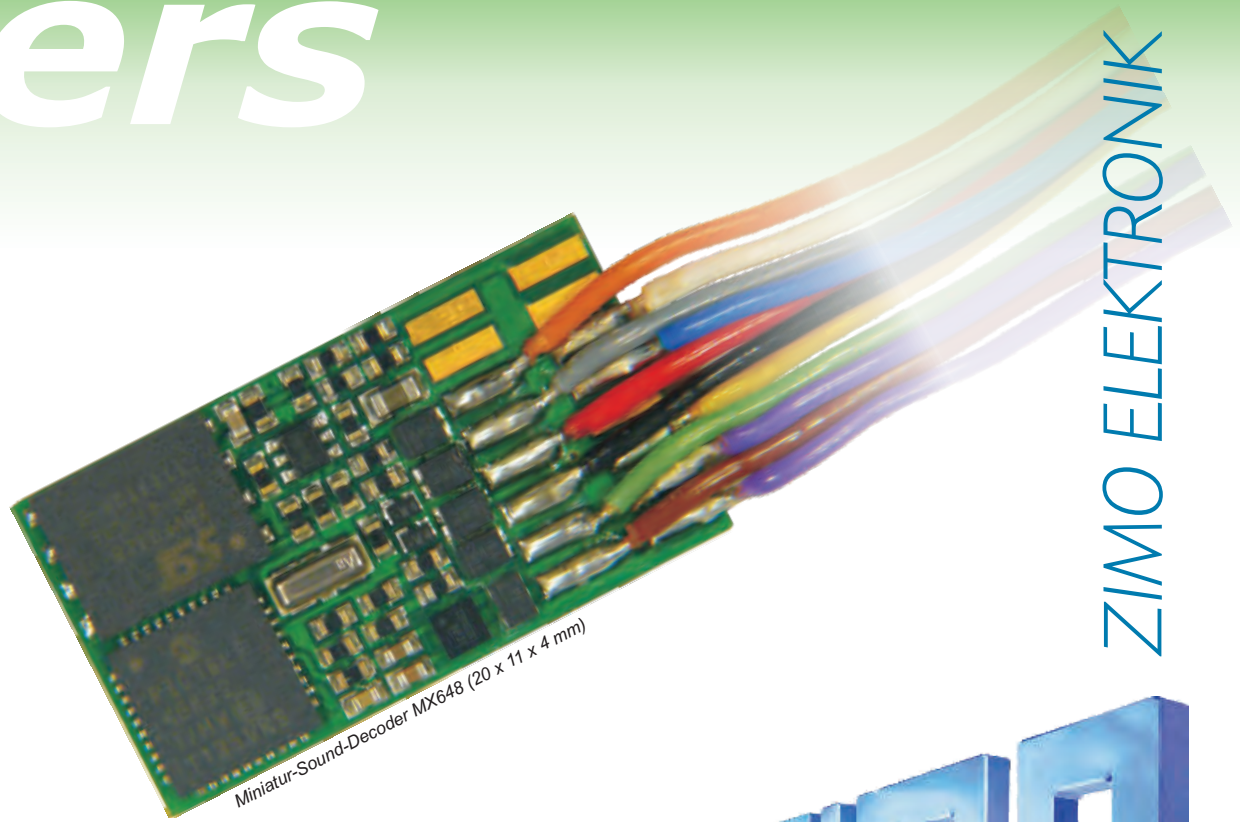
Decoders

Locomotive Decoders
Sound Decoders
Function Decoders
Accessory Decoders



Miniatur-Sound-Decoder MX648 (20 x 11 x 4 mm)

ZIMO ELEKTRONIK

Overview October 2014

www.zimo.at

ZIMO Decoders . . .

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

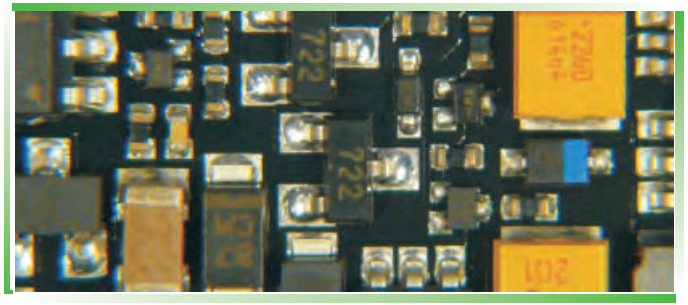
as with all products from ZIMO Digitalsystems. Here is where ZIMO employees make the complete circuit board assembly, do all the soldering and wiring, program the microcontrollers, load the sound data, initialize and test, and perform all repair work.

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, are included to satisfy our claim of "an appropriate decoder for every rail vehicle."

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), and with sound decoders, much more storage space (at minimum 32 Mbits) for sounds to be played back.

ZIMO Decoders . . .

. . . offer a selection where ALL models have ALL features.
The list of COMMON features is extensive (seen on the following pages), while the tables indicating the characteristics of each decoder families are just a few lines, because it's all about those few differences.



A close-up of an MX645 sound decoder circuit board

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.

So, the perfect decoder type for a particular application is easy to find: the dimensions, the number of function outputs where appropriate, the type and number of functional low voltages, the type of energy storage interface connection, and the connection technology are the decisive criteria shown. Rarely does the total current overload capacity need to be considered: ZIMO decoders are spaciously laid out, and so they're almost always more than "strong" enough.

ZIMO Decoders . . .

. . . offer innovative solutions. It's always been the ZIMO tradition 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 regarded as not feasible) and 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 properties such as HLU, RailCom, SUSI and servo-control are not reserved for special products, but rather are included in every model.

ZIMO exhbition booth, the decoder-wall

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 complex lighting conditions to adjust to individual desires (appropriate not only for the Swiss...) • the high level of configurability of ZIMO's sound capabilities • "Input Mapping," which is the combined function mapping upstream of the assignment of function keys.

There are no "Basic decoder" or derated versions 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, for example when new feedback options are needed.

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) but rather ZIMO 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-made bodies and resonant bass reflex speaker boxes provide very good 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 Locomotive Decod
(all decoders are largely functionally identical)

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 MXULF decoder update device (or its predecessor MXDECUP) or via MX10 base unit (the ZIMO command station). 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.
- Overvoltage protection min. 35 V, typically 50 V.

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 balance of the transmission neutral position upon direction reversal for the avoidance of starting jolt.
- 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 (Assumes 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... Smoke special 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 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 deployed applications: "On-the-main" programming and CV with confirmation reading, RailCom address feedback, feedback of the current speed. Many other applications planned in future software releases.

Sound Playback

- Powerful Sound Amplifier: in miniature sound decoders, 1 Watt for 8 Ohm speaker. In H0 sound decoders, 3 Watts for 4 or 8 Ohm speaker (or two 8 Ohm in parallel), in large-scale decoders, 10 Watts for 4 or 8 Ohm speakers (or two 8 Ohm in parallel) at 10 V.
- 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 measuring trip for 'training' load-sensitivity, both for steam engines and 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 its predecessor MXDECUP) 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

- With external energy storage (electrolytic, tantalum, Goldcap capacitors) continuous locomotive motion during a break in wheel/rail contact, eliminating flickering lights and sound disruption, also 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.
- Goldcaps 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 function low voltage sources (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 of 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; additionally, a special output for a smoke fan.
- 4 servo outputs, depending on the decoder type, via control lines, or included 3-pin connectors.
- Acceleration sensor to automatically adjust sounds on uphill gradients, curves, etc..

