StEin INSTRUCTION MANUAL

EDITIONS:

First edition 2017 12 18
2018 01 02
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2019 12 20
2020 02 08
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2020 04 13

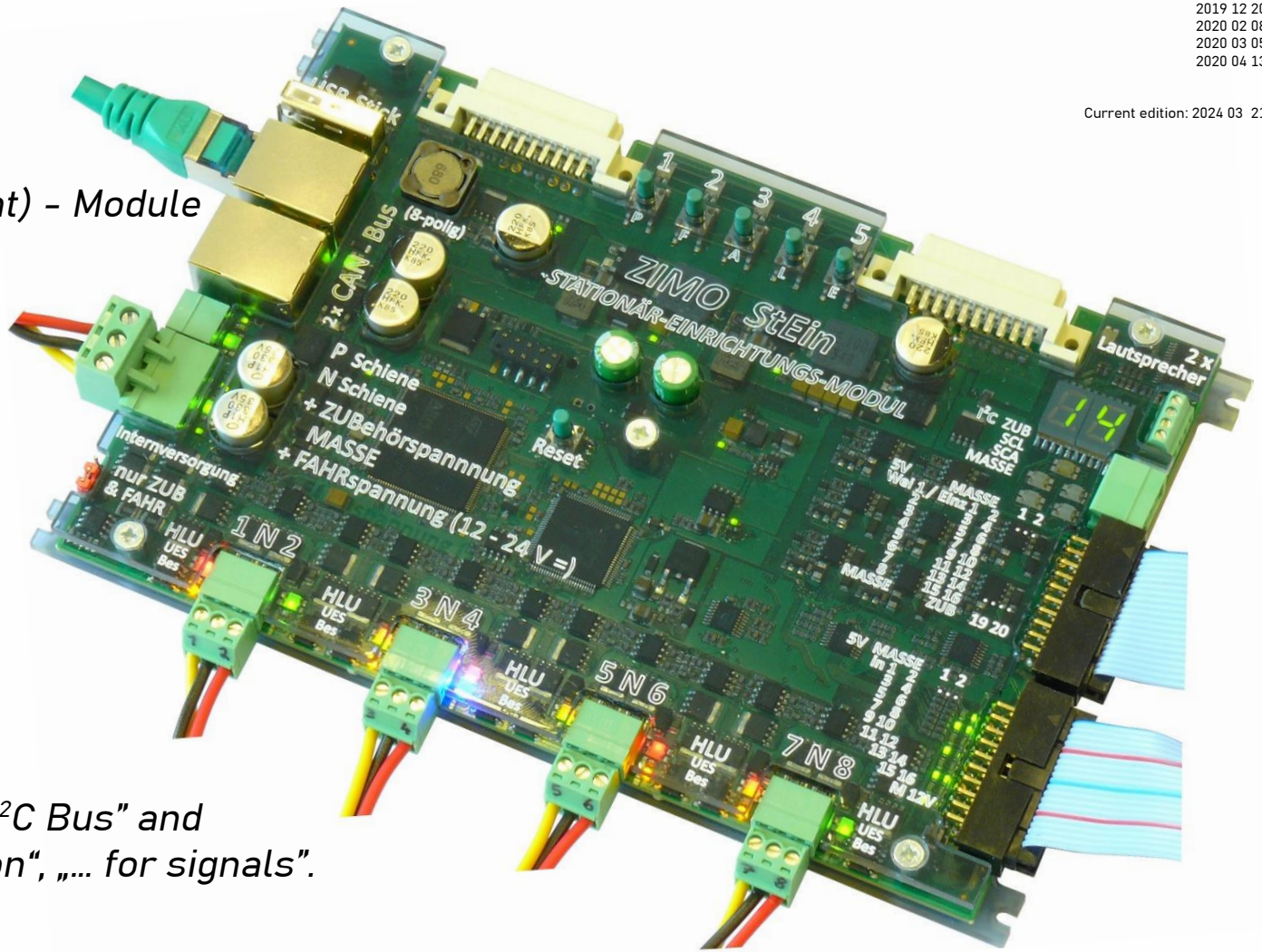
Current edition: 2024 03 21

short for

***StEin** (= **St**ationary-**E**quipment) - Module*

and

StEin expansion boards



*Note: The **"ICA signal PCBs"***
are described in chapter
"The Signal Boards at the I²C Bus" and
„The prepared configuration", „... for signals".

CONTENTS

Chapter Page

NOTES concerning the READABILITY of this manual:

Some parts are designed as double pages, for example the "Description of the objects in parameter sheets": to maintain the overview, please look at the left part (even numbers) and the right part (uneven numbers) together. This is only possible with very broad displays (or more than one displays), or by printing it.

In some sections, the description of the current software implementation takes precedence; this is currently the case in particular in the chapters "The finished configurations" (signals) and "The objects in the parameter sheets" (signals), or also in relation to the "Point sequence commands" in the chapters "Track sections, point detectors, point sequence commands ..." and in the chapter "The objects in the parameter sheets".

This is the identification colour (as font colour, background or framing) for such sections!

Changes

2019 10 17
Front page: reference to ICA signal boards …
Pages 8,9: StEin configuration strategy, cahnges in the text
Chapter „The signal boards connected tot he I2C bus": reference to connection of the ICA boards
in „Description of the objects .." KONFBIB and ADDFERT
Various corrections in tables of „Prepared configurations, signals" and „Description of the objects", Signals
2020 02 08 Chapter „Self update": dot as sign of availability and flashing for loading procedure
Chapter "Button procedures": shortcut to set module number
2020 03 22 Chapter "prepared configuration" Addition to signal conf 62 (in overview table and details) and correction of sheets
2020 05 27 Chapter "prepared configuration" Addition of the heading between ready-made configurations and individual parameter sheet
2020 07 19 Chapter "Self-update and loading", new function "outputing configuration"
2020 08 20 New version of the chapter "Ready-made configurations"
new texts and adverts in the chapter "Self-update and loading the conf., ...
2020 10 24 Chapter "Self-update, and loading...": "Single" and "Multi" as new designations,
partly new texts also for "Output... USB stick
Chapter "prepared": New version "Combinations of finished configurations ..."
Chapter "The objects in the parameter sheets" Insert "Point signalling commands" and "Point signalling commands" table
Chapter "Track sections, point indicators, point sequence commands" rewritten
2020 12 14 Chapter "Structure, technical data, ...", The StEin configuration strategy - section at the end on exporting from Excel
2021 03 11 Chapter "SW update, ...", correction and addition
2021 06 01 prepared configuration 62 ("opulent" HV signals)
2021 07 17 in chapter "prepared configurations" section "Ready-made configurations for signals" new
2021 09 10 Connection diagram for prepared configuration 62
2022 02 27 Partial revision of the chapter "prepared configuration", object classes GATYP, GA: Addition KSA (sweeping loops)
2022 04 02 Chapter "The ready-made configuration": the "reduced ready-made ..60", chapter "The objects...": ADDFERT with "reduced. prepared ...60" and SIGs
2022 09 25 Chapter "Structure, technical data, ...", subsection "The StEin configuration strategy ..."
2022 12 24 Additions and corrections in many chapters; NEW: Notes on features not yet implemented distributed in the description
2023 06 20 New version of chapter 1.2 "The basic principle of the "StEin" configuration", subchapter "outputting the current configuration on usb stick" within the chapter "SW UPDATE, LOADING CONFIG, Sound, ...", in the chapter "The ready-made configurations": additions and explanations, e.g. the meaning of "M", the prepared configuration "60" = DENOSIG, in the chapter "The objects in the parameter sheets": GATYP and GA: redefinition of "KSA - the object class for reversing loops",
2024 02 23 Integrated expansion boards for servos, among other things
2024 03 21 several chapters expanded on, respectively new translations on many pages in particular drawings

SUMMARY of the 2023 06 20 FEATURES NOT YET IMPLEMENTED (although partially described in the operating instructions)

- Ready-made configuration 63 for signals (61 and 62 are available)
- For all objects: system-wide object numbers not yet functional
- For all objects: Connection points on modules other than your own not yet possible
- Object classes KONFBIB, ADDFERT not complete
- Point sequence commands (currently pages 40, 41); there are only a few selected ones for stopping .../H
- Object types GA and GATYP: parameters and settings not yet implemented, including BEFORM =1, PUFFIX, FUBFIX, POSFIX, GLEINF, GKPARAM, ANSPRMX9, ANSPRMX9, APUGK-2,
- Object types SWI and WEITYP: parameters and settings not yet implemented: WEIPANEL (no effect in the MX32), ANTRART (= servo), POSILOG (currently provisional version), REDAUPWM, SERVO..., all greyed out parameters, STELLERK, TSTIMPLNG, TSTIMPIV, TSTIMPSPA.
- Object types SIGTYP, SIGPICTURE, SIG: parameters and settings not yet implemented: SIGART (currently only with plus pole), PANEL, PANSYMB, PANFELD

Notes to software versions and instruction manuals

This page is under construction

SOFTWARE and SOFTWARE UPDATES:

To learn more about the current **software version** and to download a free copy, go to the ZIMO website www.zimo.at and click on the tab **"Update & Software"** ("Update – System").

General information:

- Do not use ZIMO devices in excessively warm or humid locations. The air flow must not be restricted (e.g. by covering) when in operation.
- Cable links shall not be squeezed or put under tension. A tight fit of all connectors is a prerequisite for faultless power or data transmission.
- The devices should not remain under power unattended, i.e. the power supply (or power supplies) should be disconnected from the power grid, ideally via switchable power bar or by pulling the plug from the grid.
- Children under the age of 8 years must be under supervision of an adult when operating the device.
- Improper use or opening of the device without consulting ZIMO may lead to danger or loss of warranty.

IMPORTANT PLANNED IMPROVEMENTS TO THE INSTRUCTION MANUAL

- chapter 7 „Terminal loops"
- chapter 8 „The outputs for 8 turnout or 16 single consumers"

Product features and system configurations

"StEin"- Modules (**St**ationary-**E**quipment-Modules) are used together with a ZIMO base unit (digital control center) of the MX10 series and MX32 or MX33 control panels or ZIMO APPs (as soon as they have been expanded in this direction).

StEin modules CANNOT be used together with other digital systems.

According to the designation (Stationary ...), the "stationary equipment" of the model railway system is connected to the "StEin" (or in practice to several "StEin"),
i.e. - above all –

- **Fully equipped track sections** with occupancy detection and signalling, RailCom Cannel-1 and -2 (local & global), measures for overcurrent and short-circuit, ZIMO HLU for "stop before red signal", speed limits, east-west control.
- **Switches, signals. Uncouplers, etc.** (i.e. accessories of all kinds; for these, "StEin" is an alternative with many advantages over accessory decoders),
- **Light barriers, switching tracks** (signalling contacts for Intermittent ATP = "point train protection"
- **speakers** for station announcements, etc. (currently not implemented in the software).

Computer control is the usual use of the StEin modules, whereby there is particularly close technical coordination with the ESTWGJ g interlocking programme.

In **autonomous operation** (i.e. independent of the computer), certain functions can be used (points and signal switching, occupied and address messages), for example, the current positions of the trains (number of the track section) can be tracked on the ZIMO operating devices.

Automatic shuttle operations (with 3 track sections each and, if necessary, point detectors) can be set up by setting HLU direction information.

Autonomous operating options such as automatic block sections, staging yards, ... are NOT yet realized at this time (December 2022 edition), but are planned.

NOTE to **Roco „Z21 Detector with RailCom"**: This product is a ZIMO contract development and is also manufactured by ZIMO for Modelleisenbahn GmbH (Roco). It is is NOT a "cheap StEin", although certain identical circuit and software elements are used: The Roco detector has NO HLU functions, NO short-circuit switch-off (therefore the control centre must be limited to max. 5A), NO connections for accessories.

Use of the StEin with the current ZIMO system, MX10 and MX32/MX33:

ILLUSTRATION OF THE INTERCONNECTION ON THE NEXT PAGE, Notes on this below:

The power supply for the track and accessory outputs of the StEin:

A special feature of the StEin concept (compared to the occupied and RailCom detectors of other manufacturers) is the independent generation of the rail signal for the track outputs: StEin works like a multiple booster, i.e. synchronised with the base unit (via wires 7, 8 on the extended CAN bus), but without loading the rail outputs of the base unit.

In contrast to this, the typical occupancy detectors on the market (including the Z21 occupancy RailCom detectors built by ZIMO itself) pass the rail signal from the digital centre; incidentally, the "old" ZIMO MX9 track section modules also worked in this way.

Therefore: The output stages of the track outputs of a StEin module are supplied by a DC voltage to be applied to the "+ DRIVE voltage" terminal (against GROUND), NOT by the track output of a base unit. This DC voltage is usually taken from a "DC-out" output (usually S1) of the MX10 base unit.

The accessories (points, signals, ...) to be connected to the StEin are also supplied by a DC voltage; this must be applied to the "+Accessory voltage" terminal (against GROUND); this DC voltage (independent of the DRIVE voltage) can be taken either (smaller applications) from a "DC-out" output (usually S2) of the MX10 base unit, or from an external power supply unit: common for all "StEin", typ. 15 V - 18 V, recommended at least for larger applications.

The accessories (points, signals, ...) to be connected to the StEin are also supplied by a DC voltage; this must be applied to the "+Accessory voltage" terminal (against GROUND); this DC voltage (independent of the DRIVE voltage) can be taken either (smaller applications) from a "DC-out" output (usually S2) of the MX10 base unit, or from an external power supply unit: common for all "StEin", typ. 15 V - 18 V, recommended at least for larger applications.

For smaller applications (up to 5 "StEins"), it is advisable to take the entire supply (for DRIVE voltage and ACCESSORY voltage) from the MX10 base unit: this is then done via a three-pole supply cable (2.5 mm2 cross-section recommended for each) between the triple terminal on the MX10 ("DC-out": S1, GROUND, S2) and the triple terminal on the StEin (+drive voltage, GROUND, +accessory voltage).

ATTENTION: this 3-conductor cable is to connect "Pin 1 to pin 3 and pin 3 to pin 1"

ATTENTION: do NOT use the output "Schiene 2" (track 2) for the programming track in SERVICE MODE, if "DC out S2" is used for StEin accessory power.

The input/output connections of the STEIN88V module:

- **8** track section connections, with up to 8A outputs each (suitable for large-scale trains) and occupancy detection from as little as 1 mA current draw (corresponding to an axle resistor of 10 – 20 KOhm), short circuit detection and shutdown with adjustable thresholds and times, local RailCom (address recognition) and global RailCom (receiving and forwarding complete reports on "Channel 2"), ZIMO HLU speed limits in 7 steps with function influence and location detection
- **8** connections for switch motors (double coil, motor, ...) with position and rotation control. can also be used as 16 individual connections for uncoupling tracks, e.g,
- **16** logic level inputs for all kinds of sensors: rail contacts, photoelectric sensors etc.
- **1** I^2C I2C bus connection, for 16 signal or other boards near the accessories

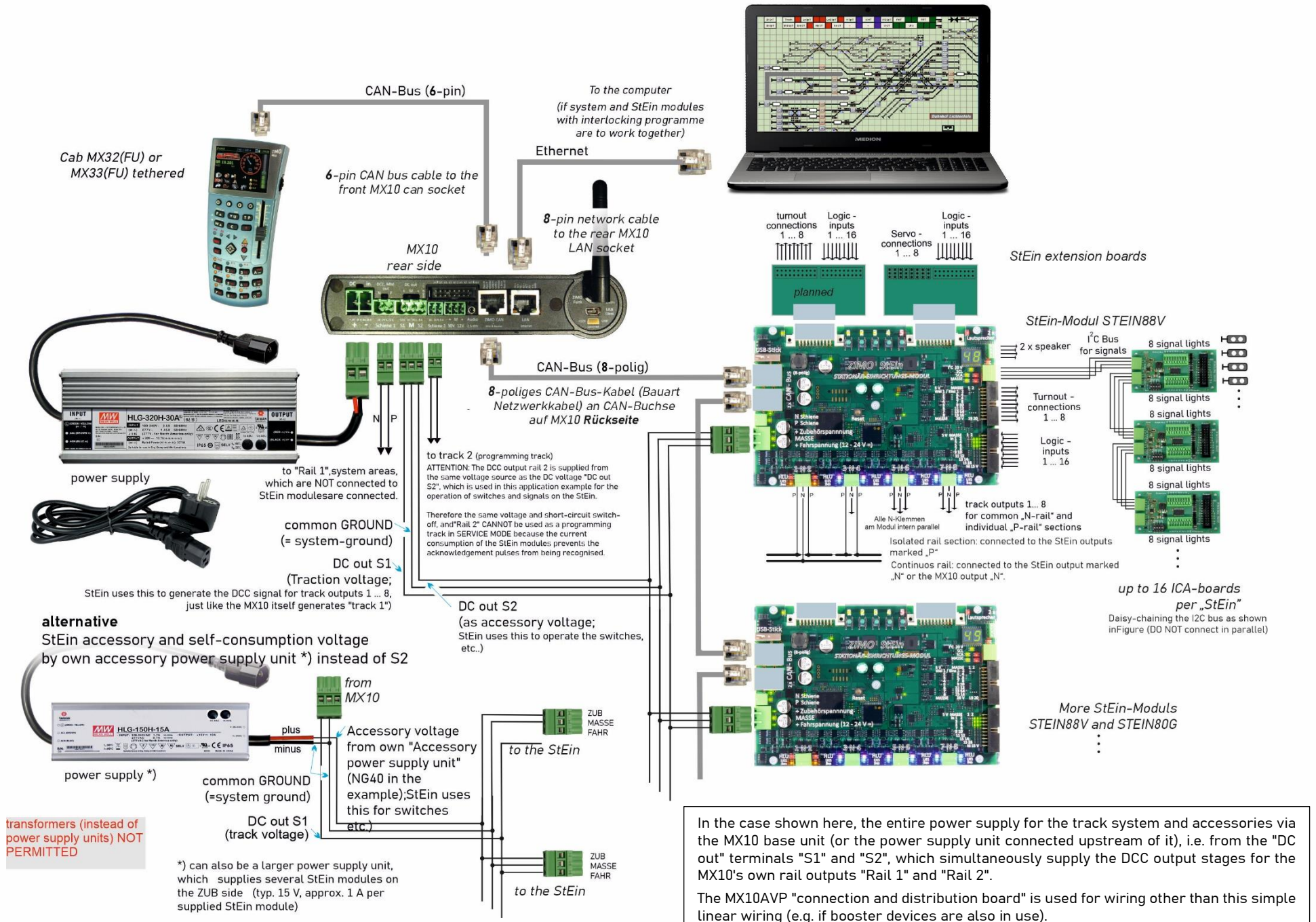
  (Signals: each signal board operates 16 LEDs or several multiplex signals),
- **2** speaker outputs for station announcements etc., from the StEin's internal sound generator,
- **2** connectors for expansion boards (for more turnouts, servos etc.).

Other "StEin" features:

The "StEin" is equipped with a **numeric display** (for displaying the module number and as support for manual setup) as well as numerous control LEDs to show occupancy status, short circuits, HLU status of each track section, input states, switching operations, various internal voltages and operating states.

The **5 buttons** are mainly used for manual module settings, for example: defined HLU settings on track sections (e.g. "slow" or "stop"), later also for automatic dependencies (such as block control or hidden stations) but also for restarts after short circuits and turnout testing etc.

The **USB drive socket** is used for software updates for the StEin module but also to load configurations that are created on external sheets; possibly also for sound files.



In the case shown here, the entire power supply for the track system and accessories via the MX10 base unit (or the power supply unit connected upstream of it), i.e. from the "DC out" terminals "S1" and "S2", which simultaneously supply the DCC output stages for the MX10's own rail outputs "Rail 1" and "Rail 2".

The MX10AVP "connection and distribution board" is used for wiring other than this simple linear wiring (e.g. if booster devices are also in use).

1. Setup technical data, "StEin" configuration strategy, "StEin" data model

***CAN-Bus Control-LED*:**

Green flashing 1 Hz = up to 25/sec messages
2 Hz = up to 100/sec received
5 Hz = up to 250/sec
10 Hz = more than 250/sec
Red flashing = CAN transmission in flashing period

Connection (pin connector) for Expansion

Buttons and LED indicators for local operation and adjustment of configuration parameters

Connection (pin connector) for Expansion board 2

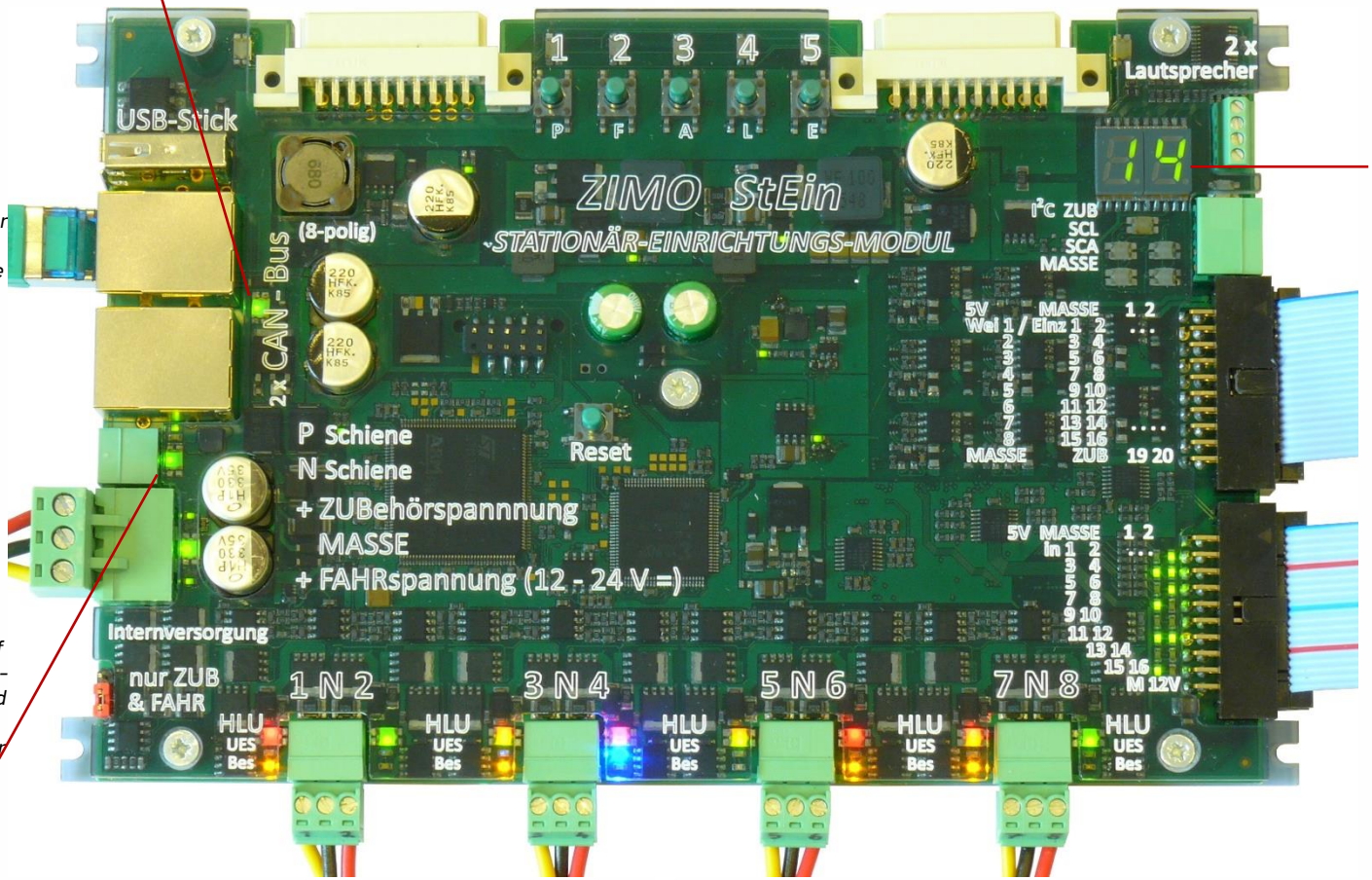
Socket for USB-stick for software update and to load/save the configuration data

2 CAN bus sockets to connect with the MX10 command station (only to the rear CAN bus socket) and to the next module

Only if it's NOT an MX10: Track P N for synchronisation

*3-fold screw terminal to Supply **running** and **accessory voltage**: NOT on output "Schiene" of the MX10, bur "DC out"*
Connections (or individual) power supply units, max. 24 V)

Jumper to switch the supply of the internal circuits (microcontroller, memory, etc), if desired from the accessory voltage (usual case) or from the higher voltage (ACC or LOCO)



Speaker outputs

*Display for **module number** und local operation (buttons)*

I²C - bus to the signal board

Outputs for 8 turnouts (coils, motor, EPL) or 16 single consumers (e.g. uncoupler); included in the 20-pin plug: auxiliary voltages 5V and accessories

16 inputs and LED-indicators for point detectors, photoelectric sensors, turnout feedback and more.

Note: brown letters mean that the connections are only available on STEIN88V, but not on STEIN80G.

***DCC signal control LED*:**

Green flashing 2 Hz = ok
Green/Red flashing = wrong polarity (only possible if DCC via track)
Red flashing = NO DCC (HLU is not possible)

8 track section outputs on four 3-pin sockets, each with 2 "P" (Positive rail) and common "N" (Negative rail) connection. LED indicators for each section: HLU (red/yellow/green), occupancy (yellow), short circuit (blue).

1.1. TECHNICAL DATA:

Power for

Track (DC-out "S1" or "S2" from ZIMO MX10 or separate power supply) ..... 12 - 24 V
Accessory (DC-out "S1" or "S2" from ZIMO MX10 or separate power supply) ..... 12 - 24 V
CAN bus (usually from the MX10 or MX1 CAN bus socket) ..... 12 - 35 V

Output current

on single track outputs (necessarily automatic short circuit switch-off) ..... 8 A
total current of all 8 track outputs ..... 10 A
for each turnout output (or other components) ..... 2 A
total current of all 16 turnout outputs ..... 5 A
for the 5V auxiliary output ..... 1 A

Others:

Minimum current flow at the track for reliable occupancy detection ..... 1 mA
(the occupancy threshold can be set higher than 1 mA in the configuration data)
Internal consumption of the StEin from track and accessory voltage ..... 350 mA
Internal consumption from the CAN bus voltage (if not supplied by track or accessory) ..... 150 mA
Dimensions ..... 180 x 120 x 20 mm

HLU

5 Limits		7 Stufen
	H Halt	
	UH Zwischenstufe	
	U Ultralangsam	
	LU Zwischenstufe	
	L Langsam	
	FL Zwischenstufe	
	F Volle Fahrt	
	(A Spannung AUS)	

The **"HLU" - technique** - also known as "signal controlled speed influence" and "location dependent function control" - is integrated in ZIMO digital systems and ZIMO decoders *).

HLU is a communication protocol from one track output of the StEin module (former MX9 track section modules) to the decoder located on the track section; HLU data can be different from one track section to another (e.g. regarding HLU steps), they do NOT have addresses and are read individually by each ZIMO decoder (and decoders of some other manufacturers).

HLU data usually contain commands to stop trains or reduce their speed to one of the 5 HLU limits; see list above. HLU data reach the decoders practically immediately, because they are sent out about 100 times/sec. On the track section outputs of the StEin, the interlocking program (on the computer) usually sets HLU steps.

*) Some decoder manufacturers also support HLU: known as far from: ESU, D&H, CT

RailCom© im StEin
RailCom ist ein Markenzeichen der Lenz Elektronik GmbH

Similar to the central command station MX10, the StEin possesses high quality RailCom detectors, but 8 of them (for each of the 8 track sections). The analysis of the feedback from the vehicles allows, for example, to show the position of a train on the controller and the interlocking program, or to show the layout-dependent direction East-West.

Note to **SETTINGS OF THE MX10** when using StEin modules concerning the overcurrent and short circuit detection of the StEin modules and the MX10 itself:

StEin modules are equipped with an **overcurrent and short circuit detection** for every track section output; also see chapter "The 8 track sections, overcurrent and short circuit"; here a short description:

In the StEin's **"Parameter sheet"** every track section can be defined individually regarding overcurrent and short circuit handling, whereby generally it is not very useful to set too many or high differences.

In case of overcurrent (typical values between 1 and 3 A in parameters UESLAMP and UESSAZT in the object lines of the track sections) it leads to a delayed switch-off (in parameters UESLAZT and UESSAZT = turn-off time),

In case of short circuits (typical threshold 4 to 8 A according to KUSAMP) it switches off immediately (i.e. after about ½ msec, this CANNOT be configured).

In both cases there is a number of automatic **restarts** (in parameters UESLEAZ, UESSEZ, KUSEZT) after which the system is finally turned off.

In case of overcurrent or short circuits, *usually* only one track section is affected. It would be bad, if an overcurrent/short circuit on a track section connected to the StEIn turned off the track output of the MX10 - which therefore shuts down a bigger range of the layout.

To avoid such misconduct, certain rules have to be complied regarding "Voltage & Current", namely the values for "OVC threshold" and "OVC turn-off time"; sometimes also "OVC tol. current" can be used. All these settings are entered via the main menu "VOLT & AMPERE detail". *).

Values for the turn-off parameters UESLAZT / UESSAZT (if there are differences, the highest value) in the object lines for the track sections	useful value for "**OVC turn-off time**" in the MX10
100 ms (to write into the StEin object), means 0.1 sec	0.3 sec
200 ms (to write into the StEin object), means 0.2 sec	0.5 sec
500 ms (to write into the StEin object), means 0.5 sec	0.8 sec
700 ms (to write into the StEin object), means 0.7 sec	1.0 sec

Values for the higher overcurrent parameter UESSAMP (if there are differences, the highest value) in the object lines for the track sections	useful value for "**OVC threshold**" in the MX10
2000 mA (to write into the StEin object), means 2 A	5 A
4000 mA (to write into the StEin object), means 4 A	10 A
	About 2.5 times or more; the total electricity consumption of the layout is also important

*) **Technical description** to the above described rules (especially the turn-off times):

In contrast to the track outputs of the central command station MX10, the outputs of the StEin do not have a constant current regulation, which would bridge the time until the turn-off (the turn-off time). The StEin hereby relies on the MX10; i.e. when exceeding the overcurrent threshold (according to parameters UESLAMP or UESSAMP, as far as the current stays beneath the threshold for short circuits KUSAMP) the current continues to flow in the amount provided by the output of the MX10 (according to "OVC threshold"). The MX10's track output therefore has to wait until its own turn-off. Therefore the value "OVC turn-off time" has to be set considerably higher than the overcurrent turn-off times UESLAZT and UESSAZT in the StEin, so the StEin output turns off faster and the rest of the layout is not affected.

Note to the **CABLING OF THE TRACK SECTIONS:**
see chapter 8 track section 2!

The basic principle of the "StEin" configuration

The numerous connections of a StEin module for track sections, points, signals, etc., i.e. for the "stationary equipment") can be used very flexibly: from the N layout to the garden railway; from the system-controlled layout to the computer-controlled layout. StEin modules must be configured for use in the respective application; i.e. the "objects" - i.e. the connected track sections, points, signals, etc. - are recorded and described by a series of individual parameters (occupancy and short-circuit thresholds, switching times, etc.).

The list of "objects" loaded into the StEin module forms its configuration - this does not always have to be created individually - often or at least partially, you can fall back on pre-saved tables (the prepared configurations).

Overview: Methods of configuration creation:

This chapter is only intended to explain the method of creating configurations, not their content (which is only mentioned as an example).

The following list starts with the simplest way of creating configurations, followed by methods with increasing design freedom (and greater effort ...).

Use of the **prepared configurations already pre-activated** on delivery:
Often sufficient for the typical H0 layout (possibly also gauge 0 or TT) with "normal" track sections, double coil points and average "German" (or similar) signalling equipment.

- Use of the (**not pre-activated, but) prepared configurations**:
  for large railway or N layouts, different drives, etc. without other "special features". Activate the prepared configurations "manually" by pressing a key sequence on the module or using ready-made "ADDFERT" tables (download from www.zimo.at, customise and load in StEin).
- Use of **prepared configurations, only signal connections** individually defined:
  So that fewer connections of the ICA boards (= signal boards) are lost, as would be the case when using the complete prepared configurations (i.e. WITH signal connection points included).
  In this case (in contrast to the above variants), a separate "parameter sheet" is created in EXCEL, which is then exported from Excel and loaded into the StEin as a .cfg file):
  This defines the connection points (of the first - red - light in each case) of the actual signals present, while the signal types and signal aspects from the prepared configuration apply.
- **Own parameter sheet**, consisting of **customised prepared configurations**:
  If the prepared configurations "almost" fit, but still need to be modified: then these are NOT activated themselves, but their "source codes" are first downloaded from www.zimo.at, entered into an EXCEL sheet and modified, resulting in your own configuration, which is then exported and loaded into the StEin as a .cfg file.
  Note on this: Some users create their own prepared configurations in order to load them instead of the "of-ficially" prepared ones: this is possible, but NOT recommended, because it can easily lead to confusion when troubleshooting.
- **Own parameter sheet**, largely or completely **customised**:
  This is the completely customised configuration (parameter sheet created in Excel, then exported and loaded into the StEin as a .cfg file). Of course, prepared configurations can also be included here for simplification (see above).

***KNOWLEDGE** of the principle of "parameter sheets" is helpful in any case; even if ready-made configurations should be used!*

EXCEL-spreadsheets, Parameter-Sheets, ...

The StEin concept takes into account small, large and also very large applications, with up to several hundred track sections, points and signals.

If the pre-activated or prepared configurations (see "Methods of configuration creation" above) are not sufficient, a custom configuration is created in the form of a "parameter sheet" - a table of "objects" such as switches or track sections and their parameters..

