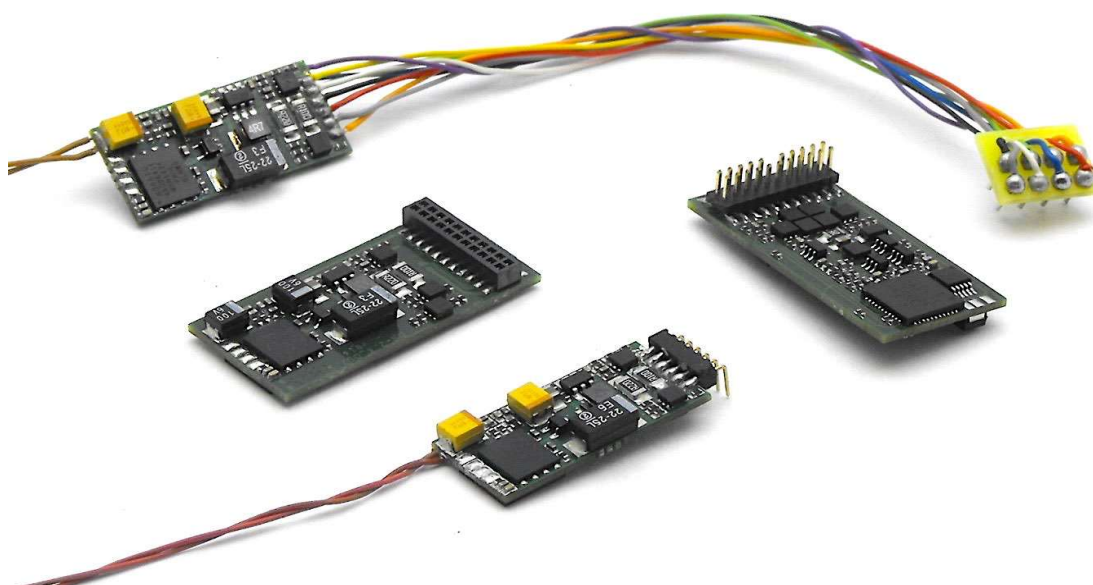




User Manual

DigiSound-4.1, -4.2, -4.3, -3.4, -3.5, -3.6

DigiSound-5.1, -5.2, -5.3, -5.5, -5.6



Document version: b4

Decoder software version (CV7 value): 034 - 036



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Thank you for choosing the product developed and produced by the
Hungarian DigiTools Electronics Ltd.

Key features:

The main purpose of this user manual is to introduce the operation and settings of the DigiSound-4.x and DigiSound-5.x combined locomotive decoder. The serial no. 4 and 5 sound decoders are the same in terms of functions and settings, they only differ in the size of the sound storing memory.

The DigiSound-4.1, -4.2, -4.3, -3.4, -4.5, -4.6 and DigiSound-5.1, -5.2, -5.3, -5.4, -5.5, -5.6, decoders will be hereinafter referred to as DigiSound-x.x decoders in the manual.

Hardware changes of DigiSound-x.x decoders compared to serial 3:

- The capacity of the built-in capacitors have been doubled to diminish the risk of contact problems.
- DigiSound-x.1 (8-pin NEM652) decoder has 2 additional function outputs.
- The height of the DigiSound-x.1 decoder has been decreased: 11.2 * 24.0 * 3.2 mm.
- The size of the DigiSound-x.5 decoder has been significantly reduced (PluX22): 15.1 * 25.4 * 4 mm.
- The DigiSound-x.5 decoder has got 7 pcs. of function outputs on top of the 2 lighting outputs. The TTL GPIO points of the PluX22 interface, can be the CV register's programmable output and input (AUX8 - AUX10).
- The DigiSound-x.5 decoder has got SUSI interface for communicating with external devices (dynamic smoke, Brawa Traxx lighting, evaluating the position).
- Preparation of our newly emerging DigiPack2 energy storing device.
- The DigiSound-4.x 64Mbit (8MB) audio memory can store 3-6 mins of audio depending on the resolution.
- The DigiSound-5.x 128Mbit (16MB) audio memory can store 6-12 mins of audio depending on the resolution.

The length of the stored audio depends on the resolution of the sounds.



Changes in version v33 software:

- The voice print set in the DSE program can stop the acceleration in normal and locomotive driver mode.
- CV4 = 0 value means the disabling of deceleration and delaying.
- Heavy vehicle function has been introduced.
- Locomotive driver mode can be switched on and off when the vehicle has halted.
- Decelerating can be set while the vehicle is rolling in locomotive drive mode.
- Troubleshooting (brake sound problem).

Changes in v34 software:

- Motor voltage measuring has changed.
- The load control has been modified; the slow speed controller has been eliminated.
- The maximum effect of load control can be adjusted in normal and consist mode.
- Acceleration-deceleration timing can be linear or prolonged at slow speed
- Change direction dependency of function output
- Changing volume between 2 selected options.
- Max. sound adjustment control (increased volume).
- Default value and function of the CV registers have changed or have been removed.

Important to note that settings saved to CV8=16 should not be re-entered, because it may lead to an error in operation.

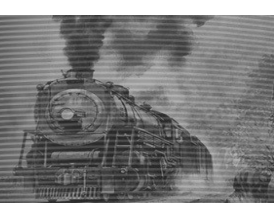
Main parameters:

- o Communication by NMRA DCC standard
- o 28, 128 speed rates, programmable speed graph
- o Address range 1-9999
- o Maximum 1 A engine output
- o Load control (can be enabled/disabled via the CV register)
- o 20 kHz motor PWM frequency
- o 2+4 (NEM652) or 2+4 (21MTC) 2+7+3 (PluX) pcs. short circuit protected function interface
- o Analogue mode
- o Asymmetric DCC sign perception (ABC mode)
- o Permanent break distance in ABC mode
- o RailCom
- o Consist (multi-locomotive) operation
- o FL, F1-F28 function handling
- o Adjustable light intensity
- o Shunting mode
- o Acceleration, deceleration modes can be switched on and off
- o Locomotive driver function
- o Disconnecting function
- o 3 or 28-point adjustable speed graph
- o Different interfaces for the different standards
- o Sound playing features:
 - o 4 - 8Ω speaker output
 - o D class sound terminal stage, 2,7Watt performance on 4 Ω
 - o 8 or 16 bit resolution, 22,05kHz sampling frequency
 - o 8 independent soundtracks played at the same time
 - o The speaker output is not short circuit protected!

Installing the Decoder:

Before installing the decoder it is recommended to do as follows:

- o if you are digitalizing your existing analogue system check if there is an integrated buffer capacitor remained on the rail!
- o when digitalizing old, not prepared locomotives it is essential to check if the value of the buffering capacitor is not higher than 47nF. If there is no reactor coil between the motor and the decoder, do not leave the capacitor on the output of the motor. Remove any capacitor between the two motor leads and the frame,
- o clean all the current collector skates and the wheels of the locomotive,
- o run the motor starting from ~5-10V in neutral gear, while measuring the current consumption. If it takes more than 200mA, check the state of the motor brush and the commutator and if necessary sweep out the coal powder from the gaps between the bites,
- o check the light bulbs, if necessary change them into higher voltage ones. The new bulbs should have at least 16V,
- o check the insulations. In case of locomotives, where one of the poles of the rail is the metal body itself it is important to check if the motor's insulation is adequate,
- o check the condition of the engine in terms of running and lubrication.



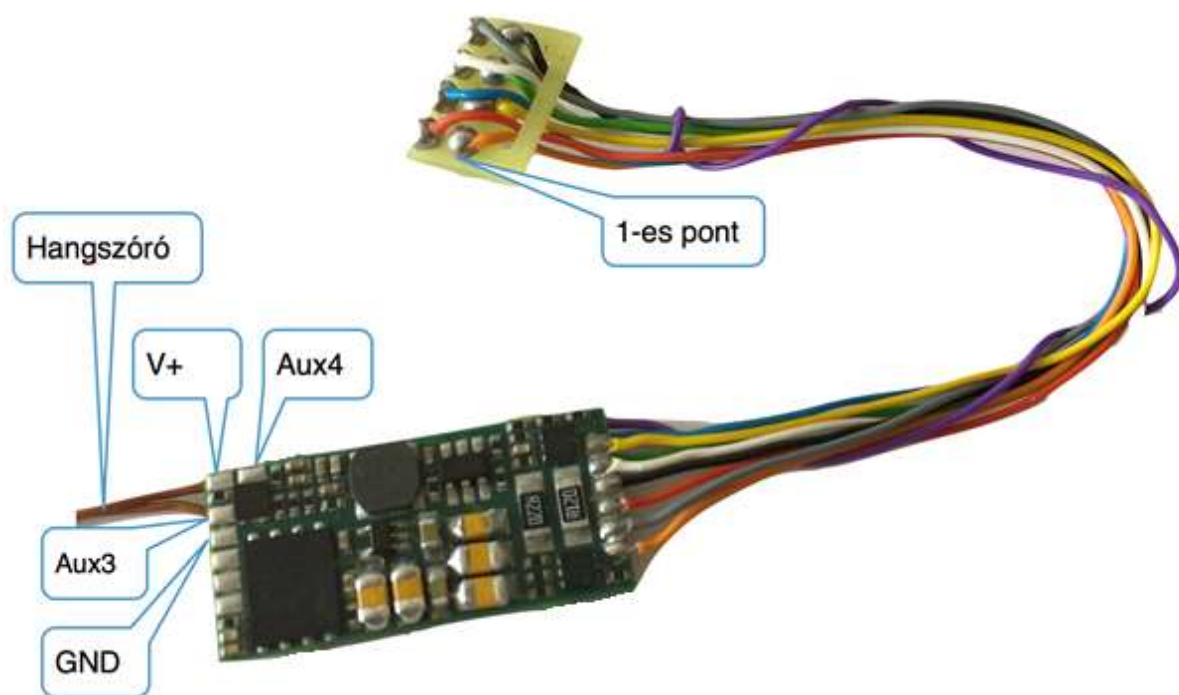
DigiSound-x.1:

The outputs of the decoder have the standard NEM652 interface.

