Disconnect the loop module from the power supply before carrying out wiring work.
- Supply the loop module only with extra-low voltage as specified in the technical data. Use only tested and approved transformers.
- Only plug the mains plugs of transformers into properly installed and fused earthed sockets.
- When making electrical connections, ensure that the cable cross-section is sufficient.
- Heating of the loop module during operation is normal and harmless.
- Do not expose the loop module to high ambient temperatures or direct sunlight. Observe the information on the maximum operating temperature in the technical data.
- Regularly check the operational safety of the loop module, e.g. for damage to the connection cables.
- If you notice damage or if malfunctions occur, disconnect the connection to the power supply immediately. Send the loop module in for inspection.

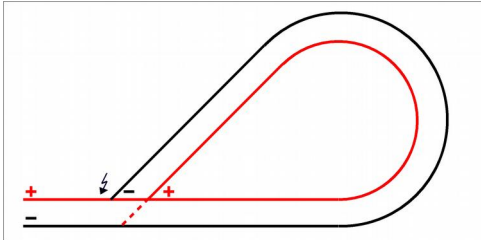
## 1.5. Care

Do not use any cleaning agents to clean the loop module. Only wipe the module dry. Disconnect the loop module from the power supply before cleaning.

## 2. Operation overview

### 2.1. Loop problems

At the loop points in two-rail-systems, different polarities meet with each other. As soon as a vehicle bridges the differently polarized sections when driving in or out the terminal loop a short circuit occurs.



In digital layouts loop modules generally have to adapt the polarity within the terminal loop to the one outside. In case the polarity outside the terminal loop would be altered, different polarities would meet with each other at the transition to the next booster section. Thus the problem would be misaligned only.

### 2.2. Mode of operation of the KSM-4

In standard operation, the KSM-4 adapts the polarity within the terminal loop according to the position of points that way, the polarities at the transition to the outside match. This foresighted setting of the polarity avoids shorts circuits at the transition between the two sections.

#### Controlling the points

The operation principle of the KSM-4 is based on switching as well the points and in doing so, adapting the polarity within the terminal loop depending on the position of points.

The points can be switched in different ways:

- automatically when a train is leaving the terminal loop;
- by means of two push-buttons;
- with DCC accessory commands to the address of the integrated points decoder.

The KSM-4 can be used to control coil driven points as well as motor-run points.

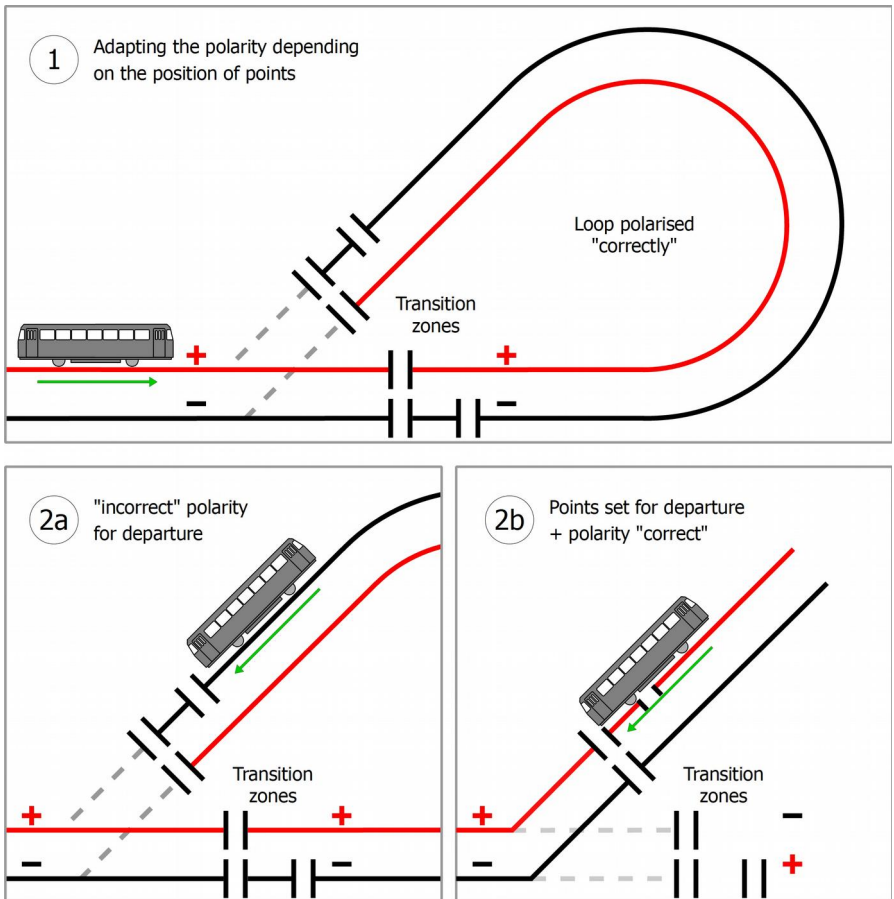
#### "Manual" setting of the points

In this context, "manual" setting of the points means any change of the position of points carried out bypassing the KSM-4; in other words without using the two push-buttons or the integrated points decoder.

