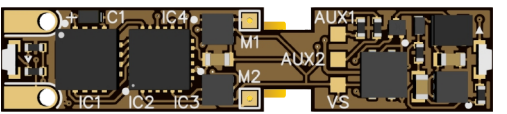
Universal Digital Decoder for AZL and Märklin Diesel Locomotives

Version 2.0



User Manual

Art. No: ZDL-AZL-01_V2

Suitable for AZL models:

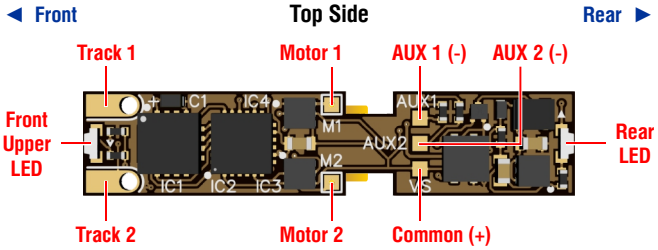
61000 **(SD70, SD70M, SD75M, SD75i)**
6200 **(GP7)**
62000 **(GP7/GP9)**
62100 **(GP30 1&2 run)**
62400 **(ES44AC)**
62500 **(GP38-2)**
62600 **(E8A, E8B, E9A, E9B)**
62900 **(F3A, F3B)**
63000 **(F7A, F7B)**
63100 **(SD70ACe)**
63200 **(SD45)**
63500 **(P42)**
64600 **(E7A, E7B)**
65100 **(C44-9W)**
65200 **(AC4400CW)**
65300 **(FP7)**

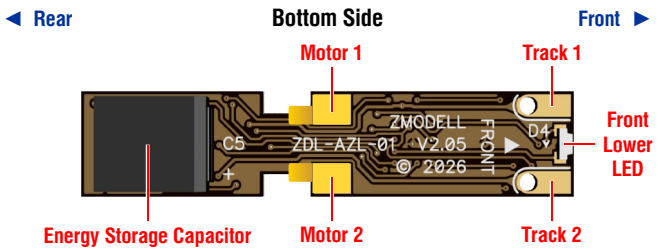
Suitable for Märklin models:

88615, 88616 **(GP38-2)**,
88625, 88626, 88627, 88628, 88629 **(E8A, E8B, E9A)**

Ver 2.05

Overview





Package contents

- **1x** ZDL-AZL-01_V2 digital decoder
- **1x** Set of plastic insulation stickers
- **1x** User 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:	Integrated highly efficient 470 µF energy storage module with thermal and overvoltage protection

Functions

F0 – Directionally controlled headlights and tail lights

F1 – Dimming function (the brightness of the headlights reduced by 50%)

F2 – Shunting mode (maximal speed reduced by 50%, short acceleration and deceleration time)

F3 – AUX 1 output

F4 – AUX 2 output

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

Installation

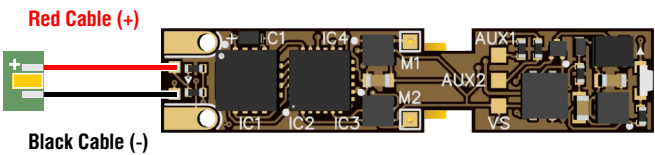
1. Prior to installing the digital decoder, make sure your locomotive runs flawlessly in analog mode without jerks and stalls.

2. Separate the locomotive housing and the chassis by pulling the body upwards. Perform this step carefully in order not to damage separately attached parts on the housing like handrails, window hoods etc.

3. Remove the stock analog circuit board by careful pulling its rear end slightly up and then backwards.

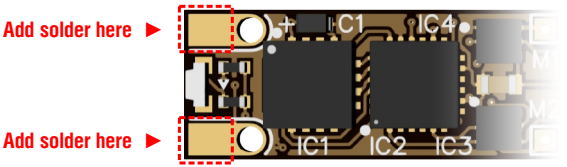
IMPORTANT: In case of installing **ZDL-AZL-01_V2** digital decoder in any of Märklin E8A or E9A locomotives **(Art. No. 88625, 88627, 88628, 88629)**, the small stock circuit board with front LED should be removed from the chassis and replaced with **Zmodell ZM-LD-001** LED board *(supplied separately)*. Front upper and lower LEDs must be unsoldered from the digital decoder circuit board, and the **ZM-LD-001** LED board should be connected to the pads as shown on the following picture:

