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	5
4	**Braking rate** (time factor like CV 3)	0-255	5
5	**Maximum speed** (must be greater than CV 2)	1 - 63	48
6	**Average speed** (must be greater than CV 2 and less than CV 5)	1 - 63	24
7	**Software version** (The processor can be updated)	-	differently
8	**Manufacturer identification** decoder reset, values like CV 59	different	162
17 18	**Long locomotive address** 17 = higher value Byte 18 = lower value Byte	1 - 9999 192 - 231 0 - 255	2000 199 208
29	**DCC standard configuration** Value 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	0-63	14
30	Error codes for function outputs, motor, and temperature monitoring: 1 = fault function outputs, 2 = fault motor, 4 = overheating	0-7	0
33-46	**Easy function mapping** **Assignment of function outputs to CVs** CV 33 Lighting function key (F0) when moving forward CV 34 Light function key (F0) when in reverse CV 35 Function key F1 CV 36 Function key F2 CV 37 Function key F3 CV 38 Function key F4 CV 39 Function key F5 CV 40 Function key F6 CV 41 Function key F7 CV 42 Function key F8 CV 43 Function key F9 CV 44 Function key F10 CV 45 Function key F11 CV 46 Function key F12 **Assignment of individual bits (with CV100 / 101 bit x = 0, standard)** Bit 0 Front light output Bit 1 Rear light output Bit 2 Function output A1 Bit 3 Function output A2 Bit 4 Function output A3 Bit 5 Function output A4 Bit 6 Switching (Shunting) Bit 7 Acceleration / deceleration	0-255	 1 2 4 8 16 32 64 128 0 0 0 0 0 0 1 2 4 8 16 32 64 128
59	**Resetting to factory settings** (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 (modulation function outputs banks 3 & 4)	0 - 4	0

* factory set values

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#36123 PIKO SmartDecoder 4.1 G, Multiprotocol loco decoder for G scale locomotives

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

Description

The PIKO SmartDecoder 4.1 G decoder is a powerful and compact multiprotocol decoder for G scale locos, that can be used with standard DCC, Selectrix, and Motorola digital systems as well as in DC or AC analog mode. It automatically detects the operating system in use.
This load regulated decoder operates 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 decoder is both RailCom® and RailCom Plus®-ready and recognizes 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 decoder provides two directional lighting outputs, as well as seven additional special funtion outputs. Slow-speed switching mode, with extended slow-speed range, along with three accelleration and braking rates, can be controlled via function keys.

Installing the G PIKO SmartDecoder 4.1 G

The decoder may be mounted with the screws provided.
Make sure that there is no short circuit caused by the mounting screws. When you install the decoder, make sure that there are no conductive connections anywhere inside the vehicle.

Connection of the G PIKO SmartDecoder 4.1 G

Install the decoder carefully according to the connection plan in this manual and the separate special wiring scheme. Use an ohmmeter to check whether the installation is correct. Check for crossed wires and short circuits before and after reinstalling the shell.
The decoder is protected against shorts and overload. However, if during the installation cables are reversed or if shorts occur between functions (e.g. wheel set and motor), the protection will not work anymore and the decoder will be damaged. We disclaim all responsibility and guarantee in case of misuse or damage of the decoder.
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.

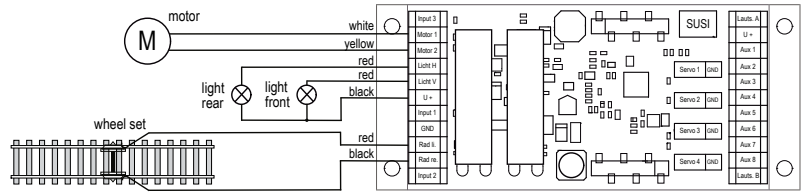

Image 1: Connections of motor, lighting front and rear, wheel set

Special functions A1 bis A8

The special function outputs A1 to A8 of the decoder are placed on the right screw terminal of the decoder (Image 1). The power consumers connected to this terminal will be provided with current by the U+ terminal. You can find detailed information about all connections in the detailed instructin manual.

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

SUSI interface

At the SUSI interface of the PIKO SmartDecoder 4.1 G 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.

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

Configuration 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 4.1G. 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®
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 G 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 decoder understands the following braking methods:
• DCC braking function
• Märklin braking section (brakes with analog DC voltage)
• 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
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.

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 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.

Servo control
The decoder can control up to four servo motors via outputs. Further information can be found in 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.

Service:
Internet: www.piko.de
E-Mail:info@piko.de
Hotline: Tuesday + Thursday 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 (EMVGesetz), the decoder module may only be used inside models bearing the CE mark.