A "parameter sheet" (a short extract from such a sheet) looks like this, for example:

NAME	MODULNR	OBJKL	WEITYP	WEISYSNR	ANTRART	POSILOG	SCHIMPZT	SCHIN	APUANT	APUSTEKO	APUZWAKO	APUHERZPOL
		WEI		0	DOSPU	1	100 ms		5.3			
		WEI		0	DOSPU	2	100 ms		5.4		5.2	
		WEI		0	MOT	2	3500 ms		5.6		5.3	
		WEI		0	MOT	3	2000 ms		5.7			
		WEI		0	EPL	3	200 ms		5.8			
		WEI		0	SERV-0	1			5.E1.3			5.4

Section of a parameter sheet (the first and last columns, columns in between not shown): Object lines for points, therefore all with object class "SWI" (in column OBJKL)

with various drives (ANTRART column), other parameters such as SCHIMZT (switching pulse time in ms), APUANT (connection to StEin module number. Switch pin on StEin); the first two columns (empty here) are optional (to be filled in if sheet for several StEin modules).

The type of configuration is referred to as "**object-orientated**" (as opposed to "address-orientated"): there is an **object** line (a data set) for each object (track section, turnout, ...), and NOT for each address The link between objects and connection points is created by parameters in the **object line** (e.g. APUANT).

The programme **EXCEL** (part of the Microsoft Office package), which is available on most Windows computers, is used to create and edit the **parameter sheets**. It is used to record the data - the objects with their parameters; the typical Excel spreadsheet task does not play a role here (therefore no knowledge of this is required).

By default, EXCEL masters everything that makes the handling of - long - tables simple and - above all - clear: copying and moving rows and blocks, search and replace, insert and delete, highlighting by colour underlay, version management, and (last but not least) extensive print support, e.g. automatic resizing so that all columns fit next to each other, and the like.

The "**parameter sheet" = the configuration** is created offline on the computer, **exported** from EXCEL in csv format and **loaded** into a StEin as a .cfg file **via a USB** stick (or by automatic forwarding to many StEins simultaneously). The loading processes are controlled via the buttons on the StEin (or in another way ...).

Conversely, the current ("active") **configuration can be read out and saved to a USB stick**. This is used to check the configuration effective in the StEin, especially in the case of composite configurations (several prepared configurations, ...), or after changing parameters during operation using an interlocking programme. The file read out can then be edited on the computer.

TIP: Creating your own parameter sheet from scratch is NOT RECOMMENDED for first-time StEin users, because the many parameters initially appear rather confusing and often offer the opportunity for erroneous entries. The "trial and error" approach using prepared configurations is MORE SUCCESSFUL, but should not be retained as a permanent configuration method ...

Object types ... for **clarity** and **flexibility** of configuration:

In practice, where the parameters are the same for many objects, rows are used for **object types** that serve as **templates** for the "actual" objects: for example

a row of the object class SWI (with self-selected type name in column SWI) as a template for rows of the object class SWI ("actual points") or a row of the object class GATYP as a template for rows of the object class GA ("actual track sections").

NAME	MODULNR	OBJKL	WEITYP	WEISYSNR	ANTRART	POSILOG	SCHIMPZT	SCHIMPPWM	UMLAMINZ	AMAXZT	APUANTR	APUSTEKO	APUZWAKO
Norm Weich		WEITYP	WEI-N-DSA	0	DOSPU	1	100 ms	100%	0	0	0	0	0
		OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	FUNFIX	KUSAMP	KUSEZT	ANSPRMX9	APUGA	APUGAV
Mu-Typ 1	26	GATYP	GA-MU-STW	0	3	0	0	0	4000 mA	500 ms	0	0	0
Mu-Typ 2	26	GATYP	GA-MU-FIX	0	0	UH	0	0	3500 mA	1000 ms	0	0	0
Einf.Weiche	26	WEI	WEI-N-DSA	M-1	"	"	"	'	"	"	M.1		
Bahnhof 1	26	GA	GA-MU-STW	"	"	"	"	"	'	"		26.1.	"
Bahnhof 1	26	GA	GA-MU-STW	"	"	"	"	"		"	"	26.2.	"
Haltepunkt	26	GA	GA-MU-FIX	"	"	"	"	"		"	"	26.3.	"
Haltepunkt	26	GA	GA-MU-FIX	"	1	0	L/H	"		800 ms	"	26.4.	"
Strecke re	26	GA	GA-MU-STP	"	"	"	"	"		600 ms	"	26.5.	"

Section of a parameter sheet (12 columns of approx. 30): here, some object types are first defined for points and track sections (rows with object class SWI-N-DSA or GATYP with type names such as "SWI-N-DSA", "GA-MU-STW", etc.).), and further down the "actual" objects, i.e. switches and track sections (lines with object classes SWI and GA and the type names "SWI-N-DSA", etc.), where the parameters to be adopted from the respective type (the "template") are labelled with ", while deviating parameters are filled in with the desired values.

The APU fields (connection points) of the TYP... lines are empty, as there are no connection points for templates, but only for "actual" objects. The sequence (whether all TYP lines and associated objects are in a row or all TYP lines in a block) is irrelevant, but is standardised for the sake of clarity.

SEE next page "Quick start-up"!

Prepared configurations ... *often the* ***first step*** *into the StEin system*:

As described above (see Overview), you can avoid creating your own parameter sheets for the initial commissioning by using prepared configurations that are already available on delivery and only need to be selected (whereby one is always pre-activated for each object type).

These existing prepared configurations are themselves parts of parameter sheets that are automatically introduced when the software is loaded (including during updates).

NAME	MODULNR	OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	KUSEZT	ANSPRMX9	APUGA	APUGAV	APUGK1	APUGK2
02 FERTIG 00		GATYP	GA-FE-LLK	0	3	0	0	500 ms	0	0	0	0	0
02 FERTIG 00		GA	GA-FE-LLK	M-1	"	"	"	"	"	M.1	"	M.1	M.9
02 FERTIG 00		GA	GA-FE-LLK	M-2	"	"	"	"	"	M.2	"	M.2	M.10
02 FERTIG 00		GA	GA-FE-LLK	M-3	"	"	"	"	"	M.3	"	M.3	M.11
02 FERTIG 00		GA	GA-FE-LLK	M-4	"	"	"	"	"	M.4	"	M.4	M.12
02 FERTIG 00		GA	GA-FE-LLK	M-5	"	"	"	"	"	M.5	"	M.5	M.13
02 FERTIG 00		GA	GA-FE-LLK	M-6	"	"	"	"	"	M.6	"	M.6	M.14
02 FERTIG 00		GA	GA-FE-LLK	M-7	"	"	"	"	"	M.7	"	M.7	M.15
02 FERTIG 00		GA	GA-FE-LLK	M-8	"	"	"	"	"	M.8	"	M.8	M.16

One of the prepared configurations, in this case for 8 track sections designed for gauge N; an excerpt from the collective parameter sheet for prepared track sections: consisting of a line with object class GATYP, where the parameters for the subsequent "actual track sections" are defined under the type name "GA-FE-LLK".

The connection points (the columns APUGA for the track sections themselves, APUGK1, APUGK2 for linked point markers) contain the letter "M" instead of the module number otherwise provided there, because the prepared configurations in each module are identical and are only replaced by real object lines (with matching module number instead of "M") after activation (selection).

Only one sheet for **all StEin module**s in a system*:*

In larger systems, a larger number of StEin modules are used; software updates and new modified configurations must therefore often be installed in all or a large number of modules. This would be quite tedious if it had to be done separately for each module (inserting a USB stick, etc.)

It is therefore possible to do this for all StEin modules together by inserting the USB stick with the new software and a collective file containing the parameter sheets for all modules into any of the StEin modules and starting the update and loading from there. The rest of the process runs automatically; the necessary data is transferred to all StEin modules via file transfer.

NAME	MODULNR	OBJKL	GATYP	GASYSNR	BEFORM	GLEINF	BESMNOR	BESMFEU	BESMNAS	GKMINZT	GKPARAM	UESLAMP
	01 StEin	GATYP	GAZIMEN18	0	3	0	1 mA	2 mA	10 mA	50 ms	0	1000 mA
AG 10/09	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"
AG 11/15	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"
MX9 13/13	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"
MX9 11/12	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"
MX9 12/09	02 StEin	GA	GAZIMEN18	0	"							

Example of the parameter sheet (the first 13 columns), which contains object lines for several StEin modules. For differentiation, the MODULNR column contains the numbers of the modules (i.e. those that can be seen on the 2-digit display of the StEin in the normal state) where the respective lines are to take effect. The NAME column, on the other hand, is free for texts without a defined effect.

See chapter "Configuration example "ZIMO N exhibition system" with 7 StEin modules", where the "Total) parameter sheet with the "MODULNR" column filled in provides a good illustration.

Future project "system-wide object numbers" (NOT yet implemented)

In the definitions for the objects of the parameter sheets, columns for parameters such as WEISYNR or GASYNR have been provided since the beginning. These will later be filled with "system-wide object numbers".

The user should then number track sections, points, signals, etc. (each object class separately!!!). (each object class separately!!!) of the entire layout. These numbers are used to address the objects so that it is irrelevant which StEin module (or which type of StEin module family) an object is actually connected to.

This will make reconfiguration easier in the event of repairs, and it will also be possible to plan the system before knowing exactly which modules are to be used (which types will be available at the start of construction)..

NAME	MODULNR	OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	FUNFIX	POSFIX	GLEINF	BESMNOR
	02 StEin	GATYP	GAZIMEN18	0	3	0	0	0	0	0	1 mA
AG 13/15	02 StEin	GA	GAZIMEN18	101	"	"	"	"	"	"	"
AG 13/11	02 StEin	GA	GAZIMEN18	102	"	"	"	"	"	"	"
MX9 13/12	02 StEin	GA	GAZIMEN18	103	"	"	"	"	"	"	"
MX9 13/13	02 StEin	GA	GAZIMEN18	4100	"	"	"	"	"	"	"
MX9 11/12	02 StEin	GA	GAZIMEN18	4200	"	"	"	"	"	"	"
MX9 12/09	02 StEin	GA	GAZIMEN18	4201	"	"	"	"	"	"	"
MX9 12/07	02 StEin	GA	GAZIMEN18	4202	"	"	"	"	"	"	"
MX9 12/05	02 StEin	GA	GAZIMEN18	4010	"	"	"	"	"	"	"

Extract from a future parameter sheet with filled-in fields for system numbers.

The object definitions ... see chapter "The objects in the parameter sheets"

This chapter describes the individual parameters of all objects, i.e. the switches (SWI) and switch types (WEITYP), the track sections (GSA) and track section types (GATYP), the signals (SIG) and signal types (SIGTYP) and the signal aspects (SIGBILD).

The prepared configurations ... see chapter "The prepared configurations"

***NOTE**: The prepared configurations are actually ready-made parameter sheets and are also described in this format, i.e. knowledge of the functions of parameter sheets is necessary to understand them and - even more so - to change them.*

In the following: short summarised instructions for ...
***Quick start-up** with selected ready-made configurations*
(i.e. without creating your own parameter set); only for simple applications

To be able to use a StEin module (or several modules) without configuration effort, the **pre-activated** or **prepared** configurations are used:

Without any intervention, the 8 track section outputs are **pre-activated** to "NNK" (prepared configuration 1, normal H0 track sections), the 8 turnout outputs to "DSA" (prepared configuration 41, double coil drives) and the signals to DEHV (see chapter "14 The prepared configurations", prepared configuration 61, connection diagram for ICA boards).

*The following table is a copy from the chapter "The prepared configurations" (as of November 2022). It contains the **pre-activated prepared** configurations - 1, 41, 61 - for - **track sections, switches, signals** - as well as the **prepared configurations** 2, 3, ..., 42, 43, ..., 62, 63, ...*

Number	Identification	Content description of the prepared configuration	Occupancy thresh
1	**NNK**	8 Track sections, "normal" value for small scales (H0, TT...)	2 / 5 / 10 mA
2	LLK	8 Track sections, low values for occupancy and overcurrent, small scales	1 / 2 / 5 mA
3	HHK	8 Track sections, higher values for occupancy and overcurrent, small scales	5 / 10 / 20 mA
4	LNK	8 Track sections, low occupancy, normal overcurrent values, small scales	1 / 2 / 5 mA
5	NHK	8 Track sections, normal occupancy, higher overcurrent values, medium...	2 / 5 / 10 mA
6	NNG	8 Track sections, typical values for large scales (G, 1...)	5 / 20 / 50 mA
7	LLG	8 Track sections, low values for occupancy and overcurrent, large scales	2 / 10 / 30 mA
8	HHG	8 Track sections, very high values for overcurrent/short circuit, gauge 1	5 / 20 / 50 mA
29	KSA	1 Reverse loop section instead of the previously defined section 7, 8	Occupancy ar

Number	Identification	Content description of the prepared configuration	Switch/Actuatior
41	**DSA**	8 double coil turnouts with end switches	0.1 sec
42	DSN	8 double coil turnouts without end switches	0.2 sec
43	MWA	8 motorized turnouts with end switches	3 sec
44	MWN	8 slow motion switch machines with end switches	5 sec
45	MWD	8 motorized turnouts (for continuous current)	0
46	EPN	8 EPL-turnouts without end switches	0.2 sec
47	SWA	8 Servo-turnouts with end switches and relays connection	3 sec
48	SWM	8 Servo- turnouts without end switches and without relays connection	3 sec

Number	and name	Content description of the prepared configurations
60	DENOSIG	Only signal types and signal aspects for HV signals; WITHOUT "actual" signals
61	**DEHV**	in total about 100 signals of the HV system, mixture of the most important types
62	DEHVXL	Similar to DEHV, but fully equipped signals (beacon, etc.), but less
63		
64		
65		

If the pre-activated prepared configurations are not to be used, but one or more of the prepared configurations are to be activated instead, the selection is made using a "button procedure" (see chapter "3 The button procedures for manual operation") - the 5 buttons at the top of the module and the double-digit display.

The following illustration is an extract from the chapter "The button procedures for manual operation..." (as of November 2022):

Press and hold button-3 (button-3 A for "Activate") → A. 1.

Button-5 → Counting down the number of the prepared configuration to be activated (according to the list of prepared configurations, e.g. 1 for "NNK", 2 for "LLK", ...

Button-3 → Counting down the number of the prepared configuration to be activated e.g. up to the desired number "43" for "MWA". 4. 3.

Button-4 → **Activate** the selected finished configuration, confirmed by A. A

If further prepared configurations are to be activated:
Button-5 → Counting up ...
Button-3 → Counting backwards ...
Button-4 → **Activate ...** can be repeated as often as required until all the desired prepared config. have been loaded.

A **ZIMO control panel (MX32 or MX33)** can be used to **control** and **monitor** the equipment (track sections, points, ...) connected to the Stein module on a **test basis**. Even if - as in most cases - the actual aim is to use the Stein modules under computer control, the display and control options on control panels (in future also apps) are very useful for testing and troubleshooting.

The following is an extract from the chapter „Operating the StEin from the MX32/33 controller" (Nov 2022)

The StEin LIST can be accessed from the LOCO (IN) or SWI operating statuses by: **E button** + 8 " StEin LIST

In the StEin LIST, all StEin modules in the system are represented by one line each, sorted by module number.

Scroll-Wheel " Selection of a specific module (module number)
↑ (Shift)-Button (short) " Switch between the displays for track sections, signals inputs and switches in the first line of the selected module. The displayed elements can be operated using the number keys:

GA – track sections: The following are displayed for each of the 8 connections:
- the active HLU status (illuminated dot in colour gradation, like the red-green LED on the module itself),
- the busy signal (yellow illuminated dot, like the yellow busy LED on the module),
- Overcurrent and short-circuit states (blue illuminated dot, similar to the blue LED on the module),

The HLU states of the track sections can be switched from the controller:
- Press the corresponding digit key SHORT " one level up (i.e. H "UH, HU "U, etc.),
- Press and hold the corresponding numeric key " Display the list of HLU states, select by pressing the numeric key

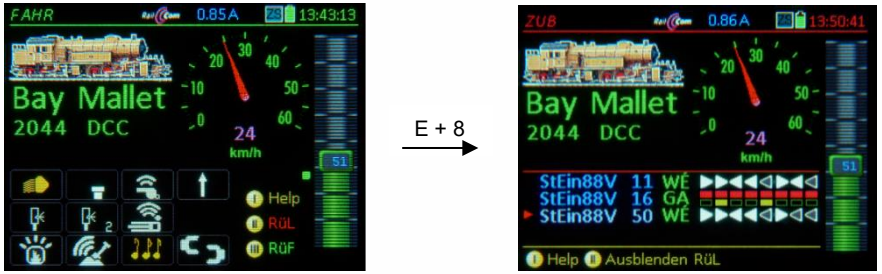
Switch a track section back on after a short circuit using the numeric key!

WE – turnouts or single outputs: The current position is displayed for each of the 8 points outputs (2 pins each):

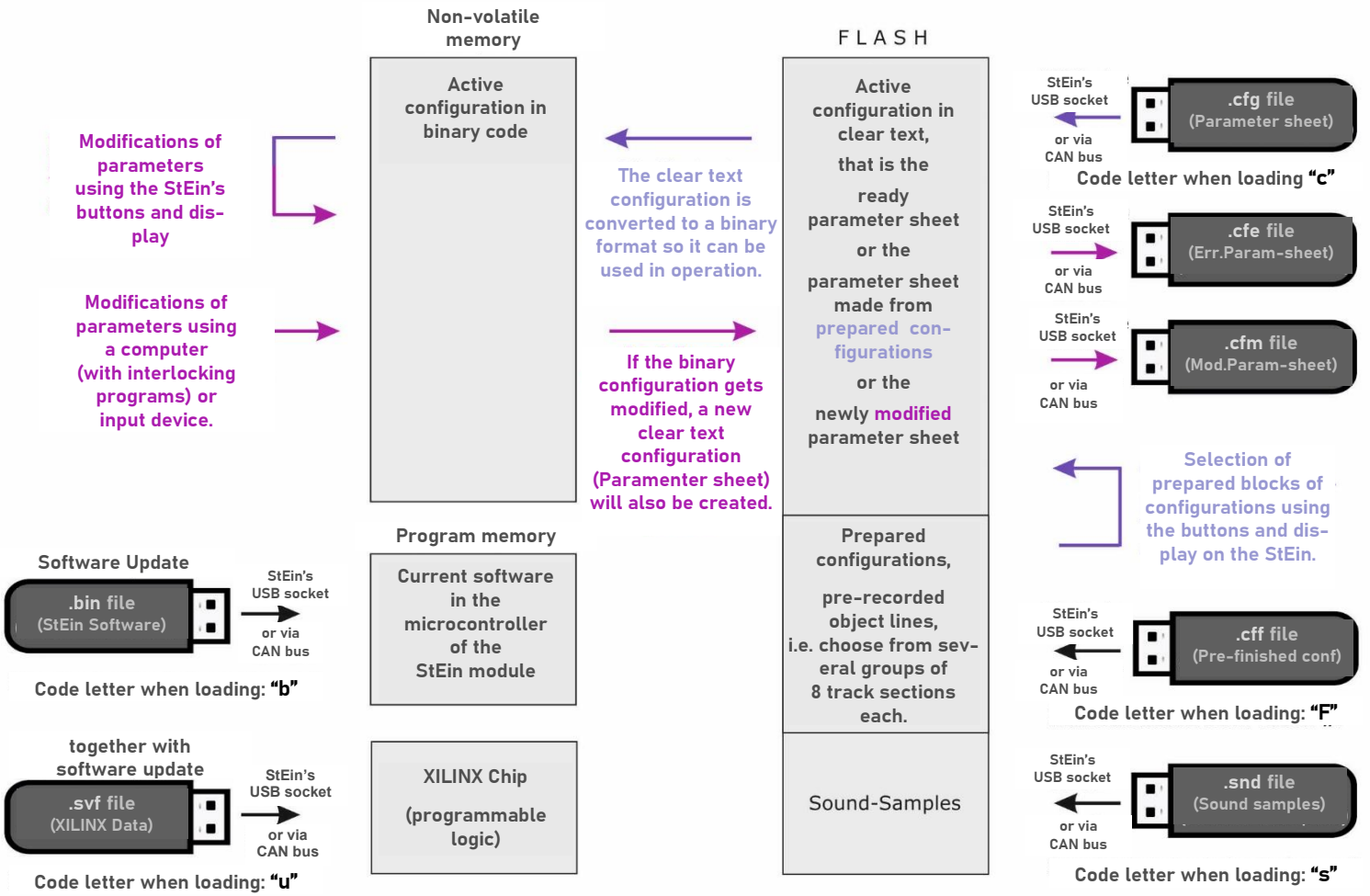
The points can be switched from the controller by pressing the respective numeric key:

IN – switch inputs: The current status is displayed for each of the 16 switch imputs (green illuminated dot means ON).

↑ (Shift) - button (LONG) " Software versions of ALL StEin modules in the list are displayed (for a quick overview)



The "StEin" Data model



Loading the Configurations into the StEin:

The list of the object lines for the StEin Module is called **parameter sheet.** This sheet is created with the program Excel. Exporting from Excel creates a **.cfg file,** which can then be uploaded to the StEin.

Configuration data output by the StEin:

Err.Param-sheet: Details about incorrect information in the parameter sheet, in the same format and layout.

Mod.Param-sheet: The parameters of the original sheet can be edited using local inputs on the StEin or via interlocking programs. From that, a new parameter sheet will be created for possible further editing.

Prepared configurations as alternative:

For a quick start-up or a permanent solution for smaller applications, select groups of object lines (i.e. 8 turnouts) that are already in the software **at the time of delivery** (but can be exchanged later with .cff files).

The so composed object lines can also be converted to a **Mod.Param-**sheet and read-out for external editing (see above).

Loading Sound:

Sound projects are created and loaded similarly to sound decoders.

2. Self update and loading config, sound and other data

The StEin module (like every ZIMO product) is software update-capable, i.e. a new software version can be loaded as soon as it is available at www.zimo.at. In addition to the software, however, there is a range of data that can also be loaded in the form of files and some of which can also be read out. All charging processes are carried out from a **USB stick** (later perhaps also directly from the computer).

One, several or all 5 file types can be provided for loading **on a USB stick** (in the root directory), but **only one file per type on the stick!**

Type:	.bin file	.svf file	.cfg file	.cff file	.snd file
Code letter:	"b"	"u"	"c"	"F"	"n"
Contents:	new software	XILINX-data	Configuration	Finished config.	Sound

As several or many StEin modules are often used in systems, software updates and configuration loading are very time-consuming if they are carried out individually for each module.

Therefore, an alternative is **"SIMULTANEOUS** loading of **all modules** of a system" (new software version, i.e. update, and/or new configuration) by connecting the USB stick to a single (any) module, which distributes the data to all other modules.

There is also the alternative "**CONTINUOUS** loading of **all files** (without operating steps)

Variants 1, 2, 3 and 4 of the charging process are described on the following pages.

The **LEDs** above the buttons: flashing - pressing possible | green – was pressed shortly | red - long press.

1 *LOADING (and software update and/or configuration) of a **SINGLE** StEin module:*

Initial situation: Normal status = module number shown on the display, e.g. 49

Inserting the USB stick Example 3b.

"**3b.**" means: "3", the **first** character in the example = the **number** of files for StEin on the stick; "b", the **second** character = the **type of** the first file, the .(dot) indicates readiness for loading (via button-3 or -4, then flashes during the process)

"b" means: the next file to be loaded is a .bin file, i.e. new software,
"c" .... is a .cfg file, i.e. a new configuration,
"n" .... is a .snd file, i.e. a collection of sound samples,

Button-3→ Load the file, in the example "3b." i.e. "b" = bin file, then "Next" to the next file
(Alternative to button-3: button-1→ Skip (do not load), immediately "Next" to the next **file**)

Ready to load the next file, in the example "2c", i.e. "c" = cfg file (configuration) 2c.

Button-3→ Load the file, in the example "2c." i.e. "c" = configuration, then "Next" to the next file
(Alternative to button-3: button-1→ Skip (do not load), immediately "Next" to the next **file**)

Ready to load the next file, in the example "1n", i.e. "n" = .snd file (sound samples) 1n.

Button-3→ Load the file, in the example "1n." i.e. "n"= sound samples, then "Next" to the end of loading
(Alternative to button-3: button-1→ Skip (do not load), immediately "Continue" to the end of the **loading** process)

All data is loaded, END of the process Success: LF Failure: LE flashing

Remove the USB stick:→ NOW the **actual** U 2 x flashing

During SW update: NO RESET via button or power interruption!

Updates carried out (software update, only if software update if .bin file is included) with subsequent automatic reset

After a few seconds, **the module number is shown** on the display **again**, **e.g:** 49

From software version 7.1.77 (as version before the

2 ***SIMULTANEOUS** LOADING (software update and/or configuration) of **ALL** modules on the CAN bus:*

The following displays apply to the "master module" (where the USB stick is inserted); except at the bottom!

Initial state: Normal state = module number shown on the display, e.g. 49

Inserting the USB stick Example 3b.

"**3b.**" means: "3", the **first** character in the example = the **number** of files for StEin on the stick; "b", the **second** character = the **type of** the first file, the .(dot) indicates readiness for loading (via button-3 or -4, then flashes during the process)

"b" means: the next file to be loaded is a .bin file, i.e. new software,
"c" .... is a .cfg file, i.e. a new configuration,
"n" .... is a .snd file, i.e. a collection of sound samples

Button-4→ Loads the file, in the case of "3b" "b" = .bin file, i.e. ***Button-4** indicates that* Software is saved in ALL modules, *update of **ALL** modules;* however, *button-3 does* NOT immediately execute *the individual module.*

Display of the number of modules where charging has been *successfully* completed e.g. 26

(Alternative to button-4: button-1→ Skip (not load) the displayed file, in the example "3b", therefore no number to report, but button-1 as "Next" button to the next file, in the example "**2c**")

Button-4→ Confirm the displayed number of modules (in the example "26"), i.e. 2c.
Press button-4 as the "Next" button→ in the example, "2c." is displayed, "c" = configuration

Button-4→ Load the displayed file, in the example "c", i.e. .cfg file (configuration)

The number of modules where charging was *successful is* displayed again, e.g. 26

(Alternative to button-4: button-1→ Skip (not load) the displayed file, in the example "2c", thus no number to report, but key-1 as "Next" key to the next file, in the example "**1n**")

Button-4→ Confirm the displayed number of modules (in the example "26"), i.e. 1n.
Press button-4 as the "Next" button→ in the example, "1n." is displayed, "n" = sound samples

Button-4→ Load the displayed file, in the example "n", i.e. .sind file (sound samples)

The number of modules where charging was *successful is* displayed again, e.g. 26

(Alternative to button-4: button-1→ Skip (do not load) the displayed file, in the example "1n", therefore no number to report, instead button-1 as "Next" button to end the loading process**)**

Button-4→ Confirm the displayed number of modules (in the example "26"). As "1n" was the last file on the stick, the success (or failure) of the entire loading process is now displayed.

All data is loaded, END of the process Success: AF Failure: AE flashing

Display SM END only on the "master module", i.e. where the USB stick is inserted.

Single file or all files have arrived: Success: LF Failure: LE flashing

Display appears AFTER EVERY FILE on "slave modules", i.e. where USB stick is NOT inserted

Remove the USB stick:→ NOW the **actual** U 2 x flashing

During SW update: NO RESET via button or power interruption!

updates are carried out (software update, *only if software update* if .bin file included) *with subsequent automatic reset*

After a few seconds, **the module numbers** are **shown again** on all displays, **e.g:** 49

3 *CONTINUOUS LOADING (software update and/or configuration) of a SINGLE module:*

"Fast" means: continuous sequence for all files on the stick without interruptions

Initial position: Normal status = module number shown on the display, e.g. 49

Inserting the USB stick Example 4U

"4U." means: the **first character** (in this case "4") = the **number** of files on the stick; the **second character** (in this case "U") = the **type of** the first file.
"U" in the example means: The first file to be loaded is an .svf file (XILINX data)

Press and hold button-3→ Fast charging procedure (without interruptions) in **ONE** module

*Press and hold (**button-3**) to start the **fast loading** (of all files on the stick without interrupting the sequence in between, i.e. "Next" button does NOT need to be pressed) of the **ONE module** where the USB stick is inserted.*

END of the process when all files have been loaded: Success: LF or failure: LE **flashing**

Remove the USB stick:→ NOW the **actual** **updates are** carried out, software update (if a .bin file has been loaded)

During SW update: NO RESET via button or power interruption!

U **2 x flashing** *during software update with subsequent automatic reset is running*

After a few seconds (time for update) **the module number** is **displayed again**, e.g: 49
(this means that the software update has been carried out and the module has been restarted).

From software version 7.1.77 (as version before the update)!

4 *CONTINUOUS SIMULTANEOUS LOADING (update and/or configuration) OF ALL MODULES:*

Initial position: Normal status = module number shown on the display, e.g. 49

Inserting the USB stick→ Example 3c

"3c." means: the first character (in this case "3") = the **number** of files on the stick; the second character (in this case "c") = the **type of** the first file.
"c" in the example means: The first file to be loaded is a .cfg file (configuration)

*Press and hold (button-4) on the "master module" (where the USB stick is inserted) to start **fast &** multi **charging** (i.e. all modules and all data without interruption)*

Press and hold button-4 (where USB stick is inserted) →
→ Fast loading procedure (without interruptions) in ALL modules

*LONG press (**button-4**) on the "master module" (where the USB stick is inserted) starts the **fast loading** (of all files on the stick without interrupting the sequence in between, the "Next" button does NOT need to be pressed) of **ALL modules** where the USB stick is inserted.*

END of the loading process of all files in all modules, 26
Display of the number of modules where loading was *successful,* e.g.
*on the "**master module**", i.e. where the USB stick is inserted*

Display of the result of the loading process Success: LF or failure: LE **flashing**
(i.e. if the number displayed on the "master module" is smaller than the total number of modules, the modules with failure can be found) *on "**slave modules**" where the USB stick is NOT inserted*

Button-4 = acknowledgement of successful and unsuccessful charging processes = confirmation of the end of charging (**NOTE**: but update has not yet been carried out!).

→ Change the display success: LF or failure: LE **flashing**
*now **also** on the "**master module**", i.e. where the USB stick* is inserted

Remove the USB stick:

During SW update: NO RESET via button or power interruption!

→ NOW the **actual** **updates are** performed, in particular software updates (if a .bin file was loaded)

U **2 x flashing** *on "master" and slave module" while Software update with subsequent automatic reset is running*

After a few seconds, **the module numbers** are **shown again** on all displays, **e.g:** 49
(i.e. software update has been carried out and modules restarted).

If software loading or update fails on a module, the following remains (or appears): LE **flashing**
(although the module still runs "normally", possibly with an old software version); module number is displayed again when the display is changed or power-on.

5 *OUTPUT OF ACTIVE CONFIGURATION to USB- stick :*

The "Active configuration" can be saved on a USB stick for each individual StEin module and then imported into an Excel worksheet on the computer.

This is particularly important if

- the active configuration is composed of finished configurations and a .cfg file and the result is to be checked (errors can very easily occur ...),
- if individual parameters (e.g. busy signal thresholds) of the loaded configuration are changed during operation, usually by the interlocking programme. Here, too, a printout can be made for checking purposes by reading out the data, or a basis can be created for further processing of the configuration on the computer.

See also chapter "The finished configurations", in particular section "Combination between ..."

PUSH BUTTON-5 LONG PRESS→ The currently active configuration is saved as a .cfm file on the USB stick currently inserted, from where it can be imported into an Excel spreadsheet.

Confirmation of storage on the US stick: success: AC failure: nC

3. The "button-procedures" for "manual operation"

Although the "StEin" is usually not controlled manually (by using the buttons on the unit), it may be helpful in certain situations:

- **using it the first time** (the "StEin" is ready for use as it comes with a "prepared configuration" activated at time of delivery - see next chapter), turnouts connected to the StEin can be tested, as well as track sections set to H - L - U - etc. while observing the effect on locomotives, even without controller or computer.
- **troubleshooting**: signals can be controlled locally to ensure that the LED's are wired correctly or turnouts can be observed for proper operation.
- a **short circuit** on a track section can be cancelled locally and power restored.

***Pressing and holding one of the 5 buttons** on the StEin starts a procedure*:

Button-*1* press/hold → *P* - Procedures (track sections HLU, occupancy thresh., module address)
Button-*2* press/hold → *F* - Procedures (Restore after a short circuit/overcurrent)
Button-*3* press/hold → *A* - Procedures (Activation of prepared configurations)
Button-*4* press/hold → *L* - Procedures (Turnout switching)
Button-5 press/hold → *E* - Procedures (Single LEDs on signal PCBs)

Track sections setup procedures:

There are a number of "handling and adjusting procedures": P1, P2, P3,....
First, use Button-1 to select which procedure to execute:

Start with the module in its normal operating state (address displayed), i.e.: 49

Press and hold Button-1 (Button-1 → P for "**P**rocedure") → P.1

Hold or press Button-1 several times → P.2., P.3., P.4., ...

