

# Digital

2021  
APRIL edition



Decoders →

## The System



170 x 200 x 40 mm

MX10 "big" version



140 x 170 x 40 mm

MX10 Economy

MX33FU

80 x 177 x 40 mm



MX33 CAD drawing

### The ZIMO starter sets with MX33 or MX33FU

Each starter set contains a command station, a cab (controller), a power supply unit and accessories (cables, ...):

#### START, -FU, -G, -GFU, -EC, -ECFU

The names of these 6 variants differ by the letters at the end ...

..FU = The start set contains a wireless cab of type MX33FU, otherwise MX33; the basic unit is always equipped with wireless cab.

..G.. = The starter set is preferably intended for large scale railways (Großbahn); it contains a power supply unit with 600 Watt power, which makes full use of an MX10 (otherwise 320 Watt).

..EC.. = The starter set contains an economy base unit MX10EC; not compatible with ..G.

### The starter set with the mouse for the waiting time till the MX33

As long as the MX33(FU) cab is not available, we recommend a **START(EC)WMM**, i.e. a ZIMO starter set with a **Roco Z21 WLANmaus**. The price means that if is purchased mouse is a device at normal cost



### Command stations: the „big“ MX10 and the „Economy“ MX10EC

Both versions are high-performance digital command stations:

**MX10** (the „big one“) has two rail outputs: "rail 1" with 12 A and "rail 2" with 8 A; **MX10EC** ("Economy") has "only" one output with 12 A.

The "full version" MX10 has additionally a built-in sound generator, more current for auxiliary voltages, more "AOS"-pins, a USB client connector (MX10EC has "only" Ethernet), and a Loconet connector (not yet in use).

Most features of MX10 and MX10EC are identical:

Finely adjustable running voltages, overcurrent thresholds, short-circuit spark suppression, the RailCom precision detectors with oversampling for measuring even attenuated signals, Communication with system products via CAN bus, with wireless cabs with "MiWi" radio, with other products via products via XpressNet, to Roco WLANmaus and apps on smartphones & tablets via LAN/WLAN.

### Controllers: MX33 on cable, MX33FU on cable and via radio

The design of the control units of the ZIMO digital system allows them to be used either as **desktop units** or as **walk-around hand controllers**. The MX33 brings a design and ergonomic upgrade over MX32 and potential for future expansion through software updates: Larger screen (2.8 inches) with capacitive multi-touch glass, additional buttons for stop handling and east-west, RGB LEDs (all colours) in the keyboard, multiple processor and memory capacity.

