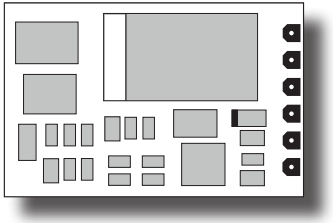
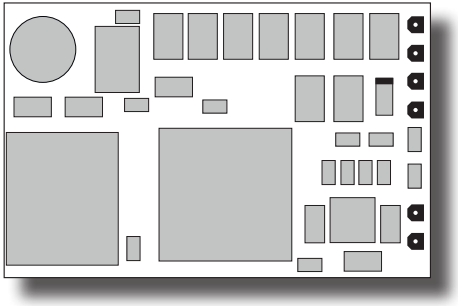
Doehler & Haass

Sound module



SH05A



SH10A

Contents

1 Introduction 3

2 Safety instructions 4

3 Warranty 4

4 Support and help 4

5 Soundmodul SH05A, SH10A 5

5.1 Functions 8

6 Installing the sound module 9

6.1 Preparation 9

6.2 Check after installation 9

6.3 Installation 10

7 System format SUSI 12

7.1 Functions 12

7.2 Setting options 12

7.3 List of supported CV or supported parameters 13

7.4 Operation 19

1 Introduction

The sound modules SH05A and SH10A are operated at the SUSI interface of a compatible car decoder. It can be used for all data formats supported by the vehicle decoder.

Our SUSI sound modules can be electrically connected to all decoders with SUSI interface. Whether 3.3 Volt or 5 Volt signals are used for the data and clock line is irrelevant. However, please note the maximum supply voltage of 30 Volt!

An operation on AC systems with change-over pulse is not permitted!
The change-over pulse leads to the destruction of the SUSI sound module!

Our SUSI sound modules must therefore not be installed in models which are also operated with analog AC voltage.

Our SUSI sound modules are not simplified products. In principle all sound functions are supported, which a sound decoder would also support. There are only some minor restrictions. Other SUSI sound modules available on the market usually have a clearly limited sound generation, which is not comparable with sound decoders at all. To make this possible, our SUSI sound modules require a permanent supply of all data required for operation via the SUSI interface.

Unfortunately not all decoders on the market output such a signal at their SUSI interface. We can therefore not guarantee an error-free function, if you connect the SUSI sound module to a decoder of the competitors. If you are unsure, please contact us.

2 Safety instructions

This product is not suitable for children under 14 years.
It might be swallowed by children under 3 years!
An improper use involves a risk of injury due to sharp edges and points.

3 Warranty

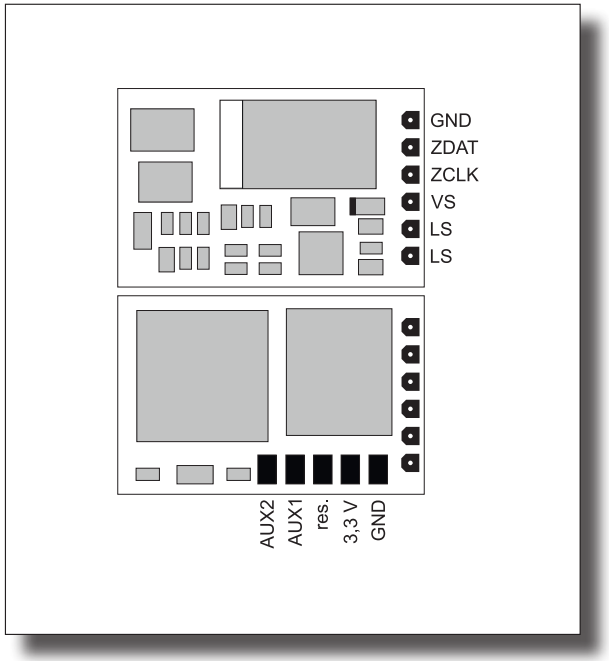
The functioning of every sound module is fully tested before delivery. Should nevertheless a failure occur, please contact the dealer where you purchased the sound module or directly the producer (Doehler & Haass enterprises). The warranty period is two years from the data of purchase.

4 Support und help

In case you have any problems or questions please contact us by email **technik@doehler-haass.de**
Usually you will get an answer within a few days.

