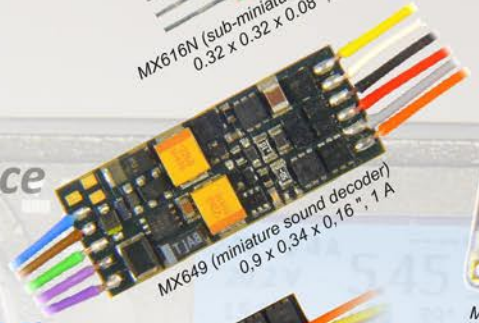
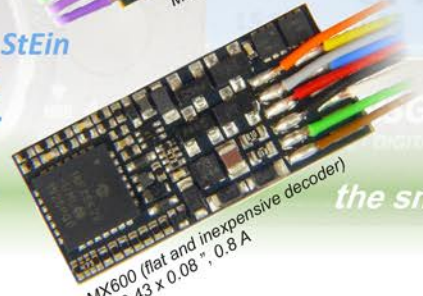
Decoders

Locomotive Decoders
Sound Decoders
Function Decoders
Accessory Decoders
Decoder Update Device

MX616N (sub-miniature decoder)
0.32 x 0.32 x 0.08 ", 0.7 A



MX649 (miniature sound decoder)
0,9 x 0,34 x 0,16 ", 1 A



MX600 (flat and inexpensive decoder)
1 x 0.43 x 0.08 ", 0.8 A

MX699KV (large scale sound decoder): 2.0 x 1.6 x 0.5 ", 6 A, 10 Watt

Decoder photos enlarged (2:1)

ZIMO system products

Brief description MX10 & MX32 & StEin last pages of this catalogue (more in the separate System catalogue).

The best for money, the smallest, the most powerful and approx. 100 other types

ZIMO ELEKTRONIK

The ZIMO Decoder Catalogue July 2017

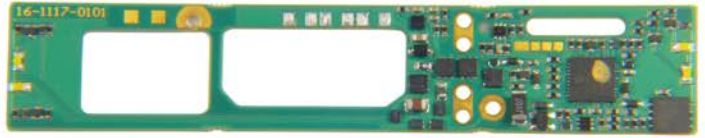
www.zimo.at

CONTENT ZIMO Decoder Catalogue

Decoder individual

Besides the standard decoders listed in this catalogue, ZIMO develops and produces special solutions for loco manufacturers. This happens when the installation space in the loco is particularly tight, when special features are necessary or when special external devices should be connected.

Typical examples are locos with camera and WiFi radio module, integration of RFID reader boards, panto machines, cog railway systems and much more.



Typical „Individual" decoder; for a Fleischmann SBB Ae 6/6 (a sound decoder directly integrated in the loco board, components used similar to the standard type MX649)

More information on the following pages;

ZIMO Sound-Decoder individual ..... Page 21
ZIMO Large scale individual ..... Page 29

The internal manufacturing plant enables ZIMO to react flexibly on requirements from the model railway industry, even „exotic" products (in small quantities) can be offered economically.

About ZIMO

Business started 1978 with the first experiments on digital model railway control. This was a completly new approach at that time. The first outcoming product was called „digital multi-channel control" in accordance to the multi-frequency systems already existing since the sixties but rather inefficient and rarely used.

The name „ZIMO" was born in 1980. In the same year the company ZIMO ELEKTRONIK was founded: it was only one room of 25 square meter, but the address was the same as today: Schoenbrunner Strasse 188, 1120 Wien, Austria.

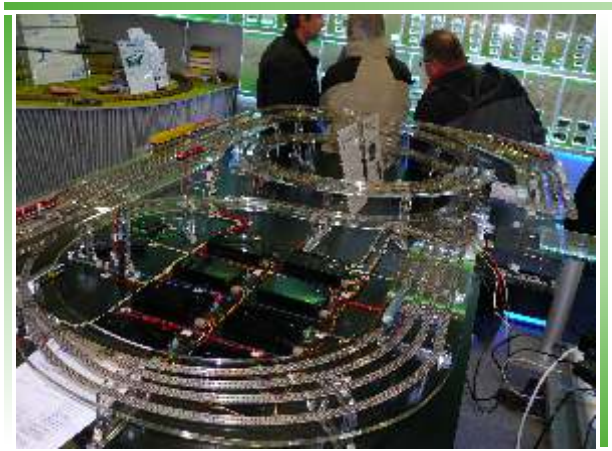
In 40 years of steady growth ZIMO has become one of the important players in the digital model railway world. It's a ZIMO tradition to introduce new ideas to the market, e.g. high-frequency motor control combined with load regulation (20 years ago considered as impossible by others), HLU braking system (15 years earlier than the so-called „advanced" brake control ABC and still much more powerful), update capability for all ZIMO decoders since 2004 (as the first manufacturer worldwide), etc. Today: the most powerful DCC command station, the largest range of decoders, and much more.

The „ZIMO house" in Vienna
Street level - production plant, 3rd floor - development and administration

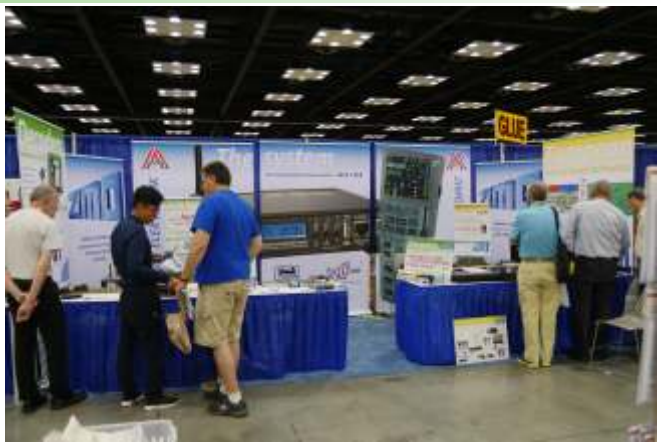
2006 the first sound decoders were presented by ZIMO. Since that time ZIMO employees and external partners (the sound providers) acquired a wide knowledge of recording prototype sounds, compiling sound samples and reproducing the sound in the model. The ZIMO sound database holds a big variety of sound projects, for more than 500 prototypes or models.

ZIMO is the decoder and sound decoder supplier for many model train manufacturers in Europe, for large companies as well as for small ones. The key competencies are a very high flexibility of ZIMO engineers in making special software supplements for special effects and in designing and manufacturing loco specific decoder boards and lighting boards for all purposes and of all sizes.

Representatives and dealers of ZIMO exist in almost every European country. While the prime market is formed by the German speaking countries, the fastest growth rate currently is observable in the UK, whereas America is still an area with a huge potential for ZIMO.



ZIMO exhibition layout (N scale) with ESTWGJ computer control



ZIMO fair stand in Indianapolis, 2016.

ZIMO Decoders . . .

ZIMO Decoders . . .

. . . come from our own production facility in Vienna,

as well as all products from ZIMO Digitalsystems. Here is where ZIMO employees make the complete circuit board assembly, do all the soldering and wiring, program the microcontrollers, load the sound data, initialize and test and perform all repair work.

This 'self-made' flexibility allows ZIMO to offer a complete, consistent range of latest generation decoders, including "exotic" types, which - while perhaps only needed in small quantities - satisfy our claim of "an appropriate decoder for every locomotive."

The dimensions of the ZIMO decoders are often smaller than those of the comparable products of other manufacturers, even though most of our decoder types are equipped with more outputs than usual and although microcontrollers feature large program memory (32K or more, leaving adequate space for software updates). ZIMO sound decoders have an external 32 Mbits flash memory for soundprojects on-board.

ZIMO Decoders . . .

. . . offer a selection where ALL typess have ALL features.

The list of COMMON features is extensive (see on the following pages), the particular features - thus the differences between the decoder families - are restricted to just a few aspects.

One of the development offices

ZIMO production machine room: two placement robots, Reflow soldering oven, soldering-paste printer, AOI device.

ZIMO Decoders . . .

. . . are equipped with the latest technology. A look at the details (see picture of sound decoder MX645, above, as an example) shows the integration density of our electronics: the components closely juxtaposed in miniaturized arrangements, no space wasted for conductors because they've been moved to the unseen internal layers of our 4-layer printed circuit board.

ZIMO Decoders . . .

. . . for a product range of currently about 100 types, divided into 25 "Decoder families." One such family corresponds to the general layout of a circuit board for several decoder types, each with different access technology (wiring, direct plug as PluX or MTC) and sometimes several variants based on type and number of outputs.

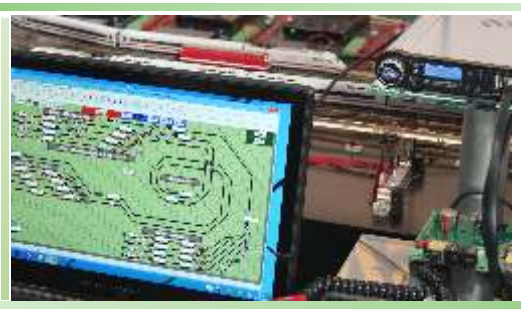
The perfect decoder type for a particular application is hence easy to find: the dimensions, the number of function outputs, the type and number of low voltage outputs, the possible type of energy storage, and the connection technology are the decisive criteria. The total current overload capacity needs rarely to be considered: ZIMO decoders are generously designed and so they're almost always more than "strong" enough.

ZIMO Decoders . . .

. . . offer innovative solutions. ZIMO's long lived tradition was always to introduce new ideas to the market. For example, the combination of high-frequency motor control and load regulation (introduced 10 years ago, and previously generally considered as not feasible) as well as the ability to update.

ZIMO Decoders . . .

. . . are not more expensive than similar quality products.. In many cases ZIMO decoders offer a considerable price advantage, especially because of properties such as HLU, RailCom, SUSI and servo-control are not reserved for special products, but rather are included in every model.



ZIMO exhibition booth (Leipzig 2016) | *ZIMO exhibition layout (N scale) with ESTWGJ computer control* | *ZIMO workshop*

Even today there are a number of unique features of ZIMO decoders, such as: • the "HLU" concept and ZIMO train number recognition • "Swiss mapping," an alternative to NMRA function mapping that links the setting of complex lighting conditions to individual desires (appropriate not only for the Swiss...) • the high level of configurability of ZIMO's sound capabilities • "ZIMO Input Mapping", which is the combined function mapping upstream of the assignment of function keys.

There are no derated "Basic decoders" in the ZIMO product line. This product policy not only eliminates the waste of our valuable labor to develop inferior products, but it's also advantageous to the user: the use of a decoder which exploits the latest technology options may not always be evident at the time of purchase, but can be relevant when it comes to adapting to new operations later on, for example when new feedback options are offered.

ZIMO Decoders . . .

. . . are NOT ONLY locomotive decoders and (locomotive) sound decoders, but also function decoders and accessory decoders:

And these decoder classes have properties that may not be self-evident. For example: function decoders for non-powered vehicles are not simply locomotive decoders with reduced features (for example, removal of the motor output), ZIMO rather adds a special feature: the second address, which - programmed to the address of the locomotive - allows for consistent activation of all facilities in the train, a step toward a 'train bus' (in this case, a "virtual" bus, i.e. without direct connection or data exchange between cars).

ZIMO Decoders . . .

. . . are supplemented by high-quality accessories: for example, a wide range of speakers for sound decoders. In addition to the usual round speakers, miniature rectangular speakers with specially-designed bodies and resonant bass reflex speaker boxes provide excellent sound from an extremely small space. Energy storage electrolytic capacitors, tantalum and Gold Caps offered by ZIMO (as components and modules) are particularly useful and recommended.

A range of adapters and locomotive boards facilitate the installation and increase the performance of our decoders.

The important Characteristics of ZIMO (Sound) Decoders

Basic Properties

- DCC-addresses 1 ...10239 Composite addresses 1 ...127, MM-addresses 1 ...80, functions F0 ...F28.
- 14, 28, 128 external speed steps; 256 or 1024 internal.
- Programming in "Service Mode" and "Operational Mode"; CV-readback in "Operational Mode" with RailCom.
- DC-analog operation, with optional unregulated or load-regulated motor control.
- AC-analog operation, including direction-reversal using Märklin-standard current-surge impulse.
- SUSI-interface: included on smaller decoders on solder pads; on larger decoders on connector.
- Software update capability: new software versions may be loaded into the decoder with the help of the ZIMO MXULFA decoder update device (or its predecessor MXDECUP/U) or via ZIMO Command Station MX10. This can be accomplished on the track without opening the locomotive. Sound projects are similarly loaded.

Operational Safety Features

- Overcurrent protection for motor and function outputs with shutdown and automatic reset.
- Over temperature protection by automatic shutdown at about 100° C (212° F).
- Protection elements (suppressor diodes) against voltage spikes from motor inductance and external sources.

Motor Control and Regulation

- Low-noise, high frequency PWM control, selectable 20/40 kHz. Alternatively, low-frequency (adjustable 30 to 150 Hz) - for certain older engine types.
- Suitable for all DC motors including coreless motors (Faulhaber, Maxxon), "difficult cases" such as Fleischmann-round motor, with additional diodes for field coil motors.
- Partial self-optimizing control, and numerous possibilities for manual adjustment.
- Speed steps either relative to a three-point curve or programmable in 28 steps.
- Alternative km/h control (1/2, 1, or 2 km/h per speed step) instead of the conventional speed step control.
- Adjustable compensation of the transmission/gear backlash to avoid a lurch at start after reversing the direction.
- Acceleration settings (NMRA standard) and additional "exponential acceleration and braking" for soft start/stop and "adaptive acceleration and braking" to avoid sudden jolts.
- Distance controlled stopping (constant stopping distance) for precise stopping in front of a red signal by HLU or ABC.
- Shunting ("Switcher") functions: half-speed, reduction or disconnection of the starting/braking times.
- Automatic motion continuation during interruption of wheel/rail contact (dirty track, switches, etc.) until reliable supply resumes (Requires the installation of an energy storage device in the locomotive).

Functions and Function Outputs

- Full NMRA Function Mapping, with extensions (direction dependence, asymmetric lighting, etc.).
- "Swiss Mapping" (not only for the Swiss!), with multiple lighting conditions defined for cases of: locomotive without train, locomotive pulling train and locomotive pushing train, and the key combinations to activate them.
- ZIMO input mapping, 'forward-connected' to the desired key function mappings which permits setting of the key allocations as desired; especially useful for decoders in which a ready-to-use sound project has been loaded.
- Dimming, flashing, American and other lighting effects: Mars ditch, strobe ... soft start, brake light, flickering...
  Special smoke functions - heating element and fan.
- High beam/low beam headlight switching via function key.
- Time-limiting of coupling control for overload protection of Krois, Roco, or other digital couplers and 'coupling-waltz' (automatic push and release).
- Besides the actual 2 (or 4, depending on the decoder) function outputs, additional "logic level" outputs are included, which may be used as control lines for standard servo drives for couplers, pantographs and other mechanical elements.
- Servo configuration with special CVs for end and middle positions, control speed and function assignment.

Train Control and Feedback

- Braking distances by DC, ABC (= stopping by asymmetric DCC signal), "Märklin braking distance".
- ZIMO HLU - "signal controlled speed influence" with speed limits in 5 steps and stop. Only in conjunction with ZIMO digital system (MX1, MX31ZL, MX10, MX32ZL as controller) and ZIMO track section modules (MX9, "StEin").
- ZIMO train number message signal via high-current pulse. Only in conjunction with ZIMO digital system (MX1, MX31ZL, MX10, MX32ZL as controller) and ZIMO track section modules (MX9, "StEin").
- RailCom (already implemented applications): programming "On-the-main" and reading of CVs both with confirmation, RailCom address feedback, feedback of the current speed. Many other applications planned in future software releases.

Sound Concept

- Powerful Sound Amplifier: In miniature sound decoders, 1 Watt for an 8 Ohm speaker, in H0 sound decoders, 3 Watt for a 4 or 8 Ohm speaker (or two 8 Ohm in parallel), in large-scale decoders, 10 Watt for a 4 or 8 Ohm speakers (or two 8 Ohm in parallel).
- Playback rate 22 kHz (used by default) and 11 kHz (for long sequences such as announcements), Flash memory 32 Mbit (3-6 min playing time), 6 sound channels can be mixed and played back simultaneously (e.g. steam 'chuffs' on two channels with overlap, air pump, whistle, etc ...).
- Acceleration and load dependent sound playback; automatic measurementing for 'training' load-sensitivity for steam engines as well as for diesel and electrical locomotives.
- Synchronization of steam 'chuffs' alternatively by an axle cam detector (mechanical contact, opto-detector, Hall-effect sensor) or by the software-simulated axle detector. Adjustment options for various steam sound effects with overlapping.
- Numerous sound CVs for real-time adaptation of the loaded sound project, in particular for diesel and electric locomotives: the volume and speed (or pitch) curves for turbochargers, thyristor and electrical motor noise and many others.
- Loading of sound projects (= overwrite the project already loaded in the decoder) using the ZIMO decoder update module MXULFA or the base unit MX10 (ZIMO Command Station), i.e. with the same equipment and similar methods as for a decoder software update. It's possible to load a sound project on the track without opening the loco (which takes about 10 minutes), or alternatively via the SUSI interface (approx. 1 min).
- Sound collection as a special form of sound project: sound samples and parameters for several series are included. For example, "European Steam/Diesel Collection" with 5 steam 'chuff' sets, 10 whistles, 2 bells, ... Real-time selection of the available samples allows you to create an individual sound for each locomotive.

Energy Storage Interface

- External energy storage (electrolytic, tantalum, Gold Cap capacitors) enable continuous locomotive motion during a break in wheel/rail contact, eliminate flickering lights and sound disruption and compensating for any loss of energy through RailCom and HLU gaps.
- Energy storage up to 5000 μF may be connected directly (without additional components) to all decoders and sound decoders that have a length of more than 20 mm, offering full effect without disrupting programming or train-number impulses or altering limitations defined by in-rush current.
- Gold Caps with unlimited capacity may be connected directly to some small decoders and to all large-scale decoders.

Special Large-scale Features

- Synchronous rectifier instead of diodes to reduce voltage drop and heat loss, offering continuous current up to 6 A without a heat sink.
- One, two or three low-voltage outputs (up to 1 A) depending on decoder type: 5 V (as servo supply, also often used for smoke fan and lights); 10 V; and adjustable low-voltage adjustable from 1.2 V to just below track voltage.
- Up to 14 "normal" function outputs (1A total load per group of 4) depending on the decoder type; a special output for a smoke fan additionally.
- 4 servo outputs, depending on the decoder type, via control lines, or included in 3-pin connectors.
- Acceleration sensor to automatically adjust sounds on uphill gradients, curves, etc...