### StEin expansion boards at upper connectors for 8 additional switches (coils, motor, servos), and 16 inputs

## Stationary equipment module

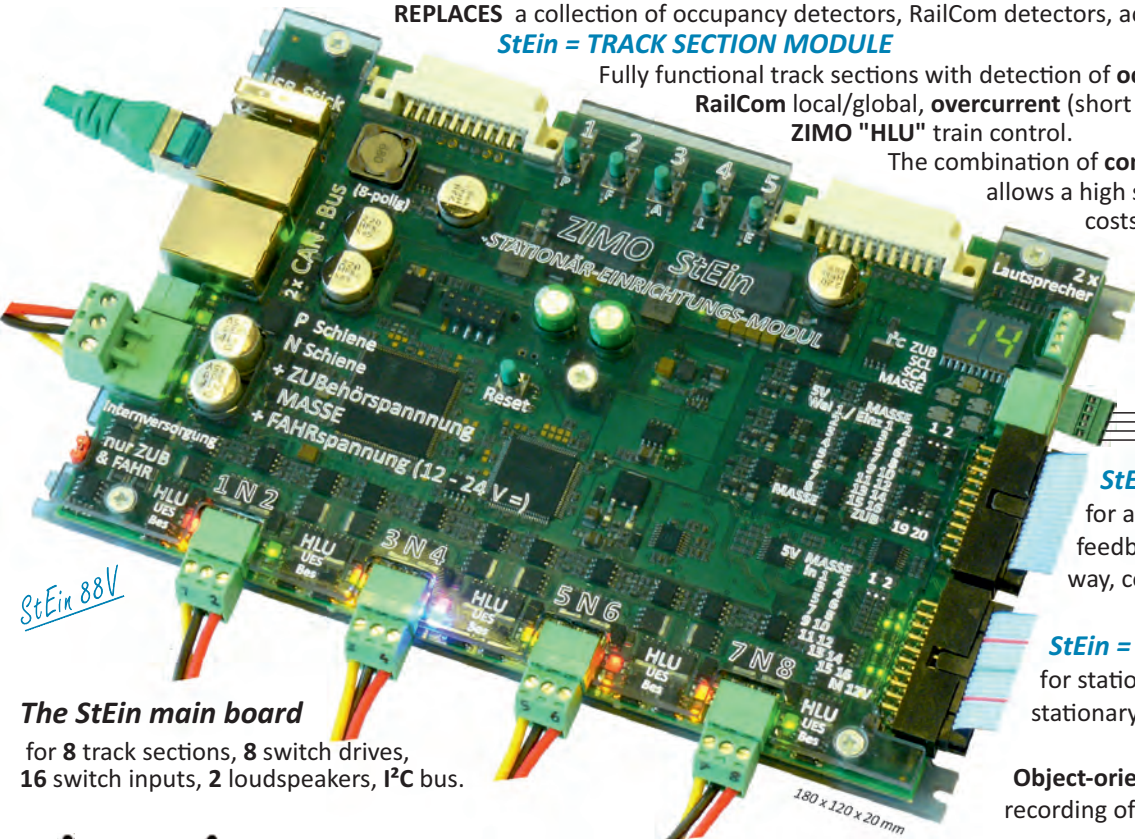
One "StEin" is more than a pure synergy of elements

REPLACES a collection of occupancy detectors, RailCom detectors, accessory decoders, etc.

#### StEin = TRACK SECTION MODULE

Fully functional track sections with detection of **occupancy** and **train number**, **RailCom** local/global, **overcurrent** (short circuit) treatment, and **ZIMO "HLU"** train control.

The combination of **continuous and intermittent ATPs** allows a high stopping point accuracy, saves costs and brings the ZIMO system nearer to ETCS (European Train Control System).



StEin 88V

### The StEin main board

for 8 track sections, 8 switch drives, 16 switch inputs, 2 loudspeakers, I<sup>2</sup>C bus.

**StEin = SWITCH MODULE** for all types of switch drives and feedback signals, two-way, three-way, comprehensive parameterisation.

