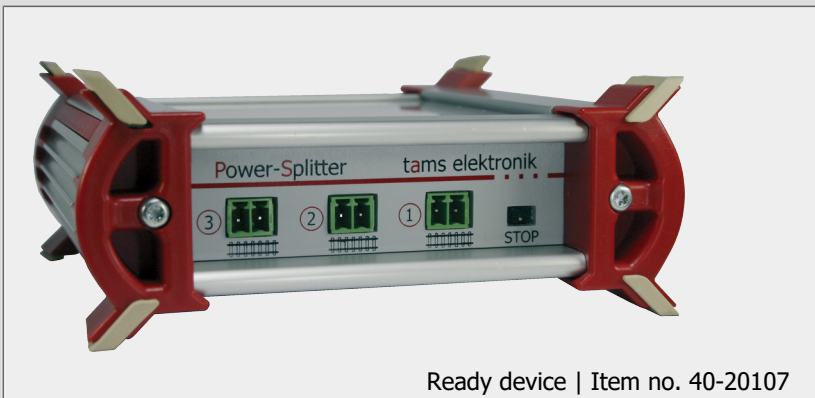
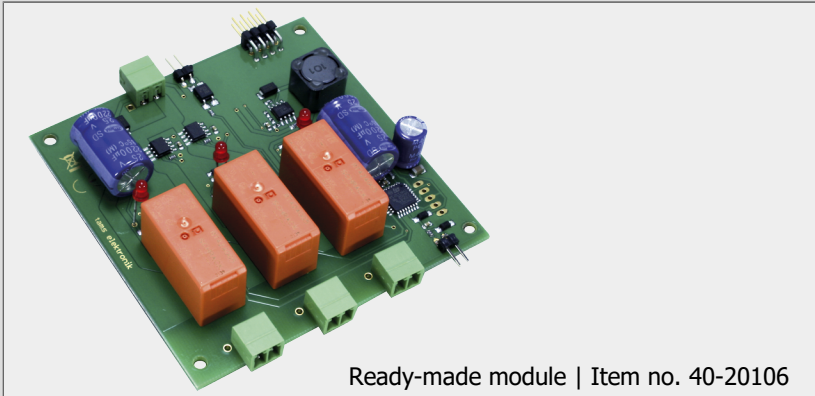


Power-Splitter

Booster power distributor

Manual



Version: 1.02 | Status: 10/2022

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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.

Contents

1. Getting started.....	5
1.1. Contents of the package.....	5
1.2. Required additional equipment.....	5
1.3. Intended use.....	6
1.4. Safety instructions.....	6
1.5. Care.....	6
2. Your Power-Splitter.....	7
2.1. Background information.....	9
3. Connections.....	10
3.1. Connections to the track output of the booster or the central unit.....	11
3.2. Connections to the booster sections.....	12
3.3. Connection of an emergency stop button.....	13
4. Settings / configuration.....	14
4.1. Jumpers.....	14
4.2. CV settings.....	15
5. Operation.....	17
5.1. LED displays.....	17
5.2. Use of turnout addresses.....	18
6. Checklist for troubleshooting and error correction.....	19
6.1. No supply to the booster sections.....	19
6.2. Problems with short circuit disconnection.....	19
6.3. Technical Hotline.....	20
6.4. Repairs.....	20
7. Technical data.....	21
8. Warranty, EU conformity & WEEE.....	23
8.1. Guarantee bond.....	23
8.2. EU Declaration of Conformity.....	24
8.3. Declarations on the WEEE Directive.....	24

1. Getting started

This manual will help you step by step to install and use your Power-Splitter safely and properly. Before you start using the module or the device, read through this manual completely, 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 or the device on to another person, please pass on the manual with it.

1.1. Contents of the package

Version "Ready-made module" (item no. 40-20106-01)

- ready-built and tested circuit board (without housing)
- 4 plug-in connection terminals 2-pole, RM 3.81
- 2 socket connectors 2-pole, RM 2.54
- 3 short circuit jumpers 2-pole, RM 2.54

Version "Ready device" (item no. 40-20107-01)

- 1 Power-Splitter in housing
- 4 plug-in connection terminals 2-pole, RM 3.81
- 2 socket connectors 2-pole, RM 2.54
- 3 short circuit jumpers 2-pole, RM 2.54
- 4 plastic brackets for fixing the enclosure

1.2. Required additional equipment

Connection cables

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

Connection to	Recommended cross-section
Track output of the digital central unit or booster	$\geq 1,5 \text{ mm}^2$
Booster sections	$\geq 0,75 \text{ mm}^2$
short circuit feedback of the (DCC-compliant) booster Emergency stop button	$\geq 0,04 \text{ mm}^2$

Emergency stop button

The connection of an emergency stop button is optional. You can use all push-buttons in the "normally open" version (e.g. art. no. 84-52127 or 84-52117).

