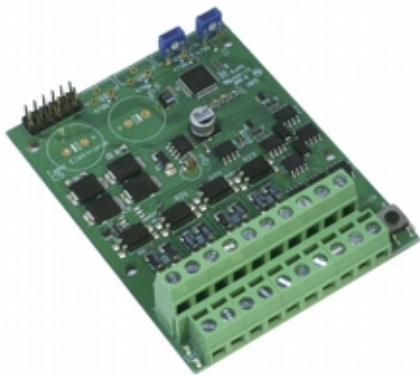


Manual

HELIOS.DC

Item no. 51-02046 | 51-02047



Shuttle-train control
for analogue d.c. model railway layouts

tams elektronik



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1. Getting started

How to use this manual

This manual gives step-by-step instructions for safe and correct fitting and connecting of the control module, and operation. 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 module on to another person, please pass on the manual with it.

Intended use

The shuttle-train control HELIOS is designed to be operated according to the instructions in this manual in model building, especially with model railways. Any other use is inappropriate and invalidates any guarantees.

The module 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 ready-built module or
- one ready-built module in a housing (complete unit),
- 6 jumpers,
- a CD (containing the manual and further information).

Required materials

In order to connect the module you need wire. Recommended diameters for the connections connections to rails and points: $\geq 0,25 \text{ mm}^2$.

When connecting points at the terminus stations which are **no** stop points you need to switch the points

- a bistable relay 12 V (e.g. item no. 84-61111) or
- a relay print RL-2 (e.g. 72-00055 as a kit or 72-00056 as a ready-built module).

Info: With stop points, only the track in which the points are set are supplied with power, while the other track is automatically de-energized when the points are switched.

If you use motor-driven points, you will need

- one AMW-1 adapter (item no. 72-00076-01) or
- one AMW-plus adapter (item no. 72-00176-01)

for each of the two points at the termini and for the two points at the branches to the intermediate stops.

Note: In the case of motor-run points with a power consumption of less than 1 A, you can connect the two points at the branches to the intermediate stops together to one AMW adapter.

2. Safety instructions



Caution:

The control module contains integrated circuits. These are very sensitive to static electricity. Do not touch components without first discharging yourself. Touching a radiator or other grounded metal part will discharge you.

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.

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 module.

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.


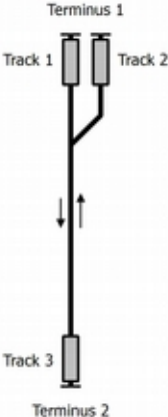
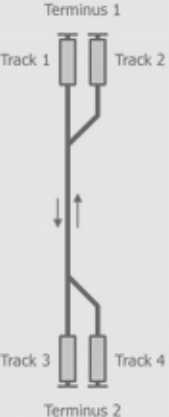
3. Operation overview

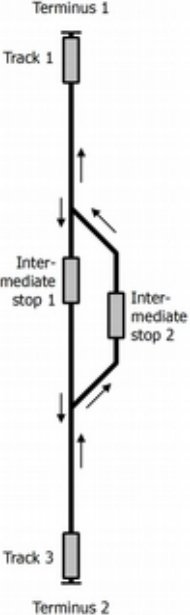
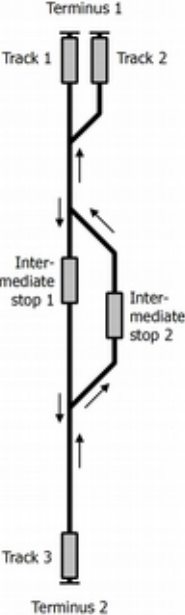
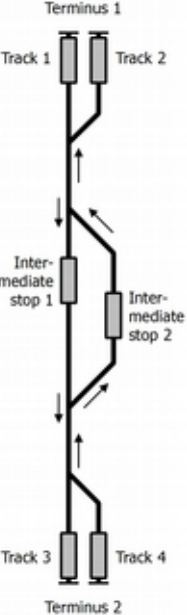
Expansion options

The module controls the shuttle-train traffic between two terminus stations of an analogue d.c. model railway layout. It is possible to build both terminus stations single- or double-track.

In addition, you can build two intermediate stops or an intermediate station with two tracks. It is not possible to build only one intermediate stop or a single-track intermediate station.

Depending on the version, it is possible to operate up to 4 different locomotives on the shuttle line.

Version 1	Version 2	Version 3*
 <p>Terminus 1</p> <p>Track 1</p> <p>Track 3</p> <p>Terminus 2</p>	 <p>Terminus 1</p> <p>Track 1</p> <p>Track 2</p> <p>Track 3</p> <p>Terminus 2</p>	 <p>Terminus 1</p> <p>Track 1</p> <p>Track 2</p> <p>Track 3</p> <p>Track 4</p> <p>Terminus 2</p>
max. 1 locomotive	max. 2 locomotives	max. 3 locomotives

Version 4	Version 5	Version 6
 <p>Diagram of Version 4 track layout. It shows a vertical main track with three terminus points: Terminus 1 at the top, Terminus 2 at the bottom, and an unlabeled Terminus 3 at the very bottom. Two intermediate stops, labeled 'Intermediate stop 1' and 'Intermediate stop 2', are positioned on the main track. From 'Intermediate stop 1', a track branches off to the right, passing through 'Intermediate stop 2', and then turns back to the left to merge with the main track. From 'Intermediate stop 2', a track branches off to the right and then turns back to the left to merge with the main track. Arrows indicate bidirectional traffic flow.</p>	 <p>Diagram of Version 5 track layout. It features a vertical main track with Terminus 1 at the top and Terminus 2 at the bottom. Two intermediate stops, 'Intermediate stop 1' and 'Intermediate stop 2', are on the main track. At the top, 'Track 1' and 'Track 2' are shown as two parallel tracks that merge into the main track. At the bottom, 'Track 3' is a single track that branches off from the main track. From 'Intermediate stop 1', a track branches off to the right, passing through 'Intermediate stop 2', and then turns back to the left to merge with the main track. From 'Intermediate stop 2', a track branches off to the right and then turns back to the left to merge with the main track. Arrows indicate bidirectional traffic flow.</p>	 <p>Diagram of Version 6 track layout. It features a vertical main track with Terminus 1 at the top and Terminus 2 at the bottom. Two intermediate stops, 'Intermediate stop 1' and 'Intermediate stop 2', are on the main track. At the top, 'Track 1' and 'Track 2' are two parallel tracks that merge into the main track. At the bottom, 'Track 3' and 'Track 4' are two parallel tracks that merge into the main track. From 'Intermediate stop 1', a track branches off to the right, passing through 'Intermediate stop 2', and then turns back to the left to merge with the main track. From 'Intermediate stop 2', a track branches off to the right and then turns back to the left to merge with the main track. Arrows indicate bidirectional traffic flow.</p>
max. 2 locomotives	max. 3 locomotives	max. 4 locomotives

