Sitraffic sX StartUp

Product Manual V1.0 for sX Control Unit, smartCore and Web Interface
A001

Intelligent Traffic Systems

SIEMENS

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Safety notice

The devices/systems are only to be employed for their intended use in accordance with the product documentation; the warning labels and product documentation are to be adhered to. The installation and initial startup of the devices may only be performed by authorized professional personnel (electrically qualified persons with the appropriate training for these devices/systems through the Siemens Academy, Traffic Systems Segment).

If not sufficiently trained personnel are working on the devices, substantial bodily damage and property damage can come as a consequence.

The devices/systems are to be tested regularly by authorized professional personnel. The test intervals and the checks to be performed can be found in the specifications of the product standards. If there are no product standards with information about regular checks for the devices, then the tests are to be performed in accordance with the standards IEC 60364-6, EN 50110 Row, HD 60364-6: 2007 article 62 and EN 50556 table 2.

Occupational safety, environmental protection

It goes without saying that all legal regulations regarding occupational safety and environmental protection are to be complied with during the course of production. We design our products (parts, devices, systems) in such a way that these present no health hazards to the user or hazards the environment according to the current state of information if properly and predictably used.

Recycling, disposal

The information above makes it possible to assess to a large extent the possible potential for hazards to people and the environment, even at the end of the product's life cycle. The regulations for recycling and disposal procedures must be observed here.

All information has been given to the best of our knowledge and belief. It is in accordance with the current state of the art. The information does not constitute a guarantee in the legal sense of a warranty.

1. Introduction

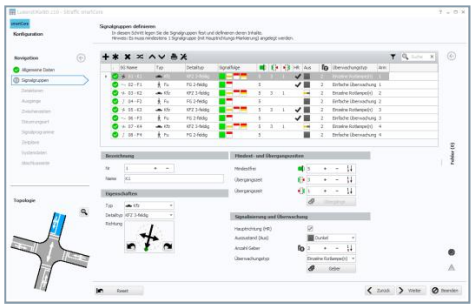
By concentrating on what is essential, Siemens has developed an entirely new generation of Traffic Control Systems. The development efforts focused on perfecting existing techniques used every day and the associated simplification of user handling while providing the same level of performance that users have become accustomed to. The result is the innovative Siemens Sitraffic smartX (sX) Traffic Control System.

Control units used for traffic control purposes are often the most important building block of a reliable, smooth and secure Traffic Control System. Their functions encompass far more than just switching traffic lights from red to yellow and green. Due to additional features, such as induction loops, traffic actuation or the synchronization of phased traffic lights ("green waves"), such control units have been significantly complex devices for quite some time - all the while guaranteeing traffic safety in every situation.

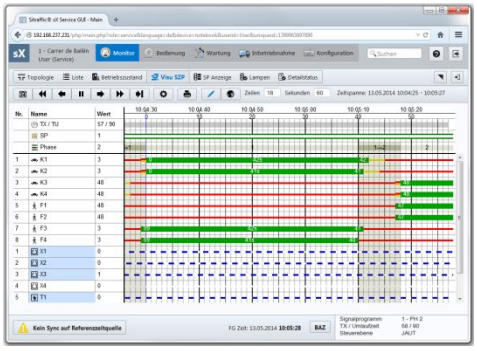
During the conception phase of the new Sitraffic sX control unit, Siemens has dealt with the question of how this complexity can be reduced without having to sacrifice important traffic control features. Siemens has gone entirely new ways in this regard.

For Sitraffic sX, an entirely new concept was developed and implemented for both the hardware as well as the software and its tools (see Fig. 1).

smartCore



sX HTML5 Interface



Sitraffic sX Control Unit

Fig. 1: The new Sitraffic sX Control Unit with its Tools

In terms of hardware, Sitraffic smartX is characterized by its space-saving design. But it can also be flexibly adapted to the complex infrastructure solutions of the future thanks to its modular framework concept. The sX also uses a PC-compatible processor that can work at ambient temperatures of up to -40°C.

The software itself is primarily geared towards ease of use and comfort. Due to the intuitive user interface, the control unit can be supplied with information and operated in a user-friendly manner using a PC, tablet or even smartphone. This allows you to perform the configuration and operation of the control unit yourself - without having any specific knowledge of the device technology itself. Time-consuming training courses are therefore a thing of the past.

The new Sitraffic sX System has therefore made modern traffic control both easy and comfortable. Traffic control has become "smart".

Find out more about the functions and properties of this "smart" control unit on the following pages - no matter whether you are already a

transportation expert or aim to become one. The Sitraffic sX StartUp document at hand will provide insight into the following contents:

- Get to know the innovative modular framework concept of our sX Control Unit, including all individual modules, in Section 2. This section also demonstrates how the control unit can be flexibly adapted to different requirements.
- The intuitive and comfortable use of the smartCore configuration software is shown step by step and using several illustrations and explanations in Section 3.
- Section 4 describes the convenient monitoring, operation and maintenance of the sX Control Unit using a browser on your PC, a tablet or smartphone in an illustrative and detailed manner.

The integrated online help function of the configuration software additionally offers detailed descriptions and explanations with concrete usage instructions.

2. The flexible Hardware of the sX System

This section provides an overview regarding the layout of the Sitraffic sX Control Unit. The comprehensive sX technical manual is also available if more detailed information is required.

During the development of the hardware concept, the creation of a future-proof technology while achieving an optimization of costs at the same time was the primary objective. For this purpose, the device is easy to install and can also be maintained with little effort. On the other hand, the innovative, modular framework and module concept offers the possibility of expanding the unit in a flexible manner and adapting it to future requirements.

Section 2.1 introduces the basic layout of the control unit hardware. Special attention is directed towards the modular framework concept as well as the functions of the individual modules.

Section 2.2 states a number of exemplary configuration options for racks and modules intended for different demands and requirements and exhibits the modularity of the control unit in this way.

Section 2.3 compares the layout of the new Sitraffic sX with that of the C9xx-Series to further highlight the differences between the control unit generations.

Section 2.4 provides information about control cabinets and which of these are suitable and available for the new control unit.

The essential properties of the device hardware are finally summarized in Section 2.5 in a succinct manner.

Note: The Sitraffic sX variant with 230V LED light switches is referred to as sX-H. The version with 33 to 64 signal groups is referred to as sX-HX (requires a 2nd cabinet)

2.1. The modular Hardware Concept

The primary idea of the modular framework concept is that the basic main frame can be supplemented or expanded by additional expansion units/frames depending on the user requirements. (See Fig. 2).

sX for up to 16 signal groups

sX for up to 32 signal groups

Fig. 2: Main frame (left), main frame with expansion frames (right)

The modular assembly concept within the main and expansion frames is described in more detail in the following section.

2.1.1. Layout of the Main Frame

The following components are generally arranged on the main frame:

- Processors for signal control
- Processors for signal monitoring
- Vehicle detectors
- I/O modules used for the detection of demand signals

- I/O modules used for the actuation of acknowledgment lamps
- Lamp switch assemblies/modules for 230V LED signal heads
- Power supply

The arrangement of components within the main frame is shown in Fig. 3.

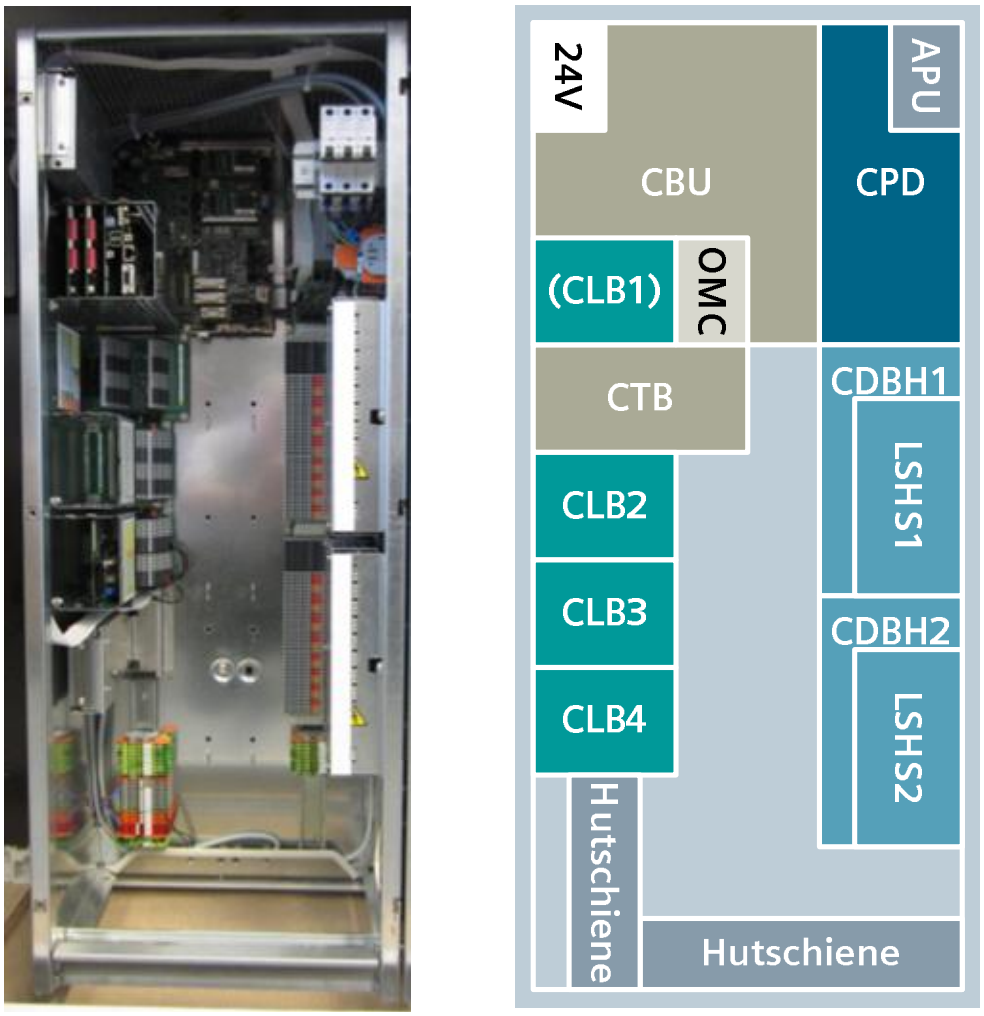


Fig. 3: The modular Assembly Concept in the Main Frame

The basic layout is composed of the following modules and assemblies:

The CBU (C10 Base Unit), which contains a total of 3 processors (2 signal monitoring processors and 1 real-time processor), is located on the top left section of the rear wall. The CBU also possesses the following connection options via the integrated CLB1:

- 8 integrated inputs/outputs (I/O) for detectors (such as buttons, acoustic signals for the visually impaired)
- 2 additional sockets for SLD4 detectors or CIE/CIO modules

SLD4 detector modules provide connections for up to 4 induction loops. CIO modules contain 8 inputs and outputs each, CIE modules additionally contain an Ethernet port

The CBU contains a socket for the main control system, also called OMC (Outstation Main Controller), which encompasses the following components and connections:

- Ethernet connections
- 2 USB connections
- 9 serial connections
- 1 GB flash (optionally up to 8 GB flash)

The CTB with the terminals for the SLD4 and the 8 inputs and outputs is located beneath the CBU. The 24V DC power supply for the modules is located on the top left section in front of the CBU. The mains voltage is 230V AC.

The CPDH power supply module is located to the right of the CBU and responsible for the lights/lamps of the external system. The 13V APU AC transformer is also located there and responsible for the power supply of the LSHS lamp switch modules. These are each attached to the two CDBH lamp switch backplanes beneath the power supply module.

One lamp switch supports a total of 8 signal groups with 230V LED technology at 5-18W of lamp output. The total power per output amounts to a maximum of 72 W.

- 4 signal groups each with 3x red (1 unmonitored), 1x yellow and 1x green and
- 4 signal groups each with 2x red (unmonitored), 1x yellow and 1x green

This makes it possible to control two lamp switches for a total of up to 16 signal groups using two available backplanes in the main frame.

Additional expansion options are offered by the spaces on the top-hat rail beneath the CTB on the left-hand side. It is possible to optionally attach the following modules to the additional CLB2 and CLB3 racks

- 2 additional SLD4 detector modules (corresponds to 2 x 4 = 8 additional loops) or
- 2 Low Power 24V DC I/O modules (CIE/CIO) for 2 x 8 = 16 inputs and outputs

It is also possible to mix SLD4 modules and I/O modules.

As an alternative to the CLB racks, it is also possible to attach 2 High Power 230 V AC modules (CIAC) with 6 inputs and outputs each to the CIAB racks. An additional CLB4 socket is provided for a 24V auxiliary power system (AC or DC) - which would be required for CIE/CIO or CIAC modules.

The required terminals for the protective grounds of the signal heads are located on the vertical top hat rail where there is also space for a heating thermostat. Additional space for CLB racks can be acquired using special mountings. A TEB module can also be installed on the left side wall of the frame, which can be used to connect an external operating and display unit (BAZ) or an external GPS receiver (CCUE).

It is also possible to install a modem on the horizontal top hat rail in the lower section of the frame.

2.1.2. Layout of the 1st Expansion Frame

In addition to expanding the main frame by multiple modules, it is possible to expand the main frame by an additional, narrower expansion frame, depending on the user's requirements. Among other things, this can be used to double the number of signal groups to 32. The arrangement of modules in the expansion frame can be seen in Fig. 4.

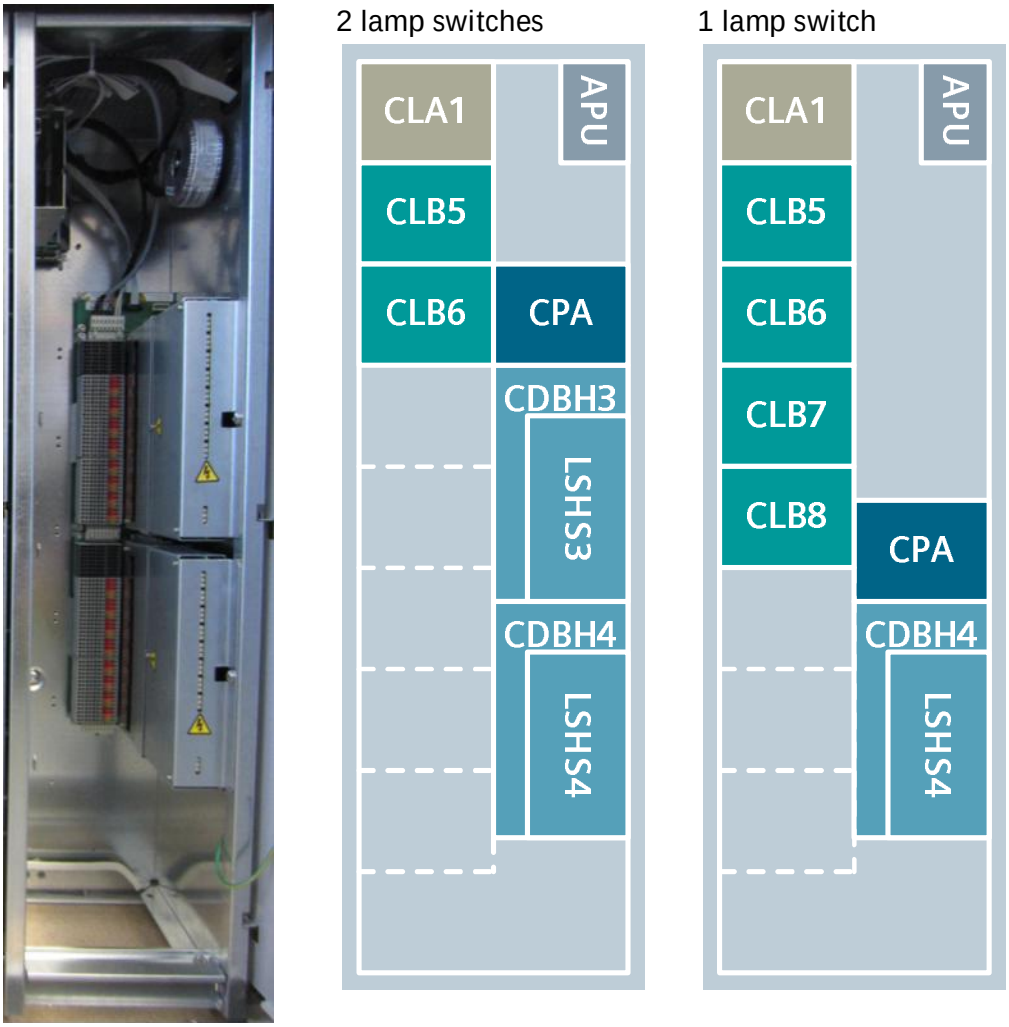


Fig. 4: Modular Assembly Concept of the Expansion Frame

Two connection modules, a CLA one for the expansion of the I/O modules and a CPA one for the lamp switch modules, are required in this regard. It should be noted here that the CLB installation slots overlap with the lamp switch installation slots. Depending on the number and installation location of the lamp switch boards, the number of available CLB installation slots will be reduced. A possible combination might, as an example, be the following (see Fig. 4, center):

- 2 additional CLB I/O racks with
- 2 additional LSHS lamp switches

With an alternative combination, (see Fig. 4, right) it is possible to install

- 4 additional CLB I/O racks and
- 1 additional LSHS lamp switch

Concerning power supply, merely a single additional APU2 transformer is required for the lamp switch modules.

2.1.3. Layout of the 2nd Main and Expansion Frame

Experience has shown that the previously mentioned combination of main and expansion frames is suitable for up to 32 signal groups. If higher numbers are required, this configuration can be supplemented by an additional main and expansion frame. The layout of this combination is demonstrated in Fig. 5.

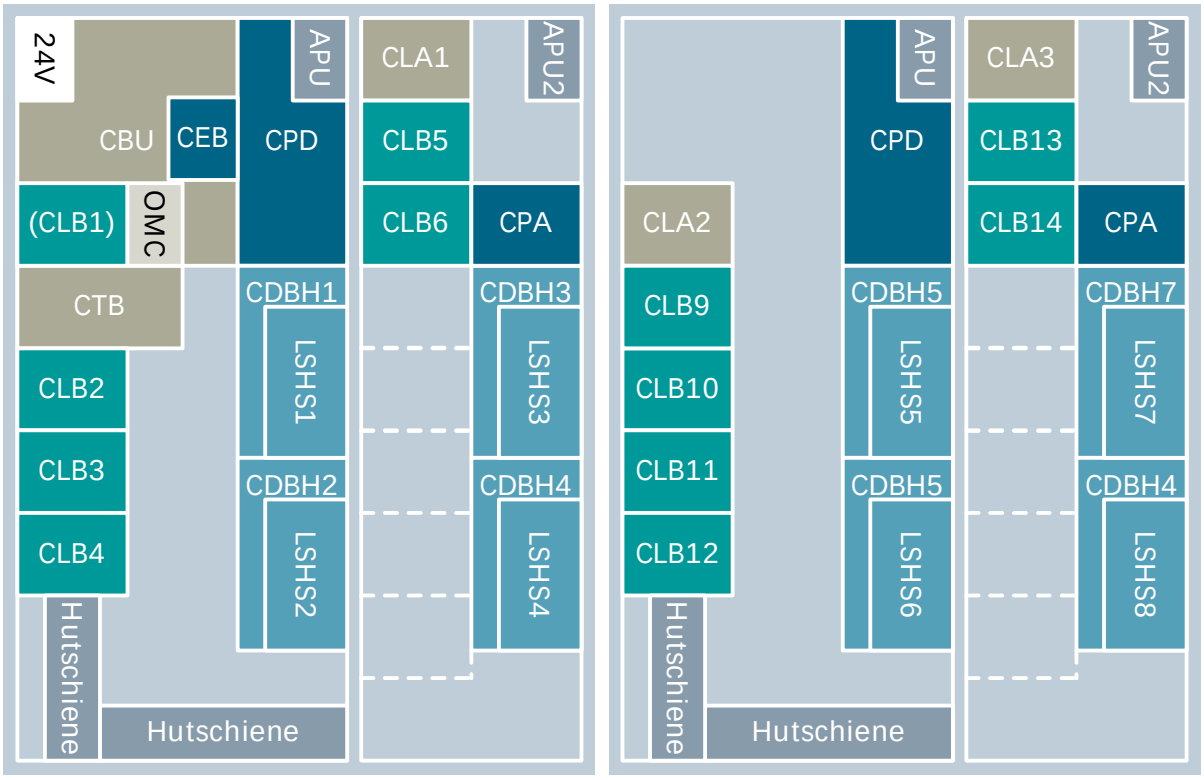


Fig. 5: Layout with two Main and Expansion Frames

The layout of the second main frame is similar to the first one. However, no additional CBU and 24V power supply are required. Merely a single additional power supply unit is required for the lamps and lamp switch logics (CPDH2 with APU). A additional expansion module CEB in main frame is necessary to control light switches 5-8 and I/O modules of second main frame. Similar to the first main frame, the second one can be expanded with the following modules:

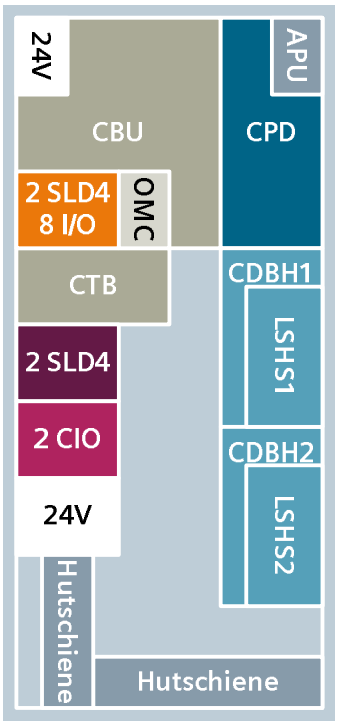
- Up to 4 CLB modules for SLD4 (8 loops each) or I/O modules (16 inputs and outputs each)
- Up to 2 LSHS lamp switches for 8 signal groups each

This makes it possible to expand the total number of signal groups to 48.

The second expansion frame is similar to the first one so that a combination of two main and expansion frames allows for a total of up to 64 signal groups.

2.2. Possible Combinations

As you can see, Sitraffic sX can be specifically configured to suit an operator's individual requirements due to the different combinations of lamp switches as well as SLD4 and CIO modules with regard to signal groups, induction loops as well as inputs and outputs. Some possible combinations are shown as examples on the following pages.
(Fig. 6 to Fig. 10).



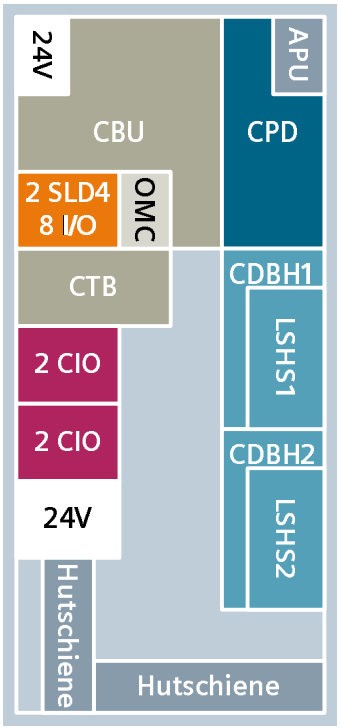
Combination 1

- 1 Main frame
- 4 SLD4 modules for 4 loops each on CBU and CLB2
- 2 CIO modules for 8 inputs/outputs each on CLB3
- 2 LSHS lamp switches for 8 signal groups each
- 1 24V auxiliary module (required when operating CIE/CIO modules)

Taking into account the 8 integrated inputs and outputs on the CBU, this combination supports a total of:

- 16 induction loops
- 24 inputs and outputs
- 16 signal groups

Fig. 6: Combination 1



Combination 2

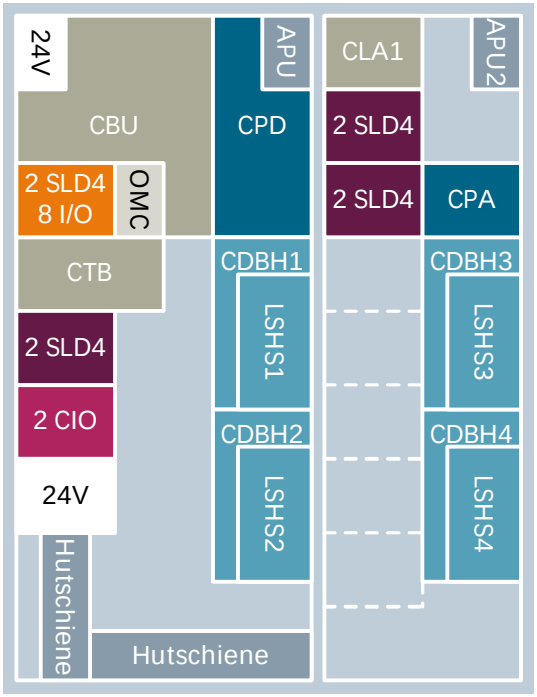
- 1 Main frame
- 2 SLD4 modules for 4 loops each on the CBU
- 4 CIO modules on CLB2 and CLB3
- 2 LSHS lamp switches for 8 signal groups each
- 1 24V auxiliary module

Result:

- 8 induction loops
- 40 inputs and outputs
- 16 signal groups

Fig. 7: Combination 2

In the next step, an expansion frame is added to the first main frame.



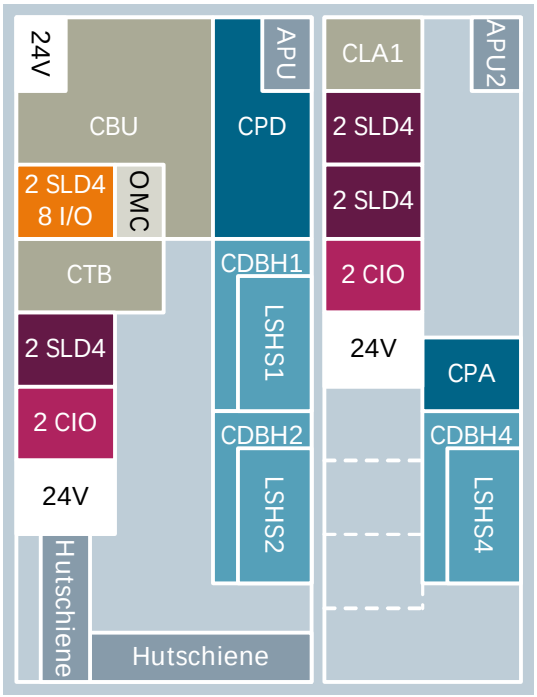
Combination 3

- 1 main frame and 1 expansion frame
- 8 SLD4 modules for 4 loops each
- 2 CIO modules for 8 inputs/outputs each
- 4 LSHS lamp switches for 8 signal groups each
- 1 24V auxiliary module

Result:

- 32 induction loops
- 24 inputs and outputs
- 32 signal groups

Fig. 8: Combination 3



Combination 4

- 1 main frame and 1 expansion frame
- 8 SLD4 modules for 4 loops each
- 4 CIO modules for 8 inputs/outputs each
- 3 LSHS lamp switches for 8 signal groups each
- 2 24V auxiliary modules

Result:

- 32 induction loops
- 40 inputs and outputs
- 24 signal groups

Fig. 9: Combination 4

In the following, the combinations will be expanded by an additional main and expansion frame.

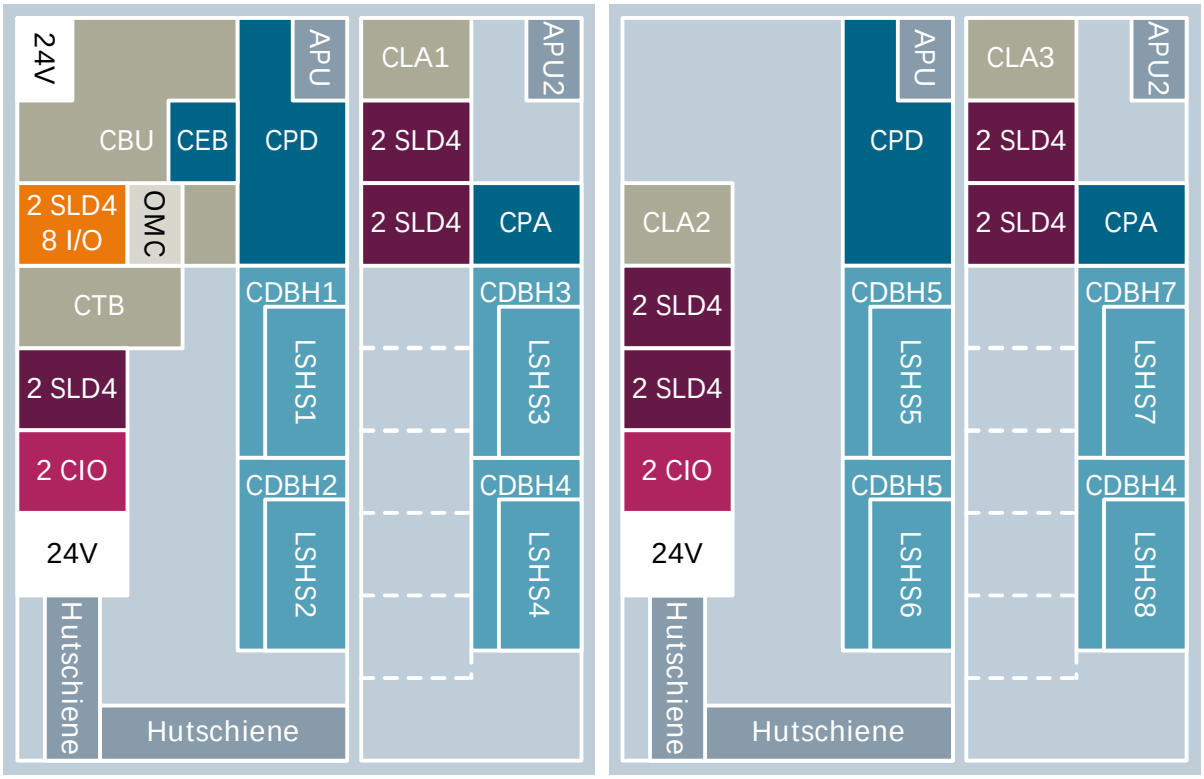


Fig. 10: Combination 5

Combination 5

- 2 main and 2 expansion frames
- 4 CIO modules for 8 inputs and outputs each
- 16 SLD4 modules for 4 loops each
- 2 24V auxiliary modules
- 8 LSHS lamp switches for 8 signal groups each

This results in

- 64 induction loops
- 40 inputs and outputs
- 64 signal groups

The shown combinations allow a glimpse into the variety of configuration options offered by Sitraffic sX. Of course, many other combinations are also possible, thus ensuring that the control unit can be customized to fully suit the operator's individual requirements.

The maximum number of individual components for the different combinations of main and expansion frames is summarized in Table 1.

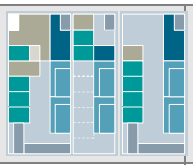
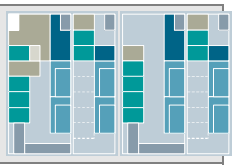
Layout					
Main frame Expansion frame		1	1 1	2 1	2 2
Number of CLB	Additional		7	4	7
	In total [1]	3	10	14	21
Max. number of SLD4	on CBU	2			
	Additional	6	14	8	14
	In total	8	22	30	44
Max. number of loops	Additional		56	32	56
	In total	32	88	100	176
Max. number of CIE/CIO	on CBU	2			
	Additional	4	10	6	10
	In total	6	16	22	32
Max. number of I/O	CBU integ.	8			
	Additional	48	80	48	80
	In total	56	136	184	264
Max. number of CDBH/ LSHS	Additional		2	2	2
	In total	2	4	6	8
Max. signal groups	Additional		16	16	16
	In total	16	32	48	64
Required 24V auxiliary modules [2]					
	Additional		2	2	2
	In total	1	3	5	7

Table 1: Overview of modular framework concepts

1 Additional space for CLB racks can be provided by special mountings.

2 The number of required 24V auxiliary modules depends on the number of used CIE/CIO modules and the required output power.

2.3. The sX System in Comparison

As you have seen, the Sitraffic sX System is based on an entirely new hardware concept that has not existed before in this shape and form.

It is therefore neither a successor product nor a modification of a previously developed control unit. A performance benchmark between the sX System and older control units would therefore be similar to a comparison of apples and oranges.

Instead, you will find a listing of various boards and modules in this section as well as their functions in comparison to those of previous control systems. This comparison is especially valuable if you already have experience with previous traffic control systems made by Siemens and would like to confirm the availability of previously existing functions.

The Sitraffic C9xx Control System is used as a reference for other control units for the purpose of this comparison in Table 2.

	Sitraffic C 9xx		Sitraffic sX	
Controller	BBX	Control module	CBU	Carrier board with the following connections: ■ 8 inputs (24V DC) ■ 8 outputs (max. 140mA) ■ CLB for 2 SLD4 loop detectors or 2 CIE/CIO modules
	BBP	Motherboard with the following connections: ■ 16 inputs (24V DC) ■ 4 outputs (100V 50mA or 130mA) ■ 3 LD4 loop detectors		
Boards/racks	BDP	Detector board for ■ 3 LD4 loop detector modules or ■ 3 BVD modules for video and magnetic field detectors or ■ 3 DIB-E modules for Sivicam	CLB	Detector board for ■ 2 SLD4 loop detectors or ■ 2 CIE I/O modules (Low Power) or ■ 2 DIB-E modules for Sivicam
	FUP	I/O board for ■ 2 BFU I/O modules (pedestrians)	CIAB	Detector board for ■ 2 CIAC I/O modules (High Power)
	VDP	Detector board for ■ 4 VIP/P video detector modules		(not available anymore, successor: DIB-E on CLB)

Modules	LD4	Loop detector module for ■ 4 loop inputs	SLD4	Loop detector module for ■ 4 loop inputs
	BFU[3]	I/O module with ■ 6 inputs (24V AC/DC - 230V AC) ■ 6 outputs (24-230V AC, 2.5A or 60V DC, 150mA) For demand buttons with 24V to 230V acknowledgment lamps	CIO[4]	I/O module with ■ 8 inputs (24V DC) ■ 8 outputs (max. 150mA) For demand buttons, acknowledgment lamps with 24V
			CIAC	I/O module with ■ 6 inputs (230V AC) ■ 6 outputs (max. 300mA) For demand buttons, acknowledgment lamps with 230V
	BVD	Detector module for ■ 20 magnetic field detectors (Wimag) via Xport	CIE	Like CIO, with additional Ethernet port for ■ 20 magnetic field detectors (Wimag) via Xport
	VIP	Video detector module for ■ Trafficam camera evaluation system		(not available anymore, successor: DIB-E)
	DIB-E	Video detector module for ■ 6 Sivicam cameras	DIB-E	Video detector module for ■ 6 Sivicam cameras

Table 2: The sX System compared to the C9xx Series

Direct comparison primarily highlights the differences between the devices when connecting different detector types. This, again, highlights the modular and simplified assembly concept that has been developed for the sX system.