Comparison Table: Locomotive Decoder (including Sou

N . . . . . H0n . . . . . TT H0 0

Each decoder family includes several types (= Different types of connection)													
Decoder Family >	**MX618**	**MX621**	**MX622**	**MX623**	**MX630**	**MX632**	**MX633**	**MX634**	SOUND **MX644**	SOUND **MX645**	SOUND **MX646**	SOUND **MX648**	SOUND **MX658**
Dimensions mm (in.) circuit board (without heat shrink tubing)	15 x 9.5 x 2.8 (.6 x .37 x .11)	12 x 8.5 x 2.2 (.47 x .33 x .1)	14 x 9 x 2.5 (.55 x .35 x .1)	20 x 8.5 x 2.5 (.79 x .33 x .1)	20 x 11 x 3.5 (.79 x .43 x .14)	28 x 15.5 x 3.5 (1.1 x .61 x .14)	22 x 15 x 3.5 (.87 x .6 x .14)	20.5x15.5x3.5 (.8x.61x.14)	30 x 15 x 4 (1.2 x .6 x .16)	30 x 15 x 4 (1.2 x .6 x .16)	28 x 10.5 x 4 (1.1 x .41 x .16)	20 x 11 x 4 (.79 x .43 x .16)	25 x 10.5 x 4 (.98 x .41 x .16)
Continuous Current Sum of Motor and Function Outputs	0.7 A	0.7 A	0.8 A	0.8 A	1.0 A	1.6 A	1.2 A	1.2 A	1.2 A	1.2 A	1.0 A	0.8 A	0.8 A
Function Outputs including two headlamp outputs	4	4	4	4	6	6	10 (9) *)	6	8	10 (9) *)	4	6 (4) *)	4
Servo/Logic Out optional logic-level outputs on SUSI-Pins	2	-	2	2	2	-	2	2	2	2	2	2	2
Function Low-Voltage	-	-	-	-	-	yes (= 0.8 A) opt. 1.5 or 5 V	-	-	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 / 4Ω	3 Watt / 4Ω	1 Watt / 8Ω	1 Watt / 8Ω	1 Watt / 8Ω
Wire Connections NEM 652 (R) / NEM 651 (F)	-	**Mx621 MX621R, -F**	**Mx622 MX622R, -F**	**Mx623 MX623R, -F**	**Mx630 MX630R, -F**	**.MX632 MX632R, -F**	**MX633 MX633R, -F**	**MX634 MX634R, -F**	-	**Mx645 MX645R, -F**	**MX646 MX646R, -F**	**MX648 MX648R, -F**	.
NEM 651 body connector 6-pole male conn. on decoder (N)	-	**MX621N**	**MX622N**	-	-	-	-	-	-	-	**MX646N / L** *straight/angled*	-	-
PluX-Plug 12, 16, or 22-pole male conn. on decoder	-	-	-	**MX623P12**	**MX630P16**	-	**MX633P16, MX633P22**	-	-	**MX645P16, MX645P22**	-	**MX648P16**	-
MTC-Plug 21-pole female connector on decoder	-	-	-	-	-	**MX632D, C**	-	**MX634D, C**	**MX644D, C**	-	-	-	-
Next-Plug	**MX618N18**	-	-	-	-	-	-	-	-	-	-	-	**MX658N18**
Energy-storage conn. (for 16V or 25V electrolytic to 5000 µF)	-	-	-	-	-	yes (25V)	yes (16V) also Goldcap	yes (25V)	yes (25V)	yes (16V)	-	-	

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

...nd-Decoder) for smaller scales

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

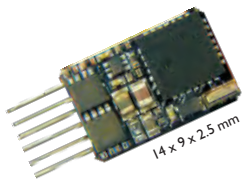
Next18	NEM 651 direct	PluX12, -16	PluX22	21MTC	Wired

MX618N18

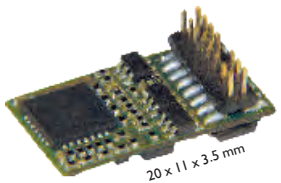
MX621N

MX623P12

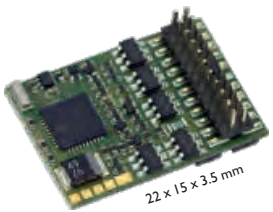
MX622N



MX630P16



MX633P22

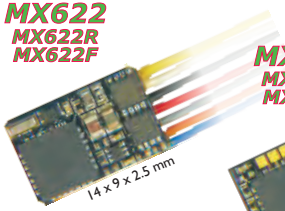


MX634D

Within almost all decoder families a through-hole version is available with free wires (.) or with plug on wires per NEM 652 (R) NEM 651 (F)

for example:

MX622
MX622R
MX622F



MX623
MX623R
MX623F

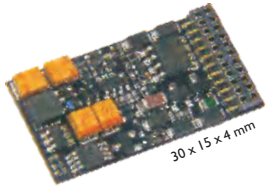
SOUND **MX658N18**

SOUND **MX646N**

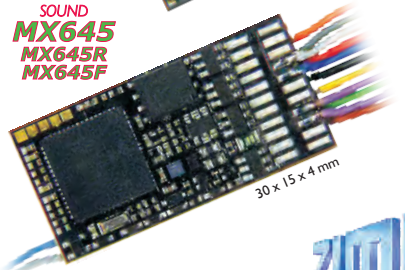
SOUND **MX648P16**

SOUND **MX645P22**

SOUND **MX644D**



SOUND **MX645**
MX645R
MX645F

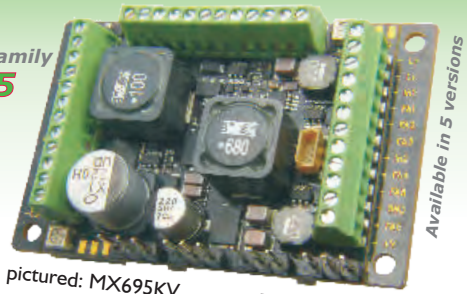


Comparison Table: Large Scale (Sound)Decoders

Decoder Families > / Decoder models >	MX695			MX696			MX697
	MX695KN	SOUND MX695LS | MX695LV	SOUND MX695KS | MX695KV	MX696N	SOUND MX696S | MX696V	SOUND MX696KS | MX696KV	SOUND MX697S | 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)	64 x 29 x 18 (2.5 x 1.2 x .7)	56 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 | 14	8 | 14	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)	5V	- | 5V	- | 5V	6V	-	- | 5V	- | 5 V
Function low-voltage 10V fixed	10V	10V	10V	-	10V	-	10V
Function low-voltage adjustable (Pot.) =1.2V	var.	- | var.	- | var.	-	- | var.	- | var.	- | var.
Audio Power/Imp. (4 Ohm = 8 Ohm or 2 x 8 Ohm parallel)	-	10 Watt / 4 Ω	10 Watt / 4 Ω	-	10 Watt / 4 Ω	10 Watt / 4 Ω	10 Watt / 4 Ω
Connector type (main connector)	32-Pole screw terminals	28 | 36 pins	28 | 36 screw terminals	20-pole pins	20+10 | 20+20 pins	20-pole screw terminals	12 + 12 pins
Connector type (Servo-connector)	4 x 3-pole pins	Solder Pads | 4 x 3-pole pins	Solder Pads | 4 x 3-pole pins	Solder Pads	Solder Pads | Single-Pins	4 x 3-pole pins	Solder Pads | 4 x 3-pole pins
Energy Storage conn. (for 16V capacitors, all types and capacities)	yes (16 V), also Goldcap Module	yes (16 V), also Goldcap Module	yes (16 V), also Goldcap Module	yes (16 V), also Goldcap Module	yes (16 V), also Goldcap Module	yes (16 V), also Goldcap Module	yes (16 V), also Goldcap Module

NOTE: Decoder comparison tables show the differences between the families and types, but NOT those features which are common to all ZIMO decoders, such as DCC + MM, analog operation, Railcom, various protective measures and control features, software update and sound loading capability, SUSI, among others (see page 3).