When attaching the decoder be careful to link the orange output of the interface to pin 1 on the printed circuit, which is usually indicated with an asterisk.

In the event of an incorrect attachment, no damage is done, but the locomotive will go in the opposite direction and the lighting function will not work.

The standard length of the cable is 8 cm, but different cable lengths are available for individual orders.



DigiSound-x.1 decoder with the new interface

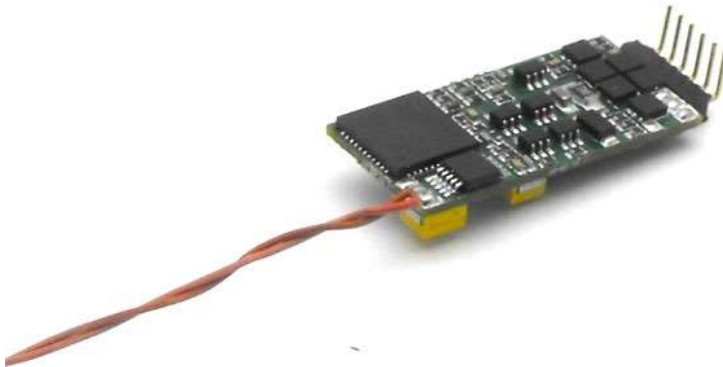
Sizes: 11.2 mm x 24.0 mm x 3.2 mm

DigiSound-x.2:

The outputs of the decoder have the standard 6-pole NEM651 interface.

It is available in two different sizes:

- straight interface
- 90° interface



DigiSound-4.2 with 90° interface

In the event of an incorrect attachment, no damage is done, but the locomotive will not work. In this case connect the device the opposite way around.

Sizes: 11.2 mm x 24.0 mm x 3.2 mm



DigiSound-x.3:

The outputs of the decoder are being shipped with customized length of cables, without interface.

Let us know what length you need when placing the order.

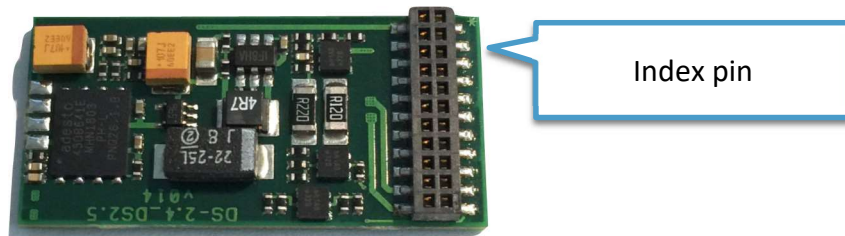
This type is ideal for digitalizing old models which do not have printed circuit for motor.

The list below will help you attach the unit:

- o Orange: Right motor terminal
- o Yellow: Rear light
- o Green: AUX1 function output
- o Red: Right track connection
- o Grey: Left motor terminal
- o White: Headlight
- o Blue: Function interface. Common „+” pole
- o Black: Left track connection
- o Purple: AUX2 function output

DigiSound-x.4:

The outputs of the decoder have standard MTC 21 pole interface.



The point indicated in the picture is the „index” pin. The „index” pin is responsible for the positioning of the decoder. This pin is omitted on the preparatory panel in the locomotive.

An incorrect attachment may result in damage in the decoder!

The loudspeaker output on the decoder is led out from the socket, so the loudspeaker must be connected to the endpoints on the locomotive’s preparatory panel. For instructions about the installation refer to the user manual.

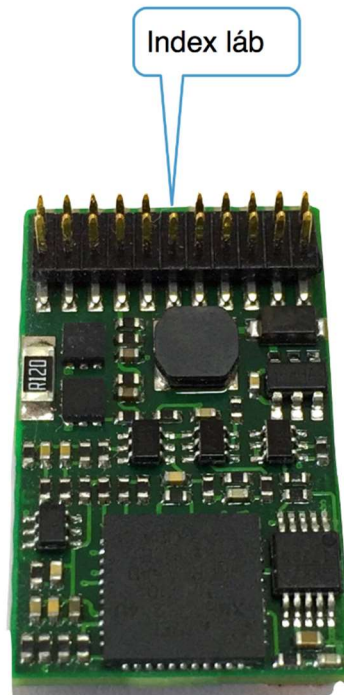
Speaker terminals are marked with S + S-, SP + SP- on the preparatory panel. (e.g.: Roco PluX22 Taurus: SPK, Piko Szergej: LSA and LSB, JC Taurus: SP1, Piko A26: LS+ and LS-)

Sizes: 15.0 mm x 31.0 mm x 4.0 mm

DigiSound-x.5 and DigiSound-x.6:

The outputs of the DigiSound-x.5 decoder have standard NEM 658, PLUX22 interface.

The outputs of the DigiSound-x.6 decoder have standard NEM 658, PLUX16 interface.



The missing pin in the middle of the pin line is the „index” pin. On the preparatory panel of the locomotive, the holes for this pin are omitted or marked separately.

An incorrect attachment may result in damage in the decoder!

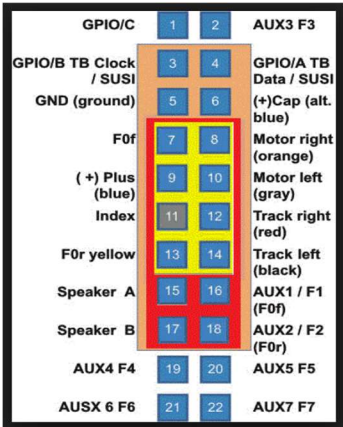
The loudspeaker output on the decoder is led out from the socket, so the loudspeaker must be connected to the endpoints on the locomotive’s preparatory panel. For instructions about the installation refer to the user manual.

Speaker terminals are marked with S + S-, SP + SP- on the preparatory panel.

Sizes: 15.0 mm x 31.0 mm x 4.0 mm

The PluX12, PluX16, PluX22 decoders are compatible with each other.

A decoder with the less no. of pins can be connected to a panel with more pins taking in- to consideration the place of the index pin and as a result the functions of the pins left out will not work.



Cable order of PluX decoders

Installation:

After having installed the decoder, check the position of the cables, they should not be in the way of any moving or rotating part. Pay particular attention to the cable of the loud-speaker, twist the two blades and make sure they do not touch anything electronically. If everything is ok, you may start the voltage test.

Motor control interface:

The decoder can control one permanent magnetic commutator direct current motor.

The H bridge made of FET transistors continuously has maximum 1A current.

The load control frequency is 20kHz.

The output is short circuit protected.

The protection is guaranteed only in case of standard installation!

If during assembling or because of an incorrect installation a short circuit should occur, for example, if one of the cables of the motor output (grey, orange) and the rail cables (black, red) touch, this may result in damage in the decoder.

If the short circuit protection sign alarms the decoder can only be reinstalled after the isolation of voltage. The output circuit alarm operates on bit 0 of the RailCom flag byte message.

Setting the load control:

The CV registers shown in the following chart belong to the motor speed control:

speed control	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV51	Effect of load control in consist mode							
CV52	Effect of load control in normal mode							
CV53	Set point calibration multiplier							
CV54	Boosting the proportional part. Default value is 3.							
CV55	Boosting the integrating part. Default value is 3.							
CV56	Boosting the derivative part. Default value is 128.							
CV49								enable *PID

*enable PID: enabling the operation of the load control



Important note: the default value, setting range or the function of the CV registers for load control have changed in v34!

It is new that you can set the effect of load control in CV51-52. Depending on speed, the maximum performance of the motor output can be limited, and so can be the tractive force. In case of heavily loaded vehicles, the motor can be spared but as a result the adjusting of the speed will not be precise. The default value of CV51 in consist mode is 150 and in normal mode the default value of the CV52 is 200. If you enter higher values in CV51-52 registers, there will be higher motor PWM.

Maximising the motor output control means the restriction of the maximum current consumption, which does not equal with the amendment of current level for short circuit protection. The current consumption of a heavily loaded locomotive can be restricted without the short circuit protection alarm which protects the locomotive from accidental damage.

The values of CV54-55-56 registers have also changed. In V34 the values of CV54 and CV55 are 1-9 and the default setting in both cases is 3. Should the value differ from these, the decoder calculates with 9. The default value of CV56 is 128, and the setting range can be 0-255.

The decoder has been tested in many vehicles, and in most cases, the basic setting has resulted in perfect locomotive movements, but it's also happened that we got the right results with extreme values. For this reason, we cannot share standard settings. We kindly encourage everybody to spend time of finding the best settings. In POM programming mode, you can instantly experience the effect of your changes.

A few tips and tricks for finding the best settings:

- Observe the movements of your locomotive at different speeds. If you observe rough and jerking movements, first e.g. reduce the value of the CV54-55 registers. The value of these two registers should be changed proportionally going up and down. The CV56 works only at abrupt change in speed, in most cases it doesn't need to be adjusted. The moving locomotive should be gently restrained in different proportions and the changes in its speed must be observed. If the speed drops too much and reaches the speed when it cannot be loaded again, you should increase the value of the CV54-55.



- If you experience a rhythmic, longitudinal waving movement in sync with the speed of the locomotive, it usually refers to a momentary friction in running. During troubleshooting, you should turn the load control off (CV49 0 bit = 0) and disable up- and down running (default value is F6). It helps to fix the problem if you can decide if this friction in the movement comes from the turning of the wheel or of the engine. You may try to let the decoder fix the problem, e.g. by increasing only the proportionate part (CV54) (<5 values), but this is not the most ideal solution.