3 Necessary if more inputs/outputs than the 16 on the BBP are required.

4 Necessary if more inputs/outputs than the 8 on the CBU are required.

2.4. Cabinets and Dimensions

As compact and space-saving as the Sitraffic sX System itself, are the matching control cabinets for the control unit. The main frame and the expansion frame can be installed in the similar design cabinets manufactured by

- Orlite (O) and
- NKT (N)

from the factory and mounted to known standard bases. Depending on whether only the main frame or multiple frames are required, cabinets are available with different dimensions and with one or two doors. A selection of cabinets is shown in Fig. 11.

1O/N cabinet for one main frame (incl. EVU)

2O/N cabinet for main and expansion frames (incl .EVU)

Fig. 11: Cabinets for Main and Expansion frames

A main frame can be installed in a 1O/N cabinet (see Fig. 11 left) together with the standard EVU component (for power supply). This has the following dimensions, depending on the manufacturer

- 806 x 380 x 1100 mm³ (W x D x H) for type 1N or
- 785 x 380 x 1100 mm³ (W x D x H) for type 1O.

The combination of a main and expansion frame can be installed in a 2O/N cabinet (see Fig. 11 right) with the dimensions

- 1136 x 380 x 1100 mm³ (W x D x H) for type 2N or
- 1115 x 380 x 1100 mm³ for type 2O

A second main and expansion frame can be installed in an additional cabinet. This combination results in a 3O/N cabinet (see Fig. 12) with the dimensions

- 1902 x 380 x 1100 mm (W x D x H) as type 3N or
- 1900 x 380 x 1100 mm³ (W x D x H) as type 3O.

Fig. 12: 3O/N cabinet

Additionally, all variants feature a small operating door in one of the cabinet doors behind which an operating and display unit is located (BAZ). For more information regarding the functions and operation of the BAZ, please refer to Section 4.4.6 of this StartUp document.

2.5. sX Hardware Summary

The previous sections have shown you how flexibly the Sitraffic sX System adapts to individual traffic requirements. The main reason for the existence of these numerous configuration and combination options is the modular framework concept of the control unit itself. The development of a PC compatible x86 processor for the sX System also ensures an increased availability of the latest technological developments and an improved compatibility with Windows systems.

The essential features and characteristics of the Sitraffic sX Hardware are summarized in the following section:

- The sX System is distinguished by a modular frame and module concept.
- The control system is made up of two main components: the OMC main control module and the CBU signal monitoring and real-time controller.
- The OMC is, among other things, equipped with LAN, USB and Flash connections.
- The processors operate at temperatures ranging from -40°C to +60°C of ambient temperature.
- The CBU is equipped with 8 parallel inputs and outputs, as well as slots for 2 SLD4 loop modules or 2 CIE/CIO modules.
- Two additional CIE/CIO modules (for 16 parallel inputs/outputs) or two SLD4 detector modules (for 8 loops) each can be attached to the additional CLB racks.
- It is possible to mix SLD4 and CIE/CIO modules on the CLB.
- A lamp switch supports 8 signal groups each with 230V LED technology at 5-18 W of lamp power and a maximum of 72W of total power per output. Two lamp switches can be installed per main or expansion frame.
- Using a single main and expansion frame, it is possible to operate up to 32 signal groups and a maximum of 88 induction loops.
- A second main and expansion frame supports up to 64 signal groups and 176 induction loops.
- The expansion frames do not require an additional power supply for the lamps of the outdoor system, but merely connection devices for the additional modules.
- A cabinet of size 1O/N with a single door suffices for the main frame. The 2O/N cabinet with one small and one large door is compatible with the combination of a main and expansion frame.

3. Easy Configuration using smartCore

Simplicity can be a real luxury – this thought was one of the decisive factors in the development of the software tools for our new generation of Traffic Control Systems. This simplicity primarily achieves an easy configuration and operation of the system.

The new Sitraffic smartCore configuration tool makes the configuration and set-up of Sitraffic sX both intuitive and comfortable. The comfortability of this software is primarily defined by the easy handling, quick implementation of individual solutions and the intuitive user interface. The integrated configuration wizard successively guides the user through the individual configuration and set-up steps necessary to adapt the Traffic Control System to the individual requirements at hand – and this merely requires basic traffic engineering knowledge.

When completed there is guaranteed to be an error-free configuration that will include the signal monitor for the Sitraffic sX without requiring that a test or simulation be run to verify the configuration.

The complete planning documents for the concerned intersection are the basis for the configuration.

The Sections 3.1 and 3.2 first describe the start menu of smartCore and the general layout of the configuration wizard.

Section 3.3 deals with the creation of a complete configuration in ten simple steps. Here, a sub-chapter is dedicated to each step - from the naming of the intersection to the final determination of system data.

Section 3.4 shows the final result of the configuration wizard just before the configuration is ultimately transferred to the device itself.

A summary of the smartCore system is finally provided in Section 3.5.

3.1. Start Menu of the Application

The smartCore software can simply be installed and used on a computer running a standard Windows operating system. The corresponding setup file will be provided to you for this purpose. When the application is started, the smartCore start window is automatically opened (see Fig. 13).

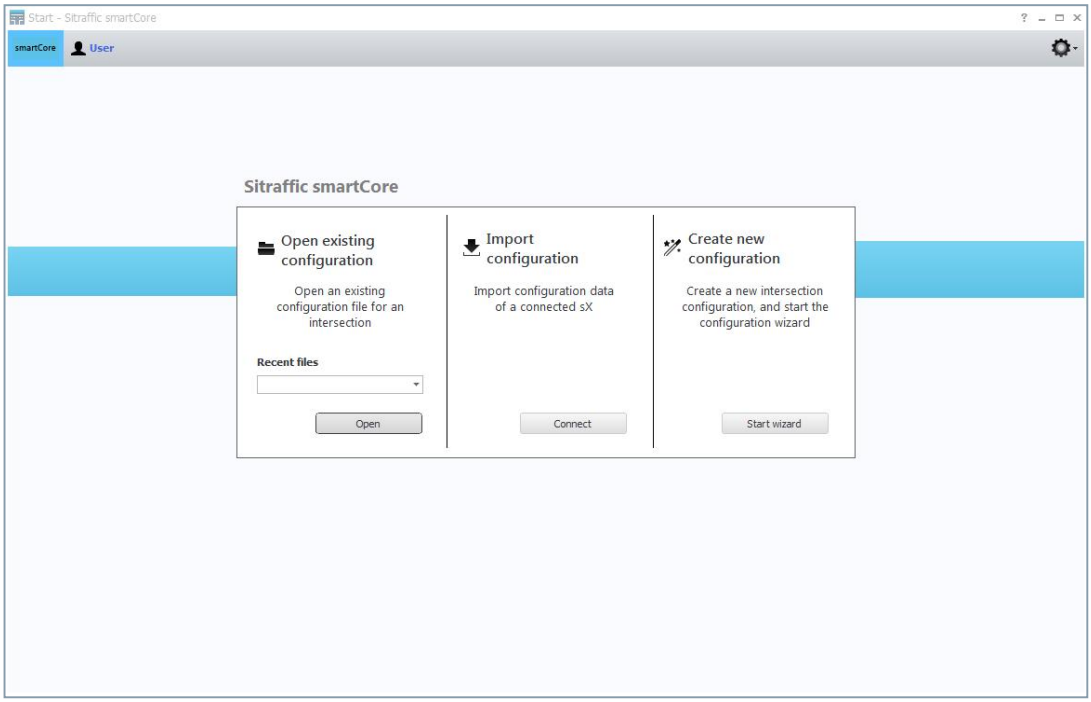


Fig. 13: Start Window of smartCore

The start menu of the software allows access to the following functions:

- Open an already created intersection
- Load an intersection from an sX
- Create a new intersection

The smartCore help function can additionally be opened by clicking on the "?“ in the top right section of the menu bar. This help function always refers to the contents of the currently opened window and provides the user with valuable hints (see Fig. 14).

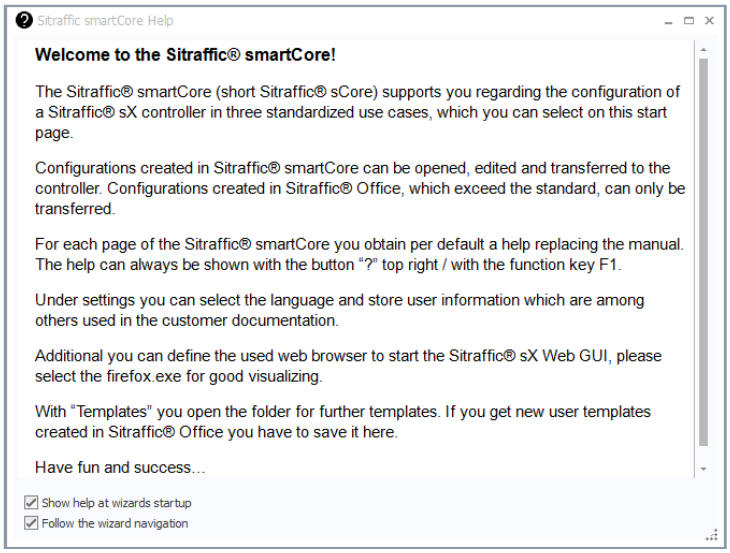


Fig. 14: Help Window of smartCore

By clicking on "Start Wizard" in the "Create Intersection" menu item, the configuration wizard is loaded. A window will be displayed, prompting you to enter the basic information pertaining to the new intersection (see Fig. 15).

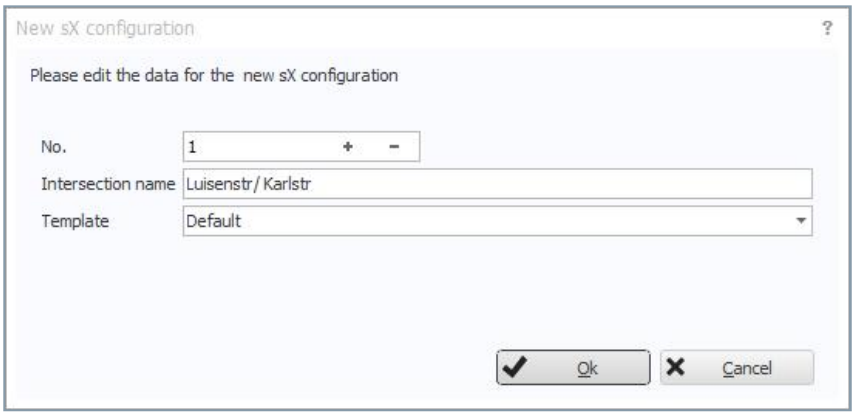


Fig. 15: Start of the Configuration

- A freely selectable number used to identify the intersection is entered in the “No.” field

- The designation of the intersection, for example the street name, is entered in the Intersection Name field
- The country-specific template is selected in the Preset field. The "Default" template is used for intersections in Germany.

By clicking on "OK", the data is accepted and the configuration wizard is started in a new window.

3.2. Layout of the Configuration Wizard

The configuration wizard of the smartCore software is based on a "10-step" plan. The basic layout of the configuration windows is always identical here (see Fig. 16).

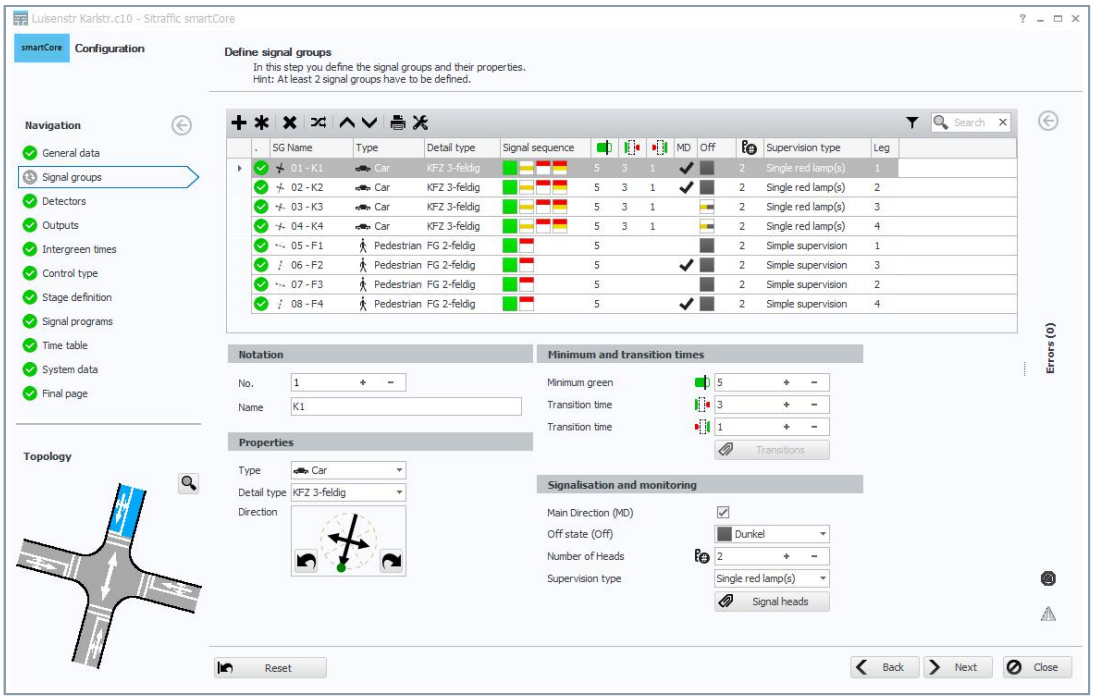


Fig. 16: Layout of the Configuration Wizard

- The menu navigation and the configuration step that you are currently working on are displayed on the left-hand side. A green checkmark symbolizes that a step has been completed.
- Starting with the 2nd step, the topology of the examined intersection is displayed in the lower left corner.

- The right side of the window will, if applicable, indicate to the user that an error has been made when entering the data. Details can be displayed by clicking on the arrow on the right.

The menu bar on the bottom of the window generally contains the following commands:

- By clicking on “Next”, you can leave the current page and move on to the next step if no errors have been made when entering the data on the present page. It is always possible to jump back to a previous step.

- By clicking on “Quit”, the entire wizard is closed. Before the wizard is actually terminated, the user will be asked whether he would like to save the previously entered data. This would create a C10 file for which the user can manually select the storage location. If the user would then like to resume the configuration at a later point in time, he merely needs to use the Open Intersection function in the start menu and select the corresponding file.

- By clicking on “Reset”, all entries made on the current page are discarded.

3.3. The 10 Steps of the Configuration Wizard

The next sections will introduce the individual steps of the Sitraffic smartCore configuration tool to you.

3.3.1. Entering the General Data

As a first step, the general data that you have entered using the previous window will be displayed again. It is additionally possible here to add optional information, such as the name of the town or city and a description as well as the GPS coordinates of the intersection (see Fig. 17).

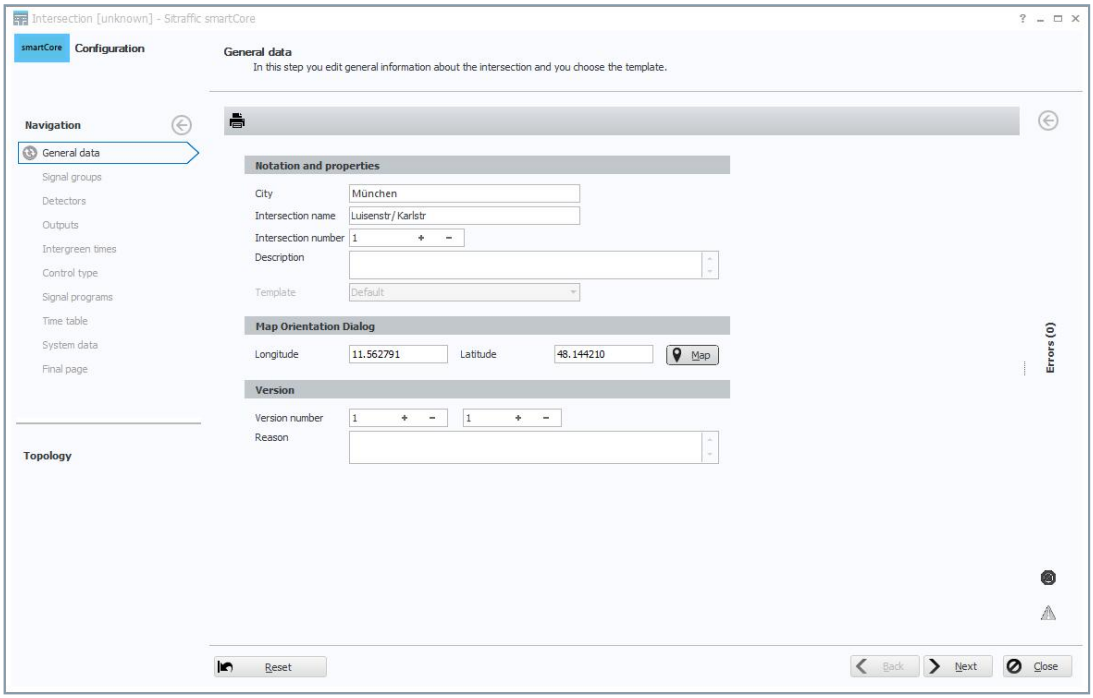


Fig. 17: Entering General Data (Step 1)

It is optionally possible to enter a version number with a change description as well.

The “Intersection Position” can also be determined by clicking on the “Map” command. This command then opens a window with a dynamic map where the intersection can simply be positioned on the desired spot by clicking with the mouse and confirming with OK (see Fig. 18).

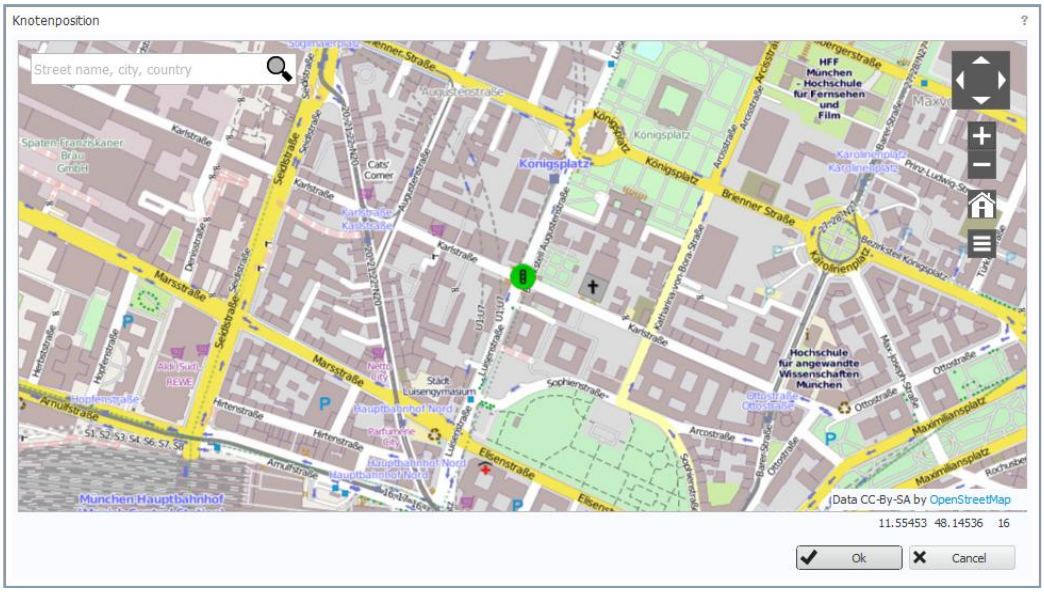


Fig. 18: Determining the Intersection Position

The GPS data is now entered automatically. As an example for this StartUp document, an intersection is placed at the Luisenstraße/Karlstraße crossroads in Munich and fictitiously configured using the smartCore software.

The next step of the configuration process is opened by clicking on “Next”.

3.3.2. Determining the Signal Groups

An additional window will first open automatically where the amount and type of signal groups can be selected. Here, you can either create all signal groups in one step or create the signal groups per access road step by step, whereas in this case, the direction of the access road can be preselected directly (see Fig. 19).

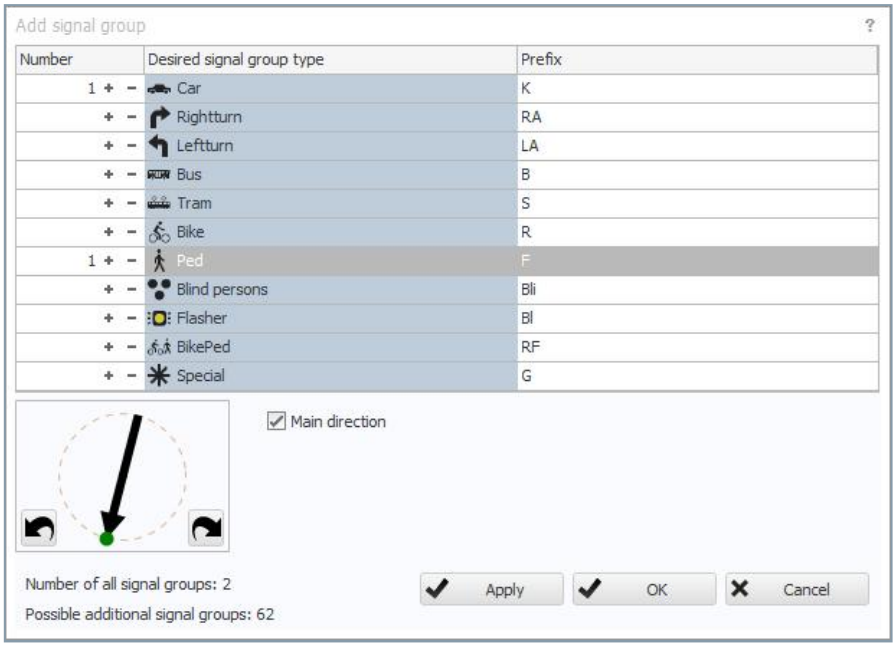


Fig. 19: Adding Signal Groups for a Main Direction

- You first have to select the direction of the relevant intersection arm in accordance with the geometrical properties using the “Arrow” in the bottom left corner.
- Tick the “Main Direction” box if the concerned access road is also a part of the main direction. This determination is especially important for the subsequent definition of the signal plans.
- The number of desired “Signal Group Types” for this direction is simply added by clicking on the “+” symbol.
- You can optionally change the “Prefix” used to identify the individual signal groups in the right column.

If the signal groups for this direction are complete, these can be added to the intersection by clicking on “Add”.

The creation of signal groups for additional intersection arms is done in the same way. The user merely has to take the orientation of the arrow and the definition of the primary and secondary directions into account (s. Fig. 20).

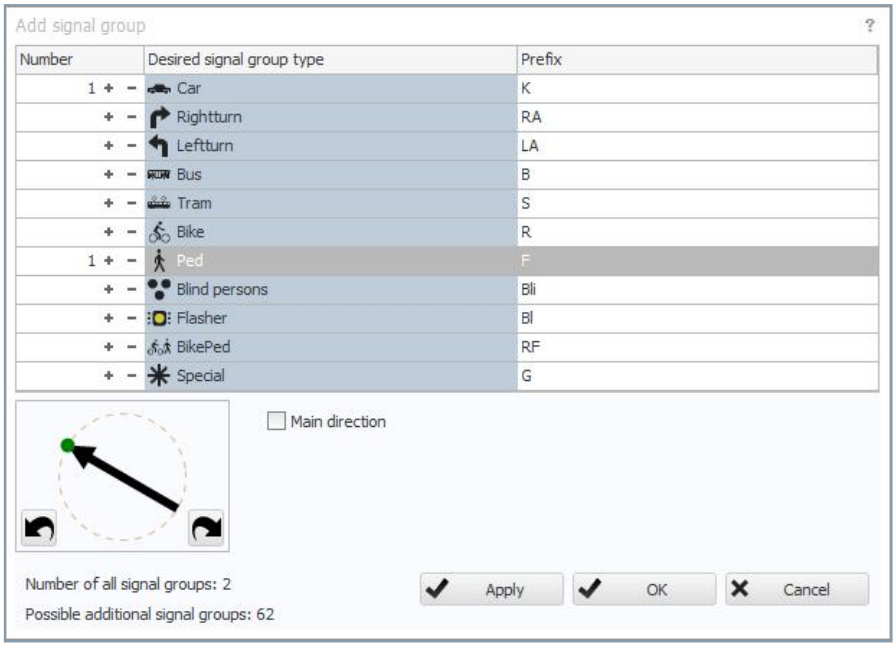


Fig. 20: Adding Signal Groups for a Secondary Direction

If you have defined all signal groups, you can close the window by clicking on “OK”. You will now be taken back to the configuration wizard itself (see Fig. 21).

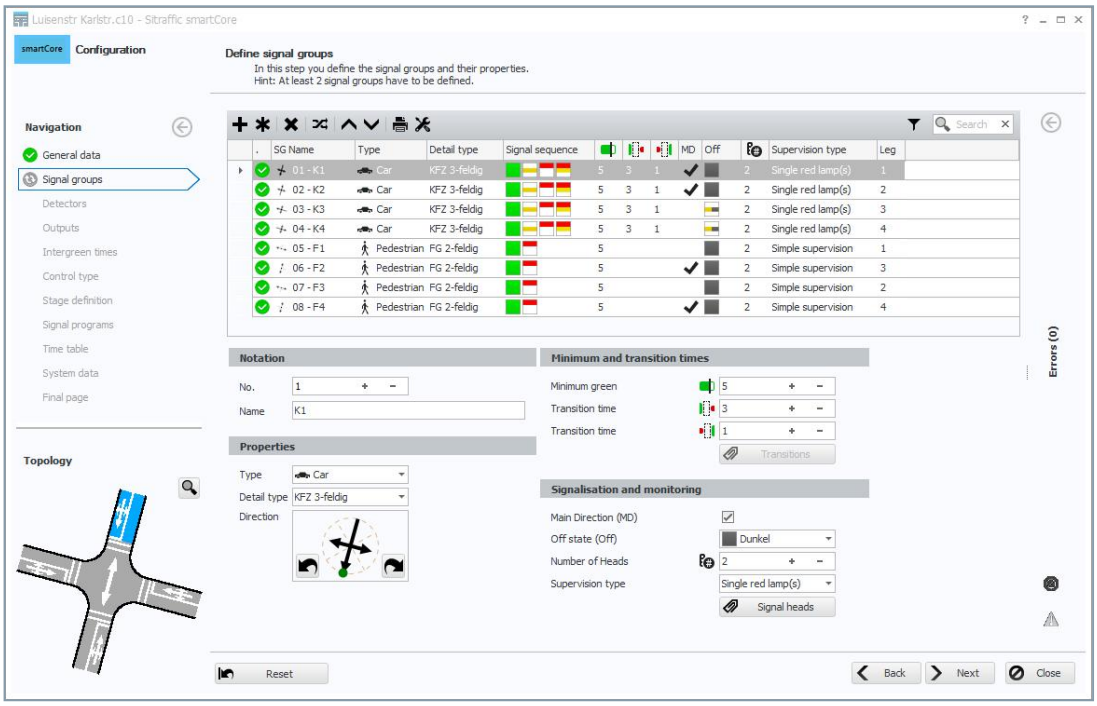


Fig. 21: Defining Signal Groups (Step 2)

The already created signal groups are displayed in the top section of the page, but cannot be edited there. You can search, filter, sort and select them there. It is also possible to select multiple lines at the same time.

- By clicking on “+”, additional signal groups can be added and the window for the definition of signal groups will be opened again.
- By clicking on “X”, the selected signal groups will be removed again.

The entries for the selected signal groups can be made in the lower part of the page.

- The number and name of the respective signal group can be changed in the “Designation” field. It should be noted here that every number can only be assigned once to ensure that all groups are uniquely identified.
- Using “Properties”, the signal group type can optionally be adjusted, which causes the minimum and transition times and/or the signaling and monitoring values to be set to the default (template) ones, which can then be corrected or adjusted, if applicable. Additionally, the permitted directions of travel can be removed and/or added by simply clicking on the corresponding quarters of the circle. Together with the directions of the signal groups, the topology of the intersections is also determined and displayed on the bottom left.
- You can also configure the minimum and transition times manually.
- You can determine the signal and deactivation behavior of the installation in case of lamp failure by selecting the number of signal heads and the monitoring type in the “Signaling and Monitoring” section. Please note the additional information regarding the selection of the monitoring type.

Click on “Next” to proceed to the next configuration step.

3.3.3. Defining Detectors

You can determine the number and type of the desired detectors in this step. As in the previous step, a small window will first open where the number of desired detector types can be defined (see Fig. 22).

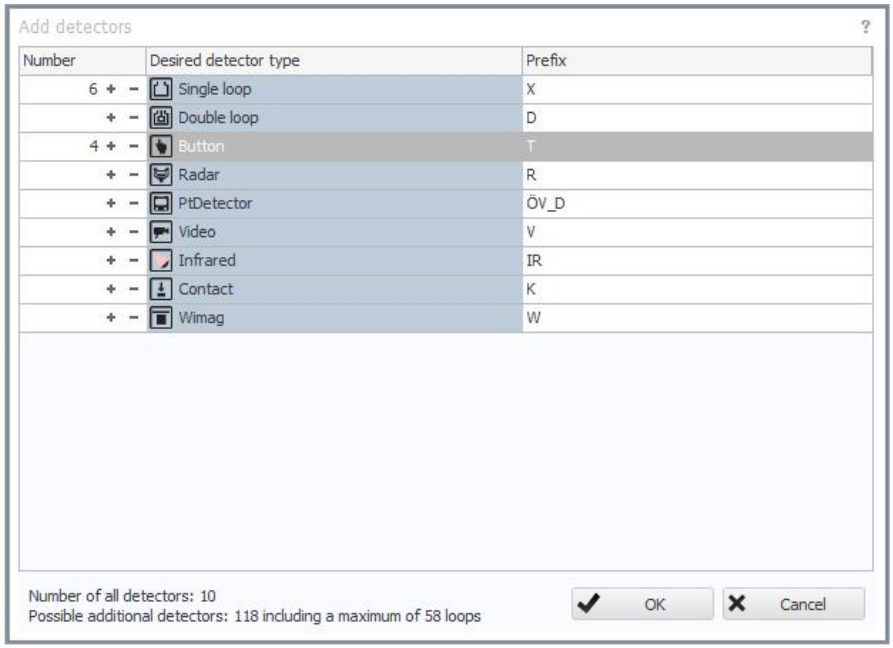


Fig. 22: Adding Detectors

By clicking on “OK”, the window is closed and the user is taken to the third step of the smartCore configuration wizard (see Fig. 23).

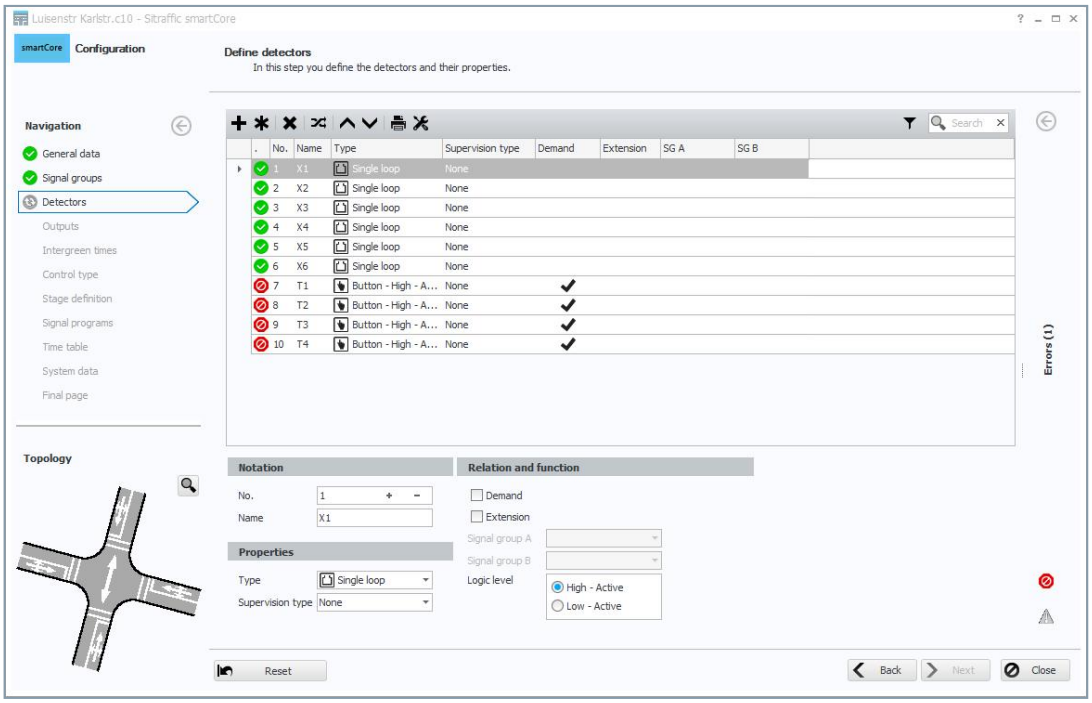


Fig. 23: Defining Detectors (Step 3)

The defined detectors are displayed in the top section, similar to the signal groups of the previous step. Under certain circumstances, an error will be displayed for some detectors in the form of a red symbol. The “Next” button will be deactivated in this case. Additionally required entries have to be made in the bottom section of the window for the concerned detectors in this case.

- You can optionally change the number and name of the selected detector in the “Designation” field.
- If necessary, you can change the detector and monitoring types again in the “Property” field.
- The function of the detectors and their references to the signal groups can be determined in the “Allocation and Function” section. It is necessary to enter at least one signal group for a demand as well as for a calculation/green phase extension. A second signal group is optional.

As soon as all entries have been made and no errors are displayed anymore, the next step is accessed by clicking on “Next” (see Fig. 24).