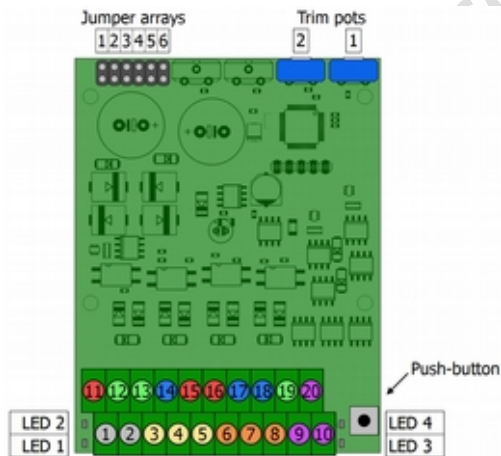
* Note on version 3: With the current software status (12/2018, silvery marking on the processor) it is not possible to control version 3. Please contact us, if you intend to build this version. Address see last page.

Settings for the automatic shuttle operation

The shuttle service between the terminus stations (and intermediate stops) always runs in four phases: acceleration, open track, braking and halt.

The length of the phases acceleration, braking and halt has to be set individually for each locomotive and each station. Additionally, the individual maximum speed for each locomotive has to be set.

When beginning the shuttle service, every locomotive starts from its assigned track. This allows to assign the individual settings to each locomotive.



All settings are made via trim pots. The settings are saved in an IC on the circuit.

Shuttle operation

The shuttle service is run fully automatically:

- After a stop (at a terminus or intermediate stop), HELIOS sets the points.
- HELIOS controls the locomotives' acceleration depending on the individual settings.
- On open track, HELIOS limits the locomotives' speed according to the individually set maximum speed.
- As soon as an integrated occupancy sensor detects a locomotive driving into a section with a station or an intermediate stop, HELIOS starts braking the locomotive.
- HELIOS makes the locomotives stop for the set time at stations or intermediate stops.

The procedure varies depending on the version, the number of locomotives on the shuttle line and the starting positions of the locomotives. Basically the following applies:

- When operating 2 locomotives which start from the two tracks of one terminus, the two locomotives shuttle one after the other between start and destination station. A possibly existing second track at the destination station will not be used.
- When operating shuttle lines with intermediate stops and at least 2 locomotives starting from the two terminus stations, the first locomotive reaching the intermediate stop waits for driving on until the oncoming (second) locomotive has reached the second track of the intermediate stop. If necessary, the set hold time will be exceeded.

Further information on operation → section 6.1.

Overcurrent protection

A fuse integrated in the module interrupts the current circuit with overload or when a short circuit occurs on the rails and thus protects the module from damage.

4. Technical specifications

Voltage supply

As a common supply for the shuttle-train control HELIOS, rails and points you need a transformer for model railroads with fixed output voltage. The output voltage has to be sufficient for switching the points. Recommended output voltage:

Nominal size	Z	N/TT	H0	0, 1, 2
D.C. voltage	12 V	14–16 V	18–20 V	20–22 V
A.C. voltage	10 V	12 V	16 V	18 V

Technical specifications

Current consumption of the circuit	approx. 50 mA
Max. current for the rails	2,000 mA
Protected to	IP 00
Ambient temperature in use	0 ... +60 °C
Ambient temperature in storage	-10 ... +80 °C
Comparative humidity allowed	max. 85 %
Dimensions of the PCB	approx. 64 x 84 mm
Dimensions including housing	approx. 100 x 90 x 35 mm
Weight of the assembled board	approx. 37 g
Weight including housing	approx. 85 g

5. Connecting HELIOS

Please note:

It is of great importance to cut-off electrically the shuttle line completely from the rest of the layout. With an electroconductive connection to other parts of the layout, the control module possibly can be damaged irreparably by compensating currents.

Please note:

Dismount anti-interference capacitors possibly mounted to the rails of the shuttle line. They can disturb the operation massively.

5.1. Dividing the shuttle line into sections

The halts at the stations and intermediate stops are initiated when the train has come into the respective section and the integrated occupancy indicator has indicated the train coming in. Cut-off the rails at the point where the coming-in train has to start braking.

The division of the shuttle-train sections should be done as follows:

- at least: terminus station 1 and terminus station 2
- optional: additional (2nd) track at terminus station 1 and/or 2
- optional: intermediate stop 1 and 2.

Between the terminus stations and the intermediate stops you can insert in each case a section "open track", where the locomotive runs with the set maximum speed.

Performing the dividing points

Take care to cut-off the sections exactly as shown in the connection diagram for the chosen version (→ sections 5.5. and 5.6.).

 **Please note:**

As a rule, you have to perform the dividing points very carefully. When bridging a dividing point (e.g. by shifting rails or by metal shavings), HELIOS cannot control the shuttle service properly. This can e.g. cause locomotive collisions!