Decoder Family **MX695**



Available in 5 versions

pictured: MX695KV

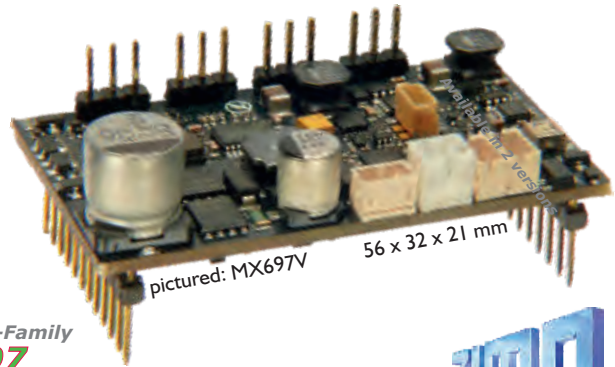
50 x 40 x 13 mm

Decoder Family **MX696**

Available in 3 versions

pictured: MX696V

55 x 29 x 13 mm



Available in 2 versions

pictured: MX697V

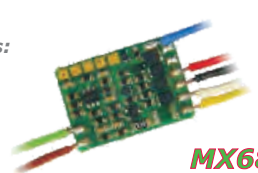
56 x 32 x 21 mm

Decoder-Family **MX697**

Comparison Table: Function Decoders

each decoder family includes multiple types (= different connection variants)	*functions decoder derived from locomotive decoders*			
Decoder Families	*MX621* **MX681**	*MX630* **MX685**	*MX631 (..634)* **MX686**	*MX632* **MX687**
Dimensions mm (in.) circuit board (without heat shrink tubing)	15 x 9.5 x 2.8	20 x 11 x 3.5	20,5x15.5x 3.5	28x15.5x 3.5
Continuous Current Sum of Motor and Function Outputs	0.7 A	1.0 A	1.2 A	1.2 A
Function Outputs including two headlamp outputs	6	8	8	8
Servo/Logic Out optional logic-level outputs on SUSI-Pins	-	2	2	2
Function Low-Voltage	-	-	-	yes (appr. 0.8 A) optional 1.5 or 5 V
Wire Connections NEM 652 (R) / NEM 651 (F)	**MX681**	**MX685**	**MX686**	**MX687**
NEM 651 body connector 6-pole male conn. on decoder (N)	**MX681N**	-	-	-
PluX-Plug 12, 16, or 22-pole male conn. on decoder	-	**MX685P1**	-	-
MTC-Plug 21-pole female connector on decoder	-	-	**MX686D**	**MX687W**
Energy-storage conn.	-	-	yes (25V)	yes (25V)

examples:



MX681

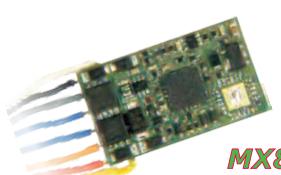
MX685

Comparison Table: Accessory Decoders

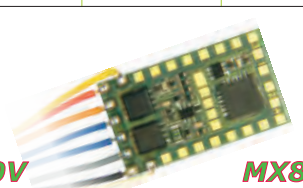
Decoder Families > 7 decoder models in all, in 2 decoder families	**MX820**						**MX821**
Decoder Models>	**MX820E**	**MX820**	**MX820V**	**MX820X**	**MX820Y**	**MX820Z**	**MX821**
Dimensions mm (in.) circuit board (without heat shrink tubing)	19 x 11 x 2 (.75 x .45 x .08)	19 x 11 x 3 (.75 x .45 x .1)	19 x 11 x 2 (.75 x .45 x .08)	19x11x2 (.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)
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	-	-
Light Output each will drive one LED/ lamp @100 mA	-	-	-	8	16	16	-
Servo/Logic level output also for Multiplex Signal	-	-	-	-	-	-	8
Servo Low-Voltage 5 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	8 wires
Energy storage conn.	-	-	-	-	-	-	-

PLANNED

examples:



MX820V



MX820Y

MX618

N, H0e, TT, ... (NO SOUND)

No version with wires available

DCC + RailCom, DC-analog, MM

15 x 9,5 x 2,8 mm

0,7 A motor, total (peak 1,5 A)

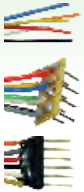
4 function outputs

4 logic level outputs for more functions, servo control line or SUSI

MX618N18
RCN-118 directly on decoder

MX621

N, H0e, TT, ... (NO SOUND)



MX621 *wires only*

MX621R *NEM 652 on wires*

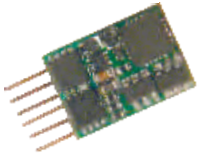
MX621F *NEM 651 on wires*

DCC + RailCom, DC-analog

12 x 8,5 x 2,2 mm

0,7 A motor, total (peak 1,5 A)

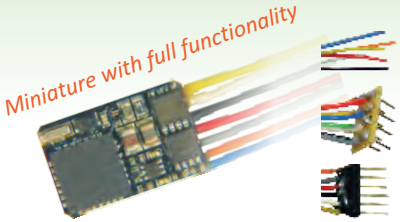
4 function outputs



MX621N
NEM 651 directly on decoder

MX622

N, H0e, TT, ... (NO SOUND)



MX622 *wires only*

MX622R *NEM 652 on wires*

MX622F *NEM 651 on wires*

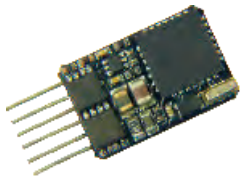
DCC + RailCom, DC-analog, MM, AC-analog

14 x 9 x 2,5 mm

0,7 A motor, total (peak 1,5 A)

4 function outputs

2 logic level outputs for more functions, servo control line or SUSI



MX622N
NEM 651 directly on decoder

MX623

TT, H0, ... (NO SOUND)

MX623 *wires only*

MX623R *NEM 652 on wires*

MX623F *NEM 651 on wires*

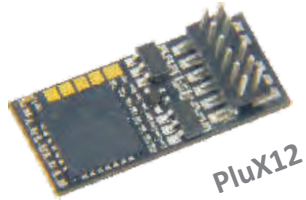
DCC + RailCom, DC-analog, MM, AC-analog

20 x 8,5 x 2,5 mm

0,8 A motor, total (peak 2,5 A)

4 function outputs

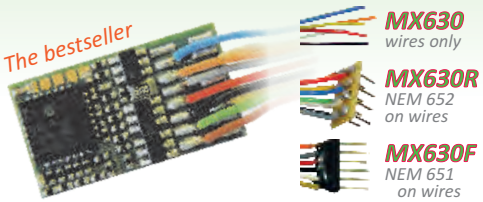
2 logic level outputs for more functions, servo control line or SUSI



MX623P12
NEM 658 directly on decoder

MX630

H0, 0m, ... (NO SOUND)



MX630 wires only

MX630R NEM 652 on wires

MX630F NEM 651 on wires

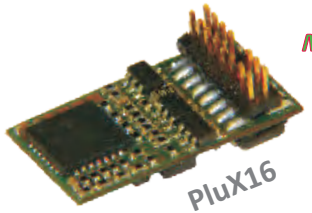
DCC + RailCom, DC-analog, MM, AC-analog

20 x 11 x 3,5 mm

1,0 A motor, total (peak 2,5 A)

6 function outputs

2 logic level outputs for more functions, servo control line or SUSI



MX630P16 NEM 658 directly on decoder

MX632

H0, 0m, 0, ... (NO SOUND)

MX623 wires only

MX623R NEM 652 on wires

MX623F NEM 651 on wires

MX632V, MX632W

variantion with low voltage 1,5 V resp. 5 V

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

28 x 15,5 x 3,5 mm

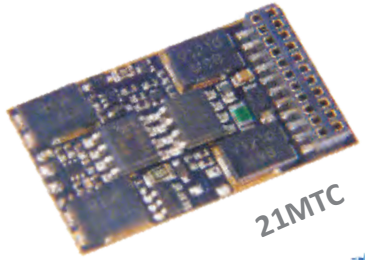
1,6 A motor, total (peak 2,5 A)