5 Sound module SH05A / SH10A

SH05A

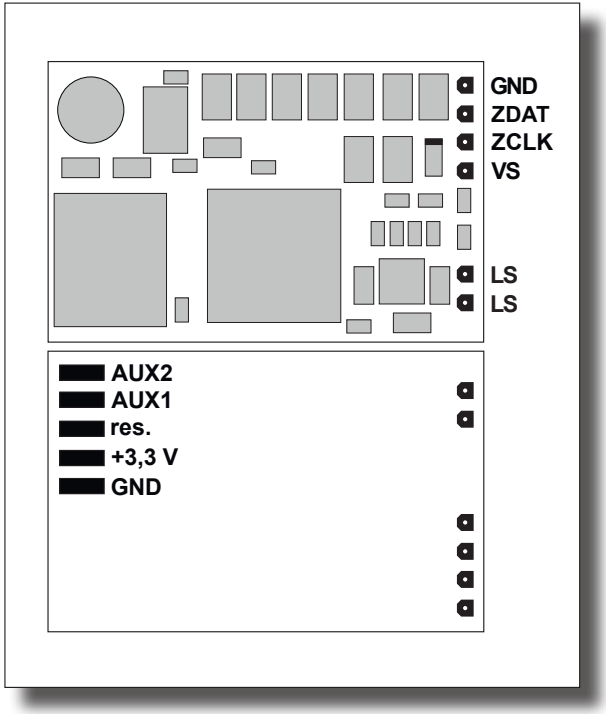


GND	Ground
ZDAT	SUSI data
ZCLK	SUSI clock
VS	Supply voltage
LS	Speaker
AUX1, AUX2	Unamplified additional function 1, 2 maximum load capacity each 20 mA
+3,3 V	Electronic supply voltage (not for the user!) maximum load capacity 100 mA
res.	Please do not connect anything!

The "VS" connection of the sound module must be connected to the "ZVS" connection of the decoder, if the decoder has one. If not, use the "VS" connection of the decoder.

As in case the unamplified function outputs AUX1 and AUX2 (logic level 0 V - 3.3 V, max. 20 mA) cannot switch greater loads, switching amplifiers (MOSFET, bipolar transistors or the like) must be provided for consumers, which either require a higher supply voltage (> 3.3 V) or a higher current (> 20 mA).

SH10A



GND	Ground
ZDAT	SUSI data
ZCLK	SUSI clock
VS	Supply voltage
LS	Speaker
AUX1, AUX2	Unamplified additional function 1, 2 maximum load capacity each 20 mA
+3,3 V	Electronic supply voltage (not for the user!) maximum load capacity 100 mA
res.	Please do not connect anything!

The “VS” connection of the sound module must be connected to the “ZVS” connection of the decoder, if the decoder has one. If not, use the “VS” connection of the decoder.

As in case the unamplified function outputs AUX1 and AUX2 (logic level 0 V - 3.3 V, max. 20 mA) cannot switch greater loads, switching amplifiers (MOSFET, bipolar transistors or the like) must be provided for consumers, which either require a higher supply voltage (> 3.3 V) or a higher current (> 20 mA).

Specifications	SH05A	SH10A
Dimensions [mm]	14.3 x 9.3 x 2.9	20.0 x 12.0 x 1.9
Sampling rate	22 kHz	22 kHz
Resolution	16 Bits	16 Bits
Independent sound channels	8	8
Memory size	128 Megabits	128 Megabits
Storage duration	up to 760 s	up to 760 s
Max. output power	1.6 W (8 Ω)	2.6/1.6 W (4/8 Ω)
Max. traction voltage	30 V	30 V
2 additional outputs (AUX1, AUX2)	unamplified	unamplified
Connecting options		
Without connection wires	SH05A-0	SH10A-0
With connection cable for the SUSI interface	SH05A-2	SH10A-2
With connection wires	SH05A-3	SH10A-3

As in case the unamplified function outputs AUX1 and AUX2 (logic level 0 V - 3.3 V, max. 20 mA) cannot switch greater loads, switching amplifiers (MOSFET, bipolar transistors or the like) must be provided for consumers, which either require a higher supply voltage (> 3.3 V) or a higher current (> 20 mA).

