

# ESU Smoke Generator

## Installation and Operating instructions

1. Edition, March 2015

54678 Smoke generator small («0 Gauge«)

54679 Smoke generator large («G Gauge«)



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## 1. EC declaration of conformity

The manufacturer, ESU GmbH & Co. KG,  
Edisonallee 29, D-89231 Ulm, hereby declares under sole  
Responsibility that the product

### **Product name:**

**Smoke Generator «Track 0» Smoke Generator «Track 1»**

**Type: 54678, 54679**

EN 55014-1: 2006 + A1: 2009 Electromagnetic compatibility  
- Requirements for household appliances, electric tools and similar  
Electrical equipment - Part 1: Emission

EN 55014-2: 1997 + A1: 2001 + A2: 2008: Electromagnetic  
Compatibility - Requirements for household appliances, electric  
tools and similar electrical appliances - Part 2: Immunity.

## 2. WEEE Declarations

Disposal of old electrical and electronic equipment (applicable in  
the European Union and other European countries with separate  
collection systems).

This symbol on the product, packaging or in the documentation  
indicates that this product may not be treated as household waste.  
Instead bring this product to the appropriate  
collection point for the recycling of electrical and  
electronic devices. If the product is disposed of  
correctly, you will help to eliminate environmental  
influences and prevent damage to health caused by  
improper disposal.



For more information about recycling of this product, please contact your local city office, your household waste disposal service or the shop, where you purchased the product.

# Important instructions

All mentioned trademarks or trademarks shown are registered trademarks or trademarks of their respective owners.

## 3. Important - Please read first!

Congratulations on your purchase of the ESU smoke generator. This guide will help you to connect your ESU decoder with a step by step module. Please read this manual carefully before installation in order to avoid defects!



- The smoke generator is designed exclusively for use with electrical-model train layouts provided. It may only operate the components described in these instructions.
- The smoke generator in operation is very hot (above 100°C). Avoid touching the unit and select an installation location so that there may be no damage due to the excessive temperature.
- Do not turn the smoke generator on when it is filled to the top. Leaks of oil and steam can cause burns.
- All connections must only be made when the unit is not in operation.
- Adhere to the principles as outlined in this manual.
- Protect from moisture and humidity.
- No cable must ever touch the metal parts of the locomotive.
- When assembling the locomotive be sure that no cable be squeezed or short circuits may occur.

## 4. General characteristics

The two ESU smoke generators provide realistic smoke and steam cloud to your models. An integrated control operates both the fan motor and the heating of the smoke generator. A sensor maintains the desired heating temperature independent of rail voltage and constant degree of filling and prevents blowing with an empty tank.

The smoke generator can be used with both steam and diesel models. The smoke generators are designed for optimal use with our LokSound XL V4.0 decoder. Attached to a decoder the desired amount of smoke is precisely adapted to sound sequencing. When connected to an ESU decoders no adjustments or programming has to be made to the smoke generator.

If using another decoder the smoke generator can be connected on the Susi interface. In this mode, however, fewer options are available. SUSI CV programming must also be done in this case.

## 5. Scope of delivery

This allows you to find the best option for your model smoke generator, two versions are available.

### 4.1. 54678 track «0»

The «little» smoke generator with its dimensions of 40 x 25 x 29mm for small lane 1 and lane 0 locomotives. In this case the electronics are separate from the mechanism with a wire harness attached. The following items are included:

- Smoke generator with attached, private electronic board
- Wiring harness
- PVC hose with 7mm diameter

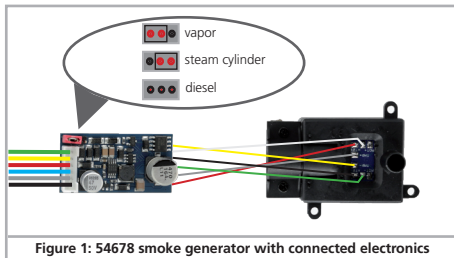


Figure 1: 54678 smoke generator with connected electronics

By means of a jumper, change between the operating mode «Diesel» and «Steam» needs to be done.