Once the desired procedure number is reached: Wait for 1 sec → dots disappear, i.e.: P3

continue with Button-2 and -3 → for individual control of the chosen procedure (Meaning of buttons depends on procedure), for example:

Confirming a selection and executing a procedure or entering parameters; see below

or **Button-1** → **abort** (i.e. after erroneous start); back to module number display, i.e.: 49

Timeout if no confirmation (i.e. Procedure selected but no further button pressed): 3 sec
Timeout if no action taken (Procedure selected, track output selected, but nothing more): 10 sec
Timeout if not continued (Procedure selected, an action executed - then, for example, a track section set to the desired HLU value, but nothing after that): 30 sec

If a procedure is aborted by a timeout, the module number is displayed again, e.g.: 49

***Shortcut to configure the** Module number (instead of pressing buttons until P 8);*

*Press/hold Button-1 and as soon as P.1 is displayed, **additionally** (to holding Button-1) press Button 5.*

Procedures P 1 to P 8 in detail:

P 1 : Confirm with ***Button-2*** → *ALL track section outputs are set to „F" (Drive)*: _F
all track section HLU-LED's turn green, after 3 sec: Display changes to 49

P 2 : Confirm with ***Button-2*** → *ALL track section outputs set auf „H" (Halt)*. _H
all track section HLU-LED's turn red, after 1 sec: Display changes to 49

P 3 : Confirm with ***Button-2*** → Occupancy threshold for *ALL* track section outputs are set to *„dry"* (threshold as per configuration), after 3 sec: display changes to 49 _b

P 4 : Confirm with ***Button-2*** → Occupancy threshold for *ALL* track section outputs are set to *"moist"* (Threshold as per configuration), after 3 sec: Display changes to 49 _d

P 5 : Confirm with ***Button-2*** → Occupancy threshold for *ALL* track section outputs are set to *"wet"* (threshold as per configuration), after 3 sec display changes to 49 _h

P 6 : Select a track section with ***Button-2***: 1, 2, 3, 4, 5, 6, 7, 8, 0, (cycl.) 1, 2... e.g.: 4U.*)

Select the HLU state with ***Button-3***: A, H, U., U, L., L, F., F, (cycl.) A, H, ... e.g. 4L *) shows current value

→ Selects the *HLU-State* for *a SINGLE* track section.

NOTE - select track section "0" (which does not exist), to exit a procedure without taking further action; this is done with button-1.

PLEASE NOTE: the difference between the HLU states "U." and "U" or "L." and "L": the "." (dot) means half a step lower, that is: "U." = "HU", "L." = "UL", "F." = "LF"

Confirm with ***Button-1*** → (Won't abort in this case)
Applies the selected setting to the track section corresponding HLU-LED for the track section changes.

Again ***Button-1*** (without button-2, -3 etc. beforehand) → Ends procedure, address returns: 49

P 7 : Select a track section with ***Button-2***: 1, 2, 3, 4, 5, 6, 7, 8, 0, (cycl.) 1, 2, ... e.g.: 3d

Select the occupancy threshold with ***Button-3***: b, d, h, (cycl.) b, d, h... e.g.: 3h

→ Selects the *Occupancy Threshold* for a *SINGLE* track section.

NOTE - select track section "0" (which does not exist), to exit a procedure without taking further action; this is done with button-1.

Confirmation with ***Button-1*** → (Won't abort in this case)
Applies the selected setting to the track section, corresponding occupancy-LED for the track section flashes

Again ***Button-1*** (without button-2, -3 etc. beforehand) → Ends procedure, address returns: 49

P 8 : With ***Button-2*** or ***Button-3*** → Decrease / Increase the *MODULE NUMBER*

Confirm with ***Button-1*** → Stores the new module address, procedure ends i.e.: 27

P 9 : Select a track section with ***Button-2***: 1, 2, 3, 4, 5, 6, 7, 8, 0, (cycl.) 1, 2, .. e.g.: 6_

Starts the measurement with ***Button-3*** → *AUTOMATIC OCCUPANCY THRESHOLD* detection, taking into account the idle current on the output (e.g. by accessories). 6_ (flickers)

Confirmation message when measurement is completed (after 1 to 2 sec) 6_

P A : Automatic offset adjustment for all track sections.
After selecting P.A. using button 1, wait until the dots disappear. Briefly press button 3/2 to display _0. Press button 3/2 again to carry out the adjustment, during which time the sections are switched off. _0 disappears again after 10 seconds and the process is complete. The whole procedure can be used in a similar way to P.9. to adjust the occupancy thresholds if any loads are connected. If individual track sections are permanently short-circuited after an update, this procedure can be used to rectify this.

P b : Display of the software version on the display

How to restore power after a short circuit/overcurrent:

Start with the module in its normal operating state (Address displayed), i.e.: 49

Press and hold Button-2 (Button-2 → F for "Driving again" A.5
the display automatically shows the number of the section
while its corresponding LED flashes BLUE & YELLOW
(or – if several – the first affected section of the module).

Confirm by ***briefly*** pressing ***Button-2*** → Restores power to the track section: E.5
after 3 sec automatically 49

If several track sections are affected by overcurrent or short circuit:
Button-3 → continues to the next shorted section, i.e. 2 x button 3 → A.7
As above ..., button-2 → Restores power to the track section → E.7
after 3 sec automatically 49
or **button-1** → **Abort** back to module number e.g. 49

So normally: that is, whenever a short circuit/overcurrent happens on one track section:
to restore power to the track section: ***2 clicks on Button-2*: 1 x long (> 1 sec) and 1 x short.**

Button procedure to switch turnouts:

Start with the module in its normal operating state (Address displayed), i.e.: 49

Press and hold Button-4 → L. 1.

Hold button-4 or press repeatedly → L.2., L.3., L.4., ...

Once the desired procedure number is reached: Wait for 1 sec → dots disappear, i.e. L 3

Button-5 → Operates the turnout, the switching position is indicated as L 3. or L.3

Button-5 → **pressed together with button-3** → starts or ends **"cleaning cycle"**
(= automatically toggles the turnout to clean its contacts)

Similar to external operation: the switching is made visible with the "5-LEDs group".

Note: The representation with 2 dots is not really required (but retains a similarity to other procedures), therefore: Turnout operation with Button-5 should work even if the two dots are still visible (so there is no difference between "L.3." and "L 3").

Press Button-4 once or repeatedly → moves (forward) to another turnout, e.g. L.5.

Press Button-3 once or repeatedly → moves (backwards) to another turnout, e.g. L.2.

Wait for 1 sec → dots disappear, i.e. L2

The newly selected turnout can be tested with **Button-5...**

Timeout if not confirmed (Turnout selected, but no other button pressed): 10 sec
Timeout if not continued (Procedure selected, an action executed –
i.e. the turnout was operated at least once but nothing after that): 30 sec

Abort back to module number i.e.: 49

or briefly press **Button-1** → **Abort** (i.e. after erroneous start); back to module number i.e.: 49

How to operate single LED's on signal boards:

Start with the module in its normal operating state (Address displayed), i.e.: 49

Press and hold Button-2 → E. 1. not yet implemented

Hold Button-5 or press repeatedly → E.2., E.3., E.4., ...

As soon as the desired signal PCB is reached: Wait for 1 sec → dots disappear, i.e. E4

Select the signal board output with **Button-4**: → 1, 2, 3, 4... i.e.: 13.
(the selected LED output is number 6 on the signal PCB 4)

continue with **Button-3** → Turns LED output ON/OFF and is displayed as 13.
or. 13

Button-1 shortly → **Abort** back to module number e.g: 49

How to activate prepared configurations:

Initial state (normal state = display of the module number), e.g: 49

Press and hold button-3 (Button-3 A for "Activate") → A. 1.

To select "Collections" button 3 again (several times) → A. 2., A. 3., A. 4., ...

This is used to select "collections" of up to 100 finished configurations each, of which there can be up to 9. However, this option should only really be utilised in special cases. In most cases, there is only one collection, namely A.1; therefore leave it as it is.

→ Dots go out after 1 sec A 1

Button-5 → Counting up the number of the prepared configuration to be activated
(according to the list of prepared configurations, e.g. 1 for "NNK", 2 for "LLK", ...

Button-3 → Counting down the number of the prepared configuration
to be activated up to the desired number, e.g. 27.
If the number of the last prepared configuration is reached or none at all) 00.

Button-4 → **Activate** the selected prepared configuration, confirmed by A.A

If further prepared configuration is to be activated:

Button-5 → counting up ...
Button-3 → couting down ...
Button-4 → **activate** ...

etc. ... can be repeated as often as required until all the desired prepared configurations have been loaded.

Button-1 shortly → **End** or **cancellation;** module number again: e.g.: 49

NOTE: There is no explicit deactivation of prepared configurations or the objects that were created by activating the prepared configurations. The deactivation of such objects (e.g. the track sections from a prepared configuration) is done automatically by activating other objects for the same connection points.

4. Operating the StEin from the MX32/33 controller

The StEin LIST in the controller MX32 bzw. MX33

Monitoring and switching of stationary devices, connected to StEin modules from the ZIMO control unit

The StEin LIST list can be accessed from the LOCO or SWI operating states via:

E-button + 8 → ***StEin LIST***

In the StEin LIST, all StEin modules present in the system are represented by one line each, sorted by module number; thus, depending on the display (half or full screen), fewer or more modules are visible at the same time. You can switch between these displays by touching (anywhere on the list).

↑ **(Shift) (short)** → Switch module line between Display **GA** (track sections), **WE** (turnouts), **SIG** (Signals), **Inp** (inputs). The displayed elements are operated using the numeric keys.

↑ **(Shift) (long)** → Display of SW versions of all StEin modules in list. ▶

The lines for ...

GA (track sections);

are displayed for each of the 8 connections:

- the **active HLU status**: illuminated dot in colour gradation (from red to green, similar to the red-green LED on the module itself), either in rectangular (without east-west) or arrow shape (with direction east/west set in HLU info).

- the **busy signal**: yellow illuminated dot (like the yellow busy LED on the module, but without "twitching" (which indicates the Rail-Com messages received on the module).

- **Overcurrent and short-circuit states**: blue light point (similar to the blue LED on the module).

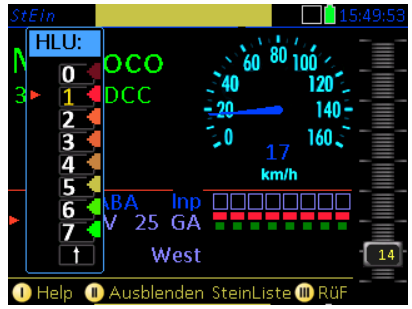
The HLU states of the track sections can also be switched from the controller (StEin list):

- **Numeric key (short) "** one **HLU level** higher (so H **"** UH, UH **"** U, etc.) Switching, cyclical circulating, visible on colour HLU light point.

- ↑ **(Shift), then - Number key → direction** (east-West) **-** Switch assignment, cyclical rotating: without east-west > west > east > without ... visible on the arrow shape of the HLU light point.

▲ *In this example, two autonomous shuttle routes have been set up (track sections 2-3-4 and 6-7-8 with arrows at each end section). East and west assignments are set for each of the end sections, whereby the trains are redirected in the respective opposite direction after entering.*

- **numeric key (long) "** Show the HLU list,
  Select a state by pressing the number key,
  Select east-west by pressing ↑ (Shift),
  first "narrow list" is displayed,
  After 3 seconds of inactivity
  Switch to "wide list".



The "narrow HLU list" for setting the HLU value and the HLU direction information

After switch-off due to **overcurrent** (or short circuit)
- Blue illuminated dot (or blue LED on module)
numeric key (short) → Switch on again!

The "broad HLU list" for setting the HLU value and the HLU direction information

WE – turnouts or single outputs;

The following is displayed for each of the 8 points outputs (2 pins each):

- The current switch position is indicated by an arrow, which is either filled in or empty depending on confirmation by feedback;
  Flashing during the waiting time until the desired end position is reached (for motorised switches) or in the event of a malfunction.

The turnouts can also be switched from the controller:

- **numeric key (short) "** Switching the turnout back and forth

IN – switch inputs;

or each of the 16 switch inputs

- the current status (green illuminated dot means ON).

5. Track Sections, Overcurrent and Shorts

Each of up to 8 track sections insulated on one side (P*) rail) is connected to a P-output of the StEin. The N*) rail is normally continuous and connected to an N output; all "N" terminals of a single StEin module are internally connected in parallel, so not all of them must always be used.

There are 3 control-LED's for each track output, next to the "P" terminal:

- Top: the **red-**green HLU-LED: indicates the current HLU setting of the track section using a color scale from red ("H") to green ("F") or red flashing (for "A").
- Middle: the blue overcurrent and short circuit-LED: to monitor overcurrent and short circuit situations; detailed description see following pages; the meaning generally is the same
  - steady blue light: track section is currently switched off; either waiting for the next automatic reset, or finally (after reaching the maximum number of reset attempts), for a manual reset.
  - flickering blue (about 10 Hz) in combination with steady light: track section was automatically switched on again, but overcurrent is still present; therefore, it will be shut down again shortly; typical picture resulting from this: alternating flickering and steady light.
  - flickering blue (about 10 Hz or slower) without coninuous lighting: immediate switch-off due to short circuit and test-based restart: final shut-down after 25 cycles.
- Bottom: the yellow occupancy and RailCom LED: in addition to occupancy detection, received RailCom messages (channel 2) are made visible by brief LED flickers; this indicates how often loco addresses are queried in a track section through DCC commands.
  - Special case - yellow flashing (approx. 1, 2, 5 Hz): After a final shut-down due to overcurrent or short circuit (i.e. blue LED steady) the yellow LED indicates the reason for the shut-down (overcurrent-slow, overcurrent-fast, or short circuit)

Wiring the track sections to the StEin modules

This is a difficult matter, as there are various "schools" of thought on the subject, each of which "swear" by their own method. There is no universally optimal solution (i.e. operational with the least possible effort for all applications) does not exist. ZIMO itself advocates and recommends the "moderate" solution described below, solution described below, i.e. one where the effort is not excessive, the vast majority of cases are covered cases are covered, and improvements may have to be made in a few cases

The basic principle of track section formation is simple in itself: the P*) rail is divided into track sections by insulators, each of which is connected separately outputs of the StEin modules. The N *) rail, on the other hand, is continuous, which means that a single N output on a StEin module would be sufficient.

*) The usual ZIMO designations of the two rails of a track, i.e. "P" and "N", are derived from "Positive" and "Negative", although the DCC track signal is symmetrical and has no polarity., but has a measurable phase position, which is an analogy to the polarity of the analogue world.

Technical considerations for the derivation of the RECOMMENDATION below:

Each StEin module is actually an independent booster, i.e. in addition to the 8 P outputs, it also has its own N output, but only one for all P-outputs (connected in parallel to all 4 N terminals).

In principle, the current from the 8 outputs should flow back via the vehicles on the 8 connected track sections into the module's own N output and not into the N outputs of other StEin modules. Otherwise there would be a risk of overloading individual N sections and the occurrence of crosstalk effects.

The logical solution resulting from this would be double-pole track separation, i.e. the formation of isolated sections of the N-rail (each opposite the P-sections) and connecting these N-sections to the N-outputs of the module. This would prevent the current from a P output of a StEin module flows back into the N output of another StEIn module.

This solution, which is indeed frequently used (some "swear" by it, see above), is in fact more of an illusory solution, however, as the current flows change as soon as the insulations are bridged by trains travelling over them (especially locomotives).

Therefore it is recommended:

DO NOT disconnect the N-rail on the entire system, i.e. leave everything connected, but

connect the N outputs of the respective StEin´s with the N track in the "geographical area" of the P-side separated track sections of the respective module.

The P outputs must of course be connected to the individual track sections.

To do this, the track sections that are connected to the P outputs of a module must be geographically reasonably close to each other (tracks of a station, consecutive blocks, ...). However, outliers should not do any harm.

This has the effect that the P currents, which "seek" the lowest possible resistance, largely flow back into their own module, but that on the other hand the N outputs of the StEin modules can "help each other out" under heavy load. It is recommended not to use the N-connector of the MX10 at all, although this was the case in the MX9 era (but MX9s were NOT booster-like constructions like StEin).

Additional note: Longer parallel lines (especially to the P sections) can provoke capacitive and inductive crosstalk, both in terms of the data forward direction (DCC signal, HLU information) and the feedback direction (RailCom, train number pulses).

Overcurrent and short circuit handling of the StEin track sections

The 8 track section-outputs of the StEin can take on different states individually, which are represented by the LEDs next to the clamps, and are also sent to controllers and computer (interlocking program), to see the states and be able to take actions (e.g. restart).

See next page for a graphic of display of track output states on the StEin itself.

The displays on controller and interlocking program are similar, but not completely identical and synchronous, because the data traffic shall not overload CAN bus and radio.

- As long as there is no overcurrent or short circuit, one of two states is valid,

  which is reported to the outside (e.g. an interlocking program):
  Normal operation-free (whereby one of the HLU steps H, UH, U, LU, L, FL, F, A is set) or
  Normal operation-occupied (whereby also one of the HLU steps H, UH, U, LU, L, FL, F, A is set).

Overcurrent - slow (threshold UESLAMP) or **overcurrent - fast** (UESSAMP): this is NO short circuit, therefore NO immediate shutdown, but switch-off after defined switch-off time, afterwards automatic restart according to parameter UESLAZT, UESLEZT, etc.

Track section states (the module reports) in this situation:
UES temporarily, i.e. UESL is detected and therefore switched on and off periodically, or
UES temporarily, i.e. UESS is detected and therefore switched on and off periodically.

LEDs on the StEin output: *blue* LED flickers (=flashed rapidly), *yellow* LED (occupancy) does not change.

- The track section is turned off once the shutdown period has elapsed (parameters UESLAZT or UESSAZT) and a reset is awaited (after the reset-time has elapsed, that is the parameter UESLEZT or UESSEZT).

  Track section states in this situation as above (report is the same), therefore still:
  UESL-temporarily, ... or
  UESS-temporarily, ...

  LEDs on the StEin output: *blue* LED steady light, *yellow* LED (occupancy) does not change.

- After the reset-time has elapsed (UESLEZT or UESSEZT), power to the track section is restored and - in case overcurrent is still present - again (as above) the shutdown is awaited after the switch-off time has ended (i.e. parameter UESLAZT or UESSAZT):

  Track section states in this situation as above (report is the same), therefore still:
  UESL-temporarily, ... or
  UESS-temporarily, ...

  LEDs on the StEin output: *Blue* LED flickers), *yellow* LED (occupancy) does not change (like in 3.)

- Depending on the number of reset attempts (parameters UESLEAZ or UESSEAZ), the above process is repeated:

  Track section states in this situation as above (report is the same), therefore still:
  UESL-temporarily, ... or
  UESS-temporarily, ...

  LEDs on the StEin output: *blue* LED flickers, combined with steady light) *yellow* LED does not change.

- After the last power turn-off (when the power will not be restored again because the number according to UESSEZT or UESLEZT was reached):

  Track section states now:
  UESL switched off, because UESL requirement was still present after all restarts, or
  UESS switched off, because UESS requirement was still present after all restarts.

  LEDs on the StEin output: *blue* LED steady light, *yellow* LED flashes 1 Hz (UESL) or 2 Hz (UESS).

- If a track section (from state UESL or UESS) is restarted manually, which can be done from the buttons on the StEin, the controller or the interlocking program, the sections enters normal operation, except when an overcurrent or short circuit is detected again immediately; in the latter: procedure as described above.

Short circuit (threshold KUSAMP):
this is a "real" short circuit, in which case an immediate shut-down is essential, due to jeopardizing vehicles and track material (and if set to 8A also the module itself is in danger); therefore, there is NO adjustable turn-off time; the number of restart attempts is also fixed, namely 50 (in the current software); there is only an adjustable restart time (parameter KUSEZT), independently, first 10 fast restart attempts are done (intervals of 100 ms each for small frog contacts, etc.) and then the ones after the intervals set in KUSEZT, whereby the restart attempts decrease, because the intervals enlarge bit by bit, at the last 50 attempts to approximately the 3-fold value. The value in KUSEZT also results in the time until the final shutdown; e.g. with a typical value of KUSEZT = 1000 ms, the final shutdown time is about 2½ min.

Track section states (the module reports) during these 25 restart attempts:
KS temporarily occupied, i.e. short circuit was detected at every restart attempt.

LEDs on the StEin output: *Blue* LED flickers in coordination with the restart attempts),
yellow LED (occupancy) steady light does not change.

- After 50 failed restart attempts, where after there is no automatic restart; i.e. after the final shutdown:

  Track section states (the module reports) during these 25 restart attempts:
  KS turned-off display status occupied, after all restart attempts have failed.
  Note: the term "display status occupied" (instead of "occupied") means that "occupied" is only presumed, but due to lack of power in the section cannot be verified.

  LEDs on the StEin output: *Blue* LED steady light *yellow* LED flashes 5 Hz.

- If a track section (from state KS turned-off) is restarted manually, which can be done from the buttons on the StEin, the controller or the interlocking program, the section enters normal operation, except when overcurrent or short circuit is detected again immediately; in the latter: procedure as described above.

NOTE (NOT relevant for normal operation) to possible track section states which are NOT explained above, but could be:

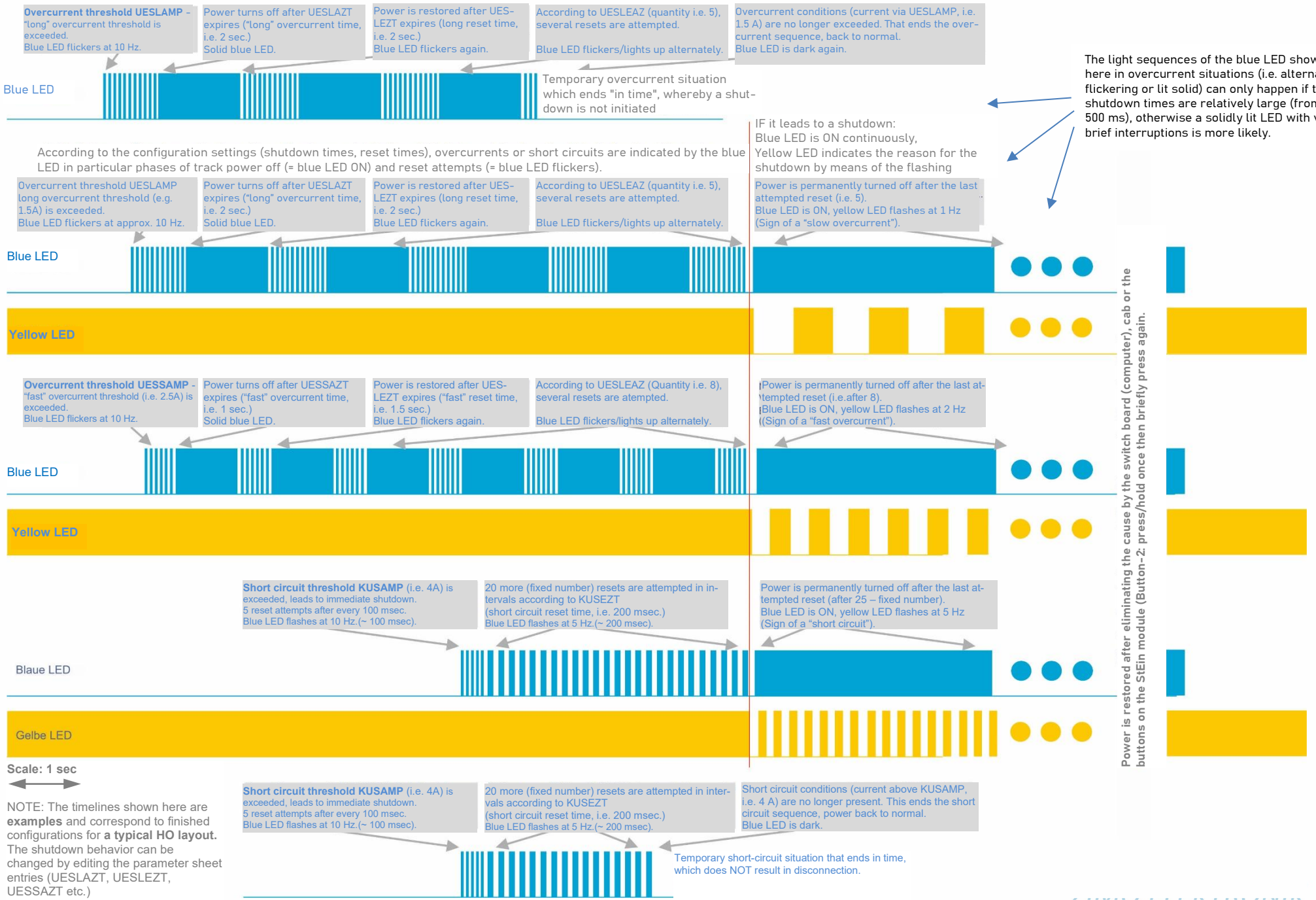
Running voltage off-display state free Track section is completely powerless (but NOT HLU step A, where there are no impulses for occupancy detection); only in special situations like missing synchronization.

detectable on the StEin output: turned-off or anomalous HLU-LED

Running voltage off-display state occupied Track section is completely powerless (but NOT HLU step A, where there are no impulses for occupancy detection); only in special situations like missing synchronization.

detectable on the StEin output: turned-off or anomalous HLU-LED

UESL turned-off display state free,
UESS turned-off display state free,
Short circuit turned-off display state free: practically no or small difference to the actual state "xxx turned-off display state occupied"; nonetheless could be practical because of interlocking logic.



NOTE: The timelines shown here are **examples** and correspond to finished configurations for **a typical HO layout.** The shutdown behavior can be changed by editing the parameter sheet entries (UESLAZT, UESLEZT, UESSAZT etc.)

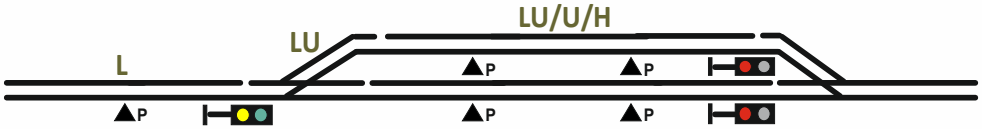
6. Track sections, point detectors, point following commands

A StEin module has (among other things) 8 outputs for track sections and 16 logic level inputs. These inputs can be used for **point detectors** *), among other things, which means that fewer track sections are required than would otherwise be necessary. This results in a technically advantageous and at the same time cost-effective type of system monitoring and control:

*) Point detectors are usually designed as simple contact tracks, as switching tracks, or as (reflex) light barriers.
Please refer to the ZIMO catalogue or the product and price list for available and recommended light barriers!

Conventional division of track sections for pure "continuous ATP" (Line Train Control) monitoring/control, in the example for two station tracks, ICONS shows the HLU stages when a route is activated from the entry signal (left) to the upper station track with stop before the exit signal. The train therefore moves gradually from the medium speed level (L) to the low speed level (U) until it stops (H).

Alternatively with point detectors: i.e. "continuous ATP" combined with elements of "intermittent ATP (automatic train protection)": this results in savings in track sections by "subdividing" the remaining track sections with light barriers. This is not only cost effective, but also tends to result in more accurate stopping points.



Das Stellwerksprogramm sorgt dafür, dass auch Schiebezüge (Lok hinten) richtig abbremsen und zum Stehen kommen, indem bei Erkennung der Zugspitze die vorausliegenden Gleisabschnitte automatisch auf die entsprechende HLU-Stufe gesetzt werden.

Point detectors (rail contacts, photoelectric sensors, etc.) are assigned to one track section each, by entering the connection point of the point detector into the object line of the parameter APUGK1 (or APUGK2).

The purpose of the point detectors is to switch the track section from one HLU step to another as soon as a train is detected; for example from L to H, displayed: L/H.

Point detectors are used for two situations;

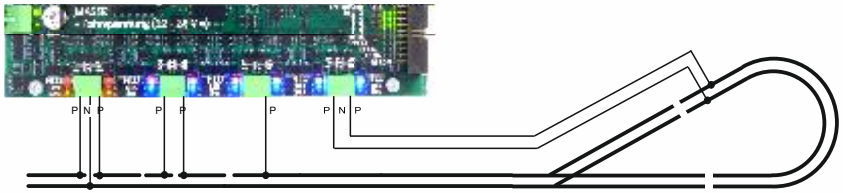
- In “operation type 3” (i.e. operation by computer): On the driveway via HLU point following commands for the track section like L/H, U/H, LU/L, etc. Those are only valid once: when leaving the corresponding driveway.
- In “operation type 0” or “1” by parameters PUFFIX, where equally L/H, U/H, etc. are entered. Those are permanently valid for this section.

IMPORTANT:

- The point detector works independent of the occupation state of the track section.
- It is only valid once; i.e. when the change is done once, the point detector is deactivated, especially if the HLU step (by other commands or keys) is changed.
- A point detector is reactivated
  - o in “operation type 3” exclusively by a newly received point following command with new content; for example: after L/H would follow the point following command U/L (probably not practical), or if after L/H follows F and after this again L/H (more probable).
  - o In “operation type 0” or “1” if the track section changed its occupation state after executing the point following command (e.g. L/H).
  - o By changing direction due to a changed HLU direction (west-east)

7. Terminal loops

Terminal loops are built with the two P outputs of a 3-pole connector of the StEin module.



PRELIMINARY TEXT:

***Operating principle*:**

One of the sectioning points always triggers a short circuit; when exceeding the lowest overcurrent threshold (of the three values UESL, UESS, KUS)

the first time its polarity is reversed and other reactions (switch-off) are suppressed,

the second time (if short circuit is detected again)
– in case terminal loop with low GA-number (track section number) has a waiting time of ... until polarity reversal –
the polarity is reversed after that time (later than “immediately”),

the third time (if short circuit is detected again)
– in case terminal loop with low GA-number (track section number) has a doubled waiting time of ... –
the polarity is reversed after that time (later than “immediately”),

the fourth time (if short circuit is detected again)
– in case terminal loop with low GA-number (track section number) has a threefold waiting time of ... –
the polarity is reversed after that time (later than “immediately”),

the fifth time (if short circuit is detected again)
normal OVC or short circuit handling

***Display*:**

display of coherence of both sections and the current polarity
Polarity display by HLU-LEDs:

long (0.4 sec on) - short (0.1 sec off) on P-pole /
long (0.4 sec off) - short (0.1 sec on) on N-pole,

when changing (starting with first switch for 2 sec):

steady light on P rail / dark on N rail
(so, immediate synchronous visualization of every change).

With every short circuit that leads to reversing the polarity the blue LED flashes
Occupancy LEDs of both outputs are always synchronized (occupancy and RailCom)

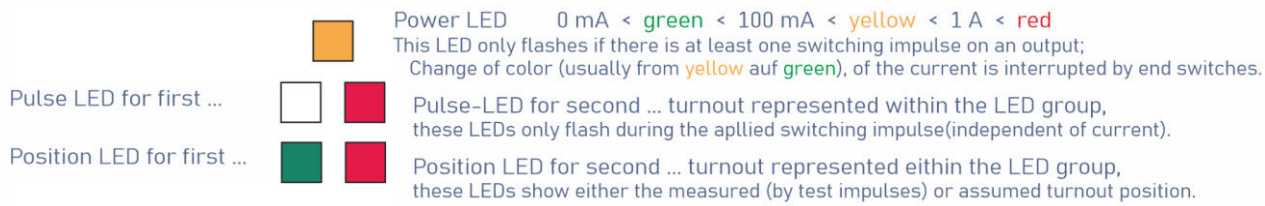
Special reading and display
as indicator for a central command station probably set too low:

If there is no repolarization at the terminal loop section (ONLY at terminal loop sections) current jump > 1 A and there is NO repolarization (because MX10 obviously does not supply enough current),

>>> warning by rapid jumps of the two yellow LEDs (inverted flashing with about 5Hz) for 5 sec as warning for possibly failed polarity-reverse attempt).

8. The outputs for 8 turnout or 16 single consumers

Operating turnouts or individual outputs is connected with associated indicators on the **"5-LED group".** It is irrelevant, what triggers the switching: operation on the module itself by the key procedure "4" (turnouts, also "automatic cleaning"), or from the controller (StEin LIST) or a computer interlocking program.

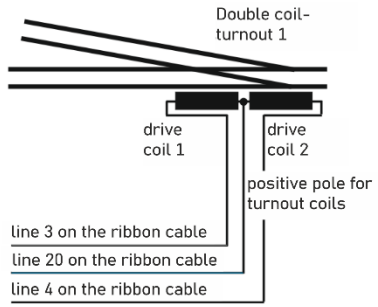


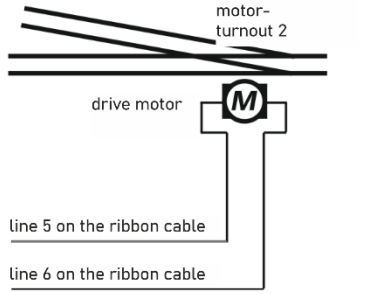
The left LED-pair (= the two left LED's) is assigned to one turnout and the right-LED pair to another. Each turnout actuation assigns one of the LED pairs to the relevant turnout. As a result, the last two operated turnouts are always visible, that is their "position LED" and their "pulse LED".

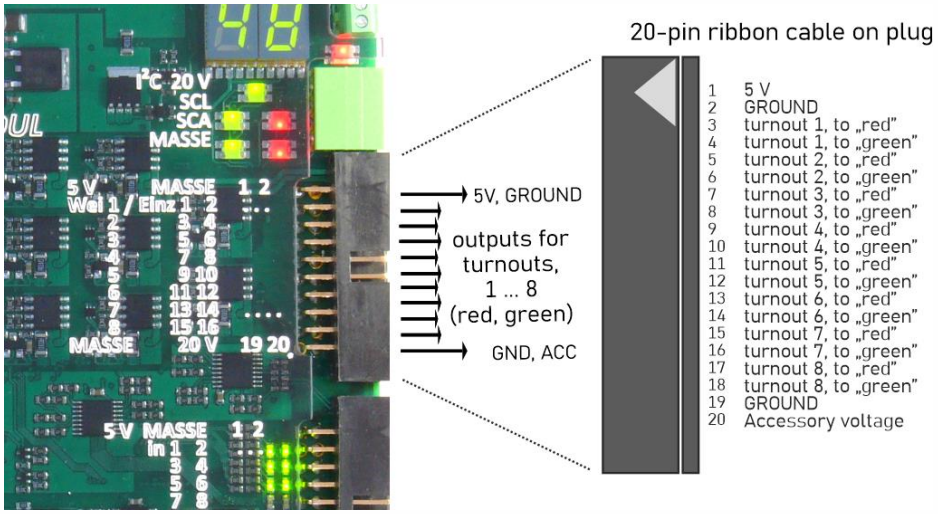
The "power LED" generally indicates (in very large steps) the power consumption of all 16 end stages of the 8 turnouts or 16 individual outputs. If only coil turnouts are present, or motorized turnouts are switched one by one (not at the same time) it is possible to draw conclusions as to the functionality of the turnouts (i.e. how much time the turnouts require).