5.1 Functions

- Operation on all locomotive decoders with standard SUSI interface
- Original vehicle specific steam, diesel and electric locomotive sound projects (no „standard sounds“)
- Realistic steam driving noise with wheel synchronous and overlapping exhaust strokes, speed dependent pitch and independent boiling noise
- Realistic diesel hydraulic driving noise with speed dependent pitch, variable idle speed and independent acceleration stages, turbocharger and dynamic brake
- Realistic diesel mechanical driving noise with several gears, idle speed, several driving and acceleration stages and possible shifting noise
- Realistic electrical driving noise with traction motor and traction motor fan as well as upgrade noises (pantograph, main switch, etc.), switching mechanism noise and dynamic brake
- Bell, horn, whistle, closing doors, etc. (depending on sound project) can be triggered separately at any time
- All sound sequences are freely configurable (“Function Mapping“) and can be triggered randomly
- Speaker terminal protected against short circuit and overload
- Low heat generation through the use of the latest technologies
- Reset function
- Updateability of the firmware via SUSI interface using a programmer
- Loadability of sound projects via SUSI interface using a programmer

The update or loading is possible in the installed state of the sound module. The vehicle must be opened and the sound module connected to the programmer via the SUSI interface. The software, firmware and sound project download can be obtained from the Internet and is free of charge.

6 Installing the sound module

6.1 Preparation

Before installation, the locomotive must be checked for perfect electrical and mechanical condition. Defects or soiling must be removed before installation. Basically the instructions of the locomotive manufacturer must be observed.

Before installing the sound module, the locomotive must also be checked for proper function in digital mode. With new locomotives it is recommended to run the locomotive in each direction of travel for half an hour.

Furthermore all existing capacitors, especially at the connections for the light and the motor, have to be removed.
We recommend using double-sided adhesive tape to fix the sound module.

With sound modules, always solder the speaker first.
Carry out all soldering work in a de-energized state.
Avoid test drives with stripped unsoldered cable ends.

6.2 Check after installation

The first test should first be carried out in programming mode (e.g. by reading the manufacturer's code). If there is no proper feedback to the central unit ("Error"), please check the assignment of the connections again.

6.3 Installation

There are three variants for connecting the sound module:

1 If your locomotive decoder has a SUSI standard socket, you should use the sound module **SH05A-2** or **SH10A-2**. It has the necessary connection cable for this socket. You can easily plug the connection cable of the sound module into the interface.

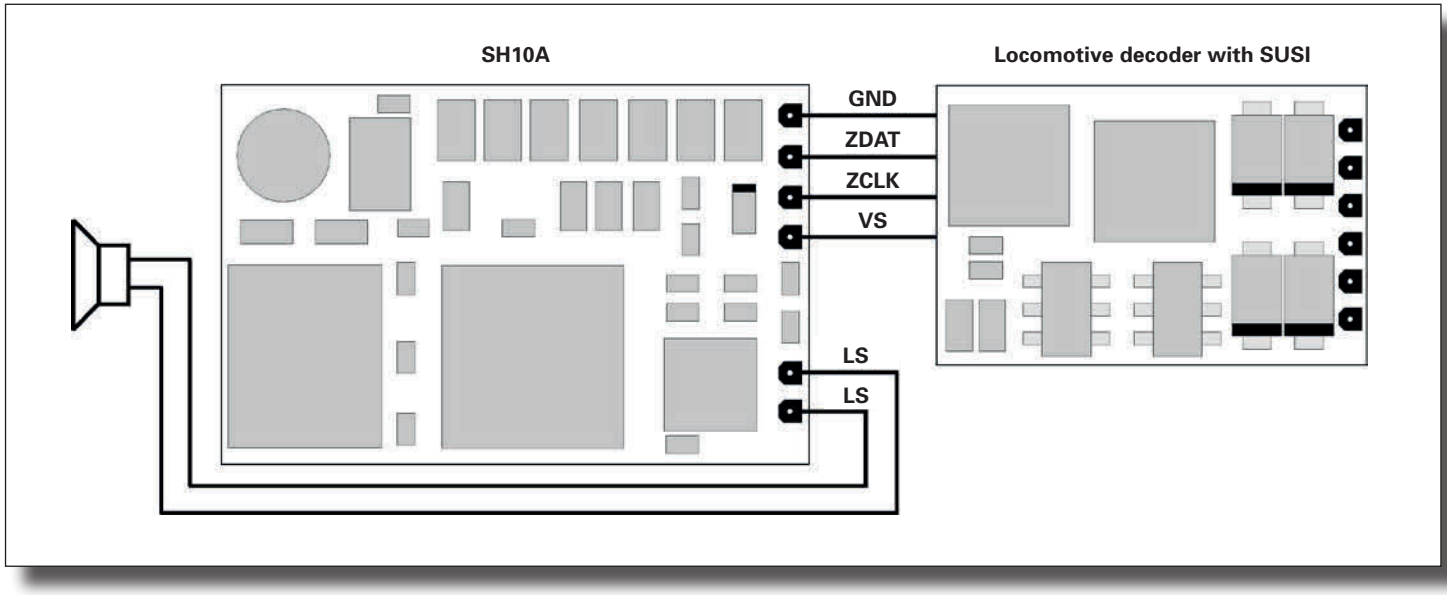
2 If your locomotive decoder has SUSI soldering connections, the sound module must be wired individually. You should use the sound module with the connecting leads for this purpose (**SH05A-3** or **SH10A-3**).