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

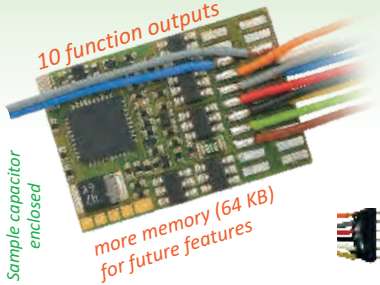


MX632D MTC directly on decoder

MX632C MTC directly on decoder

MX633

H0, 0m, ... (NO SOUND)



MX623 wires only

MX623R NEM 652 on wires

MX623F NEM 651 on wires

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

22 x 15 x 3,5 mm

1,2 A motor, total (peak 2,5 A)

10 function outputs

(„only“ 9 function outputs on PluX-22 available)

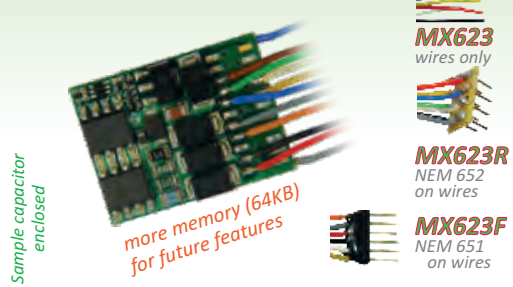
2 logic level outputs for more functions, servo control line or SUSI

direct connection for external energy storage

MX633P22 NEM 658 directly on decoder

MX634

H0, 0m, ... (NO SOUND)



MX623 wires only

MX623R NEM 652 on wires

MX623F NEM 651 on wires

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

20,5 x 15,5 x 3,5 mm

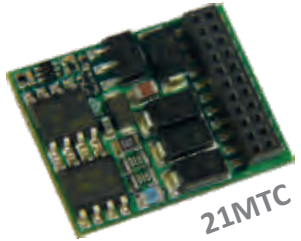
1,2 A motor, total (peak 2,5 A)

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



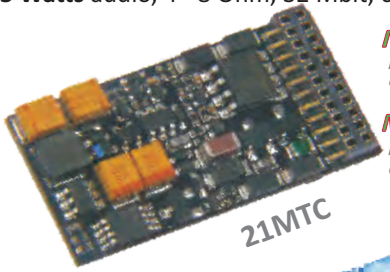
MX634D MTC directly on decoder

MX644

H0, (0) ... (SOUND)

No version with wires available

DCC + RailCom, DC-analog, MM, AC-Analog
30 x 15 x 4 mm
1,2 A motor, total (peak 2,5 A)
8 function outputs
(2 of them - **FA3, FA4** - at **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



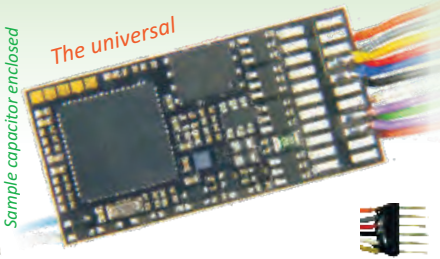
MX644D
MTC directly on decoder

MX644C
MTC directly on decoder

MX645

H0, (0) ... (SOUND)

Sample capacitor enclosed



MX645
wires only

MX645R
NEM 652 on wires

MX645F
NEM 651 on wires

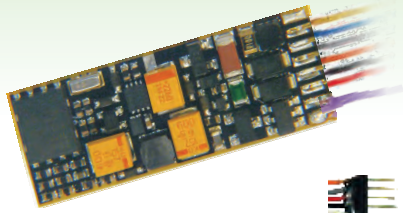
DCC + RailCom, DC-analog, MM, AC-Analog
30 x 15 x 4 mm
1,2 A Motor, total (Peak 2,5 A)
10 funktion outputs
2 logic level outputs for more functions,
servo control line or SUSI
function low voltage 5 V (200 mA)
direct connection for external energy storage
3 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX645P16
NEM 658 directly on decoder

MX645P22
NEM 658 directly on decoder

MX646

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

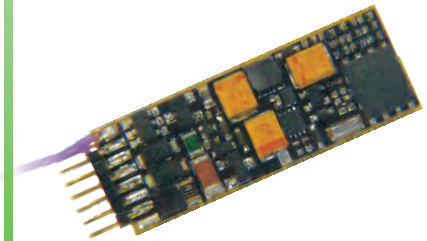


MX646
wires only

MX646R
NEM 652 on wires

MX646F
NEM 651 on wires

DCC + RailCom, DC-analog, MM, AC-Analog
28 x 10,5 x 4 mm
1,0 A motor, total (peak 1,5 A)
4 funktion outputs
2 logic level outputs for more functions,
Servo control line or SUSI
1 Watt audio, 8 Ohm, 32 Mbit, 6 channels



MX646N
NEM 651 directly on decoder

MX646L
NEM 651 angled directly on decoder

MX648

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

MX648
wires only

MX648R
NEM 652 on wires

MX648F
NEM 651 on wires

DCC + RailCom, DC-analog, MM, AC-Analog
20 x 11 x 4 mm
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

MX648P16
NEM 658 directly on decoder

MX658

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

No version with wires available

DCC + RailCom, DC-analog, MM

25 x 10,5 x 4 mm

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

MX658N18

RCN-118 directly on decoder

Next18

RailCom ist ein Markenzeichen der Lenz Elektronik GmbH

Adapter Boards

for PluX- and MTC- decoders

ADAPLU 45 x 15 x 4 mm

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

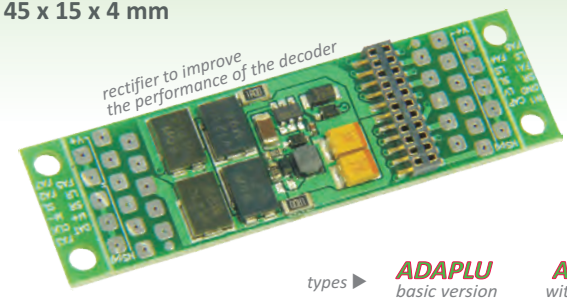
space saving short layout ADAPLU or long layout ADAPLUL (with comfortable solder pads, apart from that identical)

typical combinations -

ADAPLU (or ADAPLUL) with sound decoder MX645P22 plugged in

= sound decoder for „small large-scale locomotives":

1,8 A continuous current, **45 (65) x 15 x 8 mm**



types ▶ **ADAPLU** *basic version* | **ADAPLU15** *with 1,5 V low voltage* | **ADAPLU50** *with 5 V low voltage*

ADAMTC 44 x 26,5 x 4 mm

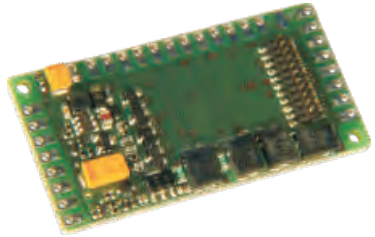
with MTC-21 pin connector and solder pads for the locomotive wiring

typical combinations -

ADAMTC in combination with sound decoder MX644D plugged in

= sound decoder for „small large-scale locomotives":

1,8 A continuous current, **44 x 26,5 x 6 mm**

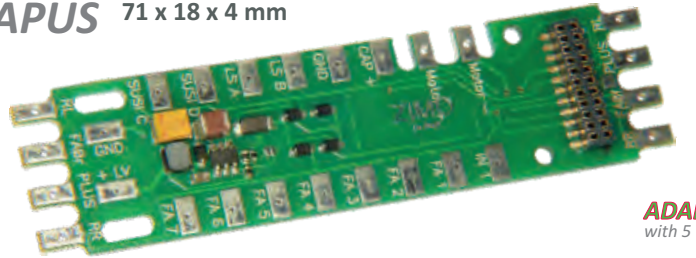


ADAMTC (+ MTC-decoder):

ZIMO Goldcap modules (or self-construction, 7 pieces in series), SUSI-plug (also for fast sound loading)

types ▶ **ADAMTC** *basic version* | **ADAMTC15** *with 1,5 V low voltage* | **ADAMTC50** *with 5 V low voltage*