#### 4.2. 54679 track «1»

The «big» smoke generator with its dimensions of 50 x 28 x 30mm is compatible with many LGB and PIKO® locomotives. It can be used as an option in conjunction with LokSound XL v4.0 decoders in the mode «Cylinder steam». The following items are provided:

- Smoke generator
- Wiring harness
- PVC hose with 13mm diameter for chimney / exhaust
- PVC hose with 6mm diameter for cylinder steam
- «elbow» to deflect the smoke flow to the cylinders
- Suitable screws «headers»

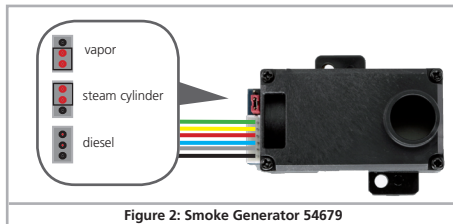


Figure 2: Smoke Generator 54679

If you want to use the smoke generator as a steam cylinder, all you have to do is remove the standard cover and replace it with the enclosed manifold. The small opening above is only for filling and must be closed during operation at your discretion.



Figure 3: Smoke Generator 54679 with mounted manifold

By using a jumper, the operating mode can be changed from «Diesel» «Steam» and «Cylinder steam».

# Installation of the smoke generator

## 5. To install the smoke generator

Place the smoke generator initially at a suitable location under a smoke stack or exhaust stack. The distance between smoke generator and housing opening should be as small as possible, however, a certain minimum distance (about 1 cm) needs to be maintained to plastic housings. Pay attention to the exhaust system so that any condensing smoke fluid will drain back into the holding tank. In order to obtain a tight connection between the housing opening and the smoke generator, a silicone hose has been supplied and should be used accordingly.

### 5.1 Fill the system

Both smoke generators can be filled with the smoke distillate through the exhaust outlet. Use only the ESU smoke distillate with ESU Art. no. 51990. Using other liquids can cause paint damage or a blockage to the system or damage to the heating unit as the result of residue formation. Use the smoke function only under supervision in a well ventilated area. The maximum capacities are as follows:

- enables 2.5 ml for the «little» smoke generator 54678. This is a period of about 8 minutes.
- 5.0 ml for the «big» smoke generator 54679. Duration of approximately 10 to 15 minutes is achieved.



Never exceed the maximum capacity of the system. When in doubt it is better using too little rather than too much! Even a dry tank cannot damage the smoke generator!  
Always fill the system on a flat surface, never on a slanted surface. Turn overfilled locomotives upside down to allow excess to drain in order to prevent leakage of smoke distillate.

### 5.2. Connection cable

To connect use the enclosed wiring harness exclusively. The 6-pin connector directly attaches to the connected circuit board of the smoke generator.

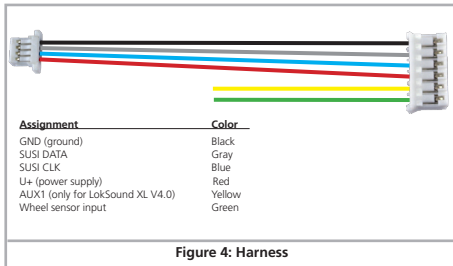


Figure 4: Harness

At the other end you will find both the 4-pin SUSI connector and two single cables.

- Use the green wire of the smoke generator to receive the steam pulses. This can come directly from a Hall sensor or (preferably) be generated directly by the decoder. For «Diesel» mode this cable is not required.
- The yellow wire of the smoke generator receives its commands when connected to a LokSound XL V4.0 decoder. If you use an external decoder, this cable is not required.