Setting the speed of the locomotive:

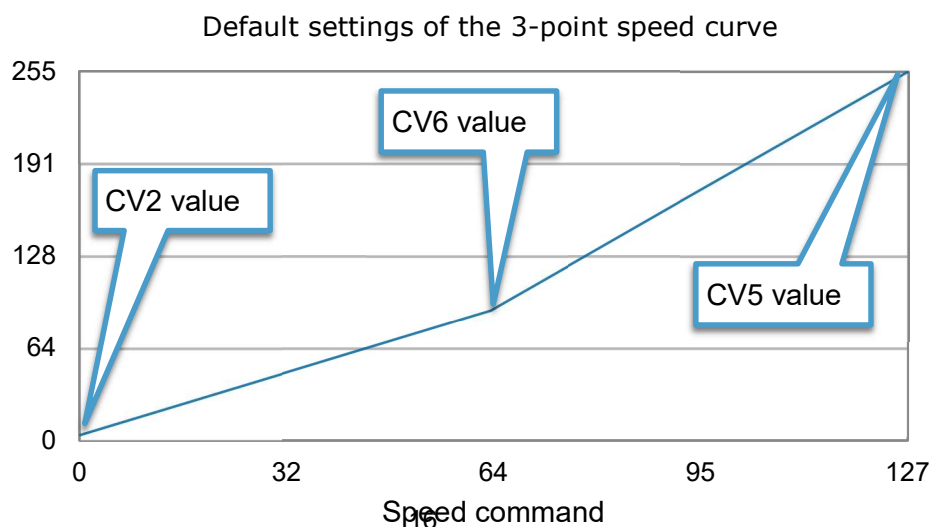
You can determine what the actual speeds of the speed gears coming from the rail are with the help of the 3 or 28-point speed curve. Since this function cannot be disabled, you should set this to your preference.

Bit 4 of the CV29 register determines if your locomotive should operate based on the 3 or 28-point speed curve. The 3-point curve is the default setting.

3-point speed curve (CV29, 4 = 0):

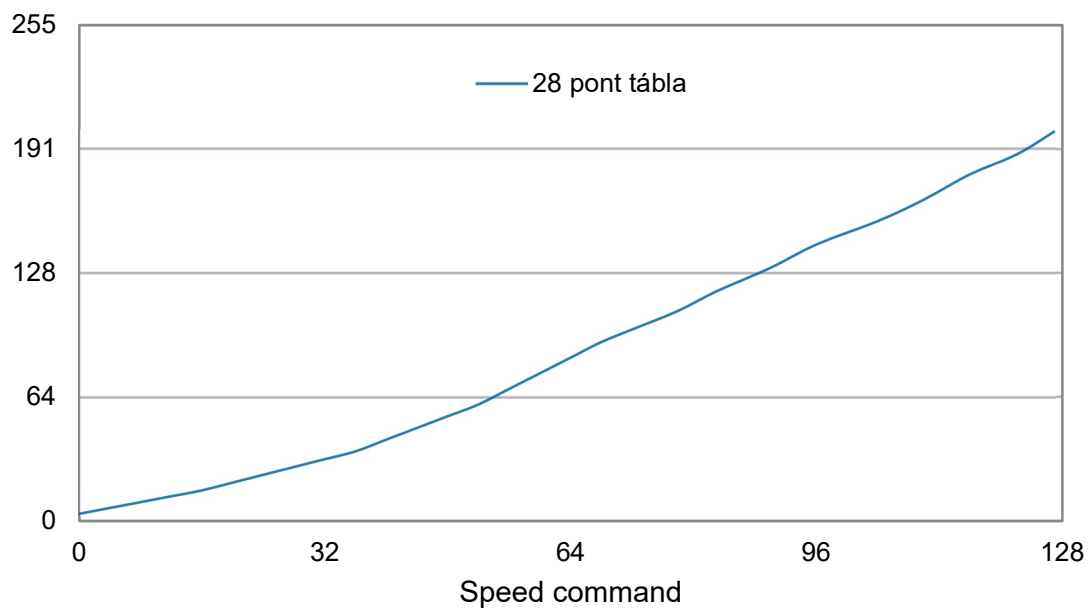
With the help of the 3 points, you can set the minimum speed (V min, CV2) the medium speed (V medium, CV6) and the maximum speed (V max, CV5) of the locomotive.

When CV6=0, the speed of the locomotive is on the line that connects CV2 and CV5 points. If CV2 is greater than CV6, in that case CV2 determines the speed of the locomotive until 64 speed point. If CV6 is greater than CV5, in that case CV6 determines the speed of the locomotive above 64 speed point.



28-point speed curve (CV29,4=1):

In this case, you do not have to worry about the CV2-6-5 registers, the speed can be set with the help of the CV67-94 registers. It is recommended to use the 28-point speed curve when you connect several locomotives, because as a result the real speed of the given speed gears of the connected locomotives can be harmonized better. CV67-94 registers can take 0-255 values and an exponential curve is set as default.



Speed set point multiplier:

In order to be able to use the whole range of the command coming from the rail, you need to coordinate the highest speed command and the EMF voltage of the highest engine speed. This EMF voltage differs in different motors and depends on the permanent magnetic excitation of the motor, the turn of the winding etc. The decoder coordinates these two values by multiplying the speed command coming from the rail with the value of the CV53 register. If you are unhappy about the maximum speed of the locomotive (with max. value of CV5), in that case increase the value of the CV53 step by step. If you see, that the locomotive reaches its maximum speed, before the remote control has been set to the highest speed, it means that the values of CV53 are too high, therefore you should gently adjust a lower value. The default setting is CV53 = 80.

Setting acceleration and deceleration:

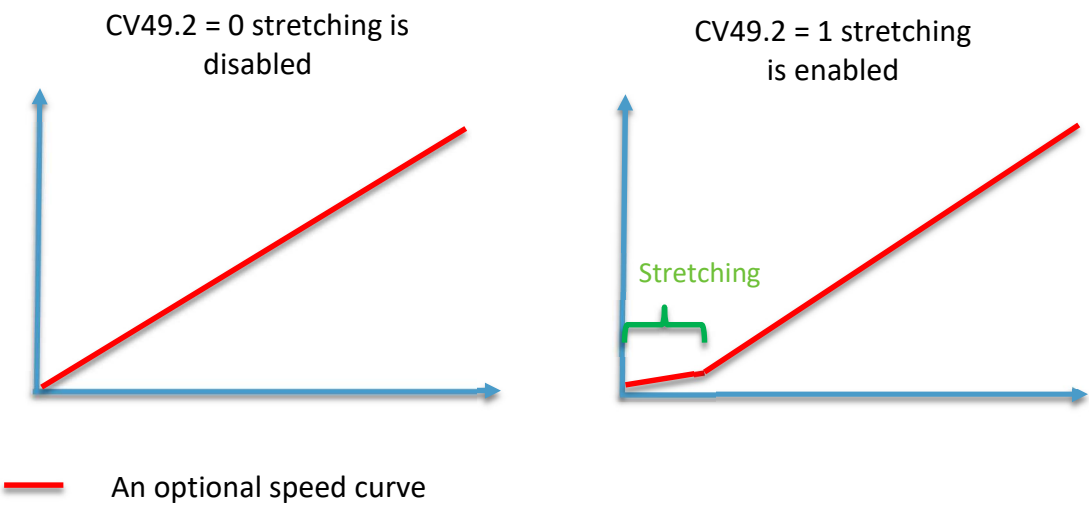
You can set the acceleration of the locomotive in CV3, and the deceleration in the CV4 registers. The greater the value is, the longer the acceleration and deceleration is. If CV4 = 0, the delaying of deceleration is completely disabled and the locomotive moves based on the speed command coming from the rail. In computer-controlled mode, you can make sure that your train will stop when requested.

The default settings are: CV3 = 31, CV4 = 10.

The stretch of delaying acceleration timing can be authorised with bit 2 of the CV49. CV49.2 = 1 = stretching is enabled.

Setting acceleration and deceleration	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV3	Delaying acceleration (0-255)							
CV4	Delaying deceleration (0-255)							
CV49						acc.-dec. stretch		

The length of the time stretch cannot be set yet.



Function outputs:

The number and type of DigiSound – x.x decoder function outputs are shown in the following chart:

	FL	RL	AUX 1	AUX 2	AUX 3	AUX 4	AUX 5	AUX 6	AUX 7	AUX 8	AUX 9	AUX 10	Sound
DigiSound-3.1	T	T	T	Tv									+
DigiSound-3.2	T	T	Tf	Tf									+
DigiSound-3.3	Tv	Tv	Tv	Tv									+
DigiSound-4.1	T	T	T	Tv	Tf	Tf							+
DigiSound-4.2	T	T	Tf	Tf	Tf	Tf							+
DigiSound-4.3	Tv	Tv	Tv	Tv	Tf	Tf							+
DigiSound-3.4	T	T	T	T	L	L	L	L					+*
DigiSound-3.5	T	T	T	T	T	T	L	L		L*	L*	L*	+*
DigiSound-4.5	T	T	T	T	T	T	T	T	T	L*	L*	L*	+*
DigiSound-3.7	T	T	T	T									+*
DigiSound-5.7	T	T	T	T									+*

Key:

T: Full value, transistor output, can be reached via the decoder connector.

Tv: Full value, transistor output can be reached via the factory-soldered line of the decoder.

Tf: Full value, transistor output can be reached via the soldering point on the decoder.

L: Logical output (0 and 3,3V). It is capable of transmitting LEDs between the output and the decoder's earth point to connect a larger consumer to a transistor (e.g. BS170). Pay particular attention to the voltage values shown here. These outputs cannot touch the parts that are on the rail or on higher voltage.

L*: Logical level, input or output (see above), can only be used as an AUX output if it is not selected as input or the SUSI interface is off.



+ : The speaker can be attached to the decoder via the output factory-soldered interface.

+* : Speaker output, the speaker can be attached to the soldering point on the preparatory panel of the locomotive.

Outputs marked in red colour are not short circuit protected!!!