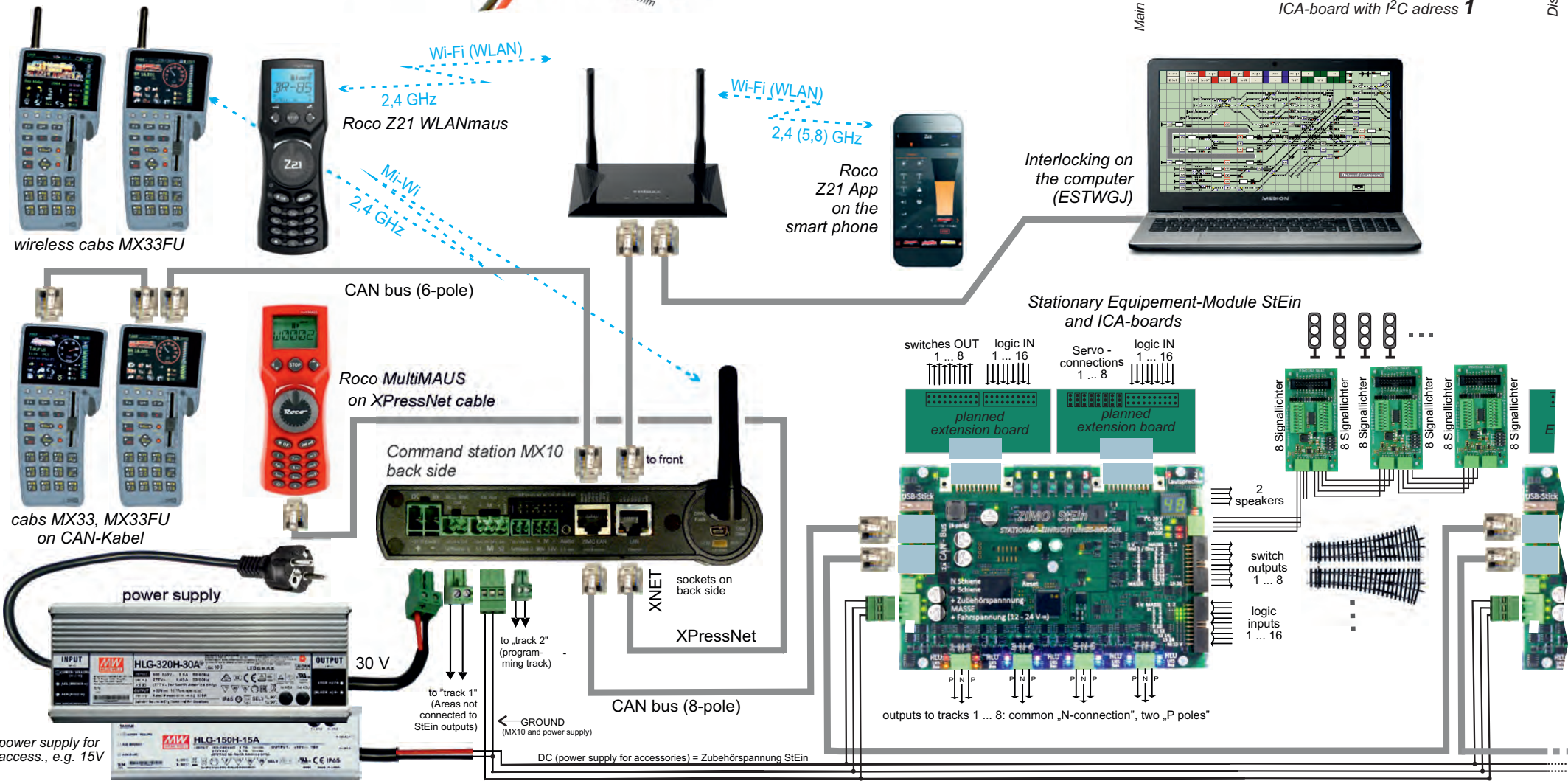
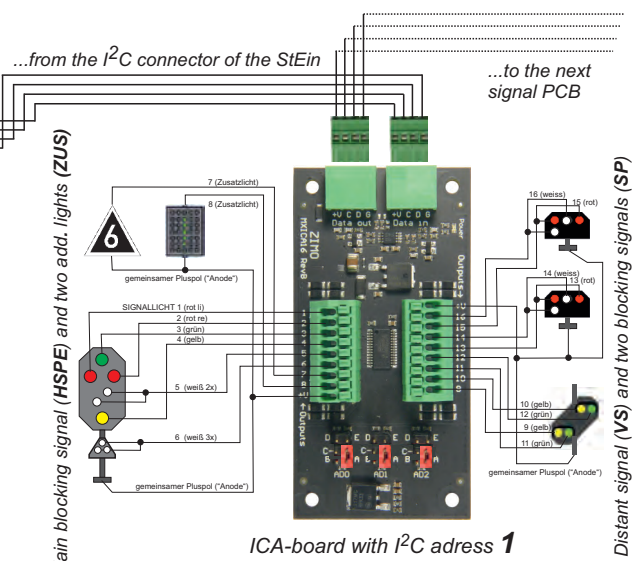
**StEin = SOUND MODULE** for station announcements and all stationary railway noise.

**Object-oriented approach** and tabular recording of the configuration.

## The StEin

### StEin = SIGNAL MODULE

Signals are not connected directly, but via the outsourced **"ICA boards"** for mounting in close proximity to the respective signals. Up to 12 boards are powered and controlled from the I<sup>2</sup>C bus connector of each StEin: each ICA board has 16 outputs for signal LEDs.





## MS SOUND DECODERS

**REAL 16 bits audio** - 22 or 44 kHz sample rate - 16 channels - 128 Mbit memory

The **most powerful microelectronics** found in the model railway world are built into these decoders: "state-of-the-art" 32-bit ARM processors with DSP characteristics (80 MHz, 100 DMIPS).

The **REAL 16 bits** refer to the complete sound project: from the sound files stored in the flash memory to the I<sup>2</sup>S-bus (=Inter-IC-Sound) for playback in stereo, to the fully digital Class "D" amplifier.

