CV	Description	Range	Default
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**	0 - 255	50
4	**Braking delay**	0 - 255	30
5	**Maximum speed** (must be greater than CV 2)	0 - 255	195
6	**Median speed** (must be greater than CV 2 and less than CV 5)	0 - 255	135
7	**Firmware version** (The processor can be updated)	-	differently
8	**Manufacturer's ID** Decoderreset CV8 = 8	-	162
12	**Decoder operating mode** Default Bit 0=1 DC (analog operation; direct current) on 1 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	0 - 117	117
17 18	**Long locomotive address** 17 = high Byte 18 = low Byte	1 - 10239 192 - 231 0 - 255	1000 195 232
27	**Brake signal settings (automatic stop)** Default 1 Bit 0 = 1 -> ABC (Automatic Brake Control) right rail positive 2 Bit 1 = 1 -> ABC left rail positive 16 Bit 4 = 1 -> DC; opposite direction of travel 32 Bit 5 = 1 -> DC; same direction of travel	0 - 51	0
29	**DCC standard configuration** Default 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 Digital mode only 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 the motor, thermal overload, and function outputs:** 1 = motor error, 2 = thermal overload error, 4 = function output error	0 - 7	0

See the detailed decoder instructions for a complete CV list

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

Service:
www.piko-america.com
support@piko-america.com
619-280-2800

In the event of a problem with this decoder, return it to PIKO along with proof of purchase 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.

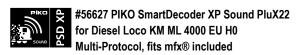Product subject to changes. All rights reserved. Printed 11/2024.
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PSD XP

#56627 PIKO SmartDecoder XP Sound PluX22
for Diesel Loco KM ML 4000 EU H0
Multi-Protocol, fits mfx® included

PIKO
MODEL TRAINS & MODEL BUILDINGS

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

Description
The state-of-the-art PIKO SmartDecoder XP Sound inside in this PIKO locomotive is a compact yet powerful multi-protocol sound decoder with a PluX22 interface. It features high fidelity, 12 bit 8-channel sound with 2.5 watts of output that ensures distortion-free sound at all levels. It complies with the current RCN standards in all areas. The decoder can be used on DCC, mfx®, and Motorola® digital systems as well as traditional DC or AC analog layouts. It automatically senses what operating mode is used on your layout and is RailCom®/RailCom Plus® compatible. The PIKO SmartDecoder XP Sound features several programmable braking distance functions in addition to numerous other programmable functions.

The PIKO SmartDecoder XP Sound is load-regulated and features auto-adaptive motor control that provides silky-smooth control of both traditional DC motors and coreless motors of up to 1.2 Amps draw. The decoder will tolerate a temporary current draw of up to 2 Amps. The motor speed table can be set using minimum, median, and maximum motor speeds (simple curve), or by a user-programable 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 or half-speed mode provides slower motor speed for precise switching. Many sound functions are user-controllable via function keys. The PIKO SmartDecoder XP works with the super-capacitor in this locomotive to provide smooth operation in case of short-term track voltage loss.

Installing the PIKO SmartDecoder XP Sound into a non-sound loco
Remove the jumper plug from your model's PluX22 interface. Insert the sound decoder into the interface socket. Take care of proper direction, as indicated by the "missing" pin 11. Install the loudspeaker as illustrated in the assembly and spare parts diagrams. 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 function outputs A1 to A7
The decoder's special function outputs A1 to A7 can only be activated if the desired functions (lights, etc.) are already connected to the model's PluX22 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!

First-time use of the decoder
Enter address 3 on your digital 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 system or with an mfx®-capable system, the decoder is detected automatically 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: If the decoder has been operated on a DCC system with RailCom Plus® technology, the address will have been changed from the default of 3 to a number above 1000.

NOTE: On DC operation, compared to analog (non-decoder) locos, a loco with a decoder installed will require much higher track voltage before starting.

Function outputs in analog mode
The directional front and rear headlights (F0) and motor sounds (F8) are factory-programmed to be active on analog DC operation. It is possible to program the decoder so that some light functions in the range of F0 - F12 (according to factory defaults) can also be activated on analog operation. See the detailed decoder instructions for further info.

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

CVs 12 and 29 control the operating mode and configuration CVs, respectively. For the vast majority of DCC users, there should be no need to change the factory defaults. An indexed CV generally contains various basic settings of a decoder, such as travel direction. See the detailed decoder instructions for further info.

RailCom®, RailCom Plus®

This decoder will be automatically recognized by DCC systems equipped with RailCom Plus® technology. The decoder name, locomotive symbol, and special function symbols will appear automatically on your control device's screen. No locomotive data needs to be stored in the DCC central station and no different addresses need to be programmed into the decoder. RailCom Plus® can be turned off and on via CV 29 bit 3.

fits mfx®

The PIKO SmartDecoder XP Sound also masters the mfx® data format and is "fits mfx®" certified. If the digital command station used is mfx® capable, the sound decoder automatically registers with its locomotive symbol, decoder name and its function symbols. No locomotive data needs to be stored in the command station and no different addresses need to be programmed into the decoder.

Braking

The sound decoder understands the following braking methods:
Märklin® braking section (brakes on analog DC voltage)
DCC braking function
ABC (Automatic Brake Control) braking section
The decoder's adjustable braking distance can bring the train to a stop within a centimeter of a signal. More information on "braking behavior" can be found in the detailed decoder 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 and F12.

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). This is only recommended for advanced DCC users.

Servo control

The sound decoder enables the control of servo motors via all function outputs. The assignment to the function keys is done exclusively via the 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.

Sound settings

The overall volume can be adjusted as desired by programming CV63 in a value range of 0 - 255.

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 XP Sound as well as the available
For setting options, please refer to the detailed operating instructions.

Factory reset

To restore the sound 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. For more information on programming options, refer to the detailed decoder instructions.

Update

The PIKO SmartDecoder XP can be updated. To perform an update, you need either the PIKO SmartProgrammer (#56415) or the digital system PIKO SmartControl$_{wlan}$ (#55821).

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RailCom® and RailComPlus® are registered trademarks of Lenz Elektronik GmbH, 35398 Gießen, Germany

Function assignments

F0	Headlights	F10	Dual White Gyralite	F20	Radiator Fan Sound
F1	Bell	F11	Red Gyralite	F21	Sander Valve Sound
F2	Horn - Playable	F12	Signal light red*	F22	Cab Chatter
F3	Short Horn	F13	Cab Interior Light	F23	Cab Chatter
F4	Dynamic Brake Sound	F14	Engine Room Light	F24	Air Compressor Sound
F5	Signal light green	F15**	Lighting double traction*	F25	Control Stand Light
F6	Signal light white	F16	Light 1x red, rear	F26	Crade Crossing Horn
F7	Headlight Dimmer	F17	Couple/Uncouple Sound	F27	Volume Stepper - 4 Steps
F8	Motor Sounds	F18	Brake Squeal/Release	F28	Switching Mode/Half Speed
F9	License plate illumination	F19	Curve Squeal Sound		

* depending on version

Note: This sound decoder features several "multi-step" functions. Each successive press of the button activates a different condition of that function, as noted here:

F15 Lighting double traction*

1x all front lights off
2x all rear lights off
3x both sides off
4x initial state lights on both sides