The rest of the outputs are short circuit protected. Once the function outputs have been shorted, the output can be restarted only after a full power reset. The output short circuit signal is on the bit 0 of the RailCom flag byte message.

Function output registers:

Allocating the function buttons:

Every function output has got 4 CV registers in which you can choose the 4 function buttons that activate the output. You can specify the logic dependency (AND/OR) between the function keys and the selected function key ON/OFF (activate or deactivate the function key). If the output has to be controlled by only one function button, set it to function '1' and set 0 to all the other unused functions.

You can find the CV parameters for the function buttons in the below chart:

	1	2	3	4
Headlight	CV118	CV119	CV120	CV121
Backlight	CV122	CV123	CV124	CV125
aux1	CV126	CV127	CV128	CV129
aux2	CV130	CV131	CV132	CV133
aux3	CV134	CV135	CV136	CV137
aux4	CV138	CV139	CV140	CV141
aux5	CV142	CV143	CV144	CV145
aux6	CV146	CV147	CV148	CV149
aux7	CV150	CV151	CV152	CV153
aux8	CV154	CV155	CV156	CV157
aux9	CV158	CV159	CV160	CV161
aux10	CV162	CV163	CV164	CV165

The interpretation of the CV parameters for the function buttons (CV118-165):

CV118-165	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	ON/OFF	AND/OR	Number of the function button					

Key:

Number of the function button: The decimal value can be 0-38. The output will not become active at value 0 or higher than 38.

Optional values:

- 1-28 = F1-F28.
- 29 = lights.
- 30 = selected input (e.g.: dynamic smoke sync signal control).
- 31-34 = voice tag control bits (hm_out_vez1-4)
- 35 = deceleration (brake light).
- 36-38 = random sound timers 1-3.

Example: enter the output function number, e.g.: 5 for F5.

AND/OR: a logic dependency can be set between the function keys. 0 = AND (the decimal value is 0), 1 (the decimal value is 64) = OR.

The logic connection is testing the previous state and the respective button.

Example: Lighting can operate if F0 or F24 are turned on:

CV118 = 29 (F0),

CV119 = 24 + 64 = 88 (F24 + OR(64)).

ON/OFF: can be selected if the function should be active, when the function button is on or off. 0 = ON (its decimal value is 0), 1 = OFF (its decimal value is 128).

Example: Lighting can operate, if F0 is on AND F6, F8 are off:

CV118 = 29 (F0),

CV119 = 6 + 128 = 134 (F6 + OFF),

CV120 = 8 + 128 = 136 (F8 + OFF).

In order to set the CV register, the decimal values of the selected parameters must be summed.

Enter the result to the CV register:

Value of the CV register = ON/OFF state + AND/OR state + number of the function button.

Function output mode setting:

Every function output includes two modes, one basic brightness and one dimmer CV register. The following chart shows the output CV allocation.

	Mode 1	Mode 2	Dimmer	Basic brightness
Headlight	CV176	CV188	CV300	CV312
Backlight	CV177	CV189	CV301	CV313
aux1	CV178	CV190	CV302	CV314
aux2	CV179	CV191	CV303	CV315
aux3	CV180	CV192	CV304	CV316
aux4	CV181	CV193	CV305	CV317
aux5	CV182	CV194	CV306	CV318
aux6	CV183	CV195	CV307	CV319
aux7	CV184	CV196	CV308	CV320
aux8	CV185	CV197	CV309	CV321
aux9	CV186	CV198	CV310	CV322
aux10	CV187	CV199	CV311	CV323

Interpretation of mode 1 registers (CV176-187):

CV176-187	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	Phase	Move	Mode					

Key:

Operation:

The operating mode of the output can be determined by the decimals entered here. Its value can be 0-12. Should the value be greater than 12, the output will operate in normal mode. Optional modes are the following:

- 0: Normal mode (switching on and off).



- 1: Dimmable mode. The brightness of the output is determined by the values set in the Basic brightness (CV312-323), or in the Dimming brightness (CV300-311) registers, depending on whether the dimming function is active or deactive. Lowering brightness can happen this way (Basic brightness > dimming brightness), or by imitating the “long distance light” (Basic brightness < dimming brightness).
- 2: Bulb mode. Output voltage changes slowly.
- 3: Fire mode. Output voltage changes randomly.
- 4: Strobe mode. The output flashes short once as set in CV112.
- 5: Strobe2 mode. The output flashes short twice as set in CV112.
- 6: Blinking mode: The output flashes as set in CV112.
- 7: Ditch mode. The output pulses as set in CV112.
- 8: Marsh mode. The output pulses according to a pre-set curve.
- 9: Smoke mode. Output varies depending on CV115-117 and operational status.
- 10: Connection mode. The output operates in accordance with the control of the digital switch structure. To start connection mode you can assign function button in CV174 parameter to this function.
- 11: DigiPack mode. The output in this mode controls the DigiPack charge control leg.
- 12: Dimming mode + lightbulb mode. It is the dimming mode complemented with the light bulb mode.

Moving: If 1 (its decimal values is 64), the output will be active only during movement.

Phase: If 1 (its decimal values is 128), the phase of the output can be reversed in certain modes.

Example: Lighting output should operate only in motion and in bulb mode:

$CV176 = 2 + 64 = 66$ (bulb mode (2) + motion (64)).

In order to set the CV register, the decimal values of the selected parameters need to be summed up.

Enter this result in the CV register:

The value of the CV register = „Phase” state + „Motion” state + Mode.



Mode 2 registers (CV188-199):

The logic for setting the direction-dependency of the function output has changed in v34. The direction-dependency can be assigned to the 4 function buttons of the output one by one. Thanks to this, daytime lights can operate regardless of the direction by switching on an optionally selected function button. (in shunting mode the steam locomotive moves back and forth at the same time).

CV188-199	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	Function button 4 Direction- dependency		Function button 3 Direction- dependency		Function button 2 Direction- dependency		Function button 1 Direction- dependency	

Key:

Function button x direction-dependency:

Setting the direction-dependency of the output control function button:

- 00: No direction-dependency
- 01: The function is true, if the function button is ON or OFF AND the direction is "Forward"
- 10: The function is true, if the function button is ON or OFF AND the direction is "Backward"
- 11: Invalid setting, the function will never be true.

Example: You can set the backward light to operate only, if the lighting is on AND the direction of the locomotive is "backward" AND 'B' end lights are not disabled (F4) OR the shunting mode is active (F6).

1. Select the three control function buttons: CV122 = 29 (lighting), CV123 = 4+0+128 (F4+AND+OFF), CV124 = 6+64 (F6+OR).
2. Set the direction-dependency: CV189 = 2 (function button 1 = 2 = backward direction, function button 3 = 0 = regardless of the direction).

Since there is a AND connection between function button 1 and 2, it is enough to set the direction-dependency for only one of them.

Basic brightness:

Adjust the basic “brightness” of the function outputs.

CV312-323	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	Basic brightness						

Key:

Basic brightness: Its decimal value can be 1-64. 1 means the smallest, 64 means the highest output voltage.

Dimming brightness:

It can be used for setting the “brightness” of the function outputs during the active state of the set dimming function.

CV300-311	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	Dimming brightness						

Key:

Dimming brightness: Its decimal value can be 1-64. The lowest output voltage is 1, the highest is 64.

Other functions:

DigiSound-x.x decoders have some internal functions that control operation on top of the physical functions as you will see below. It is their common feature that the operating function buttons can be assigned via the CV registers. **The value of these registers can be 1-29. 1-28 = F1-F28, 29 = lighting functions.**

Shunting mode:

When this function is active, the decoder will half the value of the speed command coming from the rail. This results in smoother movements when shunting and marshalling. By default F6 is selected CV167 = 6.

CV167	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

Disabling acceleration-deceleration:

By activating this function the decoder switches off the automatic controls of acceleration-deceleration and the locomotive will be controlled by the operator.

By default F6 is selected CV166 = 6.

CV166	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

Lowering brightness:

If this function is active, those outputs that have been set for dimming mode will operate with the brightness set in CV300-311, or if it is inactive, they will operate with basic brightness.

By default F5 is selected CV168 = 5.

CV168	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

Smoke generator control:

If this function is active, the decoder can control the smoke generator via a selected function output.

“Smoke” mode can be selected in the mode selector register (CV176-CV179) of the given function output. You may adjust the amount of smoke emitted in case of stopping, accelerating and rolling locomotive.

	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV176-CV179	-	-	Smoke mode (9)					
CV115	stopping locomotive smoke emission							
CV116	accelerating locomotive smoke emission							
CV117	rolling locomotive smoke emission							

Locomotive Driver Function:

Using this function, you will experience a lot of difference in controlling compared to the usual movements of the locomotive, they are more diverse since speeding is changing and the speed can be adjusted more accurately. By activating this function the speed command given by the remote control does not control the speed of the locomotive but the acceleration and deceleration. If the locomotive stops the direction of its movement is determined by turning the command button to the appropriate direction from 0 position. The more you turn it, the faster the locomotive accelerates. When the locomotive reaches the desired speed, it will keep this speed by moving the button to 0 position. Moving the button to the opposite direction the locomotive decelerates. The more you turn the button, the more effectively the locomotive decelerates. When using this function, clean the rails extra carefully, because the rolling locomotive immediately stops after a longer power cut and may change directions during deceleration. The disabling acceleration-deceleration" function cannot be used in the locomotive driver mode.

From version v33 on, you can decide if you want your train to decelerate while rolling, if yes, to what rate. If CV327 = 0 value, there is no deceleration, if other than zero, there is. The higher the value is, the more the locomotive decelerates.

CV registers are the following in the locomotive driver mode:

	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV169	-	-	Number of function button (1-29)					
CV327	Rate of deceleration when rolling							



Analogue mode:

DigiSound-x.x decoders can be used on analogue layouts.

Attention! In the default manufacturer settings the analogue mode is disabled.