1.3. Intended use

The Power-Splitter is intended for use in digital 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 Power-Splitter is not intended to be used by children under the age of 14.

1.4. Safety instructions

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

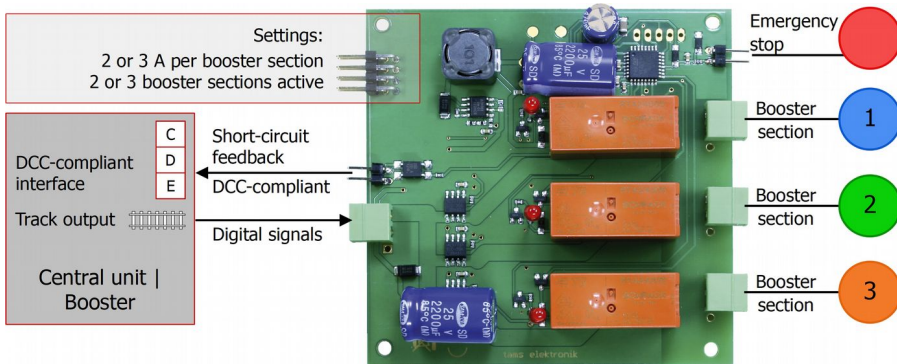
- Only use the Power-Splitter in closed, clean and dry rooms. Avoid moisture and splash water in the surrounding area. After condensation has formed, wait two hours for acclimatisation before use.
- Disconnect the Power-Splitter from the booster / digital central unit before carrying out wiring work.
- Heating of the Power-Splitter during operation is normal and harmless.
- Do not expose the Power-Splitter 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 module / unit, e.g. for damage to the connection cables or damage to the housing.
- If you notice any damage or if malfunctions occur, disconnect the booster / digital central unit immediately. Send in the Power-Splitter for inspection.

1.5. Care

Do not use any cleaning agents to clean your Power-Splitter. Only wipe the module or the device dry. Disconnect the module / device from the booster or digital central unit before cleaning.

2. Your Power-Splitter

With smaller nominal sizes, the current in the booster circuit is limited to 2 to 3 A in order to protect rails and vehicles from damage in the event of a short circuit. The Power-Splitter makes it possible to use a higher output current of the booster even with smaller nominal sizes. It is connected between the track output of the booster (or the digital central unit with integrated booster) and the track and splits the power of the booster into two or three sections with a maximum current of either 2 or 3 A.



Use with all boosters

The Power-Splitter monitors the current in the connected two or three sections. It does not interfere with the control of the booster and can therefore be used with all boosters.

The sum of the current consumption in the (two or three) connected sections must not exceed the maximum output current of the booster. Otherwise, the short circuit shutdown of the booster will react, even if the maximum current in one section has not been exceeded.

Absolute synchronicity

When crossing the separation points between booster circuits supplied by different boosters, the following problems may occur:

- Equalising currents between the booster circuits due to different output voltages of the boosters. Possible consequences: Short circuits on boosters, rails, wheels and sliders.
- Different digital signals in the two booster circuits due to different run times in the boosters. Possible consequences: Vehicle decoders misinterpret these digital signals as run or switch commands or as a command to switch to analogue mode.

The risks are all the greater the more different the construction of the boosters involved. Even when using identical boosters, the problems described can occur due to component tolerances.

When using the Power-Splitter, the output voltage and transit time of the digital signals are absolutely synchronous in all connected booster sections. This ensures that the separation points between the sections can be passed over without any problems.

Optional connections

- Short circuit feedback line: The feedback is DCC-compliant to the DCC booster connection of the digital central unit (or via an external booster to the central unit). With central units or boosters that do not have a DCC-compliant booster connection, the shortcircuit feedback line cannot be connected.
- External emergency stop button: With the button the power is switched off simultaneously for all sections. With the appropriate setting, the button can also be used to switch the current back on (e.g. after a short circuit).