When the position of points is changed manually, the KSM-4 cannot adapt foresightedly the polarity within the terminal loop. In this case, a short circuit possibly occurs when a locomotive passes the section point. Then, the KSM-4 alters immediately the polarity within the terminal loop.

This short circuit-based polarity change is intended as a safety measure only; an individual setting of the sensitivity for the polarity reversal is not provided with the KSM-4. For that reason locomotives passing the section point possibly jerk when a short circuit-based polarity change occurs.

## 2.3. Procedure



**Phase 1:** Train entering the terminal loop: When switching the points with the push-buttons or via the integrated points decoder, the polarity in the transmission zone and within the terminal loop is set automatically that way the train can enter the terminal loop without causing a short circuit. In case the position of points has not been altered since the last train has left, the polarity within the terminal loop is already set correctly.

**Phase 2:** Train leaving the terminal loop: As soon as a vehicle (a locomotive or a carriage with current consumer) coming from the inside of the terminal loop reaches one of the two transition zones, it is detected by the integrated track occupancy detector. Thereupon, the points are set that way, the vehicle can leave the terminal loop and the polarity within the loop is adapted. This foresighted setting of the polarity avoids shorts circuits when leaving the terminal loop.

## 2.4. Designing a layout with the KSM-4

The rails in the loop's inside have to be at least as long as the longest train to pass the terminal loop. Additionally, two transition zones which are at least half as long as the longest locomotive have to be added between the points and the loop's inside.

The circuit also works properly when there are several trains within the loop at the same time provided that there are not two locomotives passing the sectioning points simultaneously. This allows branching rails or installing a shadow station within in terminal loop, for example.

The maximum current of all vehicles in the loop is 3 A (including motor current of the locomotive, carriage lightings, other accessories).

## 2.5. Use with a turntable

With turntables different polarities possibly occur at the transitions between bridge and the other parts of the layout after turning the bridge. Loop modules can solve this problem.

In principle, it is possible to use the KSM-4 with turntables, but is not recommended for this application. For this application the loop module KSM-3 (item nos. 49-01135, 49-01136 or 49-01137) is more suitable.



### 3. Connections KSM-4

#### 3.1. Dividing the loop into sections

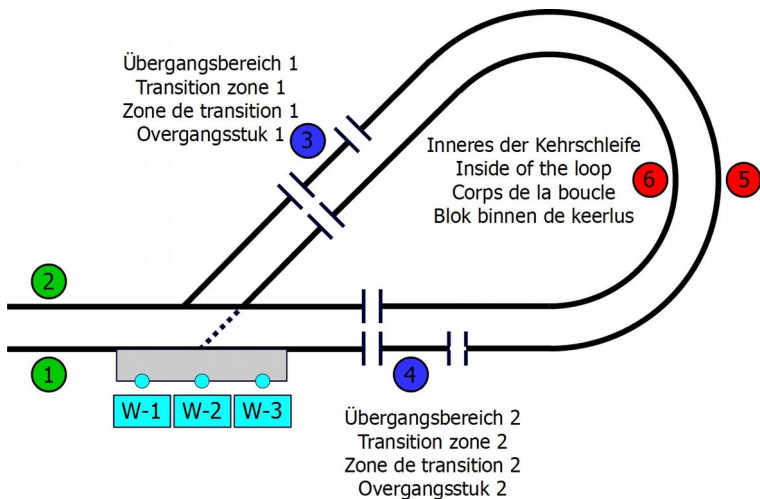
Divide the loop into three sections according to the figure.

- two transition zones near the points and
- the inner section of the loop.

Isolate

- at the transition to the points: both rails;
- at the transition to the terminal loop's inside: the outer rail in both cases.

The transition zones should be about half as long as the longest locomotive, the inner section as long as the longest train. A train within the loop should never bridge both transition zones simultaneously!