If you would like to use the locomotive having this type of decoder on analogue layout you have to enable this function with a digital system. To enable this function you have to switch on the second bit of CV29.

The decoder will work according to the digital settings in analogue mode as well. (Parameters CV3 and CV5, CV13 and CV14).

Example:

- Switch on the first bit of parameter CV13 and coordinate the AUX2 output set to steam generator to F2 function button. With this setting the steamer connected to AUX2 (purple) wire will work in analogue mode as well.
- Switch on the third bit of parameter CV13 and assign the automatic switching off of the acceleration-deceleration to the F4 function button. With these settings the vehicle will accelerate or decelerate according to the voltage change in analogue mode, not according to the values set in parameters CV3 and CV4.

Note:

- In analogue mode a loud locomotive will need a lot more voltage to set off
- Acceleration programmed digitally will work in analogue mode too, but deceleration will not

Attention! If you enable analogue mode, it will automatically disable the option to update software and download sounds! Disable the analogue mode before updating the software and downloading sounds!

Operation on track controlled by break dynamo:

Break dynamo is a system that “changes” the speed commands of the command center to stop command that applies to all of the vehicles on the track but doesn’t affect the function commands and the vehicle can be stopped before the stop signal. A DigiSound-x.x decoder will react to this command by stopping on the brake path set in CV50 or will stop by the deceleration set in CV4. The mode of stopping can be selected by bit 1 of CV49. Value 1 is the constant break path while 0 is the deceleration set in CV4.

ABC mode:

Enabling ABC mode the locomotive will be able to automatically stop before the stop signal with a simple electronic circuit and a phased rail. Arriving at a pre-set stop point (e.g. a signal) the decoder detects the asymmetric sign in the DCC sign created by the electronic circuit. Due to this setting, the decoder (CV50 register) can stop the vehicle at the desired point from any speed. By stopping asymmetries in the sign, the decoder will accelerate the vehicle to the previous speed while taking the acceleration parameter (CV3 register) into account.

It is possible to activate shunting mode i.e. coming out from stop section in stop command (asymmetric DCC sign) as well as to implement lifelike shunting movements. It can be activated with F6 function button if using the decoder with manufacturer default settings.

Attention! The ABC mode is disabled in manufacturer settings!

It can be enabled in parameter CV27 (CV27 bit 0 and bit 1).

ABC. conf.	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV27	-	-	-	-	-	-	ABC reverse	ABC norm.



- ABC mode is enabled by setting bit 0 of CV27 and the decoder stops the vehicle if the right side of the rail is the more positive (normal ABC mode). The decimal value of CV27 is 1.
- ABC mode is enabled by setting bit 1 of CV27 and the decoder stops the vehicle if the left side of the rail is the more positive (normal ABC mode). The decimal value of CV27 is 2.
- By setting both the 0 and 1 bit of CV27 at the same time, the vehicle will be stopped by both sides when reaching the ABC path. The decimal value of CV27 is 3.

Stopping on the section can be done according to the deceleration set in CV4 or the constant braking path set in the CV50 register. Selection is done by CV49 bit 1. Value 1 means the constant braking path, 0 means the deceleration according to CV4.

By adjusting the constant brake path (CV50 register), you can ensure that all vehicles on the track stop from any speed at any given point.

The distance from the braking to the stopping is directly proportional to the value set in the register. It is impossible to give an exact value to an exact distance because it depends on the mechanical construction of the locomotive, the voltage being in the system and other factors as well and due to this fact, the desired value must be set by testing.

Setting the ABC asymmetric resistance value:

The operation of the ABC system is based on measuring the voltage of DCC, so you need to be careful about the temporary flow resistances. If there is current on these temporary resistances, those vehicles that load only one of the half-period of the DCC sign can cause asymmetry on them. If you have selected an ABC-based train, do not use such a vehicle that loads the amplifier asymmetrically (e.g. in a locomotive one pole of light is tied to the wheel pantograph, or car lighting operates from one way rectifier). If the Digisound-4.x decoder detects an asymmetry greater than the value set in CV58 in the DCC signal, it will interpret it as an active ABC brake section. The default value of CV58 is 70 (~ 1,2V). If the locomotive doesn't start after the ABC sign has stopped (there is an asymmetry in the system because of the above-mentioned cases), set the value of the CV58 higher in 5-10 steps. If the decoder can't detect the ABC sign reduce the value of CV58.

ABC asymm.	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV58	ABC asymmetric resistance value.							

RailCom:

Thanks to RailCom, which is a solution by Lenz, our tools can not only receive data from the DCC signal but can also send feedback to the command center. To make this happen, you need to select a booster that can handle the “cutout”. For example: Lenz LZV100, ESU ECOS or Roco Z21. Cutout is the short moment after every DCC package, when there is no voltage in the track and when both rail lines are short cut. The decoder sends data in this moment which is received by the detector. Data are divided into two channels. The first channel contains the actual address of the decoder (short, long, consist), which is sent in every cutout after each DCC data package. The second channel contains the POM programming answers, speed, petrol level (coal, water, gasoline, etc.) or error information. The answer can leave only after having received the DCC data package to the own address. DigiSound-4.x is currently sending the address, speed, flag bits and POM data. RailCom can be enabled by bit3 of CV29. Bit0 of CV28 enables channel 1 and bit 1 enables channel 2.

Config reg. 1	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV29	-	-	long address	speed chart	enable railcom	enable analogue	-	direction

RailCom config.	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV28	-	-	-	-	-	-	enable ch2	enable ch1

The decoder sends the so-called flag bits via RailCom, which means that you get important diagnostic information about the decoder using the appropriate control panel e.g.: DigiProgrammer v.23 or above.

Bit mapping:

- Bit0: 1, if the decoder motor detects an overcurrent.
- Bit1: 1, -
- Bit2: 1, if the engine output operates.
- Bit3: 1, if the decoder detects ABC path.
- Bit4: 1, if the decoder accelerates or decelerates the vehicle.
- Bit5: 1, if the locomotive driver mode is active.
- Bit6: 1, if the engine spin function is active.
- Bit7: 1, if the decoder receives an emergency stop command.

Flag bits	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
	emergency stop	spinning	Locomotive driver mode	acceleration-deceleration	ABC mode	engine can start	function closure	engine closure

Multi locomotive operation (consist mode):

DigiSound-x.x supports the so-called “advanced” consist mode. This means that the locomotives can be driven not only by their own address but also by a common address at the same time. Consist mode can be activated by giving a consist address according to NMRA protocol, which also determines the direction of the attached vehicle. The mode can be switched off by deleting the consist address – write zero to CV19.

You can also determine which function buttons should be used in consist mode from consist address and which ones from own address. Consist mode can be also activated using a selected function button in DigiSound-4.x decoders. Find the parameters of consist mode below.

CV19 stores the consist address and its highest bit, bit 7 stores the direction. Value 0 means the normal direction. If one of the attached vehicles is in reverse position its direction can be amended in CV19 setting its bit 7.

Consist address	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV19	consist direction	Consist address						

You can determine if the function buttons should be switched on from own or consist address in CV21-22 parameters. If you set 1 to the bit of the function button it will be controlled from consist address.

Consist funct.	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV21	F8	F7	F6	F5	F4	F3	F2	F1
CV22	-	-	-	F0	F12	F11	F10	F9

The decimal number in the brackets has to be entered in the CV parameter. When more function buttons are enabled the decimal values need to be summed up and this result needs to be entered in the register.

Some centers don't support consist mode activation by NMRA therefore it is possible to activate it from a function button using DigiSound-x.x. Consist mode can be switched on and off from the function button and only from the locomotive's own address, if there is a valid address in CV19 and if the locomotive doesn't move.

Select function button by setting the registers below:

CV170	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

The mode of activating consist mode can be selected by the 4th bit of CV49. In case the value is 0, it is controlled by NMRA, and in case the value is 1, it is controlled by a function button.

Config reg.2	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV49	-			mode of consist activation				

It is important to precisely harmonize the speed and accelerating-decelerating values of the attached locomotives before applying consist mode.

Disconnecting function:

With this function a locomotive having digital clutch can automatically disconnect vehicles. By pushing the selected function button the locomotive moves to the reverse direction then inducts the coil of the digital clutch and then moves off the train. Disconnecting mode can only start if the locomotive stops and if the remote control is in 0 position. Disconnection ends if the remote control is dislodged from 0 position. The process of disconnection can be refined with the below parameters. Activating function button can be added with CV174 parameter.

In default disconnection is disabled.

CV174	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

The time of forward-backward movements can be set, 1 bit means 50ms. Max. value can be about 12 sec by directions.

Default setting is CV207 = CV208 =50 (2.5s).

Connection time	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV207	Time of shunting. 1-255							
CV208	Time of forward movement. 1-255							

The speed of movements can also be set. Take into consideration that the time of acceleration is not added to the above mentioned time setting but the deceleration is. You may not reach your desired speed at too high speed or too fast acceleration.

Default setting is CV209 = 4.

Connection speed	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV209	Moving speed. 1-127							

The function output to which the switching mechanism is connected should be set to "Attach Mode" in the associated mode register.

In connection mode, to spare the digital clutch, the function output only gives full voltage (retractor) up to 250ms after switch-on, then decreases it to the level set in CV114. It is worth finding the value where the clutch remains safely retracted. If you find that the clutch works only for a moment, in that case increase the values of CV114.

Default setting is CV114 = 128.

It is important to always use a free-running diode for the clutch coil inductive consumer, that is a parallel free-running diode!! (anode towards the function output).

supply voltage	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV114	Digit clutch supply voltage.0-255							

SUSI interface:

The SUSI interface has been developed by DIETZ to enable the separate modules of the locomotive to communicate. The interface uses two-way synchronous serial data transfer. The principle is that the locomotive decoder can be supplemented with various intelligent tools. There are external sound modules, dynamic incense, transmitter modules (Uhlenbrock Lissy), locomotive lighting functions (e.g. Brawa Traxx). SUSI works only on Digisound-x.5 Plux22 and Jumbo2 decoders, but only in one direction yet. The decoder sends the status of the speed, speed commands, loads, F0-F28 soft keys. Writing and reading the CV registers of the SUSI module connected to the decoder is possible only in direct programming mode. SUSI cannot take higher voltage than 500mA. The SUSI interface can be enabled and disabled with bit 7 of register CV49.

