

## CV table of the decoder (excerpt)

CV	Description	Area	Value
1	<b>Locomotive address</b>	DCC: 1 - 127 Motorola: 1 - 80	3
2	<b>Minimum speed</b> (the speed from 0 until the locomotive is running at speed step 1)	1 - 63	1
3	<b>Acceleration delay</b> , 1 means every 5 milliseconds the actual motor speed is increased by 1. If the maximum motor speed is 200 (CV 5 = 50 or CV 94 = 200), then the acceleration rate from 0 to maximum speed is 1 second	0-255	15
4	<b>Braking rate</b> (time factor like CV 3)	0-255	15
5	<b>Maximum speed</b> (must be greater than CV 2)	1 - 63	48
6	<b>Average speed</b> (must be greater than CV 2 and less than CV 5)	1 - 63	16
7	<b>Software version</b> (The processor can be updated)	-	differently
8	<b>Manufacturer identification</b> decoder reset, values like CV 59	different	162
17	<b>Long locomotive address</b> 17 = Byte should be lower-case: byte	1 - 9999	2000
18	18 = Byte should be lower-case: byte	192 - 231	199
		0 - 255	208
29	<b>DCC standard configuration</b>	Value	14
	Bit 0=0 Normal direction of travel	*0	
	Bit 0=1 Opposite direction of travel	1	
	Bit 1=0 14 speed steps	0	
	Bit 1=1 28 speed steps	*2	
	Bit 2=0 DCC-only mode	0	
	Bit 2=1 Automatic analog/digital recognition	*4	
	Bit 3=0 RailCom® turned off	0	
	Bit 3=1 RailCom® turned on	*8	
	Bit 4=0 Speed steps over CV 2, 5, and 6	*0	
	Bit 4=1 Use the characteristic curve from CV 67 - 94	16	
	Bit 5=0 Short address (CV1)	*0	
	Bit 5=1 Long address (CV 17/18)	32	
30	<b>Error codes for function outputs, motor, and temperature monitoring:</b> 1 = function output fault, 2 = motor fault, 4 = overload protection	0-7	0
59	<b>Resetting to factory settings</b> (also possible via CV8) 1 = CV 0 - 256, as well as CV257 - 512 (RailCom® Bank 7) 2 = CV 257 - 512 (RailCom Plus® Banks 5 & 6) 3 = CV 257 - 512 (extended function mapping banks 1 & 2) 4 = CV 257 - 512 (PWM modulation function outputs banks 3 & 4)	0 - 4	0

\*\* Factory setting

### Function assignments

F0	Directional lighting	F9*	Horn	F18*	Pressure air release 1
F1*	Sound on / off	F10*	Door finding signal	F19*	Pressure air release 2
F2	Cap lighting FS 1	F11*	Cab door open/shut	F20*	Battery mainswitch
F3	Cap lighting FS 2	F12*	Station announcement 1	F21*	Sander
F4	Interior lighting	F13*	Station announcement 2	F22*	Breakcheck
F5	High beam FS1	F14*	Station announcement 3	F23*	Rail clank sound on/off
F6	High beam FS2	F15*	Station announcement 4	F24*	Curve squeal sound on/off
F7	Shunting mode	F16*	Conductors whistle	F25*	Volume control
F8	Start/braking inertia	F17*	Pantograph	F26*	Mute

\* with connected sound module # 56429

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#56411

**PIKO multiprotocol SmartDecoder 4.1**  
for Electric multiple unit BR 412 ICE 4 H0  
with mfx® capability



**NOTE: Detailed information on the PIKO SmartDecoder 4.1 Sound is available as a PDF file on our Webshop on the page of the respective item number. The file contains a full description of all functions and operating possibilities for the new SmartDecoder 4.1 Sound.**

### Description

This locomotive decoder is a compact, very powerful multi-protocol decoder specially designed for the BR 412 ICE 4 electric multiple unit. The decoder automatically switches the current collection between the two power cars depending on the direction of travel. He can be used with standard DCC, Selectrix, and Motorola digital systems as well as in DC or AC analog mode.

The respective operating mode is detected automatically, but it can also be set manually.

These load regulated sound decoders operate on an 18.75 kHz frequency and are designed for standard DC motors as well as bell-shaped armature motors (i.e. Faulhaber, Maxon, Escap) that draw up to 1.2 A. Temporarily higher current levels up to 2 A are easily tolerated.

The decoders are both RailCom® and RailCom Plus®-ready and recognize ABC automatic stop sections and ABC reduced speed sections. The motor voltage can be controlled either by a simple three-step motor speed curve, with minimum, midpoint and maximum voltage settings, or by a user-loadable speed curve, with 28 individually-set speed steps.

The sound decoder provides two directional lighting outputs, as well as seven additional special function outputs. Slow-speed switching mode, with extended slow-speed range, along with three acceleration and braking rates, as well as the many vehicle sounds can be controlled via function keys.

### Installing the PIKO SmartDecoder 4.1

Remove the jumper plug from the 20-pin interface of your model. Insert the new decoder into the interface socket.

Note that PIN is missing on the new decoder.

Check for crossed wires and short circuits before and after reinstalling the shell. Place the model on your programming track with programming mode activated on your DCC system. During programming or when reading the model's DCC address, a small amount of current will flow through the model, which does not affect the decoder, even in the event of a short circuit.

### Special functions A1 to A7

The special function outputs A1 to A7 of the decoder are automatically connected to the desired loads in the vehicle via the 20-pin interface.

**A short circuit in the motor, lighting, pick-up wiper, or wheelsets can destroy the decoder as well as the electronics of the model!**

### SUSI Interface

Either a PIKO sound module with SUSI (e.g. ICE 4 sound module #56429), a suitable function decoder, or two servo circuits can be connected to the SUSI interface of this decoder. Please refer to the CV table to find out which CV is to be programmed for the respective application.

In the factory setting, the decoder outputs the data for the PIKO sound module at the SUSI interface.

**NOTE:** Soldering on the decoder should only be carried out by experienced specialists with the appropriate tools. Decoders damaged by improper handling are not covered by the warranty.

### Function outputs in analog mode

It is possible to program the decoder so that function keys F0 - F12 (as they are assigned in the function mapping) can also be activated in analog mode. To do this, CVs 13 & 14 must first be programmed with a DCC central control unit. The corresponding values can be found in the CV table of the detailed operating instructions. The light function F0 is factory-set to "on." (with inserted sound module # 56429)

## Motorola

The sound decoder has 3 Motorola addresses to activate functions F1 - F12 on a Motorola-format DCC system.

## Configuration of CVs

In addition to the decoder address, the indexed CVs of a locomotive decoder are the most important CVs. These are the CVs 29, 50 and 51 in the PIKO SmartDecoder 4.1 Sound. As a rule, an indexed CV contains various basic settings of a decoder, such as reversing the direction of travel. CV calculation examples can be found in the detailed operating instructions.

## RailCom®, RailCom Plus®

In the decoder, CV29 (RailCom®) can be turned on or off via bit 3. If RailCom Plus® is turned on, the decoder will be automatically recognized by a RailCom Plus®-enabled DCC control system (i.e. PIKO SmartControl) and a locomotive icon, decoder name, and its special function icons will appear on the control system's screen. With RailCom Plus® technology, no locomotive data has to be stored in the DCC central control unit and no locomotive addresses have to be programmed into the decoder.

## mfx®

Factory installed PIKO SmartDecoder 4.1 sound in PIKO AC models is specifically made for the mfx® data format. If your DCC control system uses the mfx® format, then the decoder is automatically recognized and is assigned its locomotive symbol, decoder address, and its special function symbols. With mfx® technology, no locomotive data has to be stored in the DCC central control unit and no locomotive addresses have to be programmed into the decoder.

## Braking

The PIKO SmartDecoder 4.1 understands the following braking methods:

Märklin braking section (brakes with analog DC voltage)

DCC braking function

ABC (Automatic Brake Control) braking section

The decoder can stop the model with two adjustable braking distances that are accurate down to the centimeter.

More information on "braking behavior" can be found in the detailed operating instructions for PIKO SmartDecoder 4.1.

## Function outputs

A comprehensive description of all options related to the function outputs can be found in the detailed operating instructions.

## Simple and extended function mapping

With **simple function mapping**, adjustable functions like lighting, special function outputs, switching (shunting) mode, and acceleration and braking can be freely assigned to function keys F0 to F12 of the DCC central control unit. For more information, refer to the CV table at the end of this manual, as well as the detailed user guide.

## Smoke generator control

A smoke generator can be connected to outputs A1 to A7 which are load-sensitive and react to the model's speed. For further information, please refer to the detailed operating instructions.

## Electric coupler control

PIKO electric couplers are operated by tiny copper wire resistance wires which heat up when the decoder sends current through them. The heat causes the wires to expand, causing the coupler hook to move to the uncoupled position. The model can then back away from the car. The model's sound decoder can be programmed to automatically shut off current to the coupler mechanism after a certain time period, without need to press another key.

## Switching (shunting) scenario, remote coupling/uncoupling

If your layout has remote electric uncouplers installed, you can program the locomotive decoder to perform a switching scenario like the following:

- 1) The locomotive runs in one direction for a certain distance.
- 2) The locomotive stops and reverses direction.
- 3) The locomotive uncouples and moves back from the uncoupled car for a certain distance.
- 4) The locomotive stops, and resumes switching..

For information on **extended function mapping**, refer to the detailed operating instructions.

## Servosteuerung

The PIKO SmartDecoder 4.1 can control up to three servo motors via outputs A6, A7.

The use of a servo with the decoder requires electronics expertise.

Further information can be found in the detailed operating instructions.

Information on wiring servos to the function outputs can be found in the FAQ section of the PIKO Webshop by clicking on the link "Questions about the digital system." Scroll down to the "H0" category and click on the title "Servo connection to SUSI or solder pads at the PIKO SmartDecoder 4.1".

**ATTENTION:** Soldering on the decoder should only be carried out by experienced specialists with the appropriate tools. Decoders damaged by improper handling will not be covered by the warranty.

## Factory reset

**CAUTION!** When the decoder is reset, all factory settings are erased! Only perform a reset if it is absolutely necessary. If you nonetheless have to reset the decoder remember that functions programmed at the factory may no longer function and you must reprogram the individual Function Mapping (see FAQ)

To restore the decoder back to factory settings, use CV8 for DCC programming and CV59 in Motorola programming.

To avoid having to re-enter all programming after a reset, you can select beforehand which areas of the decoder programming should be reset to factory values.

To restore the basic functions of the decoder, enter a value of 1 in the Reset CV (8 or 59).

Information on extended reset can be found in the detailed operating instructions.

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**NOTE:** This product is not a toy and is not suitable for children under the age of 14. Any liability for damage of any kind caused by improper use or failure to observe these instructions is excluded.

## Service:

Internet: [www.piko.de](http://www.piko.de)

E-Mail: [info@piko.de](mailto:info@piko.de)

Hotline: Di + Do 16-18 Uhr

In the event of a defective decoder, please return the decoder module to PIKO along with proof of purchase, the decoder address, and a short description of the problem.

## Warranty Statement

Each decoder module is fully tested before shipment. Nevertheless, should a malfunction occur within the 2-year warranty period, we will repair the module free of charge on presentation of the proof of purchase. This warranty is voided if the unit has been damaged by improper use. Please note that, according to the German Electromagnetic Compatibility Law (EMV-Gesetz), the decoder module may only be used inside models bearing the CE mark.

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