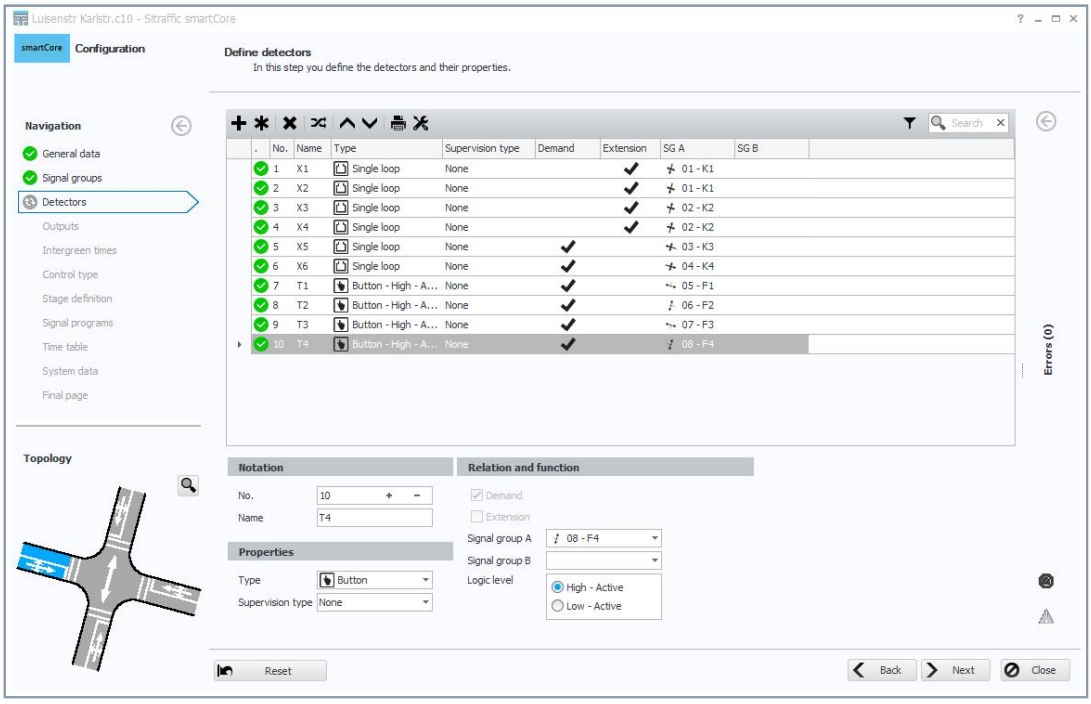


Fig. 24: Complete Definition of the Detectors

A schematic overview of the created intersection with its signal groups and detectors is displayed by clicking on the small magnifying glass in the bottom left section ("Topology") (see Fig. 25).

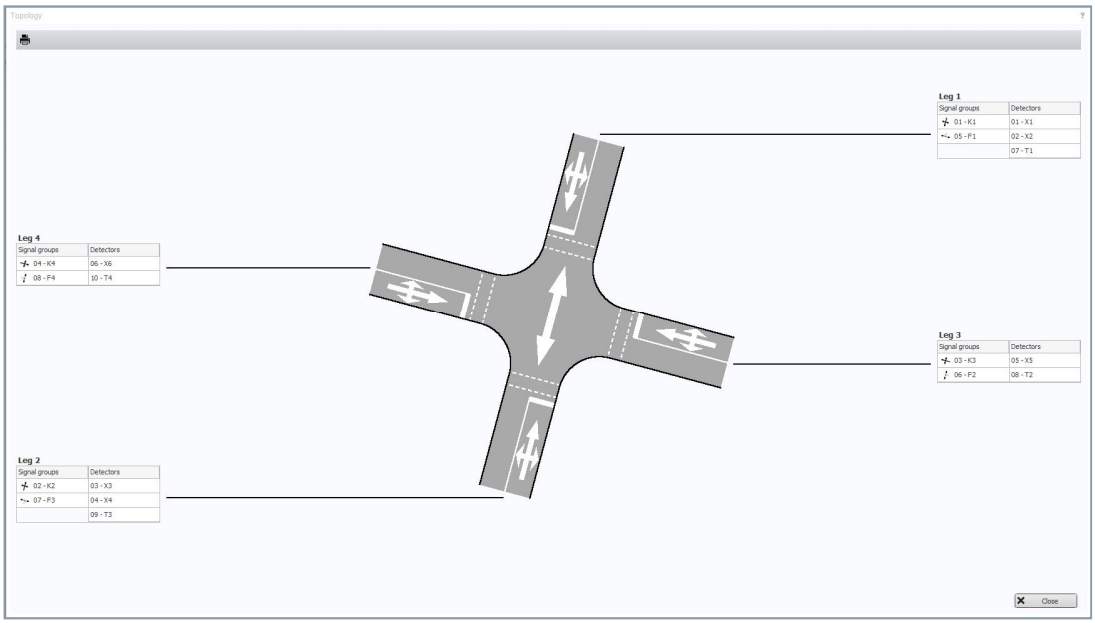


Fig. 25: Topology of the created Intersection

The double arrow in the center of the intersection also shows the previously defined primary direction.

3.3.4. Outputs

The outputs of the traffic control system are defined in the next step. Here, you will first have the option of automatically creating an acknowledgment output for the requested signal groups for existing buttons, such as a "Please Wait" prompt. Additional outputs for acknowledgments as well as system and user events can also be created (s. Fig. 26).

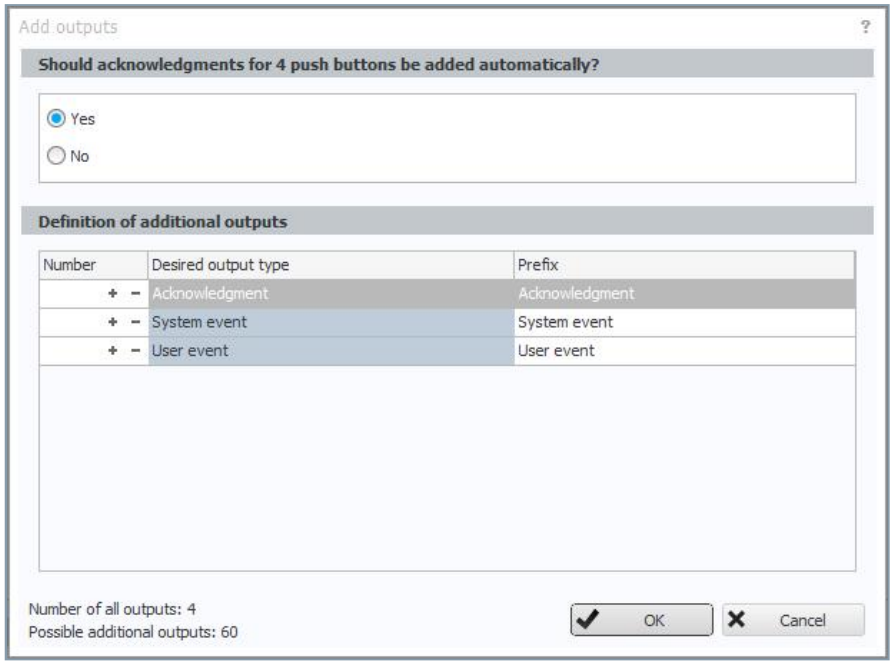


Fig. 26: Adding Outputs

- In the “System Event” section, it is possible to select a predefined event, such as the breaking of a wire or a signal monitoring fault and be provided as an output.

- A user event defines an output, which can be activated by schedules depending on certain points in time or weekdays.

By clicking on “OK”, the user is taken back to the configuration wizard. The already created outputs are displayed in the top section of the window, as before. Additional entries can be made below (see Fig. 27).

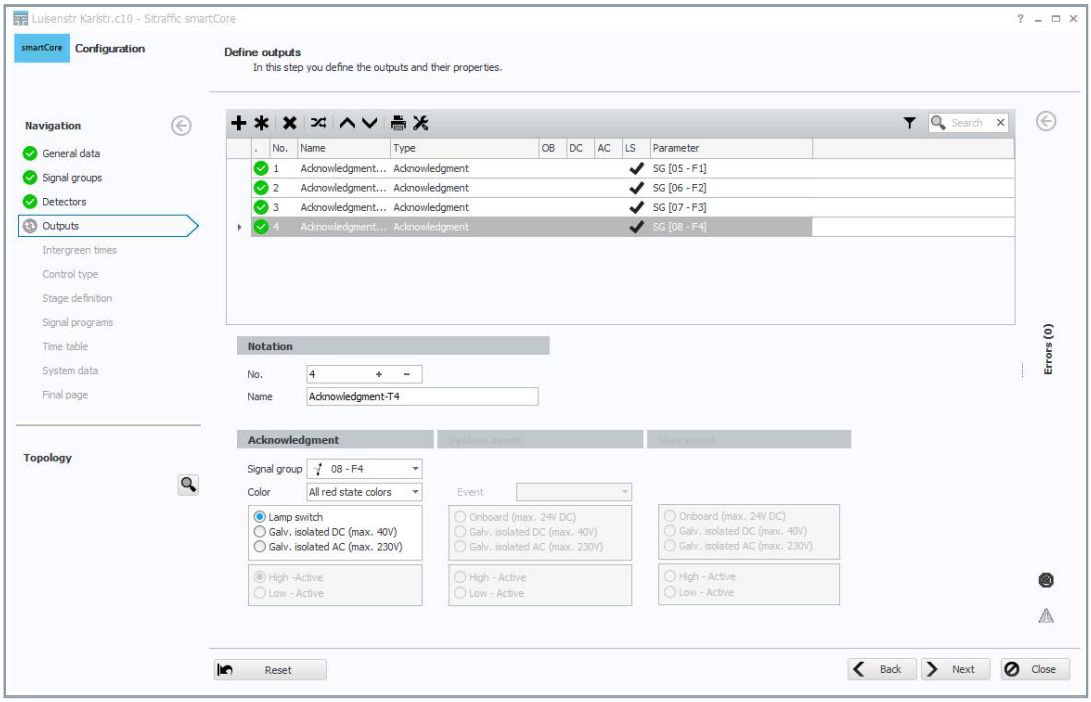


Fig. 27: Defining Outputs (Step 4)

A requested signal group has to be selected for an acknowledgment output if it has not already been assigned to a button. A specific blocking color can optionally be specified.

3.3.5. Intergreen Times

The determined and checked intergreen times are entered in the next step. A check for symmetry is permanently performed.

The outgoing signal group is highlighted in red and the incoming signal group is highlighted in green in the topology in the bottom left section relative to the current mouse position within the matrix (see Fig. 28).

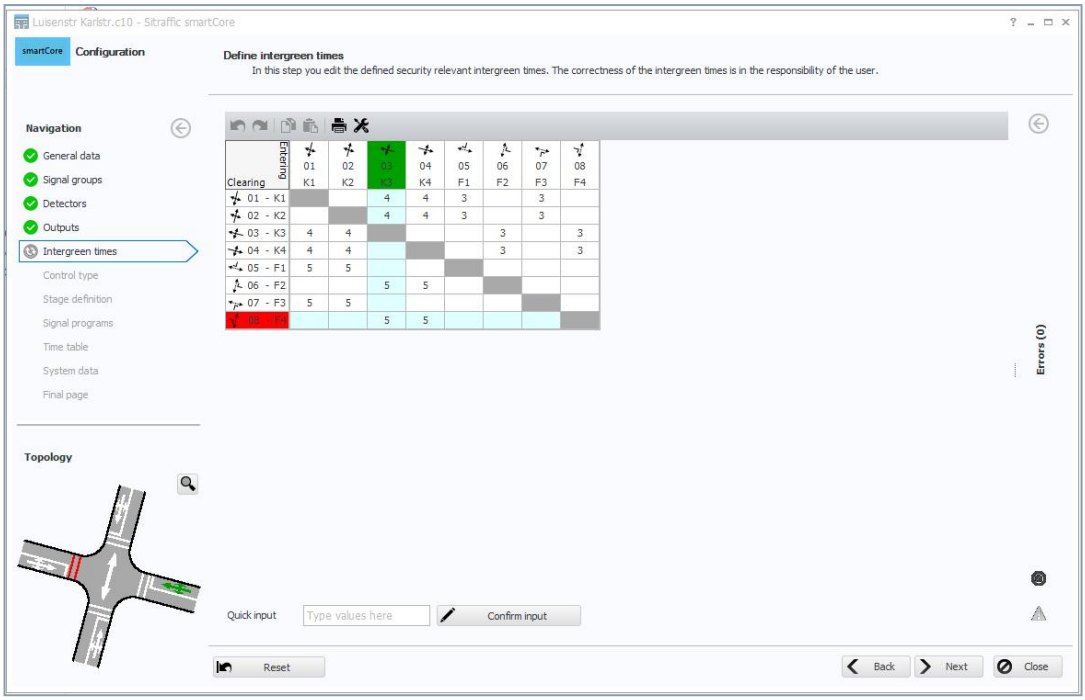


Fig. 28: Confirming the Intergreen Times (Step 5)

You can copy or add individual values or entire blocks. The Windows clipboard is used here, which means that it is also possible to, for example, copy values from Excel.

Individual intergreen times can also entered in the “Quick Entry” field below the matrix in the form of rows, columns and values. It is possible to use either a space or comma as a delimiting symbol.

Entering 2,1,5, for example, corresponds to a value of “5 seconds” in the cell of “Line 2” and “Column 1”.

By clicking on “Add Value”, the entry is copied to the matrix.

Enter the intergreen times under consideration of all conflicts derived from the traffic engineering planning!

3.3.6. Control Type

The traffic control type of the control system is selected on the following page (see Fig. 29).

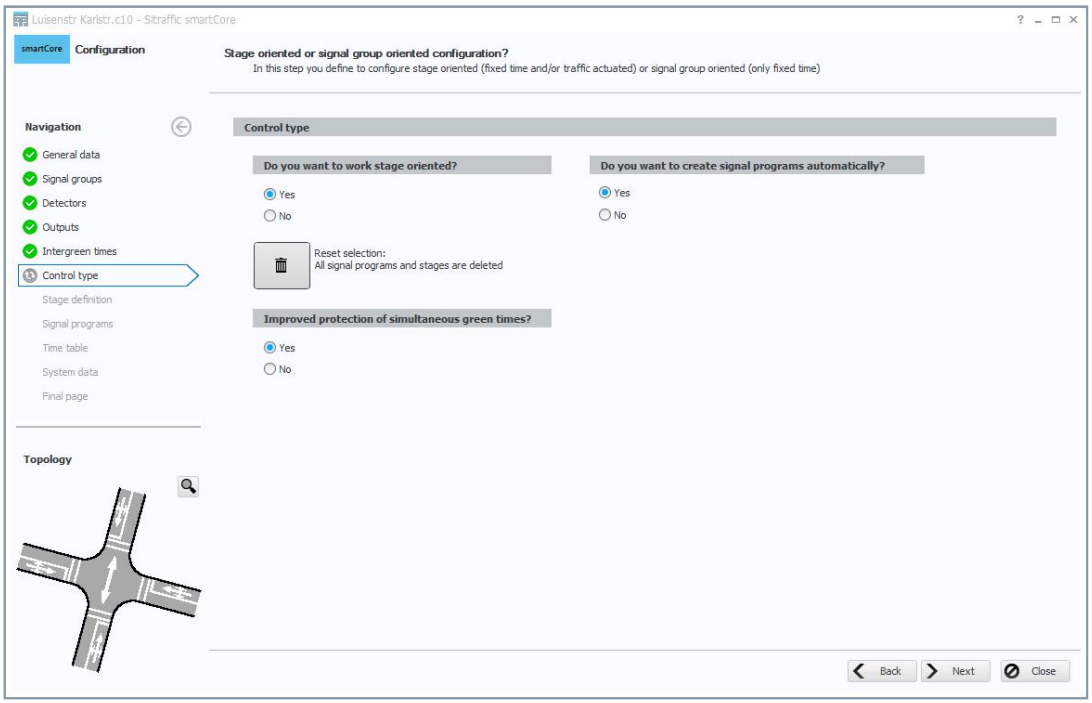


Fig. 29: Setting the Control Type (Step 6)

- With a stage-oriented control type, stages are defined based on which stage transitions are automatically calculated and the signal program is derived from the sequence of stages. A traffic-dependent controlling is also possible here. If the signal group-oriented control type is selected, you can configure the switching times of each individual signal group in the signal program. A traffic-dependent controlling is not possible here.

- By default, an activated "Increased protection for pedestrians" function ensures that pedestrians walking in the same direction as the flow of traffic will be allowed to move at the same time or earlier.

- An initially created signal program either features a minimum cycle time in case of stage-orientation or a cycle time of 90 seconds in case of signal group-orientation.

Please note that changing the control type will cause all stages and signal programs be deleted.

3.3.7. Stage Definition

This page is used to define the states or colors of the signal groups in the individual stages. There is a permanent check for conflicts based on the previously entered intergreen time matrix (see Fig. 30).

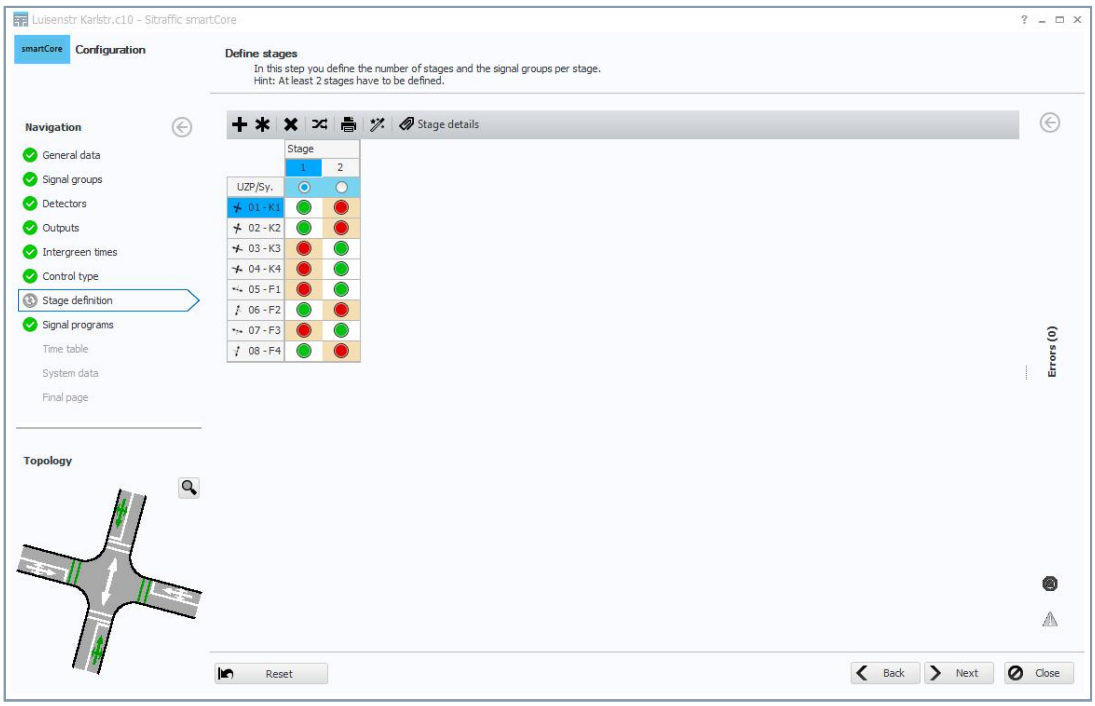


Fig. 30: Defining Stages (Step 7)

If a signal program has already been created using the “Control Type” page, stages have already been generated automatically and the page will be skipped.

- The signal groups, which are in conflict with already approved signal groups, will be marked in orange.
- Approved signal groups that are in conflict will be marked in red.
- The approved signal groups of the selected stage will be displayed in green in the lower left "Topology" section.

Generated and available stages can be customized, rearranged by drag & drop and the stage numbers can be changed (by double-clicking on the number). Another generation can be initiated by clicking the “Stage Calculation” button.

If multiple colors are permitted for an end state, these can optionally be selected via “Stage Details”.

Please note that at least two stages have to be created and that the stage transitions are automatically calculated or updated when leaving this page.

3.3.8. Signal Programs

The cycle times, switching times of the signal programs and/or the stage sequences of the stage orientation are determined in this step (see Fig. 31).

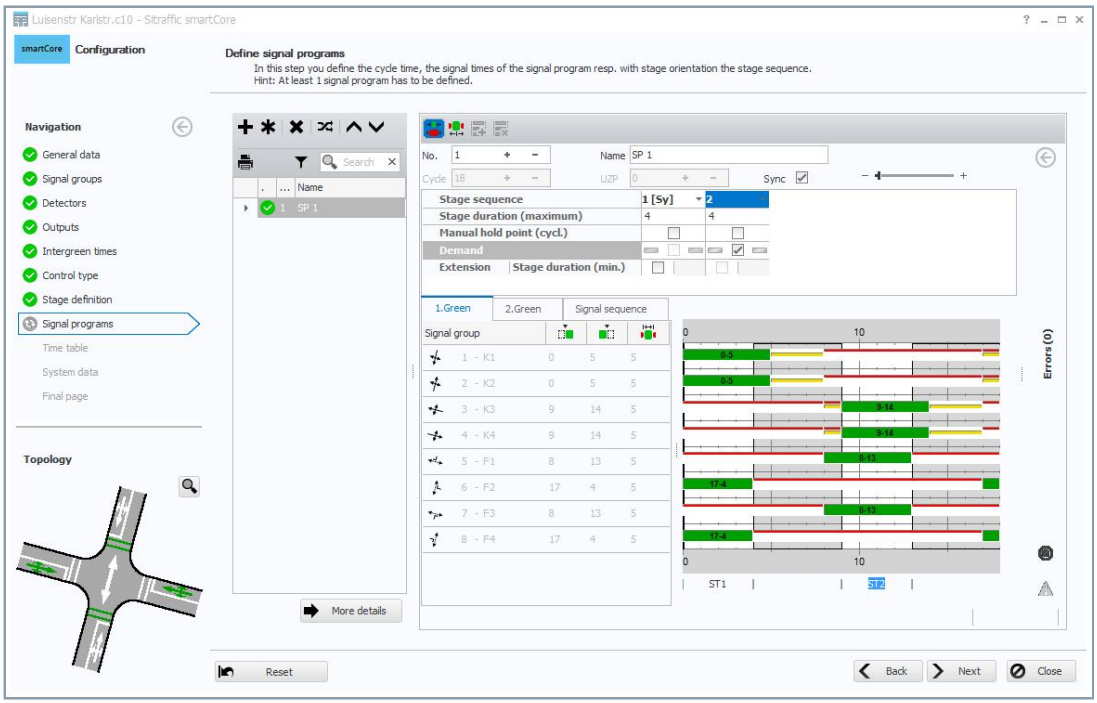


Fig. 31: Defining Signal Programs (Step 8)

The already created signal programs are displayed on the left part of the page. You can also add additional signal programs here, for example with different stage durations.

The stage sequence incl. all parameters can be determined in the right section above and the result is displayed as a graphical signal program in the upper part.

- The initial “Stage Sequence” can be adapted by adding additional stages or by deleting existing stages. The approved signal groups of a selected stage will be displayed in green in the lower left "Topology"

section. The cycle time point (UZP) used for the activation, deactivation and switching is automatically set to the beginning of the "Sy" stage and cannot be modified.

- Tick the “Sync” checkbox if you would like to synchronize the displayed signal program. Synchronization takes place at the cycle time point. The minimum and maximum stage durations of the "Sy" stage therefore correspond to the earliest or latest stage ends of the "Sy" stage.

- The stage duration for a fixed time is determined by specifying the “Stage Duration” (Maximum) The cycle time is automatically calculated from this value and the graphical signal program is changed accordingly (see Fig. 32).

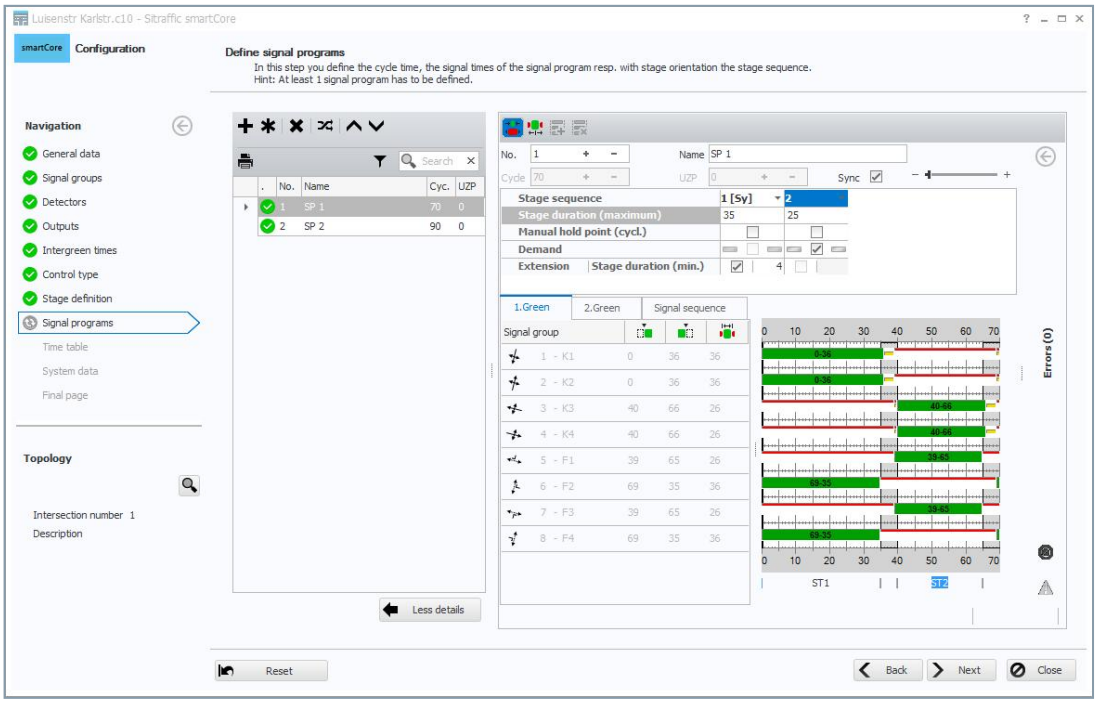
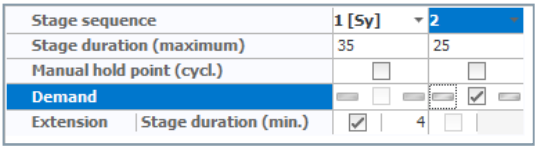


Fig. 32: Setting the maximum Stage Duration

- In manual operating mode, the Manual Hold Point (cycl.) function can optionally be used to mark the stages where the system is supposed to "hold" until it is manually advanced to the next step.

- If detectors were defined with the "Demand" or "Calculation" function in the previous steps, additional parameters can be determined to define a traffic actuation in stages with corresponding signal groups.

- If a stage is marked for a “Demand”, this stage is skipped unless there is an actual "Demand". You can also define whether the preceding or subsequent stage should receive the additional time by setting the arrows in the fourth line.



- If a stage is marked for “Calculation”, the minimum stage duration is determined without calculation using “Stage Duration (minimum)”. In reality, this results in a stage duration somewhere between the specified minimum and maximum times depending on the amount of traffic. The calculation is based on a time gap of 2.5 seconds.

The signal program can be additionally edited using the command bar in the top right section.

- Using the “Compress and Stretch” function, it is possible to increase a duration within a stage by moving the mouse to the right with the left mouse button held down or decrease it by moving the mouse to the left (see Fig. 33).

Fig. 33: Compression (left) and Stretching (right) of the Stage Duration

- You can move all signal groups along the timeline by clicking on “Shift all Switching Points”.

- The two additional buttons can be used to “Add a Stage to the Stage Sequence” or “Remove a Stage from a Stage Sequence” if available and as long as the minimum number is not violated.

The “Signal Sequence” register to the left of the graphic signal program can optionally be used to select a different signal sequence as long as this sequence is defined for a signal group and is also allowed for the current stage sequence.

3.3.9. Schedules

The schedules for your signal programs are defined in this step. A weekly schedule is first selected from a template, depending on which daily dependencies should be considered (see Fig. 34).

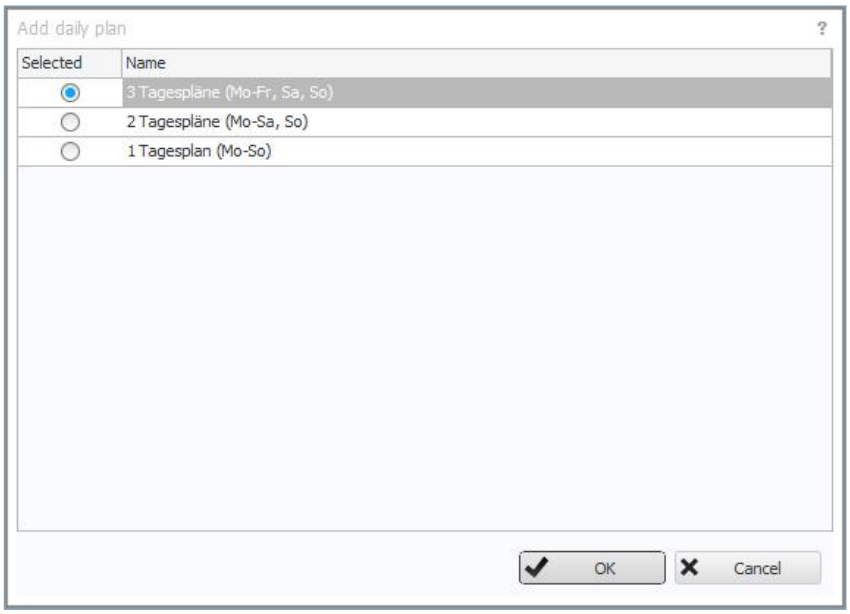


Fig. 34: Adding a Weekly Plan from a Template

The configuration for the schedules is displayed on the next page. (see Fig. 35)

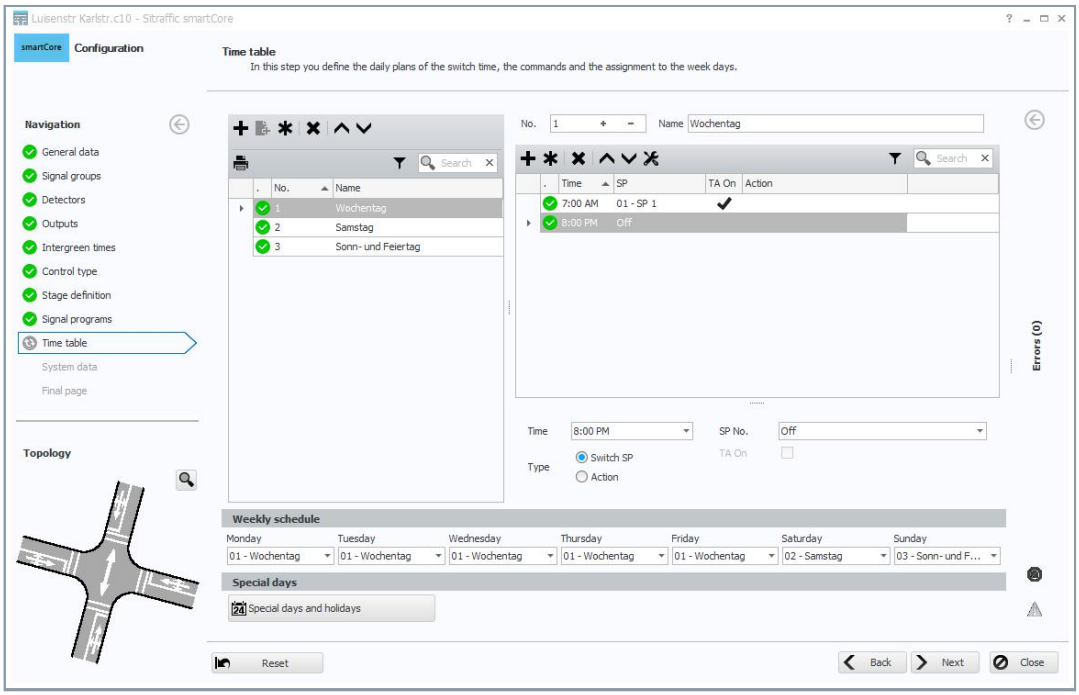


Fig. 35: Schedules (Step 9)

- The already created daily schedules are displayed on the left part of the page.

- The already created switching commands of the current daily plan are displayed chronologically on the right-hand side. The associated inputs are, as before, situated beneath. Concerning the switching commands, a distinction is made between the switching of signal programs incl. the activation and deactivation of the system and the traffic actuation/actions.

It is also possible to determine additional switching points (such as those were a different signal program is switched to) for the individual daily programs. Click on the “+” button in the top right for this purpose. A small window will then open where the number of additional switching points can be determined (see Fig. 36).

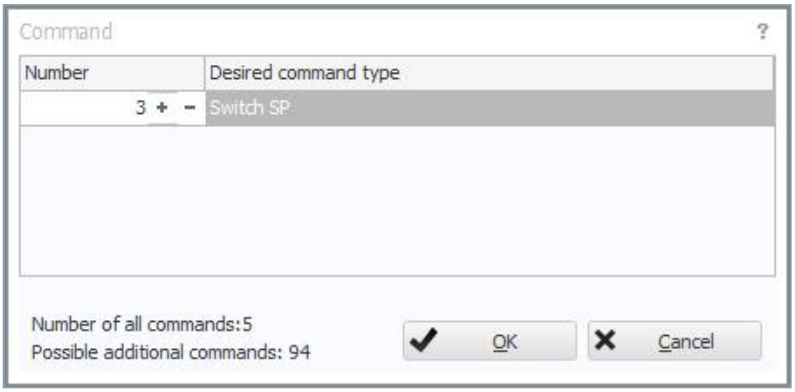


Fig. 36: Addition of Switching Points

The corresponding commands and times can then be adjusted on the right-hand side (see Fig. 37).

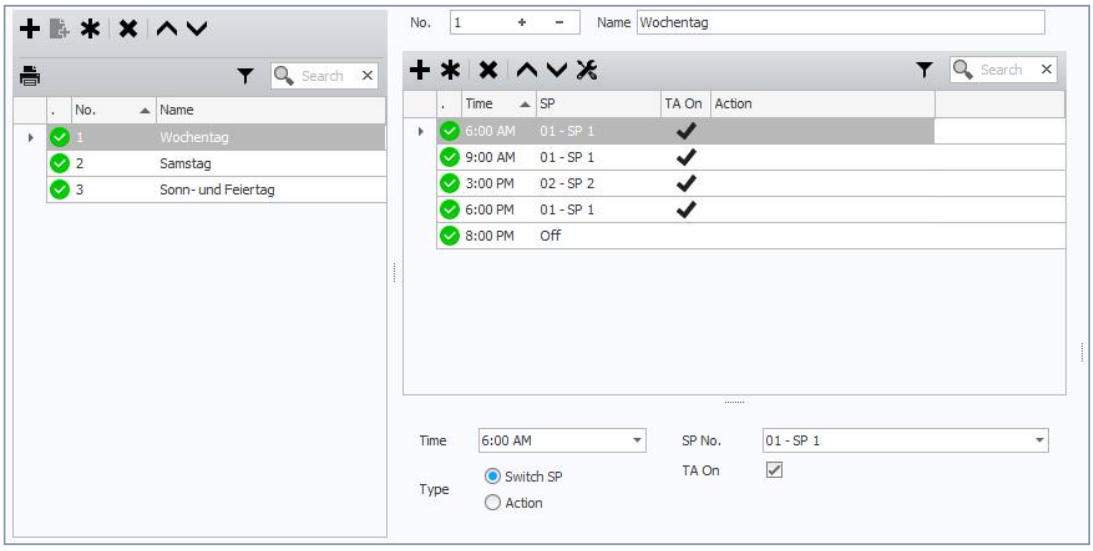


Fig. 37: Defining Switching Commands

- The relevant schedule is configured in the “Weekly Plan” for every day of the week in the lower part of the page.
- If the operator would like to use deviating schedules for certain special days or holidays, these can be defined using the “Special Days and Holidays” detail dialog. If these have not yet been defined, this problem is indicated by a corresponding error message (see Fig. 38).