Setting options

By plugging jumpers (short circuit jumpers) onto the 2x4-pole pin connectors, the following can be set

- the number of active sections (2 or 3)
- the maximum current in the sections (2 A or 3 A). The setting is made separately for each booster section.

Further settings are made using the main track programming (POM):

- Turnout addresses for separate switching on/off of the two or three booster sections with DCC turnout setting commands
- Turnout address for switching on/off the watchdog with DCC turnout setting commands
- Short circuit sensitivity: setting in 50 ms steps (50...350 ms)
- Restart time after a short circuit: Setting in 1 s steps (4...9 s)
- Use of the emergency stop button for restarting after a short circuit
- Behaviour in case of short circuit: Switching off all strings or only the affected string
- Max. duration of the inrush current ("inrush time"): setting in 50 ms steps (300...500 ms)

Note: With central units that do not support POM programming, the settings cannot be changed. Factory settings (default values) → section 4.2.

LED display of the operating status

LEDs indicate the operating status of the individual (active) strings:

- String switched on / off
- Short circuit in the connected booster section
- Emergency stop button pressed

2.1. Background information

Watchdog

The watchdog is used in PC-controlled systems to check whether the digital signals are transmitted in a booster circuit. For this purpose, the central unit (controlled by the PC software) sends a DCC turnout setting command to a turnout address assigned to the Power-Splitter at intervals of max. 5 seconds. As soon as the Power-Splitter no longer receives these commands, it automatically switches off the booster sections.

For test purposes, the watchdog function can be activated and deactivated by manually sending a turnout setting command to the assigned turnout address.

Inrush time

The sum of the charging currents of buffer capacitors on vehicle decoders (especially sound decoders) and additional external backup capacitors can become so high when the system is switched on that the short circuit shutdown of the booster reacts immediately. This makes it difficult to start up the system when the short circuit cut-off is active.

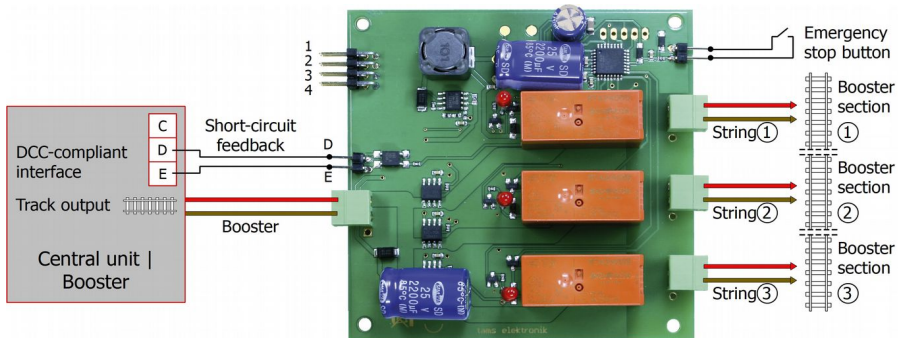
After switching on, the Power-Splitter can accept an increased current of 5 A per booster section for a short time (adjustable up to max. 500 ms) and tolerates the brief collapse of the voltage. This time is sufficient to charge buffer capacitors and support electrolytic capacitors. Only if the current does not drop again after the set time and the voltage does not rise again, the short circuit disconnection of the Power-Splitter reacts (because then a "real" short circuit can be assumed).

For further information on inrush current, see RailCommunity standard RCN 530 (at: www.railcommunity.de).

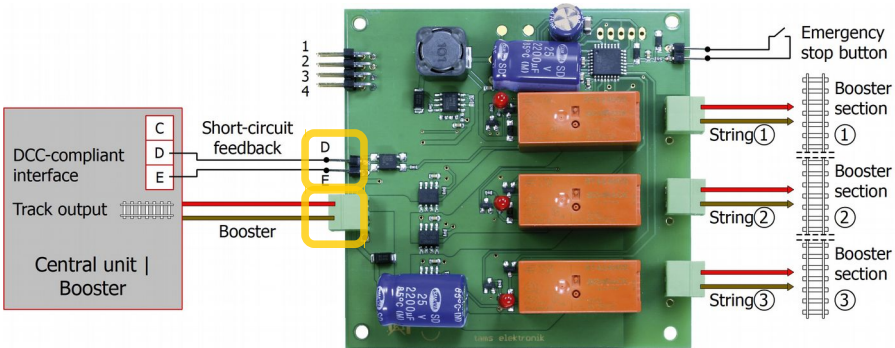
3. Connections

For the various connections are soldered on the board:

- 2-pole tub plugs for connection to the track output of the central unit or the booster and to the booster sections. Plug the connection cables into the corresponding plug-in connection terminals (included in the delivery) and screw them tight (like a luster terminal). Then plug the terminals into the tub connectors.
- 2-pole pin connectors for connecting the short circuit feedback line and the emergency stop button. Solder the connection cables to the corresponding socket connectors (included in the scope of delivery) and plug them into the pin connectors.



3.1. Connections to the track output of the booster or the central unit



Booster

Connect the booster connector of the Power-Splitter to the track output of the booster or central unit. You can connect the Power-Splitter to boosters of all types (DCC compliant, Märklin compatible or other).

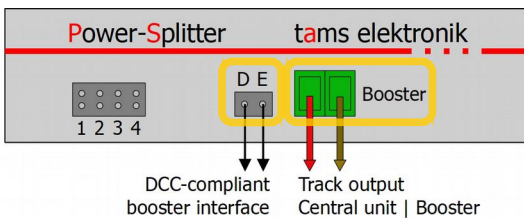
! Note:

For the connection, use a cable with a cross-section sufficient for the load (recommended cross-section: $\geq 1.5 \text{ mm}^2$). If the cross-section is too small, the overcurrent/short-circuit shutdown does not work reliably and the cable can become very warm. **Fire hazard!**

Short circuit feedback

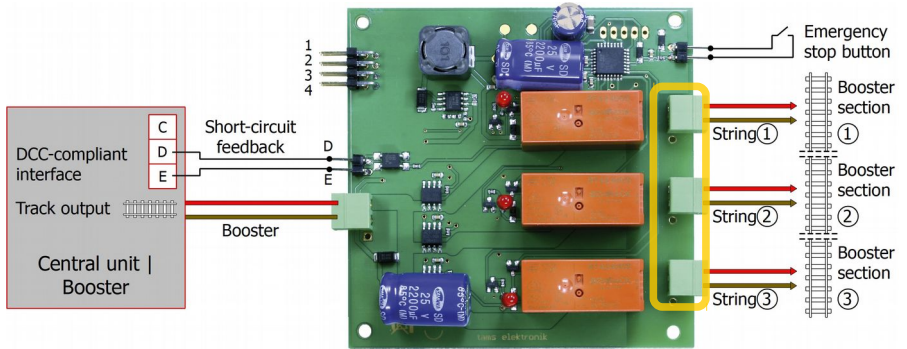
The connection of the short circuit feedback of the Power-Splitter is optional. Connect the terminals of the Power-Splitter with the terminals D (ground) and E (short circuit feedback) of the DCC-compliant interface of the booster or the central unit. When doing so, observe the assignment of the connections.

In combination with boosters or central units that do not have a DCC-compliant booster interface, the connection of the short circuit feedback of the Power-Splitter is not possible.



Front side Power-Splitter
Version "Ready device"

3.2. Connections to the booster sections

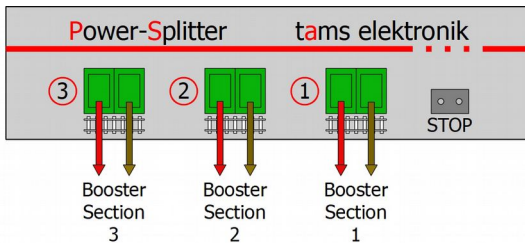


Connect the rails of the booster sections to the connections for the strings. Make the connections to the rails and the disconnections between the booster sections in the same way as when connecting a booster directly.

