



**Digital Decoder
for Märklin Class VT 98
Rail Bus Motor Car**



User's Manual

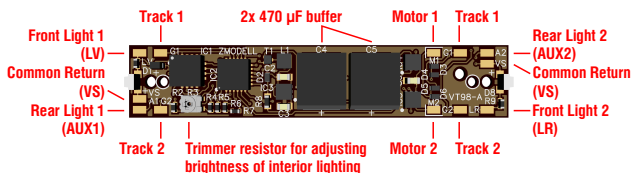
Art. No: ZDL-MRK-VT98-A

**Suitable for:
Märklin 88166, 88167, 88168
(only for new version with coreless motor)**

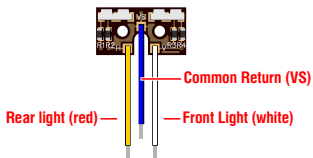
Ver 1.03

Overview

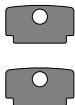
1x ZDL-MRK-VT98-A digital decoder board



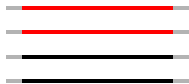
2x Light boards



2x Light filters



4x Power cables 25 mm



Package contents

- 1x ZDL-MRK-VT98-A digital decoder
- 2x Light boards with 20 mm pre-soldered cables
- 4x 25 mm power cables (2 red, 2 black)
- 2x Light filters
- 1x User's Manual

Technical data

Operating mode: DCC, MM, SelecTRIX 1, SelecTRIX 2, DC Analog

Max. voltage: 14 V in digital mode, 12 V in analog mode

Power buffer: Built-in 940 μF (2x 470 μF) energy storage module with thermal and overvoltage protection

Functions

F0 - Directionally controlled triple warm white headlights and double red rear lights

F1 - Interior lighting

F2 - Switch off headlights/rear lights at the cabin 1

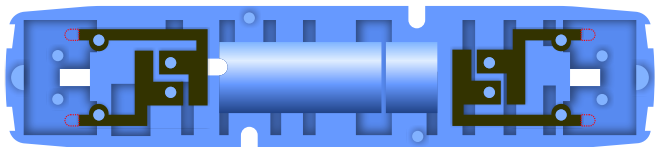
F3 - Switch off headlights/rear lights at the cabin 2

Default address: 3 (DCC), 01 (SelecTRIX)

Installation

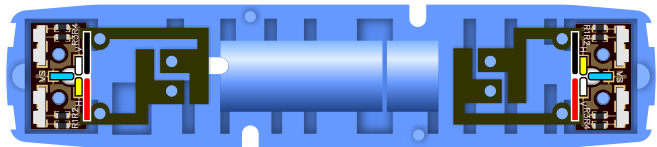
IMPORTANT: Soldering work required for installation of this decoder. Soldering station with adjustable temperature control, soldering iron with thin tip (1-1.5 mm) and good soldering skills needed for this.

1. Prior to installing the digital decoder, make sure your railbus runs perfectly in analog mode without jerks and stalls.
2. Carefully remove the housing of the railbus from the chassis.
3. Unsolder all wires from the top of the circuit board that is attached to the interior details insert.
4. Reduce the temperature of the soldering iron down to 200 °C and heat up pressed plastic pins which hold the circuit board. At the same time, slowly pull the circuit board upwards, so that it will separate freely.
5. Unscrew two screws that retain interior details insert and take the last one off the metal chassis. Take off the motor from the chassis and keep it nearby.
6. Remove plastic bogies by pushing four clips one by one from inside the chassis downwards. Keep them and the wheelsets in place.
7. Turn interior details insert upside down. Carefully hock the small circuit boards with thin slot head screwdriver. One by one, heat up pressed plastic pins that hold the boards with soldering iron heated up to 200 °C and pry the boards upwards, so that they will stay above these pins. Remember: the circuit boards are still connected with brass sliding contacts; they only need to be removed from their mounting pins at this step.
8. Now heat up the soldering iron back to the normal soldering temperature (around 350 °C). Carefully pick up the ends of sliding contacts that are soldered to the circuit boards with thin tweezers, heat them up and pull upwards a little in order to separate them from the circuit boards. Repeat this for both circuit boards and remove the boards from interior details insert completely. Remove solder residues from the ends of sliding contacts.
9. Shorten the ends of sliding contacts by 1 mm using precise cutters. It is needed to avoid short circuit with new lightboards that will be installed later:

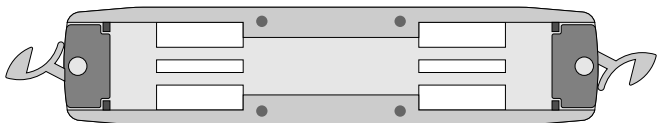


10. Install new light boards with pre-soldered wires that come with a digital decoder instead of old ones and press them gently until they sit on the pins completely. Push pre-soldered cables coming from the light boards into the holes under the circuit boards. Press two plastic pins with soldering iron heated up to 200 °C in order to fix the light boards in place.

11. Solder 25 mm red and black power cables that come in the package to the ends of sliding contacts and push them into the adjacent holes together with other cables coming from the light boards as shown on the following picture:



12. Attach supplied light filters onto the metal plates covering the coupler boxes with a small drop of glue (plastic or lasercut) as shown on this picture:



13. Place the motor onto the chassis. Push the motor outputs through the appropriate hole in the interior details part. Install the last one onto the chassis and fix it with screws.

14. Turn the chassis with attached interior details upside down and fix it on the surface in this position. Now it is time to install the wheelsets and plastic bogies back to their places. It is better to do this with the help of very thin tweezers.

Locate the sliding contacts attached to the blue interior details part - they are visible through the openings in the metal chassis from the bottom side. The ends of these sliding contacts are spring loaded; they should touch the inner surface of the wheel flanges.

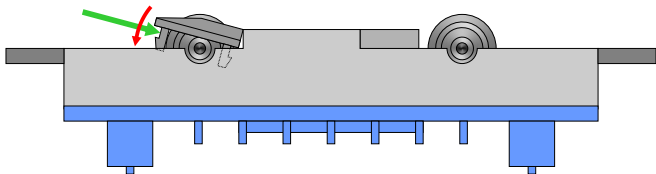
Push the ends of sliding contacts towards each other using tweezers and keep them in this position with one hand. Take the wheelsets with another hand and

carefully install them in places. A sign of correct installation will be that the wheels will not rotate and jump off, since their gears will be interlocked with the worm gear of the engine.

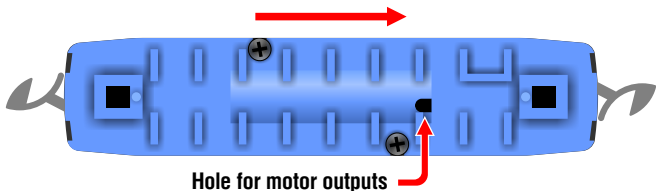
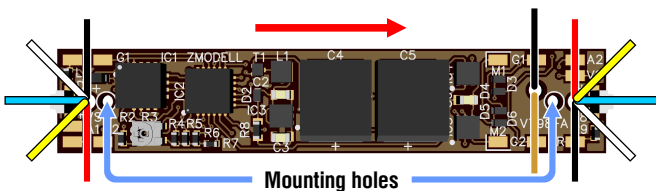
Keep holding the wheelsets with one hand and remove the tweezers. After this, carefully remove the hand from the wheelset and place the plastic bogie cover onto the opening in the chassis where it should be installed. Slightly press the outer clips of the bogie inwards with the help of small screwdriver and push down the bogie with hand until you hear the click and it will sit in place completely:

■ Press both clips with small screwdriver simultaneously

■ Carefully push down with hand



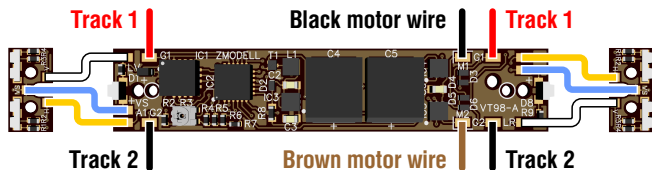
15. Turn the chassis upside down once again. Push all cables coming from the holes of interior details part through the appropriate holes in the circuit board of digital decoder as shown on the following picture:



16. Install the digital decoder board onto the upper pins of interior details part (see previous picture for reference) and press them with soldering iron heated up to 200 °C in order to fix the circuit board completely.