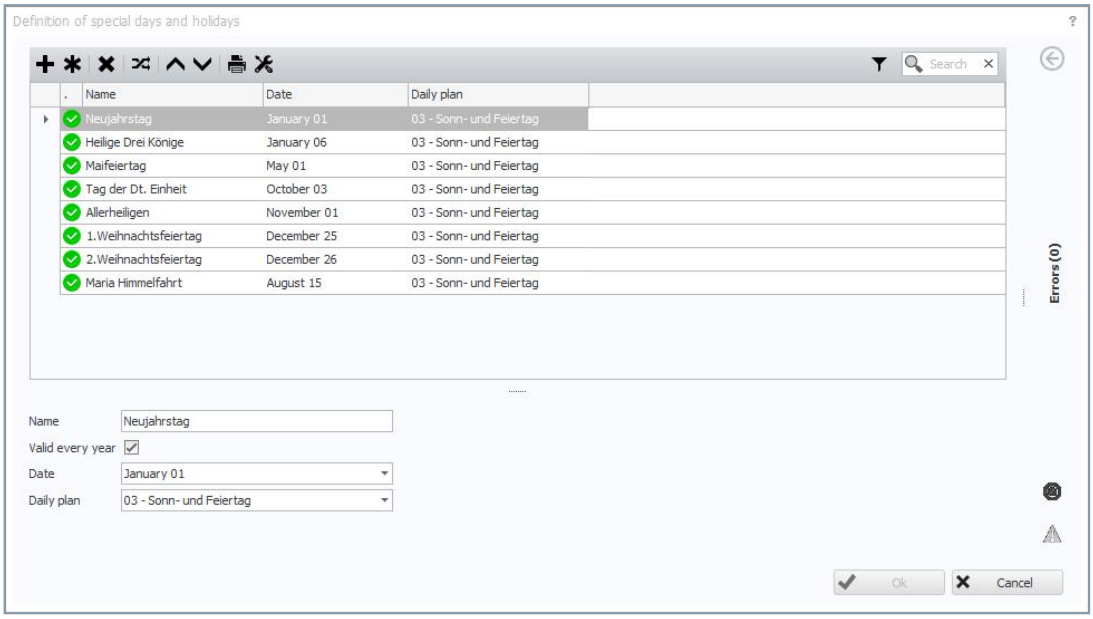


Fig. 38: Definition of Special Days and Holidays

Please note that the unit can also be operated without configuring any schedules. But in this case, the unit can only be operated manually or using a control center.

3.3.10. System Details

The remaining device-specific system data is defined on the final page and you can (or rather have to) define the hardware allocation (see Fig. 39).

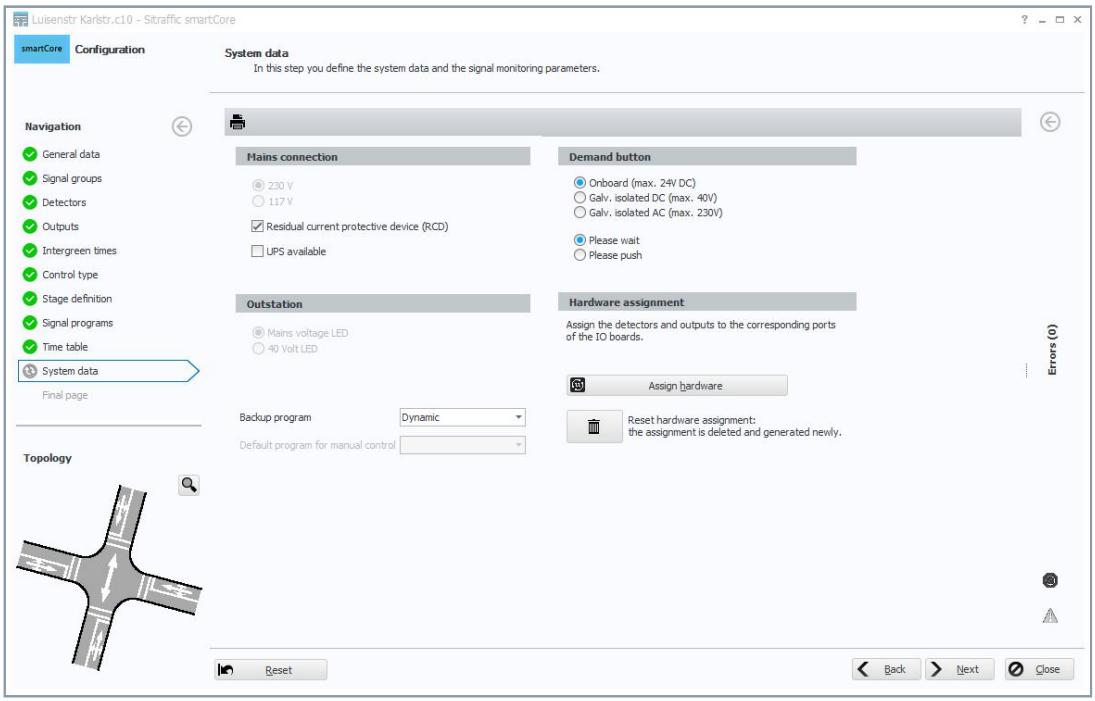


Fig. 39: Defining the System Data

- Define the parameters for the “Network Connection” and/or the “External System” here. One of the available signal programs can optionally be selected as a fail-safe program. With the Dynamic setting, the signal program operating at the corresponding point in time will be used as the fail-safe (or "emergency") program.

- Set the standard connection type as well as the acknowledgment type for the Demand Buttons.

- An automatic “Hardware Allocation” is generally performed for all signal groups and the single loops, double loops and button detector types, which you can optionally adjust or customize using the “Allocate Hardware” function. The hardware has to be manually allocated for all other types.

3.4. Completion of the Configuration Wizard

After completing all ten configuration steps, the user is taken to the final page. This page displays a summary of all configured objects (see Fig. 40).

Fig. 40: Final smartCore Page

This page can only be accessed if the configuration is consistent, which allows it to be transferred to the Sitraffic sX System and be activated there. By clicking on “Finish”, you will be taken to the intersection overview (see Fig. 41).

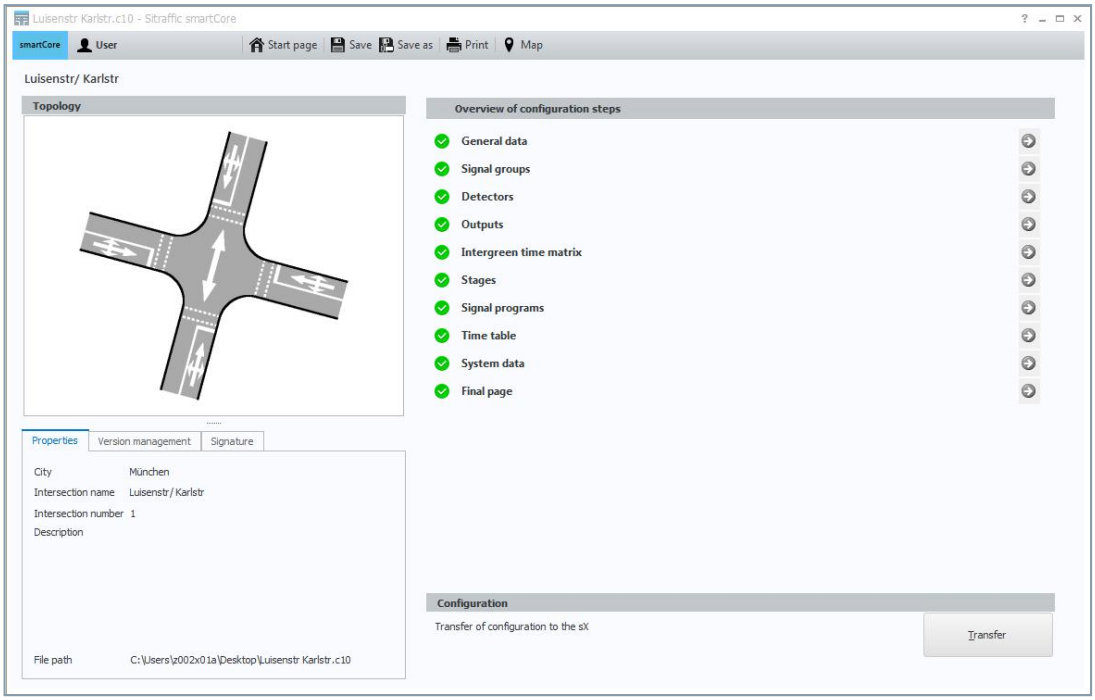


Fig. 41: intersection Overview

This page provides an overview of the intersection's entire configuration.

- The automatically generated topology of the intersection is visualized in the top left section. The individual “Properties” and extra information regarding the “Versioning” and the “Signature” are displayed beneath the visualization.

- The status of the individual Sitraffic sX Configuration Steps are displayed in the right section. You can select individual steps here and directly return to the corresponding stage of the configuration wizard.

- All configuration steps can be comfortably performed from an offline PC. Only now, after the completion of the ten configuration steps, do you have to connect to the control unit (via WLAN or LAN). You can then load the Configuration onto the Sitraffic sX Unit by clicking on “Transfer”.

You can print the customer documentation by clicking on “Print” (see Fig. 42).

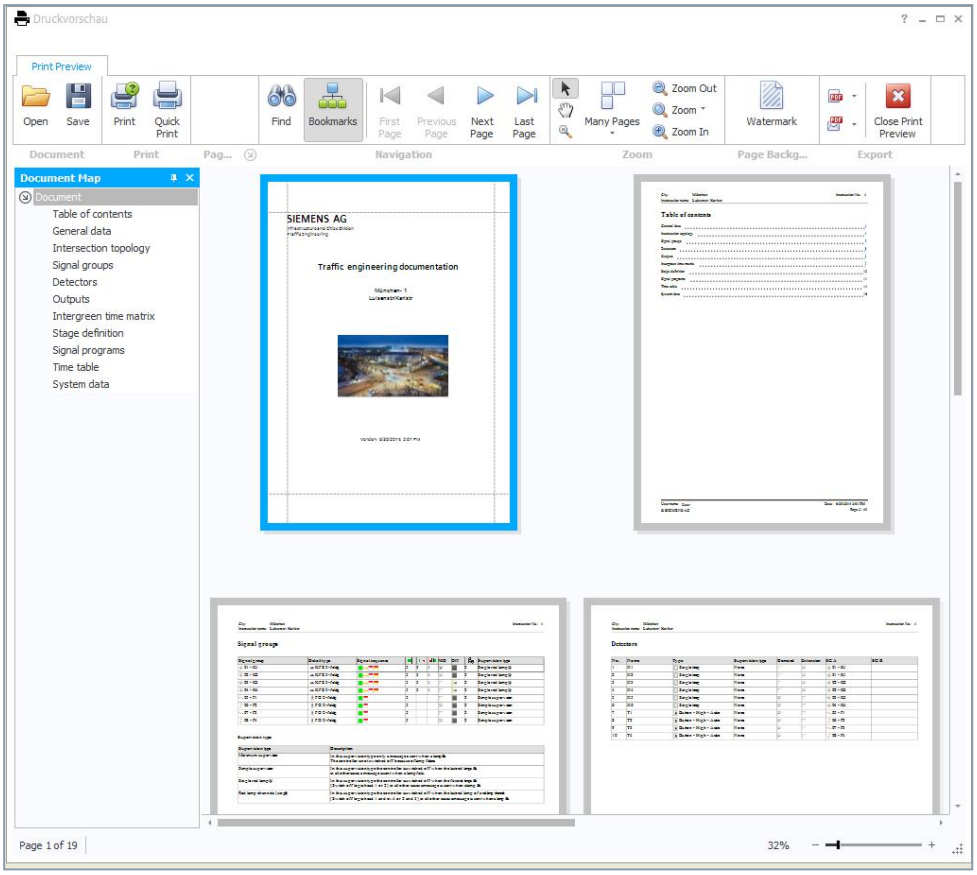


Fig. 42: Printer Preview of the Traffic Engineering Documents

- The positioning of the control unit can be examined using the Map.

Please note that the data is checked at any time, further steps are only possible after a correct configuration and that the configuration can only be transferred to the control unit if there are no errors.

3.5. smartCore sX Summary

The described smartCore sX configuration software makes the configuration of a Traffic Control System easier and more comfortable than ever before. The essential features and properties of smartCore sX are summarized once more in the following section.

- smartCore can easily be installed on a PC
- No in-depth traffic related expertise is required to supply the control unit with data.
- The country-specific traffic regulations are already predefined and can be selected as part of the configuration process.
- The configuration process itself is very intuitive and requires only ten individual steps.
- The signal head, minimum and cycle times as well as the signal monitoring can be configured for each signal group.
- Detectors can easily be assigned to a function and the concerned signal groups.
- The used signal groups and detectors are visualized by an automatically generated intersection topology.
- *Signal programs* can either be generated *automatically or manually*, depending on the selected control type.
- Daily and weekly plans can easily be created and supplemented by additional switching points.
- Erroneous or wrong entries immediately cause a warning and a faulty continuation of the configuration process is automatically prevented.
- After the configuration process has been completed, an operable configuration for the Sitraffic sX System, including signal monitoring, is guaranteed to be the result.
- A test or simulation is not required to verify the configuration.
- After the configuration process has been concluded, the traffic engineering documents are automatically created in a printable format.
- A connection to the control unit itself is only required after the configuration has been completed in order to transfer the data in a simple Plug & Play manner.

4. Simple Operation using the Web Interface

The control unit has been assembled, installed and set up using smartCore. A comfortable and easy access to the system details is available to the user for the purposes of monitoring, operation and diagnosis of the control unit itself. Thanks to the usage of HTML5 for the web interface, the device can easily be controlled from all HTML capable devices - including PCs, tablets or smartphones.

We recommend either Mozilla Firefox or Google Chrome to be used as browsers. Using Microsoft's Internet Explorer may cause display problems.

Using the newly developed user roles, a Sitraffic sX control unit can be monitored, put into service or maintained from a web interface.

The Sections 4.1 and 4.2 describe how the application can be accessed and introduce the basic layout of the web interface. The layout of the menu items and functions is also reflected in the structure of the following sections.

Section 4.3 describes the monitor in detail. In this context, all functions are combined that serve the monitoring of the intersection, such as the displaying of intersection topology, signal programs and status messages.

All functions related to the operation of the control unit are described in Section 4.4. These functions include, among other things, the adaptation or editing of signal programs, changing the control level and a virtual BAZ for the switching of the traffic light system.

Section 4.5 deals with the maintenance of the device. System information can be examined and firmware updates can be performed there.

Section 4.6 describes the functions pertaining to the commissioning of the device. Information is provided as to how a connection to a control center can be established and how the prepared configuration can be transferred via Plug & Play. This section also describes how signal monitoring tests can directly be executed from the web interface.

The archiving and modification of configurations that were previously created in smartCore are described in Section 4.7.

An explanation of the mobile view is provided in Section 4.8 while a final summary of the most important properties and features of the sX web interface can be found in Section 4.9.

4.1. Access to the sX Web Server

Access to the constantly available Sitraffic sX Web Server is always achieved using a TCP-IP connection. This can be done either locally

- by connecting a LAN cable to the OMC and the PC or
- by using a temporary WLAN USB adapter (incl. firewall) on the OMC.

Enter the following URL into the address field of your HTML5 browser to open the application:

- http://192.168.128.3 (if there is an actual connection to the sX System via LAN or WLAN)
- http://192.168.237.231 (if the sX System is being simulated as a Virtual Machine for testing purposes)

You will then be asked for a user name and password, which would have been communicated to you in accordance with your user role (see Fig. 43).

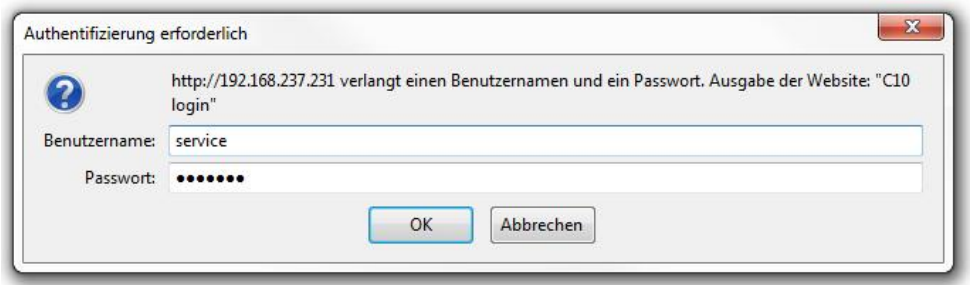


Fig. 43: Authentication in sX Web

The passwords can be changed using a special procedure at a later point in time.

After the credentials have been successfully entered, the start page of the sX web interface will open (see Fig. 44).

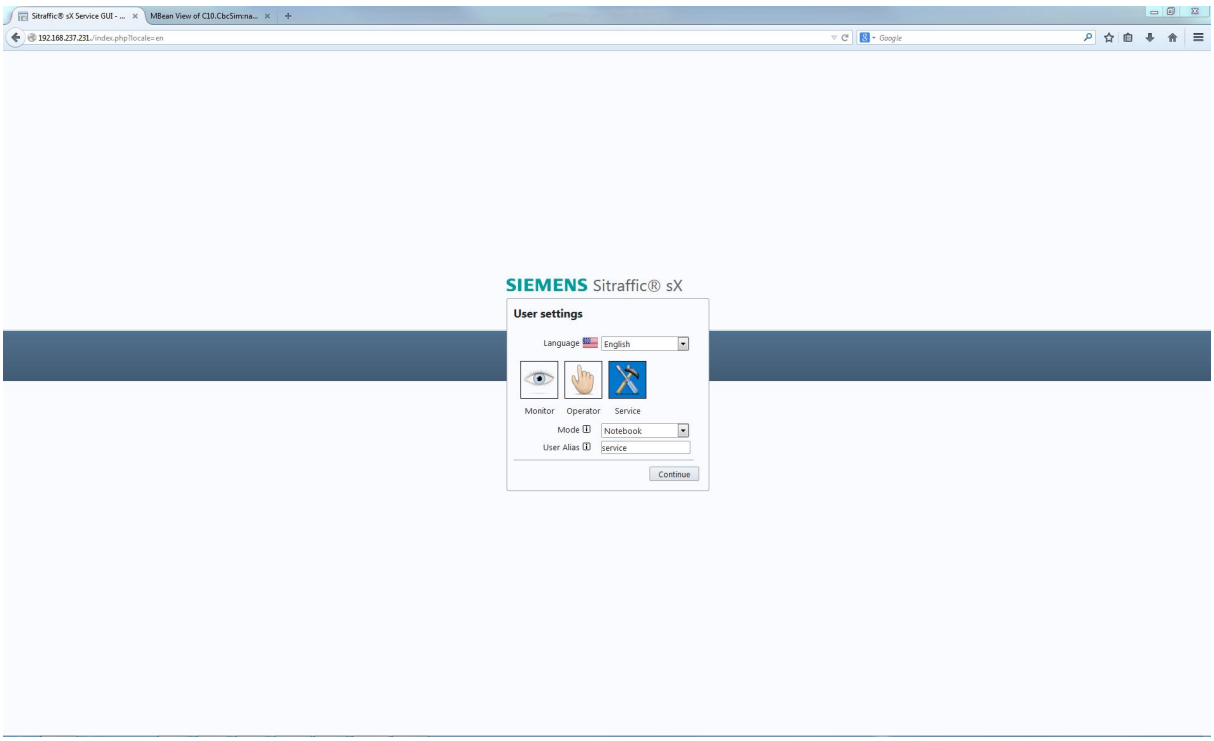


Fig. 44: Start Page of the sX Web Interface

You can change the following settings on the start page:

- Specify the desired “Language” of the user interface.
- Select the user role (“Observer”, “Operator” or “Service”). The available user roles depend on the access permissions that have been assigned to you.
- Select the device in which the browser has been opened from the “Mode” field.
- Enter a freely selectable “User Name”. This user name can be re-selected with every login and does not constitute a password.

Click on “Next” to access the application itself.

4.2. Layout of the Web Interface

The web interface is then opened. The examples shown in this document make use of different sX Control Units, some of which are operating as virtual machines. The first page initially shows the topology of the intersection with the currently active stages in real time (see Fig. 45).

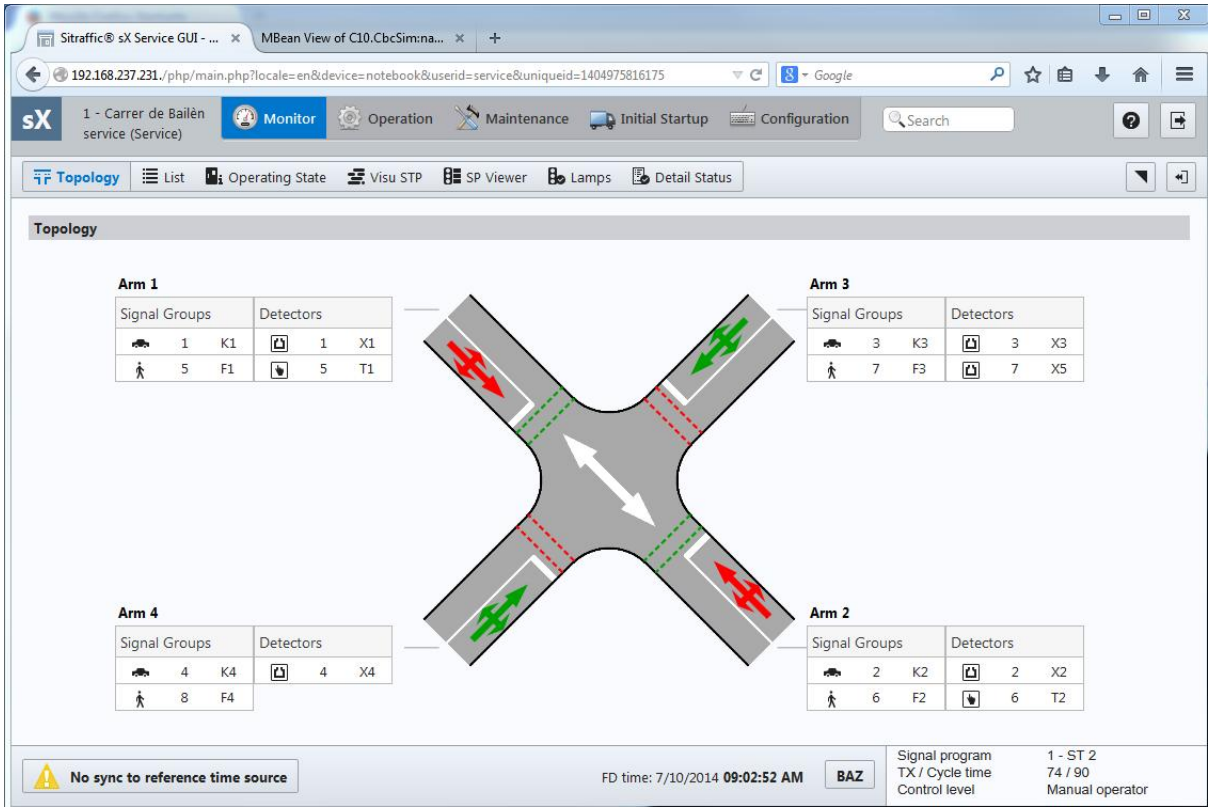


Fig. 45: Layout of the User Interface

The context menu is located in the upper area of the window. It contains the following menu items, depending on the previously determined user role:

	Monitor	Operation	Maintenance	Commissioning	Configuration
Observer	X				
Operator	X	X			
Service	X	X	X	X	X

Table 3: User Roles with Functions

The associated functions can be selected below the context menu. The individual functions pertaining to every context are described in detail by Section 4.3 and following. You can also open an English operating manual by clicking on the question mark to the right. It is also possible to leave the application here using the “Logout” function to the right of the question mark.

The current system or error message with the highest priority is displayed in the bottom left. By clicking on the field, the user is taken directly to the “Detail Status” function (more on that in Section 4.3.7).

The bottom right section also displays:

- The current signal program and the currently active stage or upcoming stage transition,
- the cycle time as well as
- the control level.

You can also display a sidebar with additional information pertaining to the system and the configuration using the button on the top right (see Fig. 46).

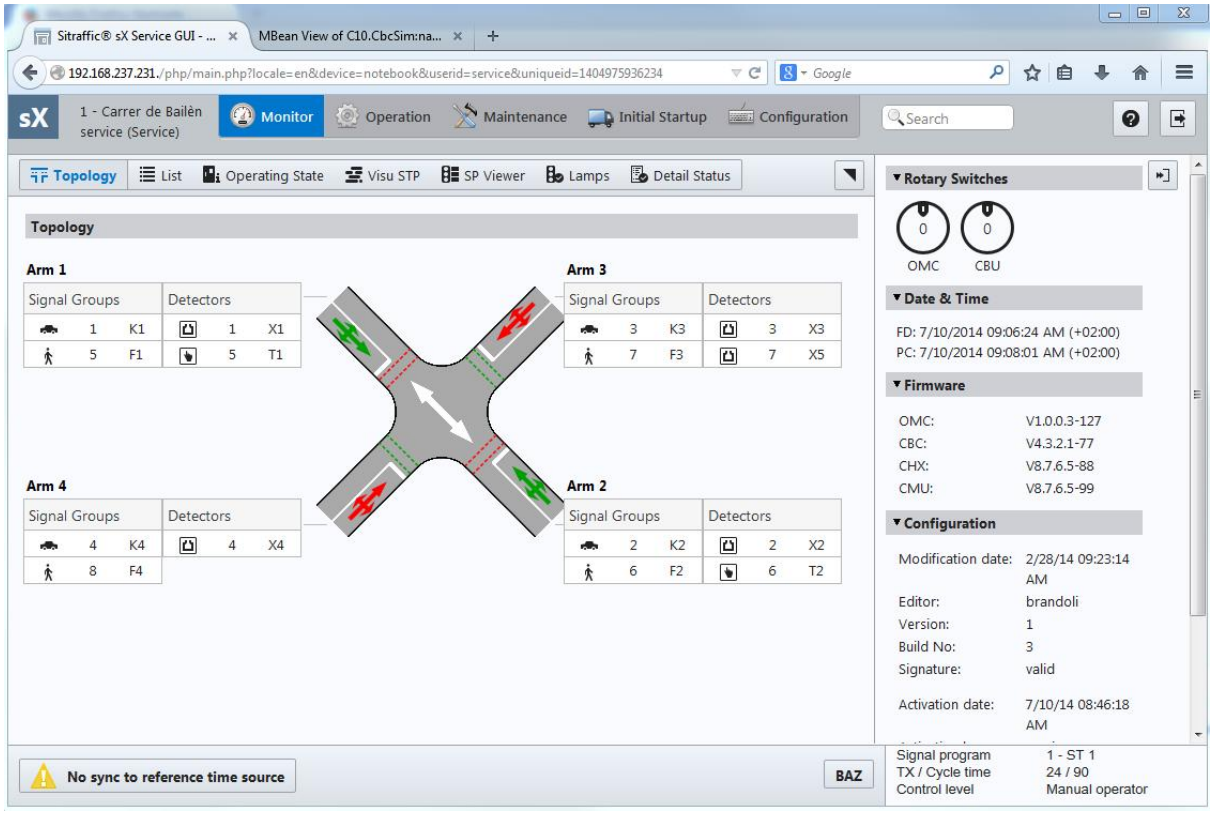


Fig. 46: Sidebar on the right-hand Side

4.3. Monitor

This context is, as the name suggests, responsible for the monitoring of the intersection. It is not possible to make any changes to the settings of the configuration here. The individual functions belonging to this context are described in the following.

4.3.1. Topology

The topology of the intersection is displayed first, similar to the smartCore configuration tool (see Fig. 47).

Fig. 47: Topology of the Intersection

The following information can be derived from the topology:

- Number of "branches"
- The main direction
- Signal groups
- Detectors

The current switching pattern of the signal groups is also displayed in real-time through color-coded arrows and pedestrian crossings.

4.3.2. List

This function displays the signal groups, detectors and outputs in a list view (see Fig. 48)

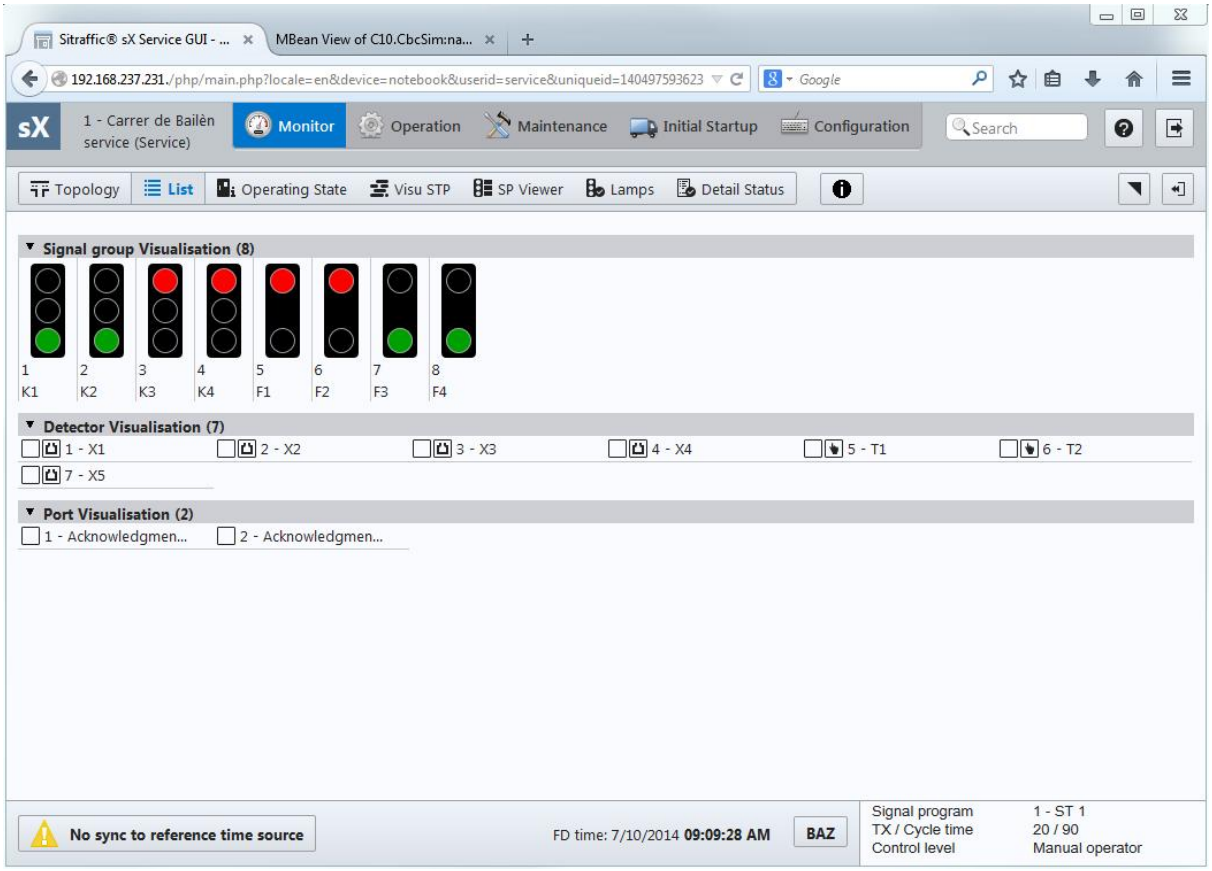


Fig. 48: List of Signal Groups and Detectors

- The “Signal Groups Visualization” shows the displayed signal colors of the heads of every signal group in real-time. The number and designation of the respective signal group is displayed underneath.
- The “Detector Visualization” shows the detectors with status, type and number. By activating the respective checkbox, it is possible to simulate a one-time or cyclical assignment of the detector.
- The “Output Visualization” section displays all outputs, for example acknowledgments. The outputs can also be set individually, just like the detectors.

4.3.3. Operating State

This function provides an overview of the current status of the Traffic Control System. (see Fig. 49).

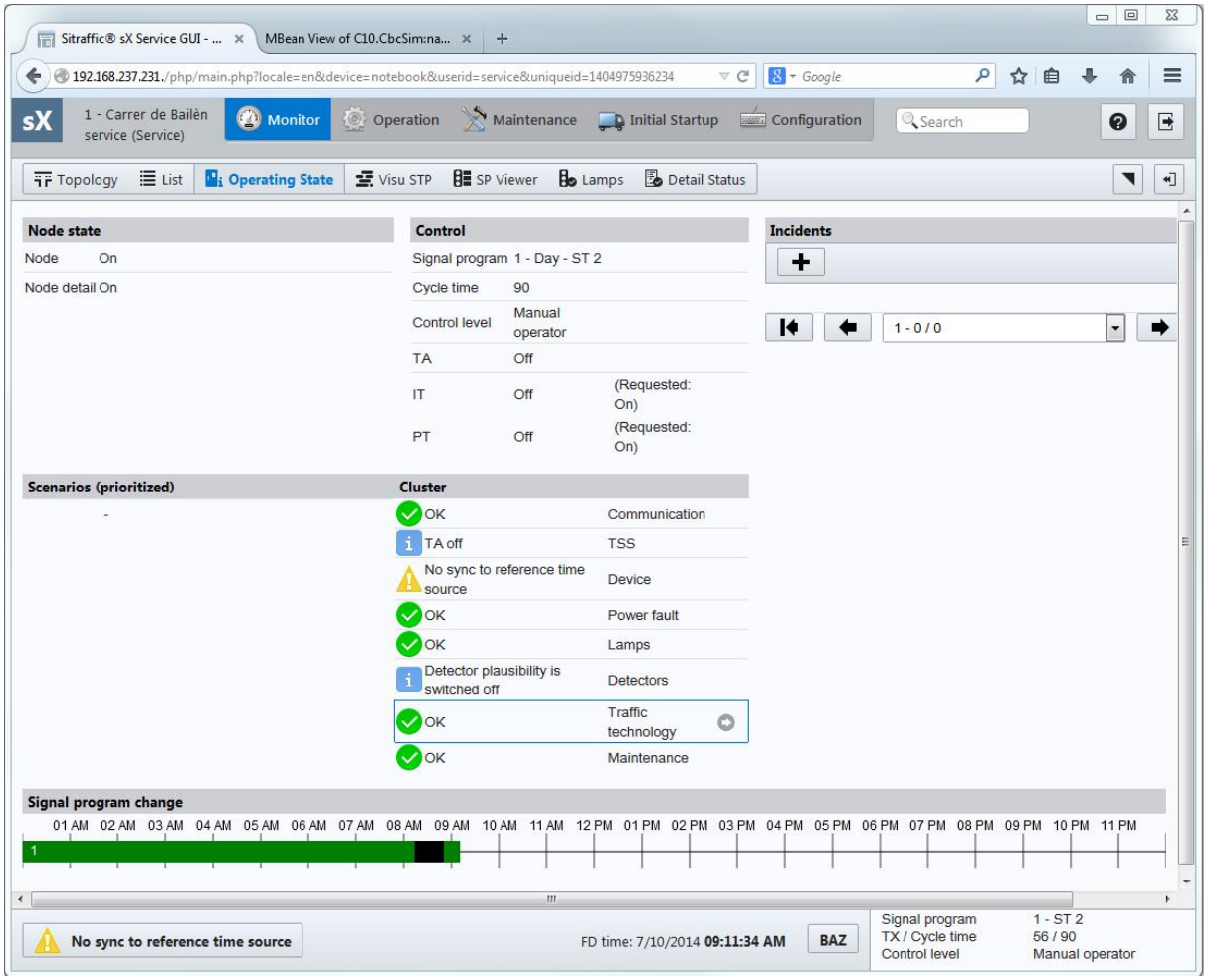


Fig. 49: Operating Condition Display

- The “Intersection Condition” displays the current and requested status of the intersection and sub-intersections, for example "yellow flashing" or "off".