In general, the following applies for all cut-offs:

- 2-rail systems according to NEM 631 (= standard), where the right rail in direction of travel is positive: With these layouts you have to cut-off the left rail in direction of travel to define a new section.
- 2-rail systems not according to NEM 631 (= special case, e.g. LGB), where the left rail in direction of travel is positive: With these layouts you have to cut-off the right rail in direction of travel to define a new section.

Dividing points 4 - 11 at the intermediate stops

The distance between the dividing points for the intermediate stops has to be sufficiently long for a train with all its current consumers. Otherwise, malfunction of the shuttle service possibly occurs when oncoming trains pass each other at the intermediate halts.

 **Please note:**

At both intermediate halts you must always cut-off both rails at both ends. Otherwise operation will be disturbed massively!

Dividing points 1 and 2, 13 and 14 at the terminus stations

You have to perform these dividing points only, when **not** using stop points. The sections between these intermediate stops and the end of the rails has to be as long as the train intended to stop there.

5.2. Connecting the power supply

As a common supply for the shuttle-train control HELIOS, rails and points you have to use a d.c. or a.c. transformer for model railroads with fixed output voltage. The required output voltage depends on the nominal size and the power requirements of the connected points (→section 4.).

The polarity is of no importance, when connectin only HELIOS.

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1	Voltage supply			
2				



Please note:

When connecting several devices to the same transformer, all connections have to be polarized the same way, as a rule. Otherwise a short circuit could occur damaging connected devices.

Do **not** use the transformer to supply other devices connected to the rails in any way. Otherwise, compensating currents can cause irreparable damages at the module.

Connecting motor-run points

When using motor-run points, you need additional adapters AMW-1 or AMW-plus for the connection between points and shuttle-train control, namely:

at the terminal stations:

one adapter per switch/station

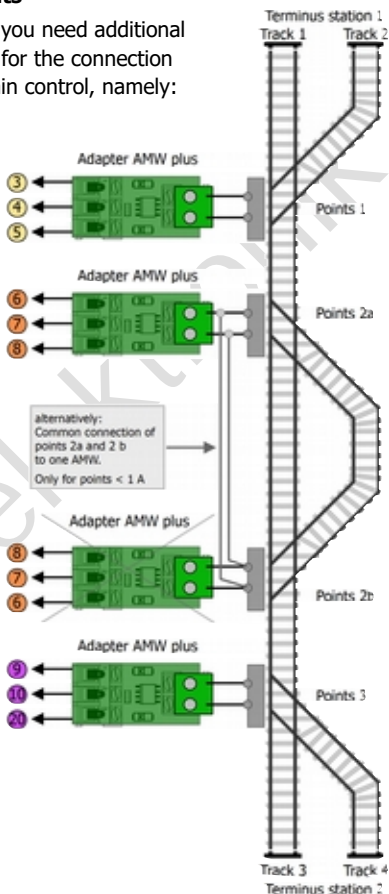
for the two switches at the intermediate stops:

turnout drives $< 1\text{ A}$:

one common adapter

turnout drives $> 1\text{ A}$:

one adapter per turnout

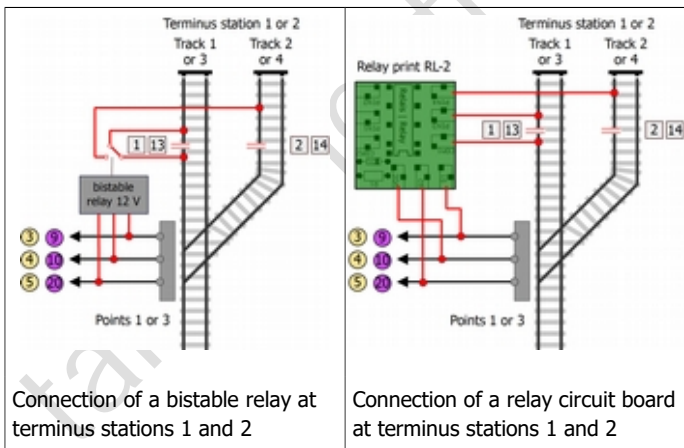


5.3. Connecting points at the terminal stations

This section is only relevant if you do not use stop points at 2-track end stations. With stop points, only the track in which the turnout is set is supplied with power, while the other track is automatically de-energised when the turnout is switched.

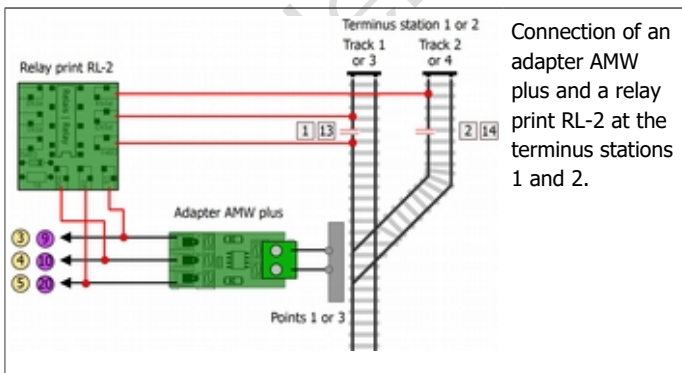
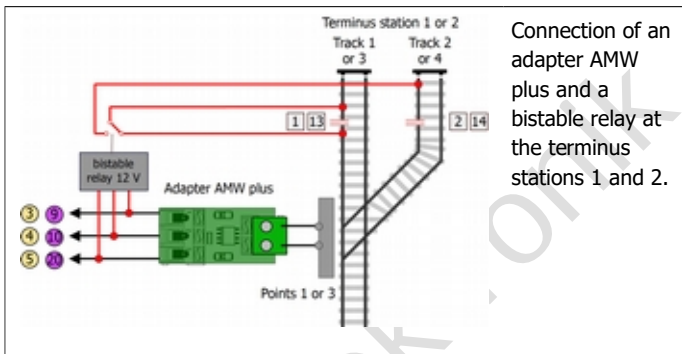
To switch the power supply for one of the two tracks on and off for the other track, you must in this case additionally connect a bistable relay 12 V (or a relay print RL-2). If neither stop points nor bistable relays are used, both tracks are permanently supplied with power in the terminus stations.