Note:
For the connection, use a cable with a cross-section sufficient for the load (recommended cross-section: $\geq 0,75 \text{ mm}^2$). If the cross-section is too small, the overcurrent/short-circuit shutdown does not work reliably and the cable can become very warm. **Fire hazard!**

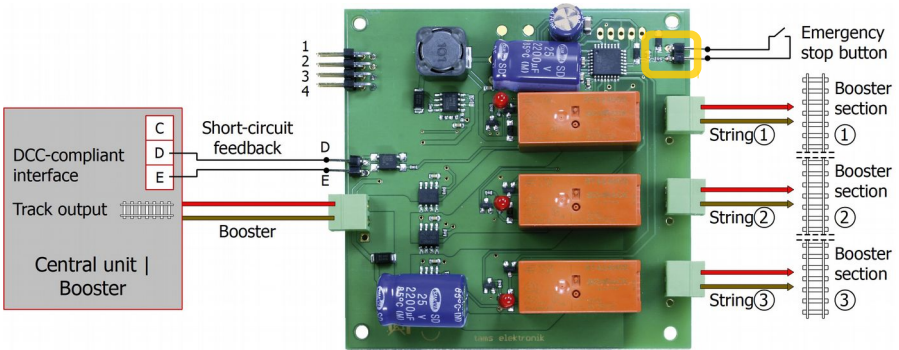
Note:
Make sure that all booster sections have identical polarity! Otherwise, malfunctions may occur when passing over the separation points (e.g. short circuits, errors during data transmission).

Note:
If a jumper is plugged onto pins 4.1 and 4.2 of the 2x4-pole pin strip, only strings 1 and 2 (booster sections 1 and 2) are supplied.

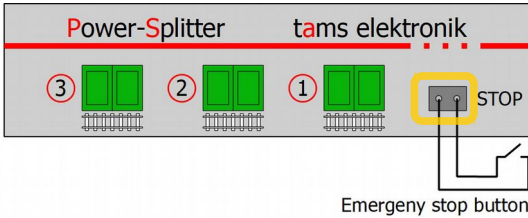


Rear side Power-Splitter
Version "Ready device"

3.3. Connection of an emergency stop button



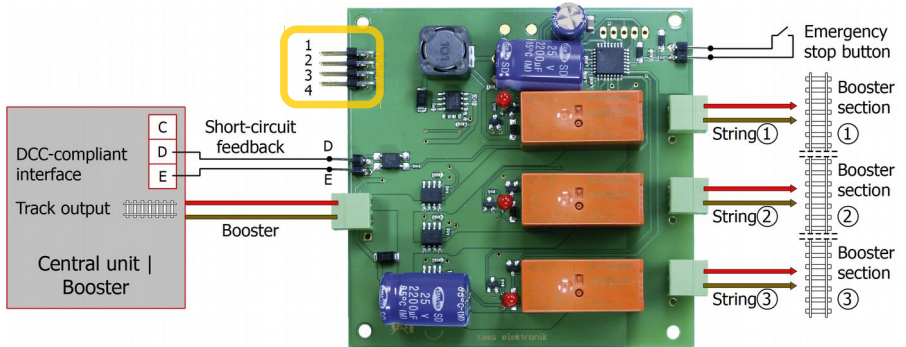
The connection of the emergency stop button ("STOP") is optional. You can use all push-buttons in the "normally open" version.



Rear side Power-Splitter
Version "Ready device"

4. Settings / configuration

4.1. Jumpers



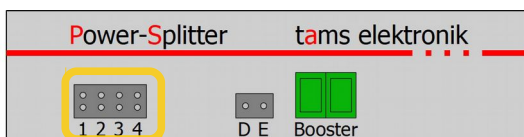
By plugging jumpers onto the jumper field (2x4-pin pin connectors), you make the following settings:

- Current per booster section: 2 or 3 A
- Number of active booster sections: 2 or 3

Pins	Setting	Jumper not plugged in (pins open)	Jumper plugged in
1	Max. current booster section 1	2 amps	3 amps
2	Max. current booster section 2	2 amps	3 amps
3	Max. current booster section 3	2 amps	3 amps
4	Number of active booster sections	3	2 (strings 1 and 2)

⚠ Note:

The sum of the current in all booster sections must not exceed the maximum output current of the booster. Otherwise, the overcurrent shutdown of the booster reacts and switches off all booster sections, even if the maximum current set for the booster sections has not been exceeded. In this case, all booster sections are always switched off, regardless of the short circuit behaviour set for the Power-Splitter.



Front side Power-Splitter
Version "Ready device"

4.2. CV settings


You can adjust the Power-Splitter to individual requirements via main track programming (POM). With central units that do not support this type of programming, the factory (default) settings cannot be changed.

Switching to programming mode

To initiate programming of the Power-Splitter, enter the value "62" for CV 7 of any DCC vehicle decoder address. Proceed as described in the instructions for your central unit. This entry has no effect on a decoder with the address in question, as no entry is possible for CV 7 of vehicle decoders (= version).