- The “Control System” displays the currently active signal program with the cycle time and the control level and also states whether the "traffic actuation" (VA), "individual traffic" (IV) or "public transport" (ÖV) modes are active. Changes to the Control System can be made as the "Operator" and "Service" user roles using the “Operate LSA” function in the “Operation” context (see Section 4.4.6).

- The latest “Incidents” are chronologically displayed on the right, stating both the time when the incident occurred and a short description.
- Significant events or incidents are summarized in the Scenarios section.
- The “Cluster” section indicates the status of the individual components and functions using symbols and short texts. More detailed information can be accessed by clicking on the concerned line.
- The “Signal Program Change” process is displayed on the bottom in the form of a timeline ranging from 00:00 to 24:00.

4.3.4. Visu SZP

This function provides a visualization of the signal timing plans for all signal groups and detectors in real-time. The signal heads are all identified by their signal color while detectors are highlighted by a blue bar (see Fig. 50).

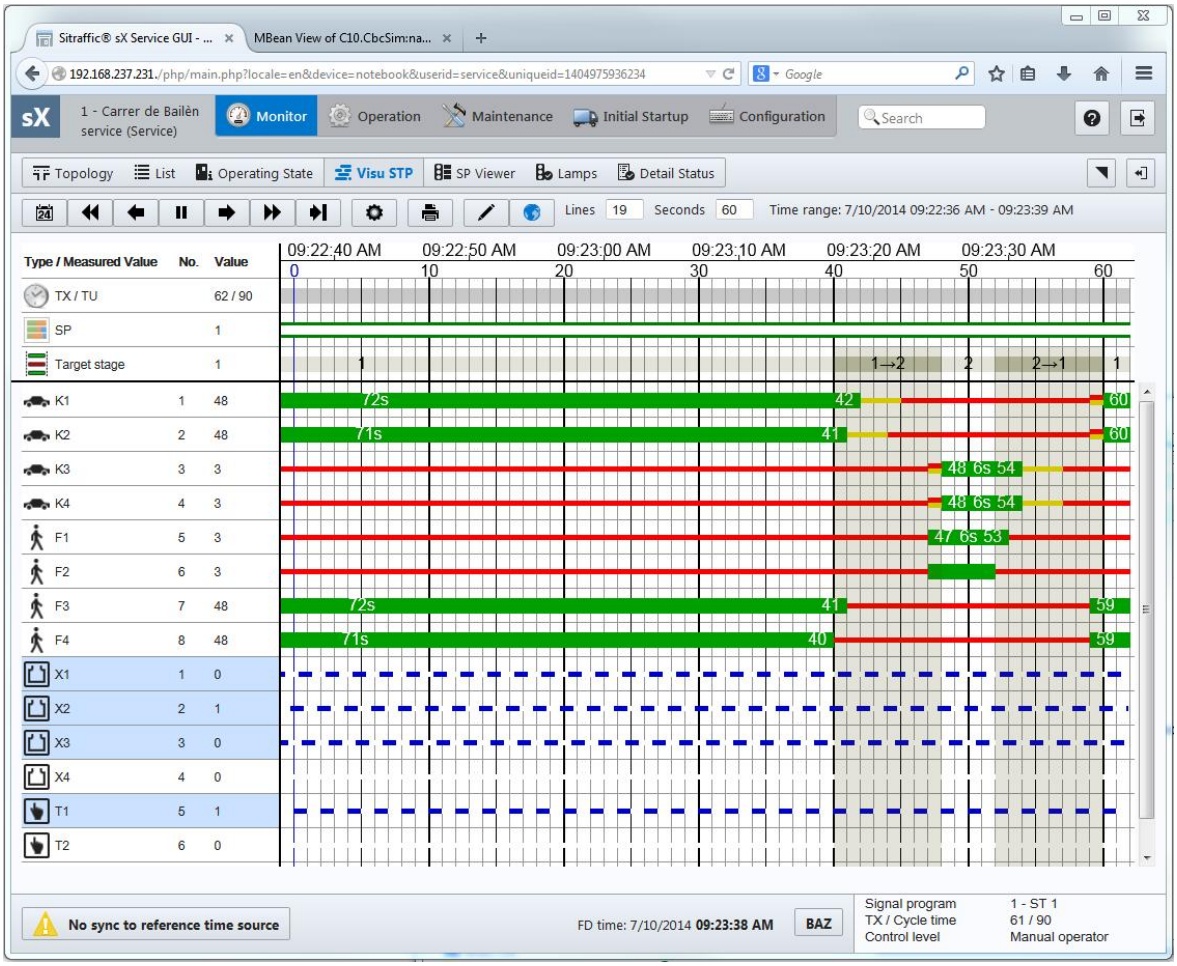


Fig. 50: Signal Program in Real-Time

The buttons at the top can be used to make adjustments to the displayed time interval and can also be used to display events pertaining to a certain point in the past.

 Pause function, pauses the current display

 Jump back by 10 seconds

 Jump forward by 10 seconds

 Jump back by 60 seconds

 Jump forward by 60 seconds

 Return to real-time

 Manually select a point of time in the past and display a snapshot (see Fig. 51)

 Settings pertaining to the “Stage Display”

 Print current display

You can also enter the number of lines and the length of the displayed time interval manually.

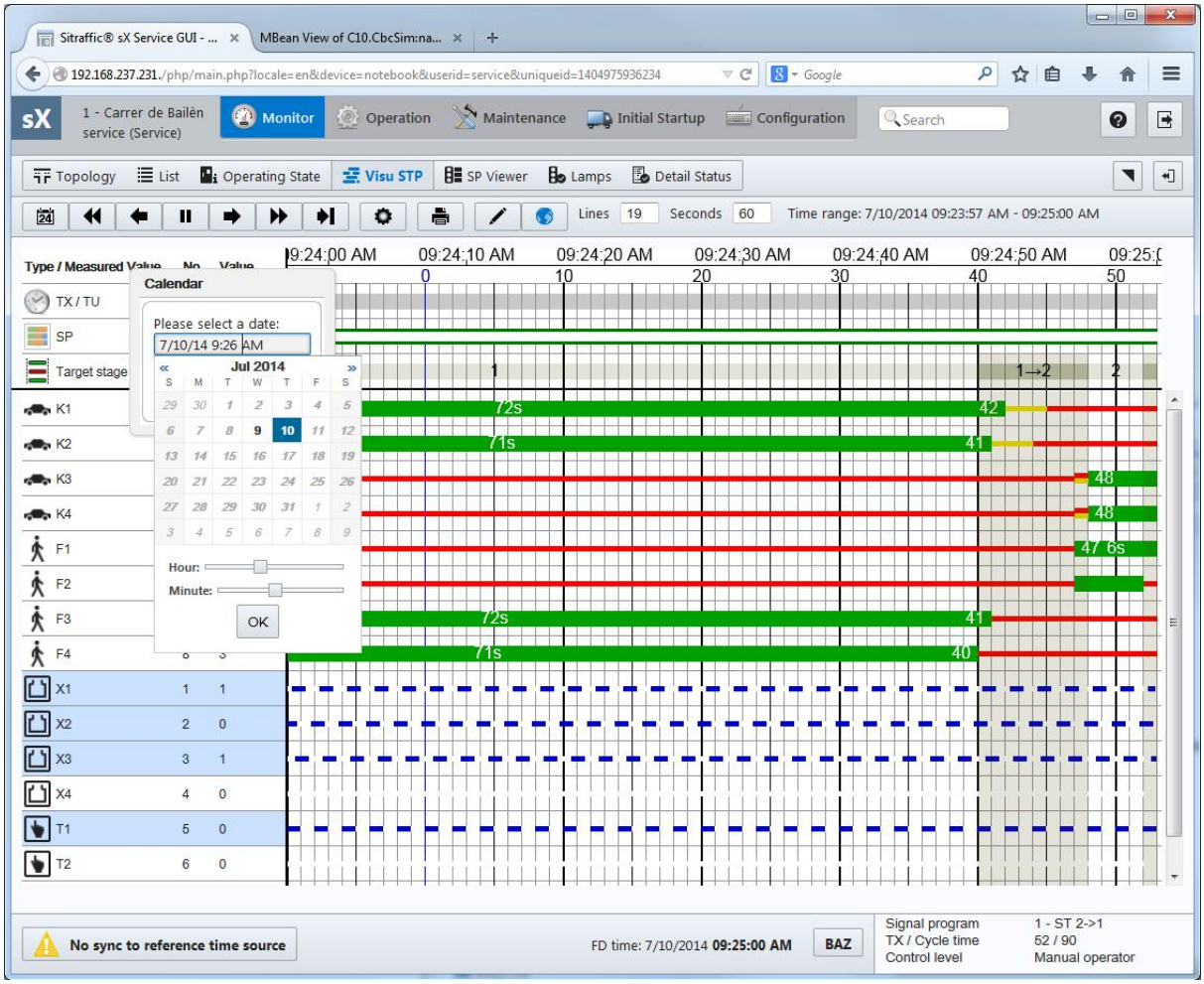


Fig. 51: Snapshot of the Signal Program

If you would like to restrict the signal program display to certain elements, this can be achieved using the following buttons:

Default setting: Everything is displayed

Selection of individual signal groups and detectors (see Fig. 52)

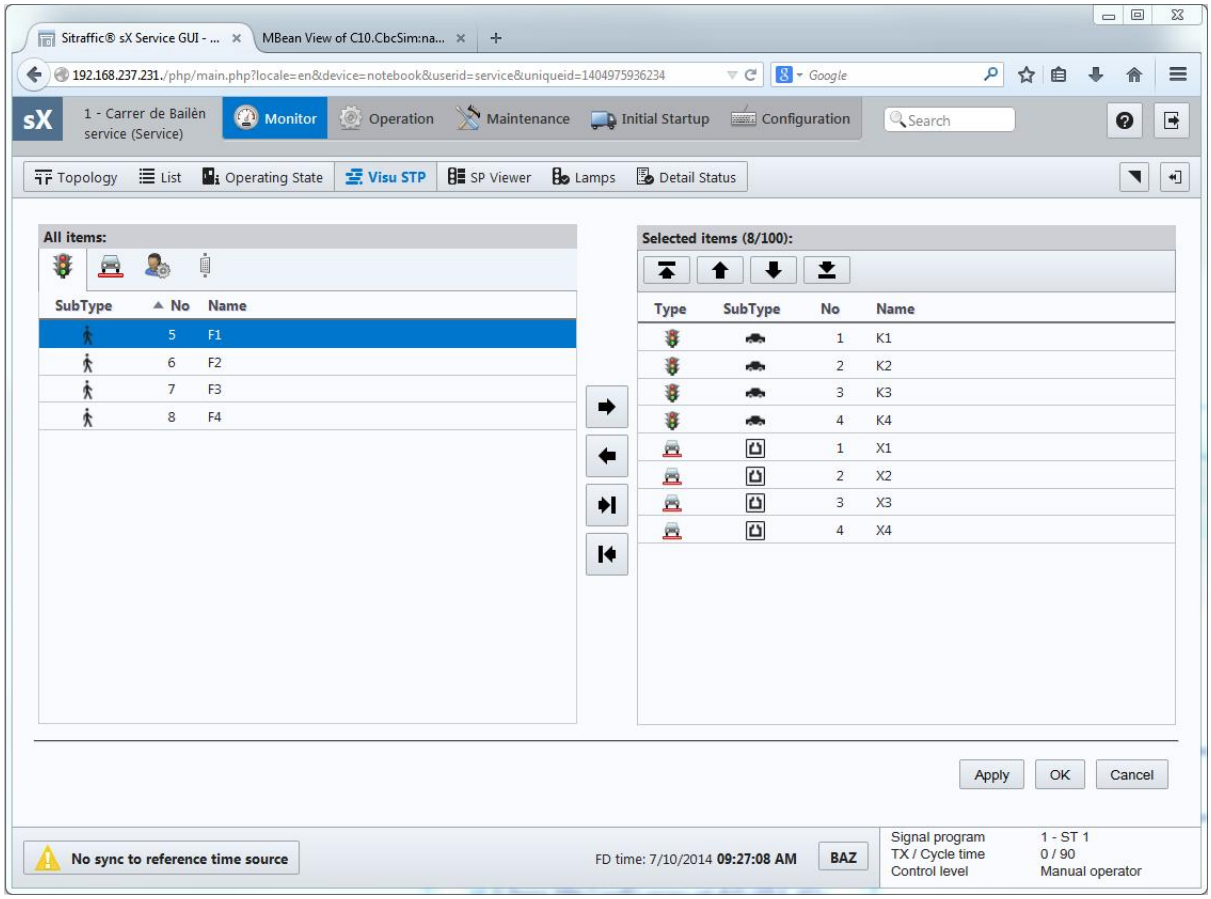


Fig. 52: Selecting Elements for SZP

The left side now contains all available elements and the right side only the selected ones. You can move the individual elements (or all of them) using the arrow buttons in the middle.

4.3.5. SP Display

The “Signal Program Display” provides in-depth information regarding the individual stages and cycle times as they were configured previously. The displayed daily program can be selected in the top section (see Fig. 53).

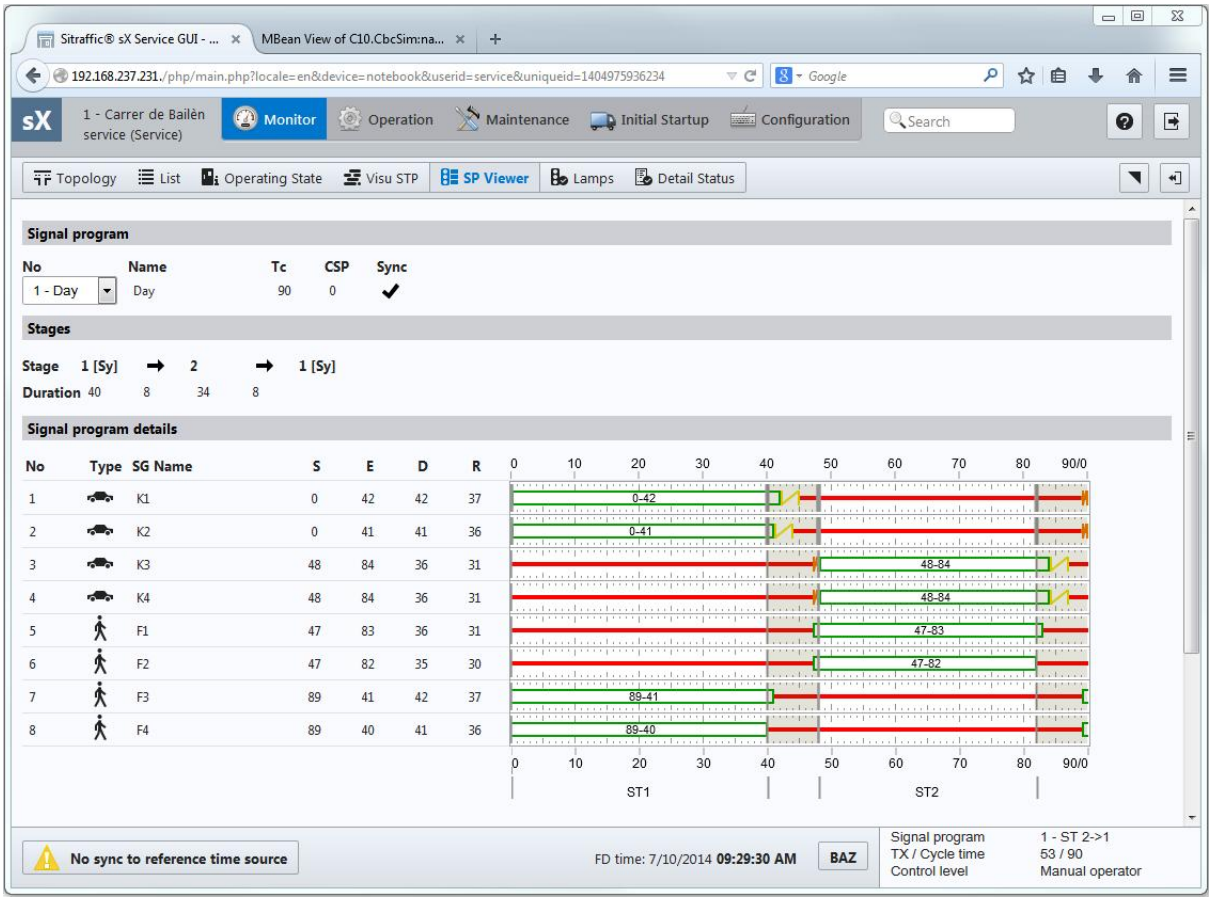


Fig. 53: Display Details regarding the Signal Program

The start and end times as well as the duration of the green and red stages are displayed for every signal group. This function merely serves display purposes and does not influence the active program in any way. Changes to the Signal Program can be made as the "Operator" and "Service" user roles using the “SP Editor” function in the “Operation” context (see Section 4.4.1).

4.3.6. Lamps

The positions and displays pertaining to all signal heads are displayed as part of this function (see Fig. 54).

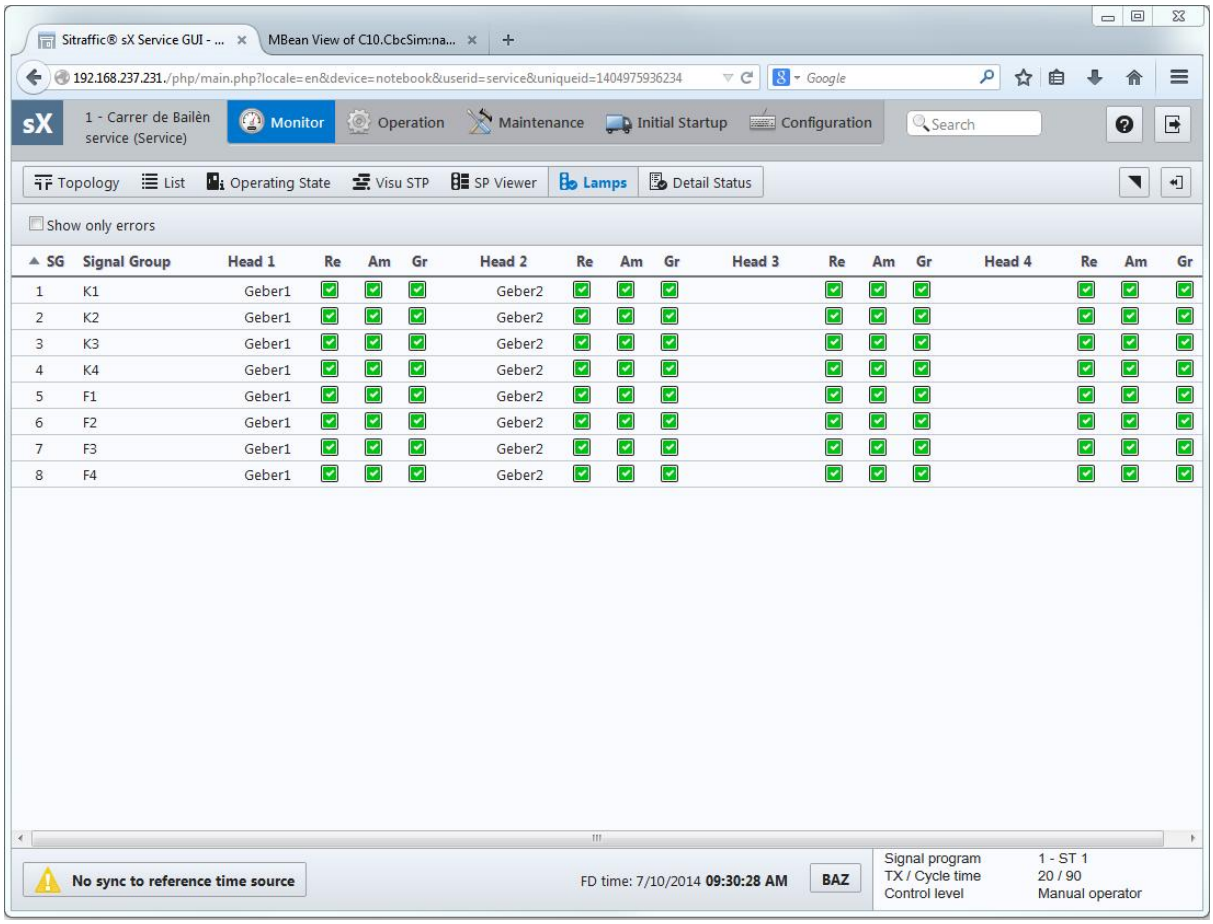


Fig. 54: Signal Head Display

The following is displayed in a table:

- The number of signal heads per signal group (line-by-line)
- The number of fields per signal head (red, yellow and green)
- The status of every field

4.3.7. Detail Status

This area displays the messages already indicated by the "Operating Condition" function in more detail (see Fig. 55)

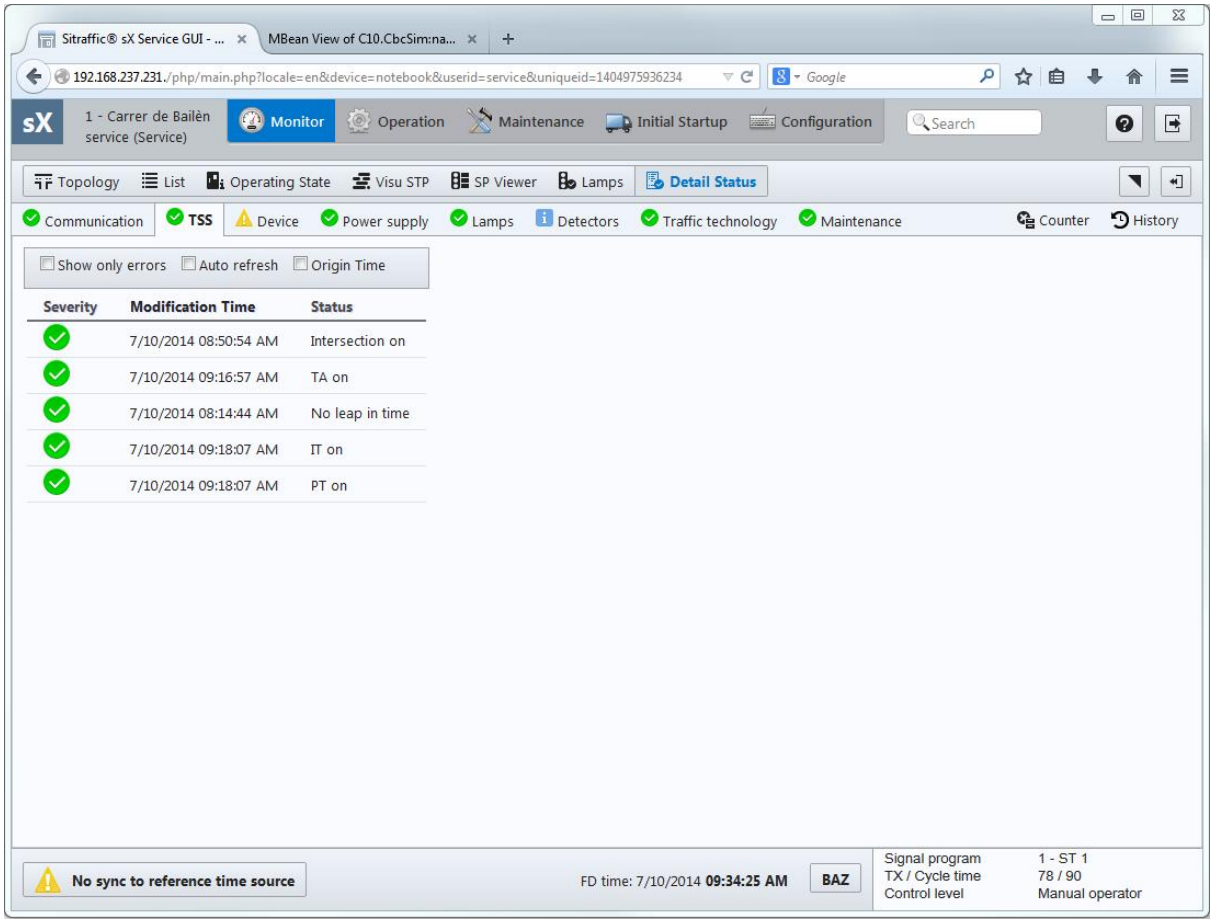


Fig. 55: Detail Status Display

You can select the individual clusters, for example "LSA" or "Device", from the menu bar. The associated individual messages are displayed underneath:

- Error with shutdown of the control unit
- Error without shutdown
- Warnings
- Note/information
- Error-free state
- Unknown state

By clicking on the lines marked with a paperclip, additional details will be displayed on the right. You can access the “Counter” (see Fig. 56) in the top right section, which counts the number of past messages. You can reset

the list using the arrow on the top left section, for example after a maintenance measure has been performed.

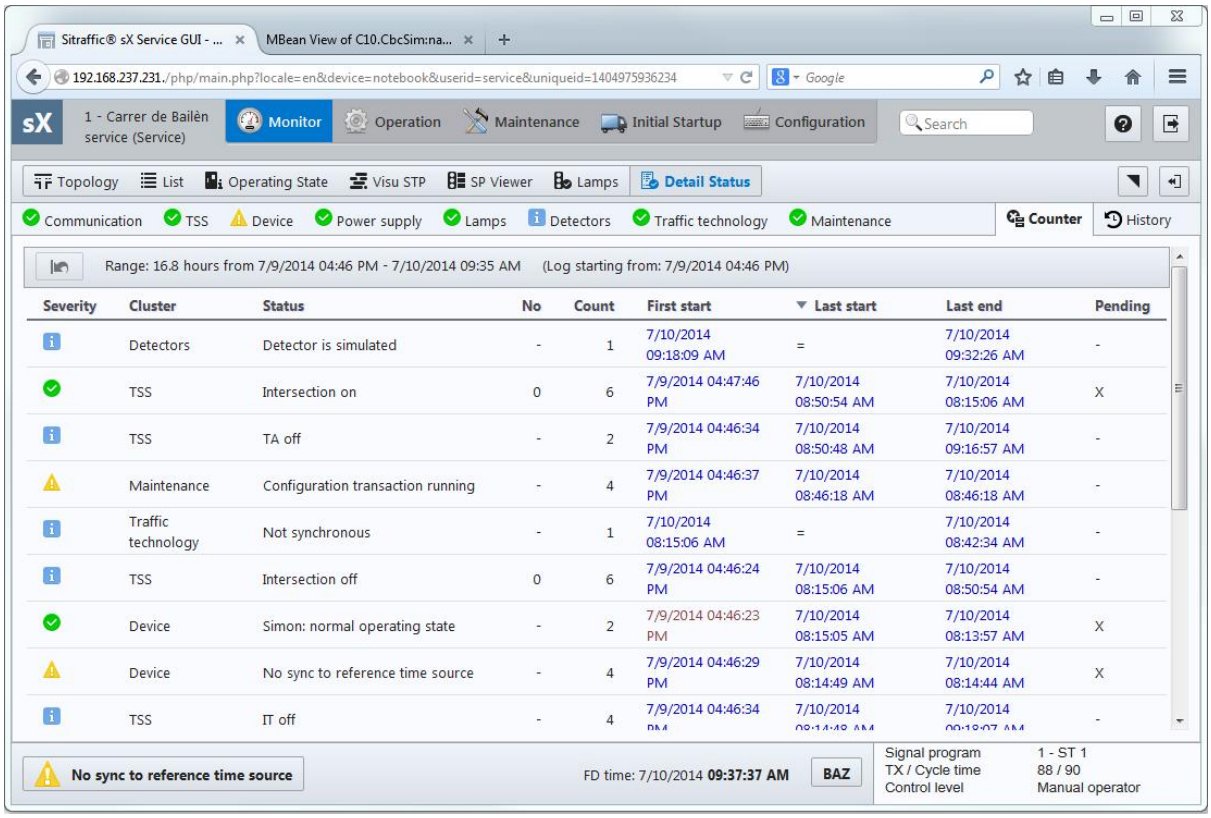


Fig. 56: Status Message Counter

By clicking on "History" next to the "Counter", it is possible to display all status messages in chronological order (see Fig. 57).

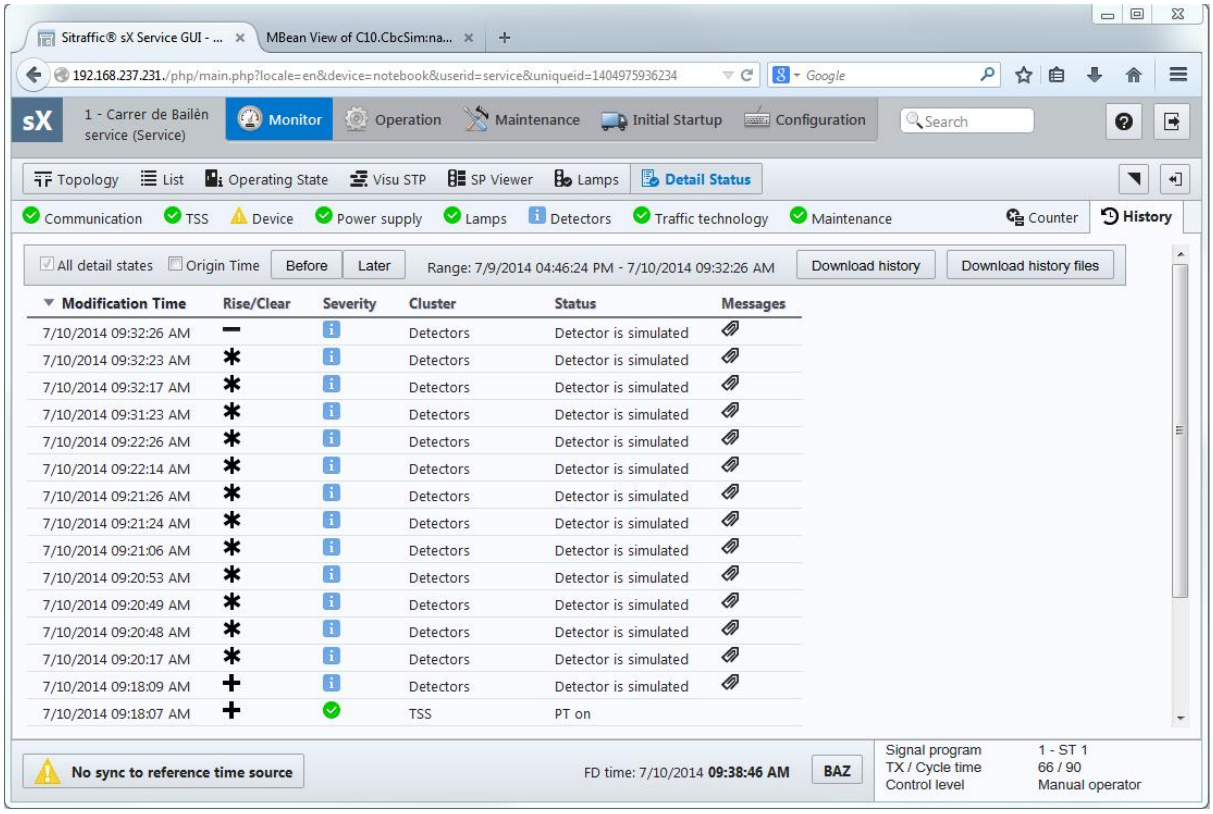


Fig. 57: History of previous Status Messages

Both lists can be sorted in accordance with the desired property, such as the severity level or the cluster. Just click on the corresponding header for this purpose.

4.4. Operation

This context can be accessed by the “Operator” and “Service” user roles and contains functions related to the operation and adjustment/configuration of the Traffic Control System.

4.4.1. SP Editor

The "Monitor" context has already provided you with the opportunity of displaying the individual signal programs. The "Editor" function now allows you to change the settings and parameters pertaining to the signal programs (see Fig. 58).

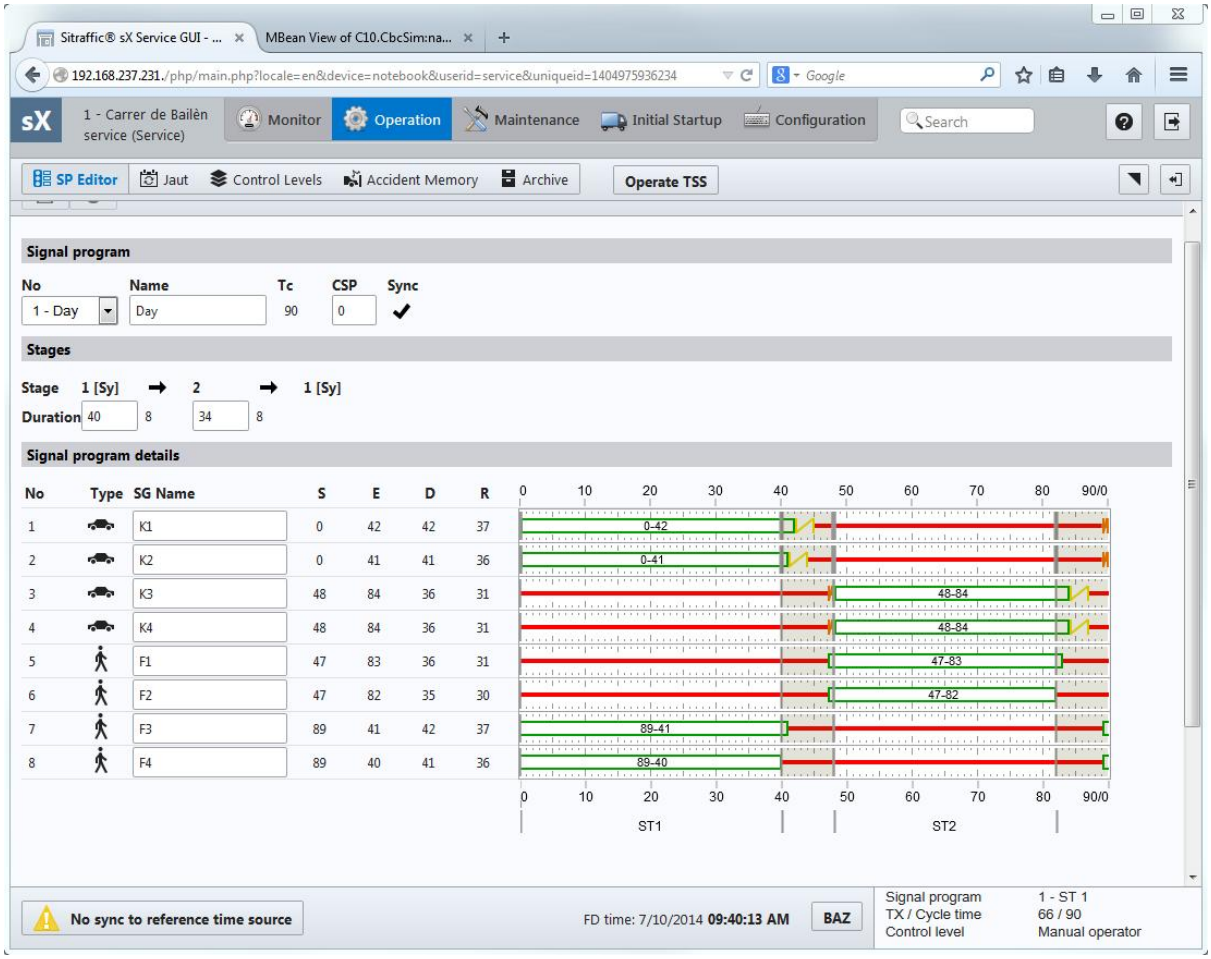


Fig. 58: Signal Program Editor

- You can select the signal program to be edited from the “Signal Program” item and change the name as well as the cycle time point (UZP).
- You can change the stage duration manually for the individual “Stages”.
- It is also possible to change the names of the individual signal groups under “Signal Program Details”.