ADAPUS 71 x 18 x 4 mm



Types ◀ **ADAPUS** *basic version*

ADAPUS15 *with 1,5 V low voltage*

ADAPUS50 *with 5 V low voltage*

with PluX-22 socket and 24 solder pads for locomotive wiring

typical use -

ADAPUS together with plugged in sound decoder MX645P22

= exchange decoder for US-models

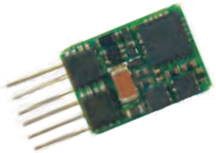
71 x 18 x 8 mm

MX681

function decoder (NO SOUND)
a variation of the loco decoder MX621

MX681
only wires

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



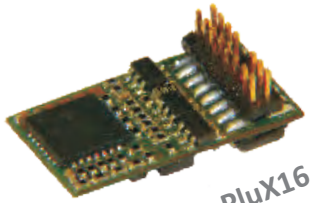
MX681N
NEM 651
directly
on decoder

MX685

function decoder (NO SOUND)
a variation of the loco decoder MX630

MX685
only wires

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



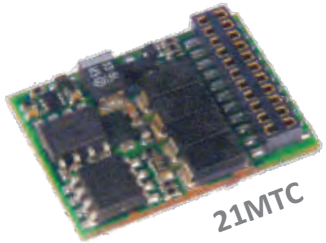
MX685P16
NEM 658
directly
on decoder

MX686

function decoder (NO SOUND)
a variation of the loco decoder MX631 or MX634

MX686
only wires

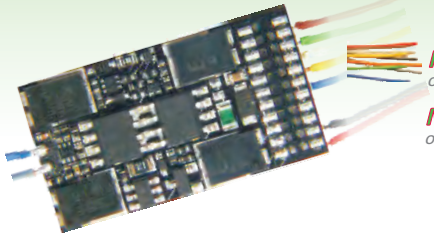
DCC + RailCom, DC-analog, MM, AC-analog
20,5 x 15,5 x 3,5 mm
1,2 A total current
8 function outputs
2 logic level outputs for more functions, servo control line or SUSI
direct connection for external energy storage



MX686D
MTC directly
on decoder

MX687

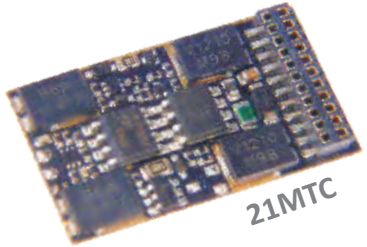
function decoder (NO SOUND)
a variation of the loco decoder MX632



MX687V
only wires
MX687W
only wires

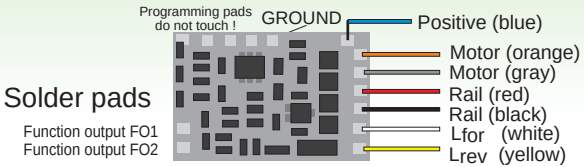
MX687V, MX687W
variations with low voltage 1,5 V respectively 5 V

DCC + RailCom, DC-analog, MM, AC-analog
28 x 15,5 x 3,5 mm
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

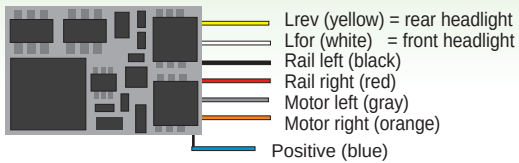


MX687WD
MTC directly
on decoder
low voltage 5 V

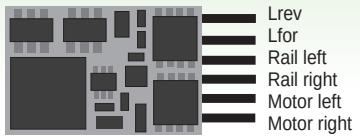
MX621, MX621R, MX621F
Connection Side
(= where the wires are soldered to !)



MX621, MX621R, MX621F
Controller Side
(= where ***no*** wires are soldered to the board!)

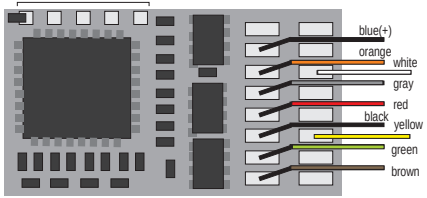


MX621N (= MX621 with 6-pin on board**)**
Controller Side
(this is also the correct installation position)



Programming pads,
do not touch!

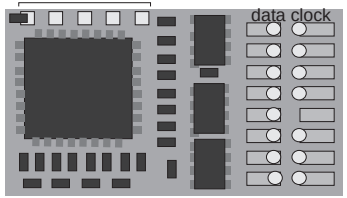
MX630 Top View, wired side



Gemeinsamer Pluspol (bue)
Motoranschluss rechts (orange)
Stirnlampe vorne (= Lvor) white
Motoranschluss links (gray)
Schiene right (red)
Schiene left (black)
Rear headlight (= Lrev) yellow
Function output FO1 (green)
Function output FO2 (brown)

Programming pads
do not touch !

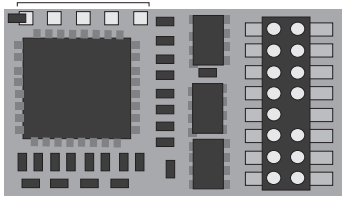
MX630 Top View, pin-out



SUSI, Servo's (2, 1) oder FA6, FA5
Common pos. (+) GROUND
Motor right Lfor
Motor left Common pos. (+)
Rail right --- (Index)
Rail left Lrev
Function output FO1 FO3
Function output FO2 FO4

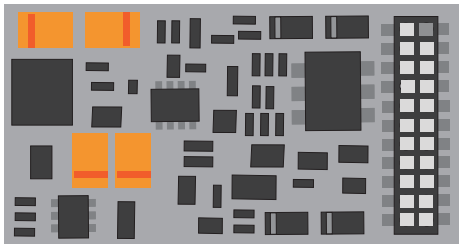
Programming pad
do not touch !

MX630P (with PluX16)



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

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



+ 5 V (200 mA) GROUND
Funktions output FO3 Speaker
Funktions output FO2 Speaker
Funktions output FO1 Front headlight (= Lfor)
Common positiv Rear headlight (= Lrev)
Capicitor negative SUSI Data (FO8, Servo 2)
Motor 1 SUSI Clock (FO7, Servo 1)
Motor 2 Function output FO4
GROUND Function output FO5
Rail left Function output FO6
Rail right Switch input

FO3 and FO4 on the MX644C are logic level
oputputs but „normal" outpus on the MX644D

MX644D, -C **Bottom View**

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

>200 uF
35V

CAP.
Pos.

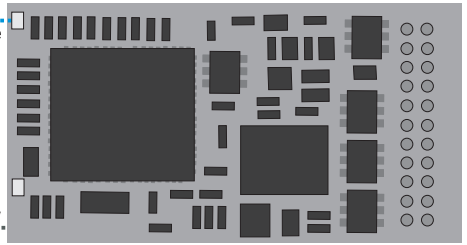
blue

Attention:
CAP. neg is
not the same
as GROUND

CAP
Neg.

gray

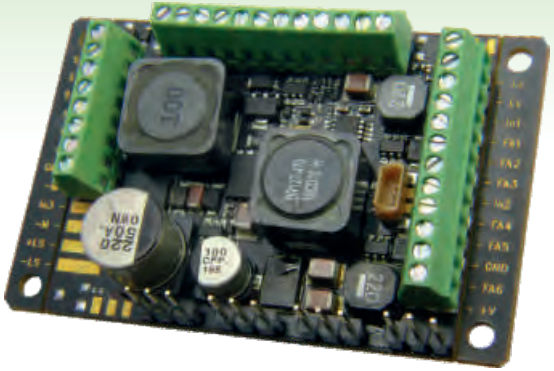
(Is the same as
common positivel)



