

KSM-3

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 assembly of the kit and installation and use of your loop module. Before you start to assemble the kit or 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 kit KSM-3 (item no. 49-01135-01), containing the components listed in the parts list (see section 3.4.) and one PCB or

1 ready-built and tested circuit board KSM-3 (item no. 49-01136-01) or

1 loop module KSM-3 in housing (item no. 49-01137-01)

1.2. Accessories

To assemble the kit you will need

- a soldering iron with temperature control and a thin tip and a deposit stand or a controlled soldering station
- a scraper, rag or sponge
- a heat-resistant pad
- a small pair of side cutters and wire strippers
- tweezers and flat-nose pliers if necessary
- electronic solder (preferably 0.5 to 0.8 mm diameter)

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:
 - gauges Z and N: $> 0.75 \text{ mm}^2$
 - other gauges: $\geq 1.5 \text{ mm}^2$
- Connection of the points: $\geq 0.25 \text{ mm}$

Connection of motor-run points

The KSM-3 has a connection to which points with double coil drive can be directly connected. To be able to connect motor-run points, you also need an adapter:

- AMW-1 (item no. 72-00076) or
- AMW plus (item no. 72-00176)

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.

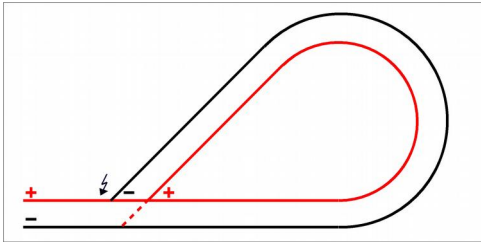


Figure :
Short circuit problem at the loop points

2.2. Mode of operation of the KSM-3

As soon as a locomotive bridges the sectioning point between differently poled sections inside and outside the loop, the KSM-3 changes the polarity within the terminal loop. The response time is extremely short, as the KSM-3 already detects the voltage drop at the switchover to a short-circuit. In consequence, the KSM-3 is able to react within milliseconds before the voltage breaks down due to the short circuit.

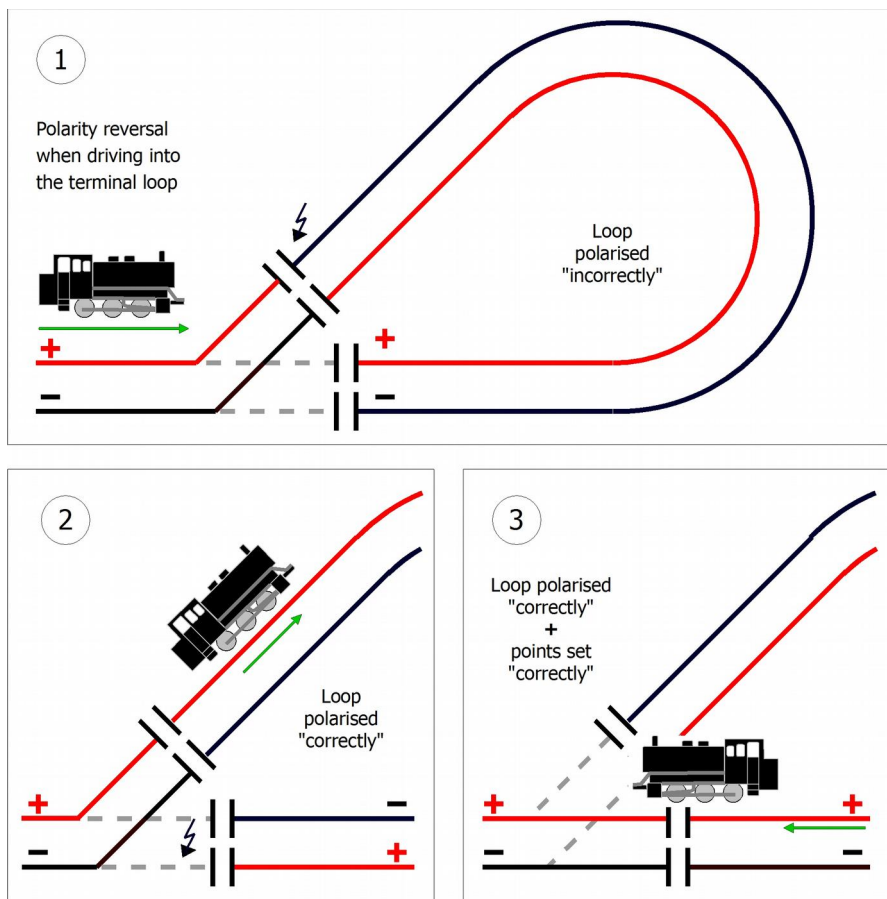
The sensitivity for the polarity reversal depends on the applied voltage and for that reason has to be set via a trimm-pot individually. In order to allow the precise setting a LED on the KSM-3 lights up as soon as the sensitivity has been set optimally (for the particular layout). That way you safely prevent wheels, current collectors and rails from damages and make sure locomotives pass the sectioning point without jerking.