Points with twin-coil drive



Motor-run points

You need for both points at the terminus stations a separate adapter AMW-1 or AMW plus and a bistable relay or a relay print RL-2.



Note on the design of the dividing points

The dividing points 1 and 2 (terminal station 1) or 13 and 14 (terminal station 2) can be arranged

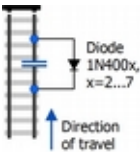
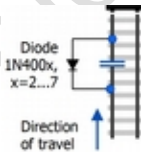
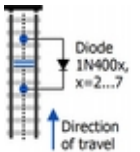
- in 2-rail systems according to NEM 361 and
- in 2-rail systems that do not correspond to NEM 631 (e.g. LGB systems)

either in the left or right rails - regardless of which side the other dividing points (4-11) are arranged on.

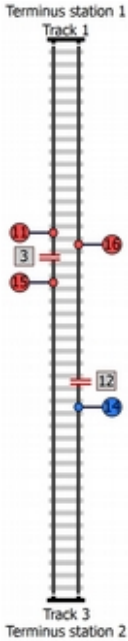
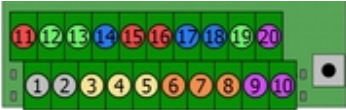
5.4. Connecting stop diodes

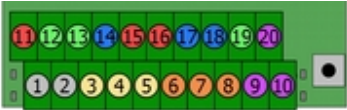
In order to prevent trains from running beyond the end of the rails in the terminus stations 1 and 2, you can install extra stop diodes.

Connect them according to the diagrams. Cut the rail that way that all current collectors driving the motor have passed the cut-off before the train reaches the end of the rails.

 <p>Diode 1N400x, x=2...7</p> <p>Direction of travel</p> <p>Connection of a stop diode in 2-rail systems according to NEM 631</p>	 <p>Diode 1N400x, x=2...7</p> <p>Direction of travel</p> <p>Connection of a stop diode in 2-rail systems not according to NEM 631</p>	 <p>Diode 1N400x, x=2...7</p> <p>Direction of travel</p> <p>Connection of a stop diode in 3-rail systems</p>
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5.5. Connections for 2-rail systems compliant to NEM 631

Version 1	2-rail system compliant to NEM 631																																								
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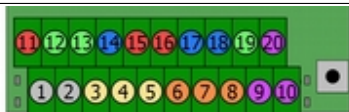
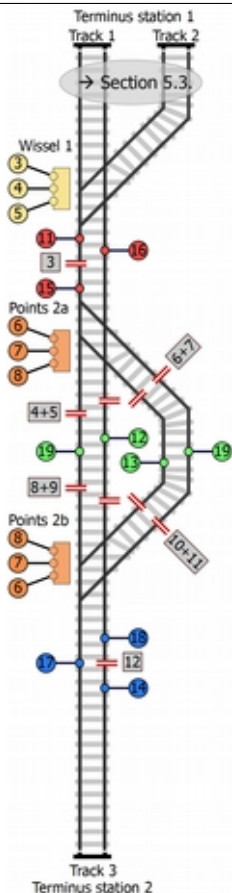
Version 3*	2-rail system compliant to NEM 631																																								
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Version 5

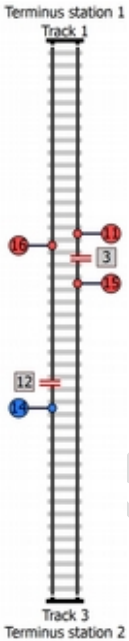

2-rail system compliant to NEM 631

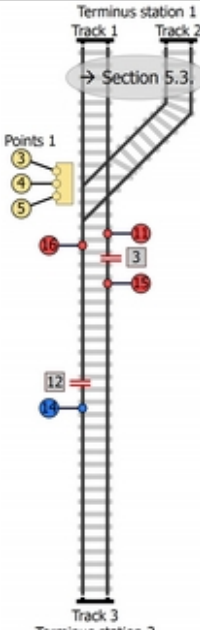
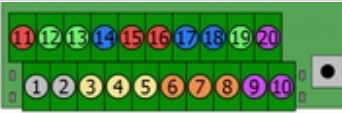


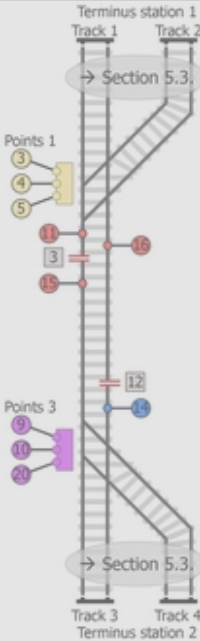
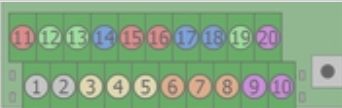
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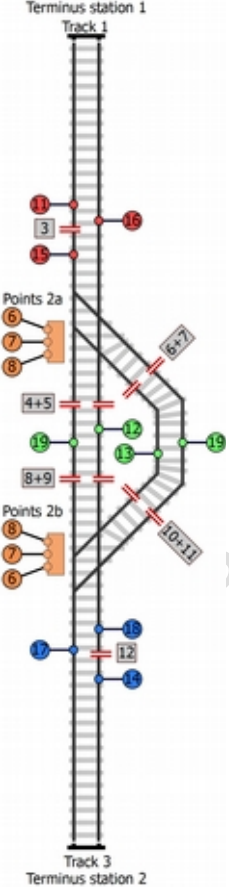

5.6. Connections for 2-rail systems non-compliant to NEM 631

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14	Terminus station 2																																								
15	Open track 1																																								
16	Open track 2																																								
17	Open track 3																																								
18	Open track 4																																								
19	Return conductor																																								