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

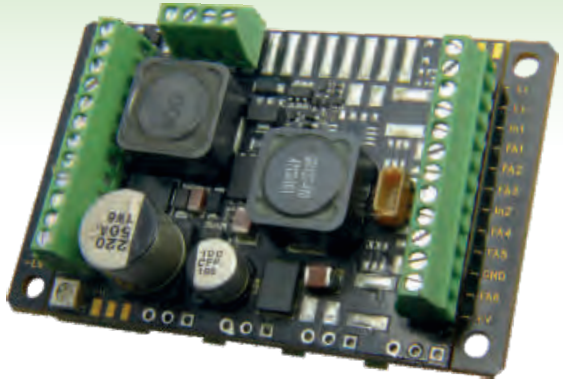
Large scale decoder (NO SOUND) with screw terminals



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

MX695KS

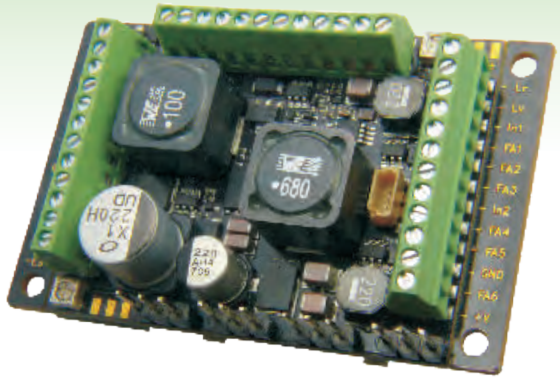
Large scale decoder (SOUND) with screw terminals



DCC + RailCom, DC-analog, MM, AC-Analog
50 x 40 x 13 mm (without break-off plates)
6 A motor, total (peak 10 A)
8 function outputs
1 smoke fan connector
3 gate Inputs
4 servo control outputs (5 V power needs to be provided externally)
1 function low voltage (10 V)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, Goldcaps or battery-switch)
10 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX695KV

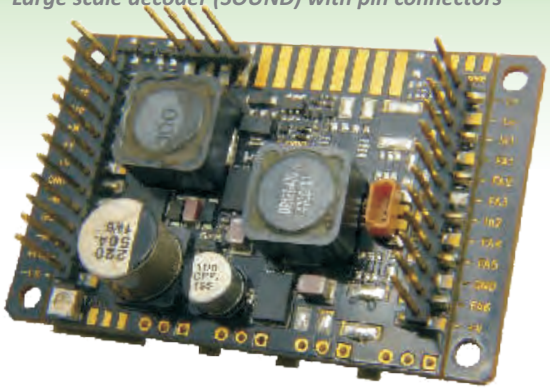
Large scale decoder (SOUND) with screw terminals



DCC + RailCom, DC-analog, MM, AC-Analog
50 x 40 x 13 mm (without break-off plates)
6 A motor, total (peak 10 A)
14 function outputs
1 smoke fan connector
3 gate inputs
4 complete servo outputs (control line, minus, 5 V)
3 function low voltages
(5 V, 10 V, variabel: 1,5 V to track voltage)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, Goldcaps or battery-switch)
10 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

MX695LS

Large scale decoder (SOUND) with pin connectors



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

50 x 40 x 15 mm (without break-off plates)

(extra long pin connectors to plug into loco board)

6 A motor, total (peak 10 A)

8 function outputs

1 smoke fan connector

3 gate inputs

4 servo control outputs (5 V external needs to be provided)

1 function low voltage (10 V)

SUSI (with 4 pin plug)

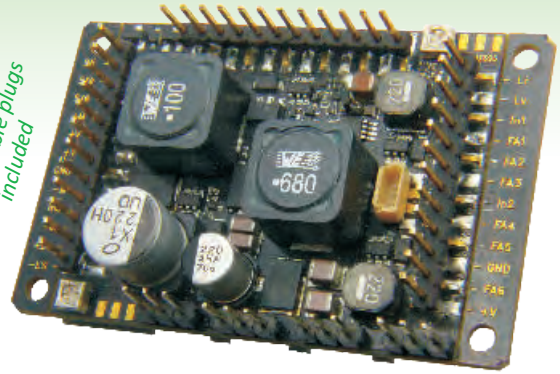
direct connection for external energy storage (capacitors, Goldcaps or battery-switch)

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

MX695LV

Large scale decoder (SOUND) with pin connectors

suitable cable plugs included



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

50 x 40 x 13 mm (without break-off plates)

6 A motor, total (peak 10 A)

14 function outputs

1 smoke fan connector

3 gate inputs

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

3 function low voltages

(5 V, 10 V, variable: 1,5 V up to track voltage)

SUSI (with 4 pin plug)

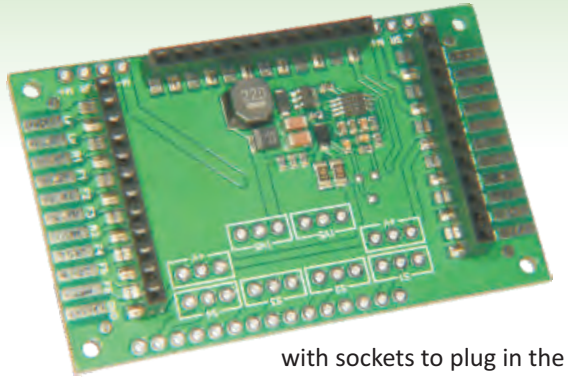
direct connection for external energy storage (capacitors, Goldcaps or battery-switch)

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

Loco Board

designed for use with large scale sound decoder MX695LS

LOKPL95BV



with sockets to plug in the decoder and 34 solder pads for loco wiring

62 x 40 x 10 mm

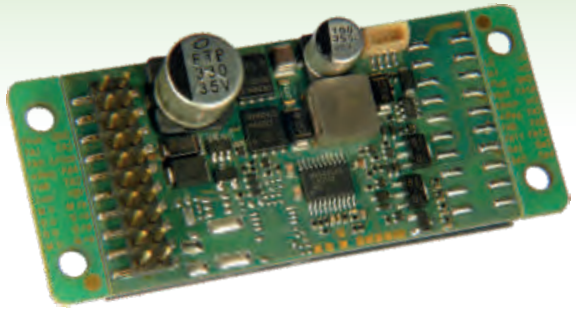
LOKPL95BS/LOKPL95BV15/LOKPL95BV50

set with/without low voltage
fixed via resistor to either 1.5V or 5V

Loco Board with decoder MX695LS plugged in

MX696N

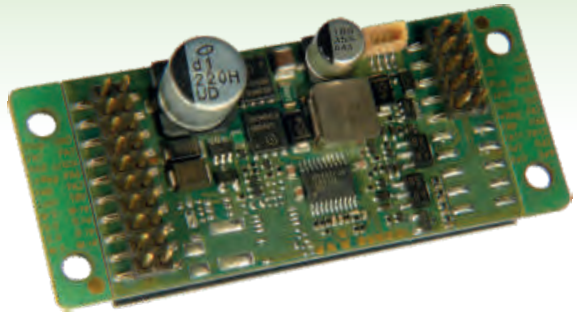
Large scale decoder (NO SOUND)



DCC + RailCom, DC-analog, MM, AC-Analog
55 x 29 x 16 mm (without break-off plates)
4 A motor, total (peak 10 A)
8 function outputs
1 smoke fan connector
3 gate inputs
4 servo outputs (+ 6 V low voltage total)
2 funktion low voltages
(6 V, 10 V)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, Goldcaps or battery-switch)