The typical switching sequence of a double coil turnout looks like this:

Flashing of the position-LED means that a clear position cannot be determined by means of test pulses.







9. The Speaker outputs of the StEin

WILL BE ADDED LATER

10. The Signal Boards connected to the I²C Bus

In contrast to track sections and switches, there are NO DIRECT CONNECTIONS for signals on the StEin module itself; those would make wiring the signals unnecessarily complicated (extensions of the lines, etc.). Instead, ZIMO provides connection boards to mount the signals in their vicinity, the **"ICA-signal PCBs" *).** Up to 12 of them are supplied and controlled by the I²C-socket of the StEin: every ICA board has 16 outputs for signal LEDs, which can be used for more than one signals (in sum with 16 LEDS or LED groups).

*) The denomination ICA derives from the bus system (I²C connection boards); generally it is possible to connect up to 125 different PCBs to this I²C bus, currently (2019) only signal PCBs exist, up to 12 of them.

Define within the configuration sheet, in the parameter APULICHT1 (connection point light 1), which signal is to be connected; this parameter - consisting of **module number** (1..99), **PCB number** (1..12), **connection number** (1..16) - refers to the first signal light of a signal. The following lights are defined by the type of signal in the corresponding definitions within the object lines SIGBILD (signal picture).

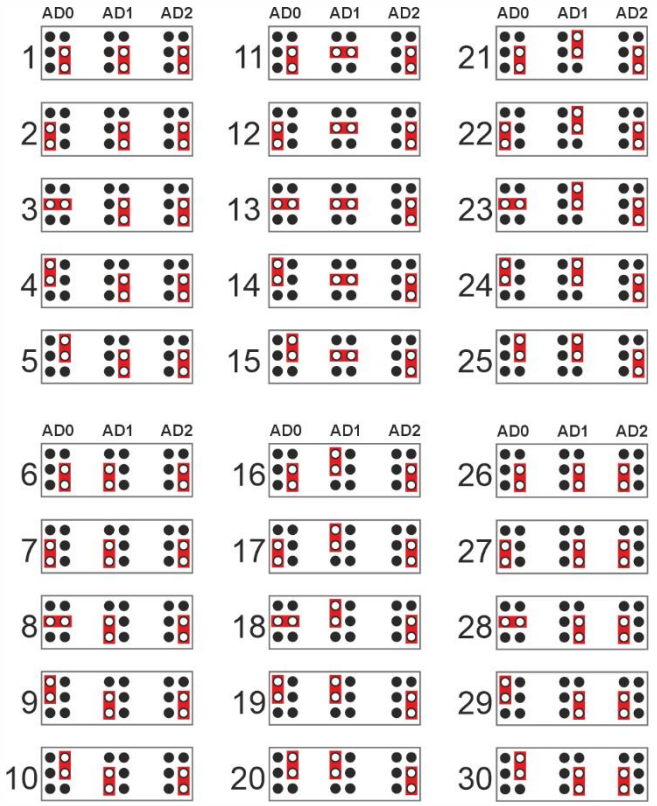
See chapter "The objects in the parameter sheets" and "The Prepared Configurations"!

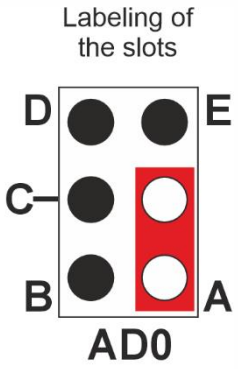
The "ICA signal boards" are connected via a bus cable, which runs from one board to another (not connected in parallel but by an amplifying chip on each board): see the example-pictures in chapter "The prepared configurations".

IMPORTANT: On **every "ICA signal PCB"** an individual **I²C address** has to be set by jumpers.

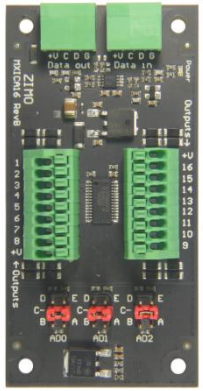
The jumpers for the first 30 I²C addresses *) can be seen in the following illustration. The logic for more addresses (up to 125, seldom used) can be derived from it.

*) Although only 12 PCBs are connected to the bus, they do not necessarily have the first 12 addresses. For purposes of clarity also another combination can be used, e.g. prepared configurations which contain more than 12 PCBs, where the user selects parts of and actually uses.





Dim.: 43.5 x 86.0mm



Connecting the ICA boards to the I²C bus:

see chapter „The Prepared configurations", section "The Prepared Configurations for signals"" (2-page picture with 12 ICA-PCBs)

11. The Track Section Expansion Boards

WILL BE ADDED LATER

12. The Turnout Expansion Boards

WILL BE ADDED LATER

13. The Servos Expansion Boards

WILL BE ADDED LATER

14. The Prepared Configurations

...for a quick and easy start.

The StEin module offers **comprehensive options for flexible configuration**; **see** chapter "**The StEin configuration strategy** ...". In a self-created PARAMETER-SHEET can be set individually for each track section, for each turnout, for each signal, etc.: for example, busy signal thresholds for track sections in different situations (normal / damp / wet), overcurrent and short-circuit thresholds, various position detections for turnouts, and much more.

Sometimes (in the long term or initially just to get to know each other)
PREPARED CONFIGURATIONS can be used instead of a PARAMETER SHEET:
In addition to the SOFTWARE itself (the **.bin** file) and the XILINX data (the **svf** file), the **delivery status** of a StEin module also contains a COLLECTION OF PREPARED CONFIGURATIONS (summarised in a single **.cff** file).

These files are replaced together or individually with newer versions in the course of updates, see chapter "SW update. Loading configurations, etc."); when a **.cff** file is **loaded**, the prepared configurations it contains are saved in the module and the first one is automatically activated (see below).

NOTE: .cff files (as delivered or downloaded) and thus the prepared configurations are part of the ZIMO StEin software package; they CANNOT be modified, but can be loaded separately from the actual software if required.

The following tables show the names and properties of the PREPARED CONFIGURATIONS as of February 2022 in the .cff file of the delivery status; the detailed content of these prepared configurations - in the form of parameter sheets as written for them at ZIMO - is shown two pages further on. This COLLECTION therefore contains (as of the above-mentioned status).

8 prepared configurations for (objects of the class) track sections for H0 layout (NNK)
8 prepared configurations for standard coil turnouts (DSA),
including a "modification configuration" for reversing loops, and
2 "ready assortments" of approx. 100 HV signals of various (German) types each.

The first lines of each of these object groups (i.e. the **NNK, DSA, DEHV** printed in bold) contain those prepared configurations that are active (i.e. AUTOMATICALLY ACTIVATED) in the **delivery state**, or immediately **after loading** the ..cff file.

ACTIVATE = Include a prepared configuration in the "Active binary configuration", which consists of several prepared configurations or a combination of a self-created .cfg file (from a self-created parameter sheet) with prepared configurations.
see "The StEin data model" in the chapter "Structure, technical data, ...)

If a prepared configuration is NOT automatically activated (because it is NOT in the first position), there are two ways of ACTIVATING one of the RELEASE CONFIGURATIONS:

- by pressing and holding the key procedure starting with **key-3** (see chapter "3 The button procedures for manual operation"): this selects and activates a prepared configuration, for example with typical values for large railways (i.e. NNG), see table below); by applying it several times in succession, one can be selected from each object group (e.g. track sections or points), but NOT two from one group.

  You can experiment with different variants by making a new selection using a key procedure (which overwrites the previous objects from the same group).

- by entering (at the BEGINNING of a self-created PARAMETER-SHEET) object lines with the **object class ADDFERT** (where each such line contains the number of a prepared configuration). The parameter sheet can either contain only such ADDFERTs, or the ADDFERTs at the beginning and then self-created object lines.

For the ADDFERT object class: see the beginning of the chapter "The objects in the PARAMETER SHEETS"

Number	Identification	Content description of the prepared configuration	Occupancy threshold normal, moist or wet	OVC-threshold (slow / fast)	Short-threshold	Assigned inputs
1	**NNK**	8 Track sections, "normal" value for small scales (H0, TT...)	2 / 5 / 10 mA	Threshold 1.5 / 2.5 A turning-off in 0.2 / 0.1 sec	3 A	2 detector inputs for each of the 8 track sections
2	LLK	8 Track sections, low values for occupancy and overcurrent, small scales	1 / 2 / 5 mA	Threshold 0.5 / 1 A turning-off in 0.2 / 0.1 sec	2 A	2 detector inputs for each of the 8 track sections
3	HHK	8 Track sections, higher values for occupancy and overcurrent, small scales	5 / 10 / 20 mA	Threshold 2 / 3 A turning-off in 0.2 / 0.1 sec	4 A	2 detector inputs for each of the 8 track sections
4	LNK	8 Track sections, low occupancy, normal overcurrent values, small scales	1 / 2 / 5 mA	Threshold 1.5 / 2.5 A turning-off in 0.2 / 0.1 sec	3 A	2 detector inputs for each of the 8 track sections
5	NHK	8 Track sections, normal occupancy, higher overcurrent values, medium...	2 / 5 / 10 mA	Threshold 2 / 3 A turning-off in 0.2 / 0.1 sec	4 A	2 detector inputs for each of the 8 track sections
6	NNG	8 Track sections, typical values for large scales (G, 1...)	5 / 20 / 50 mA	Threshold 3 / 4 A turning-off in 0.2 / 0.2 sec	5 A	2 detector inputs for each of the 8 track sections
7	LLG	8 Track sections, low values for occupancy and overcurrent, large scales	2 / 10 / 30 mA	Threshold 2 / 3 A turning-off in 0.2 / 0.2 sec	4 A	2 detector inputs for each of the 8 track sections
8	HHG	8 Track sections, very high values for overcurrent/short circuit, gauge 1	5 / 20 / 50 mA	Threshold 3 / 4 A turning-off in 0.2 / 0.2 sec	8 A	2 detector inputs for each of the 8 track sections
29	KSA	1 Reverse loop section instead of the previously defined section 7, 8	Occupancy and over-current thresholds copied from track section 7			2 detector inputs for track section 7

Number	Identification	Content description of the prepared configuration	Switch/Actuation time
41	**DSA**	8 double coil turnouts with end switches	0.1 sec
42	DSN	8 double coil turnouts without end switches	0.2 sec
43	MWA	8 motorized turnouts with end switches	3 sec
44	MWN	8 slow motion switch machines with end switches	5 sec
45	MWD	8 motorized turnouts (for continuous current)	0
46	EPN	8 EPL-turnouts without end switches	0.2 sec
47	SWA	8 Servo-turnouts with end switches and relays connection	3 sec
48	SWM	8 Servo- turnouts without end switches and without relays connection	3 sec

Number	and name	Content description of the prepared configurations
60	DENOSIG	Only signal types and signal aspects for HV signals; WITHOUT "actual" signals
61	**DEHV**	in total about 100 signals of the HV system, mixture of the most important types
62	DEHVXL	Similar to DEHV, but fully equipped signals (beacon, etc.), but less
63		
64		
65		

The COLLECTION OF PREPARED CONFIGURATIONS for download

The COLLECTION OF PREPARED CONFIGURATIONS (printed on the following pages) (included as a .cff file as delivered or downloaded) is also available for **download** as an **Excel sheet on the ZIMO website** (System / Stationary setup module StEin); in addition to its actual purpose (loading the .cff file into a StEin), it can also serve as a collection of sample objects which the creator of his own configuration (parameter sheet, exported in .cfg.file) can use as a guide or copy out individual object lines or blocks.

Up to 99 PREPARED CONFIGURATIONS are possible (available in the .cff file depending on the configuration status); in the case of track sections and turnouts, these are the blocks in the Excel sheet separated by blank lines, which contain a type line and 8 object lines (with the same number - 01, 02, ... in the first column). A finished configuration for signals is more complicated: blocks for signal types and signal images and approx. 100 object lines.

The **connection points** of the objects in a prepared configuration contain an "M" instead of the module number normally found there. After all, a prepared configuration is suitable for StEin module and accordingly the "M" is replaced by the module number when it is activated.

NOTE: A PREPARED CONFIGURATION is NOT suitable for cases where some of the connection points are to be located in another module. If, for example, a distant signal is to be dark-switched by the stop position of a main signal, but is connected to a module, the configuration of the signals would have to be done WITHOUT a DONE CONFIGURATION, but defined in a separate PARAMETER SHEET, possibly by offline modification of the downloaded DONE CONFIGURATIONS.

Combination between PREPARED CONFIGURATIONS and your own PARAMETER SHEET:

In many cases, some of the necessary objects can be taken from the existing PREPARED CONFIGURATIONS, but others cannot: for example, the turnouts from "LNK" fit, but there is no prepared configuration for the track sections). There are several possible combinations: you can

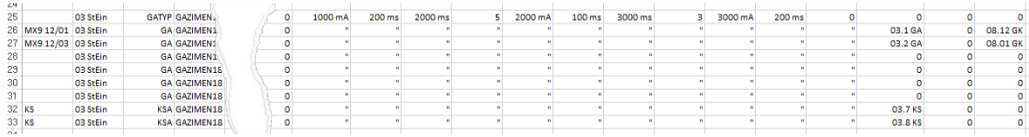
- From **the downloaded Excel sheet** with the collection of prepared configurations (see above), the desired prepared configurations are copied into the self-created parameter sheet,
- **ADDFERT objects** (see above and beginning of the chapter "The objects in the parameter sheets", with the desired prepared configurations as the first lines in your own parameter sheets,
- the configuration **in the StEin module itself**: to do this, first activate the appropriate prepared configurations (via button procedure, see chapter "3 The button procedures for manual operation") and then load your own parameter sheet (i.e. a .cfg file).

  for example ....

  - Activate the "LNK" finished configuration using the "Button procedure" (see chapter "3 The button procedures for manual operation"), so

  button-3 long → Start the procedure for activating prepared configurations, display A. I.
  button-5 → Select the number of the finished configuration to be activated, in the example "4" for "LNK"
  (according to the list of finished configurations): 0 4.
  button-4 → Loading & activating the selected finished configuration: A.A
  button-1 short → End of the procedure; the module number is displayed again, e.g.: 4 9

- Create and load your own .cfg file, in the example for track sections (see chapter "15 The objects in the parameter sheets"), first created in Excel as a separate parameter sheet::



25		03 StEin	GATYP	GAZIMEN	0	1000 mA	200 ms	2000 ms	5	2000 mA	100 ms	3000 ms	3	3000 mA	200 ms	0	0	0	0
26	MX9 12/01	03 StEin		GA	GAZIMEN1	0	"	"	"	"	"	"	"	"	"	"	"	03.1 GA	0	08.12 GK
27	MX9 12/03	03 StEin		GA	GAZIMEN1	0	"	"	"	"	"	"	"	"	"	"	"	03.2 GA	0	08.01 GK
28		03 StEin		GA	GAZIMEN1	0	"	"	"	"	"	"	"	"	"	"	"	0	0	0
29		03 StEin		GA	GAZIMEN1&	0	"	"	"	"	"	"	"	"	"	"	"	0	0	0
30		03 StEin		GA	GAZIMEN1&	0	"	"	"	"	"	"	"	"	"	"	"	0	0	0
31		03 StEin		GA	GAZIMEN1&	0	"	"	"	"	"	"	"	"	"	"	"	0	0	0
32	KS	03 StEin		KSA	GAZIMEN1&	0	"	"	"	"	"	"	"	"	"	"	"	03.7 KS	0	0
33	KS	03 StEin		KSA	GAZIMEN1&	0	"	"	"	"	"	"	"	"	"	"	"	03.8 KS	0	0

Exporting from the Excel spreadsheet to the USB stick, loading the .cfg file from the USB stick into the StEin (see chapter "2 SW update, loading config., sound, ..., outputting config."):

Insert the USB stick (in the example, the only file, namely the configuration, on the stick) → display lc.
button-3 → Load the file (in the example the only one on the stick, therefore END of the process), LF
Remove the USB stick; the module number is displayed again, e.g.: 4 9

SPECIAL EXPLANATION on the PREPARED CONFIGURATION "60" = "DENOSIG": This "prepared configuration" is not really a "finished" one, because not a single object can actually be controlled with it. It only consists of lines for object classes SIGTYP and SIGBILD, albeit for all (as far as taken into account) German HV signals.

However, there are NO lines with the object class "SIG" in the prepared configuration "60", in contrast to the prepared configurations for signals from "61"). This means that the actual signals, i.e. the SIG objects, must be created individually.

By dispensing with ready-made signals, the space on the ICA board can be optimally utilised.

NOTE: Alternatively, prepared configurations can be activated using ADDFERT objects (see chapter "The objects in the parameter sheets") as a "preamble" (i.e. before the other objects); this saves the "button procedure", which is particularly useful if several prepared configurations are to be activated.

Important (in combinations of prepared configurations and own parameter sheet)

When loading your own .cfg file, all prepared configurations whose object classes appear in this .cfg file are automatically **removed** from the active configuration.

For example: if - as in the example above - objects of the object class "GATYP" and/or "GA" are present in the .cfg file, a previously activated prepared configuration for track sections - as in the example above - is deleted.

This also applies vice versa if the .cfg file is loaded first and then the finished configuration is activated (or several finished configurations).

For example: if a prepared configuration for track sections is activated, the objects of the object classes "GATYP" and "GA" are deleted from the previously loaded .cfg file.

Prepared configurations for track sections:

Each block consisting of 9 lines constitutes a prepared configuration; a maximum of one of them can be active. As standard, that is at delivery, the first one is active (i.e. "NNK"); one of the others can be selected (as mentioned before) by button procedure (starting with *pressing/holding Button-3*) and activated instead. By loading a created configuration, all prepared configurations are deactivated.

The individual "blocks" each consist of the first line - with the object class "GATYP" (track section type), i.e. the definition of the parameters for all 8 subsequent "actual" track sections, i.e. the lines with object class "GA", where the transfer of the parameter from the "GATYP" is indicated by " in the individual columns.

	NAME	MODULNR	OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	FUNFIX	POSFIX	GLEINF	BESMNOR	BESMFEU	BESMNAS	GKMINZT	GKPARAM	UESLAMP	UESLAZT	UESLEZT	UESLEAZ	UESSAMP	UESSAZT	UESSEZT	UESSEAZ	KUSAMP	KUSEZT	ANSPRMX9	APUGA	APUGAV	APUGK1	APUGK2
4																															
5	01 FERTIG 00		GATYP	GA-FE-NNK	0	3	0	0	0	0	0	2 mA	5 mA	10 mA	50 ms	0	1500 mA	3000 ms	2000 ms	10	2500 mA	1000 ms	2000 ms	12	3000 mA	500 ms	0	0	0	0	0
6	01 FERTIG 00		GA	GA-FE-NNK	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	M.1	M.9
7	01 FERTIG 00		GA	GA-FE-NNK	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
8	01 FERTIG 00		GA	GA-FE-NNK	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
9	01 FERTIG 00		GA	GA-FE-NNK	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
10	01 FERTIG 00		GA	GA-FE-NNK	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
11	01 FERTIG 00		GA	GA-FE-NNK	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
12	01 FERTIG 00		GA	GA-FE-NNK	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
13	01 FERTIG 00		GA	GA-FE-NNK	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
14																															
15	02 FERTIG 00		GATYP	GA-FE-LLK	0	3	0	0	0	0	0	1 mA	2 mA	5 mA	50 ms	0	500 mA	3000 ms	2000 ms	10	1000 mA	1000 ms	2000 ms	12	2000 mA	500 ms	0	0	0	0	0
16	02 FERTIG 00		GA	GA-FE-LLK	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	M.1	M.9
17	02 FERTIG 00		GA	GA-FE-LLK	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
18	02 FERTIG 00		GA	GA-FE-LLK	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
19	02 FERTIG 00		GA	GA-FE-LLK	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
20	02 FERTIG 00		GA	GA-FE-LLK	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
21	02 FERTIG 00		GA	GA-FE-LLK	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
22	02 FERTIG 00		GA	GA-FE-LLK	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
23	02 FERTIG 00		GA	GA-FE-LLK	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
24																															
25	03 FERTIG 00		GATYP	GA-FE-HHK	0	3	0	0	0	0	0	5 mA	10 mA	20 mA	50 ms	0	2000 mA	3000 ms	2000 ms	10	3000 mA	1000 ms	2000 ms	12	4000 mA	500 ms	0	0	0	0	0
26	03 FERTIG 00		GA	GA-FE-HHK	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	M.1	M.9
27	03 FERTIG 00		GA	GA-FE-HHK	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
28	03 FERTIG 00		GA	GA-FE-HHK	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
29	03 FERTIG 00		GA	GA-FE-HHK	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
30	03 FERTIG 00		GA	GA-FE-HHK	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
31	03 FERTIG 00		GA	GA-FE-HHK	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
32	03 FERTIG 00		GA	GA-FE-HHK	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
33	03 FERTIG 00		GA	GA-FE-HHK	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
34																															
35	04 FERTIG 00		GATYP	GA-FE-LNK	0	3	0	0	0	0	0	1 mA	2 mA	5 mA	50 ms	0	1500 mA	3000 ms	2000 ms	10	2500 mA	1000 ms	2000 ms	12	3000 mA	500 ms	0	0	0	0	0
36	04 FERTIG 00		GA	GA-FE-LNK	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	M.1	M.9
37	04 FERTIG 00		GA	GA-FE-LNK	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
38	04 FERTIG 00		GA	GA-FE-LNK	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
39	04 FERTIG 00		GA	GA-FE-LNK	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
40	04 FERTIG 00		GA	GA-FE-LNK	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
41	04 FERTIG 00		GA	GA-FE-LNK	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
42	04 FERTIG 00		GA	GA-FE-LNK	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
43	04 FERTIG 00		GA	GA-FE-LNK	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
44																															

etc. - some lines (45 ... 56) of the prepared configuration for track sections are not shown due to lack of space.

57	06 FERTIG 00		GA	GA-FE-NNG	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
58	06 FERTIG 00		GA	GA-FE-NNG	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
59	06 FERTIG 00		GA	GA-FE-NNG	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
60	06 FERTIG 00		GA	GA-FE-NNG	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
61	06 FERTIG 00		GA	GA-FE-NNG	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
62	06 FERTIG 00		GA	GA-FE-NNG	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
63	06 FERTIG 00		GA	GA-FE-NNG	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
64																															
65	07 FERTIG 00		GATYP	GA-FE-LLG	0	3	0	0	0	0	0	2 mA	10 mA	30 mA	100 ms	0	2000 mA	3000 ms	2000 ms	10	3000 mA	1000 ms	2000 ms	12	4000 mA	800 ms	0	0	0	0	0
66	07 FERTIG 00		GA	GA-FE-LLG	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	M.1	M.9
67	07 FERTIG 00		GA	GA-FE-LLG	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
68	07 FERTIG 00		GA	GA-FE-LLG	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
69	07 FERTIG 00		GA	GA-FE-LLG	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
70	07 FERTIG 00		GA	GA-FE-LLG	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
71	07 FERTIG 00		GA	GA-FE-LLG	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
72	07 FERTIG 00		GA	GA-FE-LLG	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
73	07 FERTIG 00		GA	GA-FE-LLG	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
74																															
75	08 FERTIG 00		GATYP	GA-FE-HHG	0	3	0	0	0	0	0	5 mA	20 mA	50 mA	100 ms	0	3000 mA	200 ms	2000 ms	10	4000 mA	1000 ms	2000 ms	12	8000 mA	800 ms	0	0	0	0	0
76	08 FERTIG 00		GA	GA-FE-HHG	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	M.1	M.9
77	08 FERTIG 00		GA	GA-FE-HHG	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	M.2	M.10
78	08 FERTIG 00		GA	GA-FE-HHG	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	M.3	M.11
79	08 FERTIG 00		GA	GA-FE-HHG	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	M.4	M.12
80	08 FERTIG 00		GA	GA-FE-HHG	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	M.5	M.13
81	08 FERTIG 00		GA	GA-FE-HHG	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	M.6	M.14
82	08 FERTIG 00		GA	GA-FE-HHG	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	M.7	M.15
83	08 FERTIG 00		GA	GA-FE-HHG	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	M.8	M.16
84																															
85	29 FERTIG 00		KSA	0	0	3	0	0	0	0	0	2 mA	5 mA	10 mA	50 ms	0	3000 mA	200 ms	2000 ms	10	2500 mA	1000 ms	2000 ms	12	3000 mA	200 ms	0	M. 7	0	M.7	M.8
86																															
87			OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	FUNFIX	POSFIX	GLEINF	BESMNOR	BESMFEU	BESMNAS	GKMINZT	GKPARAM	UESLAMP	UESLAZT	UESLEZT	UESLEAZ	UESSAMP	UESSAZT	UESSEZT	UESSEAZ	KUSAMP	KUSEZT	ANSPRMX9	APUGA	APUGAV	APUGK1	APUGK2

Prepared configurations for "two-way turnouts"

Each block consisting of 9 lines constitutes a prepared configuration; similar to the track sections a maximum of one of them can be active (therefore "DSA").

The individual "blocks" each consist of the first line - with the object class "GATYP" (track section type), i.e. the definition of the parameters for all 8 subsequent "actual" track sections, i.e. the lines with object class "GA", where the transfer of the parameter from the "GATYP" is indicated by " in the individual columns.

	NAME	MODULNR	OBJKL	WEITYP	WEISYSNR	ANTRART	POSILOG	SCHIMPZT	SCHIMPPWM	REDAUPWM	SERVPOS1	SERVPOS2	SERVUMLAU	STELLERK	TSTIMPLNG	TSTIMPINV	TSTIMPSPA	ZWAKOREF	RZPOLPWM	IMLAMINAMP	ILAMAXAMP	UMLAMINZT	UMLAMAXZT	APUANTR	APUSTEKO	APUZWAKO	PUHERZPOL
91																											
92	41 FERTIG 00		WEITYP	WEI-FE-DSA	0	DOSPU	1	100 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0%	0	0	0	0	0	0	0	0
93	41 FERTIG 00		WEI	WEI-FE-DSA	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
94	41 FERTIG 00		WEI	WEI-FE-DSA	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
95	41 FERTIG 00		WEI	WEI-FE-DSA	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
96	41 FERTIG 00		WEI	WEI-FE-DSA	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
97	41 FERTIG 00		WEI	WEI-FE-DSA	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
98	41 FERTIG 00		WEI	WEI-FE-DSA	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
99	41 FERTIG 00		WEI	WEI-FE-DSA	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
100	41 FERTIG 00		WEI	WEI-FE-DSA	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"
101																											
102	42 FERTIG 00		WEITYP	WEI-FE-DSN	0	DOSPU	1	200 ms	100%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0	0	0
103	42 FERTIG 00		WEI	WEI-FE-DSN	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
104	42 FERTIG 00		WEI	WEI-FE-DSN	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
105	42 FERTIG 00		WEI	WEI-FE-DSN	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
106	42 FERTIG 00		WEI	WEI-FE-DSN	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
107	42 FERTIG 00		WEI	WEI-FE-DSN	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
108	42 FERTIG 00		WEI	WEI-FE-DSN	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
109	42 FERTIG 00		WEI	WEI-FE-DSN	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
110	42 FERTIG 00		WEI	WEI-FE-DSN	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"
111																											
112	43 FERTIG 00		WEITYP	WEI-FE-MWA	0	MOT	1	3000 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0%	0	0	0	0	0	0	0	0
113	43 FERTIG 00		WEI	WEI-FE-MWA	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
114	43 FERTIG 00		WEI	WEI-FE-MWA	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
115	43 FERTIG 00		WEI	WEI-FE-MWA	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
116	43 FERTIG 00		WEI	WEI-FE-MWA	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
117	43 FERTIG 00		WEI	WEI-FE-MWA	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
118	43 FERTIG 00		WEI	WEI-FE-MWA	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
119	43 FERTIG 00		WEI	WEI-FE-MWA	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
120	43 FERTIG 00		WEI	WEI-FE-MWA	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"
121																											
122	44 FERTIG 00		WEITYP	WEI-FE-MWN	0	MOT	1	5000 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0%	0	0	0	0	0	0	0	0
123	44 FERTIG 00		WEI	WEI-FE-MWN	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
124	44 FERTIG 00		WEI	WEI-FE-MWN	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
125	44 FERTIG 00		WEI	WEI-FE-MWN	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
126	44 FERTIG 00		WEI	WEI-FE-MWN	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
127	44 FERTIG 00		WEI	WEI-FE-MWN	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
128	44 FERTIG 00		WEI	WEI-FE-MWN	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
129	44 FERTIG 00		WEI	WEI-FE-MWN	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
130	44 FERTIG 00		WEI	WEI-FE-MWN	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"
131																											
122	44 FERTIG 00		WEITYP	WEI-FE-MWN	0	MOT	1	5000 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0%	0	0	0	0	0	0	0	0
123	44 FERTIG 00		WEI	WEI-FE-MWN	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
124	44 FERTIG 00		WEI	WEI-FE-MWN	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
125	44 FERTIG 00		WEI	WEI-FE-MWN	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
126	44 FERTIG 00		WEI	WEI-FE-MWN	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
127	44 FERTIG 00		WEI	WEI-FE-MWN	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
128	44 FERTIG 00		WEI	WEI-FE-MWN	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
129	44 FERTIG 00		WEI	WEI-FE-MWN	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
130	44 FERTIG 00		WEI	WEI-FE-MWN	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"
131																											
132	45 FERTIG 00		WEITYP	WEI-FE-MWD	0	MOT	1	0 ms	100%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0	0	0
133	45 FERTIG 00		WEI	WEI-FE-MWD	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
134	45 FERTIG 00		WEI	WEI-FE-MWD	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
135	45 FERTIG 00		WEI	WEI-FE-MWD	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
136	45 FERTIG 00		WEI	WEI-FE-MWD	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
137	45 FERTIG 00		WEI	WEI-FE-MWD	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
138	45 FERTIG 00		WEI	WEI-FE-MWD	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
139	45 FERTIG 00		WEI	WEI-FE-MWD	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
140	45 FERTIG 00		WEI	WEI-FE-MWD	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"
141																											
142	46 FERTIG 00		WEITYP	WEI-FE-EPN	0	EPL	1	200 ms	100%	0	0	0	0	0	0	0	0	0	0%	0	0	0	0	0	0	0	0
143	46 FERTIG 00		WEI	WEI-FE-EPN	M-1	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.1	"	"	"
144	46 FERTIG 00		WEI	WEI-FE-EPN	M-2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.2	"	"	"
145	46 FERTIG 00		WEI	WEI-FE-EPN	M-3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.3	"	"	"
146	46 FERTIG 00		WEI	WEI-FE-EPN	M-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.4	"	"	"
147	46 FERTIG 00		WEI	WEI-FE-EPN	M-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.5	"	"	"
148	46 FERTIG 00		WEI	WEI-FE-EPN	M-6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.6	"	"	"
149	46 FERTIG 00		WEI	WEI-FE-EPN	M-7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.7	"	"	"
150	46 FERTIG 00		WEI	WEI-FE-EPN	M-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	M.8	"	"	"

The prepared configuration for signals:

Prepared configurations for signals contain a lot more lines as for track sections or turnouts.

The purpose of the prepared configurations for signals is to enable connecting all signal types of one system (e.g. German "HV-signals") distributed to 12 signal PCBs to the I²C-bus of a StEin module.

Consider a practical distribution of the signal types, like in the example (table on the right) of the HV-signals (prepared configuration "DEHV"):

8 main blocking signals
(4 of them with distant signal on mast),

12 3-aspect main signals
(4 of them with distant signal on mast),

12 blocking or ground signals

12 2-aspect block signals

Various additional lights

The lamps defined with "spare red" in main and main blocking signals do not have to be used.