Comparison table: Locomotive (Sound) Decoders for smaller scales

Each decoder family includes several types (= Different types of connection)

Decoder Family >	Flat decoder	Sub miniature	Miniature		Standard H0		High end H0		High power H0, 0		SOUND	SOUND	SOUND
	MX600	MX616	MX617	MX618	MX623	MX630	MX633	MX634	MX635	MX636	MX644	MX645	MX648
Dimensions mm (in.) circuit board (without heat shrink tubing)	25 x 11 x 2 (1 x .43 x .08)	8 x 8 x 2 (.32 x .32 x .08)	13 x 9 x 2.6 (.5 x .35 x .1)	15 x 9.5 x 2.8 (.6 x .37 x .11)	20 x 8.5 x 2.5 (.79 x .33 x .1)	20 x 11 x 3.5 (.79 x .43 x .14)	22 x 15 x 3.5 (.87 x .6 x .14)	20.5x15.5x3.5 (.8x.61x.14)	26x15x3.5 (1x.6x.14)	26x15x3.5 (1x.6x.14)	30 x 15 x 4 (1.2 x .6 x .16)	30 x 15 x 4 (1.2 x .6 x .16)	20 x 11 x 4 (.79 x .43 x .16)
Continuous Current Sum of Motor and Function Outputs	0,8 A	0,7 A	0,8 A	0,7 A	0,8 A	1,0 A	1,2 A	1,2 A	1,8 A	1,8 A	1,2 A	1,2 A	0,8 A
Function Outputs including two headlamp outputs	4	6	6	4	4	6	10 (9) *)	6 **)	10 (9) *)	8 **)	8 **)	10 (9) *)	6 (4) *)
Servo/Logic Out optional logic-level outputs on SUSI-Pins	-	-	-	2	2	2	2	2	2	2	2	2	2
Function Low-Voltage	-	-	-	-	-	-	-	-	alternatively 14 V, 5 V, 1,5 V 0,8 total	alternatively 14 V, 5 V, 1,5 V 0,8 A total	only low-current: 5V / 200 mA	only low-current: 5V / 200 mA	-
Audio Power/Imp. (4 Ohm --> 8 Ohm or 2 x 8 Ohm parallel)	-	-	-	-	-	-	-	-	-	-	3 Watt / 4 W	3 Watt / 4 W	1 Watt / 8 W
Next-Plug		-	-	MX618N18	-	-	-	-	-	-	-	-	-
NEM 651 body connector 6-pole male conn. on decoder (N)	-	MX616N	MX617N	-	-	-	-	-	-	-	-	-	-
PluX-Plug 12, 16, or 22-pole male conn. on decoder	MX600P12	-	-	-	MX623P12	MX630P16	MX633P16, MX633P22	-	MX635P22	-	-	MX645P16, MX645P22	MX648P16
MTC-Plug 21-pole female connector on decoder	-	-	-	-	-	-	-	MX634D, C		MX636D, C	MX644D, C	-	-
Wire Connections NEM 652 (R) / NEM 651 (F)	MX600 MX600R	MX616 MX616R	MX617 MX617R, -F	-	MX623 MX623R, -F	MX630 MX630R, -F	MX633 MX633R, -F		MX635 MX635R, -F	-	-	MX645 MX645R, -F	MX648 MX648R, -F
Energy-storage conn. (for 16V or 25V electrolytic to 5000 µF)	-	-	-	-	-	-	yes (16V) also GoldCap	yes (25V)	yes (16V) also GoldCap	yes (16V) also GoldCap	yes (25V)	yes (16V)	

*) The wired decoders have more function outputs than the PluX types because the PluX plug has one pin less ("Index-pin" used as a safeguard against false insertion: "22-pin" connector actually has only 21 pins)

**) Decoders with MTC interface also have some logic level function outputs depending on type: „C" versions (FA3, FA4 logic level vs. „D" FA3, FA4 normal outputs)

Selection by type of connection, dimensions, sound or non-sound

SOUND MX649	SOUND MX658
23 x 9 x 4 (.9 x .35 x .16)	25 x 10,5 x 4 (.98 x .41 x .16)
0,7 A	0,8 A
4	4
2	2
-	-
1 Watt / 8 W	1 Watt / 8 W
-	MX658N18
MX649N/L gerade/gewinkelt	-
-	-
-	-
MX649 MX649R, -F	.
-	-

Decoder with connectors

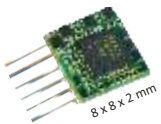
Next18

MX618N18

MX658N18

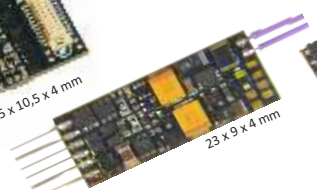
NEM 651 direct

MX616N



MX617N

MX649N



PluX12, PluX16

MX623P12

MX630P16

MX648P16

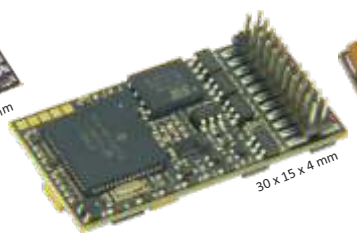
PluX22

MX633P22

MX635P22

No photo at time of printing

MX645P22



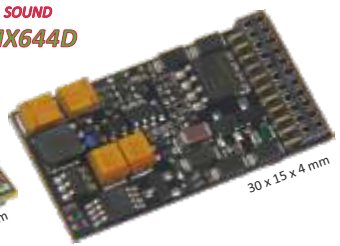
21MTC

MX634D, -C

MX636D, -C

No photo at time of printing

MX644D



Wired decoders

Wired versions are available within almost all decoder families

with free wires (.) *or* *with plug on wires fullfilling NEM 652 (R) NEM 651 (F)*

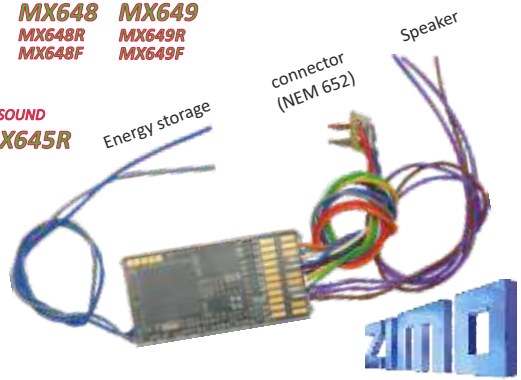
MX600 MX600R
MX616 MX621R
MX617 MX622R MX622F
MX623 MX623R MX623F
MX630 MX630R MX630F
MX633 MX633R MX633F
MX635 MX635R MX635F

MX617

MX623F

SOUND **MX645** MX645R MX645F
SOUND **MX648** MX648R MX648F
SOUND **MX649** MX649R MX649F

SOUND **MX645R**



Comparison table: Large Scale (Sound) Decoders

Each decoder family includes several types (= Different types of connections)	MX699				MX69				MX69	
Decoder Family >	**MX695KN**	**MX699LS** SOUND	**SOUND MX699LV**	**MX699KS** SOUND	**SOUND MX699KV**	**MX696N**	**MX696S** SOUND	**SOUND MX696V**	**MX696KS** SOUND	**SOUND MX696KV**	**MX697S** SOUND	**SOUND MX697V**
Dimensions mm (in.) (Length without 2 x 6 mm breakoff)	50 x 40 x 13 (2.0 x 1.6 x .5)	50 x 40 x 13 (2.0 x 1.6 x .5)		50 x 40 x 13 (2.0 x 1.6 x .5)		55 x 29 x 16 (2.2 x 1.2 x .63)	55 x 29 x 16 (2.2 x 1.2 x .63)		68 x 29 x 20 (2.5 x 1.2 x .7)		60 x 32 x 21 (2.2 x 1.3 x .83)	
Continuous Current Sum of Motor and Function Outputs	6 A	6 A		6 A		4 A	4 A		4 A		4 A	
Function Outputs including two headlamp outputs	14	8	15	8	15	4	8	14	8	14	10	
Servos: control lines (complete with 5V supply)	- 4	4 -	- 4	4 -	- 4	- 4	4 -		- 4		4 -	- 4
Function low-voltage 5V fixed (MX696N: 6V)	5 V	5 V	5 V	5 V	5 V	6 V	-		-	5 V	-	5 V
Function low-voltage 10V fixed	10 V	10 V		10 V		-	10 V		-		10 V	
Function low-voltage adjustable (Pot.) ≥ 1.2V	Potentiometer	- -	Code switch for: 1,5 - 6,5 - 14 -19 V	- -	Code switch for: 1,5 - 6,5 - 14 -19 V	-	-	Pot.	-	Pot.	-	Pot.
Audio Power/Imp. (4 Ohm --> 8 Ohm or 2 x 8 Ohm parallel)	-	10 Watt / 4 W		10 Watt / 4 W		-	10 Watt / 4 W		10 Watt / 4 W		10 Watt / 4 W	
Connector type (main connector)	32 Srew terminals	28 Pins	42 Pins	30 Srew terminals	38 Srew terminals	20 (2 x 10) Srew terminals	20 + 10 Pins	20 + 20 Pins	20 Srew terminals		12 + 12 Pins	
Connector type (Servo-connector)	4 x 3- pins	Solder pads	4 x 3 pins	Solder pads	4 x 3 pins	Solder pads	Solder pads	Pins	4 x 3 pins		Solder pads	4 x 3 pins
Internal supercaps as energy storage	-	1 Farad (8 V) *)		1 Farad (8 V) *)		-	-		-		-	
Energy Storage conn. (for 16V capacitors, all types and capacities)	yes (17 V), for elc. capacitors or 7-cell Goldcap moduls	yes (17 V), for elc. capacitors or 7-cell Goldcap moduls		yes (17 V), for elc. capacitors or 7-cell Goldcap moduls		yes (17 V), for elc. capacitors or 7-cell Goldcap moduls	yes (17 V), for elc. capacitors or 7-cell Goldcap moduls		yes (17 V), for elc. capacitors or 7-cell Goldcap moduls		yes (17 V), for elc. capacitors or 7-cell Goldcap moduls	

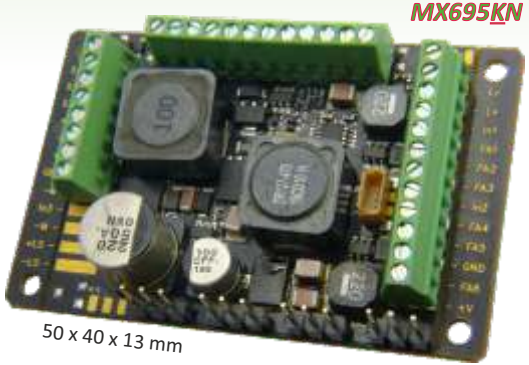
*) the internal energy storage of the MX699 makes the MX699 run continuously for 1 ... 5 sec, at reduced speed, but sound with full volume.

Selection by type of connection, dimensions, sound or non-sound

Decoder with various connectors

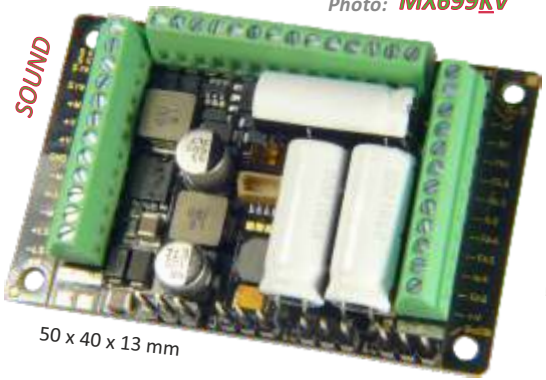
Screw terminals

Non-sound decoder
MX695KN



50 x 40 x 13 mm

Types MX699KS, MX699KV
Photo: **MX699KV**

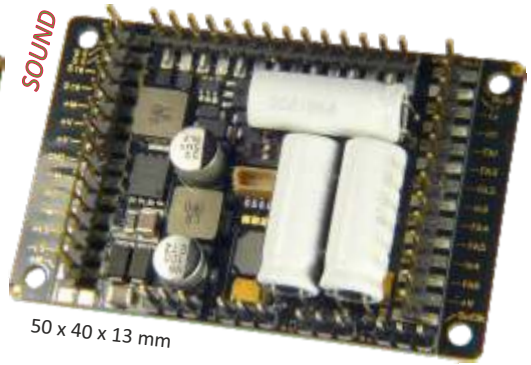


50 x 40 x 13 mm

single-row pin connector

NO
non-sound decoders
with single-row

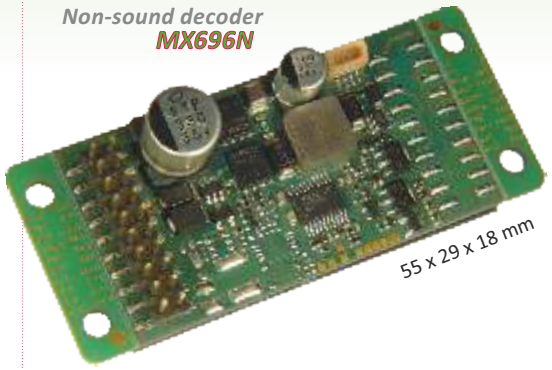
Types MX699LS, MX699LV
Photo: **MX699LV**



50 x 40 x 13 mm

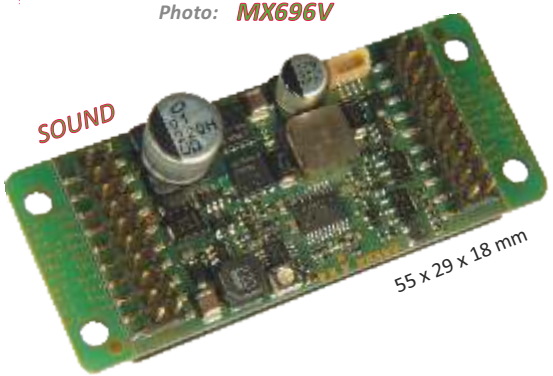
double-row pin connector

Non-sound decoder
MX696N



55 x 29 x 18 mm

Types MX696S, MX696V
Photo: **MX696V**



55 x 29 x 18 mm

„american" connectors
(Bachmann, Aristo, ...)

NO
non-sound decoders
with „american" connectors

Types MX697S, MX697V
Photo: **MX697V**

60 x 32 x 21 mm

Comparison Table: Function decoders

Select by type of connection

Each decoder family includes several types (= Different types of connection)

Function decoders derived from loco decoders: MX621 · MX630 · MX634 · MX632 · MX645

Decoder Family >	MX681	MX685	MX686	MX687	MX689 SOUND
Dimensions mm (in.) circuit board (without heat shrink tubing)	12 x 8.5 x 2.2 (.47 x .33 x .09)	20 x 11 x 3.5 (.79 x .43 x .14)	20.5x15.5x3.5 (.8 x .61 x .14)	26x15x3.5 (1.0 x .6 x .14)	30 x 15 x 4 (1.2 x .6 x .16)
Continuous Current Sum of Motor and Function Outputs	0,7 A	1,0 A	1,2 A	1,2 A	1,2 A
Function Outputs including two headlamp outputs	6	8	8	8	10
Servo/Logic Out optional logic-level outputs on SUSI-Pins	-	2	2	2	2
Function Low-Voltage	-	-	-	yes (0,8 A) opt. 1,5 or 5V	-
Audio Power/Imp. (4 Ohm --> 8 Ohm or 2 x 8 Ohm parallel)	-	-	-	-	3 Watt / 4 W
Wire Connections NEM 652 (R) / NEM 651 (F)	MX681R	MX685R	-	-	-
NEM 651 body connector 6-pole male conn. on decoder (N)	MX681N	-	-	-	-
PluX-Plug 12, 16, or 22-pole male conn. on decoder	-	MX685P16	-	-	MX689P22
MTC-Plug 21-pole female connector on decoder	-	-	MX686D	MX687WD	-
Free wires	MX681	MX685	MX686	MX687V MX687W	MX689
Energy-storage conn. (for 16V or 25V electrolytic to 5000 µF)	-	-	yes (25V)	yes (25V)	yes (16V)

Function decoder with connectors

NEM 651 direct

MX681N

PluX-16, -22

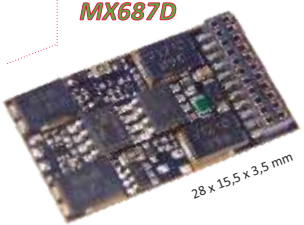
MX685P16

SOUND MX689P22

21MTC

MX686D

MX687D



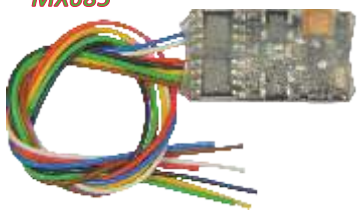
Wired ...

A through-hole version is available within almost all decoder families. With or with plug on wires per

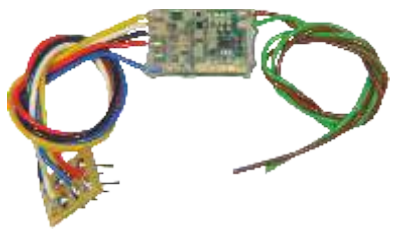
free wires (.) *NEM 652 (R)*

examples:

MX685



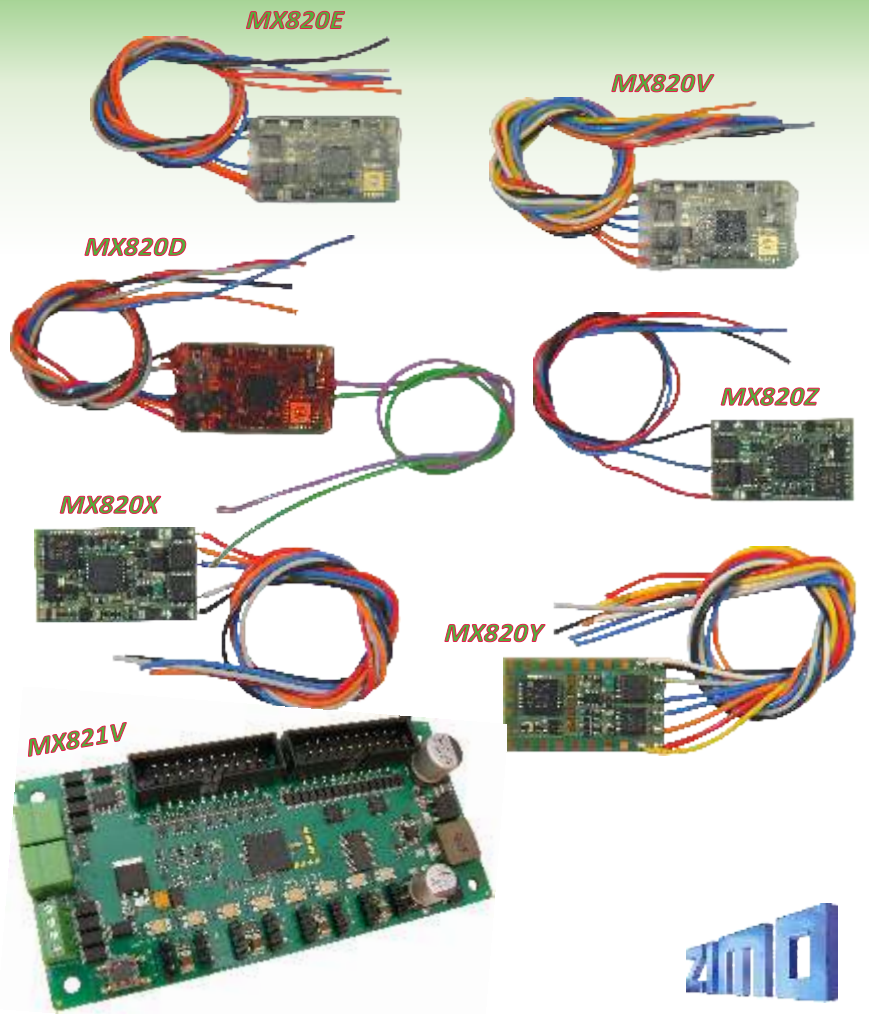
MX681R



Comparison table: Accessory decoders

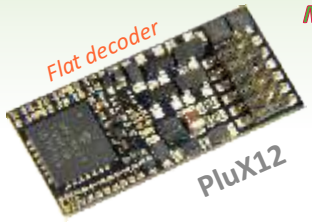
Decoder Families > (7 decoder models in all, in 2 decoder families)	MX820						MX821
Decoder Models>	**MX820E**	**MX820D**	**MX820V**	**MX820X**	**MX820Y**	**MX820Z**	**MX821 S/V**
Dimensions mm (in.) circuit board (without heat shrink tubing)	19 x 11 x 2 (.75 x .45 x .08)	19 x 11 x 3 (.75 x .45 x .1)	19 x 11 x 2 (.75 x .45 x .08)	19 x 11 x 2 (.75 x .45 x .08)	19 x 11 x 2 (.75 x .45 x .08)	19 x 11 x 2 (.75 x .45 x .08)	90 x 50 x 12 (3.6 x 2 x .0.5)
Continuous Current Sum of all outputs	1.0 A	1.0 A	1.0 A	1.0 A	1.0 A	1.0 A	-
Switch Outputs also usable for two lamps	1	1	2	1	2	-	-
Inputs control circuits or location signals	2	2	4	2	4	-	0/16
Light Output each will drive one LED/ lamp @100 mA	-	-	-	8	16	16	0/16
Servo/Logic level output also for Multiplex Signal	-	-	-	-	-	-	8
Servo Low-Voltage 5 or 6 V	-	-	-	-	-	-	yes
Audio Power/Imp. (4 Ohm --> 8 Ohm or 2 x 8 Ohm parallel)	-	-	-	-	-	-	-
Wiring loose wires with no connector	5 wires	7 wires	7 wires	5 wires	7 wires	3 wires	screw term., pin conn.
Energy storage conn.	-	-	-	-	-	-	-
	*Single-switch (**E**)*	*Sealed version (**D**)*	*Two switches (**V**)*	*8 or 16 Light outputs (LEDs) + 1 switch*	*+ 2 switches*	*no*	