### 5.3. Following ESU decoders

When connected to an ESU LokSound XL V4.0 decoder, the 4-pin connector on the wiring harness is not required. Cut these off and therefore make the cable connections as shown in Figure 6. This command is replaced by the smoke generator via the yellow cable. It is mandatory that this be connected to the AUX1 output of the decoder. Only the AUX1 output is capable of providing data after it has been configured accordingly (see section 6.1).

## Connecting decoder

The green wire connects to any AUX connection (AUX 2 to 10). This output provides for a synchronous burst of steam with the sound. In the Example AUX2 is used.

The LokSound decoder must then as described in section 6.1. be programmed.

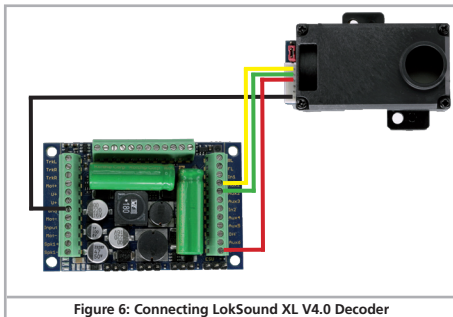


Figure 6: Connecting LokSound XL V4.0 Decoder

### 5.4. Connecting to other decoders (SUSI)

Of course, the ESU smoke generator can be used with decoders from other manufacturers.

Here are two common types of this is shown as an example.

#### 5.4.1. ZIMO MX695 / MX696

The SUSI connector of the module as a usual coder is connected directly to the disassembly. As for the connected coder use assembly shown with the parts provided.

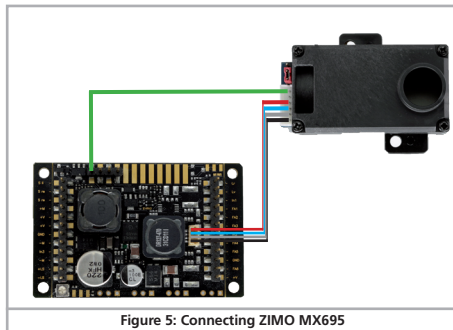


Figure 5: Connecting ZIMO MX695

For this initial work, the CVs have to be set correctly. In particular, a function output must be (here: FA2) defined as «heat level».

Programming example for steam generator FA2:

	steam	diesel
CV 128	72	80

You can search for various properties for programming the decoders smoke generator by SUSI CVs.

Section 6.2. provides information.

#### 5.4.2. Massoth eMotion XLS

The SUSI connector of the smoke generator is as usual directly connected to the decoder. To be the trigger for the steam they utilize the output A3 / F3.

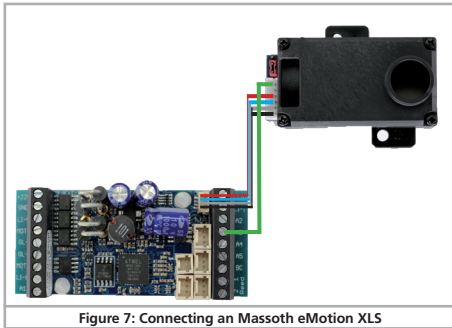


Figure 7: Connecting an Massoth eMotion XLS

For this initial work, the CVs have been set correctly.

CV 49	18	SUSI and load control «on»
CV 114	30	F3 output as clock output

By using the SUSI CVs you can program various properties to the smoke generator.

6.2. provides more information.

## 6. Programming the smoke generator

The smoke generator has several options within the settings that allow you to adapt the function of the model. Depending on what decoder you use each will likely have different settings.

### 6.1. For ESU LokSound XL Decoder

You can configure the large smoke generator to your preference. It is, however, imperative to have a LokProgrammer 53451/53452 because you need to change settings in the sound sequencing. You must first change the desired sound project, load it into the LokProgrammer and then specifically change settings. Sound and smoke control work so closely together, that if you do not make these changes in settings no result will be possible. An example of this is shown of the file 56529 (BR 50) file. This file has all the required settings. It is a good example of what will need to be done to other files to make the Smoke Units work properly.