After you have started the programming mode (entered the value "62" for CV 7), the LEDs flash. You can now change the settings of the Power-Splitter by selecting CV 7 again and entering a value from the following table for it.

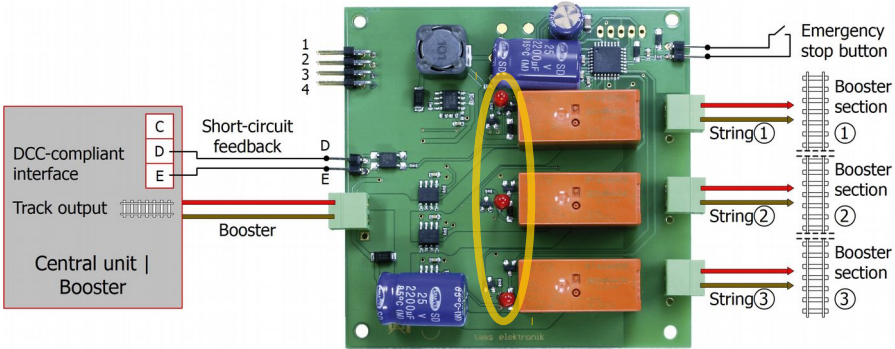
If no value is entered for CV 7 within 30 seconds after starting the programming mode, the programming of the Power-Splitter is automatically aborted. After a value has been entered, the programming mode is automatically terminated. If you want to change further values, you must restart the programming mode by entering the value "62" for CV 7.

Function	Input value for CV 7	Setting / Comment
Start programming mode	62	To change settings, you must enter a value for CV 7 again within 30 seconds. Otherwise, the programming mode is automatically terminated.
Reset	8	To reset all settings to the default values (= values at delivery).
Turnout addresses	1	Turnout address for string 1. Default value: 100
	2	Turnout address for string 2. Default value: 101
	3	Turnout address for string 3. Default value: 102
	4	Turnout address for watchdog. Default value: none
	After you have entered the value 1, 2, 3 or 4 for CV 7, you can assign a turnout address to one of the strings / the watchdog. To do this, select a turnout address at your central unit and execute a switching command for this address.	
Short circuit sensitivity	11	50 ms
	12	100 ms = default value
	13, 14, ... 17	150, 200, 250, 300, 350 ms
	 Note: Set the short circuit sensitivity of the Power-Splitter at least 200 ms lower than that of the booster. Otherwise, the booster may switch off sooner than the Power-Splitter in the event of a short circuit.	
Restart time after short circuit	24	4 s = Default value
	25	5 s
	26, 27, ... 29	6, 7, 8, 9 s
Emergency stop button	30	Use of the emergency stop button also for switching on: no
	31	Use of the emergency stop button also for switching on: yes = Default value
Behaviour in case of short circuit	40	All strings are switched off.
	41	Only the affected string is switched off. = Default value
Max. duration of inrush current ("inrush time")	50	300 ms = Default value
	51, 52, ... 54	350, 400, 450, 500 ms

5. Operation

5.1. LED displays

A LED is assigned to each of the 3 strings to indicate the various operating states. Note: If only two booster sections are activated (strings 1 and 2, jumpers inserted on pins 4), the LED for string 3 remains permanently off.



LED displays for individual strings

	Display	Meaning
	permanently on	The associated string is switched on .
	slow flashing	The associated string has been switched off .
	fast flashing	There is a short circuit in the associated string. Note: In this case, the LEDs for the unaffected strings are permanently on - regardless of whether they have also been switched off or not (→ CV setting for behaviour in the event of a short circuit).
	permanently off	The associated string (string 3) is inactive, jumper on pins 4 is plugged.

LED displays for all strings


all LEDs	Display	Meaning
	slow flashing	Change to programming mode
	fast flashing	The emergency stop button has been pressed and all strings have been switched off.

5.2. Use of turnout addresses

The three booster sections and the watchdog can be switched via turnout addresses.

	Turnout "straight ahead"	Turnout to "branch"
Booster sections 1, 2 or 3	on	off
Watchdog	on / refresh	off
	<p>If the power supply for the Power-Splitter is interrupted, the watchdog is automatically deactivated. To activate the watchdog, the setting command "turnout straight ahead" must be sent to the assigned turnout address.</p> <p>In standard operation, the activation of the watchdog is taken over by the PC control. For test purposes, the watchdog can be switched on and off manually via turnout setting commands.</p>	

6. Checklist for troubleshooting and error correction

 **Warning:** If you notice a strong heat development, immediately disconnect the Power-Splitter and the booster / digital central unit from the supply voltage. **Fire hazard!** Send in the Power-Splitter for testing.