3 The sound module **SH05A-0** or **SH10A-0** should only be used by experienced model railroaders, because here the connecting wires have to be soldered directly onto the sound module.

Connect the wires of the sound module according to the following scheme:

black wire ..... Ground (GND)
grey wire ..... SUSI data (ZDAT)
blue wire ..... SUSI clock (ZCLK)
red wire ..... Supply voltage (ZVS)
brown wires ..... Speaker

The “VS” connection of the sound module must be connected to the “ZVS” connection of the decoder, if the decoder has one. If not, use the “VS” connection of the decoder.



Function outputs:
The function outputs AUX1, AUX2 are located on the bottom of the sound module and must be connected to the switching amplifiers with extra wires.

7 System format SUSI

7.1 Functions

Speed steps 127
Front light/rear light ..... yes
Additional functions 28
Main track programming ..... yes

7.2 Setting options

The properties of the sound module for operation can be changed as often as desired by programming the "Configuration Variables" (CV) or the parameters (par). Please take the programming informations out of the instructions of your programming device.

The sound module always occupies the CV ranges 1 and 2, so an additional SUSI module must be set to CV range 3 (CV897/par897 = 3). The SH05A or SH10A sound module can remain connected for this purpose, as it does not react to readout or programming commands from CV897/par897. This avoids the cumbersome and difficult to understand "CV banking" procedure (see SUSI specification version 3.10 for more information).

Hint:
If different speed levels are programmed in the locomotive decoder in DCC mode than in the driving unit, malfunctions may occur. These also affect connected sound modules. Please also note the instructions for your digital system.

7.3 List of supported CVs and supported parameters

CV/par	Name and definition	Range	Standard
900	**Manufacturer identification** (read only) 97 = Doehler & Haass (Decoder reset with “8“ or “101“)		
901	**Decoder number** (read only) SH05A = 50, SH10A = 100		
902	**Version number** (read only)		
903	**Date** (read only)		
904	**Revision number** (read only)		
905	**Date** (read only)		
908	**Function mapping AUX1** 0 = deactivated, 1 ... 28 = F1 ... F28, 29 = F0 (light), 30 = driving sound, 31 = secondary driving sound, 32 = gear sound, 33 = brake sound, 34 ... 46 = sound flow 4 ... 16, values greater 46 = deactivated Sound flow 3 is not available for technical reasons!	**0-255**	**0**
909	**Function mapping AUX2** (as CV908)	**0-255**	**0**
911	**Function mapping driving sound** 0 = deactivated, 1 … 28 = F1 … F28, 29 = F0 (light) Traction motor at electric locomotives, chuffs at steam locomotives, etc.	**0-29**	**1**
912	**Function mapping secondary driving sound** (as CV911) Traction motor fan at electric locomotives, boiling sound at steam locomotives, etc.	**0-29**	**1**
913	**Function mapping gear sound** (as CV911)	**0-29**	**0**
914	**Function mapping brake sound** (as CV911)	**0-29**	**7**