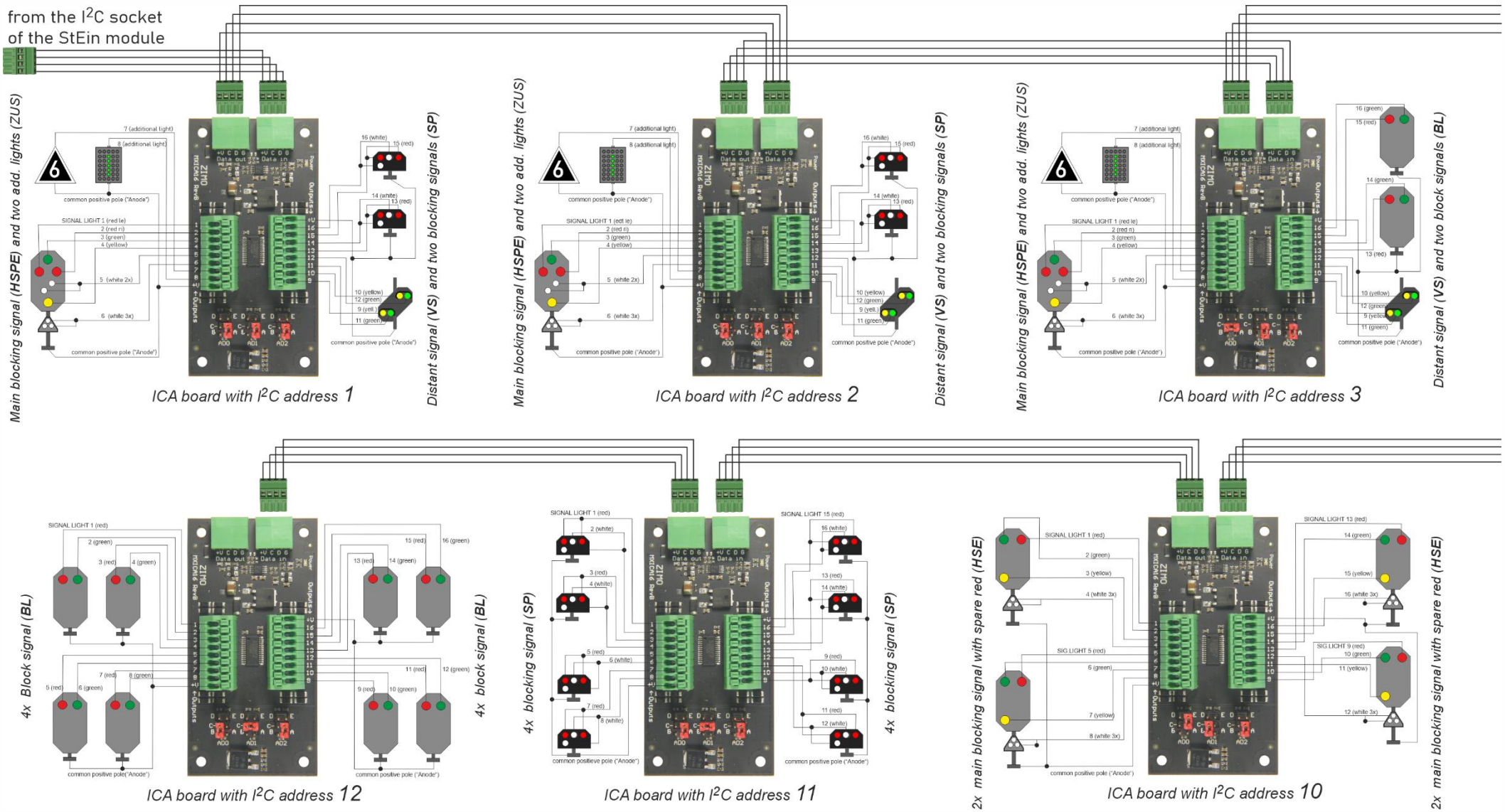
The table on the right (row "number of lamps") presents the corresponding data (number of lamps and denominations) of the signal types in the signal panel on the controller; SpareRed is not shown on the controller, therefore the number sometimes is smaller.

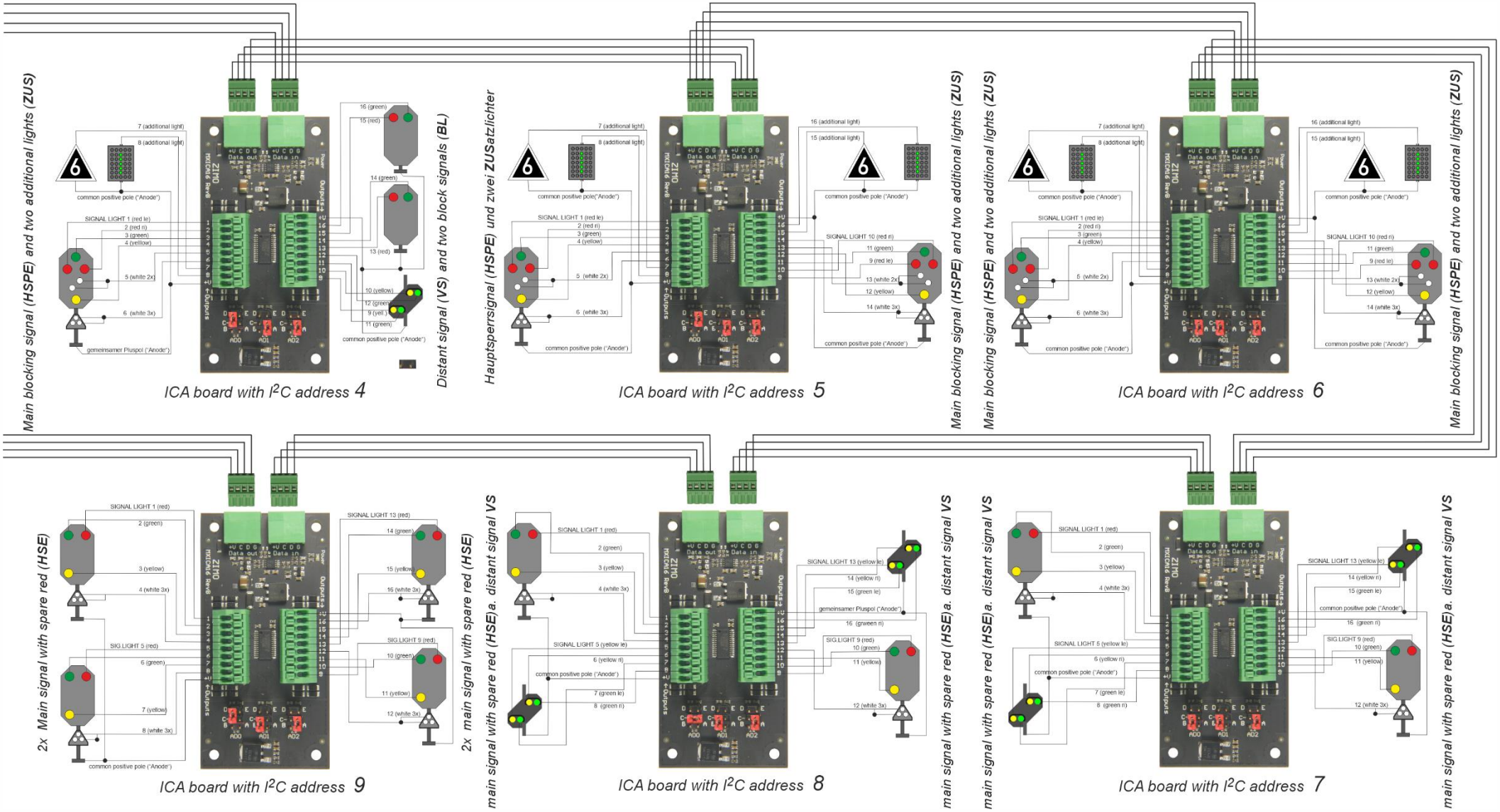
Of course, using prepared configurations (especially concerning signals) does not use all connections provided on the signal boards.

This can be improved with self-made configurations, which may also be more comprehensive and clear.

To define the actual signals for the prepared configuration, all used signal types and aspects have to be defined; those are the first two blocks on the following page.
After that (line 183 and below) the blocks with the signals for each of the 12 signal boards are presented. The number (that is: I²C address 1, 2, 3, ...) of the corresponding signal PCB is defined in the second value of the parameter APULICHT1.

Signal PCB I2C Address	Signal type (all DE HV)	Number of lamps (on the controller)	Connection sequence	APU
1	HSPE - main blocking signal with spare red	6 (5 DEHSP)	from 1: red left - red right - green - yellow - white (2x) - spareF00	M.1.1
	ZUS - additional light (e.g. speed indicator)	1 (1 L1)	7	M.1.7
	ZUS - additional light (e.g. start light)	1 (1 L1)	8	M.1.8
	VS - 3-aspect distant signal on mast)	4 (4 DEVS)	from 9: yellow le - yellow ri - green le - green ri	M.1.9
	SP - blocking signal, also ground signal	2 (2 DESP)	from 13: red (2x) – yellow (2x)	M.1.13
	SP - blocking signal, also ground signal	2 (2 DESP)	from 15: red (2x) – yellow (2x)	M.1.15
2				
	all 6 lines like 1	like 1	like 1	M.2.1 ... like 1
3	HSPE - main blocking signal with spare red	6 (5 DEHSP)	from 1: red left - red right - green - yellow - white (2x) - spareF00	M.3.1
	ZUS - additional light (e.g. speed indicator)	1 (1 L1)	7	M.3.7
	ZUS - additional light (e.g. start light)	1 (1 L1)	8	M.3.8
	VS - 3-aspect distant signal on mast)	4 (4 DEVS)	from 9: yellow le - yellow ri - green le - green ri	M.3.9
	BL - 2-aspect block signal	2 (2 DEBL)	from 13: red - green	M.3.13
	BL - 2-aspect block signal	2 (2 DEBL)	from 15: red - green	M.3.15
4				
	all 6 lines like 3	like 3	like 3	M.4.1 ... like 3
5	HSPE - main blocking signal with spare red	6 (5 DEHSP)	from 1: red le - red ri - green - yellow - white (2x) - spare R00	M.5.1
	ZUS - additional light (e.g. speed indicator)	1 (1 L1)	7	M.5.7
	ZUS - additional light (e.g. start light)	1 (1 L1)	8	M.5.8
	HSPE - main blocking signal with spare red	6 (5 DEHSP)	from 9: red le - red ri - green - yellow - white (2x) - spareF00	M.5.9
	ZUS - additional light (e.g. speed indicator)	1 (1 L1)	15	M.5.15
	ZUS - additional light (e.g. start light)	1 (1 L1)	16	M.5.16
6				
	all 6 lines like 5	like 5	like 5	M.6.1 ... like 5
7	HSE - 3-aspect main signal with spare red	4 (3 HSE)	from 1: red - green - yellow - spare R0	M.7.1
	VS - 3-aspect distant signal on mast)	4 (4 DEVS)	from 5: yellow le – yellow ri – green le – green ri	M.7.5
	HSE - 3-aspect main signal with spare red	4 (3 HSE)	from 9: red - green - yellow - spareR0	M.7.9
	VS - 3-aspect distant signal on mast)	4 (4 DEVS)	from 13: yellow le - yellow ri - green le - green ri	M.7.13
8				
	all 4 lines like 7	like 7	like 7	M.8.1 ... like 7
9	HSE - 3-aspect main signal with spare red	4 (3 HSE)	from 1: red - green - yellow - spare R0	M.9.1
	HSE - 3-aspect main signal with spare red	4 (3 HSE)	from 5: red - green - yellow - spare R0	M.9.5
	HSE - 3-aspect main signal with spare red	4 (3 HSE)	from 9: red - green - yellow - spareR0	M.9.9
	HSE - 3-aspect main signal with spare red	4 (3 HSE)	from 13: red - green - yellow - spare R0	M.9.13
10				
	all 4 lines like 9	like 9	like 9	M.10.1 ... like 9
11	SP - blocking signal, also ground signal	2 (2 DESP)	from 1: red (2x) – yellow (2x)	M.11.1
	SP - blocking signal, also ground signal	2 (2 DESP)	from 3: red (2x) – yellow (2x)	M.11.3
	SP - blocking signal, also ground signal	2 (2 DESP)	from 5: red (2x) – yellow (2x)	M.11.5
	SP - blocking signal, also ground signal	2 (2 DESP)	from 7: red (2x) – yellow (2x)	M.11.7
	SP - blocking signal, also ground signal	2 (2 DESP)	from 9: red (2x) – yellow (2x)	M.11.9
	SP - blocking signal, also ground signal	2 (2 DESP)	from 11: red (2x) – yellow (2x)	M.11.11
	SP - blocking signal, also ground signal	2 (2 DESP)	from 13: red (2x) – yellow (2x)	M.11.13
	SP - blocking signal, also ground signal	2 (2 DESP)	from 15: red (2x) – yellow (2x)	M.11.15
12	BL - 2-aspect block signal	2 (2 DEBL)	from 1: red - green	M.12.1
	BL - 2-aspect block signal	2 (2 DEBL)	from 3: red - green	M.13.3
	BL - 2-aspect block signal	2 (2 DEBL)	from 5: red - green	M.12.5
	BL - 2-aspect block signal	2 (2 DEBL)	from 7: red - green	M.12.7


from the I²C socket of the StEin module
Main blocking signal (HSPE) and two add. lights (ZUS)
Distant signal (VS) and two blocking signals (SP)
ICA board with I²C address 1
Main blocking signal (HSPE) and two add. lights (ZUS)
Distant signal (VS) and two blocking signals (SP)
ICA board with I²C address 2
Main blocking signal (HSPE) and two add. lights (ZUS)
Distant signal (VS) and two block signals (BL)
ICA board with I²C address 3
4x Block signal (BL)
4x block signal (BL)
ICA board with I²C address 12
4x blocking signal (SP)
4x blocking signal (SP)
ICA board with I²C address 11
2x main blocking signal with spare red (HSE)
2x main blocking signal with spare red (HSE)
ICA board with I²C address 10


Main blocking signal (HSPE) and two additional lights (ZUS)
Distant signal (VS) and two block signals (BL)
ICA board with I²C address 4
Hauptsperrsignal (HSPE) und zwei ZUSatzlichter
ICA board with I²C address 5
Main blocking signal (HSPE) and two additional lights (ZUS)
Main blocking signal (HSPE) and two additional lights (ZUS)
ICA board with I²C address 6
Main blocking signal (HSPE) and two additional lights (ZUS)
2x Main signal with spare red (HSE)
ICA board with I²C address 9
2x main signal with spare red (HSE)a. distant signal VS
ICA board with I²C address 8
main signal with spare red (HSE)a. distant signal VS
main signal with spare red (HSE)a. distant signal VS
ICA board with I²C address 7
main signal with spare red (HSE)a. distant signal VS

For a signalling system (such as the "German HV signals") there can be several prepared configurations, for example (here) 61 for "simple signals" (see previous pages) and 62 for "fully developed signals" (see this page).

In this case (it does not have to be this way), the objects SIGTYP and SIGBILD are defined together for both prepared configurations (lines with name "00 FERTIG DE") and object classes SIGTYP and SIGBILD, because this is clearer (and some signal types occur in both prepared configurations).

The prepared configuration 62 (DEHVXL) for "fully equipped German HV signals, with additional signals":

The prepared configuration 62 refers to the same signalling system (HV signals) as 61 (DEHV), but signals with a full set of additional signals can also be controlled (which are more likely to be available for large gauges).

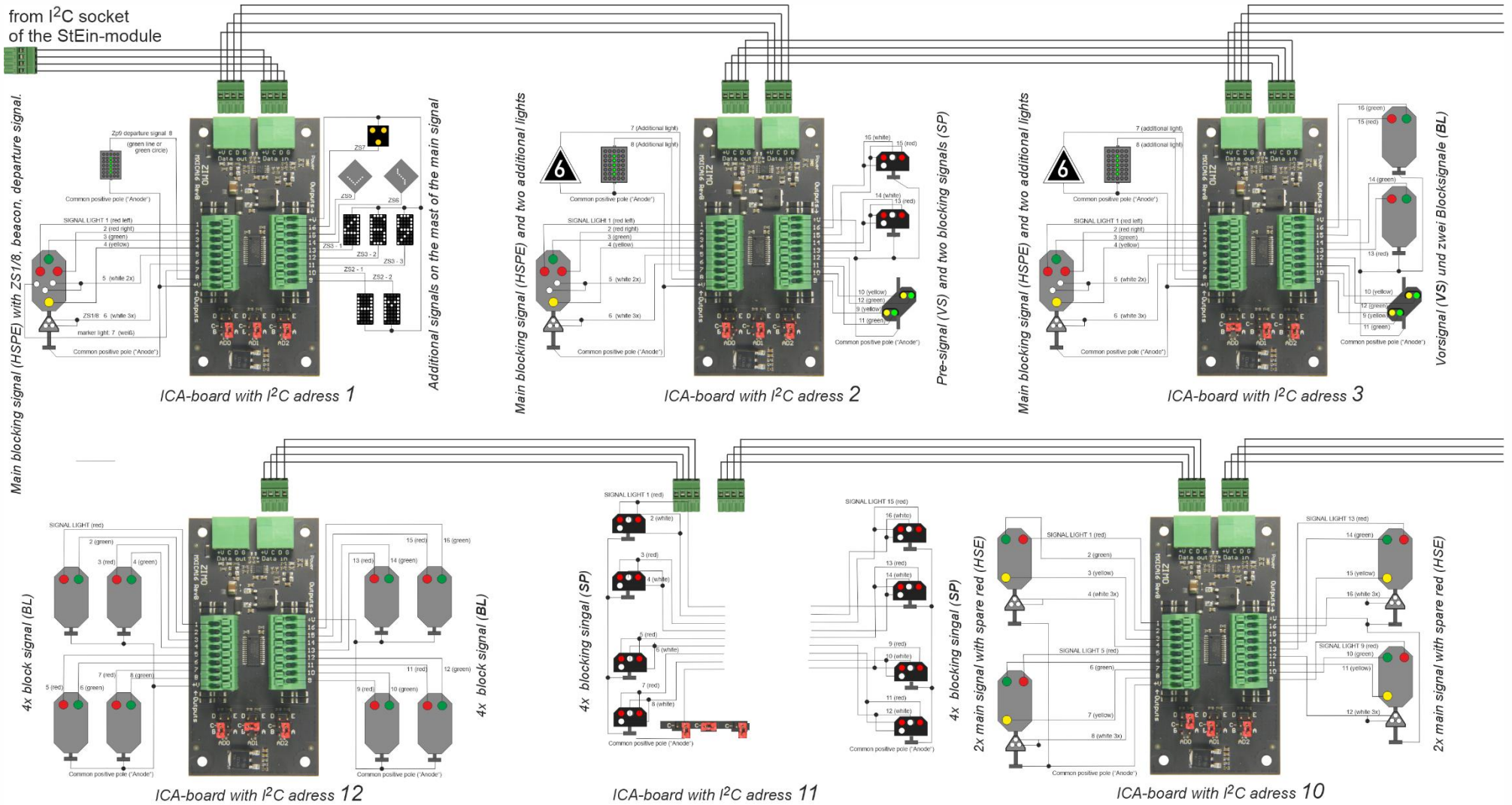
Naturally, the number of included signals is lower for "DEHVXL" than for "DEHV"):

- 4 Main blocking signals with all additional signals (without distant signal on the same board),
- 4 distant signals on the mast (as a supplement to the main blocking signals, on a separate circuit board, where there is no distant signal on the same circuit board),
- 2 Freestanding distant signals as an alternative supplement to the main blocking signals where there is no distant signal on the same circuit board),
- 4 Main blocking signals with reduced additional signals (each with distant signal on the mast on the same circuit board),
- 12 Blocking signals or dwarf signals,
- 12 Block signals two-term.

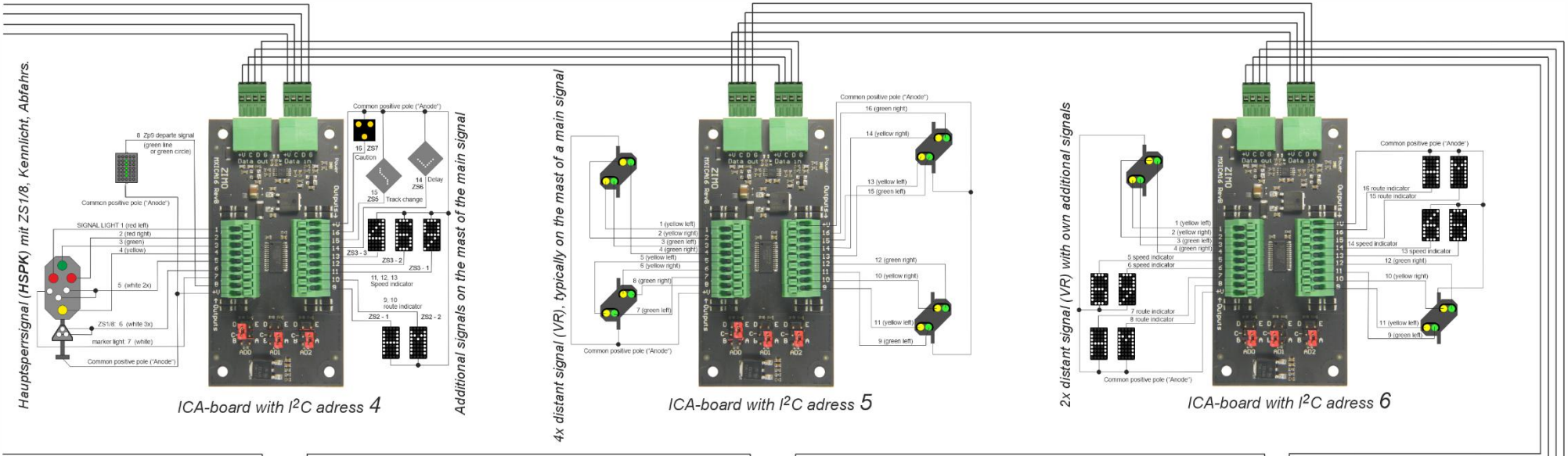
In many applications, there will be a need to use mixed signals from the prepared configurations 61 and 62. However, this is not possible on a single StEin module, as the 12 ICA boards can only be categorised according to either "61" or "62"

Therefore, in such a case, the signals must be divided between the ICA boards of two StEin modules! It is possible to control each signal from each module, but this means a certain load on the CAN bus.

Signalplatine I2C Adresse	Signaltyp (alle DE HV)	Anzahl Lampen (im Fahrpult)	Anschlussfolge	APU
1	HSPK Main blocking signal with ZS1/8 and beacon	7 (5 DEHSP)	1: red left – red right - green - yellow - white (2x) – white (3x) – white (1x)	M.1.1
	Zp9 Departure order	1 (1 L1)	8	M.1.8
	ZS2-1 Route indicator signal aspect 1	1 (1 L1)	9	M.1.9
	ZS2-2 Route indicator signal aspect 2	1 (1 L1)	10	M.1.10
	ZS3-1 Speed indicator signal aspect 1	1 (1 L1)	11	M.1.11
	ZS3-2 Speed indicator signal aspect 2	1 (1 L1)	12	M.1.12
	ZS3-3 Speed indicator signal aspect 3	1 (1 L1)	13	M.1.13
	ZS5 Delay indicator	1 (1 L1)	14	M.1.14
	ZS6 Track change indicator	1 (1 L1)	15	M.1.15
	ZS7 Caution indicator	1 (1 L1)	16	M.1.16
2	Everything like 1	like 1	like 1	M.2.1 ... like 1
3	Everything like 1	like 1	like 1	M.3.1 ... like 1
4	Everything like 1	like 1	like 1	M.4.1 ... like 1
5	VR Pre-signal on the mast	4 (4 DEVS)	from 1: yellow left – yellow right – green left – green right	M.5.1
	VR Pre-signal on the mast	4 (4 DEVS)	from, 5: yellow left – yellow right – green left – green right	M.5.5
	VR Pre-signal on the mast	4 (4 DEVS)	from 9: yellow left – yellow right – green left – green right	M.5.9
	VR Pre-signal on the mast	4 (4 DEVS)	from 13: yellow left – yellow right – green left – green right	M.5.13
6	VR Freestanding distant signal A	4 (VS DEVS)	from 1: yellow left – yellow right – green left – green right	M.6.1
	ZS2v-1 Direction indicator A signal aspect 1	1 (1 L1)	5	M.6.5
	ZS2v-2 Direction indicator A signal aspect 2	1 (1 L1)	6	M.6.6
	ZS3v-1 Speed indicator A signal aspect 1	1 (1 L1)	7	M.6.7
	ZS3v-2 Speed indicator A signal aspect 2	1 (1 L1)	8	M.6.8
	VR Freestanding distant signal B	4 (VS DEVS)	from 9: yellow left – yellow right – green left – green right	M.6.9
	ZS3v-1 Speed indicator B signal aspect 1	1 (1 L1)	13	M.6.13
	ZS3v-2 Speed indicator B signal aspect 2	1 (1 L1)	14	M.6.14
	ZS2v-1 Direction indicator B signal aspect 1	1 (1 L1)	15	M.6.15
	ZS2v-2 Direction indicator B signal aspect 2	1 (1 L1)	16	M.6.16
7	HSPK Main blocking signal with ZS1/8 and beacon	7 (5 DEHSP)	1: red left – red right - green - yellow - white (2x) – white (3x) – white (1x)	M.7.1
	Zp9 Departure order	1 (1 L1)	7	M.7.8
	ZS2 Route indicator (1 signal aspect only)	1 (1 L1)	9	M.7.9
	ZS3 Speed indicator (1 signal aspect only)	1 (1 L1)	10	M.7.10
	ZS6 Track change indicator	1 (1 L1)	11	M.7.11
	ZS7 Caution indicator	1 (1 L1)	12	M.7.12
	VR Pre-signal on mast	4 (VS)	from 13: yellow left – yellow right – green left – green right	M.7.13
8	Everything like 7	like 7	like 7	M.8.1 ... like 7
9	Everything like 7	like 7	like 7	M.8.1 ... like 7
10	Everything like 7	like 7	like 7	M.8.1 ... like 7
11	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 1: red (2x) – yellow (2x)	M.11.1
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 3: red (2x) – yellow (2x)	M.11.3
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 5: red (2x) – yellow (2x)	M.11.5
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 7: red (2x) – yellow (2x)	M.11.7
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 9: red(2x) – yellow (2x)	M.11.9
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 11: red (2x) – yellow (2x)	M.11.11
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 13: red (2x) – yellow (2x)	M.11.13
	SP Blocking signal, also dwarf signal	2 (2 DESP)	from 15: red (2x) – yellow (2x)	M.11.15
12	BL Block signal two-term	2 (2 DEBL)	from 1: red - green	M.12.1
	BL Block signal two-term	2 (2 DEBL)	from 3: red - green	M.13.3
	BL Block signal two-term	2 (2 DEBL)	from 5: red - green	M.12.5
	BL Block signal two-term	2 (2 DEBL)	from 7: red - green	M.12.7
	BL Block signal two-term	2 (2 DEBL)	from 9: red - green	M.12.9
	BL Block signal two-term	2 (2 DEBL)	from 11: red - green	M.12.11
	BL Block signal two-term	2 (2 DEBL)	from 13: red - green	M.12.13
	BL Block signal two-term	2 (2 DEBL)	from 15: red - green	M.12.15



prepared configuration 62



prepared configuration 62

*Combined prepared configuration for "**61**" and "**62**"*

00 FERTIG" lists the objects "SIGTYP" and "SIGBILD", which are used together for "61" and "62".

NAME	MODULNR	OBJKL	SIGTYP	SIGTYPSYNU	ANZLAMP	SIGART	AUFGLIZT	AUFGLIVERZ	ABGLIZT	SIGHELLTAG	SIGHELLNAC	ANZBILD	SIGBILD-1	SIGBILD-2	SIGBILD-3	SIGBILD-4	SIGBILD-5	SIGBILD-6	SIGBILD-7	SIGBILD-8	SIGBILD-9	SIGBILD-10	
00 FERTIG DE	0	SIGTYP	DEHV69BL	0	2	0	800 ms	200 ms	800 ms	100%	40%	2	Hp0	Hp1									2-terminal signal (red-green)
00 FERTIG DE	0	SIGTYP	DEHV69HS	0	3	0	800 ms	200 ms	800 ms	100%	40%	3	Hp0	Hp1	Hp2								Main signal, 3-grip (red-green-yellow)
00 FERTIG DE	0	SIGTYP	DEHV69HSE	0	4	0	800 ms	200 ms	800 ms	100%	40%	4	Hp0	Hp1	Hp2		HXZ1	H0Z1	HXZ8	H0Z8			Main signal, with ZS1/ZS8 (ZS images optionally with main signal dark or Hp0)
00 FERTIG DE	0	SIGTYP	DEHV69HSK	0	5	0	800 ms	200 ms	800 ms	100%	40%	6	Hp0	Hp1	Hp2		HXZ1	H0Z1	HXZ8	H0Z8	HKen		Main signal, with ZS1/ZS8 and marker light
00 FERTIG DE	0	SIGTYP	DEHV69HSP	0	5	0	800 ms	200 ms	800 ms	100%	40%	4	Hp00	Hp1	Hp2	Sh1							Main blocking signal (red left - red right - green - yellow - white (2x))
00 FERTIG DE	0	SIGTYP	DEHV69HSPE	0	6	0	800 ms	200 ms	800 ms	100%	40%	5	Hp00	Hp1	Hp2	Sh1	HXZ1	H0Z1	HXZ8	H0Z8			Main blocking signal, with ZS1/ZS8
00 FERTIG DE	0	SIGTYP	DEHV69HSPK	0	7	0	800 ms	200 ms	800 ms	100%	40%	6	Hp00	Hp1	Hp2	Sh1	HXZ1	H0Z1	HXZ8	H0Z8	HKen		Hauptsperrsignal, mit ZS1/ZS8 und Kennlicht
00 FERTIG DE	0	SIGTYP	DEHV69ZUS	0	1	0	800 ms	200 ms	800 ms	100%	40%	2	aus	ein									General additional signal
00 FERTIG DE	0	SIGTYP	DEHV69ZP9	0	1	0	800 ms	200 ms	800 ms	100%	40%	2	aus	Zp9									Dispatch order Zp9
00 FERTIG DE	0	SIGTYP	DEHV69RIA	0	2	0	800 ms	200 ms	800 ms	100%	40%	3	aus	RiA	RiB								route indicator
00 FERTIG DE	0	SIGTYP	DEHV69GEA	0	3	0	800 ms	200 ms	800 ms	100%	40%	4	aus	GeA	GeB	GeC							speed indicator
00 FERTIG DE	0	SIGTYP	DEHV69ZS5	0	1	0	800 ms	200 ms	800 ms	100%	40%	2	aus	Zs5									Delay indicator
00 FERTIG DE	0	SIGTYP	DEHV69ZS6	0	1	0	800 ms	200 ms	800 ms	100%	40%	2	aus	Zs6									Track change indicator
00 FERTIG DE	0	SIGTYP	DEHV69ZS7	0	1	0	800 ms	200 ms	800 ms	100%	40%	2	aus	Zs7									Caution indicator
00 FERTIG DE	0	SIGTYP	DEHV69VS	0	4	0	800 ms	200 ms	800 ms	100%	40%	3	Vr0	Vr1	Vr2								Pre-signal (yellow left - yellow right green left - green right)
00 FERTIG DE	0	SIGTYP	DEHV69VSK	0	5	0	800 ms	200 ms	800 ms	100%	40%	4	Vr0	Vr1	Vr2	Vken							Pre-signal with beacon
00 FERTIG DE	0	SIGTYP	DEHV69RIAV	0	2	0	800 ms	200 ms	800 ms	100%	40%	3	aus	RiA	RiB								Route indicator at the distant signal
00 FERTIG DE	0	SIGTYP	DEHV69GEAV	0	2	0	800 ms	200 ms	800 ms	100%	40%	3	aus	GeA	GeB								Speed indicator at the distant signal
00 FERTIG DE	0	SIGTYP	DEHV69SP	0	2	0	800 ms	200 ms	800 ms	100%	40%	2	Sp0	Sp1									Blocking signal

NAME	MODULNR	OBJKL	SIGTYP	SIGBILD	SIGBILDSYNU	ANZLICHT	SIGLICHT-1	SIGLICHT-2	SIGLICHT-3	SIGLICHT-4	SIGLICHT-5	SIGLICHT-6	SIGLICHT-7	SIGLICHT-8	SIGLICHT-9	SIGLICHT-10	SIGLICHT-11	SIGLICHT-12	SIGLICHT-13	SIGLICHT-14	SIGLICHT-15	SIGLICHT-16	Kommentar
							rot	grün	gelb														
00 FERTIG DE	0	SIGBILD	DEHV69HS	Hp0	0	3	EIN												Main signal, 3-grip (red-green-yellow)				
00 FERTIG DE	0	SIGBILD	DEHV69HS	Hp1	0	3		EIN															
00 FERTIG DE	0	SIGBILD	DEHV69HS	Hp2	0	3		EIN	EIN														
							rot	grün	gelb	ZS1/ZS8													
00 FERTIG DE	0	SIGBILD	DEHV69HSE	Hp0	0	4	EIN												Main signal, with ZS1/ZS8				
00 FERTIG DE	0	SIGBILD	DEHV69HSE	Hp1	0	4		EIN															
00 FERTIG DE	0	SIGBILD	DEHV69HSE	Hp2	0	4		EIN	EIN														
00 FERTIG DE	0	SIGBILD	DEHV69HSE	HXZ1	0	4				EIN													
00 FERTIG DE	0	SIGBILD	DEHV69HSE	H0Z1	0	4	EIN			EIN													
00 FERTIG DE	0	SIGBILD	DEHV69HSE	HXZ8	0	4				BL1													
00 FERTIG DE	0	SIGBILD	DEHV69HSE	H0Z8	0	4	EIN			BL1													
							rot	grün	gelb	ZS1/ZS8	Kennl												
00 FERTIG DE	0	SIGBILD	DEHV69HSK	Hp0	0	5	EIN												Main signal, with ZS1/ZS8 and marker light				
00 FERTIG DE	0	SIGBILD	DEHV69HSK	Hp1	0	5		EIN															
00 FERTIG DE	0	SIGBILD	DEHV69HSK	Hp2	0	5		EIN	EIN														
00 FERTIG DE	0	SIGBILD	DEHV69HSK	HXZ1	0	5				EIN													
00 FERTIG DE	0	SIGBILD	DEHV69HSK	H0Z1	0	5	EIN			EIN													
00 FERTIG DE	0	SIGBILD	DEHV69HSK	HXZ8	0	5				BL1													
00 FERTIG DE	0	SIGBILD	DEHV69HSK	H0Z8	0	5	EIN			BL1													
00 FERTIG DE	0	SIGBILD	DEHV69HSK	HKen	0	5					EIN												
							rot-li	rot-re	grün	gelb	uezz 2x												
00 FERTIG DE	0	SIGBILD	DEHV69HSP	Hp00	0	5	EIN	EIN											Main blocking signal (red left - red right - green - yellow - white				
00 FERTIG DE	0	SIGBILD	DEHV69HSP	Hp1	0	5			EIN														
00 FERTIG DE	0	SIGBILD	DEHV69HSP	Hp2	0	5			EIN	EIN													
00 FERTIG DE	0	SIGBILD	DEHV69HSP	Sh1	0	5	EIN				EIN												