**22 kHz Sample rate** by default, but also (defined by the sound project) sound channels of **11 kHz** for simpler sounds (e.g. station announcements) and **44 kHz** for sounds of maximum hi-fi quality.

**128 Mbit sound** memory means 360 sec playback time of high quality (16 bits / 22 kHz); at economical memory usage (8 bits / 11kHz) up to 1440 seconds are possible (neglecting the overhead).

**16 sound channels** can be played back simultaneously and adjusted individually, and can also be distributed to two speakers in "stereo decoders" (especially, but not limited to, large-scale decoders).

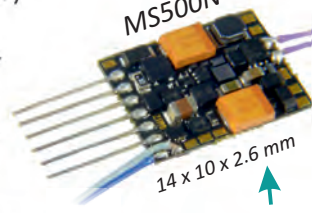
The **timbres** of driving sounds (e.g.: chuff sounds, diesel engine, whistles, horns, ...) can be adjusted via high and low pass filters via CV configuration. (planned at the time of printing).

**Note!** Even "old" (not converted) 8 bit sound projects do sound better with the MS hardware!



### Multiprotocol: DCC, mfx, MM

With the introduction of the MS generation, ZIMO decoders are able to handle not only DCC and MM but also the mfx rail signal, including **automatic registration** with Märklin digital control devices.