#### 6.1.1. Basic settings

First, the AUX1 output must be set so that it provides data for the smoke generator instead of a normal function output.

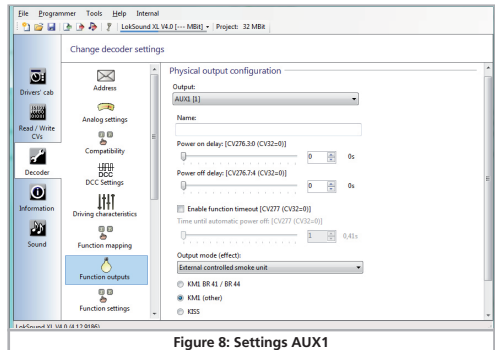
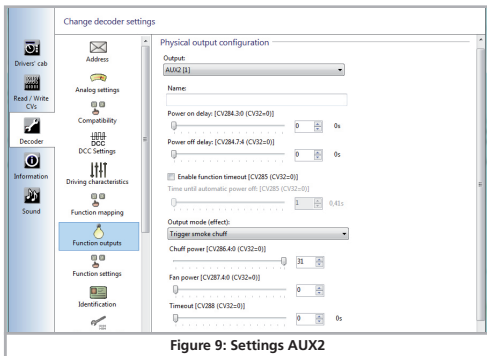


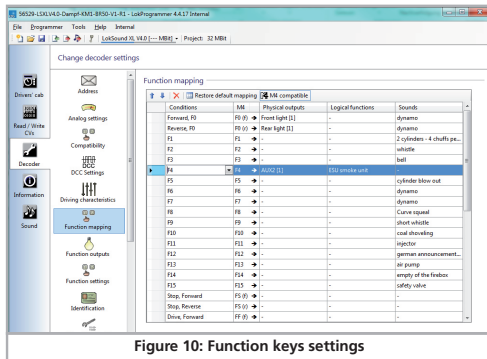
Figure 8: Settings AUX1

# Programming

- In the tab «function outputs» select output «AUX2 [1]» and select the mode «smoke generator with external control board». Then click on the middle node. Then the key labeled with the green cable outlet will be configured to send a burst of steam when triggered. In our example, AUX2.
- Select the mode «steam burst trigger» and set the «Strength of the steam surge» and the «strength of the blower» on the Value 31, the «Timeout» however to 0.



- Now you need to define the function button, with which the Smoke generator will be switched on. This is done in register «Function assignment». In the mapping line of the desired function key the logical function «ESU smoke generator» could be selected. In our example, this is the F4 key.



## 6.1.2. Sound synchronisation settings

The most important settings in the tab bar is to synchronize the sound with the smoke. You must be in sound sequencing and set the desired heating temperatures and fan speeds. Only a few of the most recent files are set up from ESU with the correct default settings for this to work «right out of the box». For the other sound files you will need to make the following adjustments:  
First select Sound Slot 1 from the list of available sound slots .



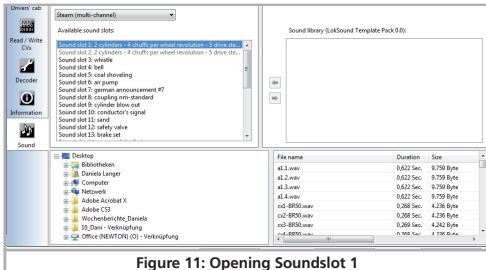


Figure 11: Opening Soundslot 1

Opening «Soundslot 1» will open a new window as illustrated below in Figure 12. Contents of the new window will vary by sound file. You will notice 2 subsections:

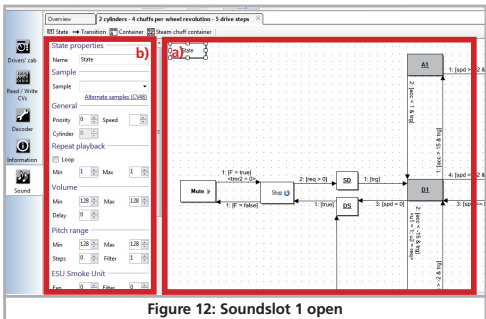
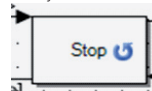


Figure 12: Soundslot 1 open

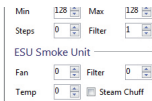
- a) states and state transitions
- b) characteristics of the selected state or state transition

Shown in the left part properties change interactively depending on what was in the tile marked on the top right. Transitions are triggered by a white rectangle shown. Click with your mouse the «Stop» as in the shown figure.



To adjust the Smoke Unit settings for this state look to the left at the state properties in the section labeled «ESU Smoke Unit».

- Fan: Here you can set the speed of the fan motor. The larger the Values, the faster the fan spins and the more smoke is expelled. A value of 255 means «full throttle». The appropriate values you need depends on the model. High fan speed usually also require a higher heating temperature, so that the desired amount of smoke is also generated.
- Temp: Allows you to set the temperature in degrees Celsius. Higher values produce more smoke, but lead to high thermal stresses the smoke generator. The maximum temperature of the smoke generator is also internally limited and dependent of the mechanics. The potential setting of 255 ° C therefore will not be achieved.
- Filter: You can set how fast the fan motor will react to changes of the desired speed. The value 0 gives a direct adjustment, while higher values cause a smooth transition. This can sometimes cause realistic smoke effects.
- Steam boost: This box must be set anywhere you want bursts of steam to play. Only if the box is checked will the smoke generator instruct the LokSound decoder to generate a steam burst. Otherwise, a continuous vapor is discharged (Diesel mode).



# Programming

You have to enter appropriate values for each condition. In practice, we recommend the following procedure:

STOP:

Here low values should be entered, for example:

Fan	59
Temperature	165
Filter	0
Steam boost	Not set

SD conditions («Stop to Drive»), DS («Drive to Stop»):

You can start with the following values:

Fan	42
Temperature	235
Filter	0
Steam boost	Not set

States «Coast» and «DCX»

Fan	42
Temperature	155
Filter	0
Steam boost	Not set

The actual speed steps in all ESU projects with Dx referred to. Some sound projects include D1 to D4, other go to D8. These are the normal bursts of steam. Here you should experiment with the following values:

Fan	212
Temperature	220
Filter	0
Steam boost	law

For the acceleration levels A (mostly from A1 to A4, sometimes also to A8), you should higher calorific values and fan speeds pretend, for example,

Fan	245
Temperature	235
Filter	0
Steam boost	law



You can select multiple states simultaneously by holding down the «Shift» key (hold and then sequentially checking the boxes.)

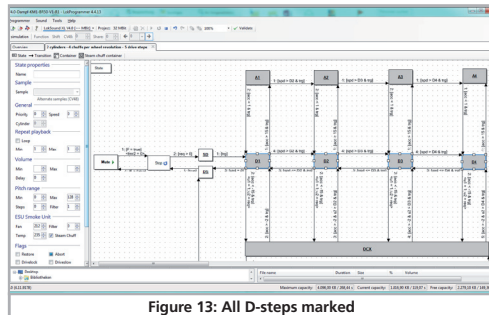


Figure 13: All D-steps marked

If you now change the fan and temperature values, apply these changes for all currently selected states.  
If in the list of available sound slots sound slot 2 is also occupied, but is marked in gray, this is no reason for concern. This means that two sound channels for the shot of steam used will automatically get a copy of the sound in slot 1 to be used in the steam engine. You don't need to set anything else on it.

### 6.1.3. Optimization of the function

For the last step, in the «smoke generator» here are more options optimize the smoke generator. Figure 14 displays all the available options.