◄ **Front** **Top Side** **Rear** ►



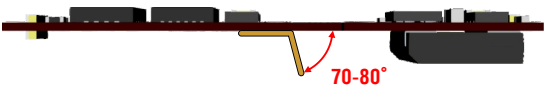
4. In certain cases, during installing the digital decoder into the locomotives without screw mounting **(AZL 61000, 6200, 62000, 62100 1st run, 62400, 62500, 62600, 62900, 63000, 63100, 63200, 63500, 64600, 65300 series, Märklin 88615, 88616, 88625, 88626, 88627, 88628, 88629)**, some solder must be added to the front parts of the track pads on the top side of the digital decoder circuit board in case the electric contact between the chassis and the digital decoder is unreliable. Use good soldering flux and add a small amount of solder onto the track

pads as shown on the following picture. Please proceed carefully using a soldering iron with thin tip (1-2 mm) and avoid touching surrounding components and making solder bridges:



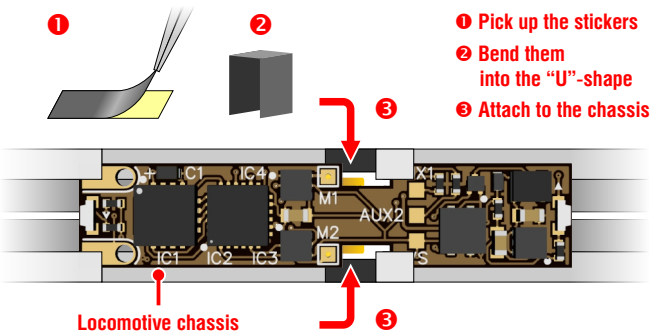
Note: In case of installing the digital decoder into the locomotives with screw mounting (AZL 62100 2nd run, 65100, 65200 series), this step must be omitted.

5. Make sure that the ends of the motor pads on the bottom side of the circuit board are bent downwards by 70-80 degrees, as shown on the following picture. Do not bend the tabs farther, otherwise they may break or become crumpled during the installation:



ZDL-AZL-01_V2 digital decoder, side view

6. Attach the supplied stickers to the locomotive chassis in the area where the motor tabs of the digital decoder make contact with the motor terminals as shown on the following picture:



7. Carefully install the digital decoder onto the chassis. In case of installing the digital decoder into the locomotives with screw mounting **(AZL 62100 2nd run, 65100, 65200 series)**, fix the decoder in place with screws. Please do not overtighten the screws in order not to damage the digital decoder circuit board.

Important: Please make sure that there is no short circuit between the motor tabs and the chassis. Check it thoroughly with the multimeter. The short circuit between the motor tabs and the chassis will destroy the digital decoder!

8. It is recommended to put the locomotive onto the programming track at this step and check if all functions work correctly (reading address, lights and motor).

Tip: In case of incorrect or unreliable reading of the address or adjusting decoder settings, please check whether the wheelsets and the track are absolutely clean. It is also recommended to additionally clean the brass springs attached to the chassis and the tabs coming from the trucks. The brass springs can be further bent downwards to put more pressure on the tabs and provide better electrical connection.

9. If the previous step was successful, the locomotive now needs to be re-assembled completely. For this, carefully install the housing back onto the chassis and gently press on it until it sits on the chassis completely.

10. Put the locomotive onto the track. It is recommended to perform a break-in run at full speed during 5-10 minutes in both directions.

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

Additional Functions

ZDL-AZL-01_V2 digital decoder features two auxiliary outputs with maximum load capability of 300 mA each (total load capacity of the digital decoder including all consumers like motor and lights should not exceed 0.5 A). Auxiliary outputs are shunted with 4.7 kΩ resistors and allow direct connection of LEDs and other consumers. They can be connected to the corresponding pads on the circuit board marked with **VS (+)** and **AUX 1 (-)**, **AUX 2 (-)**.