Version 6	2-rail system non-compliant to NEM 631																																								
	<table border="1"> <tr> <td data-bbox="396 350 446 394">1</td> <td data-bbox="446 350 956 394">Voltage supply</td> </tr> <tr> <td data-bbox="396 394 446 438">2</td> <td data-bbox="446 394 956 438">Voltage supply</td> </tr> <tr> <td data-bbox="396 438 446 481">3</td> <td data-bbox="446 438 956 481">Points 1, switching contact 1</td> </tr> <tr> <td data-bbox="396 481 446 525">4</td> <td data-bbox="446 481 956 525">Points 1, return conductor</td> </tr> <tr> <td data-bbox="396 525 446 569">5</td> <td data-bbox="446 525 956 569">Points 1, switching contact 2</td> </tr> <tr> <td data-bbox="396 569 446 656">6</td> <td data-bbox="446 569 956 656">Points 2a, switching contact 1 Points 2b, switching contact 2</td> </tr> <tr> <td data-bbox="396 656 446 700">7</td> <td data-bbox="446 656 956 700">Points 2a und 2b, return conductor</td> </tr> <tr> <td data-bbox="396 700 446 787">8</td> <td data-bbox="446 700 956 787">Points 2a, switching contact 2 Points 2b, switching contact 1</td> </tr> <tr> <td data-bbox="396 787 446 831">9</td> <td data-bbox="446 787 956 831">Points 3, switching contact 1</td> </tr> <tr> <td data-bbox="396 831 446 875">10</td> <td data-bbox="446 831 956 875">Points 3, return conductor</td> </tr> <tr> <td data-bbox="396 875 446 918">20</td> <td data-bbox="446 875 956 918">Points 3, switching contact 2</td> </tr> <tr> <td data-bbox="396 918 446 962">11</td> <td data-bbox="446 918 956 962">Terminus station 1</td> </tr> <tr> <td data-bbox="396 962 446 1006">12</td> <td data-bbox="446 962 956 1006">Intermediate stop 1</td> </tr> <tr> <td data-bbox="396 1006 446 1049">13</td> <td data-bbox="446 1006 956 1049">Intermediate stop 2</td> </tr> <tr> <td data-bbox="396 1049 446 1093">14</td> <td data-bbox="446 1049 956 1093">Terminus station 2</td> </tr> <tr> <td data-bbox="396 1093 446 1137">15</td> <td data-bbox="446 1093 956 1137">Open track 1</td> </tr> <tr> <td data-bbox="396 1137 446 1180">16</td> <td data-bbox="446 1137 956 1180">Open track 2</td> </tr> <tr> <td data-bbox="396 1180 446 1224">17</td> <td data-bbox="446 1180 956 1224">Open track 3</td> </tr> <tr> <td data-bbox="396 1224 446 1268">18</td> <td data-bbox="446 1224 956 1268">Open track 4</td> </tr> <tr> <td data-bbox="396 1268 446 1343">19</td> <td data-bbox="446 1268 956 1343">Return conductor</td> </tr> </table>	1	Voltage supply	2	Voltage supply	3	Points 1, switching contact 1	4	Points 1, return conductor	5	Points 1, switching contact 2	6	Points 2a, switching contact 1 Points 2b, switching contact 2	7	Points 2a und 2b, return conductor	8	Points 2a, switching contact 2 Points 2b, switching contact 1	9	Points 3, switching contact 1	10	Points 3, return conductor	20	Points 3, switching contact 2	11	Terminus station 1	12	Intermediate stop 1	13	Intermediate stop 2	14	Terminus station 2	15	Open track 1	16	Open track 2	17	Open track 3	18	Open track 4	19	Return conductor
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10	Points 3, return conductor																																								
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18	Open track 4																																								
19	Return conductor																																								

6. Adjusting and programming HELIOS



Before adjusting the driving characteristics for your locomotives (→ sections 6.2. to 6.5.), a trial operation with the factory (default) settings is recommended. This allows you to check, if all dividing points and connections have been made correctly.

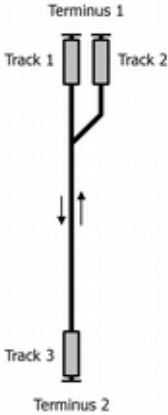

6.1. Determining the version



By inserting jumpers you determine

- if the shuttle line has intermediate stops or not,
- how many locomotives are run on the shuttle line,
- from which tracks of the terminus stations the locomotives start.

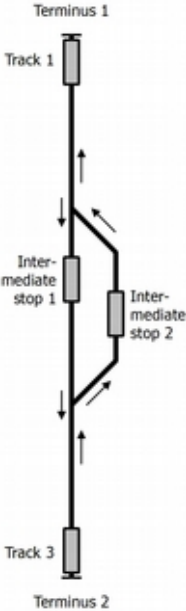

If your HELIOS is built into a housing, you must remove the housing cover to be able to plug in the jumpers.

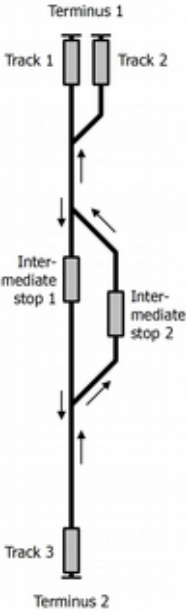


Version 1: max. 1 locomotive	Settings	Effects
		<p>no intermediate stop</p> <p>Starting track: 1</p> <p>Operation: Locomotive 1 shuttles between the two terminus stations.</p>
	5 inserted	no intermediate stop
	1 inserted	Starting track: 1
	2 3 and 4 open	

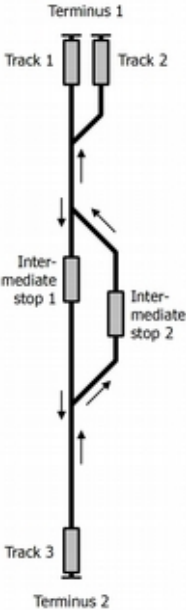

Version 2: max. 2 locomotives	Settings	Effects
		
	5 inserted	no intermediate stop
	1 and/or 2 inserted	Starting tracks: 1 and/or 2
	3 and 4 open	
<p>Operation:</p> <p>Locomotive 1 and locomotive 2 shuttle in turns between the two terminus stations.</p> <p>When setting only one locomotive for the shuttle service, the operation is the same as described for version 1. In this case, the points at terminus station 1 will not be switched.</p>		