Selection by type of connection



MX600

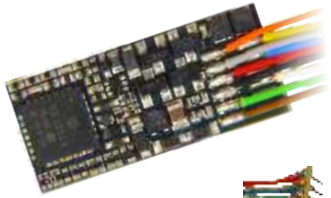
H0, ... (NON SOUND)



MX600P12
NEM 658 directly on decoder

DCC + RailCom, DC-analog
25 x 11 x 2 mm **1 x .43 x .08 in**
0,8 A motor, total (peak 1,5 A)
4 function outputs

The budget-priced decoder, with full feature set



MX600
wires only

MX600R
NEM 652 on wires

MX616

N, H0e, TT, ... (NON SOUND)

MX616N
NEM 651 directly on decoder

DCC + RailCom, DC-analog
8 x 8 x 2 mm **.32 x .32 x .08 in**
0,7 A motor, total (peak 1,5 A)
6 function outputs

MX616
wires only

MX616R
NEM 652 on wires

MX616F
NEM 651 on wires

MX617

N, H0e, TT, ... (NON SOUND)

MX617N
NEM 651 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
13 x 9 x 2,6 mm **.5 x .35 x .1 in**
0,8 A motor, total (peak 1,5 A)
6 function outputs

MX617
wires only

MX617R
NEM 652 on wires

MX617F
NEM 651 on wires

MX618

N, H0e, TT, ... (NON SOUND)

MX618N18
RCN-118 directly on decoder

DCC + RailCom, DC-analog, MM
15 x 9,5 x 2,8 mm **.6 x .38 x .11 in**
0,7 A motor, total (peak 1,5 A)
4 function outputs
4 logic level outputs for more functions, servo control line or SUSI

No version with wires available

MX623

TT, H0, ... (NON SOUND)

MX623P12
NEM 658 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
20 x 8,5 x 2,5 mm **.8 x .33 x .1 in**
0,8 A motor, total (peak 2,5 A)
4 function outputs
2 logic level outputs for more functions, servo control line or SUSI

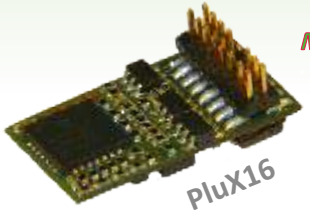
MX623
wires only

MX623R
NEM 652 on wires

MX623F
NEM 651 on wires

MX630

H0, 0m, ... (NON SOUND)



MX630P16
NEM 658 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
20 x 11 x 3,5 mm **.8 x .43 x .14 in**
1,0 A motor, total (peak 2,5 A)
6 function outputs
2 logic level outputs for more functions, servo control line or SUSI

The bestseller

MX630
wires only

MX630R
NEM 652 on wires

MX630F
NEM 651 on wires

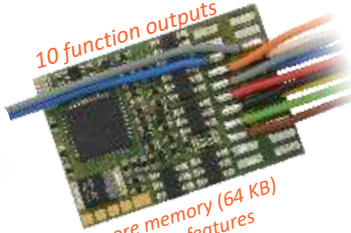
MX633

H0, 0m, ... (NON SOUND)

MX633P22
NEM 658 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
22 x 15 x 3,5 mm **.9 x .6 x .14 in**
1,2 A motor, total (peak 2,5 A)
10 function outputs
(„only" 9 function outputs on PluX-22 available)
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage

10 function outputs



more memory (64 KB) for future features

MX633
wires only

MX633R
NEM 652 on wires

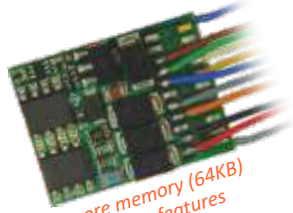
MX633F
NEM 651 on wires

MX634

H0, 0m, ... (NON SOUND)

MX634D
MTC directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
20,5 x 15,5 x 3,5 mm **.8 x .62 x .14 in**
1,2 A motor, total (peak 2,5 A)
6 function outputs
(2 of them - **FA3, FA4** - switchable to l**ogic level)**
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage



more memory (64KB) for future features

MX634
wires only

MX634R
NEM 652 on wires

MX634F
NEM 651 on wires

MX632

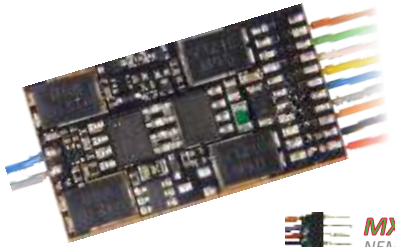
phased-out type, replaced by MX635, MX636

H0, 0m, 0, ... *(NON SOUND)*

MX632D
MTC directly on decoder

MX632C
MTC directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
28 x 15,5 x 3,5 mm **1.1 x 0,62 x .14 in**
1,6 A motor, total (peak 2,5 A)
8 function outputs
(2 of them - **FA3, FA4** - at **C-type** as l**ogic levels)**
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage



MX632
wires only

MX632R
NEM 652 on wires

MX632F
NEM 651 on wires

MX632V, MX632W
variations with low voltage 1,5V resp. 5V

MX635

H0, 0m, 0, ... *(NON SOUND)*

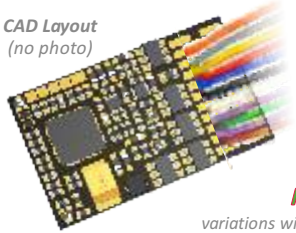
MX635P22
NEM 658 directly on decoder

CAD Layout (no photo)

MX635VP, MX632WP
variations with low voltage 1,5V resp. 5V

DCC + RailCom, DC-analog, MM, AC-analog
26 x 15 x 3,5 mm **1 x .6 x .14 in**
1,8 A motor, total (peak 2,5 A)
10 function outputs
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage
(allowed GoldCap modules with more than 5000 µF also)

CAD Layout (no photo)



MX635
wires only

MX635R
NEM 652 on wires

MX635V, MX632W
variations with low voltage 1,5V resp. 5V

MX636

H0, 0m, 0, ... *(NON SOUND)*

still no photo

MX636D
MX636C
MTC directly on decoder

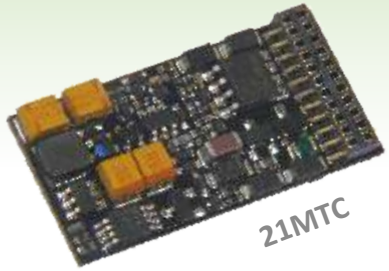
MX636VD, MX636WD
with low voltage 1,5V resp. 5V

DCC + RailCom, DC-analog, MM, AC-analog
26 x 15 x 3,5 mm **1 x .6 x .14 in**
1,8 A motor, total (peak 2,5 A)
8 function outputs
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage
(allowed GoldCap modules with more than 5000 µF also)

No version with wires available

MX644

H0, (0) ... ***(SOUND)***



MX644D
MTC directly on decoder

MX644C
MTC directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
30 x 15 x 4 mm **1.2 x .6 x .16 in**
1,2 A motor, total (peak 2,5 A)
8 function outputs
(2 of them - **FA3, FA4** - on **C-type** as l**ogic level)**
2 logic level outputs for more functions, servo control line or SUSI
function low voltage 5 V (200 mA)
direct connection for external energy storage
3 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

No version with wires available

MX645

H0, (0) ... ***(SOUND)***

MX645P16
NEM 658 directly on decoder

MX645P22
NEM 658 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
30 x 15 x 4 mm **1.2 x .6 x .16 in**
1,2 A Motor, total (peak 2,5 A)
10 function outputs and additionally
2 logic level outputs for more functions,
servo control line or SUSI
function low voltage 5 V (200 mA)
direct connection for external energy storage
3 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX645
wires only

MX645R
NEM 652 on wires

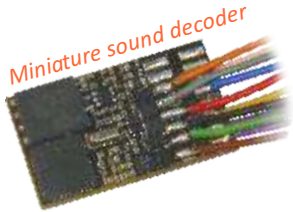
MX645F
NEM 651 on wires

MX648

N, TT, H0e, H0, ... ***(SOUND)***

MX648P16
NEM 658 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
20 x 11 x 4 mm **.8 x .43 x .16 in**
0,8 A motor, total (peak 1,5 A)
6 function outputs
(„only" 4 function outputs on PluX-16 available)
2 logic level outputs for more functions,
servo control line or SUSI
1 Watt audio, 8 Ohm, 32 Mbit, 6 channels



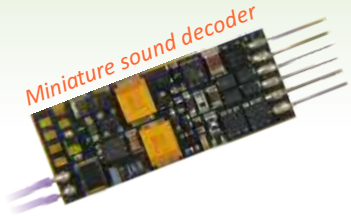
MX648
wires only

MX648R
NEM 652 on wires

MX648F
NEM 651 on wires

MX649

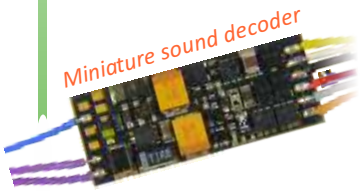
N, TT, H0e, H0, ... ***(SOUND)***



MX649N
NEM 651 directly on decoder

MX649L
NEM 651 angled directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
23 x 9 x 4 mm **.9 x .35 x .16 in**
0,7 A motor, total (peak 1,5 A)
4 function outputs
2 logic level outputs for more functions,
servo control line or SUSI
1 Watt audio, 8 Ohm, 32 Mbit, 6 channels



MX649
wires only

MX649R
NEM 652 on wires

MX649F
NEM 651 on wires

MX658

N, H0e, TT, ... ***(SOUND)***

MX658N18
RCN-118 (NEM 662) directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
25 x 10,5 x 4 mm **.95 x .4 x .16 in**
0,8 A motor, total (peak 1,5 A)
4 function outputs
2 logic level outputs for more functions,
servo control line or SUSI
1 Watt audio, 8 Ohm, 32 Mbit, 6 channels

No version with wires available

Adapter Boards . . . for decoders with PluX-22 interface

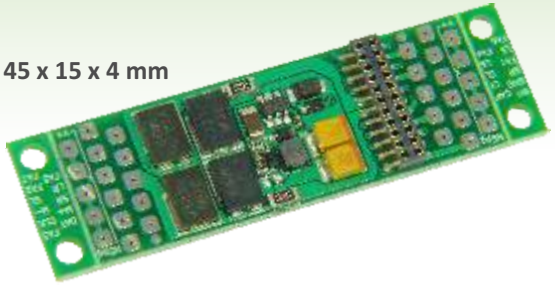
with PluX-22 connector and 30 solder pads
for the locomotive wiring

with ZIMO Sound decoder plugged-in
(ADAPLU + MX645P22):

1,5 A motor (peak 2,5 A)
9 function outputs
2 logic level outputs (Servo, SUSI)
direct connection for external energy storage
(allowed GoldCap modules with more than 5000 µF also)
3 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

with ZIMO Non-sound decoder plugged-in
(ADAPLU + MX633P22 or MX635P22):
as above, but without sound

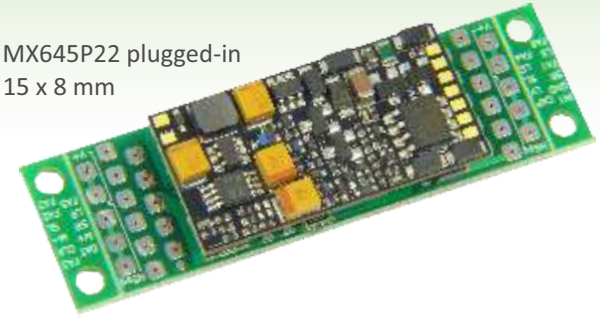
ADAPLU **45 x 15 x 4 mm**



Separate rectifier for power increase

Types ▶ **ADAPLU** *normal version* **ADAPLU15** *1,5V low voltage* **ADAPLU50** *5V low voltage for functions*

with MX645P22 plugged-in
45 x 15 x 8 mm



A Sound decoder for „small" Large scale locos !

with PluX-22 connector and **24** solder pads
for the locomotive wiring

with ZIMO Sound decoder plugged-in
(*ADAPUS + MX645P22):*

1,5 A motor (peak 2,5 A)
8 functions outputs
2 function outputs
2 logic level outputs (Servo, SUSI)
direct connection for external energy storage

3 Watt Audio, 4 - 8 Ohm, 32 Mbit, 6 channels

ADAPUS **71 x 18 x 4 mm**

Types ▶ **ADAPUS** *normal version* **ADAPUS15** *1,5V low voltage* **ADAPUS50** *5V low voltage for functions*

mit MX645P22 plugged-in
71 x 18 x 8 mm

Exchange decoder for US models (H0)

. . . for decoders with 21MTC interface

with 21MTC connector and **28** solder pads
for the locomotive wiring

with ZIMO Sound decoder plugged-in
(ADAMTC + MX645P22):

1,8 A motor (peak 2,5 A)
8 function outputs
2 logic level outputs (Servo, SUSI)
direct connection for external energy storage
(allowed GoldCap modules with more than 5000 µF also)
3 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

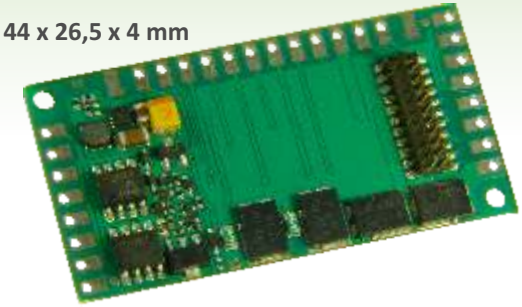
with ZIMO Non-sound decoder plugged-in
(ADAMTC + MX634D or MX636D):
as above, but without sound

as above,
but with 28 screw terminals
(instead of solder pads)

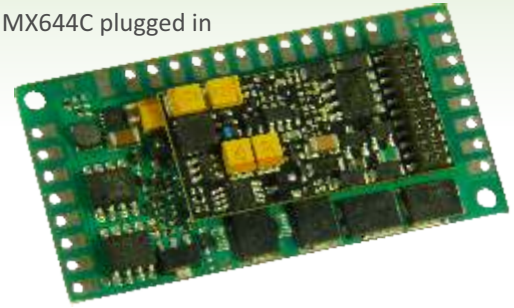
ADAMTC

44 x 26,5 x 4 mm

Separate rectifier for increase of power



with MX634C oder MX644C plugged in
44 x 26,5 x 6 mm



Typen ▶ **ADAMTC** *Normal version* **ADAMTC15** *1,5 V low voltage* **ADAMTC50** *5 V low voltage for functions*

ADAMKL with screw terminals

44 x 26,5 x 12 mm

Separate rectifier for more power of the combination (1.8 A)

with
MX634C oder MX644C
plugged-in
44 x 26,5 x 12 mm

A Sound decoder for „small" Large scale locos !

Types ▶ **ADAMKL** *Normal version* **ADAMKL15** *1,5V low voltage* **ADAMKL50** *5V low voltage for functions*

MX681

function decoder (NON SOUND)
a variation of the loco decoder MX621

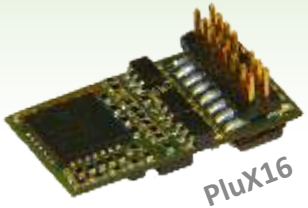
MX681N
NEM 651 directly on decoder

DCC + RailCom, DC-analog, MM
12 x 8,5 x 2,2 mm .5 x .33 x ,09 in
0,7 A total current
6 function outputs

MX681
only wires

MX685

function decoder (NON SOUND)
a variation of the loco decoder MX630



MX685P16
NEM 658 directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
20 x 11 x 3,5 mm .8 x .43 x .14 in
1,0 A total current
8 function outputs
2 logic level outputs for more functions, servo control line or SUSI

MX685
only wires

MX686

function decoder (NON SOUND)
a variation of the loco decoder MX631 or MX634

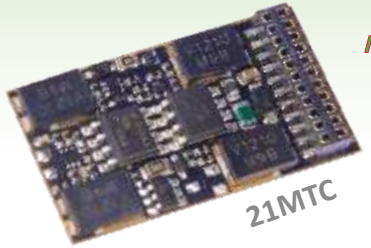
MX686D
MTC directly on decoder

DCC + RailCom, DC-analog, MM, AC-analog
20,5 x 15,5 x 3,5 mm .8 x .62 x .14 in
1,2 A total current
8 function outputs
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage

MX686
only wires

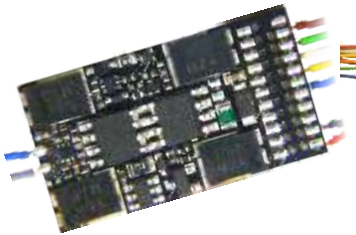
MX687

function decoder (NON SOUND)
a variation of the loco decoder MX632 (later MX636)



MX687WD
MTC directly on decoder low voltage 5V

DCC + RailCom, DC-analog, MM, AC-analog
28 x 15,5 x 3,5 mm 1.1 x .62 x .14 in
1,2 A total current
8 function outputs
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage



MX687V
only wires

MX687W
only wires

MX687V, MX687W
variations with low voltage 1,5V respectively 5V

MX688

function decoder (NON SOUND)
a variation of the loco decoder MX618

MX688N18
RCN-118 (NEM 662) directly on decoder

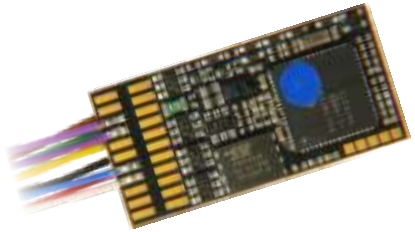
DCC + RailCom, DC-analog, MM
15 x 9,5 x 2,8 mm **.6 x .38 x .11 in**
0,7 A total current
6 function outputs
2 logic level outputs for more functions, servo control line or SUSI

MX689

function decoder (SOUND)
a variation of the loco decoder MX645
currently not available

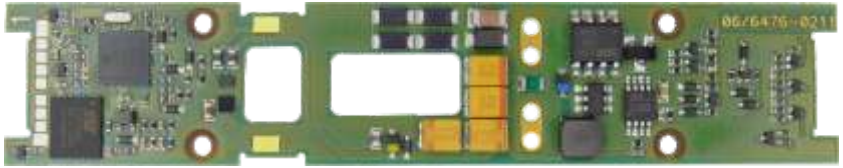
MX689P22
NEM 658(22 pin) directly on decoder

DCC + RailCom, DC-analog, MM, AC-Analog
30 x 15 x 4 mm **1.2 x .6 x .16 in**
1,2 A total current
8 function outputs
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage
Low voltage for functions 5V (200 mA)



ZIMO Sound decoder und adapter boards *individual*

Customized loco decoder for Roco N scale Taurus



Customized loco decoder for Fleischmann N scale Re 460

Besides the standard products many special solutions are being developed for loco manufacturers.

In many cases ZIMO manufactures customized decoders (frequently used in N scale because of lack of space), in other situations ZIMO produces adapter boards, which contain lighting, energy storage, micro motors for pantographs, etc.

Loco adapter board for a swedisch „Class Du" with sound decoder MX644 (MTC interface) plugged-in. The board includes energy storage containing 6 Tantalium capacitors.