SUSI is disabled as default.

CV49	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	enable SUSI							

Saving function button status:

The command center does not continuously send the status of functions F13-F28 to the track, only when it changes and only a few times. The function of the decoder is to store the function state in the non-volatile memory. It can be useful or distracting. E.g. you play with the engine spinning (F20) and then you put it away in the box. and after 1 month you unpack it again and find that the locomotive does not start (engine spin remained on). It can be selected with the help of bit 3 of CV49 whether the function state should be saved or not.

Heavy vehicle function:

There is a new function in firmware v33, with which you can simulate the sluggish motion of a locomotive. As a result of activating the function button that has been selected in CV324, the acceleration of the locomotive is controlled by CV325 instead of CV3 and the deceleration is controlled by CV326 instead of CV4. If the value of CV325-326 is higher than CV3-4, in that case the movement of the locomotive can be prolonged, while the engine sound assigned to the speed command will play. The opposite happens at deceleration, the engine sound will have plenty of time to go back to neutral and the brake sound can be prolonged. When the Heavy vehicle function is active, it will prolong the acceleration in locomotive driver mode as well.

Heavy vehicle function is disabled as default. This function is not compatible with our older sounds (e.g. Ludmilla). The upgrade of these sounds is in progress and will be available soon.

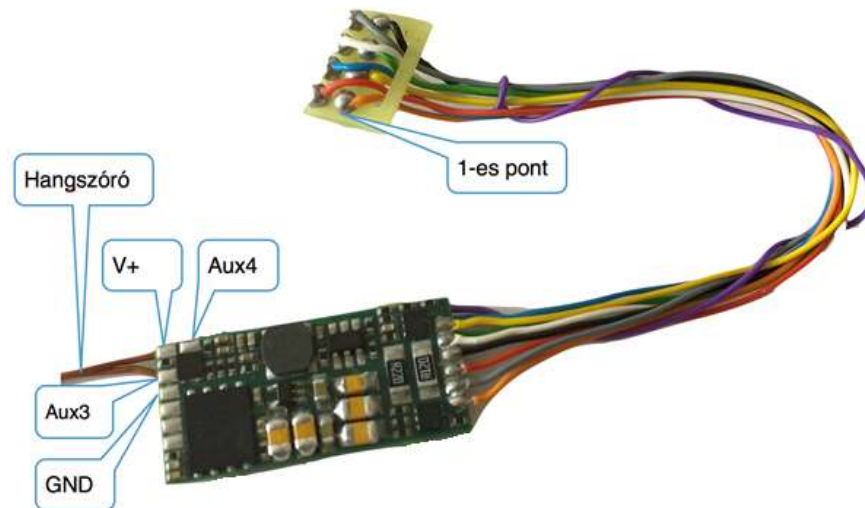
	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV324	-	-	Number of function button (1-29)					
CV325	Heavy vehicle acceleration							
CV326	Heavy vehicle deceleration							

Energy supply (DigiCap, DigiPack):

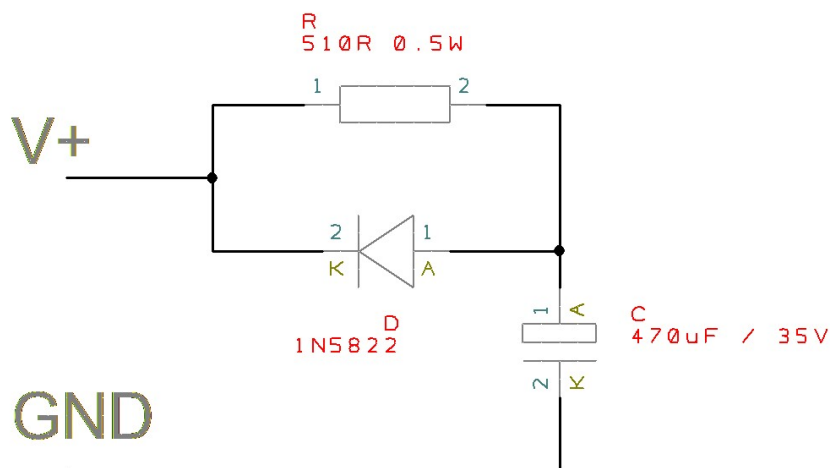
The disturbance of the power-disturbance of DigiSound-x.x decoders can be reduced by a number of solutions.

DigiCap

It is an easier way how to supply your decoder with energy.



The disturbance state of the decoder can be reduced for a few 100 msec period by using a simple circuit between the soldering points of GND and V+ depending on the capacity of the capacitor and the current consumption of the active functions.



C:

- The bigger the capacity is, the longer it works during a power cut.
- Voltage tolerance is minimum 1.5 times of the voltage applied on the track.

D:

- Quick-acting Schottky diode

- Closing voltage tolerance should be minimum 1.5 times of the voltage applied on the track.
 - Maximum load capacity should be 1.5 times of the locomotive load.
- R:
- Minimum 510Ω 0,5W.

When using DigiCap, the decoder does not require any other settings.

When connecting the circuit, pay particular attention to the location of the circuit and the correct soldering.

Incorrect, short-circuit soldering will immediately damage the decoder, and no warranty is provided for such cases.

DigiPack:

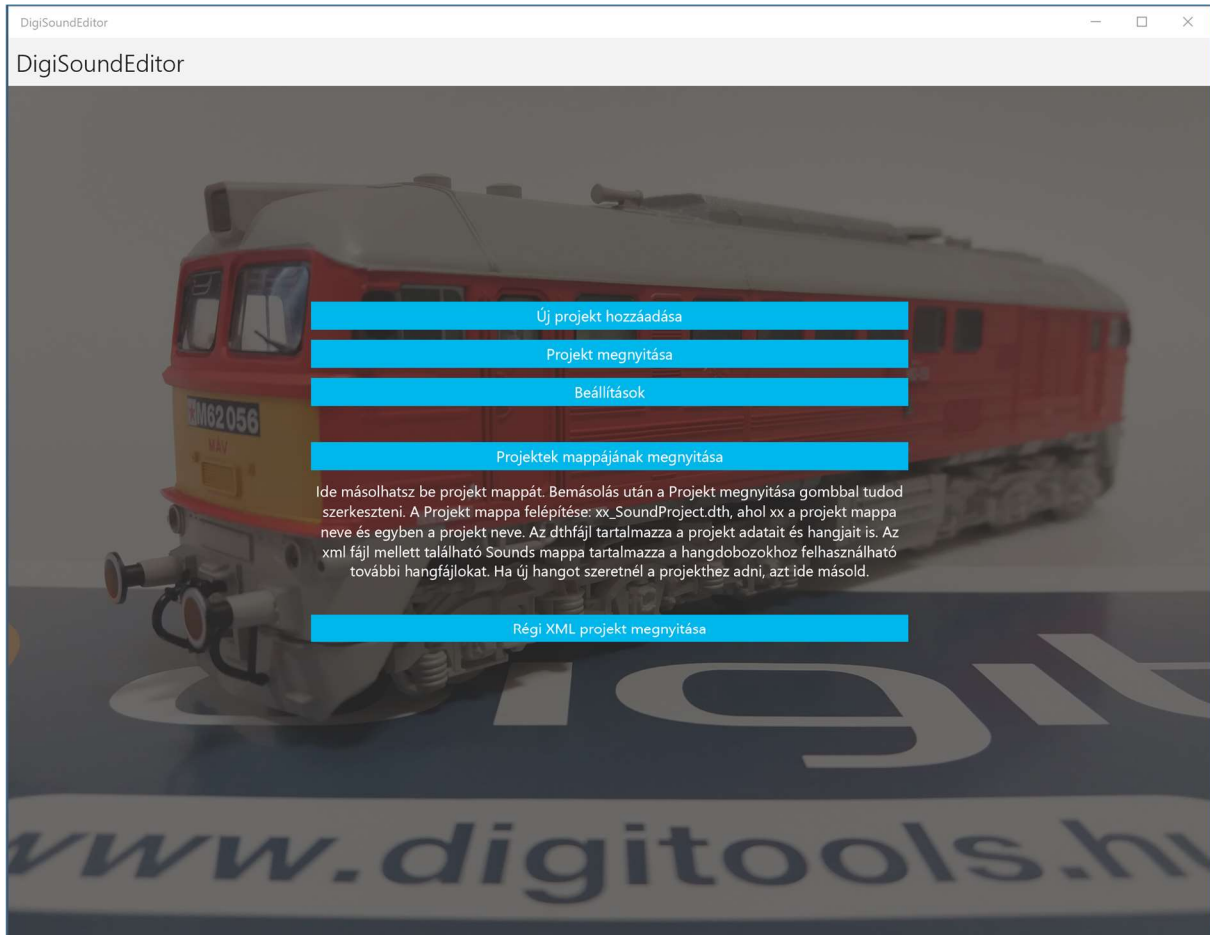
This is a more complex way to provide energy for the decoder, and you will be able to tackle even several second-long power failures. You can learn more about installation of the Digi-Pack in the DigiPack Manual.

Config reg.2	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV49	-	enable DigiPack	-	-	-	-	-	-



Sound settings:

Sounds and their features can be set and edited in DigiSoundEditor (DSE).



Download the program for free from the Windows Store (software store).