6.1. No supply to the booster sections

All LEDs permanently switched off

- Possible cause: The connection to the booster is faulty. → Check the connections.

Only LED for string 3 permanently switched off

Booster section 3 is not supplied with power, although string 3 is correctly connected to the rails and the output of the Power-Splitter.

- Possible cause: A jumper is plugged into pins 4. This limits the number of active strings to two (strings 1 and 2). → Remove the jumper.

LEDs light up

Depending on the number of active strings, the LEDs for strings 1 and 2 or all three LEDs light up. The strings are still not supplied with power.

- Possible cause: The connection to the rails is faulty. → Check the connections.

6.2. Problems with short circuit disconnection

Short circuit cut-off without exceeding the current in the booster sections

The booster switches off all booster sections although the maximum current in the booster sections has not been exceeded (2 or 3 A depending on the setting).

The booster switches off all booster sections although it is set so that only the affected booster section is to be switched off in the event of a short circuit.

- Possible cause: The maximum output current of the booster has been exceeded. It is smaller than the sum of the current in the booster sections. → Reduce the current consumption in the booster sections or the number of active booster sections (from 3 to 2).

No short circuit cut-off

The central unit / the booster does not switch off in case of a short circuit, although the short circuit feedback of the Power-Splitter is connected.

- Possible cause: The connections D and E are connected to the interface the wrong way round. → Check the connections and change them if necessary.
- Possible cause: The short circuit feedback was not connected to a DCC-compliant booster interface, but to one according to another standard (e.g. Märklin-compatible). However, the short circuit feedback of the Power-Splitter is only possible with a DCC-compliant booster interface. With central units or boosters that do not have a DCC-compliant booster connection, the short circuit feedback line cannot be connected.
- Possible cause: The short circuit sensitivity of the booster is set lower than that of the Power-Splitter. → Set the short circuit sensitivity of the booster at least 200 ms higher than that of the Power-Splitter.

6.3. Technical Hotline

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

6.4. Repairs

You can send us a defective Power-Splitter 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.

7. Technical data

Interfaces

Booster	2-pole, for connection to track output of booster / central unit
Short circuit feedback line	2-pole, DCC-compliant ("D" and "E"), optional
Strings 1 to 3	2-pole for connection to tracks of two or three booster sections
Emergency stop button	2-pole for connection of a push-button ("normally open" version), optional

Electrical characteristics

Power supply	via the connected booster
Current consumption	max. 60 mA (without consumers)
Output voltage	as output voltage of the booster
Output current	max. 2 or 3 A per booster section (adjustable)

Configuration

Procedure	Main track programming (POM), DCC compliant
Assignment of turnout addresses	<ul style="list-style-type: none"> ▪ to the strings Default values: 100, 101, 102 ▪ to the watchdog Default value: none
Short circuit sensitivity	50...350 ms (adjustable in 50 ms steps) Default value: 100 ms
Reconnection time after a short circuit	4...9 s (adjustable in 1 s steps) Default value: 4 s
Behaviour in the event of a short circuit	Optionally switch off all strings or only the affected string. Default value: switching off only the affected string
Use of the Emergency stop button	Also for switching on: yes / no Default value: yes
Inrush time	300...500 ms (adjustable in 50 ms steps) Default value: 300 ms

Protection

Protection class	<p>Ready-made module (without housing): IP 00 Meaning: No protection against foreign bodies, contact and water.</p> <p>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.</p>
Overcurrent protection (short circuit protection)	<p>Automatic disconnection of the voltage when the set maximum current is exceeded (2 or 3 A), either</p> <ul style="list-style-type: none"> ▪ for the affected string or ▪ for all strings

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.)	<p>Circuit board: 85 x 85 mm</p> <p>Ready device including housing: 118 x 122 x 47 mm</p>
Weight (approx.)	<p>Assembled board (ready-made module): 85 g</p> <p>Ready device including housing: 395 g</p>

8. Warranty, EU conformity & WEEE

8.1. 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.

8.2. 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.

8.3. 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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