Integrated switching of the points

The KSM-3 can also control the position of the points. The loop control works independently of the points control, so that the connection of the points is not obligatory. Coil driven points can be connected directly to the output for the points. In order to be able to use motor-run points, an adapter for motorised turnouts AMW-1 (item no. 72-00076) or AMW plus (item no. 72-00176) is additionally required.

The points are switched automatically as soon as the locomotive reaches one of the two sectioning points (simultaneously with altering the polarity). The two sectioning points are assigned to a particular correct position of points. That way externally switching the points does not interfere with the safe procedure.

2.3. Procedure



Phase 1: According to the current position of points the locomotive runs clockwise or counter-clockwise through the terminal loop. When the train is intended to run in a specific direction through the loop, the points can be set accordingly from the outside.

Phase 2: When the train running into the loop arrives at the sectioning point behind the points, the polarity within the loop is altered (if necessary).

Phase 3: When the train running out of the loop arrives at the sectioning point before the points, the polarity within the loop is altered and at the same time the points are set properly for the train to run out of the terminal loop.

2.4. Designing a layout with the KSM-3

The rails in the loop's inside between the two sectioning points have to be at least as long as the longest train to pass the terminal loop.

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 within in terminal loop, for example.

The maximum current of all vehicles in the loop is 8 A (including motor current of the locomotive, carriage lighting, other accessories).

2.5. Use with a turntable

With turntables different polarities possibly meet at the transitions between bridge and the other parts of the layout after turning the bridge. The KSM-3 can solve this problem. For that purpose you have to connect the bridge like the loop's inside.

3. Assembling the kit

You can skip this section if you have purchased a ready-built module or device.

3.1. 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.

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.

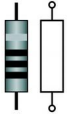
3.2. Soldering properly

- Use a soldering iron with temperature control, which you set to approx. 300 °C.
- Only use electronic solder with a flux.
- Never use soldering water or soldering grease when soldering electronic circuits. These contain an acid that destroys components and conductor paths.
- Insert the connecting wires of the components as far as possible through the holes of the board without using force. The body of the component should be close above the board.
- Make sure that the polarity of the components is correct before soldering them.
- Solder quickly: soldering for too long can cause pads or tracks to become detached or even destroy components.
- Hold the soldering tip on the soldering point in such a way that it touches the component wire and the pad at the same time. Add (not too much) solder simultaneously. As soon as the solder begins to flow, remove it from the soldering point. Then wait a moment for the solder to flow well before removing the soldering iron from the soldering joint.
- Do not move the component you have just soldered for about 5 seconds.
- A clean, non-oxidised (scale-free) soldering tip is essential for a perfect soldering joint and good soldering. Therefore, before each soldering, wipe off excess solder and dirt with a damp sponge, a thick damp cloth or a silicone wiper.
- After soldering, cut off the connecting wires directly above the soldering point with a side cutter.
- After assembly, always check each circuit again to ensure that all components are correctly inserted and polarised. Also check that no connections or tracks have been accidentally bridged with tin. This can lead not only to malfunction, but also to the destruction of expensive components. You can re-liquefy excess solder with the clean hot soldering tip. The solder then flows from the board to the soldering tip.

3.3. Preparation

Put the sorted components in front of you on your workbench. The separate electronic components have the following special features you should take into account in assembling:

Resistors



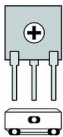
Resistors reduce current.

The value of resistors for smaller power ratings is indicated through colour rings. Every colour stands for another figure.

Carbon film resistors have 4 colour rings. The 4th ring (given in brackets here) indicates the tolerance of the resistor (gold = 5 %).