83	00 FERTIG DE	0	SIGBILD	DEHV69RIA	aus	0	2												Richtungsanzeiger ZS2
84	00 FERTIG DE	0	SIGBILD	DEHV69RIA	RiA	0	2	EIN											
85	00 FERTIG DE	0	SIGBILD	DEHV69RIA	RiB	0	2		EIN										
								GeA	GeB	GeC									
87	00 FERTIG DE	0	SIGBILD	DEHV69GEA	aus	0	3												Geschwindigkeitsanzeiger ZS3
88	00 FERTIG DE	0	SIGBILD	DEHV69GEA	GeA	0	3	EIN											
89	00 FERTIG DE	0	SIGBILD	DEHV69GEA	GeB	0	3		EIN										
90	00 FERTIG DE	0	SIGBILD	DEHV69GEA	GeC	0	3			EIN									
92	00 FERTIG DE	0	SIGBILD	DEHV69ZS5	aus	0	1												Verzögerungsanzeiger ZS5
93	00 FERTIG DE	0	SIGBILD	DEHV69ZS5	Zs5	0	1	EIN											
95	00 FERTIG DE	0	SIGBILD	DEHV69ZS6	aus	0	1												Gleiswechselanzeiger ZS6
96	00 FERTIG DE	0	SIGBILD	DEHV69ZS6	Zs6	0	1	EIN											
98	00 FERTIG DE	0	SIGBILD	DEHV69ZS7	aus	0	1												Vorsichtsanzeiger ZS7
99	00 FERTIG DE	0	SIGBILD	DEHV69ZS7	Zs7	0	1	EIN											
								gelb-li	gelb-re	grün-li	grün-re								
101	00 FERTIG DE	0	SIGBILD	DEHV69VS	Vr0	0	4	EIN	EIN										Vorsignal (gelb li - gelb re grün li - grün re)
102	00 FERTIG DE	0	SIGBILD	DEHV69VS	Vr1	0	4			EIN	EIN								
103	00 FERTIG DE	0	SIGBILD	DEHV69VS	Vr2	0	4	EIN		EIN									
								gelb-li	gelb-re	grün-li	grün-re	Kennl							
105	00 FERTIG DE	0	SIGBILD	DEHV69VSK	Vr0	0	5	EIN	EIN										Vorsignal mit Kennlicht
106	00 FERTIG DE	0	SIGBILD	DEHV69VSK	Vr1	0	5			EIN	EIN								
107	00 FERTIG DE	0	SIGBILD	DEHV69VSK	Vr2	0	5	EIN		EIN									
108	00 FERTIG DE	0	SIGBILD	DEHV69VSK	VKen	0	5					EIN							
								RiA	RiB										
110	00 FERTIG DE	0	SIGBILD	DEHV69RIAV	aus	0	2												Richtungsanzeiger am Vorsignal
111	00 FERTIG DE	0	SIGBILD	DEHV69RIAV	RiA	0	2	EIN											
112	00 FERTIG DE	0	SIGBILD	DEHV69RIAV	RiB	0	2		EIN										
								GeA	GeB										
114	00 FERTIG DE	0	SIGBILD	DEHV69GEAV	aus	0	2												Geschwindigkeitsanzeiger am Vorsignal
115	00 FERTIG DE	0	SIGBILD	DEHV69GEAV	GeA	0	2	EIN											
116	00 FERTIG DE	0	SIGBILD	DEHV69GEAV	GeB	0	2		EIN										
								rot 2x	wess 2x										
118	00 FERTIG DE	0	SIGBILD	DEHV69SP	Sp0	0	2	EIN											Sperrsignal
119	00 FERTIG DE	0	SIGBILD	DEHV69SP	Sp1	0	2		EIN										
121	00 FERTIG DE	0	SIGBILD	0	Hp0	0	3	EIN											Restliche Signalbilder (wenn oben nicht aufgeführter SIGTYP
122	00 FERTIG DE	0	SIGBILD	0	Hp1	0	3		EIN										
123	00 FERTIG DE	0	SIGBILD	0	Hp2	0	3		EIN	EIN									
124	00 FERTIG DE	0	SIGBILD	0	Vr0	0	4	EIN	EIN										
125	00 FERTIG DE	0	SIGBILD	0	Vr1	0	4			EIN	EIN								
126	00 FERTIG DE	0	SIGBILD	0	Vr2	0	4	EIN		EIN									
127	00 FERTIG DE	0	SIGBILD	0	Sp0	0	2	EIN											
128	00 FERTIG DE	0	SIGBILD	0	Sp1	0	2		EIN										
129	00 FERTIG DE	0	SIGBILD	0	aus	0	1												
130	00 FERTIG DE	0	SIGBILD	0	ein	0	1	EIN											

ZEILE	NAME	MODULNR	OBJKL	SIGTYP	SIGSYNU	PANEL	PANSYMB	PANFELD	ANZLAMP	SIGART	AUFGLIZT	AUFGLIVERZ	ABGLIZT	SIGHELLTAG	SIGHELLNAC	APULICHT1	APUDUS1	APUDUS2	APUDUS3	Kommentar
134	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-1 DE	DEHSP	1	6	"	"	"	"	"	"	M.1.1				für ein Haupt(sperr)signal mit Vorsignal am Mast
135	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-1 DE			1	"	"	"	"	"	"	M.1.7	M.1.1			(Zusatzanzeiger beliebiges "ZUS" und "Zp9")
136	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-1 DE			1	"	"	"	"	"	"	M.1.8	M.1.1			
137	61 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	2	4	"	"	"	"	"	"	M.1.9	M.1.1			(Rest für zwei Sperrsignale)
138	61 FERTIG DE		SIG	DEHV69SP		61 FERT-1 DE	DESP	3	2	"	"	"	"	"	"	M.1.13				
139	61 FERTIG DE		SIG	DEHV69SP		61 FERT-1 DE	DESP	4	2	"	"	"	"	"	"	M.1.15				
141	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-1 DE	DEHSP	5	6	"	"	"	"	"	"	M.2.1				für ein Haupt(sperr)signal mit Vorsignal am Mast
142	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-1 DE			1	"	"	"	"	"	"	M.2.7	M.2.1			(Zusatzanzeiger beliebiges "ZUS" und "Zp9")
143	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-1 DE			1	"	"	"	"	"	"	M.2.8	M.2.1			
144	61 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	6	4	"	"	"	"	"	"	M.2.9	M.2.1			(Rest für zwei Sperrsignale)
145	61 FERTIG DE		SIG	DEHV69SP		61 FERT-1 DE	DESP	7	2	"	"	"	"	"	"	M.2.13				
146	61 FERTIG DE		SIG	DEHV69SP		61 FERT-1 DE	DESP	8	2	"	"	"	"	"	"	M.2.15				
148	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-1 DE	DEHSP	9	6	"	"	"	"	"	"	M.3.1				für ein Haupt(sperr)signal mit Vorsignal am Mast
149	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-1 DE			1	"	"	"	"	"	"	M.3.7	M.3.1			(Zusatzanzeiger beliebiges "ZUS" und "Zp9")
150	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-1 DE			1	"	"	"	"	"	"	M.3.8	M.3.1			
151	61 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	10	4	"	"	"	"	"	"	M.3.9	M.3.1			(Rest für zwei Blocksignale)
152	61 FERTIG DE		SIG	DEHV69BL		61 FERT-1 DE	DEBL	11	2	"	"	"	"	"	"	M.3.13				
153	61 FERTIG DE		SIG	DEHV69BL		61 FERT-1 DE	DEBL	12	2	"	"	"	"	"	"	M.3.15				
155	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-1 DE	DEHSP	13	6	"	"	"	"	"	"	M.4.1				für ein Haupt(sperr)signal mit Vorsignal am Mast
156	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-1 DE			1	"	"	"	"	"	"	M.4.7	M.4.1			(Zusatzanzeiger beliebiges "ZUS" und "Zp9")
157	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-1 DE			1	"	"	"	"	"	"	M.4.8	M.4.1			
158	61 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	14	4	"	"	"	"	"	"	M.4.9	M.4.1			(Rest für zwei Blocksignale)
159	61 FERTIG DE		SIG	DEHV69BL		61 FERT-1 DE	DEBL	15	2	"	"	"	"	"	"	M.4.13				
160	61 FERTIG DE		SIG	DEHV69BL		61 FERT-1 DE	DEBL	6	2	"	"	"	"	"	"	M.4.15				

162	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-2 DE	DEHSP	1	6	"	"	"	"	"	"	M.5.1				für 2 Haupt(sperr)signale ohne Vorsignale			
163	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-2 DE			1	"	"	"	"	"	"	M.5.7	M.5.1			(Zusatzanzeiger beliebiges "ZUS" und "Zp9")			
164	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-2 DE			1	"	"	"	"	"	"	M.5.8	M.5.1						
165	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-2 DE	DEHSP	2	6	"	"	"	"	"	"	M.5.9							
166	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-2 DE			1	"	"	"	"	"	"	M.5.15							
167	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-2 DE			1	"	"	"	"	"	"	M.5.16							
169	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-2 DE	DEHSP	3	6	"	"	"	"	"	"	M.6.1				für 2 Haupt(sperr)signale ohne Vorsignale			
170	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-2 DE			1	"	"	"	"	"	"	M.6.7	M.6.1			(Zusatzanzeiger beliebiges "ZUS" und "Zp9")			
171	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-2 DE			1	"	"	"	"	"	"	M.6.8	M.6.1						
172	61 FERTIG DE		SIG	DEHV69HSPE		61 FERT-2 DE	DEHSP	4	6	"	"	"	"	"	"	M.6.9							
173	61 FERTIG DE		SIG	DEHV69ZUS		61 FERT-2 DE			1	"	"	"	"	"	"	M.6.15							
174	61 FERTIG DE		SIG	DEHV69ZP9		61 FERT-2 DE			1	"	"	"	"	"	"	M.6.16							
176	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	5	4	"	"	"	"	"	"	M.7.1				für 2 Hauptsignale mit Vorsignalen am Mast			
177	61 FERTIG DE		SIG	DEHV69VS		61 FERT-2 DE	DEVS	6	4	"	"	"	"	"	"	M.7.5	M.7.1						
178	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	7	4	"	"	"	"	"	"	M.7.9							
179	61 FERTIG DE		SIG	DEHV69VS		61 FERT-2 DE	DEVS	8	4	"	"	"	"	"	"	M.7.13	M.7.9						
181	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	9	4	"	"	"	"	"	"	M.8.1				für 2 Hauptsignale mit Vorsignalen am Mast			
182	61 FERTIG DE		SIG	DEHV69VS		61 FERT-2 DE	DEVS	10	4	"	"	"	"	"	"	M.8.5	M.8.1						
183	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	11	4	"	"	"	"	"	"	M.8.9							
184	61 FERTIG DE		SIG	DEHV69VS		61 FERT-2 DE	DEVS	12	4	"	"	"	"	"	"	M.8.13	M.8.9						
186	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	13	4	"	"	"	"	"	"	M.9.1				für 4 Hauptsignale ohne Vorsignale und Zusatz			
187	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	14	4	"	"	"	"	"	"	M.9.5							
188	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	15	4	"	"	"	"	"	"	M.9.9							
189	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	16	4	"	"	"	"	"	"	M.9.13							
191	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	17	4	"	"	"	"	"	"	M.10.1				für 4 Hauptsignale ohne Vorsignale und Zusatz			
192	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	18	4	"	"	"	"	"	"	M.10.5							
193	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	19	4	"	"	"	"	"	"	M.10.9							
194	61 FERTIG DE		SIG	DEHV69HSE		61 FERT-2 DE	DEHS	20	4	"	"	"	"	"	"	M.10.13							
196	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	1	2	"	"	"	"	"	"	M.11.1				für 8 Sperrignale			
197	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	2	2	"	"	"	"	"	"	M.11.3							
198	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	3	2	"	"	"	"	"	"	M.11.5							
199	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	4	2	"	"	"	"	"	"	M.11.7							
200	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	5	2	"	"	"	"	"	"	M.11.9							
201	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	6	2	"	"	"	"	"	"	M.11.11							
202	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	7	2	"	"	"	"	"	"	M.11.13							
203	61 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	8	2	"	"	"	"	"	"	M.11.15							
205	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	1	2	"	"	"	"	"	"	M.12.1				für 8 Blocksignale (zweibegriffige)			
206	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	2	2	"	"	"	"	"	"	M.12.3							
207	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	3	2	"	"	"	"	"	"	M.12.5							
208	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	4	2	"	"	"	"	"	"	M.12.7							
209	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	5	2	"	"	"	"	"	"	M.12.9							
210	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	6	2	"	"	"	"	"	"	M.12.11							
211	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	7	2	"	"	"	"	"	"	M.12.13							
212	61 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	8	2	"	"	"	"	"	"	M.12.15							
ZEILE	NAME	MODULNR	OBJKL	SIGTYP	SIGSYNU	PANEL	PANSYMB	PANFELD	ANZLAMP	SIGART	AUFGLIZT	AUFGLIVERZ	ABGLIZT	SIGHELLTAG	SIGHELLNAC	APULICHT1	APUDUS1	APUDUS2	APUDUS3	Kommentar			
216	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-1 DE	DEHSP	1	7	"	"	"	"	"	"	M.1.1				für ein voll-ausgebautes Haupt(sperr)signal mit Zusatzsignalen			
217	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-1 DE	ARG	2	1	"	"	"	"	"	"	M.1.8	M.1.1			(ZS1/ZS8 und Kennlicht im HSPK integriert, andere Zusatzsignale extra)			
218	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-1 DE	ARG	2	2	"	"	"	"	"	"	M.1.9	M.1.1						
219	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-1 DE	ARG	2	3	"	"	"	"	"	"	M.1.11	M.1.1						
220	62 FERTIG DE		SIG	DEHV69ZS5					1	"	"	"	"	"	"	M.1.14	M.1.1						
221	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.1.15	M.1.1						
222	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.1.16	M.1.1						
224	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-1 DE	DEHSP	4	7	"	"	"	"	"	"	M.2.1				für ein voll-ausgebautes Haupt(sperr)signal mit Zusatzsignalen			
225	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-1 DE	ARG	5	1	"	"	"	"	"	"	M.2.8	M.2.1			(ZS1/ZS8 und Kennlicht im HSPK integriert, andere Zusatzsignale extra)			
226	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-1 DE	ARG	5	2	"	"	"	"	"	"	M.2.9	M.2.1						
227	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-1 DE	ARG	5	3	"	"	"	"	"	"	M.2.11	M.2.1						
228	62 FERTIG DE		SIG	DEHV69ZS5					1	"	"	"	"	"	"	M.2.14	M.2.1						
229	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.2.15	M.2.1						
230	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.2.16	M.2.1						

232	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-1 DE	DEHSP	7	7	"	"	"	"	"	"	M.3.1				für ein voll-ausgebautes Haupt(sperr)signal mit Zusatzsignalen
233	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-1 DE	ARG	8	1	"	"	"	"	"	"	M.3.8	M.3.1			(ZS1/ZS8 und Kennlicht im HSPK integriert, andere Zusatzsignale extra)
234	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-1 DE	ARG	8	2	"	"	"	"	"	"	M.3.9	M.3.1			
235	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-1 DE	ARG	8	3	"	"	"	"	"	"	M.3.11	M.3.1			
236	62 FERTIG DE		SIG	DEHV69ZS5					1	"	"	"	"	"	"	M.3.14	M.3.1			
237	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.3.15	M.3.1			
238	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.3.16	M.3.1			
240	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-1 DE	DEHSP	10	7	"	"	"	"	"	"	M.4.1				für ein voll-ausgebautes Haupt(sperr)signal mit Zusatzsignalen
241	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-1 DE	ARG	11	1	"	"	"	"	"	"	M.4.8	M.4.1			(ZS1/ZS8 und Kennlicht im HSPK integriert, andere Zusatzsignale extra)
242	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-1 DE	ARG	11	2	"	"	"	"	"	"	M.4.9	M.4.1			
243	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-1 DE	ARG	11	3	"	"	"	"	"	"	M.4.11	M.4.1			
244	62 FERTIG DE		SIG	DEHV69ZS5					1	"	"	"	"	"	"	M.4.14	M.4.1			
245	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.4.15	M.4.1			
246	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.4.16	M.4.1			
248	62 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	3	4	"	"	"	"	"	"	M.5.1	M.1.1			für 4 Vorsignale an den Masten der obigen Hauptsperrsignale
249	62 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	6	4	"	"	"	"	"	"	M.5.5	M.2.1			(dunkel vom Hauptsignal, am Fahrpult im Panel der Hauptsignale)
250	62 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	9	4	"	"	"	"	"	"	M.5.9	M.3.1			
251	62 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	12	4	"	"	"	"	"	"	M.5.13	M.4.1			
253	62 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	13	4	"	"	"	"	"	"	M.6.1				für 2 freistehende Vorsignale mit Richtungs- und Geschwindigkeitsanzeigern
254	62 FERTIG DE		SIG	DEHV69RIA		61 FERT-1 DE	ARG	14	2	"	"	"	"	"	"	M.6.5	M.6.1			(keine Dunkelschaltung des Vorsignals, da nicht am Mast eines HAuptsignals
255	62 FERTIG DE		SIG	DEHV69GEA		61 FERT-1 DE	ARG	14	2	"	"	"	"	"	"	M.6.7	M.6.1			
256	62 FERTIG DE		SIG	DEHV69VS		61 FERT-1 DE	DEVS	15	4	"	"	"	"	"	"	M.6.9				
257	62 FERTIG DE		SIG	DEHV69RIA		61 FERT-1 DE	ARG	16	2	"	"	"	"	"	"	M.6.13	M.6.9			
258	62 FERTIG DE		SIG	DEHV69GEA		61 FERT-1 DE	ARG	16	2	"	"	"	"	"	"	M.6.15	M.6.9			
260	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-2 DE	DEHSP	1	7	"	"	"	"	"	"	M.7.1				für ein teil-ausgebautes Haupt(sperr)signal mit Zusatzsignalen
261	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-2 DE	ARG	2	1	"	"	"	"	"	"	M.7.8	M.7.1			und Vorsignal am Mast
262	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-2 DE	ARG	2	1	"	"	"	"	"	"	M.7.9	M.7.1			
263	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-2 DE	ARG	2	1	"	"	"	"	"	"	M.7.10	M.7.1			
264	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.7.11	M.7.1			
265	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.7.12	M.7.1			
266	62 FERTIG DE		SIG	DEHV69VS		62 FERT-2 DE	DEVS	3	4	"	"	"	"	"	"	M.7.13	M.7.1			
268	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-2 DE	DEHSP	4	7	"	"	"	"	"	"	M.8.1				für ein teil-ausgebautes Haupt(sperr)signal mit Zusatzsignalen
269	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-2 DE	ARG	5	1	"	"	"	"	"	"	M.8.8	M.8.1			und Vorsignal am Mast
270	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-2 DE	ARG	5	1	"	"	"	"	"	"	M.8.9	M.8.1			
271	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-2 DE	ARG	5	1	"	"	"	"	"	"	M.8.10	M.8.1			
272	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.8.11	M.8.1			
273	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.8.12	M.8.1			
274	62 FERTIG DE		SIG	DEHV69VS		62 FERT-2 DE	DEVS	6	4	"	"	"	"	"	"	M.8.13	M.8.1			
276	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-2 DE	DEHSP	7	7	"	"	"	"	"	"	M.9.1				für ein teil-ausgebautes Haupt(sperr)signal mit Zusatzsignalen
277	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-2 DE	ARG	8	1	"	"	"	"	"	"	M.9.8	M.9.1			und Vorsignal am Mast
278	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-2 DE	ARG	8	1	"	"	"	"	"	"	M.9.9	M.9.1			
279	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-2 DE	ARG	8	1	"	"	"	"	"	"	M.9.10	M.9.1			
280	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.9.11	M.9.1			
281	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.9.12	M.9.1			
282	62 FERTIG DE		SIG	DEHV69VS		62 FERT-2 DE	DEVS	9	4	"	"	"	"	"	"	M.9.13	M.9.1			
284	62 FERTIG DE		SIG	DEHV69HSPK		62 FERT-2 DE	DEHSP	10	7	"	"	"	"	"	"	M.10.1				für ein teil-ausgebautes Haupt(sperr)signal mit Zusatzsignalen
285	62 FERTIG DE		SIG	DEHV69ZP9		62 FERT-2 DE	ARG	11	1	"	"	"	"	"	"	M.10.8	M.10.1			und Vorsignal am Mast
286	62 FERTIG DE		SIG	DEHV69RIA		62 FERT-2 DE	ARG	11	1	"	"	"	"	"	"	M.10.9	M.10.1			
287	62 FERTIG DE		SIG	DEHV69GEA		62 FERT-2 DE	ARG	11	1	"	"	"	"	"	"	M.10.10	M.10.1			
288	62 FERTIG DE		SIG	DEHV69ZS6					1	"	"	"	"	"	"	M.10.11	M.10.1			
289	62 FERTIG DE		SIG	DEHV69ZS7					1	"	"	"	"	"	"	M.10.12	M.10.1			
290	62 FERTIG DE		SIG	DEHV69VS		62 FERT-2 DE	DEVS	12	4	"	"	"	"	"	"	M.10.13	M.10.1			
292	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	1	2	"	"	"	"	"	"	M.11.1				für 8 Sperrignale
293	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	2	2	"	"	"	"	"	"	M.11.3				
294	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	3	2	"	"	"	"	"	"	M.11.5				
295	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	4	2	"	"	"	"	"	"	M.11.7				
296	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	5	2	"	"	"	"	"	"	M.11.9				
297	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	6	2	"	"	"	"	"	"	M.11.11				
298	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	7	2	"	"	"	"	"	"	M.11.13				
299	62 FERTIG DE		SIG	DEHV69SP		61 FERT-3 DE	DESP	8	2	"	"	"	"	"	"	M.11.15				
301	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	1	2	"	"	"	"	"	"	M.12.1				für 8 Blocksignale (zweibegriffige)
302	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	2	2	"	"	"	"	"	"	M.12.3				
303	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	3	2	"	"	"	"	"	"	M.12.5				
304	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	4	2	"	"	"	"	"	"	M.12.7				
305	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	5	2	"	"	"	"	"	"	M.12.9				
306	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	6	2	"	"	"	"	"	"	M.12.11				
307	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	7	2	"	"	"	"	"	"	M.12.13				
308	62 FERTIG DE		SIG	DEHV69BL		61 FERT-4 DE	DEBL	8	2	"	"	"	"	"	"	M.12.15				
	NAME	MODULNR	OBJKL	SIGTYP	SIGSYNU	PANEL	PANSYMB	PANFELD	ANZLAMP	SIGART	AUFGLIZT	AUFGLIVERZ	ABGLIZT	SIGHELLTAG	SIGHELLNAC	APULICHT1	APUDUS1	APUDUS2	APUDUS3	Kommentar

In preparation:

The prepared configuration **63**
for "Swiss signals, type L":

From a logical point of view, there is a matrix of driving terms and signal types:

Main signalling terms (signal aspects)

Signal board assignment type 1
1 main signal 7 lights
+ 1 distant signal 5 lights
or 1 combination signal 10 lights
+ 4 additional lights (can be assigned as required)

Assignment type 2
2 main signals 4 lights each (green-red-yellow-green)
+ 1 distant signal 5 lights
+ 3 additional lights (can be assigned as required)

Assignment type 3
2 main signals 4 lights each (green-red-yellow-green)
+ 2 distant signals 4 lights
or 2 combination signals 8 lights

Assignment type 4
8 block signals 2 lights each
Belegungstyp 5
4 Blocksignale (Kombi) je 4 Lichter (2xgelb-grün-rot-gelb)

Assignment type 6
2 block signals (combination) 7 lights each (distant signal + green-red)
+ 2 additional lights (can be assigned as required)

Assignment type 7
5 dwarf signals 3 lights each
+ 1 additional light

Assignment type 8
3 dwarf signals with additional signal 5 lights each
+ 1 additional light

Signalplatine I2C Adresse	Signaltyp (alle DE HV)	Anzahl Lampen (im Fahrpult)	Anschlussfolge	APU
1	HSPK Hauptsperrsignal mit Kennlicht	7 (5 DEHSP)	1: rot li – rot re - grün - gelb - weiß (2x) - Kennlicht - Ersatz	M.1.1
	ZUS Zusatzlicht (z. B. Geschw'anzeiger)	1 (1 L1)	8	M.1.8
	VSK Vorsignal am Mast dreibegriff mit Kennl	5 (4 DEVS)	ab 9: gelb li – gelb re – grün li – grün re - Kennlicht	M.1.9
	ZUS Zusatzlicht (z. B. Abfahrlicht)	1 (1 L1)	14	M.1.14
	ZUS Reserve	1 (1 L1)	15	M.1.15
	ZUS Reserve	1 (1 L1)	16	M.1.16
2	alle 6 Zeilen wie 1	wie 1	wie 1	M.2.1 ... wie 1
3	HSPE Hauptsperrsignal mit Ersatzrot	6 (5 DEHSP)	ab 1: rot li – rot re – grün – gelb – weiß (2x) – ErsF00	M.3.1
	ZUS Zusatzlicht (z. B. Geschw'anzeiger)	1 (1 L1)	7	M.3.7
	ZUS Zusatzlicht (z. B. Abfahrlicht)	1 (1 L1)	8	M.3.8
	VS Vorsignal am Mast dreibegriffig	4 (4 DEVS)	ab 9: gelb li – gelb re – grün li – grün re	M.3.9
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 13: rot – grün	M.3.13
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 15: rot – grün	M.3.15
4	alle 6 Zeilen wie 3	wie 3	wie 3	M.4.1 ... wie 3
5	HSPE Hauptsperrsignal mit Ersatzrot	6 (5 DEHSP)	ab 1: rot li – rot re – grün – gelb – weiß (2x) – ErsR00	M.5.1
	ZUS Zusatzlicht (z. B. Geschw'anzeiger)	1 (1 L1)	7	M.5.7
	ZUS Zusatzlicht (z. B. Abfahrlicht)	1 (1 L1)	8	M.5.8
	HSPE Hauptsperrsignal mit Ersatzrot)	6 (5 DEHSP)	ab 9: rot li – rot re – grün – gelb – weiß (2x) – ErsF00	M.5.9
	ZUS Zusatzlicht (z. B. Geschw'anzeiger)	1 (1 L1)	15	M.5.15
	ZUS Zusatzlicht (z. B. Abfahrlicht)	1 (1 L1)	16	M.5.16
6	alle 6 Zeilen wie 5	wie 5	wie 5	M.6.1 ... wie 5
7	HSE Hauptsignal dreibegriffig mit Ersatzrot	4 (3 HSE)	ab 1: rot – grün – gelb – ErsR0	M.7.1
	VS Vorsignal am Mast dreibegriffig	4 (4 DEVS)	ab 5: gelb li – gelb re – grün li – grün re	M.7.5
	HSE Hauptsignal dreibegriffig mit Ersatzrot	4 (3 HSE)	ab 9: rot – grün – gelb – ErsR0	M.7.9
	VS Vorsignal am Mast dreibegriffig	4 (4 DEVS)	ab 13: gelb li – gelb re – grün li – grün re	M.7.13
8	alle 4 Zeilen wie 7	wie 7	wie 7	M.8.1 ... wie 7
9	HSE Hauptsignal dreibegriffig mit Ersatzrot	4 (3 HSE)	ab 1: rot – grün – gelb – ErsR0	M.9.1
	HSE Hauptsignal dreibegriffig mit Ersatzrot	4 (3 HSE)	ab 5: rot – grün – gelb – ErsR0	M.9.5
	HSE Hauptsignal dreibegriffig mit Ersatzrot	4 (3 HSE)	ab 9: rot – grün – gelb – ErsR0	M.9.9
	HSE Hauptsignal dreibegriffig mit Ersatzrot	4 (3 HSE)	ab 13: rot – grün – gelb – ErsR0	M.9.13
10	alle 4 Zeilen wie 9	wie 9	wie 9	M.10.1 ... wie 9
11	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 1: rot (2x) – gelb (2x)	M.11.1
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 3: rot (2x) – gelb (2x)	M.11.3
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 5: rot (2x) – gelb (2x)	M.11.5
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 7: rot (2x) – gelb (2x)	M.11.7
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 9: rot (2x) – gelb (2x)	M.11.9
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 11: rot (2x) – gelb (2x)	M.11.11
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 13: rot (2x) – gelb (2x)	M.11.13
	SP Sperrsignal, auch Zwergsignal	2 (2 DESP)	ab 15: rot (2x) – gelb (2x)	M.11.15
12	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 1: rot – grün	M.12.1
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 3: rot – grün	M.13.3
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 5: rot – grün	M.12.5
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 7: rot – grün	M.12.7
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 9: rot – grün	M.12.9
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 11: rot – grün	M.12.11
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 13: rot – grün	M.12.13
	BL Blocksignal zweibegriffig	2 (2 DEBL)	ab 15: rot – grün	M.12.15

15. The objects in the parameter sheets

A parameter sheet is created on the computer as an Excel sheet, exported from there as a CSV file, this .csv file must then be renamed to .cfg, which is loaded into the StEin module using a USB stick.

See chapter "*Setup technical data, "StEin" configuration, ...*"

Parameter sheets can contain objects for a single module or for several (or all) StEin modules: the respective module then selects its "own" objects (based on the MO-DULNR in the second column) and only uses them to create the binary configuration for its own working memory. In contrast, all objects of the parameter sheet are loaded in the flash memory.

NOTE: If a parameter field is **not filled** in, the entry from the first prepared configuration of the respective object class is used as a **substitute value** (default), e.g.: if no busy signal threshold is specified for a track section, 2 mA from prepared configuration 1 automatically applies.

ATTENTION: "0" (zero) means "**nothing**" or "no" in many cases (if all options for a parameter are not to be used), **but not always**, e.g. not for current values for busy or overcurrent detection (in this case, "0" would actually apply, which would hardly make sense..

Optional: *KONFBIB and ADDFERT - general information concerning the configuration*

The lines represent a "parameter sheet" (formally object classes "KONFBIB" and "ADDFERT" contain "bibliographical data" for the parameter sheet (like name, version,...) or indications to add prepared configurations to the individually created parameter sheet; both are optional, that is for example, valid configurations also work without KONFBIB, i.e. without name, etc

NAME
Here you can enter any desired text - it has no effect on the operation, but is only a commentary.
This cell can also be empty.

MODULNR
Here you can enter the number of the StEin module (according to its number on the display), this object line shall be active.
This enables a homogenous parameter sheet for all modules (instead of one sheet per module).
This also saves some time, because the file only has to be loaded into one StEin module, and will be distributed to the other modules by themselves.

OBJKL (Objektklasse) - i.e. in this case (general data)
= KONFBIB Bilblografical information concerning the configuration (this parameter sheet) of the module according to MODULNR.
= ADDFERT Perpared configuration shall be added to this configuration (according to this parameter sheet)

NAME, VERSION, ...
(if OBJKL = KONFBIB)
bibliographical information concerning the parameter sheets

FERTNUM
(if OBJKL = ADDFERT)
Number of prepared configuration to be added

	NAME	MODULNR	OBJKL	NAME	VERSION	DATUM	ERSTELL	AUTOR
5		23 StEin	KONFBIB	N-ANL-2	3	191017		

	NAME	MODULNR	OBJKL	FERTNUM
9		23 StEin	ADDFERT	4
10		23 StEin	ADDFERT	46
11		23 StEin	ADDFERT	62

Using the "reduced prepared configuration 60"

In this case, the "prepared configuration 60" is inserted into the individual configuration(.cfg file), which is not a real prepared configuration, but contains the object lines SIGTYP and SIGBILD of the German prepared configurations 61 and 62 (and other 6...), but no SIG lines, i.e. no actual signals.

The actual signals (object class SIG) do not come from a prepared configuration, but are written individually. This allows full flexibility with regard to the arrangement and assignment of the ICA boards.

Below are examples of some of the "real signal lines" with the types that must occur in "60" and the details (especially connection points) of the actual signals.

	NAME	MODULNR	OBJKL	FERTNUM
6		23 StEin	ADDFERT	4
7		23 StEin	ADDFERT	46
8		23 StEin	ADDFERT	60

Load prepared configuration LNK (8 track sections for small gauges)
Load prepared configuration EPN (8 EPL switches)
All objects of the classes SIGTYP and SIGBILD that belong to the GERMAN prepared configurations DEHV, DEHVXL, etc...

	NAME	MODULNR	OBJKL	SIGTYP	SIGSYNU	PANEL	PAN	IAC	APULICHT1	APUDUS1	APUDUS2	APUDUS3	Kommentar
12		23 StEin	SIG	DEHV69HSPE		61 FERT-1 DE		"	023.1.1				for a main (blocking) signal with distant signal on the mast
13		23 StEin	SIG	DEHV69ZUS		61 FERT-1 DE		"	023.1.7	023.1.1			(Additional indicator any „ZUS“ and „Zp9"
14		23 StEin	SIG	DEHV69ZP9		61 FERT-1 DE		"	023.1.8	023.1.1			
15		23 StEin	SIG	DEHV69VS		61 FERT-1 DE	[	"	023.1.9	023.1.1			(Remainder for two blocking signals)

Not yet fully implemented, some object classes are missing!