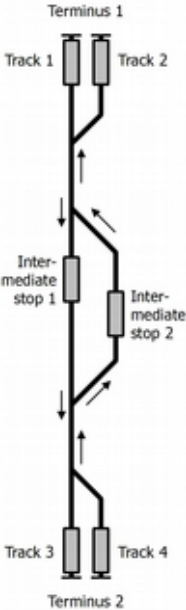

Version 3*: max. 3 locomotives	Settings	Effects
		
	<input type="checkbox"/> 5 inserted	no intermediate stop
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 inserted	Starting tracks: 1, 2 and/or 3
	<input type="checkbox"/> 4 open	
	<p>Operation:</p> <ol style="list-style-type: none"> 1. Locomotive 1 runs from terminus station 1, track 1 to terminus station 2, track 4. 2. Locomotive 3 runs from terminus station 2, track 3 to terminus station 1, track 1. 3. Locomotive 2 runs from terminus station 1, track 2 to terminus station 2, track 3. and so forth.	
	When setting less than 3 locomotives for the shuttle service, the operation is the same as described for versions 1 or 2.	

* Note on version 3: With the current software status (12/2018, silvery marking on the processor) it is not possible to control version 3. Please contact us, if you intend to build this version. Address see last page.

Version 4: max. 2 locomotives	Settings	Effects
		
	<input type="checkbox"/> 5 open	with intermediate stop
	<input type="checkbox"/> 1 and/or <input type="checkbox"/> 3 gesetzt	Starting tracks: 1 and/or 3
	<input type="checkbox"/> 2 and <input type="checkbox"/> 4 open	1 and/or 3
	<p>Operation:</p> <p>Both locomotives start the shuttle service between the two terminus stations at the same time. The locomotives stop at the two intermediate stops for the set hold time, but at least until the oncoming locomotive has reached the intermediate stop as well.</p> <p>When setting only one locomotive for the shuttle service, the locomotive stops on its outward journey at the one intermediate stop, and on its return journey at the other stop.</p>	

Version 5: 2 locomotives	Settings	Effects
		
	<input type="checkbox"/> 5 open	with intermediate stop
	<input checked="" type="checkbox"/> 1 and <input checked="" type="checkbox"/> 2 inserted	Starting tracks: 1 and 2
	<input type="checkbox"/> 3 and <input type="checkbox"/> 4 open	
	<p>Operation: Locomotive 1 and locomotive 2 shuttle in turns between the two terminus stations. On their outward journey, they stop at the one intermediate stop, and on their return journey at the other stop.</p>	
		
	<input type="checkbox"/> 5 open	with intermediate stop
	<input checked="" type="checkbox"/> 2 and <input checked="" type="checkbox"/> 3 inserted	Starting tracks: 2 and 3
<input type="checkbox"/> 1 and <input type="checkbox"/> 4 open		
<p>Operation: Locomotive 2 and 3 start at the two terminus stations at the same time. The locomotives stop at the two intermediate stops. In this case, the points at terminus station 1 will not be switched.</p>		

Version 5: 3 locomotives	Settings	Effects
		
		5 open
	1 2 3 inserted	Starting tracks:
	4 open	1, 2 and 3
	<p>Operation:</p> <p>Locomotive 1 and 3 start at the two terminus stations at the same time. The locomotives stop at the two intermediate stops for the set hold time, but at least until the oncoming locomotive has reached the intermediate stop as well.</p> <p>Afterwards, the operation will be repeated with locomotive 2 from track 2 and locomotive 1 from track 3 and so forth.</p>	

Version 6: max. 4 locomotives	Settings	Effects
	 <input type="text" value="5"/> open <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/> inserted	 with intermediate stop Starting tracks: 1, 2, 3 and 4 Operation: Locomotive 1 and 3 start at the two terminus stations at the same time. The locomotives stop at the two intermediate stops for the set hold time, but at least until the oncoming locomotive has reached the intermediate stop as well. Afterwards, the operation will be repeated with locomotive 2 from track 2 and locomotive 4 from track 4 and so forth. When setting less than 4 locomotives for shuttle service, the operation is the same as described for version 4 or 5.

6.2. Setting the locomotives' driving characteristics

You set individually for each locomotive one after the other in 3 programming steps:

- the maximum velocity,
- the duration for accelerating and braking,
- the halt time.

You adjust the length of the phases separately for both terminus stations and in common for intermediate stops. In order to alter the settings, you have to change the trimpots' positions. The settings are saved in an IC. After having saved the settings, the trimpots' positions do not have any effect.

Preparations

1. Warming up the locomotive. Do not start making settings before the locomotive you have run it some rounds (and the motor is warm).

2. Determining the starting tracks. The settings made for a locomotive's driving characteristics are saved for a specific starting track. For that reason, you have to determine from which tracks of the terminus stations the locomotives start when beginning the shuttle operation. When starting a locomotive from another track than the one chosen when setting the driving characteristics, the locomotive does not run with its "own" characteristics but the ones of another locomotive.

3. Taking off the housing lid: If your HELIOS is built into a housing, you have to remove the housing cover, because during programming you have to change the settings of the trim pots and change jumpers.

4. Reconnecting the jumpers: You use the jumpers to define for the individual programming steps





- which type of settings you make,
- for which locomotives you make settings,
- for which stations you make settings.

5. Turning the trimpots to left limit stop. Before any programming step, turn both trimpots to left limit stop. Otherwise, the locomotives possibly run too fast after changing into the programming mode, or the the phases for accelerating, braking and halting are too long.

At any time, you can alter single settings. The other settings remain unaffected by the changes.