Value:	Colour rings:
150 Ω	brown - green - brown (gold)
4,7 k Ω	yellow - violet - red (gold)
22 k Ω	red - red - orange (gold)

Trimm-potentiometers



Trimm-potentiometers (abrv. "trimm-pots") are resistors which allow the value of resistance to be varied and that way to be adapted to the particular demands. In the middle they have a small slot into which a small screwdriver can be put in order to vary the value of resistance. The maximum value is printed on the housing.

Depending on the mounting situation trimmpots with a lying or a standing package are used.

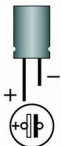
Ceramic capacitors



Among other things ceramic capacitors are used for filtering interference voltages or as frequency determining parts. Ceramic capacitors are not polarized. Normally they are marked with a three-digit number which indicates the value coded.

Number:	Value:
224	220 nF
474	470 nF

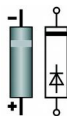
Electrolytic capacitors



Electrolytic capacitors are often used to store energy. In contrast to ceramic capacitors they are polarized. The value is given on the package.

Electrolytic capacitors are available with different voltage sustaining capabilities. Using an electrolytic capacitor with a voltage sustaining capability higher than required is always possible.

Diodes and Zener diodes

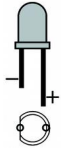


Diodes allow the current to pass through in one direction only (forward direction), simultaneously the voltage is reduced by 0,3 to 0,8 V. Exceeding of the limit voltage always will destroy the diode, and allow current to flow in the reverse direction.

Zener diodes are used for limiting voltages. In contrast to "normal" diodes they are not destroyed when the limit voltage is exceeded.

The diode type is printed on the package.

Light emitting diodes (LEDs)



When operated in the forward direction the LEDs light. They are available in several different versions (differing in colour, size, form, luminosity, maximum current, voltage limits).

Light emitting diodes should always be connected via a series resistor which limits the current and prevents failure. In circuits to which light-emitting diodes are connected, the series resistors are usually integrated on the circuit board.

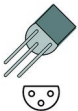
Rectifiers



Rectifiers convert alternating into direct voltage. They have four pins: two for the input voltage (a.c. voltage) and two for the output voltage (d.c. voltage). The pins for the output voltage are polarized.

Transistors

Transistors are current amplifiers which convert low signals into stronger ones. There are several types in different package forms available. The type designation is printed on the component.



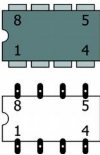
Transistors for a low power rating (e.g. BC types) have a package in form of a half cylinder (SOT-package).



Transistors for a high power rating (e.g. BD types) have a flat package (TO-package), which is in use in different versions and sizes.

The three pins of bipolar transistors (e.g. BC and BT types) are called basis, emitter and collector (abbreviated with the letters B, E, C in the circuit diagram).

Integrated circuits (ICs)



Depending on the type, ICs fulfil various tasks. The most common housing form is the so-called "DIP"-housing, from which 4, 6, 8, 14, 16, 18 or more "legs" (pins) are arranged along the long sides.

ICs are sensitive to damage during soldering (heat, electrostatic charging). For that reason in the place of the ICs IC sockets are soldered in, in which the ICs are inserted later.

Microcontrollers

Microcontrollers are ICs, which are individually programmed for the particular application. The programmed controllers are only available from the manufacturer of the circuit belonging to it.

Relays

Relays are electronic switches, depending on their position the one or other (internal) connection is closed. The mode of operation of monostable relays can be compared to that of a push-button switch, i.e. the connection is only closed as long as the voltage is applied. Bistable relays keep their status after switching – comparable to a switch.

Relays which combine two switches in one housing are common as well (shortly 2xUM). The switching between the two connections can be heard clearly because of the resulting clicking sound.

Screw terminals

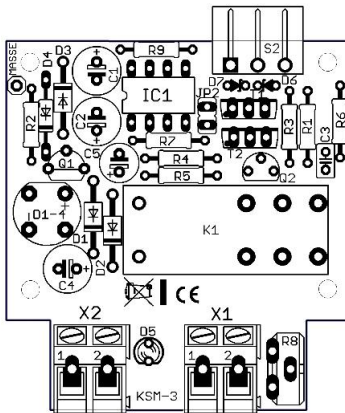
Screw terminals provide a solder-free and safe connection of the cables to the circuit, which can still be separated any time.