KSA - the object class for reversing loops

*Lines with the object class KSA are used when a reversing loop section is set up; **two** track section outputs are combined for this: for the **two poles** of the section separated on both sides. Either 1 & 2, 3 & 4, 5 & 6, or 7 & 8 can be used as outputs; the latter is recommended. Object lines KSA (instead of GA and structured identically to object lines GA) are used for **both** sections; a separate GATYP is useful for these two lines to ensure that the parameters of the lines are identical. See example below.*

GATYP and GA - object types and objects for "track sections"

These object lines contain the definitions for each track section concerning occupancy thresholds and overcurrent and short circuit handling. Additionally, there are special parameters for a module autonomous operation (...FIX) and the connection points for the corresponding track section and - if in use - point contacts.

*The (optional but very useful) object lines of the object class **GATYP** (=track section types) represent templates for the actual track sections; the parameters of these templates can be taken over into the object lines of the object class GA (actual track sections) or replaced by different values.*

BESMNOR (Besetztschwelle in NORmalen Betrieb)
= xxx mA

BESMFEU (Besetztschwelle im FEUchten Zustand)
Higher occupancy detection threshold, first step "_d"

BESMNAS (Besetztschwelle im NASsen Zustand)
Higher occupancy detection, second step "_h"

GKMINZT (Gleiskontake Mindestansprechzeit)
Valid for both possible track contacts
= xxx ms

GKPARAM (Gleiskontakte Parameter)
Type of parameters depending on the type of the track contacts

BEFORM (Betriebsform)
=0: defined HLU step
=1: automatic entry into the track
=3: controlled ecternally (computer, etc.)
=4: controlled externally, simulates a track section on the module MX9
The configurations 0, 1 need specifications of the following parameters. Type of operation 4 can only occur in pairs
(A, B, partial sections of the MX9).

HLUFIX (fixe HLU-Stufe)
if BEFORM = 0: actual fixed value
if BEFORM = 1, 3, 4: initial value
=H: Stop
=UH: intermediate step
=U: ultraslow
=LU: intermediate step
=L: slow

PUFFIX (fixe Punktfolgebefehle)
only valid, if BEFORM =0 or =1 and one or two track sections defined in APUGK1:
=F/H
=FL/H
=L/H
=LU/H
etc., according to the description of the point following commands.

FUBFIX (fixe Funktionsbits)
=0: no function defined
= 0000-0001: F1 set
= 0000-0100: F3 set
= 0010-1010: F2+F4+F6 set usw.
Depending on the decoder type it is possible to map to other functions or direction dependencies or complexes

POSFIX (Positionscode oder Fahrwegaadresse)
=0: no position code
=1-255: position code
usage (type of actual command) not defined yet.

GLEINF (Gleiseinfahrt mit Vorabschnitt)
only valid, if BEFORM = 1, pre-section has to be defined in APUGV.
=H: target-limitH
=UH: target-limit UH
=U: target-limit U
=LU: target-limit LU
=L: target-limit L
=F: target-limit F
=A: switched off target-limit A .

NAME
Here you can enter any desired text - it has no effect on the operation, but is only a commentary.
This cell can also be empty.

MODULNR
Here you can enter the number of the StEin module (according to its number on the display), this object line shall be active.
This enables a homogenous parameter sheet for all modules (instead of one sheet per module).
This also saves some time, because the file only has to beloaded into one StEin module, and will be distributed to the other modules by themselves.

OBJKL (Objektklasse) - i.e. type (template) or actual section
= **GATYP** Characteristic of an object of the object class „track section type", that is a template for a group of concrete track sections or
= **GA** characteristic of an object class „track section"
i.e. every line describes a concrete track section

GATYP (Gleisabschnittstyp)
if object line (according to OBJKL, see left) of the **object class GATYP**:
denomination of a track section type of which the values of the parameters shall be valid for every track section by default (if " is entered in the respective cells).
if object line (according to OBJKL, see left) of the **object class GA**:
denomination of a track section type of which the values of the parameters shall be valid for every track section by

GASYNU (Gleisabschnittsnummer systemweit)
= 1 to 65000: each number can only be used once on the layout, i.e. system wide. With this number, a track section can be addressed directly from the computer, without APUGA being defined.

Description of parameters is valid for track section types GATYP and track sections GA (excluding connection points APU, which only exist for „actual" track sections)... ...

Object lines for Track section types

Object lines for Track section types

												Besetztmelde-Schwellen				
NAME	MODULNR	OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	FUNFIX	POSFIX	GLEINF	BESMNOR	BESMFEU	BESMNAS	GKMINZT	GKPARAM
Mu-Typ 1	26	GATYP	GA-MU-STW	0	3	0	0	0	0	0	1 mA	3 mA	10 mA	0	0
Mu-Typ 2	26	GATYP	GA-MU-FIX	0	0	UH	0	0	0	0	2 mA	5 mA	15 mA	0	0
Bahnhof 1	26	GA	GA-MU-STW	"	"	"	"	"	"	"	"	"	"	"	"
Bahnhof 1	26	GA	GA-MU-STW	"	"	"	"	"	"	"	"	2 mA	4 mA	"	"
Haltepunkt	26	GA	GA-MU-FIX	"	"	"	"	"	"	"	"	"	"	"	"
Haltepunkt	26	GA	GA-MU-FIX	"	1	0	L/H	"	"	"	3 mA	3 mA	"	"	"
Strecke	26	GA	GA-MU-STW	"	"	"	"	"	"	"	"	"	"	"	"

Not yet fully implemented, some object classes are missing!

IIn the example object lines (below on this double page) first, the track section type GA-MU-STW of the object class GATYP is defined; for track sections controlled by an interlocking program (like ESTWGJ, STP,...) the parameter BEFORM = 3 (controlled externally) is defined; the lines below that of the object class GA, but also of GATYP = GA-MU-STW define three actual track sections. The latter partially take over the parameters of the type (all cells with "), but also define some of the parameters differently.

The second example (also GATYP, i.e. template, and GA, i.e. track sections) with track section type GA-MU-FIX is intended for track sections which are not controlled by a computer (therefore, BEFORM = 0) but have fixed parameters (in this case HLUFIX = UH).

NOTE: the parameters in this example do not make much sense, they only show some of the possibilities.

ANSPRMX9 (Ansprechen unter MX9-Adresse)
only valid, if BEFORM = 4

Only for application with old ZIMO systems (MX1, MX9, etc.) where the track sections of the StEin imitate MX9 modules.
details see instruction manual.

APUGA - nur in Tabelle GA (Anschlusspunkt des Gleisabschnitts)
Module number and used track section output on the module, e.g. 35.2
Module number = 1 - 65000
connection on the module = 1 - 65000 .

APUGV- nur in Tabelle GA (Anschlusspunkt eines Vorabschnitts)
Optional entry of the module number and the used track section pre-section for entries into
track sections, e.g. 49.3
module number = 1 - 65000

APUGK1- nur in Tabelle GA (Anschlusspunkt erster Gleiskontakt)
Optional entry of a track contact (photoelectric sensor, etc.) for point followingcommands, e.g. 35.13
module number = 1 - 65000
connection on the module = 1 - 65000 (switch inputs).

APUGK2- nur in Tabelle GA (Anschlusspunkt zweiter Gleiskontakt)
Optional entry of a track contact (photoelectric sensor, etc.) for point followingcommands, e.g. 35.7
module number = 1 - 65000
connection on the module = 1 - 65000 (switch inputs).

KUSAMP (Kurzschluss-Überstromschwelle)
Current limit, at which it is immediately (=1/2 ms) turned off.
= xxxx mA

KUSEZT (Wiedereinschalten bei Kurzschluss)
Time after the short circuit, it is switched on again; there are 50 trys - this number cannot be changed.
= xxxx ms max 60000 ms = 1 min

UESSAMP (kurzdauernde „schnelle" Überstromschwelle)
Current threshold, on exceeding which it is switched off, as long as it exceeds UESSAZT
= xxxx mA

UESSAZT (kurzdauernde „schnelle" Überstromzeit)
Time, theovercurrent threshold according to UESSAMP can be exceeded before it is turned off.

UESSEZT (Wiedereinschalten bei „schnellem" Überstrom)
Time that has to pass after a switch off, until it is switched on again.
= xxxx ms

UESSEAZ (Anzahl des Wiedereinschaltens „schnell")
Only after this, it is finally switched off because of an overcurrent.
= xx = 0: permanent restart

UESLAMP (langdauernde „langsame" Überstromschwelle)
current limit, on exceeding which (longer than UESLAZT) it is switched off.
= xxxx mA

UESLAZT (langdauernde „langsame"Überstromzeit)
Time, the threshold defined in UESLAMP can be exceeded befor it is switched off..
= xxxx ms

UESLEZT (Wiedereinschalten bei „langsamen" Überstrom)
Time after the switch off, it is automaticaly switched on again..
= xxxx ms

UESLEAZ (Anzahl des Wiedereinschaltens „langsam")
Only after this, it is finally switched off because of overcurrent..
= xx = 0: permanent restart

	Parameter für langsame Überstromabschaltung				Parameter für scnelle Überstromabschaltung				Kurzschlussabschaltung			Anschlusspunkte			
1	UESLAMP	UESLAZT	UESLEZT	UESLEAZ	UESSAMP	UESSAZT	UESSEZT	UESSEAZ	KUSAMP	KUSEZT	ANSPRMX9	APUGA	APUGAV	APUGK1	APUGK2
)	3000 mA	5000 ms	2000 ms	10	4000 mA	500 ms	2000 ms	15	4000 mA	500 ms	0	0	0	0	0
	2000 mA	4000 ms	2500 ms	5	3000 mA	1000 ms	3000 ms	10	3500 mA	1000 ms	0	0	0	0	0
	"	"	"	"	"	"	"	"	"	"		26.1.	"	"	"
	2000 ma	"	"	15	"	"	"	"	"	"	"	26.2.	"	"	"
	"	"	"	"	"	"	"	"	"	"	"	26.3.	"	"	"
	"	"	"	"	"	"	"	"	"	800 ms	"	26.4.	"	26.7 GK	"
	"	"	"	"	"	"	"	"	"	600 ms	"	26.5.	"	"	"

ATTENTION: NOT FULLY IMPLEMENTED YET

I N S E R T within the chapter "The objects in the parameter sheets" - 2 pages on "Point sequence commands" -

Point sequence commands

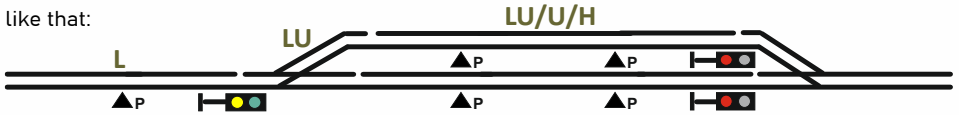
and your entry in the PUFFIX parameter of the GA or GATYP objects (track sections)

See also chapter "Track sections, point detectors, point sequence commands"

"Point sequence commands" are an alternative to dividing the route into many track sections by making longer sections (e.g. a single track section for the entire station track) and dividing these logically using point signalling contacts (switching tracks, light barriers, ...), for example

instead of ...

like that:



This saves on expensive connections to StEin modules; at the same time, the functional principle of the "point-type train protection system" (Intermittent ATP (autom Train Protection)) is incorporated, which can certainly offer advantages, while retaining the basic principle of the "line train protection system" (LZB).

The "point sequence command" instead of a simple "H", "L", "U" state in a track section means that when a point detector is passed over ("onclick") or left ("offclick"), the system switches to the next HLU state defined in the point signalling command.

Point sequence commands are mainly intended for use by external interlocking programmes, but can also be entered in the PUFFIX parameter with regard to StEin autonomous operation.

Examples for point sequence commands (as they appear in the following table):

„F/H“ means:

Track section speed limit is initially set to "F", when passing the point detector to "H"; i.e. first full driving and after the point detector (switching track, light barrier, ...) braking (according to the settings in the decoder) until stopping.

„L/U/H“ means:

The track section is first set to "L" (slow), then to "U" (ultra slow) when the first point detector is passed and to "H" (stop) after the second point detector.

„F/L\H“ means:

Track section initially set to "F", when the point detector is passed by the head of the train set to "U" (i.e. ultra-slow for pre-braking) and when leaving the point detector set to "H" (stop when the whole train has passed). This method therefore only requires a single point detector, but only makes sense if this point detector is designed in such a way that it remains active throughout the entire train, for example a double reflex light barrier (double, so that the gap between the carriages does not cause the train to "flash past"),

L/**H**-W-U/L means:

Track section speed limit initially set to "L" (slow), after the point detector set to "H" (braking to a stop), after a short waiting time switch the HLU direction to "W" (i.e. west), after another short waiting time set the track section speed limit to "U" (i.e. slow restart, usually in the opposite direction), after the point detector (the same one that previously triggered the "H") set to "L" (i.e. increase the limit).

This is therefore used for an autonomous change of direction (oscillation) with graduated braking. However, it is easier to reverse direction by simply setting the direction bit in the end section of the oscillating section accordingly, either from the controller or using the "W-U" point sequence command.

NOTE: Due to the change of direction, the point detector is always considered to have been newly crossed, even if it was actually active throughout (during the stop and restart).

The **selection** of point signalling commands that can be entered in PUFFIX:

Only those point reporting commands can be entered whose table fields are "shaded" (i.e. highlighted) in light blue, for example:

F/H L/H U/H F/U/H L/U/H but not FL/H LU/H etc.

The **spelling** of the point reporting commands in the PUFFIX fields:

To make typing easier, the separators do not have to be adhered to or can be omitted (this is not checked during interpretation); only in the case of \ (addressing the point detector when exiting - "offclick") must this character actually be written.

Otherwise, for example

instead „F/H“ also „FH“ or
instead „L/U/H“ also „LUH“ or
instead „L/**H**-W-U/L“ also LHWUL be written, but.
instead „F/L\H“ at most the abbreviation „FL\H“.

„ Top (blue) line: Numerical designation of the point sequence commands (from top to bottom and - if two columns - right-hand column thereafter, fields with blue lettering - with W or E - after the black ones)

1 - 10	11 - 20 | 21 - 30			31 - 36	41 – 50			51 - 60 | 61 - 70			71 - 74	81 - 90			91 - 100			101 - 106 | 111 -116			121 - 127		
usual HLU	Stop onclick at the (single) point contact			Stop onclick on 2nd point contact, 1st point ignored	Decelerate/stop onclick/onclick with 2 point contacts			Decelerate/stop by onclick/offclick of one (1) point contact			Stop offclick 2nd point contact, 1st point ignored	Decelerate/stop onclick/onclick with 2 point contacts			Decelerate/stop by onclick/offclick of a single (i.e. 1) point contact			Acceleration onclick with 1 point contact			Acceleration offclick with 1 point contact		
F	F/**H**	F/U	F/L	F/F/**H** *)	F/U/**H**	F/L/**H**	F/L/U	F**H**	F\U	F\L	F\F**H** *)	F\U**H**	F\L**H**	F\L\U	F/U**H**	F/L**H**	F/L\U	-	-	-	-	-	-
FL	FL/**H**	FL/U	FL/L	FL/FL/**H**	FL/U/**H**	FL/L/**H**	FL/L/U	FL**H**	FL\U	FL\L	FL\FL**H**	FL\U**H**	FL\L**H**	FL\L\U	FL/U**H**	FL/L**H**	FL/L\U	FL/F	-	-	FL\F	-	-
L	L/**H**	L/U	-	L/L/**H**	L/U/**H**	-	-	L**H**	L\U	-	L\L**H**	L\U**H**		-	L/U**H**	-	-	L/F	-	-	L\F	-	-
LU	LU/**H**	LU/U	-	LU/LU/**H**	LU/U/**H**	-	-	LU**H**	LU\U	-	LU\LU**H**	LU\U**H**		-	LU/U**H**	-	-	LU/F	LU/L	-	LU\F	LU\L	-
U	U/**H**	-	-	U/U/**H**	-	-	-	U**H**	-	-	-	-		-	-	-	-	U/F	U/L	-	U\F	U\L	-
UH	UH/**H**	-	-	UH/UH/**H**	-	-	-	UH**H**	-	-	-	-		-	-	-	-	UH/F	UH/L	UH/U	UH\F	-	-
H	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	H/F **)	H/L **)	H/U **)	-	-	-
A	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	F/**H**-W-U/F				L/U/**H**-W-U/U/L			F/**H**-W-U/F				L/U/**H**-W-U/U/L			L/U**H**-W-U/U\L								
	F/**H**-E-U/F				L/U/**H**-E-U/U/L			F/**H**-E-U/F				L/U/**H**-E-U/U/L			L/U**H**-E-U/U\L								
W-U	L/**H**-W-U/L							L/**H**-E-U/L															
E-U	L/**H**-E-U/L							L/**H**-E-U/L															

General event logic (symbols in the table):
onclick (/) = The HLU state is switched when the point contact first responds (first axis detected, first reflex on optical barrier, etc.)
offclick (\) = Switching after releasing the point contact; only useful if continuous response as long as train at point contact (i.e. NOT with axle counter, but e.g. with relatively long contact track or - better - with double reflex barrier),
*) If there are two point contacts in a track section, there is the normal case (e.g. L/U/H), and also the variant in which no HLU change occurs at the first point contact (e.g. L/L/H, i.e. "ignored 1st point");
Time-controlled (-) = the change of direction to "W" or "E" (usually between stopping, i.e. H, and starting in the opposite direction, i.e. U) takes place automatically 3 seconds after stopping, or starting 3 seconds after the change of direction.
The following are suitable for braking/stopping via point contacts: the stopping section in station tracks or blocks (with H after last contact) and, with restrictions, sections in front of the stopping section (with U, L after last contact).
(Restrictions: only if no preceding section is defined or if the preceding section is unambiguous according to the track plan).
Exit sections are suitable for acceleration, e.g. switch sections (not the actual exit tracks, which are generally stopping sections); preferably in combination with a point sequence condition in the station track as well,
because the entire station track is then taken along by the preliminary section in HLU terms.
**) Switching from H to F or L by point contact can be useful if the route is set but the actual exit should only be possible manually (left to the train driver, actuation of the MN button, possibly time-limited MN).
Each of the sequential switching states defined above is also available in a variant with a PRESET (to be defined in the GA object); this is then automatically included when the HLU state is changed (e.g. set to U or H)
Messages to computer (or AOS system): successful change of the respective HLU state and, quasi-separately, reaching or leaving a point contact (only if leading to a change or pseudo-change, so no multiple),
Interlocking programme can make virtual busy signals from this!
F/U/**H** (e.g.) Fields with a bluish background colour indicate those variants that can also appear under the PUFFIX parameter in the object for track sections for autonomous stopping or changing direction (to W or E).

APPLICATION EXAMPLES

Automatic staging yard (with or without computer) with as few track sections as possible (e.g. one StEin with 8 sections for a 6-track staging yard):
Track section division: 1 Track section for the entire entry area (the last block incl. entry signal and entire switch harp),
with a point contact for braking (e.g. 1 m) before the entry stop (virtual entry signal) and a point contact at the location of this (virtual) entry signal,
1 track section per staging yard track, each with a point contact for stopping at the end of the track (H-switching),
1 Track section for the entire exit area (switch harp and first block after the station) with point contact for possible stopping at the end of the block.

Automatic block section (with or without computer) with one track section per block:
Track section division: 1 track section per block, each with 1 or 2 point contacts for pre-braking (optional) and stopping, if required, preceding block as PRE-SECTION,
If double-directional block operation, 2 point contacts must be present in any case.

General railway station (rather with computerised signal box) with only one track section per track:
Track section division: 1 Track section in the entry signal area with 1 or 2 point contacts for pre-braking (optional) and stopping - as in the block,
x Track sections in the switch field as usual (the problem of parallel trains in the switch area cannot be solved with point contacts),
je 1 track section per station track, with (up to) 2 point contacts,
x Track sections in the switch field as usual (the problem of parallel trains in the switch area cannot be solved with point contacts),
1 Track section in the exit area, with 1 or 2 point contacts (or no point contact at all) - usually the first block signalling at the same time.

WEITYP and WEI - object types and objects for "two-way turnouts"

*These object lines contain the definition for all turnouts connected to StEin, concerning switch impulse times, position test impulses, frog polarization etc. *)*

**) Organization and object class WEI as template for object class WEI of the actual turnout: see Note below GATYP and GA!*

SCHIMPZT (Schaltimpulszeit; Switching impulse time
only relevant, if the switch has a corresponding motor.
= xxxx ms Default 200 (= 0,2 s)

SCHIMPINT (Switching pulses with reduced intensity, if HW enables this, probably only in expansion board)
only relevant, if the switch has a corresponding motor.
= 100%, 95%, 90%, 85%, usw.

REDAUPWM (Halltespannng auf Dauer nach eigentlichem Impuls)
only relevant, if the switch has a corresponding motor.
= 100%, 95%, 90%, 85%, ... 0%

SERVPOS1
(Servo position for first - left - position of the switch)
(only relevant if drive type is SERVO)
= 0 - 255 def. 49

SERVPOS2
(servo position for second - right - position of the switch)
(only relevant if drive type is SERVO)
= 0 - 255 def. 205

SERVUMLAU
(Servo cycle time between the defined positions)
(only relevant if drive type is SERVO)
xxxx ms Default 2000 (= 2s)

ANTRART (Antriebsart - drive type)
= 0 or NOTHING
= 1 orHAND (manual switch = no motor)
= 2 or DOSPU (double coil)
= 3 or MOT (motor) = 4 or EPL (EPL)
= 4 or EPL: EPL
= 100 or SERV-0: Servo type 0 (active only during movement)
= 101 or SERV-1: Servo type 1 (active continuous)

POSILOG (position logic) (October 2024) only feedback 0 and 1 implemented.

0 / 1 / 3 / 4 / 5 / 6
= 1: left/right/left defective/right defective/undefined/undefined defective
=2: right/left/right defective/left defective/undefined/undefined defective
=3: straight/angled/straight defective/angled defective/undefined/undefined defective
=4: angled/straight/angled defective/straight defective/undefined/undefined defective
=5: straight/angled left/straight defective/angled defective/undefined/undefined defective
=6: angled left/straight/angled defective/straight defective/undefined/undefined defective
=7: straight/angled right/straight defective/angled defective/undefined/undefined defective
=8: angled right/straight/angled defective/straight defective/undefined/undefined defective

Meaning of the **feedback**:

Left: Point is set to the left according to the last command, determined by the limit switch/test pulses or position contact or target, according to the point machine.
right: points are set to the right according to the last command, determined by the limit switch/test pulses or position contact or setpoint, according to the ACTUATOR
left defective: Switch is set to the right, but against the last command (left), detected bylimit switch/test pulses/position contact.

Right defective: Pointing to the left, but against the last command (right), detected bylimit switch/test pulses/position contact.(If STELLERK = setpoint, there can be no "left defective"and "right defective").

indefinite: position cannot be determined.

indefinitely defective: position cannot be determined, does not respond to setting commands.

NAME
Here you can enter any desired text - it has no effect on the operation, but is only a commentary.
This cell can also be empty.

MODULNR
Here you can enter the number of the StEin module (according to its number on the display), this object line shall be active. This enables a homogenous parameter sheet for all modules (instead of one sheet per module).
This also saves some time, because the file only has to be loaded into one StEin module, and will be distributed to the other modules by themselves.

OBJKL (Objektklasse) - i.e. type (template) or actual turnout
= **WEITYP** characteristic fo an object of the object class „two-way-turnout type" (i.e. a template for more than one „actual" turnouts, or
= **WEI** characteristic for the object class „two-way-turnout"
i.e. one line describes one actual turnout

WEITYP (type of switch)
if the object line (according to OBJKL) is objectclass WEITYP:
Name of the switch type, of which the parameter values for the switches of this type shall be valid by default (if " is written into the cell).
if the object line (according to OBJKL) of the **objectclass WEI**
Name of the switchtype, of which the parameters are valid for this switch, if "is written in the cell.

WEISYNU
(switch number system-wide)
=1-65000: each number can only be defined once for the whole layout (system-wide).
The computer talks to the switch via this number,WITHOUThaving to define a certain connection point on a certain module.

WEIPANEL (switch panel)
(WEI-Panel in ZIMO controllers)
only if object line (acc. to OBJKL) of the object class WEI (not WEITYP).
Name of the panel (they can be displayed on ZIMO controllers or apps) the turnout shall be added to.

Object lines for turnout types

Object lines for single turnouts

								Parameter für Schaltimpulse			Parameter für Servos				Paramter für Testimpulse		
NAME	MODULNR	OBJKL	WEITYP	WEISYNU	WEIPANEL	ANTRART	POSILOG	SCHIMPZT	SCHIMPPWM	REDAUPWM	SERVPOS1	SERVPOS2	SERVUMLAU	STELLERK	TSTIMPLNG	TSTIMPINV	TSTIMPSPA
Doppelspu	5	WEITYP	WDOSPU	0	0	DOSPU	1	100ms	100%	0	0	0	0	1	1ms	1s	0
Motor	5	WEITYP	WMOT	0	0	MOT	2	350ms	40%	10%	0	0	0	1	5ms	2s	0
LGB Weiche	5	WEITYP	WEPL	0	0	EPL	3	200ms	80%	0	0	0	0	0	0	0	0
Servo	5	WEITYP	WSERV	0	0	SERV-0	1	0	0	0	49	185	1500ms	1	0	0	0
Bahnhof 1	5	WEI	WDOSPU	0	HBFLINKS	"	2	"	"	"	"	"	"	"	"	"	"
Bahnhof 1	5	WEI	WDOSPU	0	HBFLINKS	"	"	4000ms	100%	30%	"	"	"	"	"	"	"
Ausweiche	5	WEI	WSERV	0	0	"	"	"	"	"	60	"	"	3	"	"	"

In the example object lines (below on this double page) first, various turnout types are defined with the object class WEITYP (double coil, motor, EPL) and in the lines below that some actual turnouts are defined by the object class WEI, but also by turnout type from the templates. The latter partially take over the parameters of the type (all cells with "), but also define some of the parameters differently.

Description of the parameters applies to track section types GATYP and track sections GA (except for the connectionpoints APU, which only exist for the 'actual' track sections)...

APUANTR - only in table WEI (Anschlusspunkt der Weiche / connection point of the switch)

Specify the module number and the used switch output on the module (i.e. pin row with two pins) e.g. 49.3 or
if connection on extension board,
e.g. 49.E2.6 (E.-board 2 in this example)
module number = 1... 4095
extension board slot = 1... 10
connection on module = 1... 255

APUSTEKO - only in table WEI (Anschlusspunkte Stellungskontakte/ Connection points Position contacts)

Specification of the module number and the inputs used (pin row) on the module. e.g. 49.4. (Note: as soon as there are inputs on expansion boards, the format will need to be expanded.
Module number = 1... 4095
Connection on module = 1... 255

APUZWAKO - nur in Tabelle WEI (Anschlusspunkt Zwangsschaltkontakte/ Connection point for forced switching contacts)

Specification of the module number and the inputs used on the module. e.g. 49.7.

if connection on extension board,e.g. 49.E2.4 (E.-platine 2 in this example)
Module number = 1... 4095 (currently 99)
Expansion board slot = 1... 10 (currently 2)
Connection on module = 1... 255

APUHERZPOL - nur in Tabelle WEI (Anschlusspunkt Herzstück-polarisierung / Connection point frog polarisation)

Optional definition of a track contact (photoelectric sensors, ...) for point following commands.

Module number = 1 - 4095
connection on the module = 1 - 65000 (inputs).

UMLAMINAMP (Umlaufkontrolle - Umlauf-Minimalstrom);

= xxxx mA def 0,1 A

UMLAMAXAMP (Umlaufkontrolle - Umlauf-Maximalstrom / circulation control - maximum circulating current)

= xxxx mA def 0,1 A

UMLAMINZT (Umlaufkontrolle - Umlauf-Minimalzeit);

= xxxx mS def 0,1s

UMLAMAXZT (Umlaufkontrolle - Umlauf-Maximalzeit);

= xxxx ms def 0,1sec

ZWAKOREF (Zwangschaltekontakte, Aktivierungspolarität)

= 0: to ground

= 1: to min. 5V (incl. DCC).

HERZPOLPWM (Relaisanschluss für Herzstückpolarisierung, reduzierter Intensität, per PWM)

= 100%, 95%, 90%, 85%, ... 0%
format within the StEin: time in tenths of a second.

grey printed parameters not yet implemented. (October 2024)

STELLERK (Stellungserkennung); position detection of the turnout

=0: none

=1: limit switch

=2: position contacts

=3: target feedback (pseudo).

TSTIMPLNG (Testimpulslänge/ test pulse length);
(only relevant with end switch)

= xxxx µs def 100 µs

TSTIMPINV (test impulse interval);
(only relevant with end switch)

= xxxx ms def. 1 sec

TSTIMPSPA (test impulses at reduced intensity, if HW allows it, probably only in the expansion board**)**
(only relevant with end switch)

= 100%, 95%, 90%, 85%, etc.

		Paramter für Umlaufkontrolle				Anschlusspunkte			
ZWAKOREF	HERZPOLPWM	UMLAMINAMP	UMLAMAXAMP	UMLAMINZT	UMLAMAXZT	APUANT	APUSTEKO	APUZWAKO	APUHERZPOL
0	70%	0	0	0	0	0	0	0	0
0	70%	0	0	0	0	0	0	0	0
0	50%	0	0	0	0	0	0	0	0
1	70%	0	0	0	0	0	0	0	0
"	"	"	"	"	"	35.1	"	35.1	v
"	100%	"	"	"	"	35.3	"	35.3	"
"	"	"	"	"	"	"	"	"	35.E1.5
						35.E1.6			

SIGTYP, SIGBILD (the "preliminary tables" for SIG) – signal types and aspects

The procedure to define signals is a little different to track sections and turnouts, because it has two levels; SIGTYP and SIG do not have the continuously equal parameters (like for WEI). There are two preliminary tables for the actuals signals in the table SIG: 1) table SIGTYP (description on this page) of the signal types which itself needs the signal aspects from SIGBILD, and 2) table SIGBILD (description on the page on the right) for the signal aspects.

ANZBILD
(Anzahl der Signalbilder)
number of signal aspects

= 0: the SIGTYP is pseudo
= 1 ...: number

The number defined here is the number of signal aspects described in the following parameters.

-SIGBILD-1

Signal aspect: the first is preferrably "stop", "Hp0" for this signal type.

Entry is only valid, if this signal aspect is used in the table SIGBILD for the corresponding signal type or in general.

Typical example: "Hp1": in the table SIGBILD all lights are defined, which are NOT turned off. Therefore, the signal aspect can be used in various signal types.

SIGBILD-2

Another signal aspect for this signal type, e.g. Hp1, Hp2, ...

Entry is only valid, if this signal aspect is used in the table SIGBILD for the corresponding signal type or in general.

SIGBILD-3

SIGBILD-4

. . . . . .

SIGBILD-10

Another signal aspect for this signal type, e.g. Hp1, Hp2, ...

Entry is only valid, if this signal aspect is used in the table SIGBILD for the corresponding signal type or in general.

ANZLAMP
(Anzahl der Signallichter)
number of signal lights

= 1 ... 255

This refers to the signal type; the actual signal in the class LIGHT SIGNAL may showless light.

SIGART
(Bauart des Signals) type of signal

= 0: LEDs, common positive, resistors within the signal, (the usual)
= 1: LEDs, common negative (ground)
= 2: lamps, common positive
= 3: lamps, common negative

AUFGLIZT (Aufglimmzeit)
glow up time

= xxxx ms def. 500 ms

AUFGLIVERZ
(Aufglimmverzögerung)
Glow-up delay

= xxxx ms def. 500 ms

ABGLIZT (Aufglimmzeit;
glow up time

= xxxx ms def. 500 ms

SIGHELLTAG

= xxx % def. 100 %

SIGHELLNAC

xxx % def. 100 %

NAME

Here you can enter any desired text - it has no effect on the operation, but is only a commentary.

This cell can also be empty.

MODULNR

Here you can enter the number of the StEin module (according to its number on the display), this object line shall be active.

This enables a homogenous parameter sheet for all modules (instead of one sheet per module).

This also saves some time, because the file only has to be loaded into one StEin module, and will be distributed to the other modules by themselves.

OBJKL (Objektklasse) = SIGTYP

Valid for all objects in adefined section. Those objects can also be used as templates for objects,

SIGTYP does NOT really contain signals (objects) because it does not provide connection points, but oly the possible sigal types, which are referred to in table SIG (in SIGTYP).

SIGTYP (Name des Signaltyps)

= 0: the signal aspect defined with this obect is valid for all signal types or the ones, no special aspect is defined for.

= a signal type from table SIGTYP: the signal aspect defined here is valid for a special signal type.

Thereby, signal aspects - if they fit the layout, likeHVsignals according to1935 to1959 - canbe used for various signal types at the same time, or have different meaning depending on the signal type linked to it.

SIGTYPSYNU
(Signaltyp-Nummern systemweit)

= 0: this SIGTYP is only locally valid
= 1 ... 65000: each number must only be used once on the whole layout (system-wide)

We will see, if this parameter is really useful: It marks that the corresponding SIGTYP may only be defined once on the whole layout, but it produces much data traffic!