6.3. Setting the maximum speed

Choosing a locomotive for programming

Locomotive 1 Starting positiong: track 1 -- inserted	
Locomotive 2 Starting positiong: track 2 <input type="checkbox"/> 1 inserted	
Locomotive 3 Starting positiong: track 3 <input type="checkbox"/> 2 inserted	
Locomotive 4 Starting positiong: track 4 <input type="checkbox"/> 1 and <input type="checkbox"/> 2 inserted	





You can put locomotives 1 and 2 or locomotives 3 and 4 on the tracks at once, in order to program them one after the other. The tracks of the opposite terminus station always have to be open when changing into the programming mode.

Setting the maximum speed

Preparation	Turn the trimpots to left limit stop.. Choose a locomotive for programming (by inserting jumpers).
Starting the programming mode	Only necessary after having switched off the voltage supply: In order to change into the programming mode, hold the push-button pressed while switching on the voltage supply for approx. 1 second. LED 1 flashes and the locomotive starts shuttle operation from its starting track.
Setting the maximum speed	By turning trimpot 1 you alter the maximum speed.
Saving the settings	By pressing the push-button you save the set maximum speed. Please note: The settings can only be saved when the locomotive approaches the starting station. For that reason you have to keep the button pressed until the LEDs 2 to 4 start to flash quickly. HELIOS shows taking over the settings by the LEDs 2 to 4 flashing slowly.
Changing to making further settings or finishing the programming mode	Change the jumpers' position and press the button anew or Switch off the voltage supply in order to finish the programming mode. Note: Before starting regular shuttle operation, you must set the version with the jumpers (→ section 6.1).





6.4. Setting the duration of accelerating and braking

Choosing a locomotive for programming

Locomotive 1 Starting positioning: track 1 5 inserted	
Locomotive 2 Starting positioning: track 2 1 and 5 inserted	
Locomotive 3 Starting positioning: track 3 2 and 5 inserted	
Locomotive 4 Starting positioning: track 4 1 2 and 5 inserted	
Choosing the station → Tablet on the next page	

You can put locomotives 1 and 2 or locomotives 3 and 4 on the tracks at once, in order to program them one after the other. The tracks of the opposite terminus station always have to be open when changing into the programming mode.

Choosing a station for programming

Terminus station 1 5 inserted	
Intermediate stop 1 3 and 5 inserted	
Terminus station 2 4 and 5 inserted	
Intermediate stop 2 3 4 and 5 inserted	
Choosing the locomotive → Tablet on the previous page	





Setting the duration of accelerating and braking

Preparation	Turn the trimpots to left limit stop.. Insert a jumper on array 5. Choose a locomotive and a station for programming (by inserting jumpers).
Starting the programming mode	Only necessary after having switched off the voltage supply: In order to change into the programming mode, hold the push-button pressed while switching on

	<p>the voltage supply for approx. 1 second. LED 1 flashes and the locomotive starts shuttle operation from its starting track.</p> <p>When the terminus stations have been chosen, the locomotive runs through the intermediate stops. At the stations not chosen for programming, the duration for accelerating and braking is minimized.</p>
Setting the duration of accelerating and braking	<p>By turning trimpots 1 and 2 you alter the duration of accelerating and braking.</p> <p>Trimpot 1: Accelerating Trimpot 2: Braking</p> <p>The changes will be implemented immediately.</p>
Saving the settings	<p>By pressing the push-button you save the set duration of accelerating and braking. Please note: The settings can only be saved when the locomotive approaches the starting station. For that reason you have to keep the button pressed until the LEDs 2 to 4 start to flash quickly.</p> <p>HELIOS shows taking over the settings by the LEDs 2 to 4 flashing slowly.</p>
Changing to making further settings or finishing the programming mode	<p>Change the jumpers' position and press the button anew or</p> <p>Switch off the voltage supply in order to finish the programming mode.</p> <p>Note: Before starting regular shuttle operation, you must set the version with the jumpers (→ section 6.1).</p>





6.5. Setting the halt time

Choosing a locomotive for programming

Locomotive 1 Starting positioning: track 1 6 inserted	
Locomotive 2 Starting positioning: track 2 1 and 6 inserted	
Locomotive 3 Starting positioning: track 3 2 and 6 inserted	
Locomotive 4 Starting positioning: track 4 1 2 and 6 inserted	
Choosing the station → Tablet on the next page	

You can put locomotives 1 and 2 or locomotives 3 and 4 on the tracks at once, in order to program them one after the other. The tracks of the opposite terminus station always have to be open when changing into the programming mode.

Choosing a station for programming

Terminus station 1 6 inserted	
Intermediate stop 1 3 and 6 inserted	
Terminus station 2 4 and 6 inserted	
Intermediate stop 2 3 4 and 6 inserted	
Choosing the locomotive → Tablet on the previous page	

Setting the halt time

Preparation	Turn the trimpots to left limit stop.. Insert a jumper on array 6. Choose a locomotive and a station for programming (by inserting jumpers).
Starting the programming mode	Only necessary after having switched off the voltage supply: In order to change into the programming mode, hold the push-button pressed while switching on

	<p>the voltage supply for approx. 1 second. LED 1 flashes and the locomotive starts shuttle operation from its starting track.</p> <p>When the terminus stations have been chosen, the locomotive runs through the intermediate stops. At the stations not chosen for programming, the halt time is minimized (approx. 0.5 sec.).</p>
Setting the halt time	<p>By turning trimpot 1 you alter the halt time. The changes will be implemented immediately. Please note: In programming mode the halt time is reduced to $\frac{1}{4}$ of the halt time in future operation, in order to reduce waiting time.</p>
Saving the settings	<p>By pressing the push-button you save the set halt time. Please note: The settings can only be saved when the locomotive approaches the starting station. For that reason you have to keep the button pressed until the LEDs 2 to 4 start to flash quickly. HELIOS shows taking over the settings by the LEDs 2 to 4 flashing slowly.</p>
Changing to making further settings or finishing the programming mode	<p>Change the jumpers' position and press the button anew or</p> <p>Switch off the voltage supply in order to finish the programming mode.</p> <p>Note: Before starting regular shuttle operation, you must set the version with the jumpers (→ section 6.1).</p>



6.6. Reset

In order to restore the factory (default) settings, insert jumpers into fields 5 and 6. Then, switch on the voltage supply while holding the push-button pressed for approx. 1 second. HELIOS shows taking over the reset by the LEDs 2 to 4 flashing slowly.