CV/par	Name and definition		Range	Standard
915	**Function mapping sound flow 3**	(as CV911)	**0-29**	**2**
916	**Function mapping sound flow 4**	(as CV911)	**0-29**	**3**
917	**Function mapping sound flow 5**	(as CV911)	**0-29**	**4**
918	**Function mapping sound flow 6**	(as CV911)	**0-29**	**5**
919	**Function mapping sound flow 7**	(as CV911)	**0-29**	**6**
920	**Function mapping sound flow 8**	(as CV911)	**0-29**	**9**
921	**Function mapping sound flow 9**	(as CV911)	**0-29**	**10**
922	**Function mapping sound flow 10**	(as CV911)	**0-29**	**11**
923	**Function mapping sound flow 11**	(as CV911)	**0-29**	**12**
924	**Function mapping sound flow 12**	(as CV911)	**0-29**	**13**
925	**Function mapping sound flow 13**	(as CV911)	**0-29**	**14**
926	**Function mapping sound flow 14**	(as CV911)	**0-29**	**15**
927	**Function mapping sound flow 15**	(as CV911)	**0-29**	**16**
928	**Function mapping sound flow 16**	(as CV911)	**0-29**	**17**
929	**Function mapping fade-out effect**	(as CV911)	**0-29**	**8**
930	**Total volume** 0 … 255 = 0% … 100%		**0-255**	**64**
931	**Volume driving sound** 0 … 128 … 255 = 0% … 100% …200% Value higher 100% can lead to overload!		**0-255**	**128**
932	**Volume secondary driving sound**	(as CV931)	**0-255**	**128**

CV/par	Name and definition	Range	Standard
933	**Volume gear sound** (as CV931)	**0-255**	**128**
934	**Volume brake sound** (as CV931)	**0-255**	**128**
935	**Volume sound flow 3** (as CV931)	**0-255**	**128**
936	**Volume sound flow 4** (as CV931)	**0-255**	**128**
937	**Volume sound flow 5** (as CV931)	**0-255**	**128**
938	**Volume sound flow 6** (as CV931)	**0-255**	**128**
939	**Volume sound flow 7** (as CV931)	**0-255**	**128**
940	**Volume sound flow 8** (as CV931)	**0-255**	**128**
941	**Volume sound flow 9** (as CV931)	**0-255**	**128**
942	**Volume sound flow 10** (as CV931)	**0-255**	**128**
943	**Volume sound flow 11** (as CV931)	**0-255**	**128**
944	**Volume sound flow 12** (as CV931)	**0-255**	**128**
945	**Volume sound flow 13** (as CV931)	**0-255**	**128**
946	**Volume sound flow 14** (as CV931)	**0-255**	**128**
947	**Volume sound flow 15** (as CV931)	**0-255**	**128**
948	**Volume sound flow 16** (as CV931)	**0-255**	**128**
949	**Volume fade-out effect** (as CV930)	**0-255**	**0**
950	**Coasting delay time** The value corresponds to the time in 100 ms steps until the compulsory change from driving sound to coasting. 0 = deactivated	**0-255**	**0**

CV/par	Name and definition	Range	Standard
951	**Acceleration time** The value corresponds to the time in seconds from standstill to maximum speed	**0-255**	**3**
952	**Braking time** The value corresponds to the time in seconds from the maximum speed until stopped	**0-255**	**3**
953	**Chuffs at speed step 1** The value corresponds to the time in 64 ms steps between the chuffs at speed step 1	**0-255**	**120**
954	**Chuffs at higher speed steps** The value determines the time of reduction between the chuffs at higher speed steps	**0-255**	**20**
955	**Brake squeal at minimal speed step** The minimum speed step that must be reached, to make brake squeal possible	**0-127**	**20**
956	**Brake squeal at initial speed step** The speed step at which brake squeal begins when the vehicle stops	**0-127**	**13**
957	**Secondary driving sound modulation** The value determines how strongly the speed level influences the pitch. 0 = deactivated	**0-255**	**0**
958	**Driving sound modulation** (as CV957)	**0-255**	**11**
959	**Timer for fade-out effect** The value corresponds to the time in seconds from the adjusted total volume to silence	**0-255**	**8**

CV/par	Name and definition	Range	Standard
960	**Write protection Flash-ROM** Must be "0" for sound operation (is operated during the loading process)	**0, 1**	**0**
961	**Threshold value ZVS** The value corresponds to about the supply voltage in volt. At that voltage it will be changed to the energy saving mode (small values induces resetting the sound module and great values cause a "stuttering" sound).	**0-14**	**7**
962	**Chuffs at speed step 127** The value corresponds to the minimum time in 1 ms steps between the chuffs at speed step 127, which must not be undercut	**0-255**	**0**
964	**Brake squeal at final speed step** The speed step, where the brake squeal changes into the final sequence of the sound flow (actual end at speed step 0 at the latest).	**0-127**	**6**
965	**Brake squeal at deceleration time** The value corresponds to the time in 8 ms steps, which may pass by between two speed step reductions, in order that brake squeal is still possible.	**0-255**	**3**
966	**Brake squeal at minimum delay** The value corresponds to the number of speed steps, which must run through within the deceleration time at least, in order that brake squeal is still possible.	**0-127**	**0**
967	**Random sounds** **Bit Function Value** 0.....Random sounds allowed while standing.....1 1.....Random sounds allowed while running .....2 2.....Currently without function	**0-7**	**3**
968	**Volume dynamic sound** (as CV931)	**0-255**	**128**
969	**Volume turbo sound** (as CV931)	**0-255**	**128**