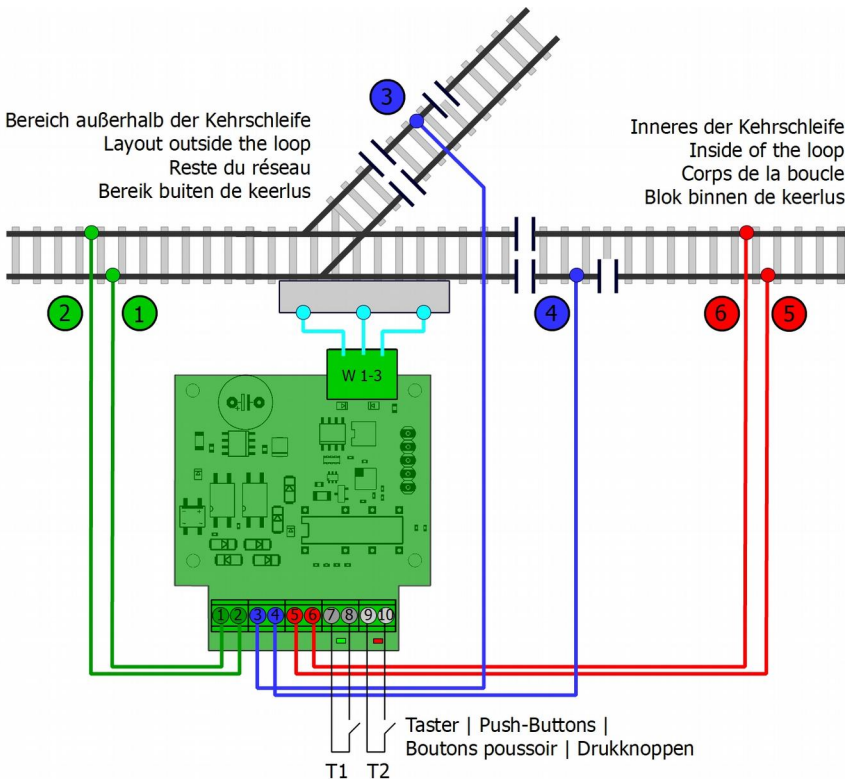


## 3.2. Connections

There are terminal strips soldered to the module which are used to insert and screw on the connecting cables.

1   2	Rails outside the terminal loop. Pay attention to assigning both rail connections exactly as shown in the figure!
3   4	Transition zones, outer rail in both cases.
5   6	Inner section of the loop: 5 → outer rail   6 → inner rail
7   8	Push-button 1
9   10	Push-button 2

	Coil driven points:	Motor-run points:
W 1	Position of points 1	Connection 1
W 2	Voltage supply / Return conductor	not in use
W 3	Position of points 2	Connection 2



## 4. Operation

### LED displays

There are two LEDs (red and green) on the PCB, showing significant operating states:

	red LED	green LED
Standard operation	on → showing the points' switching time	on → position of points 1 off → position of points 2
Setting the address		fast flashing → KSM-4 in programming mode
	After having programmed the new address, both LEDs flash together several times and remain switched on until the points are switched for the next time.	
Setting the switching time for points	on → showing the points' switching time	fast flashing → KSM-4 in setting mode

### Points address

In state of delivery the points react to address 100. In order to change the address, proceed as follows:


1. Switch on the voltage supply ("go"). Push both push-buttons simultaneously. The green LED flashes, the KSM-4 is in programming mode.
2. Enter the desired address at you digital central unit and perform a switching command for this address.
3. The programming mode is terminated automatically. Both LEDs flash together several times and remain switched on until the points are switched for the next time.

### Setting the switching time for the points

In state of delivery the switching time for the points is set to 500 ms. In order to change the switching time, proceed as follows:

1. Switch off the voltage supply ("stop"). Switch on the voltage supply ("go") again and while doing so, keep both push-buttons pushed simultaneously. The green LED flashes, the red one shows the points' switching time.
2. Then, push the push-buttons to alter the switching time; push-button 1 to decrease the switching time, push-button 2 to increase the switching time. The red LED always shows the set switching time. Before altering the switching time again, you have to wait for the red LED to go out.
3. In order to finish the setting of the switching time, switch off the voltage supply again ("stop").

## 5. Checklist for troubleshooting and error correction

 **Warning:** If you notice a strong heat development, immediately disconnect the connection to the supply voltage. **Fire hazard!**

Possible causes:

- One or more connections are faulty. → Check the connections.
- The current consumption of the vehicles in the terminal loop exceeds 3 A. → Reduce the current consumption.
- The module is defective. → Send the loop module in for inspection.

