

CV	Description	Area	Value
1	Locomotive address	DCC: 1 - 127 Motorola®: 1 - 80	3
2	Minimum speed (the speed from 0 until the locomotive is running at speed step 1)	1 - 63	1
3	Acceleration delay, 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	Braking rate (time factor like CV 3)	0-255	20
5	Maximum speed (must be greater than CV 2)	1 - 63	36
6	Average speed (must be greater than CV 2 and less than CV 5)	1 - 63	11
7	Software version (The processor can be updated)	-	differently
8	Manufacturer identification decoder reset, values like CV 59	different	162
17	Long locomotive address	1 - 9999	2000
18	17 = Byte should be lower-case: byte 18 = Byte should be lower-case: byte	192 - 231 0 - 255	199 208
29	<b>DCC standard configuration</b> Bit 0=0 Normal direction of travel Bit 0=1 Opposite direction of travel Bit 1=0 14 speed steps Bit 1=1 28 speed steps Bit 2=0 DCC-only mode Bit 2=1 Automatic analog/digital recognition Bit 3=0 RailCom® turned off Bit 3=1 RailCom® turned on Bit 4=0 Speed steps over CV 2, 5, and 6 Bit 4=1 Use the characteristic curve from CV 67 - 94 Bit 5=0 Short address (CV1) Bit 5=1 Long address (CV 17/18)	Value *0 1 0 *2 0 *4 0 *8 *0 16 *0 32	0-63 14
30	Error codes for function outputs, motor, and temperature monitoring: 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	Head light	F10	Bad weather lamp (under green lamp)	F20	Train brake release / set brake
F1	Battery master switch	F11	Bad weather lamp (over headlight)	F21	Sanding
F2	Machine room door open / close	F12	Train lighting: loco pushing	F22	Curve squeal sound on / off
F3	Driver Cab door open / close	F13	Train lighting: loco pulling	F23	Rail clank sound on / off
F4	Preheater	F14	Driver cab light	F24	Rail clank train sound on / off
F5	Sound on / off	F15	Compressed air	F25	Station announcement 1
F6	Horn	F16	Hand brake release / set brake	F26	Station announcement 2
F7	Whistle	F17	Radio 1	F27	Volume control
F8	Shunting mode	F18	E-coupling front	F28	Mute
F9	Light white, front / rear	F19	E-coupling rear		

55909-90-7001\_2019

**PIKO Spielwaren GmbH**  
Lutherstr. 30  
96515 Sonneberg  
GERMANY



**PIKO SmartDecoder 4.1 PluX22**  
for Diesel locomotives BR D.145  
w PIKO digital coupling, multiprotocol



**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

The PIKO SmartDecoder 4.1 Sound PluX22 is a powerful and compact multiprotocol decoder that can be used with standard DCC, Selectrix®, and Motorola® digital systems as well as in DC or AC analog mode. The sound decoder is RailCom® and RailCom Plus® capable as well as mfx®-capable for AC models that are factory-equipped with PIKO SmartDecoder 4.1 Sound. The innovative PIKO SmartDecoder 4.1 Sound automatically recognizes the layout operating mode and has a wide range of program options for its additional functions.

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, the electric couplers, 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 Sound

Remove the jumper plug from your model's PluX22 interface. Insert the new sound decoder into the interface socket. Note that PIN 11 is missing on the new decoder. Please install the loudspeaker as shown in the graphic of the "Spare parts list". 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 decoder's special function outputs A1 to A7 can only be activated if the desired functions are already connected to the model's PluX22 interface or if solder pads are available for the special function outputs on the main circuit board.

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

#### First-time use of the decoder (state of delivery)

Enter address 3 on your DCC control system. Depending on the data format used to address the sound decoder, the locomotive runs in DCC mode with 28 speed steps or in Motorola® mode. When using a RailCom Plus®-enabled DCC system or with an mfx®-capable DCC system (for this use decoder 56401), the decoder is recognized in a few seconds and can be operated immediately. If the decoder is used on a conventional analog layout, it can be controlled with a DC or AC power pack. The decoder will automatically detect the layout's operating mode.

**NOTE:** In DC analog mode, your model will only start at a higher voltage than what you may accustomed to when operating analog models. You will need to turn the throttle up for the model to start operating. Please note that interference-free sound operation with electronic speed controllers (PWM operation) cannot be guaranteed due to the large number of often unstable systems available on the market.

#### 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 and the motor noise F5 are switched "on" ex works.

## 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 sound 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®

The PIKO SmartDecoder 4.1 Sound, factory-installed in PIKO AC models, is mfx®-capable. 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 sound decoder.

## Braking

The sound decoder understands the following braking methods:

Märklin® braking section (brakes with analog DC voltage)

DCC braking function

ABC (Automatic Brake Control) braking section

The sound 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 Sound.

## 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..
- 5) The coupling bracket must be lifted for a renewed operationally safe coupling!

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

## Servo control

The sound decoder 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.

## Sound settings

To change the overall volume of the PIKO SmartDecoder 4.1 Sound, first program the CV1021 = 2!

This will take you to the programming area for setting the total volume. You can now adjust the overall volume according to. If desired, set the CV900 in the value range from 0 - 255. Finally, program the CV1021 = 0 around the area of these sound settings again.

NOTE: In order to play a PIKO sound on the sound decoder, the test and programming device requires PIKO SmartProgrammer (#56415) and (optional) the PIKO SmartTester (#56416).

All further information about the sound section of the PIKO SmartDecoder 4.1 Sound as well as the available For setting options, please refer to the detailed operating instructions.

## 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.

Märklin® and mfx® are registered trademarks of Gebr. Märklin & Cie. GmbH, Göppingen  
Motorola® is a registered trademark of Motorola Inc. Tempe, (Phoenix) Arizona / USA  
RailComPlus® is a registered trademark of Lenz Elektronik GmbH  
Selectrix® is a registered trademark of Gebr. Märklin & Cie. GmbH, Göppingen

**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.

Product subject to changes. All rights reserved. Printed 12/2019.

Copy and duplication of this text are permissible only with the permission of the publisher.