Afterwards, switch off the voltage supply again.

6.7. Choosing the starting mode

You start the shuttle service either immediately after switching on the voltage supply or only after pressing the push-button. Adjusting is made by inserting a jumper to field 6 (in addition to the jumpers set to define the version).

<p>Starting the shuttle service when switching on the voltage supply --- inserted</p>	
<p>Starting the shuttle service by pressing the push-button 6 inserted</p>	

7. Operation

Overload protection



Caution:

The maximum current of **all** trains running at the same time on the shuttle line (including all accessories, e.g. carriage lightings) should not exceed 2,000 mA. If the maximum current is exceeded, the integrated overload protection switches off the module. At worst, components on the circuit possibly are damaged.

LED display after the activation of the overload protection:

Quick flashing of all 4 LEDs	All locomotives on the shuttle line stop.
------------------------------	---

Before restarting the shuttle operation after having eliminated the short circuit or reduced the current consumption, you have to put all locomotives back on their starting tracks. It is not possible to restart the shuttle service from the positions the locomotives had when the overload protection was activated.

Starting the shuttle service

Before starting the shuttle service, you have to make sure that

- all locomotives are on their assigned starting tracks in the terminus stations and
- both intermediate stops are free.

When having finished operation regularly (by pressing the button), all locomotives are on their assigned starting tracks.

Depending on the settings (→ section 6.7.), operation starts

- immediately after switching on the voltage supply or
- after pressing the button.

LED displays when starting operation:

Light sequence on all 4 LEDs	HELIOS waits for you pressing the button to start the shuttle operation.	
LED1 flashing	Track 1	HELIOS does not detect a locomotive on the track assigned to the LED, although the track has been defined as a starting track. Possible causes: bad contact or wrong position of the locomotive.
LED2 flashing	Track 2	
LED3 flashing	Track 3	
LED4 flashing	Track 4	

Switching points

The points at the intermediate stops and the terminus stations are always set correctly before the locomotives start from a terminus station or an intermediate stop. When points have been switched externally, the setting of the points will be adjusted at this moment.



Make sure, that the points are not switched externally after the locomotives have started. As a consequence, collisions with oncoming trains possibly occur.

Finishing shuttle operation

When pressing the button in standard operation until the LEDs flash, all locomotives are driven to their starting tracks and operation will be stopped. Hint: Depending on the operating status, this can take some time. By pressing the button again, operation will be restarted.

LED display when finishing operation:

Flashing of all 4 LEDs	Operation has been finished by pressing the button, all locomotives are driven to their starting tracks. As soon as the locomotives have reached their starting tracks, the LEDs stop flashing.
------------------------	---

8. Check list for troubleshooting

- Parts are getting too hot and/or start to smoke.



Disconnect the system from the mains immediately!

Possible cause: One or several connections are faulty.

→ Check the connections.

- The locomotives stop and the LEDs flash quickly.

Possible cause: The integrated overload protection has switched off the circuit due to overload or short circuit.

→ Check, if there is a short circuit at the tracks or if the current consumption of locomotives and carriages exceeds 2,000 mA. Switch off the voltage supply. Put all locomotives on their assigned starting tracks and restart operation.

- The locomotive does not run with the set driving characteristics.

Possible cause: When starting shuttle operation, the locomotive has not started from its assigned starting track.

→ Switch off the voltage supply. Put all locomotives on their assigned starting tracks and restart operation.

- The shuttle operation does not comply with the plans.

Possible cause: One or several dividing points have been placed incorrectly or are bridged (by mistake).

→ Check the dividing points.

- The locomotive runs against the buffer of the terminus station.

Possible cause: The stop diode has been mounted with wrong polarity.

→ Check the stop diode and alter the mounting direction, if necessary.

- One or more LEDs flash after starting the shuttle service, operation does not start.

Possible cause: Bad contact of the locomotive(s) on the starting tracks assigned to the LEDs.

→ Check the current collectors of the locomotive(s).

Possible cause: Faulty assignment of the starting tracks.

→ Check the jumper settings used to define the starting tracks.

Possible cause: Wrong position of the locomotive(s) on the starting tracks. → Check, if the locomotives are standing on tracks defined as starting tracks.

Hotline

If problems with your module occur, our hotline is pleased to help you (mail address on the last page).

Repairs

You can send in a defective module for repair (address on the last page). In case of guarantee the repair is free of charge for you. With damages not covered by guarantee, the maximum fee for the repair is 50 % of the current sales price according to our valid price list. We reserve the right to reject the repairing of a module when the repair is impossible for technical or economic reasons.

Please do **not** send in devices for repair 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 repairs not covered by guarantee you have to bear the expenses for sending back and forth.

9. 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.

10. EU declaration of conformity

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

2004/108/EG on electromagnetic. Underlying standards: EN 55014-1 and EN 61000-6-3. To guarantee the electromagnetic tolerance in operation you must take the following precautions:

- Connect the transformer only to an approved mains socket installed by an authorised electrician.
- Make no changes to the original parts and accurately follow the instructions, connection diagrams and PCB layout included with this manual.
- Use only original spare parts for repairs.

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

11. Declarations conforming to the WEEE directive



This product conforms with the EC-directive 2012/19/EG on waste electrical and electronic equipment (WEEE).

Don't dispose of this product in the house refuse, bring it to the next recycling bay.

tams elektronik

tams elektronik

Information and tips:

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

Warranty and service:

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