As soon as changes have been made, you can either save these by clicking on the "Disk" icon (Save) and therefore activate them immediately or discard them again by clicking on the button with the circular arrow. It is also possible to directly synchronize the configuration with the control center by clicking on the right arrow (if a connection to the control center has been established).

4.4.2. Jaut

Using the "Jaut" (Annual Automatic System), you can define and adjust daily as well as weekly plans/schedules similar to the smartCore configuration (see Fig. 59).

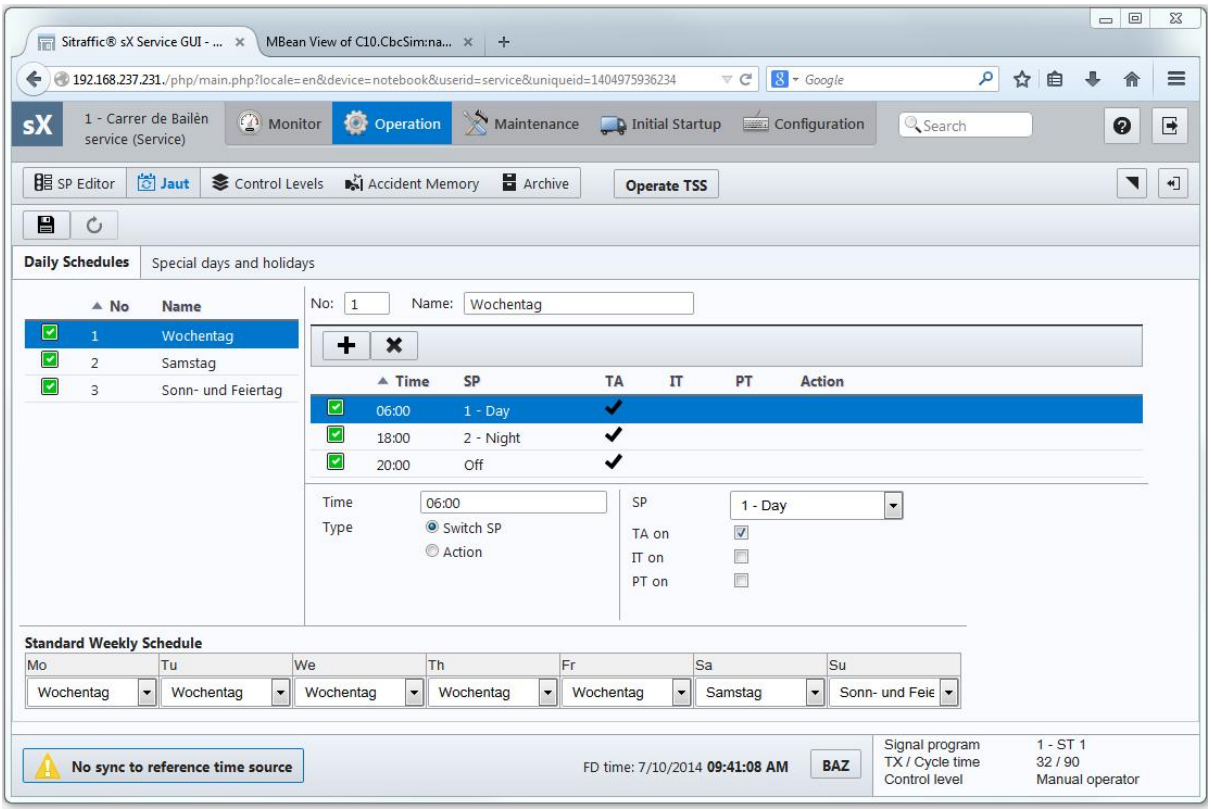


Fig. 59: Daily and weekly Schedules

- You can specify “Daily Plans” and assign these to every weekly plan.
- Switching Points can be added to or removed from the daily plans.
- You can also activate or deactivate “Traffic Actuation”.

Using the "Holidays and Special Days" tab, you can also define fixed days where the "Holidays and Special Days Program" is supposed to be run (see Fig. 60).

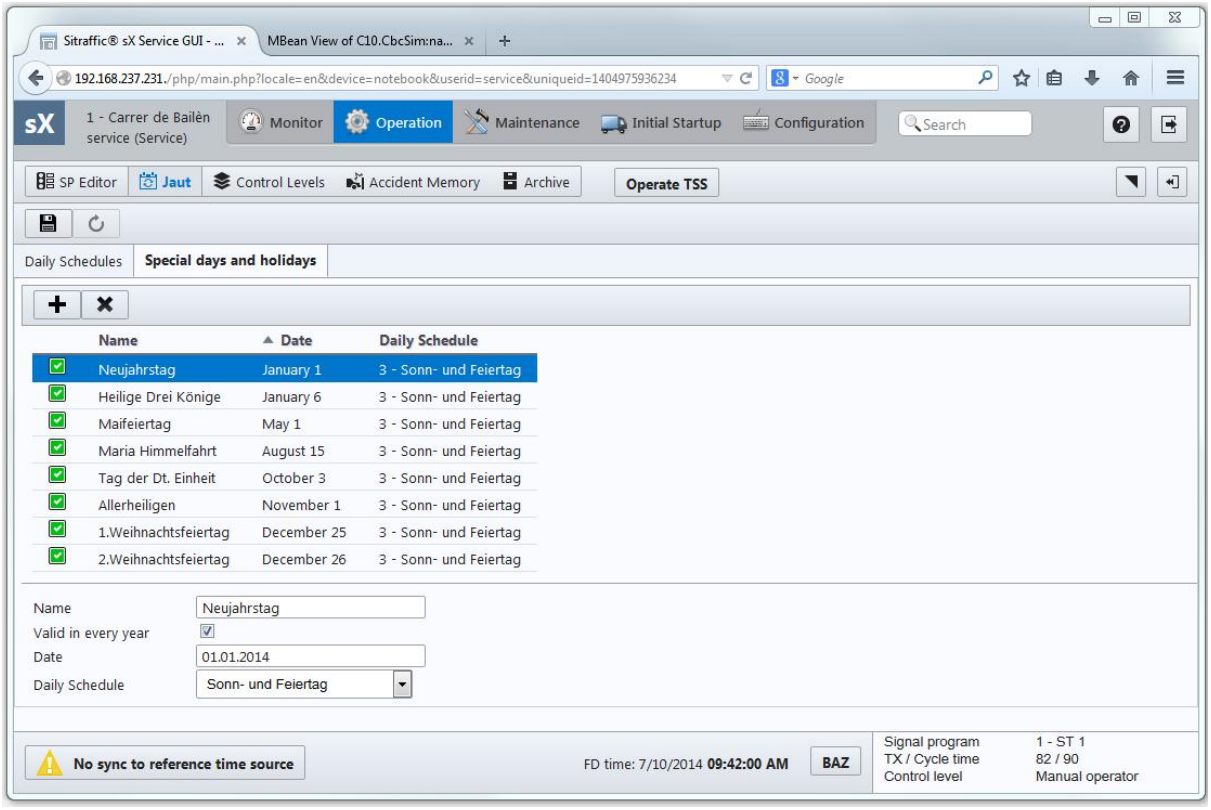


Fig. 60: Defining Holidays and Special Days

4.4.3. Control Levels

This functional area shows all possible control levels in the form of a matrix (column header) and the available functions (line header) and therefore provides an overview of the current status (see Fig. 61).

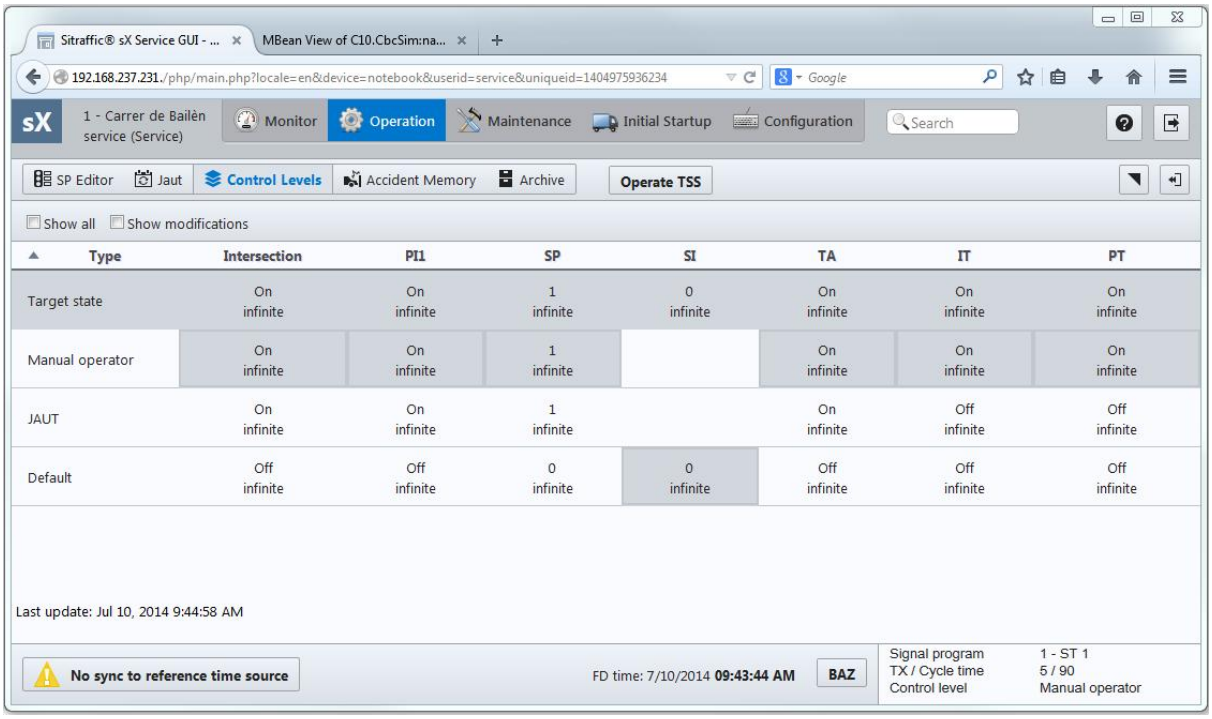


Fig. 61: Control Levels and Functions

The individual control levels are sorted from top to bottom in accordance with their priorities. The “Target State” is indicated by the first line and grayed out. To display additional levels, even those that are not currently being used, tick the corresponding box at “Display all Control Levels” and “Show Modifications”.

4.4.4. Accident memory

This functional area can be used to retrospectively display the actual signaling for the analysis of accidents. The presentation and operation is similar to the visualization of the signal time program in the "Monitor" context as described in Section 4.3.4.

The accident memory merely displays the signal groups without detectors and, additionally, the status of the traffic actuation (see Fig. 62).

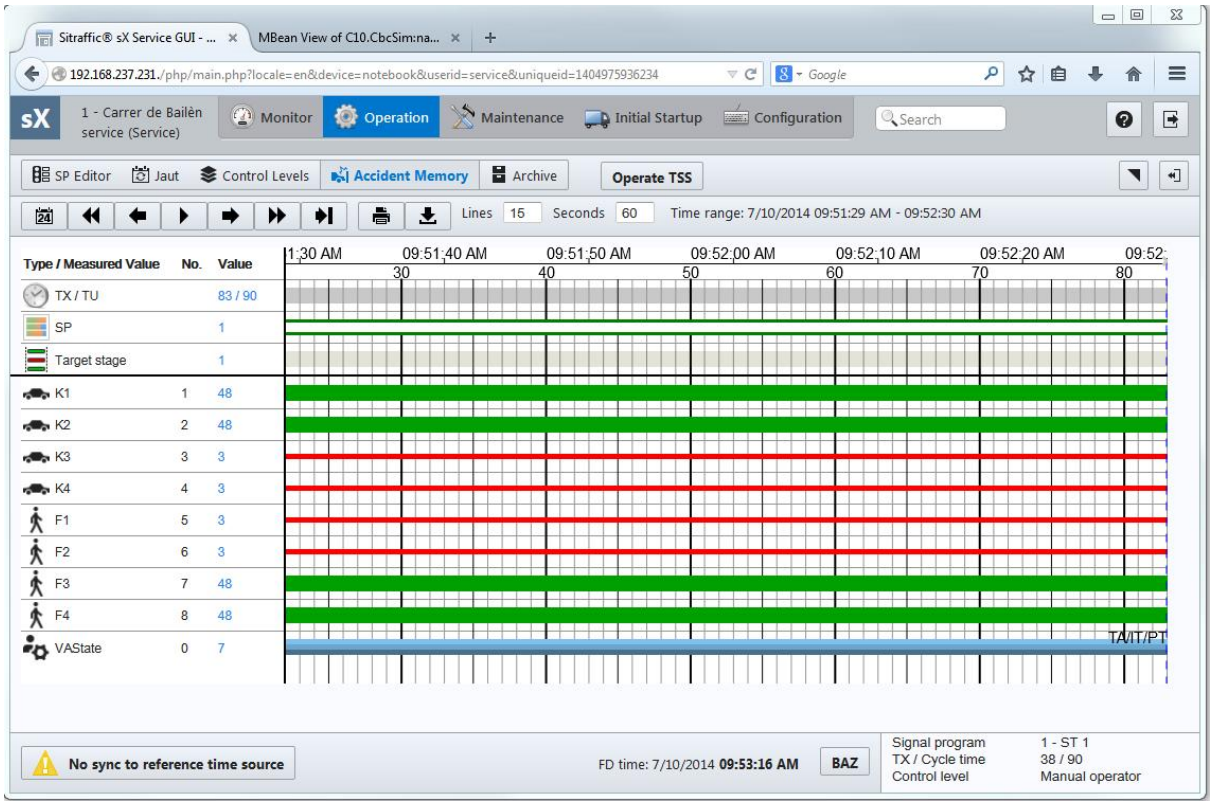


Fig. 62: Accident Memory Display

4.4.5. Archive

The archive displays a list with collected status details pertaining to the selected signal groups and detectors (see Fig. 63).

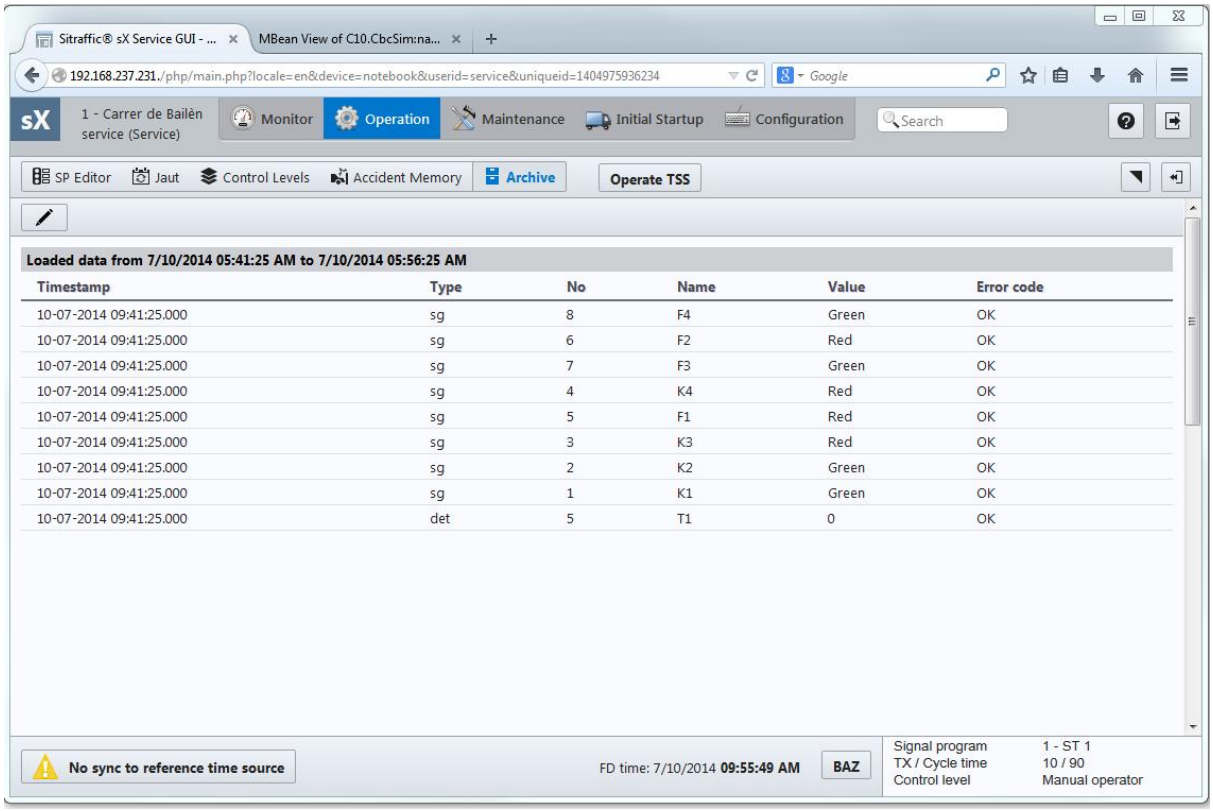


Fig. 63: Displaying Archive Data

The following values are displayed for the selected components in chronological order:

- Time stamp
- Type (for example "signal group" or "detector")
- Number and name
- Measurement value
- Error status

Please click on the symbol with the pen on the top left to select individual elements. The left side now contains all available elements and the right

side only the selected ones You can move the individual elements (or all of them) using the arrow buttons (see Fig. 64).

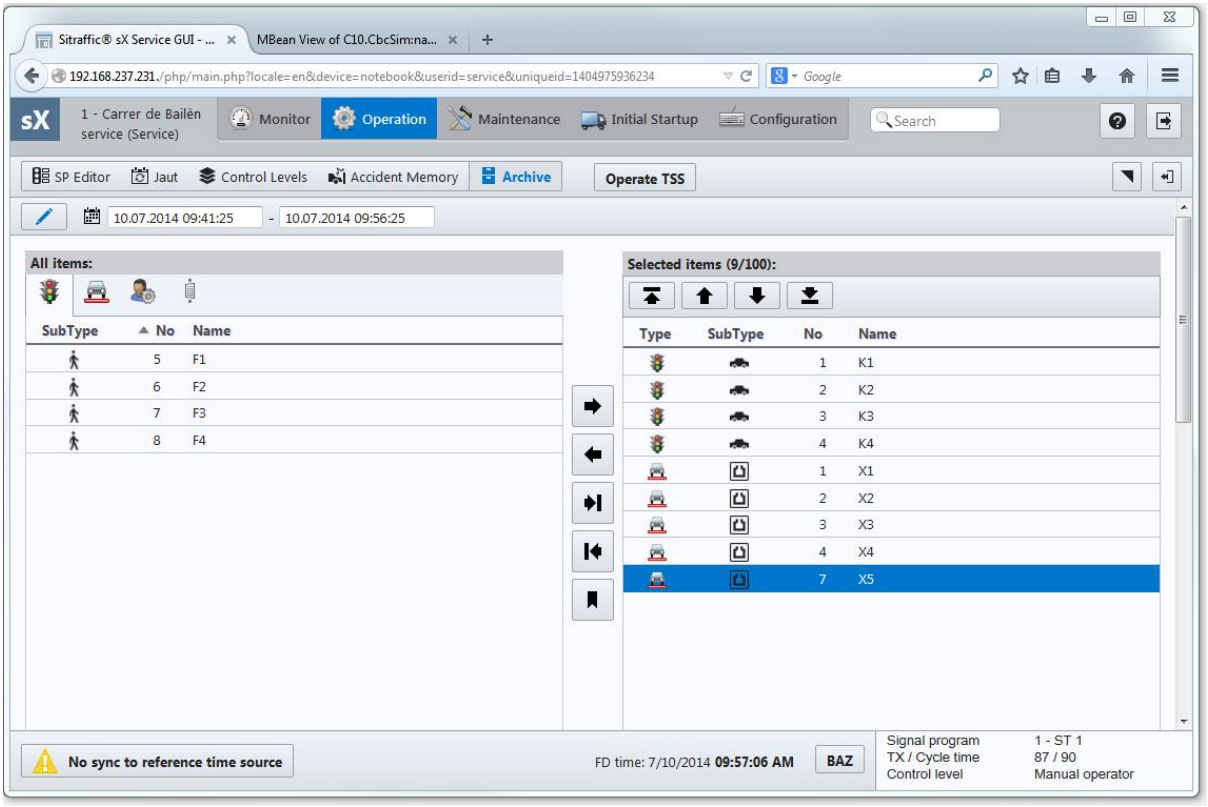


Fig. 64: Selecting Elements for the Archive List

By clicking on “Display”, the user is taken back to the list view. You can also specify the desired time interval in the top field, which can be up to 60 minutes long. By clicking on “Export”, it is also possible to save the data in an external file.

4.4.6. Operating the LSA

A small window in which you can switch the “LSA” is opened by clicking on the “Operate LSA button” (see Fig. 65).

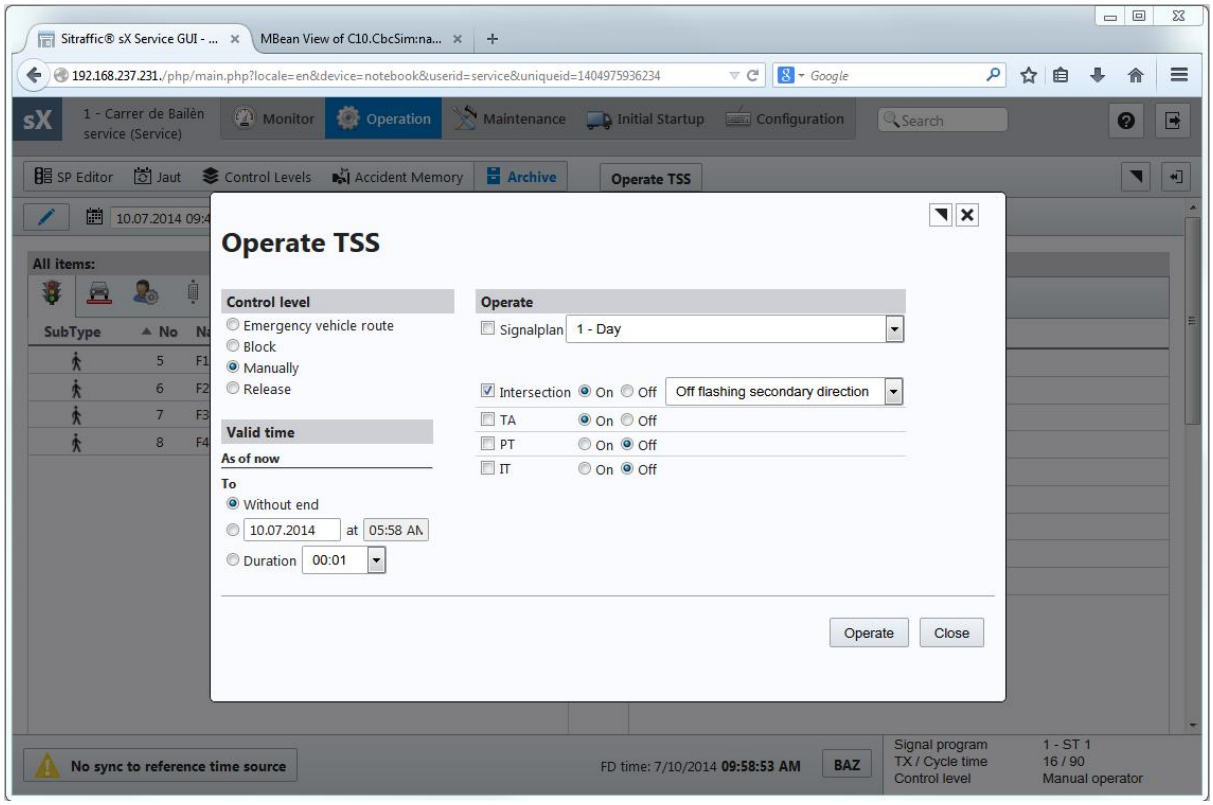


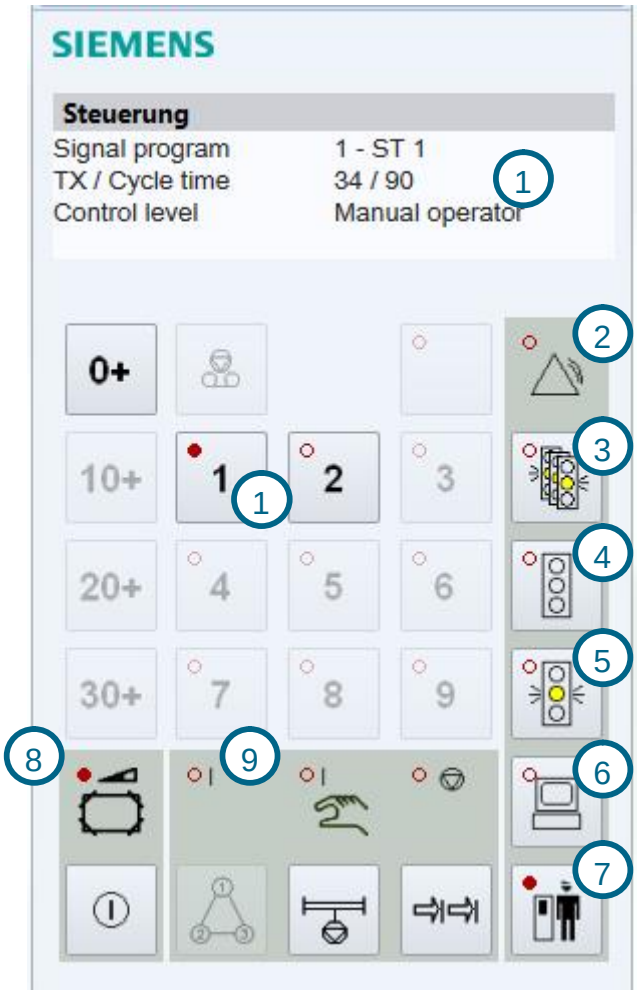
Fig. 65: Operating the LSA

The following control parameters can be adjusted here:

- “Control Level Change”
- Operate a different “Signal Plan”
- Activate/deactivate the entire intersection as well as traffic actuation
- Specify the “Period of Validity” for the selected configuration

By clicking on “Switch”, the desired configuration is activated and copied to the current control system. The application is terminated by clicking on “Close” and the user is taken back to the web interface in the background.

As a more comfortable alternative, the LSA can be controlled by clicking on the BAZ button in the bottom right. A virtual operating and display unit will then be opened (see Fig. 66)



1 Buttons for signal program selection
2 Device alarm
3 Everything off, flashing
4 Off dark
5 Off flashing
6 Control center operation / JAUT
7 Local mode
8 Traffic-actuation on / reduced
9 Manual mode
10 Display

Fig. 66: BAZ Functions

The essential functions of the Traffic Light System can be displayed and controlled using the BAZ:

- Manual selection of the signal program. The current signal program is highlighted by the red light dot.
- Deactivation of the system and selection of the "off" state
- Selection of the control system or change to manual operation
- Activation and deactivation of traffic actuation

The BAZ is also located as a "real" operating unit in the small door on the control unit cabinet.

4.5. Maintenance

The "Maintenance" context will be activated if you have selected the “Service” user role when you logged on to the sX Web Interface.

4.5.1. Checklist

This function is used to document all maintenance operations. The maintenance mode should be activated at the beginning of a maintenance procedure and deactivated again after its conclusion. The checklist can be filled out and, if necessary, printed as an extra aid (see Fig. 67).

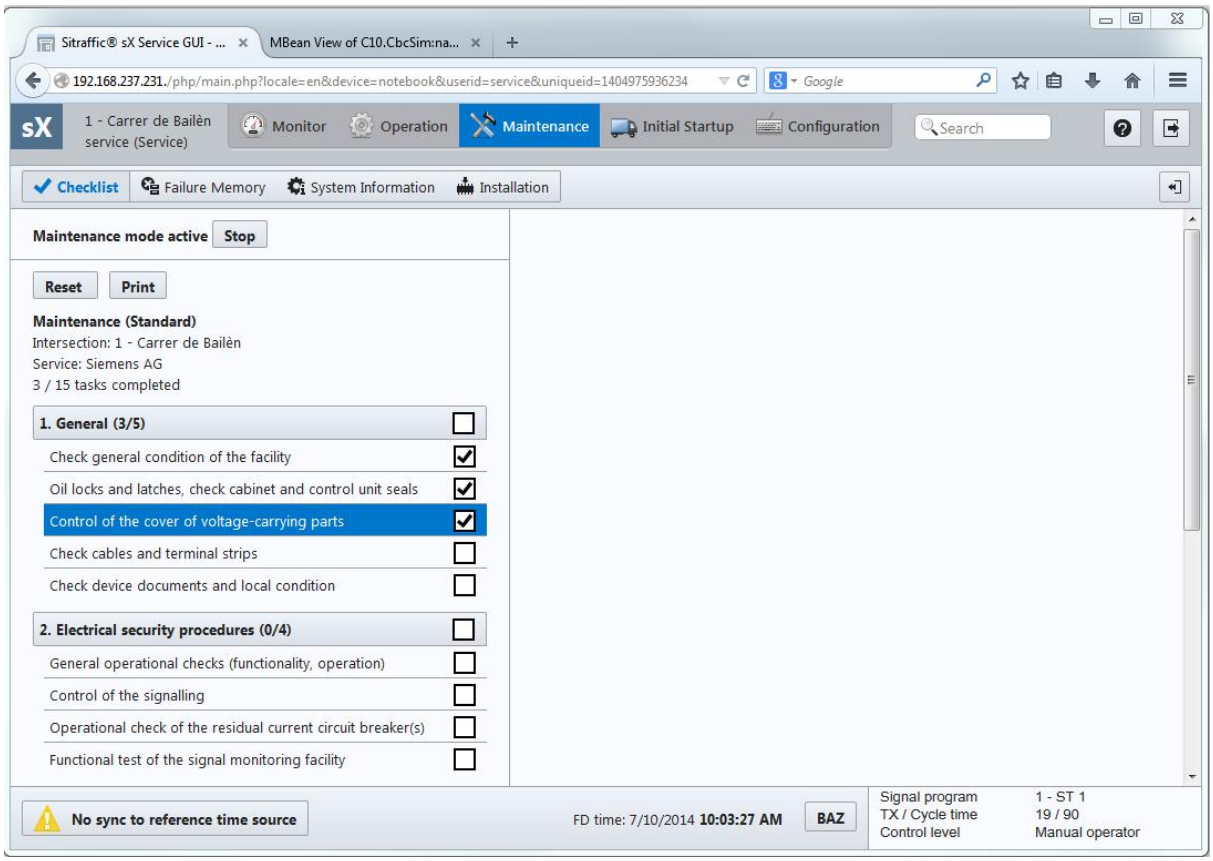


Fig. 67: Checklist in active Maintenance Mode

4.5.2. Fault Memory

This function corresponds to the “Detail Status” in the “Monitor” concept and is described in detail in Section 4.3.7 (see Fig. 68).

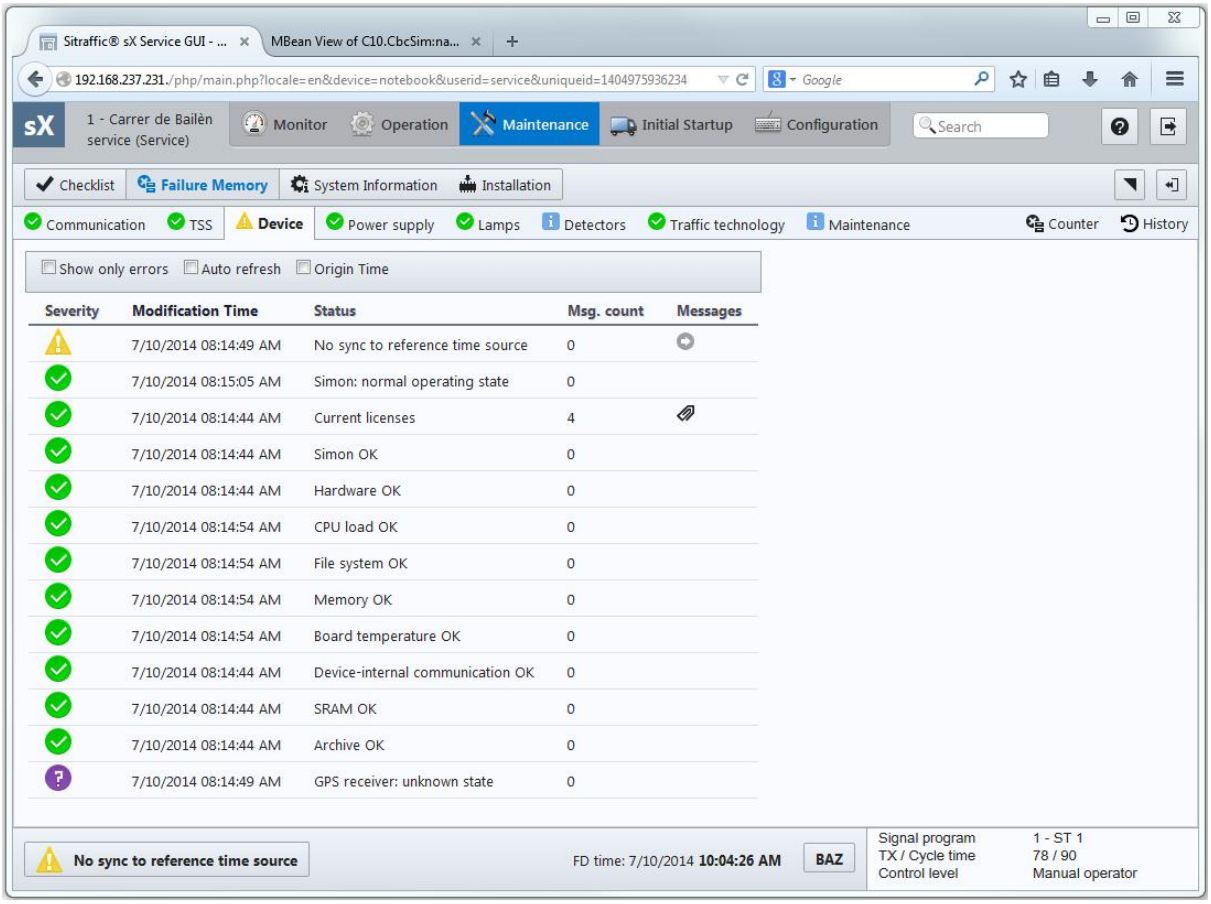


Fig. 68: Error Memory Display

4.5.3. System Information

This function can be used to display a variety of detailed system information. Select the desired system area from the “Service” or “File” field on the left and you will receive the corresponding detail information on the right (see Fig. 69).