### **Short circuit when entering the transition areas**

Possible causes:

- The connections to the points W1 and W3 have been connected the wrong way. For that reason the polarity within the terminal loop does not correspond to the actual position of points. → Interchange the connections to the points W1 and W3.
- The connections to the rails differ from the connections diagram. → Check the connections 1 to 6 and correct them if necessary.
- The points have been set manually (bypassing the KSM-4). → You should use the push-buttons or the integrated points decoder to set the points instead.

### **Stop of the locomotive when entering the transition areas**

Possible causes:

- One or several connections to the rails have been interrupted. → Check the connections 1 to 6 and correct them if necessary.

## 5.1. Technical Hotline

If you have any questions about the use of your loop module, our technical hotline will help you (telephone number and e-mail address on the last page).

## 5.2. Repairs

You can send us a defective module for repair (address on the last page). In the event of a warranty or guarantee claim, the repair is free of charge for you. As proof of any warranty or guarantee claim, please enclose the proof of purchase with your return.

If there is no warranty or guarantee claim, we are entitled to charge you the costs of the repair and the costs of the return shipment. We charge a maximum of 50% of the new price for the repair according to our valid price list. We reserve the right to refuse the repair if it is technically impossible or uneconomical.

If you want to clarify whether a repair is possible or economical before sending it in, please contact our Technical Hotline (telephone number and email address on the last page).

Please do not send us repair shipments freight collect. In the event of a warranty or guarantee claim, we will reimburse you for the regular shipping costs.

## 6. Technical data

### Digital protocols

Data format	all
Digital format of the integrated points decoder	DCC Address range: 2.040

### Interfaces, outputs and inputs

Track outputs	2 for connecting the tracks inside the reversing loop 2 for connecting the tracks in the transition areas 2 for connecting the tracks outside the reversing loop
Points output	Connection of points mandatory Number: 1 For the direct connection of coil-driven or motor-run points Maximum current: 1 A Switching time: 100 ms to 5 sec (adjustable)
Inputs	2 connections for push-buttons

### Electrical characteristics

Voltage supply	via the rails
Current consumption (without connected devices)	ca. 40 mA
Max. current of all vehicles in the loop	3 A

### Protection

Protection class	Ready-made module (without housing): IP 00 Meaning: No protection against foreign bodies, contact and water.  Ready device (in housing): IP 20 Meaning: Protected against solid foreign bodies with diameter $\geq 12.5$ mm and access with a finger. No protection against water.
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**Environment**

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For use in closed rooms

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Ambient temperature during operation	0 ~ + 30 °C
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Permissible relative humidity during operation	10 ~ 85% (non-condensing)
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Ambient temperature during storage	- 10 ~ + 40 °C
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Permissible relative humidity during storage	10 ~ 85% (non-condensing)
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**Other features**

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Dimensions (approx.)	Circuit board: 48 x 52 mm
	Ready device including housing: 70 x 60 x 25 mm

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Weight (approx.)	Assembled board (ready-made module): 22 g
	Ready device including housing: 39 g

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## 7. Warranty, EU conformity & WEEE

### 7.1. 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-made module or device,
- if damaged by other persons,
- if damaged by faulty operation or by careless use or abuse.



## 7.2. EU Declaration of Conformity



This product fulfils the requirements of the following EU directives and therefore bears the CE marking.

2001/95/EU Product Safety Directive

2015/863/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

2014/30/EU on electromagnetic compatibility (EMC Directive). Underlying standards:

DIN-EN 55014-1 and 55014-2: Electromagnetic compatibility - Requirements for household appliances, electric tools and similar electrical appliances. Part 1: Emitted interference, Part 2: Immunity to interference

To maintain electromagnetic compatibility during operation, observe the following measures:  
Only connect the supply transformer to a professionally installed and fused earthed socket.  
Do not make any changes to the original components and follow the instructions, connection and assembly diagrams in this manual exactly.  
Only use original spare parts for repair work.

## 7.3. Declarations on the WEEE Directive

This product is subject to the requirements of the EU Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE), i.e. the manufacturer, distributor or seller of the product must contribute to the proper disposal and treatment of waste equipment in accordance with EU and national law. This obligation includes

- registration with the registering authorities ("registers") in the country where WEEE is distributed or sold
- the regular reporting of the amount of EEE sold
- the organisation or financing of collection, treatment, recycling and recovery of the products
- for distributors, the establishment of a take-back service where customers can return WEEE free of charge
- for producers, compliance with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive.



The "crossed-out wheeled bin" symbol means that you are legally obliged to recycle the marked equipment at the end of its life. The appliances must not be disposed of with (unsorted) household waste or packaging waste. Dispose of the appliances at special collection and return points, e.g. at recycling centres or at dealers who offer a corresponding take-back service.





Further Information and Tips:

<http://www.tams-online.de>

Warranty and Service:

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