<https://www.microsoft.com/hu-hu/p/digisoundeditor/9nfj89fbq370>

For more information and for the user manual visit our website:

<http://www.digitools.hu/termek/hangszerkeszto-program>

Volume settings:

Volume settings have changed in v34. Every time when you turn on the selected function button, you can choose from one of the 2 volumes set in the CV register. CV210 stores the 1st level of the volume, which is 164 in default setting, and CV211 stores the 2nd level of the volume, which is 80 in default setting. Should you experience distortion at higher volume, reduce the value of the volume because it puts pressure on the speaker. **It is highly recommended to avoid this in order to extend the lifespan of the speakers.**

Volume function button is assigned to F9 as default.

Volume settings	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV173	-	-	Number of function button (1-29)					
CV210	Volume 1 (0-255)							
CV211	Volume 2 (0-255)							

Setting volume of different sounds

CV220-251 registers can be used to adjust the volume of different voices. CV220 is the first sound, CV221 is the second sound, and so on. A list of sounds used in a given sound project can be identified from our website.

A locomotive's audio may contain 32 different sounds.

Sound is the collection of complex fragments of sounds and sound patterns that can also be individually identified.

There are different sort of sounds, such as: the sound of an air horn, engine sound, braking sound, the sound of the conductor's whistle, loudspeaker etc.

A sound might consist of hundreds of sound samples.

In case of a diesel locomotive, the engine sound contains different sound samples, like starting the engine, neutral gear, first level, second level, killing the engine etc.

Thanks to this solution, you can adjust the volume of the separate sounds proportionally.

16-bit sounds

The sounds of original locomotives were recorded at 44.1kHz 16bit, with professional microphone and recording system. In order to make the best of it, DigiSound-x.x decoder has been enabled to play 16-bit sound files. Thanks to this, the disturbing noise that came from converting the sound to 8 bits, has ceased and the dynamic range has increased.

Delaying acceleration

In certain cases, the acceleration of the locomotive should depend on the sound. For example a diesel locomotive should start accelerating only after having produced the rev up engine sound. The delay starting sound track can be selected in DigitoolsSoundEditor. The time of the acceleration delay can be set in CV 60. 1 bit equals with 10ms, the default setting is 50. This means that the acceleration of the locomotive is delayed by half a second after the set sound track starts. Acceleration delay doesn't work in active consist mode.

Delay accel.	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV60	Delaying acceleration (1 bit 10ms)							

Steam locomotive mode

You can synchronize the sound of steam pumps with the moving of the wheel in CV61 parameter. Default setting is 50 which is only a ratio value, it needs to be set by testing. Higher value means slower, lower value means more frequent pumping sounds at the same speed.

Wheel diameter	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV61	Setting steam pump sync							

The value of the speed can be set in CV213 above which the beat of “puffing” doesn’t accelerate. Default setting is CV213 = 130.

CV213	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	Minimum time between the puffs							

By using the DigiSound-x.4, x.5 decoders (21MTC and PluX22) you can select the source of the synchronization signals of the steam locomotive sound, which can be an internal timer set in CV61 or the sign of an external sensor. You can choose it by setting bit 5 of CV49. Setting it to value 1 means that the sounds are controlled by an external synchronous sign.

Config reg.2	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV49			trigger source					

Synchronous sign input

For decoders with Plux22 and 21MTC connectors, it can be selected by register CV212 which of the GPIOA-GPIOB-GPIOC (Aux 8-9-10) terminals should become the input and serve as a synchronous signal source. The REED tube or Hall battery, inserted between the earth of the decoder and the selected input, starts the sounds. GPIOA-GPIOB can only be selected as an input if the SUSI interface is disabled in CV49.

Select input	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV212	-	-	-	-	-	GPIOC	GPIOB	GPIOA



Multichannel steam locomotive sound

The typical puffing sound of the steam engine will now be played on multiple channels. Instead of interrupting or replacing the voice pattern of the previous beat signal, the next sound pattern will be played on another audio channel, while the sound of the previous beat will fade. As a result, it has become more lifelike, especially the sound of the higher speed steam locomotive.

Randomly starting sounds

The sounds of your locomotives will become more diverse, if certain sounds are produced randomly like the sound of the compressor of an electric locomotive or the sound of coal scooping. There are 3 random sound timers in DigiSound-x.x decoders.

These sounds can be controlled separately by function buttons.

They can be enabled by the function buttons set in CV171 parameter.

As default the F1 function button is responsible for the random sounds to start at the same time with the main sound.

CV171	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function buttons (1-29)					

The minimum repetition and the active time can be set by each timer. In the parameters adjusting the timers 1 bit equals 500ms. This means that for example timer 1 switches on for 5 sec in every 30 sec (the maximum of the random value is 128 sec). You can allocate the sounds to the timers in DigiToolsSoundEditor.

Random time setting	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV200	Random timer 1 min. repetition time (1bit 500ms)							
CV201	Random timer 1 min. switch on time (1bit 500ms)							
CV202	Random timer 2 min. repetition (1bit 500ms)							
CV203	Random timer 2 min. switch on time (1bit 500ms)							
CV204	Random timer 3 min. repetition time (1bit 500ms)							
CV205	Random timer 3 min. switch on time (1bit 500ms)							

Lowering volume

There is a clear sound effect of the changing engine working current in case of electric, vehicles mainly those with an inverter. It can be imitated using CV206 parameter. If there is no acceleration/deceleration the sound tracks set in DigitoolsSoundEditor fade to the rate set in CV206. Value 255 means that there is no fading, while value 128 means half of the volume.

volume lowering	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV206	Unit of fading							

Running in neutral gear

In case of diesel locomotives it is possible to “run the engine in neutral gear”. This function can be turned on by a selected function button. It can be activated for real, if the locomotive is stopping and can be deactivated if the remote control is in 0 position. When the engine running is on, the locomotive does not move and the remote controls the different sounds of the engine. You can choose the function button in the below parameters.

CV172	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

Muting function:

When a selected function button is activated, the decoder will slowly silence the sound, and will slowly mute it when it is turned off. E.g.: when the train goes into a tunnel its sound mutes as well.

By default, F28 is selected, CV175 =28.

CV175	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	Number of function button (1-29)					

Disabling sound controlled acceleration:

From v33 onward, the sound track output bit set in DSE program can disable the acceleration of the locomotive. (e.g.: when changing gears). You can select in CV214 that which “hm_out_bit(x)” bit should be checked by the acceleration control.

CV214	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
Value	-	-	-	-	hm_o_4	hm_o_3	hm_o_2	hm_o_1



Programming:

The DigiSound-x.x decoders can be programmed in accordance with the NMRA RP 9.2.3 standards and in POM modes according to RP 9.2.1.

ACK impulse:

The intensity of the permitting sign of the programming commands has been decreased in order to spare the parts of the engine and the drive. This is beneficial for bigger locomotives and does not cause any problems. If the command center flags an error in vehicles with small engine (TT models) set the value of CV57 higher. Its default value is CV57=128 which is about half of the max. available ACK impulse.

Resetting CV parameters to default and saving:

When writing the CV8 register, the following operations can be performed:

CV8 = 0: Restore the default status of CV registers.

CV8 = 8: Reset CV registers to a previously saved configuration.

CV8 = 16: Save all your CV register settings (address, acceleration, functions, etc.).

IMPORTANT! The resetting itself will become active only after restarting. If a re-set has been done in POM mode, switch off and on again the rail voltage to see the changes.

Counting long address:

In case of an address higher than 99, do the following:

Divide the address by 256, take the integer part of it and add 192 to it. Enter this number in parameter CV17.

The fractional part – the remaining part of the division – has to be entered to parameter CV18.

Write 40 in the CV29 register (besides the default settings).



Default setting of function buttons:

- F0 (FL, RL): Lighting, forward-backward, regardless of direction
- F1: Main sound on
- F2: Horn or whistle
- F6: Shunting mode, switching off acceleration-deceleration
- F5: Lowering light brightness, forward-backward, regardless of direction
- F9: Setting volume
- F20: Running in neutral gear
- F21 – F27: Switching on and off AUX1 – AUX7 outputs
- F28: Muting function

Configuration registers CV29, CV49:

The bits of the two registers that control the main features of the decoder are the following.

CV29:

Config reg.1	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV29	-	-	Long addresses	enable 28-point chart	enable RailCom	enable Analogue	-	Reverse direction

Key for bits:

- Bit0: If enabled, the direction of the locomotive will be reversed.
- Bit2: If enabled, the decoder will be able to operate on analogue tracks as well.
- Bit3: If enabled, the decoder will send the messages.
- Bit4: If enabled, the decoder will be using the 28-point speed chart.
- Bit5: If enabled, the decoder will use the long address set CV17-18.

CV49:

Config reg.2	Bit 7 (128)	Bit 6 (64)	Bit 5 (32)	Bit 4 (16)	Bit 3 (8)	Bit 2 (4)	Bit 1 (2)	Bit 0 (1)
CV49	enable SUSI	enable DigiPack	enable external trigger	activate Consist mode	enable F13-28 saving	Prolong accel.-decel.	enable constant brake path	enable Emf

Key for bits:

Bit0: If enabled, the load control is enabled.

Bit1: If enabled, the brake path is constant on the brake generator or ABC controlled part.

Bit2: If enabled, acceleration-deceleration timing will increase at starting and stopping.

Bit3: If enabled, the state of the F13-28 function buttons will be saved to the non-volatile memory.

Bit4: If enabled, consist mode will be switched on and off by a function button.

Bit5: If enabled, the set mode will start the selected sound (beat of puffing)

Bit6: If enabled, DigiPack is enabled too (sound and motor control)

- Bit7: If enabled, SUSI interface is enabled.