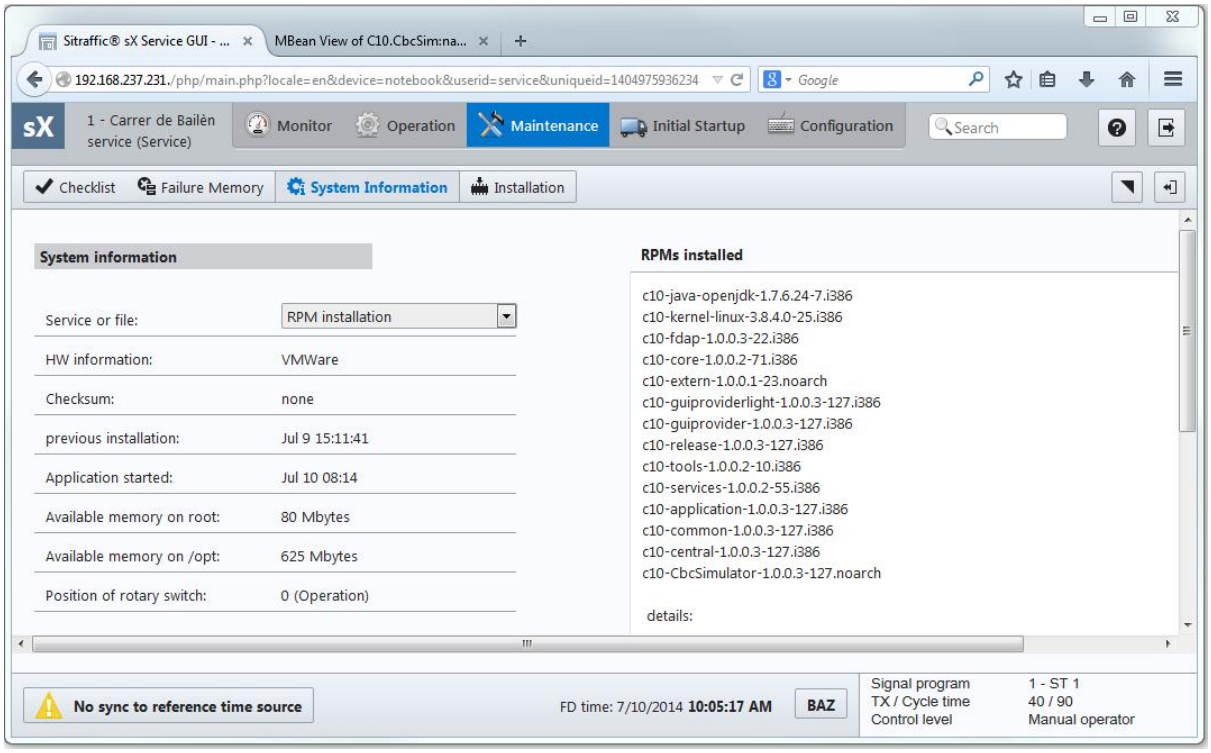


Fig. 69: Viewing System Information

You can, for example, examine the boot log file here, get information regarding memory usage and allocation or identify the version of the Linux operating system. You can also save the data to a file by clicking on ”Save Log Files”.

4.5.4. Installation

This function is used to update the firmware of the Sitraffic sX System. Click on "Browse" and navigate to the .rpm file you would like to upload just as you normally would use the Windows explorer (see Fig. 70).

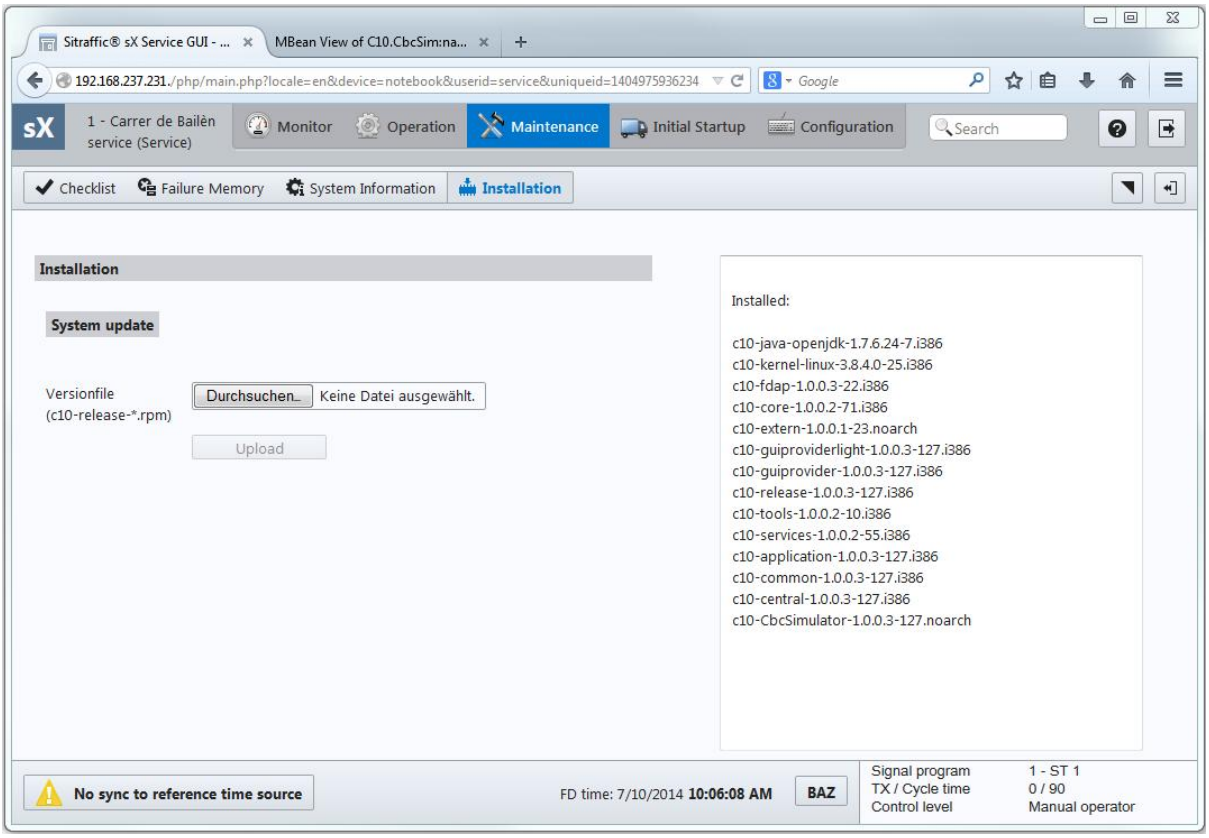


Fig. 70: Performing a System Update

Depending on the type of the update, it may be necessary to restart the control unit. In this rare case, you will be notified of this requirement by a message box. Otherwise, you will merely be informed of the successful update after the installation has been completed and can then continue to use the web interface as usual.

In this manner, control units can also be kept up-to-date with the very latest firmware status by remote maintenance (retrograde updatability)

4.6. Commissioning

This context deals with the initial startup and commissioning of the control unit and can therefore only be accessed by the “Service” user role.

4.6.1. Commissioning Wizard

If the control unit has not yet been configured, you first have to upload the configuration file to the control unit from the "Commissioning" context. You first have to enter the date and time (see Fig. 71).

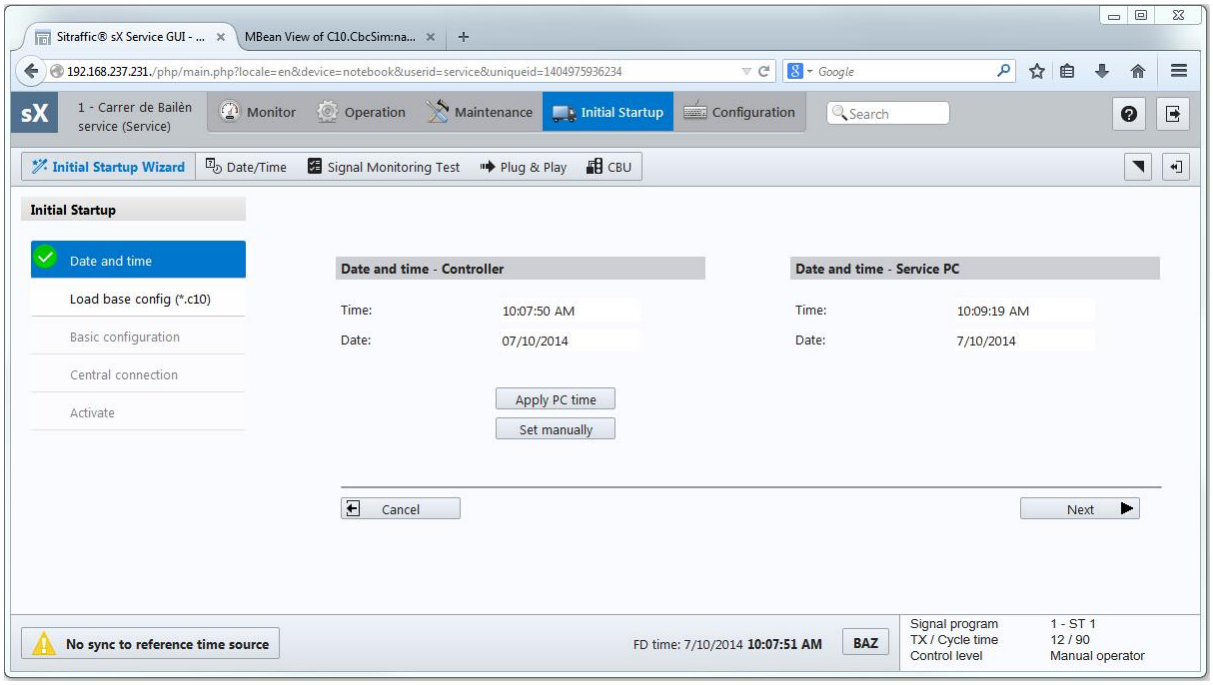


Fig. 71: Starting the Commissioning Wizard

The next step is opened by clicking on “Next”. You can select the desired c10 file, which was previously created using smartCore, and upload it by clicking on “Activate” (see Fig. 72).

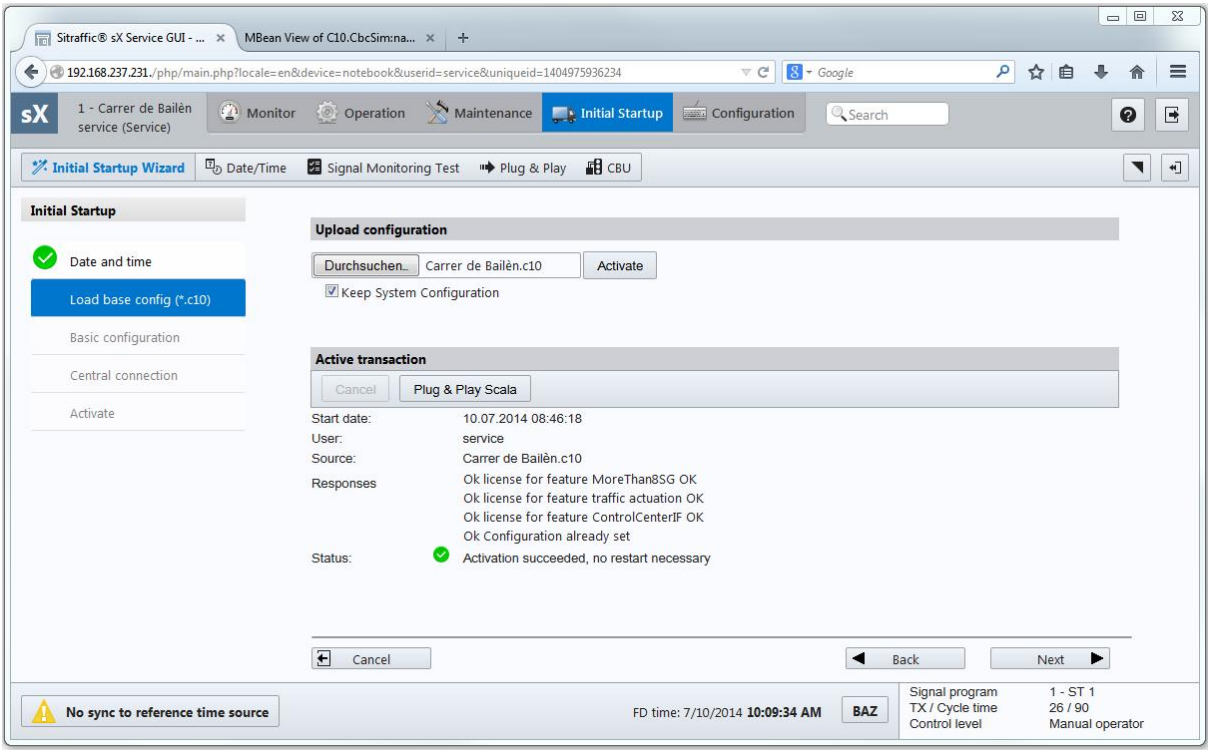


Fig. 72: Uploading a c10 Configuration File

In the following step, you can also select whether or not the control unit should be connected with a control center and, if applicable, enter the corresponding connection data there (see Fig. 73).

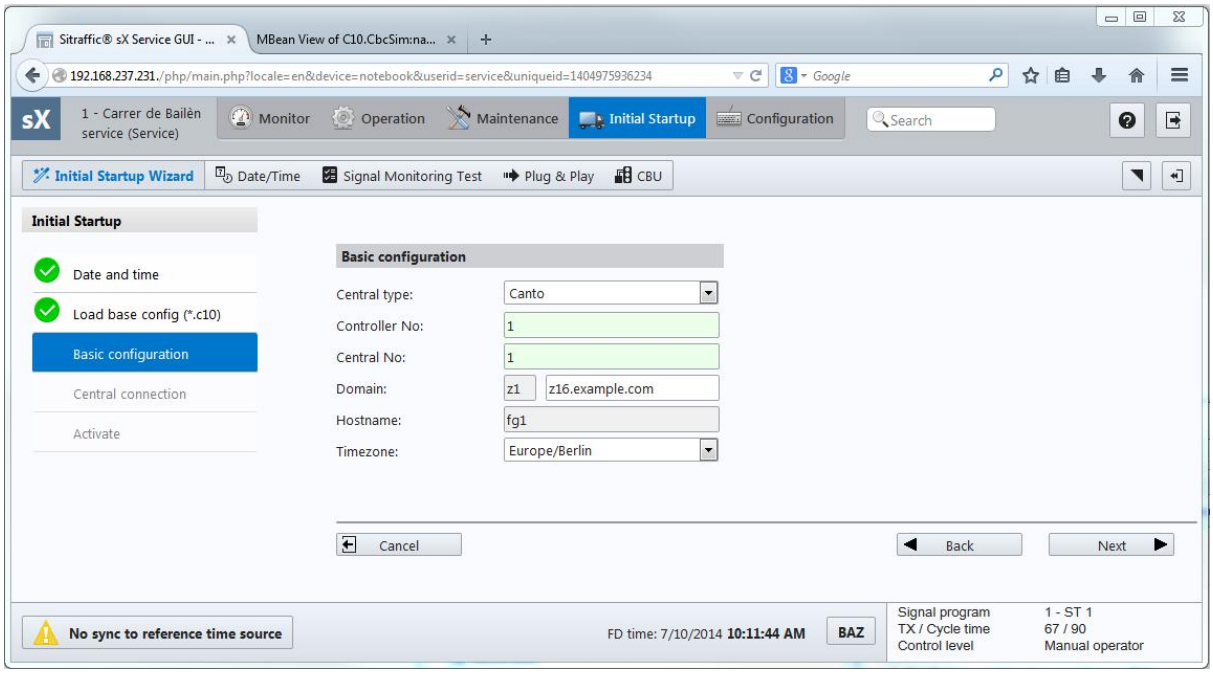


Fig. 73: Entering the Basic Configuration Data

Detail information regarding the control center connection is entered in the following step (see Fig. 74).

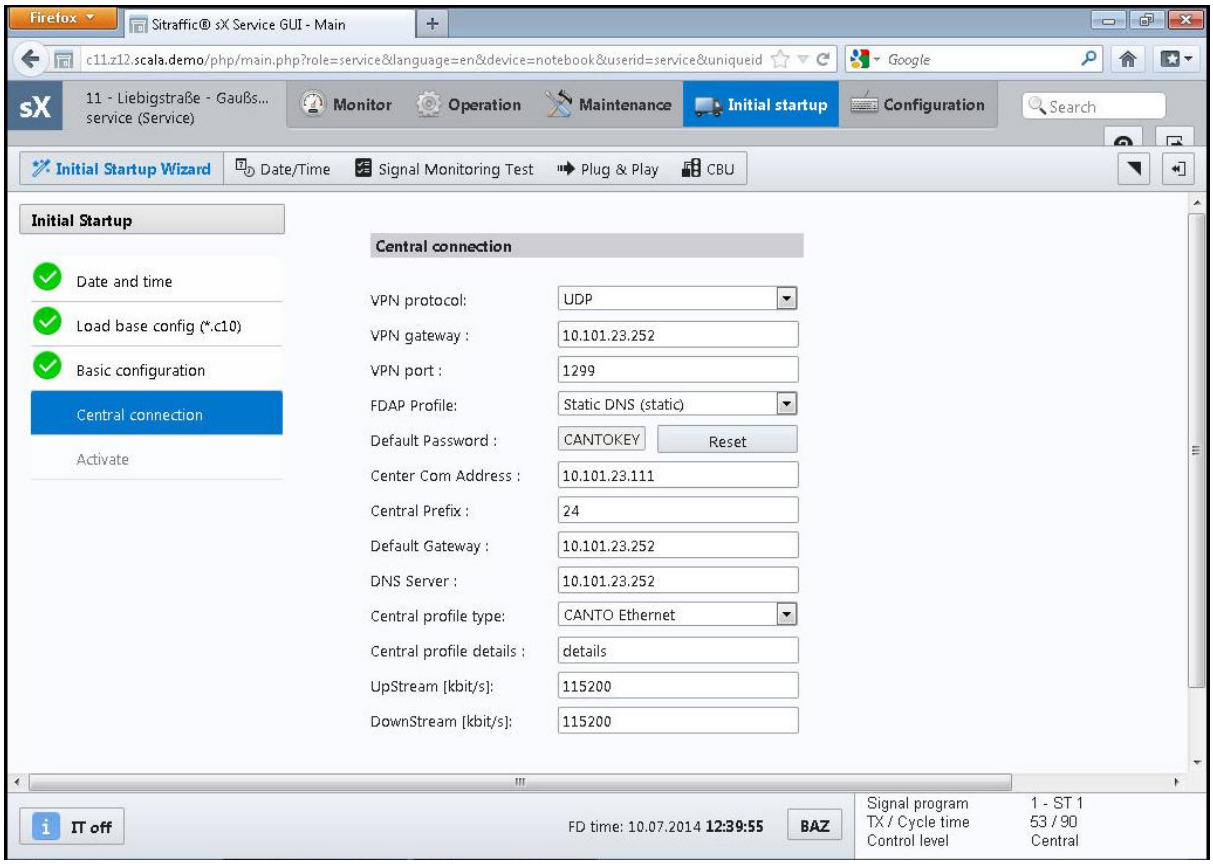


Fig. 74: Entering Control Center Details

Finally, click on “Activate” to transfer the configuration file (with the control center connection configured) to the control unit (see Fig. 75).

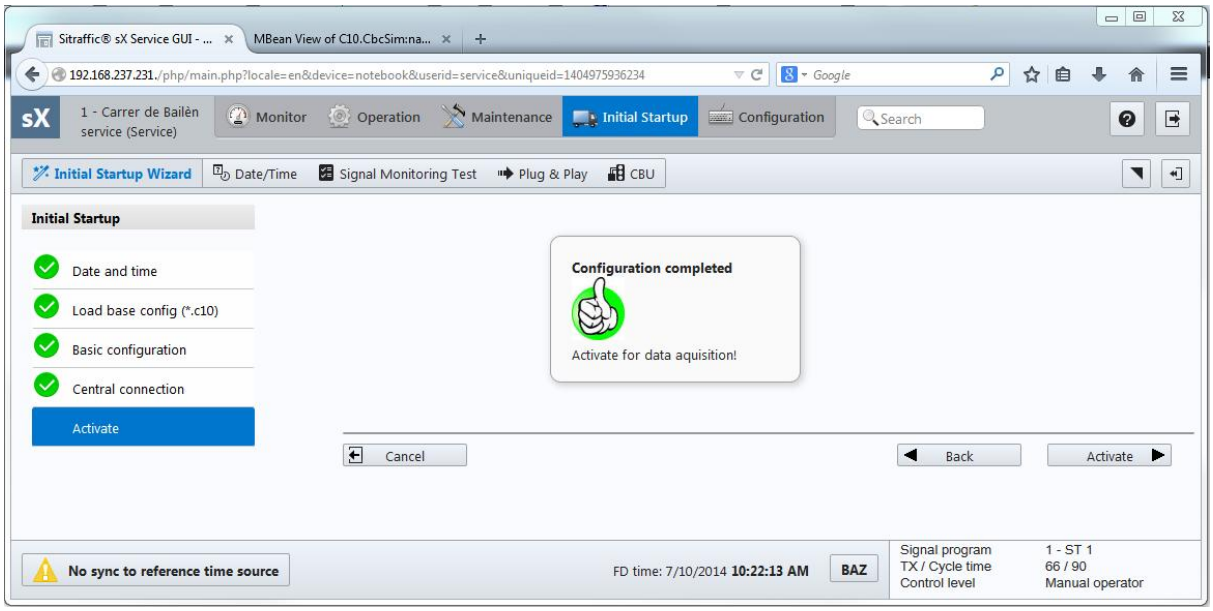


Fig. 75: activate the configuration

A corresponding window will appear after successful activation, which you simply close by clicking on “OK”. You can now leave the “Commissioning Wizard”.

4.6.2. Date/Time

Even after the unit has been configured, it is still possible to change the date and time on the control unit (see Fig. 76).

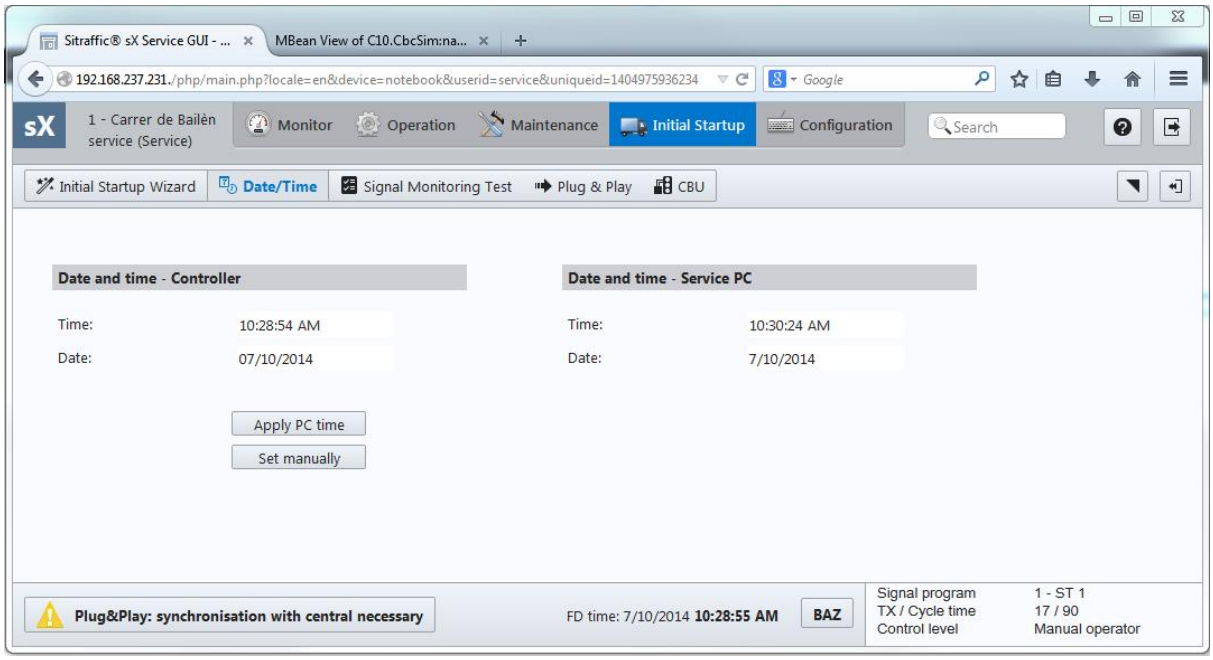


Fig. 76: Setting the Date and Time.

The right side shows you the current time as determined by your PC as a reference. The time on the control unit is displayed on the left and can now either be

- synchronized with the time on the PC or
- manually changed.

4.6.3. Signal Monitor Test

You can perform a signal monitoring test here. When attempting to start this function, you will be prompted to secure the site accordingly (see Fig. 77).

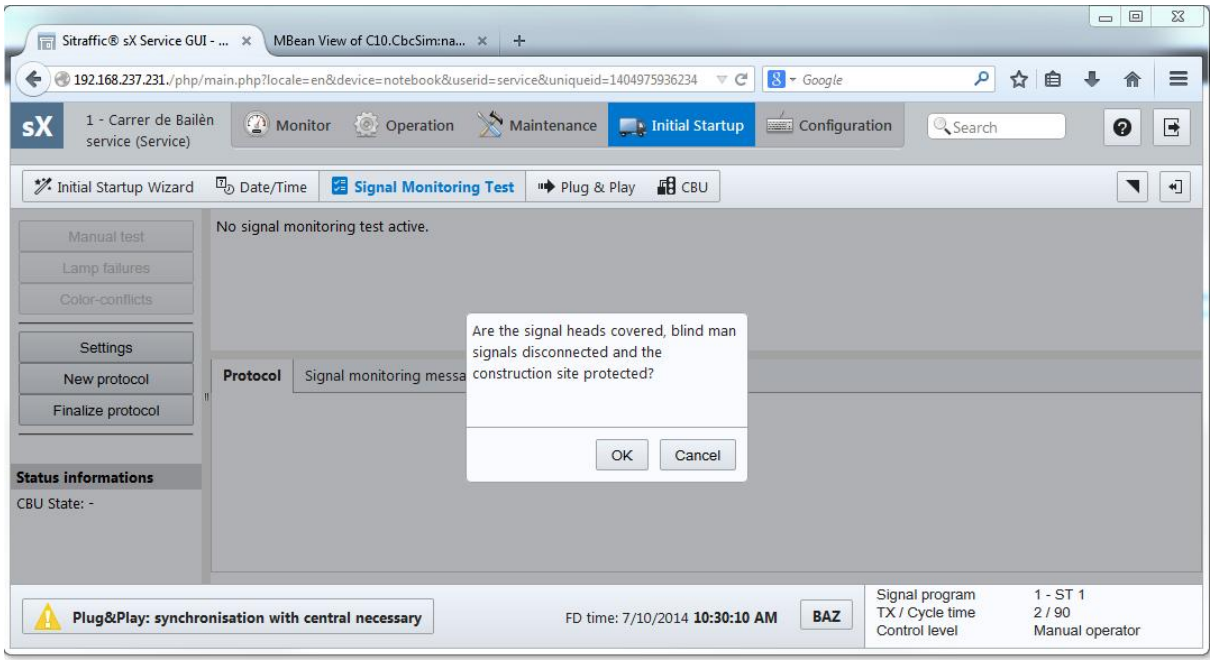


Fig. 77: Starting the Signal Monitoring Test

Once you have turned the so-called "CBC" rotary switch to position "4" and triggered a restart of the device, it is possible to start the test itself. The intersection is now deactivated and/or in the "yellow flashing" state. You can now select different signal monitoring tests from the left-hand side of the web interface (see Fig. 78).

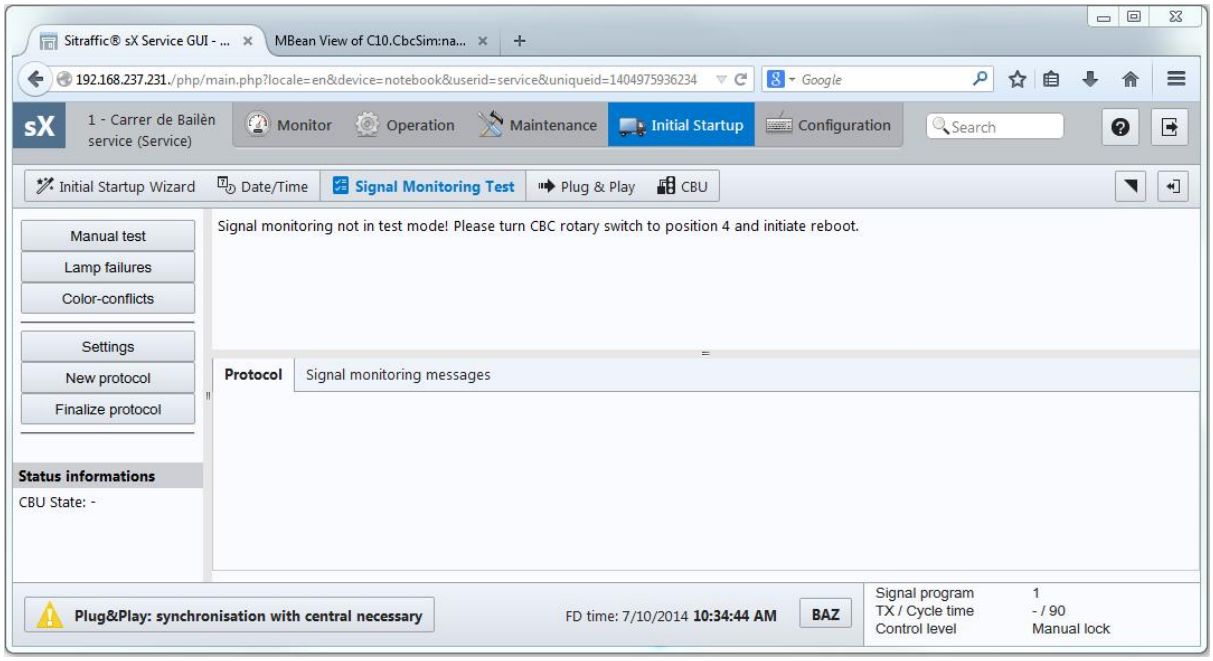


Fig. 78: Signal Monitoring Test Start Page

You can activate and deactivate every single color of the signal heads by a mouse click using the “Manual Test”. By clicking on “Send Pattern”, the desired color combination is sent to the traffic light system. This test is primarily used in order to be able to attribute the signal groups to the signal heads on site. As a secondary purpose, it is also possible to identify conflicting color combinations in this way. In this case, the installation is turned off automatically and a color conflict error will be added to the “Log” (see Fig. 79).

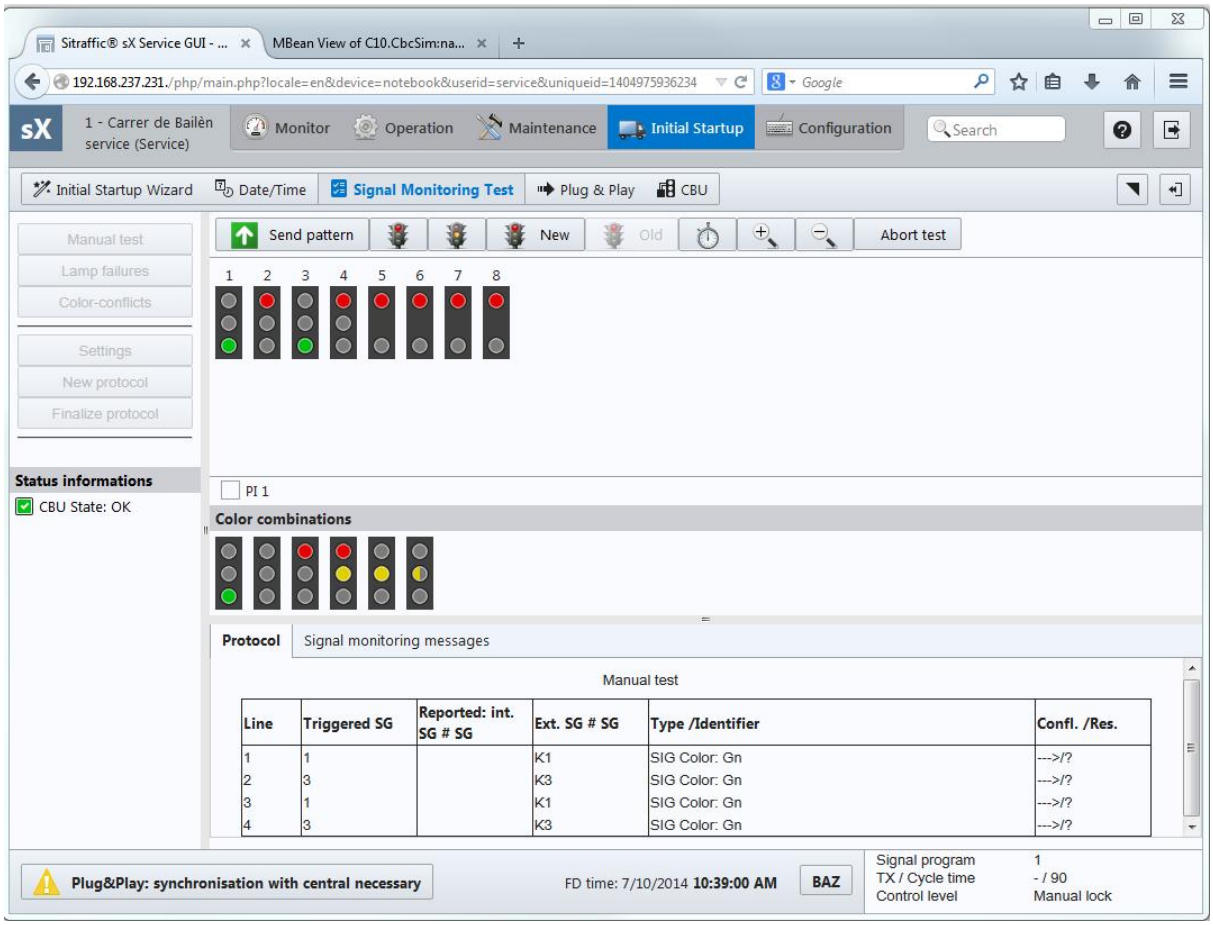


Fig. 79: Manual Test

In order to continue the manual test after a color conflict error, you first have to click on the button with the red “LSA” located in the top section  in order to reset the signal pattern back to the initial state. You can terminate the manual test by clicking on “Abort Test”.