It is recommended to use thin stranded flexible wire for this. Single-core enameled cables (magnet wire) are not recommended. The brightness of auxiliary outputs is adjustable (see §10 of the "Programming" section). In case of connecting consumers other than standard LEDs (for example, blinking LEDs), the brightness should be always set to the maximum level. Otherwise, such consumers may show malfunction.

ZDL-AZL-01_V2 digital decoder is equipped with dual warm white front light LEDs on both sides of the circuit board which together provide approximately 5 times higher brightness than the front LED on the stock analog board at full throttle. This feature significantly improves the illumination of headlights on many compatible locomotive models that have weak headlights and/or ditch lights from the factory due to the long and winding lightguides.

Programming

This digital decoder is based on Doehler & Haass® hardware and software technology. For detailed information about all available features and programming in all available modes (DCC, 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; they are defined by **CV17** and **CV18**; also, **CV29** bit 5 should be enabled. Please refer to the complete programming manual available on Doehler & Haass® official website.

2. Starting speed: It is recommended to increase the value of **CV2** if the locomotive does not start at the first speed step. The range is 0-15. Default value is 0.

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

4. Shunting speed: To adjust shunting speed, change **CV61** to desired value (range 0-127). Default value is 63.

5. Acceleration time: The value of **CV3** corresponds to the time in seconds from start to maximum speed (available range 0-255). Default value is 5.

6. Deceleration time: The value of **CV4** corresponds to the time in seconds from the maximum speed to stop (available range 0-255). Default value is 5.

7. Acceleration and deceleration time in shunting mode: The value of **CV62** corresponds to the time in seconds between stop and maximum speed in shunting mode (available range 0-255). Default value is 1.

8. Driving direction: In certain scenarios, normal driving direction must be inverted (for example, in multiple F/E-units configurations like A-A or similar, when noses of different locomotives in consist point in opposite directions). To invert normal driving direction, write 0 to **CV51**. The driving direction will also change for analog mode, and the front and tail lights will be inverted correctly, too. Default value is 7.

Note: Please do not use **CV29** bit 0 for changing normal driving direction.

9. Deactivation of light functions: Certain locomotive models are equipped with front lights only (F/E A units) either have no lights at all (F/E B units). To use the digital decoder with these models, light functions can be deactivated so that they remain **OFF** regardless of the status of the **F0** function. This setting applies to analog mode, too:

Lights Configuration	CV33	CV34
Front and rear lights (default)	1	2
Front lights only	1	0
Tail lights only	0	2
No lights	0	0

10. LED Brightness: The brightness of the lights can be adjusted. To change it, see the following settings table:

CV	Function	Range	Default
52	Brightness of the front and rear LEDs	0-31	31
53	Brightness of the front and rear LEDs in dimming mode	0-31	15
54	Brightness of the AUX 1 output	0-31	31
55	Brightness of the AUX 2 output	0-31	31

Information: If the LEDs connected to the auxiliary outputs have capacitors connected in parallel, then adjusting the brightness of the auxiliary outputs may have no to minimal effect.

11. Auxiliary outputs in analog mode: It is possible to configure which auxiliary outputs should be activated in analog mode:

Auxiliary Outputs Configuration	CV13
AUX 1 and AUX 2 OFF (default)	0
AUX 1 only	4
AUX 2 only	8
AUX 1 and AUX 2 ON	12

Information: Please note that the digital decoder requires at least 6.5-7 Volts in analog mode to start.

12. Decoder reset: To reset decoder to the factory defaults, write 8 to **CV8**.

ATTENTION: This product is intended only to experienced users! Please perform all operations with all precautions that apply to work with ESD sensitive devices. This product is not suitable for children under 15 years. The functioning of every decoder is fully tested before delivery. Should nevertheless a failure occur, please contact the supplier where you purchased the decoder or directly the manufacturer. The warranty period is one year from the date of purchase. 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 parameters.

IMPORTANT: For certain installation scenarios, soldering work may be required for this decoder. Soldering iron with thin tip (1-2 mm) and good soldering skills needed for this.

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User's Manual
Ver 2.05

Art. No: ZDL-AZL-01_V2

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