Terminal strips are available as single or double row versions with 2 or 3 poles (resp. 2x2 or 2x3 poles). Connections with any number of poles can be created by linking several terminal strips. In order to fix them the connecting cables are inserted and screwed (similar to a lustre terminal).

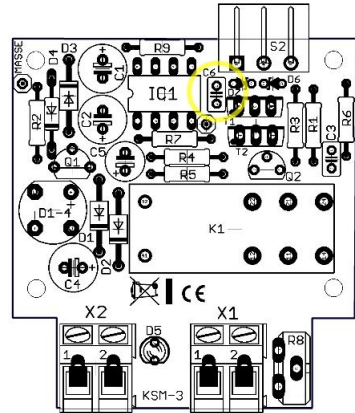
Plug-in units consist of a 2-, 3-, 4- or more pole box header to be soldered on the PCB and an appropriate plug-in part into which the connecting cables have to be inserted and screwed.

3.4. Assembly diagrams and parts list

Assembly diagram hardware version 1



Assembly diagram hardware version 2



Parts list

Resistors	R5	150 Ω
	R2, R3, R4, R6, R7, R9	4,7 k Ω
	R1	22 k Ω
Trim pots	R8	10 k Ω (standing)
Diodes	D1, D2, D3, D6, D7	1N400x, x=2...7
Zener diodes	D4	5V6
LEDs	D5	3 mm (green)
Rectifiers	D1-4	B80C1500 (or similar)
Capacitors	C3	220 nF
	Hardware version 2 only: C6	470 nF
Electrolytic capacitors	C5	2,2 μ F / 25 V
	C1, C2	100 μ F / 25 V
	C4	220 μ F / 25 V
Transistors	Q2	BC337
	Q1	BC547B
	T1, T2	BD679
Micro-Controllers	IC1	PIC12F1571-I/P
IC-sockets	IC1	8-pole
Relais	K1	2xUm, 8 A, 5V monostable
Terminal strips	X1, X2	1x2-pole
Plug-in units	S2	3-pole box header
		3-pole plug-in part

3.5. Assembly

Proceed according to the order given in the list below. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutter. Follow the instructions on soldering in section 3.2.



Caution:

Several components have to be mounted according to their polarity. When soldering these components the wrong way round, they can be damaged when you connect the power. In the worst case the whole circuit can be damaged. At the best, a wrongly connected part will not function.

1.	Resistors	Mounting orientation of no importance.
2.	Diodes, Zener diodes	Observe the polarity! The negative end of the diodes is marked with a ring. This is shown in the PCB layout. Solder the diode D6 and D7 that way, their bodies are standing upright on the PCB.
3.	Ceramic Capacitors	Mounting orientation of no importance.
4.	IC sockets	Mount the sockets that way, the markings on the sockets show in the same direction as the markings on the PCB board.
5.	Transistors	Observe the polarity! The cross section of transistors for a low power rating in SOT-packages is shown in the PCB layout. With transistors for a high power rating in TO packages (e.g. BD types) the unlabelled back side is marked in the PCB layout by a thick line.
6.	Rectifiers	Observe the polarity! The pin connections are printed on the housing. The longer connecting pin is the positive pole.
7.	Electrolytic capacitors	Observe the polarity! One of the two leads (the shorter one) is marked with a minus sign.
8.	Relays	The mounting orientation is given by the layout of the pins.
9.	Light emitting diodes (LEDs)	Observe the polarity! With wired LEDs the longer lead is always the anode (positive pole).
10.	Srew terminals	Terminal strips and box header of the plug-in unit.
11.	Trimm-potentiometers	The mounting orientation is preset by the layout of the three pins.

12.	ICs in DIL-housing	Insert the ICs into the soldered socket. Do not touch the ICs without first discharging yourself by touching a radiator or other grounded metal parts. Do not bend the "legs" when inserting them into the sockets. Check that the markings on the PCB, the socket and the IC show to the same direction.
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3.6. Performing a visual check

Perform a visual check after the assembly of the module and remove faults if necessary:

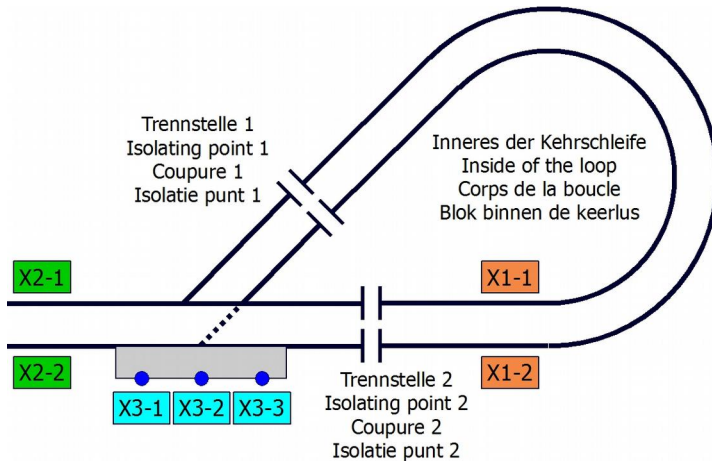
- Remove all loose parts, wire ends or drops of solder from the PCB. Remove all sharp wire ends.
- Check that solder contacts which are close to each other are not unintentionally connected to each other. Risk of short circuit!
- Check that all components are polarised correctly.

When you have remedied all faults, go on to the next part.

4. Connections KSM-3

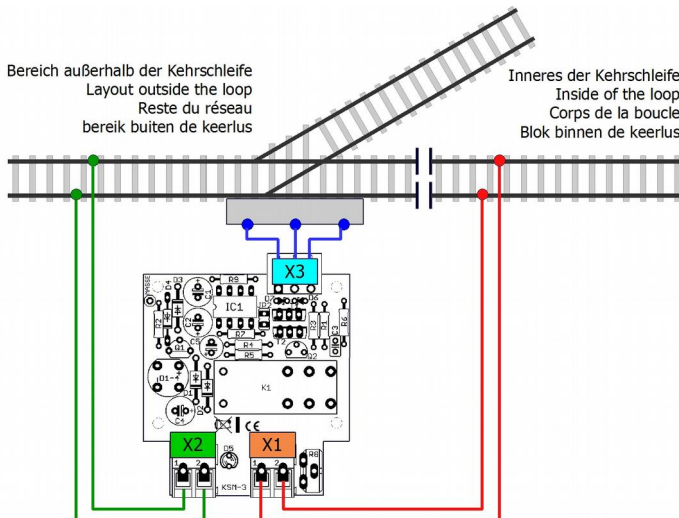
4.1. Isolating the terminal loop from the layout

First isolate the loop completely from the rest of the layout. Arrange the two isolating points as near to the points as possible.



4.2. Connections

There are two terminal strips for the connection of the rails and a plug-in unit (consisting of a box header and an appropriate plug-in part) for the connection of the points soldered to the module which are used to insert and screw on the connecting wires.



Terminal assignment

X1	Inside of the loop 1 → inner rails 2 → outer rails
X2	Layout outside the loop 1 → inner rails 2 → outer rails
X3	Optional: coil driven points (or motor-run points with additional adapter AMW-1 or AMW plus) 1 →Position of points 1 2 →Voltage supply / Return conductor 3 →Position of points 2

Connecting points

Connecting points to the KSM-3 is optional. You can do without when you do not intend to switch the points automatically.

Each of the two isolating points is assigned firmly to one position of points. If the position is "branch" or "straight" depends on the particular mounting situation.

For that reason you have to check after having connected them if the points switch "correctly", when the locomotive passes the isolating points on its way out of the loop. If not, you have to interchange the connections of the points (X3-1 and X3-3).