**Sub-miniature with sound, but without functional differences to the larger ones.**

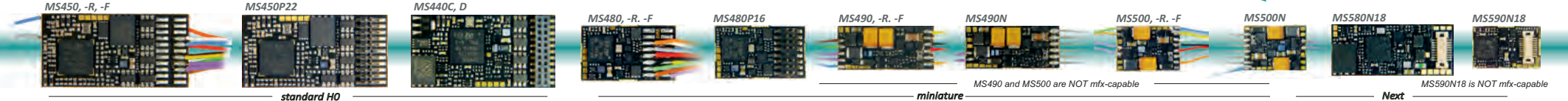


**The new bestseller among the sound decoders, with the PluX interface, which is becoming ever more popular.**

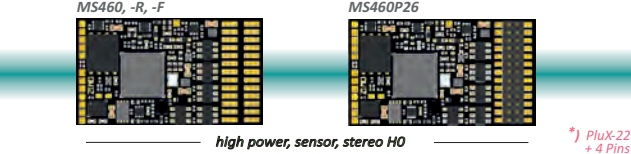


**"Next" (Next18 interface) with internal or external StayAlive.**

**The current full MS list**

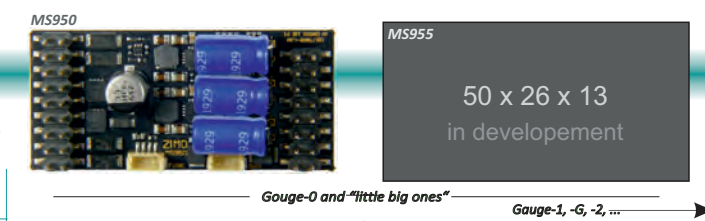


MS decoders (mono) for small scales (N, H0e, HO, ...)	MS450, MS450R, MS450F	MS450P22, MS450P16	MS440C, D	MS480, MS480R, MS480F	MS480P16	MS490, MS490R, MS490F	MS490N, L	MS500, MS500R, MS500F	MS500N	MS580N18, MS580N18G with external mini Goldcaps	MS590N18
Dimensions (mm)	30 x 15 x 4	30 x 15 x 4	30 x 15 x 4	19 x 11 x 3.1	19 x 11 x 3.1	19 x 8,6 x 2,9	19 x 8,6 x 2,9	14 x 10 x 2,6	14 x 10 x 2,6	25 x 10,5 x 4	15 x 9,5 x 3,3
Connections <i>Wires and/or standardized interfaces</i>	<b>13 wires</b> NEM-652, NEM-651	<b>PluX-22, PluX-16</b>	<b>21MTC</b> , F03-F06: logic level (std)/ „amplified“ outputs	<b>13 wires</b> NEM-652, NEM-651	<b>PluX-16</b>	<b>11 wires</b> NEM-652, NEM-651	<b>NEM-651 direkt</b>	<b>11 wires</b> NEM-652, NEM-651	<b>NEM-651 direkt</b>	<b>Next18</b>	<b>Next18</b>
Continuous Current <i>motor+sound+FOs (peak)</i>	<b>1.2 A</b> (2.5 A)	<b>1.2 A</b> (2.5 A)	<b>1.2 A</b> (2.5 A)	<b>0.8 A</b> (1.5 A)	<b>0.8 A</b> (1.5 A)	<b>0.7 A</b> (1.5 A)	<b>0.7 A</b> (1.5 A)	<b>0.7 A</b> (1.5 A)	<b>0.7 A</b> (1.5 A)	<b>0.8 A</b> (1.5 A)	<b>0.7 A</b> (1.5 A)
Function Outputs <i>incl. 2 x headlights (+ logic-level outputs)</i>	<b>10</b> 4 with wires 6 on s.pads (+ 2 logic level)	<b>10</b> 9 on plug 1 on s.pad (+ 2 logic level)	<b>4/8</b> 4 on plug, 4 on s.pad (+ 6/2 logic level)	<b>6</b> 4 with wires, 2 on s.pad (+ 2 logic level)	<b>6</b> 4 on plug, 1 on s.pad (+ 2 logic level)	<b>4</b> all 4 with wires (+ 2 logic level)	<b>4</b> 2 on plug, 2 on s.pad (+ 2 logic level)	<b>4</b> all 4 with wires (+ 2 logic level)	<b>4</b> 2 on plug, 2 on s.pad (+ 2 logic level)	<b>4</b> all 4 on plug (+ 2 logic level) + 2 LED (6 mA)	<b>4</b> all 4 on plug (+ 2 logic level)
Servo - control lines <i>(complete with 5V supply)</i>	2 alternate use of logic-level (NO, ext. 5V needed)	2 alternate use of logic-level (NO, ext. 5V needed)	2 alternate use of logic-level (NO, ext. 5V needed)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, ext. 5V needed)	2 alternate use of logic-level (NO, ext. 5V needed)
SUSI - connection <i>alternatively SUSI, I2C, sound loading</i>	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Switching Inputs <i>for cam sensors, Reed switches, i.a.</i>	1 on s.pads + 2 alternate use of logic level	1 on s.pads + 2 alternate use of logic level	2 on MTC + 2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level	2 alternate use of logic level
Energy Storage - connect. <i>15V - capacitors DIRECTLY on the decoder</i>	yes with wires (no limit)	yes on PluX (no limit)	yes on s.pads (no limit)	yes on s.pads max 1000µF	yes on PluX max 1000µF	yes on s.pads max 1000µF	yes on s.pads max 1000µF	yes on s.pads max 1000µF	yes on s.pads max 1000µF	yes on s.pads max 1000µF	no
Speaker Outputs <i>dep. on dec. 8Ω or 4Ω (2 x 8Ω in parallel)</i>	1 3 watt / 4 Ω with wires	1 3 watt / 4 Ω on PluX	1 3 watt / 4 Ω on MTC	1 1 watt / 8 Ω with wires	1 1 watt / 8 Ω on PluX	1 1 watt / 8 Ω with wires	1 1 watt / 8 Ω with wires	1 1 watt / 8 Ω with wires	1 1 watt / 8 Ω with wires	1 1 watt / 8 Ω on Next18	1 1 watt / 8 Ω on Next18

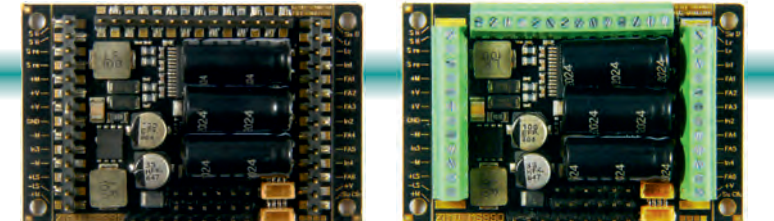


**MS decoders ("stereo") for small and large scales**

MS460, MS460R, MS460F	MS460P26, MS460P22
Dimensions (mm)	30 x 17 x 4.2
Connections <i>Function outputs, servo, SUSI a.o.: MS460 like MS450</i>	<b>15 wires</b> NEM-652, NEM-651
Continuous Current <i>motor+sound+FOs (peak)</i>	<b>1.6 A</b> (2.5 A)
Speaker Outputs <i>dep. on dec. 8Ω or 4Ω (2 x 8Ω in parallel)</i>	2 x 3 watts / 4 Ω with wires