MX696S

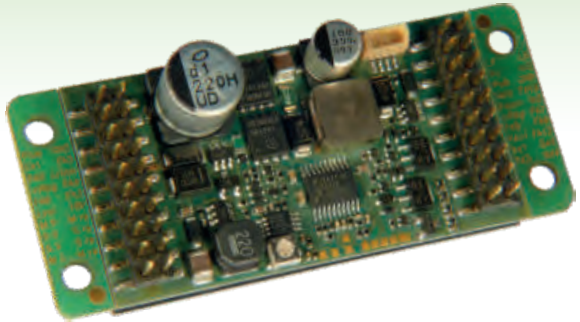
Large scale decoder (SOUND) slim design



DCC + RailCom, DC-analog, MM, AC-Analog
55 x 29 x 13 mm (without break-off plates)
4 A motor, total (peak 10 A)
8 function outputs
1 smoke fan connector
3 gate inputs
4 servo control outputs (5 V external needs to be provided)
1 funktion low voltage (10 V)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, Goldcaps or battery-switch)
10 Watts 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 16 mm (without break-off plates)
4 A motor, total (peak 10 A)
14 function outputs
1 smoke fan connector
3 gate inputs
4 servo outputs (4 control lines, 5 V from variable low-voltage)
2 funktion low voltage
(10 V, variabel 1,5 V to track voltage)
SUSI (with 4 pin plug)
direct connection for external energy storage
(capacitors, Goldcaps or battery-switch)
10 Watts audio, 4 - 8 Ohm, 32 Mbit, 6 channels

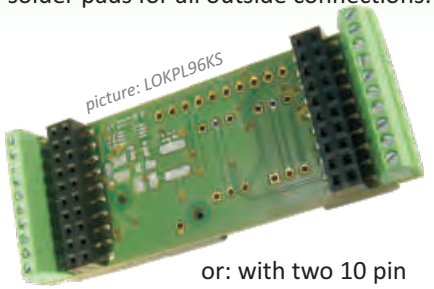
Loco Board

'esigned for use with large scale decoder MX696 (all types)

two 20 pin sockets for plugging in of a decoder MX696 and solder pads for all outside connections:

64 x 26 x 6 mm

LOKPL96LS



or: with two 10 pin screw terminals:

LOKPL96KS

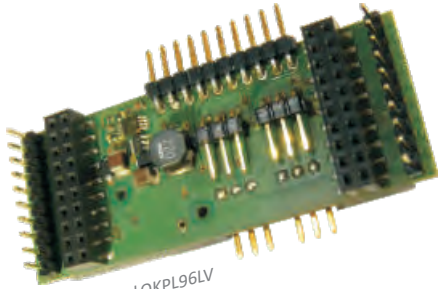
---

like LOKPL96LS but additionally:

4 complete servo outputs
(control, minus, 5 V from own voltage regulator on the LOKPL96)

9 more pin connections for function outputs etc.

LOKPL96LV



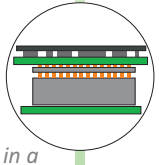
or: with two 10 pin screw terminals

LOKPL96KV

MX696KS

Large scale decoder (with SOUND)
combination of
LOKPL96KS** and **MX696S

nearly a MX695KS, but slim



placement in a 32 mm boiler

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

64 x 29 x 18 mm

4 A motor, total (peak 10 A)

8 function outputs

1 smoke fan connector

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

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

SUSI (with 4 pin plug)

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

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

MX696KV

Large scale decoder (with SOUND)
combination of
LOKPL96KV** and **MX696V

nearly a MX695KV, but slim

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

64 x 29 x 18 mm

4 A motor, total (peak 10 A)

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, 5 V)

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

SUSI (with 4 pin plug)

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

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

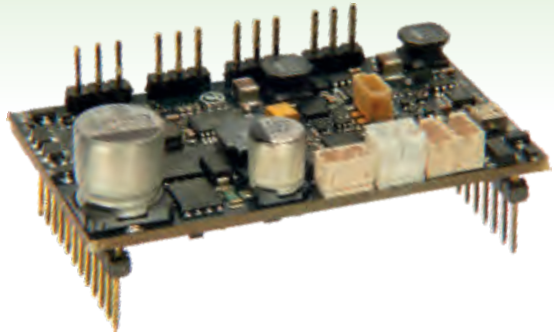
MX697S

large scale decoder (SOUND) for „american interfaces”

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

MX697V

large scale decoder (SOUND) for„american interfaces”



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

MX698

large scale decoder (SOUND) for PluG interface

at time of printing was no picture available

at time of printing was no picture available

MX820 E, D

accessory decoder for 1 switch

MX820E
standard layout, one-sided board assembly

DCC + RailCom

19 x 11 x 2 mm

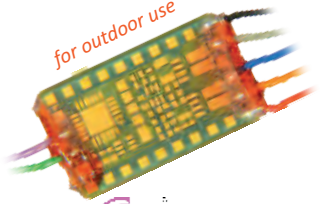
MX820D with waterproof shrink tube: 24 x 12 x 3 mm

1,0 A total current

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

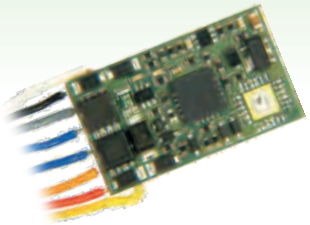
2 inputs for forced switching or stance contacts

MX820D
as MX820E, but waterproof



MX820 V

accessory decoder for 2 switches



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

DCC + RailCom

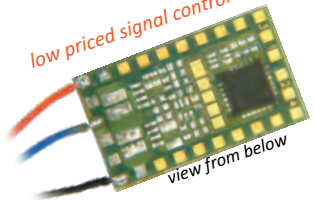
19 x 11 x 3 mm

1,0 A total current

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

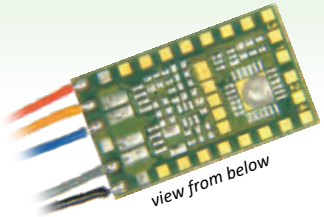
4 inputs for forced switching or stance contacts

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



MX820 X, Y, Z

accessory decoder with light output



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

DCC + RailCom

19 x 11 x 3 mm

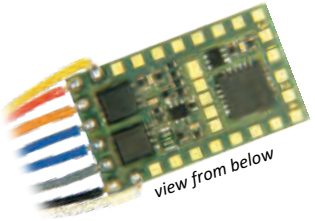
1,0 A total current

1, 2 resp. **0** 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



MX821

accessory decoder for servos and multiplex

MX821E
4 in-/outputs

at time of printing was no picture available

DCC + RailCom

19 x 11 x 2 mm

4 resp. **8** in-/outputs for 4 resp. 8 servo control lines (alternatively as input for forced switching and stance contacts) or

1 resp. **2** (4 wire) multiplex-signals

1 low voltage (5 V, 1 A) for energy

MX821V
8 in-/outputs

at time of printing was no picture available

energy storage for ZIMO decoders

Capacitor-Assortments and ready-to-use-modules

Energy storage can be connected to the decoder . . .

+ to enable driving over un-energized tracks and turnout frogs,
+ to enable interference-free sound reproduction (often in practice the most important point),
+ 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 without further action by the appropriate pins or wires. For other decoders (especially miniature types) additional components are needed. The following ranges of capacitors are available at ZIMO (alternatively, such components can be purchased on the electronics market):

SPEIKOMP . . .

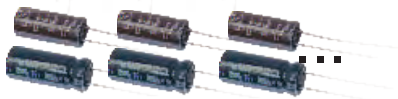
Assortment of capacitors, inductors, diodes, resistors
for a ZIMO decoder
WITHOUT direct energy storage connection,
i.e. for MX621, MX622, MX623, MX630, MX646, MX648

ELKSODR . . .

Assortment of capacitors, inductors, diodes, resistors
for 10 ZIMO decoders
WITHOUT direct energy storage connection,
i.e. for MX621, MX622, MX623, MX630, MX646, MX648

ELKSOMT . . .

Capacitor-assortment (20 x 470µF, 20 x 680µF, 35 V)
for 10 to 20 ZIMO decoders (2 to 3 per decoder)
with direct energy storage connection „35 V"
i.e. for MX632,MX634, MX644



ELKSOPL . . .

