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	1
3	**Acceleration delay**	0 - 255	30
4	**Braking delay**	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's ID** Decoderreset CV8 = 8	-	162
12	**Decoder operating mode** Bit 0=1 DC (analog operation; direct current) on Bit 2=1 DCC data format on Bit 4=1 AC (analog 3-rail operation; alternating current) on Bit 5=1 Motorola® data format on Bit 6=1 mfx® data format on	Value *1 *4 *16 *32 *64	0 - 117	117
17 18	**Long locomotive address** 17 = high Byte 18 = low Byte	Value 1	1 - 10239 192 - 231 0 - 255	1000 195 232
27	**Brake signal settings (automatic stop)** Bit 0 = 1 -> ABC (Automatic Brake Control) right rail positive Bit 1 = 1 -> ABC left rail positive Bit 4 = 1 -> DC; opposite direction of travel Bit 5 = 1 -> DC; same direction of travel	Value 2 16 32	0 - 51	0
29	**DCC standard configuration** 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 Digital mode only 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)	*0 1 0 *2 0 *4 0 *8 *0 16 *0 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

* factory set values

Function assignments

F0	Light
F1	A1
F2	Switching Gear
F3	ABV
F12	Light

PIKO Spielwaren GmbH
Lutherstr. 30
96515 Sonneberg
GERMANY

56503-90-7003_2024

#56503 PIKO SmartDecoder XP NEM652
multiprotocol, fits mfx® included

NOTE: Detailed information on the PIKO SmartDecoder XP 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.

Description
This PIKO SmartDecoder XP with 8-pin interface according to NEM652 is a compact, yet powerful multi-protocol 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 features several programmable braking distance functions in addition to numerous other programmable functions.

The load-controlled decoder operates with an auto-adaptive motor control and is therefore suitable not only for DC motors, but also for bell armature motors up to a continuous current consumption of 1.2 A. 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 has two directional light outputs and an additional special function output, which can be activated via function keys up to F68 (DCC). The switching (shunting) gear, with extended slow speed range, the three possible starting and braking delays, are also switchable via function keys. Due to the advanced power management the PIKO SmartDecoder XP is supported in case of brief loss of power is supported.

Installing the PIKO SmartDecoder XP
Remove the jumper plug from your model's NEM 652 interface. At the same place insert the 8-pin plug of the decoder carefully into the interface socket. Please note the coding of PIN 1 note. If the plug is turned 180°, the locomotive will run in the wrong direction and the light will not work. 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 A1
The special function output A1 of the PIKO SmartDecoder XP can only be used if the desired consumer is already connected to the NEM 652 interface in the vehicle, or if there are solder pads on the main 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 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 functions are switched on at the factory via F12.

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. 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. 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 also masters the mfx® data format and is fits mfx® certified. If the digital command station used is mfx® capable, the 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 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
In the simple function mapping according to RCN-225 (CV96=1) the switching tasks such as lighting and special function output can be freely assigned to the function keys F0 to F12 of the digital command station (CV33 - CV46). The switchable starting and braking delay and the shunting gear can be assigned to any function key up to F68 in CVs 156 and 157 can be assigned to any function keys up to F68. More information can be found in the detailed operating instructions.

Smoke generator control
A smoke generator can be connected to output A1, which can be controlled by the decoder either load- or speed-dependent.
speed-dependent by the decoder. The assignment to the function keys is done exclusively via the extended function mapping extended function mapping.

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 decoder enables the control of a servo motor via function output A1. 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.

NOTE: To upload a PIKO locomotive project to the decoder, you need the test and programming device PIKO SmartProgrammer (#56415) and (optional) the PIKO SmartTester (#56416).

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 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.

NOTE: This product is not a toy and is not suitable for children under 14 years of age. Any liability for damages of any kind caused by improper use, as well as by not following these instructions, is excluded.

Service:
Internet: www.piko.de
E-Mail: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.