When testing for “Lamp Failures”, you should first select the lamps to be examined for failures (see Fig. 80).

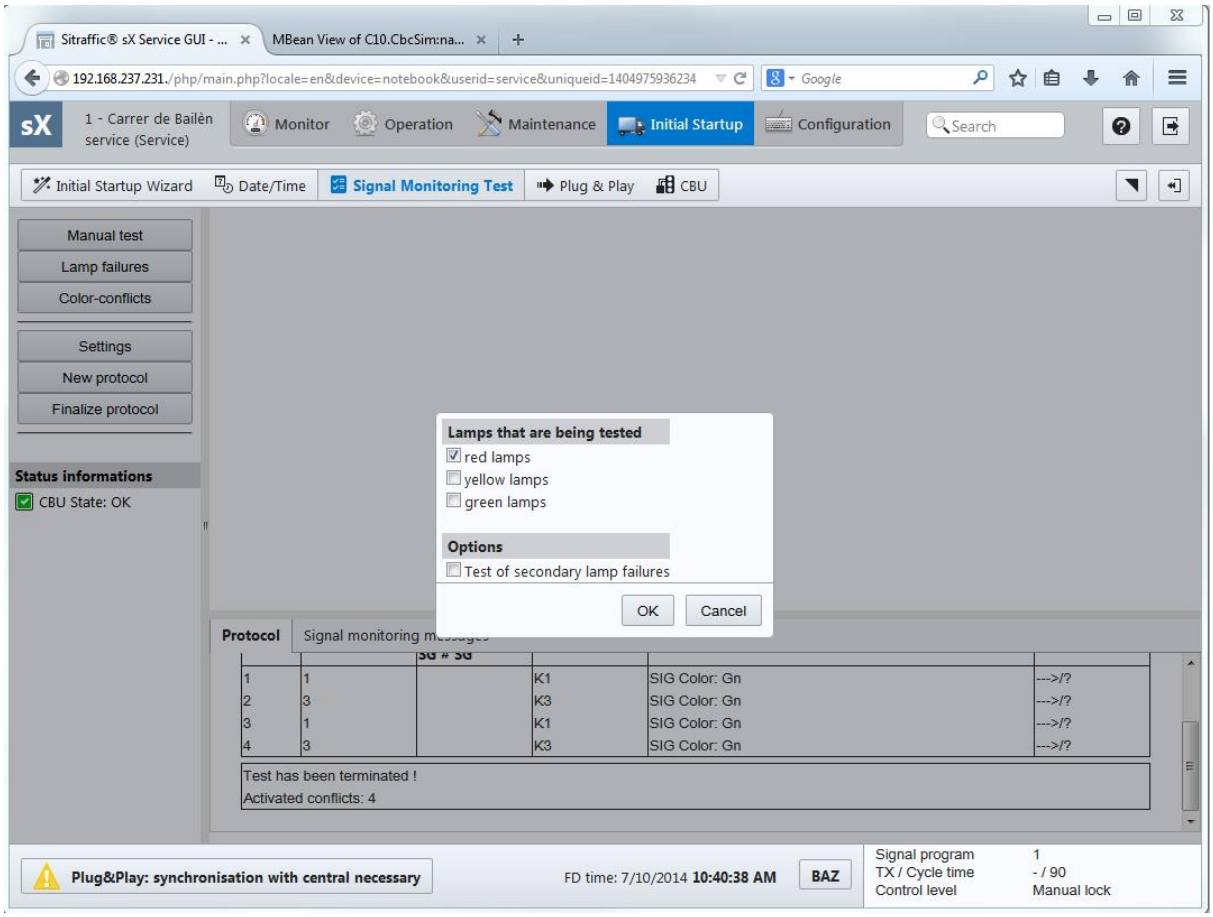


Fig. 80: Testing for Lamp Failures

The lamp failure is generated directly on the control unit by loosening the individual connections to the lamp switch terminals. The lamp failure will then be reported in the web interface (see Fig. 81).

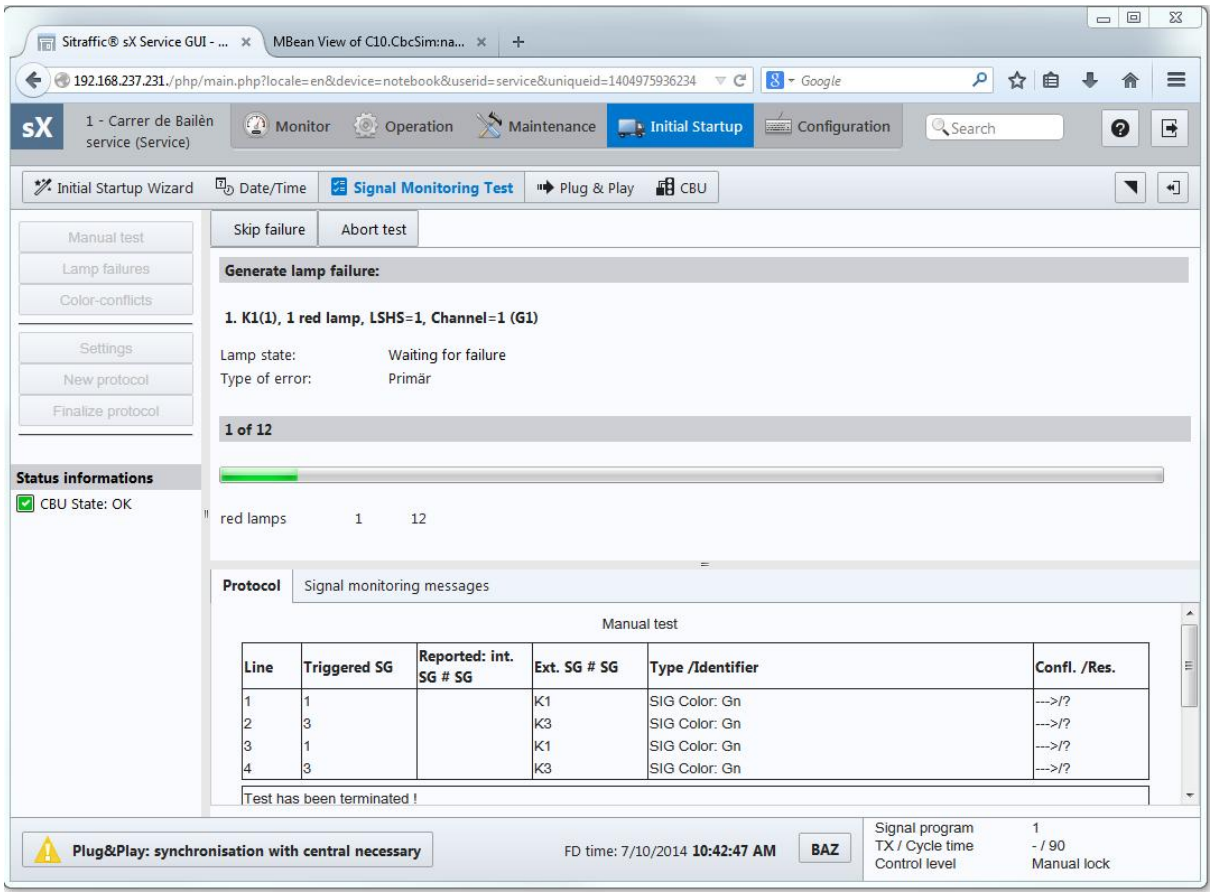


Fig. 81: Displaying Lamp Failures

Click on “Skip Failure” if you do not want to generate the lamp failures in an order from top to bottom in the device. The test run is terminated, as before, using the “Abort Test” button.

The “Color Conflict” test automatically tests all conceivable color combinations – this is also visible on the installation itself – and checks for color conflicts. Color conflict errors are then documented in the log file, also indicating the conflicting signal groups and signal patterns (see Fig. 82).

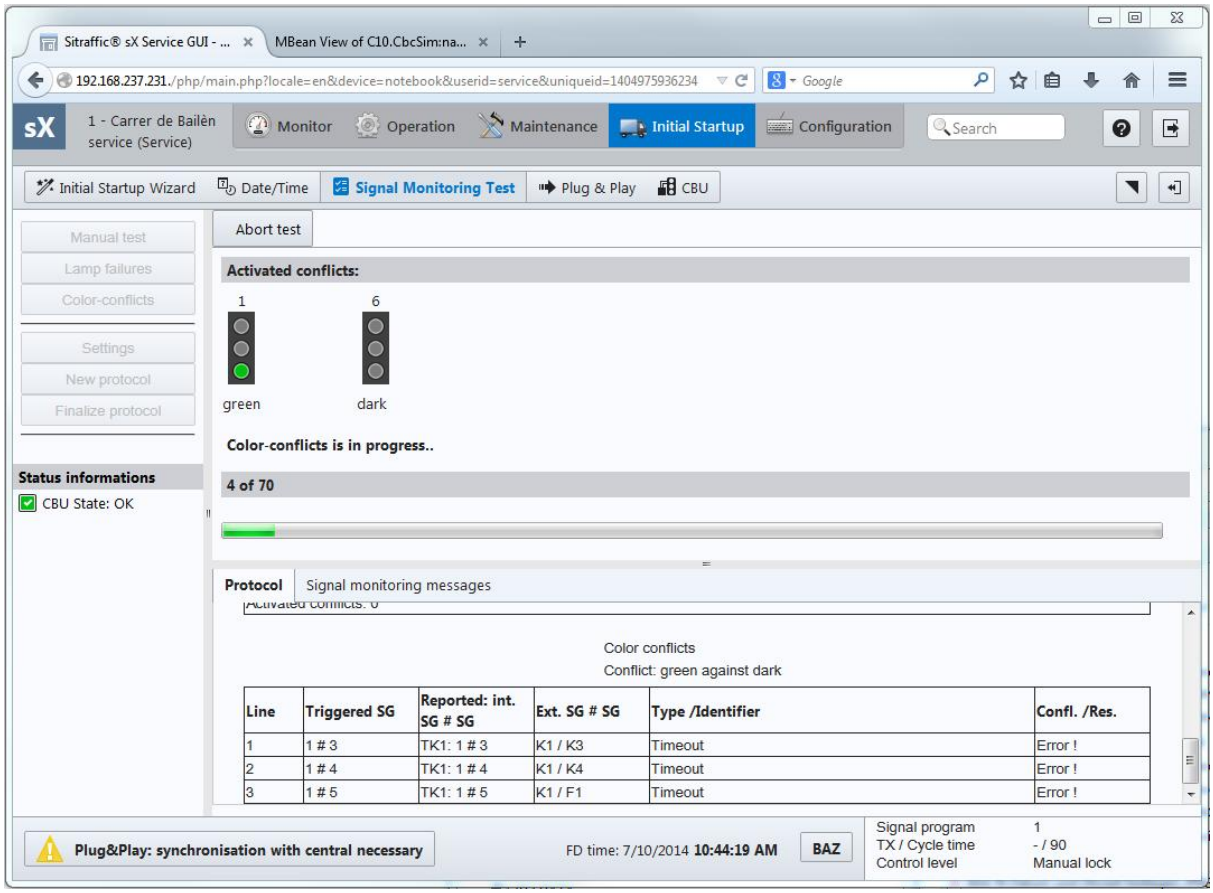


Fig. 82: Testing for Color Conflicts

Once all color combinations have been tested, the “Test completed!” message will appear and you can return to the selection page by clicking on “Abort Test”.

- Using the Settings button on the left-hand side, you can also determine whether the minimum and intergreen times should be monitored as part of the test.

- The test results listed below are saved in a PDF document by clicking on “Save Log”.

- If you would like to start a new testing documentation, please click on “New Log” and the test results will be reset accordingly.

As long as the protocol has not been finalized (saved) or a new one has been created, the results of the individual tests will be added to the log even if you are switching between the tests.

4.6.4. Plug & Play

Thanks to this function, the most important configuration data of the sX can be quickly and easily forwarded to a control center via Sitraffic Canto. If you have previously configured a control center connection as part of the “Commissioning Wizard” (see Section 4.6.1), the start page will initially display your ID as well as the data pertaining to the control center connection (see Fig. 83).

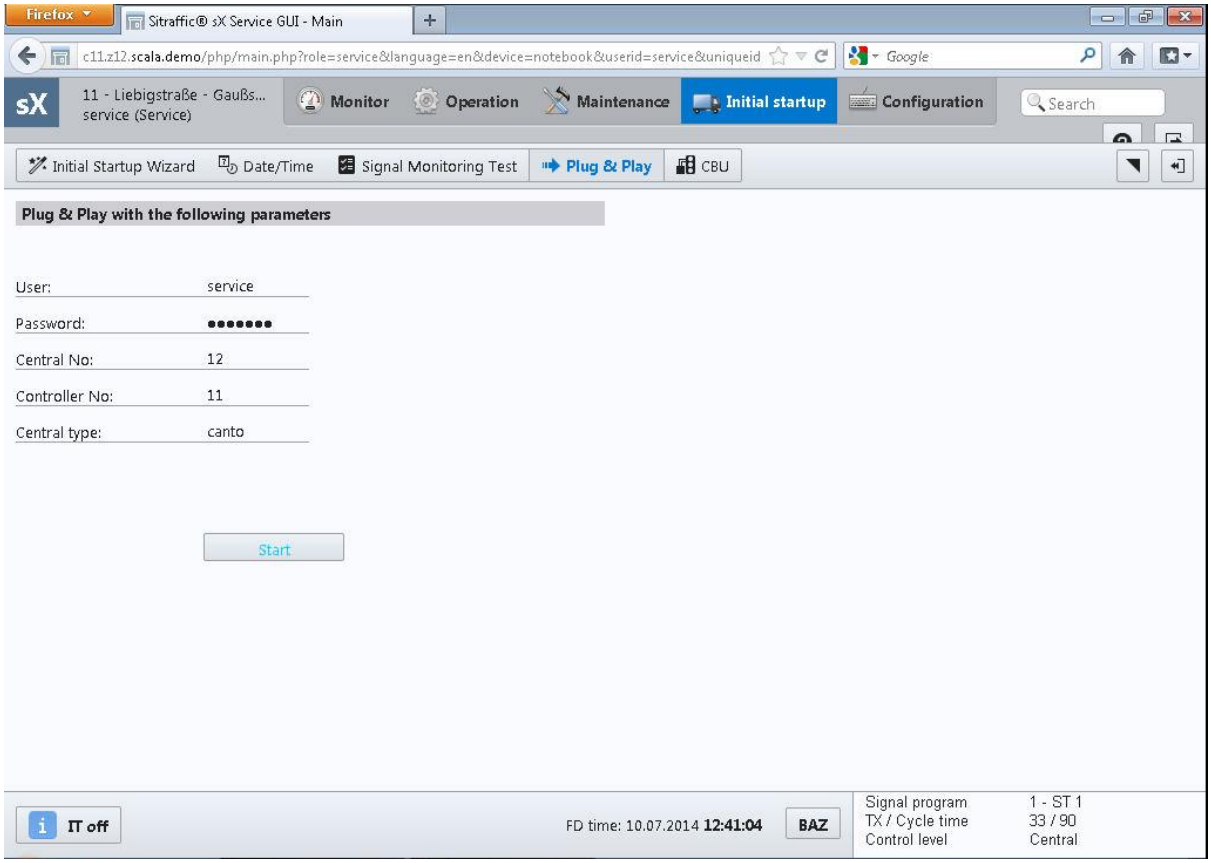


Fig. 83: Plug & Play Function

The "Plug & Play" process is started by clicking on “Start”. The progress is indicated by the yellow bar. As soon as the progress bar has reached 100%,

the process is finished and you can leave the function by simply selecting a different menu item (see Fig. 84).

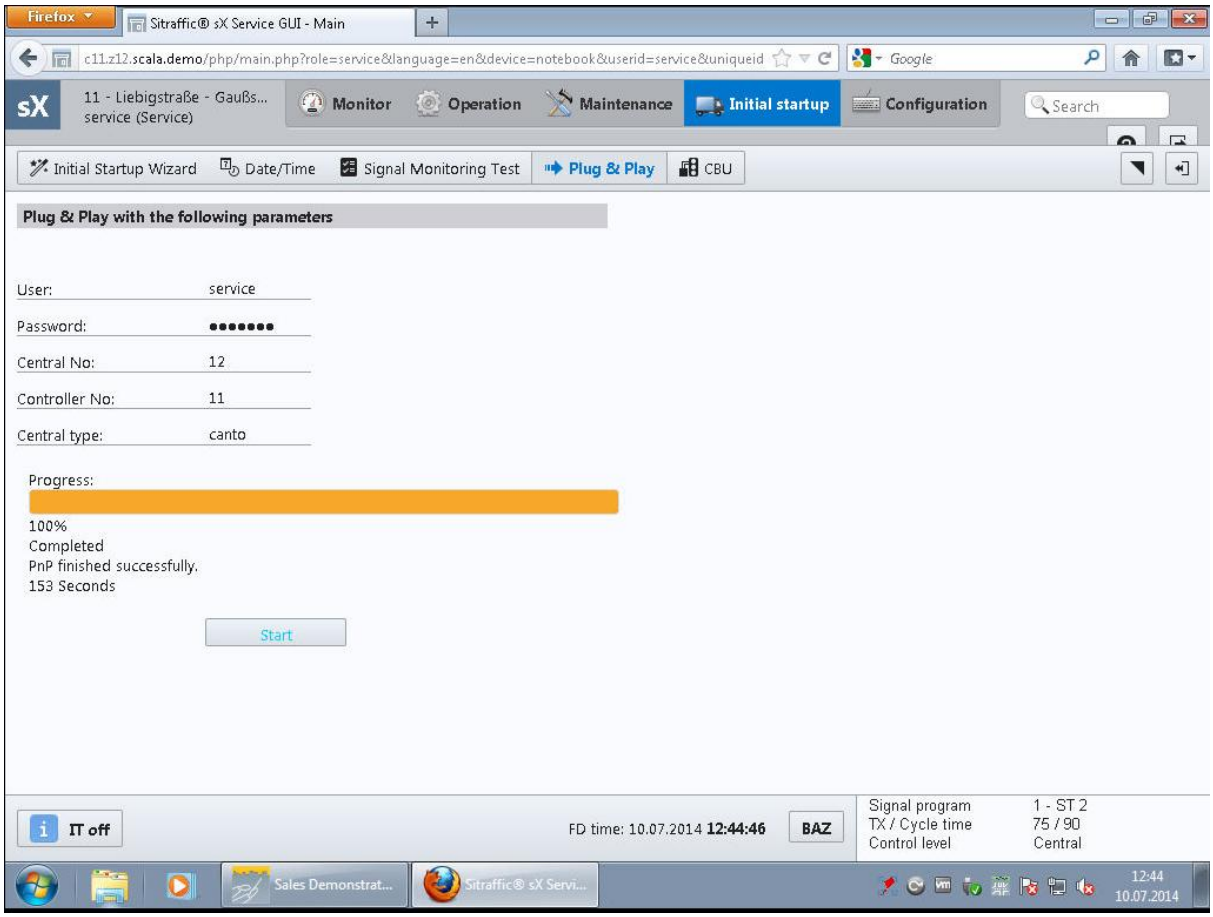


Fig. 84: Completed Plug & Play Process

Plug & Play ultimately achieves a quick and automatic transfer of the control unit configuration to a control center, which also serves to exclude any data supply errors caused by manual entering of the data.

4.6.5. CBU

This function displays the status of the individual processors located on the CBU of the sX Unit (see Fig. 85).

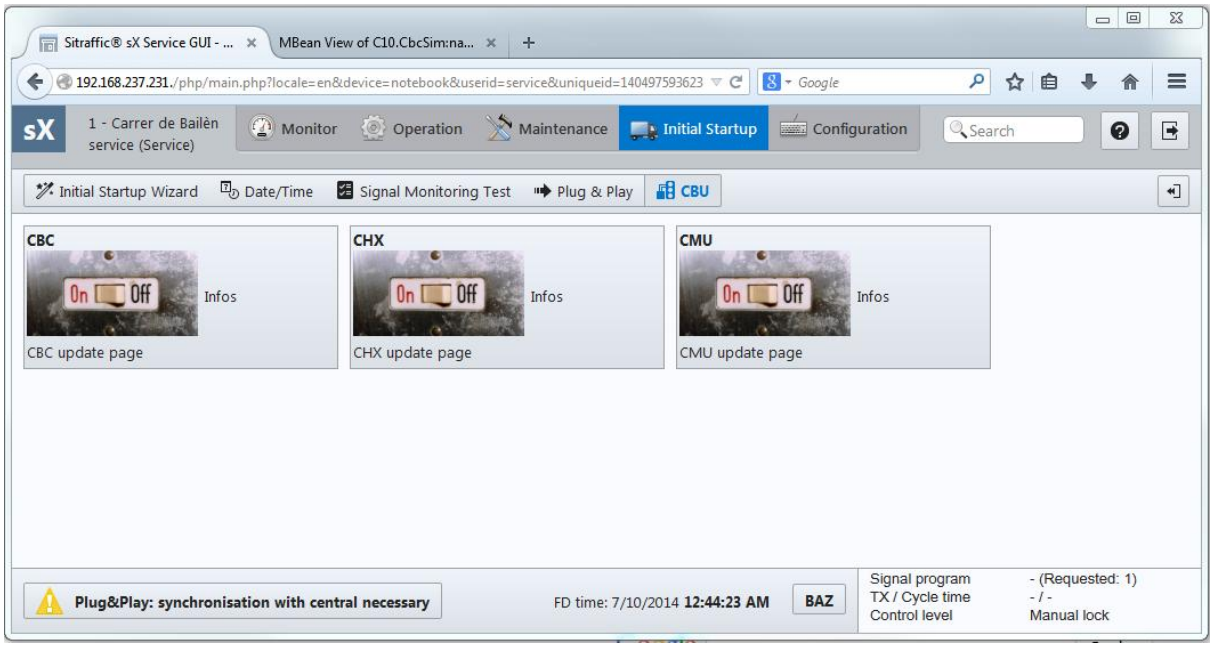


Fig. 85: Processors on the CBU

- The CBC processor is responsible for real-time controlling
- The CHX and CMU processors are responsible for signal monitoring

It is also possible to perform firmware updates for each of the processors individually. For more information on this topic, please refer to the Sitraffic sX Software Manual.

4.7. Configuration

This context manages the configuration files of the control unit and allows for new ones to be added if necessary.

4.7.1. Configurations

You can “Upload a new Configuration” with this function on the left hand side by adding the desired c10 file using “Browse”. The corresponding configuration is activated by clicking on “Activate”.

The difference to the “Commissioning Wizard” (see Section 4.6.1) is that this function only activates a new configuration for the sX unit, but the previously established control center connection and the time data are maintained.

A restart of the control unit is only required if the selected configuration file possesses a different intersection topology than the currently active configuration (see Fig. 86).

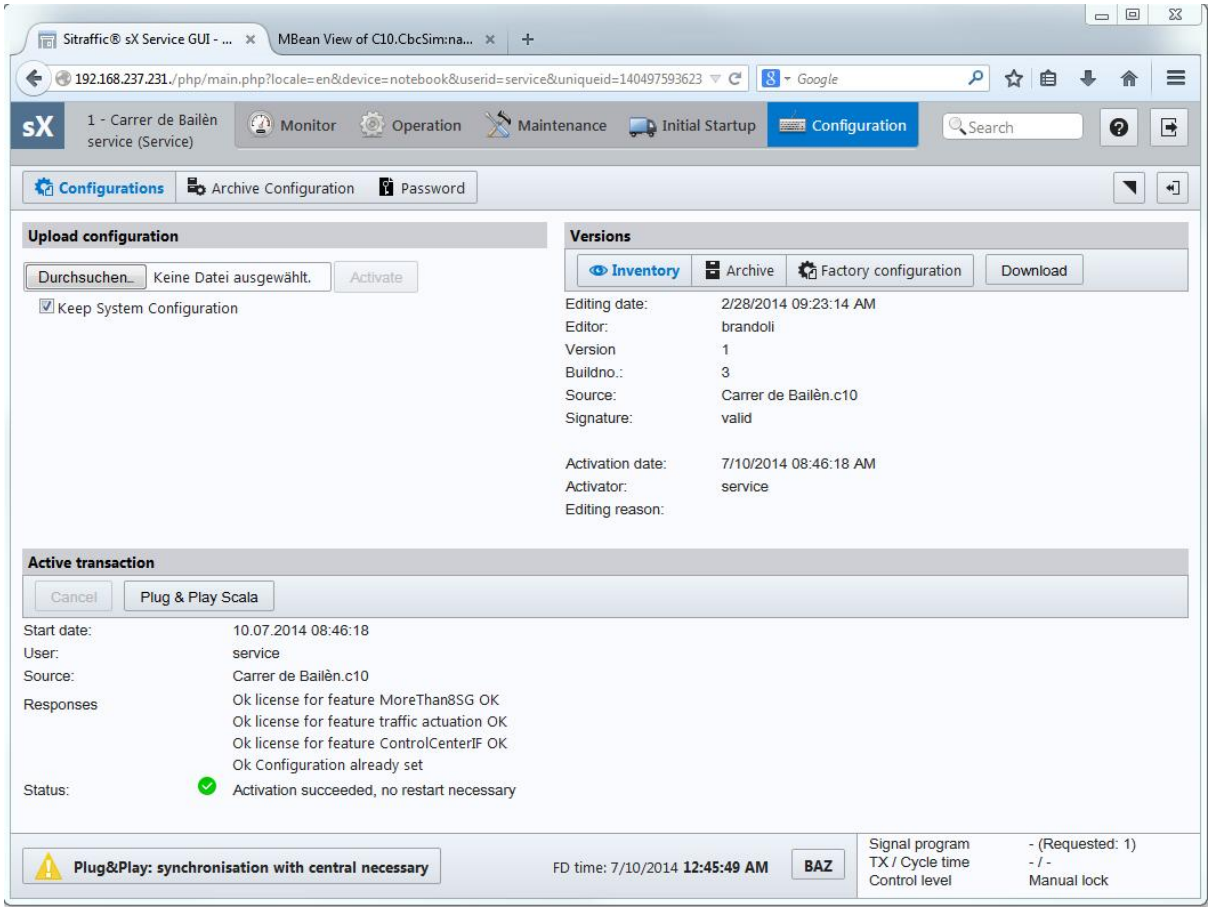


Fig. 86: Managing Configurations

The right-hand side displays information regarding the used “Versions” of the current and last used configuration.

The “Inventory” shows the currently active configuration with its version, source as well as activation and modification dates. The source is either the name of the original c10 file or the name of the editor if the configuration was modified.

The “Archive” shows the configuration file that was used before the currently operating one. There is also an “Activate” button, which can be used to activate this configuration file.

- The “Factory Configuration” function resets the control unit to the default factory settings after clicking on “Activate”. This causes all signal groups and programs to be deleted and the last used configuration to be saved in the archive.
- The current configuration can be saved as a c10 file using the “Download” function.
- The status for the Active Transaction is displayed in the lower section.

4.7.2. Archive Configuration

Use this function to display the memory as well as the size of the archived data on the Sitraffic sX System (see Fig. 87).

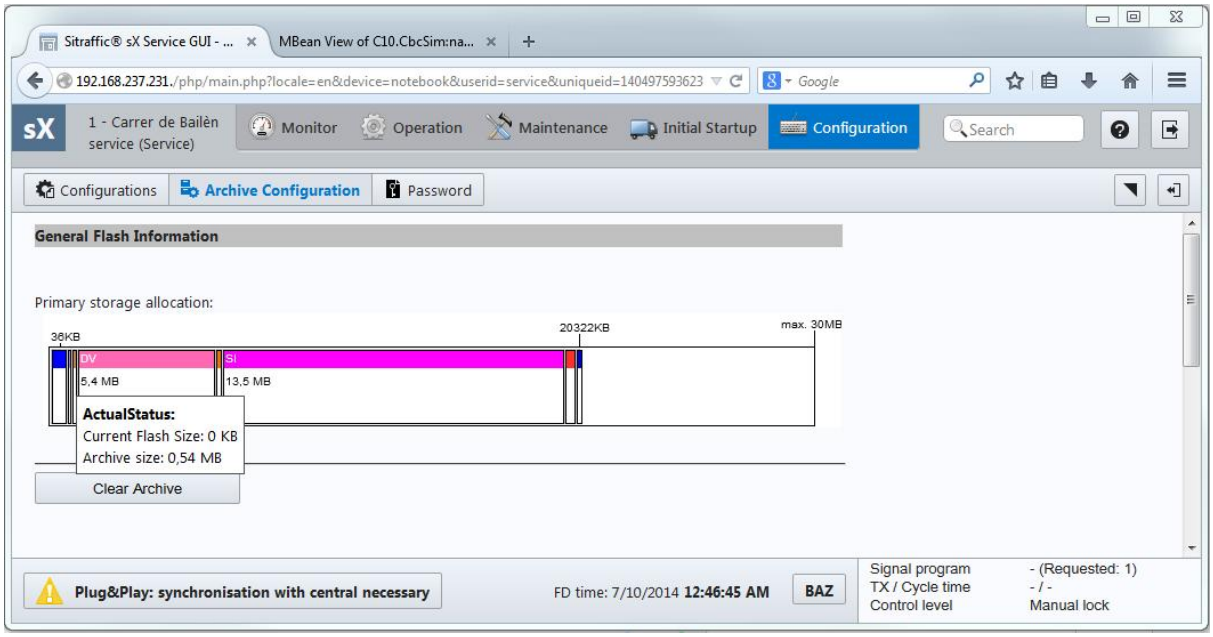


Fig. 87: Memory allocation

The memory allocation is indicated by colored bars.

4.8. Access using Mobile Devices

Due to the accessibility of the sX Service Tool via an HTML5 capable browser, the sX Control Unit can also be operated using mobile devices, such as tablets or smartphones – without requiring installation of additional smartphone apps. If you select the “Smartphone” option in the Mode field located on the start page of the web interface, the service tool will be displayed in a mobile view. (see Fig. 88).

Fig. 88: Smartphone Display

The mobile view contains

- an overview of the Operating State,
- the Overall Status of the clusters and
- the possibility of controlling the device using the virtual BAZ.

4.9. sX Web Interface Summary

This document has highlighted the fact that the HTML interface used to operate and control the sX System is as simple and convenient as the smartCore configuration utility. The most important properties and functions of the web interface are summarized in the following:

- No additional software is required for the service and operating tool.
- The application can be opened using an HTML5 capable Browser - from a PC, tablet or smartphone.
- The connection to the sX Control Unit is established via LAN or WLAN.
- The "Observer", "Operator" and "Service" User Roles provide different functions.
- The Topology, the Signal Programs and the Operating Status are displayed in the "Monitor" context in real-time.
- Detectors can be assigned in a manual or cyclical manner for simulation purposes.
- Past Errors and System Events can be examined using the Archive and sorted by clusters.
- The Virtual BAZ is used to directly control, activate and deactivate the sX Unit from the web interface.
- Signal Programs and Switching Points as well as other not safety-relevant Parameters can be directly adjusted and modified using the "Operation" context.
- Firmware-Updates can be performed using the "Maintenance" context without requiring the control unit to be restarted.
- Plug&Play can be used to connect Sitraffic sX to control centers for a quick commissioning and startup of the system and prevention of any data supply (data entry) errors.
- Signal Monitoring Tests can be performed directly from the web interface.
- Configuration Files can directly be uploaded to the control unit and archived there.

5. List of Abbreviations

Abbreviation	Name	Description
	Auxiliary Power Unit	Power supply for the lamp switch logics
BAZ	Display and command unit	User interface on the control unit
C10	Controller10	Development name for the sX system
CBC	C10 Base Controller	Processor module with real-time operating system used to process time-critical OMC interfaces
CBU	C10 Base Controller Unit	Carrier board for the processor modules used for device controlling and signal monitoring
CCUE	C10 Clock Unit (GPS), external	External GPS receiver
CDBH	C 10 Power Distribution Backplane	Backplane for lamp switches
CHX	C10 Phase Bus Monitor extended (C10 PHX)	Signal monitoring processor 1 used to control and monitor the signal heads
CIAB	C10 I/O 230V AC Backplane	Backplane for CIAC modules
CIAC	C10 I/O AC 24V/230V	High Power I/O module with 8 inputs and outputs
CIE	C10 IO Board + Ethernet	Low Power I/O module with 6 inputs and outputs and additional Ethernet connection
CIO	C10 IO Board	Low Power I/O module with 6 inputs and outputs
CLA	C10 Loop Adapter	Connection module for CLB modules in the expansion frame
CLB	C10 Loop Detector Backplane	Backplane for IO modules and detectors
CMU	C10 Monitoring Unit	Signal monitoring processor 2 used to monitor the functioning of signal monitoring processor 1
CPA	C10 Power Distribution Adapter	Connection module for lamp switches in the expansion frame

CTB	C10 Terminal Board	Backplane for female connectors with IOs of the CBU
CPDH	C10 Power Distribution High Voltage	Power distribution for up to four LSHS 230V lamp switches
I/O	Input/Output	Input and output, for example for detectors, acknowledgment devices, acoustic signals for the visually impaired
JAUT (scheduler)	12 month automatic routine	Automatic signal program in accordance with weekly and daily plans
LSHS	Lamp Switch 230V serial	Lamp switch for 230V signal heads
OMC	Outstation Main Controller	Main processor
SLD4	Loop detector for 4 loops	Module for loops
TEB	Driver for external operating unit	Module used to connect an external BAZ or GPS receiver

6. Index

T

W

Further information
is provided by:

Siemens AG
Infrastructure and Cities Sector
Mobility and Logistics Division
Road and City Mobility

Otto - Hahn - Ring 6
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The information in this manual contains descriptions and features which can change due to the development of products. The desired features are only binding if they were agreed upon conclusion of the contract.

Order no. A24730-A890-B009

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