Capacitor-assortment (20 x 680µF, 20 x 2200µF, 16 V)
for 20 to 30 ZIMO decoders (1 to 2 per decoder)
with direct energy storage connection „16 V"
i.e. for MX633, MX645

ELKSOGR

Elko-sortiment (5 x 10000 µF, 5 x 22000 µF)
for 5 to 10 ZIMO large scale decoders
with energy storage connection „16 V"
i.e. for MX695, MX696, MX697, MX698

TANTSOPL

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

GOLDSORG . . .

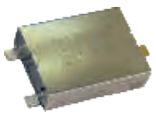
Goldcap-assortment (15 x 1 F, 8 x 12 mm)
for ZIMO large scale decoders and
certain H0-decoders (series of 7 Goldcaps)
i.e. for MX695, MX696, ..., MX633, possibly further enhanced types

GOLMRUND
25 x 14 mm

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

GOLMLANG
60 x 8 x 14 mm

Goldcap - ready-to-use-module (board with 7 pieces, 140000 µF)
for ZIMO large scale decoder and certain H0-decoders
i.e. for MX695, MX696, ..., MX633, possibly further enhanced types



SUPERCAP68
27 x 15 x 5,5 mm

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

Speakers for ZIMO decoders

a lot of sound on little space

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	8 ohm / 1 W

ZIMO special types with integrated sound box;

the sound outputs of the decoders MX644,MX645 are able to operate two 8 ohm speakers parallel (volume effect such as one 4 Ohm / 2 W); with MX646, MX648 only 1 speaker
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

LS1635B	39 x 20 x 8 mm	200 Hz - 20 kHz	8 ohm / 2 W
LS1635V	39 x 20 x 8 mm	200 Hz - 20 kHz	4 ohm / 2 W
LS2040B	58 x 22 x 9 mm	200 Hz - 20 kHz	8 ohm / 2 W
LS2040V	52 x 18 x 15 mm	200 Hz - 20 kHz	4 ohm / 2 W

ZIMO special types (DCC Supplies), partly with bassreflex hole, these speakers are complete „speaker boxes".

LSK50WP	5 cm, low installation depth	170 Hz - 17 kHz	8 Ohm / 3 W
LSK64WP	6 cm, low installation depth	170 Hz - 15 kHz	8 Ohm / 3 W
LSFRS5	5 cm	150 Hz - 20 kHz	8 Ohm / 5 W
LSFRS7	7 cm	150 Hz - 20 kHz	8 Ohm / 5 W
LSFRS8	8 cm	100 Hz - 20 kHz	4 Ohm / 30 W

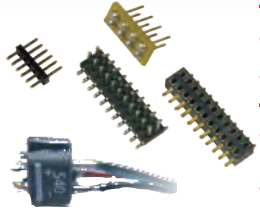
The *ZIMO selection of VISATON for large scale decoders;*

modern ZIMO large scale decoders such as MX695,MX696, MX697 supply the sound amplifier with 10 V and can therefore use full capacity of the speaker performance; other decoders can't do this.

material for ZIMO decoders

plugs, connection material, smoke generator

FLEXL10xx	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)
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**
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 fan for large scale 49 x 29 x 33 mm (without flange), tank volume 4 ml

MXULF , MXULFA

decoder update and sound loading device

✶ **MXULF and MXULFA:** MXULFA = MXULF with display!

„ULF" are the initials of „**U**pdate", „**L**aden", „**F**ahren" (German for loading and driving).

starting screen on the MXULFA, with display of the track voltage for updating

✶ **self-update from USB-stick**

display after self-update on MXULFA; in addition „LED 3" green (also visible on the MXULF)

✶ **decoder update and sound loading with the USB-Stick**

MXULFA tries to find out, which decoder type it is (from the UID)

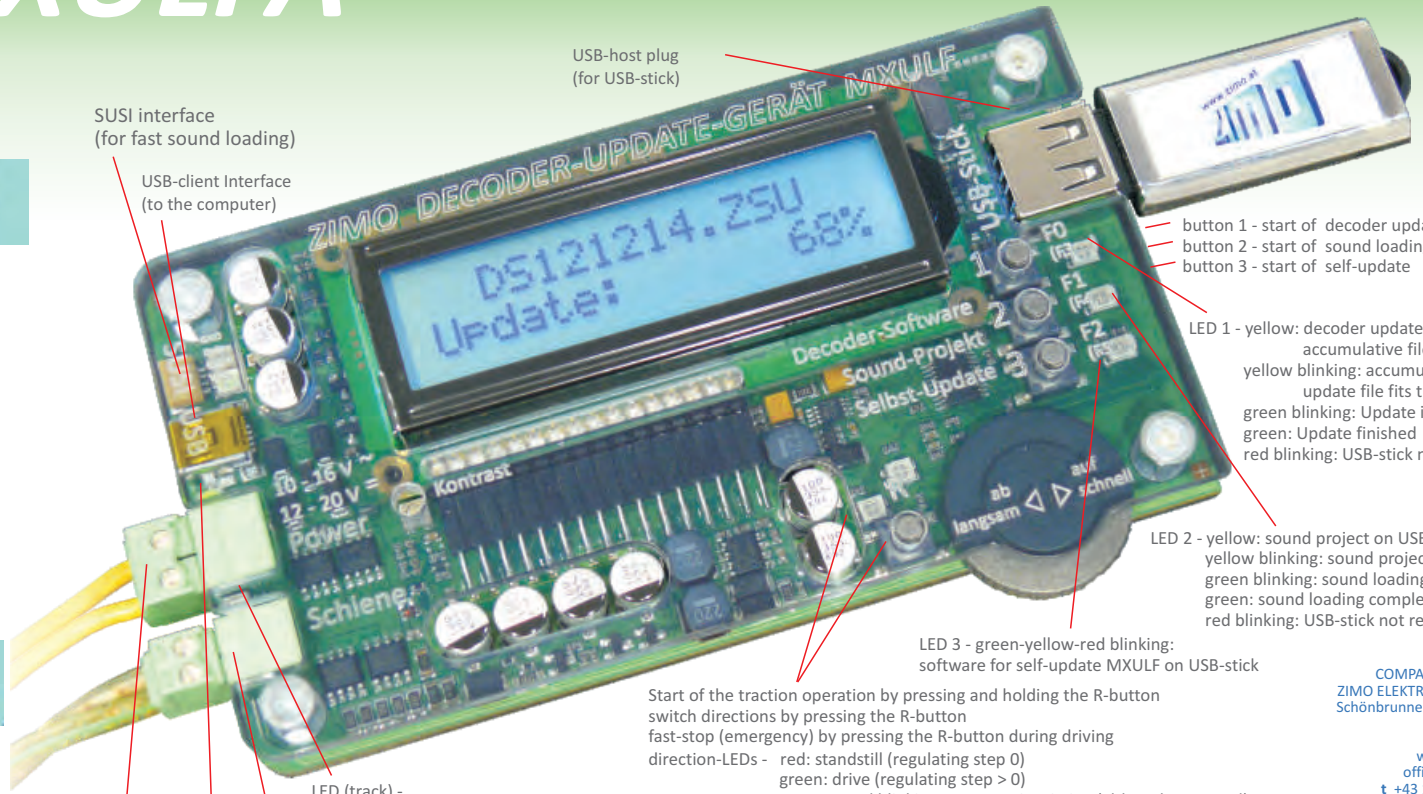
success message

display of the loading progress, both in case of loading via track and via „SUSI loading"

✶ **Driving locos and programming CVs with MXULFA**

„DRIVE" screen with directions, regulating step, address, status of a selection of functions

emergency stop!



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 self-update

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

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

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

Start of the traction 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 blinking: response is missing (although expected)
both LEDs red blinking: short circuit, voltage OFF

power supply (10 - 20 V AC or DC)

LED (track) -
yellow: decoder found at track output
yellow blinking: decoder matches the file on the USB-stick
green blinking: decoder update or sound loading in progress
green: decoder update successfully completed

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

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

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