MS950	MS955
Dimensions (mm)	50 x 23 x 13
Connections <i>Function outputs, servo, SUSI a.o.: MS460 like MS450</i>	<b>11</b> function outputs + 4 logic level outputs
Continuous Current <i>motor+sound+FOs (peak)</i>	<b>4 A</b> (10 A)
Speaker Outputs <i>dep. on dec. 8Ω or 4Ω (2 x 8Ω in parallel)</i>	2 x 3 watts / 4 Ω



MS990L	MS990K
Dimensions (mm)	50 x 40 x 13
Connections <i>Function outputs, servo, SUSI a.o.: MS460 like MS450</i>	<b>15</b> function outputs + 2 fan outputs
Continuous Current <i>motor+sound+FOs (peak)</i>	<b>6 A</b> (10 A)
Speaker Outputs <i>dep. on dec. 8Ω or 4Ω (2 x 8Ω in parallel)</i>	2 x 10 watts / 4 Ω

**StayAlive!**

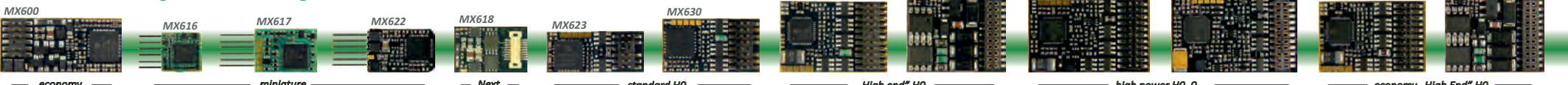
**"StayAlive"** - a ZIMO focus: NO bulky powerpacks, but **space-saving, economical, effective solutions:**

Mini Goldcaps (modules of 6) for direct connection for H0 decoders, (2 or 3 in series) via StayAlive controllers for miniature decoders, onboard capacities in Next decoders up to large scale (all types).

**The flagship of decoder technology**

**Synchronous rectifier** for high performance without overheating, **low voltages** (5 V, 10 V and variable) for functions, **3 StayAlive supercaps** onboard (these 3 are more effective than 2) **2 loudspeaker outputs** (stereo and timbre filter), **2 SUSI-interfaces** (also as I<sup>2</sup>C, sound-load-connector, etc.), **2 smoke generators**, each with its own heating element and fan, **Gyro and acceleration sensor** for inclination and curve measurement.