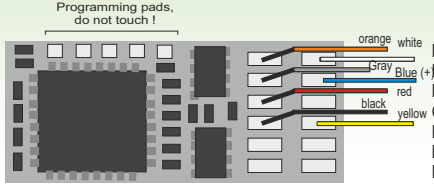
The loco board with MX648P16 plugged-in for Fleischmann „Berg" Loco (BR 98)

Connection diagrams

A selection of decoders with wires or PluX connectors

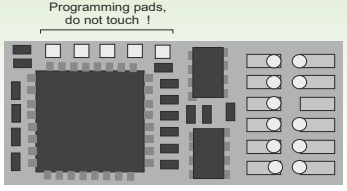
MX623

MX623 Top View, wired side



Motor right	(orange)
Front headlight (= Lfor)	white
Motor left	(gray)
Common positive	(blue)
Right rail	(red)
Left rail	(black)
Rear headlight (= Lrev)	yellow

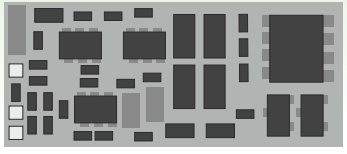
MX623 Top View, pin-out (PluX-12)



Motor right		Lfor
Motor left	Gem. Pluspol (+)	
Right rail		--- (Index)
Left rial		Lrev
Function outputs	FO1	FO3
Function outputs	FO2	FO4

FO3, Fo4 are logic level outputs !

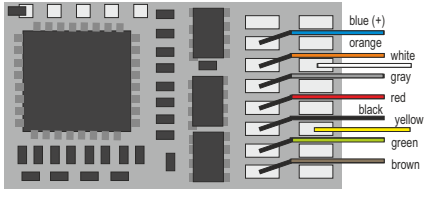
MX623 Bottom View



GROUND
SUSI Clock or Servo 2, FO6
SUSI Data or Servo 1, FO5

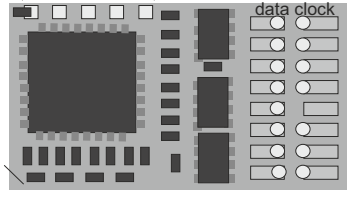
MX630

MX630 Top View, wired side



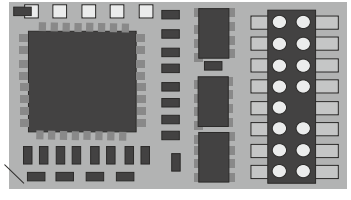
Common positive	(blue)
Motor right	(orange)
Front headlight (= Lfor)	white
Motor left	(gray)
Right rail	(red)
Left rail	(black)
Rear headlight (= Lrev)	yellow
Function output FO1	(green)
Function output FO2	(brown)

MX630 Top View, pin-out



SUSI, Servo‘s (2, 1) or		FO6, FO5
Common pos. (+)		GROUND
Motor right		Lfor
Motor left	Common pos. (+)	
Right rail		--- (Index)
Left rail		Lrev
Function output	FO1	FO3
Function output	FO2	FO4

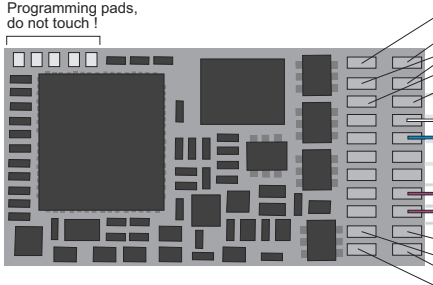
MX630P16 (with PluX16)



SUSI, Servo‘s (2, 1) or	FO6, FO5
Common pos. (+)	GROUND
Motor right	Front light (= Lfor)
Motor left	Common pos. (+)
Right rail	--- (Index)
Left rail	Rear light (= Lrev)
Function output	FO1 FO3
Function output	FO2 FO4

MX645

MX645 wires only Top Side



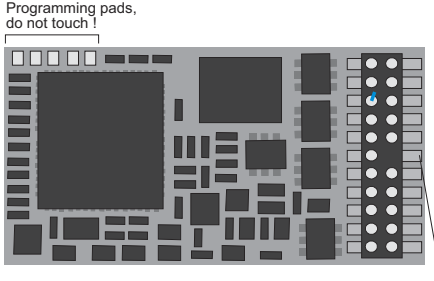
The SUSI outputs can alternatively be used as servo outputs:

Function output FO3
Switch input IN1
SUSI Data, Servo 2, FO10, IN3 -- SUSI Clock, Servo 1, FO9, IN2
Cap. pos.
Ground

orange — Motor right
gray — Motor left
White — Front headlight
blue — Common pos. (+)
red — Right rail
black — Left rail
yellow — Rear headlight
purple — Speaker
purple — Speaker
green — Function output FO1
brown — Function output FO2

Function output FO 4
Function output FO 5
Function output FO 6
Function output FO 7

MX645P22 Top Side (with PluX22)



The SUSI outputs can alternatively be used as servo outputs:

Function output FO3	Switch input IN1
SUSI Data,Servo2,FO10,IN3	SUSI Clock,Servo1,FO9,IN2
Capacitor positive	Ground
Motor right	Front headlight
Motor left	Common positive (+)
Right rail	--- (Index)
Left rail	Rear headlight
Function output FO1	Speaker
Function output FO2	Speaker
Function output FO5	FO4
Function output FO7	FO6

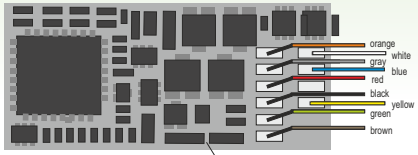
Function output FO8

A selection of decoders with NEM 651 and 21MTC connectors

MX600 MX621

MX600, MX600R Wire side, top
(single-layer board)

FO3 and FO4 on the backside are not implemented / usable



Motor right (orange)
Front headlight (= Lfor) white
Motor left (gray)
Common positive (blue)
Right rail (red)
Left rail (black)
Front headlight (= Lrev) yellow
Function output FO1 (green)
Function output FO2 (brown)

Makeshift ground terminal if required between the diodes and the capacitor

MX621, MX621R, MX621F
Connection Side
(= where the wires are soldered to !)

Wires

Programming pads, do not touch !

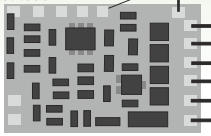
GROUND

Positive (blue)

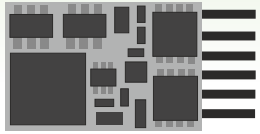
Solder pads

Function output FO1
Function output FO2

Motor (orange)
Motor (gray)
Rail (red)
Rail (black)
Lfor (white)
Lrev (yellow)



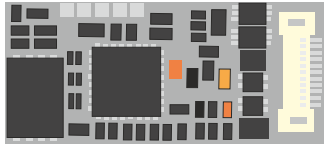
MX621N (= MX621 with 6-pin plug on board)
Pin layout also valid for: **MX616N, MX617N**
View on back side to pins
(this is also the correct installation position)



Lrev
Lfor
Left rail
Right rail
Motor left
Motor right

MX658 MX622

MX658N18
Plug Side (Next 18)



Left track	Left rail
Motor left	Front headlight Lf
Fu-Output FO2	Speaker
SUSI (Data) or FO4	+ Positive
GROUND	GROUND
+ Positive	SUSI (Clock) or FO3
Speaker	Fu-Output FO1
Rear headlight Lr	Motor right
Right rail	Right rail

Note FO3, FO4:
are logic level Fu-Outputs
on the SUSI pins, when
CV #124, Bit 7 = 1

MX622, MX622R, MX622F
Connection Side
(= where the wires are soldered to !)

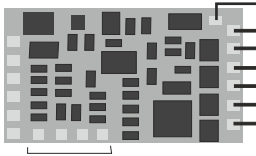
Wires

Solder pads

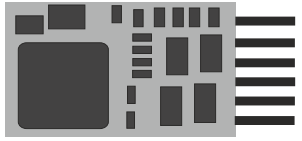
Function output FO2
Function output FO1
Positive for "SUSI" or capacitor
"SUSI" CLOCK or FO3
"SUSI" DATA or FO4
GROUND

Positive (blue)
Motor (orange)
Motor (gray)
Rail (red)
Rail (black)
Lfor (white)
Lrev (yellow)

Programming pads, do not touch !



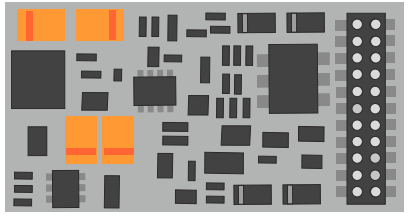
MX620N or MX622N (with 6-pin plug on board)
Controller Side
(this is also the correct installation position !)



Lrev
Lfor
Left rail
Right rail
Motor left
Motor right

MX644

MX644D, C Top View (with 21-pin „MTC" connector)



+ 5 V (200 mA)	GROUND
Function output FO3	Speaker
Function output FO2	Speaker
Function output FO1	Front headlight (= Lfor)
Common positive	Rear headlight (= Lrev)
Capacitor negative	SUSI Data (FO8, Servo 2)
Motor 1	SUSI Clock (FO7, Servo 1)
Motor 2	Function output FO4
GROUND	Function output FO5
Left rail	Function output FO6
Right rail	Switch input

FO3 and FO4 on the MX644C are logic level outputs, but "normal" outputs on the MX644D.

> 220 uF
35 V
\- +

Capacitor as back-up power.
(If not mounted on loco board and connected via plug)

(Is the same as common positive)

CAP. Pos.

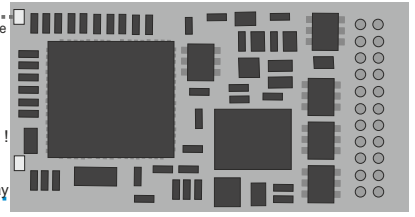
Blue

MX644D, C Bottom View

Attention:
CAP. neg. Is not the same as GROUND !

CAP. Neg.

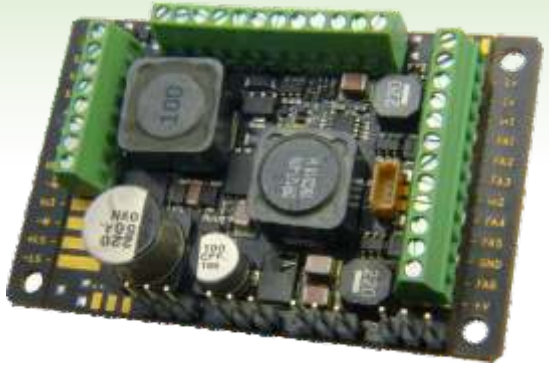
Gray



Attention:
There are engines where the decoder must be plugged in normal (with the side top up) while on others it must be inserted upside down.

MX695KN

Large scale decoder (NON SOUND) with screw terminals



DCC + RailCom, DC-analog, MM, AC-analog
50 x 40 x 13 mm (without break-off plates) **2 x .1.6 x .5 in**
6 A motor, total (peak 10 A)
14 function outputs
1 smoke fan connector
3 gate inputs
4 complete servo outputs (control line, minus, 5V)
3 low voltage function outputs
(5V, 10V, variable: 1,5V to track voltage)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)

MX699KS

Large scale decoder (SOUND) with screw terminals

DCC + RailCom, DC-analog, MM, AC-analog
50 x 40 x 13 mm (without break-off plates) **2 x .1.6 x .5 in**
6 A motor, total (peak 10 A)
8 function outputs
2 smoke fan outputs
4 gate inputs
4 complete servo control outputs (control line, minus, 5V)
2 low voltage function outputs (5V, 10V)
SUSI (with 4 pin plug)
3 SuperCaps (3F each) as internal energy storage
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX699KV

Large scale decoder (SOUND) with screw terminals

DCC + RailCom, DC-analog, MM, AC-analog
50 x 40 x 13 mm (without break-off plates) **2 x .1.6 x .5 in**
6 A motor, total (peak 10 A)
15 function outputs
2 smoke fan outputs
4 gate inputs
4 complete servo control outputs (control line, minus, 5V)
3 low voltage function outputs
(5V, 10V, code switch adjustable 1,5 - 6,5 - 14 - 19V)
SUSI (with 4 pin plug)
3 SuperCaps (3F each) as internal energy storage
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX699LS, -LLS

Large scale decoder (SOUND) with pin connectors

Pin connectors standard version (MX699LS and MX699LV) length 6 mm above socket (= 10 mm above board)
*special version: **MX699LLS** und **MX699LLV** length 12 mm above socket (= 16 mm above board)*

DCC + RailCom, DC-analog, MM, AC-analog
50 x 40 x 13 mm (without break-off plates) **2 x .1.6 x .5 in**
6 A motor, total (peak 10 A)
8 function outputs
2 smoke fan outputs
4 gate inputs
4 complete servo control outputs (control line, minus, 5V)
2 low voltage function outputs (5V, 10V)
SUSI (with 4 pin plug)
3 SuperCaps (3F each) as internal energy storage
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX699LV, -LLV

Large scale decoder (SOUND) with pin connectors

DCC + RailCom, DC-analog, MM, AC-analog
50 x 40 x 13 mm (without break-off plates) **2 x .1.6 x .5 in**
6 A motor, total (peak 10 A)
15 function outputs
2 smoke fan outputs
4 gate inputs
4 complete servo control outputs (control line, minus, 5V)
3 low voltage function outputs
(5V, 10V, code switch adjustable 1,5 - 6,5 - 14 - 19V)
SUSI (with 4 pin plug)
3 SuperCaps (3F each) as internal energy storage
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX699LM

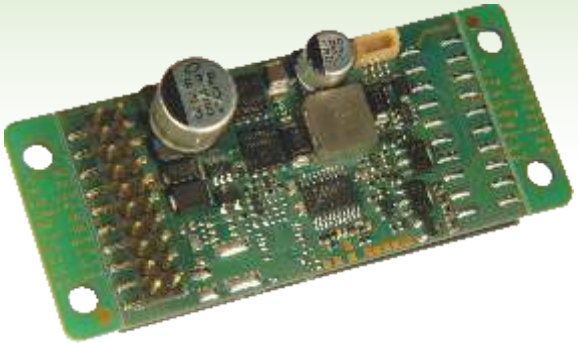
Large scale decoder (SOUND) for Märklin interface

as MX699LV, with pin connector (long side) bended down in order to keep it accessible when decoder is inserted in Märklin connector.

DCC + RailCom, DC-analog, MM, AC-analog
50 x 40 x 13 mm (without break-off plates) **2 x .1.6 x .5 in**
6 A motor, total (peak 10 A)
15 function outputs
2 smoke fan outputs
4 gate inputs
4 complete servo control outputs (control line, minus, 5V)
3 low voltage function outputs
(5V, 10V, code switch adjustable 1,5 - 6,5 - 14 - 19V)
SUSI (with 4 pin plug)
3 SuperCaps (3F each) as internal energy storage
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX696N

Large scale decoder (NON SOUND)



DCC + RailCom, DC-analog, MM, AC-analog
55 x 29 x 15 mm (without break-off plates) **2.2 x 1.1 x .6 in**
4 A motor, total (peak 10A)
8 function outputs
1 smoke fan connector
3 gate inputs
4 servo outputs (+ 6V low voltage total)
2 low voltage function outputs
(6V, 10V)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)

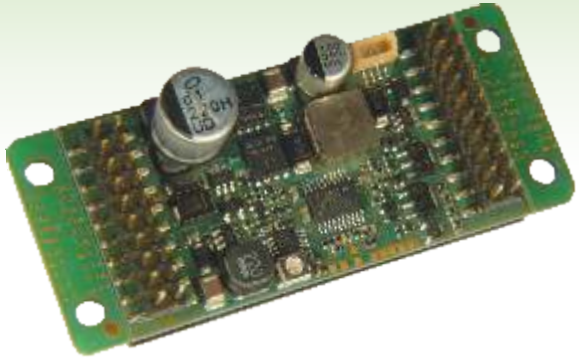
MX696S

Large scale decoder (SOUND) slim design

DCC + RailCom, DC-analog, MM, AC-Analog
55 x 29 x 15 mm (without break-off plates) **2.2 x 1.1 x .6 in**
4 A motor, total (peak 10A)
8 function outputs
1 smoke fan connector
3 gate inputs
4 servo control outputs (+5V external needs to be provided)
1 low voltage function output (10V)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX696V

Large scale decoder (SOUND) slim design



DCC + RailCom, DC-analog, MM, AC-Analog
55 x 29 x 15 mm (without break-off plates) **2.2 x 1.1 x .6 in**
4 A motor, total (peak 10A)
14 function outputs
1 smoke fan connector
3 gate inputs
4 servo outputs (4 control lines, +5V from variable low voltage)
2 low voltage function outputs
(10V, variabel 1,5V to track voltage)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX697N

large scale decoder (NON SOUND) for „american interfaces"

No picture available;
MX697N (Large Scale Decoder for american locos WITHOUT SOUND) produced only on request.

DCC + RailCom, DC-analog, MM, AC-analog
56 x 32 x 21 mm 2.2 x 1.3 x .8 in
4 A motor, total (peak 10A)
10 function outputs
1 smoke fan connector
3 gate inputs
4 servo control outputs (control line, minus, 5V)
3 low voltage function outputs
(5V, 10V, variable 1,5V to track voltage)
SUSI (with 4 pin plug)
direct connection for external energy storage
(17V: capacitors, GoldCaps or battery-switch)

MX697S

large scale decoder (SOUND) for„american interfaces, usually to insert directly in Bachmann locos

DCC + RailCom, DC-analog, MM, AC-analog
56 x 32 x 21 mm 2.2 x 1.3 x .8 in
4 A motor, total (peak 10A)
10 function outputs
1 smoke fan connector
3 gate inputs
4 servo control outputs (+5V power needs to be provided externally)
1 low voltage function outputs (10V)
SUSI (with 4 pin plug)
direct connection for external energy storage
(17V: capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX697V

large scale decoder (SOUND) for„american interfaces, usually to insert directly in Bachmann locos; with additional connector on top side (parallel to bottom)

DCC + RailCom, DC-analog, MM, AC-analog
56 x 32 x 21 mm 2.2 x 1.3 x .8 in
4 A motor, total (peak 10A)
10 function outputs
1 smoke fan connector
3 gate inputs
4 servo control outputs (control line, minus, 5V)
3 low voltage function outputs
(5V, 10V, variable 1,5V to track voltage)
SUSI (with 4 pin plug)
direct connection for external energy storage
(17V: capacitors, GoldCaps or battery-switch)
10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

Loco Board

designed for use with large scale sound decoders MX699LS, -LV

Three 14 pin sockets and four 3 pin sockets to insert an MX699 decoder

Solder pads for external connections.

62 x 46 x 12 mm
2.4 x 1.8 x .5 in

LOKPL99

Loco Board with decoder MX699LS plugged in

Loco Boards

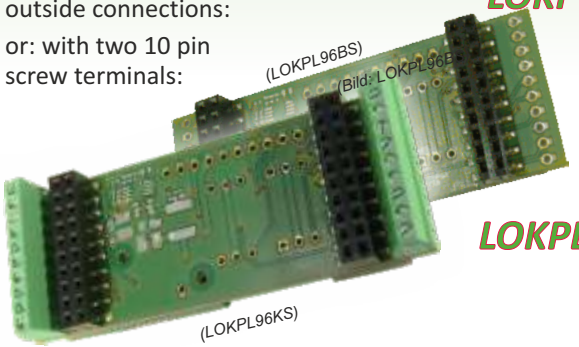
designed for use with large scale decoder MX696 (all types)

two 20 pin sockets to insert an MX696 decoder and solder pads for all outside connections:

68 x 26 x 6 mm
2.7 x 1 x .2 in

LOKPL96BS

or: with two 10 pin screw terminals:



or:

LOKPL96KS

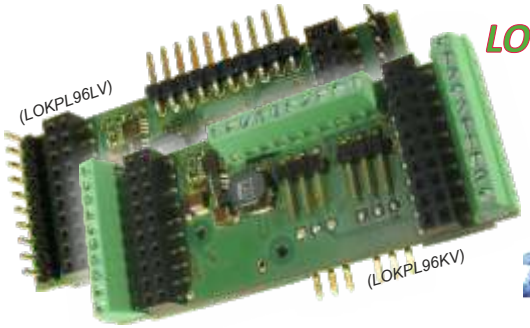
like LOKPL96BS and -KS but additionally:

LOKPL96LV

4 complete servo outputs
(control, minus, 5V from own voltage regulator on the LOKPL96)
9 more pin connections for function outputs etc.

or:

LOKPL96KV



Loco Boards

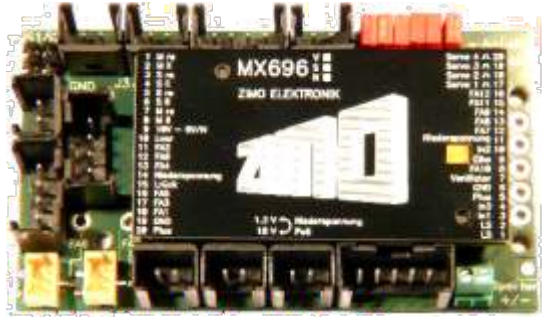
designed for use with large scale decoder

20 pin sockets to insert an MX696 decoder.