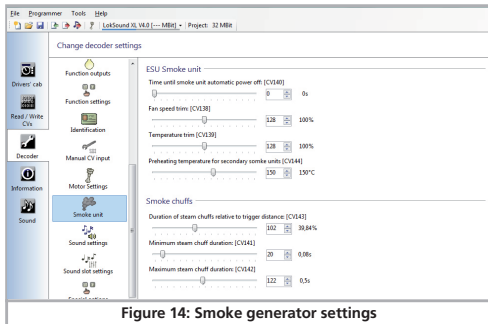


Figure 14: Smoke generator settings

- Time to automatic switch-off: Here you can set whether the smoke generator will automatically shut off after a predetermined amount of time. Normally, a time of 10 minutes is recommended. This prevents excessive current draw on an empty tank. When the automatic shutdown is performed, the smoke generator will be activated again by turning the power cycle on.
- Adjusting the fan speed: Here, the fan speed will be changed relative to the values set in the sound sequencing.
- Adaptation of the heating temperature: Here, the heating temperature will be changed relative to the values set in the sound sequencing.
- Preheat for secondary smoke generators: If desired the smoke generator can be pre-heated to ensure faster function. Note that this preheating is always active when the smoke generator is switched on and according to current needs.
- Duration of the bursts of steam: Depending on the wheel diameter and installation situation it may be that the bursts of steam are too short. In this case, increase the value to get more powerful bursts of steam. The duration is specified in relation to their distance in%. Therefore, a value of 50% ensures bursts of steam that are half as long as their spacing.
- Minimum duration of a steam burst: No matter how fast the wheel pulses come, the minimum length of the steam burst can never fall below the value set here.
- Maximum steam burst: Here you can set the length limit of the steam burst to the maximum set value.

## 6.1.4. Cylinder steam function

You can use the «big» smoke generator 54679 setting the jumper so that it works in the «cylinder steam»(see Figure 2). This means in practice, that with two smoke generators located in the locomotive you need to take care in using the correct wiring so that both smoke generators have a power supply (red cable to U + terminal of the decoder, the black wire to the GND terminal of the decoder)and both receive it and that both the above commands get the AUX1 output in parallel. The cylinder steam required no steam burst trigger (green wire).

You now only have the sound outlet for the noise «cylinder blow out» the corresponding values for the heating and setting the fan speed. In our example, this is stored in the sound slot 9 «cylinder blow out». The LokSound decoder is at all sound slots> 4 and assumes that the cylinder steam must act and sends the appropriate commands to the smoke generator.

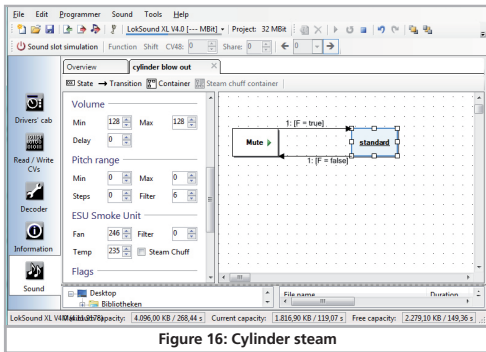


Figure 16: Cylinder steam



Be sure to set both the CV values and also the sound again on the decoder. The flue settings can be written together with the sound data.

## 6.2. For other decoder (SUSI)

When operating with other decoders from the SUSI interface usually only the current speed and the condition the function keys transmitted. The smoke generator must piece together the data in conjunction with the steam pulses. For this to succeed in practice, ESU smoke generators have some SUSI CVs.

Once you have connected the smoke generator you must program these CVs to matching. This is done on the programming track as with «normal» CVs too. The decoder is normally sufficient on the SUSI CVs to the smoke generator and can also be read.

### 6.2.1. Function key

First, you must determine which function key the smoke generator will be switched on with. The desired key is defined in the CV 902. The work value «1» stands for F1.