## MX (NON SOUND) DECODERS



MX decoders (non sound)	MX600, -R, -P12	MX616, -R, -F, -N	MX617, -R, -F, -N	MX618N18	MX622, -R, -F, -N	MX623, -R, -F, -P16	MX630, -R, -F, -P16	MX633, -R, -F, -P22	MX634C, D	MX635, -R, -F, -P22	MX636C, D	MX637P22	MX638C, D
Dimensions (mm)	25 x 11 x 2	8 x 8 x 2.4	13 x 9 x 2.5	15 x 9.5 x 2.8	14 x 9 x 2.5	20 x 8.5 x 2.5	20 x 11 x 3.5	22 x 15 x 3.5	22 x 15 x 3.5	26 x 15 x 3.5	26 x 15 x 3.5	22 x 15 x 3.5	20.5 x 15.5 x 3.5
Connections <i>wires and/or standardized interfaces</i>	<b>9 wires</b> or PluX-12	<b>7 wires</b> or NEM-651	<b>7 wires</b> or NEM-651	<b>Next18</b>	<b>7 wires</b> or NEM-651	<b>7 wires</b> or PluX-12	<b>9 wires</b> or PluX-16	<b>11 wires</b> or PluX-22	<b>21MTC</b>	<b>12 wires</b> or PluX-22	<b>21MTC</b>	<b>9 wires</b> or PluX-22	<b>21 MTC</b>
Continuous Current	<b>0.8 A</b>	<b>0.7 A</b>	<b>0.8 A</b>	<b>0.8 A</b>	<b>0.8 A</b>	<b>0.8 A</b>	<b>1.0 A</b>	<b>1.2 A</b>	<b>1.2 A</b>	<b>1.2 A</b>	<b>1.2 A</b>	<b>1.2 A</b>	<b>1.2 A</b>
Function Outputs <i>incl. 2 x headlights (+ logic-level outputs)</i>	<b>4</b> all 4 with wires or on plug	<b>6</b> 2 wires or pins 4 on s.pads	<b>6</b> 2 wires or pins 4 on s.pads	<b>4</b> 4 on plug (+ 4 logic-level)	<b>4</b> 2 wires or pins 2 on s.pads (+ 2 logic-level)	<b>4</b> 2 wires or PluX 2 pads or PluX (+ 4 logic-level)	<b>6</b> 4 wires or PluX 4 s.pads or PluX (+ 2 logic-level)	<b>10(9)</b> 4 wires or PluX or PluX (+ 2 logic-level)	<b>6(8)</b> MTC (+ 2(4) logic-level)	<b>10(9)</b> 4 wires or PluX (+ 2 logic-level)	<b>6(8)</b> (+ 2(4) logic-level)	<b>10(9)</b> PluX (+ 2 logic-level)	<b>6(8)</b> (+ 2(4) logic-level)
Servo - control wires <i>(complete with 5V supply)</i>	-	-	-	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (NO, external 5V)	2 alternate use of logic-level (YES, version „V“)	2 alternate use of logic-level (YES, version „V“)	2 alternate use of logic-level (NO, external 5V)
SUSI - connect. (altern. SUSI, I2C)	-	-	-	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level	2 alternate use of logic-level
Energy Storage - connect. <i>15V - capacitors DIRECTLY to the decoder</i>	-	-	-	-	-	-	-	yes via wires or PluX	yes via MTC	yes via wires or PluX	yes via MTC	-	-

## SPECIALITIES

**HLU unmatched for 20 years**

From the beginning (1980), "HLU", initially under the designation "signal controlled speed influence", has been a fixed component of ZIMO digital systems and decoders. While DCC, according to the standard, sends **addressed commands** to each individual vehicle, individual **separate track sections** can be given **HLU information** at the same time. These are not addressed, but are location-dependent for decoders located there.

In this way, trains receive HLU instructions to **stop before red signals** or **speed limits**.

HLU information is generated by the track section outputs of a **"StEin module"** (see front of this sheet), usually under the control of a computer controller (interlocking software).

H Halt	7
S UH intermediate	7
U Ultraslow	S
L intermediate	t
FL Slow	u
F Full speed	f
(A voltage OFF)	e
	n

The HLU speed limits (including „Halt“ und „Full speed“)

**That's only with ZIMO:** Features that are unique, or ahead of their time, make a difference to "normal" products. Much is based on sophisticated software. The hardware contributes its share: not geared to lowest cost, but to high quality and sustainability.

**EW right direction**

Since the model railway runs digitally, the direction selected on the controller is not track-related but locomotive-related (Forward = "cab 1 ahead"). This is often, but not always, advantageous. ZIMO offers the possibility to drive specifically in a **given layout-related direction**, called "East" and "West", if required. Technically, this is the phasing of the DCC track signal.

The characteristic feature is: the entire directional logic is NOT simply switched over, but "forward-backward" and "east-west" work together:

- always correct start-up without knowing the rerail direction
- display the complete directional information via RailCom on the controller ("Forward-Backward" and "East-West"), without loss of the usual handling.

**It's all PoM**

For some time now, it has been the general standard to read and program CVs on the main track; however, the classic programming track output is still used for addressing decoders. ZIMO has developed the **re-addressing on the main track** (i.e. in "Operational Mode", PoM).

The "on-track search" is used to **find the unknown address(es)** of one or a few vehicles. The vehicle currently being searched for is briefly de-energised:

**MXULFA**

The decoder update and sound loading device loads the new software or sound project either from the USB stick or from the computer, via the track or (the sound) via the SUSI interface (especially fast).

**innovative RailCom applications!**

its address and (if already present) name appear after a few seconds.