75 x 42 x 10 mm
3 x 1.7 x.4 in

LOKPLSHMAL

Connectors compatible with cabling of the HSB Mallet, „Pfiffi" of Trainline45 Gartenbahnen.



Loco board with decoder MX696S

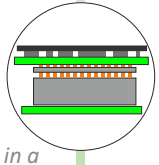
Original equipment for TrainLine45.

MX696KS

Large scale decoder (with SOUND) made from combination of

LOKPL96KS *and* **MX696S**

nearly a MX695KS, but slim



placement in a 32 mm boiler

DCC + RailCom, DC-analog, MM, AC-Analog

68 x 29 x 18 mm 2.7 x 1.1 x .7 in

4 A motor, total (peak 10A)

8 function outputs

1 smoke fan connector

1 gate input on clamp (+ 2 as solder pads)

4 servo control outputs on solder pads (5V power needs to be provided externally)

SUSI (with 4 pin plug)

direct connection for external energy storage (capacitors, GoldCaps or battery-switch)

10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX696KV

Large scale decoder (with SOUND) made from combination of

LOKPL96KV *and* **MX696V**

nearly a MX695KV, but slim

DCC + RailCom, DC-analog, MM, AC-Analog

68 x 29 x 18 mm 2.7 x 1.1 x .7 in

4 A motor, total (peak 10A)

14 function outputs (8 on clamps, 6 as pins)

1 smoke fan connector

3 gate inputs (1 on clamp, 2 as pins)

4 complete servo outputs (control line, minus, 5V)

2 low voltage function outputs (5V, adjustable 1,5V to track voltage)

SUSI (with 4 pin plug)

direct connection for external energy storage (capacitors, GoldCaps or battery-switch)

10 Watt audio, 4 - 8 Ohm, 32 Mbit, 6 channels

Large scale *individual*

Some demands can be fulfilled most easily by little modifications of serial products, e.g. for special energy storage solutions or a train bus which is not fully conformant to the standard.

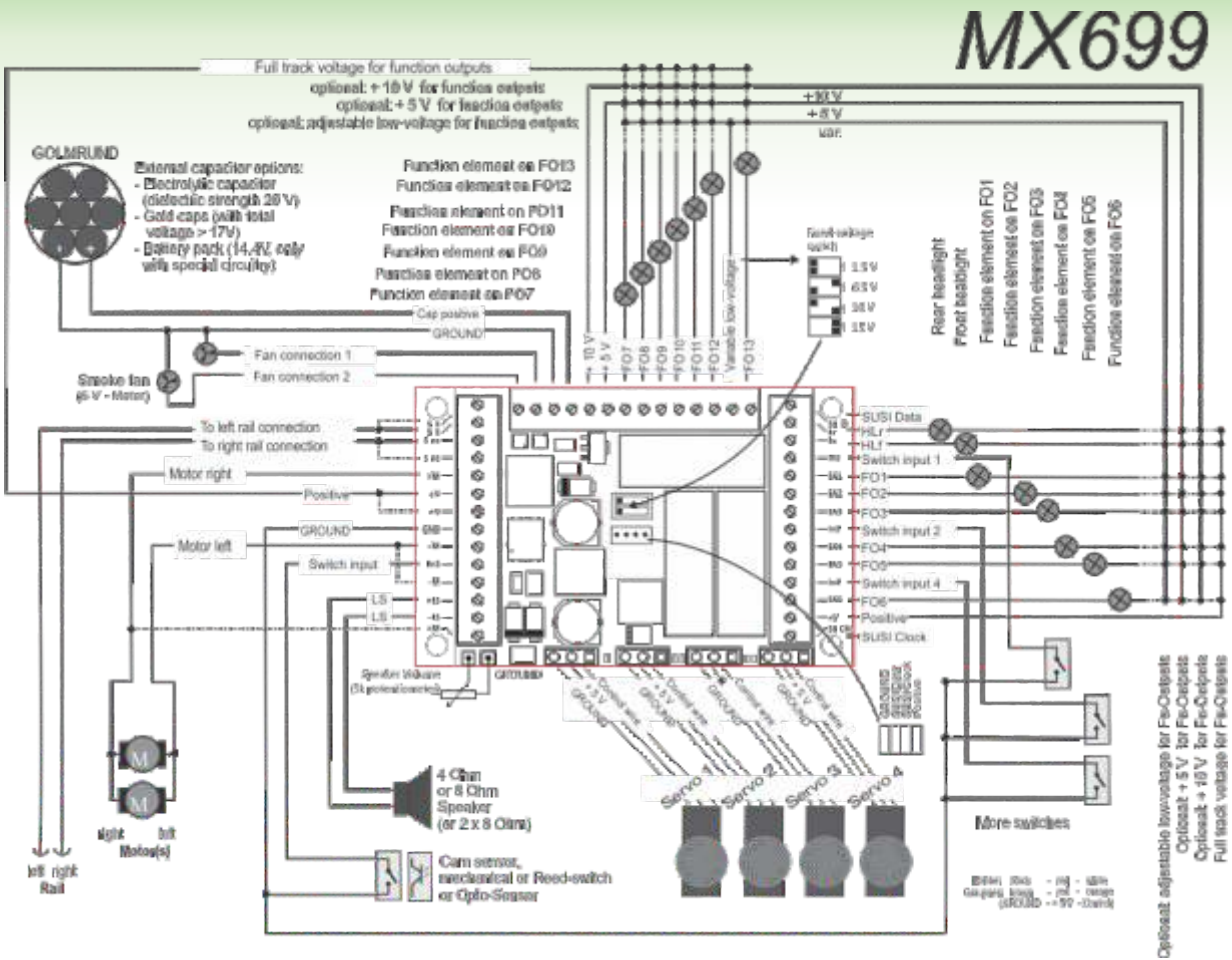
Märklin-LGB G scale „Allegra" (RhB ABe) after installing supercap energy storage, speaker, and decoder MX695LS.

Trainline HSB Mallet, installation of loco board LOKPLSHMAL and inserted Large scale Sound decoder MX696S

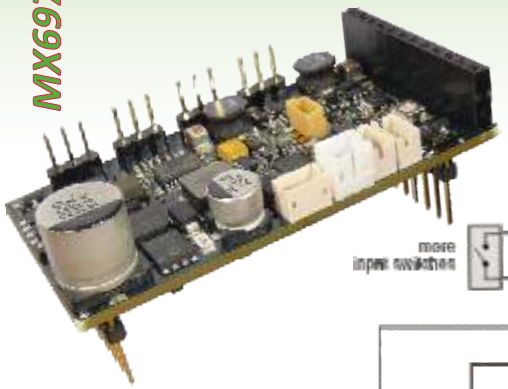
Connecting decoders

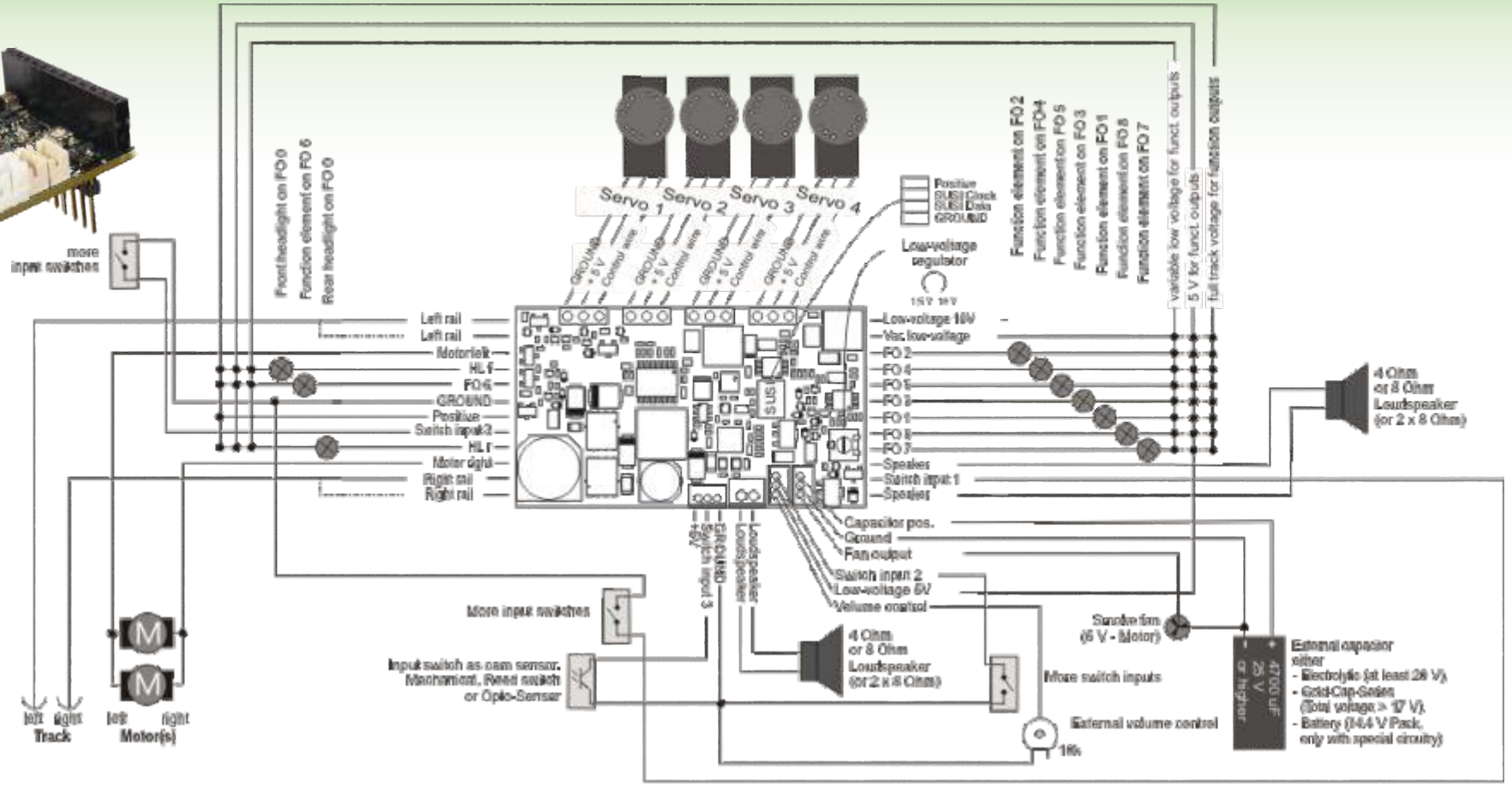
MX699

MX699



MX697




Servo 1
Servo 2
Servo 3
Servo 4
Positive
SUS Clock
SUS Data
GROUND
Low-voltage regulator
Front headlight on FO 0
Function element on FO 6
Rear headlight on FO 0
Left rail
Left rail
Motor left
HLF
FO 6
GROUND
Positive
Switch input 2
HLF
Motor right
Right rail
Right rail
Low-voltage 16V
Voc. low-voltage
FO 2
FO 4
FO 5
FO 3
FO 1
FO 8
FO 7
Speaker
Switch input 1
Speaker
Capacitor pos.
Ground
Fan output
Switch input 2
Low-voltage 5V
Volume control
Switch input 3
Loudspeaker
Loudspeaker
Function element on FO 2
Function element on FO 4
Function element on FO 5
Function element on FO 3
Function element on FO 1
Function element on FO 8
Function element on FO 7
variable low voltage for funct. outputs
5 V for funct. outputs
full track voltage for function outputs
4 Ohm or 8 Ohm Loudspeaker (or 2 x 8 Ohm)
more input switches
Input switch as cam sensor, Mechanical, Reed switch or Opto-Sensor
4 Ohm or 8 Ohm Loudspeaker (or 2 x 8 Ohm)
Servo 5m (5 V - Motor)
more switch inputs
External volume control
10k
4700 µF 25 V or higher
External capacitor either
- Electrolytic (at least 25 V),
- Gold-Cap-Series (Total voltage > 12 V),
- Battery (14.4 V Pack, only with special circuitry)
more input switches
left right
Track
left right
Motor(s)

MX820E, D

accessory decoder for 1 switch

MX820E
standard layout, one-sided board assembly

DCC + RailCom

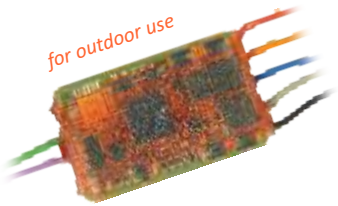
19 x 11 x 2 mm .7 x .4 x .07 in

MX820D with waterproof shrink tube: 24 x 12 x 3 mm

1,0 A total current

1 output for a switch with double coil drive, motor drive, EPL drive or a signal with 2 lights

2 inputs for forced switching or stance contacts



MX820D
same as MX820E, but with a water-proof shrinking tube

MX820V

accessory decoder for 2 switches

MX820V
as MX820E, but two-sided board assembly for 2 output pairs

DCC + RailCom

19 x 11 x 3 mm .7 x .4 x .1 in

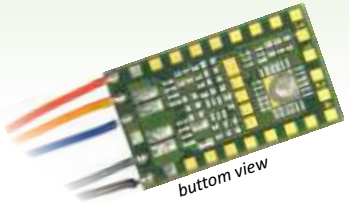
1,0 A total current

2 outputs for switches with double coil drive, motor drive, EPL drive or signals with 2 lights each

4 inputs for forced switching or stance contacts

MX820X, Y

accessory decoder with light outputs



MX820X
as MX820E, but with additional 8 outputs for signal lights etc. on solder pads

DCC + RailCom

19 x 11 x 3 mm .7 x .4 x .1 in

1,0 A total current

1 resp. **2** outputs for switch-drives

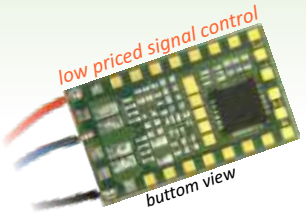
8 resp. **16** outputs for signal lights (LEDs or light bulbs up to 100 mA)

4 inputs for forced switching or stance contacts

MX820Y
as MX820V, but with additional 16 outputs for signal lights etc. on solder pads

MX820Z

accessory decoder with light outputs



MX820Z
NO „normal" outputs for track-switches, but 16 outputs for signal lights etc. on solder pads

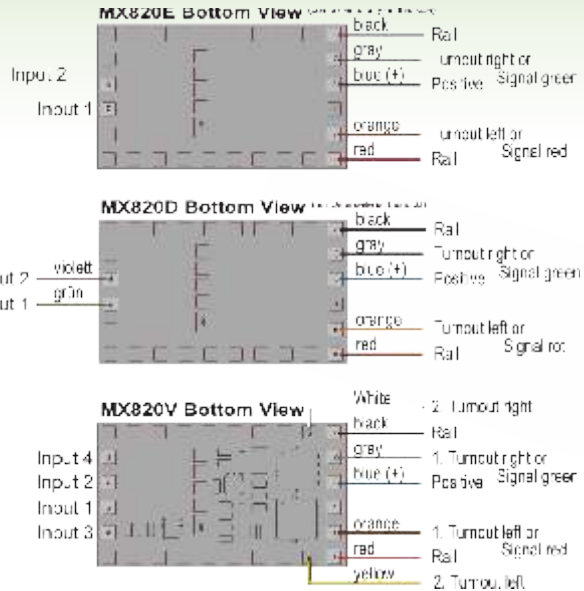
DCC + RailCom

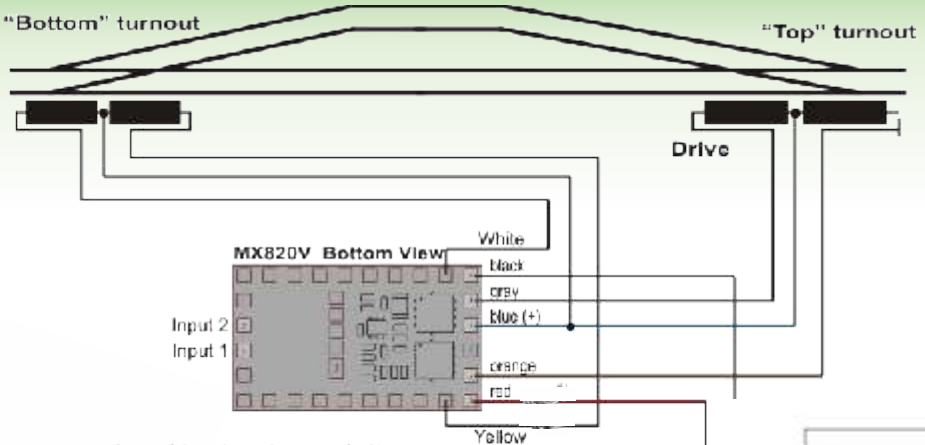
19 x 11 x 3 mm .7 x .4 x .1 in

1,0 A total current

16 outputs for signal lights (LEDs or light bulbs up to 100 mA)

Connecting accessory decoders



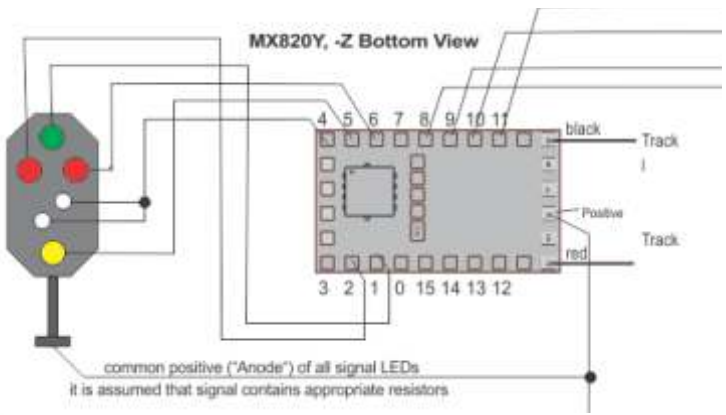


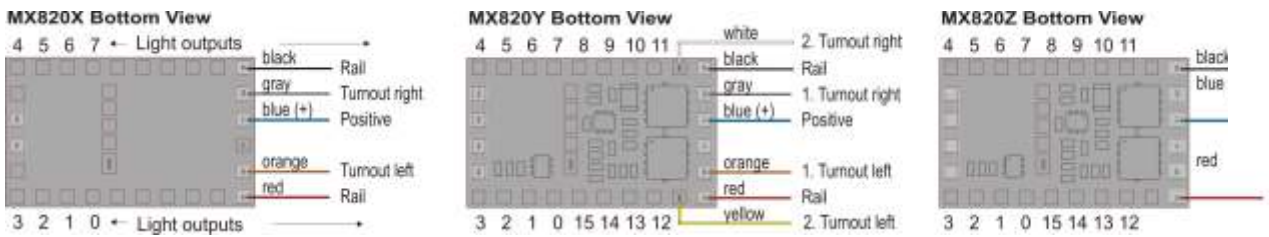
i.e. (Address 15, sub-addresses 2 ,3):
Address: CV's #513, 521 = 15 (Address 15)
Sub-address: CV #545 = 32 (Turnout on F2, F3)
Switch time of sub-address 2: CV #517 = 2 (0.2 sec, default)
Switch time of sub-address 3: CV #518 = 2 (0.2 sec, default)

Example: Connecting a main signal
(matching the default signal aspect in CV #150 ... 157 with control mode = 0):

Light output 0 is not used
Light output 1 to green LED
Light output 2 to (first) red LED
Light output 3 not used
Light output 4 to white LEDs (Shunting signal)
Light output 5 to yellow LED
Light output 6 to (second) red LED