CV/par	Name and definition	Range	Standard
970	**Modulation dynamic brake** (as CV957)	**0-255**	**0**
971	**Modulation dynamic drive** (as CV957)	**0-255**	**0**
972	**Modulation turbo sound proportional part** (as CV957)	**0-255**	**0**
973	**Modulation turbo sound integral part** (as CV957)	**0-255**	**0**
974	**Function mapping volume reduction** (as CV911) With every keystroke (on/off) the total volume will be permanently reduced	**0-29**	**0**
975	**Function mapping volume enhancement** (as CV911) With every keystroke (on/off) the total volume will be permanently enhanced	**0-29**	**0**
976	**Function mapping brake squeal deactivation** (as CV911) If the corresponding function key is pushed, no brake squeal will be represented, even if the conditions should actually be fulfilled for it	**0-29**	**0**
977	**Function mapping forced coasting** (as CV911) If the corresponding function key is pushed, the driving sound remains coasting even during acceleration	**0-29**	**0**
978	**Function assignment automatic idle** (as CV911) When the corresponding function key is pressed, the automatic idling after the time period from CV350 has elapsed. If no function key is assigned, the automatic idle is always effective.	**0-29**	**0**
979	**Function assignment forced acceleratio** (as CV911) When the corresponding function key is pressed, the driving noise even during a deceleration in acceleration.	**0-29**	**0**

All programmable CVs can be changed during operation (POM / "**P**rogramming **O**n The **M**ain" / main track programming).
The given default values can be overwritten depending on the sound project!

7.4 Operation

Put the locomotive on the programming track and read out the manufacturer identification of the sound module (CV900/par900). The default value should be 97. Program the desired locomotive address and start running the locomotive keeping these setup values. After the first check you can vary the CV or parameters of the locomotive according to your requirements.

In case your programming device indicates "Error", please check again the correct wiring of the locomotive and pay attention to the notices for connecting the programming track. **Never put such a locomotive into operation!**

Please take the mapping, which sound flow corresponds to which sound, from the instruction of the particular sound project. Not all sound flows from 1 to 16 must contain sounds.

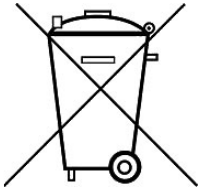
Starting delay:

The starting delay from speed level 0 to speed level 1 (CV63/par016) of the locomotive decoder should be set to a suitable value. Unsuitable values will result in the starting of the locomotive not matching the noise level. The exact value depends on the individual sound data.

Hint:

The acceleration time (CV03/par011) and the braking time (CV04/par012) of the locomotive decoder should be set to at least value 8. Times that are set too low will cause some sound sequences to be skipped and cannot be played back! If necessary the values of CV/par951 and CV/par952 can be increased step by step for fine tuning.

Notes



Dieses Produkt darf am Ende seiner Nutzungsdauer nicht über den normalen Hausmüll entsorgt werden. Bitte benutzen Sie die Entsorgungsstelle Ihrer Gemeinde.

This product must not be disposed off with normal household waste at the end of its useful life. Please use the disposal point in your municipality.

Ce produit ne doit pas être éliminé avec les déchets ménagers normaux à la fin de sa vie utile. Veuillez utiliser le point d'élimination de votre autorité locale.

CE

Nicht geeignet für Kinder unter 3 Jahren wegen der Gefahr des Verschluckens sowie der Verletzung durch scharfkantige Teile!

Not suitable for children under 36 month because of the danger of swallowing the product and of injuries due to sharp-edged parts.

Ne convient pas aux enfants au-dessous de 3 ans, dus au risque d'avaler le produit ou bien d'être blessés par des pièces à arêtes vives!

Company Stamp

Doehler & Haass Steuerungssysteme GmbH & Co. KG
Eichelhäherstrasse 54
D-81249 München
Tel. +49 (0)89 95 47 49 27
technik@doehler-haass.de
www.doehler-haass.de

© 2020 Doehler & Haass
Changes and errors reserved

Edition 09/2020