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**	0 - 255	170
4	**Braking delay**	0 - 255	90
5	**Maximum speed** (must be greater than CV 2)	0 - 255	240
6	**Average speed** (must be greater than CV 2 and less than CV 5)	0 - 255	182
7	**Firmware version** (The processor can be updated)	-	differently
8	**Manufacturer's ID** Decoderreset CV8 = 8	-	162
12	**Decoder operating mode** **Value** 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)** **Value** Bit 0 = 1 -> ABC (Automatic Brake Control) right rail positive 1 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	0 - 51	0
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 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 = fault motor, 2 = fault thermal overload, 4 = fault function output, 8= fault sound memory	0 - 15	0

* set ex works

Function assignments

F0	Light	F10	Train Lighting: Engine pulling	F20	Conducter's Whistle
F1	Running Sound – Diesel Loco	F11	Train Lighting: Engine pushing	F21	Trainheating
F2	High Tone Horn	F12	Station Announcement	F22	Auxiliary diesel
F3	Low Tone Horn	F13	Radio	F23	Sanding
F4	Cab Light 1	F14	Volumeregulator	F24	Refuel locomotive
F5	Cab Light 2	F15	Tunnel mode	F25	Curve Squeal
F6	Engine Room Lights	F16	High Tone Horn, long	F26	Clickety-Clack
F7	Switching Gear	F17	Low Tone Horn long	-	-
F8	Engineer's Greeting	F18	Bell	-	-
F9	Coupling	F19	Engine Break	-	-

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#56656 PIKO SmartDecoder XP Sound PluX22 for Diesel locomotives BR 215 H0 multiprotocol, fits mfx® included

NOTE: Detailed information on the PIKO SmartDecoder XP 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 XP Sound.

Description
The state-of-the-art PIKO SmartDecoder XP Sound inside in this PIKO locomotive is a compact yet powerful multi-protocol PluX22 sound decoder. 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 RC 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 works with of 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-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 (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. Depending on the project, the sound section can control defined function outputs and the motor output of the decoder. For example, the lighting of a diesel locomotive flickers when the engine is started. The PIKO SmartDecoder XP is supported by the further developed power management in case of short-term voltage loss.

Installing the PIKO SmartDecoder XP 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 function outputs 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 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: In analog mode, your vehicle will not start until the voltage is higher (speed control turned up further) than you may have been used to when operating with analog vehicles.

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 central control unit. The corresponding values can be found in the CV table of the detailed operating instructions. The light function F0 and the running sound F1 are switched on at the factory.

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. 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. The decoder is automatically recognized by RailCom Plus® - equipped command stations (like PIKO SmartControl*wlan*) if the RailCom Plus® option is activated in CV 28. The decoder name, locomotive symbol, and special function symbols will appear automatically on your control device'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.

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 complete special function symbols. This mfx® technology means that no locomotive data needs to be stored in the command station and no locomotive addresses need 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 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 operating instructions for
PIKO SmartDecoder XP Sound.
NOTE: If the start-up and braking behavior is to be effectively changed via CVs 3 and 4, it is recommended to switch off the soft start ramp beforehand with CV53 = 255.

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

Simple function mapping (CV96 = 1)
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 (CV96 = 6, factory setting)
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 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 set 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. This decoder can be used with the PIKO SmartControl*wlan*, PIKO SmartControl*light*, DCC system, the PIKO SmartControl DCC system, or any other Motorola-based system.
For more information on programming options, please refer to the instruction manual.

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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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
E-Mail:info@piko.de
Hotline: Di + Do 16-18 Uhr

Service: In the event of a complaint about the item, please send us the item with the proof of purchase (copy) and the completed complaint form, which you can find in our webshop under "Cancellation and returns".

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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