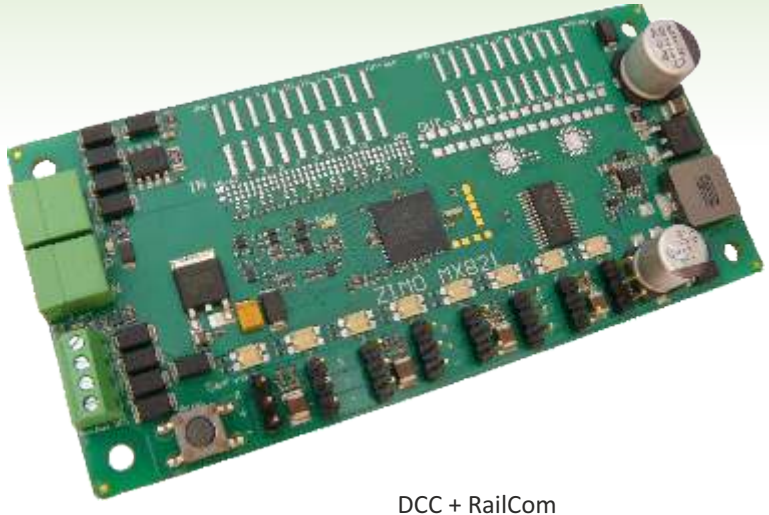
Signal aspects in the CVs #150 ... 157:
Hp00 = 01000100 = 68 (= both red LEDs ON)
Hp1 = 00000010 = 2 (= green LED)
Hp2 = 00100010 = 34 (= green and yellow LEDs)
SH1 = 01010000 = 80 (= one red and white LED)





MX821S

accessory decoder for 8 servos



DCC + RailCom

105 x 50 x 12 mm 4.1 x 2 x .5 in

8 complete servo outputs
(control, minus, 5V from own voltage regulator)

low voltage for servo supply
(5 oder 6V, 3A)

MX821V

accessory decoder for 8 servos, 16 inputs and 16 outputs

DCC + RailCom

105 x 50 x 12 mm 4.1 x 2 x .5 in

8 complete servo outputs
(control, minus, 5V from own voltage regulator)

low voltage for servo supply and
16 loads at the outputs
(5 oder 6V, 3A)

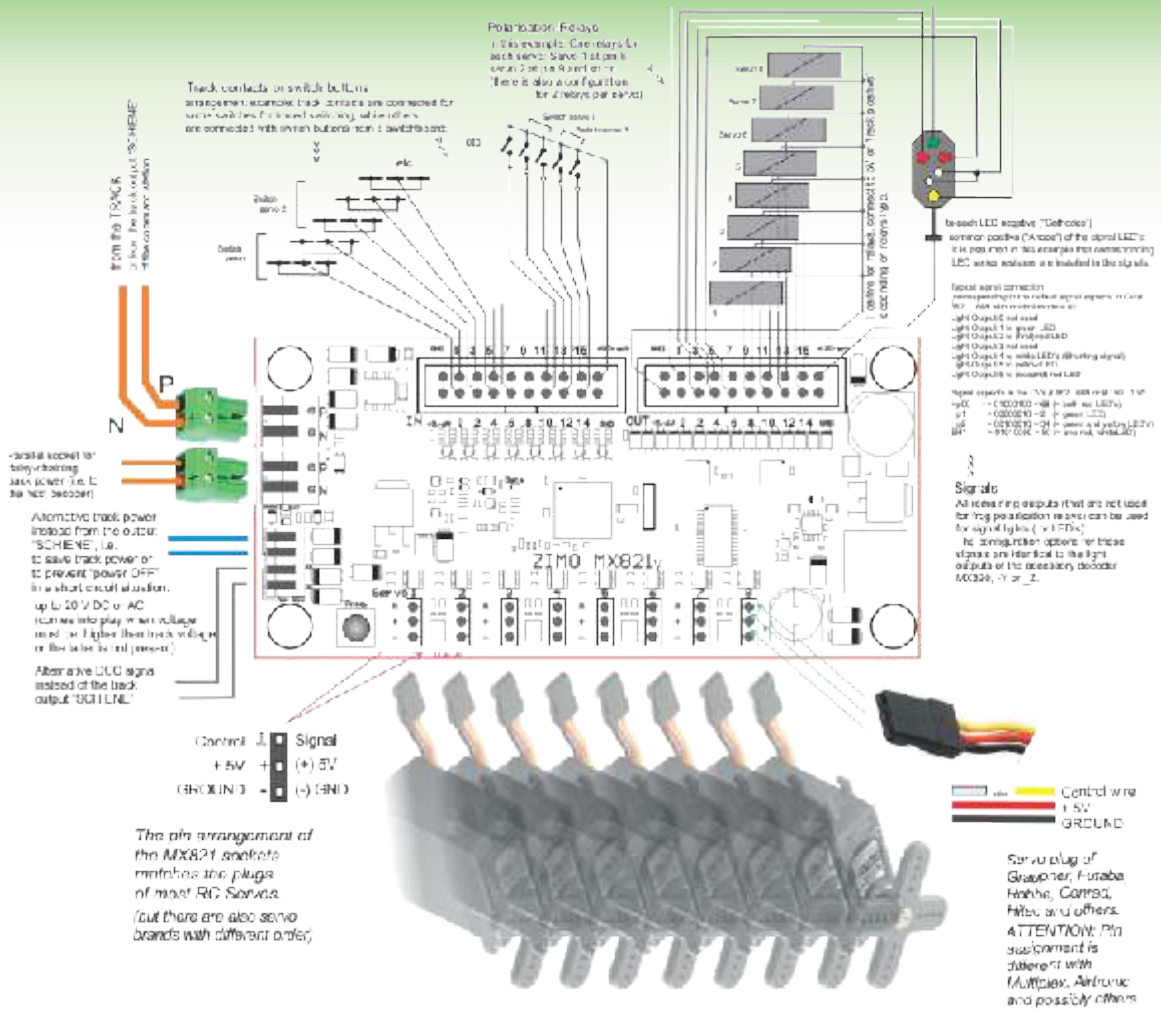
16 inputs for forced switching or
stance contacts

16 outputs for relais or
or signal lights

Connecting accessory decoders MX821

MX821V

MX821S as MX821V, but without in- and outputs.



ZIMO accessory decoders MX820 und Mx821

Three methods for addressing:

1) The address programming (= allocating the requested accessory address 1…511) is normally done with “Service mode” programming at the command station's programming track output, which allows only one decoder to be connected at the time.

2) If the decoder is not yet installed in the layout, or is at least easily accessible, it can also be programmed with a new address using the button on the MX821.After the decoder is connected and powered up, press the button until the servo LED's change from red (or green) to orange. The decoder is now in the “address learn” (configuration) mode waiting for the next switch command.

3) This is a new feature of ZIMO accessory decoders introduced in 2013 (which includes the MX820, MX821…with software versions from September 2013). It is typically used when decoders get installed without first changing the delivery address 3 to a unique address, which happens quite frequently.

. The „synchronous software update”:

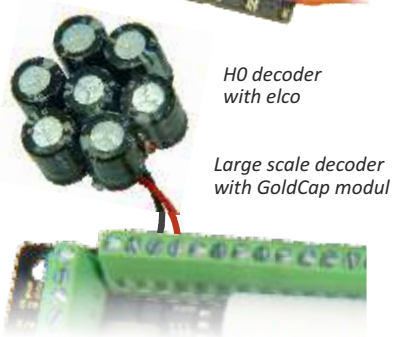
A distinctive feature of the ZIMO accessory decoders is the „synchronous update”, which takes into account that accessory decoders are usually installed permanently in the layout and should preferably remain there during the update.

For the synchronous (simultaneous) update of all accessory decoders, connect the decoder update module MXULFA to the track (power bus) in place of the DCC command station and start the special synchronous software update procedure. The MXULF searches for any accessory decoders (suitable for the synchronous update) and subsequently the update starts.

Energy storage for ZIMO decoders

Capacitor-Assortments and ready-to-use-modules

H0 decoder with elco



Large scale decoder with GoldCap modul

Energy storage can be connected to the decoder . . .

+ to enable driving over un-energized tracks and turnout frogs,
+ to enable interference-free sound reproduction (the most important point in practice),
+ to reduce decoder heat, usually produced by low restistance motors,
+ to compensate for energy losses due to HLU and RailCom gaps.

Many ZIMO decoders (see decoder summary and descriptions) are equipped with a „direct connection for external energy storage", in which case electrolytic, tantalum or Goldcap capacitors can be connected to the appropriate pins without further electronic circuits. For other decoders (especially miniature types) additional components are needed. The following ranges of capacitors (see on the right) are available at ZIMO (alternatively, such components can be purchased on the electronics market).

Small decoders do not have a „direct connection", but an energy storage (at almost no cost) is still possible with some additional components.

The following assortments and modules are available from ZIMO:

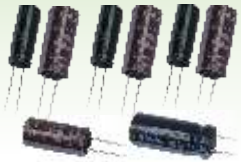
SPEIKOMP

Assortment of capacitors, inductors, diodes, resistors
for one ZIMO decoder
WITHOUT direct energy storage connection,
e.g. for MX621, MX622, MX623, MX630, MX646, MX648

ELKSODR

...

Assortment of capacitors, inductors, diodes, resistors
for 10 ZIMO decoders
WITHOUT direct energy storage connection,
e.g. for MX621, MX622, MX623, MX630, MX646, MX64



ELKSOMT
ELKSOPL
ELKSOGR

Elko assortment for 10 - 20 ZIMO decoders with 35V connectic
Elko assortment for 20 - 30 ZIMO decoders mit 16V connectio
Elko assortment for 5 - 10 ZIMO large scale decoders with 16V connection
Capacities varying with availability

TANTSOPL

...

Tantal assortment (30 x 220 µF)
for 2 to 4 ZIMO decoders (10 to 20 per decoder)
with direct energy storage connection „16V"
e.g. for MX633, MX645 and large scale decoders MX695, MX696, ...

GOLDSORG

GoldCap assortment (15 x 1 F, 8 x 12 mm)
for ZIMO large scale decoders and
certain H0-decoders (series of 7 Goldcaps)
e.g. for MX695, MX696, ..., MX633, possible further enhanced types

GOLMRUND
25 x 14 mm

GoldCap - ready for use module (board with 7 pieces, 140000 µF)
for ZIMO large scale decoders and certain H0-decoders
e.g. for MX695, MX696, ..., MX633, possible further enhanced types

GOLMLANG
60 x 8 x 14 mm

GoldCap - ready for use module (board with 7 pieces, 140000 µF)
for ZIMO large scale decoders and certain H0-decoders
e.g. for MX695, MX696, ..., MX633, possible further enhanced types

SUPERCAP68
27 x 15 x 5,5 mm

GoldCap - ready for use module with 6800 µF
for **all** ZIMO decoders with 16V energy connection
e.g. for MX633, MX645, ...

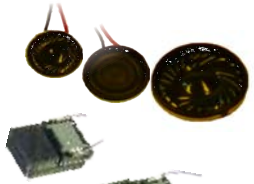
Speakers for ZIMO decoders

a lot of sound from a small volume

LS8X12	8 x 12 x 8 mm	miniature rectangular speaker
LS10X15	10 x 15 x 8 mm	8 ohm / 1 W
LS10X15H11	10 x 15 x 11 mm	8 ohm / 1 W
LS13X18	13 x 18 x 13 mm *„Dumbo"*	8 ohm / 1 W

ZIMO special types with integrated sound box;

the sound outputs of MX644 and MX645 decoders are able to operate two 8 ohm speakers in parallel (volume effect as one 4 Ohm / 2 W); connect only one speaker to MX646, MX648. NOT suitable for a large scale decoder (because of 10 V output)



LS20R	20 mm round speaker	8 ohm / 1 W
LS23R	23 mm round speaker	8 ohm / 0,5 W
LS28R	28 mm round speaker	8 ohm / 0,5 W

LS26X20X08	26 x 20 x 8 mm	200 Hz - 20 kHz	8 ohm / 1 W
LS40X20X09	40 x 20 x 9 mm	more low frequency	8 ohm / 1 W
LS40X22X09	40 x 22 x 9 mm	high volume	4 ohm / 2 W
LS50X15X14	50 x 15 x 14 mm	both types for more	4 ohm / 2 W
LS55X22X09	55 x 22 x 9 mm	low frequencies and high volume	

ZIMO special types with integrated sound box, the larger types consisting of 2 „Dumbos".

LSG50X15X14	50 x 15 x 14 mm	if shortage of space	16 ohm / 2 W
LSK50WP	5 cm, low install. depth	170 Hz - 17 kHz	8 ohm / 3 W
LSK64WP	6 cm, low install. depth	170 Hz - 15 kHz	8 ohm / 3 W
LSFRS5	5 cm, with mounting plate	150 Hz - 20 kHz	8 ohm / 5 W
LSFRWS5	5 cm, low install. depth	150 Hz - 20 kHz	8 ohm / 4 W
LSFRWS5R	5 cm, w/o mounting plate	150 Hz - 20 kHz	8 ohm / 4 W
LSFRS7	7 cm	150 Hz - 20 kHz	8 ohm / 5 W
LSFRS8	8 cm	100 Hz - 20 kHz	4 ohm / 30 W

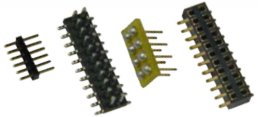
This is the ZIMO selection of VISATON for large scale decoders.

ZIMO large scale decoders such as MX696, MX697, MX699 supply the sound amplifier with 10 V, thus full capacity of the speakers can be used.

Material for ZIMO decoders

plugs, connection material, smoke generator

FLEXL10-xx	10 m highly flexible stranded wire *colors: black, red, blue, grey, yellow, orange, green, white, brown, violet*
FLEXL1000xx	1000 m highly flexible stranded wire, reel



STIFT6	NEM651 plug for refitting (= 6 pin plug connector)
RSTECK	NEM652 plug for refitting (2 x 4 = 8 pin)
BUCHS6	counterpart of 6 pin plug connector (NEM651: N, F -decoders)
STIFT22	counterpart of 21 pin socket board (MTC: D, C -decoders)
BUCHS22	counterpart of 22 pin plug connector (PluX: P16, P22 -decoders)

BUCHS8KAB	8 pin female connector for NEM 652 with cable
M4000Z	amplifier module for logic level output
LITZAWG22xx	7 m wire for large scale applications colors: black, red, white grey, blue, orange, yellow, green, brown

CRIBUCHS12	12 pin crimp-socket for large scale decoder MX695
CRIBUCHS14	14 pin crimp-socket for large scale decoder MX699
CRIMPTOOL	crimping-tool for socket CRIBUCHS12
CRIBUSET	assortment: 12 x CRIBUCHS12 + crimp-tool

BAKASTE2X5	ribbon cable plug (cutting terminal) 10 pin (2 x 5)
BAKASTE2X10	ribbon cable plug (cutting terminal) 20 pin (2 x 10)
BAKAB20POL	30 m ribbon cable 20 pin **for large scale decoder MX696**

SCHRAUB10	screw adapter for 10 pin plug connector for MX696S
SCHRAUB16	screw adapter for 16 pin plug connector for MX690
SCHRAUB20	screw adapter for 20 pin plug connector for MX696
SUSIKAB	4 pin connection cable for SUSI interface
TR92-101	smoke generator with vent for large scale 50 x 30 x 30 mm (without flange), tank volume 4 ml

Sound projects, sound loading

► A ZIMO decoder never comes „empty”, but loaded with a sound project, by default with a “sound collection” (= several engines, whistles, etc. for selection by the user). Other ZIMO sound projects can be downloaded from the ZIMO sound database on www.zimo.at.

► Among the sound projects available from the ZIMO sound database there are two types:
“Free Download” (= no charge) sound projects, and
“Coded” sound projects, from external sound providers.

The "Coded sound projects" are contributed by ZIMO partners (= providers, see next double page), who get reimbursed by the sale of "load codes". These fee-based projects can be downloaded from the ZIMO Sound Database, but can only be used in "coded" decoders, i.e. those in which the appropriate "load code" has been programmed beforehand. “Encoded decoders" can be purchased with the “load code” pre-installed (subject to a charge, see price list) or the load code is purchased later and entered to the appropriate decoder CV's (# 260, ff). The "load code" authorizes the use of sound projects of a specific sound provider for this decoder.

A third type of sound projects is
“Preloaded” sound projects; these are exclusively available in pre-programmed decoders or installed in new locomotives. “Preloaded” sound decoders are provided by model railroad manufacturers and some distributors.

► Sound project are loaded into the decoder by means of

- **MXULFA** (ZIMO Decoder update and sound loading device), or
- **MX10** (ZIMO command station; as of end 2017), or the black
- **Z21** (Roco command station, for decoder types used by Roco).

ZIMO offers a specific feature: the loading can be performed alternatively by USB-stick (without direct computer connection), which is very popular, or directly from the computer.

„Components” of a sound project

► 1) the **"main engine"** sound: this is the central sound, such as the chuff or diesel engine sound, or the cooling fan (which is the key sound in electric locomotive projects). The "main engine" sound is associated with a schedule, especially the transitions between different sound samples in various speed, acceleration and load situations. The schedule can only be changed in the "ZIMO Sound Programmer" ZSP, not by CV's. However, there are numerous possibilities for fine-tuning the main engine sound using CV's (e.g. relation between chuff frequency and speed, lead-chuff accentuation, coasting/notching functions, etc.)

► 2) **Other scheduled sounds**: these are boiling, draining, turbocharger or brake squealing sounds and many others; in the case of electric locomotives also the actual primary sounds of the thyristor unit and the electric motor.

Both the "main engine" and "other scheduled sounds" are characterized by the fact that the decoder plays them automatically based on the driving situation, while the "function sounds" are activated by function keys.

► 3) The **function sounds,** which are played by pressing the corresponding function keys, include acoustic signals such as whistles, horns, bells but also other sounds like coal shoveling, coupler clank, pumps, lowering of pantographs as well as station announcements.

The volumes of each sound and whether it is “looped” (for continuous playback as long as the function key is pressed) is defined by CV's but can also be modified by these CV's or with the CV #300 procedure. Here too, only the sound samples of the project or selections of several projects are predefined.

► 4) and 5) the **switch input and random** sounds are normally sounds that can also be used as function sounds but are triggered by switch inputs or random generators.

The ZIMO sound database

The ZIMO speciality „Sound collection”

► ZIMO Sound decoders are usually loaded at delivery with a **„Sound collection”** (a special version of a sound project), e.g. with the „European steam/diesel collection” or the „US Steam/Diesel collection”.

► A Sound collection contains sound samples and parameters for more than one loco types (eg. five types). These are simultaneously in the memory of the decoder. The user chooses one of the sounds by CV # 265 for real operation .

► The user also has the freedom to modify the tone of the sound. And the user is able to compile a mixture from the sound samples in the collection, e.g. taking the motor sound from the first loco of the collection, the whistle from the third one, and the bel from the fourth. In this way much more „loco types” than the 5 originals are created (although not completely prototypical).

This compilation is done by the „CV # 300 procedure“, which allows the choice among the various sound samples of a class, by automatically playing the sound samples during the procedure.

► „Normal” sound projects (not declared as collections) can also have features of collections, e.g. containing more than the one necessary whistle. The user has the option of choosing the whistle he likes most, so that each among the locos containing the identical sound project, has its own recognition characteristic.

The ZIMO Sound Database

The ZIMO Sound Database lists currently more then 500 sound projects, in some cases, these projects are split into various „subprojects" (for specific models or general) from the same prototype. To keep an overview, you may expand or collapse the list. You will find the link for download, information on the prototype and on function keys of the model as well as pictures for the cab (e.g. MX32).

Keith Pearson - Mr Soundguy (UK)

Keith Pearson has brought together a lifetime interest in model railways, a career in computer software development and testing, and significant experience in professional sound engineering, to launch a range of model railway sound projects under the brand of ŒMr Soundguy[1]. The sound projects use authentic sounds from recordings, and these are further tailored using spectrum analysis in order to obtain the best results from the specific speaker/enclosure.