### 6.2.2. Heating and fan speed monitoring

The smoke generator recognizes SUSI Mode in 4 states:

- Stop: The model is stopped, the fan is running
- Drive: The model runs
- Acceleration: The model accelerates
- Coast: The model rolls (controller was turned back from state drive)

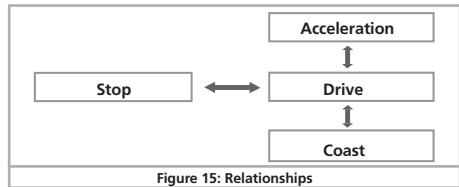


Figure 15: Relationships

The relationship is as follows:

For each state, the desired heating temperature and fan speed must be set. Section 7 provides information on the CV numbers. Furthermore, you can still set when the transition to drive to acceleration drive occurs after coast is cancelled. The corresponding thresholds define the acceleration or deceleration values, from which the smoke generator is to change the mode. Finally, the minimum in the SUSI mode, the maximum steam burst length, and the duration of the bursts of steam can be adjusted in proportion to their distance.

### 6.3. Firmware update with LokProgrammer

Of course, the ESU smoke generator using the ESU LokProgrammer can be supplied with a new firmware. For this purpose, the smoke generator must be removed, however, and then connected to the LokProgrammer. Two separate solder connections are available for this. These are marked «PROG». Figure 17 shows where they are located. These two connections to the output must be connected to the LokProgrammer.

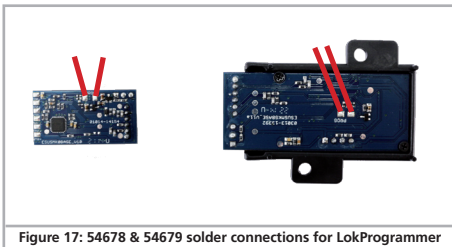


Figure 17: 54678 & 54679 solder connections for LokProgrammer

## 7. Support and help

If you do not know how to proceed, first contact your dealer where you purchased your ESU product. He is your competent partner for all questions about model trains.

In difficult cases, you can contact us directly. Look first on our website under «Support / FAQ» to see whether the question has already been answered. If this is not the case, we ask you to make these available to us either in our support forum or to contact us by e-mail. We also provide a telephone hotline, which should only be used in the case of really special requests.

### Germany

By phone: +49 (0) 731 - 1 84 78 - 106  
Tuesday & Wednesday  
from 10.00 to 12.00 o'clock  
By Fax: +49 (0) 731 - 1 84 78 - 299  
By E-Mail: [www.esu.eu/kontakt](mailto:www.esu.eu/kontakt)  
By mail: ESU GmbH & Co. KG  
Edisonallee 29  
D-89231 Neu-Ulm

[www.esu.eu](http://www.esu.eu)

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ESU LLC  
By phone: +1 570-980-1982  
By Fax: +1 866-591-6440  
By E-Mail: [support@loksound.com](mailto:support@loksound.com)  
By mail: ESU LLC  
23 Howard Street  
Montoursville PA 17754

[www.loksound.com](http://www.loksound.com)

## 8. List of SUSI-CVs

CV	Description	Value
900	Manufacturer ID	151
901	version number	0
902	function key to turn the smoke generator	1
903	Stop state - temperature	175
904	State Drive - Temperature	190
905	state Acceleration - Temperature	210
906	state Coast - Temperature	180
907	state stop - Fan speed	30
908	state drive - Fan speed	80
909	state Acceleration - Fan speed	120
910	state Coast - Fan speed	40
911	threshold transition Drive <=> Acceleration	3
912	threshold transition Drive <=> Coast	3
913	Minimum duration of a steam burst	20
914	Maximum duration of a steam burst	80
915	duration of the bursts of steam relative to trigger pulses	50

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## 9. Guarantee certificate

### **24 months warranty from date of purchase**

Dear customer,

Congratulations on purchasing this ESU ECoS command station. This quality product was manufactured applying the most advanced production methods and processes and was subject to stringent quality checks and tests.