CAUTION: Digital decoder circuit board is very thin - only 0.2 mm. Making it so thin is the only way to fit all electronic components in a very limited space inside the railbus without making irreversible modifications to the model. Please handle the circuit board very carefully and never bend it!

17. Solder all cables to the pads on the digital decoder board as shown below:



18. Now the electric part of assembly is complete. At this step, do not install the housing yet, but place the railbus on the track, turn on the command station and check if lighting and other functions work correctly.

You may also adjust the brightness of interior lighting at this stage (brightness of headlights and tail lights can be adjusted later via decoder settings). To do this, use small slot head screwdriver and adjust the trimmer resistor on the circuit board. Turning clockwise increases the brightness, and vice versa. Please support the circuit board with your hands during this in order not to damage it accidentally due to excessive pressure.

19. Carefully install the housing of the railbus onto the chassis. It is recommended to perform a break-in run at the full speed from 5 to 15 minutes in both directions.

Important: To achieve best driving performance, please always keep the wheelsets of the railbus and tracks clean from dust, fiber and grease.

Programming

This digital decoder is based on Doehler & Haass® hardware and software technology. All functions and features are equal to those of Doehler & Haass® DH05C multiprotocol digital decoder. Programming samples shown below only for DCC mode. For detailed information about all available features, as well as programming in other modes (MM, SelecTRIX 1 and 2), please refer to the complete programming manual available on Doehler & Haass official website: <https://doehler-haass.de>

1. DCC Address: Default DCC address is 3. To change default address, desired value (1-127) should be written to CV1. Long addresses (0001-9999) available; please refer to the complete programming manual available on Doehler & Haass® official website.

2. LED Brightness: The brightness of headlights, tail lights and interior lighting can be adjusted. To change it, refer to the following table of decoder settings:

CV	Function	Range	Default
52	Brightness of headlights at the both ends	0-31	31
54	Brightness of tail lights, cab 1	0-31	31
55	Brightness of tail lights, cab 2	0-31	31
N/A	Brightness of interior lighting (analog)	10-100%	100%

3. Maximal speed: To adjust maximal speed, change CV5 to desired value (range 0-127). Default value is 92.

4. Advanced light control: One of distinguishing features of this decoder is ability to control all headlights and tail lights separately. It is useful when several railbuses drive in consist. In this case, unnecessary lights between the cars can be turned off.

Default method to do this is to assign different DCC addresses to each of the railbuses and switch off unnecessary lights on each car separately. It is also possible to control all cars in consist using only one DCC address. Please see complete programming manual available on Doehler & Haass® official website for reference.

5. Decoder reset: The digital decoder comes already programmed; no additional adjustments needed. To reset decoder to the factory defaults, write "8" to CV8.

After reset either a firmware update, the following settings should be restored for correct functioning of the power buffer, motor and lights:

CV9 = 0, CV33 = 9, CV34 = 6, CV35 = 16, CV36 = 0, CV37 = 0, CV113 = 2, CV114 = 4, CV115 = 2, CV116 = 4, CV137 = 2.

ATTENTION: This product is intended only for experienced users! Please perform all operations with all precautions that apply to work with ESD sensitive devices. The manufacturer is not responsible for any damage to the train model and/or digital decoder caused by improper installation, assembly or disassembly of the model, as well as by exceeding the maximum allowed operating voltage.

IMPORTANT: Soldering work required for installation of this decoder. Soldering station with adjustable temperature control, soldering iron with thin tip (1-1.5 mm) and good soldering skills needed for this. Also, the following tools required: M1 slot head screwdriver, M1.4 cross-type screwdriver, small tweezers with needle-point tips and precise cutters able to cut thin sheet metal.

**Digital Decoder
for Märklin Class VT 98 Rail Bus Motor Car**

User's Manual
Ver 1.03

Art. No: ZDL-MRK-VT98-A

 facebook.com/zmodelltrains
Email: zmodell@ukr.net



© Zmodell 2023
Made in Ukraine

Märklin® and SelecTRIX® are registered trademarks of Gebr. Märklin & Cie. GmbH, Postfach 860, D-73008 Göppingen, Germany

Doehler & Haass® is a registered trademark of Doehler & Haass GmbH & Co. KG, D-81249 Munich, Germany