								Parameter für Zustandswechsel und Helligkeiten					Anzahl der definierten Signalbilder und Zuordnung der Signalbilder						
2																			
3	NAME	MODULNR	OBJKL	SIGTYP	SIGTYPSYNU	ANZLAMP	SIGART	AUFGLIZT	AUFGLIVERZ	ABGLIZT	SIGHELLTAG	SIGHELLNAC	ANZBILD	SIGBILD-1	SIGBILD-2	SIGBILD-3	SIGBILD-4	ILD-9	SIGBILD-10
4																			
5	HV 1935	27	SIGTYP	DEHV35HS	0	3	0	800 ms	200 ms	800 ms	100%	40%	3	Hp0	Hp1	Hp2			
6	"	27	SIGTYP	DEHV35HE	0	4	0	800 ms	200 ms	800 ms	100%	40%	4	Hp0	Hp1	Hp2	ErsR		
7	"	27	SIGTYP	DEHV35BL	0	2	0	800 ms	200 ms	800 ms	100%	40%	2	Hp0	Hp1				
8	"	27	SIGTYP	DEHV35VS	0	4	0	800 ms	200 ms	800 ms	100%	40%	3	Vr0	Vr1	Vr2			
9	HV 1959	27	SIGTYP	DEHV59HS	0	3	0	500 ms	150 ms	400 ms	80%	30%	4	Hp0	Hp1	Hp2			
10	"	27	SIGTYP	DEHV59HE	0	4	0	500 ms	150 ms	400 ms	80%	30%	4	Hp0	Hp1	Hp2	ErsR		
11	"	27	SIGTYP	DEHV59SP	0	4	0	500 ms	150 ms	400 ms	80%	30%	2	Sp0	Sp1				
12	HV 1969	27	SIGTYP	DEHV69HSP	0	5	0	800 ms	200 ms	800 ms	100%	40%	4	Hp0	Hp1	Hp2	Sh1		
13	HV 1984	27	SIGTYP	DEHV84HSP	0	6	0	800 ms	200 ms	800 ms	100%	40%	4	Hp00	Hp1	Hp2	Sh1		
14	"	27	SIGTYP	DEHV84HS	0	3	0	800 ms	300 ms	1200 ms	100%	40%	3	Hp0	Hp1	Hp2			
15	"	27	SIGTYP	DEHV84BL	0	2	0	800 ms	300 ms	1200 ms	100%	40%	2	Hp0	Hp1				
16	"	27	SIGTYP	DEHV84VS	0	4	0	800 ms	300 ms	1200 ms	100%	40%	3	Vr0	Vr1	Vr2			
17	Zusatzanz	27	SIGTYP	DEHVZUS	0	1	0	500 ms	500 ms	500 ms	100%	50%	2	Aus	Ein				

ANZLICHT
(Anzahl der Signallichter)
number of signal lights

= 1 ... 255

The number of signal lights defined here is described by the following parameters.

This number refers to the signals aspect; it is usually the same as defined in table SIGTYP

SIGLICHT-1 first signal light, typically the red one)

Defines the type of switching on the signal light for the corresponding signal aspect by various codes (expandable in future).

= EIN (ON): signallight is fully switched on
= BLIL: flashes slowly
= BLIS: flashes quickly
= AUS (OFF): only, if light shall be available to Scripts.

SIGLICHT-2
(second signal light, typically the green one

... like -1 ...

SIGLICHT-3
third signal light

... like -1 ...

. . . . . .

SIGBILD-16
(sixteenth signal light)

... like -1 ...

Planned: SCRIPTs
to change between SIGBILDs.

The script contains a command chain for the involved lights, on how the aspect shall change.

Only signal lights are valid which are used in at least one of the two involved signal aspects, if necessary also as „AUS" (OFF).

NAME

Here you can enter any desired text - it has no effect on the operation, but is only a commentary.

This cell can also be empty.

MODULNR

Here you can enter the number of the StEin module (according to its number on the display), this object line shall be active.

This enables a homogenous parameter sheet for all modules (instead of one sheet per module).

This also saves some time, because the file only has to be loaded into one StEin module, and will be distributed to the other modules by themselves.

OBJKL (Objektklasse) = SIGBILD

for all objects of this table; they define the signal aspects needed for various signals.

The table SIGTYP does NOT really contain signals (objects) because it does not provide connection points, but defines for all signal aspects, which lights are to be switched on - maybe flashing. Tables SIGTYP and SIG refer to this (in SIGBILD-1, SIGBILD-2, etc.).

SIGTYP (Name des Signaltyps)

= 0: the signal aspect defined with this obect is valid for all signal types or the ones, no special aspect is defined for.

= a signal type from table SIGTYP: the signal aspect defined here is valid for a special signal type.

Thereby, signal aspects - if they fit the layout, like HVsignals according to1935 to1959 - canbe used for various signal types at the same time, or have different meaning depending on the signal type linked

SIGBILD
(Name des Signalbilds)

Name of a signal aspect defining signal lights switched on or being default for the signals of this type, e.g. DEHVHSP (Germany, STW60, main blocking signal).

One signal aspect can be used for one or more signal types, see SIGTYP.

SIGBILDSYNU
(Signalbildennummern systemweit)

= 0: this SIGTYP is only locally valid
= 1 ... 65000: each number can only be used once on the whole layout (system-wide)

We will see, if this parameter is really useful: It marks that the corresponding SIGTYP may only be defined once on the whole layout, but it produces much data traffic!

							Anzahl der definierten Signallichter und Angabe deren Einschaltezuständen in den einzelnen Bildern												
NAME	MODULNR	OBJKL	SIGTYP	SIGBILD	SIGBILDSYNU	ANZLICHT	SIGLICHT-1	SIGLICHT-2	SIGLICHT-3	SIGLICHT-4	SIGLICHT-5	SIGLICHT-6	SIGLICHT-7	SIGLICHT-8	SIGLICHT-9	SIGLICHT-10		SIGLICHT-15	SIGLICHT-16
							rot-links	rot-rechts	grün	gelb	weiss 2x	ErsRot							
div. Typen	27	SIGBILD	0	Hp00	0	2	EIN	EIN											
div. Typen	27	SIGBILD	0	ErsR	0	1						EIN							
div. Typen	27	SIGBILD	0	Hp0	0	1	EIN												
div. Typen	27	SIGBILD	0	Hp1	0	1			EIN										
div. Typen	27	SIGBILD	0	Hp2	0	2			EIN	EIN									
div. Typen	27	SIGBILD	0	Sh1	0	2	EIN				EIN								
							gelb	grün	gelb	grün									
div. Typen	27	SIGBILD	0	Vr0	0	2	EIN		EIN										
div. Typen	27	SIGBILD	0	Vr1	0	2		EIN		EIN									
div. Typen	27	SIGBILD	0	Vr2	0	2	EIN		EIN										
div. Typen	27	SIGBILD	0	Sp0	0	1	EIN												
	27	SIGBILD	0	Sp1	0	1		EIN											
div. Typen																			
							rot	grün	gelb										
für VS 1984	27	SIGBILD	DEHV84HS	Hp0	0	1	EIN												
für VS 1984	27	SIGBILD	DEHV84HS	Hp1	0	1		EIN											
für VS 1984	27	SIGBILD	DEHV84HS	Hp2	0	2		EIN	EIN										
für VS 1984	27	SIGBILD	DEHV84BL	Hp0	0	1	EIN												
für VS 1984	27	SIGBILD	DEHV84BL	Hp1	0	1		EIN											
							ein												
div. Typen	27	SIGBILD		Aus	0	0													
div. Typen	27	SIGBILD		Ein	0	1	EIN												

SIG - objects for signals (based on the preliminary tables SIGTYP and SIGBILD)

These object lines define how the aspects are presented for every signal connected to StEin, the brightness by day and by night, etc.

In this case (different to WEI and WEITYP, not all parameters can be overwritten from SIGTYP and SIG, especially not the signal aspects defined in the signal type.

Here, also the corresponding symbols for the panels of ZIMO input devices can be linked or created.

APULICHT1- nur in Tabelle SIG (Anschlusspunkt erstes Licht) Connection point first light

Definition of module number, I2C address and connection point on the I2C module.

Further signals of this signal have to be connected to the connection points of the I2C module following this one.

APUDUS1
Signal, which, if red, shall result in darkening the signal defined here,

defined by its APULICHT1, or by its system-wide signal number SIGSYNU.

This is useful, if the signal defined here is used, for example, as distant signal.

APUDUS2
Another signal, which, if red, shall result in darkening the signal defined here,

defined by its APULICHT1, or by its system-wide signal number SIGSYNU.

This is useful, if the signal defined here is used, for example, as distant signal.

APUDUS3
Another signal, which, if red, shall result in darkening the signal defined here,

defined by its APULICHT1, or by its system-wide signal number SIGSYNU.

This is useful, if the signal defined here is used, for example, as distant signal.

ANZLAMP (Number of signalling lights)

= 1 ... 255

This refers to the signal type; the actual signal in the class LIGHT SIGNAL may show less light.

SIGART (Bauart Signal) type of the signal

= 0: LEDs, common positive, resistors within the signal, (the usual)

= 1: LEDs, common negative (ground)

= 2: lamps, common positive

= 3: lamps, common negative

AUFGLIZT (Aufglimmzeit) glow up time

= xxxx ms def. 500 ms

AUFGLIVERZ (Aufglimmverzögerung) glow up delay

= xxxx ms def. 500 ms

ABGLIZT (Aufglimmzeit) glow up time

= xxxx ms def. 500 ms

SIGHELLTAG

= xxx % def. 100 %

SIGHELLNAC

xxx % def. 100 %

NAME

Here you can enter any desired text - it has no effect on the operation, but is only a commentary.

This cell can also be empty.

MODULNR

Here you can enter the number of the StEin module (according to its number on the display), this object line shall be active.

This enables a homogenous parameter sheet for all modules (instead of one sheet per module).

This also saves some time, because the file only has to be loaded into one StEin module, and will be distributed to the other modules by themselves.

OBJKL (Objektklasse) = SIG object class

for all objects in this table; these objects are not the „actual signals"; it will often, but doesn't have to, include one whole post.

SIGTYP (Name des Signaltyps) Name of the signal type

= 0: the signal aspect defined with this obect is valid for all signal types or the ones, no special aspect is defined for.

= a signal type from table SIGTYP: the signal aspect defined here is valid for a special signal type.

Thereby, signal aspects - if they fit the layout, like HVsignals according to 1935 to1959 - can be used for various signal types at the same time, or have different meaning depending on the signal type

SIGSYNU (Signal number system-wide)

= 1 ... 65000: each number must only be defined once on the whole layout (syste-wide)

With this number it is possible to address a signal from the computer, WITHOUT defining ist connection point at

PANEL (referring to an accessory panel, operation state WEI in ZIMO controllers)

Name of the panel (they can be displayed on ZIMO controllers or apps) the sgnal shall be added to.

A panel (empty or not) with this name has to be created directly on the controller; it is also possible to have it on more than one controller with the same name.

PANSYMB (Icon to be used in the panel)

Name of the symbol which shall be displayed on the panel.

This could simply correspond to the SIGTYP; nevertheless, not every type is necessarily represented with ist own symbol in the controller.

PANFELD (Placement in the panel)

Number of the position (1, 2, ...), the panel shall be placed.

This enables you to design the panel freely; it is also possible to mix signals and turnouts (or others).

= 0: automatically places the symbol

49																		
50	NAME	MODULNR	OBJKL	SIGTYP	SIGSYNU	PANEL	PANSYMB	PANFELD	ANZLAMP	SIGART	AUFGLIZT	AUFGLIVERZ	ABGLIZT	SIGHELLTAG	SIGHELLNAC	APULICHT1	APUDUS1	APUDUS2	APUDUS3
51																			
52		27	SIG	DEHV35BL	1	Strecke	DEBL	4	"	"	"	"	"	"	"	StEin49.7.6			
53		27	SIG	DEHV69HSP	3	HbfAusfLi	DEHSP	3	"	"	"	"	"	"	"	StEin48.10.1	14		
54		27	SIG	DEHV35HE	14	HbfAusfLi	DEHSP	7	3	"	"	"	"	"	"	StEin48.2.4			
55																			

The SIGNAL TYPES used in the examples:

German "HV-Signals" according to signal book 1935

DEHV35HS (4 lights; the 4th is opt. replacement red)
DEHV35BL (2 lights)
DEHV35VS (4 lights)

Follow-up sequence: red - green - yellow resp.
yellow-yellow-green-green (from left to right)

German "HV-Signals" according to signal book 1959

DEHV59HS (4 Lights), Logic like DEHV35HS
DEHV35SP (2 Lights, High- and dwarf shape))

Follow-up sequence: red - green - yellow - substitute red or
red (2x) - white (2x)

German "HV signals" design 1969 (introduction of the main blocking signal)

DEHV69HSP (5 lights)

Connection sequence: red left - red right - green - yellow - white (2x)

German "compact signals" design 1984 (VS compact signals)

DEHV84HSP (5 lights), logic like DEHV69HSP
DEHV84HS (3 lights), logic like DEHV35HS
DEHV84BL (2 lights), logic like DEHV35BL
DEHV84VS (4 lights), logic like DEHV35VS

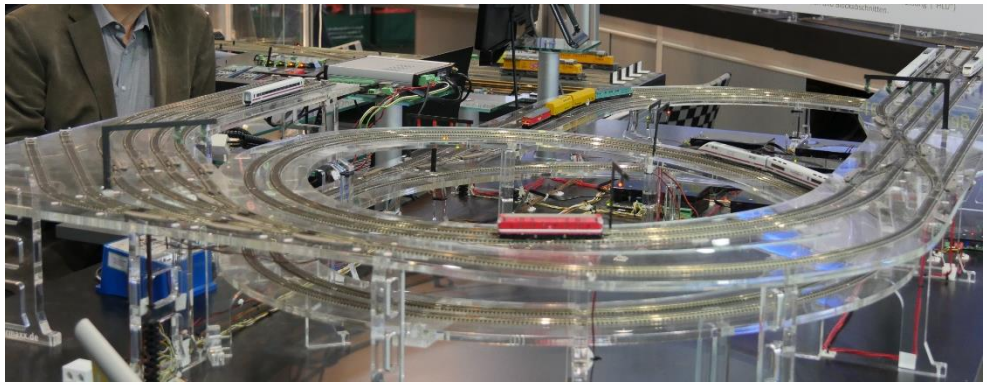
Follow-up sequence: red left - red right - green - yellow - white (2x) or
red - green - yellow or
yellow-yellow-green-green (from left to right)

German "HV signals", various single light additional indicators

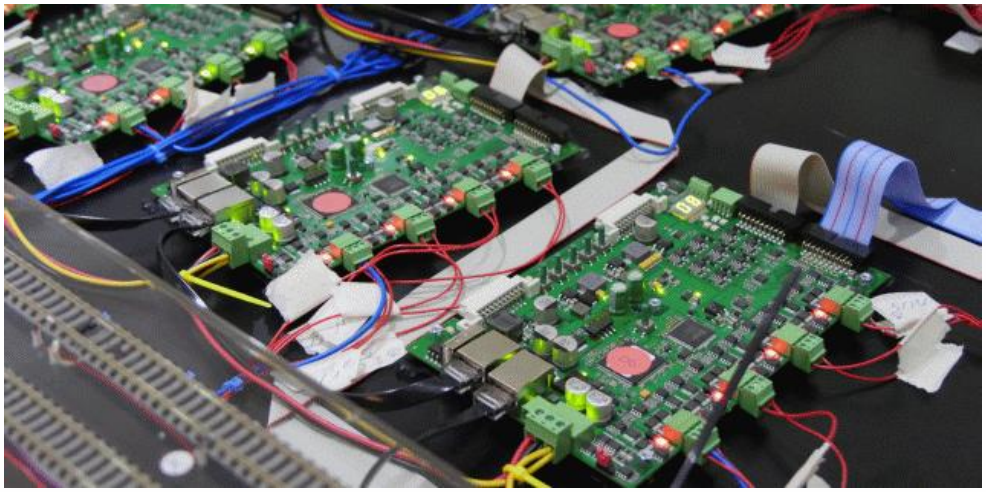
DEHVZUS (1 lights)

16. Configuration Example (ZIMO N-Scale Show Layout)

The ZIMO N-scale layout is built on an area of 2 x 1.3 m. The track is mounted directly on acrylic glass. Since it is a demonstration layout, all (StEin-) modules along with the wiring are openly installed so they are visible.



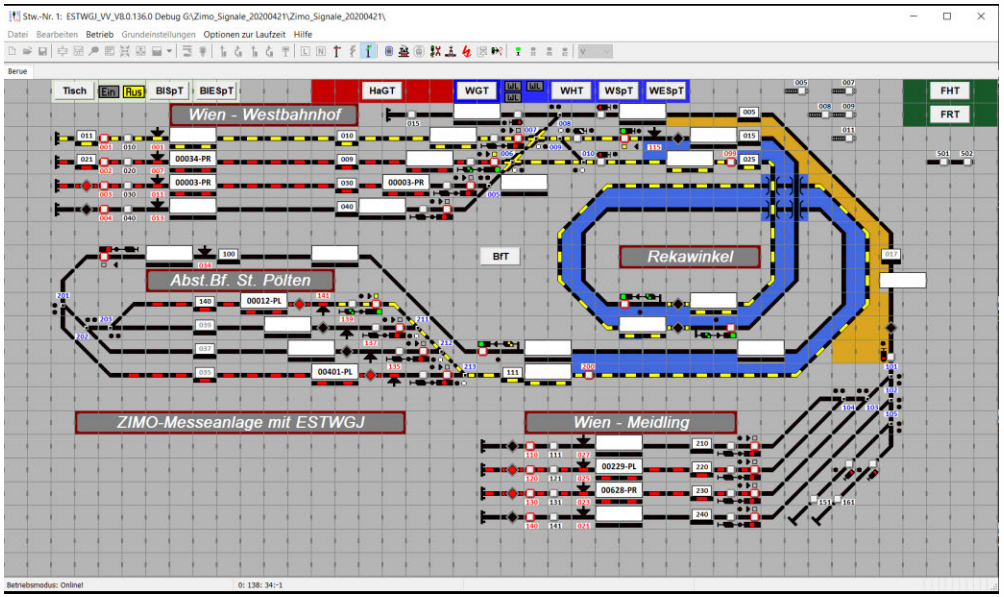
There are three "stations", two of them terminus stations, with a total of 12 tracks, 3 lines in block operation and a reversing loop.



The electronic equipment consists of the ZIMO MX10 basic unit and (usually) 2 to 3 controllers and 8 StEin modules (in the picture some of them without a lid) for the signals there are - at least until 2018 - special signal bridges with integrated accessory decoders; a later conversion to StEin signal boards is possible.

Note: This is the state after conversion in 2018; before that, MX8 accessory modules and MX9 track section modules (9 in total) were used instead of StEin.

The ESTWGJ program (from H.W. Grandjean) is used to control the layout; the dispatcher panel representation gives a good overview:



Before the StEin modules can actually be configured, that is, the creation of the parameter sheets (or, as in this case, the single parameter sheet), **the track section divisions and connection points**, the location of point detectors, switches, uncouplers, and later also the signals, must be determined.

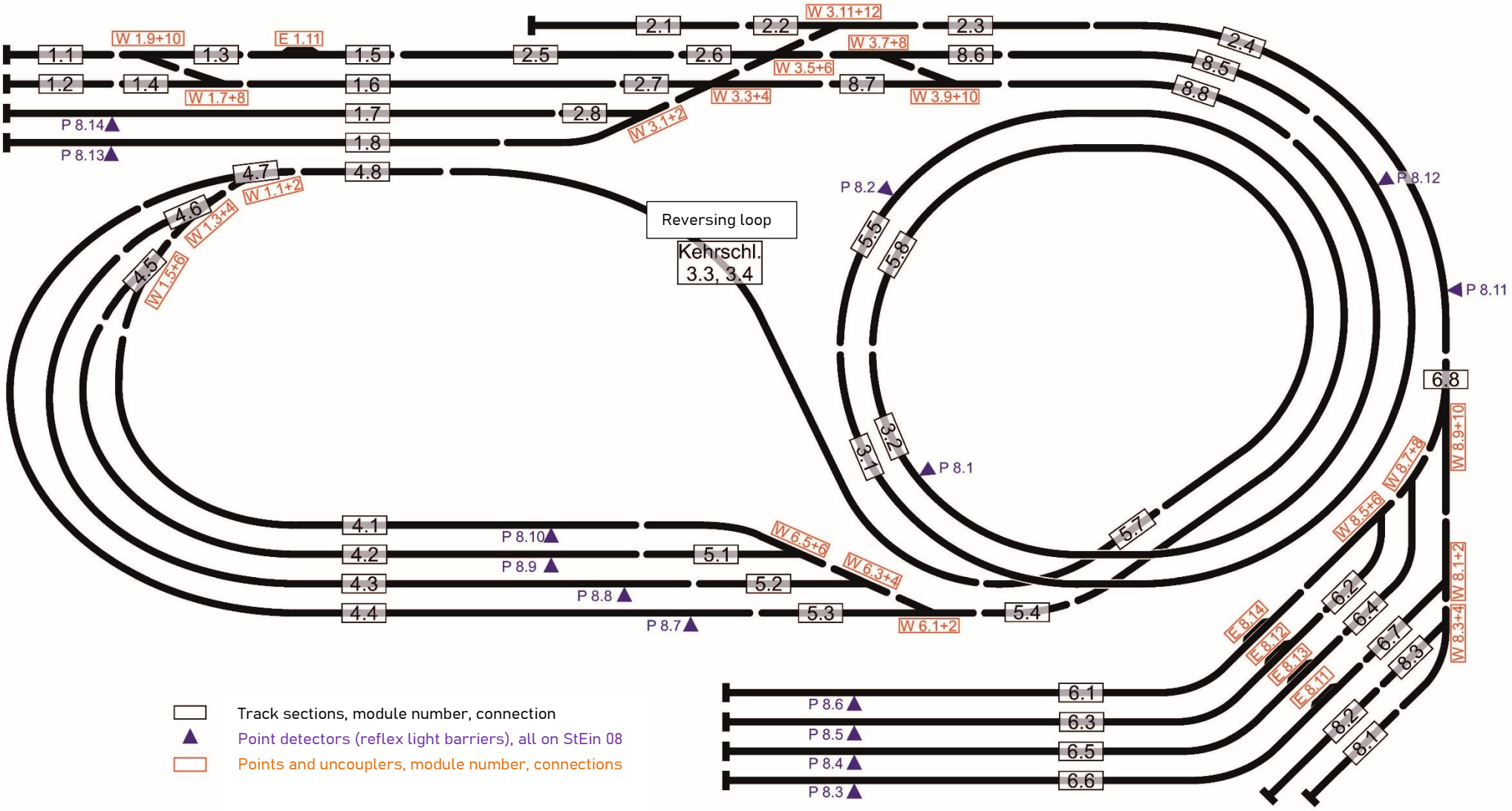
ZIMO traditionally calls this step **"track section planning"**, because the track sections and their division are indeed the main focus of considerations and also because they usually determine the number of necessary StEin modules.

On the following page you can see the result of the N-layout planning, which is based on general principles (again mainly concerning the track sections), which are listed below:

- Each station track needs at least one insulated track section on one side (to one of the track output terminals 1 ... 8). If several trains are to be parked one behind the other, more sections are needed; However, this is not the case with this layout.

  Before the stop points - at the red signals or bumpers at the end of the track - either dedicated brake sections connected to separate track section output pins, or - much cheaper - point detectors can be used (here infrared sensors). In either case, this forms a stopping distance, starting with the rail gap to the brake section or the point detector and ending with the end of the stop section track. The trains were slowed down already in the brake section before entering the stop section and so will come to a standstill at a stopping point as exact as possible.

- On the main line each block consists of at least one track section; Similar to the station tracks, the brake or stop sections of a block can also be formed either by a separate track section or by a point detector.
- In the turnout areas, the division of track sections must be carried out in such a way that in all intended operating situations no track section exists that would be part of two routes at the same time. This means that there are several track sections, which consist only of a single turnout. **NOTE:** For track sections like these, there are "cheaper" connections on expansion boards than the actual track outputs on the StEin modules themselves. These expansion boards were not considered on the N-layout because they are not yet available.
- The point detectors (infrared sensors) are all connected to one single StEin module, which in this case simplified the wiring.
- The turnout and coupler drives are connected to 3 (of the 8) Stein modules; this is also a contribution to clarity.
- THE WIRING OF THE SIGNALS WILL BE EXPLAINED LATER (At the time of writing this text, the signals were still operated by separate signal-bridge decoders, not by the StEin).



The configuration sheet on the next page shows the object lines created for the ZIMO exhibition layout in N-scale; the lines 43 to 64 are not shown due to lack of space.

This is the entire layout configuration, i.e. for all 8 StEin modules together on a single parameter sheet. Therefore, ahead of the actual object lines is the optional column MOULNR (01 ... 08), which is used at each StEin module when loading the configuration sheet (.cfg file) to select only the object lines needed.

Additionally, the sheet also contains the optional column NAME, which has no function in operation, but just serves as a reminder during the configuration stage as to where the track sections and turnouts used to be connected to the track section modules MX9 (before the layout was changed from the "old" technology to the StEin).

For each of the 8 StEin modules, the sheet contains an object line of the class GATYP (= a track section type with the designation "GAZIMEN18"), which contains the parameters for the 8 individual track sections to be defined, which in this case are always the same. The individual track sections (objects of class GA) therefore have a " (quotation mark) in almost all boxes, which means that the parameters are copied from the GATYP; only the connection points (APUGA column) for the track section itself and the point detectors (APUGK1) are different.

NOTE: Later, when operating the layout, it might turn out that some track sections should have a higher occupancy threshold because of their particular section length; In such a case, the BESMNOR parameters should be changed in the respective object lines.

The turnouts are organized in a similar manner to the track sections: for each StEin that has a turnout connected, an object line of the class WEITYP is needed, and then the object lines for the individual points, which differ in the connection points (column APUANTR).

In the current state (1st half of 2018) there are no signals on the system that are controlled by the StEin (only signal bridges with built-in decoders), therefore, there are no relevant object lines.

GENERAL REMARK about the parameter sheet configuration method:

It can be seen in the sheet shown here that the creation of a system configuration using such a table can be done quite clearly and quickly: the majority of the inputs are obtained by copying from other object lines or entire blocks of lines - that is the big advantage of a table compared to the usual input masks.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	
1																															
2																															
3	NAME	MODULNR	OBJKL	GATYP	GASYSNR	BEFORM	HLUFIX	PUFFIX	FUNFIX	POSFIX	GLEINF	BESMNOR	BESMFEU	BESMNAS	GKMINZT	GKPARAM	UESLAMP	UESLAZT	UESLEZT	UESLEAZ	UESSAMP	UESSAZT	UESSEZT	UESSEAZ	KUSAMP	KUSEZT	ANSPRMX9	APUGA	APUGAV	APUGK1	
4																															
5		01 StEin	GATYP	GAZIMEN18	0	3	0	0	0	0	0	1 mA	2 mA	10 mA	50 ms	0	1000 mA	200 ms	2000 ms	5	2000 mA	100 ms	3000 ms	3	3000 mA	200 ms	0	0	0	0	
6	MX9 10/09	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.1 GA	0	0	
7	MX9 11/15	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.2 GA	0	0	
8	MX9 10/10	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.3 GA	0	0	
9	MX9 10/08	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.4 GA	0	0	
10	MX9 11/11	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.5 GA	0	0	
11	MX9 10/07	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.6 GA	0	0	
12	MX9 11/14	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.7 GA	0	08.13 GK	
13	MX9 10/04	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.8 GA	0	08.14 GK	
14																															
15		02 StEin	GATYP	GAZIMEN18	0	3	0	0	0	0	0	1 mA	2 mA	10 mA	50 ms	0	1000 mA	200 ms	2000 ms	5	2000 mA	100 ms	3000 ms	3	3000 mA	200 ms	0	0	0	0	
16	MX9 13/15	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.1 GA	0	0	
17	MX9 13/11	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.2 GA	0	0	
18	MX9 13/12	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.3 GA	0	0	
19	MX9 13/13	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.4 GA	0	08.11 GK	
20	MX9 11/12	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.5 GA	0	0	
21	MX9 12/09	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.6 GA	0	0	
22	MX9 12/07	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.7 GA	0	0	
23	MX9 12/05	02 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	02.8 GA	0	0	
24																															
25		03 StEin	GATYP	GAZIMEN18	0	3	0	0	0	0	0	1 mA	2 mA	10 mA	50 ms	0	1000 mA	200 ms	2000 ms	5	2000 mA	100 ms	3000 ms	3	3000 mA	200 ms	0	0	0	0	
26	MX9 12/01	03 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.1 GA	0	08.12 GK	
27	MX9 12/03	03 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.2 GA	0	08.01 GK	
28		03 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	0	0	0	
29		03 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	0	0	0	
30		03 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	0	0	0	
31		03 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	0	0	0	
32	KS	03 StEin	KSA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.7 KS	0	0	
33	KS	03 StEin	KSA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.8 KS	0	0	
34																															
35		04 StEin	GATYP	GAZIMEN18	0	3	0	0	0	0	0	1 mA	2 mA	10 mA	50 ms	0	1000 mA	200 ms	2000 ms	5	2000 mA	100 ms	3000 ms	3	3000 mA	200 ms	0	0	0	0	
36	MX9 15/02	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.1 GA	0	08.10 GK	
37	MX9 15/04	01 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.2 GA	0	08.09 GK	
38	MX9 15/06	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.3 GA	0	08.08 GK	
39	MX9 15/08	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.4 GA	0	08.07 GK	
40	MX9 10/11	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.5 GA	0	0	
41	MX9 10/12	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.6 GA	0	0	
42	MX9 10/15	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.7 GA	0	0	
43	MX9 10/16	04 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	04.8 GA	0	0	
64																															
65		08 StEin	GATYP	GAZIMEN18	0	3	0	0	0	0	0	1 mA	2 mA	10 mA	50 ms	0	1000 mA	200 ms	2000 ms	5	2000 mA	100 ms	3000 ms	3	3000 mA	200 ms	0	0	0	0	0
66	MX9 14/13	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.1 GA	0	0	0
67	MX9 14/15	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.2 GA	0	0	0
68	MX9 13/05	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.3 GA	0	0	0
69		08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.4 GA	0	0	0
70	MX9 11/01	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.5 GA	0	0	0
71	MX9 12/15	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.6 GA	0	0	0
72	MX9 13/13	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.7 GA	0	0	0
73	MX9 12/14	08 StEin	GA	GAZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.8 GA	0	0	0
74																															
75																															

76	NAME	MODULNR	OBJKL	WEITYP	WEISYSNR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
77																											
78		01 StEin	WEITYP	WEIZIMEN18	0	DOSPU	1	100 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0	0	0	0	0	0	0	0	0
79	W201	01 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.01 WEI	"	"	"
80	W202	01 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.03 WEI	"	"	"
81	W203	01 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.05 WEI	"	"	"
82	W002	01 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.07 WEI	"	"	"
83	W001	01 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	01.09 WEI	"	"	"
84																											
85		03 StEin	WEITYP	WEIZIMEN18	0	DOSPU	1	100 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0	0	0	0	0	0	0	0	0
86	W005	03 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.01 WEI	"	"	"
87	W006	03 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.03 WEI	"	"	"
88	W007	03 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.05 WEI	"	"	"
89	W009	03 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.07 WEI	"	"	"
90	W010	03 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.09 WEI	"	"	"
91	W008	03 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	03.11 WEI	"	"	"
92																											
93		06 StEin	WEITYP	WEIZIMEN18	0	DOSPU	1	100 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0	0	0	0	0	0	0	0	0
94	W213	06 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	06.01 WEI	"	"	"
95	W212	06 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	06.03 WEI	"	"	"
96	W211	06 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	06.05 WEI	"	"	"
97																											
98		08 StEin	WEITYP	WEIZIMEN18	0	DOSPU	1	100 ms	100%	0	0	0	0	1	1000 µs	1000 ms	0	0	0	0	0	0	0	0	0	0	0
99	W102	08 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.01 WEI	"	"	"
100	W105	08 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.03 WEI	"	"	"
101	W104	08 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.05 WEI	"	"	"
102	W103	08 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.07 WEI	"	"	"
103	W101	08 StEin	WEI	WEIZIMEN18	0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	08.09 WEI	"	"	"
104																											

17. ANNEX: Glossary

CAN-bus:

International standard for secure data exchange between electronic devices, assemblies, etc.; it is used among others in automotive electronics. ZIMO uses this protocol for communication on the connection cables (= "CAN-bus cable") between the command station, controllers, accessory decoders, track section modules, turn table control modules, etc.

Instead of “CAN bus cable” sometimes also the name “controller cable” is used.

Also see: ZIMO system brochure or catalog, info at www.zimo.at

Signal controlled speed influence (a.k.a.: “location dependent control“, “HLU“ method):

For prototypical railroad operations it is not only important to have the ability to control all trains independently (that is a basic DCC function), but also to keep trains safe through the overriding influence of signals, block control, routes etc.

The well-known method in conventional model railroad layouts of killing power in a section of track before a red signal is not suitable in combination with a DCC system, because it leads to the loss of accessory devices (lights, smoke…) and causes abrupt train stops.

ZIMO therefore uses the special method of signal controlled speed influence. Additional information is fed to a track section ahead of a red signal (where any train should stop automatically).

Also see: ZIMO system brochure or catalog, info at www.zimo.at

Turnout ladder:

A turnout ladder is a combination of turnouts that switch to predetermined directions, which is first defined as such and can later be called up when needed.

Route:

A “route” as used here is an extended turnout ladder, i.e. a combination of turnouts set to specific positions, possibly also through buttons (to be connected to a switch panel), and of track sections (connected to track section modules StEin or MX9).

Line, block, unidirectional, bidirectional:

The term "line" is used for a sequence of "blocks"; a block in turn consists of at least two "track sections", of which (usually) the last is a "stop section". The term "block section" should not be used because it is often unclear whether a single block or the entire route is meant.

Note: In model railroad literature, especially in documents of other manufacturers, this combination of turnouts is often referred to as routes, but ZIMO uses the term route for a more evolved set-up: a turnout ladder that includes track section control (a feature most often not available from other sources, so no differentiation is needed).

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