Therefore ESU electronic solutions ulm GmbH & Co. KG grants you a warranty for the purchase of ESU products that far exceeds the national warranty as governed by legislation in your country and beyond the warranty from your authorised ESU dealer.

### **Manufacturer's warranty of 24 months from date of purchase.**

#### **Warranty conditions:**

This warranty is valid for all ESU products that have been purchased from an authorised ESU dealer.

Any service, repair or replacement under this warranty requires proof of purchase. The filled in warranty certificate together with the receipt from your ESU dealer serves as proof of purchase. We recommend keeping the warranty certificate together with the receipt.

In case of a claim please fill in the enclosed failure report card as detailed and precise as possible and return it with your faulty product.

Please use the appropriate postage when shipping to ESU.

#### **Extend of warranty / exclusions:**

This warranty covers free of charge repair or replacement of the faulty part, provided the failure is demonstrably due to faulty design, manufacturing, material or transport. Any further claims are explicitly excluded.

#### **The warranty expires:**

- In case of wear and tear due to normal use.
- In case of conversions of ESU – products with parts not approved by the manufacturer.
- In case of modification of parts.
- In case of inappropriate use (different to the intended use as specified by the manufacturer).
- If the instructions as laid down in the user manual by ESU electronic solutions ulm GmbH & Co. KG were not adhered to.

There is no extension of the warranty period due to any repairs carried out by ESU or replacements.

You may submit your warranty claim either with your dealer or by shipping the product in question with the warranty certificate, the receipt of purchase and the fault description directly to ESU electronic solutions ulm GmbH & Co. KG at:

ESU GmbH & Co. KG  
- Guarantee Section -  
Edisonallee 29  
D-89231 Neu-Ulm

# Trouble shooting sheet

## 1. Personal data











(Please write in block letters)

Name:.....	_____
Street:.....	_____
ZIP/City: .....	
Country: .....	_____
Email:.....	_____
Phone: .....	_____
Date:.....	_____
Signature: .....	_____

## 2. Product details and system environment (use extra page if needed)

<b>Art.No.:</b> _____	<b>Purchase Date:</b> _____	<b>Address:</b> _____		
<b>Operation Mode:</b> <input type="checkbox"/> AC Analogue	<input type="checkbox"/> AC Digital	<input type="checkbox"/> DC Analog	<input type="checkbox"/> DC Digital (DCC)	
<b>Digital system:</b> <input type="checkbox"/> ESU ECoS	<input type="checkbox"/> Märklin® 6012	<input type="checkbox"/> ROCO® Digital	<input type="checkbox"/> LGB® Digital	<input type="checkbox"/> LGB® MZS
<input type="checkbox"/> Intellibox®	<input type="checkbox"/> Lenz® Digital	<input type="checkbox"/> Others:		

## 3. Error description

<input type="checkbox"/> Headlight output front 	<input type="checkbox"/> No Sound 	<input type="checkbox"/> Cable 
<input type="checkbox"/> Headlight output rear 	<input type="checkbox"/> Wrong Sound 	<input type="checkbox"/> Change direction probl 
<input type="checkbox"/> Motor output 	<input type="checkbox"/> Short circuit 	<input type="checkbox"/> Without any function (DOA)
<input type="checkbox"/> Programming 	<input type="checkbox"/> AUX output 	<input type="checkbox"/> Other problems: _____

## 4. Receipt - Proof of purchase (Please enclose this document!)

Please enclose your receipt / invoice. Otherwise no warranty possible!

## 5. Additional information:

_____
_____
_____
_____
_____
_____

## 6. Your retailer:

_____
_____
_____
_____
_____
_____

Retailer's stamp or address