UK distributor: www.railexclusive.com

Two of many locos with sound projects from Paul Chetter: SLW 00 gauge Class 24 , Minerva Pecket

Paul Chetter (UK)

... is the regular DCC Sound contributor to Hornby Magazine and has been a 'Champion' of ZIMO since 2009. Paul has created many British steam and diesel locomotive sound projects which are available from a number of UK ZIMO retailers. He has created custom projects for a number of model manufacturers across a range of gauges.

Many new features have resulted from suggestions, developments and field testing originating from Paul, the most recent being the Brake Key and Manual Notching for decoders and the numbering of sound samples in ZSP. He continues to be at the forefront of project enhancements, helping to bring the ZIMO brand to more users.

Paul's most recent projects are for the Sutton's Locomotive Works Class 24 Diesel-Electric in 00 gauge and Minerva Models' Peckett E Steam loco in 0 gauge; both were released in December 2015.

Although standard gauge mainline locomotives and multiple units form a large part of his portfolio Paul continues to support the needs of Industrial and Narrow Gauge modellers with a range of custom projects.

Chetter sound projects are „preloaded" only in ZIMO decoders or in ZIMO equipped UK locos, availabe from UK dealers. See Sound database on ZIMO Website and contact directly the dealers or ZIMO's distributor for UK: office@philipsutton.com

Modelleisenbahn GmbH (A)

From the year 2010 (as ZIMO started to deliver decoders to Roco and Fleischmann) many sound projects were created, in many cases as results of cooperation between ZIMO and Roco sound specialists, sometimes also with the help of external sound providers. Most of theses sound projects are now available on the ZIMO sound database for frei download.

Besides of standard locomotives there exist special cases, which demonstrate what ZIMO technology is able to do: e.g. turning and lowering/lifting the vehicle body, snow blowing, of course everything with original sound.

Beilhack rotary snow plow (a Roco model)

ZIMO ELEKTRONIK GmbH (A)

Also ZIMO itself acts as an sound provider: two employees working on design of sound projects (besides of other tasks).

Sound projects are made as own products (for free download from the sound database) or on order of loco manufacturers.

Oswald Holub

Quang Nguyen

Sound providers

These pages show ZIMO partners who make sound projects for ZIMO sound decoders. They are not employed at ZIMO, selling their projects directly, but are a part of ZIMO's human resources.

Heinz Däppen (CH) (Sound Design)

... has started in the year 2009 to design sound projects commercially. He together with ZIMO invented the „coded" project, where a load code has to be written to the CVs # 260 - 263 before loading the sound project itself. This is the basis for all sound providers to get money from the customers using their projects.

Heinz Däppen also works for famous model railway manufactures which pre-install his sound projects in their locos. Heinz Däppen together with Matthias Henning defined the „ZIMO Advanced Standard" for assigning functions to lighting and sound effects. Now there exists also a „ZIMO US Standard".

Switzerland (RhB) ...)

... and USA (Mogul)

the sound portfolio of Heinz Däppen contains Swiss and USA vehicles, mostly narrow-gauge prototypes.

www.sound-design.white-stone.ch

Gabriel Meszároš (SK) (Artol s.r.o., Slovakia)

(Self introduction) My first attempt with sound projects is dated to 2008, when I was asked to prepare a sound project for steam locomotive Class 556.0 "Stoker". Then I started working on some other sound projects. It required study of decoder features and orienting in th options. I like the large variability of sounds matching options and work with them via settings in the decoder. It is not always easy, but hope that my aim to achieve realistic sound is fulfilled.

I prefer working on diesel locomotive projects, whose sound can be quite different depending on the operating mode. It is always a challenge, as the best record sounds, process them, snip and assemble them into a final sound project. Continue to update older sound projects as new decoders brings new possibilities or I have the opportunity to record new sound to achieve better experience for model railroaders enthusiasts.

www.artol.sk

Matthias Henning (D) (Modellbahnwelt Henning)

(Self introduction) Born in the DDR (GDR - German democratic republic) I got my first PIKO model railway in the year 1961. In the eighties I started to make sound and substandard film recordings from locomotivs. From this early activities I could use something much later for my sound projects.

My special field are the locomotives from the former „Deutsche Reichsbahn", epoch III and iV. In the year 2000 I started to make sound projects for other decoder manufacturers, from the year 2010 for ZIMO sound decoders.

Currently (when this text is written, in the year 2015) i am working on sound projects for the „sächsische VIIK", the „996102" and the „VT2.09"

www.henning-modellbahn.de

Die BR118 DR, PIKO Modell in TT

Free Tools to create sound projects and...

ZSP - ZIMO Sound Programmer

This **ZSP** Windows tool is used to create-, preview- and modify sound projects, upload the sound projects into the ZIMO decoders, as well as load new software versions in the decoder (decoder software update).

ZSP was created in 2004 as ZIMO started to produce and offer sound decoders; at the same time decoder software update was introduced. ZSP is continuously developed further.

An adequate hardware is needed to load software as well as sound projects into the decoders: the **„Decoder-update-and-sound-loading-device"**. ZIMO calls its device **„MXULFA"** (acronym of German name „**U**pdate-**L**aden-**FA**hren" (means: Updtae, Load and Drive).

The **Command Station MX10** is able to do the update and loading job as well (starting end 2017) .

ZCS - ZIMO CV Setting

This tool was created by model railroaders from Austria (Oliver Zoffi) and Switzerland (Matthias Manhart) - There is an own homepage for ZCS:

www.beathis.ch/zcs/index.html.

ZCS provides a bunch of comfortable windows for the various topics of configuration, e.g. adjustment for driving the loco, function mapping, assignments of sounds, etc...

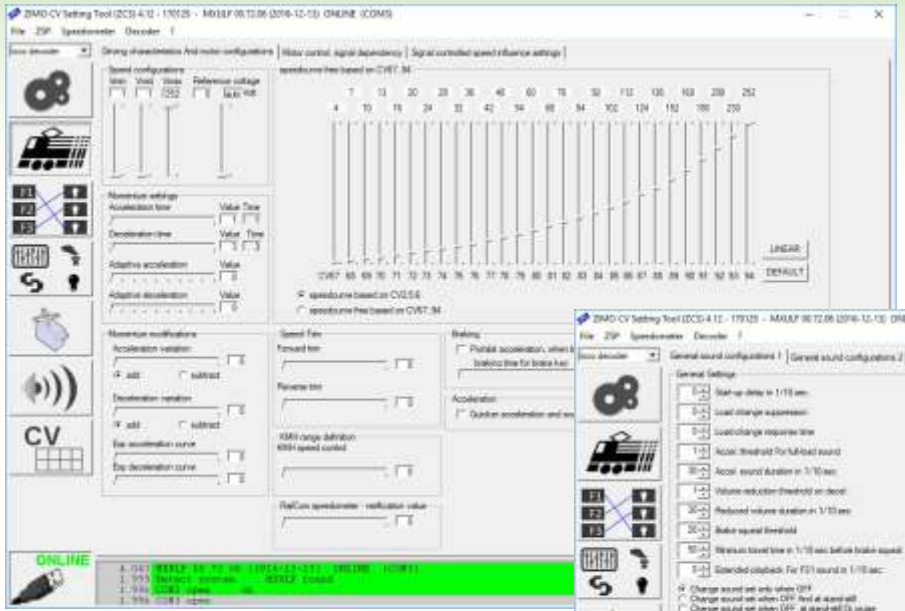
A ZIMO speciality is the high configurability of the sound using CVs; this is even true for the motor sound in each of its forms (steam, diesel, electric).

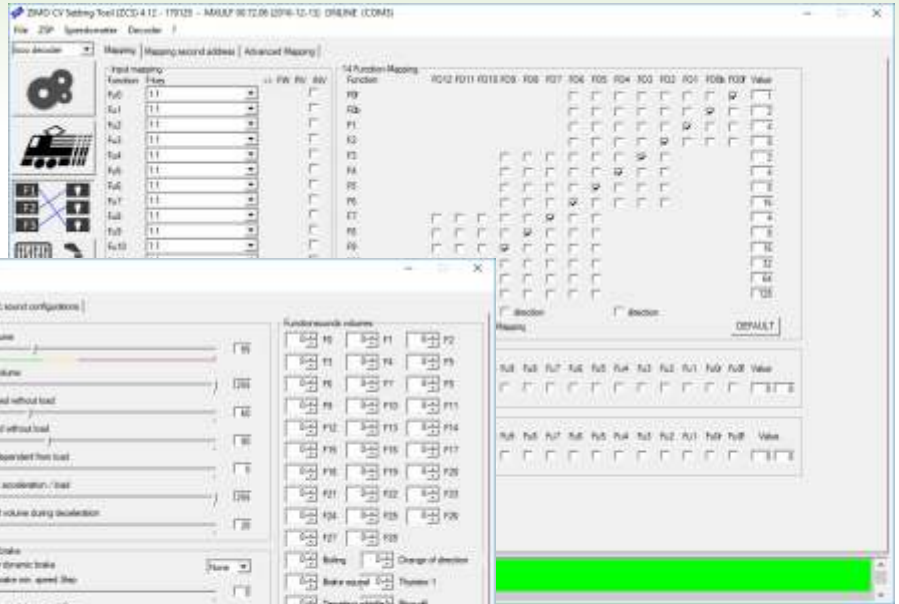
Therefore, ZCS is a very powerful tool, although it does not change sound samples and state machines (this is done only by ZSP).

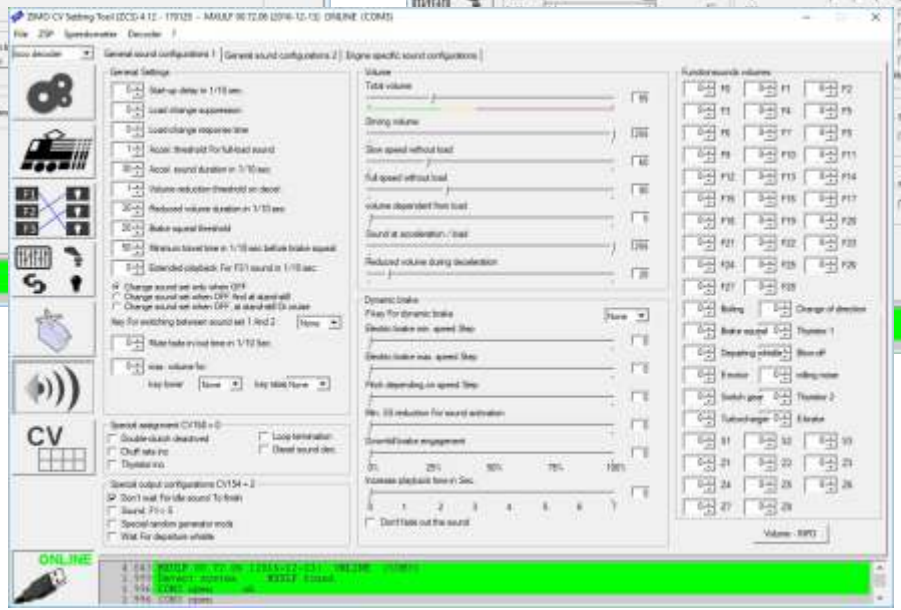
ZCS can be used for modification of sound projects (the modified files are loaded afterwards in the decoder) as well as for real time modification of CVs.

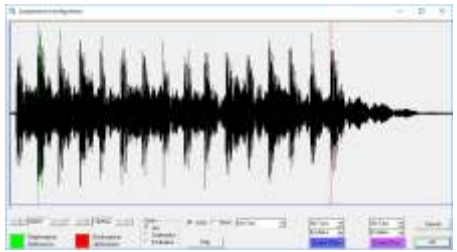
The interface device between the computer (where ZCS runs) and the decoder is also **MXULFA** or **MX10**, the same devices as for ZCS.

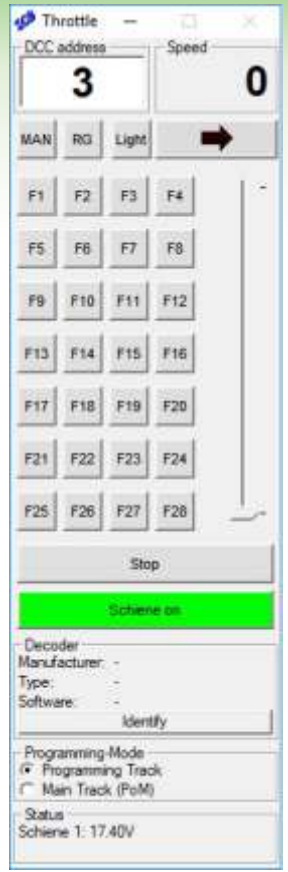
In latter case, CVs are set in „Operational mode" ("POM"), acknowledgements and reading of CV values is done through RailCom.





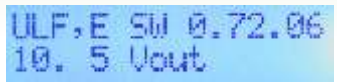





Throttle
DCC address
3
Speed
0
MAN
RG
Light
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
F15
F16
F17
F18
F19
F20
F21
F22
F23
F24
F25
F26
F27
F28
Stop
Schiene on
Decoder
Manufacturer:
Type:
Software:
Identify
Programming Mode
Programming Track
Main Track (PoM)
Status
Schiene 1: 17.40V

MXULFA Decoder-Update-and-

The letters „ULF" in „MXULF" mean „**U**pdate", „**L**oad" and „**F**ahren" (German for „drive"). The product name symbolysis the fact, that this is not only a simple update- and sound upload device, but also a small command station with a throttle and even function keys.



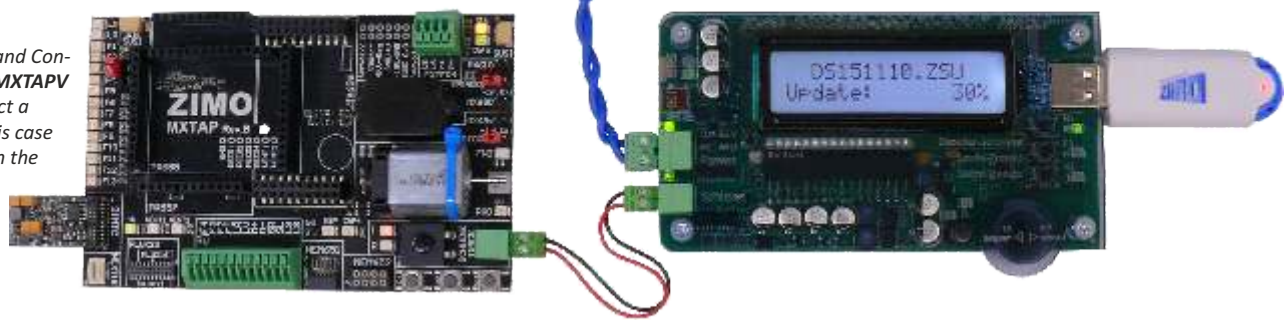
Start screen of the MXULFA, with display of the track voltage for the update mode

✶ Self-Update

The updateability for an update device is as necessary as for all other components of a digital system. This ability is needed to be able to use the latest decoder technolog as to terms of speed and data volume.

The self update of the MXULFA is run out of a USB flash drive.

Display after self update of the MXULFA; „LED 3" green (to be seen on the MXULF body)



*„Decoder Test and Connecor board " **MXTAPV** to easily connect a decoders (in this case an Mx644) with the MXULFA.*

✶ Decoder update and sound upload from the USB flash drive

Using a USB sticks as a media for software and sound is convenient: the independence of a computer, no connection problems, no search for files.

MXULFA searches for the decoder type (reading it's UID)

The „Decoder-Software-Container-File" of a specific developpment level (date) includes all ZIMO decoder types , i.e. only one file must be downloaded from the ZIMO website and copied to the flash drive. The MXULFA sends the correct data to the connected decoder.

Success message

„Drive" screen showing the direction, speed step, address and the first three function keys (on/off).

Display of the loading progress, in both cases: loading via track or „SUSI"

✶ The quick alternative to upload a sound: „SUSI"

Uploading a sound project via the tracks (usually on the programming track) takes some time (more than 15 min.) due to the large amount of data (mostly some MB) to be transfered.

This can be done much faster (1 - 2 min.) using the „SUSI" plug on each ZIMO decoder, although not the original „SUSI" protocol is used, as it is to slow for such purpose.

This methode of sound uploading requires a direct connection between the MXULF and the (small scale) decoder. The large scale decoders have also a plug, or one may use a spring contact stylus or a temporary joint.

This methode is also applicable to a larger amount of decoders, that receive a new sound upload before being mounted into a locomotive.

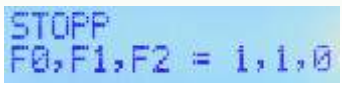
✶ Driving mode with the MXULFA

After a successful software update or sound upload, one may start a test drive. The control and display is given by ...

-Sound-Loading-Device

...the scrolling wheel, four keys, eight LEDs. These are used to choose an address, control the speed, change directions, switch functions and MAN bit as well as the emergency stop.

Emergency stop !



✶ CVs programming and reading with the MXULFA

„Service mode programming" (on the programming track) as well as „Operational mode" (POM, „programming on-the-main") are available, in latter case with RailCom feedback of a done programming or to read the CV value.

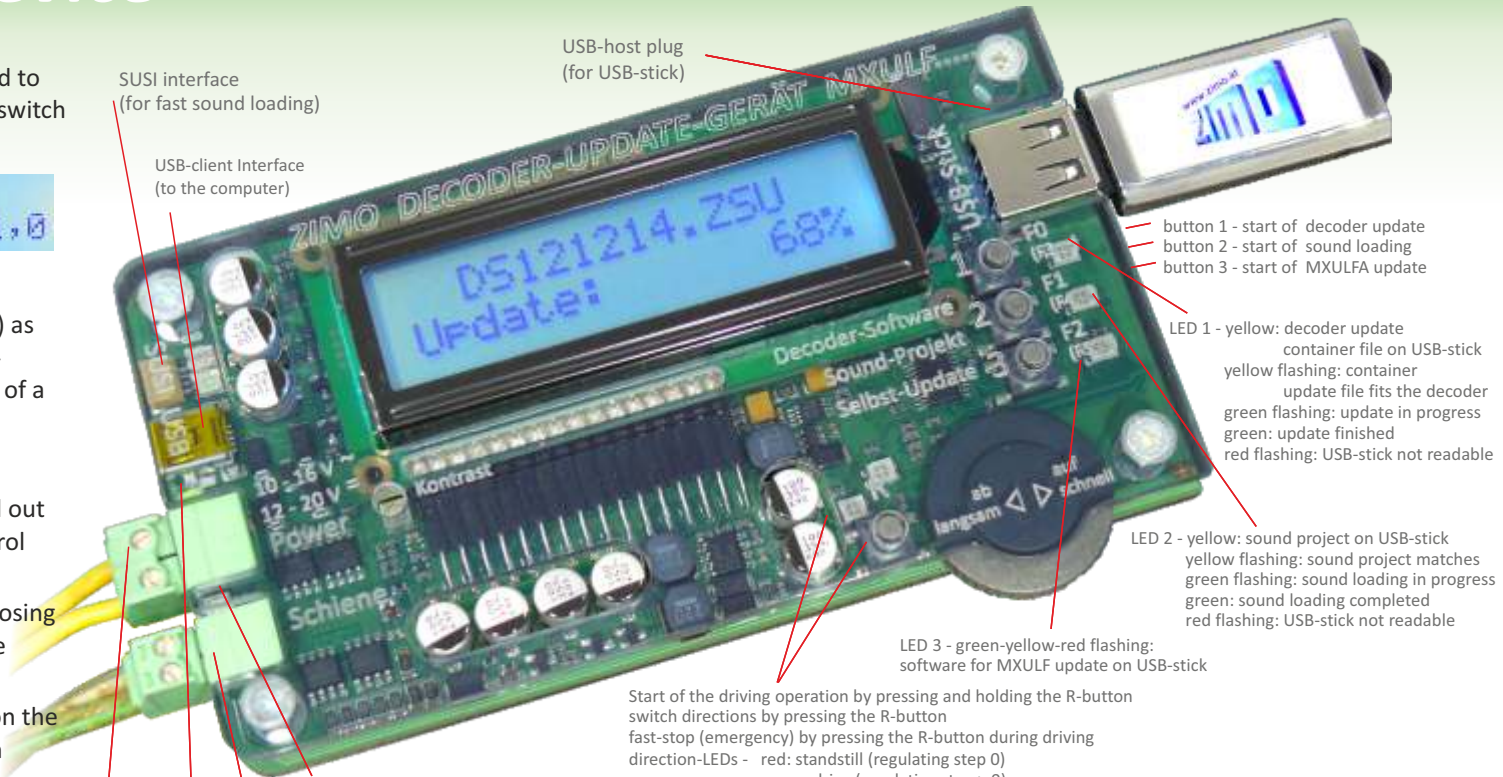
✶ The MXULFA controled by computer

All the aforementioned tasks of the MXULF can be carried out not only localy by the device but also via an extrenal control through the USB interface ("USB-client"):

Decoder software update and sound upload, directly choosing the required files from the ZIMO website, controll of the upload success on the computer.