CV registers

CV	Name	Description	Range	Default value
1	Short address	The short address of the locomotive	1-99	3
2	Minimum speed	Setting min. speed of the 3-point speed curve	0-255	4
3	Rate of acceleration	Time of changing into higher gear by 1 = (value x 1ms)	0-255	31
4	Rate of deceleration	Time of changing into lower gear by 1 = (value x 1ms)	0-255	10
5	Maximum speed	Setting max. speed of the 3-point speed curve	0-255	255
6	Medium speed	Setting med. speed of the 3-point speed curve	0-255	90
7	Version number	Firmware version	0-255	34
8	Manufacturer's ID	CV parameters can be reset to default by writing this parameter.	0-255	75
11	DCC „time out”	Emergency stop, if there is no DCC sign set here for a while. Value 0 = no emergency stop.	0-255	25
13	Analogue functions F1-F8	Function buttons activated in analogue mode F1-F8	0-255	0
14	Analogue functions F9-FL	Function buttons activated in analogue mode F9-F12, FL	0-255	16
17 18	Long address	Long address upper byte Long address lower byte	192-255 0-255	192 0
19	Consist address	Address of connected locomotives. 0 and 128 = switch off consist 1-127 = consist address and forward direc. 129-255 consist address and backward direc.	0-255	0
21	Consist mode F1-F8	Controlling function buttons in consist mode F1-F8	0-255	0
22	Consist mode F9-FL	Controlling function buttons in consist mode F9-FL	0-255	0
27	ABC config.	Bit0 = enable ABC to normal direction Bit1 = enable ABC to opposite direction	0-3	0
28	RailCom config.	Bit0 = enable sending decoder address Bit1 = enable sending decoder data	0-3	3



29	Config. register 1	Bit0 = reverse direction Bit2 = enable analogue mode Bit3 = enable RailCom Bit4 = enable 28-point speed chart Bit5 = enable long address	0-255	8
49	Config. register 2	Bit0 = enable load control Bit1 = enable constant brake path Bit2 = accel. decel. delay prolong Bit3 = enable F13-F28 function saving Bit4 = activate consist via function button Bit5 = Trigger source Bit6 = enable DigiPack Bit7 = enable SUSI	0-255	7
50	Brake path	Constant brake path	0-255	3
51	Effect of PID control1	Setting the load control consist mode	0-255	150
52	Effect of PID control2	Setting the load control normal mode	0-255	200
53	Set point multiplier	Adjusting the set point to the maximum measurable engine voltage.	0-255	80
54	P	Boosting the proportional part of the performance controller	0-9	3
55	I	Boosting the integration part of the performance controller	0-9	3
56	D	Boosting the differential part of the performance controller	0-255	128
57	ACK impulse	The intensity of the ack. sign of the programmer	0-255	128
58	ABC asymmetry	Value of ABC asymmetry	0-255	70
60	Delaying acceleration	Setting acceleration delay to the sound	0-255	128
61	Wheel diameter	Steam locomotive sound synchronous setting	0-255	50
67-94	Speed chart	28-point speed chart	0-255	0-255
112	Blinker speed	Blinker period of the function output = value x 10ms	0-255	50
114	Clutch keeping voltage	Digital clutch keeping voltage	0-255	128
115	Quantity of smoke in stopping position	The value of the output of smoke generator in stopping and deceleration positions.	0-255	64
116	Smoke in acceleration mode	The value of the output of smoke generator while accelerating	0-255	255



117	Smoke in moving position	The value of the output of smoke generator while moving	0-255	128
118	Headlight configuration	Setting headlight output to a function button	0-255	29
119				0
120				0
121				0
122	Backlight configuration	Setting backup light output to a function button	0-255	29
123				0
124				0
125				0
126	AUX1 config	Setting AUX1 output to a function button	0-255	21
127				0
128				0
129				0
130	AUX2 config	Setting AUX2 output to a function button	0-255	22
131				0
132				0
133				0
134	AUX3 config	Setting AUX3 output to a function button	0-255	23
135				0
136				0
137				0
138	AUX4 config	Setting AUX4 output to a function button	0-255	24
139				0
140				0
141				0
142	AUX5 config	Setting AUX5 output to a function button	0-255	25
143				0
144				0
145				0
146	AUX6 config	Setting AUX6 output to a function button	0-255	26
147				0
148				0
149				0
150	AUX7 config	Setting AUX7 output to a function button	0-255	27
151				0
152				0
153				0
154	AUX8 config	Setting AUX8 output to a function button	0-255	0
155				0
156				0
157				0
158	AUX9 config	Setting AUX9 output to a function button	0-255	0
159				0
160				0
161				0



162	AUX10 config	Setting AUX10 output to a function button	0-255	0
163				0
164				0
165				0
166	Config acceleration-deceleration	Setting disabling acceleration-deceleration to a function button	0-255	6
167	Config shunting mode	Setting shunting mode to a function button	0-255	6
168	Lowering brightness config	Setting lowering brightness to a function button	0-255	5
169	Loc. driver config	Setting driver mode to a function button	0-255	0
170	Consist active config	Setting consist mode activation to a function button	0-255	0
171	Random permission	Setting random timers to function button and enabling	0-255	1
172	Running in neutral gear	Running in neutral gear setting to function button	0-255	0
173	Setting volume	Setting volume to function button	0-255	9
174	Disconnection config	Setting disconnection function to a function button	0-255	0
175	Muting	Setting muting to function button	0-255	28
176	Forward light	Selecting forward light option	0-255	1
177	Backward light	Selecting backward light option	0-255	1
178	Aux1 mode	Selecting Aux1 mode	0-255	0
179	Aux2 mode	Selecting Aux2 mode	0-255	0
180	Aux3 mode	Selecting Aux3 mode	0-255	0
181	Aux4 mode	Selecting Aux4 mode	0-255	0
182	Aux5 mode	Selecting Aux5 mode	0-255	0
183	Aux6 mode	Selecting Aux6 mode	0-255	0
184	Aux7 mode	Selecting Aux7 mode	0-255	0
185	Aux8 mode	Selecting Aux8 mode	0-255	0
186	Aux9 mode	Selecting Aux9 mode	0-255	0
187	Aux10 mode	Selecting Aux10 mode	0-255	0



188	Forward light mode 2	Brightness of forward light	0-255	1
189	Backward light mode 2	Brightness of forward light	0-255	2
190	Aux1 mode 2	Aux1 output dimmer value	0-255	0
191	Aux2 mode 2	Aux2 output dimmer value	0-255	0
192	Aux3 mode 2	Aux3 output dimmer value	0-255	0
193	Aux4 mode 2	Aux4 output dimmer value	0-255	0
194	Aux5 mode 2	Aux5 output dimmer value	0-255	0
195	Aux6 mode 2	Aux6 output dimmer value	0-255	0
196	Aux7 mode 2	Aux7 output dimmer value	0-255	0
197	Aux8 mode 2	Aux8 output dimmer value	0-255	0
198	Aux9 mode 2	Aux9 output dimmer value	0-255	0
199	Aux10 mode 2	Aux10 output dimmer value	0-255	0
200	Random 1 min time	Timer of Random1 min break time	0-255	180
201	Random 1 switch on	Random1 switching on time	0-255	30
202	Random 2 min time	Timer of Random2 min break time	0-255	180
203	Random 2 switch on	Random2 switching on time	0-255	30
204	Random 3 min time	Timer of Random3 min break time	0-255	180
205	Random 3 switch on	Random3 switching on time.	0-255	30
206	Lowering volume	Setting lowering volume	0-255	128
207	Disconnection config.	Disconnection backward time	0-255	50
208	Disconnection config	Disconnection forward time	0-255	50
209	Disconnection config	Speed of disconnection	0-255	4
210	Volume 1	Volume 1	0-255	164
211	Volume 2	Volume 2	0-255	80
212	Choosing interface	Choosing the pin of the sync sign	0-4	0
213	Puffing min time	Max. speed of the puffing sound of steam locomotives	0-255	130
214	disable sound contr. accel.	disable sound controlled accel., select bit	0-15	0



220-251	sound and volume	Setting the volume of each sound separately.	0-255	255
300	FL output dimming brightness	Headlight – dimming brightness	0-64	16
301	RL output dimming brightness	Backlight – dimming brightness	0-64	16
302	AUX1 output dimming brightness	AUX1 output – dimming brightness	0-64	16
303	AUX2 output dimming brightness	AUX2 output – dimming brightness	0-64	16
304	AUX3 output dimming brightness	AUX3 output – dimming brightness	0-64	16
305	AUX4 output dimming brightness	AUX4 output – dimming brightness	0-64	16
306	AUX5 output dimming brightness	AUX5 output – dimming brightness	0-64	16
307	AUX6 output dimming brightness	AUX6 output – dimming brightness	0-64	16
308	AUX7 output dimming brightness	AUX7 output – dimming brightness	0-64	16
309	AUX8 output dimming brightness	AUX8 output – dimming brightness	0-64	16
310	AUX9 output dimming brightness	AUX9 output – dimming brightness	0-64	16
311	AUX10 output dimming brightness	AUX10 output – dimming brightness	0-64	16
312	FL output brightness	Headlight - brightness	0-64	64
313	RL output brightness	Backlight - brightness	0-64	64
314	AUX1 output brightness	AUX1 output brightness	0-64	64
315	AUX2 output brightness	AUX2 output brightness	0-64	64
316	AUX3 output brightness	AUX3 output brightness	0-64	64
317	AUX4 output brightness	AUX4 output brightness	0-64	64
318	AUX5 output brightness	AUX5 output brightness	0-64	64



319	AUX6 output brightness	AUX6 output brightness	0-64	64
320	AUX7 output brightness	AUX7 output brightness	0-64	64
321	AUX8 output brightness	AUX8 output brightness	0-64	64
322	AUX9 output brightness	AUX9 output brightness	0-64	64
323	AUX10 output brightness	AUX10 output brightness	0-64	64
324	Heavy vehicle config.	Setting heavy vehicle function to function button	0-255	0
325	Heavy vehicle config.	Heavy vehicle acceleration	0-255	85
326	Heavy vehicle config.	Heavy vehicle deceleration	0-255	60
327	Driver mode rolling decal.	Loc. driver mode rolling deceleration	0-255	80



Private notes: