

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)	0 - 255	0
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	30
4	Braking rate (time factor like CV 3)	0 - 255	30
5	Maximum speed (must be greater than CV 2)	0 - 255	200
6	Average speed (must be greater than CV 2 and less than CV 5)	0 - 255	100
7	Software version (The processor can be updated)	-	differently
8	Manufacturer identification decoder reset, values like CV 59	different	162
	<b>Decoder operating mode</b>	<b>Value</b>	
12	Bit 0=1 DC (analog operation; direct current) on	*1	0 - 117
	Bit 2=1 DCC data format on	*4	
	Bit 4=1 AC (analog 3-rail operation; alternating current) on	*16	
	Bit 5=1 Motorola® data format on	*32	
	Bit 6=1 mfx® data format on	*64	
17	Long locomotive address	1 - 10239	1000
18	17 = Byte should be lower-case: byte	192 - 231	195
	18 = Byte should be lower-case: byte	0 - 255	232
	<b>Brake signal settings (automatic stop)</b>	<b>Value</b>	
27	Bit 0 = 1 -> ABC (Automatic Brake Control) right rail positive	1	0 - 51
	Bit 1 = 1 -> ABC left rail positive	2	
	Bit 4 = 1 -> DC; opposite direction of travel	16	
	Bit 5 = 1 -> DC; same direction of travel	32	
	<b>DCC standard configuration</b>	<b>Value</b>	
29	Bit 0=0 Normal direction of travel	*0	0-63
	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	Error codes for function outputs, motor, and temperature monitoring: 1 = function output fault, 2 = motor fault, 4 = overload protection	0-7	0
	<b>Simple function mapping (DCC standard RCN-225)</b>	<b>Assignment of the</b>	
	<b>Assignment of the function outputs to the CVs</b>	<b>Fct. outputs</b>	
33-46	CV 33 Light function key (F0) during forward travel	f0v	1
	CV 34 Light function key (F0) during reverse travel	f0h	2
	CV 35 function key F1	A1	4
	CV 36 function key F2	A2	8
	CV 37 function key F3	A3	16
	CV 38 function key F4	A4	4
	CV 39 function key F5	A5	8
	CV 40 function key F6	A6	16
	CV 41 function key F7	A7	32
	CV 42 function key F8	-	64
	CV 43 function key F9	-	16
	CV 44 function key F10	-	32
	CV 45 function key F11	-	64
	CV 46 function key F12	-	128
156	function key ABV off/on	0 - 68	9
157	function key shunting mode	0 - 68	8

\* factory set values

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56500-90-7001\_2021



#56500

PIKO multiprotocol SmartDecoder XP 5.1 PluX22

mfx® capability included



**NOTE: Detailed information on the PIKO SmartDecoder XP 5.1 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 XP 5.1.**

#### Description

The state-of-the-art PIKO SmartDecoder XP 5.1 inside in this PIKO locomotive is a compact yet powerful multi-protocol PluX22 decoder. It complies with the current RCN standards in all areas and can be used in DCC, mfx® and Motorola® digital systems. The decoder can be used on DC or AC analog layouts. It automatically senses what operating mode is used on your layout and is RailCom®/RailCom Plus® compatible. The SmartDecoder XP 5.1 features several programmable braking distance functions in addition to numerous other programmable functions.

The PIKO SmartDecoder XP5.1 Sound is load-regulated and features auto-adaptive motor control that works with a fundamentally newly developed traditional DC motors for a silky smooth ride as well as 1.2 Amp coreless motors. The decoder will also tolerate a temporary current draw up to 2 Amps. The motor speed table can be set using the minimum, median, and maximum motor speed (simple curve), or by the user-programmable 28-speed step extended curve. The decoder features two directional lighting outputs and seven additional special function outputs that can be activated using function keys up to F68 (DCC). The switching (shunting) gear, with extended slow speed range, the three possible starting and braking delays, as well as the many vehicle sounds are also switchable via function keys. The sound of a suitable SUSI sound module can control specified function outputs as well as the motor output of the decoder. For example, the lighting of a diesel locomotive flickers when the engine is started. The PIKO SmartDecoder XP 5.1 is supported by the further developed power management in case of short-term voltage loss.

#### Installing the PIKO SmartDecoder XP 5.1

Remove the jumper plug from your model's PluX22 interface. Insert the new decoder into the interface socket. Note that PIN 11 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 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!**

#### SUSI interface

The decoder's SUSI interface is controlled by the PluX22 interface. If the main circuit board of the model is equipped with a SUSI interface, you can either use a PIKO sound module with SUSI or a suitable single-function decoder. You can find which CV should be programmed for its respective function output in the operating instructions. The decoder is factory set to send data to the PIKO sound module via the SUSI interface.

**CAUTION:** Soldering the decoder itself should only be done by experienced DCC professionals using appropriate equipment. Decoders damaged by improper handling are not covered by the warranty.

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

Enter address 3 on your DCC control system. Depending on your DCC system's data format, the decoder will operate using 28 speed steps or in Motorola® mode. When using a RailCom Plus®-enabled DCC system or with an mfx®-capable system, 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.

#### 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."

## Motorola®

The decoder utilizes 4 Motorola® addresses to access functions F1 - F 16, when using a Motorola—based command station. The three sequence addresses for the functions F5 - F16 are ascending to the decoder address and can be activated in CV61 as required by the values 1 (F5 - F8), 2 (F5 - F12), or 3 (F5 - F16).

## 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 12 and 29 in the PIKO SmartDecoder XP 5.1. 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®

PIKO SmartDecoder XP 5.1 is specifically made for the mfx® data format. If your control system uses the mfx® format, then the decoder is automatically recognized and is assigned its locomotive symbol, decoder address, and its up to 16 special function symbols. With mfx® technology, no locomotive data has to be stored in the central control unit and no locomotive addresses have to be programmed into the decoder.

## Braking

The decoder 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.

## 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

Easy-to-use **function mapping** allows you to assign functions like lighting and other outputs to any key between F0 – F12. Acceleration, braking delay, and switching (shunting) mode can be assigned to any function keys using CVs 156 and 157.

## 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.

Function key assignment is done using extended function mapping.

## 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. With the appropriate decoder settings, function outputs A4 and A5 will automatically switch off after a user-adjustable time without having to press their function 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..

## Extended function mapping

Due to its complex nature, extended **function mapping** cannot easily be set by programming individual CVs. To work with extended **function mapping**, you will need the PIKO SmartProgrammer device (#56415) and, if desired, the PIKO SmartTester (#56416). Detailed information on extended function mapping is available in the instruction manual.

## Servo control

The decoder can control up to two servo motors via outputs A6, A7. Function key assignment is done exclusively via extended function mapping.

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

Further information can be found in the detailed operating instructions.

**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

To restore the decoder to its factory settings, program CV8 to a value of 8.

## Programming

Configuration variables (CVs) form the basis of all the decoder's settings. This decoder can be used with the PIKO SmartControllight DCC system, the PIKO SmartControl DCC system, or any other DCC- and Motorola based systems. For more information on programming options, please refer to the instruction manual.

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Motorola® is a registered trademark of Motorola Inc. Tempe, (Phoenix) Arizona / USA  
RailComPlus® is a registered trademark of Lenz Elektronik GmbH

## Service:

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

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

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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