4.3. Setting the sensitivity for the polarity reversal

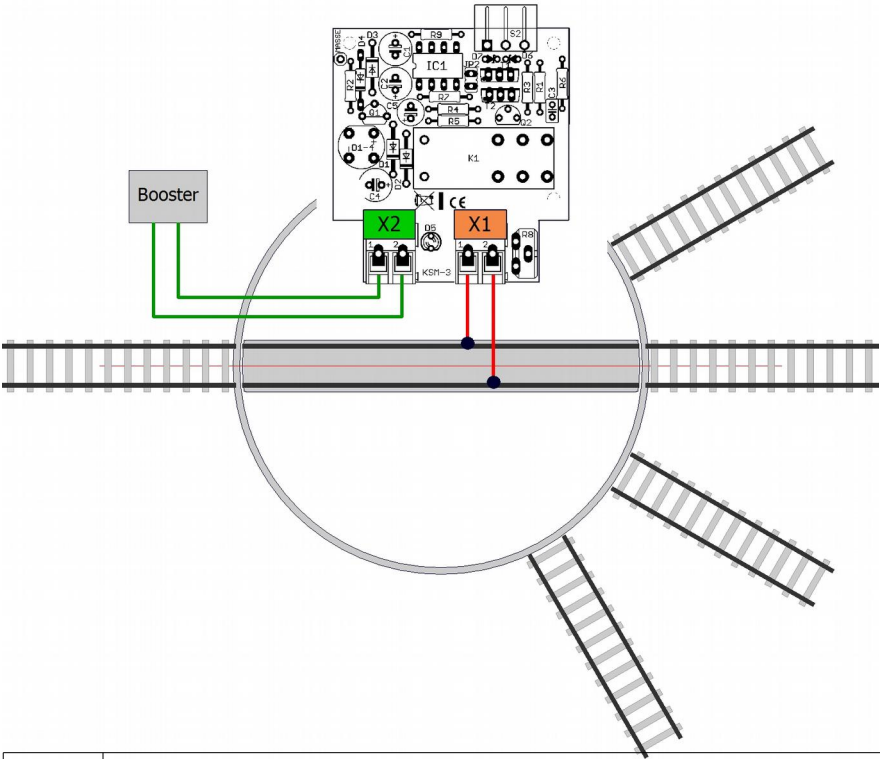
Proceed accurately when setting the sensitivity for the polarity reversal in order to make sure the KSM-3 already reacts at the beginning of the voltage drop and alters the polarity within the loop as quickly as possible. If the inevitably occurring short circuit lasts too long, wheels, rails and current collectors possibly corrode or locomotives passing the sectioning point possibly jerk. With a very high current the short circuit interruption of the booster possibly reacts.

First set the trimm-pot by use of a small screwdriver as far to the left as possible. Then turn it

1. slowly to the right, until the LED lights up or flashes
2. further to the right, until the LED goes out or the relay switches (audible by a clicking sound)
3. carefully back to the left, until the LED lights up or flashes again or the relay stops to switch

4.4. Connecting a turntable

You can use the KSM-3 in combination with a turntable.



X1	Rails of the bridge. The assignment of the connections 1 and 2 is of no importance.
X2	Rail output of the booster 1 → connection for "inner" rails 2 → connection for "outer" rails

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.
- "Kit" version: one or more components are soldered incorrectly. → Carry out a visual inspection (→ section 3.6.) and eliminate the faults, if necessary.
- The current consumption of the vehicles in the terminal loop exceeds 8 A. → Reduce the current consumption.
- The module is defective. → Send the feedback module in for inspection.

When setting the trimming pot the relay does not switch.

Possible causes:

- "Kit" version: One or more components are soldered incorrectly. → Perform a visual check.
- "Kit" version: The IC has been inserted into the IC-socket in the wrong direction. → The IC has consequently been destroyed and must be replaced. (The programmed IC can only be purchased directly from Tams Elektronik!)

During operation the central unit switches off.

Possible causes:

- "Kit" version: One or more components are soldered incorrectly. → Perform a visual check.
- The trimming pot is set incorrectly. → Set the trimming pot according to the section "Setting the operating point" and repeat the test.

When the train is driving out of the loop the points are switched incorrectly.

Possible causes:

- The connections X3-1 and X3-3 have been assigned incorrectly. → Interchange the connections.

When switching the points, a short circuit occurs, possibly the points clatter.

Possible causes:

- The current needed to switch the points is higher than 1 A. → Solder a choke (e.g. 3,3 µH) into the conductor to the points' voltage supply (middle connector).

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
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Interfaces, outputs and inputs

Track outputs	2 for connecting the tracks inside the loop 2 for connecting the tracks outside the loop
Points output	Connection of points optional Number: 1 For the direct connection of coil-driven points Maximum current: 1 A

Electrical characteristics

Voltage supply	via the rails
Current consumption (without connected devices)	ca. 20 mA
Max. current of all vehicles in the loop	8 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 ≥ 12.5 mm and access with a finger. No protection against water.
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Environment



For use in closed rooms

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

Other features

Dimensions (approx.)	Circuit board: 48 x 52 mm
	Ready device including housing: 70 x 60 x 25 mm
Weight (approx.)	Assembled board (ready-made module): 37 g
	Ready device including housing: 54 g

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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