Drive mode controled by computer using a driver's desk on the screen as offered by a number of programms for system control such as Pfusch, ESTWGJ, Train Controller, ... (when ZIMO protocoll is implemented).

Configurate a decoder, i.e. programming and reading of Cvs using a computer and software such as PfuSch, JMRI Programmer, ZSP, ZCS, ...



USB-host plug (for USB-stick)

SUSI interface (for fast sound loading)

USB-client Interface (to the computer)

button 1 - start of decoder update
button 2 - start of sound loading
button 3 - start of MXULFA update

LED 1 - yellow: decoder update container file on USB-stick
yellow flashing: container update file fits the decoder
green flashing: update in progress
green: update finished
red flashing: USB-stick not readable

LED 2 - yellow: sound project on USB-stick
yellow flashing: sound project matches
green flashing: sound loading in progress
green: sound loading completed
red flashing: USB-stick not readable

LED 3 - green-yellow-red flashing: software for MXULF update on USB-stick

Start of the driving operation by pressing and holding the R-button
switch directions by pressing the R-button
fast-stop (emergency) by pressing the R-button during driving
direction-LEDs - red: standstill (regulating step 0)
green: drive (regulating step > 0)
green or red flashing: response is missing (although expected)
both LEDs red flashing: short circuit, voltage OFF

power supply (10 - 20 V AC or DC)

LED (supply) - green: OK yellow: voltage to low

LED (track) - yellow: decoder found at track output
yellow flashing: decoder matches the file on the USB-stick
green flashing: decoder update or sound upload in progress
green: decoder update successful

track: update-, loading- respectively drive-track (track output to decoder or vehicle)

fuction switching F0, F1, F2 by pressing the 1, 2, 3 buttons
changing over to „second line" by pressing and holding button 2
turning on/off of F3, F4, F5 by pressing the 1, 2, 3 buttons
changing over to „third line" by pressing and holding the button 3
turning on/off of F6, F7, F8 by pressing the 1, 2, 3 buttons

The System


WiFi WLAN
2.4 GHz
Smart phone apps
(i.e. Roco Z21)
Tablet apps
(RailManager shown)
PC switch board
(ESTWGJ shown)
Mi-Wi
2,4 GHz
MX32FU radio cabs
CAN-Bus
Ethernet
MX10 command station,
back view
MX32 and MX32FU cabs tethered
(also allowed: Old MX31 cabs)
USB
433 MHz
Massoth-radio
DIMAX
radio module
(Massoth)
DIMAX
Navigator
(Massoth)
"CAN/XNET on the front)
XPressNet
Power supply
to track 2
(programming
track)
to track 1
DC out
(from track 1)
CAN bus
Stationary
StEin modules
Roco
Multimaus

The Command Station MX10

Rotary knob for scrolling, setting parameters, and misc.

128 x 64 pixel display, RGB colour backlit.

3 buttons for quick user intervention.

Socket for USB-stick.

Connectors for CAN, XNET, LAN, etc, also on the rear side of the device.

High power in each point - the technical data of the MX10

Track voltage, adjustable separately for Track 1 and 2 . . . . . **10 to 24 V**
Boot-up time, adjustable separately for Track 1 and 2 . . . . . 1 t o 60 sec
Boot-up current, adjustable separately for Track 1 and 2 . . . . . 1 to 12 A
Overcurrent threshold, adjustable for . . . . . **Track 1: 1 to 12 A**, **Track 2: 1 to 8 A**
Overcurrent turn-off speed, adjustable separately for Track 1 and 2 . . . . . 0.1 to 5 sec
Tolerated transgression of overcurrent threshold, adjustable . . . . 0 to 4 A for 1 to 60 sec
Adaptive overcurrent (turn-off because of an abrupt current rise) . 1 to 10 A in 1 to 500 ms
Spark suppression (to avoid electric arcs damaging wheels and rails) . . Off / Level 1 / Level 2

Two RailCom detectors (one for each track output) sensing currents . . . . starting from 4 mA
Two system busses (ZIMO CAN bus 1 and 2) operating at a speed of . . . . . 125 Kbit/s

LAN, USB, MiWi radio communication, USB-stick socket, two XPressNet busses, prepared for Loconet and S88, aux voltage outputs 12 and 32 V, audio output, 6 LED outputs, 8 logic inputs.

Complete information for the user - the MX10 display during „normal" operation

***AOS In/Outputs**, displays the status of all 14 rear connections.*

***Voltage and current** from the power supply unit at the input **"DC in"**, which supplies the MX10 as well as the layout ("primary power").*

***Voltage and current** at output **"track-1"**(Schiene-1 includes DC output S1).*

***Voltage and current** at output **"track-2"**(Schiene-2 includes DC output S2).*

***DCC signal statistics** (number of sent command packets per sec).*
xx DCC = *DCC packets only*
xx MM = *MM packets only*

***RailCom statistics** (number of received messages as answers to DCC commands).*

***CAN bus statistics** (number of CAN packets);*
CAN xxx E = *number of CAN packets per sec*
CAN xxx E yy% = *as above with percentage error*

***Temperature measured** on the circuit board.*

Emergency stop, short circuit, etc.

*Display changes to **RED**, STOP & OFF - screen:*
Broadcast stop (BCS) on track-1,
Normal operation is maintained on track-2.

Status of track-1: BCS – Broadcast stop
Pressing button **1** (1) *changes track output 1 to OFF.*

Status of track-2 (below): Normal driving is maintained, button **2** (***MENU***) *can be used to switch between states.*

DCC packets monitor

The types of packets that were sent to this address twice per sec. are shown. How often a particular packet type indicator flares up (e.g. "F") represents the intensity of the data transmission. If the speed slider is moved on the cab, the "F" flashes rapidly.

First start up of the ZIMO system

The ZIMO system usually comes as a starter set:

1 Command Station MX10,
1 cab MX32 (tethered) or MX32FU (radio and tethered),
1 power supply with 30 V / 240 VA or more,
different plugs, CAN cable, power cable.

In a first step, all connections must be established:

- ★ The MX32 cab is connected to the Command Station MX10 (“ZIMO CAN” socket) using the CAN bus cable,
- ★ the track to the terminal “Schiene 1” (track 1) or “Schiene 2” (track 2) of the MX10. Track 2 may be used as a separate main track but can also be used for “Service mode” programming,
- ★ the power supply cable to the terminal “DC in” of the MX10,
- ★ the Command Station MX10 starts automatically when power is supplied. The boot sequence shows a red, then blue screen.
- ★ the cab MX32 starts subsequently (15 sec.),
- ★ because it is a new MX32: it shows the ***LOCO IN*** screen. The address of a loco must be entered here.
- ★ After entering the address, the new loco is activated through the F key: the screen turns into the ***LOCO*** screen. Usually a tachometer and a panel of function keys are displayed besides the address.
- ★ Now the loco can be driven using the slider, the R key (direction) and the function keys.

Cab MX32 in typical *LOCO* mode

Display header
Current operating mode ***LOCO*** *shown;* Track voltage & current; “Communications dot” for monitoring the data traffic with the command station; RailCom logo when receiving data; Battery status; Clock and fast clock.

Loco picture
If available, change size by tapping on image.

Loco Name, Address, Data Format

Speedo
shown with a blue needle if speed is derived from current speed step or magenta needle if the actual speed is shown by means of RailCom feedback.

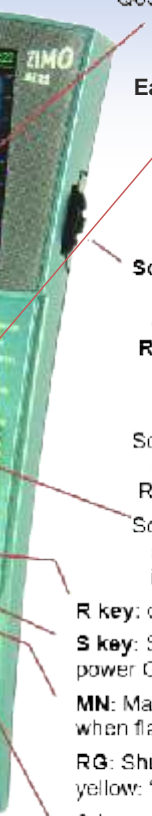
Function key icons
shown in the numeric key pad arrangement describe their current function and can also be operated through the touch screen. The picture shows the display in the “Photo style” (the “Black” style is the default style).

Soft keys M (= Menu), I, II, III

Speed step indicator
Screen representation of the speed slider indicates the current speed step, loco take-over state, speed influence and more.

Functions (F0 – F9) and number (1 – 0) keypad
also used for text input

Cab and Radio cab MX32



Send/receive statistics
QoS - Symbol

East-West Indicators:
DCC controls the direction of a loco (forward/backward), independently oft he movement relative to the layout. With these indicators, the user can see and control the absolute direction oft he train, based on the measurement of track polarity and the feedback of this information via RailCom

Scrolling wheel in *LOCO* - mode:
Fine tuning of speed (+/- 10 steps) or controller of assigned parameters (e.g. sound volume).

Rocker switch (above scrolling wheel) as an alternative possibility to switch locos or to switch between assigned parameters.

Scrolling wheel in *LOCO* mode with open *LoR* scroll the lines (addresses) in the *LoR*, Rocker switch to switch the display level.

Scrolling wheel in *SERV PROG*, *OP PROG* mode: scroll the lines in the list of CV's, rocker switch to increment/decrement a value.

R key: direction

S key: Stop, Track power OFF

MN: Manual; active when flashing

RG: Shunting yellow: "Half speed"

A key: Accept, Enter

E key: End, Escape

The small keypad

F key → switch from address input *LOCO IN* to driving mode *LOCO*.

U key → switch locos within *LOCO* or takeover of a loco from another cab.

TP key → switch between multiple units or assign locos to MU's or dissolve MU's.

W key → switch to and from *SWI*

C key → clear: delete locos from *LoR* or writing in *LOCO IN*.

*When driving a loco, the cab is in the **LOCO** state: you can choose between different screen presentations showing the loco in control, informing about speed, direction, functions, etc., and about further topics of interest for the layout operation (turnouts, signals, etc...).*

◀◀ *Leftmost (photo of the entire MX32): Typical standard screen with loco picture, name, address, speedo and function key symbols (for 28 functions in three levels)*

◀ *Left: Similar, the lower part of the screen shows the locos in the background memory (with speedo, etc...), these can be selected quickly for direct control (call to foreground).*

◀ *Enter a new loco: type the address and the name, select the data format, activate immediately or continue by selecting a picture and/or symbols first.*

During this procedure, already existing locos with similar addresses/names are displayed out of the background memory.

▲ *Similar, but large picture, digital speedo (without graphics), and function key symbols.*

◀ *A loco presentation without picture, but name and address written in big scripture - for easy reading.*

◀ *A mixture of driver's screen and switch operation screen. The lower half shows accessory decoder addresses (selected before) and indicators for switch (or signal) positions. Function keys (usually controling loco functions) operate the highlighted switches.*

▲

Another (more elegant) way to arrange and operate the accessories is the panel presentation: each switch or signal has its symbol field. The kind and orientation of the symbol as well as the address of the related accessory are defined in a configuration procedure beforehand.

An optimized screen view for each operation and configuration situation

◀ *Operational mode Programming (OP PROG, POM) starts with decoder identification, i.e. automatic reading of some CVs such as decoder manufacturer and type, software version (if ZIMO decoder), UID and sound load code.*

CV programming begins thereafter (or also without waiting for full identification) .

◀ *CV programming and reading (by RailCom) is done in a list of unrestricted length. There is always full overview of the CVs already processed and scrolling back and forth is always possible.*

For easy use, short descriptive names are displayed with CV numbers (complete for ZIMO, standard otherwise)

◀ *For several frequently used configuration topics, the ZIMO cab provides special screens: standard NMRA CV mapping as well as „Swiss mapping", ZIMO advanced mapping, ZIMO input mapping, sound sample, volume and loop assignment .*

Screen photo shows „Swiss mapping", which is used for complex lighting.

◀ *This screen is an example for a situation, when another device takes control over the loco which is in the foregound of the ZIMO cab:*

in this case the yellow header (flashing „X-Net Device") refers to an XPressNet cab or App, such as the one from Roco.

◀ *Short circuit on track 1, track voltage is switched off ! Immediatly all cabs show the „Stop and Overcurrent" window with the current state of each track output and the options the user may choose.*

Touching on the fields returns to full operation or to broadcast stop (BCS).

◀ *The Object database lists all locos known in this cab: the ones in the „quick" background memory (green), locos driven in other cabs (blue) and locos which are inactive in the Command Station MX10 (grey).*

Information like speed, direction and function status (F0 .. F9), and whether it is part of a consist in the own cab or another cab is provided for each address.

◀ *Adjustments for HLU (special ZIMO feature) speed limits:*

This screen shows the state of the tracks sections of an MX9 module: Occupancy indicators, HLU steps (unrestricted, slow, ultra-slow, stop), and the loco addresses which were detected.

◀ *System controlled consisting: the presentation of the background memory is used to define which addresses should be part of a consist by typing T1, T2, etc. in the corresponding lines.*

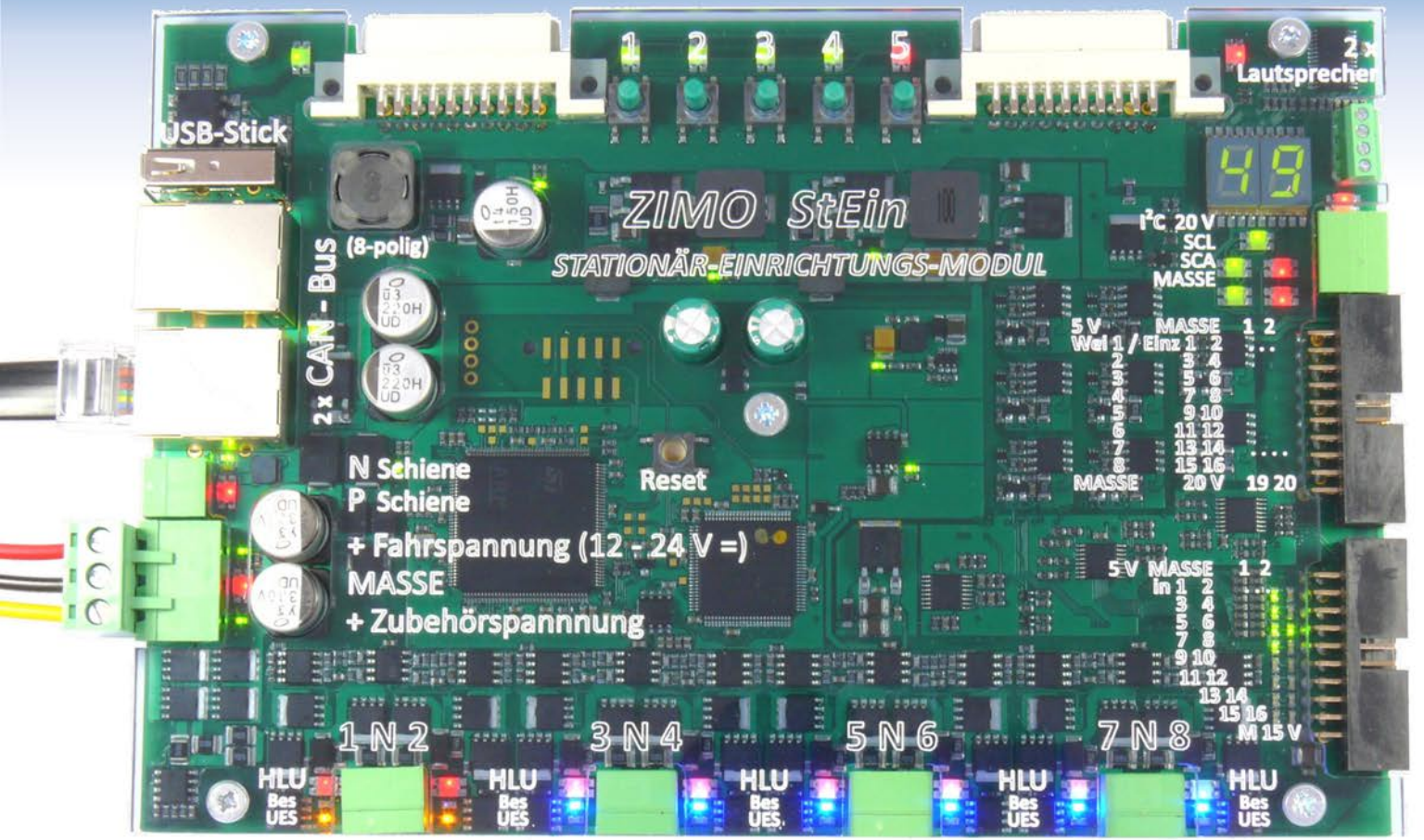
Consists residing in other cabs are also indicated here, e.g. FT(2), etc.

◀ *When using ZIMO decoders (or any with RailCom feedback) the „real" speed measured by the decoder is indicated in the speedo of the cab.*

In case, an easy adjustment of the RailCom speedo is possible using an automatic programming procedure of CV # 136.

The ZIMO StEin

„StEin" is an acronym of „StationärEinrichtungs . . .",
which is German for stationary products (accessories and similar)



Everything except the rolling stock, is a "candidate" for being controlled by „StEin": switches (points), signals, decouplers, stationary lighting, speakers, ... „StEin" also provides inputs for rail contacts, photo sensors, ...

Most important: the track sections, which are driven and monitored by „StEin" modules (in this way - indirectly - of course, also the rolling stock is controlled).

For some of these items the „StEin" works similarly to a group of accessory decoders; it provides many features, an independent power and a more effective bi-directional data communication (CAN bus instead track).

The actual "StEin" is the first member of a family of future "StEin's" with different focus. This one has

- **8** outputs for track sections, up to 8 Amps each, (fit for large scale), occupancy detection (1 mA), short circuit detection (value and time adjustable) application of HLU speed limits, address recognition by RailCom and ZIMO ACK, detection of RailCom channel 2 messages and forwarding.
- **8** outputs for switch engines (all types), various ways of position feedback, many configuration options, also usable for 16 single functions.
- **16** sensor inputs, track feedback by various means.
- **1** I²C bus for future signal control boards
- **2** speaker outputs for the internal sound generator.
- **2** connectors for future extension boards carrying further inputs and outputs.

ZIMO employees

ZIMO ELEKTRONIK GmbH
Schoenbrunner Strasse 188
1120 Wien (Vienna)
ÖSTERREICH (AUSTRIA)

www.zimo.at
office@zimo.at

t +43 1 8131007 0
f +43 1 8131007 8


Quang Nguyen


Viktor Obrist-Wilde


Oswald Holub
Development manager


Marijana Lazarevic


Vincent Hamp


Peter Ostatnik


Michael Schwarzer


Stephan Lampert


Stephan Zimmerer


Michael Rubitschka

Development - test - sound design


Peter W. Ziegler
Owner


Richard Medina-Traxler


Tan Hung Huymh
Production manager


Maria Liszka


Michael Che


Nada Radulovic


Ferenc Györe


Judith Bittermann


Selda Telci


Gerhard Kaiser

Manufacturing - purchasing


Thomas Mader


Manuel Herlt


Manoj Abraham


Manojela Stanojevic

Sales - administration- documentation


Oi Van Beranek-Che
Sales manager


Sven Fuchs


Senad Topcic


Manfred Brückner


Stephan Hubinger


Alexander Mayer

Service - repair - testing equipment