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Deliverable D.1.3 – Functional Interfaces Definition Document

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Section 1 – Executive Summary

The objective of the work package D1 is to establish the guidelines and environment in which the functional requirements will be created and expressed. This report which is linked to the task D.1.3 should indicate the functional interfaces around the interlocking system and thus indicate the environment and the functional boundaries to the system. These functional interfaces are derived from the functional requirements database for interlocking systems and the UML interlocking model. The nature of these interfaces is purely functional, therefore describing only information required for the interlocking system to function as defined by its functional requirements.

Section 2 – Introduction

The objective of the work package D1 is to establish the guidelines and environment in which the functional requirements will be created and expressed. Task D.1.3 should indicate the functional interfaces around the interlocking system and thus indicate the environment and the functional boundaries to the system. It is important to note that the nature of these interfaces is purely functional, therefore describing only information required for the interlocking system to function as defined by its functional requirements.

The methodology used to investigate the functional interfaces relies on the Euro-Interlocking DOORS functional requirements database and on the existing Euro-Interlocking UML interlocking system model.

In the database of functional requirements for interlocking systems, the following functional interfaces will be identified:

1. all inputs to the interlocking system requesting an action from an actor (commands)
2. all inputs to the interlocking system providing information about the external elements or devices (detected values)
3. all outputs from the interlocking system providing information about the operation of the interlocking system or its elements (statuses)
4. all outputs from the interlocking system to drive the external elements or devices (driving values)

The database contains separate modules describing commands, statuses, detected and driving values. Each command, status, detected and driving value object will be linked to its related functional requirements in the other functional requirements modules. This process will allocate the functionality of the interlocking system to each value of the functional interface.

The same identification of functional interfaces will be done in a second part with the UML interlocking system model which was derived from the requirements database.

Section 3 – Functional interface definition document

1. Functional interfaces derived from the requirements database.

The objective of the work package D1 of the INESS project is to establish the guidelines and environment in which the functional requirements will be created and expressed. The starting point of this work package is what was previously developed in the framework of the Euro-Interlocking project, and one of the main parts of this 'preliminary' work is a database of functional requirements for interlocking systems which has been set after a close cooperation between UIC and several railways.

The aim of the task D.1.3 is to indicate the functional interfaces around the interlocking system. It is important to note that the nature of these interfaces is purely functional, therefore describing only information required for the interlocking system to function as defined by its functional requirements. In order to indicate these functional interfaces, the first step is to describe how the database of requirements is structured and how all its functionalities are used to define the interfaces (part 1.1). Then, you will find four different parts describing the interfaces with the various actors (from part 1.2 to part 1.5).

1.1 Process for obtaining the functional interfaces from the functional requirements database.

1.1.1 Presentation of the requirements management tool.

This database uses the requirements management tool Telelogic DOORS which is an environment for textual requirements expression. It is designed to capture, link, trace, analyze and manage a wide range of information required to provide solutions in complex projects.

The requirements and related information are stored in a central database in DOORS. The information in the database is stored in modules and can be organized using folders and projects. The projects are a special kind of folder that contains all the data for a particular project. The information

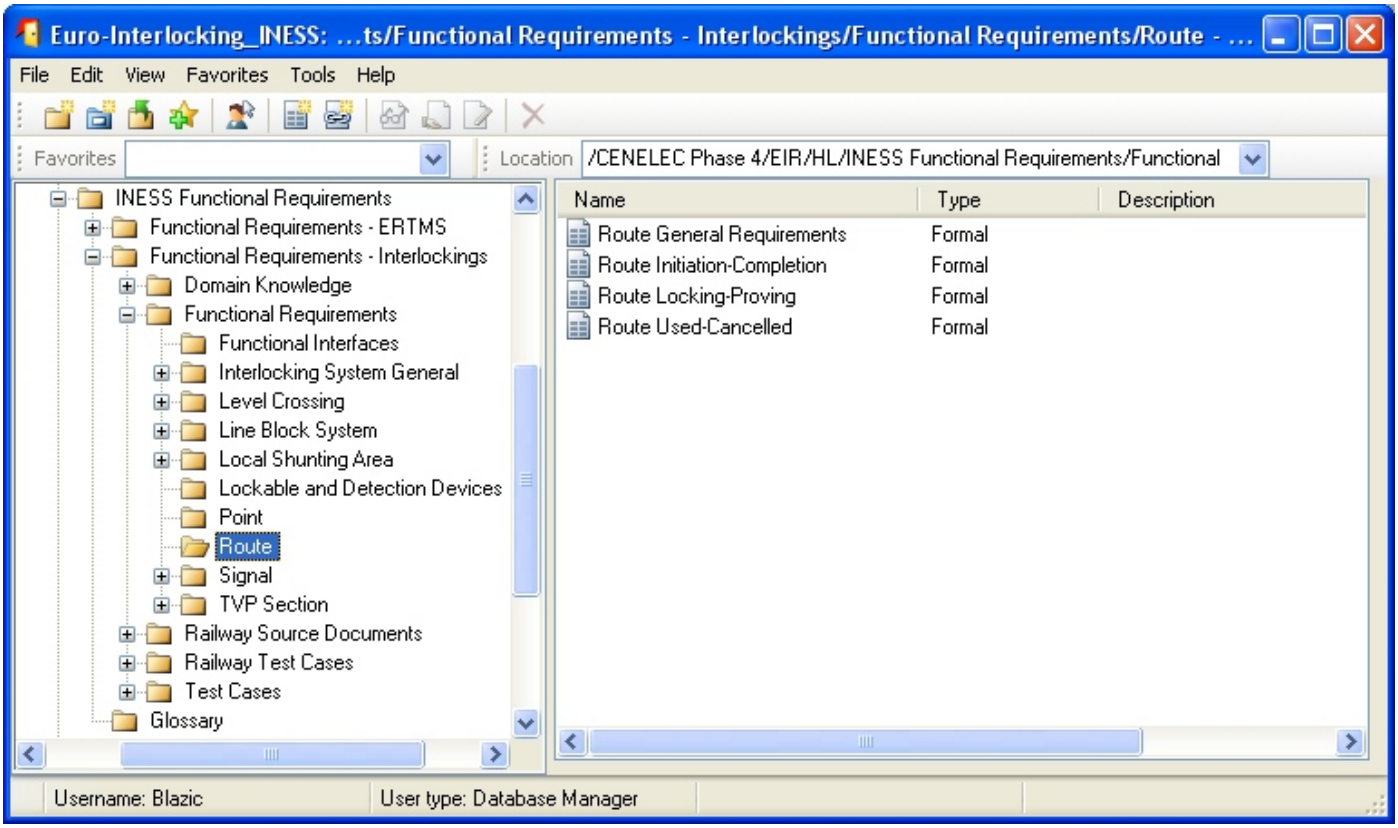
within each module is divided into objects and their attributes. An object may be a block of text, a graphic image or a table from another program. Each object has its own identifier, which does not change in the project lifetime.

The requirements stored in the database must be written in an understandable, uniform and structured manner. Such format enables clarity and comparison of the requirements. Important format issues are clear structure, uniform syntax and terminology used in developing the requirements.

1.1.2 Presentation of the requirements database.

In our case, the requirements database is structured to enable the capturing of functional requirements for interlocking systems in a common way for all participating railways. Therefore the functional requirements form the major part of the database. The basic principle behind the database is that each requirement is an individual object with its properties described in attributes. All requirements are written in an atomized manner, minimizing the content as much as possible.

A high-level view of the database structure is displayed on the following diagram.



Functional requirements are located in the folder INESS Functional Requirements. This folder contains sub-folders containing functional requirements for ERTMS, functional requirements for conventional interlocking systems and the glossary.

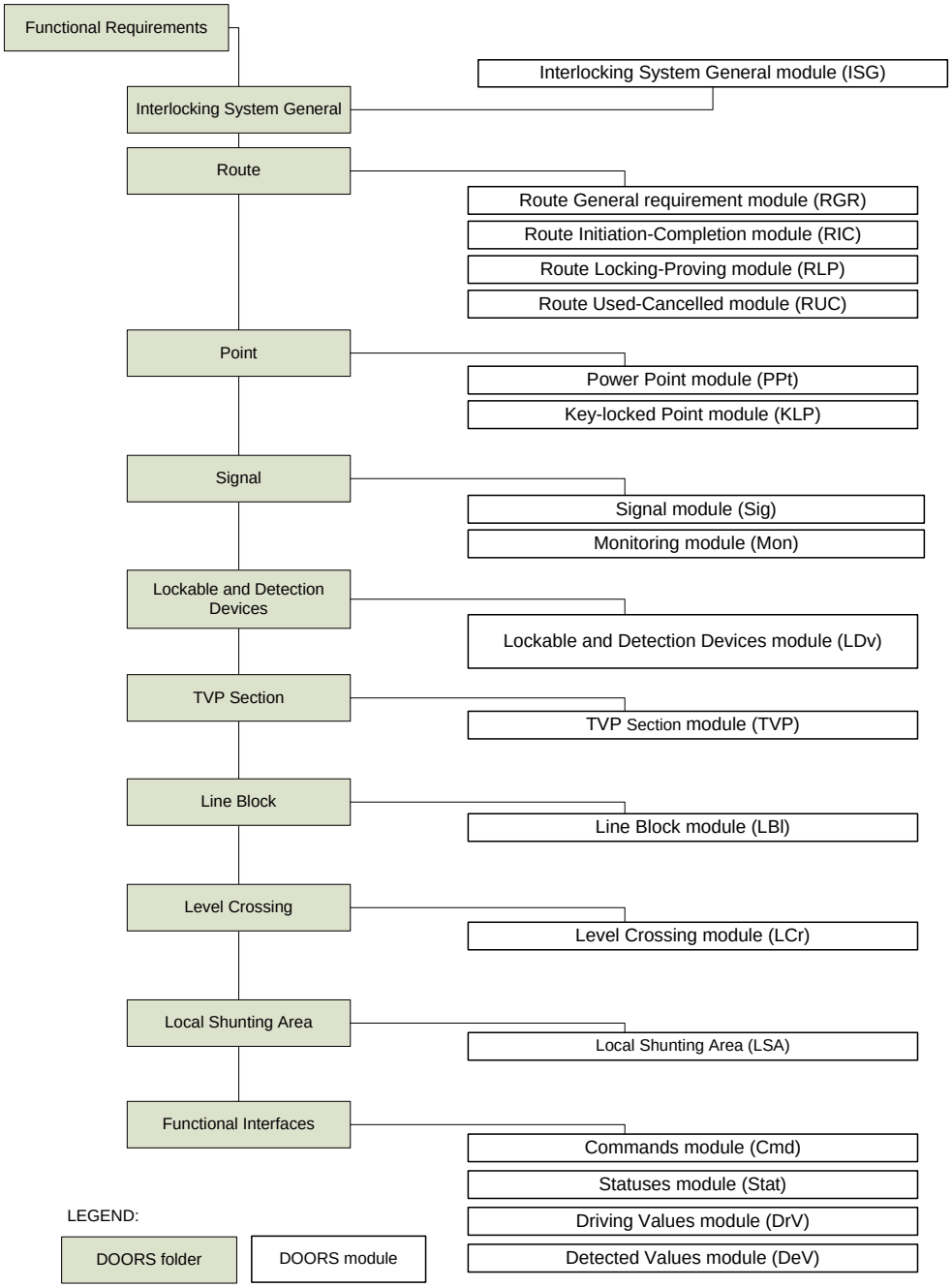
The folder Functional Requirements – ERTMS will contain ERTMS requirements corresponding to WP D3. The contents will be defined once the work package will start.

The folder Functional Requirements – Interlockings will contain interlocking system functional requirements corresponding to WP D2. The folder consists of sub-folders representing the domain knowledge and the functional requirements. The functional requirements are grouped by logical interlocking concepts in the following manner:

Folder	**Description**
Interlocking System General	General requirements describing Interlocking System start-up procedures, bordering issues, operation modes…
Route	Requirements for setting, locking and using routes
Point	Requirements regulating powered points (moveable elements) and key locked points (moveable elements)
Signal	Requirements regulating signals and monitoring
Lockable and Detection Devices	Requirements regulating miscellaneous lockable and detection devices such as bridges, gates, slide detectors…
TVP Section	Requirements regulating TVP systems, including track circuit and axle counting types
Line Block	Requirements regulating line block systems
Level Crossing	Requirements describing the functionality of level crossings from the perspective of the interlocking system
Local Shunting Area	Requirements describing the local shunting area
Functional Interfaces	Requirements for handling commands, statuses, driving values, detected values

A detailed overview of the structure of *Functional Requirements* folder is displayed on the following diagram.

FUNCTIONAL REQUIREMENTS FOLDER STRUCTURE

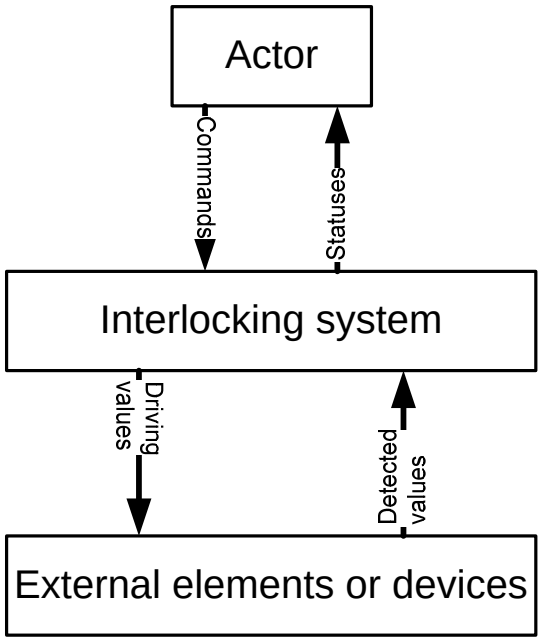


Among these requirements modules, four of them are particularly interesting for this deliverable: the modules which are part of the “Functional Interfaces” folder. The information they contain is exactly what compose the functional interfaces. You will find below the names of these modules with their description:

- “Commands”: all inputs to the interlocking system requesting an action from an actor.
- “Statuses”: all outputs from the interlocking system providing information about the operation of the interlocking system or its elements.

- "Detected values": all inputs to the interlocking system providing information about the external elements or devices.
- "Driving values": all outputs from the interlocking system to drive the external elements or devices.

The diagram below summarizes the interactions between the interlocking system and the different actors.



In addition of all these modules of requirements, links modules have been created: one link module has been associated to each module in the folder "Functional Interfaces". In our case, 4 links modules have been created in this respect: "Commands", "Statuses", "Driving Values" and "Detected Values".

Each link module contains different linksets: a linkset is used to define which two modules can be linked together. A linkset defines a formal module pair between which links can exist. If we consider the example of the links module "Commands", it is composed of 14 linksets which contain all the links created between a requirement from a requirements module "Commands" and a requirement in one of the 14 requirements modules in the database (there are 18 modules in total but there is no link from one of the four functional interfaces requirements module to a requirement of one of them).

The aim of the links in DOORS is to link two or more objects that have a relationship with each other. When two objects are linked, it is because they are related to each other.

In our database, link modules have been created for the functional interfaces requirements modules only. All the commands / statuses / detected values / driving values listed in these modules are linked to the explanation of the functionality of the interlocking system. It enables us to know exactly which of these relations are really used, by which countries, and to define which interfaces can be defined by country, and thus to define kind of common interface.

1.1.3 Methodology used to obtain the functional interfaces.

In the following parts below, you will find the result of the study done on the functional interfaces. From the database previously set, the first step was to check which elements from the functional interfaces requirements modules were completely described in term of functionality in the requirement database. Then the next step was to link each of these requirements to the instances of these concepts in the requirements database (actually in one of the 14 modules describes in the previous part). From this point it was easy to keep only the commands, statuses, detected or driving values completely defined, and then to export them in order to show how they were used.

In part 1.2, you will find the part related to the Commands module, divided in three columns. For each command (in the middle column), his unique ID number has been associated in the left column, and their instances in the other modules of requirements have been added in the right column. The commands which are in this table are well integrated and will be certainly a basis for the definition of a common functional interface between the external actors (signaller, shunter...) and the interlocking system.

By the same token you will find in part 1.3 what is linked to the Statuses the interlocking system send to different actors, in part 1.4 and 1.5 what is linked to the Detected and Driving Values (communications between the interlocking system and the external elements).

1.2 Commands

Cmd26	***1 Route***	
Cmd786	Acknowledge route	ISG199 •*a request 'Acknowledge route' is received from the signaller of the interlocking system which has not requested the route within a configured time following the route request* RIC340 •*part of the requested route is located in the area of the neighbouring signaller, and no request 'Acknowledge route' is received from that signaller within a configured time*
Cmd839	Set route blocking	ISG194 'Route blocking' shall be applied to a route if the request 'Set route blocking' is received from the maintainer.
Cmd840	Remove route blocking	ISG196 'Route blocking' shall be removed from the route if a request 'Remove route blocking' is received from the maintainer.
Cmd27	**1.1 Main route setting**	
Cmd28	Set main route	RGR243 •*a request 'Set main route' is received that includes more than one single main route between the requested route entry and exit signal* RGR273 •*a request 'Set main route' is received* RIC304 •*a request 'Set main route' is received for a route with the identical route body as the remaining locked route body of the previous route* Mon544 •*a request 'Set main route' is received from the signaller for the same route* Mon545 •*a request 'Set main route' is received from the signaller for the same route*
Cmd837	Set main route (ARS system)	RGR273 •*a request 'Set main route' is received*
Cmd31	Set main route, overlap 0	RGR277 •*a request 'Set main route, overlap 0' is received from the signaller*
Cmd33	Set warning route	RGR324 A 'warning' route shall be requested if a request 'Set warning route' is received from the signaller. RGR325 A 'warning' route shall be requested with a shorter overlap.
Cmd34	Set drive on sight route	RGR262

		A 'drive on sight' route shall be requested without an overlap. RGR294 •*a request 'Set drive on sight route' is received from the signaller* RIC56 •*none of the TVP sections permitted to be occupied for 'drive on sight' routes is 'occupied' if the request 'Set drive on sight route' was used* RIC232 •*a request 'Set drive on sight route' is received for a route with the identical route body as the remaining locked route body of the previous route* RIC342 •*a requested route body element is being used as a route body element of an opposing route unless the element is in the destination track of the requested route and the request 'Set drive on sight route' was used* RIC343 •*a requested route body element is being used as a route body element of another residual route unless the element is in the destination track of the requested route and the request 'Set drive on sight route' was used* RIC375 •*the requested route exit is being used as a main route entry signal and the request 'Set drive on sight route' is used* RIC399 •*a requested moveable element is 'blocked' in the incorrect position for the requested flank protection unless the request 'Set drive on sight route' was used* RIC401 •*a requested moveable element is being used in another route in the incorrect position for the requested flank protection unless the request 'Set drive on sight route' was used*
Cmd667	Set conditional route	RGR240 •*a request 'Set conditional route' is received from the signaller* RIC246 •*the request 'Set conditional route' has been used while none of the requested route elements has 'automatic route setting blocking' applied* RIC257 •*the requested route exit signal is 'dark', unless the request 'Set conditional route' has been used*
Cmd668	Set STS route	RGR170 An STS route shall be set if a request 'Set STS route' is received from the signaller.

Cmd682	Set route for freight train	RGR315 Sig493	•*a request 'Set route for freight train' is received from the signaller* •*the route is set as a main route with a 'Set route for freight train' request*
Cmd664	Set main route to non-electrified tracks	RGR274 RIC176	•*a request 'Set main route to non-electrified tracks' is received from the signaller* •*the requested route leads from electrified tracks to non-electrified tracks or dead power tracks, unless the request 'Set main route to non-electrified tracks' has been used*
Cmd734	Set main route to dark territory	RGR276	•*a request 'Set main route to dark territory' is received from the signaller*
Cmd735	Set composite main route	RGR244	•*a request 'Set composite main route' is received*
Cmd736	Set main route to key-locked point on the line	KLP214 RGR275 RIC186	•*a request 'Set main route to key-locked point on the line' was used to set the route into the line* •*a request 'Set main route to key-locked point on the line' is received from the signaller* •*enabling the release of the key-locked point on the line upon the occupation of its associated TVP section, if the request 'Set main route to key-locked point on the line' has been used*
Cmd813	Set main route from key-locked point on the line	KLP281 KLP289 RGR328	•*a request 'Set main route from key-locked point on the line' is received from the signaller* •*a release delay timer expired after the request 'Set main route from key-locked point on the line' was received* •*a request 'Set main route from key-locked point on the line' is received from the signaller*
Cmd802	Set main route with storing override	RGR304 RIC370	•*a request 'Set main route with storing override' is received from the signaller* •*a requested route element is stored in another conflicting route, unless a request 'Set main route with storing override' has been used*
Cmd822	Set main route without occupancy proving	RGR309	•*a request 'Set main route without occupancy proving' is received from the signaller*
Cmd55	**1.2 Shunting route setting**		

Cmd56	Set shunting route	RGR253	•*a request 'Set shunting route' is received from the signaller that includes more than one single shunting route between the requested route entry and exit signal*
		RGR278	•*a request 'Set shunting route' is received from the signaller*
		Mon137	•*a request 'Set shunting route' is received from the signaller for the same route*
Cmd662	Set shunting route with permission to override track blocking	RGR279	•*a request 'Set shunting route with permission to override track blocking' is received from the signaller*
		RIC224	•*a TVP section in the requested route body is 'track blocked' unless the request 'Set shunting route with permission to override track blocking' has been used*
Cmd665	Set shunting route to non-electrified tracks	RGR280	•*a request 'Set shunting route to non-electrified tracks' is received from the signaller*
		RIC221	•*the requested route leads from electrified tracks to non-electrified tracks or dead power tracks, unless the request 'Set shunting route to non-electrified tracks' has been used*
Cmd738	Set shunting route without level crossing activation	RGR281	•*a request 'Set shunting route without level crossing activation' is received from the signaller*
Cmd739	Set shunting route without occupancy proving	RGR73	•*a request 'Set shunting route without occupancy proving' is received from the signaller*
		RIC300	•*a requested TVP section is 'occupied', unless the request 'Set shunting route without occupancy proving' has been used*
		Mon526	•*all TVP sections in the route body required to be not 'occupied' by configuration are not 'occupied' unless the shunting route has been set with the request 'Set shunting route without occupancy proving'*
Cmd740	Set composite shunting route	RGR254	•*a request 'Set composite shunting route' is received from the signaller*
Cmd803	Set shunting route with storing override	RGR306	•*a request 'Set shunting route with storing override' is received from the signaller*
		RIC372	•*a requested route element is stored in another conflicting route unless a request 'Set shunting route with storing override' has been used*
Cmd838	Set call-on route	RGR326	

		A 'call-on' route shall be requested if a request 'Set call-on route' is received from the signaller.
Cmd878	Set maintenance route	RGR330 A maintenance route shall be requested if a request 'Set maintenance route' is received from the signaller.
Cmd43	**1.3 Route cancellation**	
Cmd44	Cancel route	RUC449 •*a request 'Cancel route' is received from the signaller* • RUC487 •*'Cancel route' from the signaller* RUC633 •*a request 'Cancel route' is received from the signaller* RUC661 •*a request 'Cancel route' is received from the signaller* RUC670 •*a request 'Cancel route' is received from the signallert* RUC687 •*a request 'Cancel route' is received from the signaller* RUC698 •*a request 'Cancel route' is received from the signaller* RUC855 A release delay timer shall be started if the request 'Cancel route' is received. RUC856 •*a request 'Cancel route' is received from the signaller* RUC857 A release delay timer shall be started if the request 'Cancel route' is received.
Cmd49	Cancel stored route	RIC120 •*a request 'Cancel stored route' is received from the signaller for the stored route*
Cmd51	Cancel residual route	RUC485 •*'Cancel residual route' from the signaller* RUC638 •*a request 'Cancel residual route' is received from the signaller* RUC682 •*a request 'Cancel residual route' is received from the signaller*
Cmd663	Emergency route cancel	RUC450 •*a request 'Emergency route cancel' is received from the signaller*

		RUC486 •*'Emergency route cancel' from the signaller* RUC804 •*a request 'Emergency route cancel' is received from the signaller* RUC816 •*a request 'Emergency route cancel' is received from the signaller* RUC819 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if the request 'Emergency route cancel' was used* RUC822 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if the request 'Emergency route cancel' was used* RUC846 •*a request 'Emergency route cancel' is received from the signaller* RUC847 A release delay timer shall be started if the request 'Emergency route cancel' was used.
Cmd824	Auxiliary route cancel	RUC814 •*'Auxiliary route cancel' from the signaller* RUC818 •*a request 'Auxiliary route cancel' is received from the signaller* RUC821 •*a request 'Auxiliary route cancel' is received from the signaller* RUC826 •*a request 'Auxiliary route cancel' is received from the signaller* RUC831 •*a request 'Auxiliary route cancel' is received from the signaller* RUC832 •*a request 'Auxiliary route cancel' is received from the signaller* RUC836 •*all TVP sections in the route body and overlap are not 'occupied' unless the request 'Auxiliary route cancel' was used* RUC837 •*all TVP sections in the route body and overlap are not 'occupied' unless the request 'Auxiliary route cancel' was used*

		RUC838 •*a request 'Auxiliary route cancel' is received from the signaller*
Cmd669	Cancel STS route	RUC217 An STS route cancellation shall be initiated if a request 'Cancel STS route' is received from the signaller. RUC294 •*'Cancel STS route' from the signaller*
Cmd67	***2 Local shunting area***	
Cmd69	Set local shunting area	LSA17 •*a request 'Set local shunting area' is received from the signaller*
Cmd70	Withdraw local shunting area	LSA116 •*a request 'Withdraw local shunting area' is received from the signaller* LSA160 •*a request 'Withdraw local shunting area' is received from the signaller* LSA194 A local shunting area returned from established to initiated shall be completely withdrawn if a request 'Withdraw local shunting area' from the signaller has been received.
Cmd647	Emergency set local shunting area	LSA18 •*a request 'Emergency set local shunting area' is received from the signaller* LSA91 •*a moveable element within the proposed local shunting area is 'blocked', unless the request 'Emergency set local shunting area' has been used to set the local shunting area* LSA92 •*a TVP section within the proposed local shunting area is 'track blocked', unless the request 'Emergency set local shunting area' has been used to set the local shunting area* LSA212 •*a moveable element within the proposed local shunting area has route blocking applied, unless the request 'Emergency set local shunting area' has been used to set the local shunting area*
Cmd648	Emergency withdraw local shunting area	LSA117 •*a request 'Emergency withdraw local shunting area' is received from the signaller*
Cmd687	Accept local shunting area	LSA188 •*a request 'Accept local shunting area' is received from the LPCP*
Cmd679	Return local shunting area	LSA115 •*a request 'Return local shunting area' is received from the LPCP*
Cmd835	Return local shunting area	LSA227 •*a request 'Return local shunting area' is received from the shunting signaller*
Cmd686	Block local shunting area	LSA184

		A local shunting area shall be 'blocked' if a request 'Block local shunting area' is received from the signaller.
Cmd825	Unblock local shunting area	LSA186 A local shunting area shall become not 'blocked' if a request 'Unblock local shunting area' is received from the signaller.
Cmd86	***3 Powered Moveable Elements***	
Cmd820	Set out of operation	PPt717 •*a request 'Set out of operation' is received from the signaller*
Cmd821	Remove element power	PPt719 The power supplied to the powered moveable element shall be removed if a request 'Remove element power' is received from the signaller.
Cmd823	Remove element power-all elements	PPt737 The power supplied to all powered moveable element shall be removed if a request 'Remove element power-all elements' is received from the signaller
Cmd88	**3.1 Movement**	
Cmd91	Move	PPt82 •*a 'Move' request is received from the signaller* PPt454 •*'Move' request from the signaller*
Cmd688	Move	PPt97 •*a 'Move' request is received from the LPCP* PPt456 •*'Move' request from an LPCP*
Cmd789	Move	PPt650 •*'Move' request from the maintainer* PPt660 •*a 'Move' request is received from the maintainer*
Cmd93	**3.2 Movement of occupied elements**	
Cmd96	Move occupied	PPt458 •*'Move occupied' request from the signaller* PPt465 •*a 'Move occupied' request is received from the signaller*
Cmd99	**3.3 Movement of trailed elements**	
Cmd102	Move trailed	PPt115 •*a 'Move trailed' request is received the signaller* PPt459 •*'Move trailed' request from the signaller* PPt693 If the powered moveable element moved with a 'Move trailed' request becomes 'detected', the element shall become 'blocked' in the detected position.
Cmd650	Remove trailing status	PPt298

		PPt303 •*a request 'Remove trailing status' is received from the signaller within 10 seconds after the element became 'detected'* •*a request 'Remove trailing status' is received from the maintainer within 10 seconds after the element became 'detected'* PPt731 •*a request 'Remove trailing status' is received from the signaller after the element became 'detected'*
Cmd116	**3.4 Blocking moveable elements**	
Cmd119	Set blocking	PPt557 •*a request 'Set blocking' is received from the signaller*
Cmd122	Remove blocking	PPt190 •*a request 'Remove blocking' is received from the signaller*
Cmd128	**3.5 Local element operation**	
Cmd129	Release to local operation	PPt181 •*a request 'Release to local operation' is not stored for the element* PPt201 •*a request 'Release to local operation' is received from the signaller* PPt672 •*a request 'Release to local operation' from the signaller*
Cmd815	Release to local operation	PPt663 •*a request 'Release to local operation' is received from the maintainer* PPt673 •*a request 'Release to local operation' from the maintainer*
Cmd816	Accept local operation	PPt702 •*a request 'Accept local operation' is received from the LPCP*
Cmd130	Withdraw from local operation	PPt266 •*a request 'Withdraw from local operation' is received from the signaller*
Cmd817	Return from local operation	PPt704 •*a request 'Return from local operation' is received from the LPCP*
Cmd819	Release for maintenance	PPt705 •*a request 'Release for maintenance' is received from the maintainer*
Cmd818	Accept release for maintenance	PPt706 •*a request 'Release for maintenance' is received from the signaller*
Cmd670	**3.6 Route blocking**	
Cmd671	Set ARS blocking on a powered moveable element	PPt590 •*a request 'Set ARS blocking on a powered moveable element' is received from the signaller*
Cmd672	Remove ARS blocking from a powered moveable element	PPt513 Blocking of automatic route setting shall be removed from a powered moveable element if a request 'Remove ARS blocking from a powered moveable element' is received from the signaller.
Cmd676	Set route blocking on a	PPt592

	powered moveable element	•*a request 'Set route blocking on a powered moveable element' is received from the signaller*
Cmd677	Remove route blocking from a powered moveable element	PPt519 Route blocking shall be removed from a powered moveable element if a request 'Remove route blocking from a powered moveable element' is received from the signaller.
Cmd136	***4 Key-locked Moveable Elements***	
Cmd137	Release key	KLP48 •*a request 'Release key' is received from the signaller* KLP238 •*a request 'Release key' is received from the signaller* KLP244 •*a request 'Release key' is received from the signaller*
Cmd138	Cancel key release	KLP145 •*a request 'Cancel key release' is received from the signaller while the corresponding key is still detected 'in place' before use* KLP192 •*a request 'Cancel key release' is received from the signaller*
Cmd744	Emergency release key	KLP256 •*a request 'Emergency release key' is received from the signaller*
Cmd701	**4.1 Blocking Elements**	
Cmd702	Set blocking	KLP204 •*a request 'Set blocking' is received from the signaller*
Cmd707	Remove blocking	KLP210 •*a request 'Remove blocking' is received from the signaller*
Cmd910	**4.2 Route Blocking**	
Cmd911	Set route blocking	KLP230 •*a request 'Set route blocking' is received from the signaller*
Cmd912	Remove route blocking	KLP233 Route blocking shall be removed from a point if a request 'Remove route blocking' is received from the signaller.
Cmd141	***5 Signal***	
Cmd142	**5.1 General**	
Cmd143	Set signal to stop	Sig73 A signal shall be set to a 'stop' aspect immediately if a request 'Set signal to stop' is received from the signaller.
Cmd656	Set all signals to stop	Sig74 All signals within the supervised area shall be set to 'stop' aspects immediately if a request 'Set all signals to stop' is received from the signaller.
Cmd654	Block signal	Sig42 •*a request 'Block signal' is received from the signaller*
Cmd829	Block all signals	Sig697 •*a request 'Block all signals' is received from the signaller and the signal is in the configured supervised area*
Cmd655	Unblock signal	Sig47 A signal shall become not 'blocked' if a request 'Unblock signal' is received from

		the signaller.
Cmd678	Reclear signal	Mon84 •*a request 'Reclear signal' is received from the signaller* Mon136 •*a request 'Reclear signal' is received from the signaller* Mon478 •*a request 'Reclear signal' is received from the signaller* Mon508 •*a request 'Reclear signal' is received from the signaller for the route entry signal* Mon514 •*a request 'Reclear signal' is received from the signaller for the route entry signal* Sig83 •*a request 'Reclear signal' is received from the signaller* Sig348 •*a request 'Reclear signal' is received from the signaller* Sig380 •*a request 'Reclear signal' is received from the signaller for the route entry signal* Sig423 •*a request 'Reclear signal' is received from the signaller, if the signal is in an 'automatic line block'* Sig460 •*the signal shall be upgraded if a request 'Reclear signal' is received from the signaller* Sig545 •*the signal shall display a 'drive on sight' aspect if a request 'Reclear signal' is received from the signaller*
Cmd149	**5.2 Main signal**	
Cmd657	Set signal to drive on sight	Sig107 •*a request 'Set signal to drive on sight' is received from the signaller*
Cmd681	Set signal to auxiliary	Sig434 •*a request 'Set signal to auxiliary' for the signal is received from the signaller*
Cmd790	Activate speed degradation	Sig593 Speed degradation on a signal shall be activated if a request 'Activate speed degradation' is received from the signaller.
Cmd792	Activate speed degradation	Sig175 Speed degradation on a signal shall be activated if a request 'Activate speed degradation' is received from the maintainer.

Cmd791	Deactivate speed degradation	Sig595 Speed degradation on a signal shall become not activated if a request 'Deactivate speed degradation' is received from the signaller.
Cmd793	Deactivate speed degradation	Sig594 Speed degradation on a signal shall become not activated if a request 'Deactivate speed degradation' is received from the maintainer.
Cmd150	**5.2.1 Automatic operation**	
Cmd151	Set signal to automatic oversetting mode	RIC307 •*a request 'Set signal to automatic oversetting mode' is received from the signaller for the route entry signal*
Cmd152	Cancel signal from automatic oversetting mode	RIC312 •*a request 'Cancel signal from automatic oversetting mode' is received from the signaller for the route entry signal*
Cmd172	**5.3 Shunting signal**	
Cmd750	Set signal to cancelled	Sig91 •*a request 'Set signal to cancelled' is received from the signaller* Sig232 •*a request 'Set signal to cancelled' is received from the signaller*
Cmd673	**5.4 Route blocking**	
Cmd674	Set ARS blocking on a signal	Sig371 •*a request 'Set ARS blocking on a signal' is received from the signaller* Sig499 •*the route entry signal, if the request 'Set ARS blocking on a signal' was used* Sig626 •*the block signal protecting a block section, if the request 'Set ARS blocking on a signal' was used*
Cmd811	Set ARS blocking on a route exit signal	Sig500 •*the route exit signal, if the request 'Set ARS blocking on a route exit signal' was used* Sig633 •*a request 'Set ARS blocking on a route exit signal' is received from the signaller*
Cmd675	Remove ARS blocking from a signal	Sig359 Blocking of automatic route setting shall be removed from a signal if a request 'Remove ARS blocking from a signal' is received from the signaller.
Cmd826	Remove ARS blocking from a route exit signal	Sig719 Blocking of automatic route setting shall be removed from a route exit signal if a request 'Remove ARS blocking from a route exit signal' is received from the signaller.
Cmd153	Set ARS blocking on all signals	Sig623 •*a request 'Set ARS blocking on all signals' is received from the signaller*
Cmd683	Set route blocking on a signal	Sig375 •*a request 'Set route blocking on a signal' is received from the signaller*

		Sig639 •*the route entry signal, if the request 'Set route blocking on a signal' was used*
Cmd812	Set route blocking on a route exit signal	Sig637 •*a request 'Set route blocking on a route exit signal' is received from the signaller* Sig640 •*the route exit signal*, *if the request 'Set route blocking on a route exit signal' was used*
Cmd684	Remove route blocking from a signal	Sig365 Route blocking shall be removed from a signal if a request 'Remove route blocking from a signal' is received from the signaller.
Cmd827	Remove route blocking from a route exit signal	Sig720 Route blocking shall be removed from a route exit signal if a request 'Remove route blocking from a route exit signal' is received from the signaller.
Cmd182	***6 TVP section***	
Cmd796	TVP section override	TVP132 A TVP section shall be 'overridden' if the request 'TVP section override' is received from the signaller.
Cmd801	Set diamond crossing direction	TVP126 •*a request 'Set diamond crossing direction' is received from the signaller for that branch*
Cmd804	Set diamond crossing direction	TVP128 •*a request 'Set diamond crossing direction' is received from the maintainer for that branch*
Cmd183	**6.1 Route Blocking on a TVP section**	
Cmd184	Set route blocking on a TVP	TVP36 •*a request 'Set route blocking on a TVP' is received from the signaller*
Cmd185	Remove route blocking from a TVP	TVP41 'Track blocking' shall be removed from a TVP section if a request 'Remove route blocking from a TVP' is received from the signaller.
Cmd188	**6.2 Axle counters**	
Cmd190	Reset of an axle counting TVP section	TVP89 •*a request 'Reset of an axle counting TVP section' is received from the signaller*
Cmd805	Reset acknowledge	TVP115 •*a request 'Reset acknowledge' is received from the signaller after the TVP section became not' occupied'*
Cmd196	***7 Line block***	
Cmd198	Reverse travel direction	LBl74 •*a request 'Reverse travel direction' received from the signaller* LBl210 •*a request 'Reverse travel direction' has been used* LBl236 •*a request 'Reverse travel direction' received from the signaller, if the line block type is consecutive route line block*

		LBI237 •*a request 'Reverse travel direction' has been used, if the line block type is consecutive route line block*
Cmd834	Emergency reverse travel direction	LBI209 •*a request 'Emergency reverse travel direction' received from the signaller* LBI214 If a request 'Emergency reverse travel direction' has been used: LBI218 The line block travel direction shall be changed following an 'Emergency reverse travel direction' request if all the following conditions are satisfied: LBI219 •*a request 'Emergency reverse travel direction' has been used* LBI267 •*a request 'Emergency reverse travel direction' has been used* LBI268 •*changing the block travel direction to inbound of the station requesting the change, if a request 'Emergency reverse travel direction' has been used* LBI280 A request 'Emergency reverse travel direction' shall be rejected if the block travel direction is not inbound to the station requesting the change.
Cmd831	Set travel direction to neutral	LBI234 •*a request 'Set travel direction to neutral' received from the signaller, if the line block type is automatic line block* LBI238 •*a request 'Set travel direction to neutral' has been used, if the line block type is automatic line block* • LBI245 •*changing the block travel direction to neutral, if a request 'Set travel direction to neutral' has been used*
Cmd697	Permit travel direction reversal	LBI149 •*an acknowledgement 'Permit travel direction reversal' is received from the signaller of the opposing station, if the changing of the block travel direction was requested from a signaller* LBI180 •*changing of the block travel direction is 'blocked' and an acknowledgement 'Permit travel direction reversal' is received from the signaller of the opposing station* LBI213

		•*an acknowledgement 'Permit travel direction reversal' is received from the signaller of the opposing station if the interlocking system is operated in 'local' mode* LBl270 If the acknowledgement 'Permit travel direction reversal' is not received from the signaller of the opposing station while the acknowledgement timer is running:
Cmd754	Travel direction blocking	LBl169 •*a request 'Travel direction blocking' is received from the signaller*
Cmd795	Travel direction unblocking	LBl172 The block travel direction shall become not 'blocked' if a request 'Travel direction unblocking' is received from the signaller.
Cmd666	Line block override	LBl138 The 'signalling conditions' for a signal protecting a block section shall be overridden if a request 'Line block override' is received from the signaller.
Cmd696	Reset line block	LBl140 •*a request 'Reset line block' is received from the signaller*
Cmd755	Reset TVP sequence	LBl161 •*a request 'Reset TVP sequence' is received from the signaller*
Cmd797	Set route blocking to the line	LBl265 •*a request 'Set route blocking to the line' is received from the signaller*
Cmd798	Remove route blocking to the line	LBl189 Route blocking shall be removed from the line block if a request 'Remove route blocking to the line' is received from the signaller.
Cmd808	Telephone block request	Sig604 •*a request 'Telephone block request' is received from the signaller*
Cmd235	***8 Level crossing***	
Cmd756	**8.1 Individual Track**	
Cmd770	Request activation-individual track	LCr311 •*a request 'Request activation-individual track' is received from the signaller* LCr737 •*a request 'Request activation-individual track' is received from the signaller*
Cmd244	Maintain activation after first train-individual track	LCr767 •*a request 'Maintain activation after first train-individual track' is received from the signaller for the applicable track*
Cmd773	Request deactivation-individual track	LCr425 •*a request 'Request deactivation-individual track' is received from the signaller for the applicable track*
Cmd776	Auxiliary deactivation-individual track	LCr574 •*a request 'Auxiliary deactivation-individual track' is received from the signaller* LCr733 •*a request 'Auxiliary deactivation-individual track' is received from the signaller*
Cmd814	Permit deactivation by vehicle detection-individual track	LCr772 •*a request 'Permit deactivation by vehicle detection-individual track' was received from the signaller if the activation request was a manual activation request*

Cmd787	Remove auxiliary deactivation-individual track	LCr735 •*a request 'Remove auxiliary deactivation-individual track' is received from the signaller*
Cmd757	**8.2 All Tracks**	
Cmd771	Request activation-all tracks	LCr535 •*a request 'Request activation-all tracks' is received from the signaller*
Cmd772	Request activation-all tracks	LCr537 •*a request 'Request activation-all tracks' is received from the local level crossing operator* LCr713 •*a request 'Request activation-all tracks' from the local level crossing operator is present*
Cmd774	Request deactivation-all tracks	LCr553 •*a request 'Request deactivation-all tracks' is received from the signaller*
Cmd775	Request deactivation-all tracks	LCr559 •*a request 'Request deactivation-all tracks' is received from the local level crossing operator*
Cmd828	Auxiliary deactivation-all tracks	LCr789 All protecting signals of the level crossing shall be set to display a 'stop' aspect if a request 'Auxiliary deactivation-all tracks' is received from the signaller. LCr791 •*a request 'Auxiliary deactivation-all tracks' is received from the signaller* LCr793 •*when a request 'Auxiliary deactivation-all tracks' is received from the signaller*
Cmd236	**8.3 Other Level Crossing Commands**	
Cmd777	Disable level crossing	LCr583 •*a request 'Disable level crossing' is received from the signaller*
Cmd778	Enable level crossing	LCr591 •*a request 'Enable level crossing' is received from the signaller*
Cmd783	Override failed critical state	LCr619 •*a request 'Override failed critical state' is received from the signaller*
Cmd649	***9 Lockable devices***	
Cmd698	Release lockable device	LDv137 •*a request 'Release lockable device' is received from the signaller* LDv141 •*a request 'Release lockable device' is received from the signaller*
Cmd699	Cancel lockable device release	LDv147 •*a request 'Cancel lockable device release' is received from the signaller*
Cmd779	Return lockable device	LDv148 •*a request 'Return lockable device' is received from the device operator*
Cmd832	Open tunnel gate	LDv196

		•*a request 'Open tunnel gate' is received from the signaller*
Cmd833	Close tunnel gate	LDv199 •*a request 'Close tunnel gate' is received from the signaller*
Cmd782	**9.1 Blocking Lockable Devices**	
Cmd780	Set blocking	LDv167 •*a request 'Set blocking' is received from the signaller*
Cmd781	Remove blocking	LDv160 A lockable device shall become not 'blocked' if a request 'Remove blocking' is received from the signaller.
Cmd284	***10 Other Commands***	
Cmd285	**10.1 Interlocking System Control Mode**	
Cmd809	Give control to maintainer	ISG163 The maintainer shall be enabled to operate the interlocking system if a request 'Give control to maintainer' is received from the signaller.
Cmd810	Take control from maintainer	ISG165 The maintainer shall be disabled to operate the interlocking system if a request 'Take control from maintainer' is received from the signaller.
Cmd711	**10.2 Automatic Point Operation**	
Cmd709	Disable automatic operation of moveable elements	PPt540 'Automatic operation' shall be disabled if a request 'Disable automatic operation of moveable elements' is received from the signaller.
Cmd710	Enable automatic operation of moveable elements	PPt543 'Automatic operation' shall be restored if a request 'Enable automatic operation of moveable elements' is received from the signaller.
Cmd751	**10.3 Signal Intensity Level**	
Cmd253	Signal intensity level-day	ISG105 The light intensity level of a signal or a group of signals shall be changed to 'day' settings if a request 'Signal intensity level-day' is received from the signaller.
Cmd254	Signal intensity level-night	ISG106 The light intensity level of a signal or a group of signals shall be changed to 'night' settings if a request 'Signal intensity level-night' is received from the signaller.
Cmd700	Signal intensity-automatic mode	ISG107 The light intensity level of a signal or a group of signals shall be changed automatically if a request 'Signal intensity-automatic mode' is received from the signaller.
Cmd752	Signal intensity-manual mode	ISG109 The light intensity level of a signal or a group of signals shall be changed manually by the signaller if a request 'Signal intensity-manual mode' is received from the signaller.
Cmd758	**10.4 Element Heating**	
Cmd766	Point heating-automatic mode	ISG151 The heating of a point or a group of points shall be switched automatically if a request 'Point heating-automatic mode' is received from the signaller.
Cmd767	Point heating-manual mode	ISG150 If a request 'Point heating-manual mode' is received from the signaller:
Cmd768	Point heating-off mode	ISG152

		The heating of a point or a group of points shall be switched off if a request 'Point heating-off mode' is received from the signaller.
Cmd799	Signal heating-manual mode	ISG157 The heating of a signal or a group of signals shall be switched on if a request 'Signal heating-manual mode' is received from the signaller.
Cmd800	Signal heating-off mode	ISG158 The heating of a signal or a group of signals shall be switched off if a request 'Signal heating-off mode' is received from the signaller.
Cmd764	**10.5 Lighting Control**	
Cmd759	Lighting on	ISG161 The yard lighting of a station or part of a station shall be switched on if a request 'Lighting on' is received from the signaller.
Cmd765	Lighting off	ISG162 The yard lighting of a station or part of a station shall be switched off if a request 'Lighting off' is received from the signaller.

1.3 Statuses

Stat21-Com	***1 Route***	
Stat24-Req	Route cancellation timing	RUC107 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if the route is configured to always release after the delay timer* RUC423 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if the approach zone of the route is 'occupied'* RUC424 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if there is no TVP section in rear of the route entry signal* RUC647 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect* RUC819 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if the request 'Emergency route cancel' was used* RUC822 •*starting the release delay timer when the route entry signal is displaying a 'stop' aspect, if the request 'Emergency route cancel' was used* RUC843 •*starting the release delay timer*
Stat363-Req	Residual route cancellation timing	RUC672 •*starting the residual release delay timer when the route entry signal is displaying a 'stop' aspect* RUC690 •*starting the residual release delay timer*
Stat364-Req	Approach zone occupied	RUC762 An approach zone shall be assigned as 'occupied' if:
Stat365-Req	Overlap release timing	RUC733 The overlap release timer shall be started if:
Stat366-Req	Route monitoring conditions failed	Mon18 If the main 'proceed' aspect monitoring conditions become disturbed:

		Mon492 If the 'drive on sight' aspect monitoring conditions become disturbed: Mon496 If the shunting 'proceed' aspect monitoring conditions become disturbed:
Stat423-Req	Route setting rejected	RIC150 If the route request is rejected, all elements of the route shall become available for use by other requests.
Stat429-Req	Entire route locked	RLP111 The entire route shall be assigned as 'locked' when:
Stat34-Com	***2 Local shunting area***	
Stat36-Req	Local shunting area not established	LSA61 An established local shunting area shall be withdrawn if:
Stat38-Req	Local shunting area established	LSA153 An initiated local shunting area shall be established when all the following conditions become satisfied:
Stat281-Req	Local shunting area monitoring failed	LSA44 If the monitoring conditions of an established local shunting area become disturbed:
Stat52-Com	***3 Moveable elements***	
Stat53-Com	**3.1 Powered Moveable Elements**	
Stat54-Com	**3.1.1 General**	
Stat55-Req	Detected right	PPt47 A powered moveable element shall be assigned as 'detected' if:
Stat56-Req	Detected left	PPt47 A powered moveable element shall be assigned as 'detected' if:
Stat323-Req	Detected on rail	PPt47 A powered moveable element shall be assigned as 'detected' if:
Stat324-Req	Detected off rail	PPt47 A powered moveable element shall be assigned as 'detected' if:
Stat57-Req	Not detected	PPt47 A powered moveable element shall be assigned as 'detected' if:
Stat60-Req	Trailed	PPt289 A powered moveable elements shall be assigned as 'trailed' if: PPt295 A powered moveable element shall become not 'trailed' if all the following conditions are satisfied: PPt300 A powered moveable element shall become not 'trailed' if all the following conditions are satisfied: PPt305

		A powered moveable element shall become not 'trailed' if all the following conditions are satisfied:
Stat65-Req	Blocked	PPt175 A powered moveable element shall be 'blocked' if all the following conditions are satisfied: PPt189 A powered moveable element shall become not 'blocked' if all the following conditions are satisfied: PPt693 If the powered moveable element moved with a 'Move trailed' request becomes 'detected', the element shall become 'blocked' in the detected position.
Stat80-Req	Failed	PPt19 If one of the coupled moveable elements is 'failed', all of the coupled moveable elements shall be assigned as 'failed'. PPt48 A powered moveable element shall be assigned as 'failed' if:
Stat74-Req	Released for local point operation	PPt200 A powered moveable element shall be released for 'local operation' if all the following conditions are satisfied: PPt265 A powered moveable element shall be withdrawn from 'local operation' if all the following conditions are satisfied: PPt676 A powered moveable element shall be released for 'local operation' by the mainainer if all the following conditions are satisfied:
Stat438-Req	Fouled	TVP63 •*points*
Stat69-Com	**3.1.2 Locking**	
Stat367-Req	Locked	RLP156 •*all moveable elements in the route*
Stat70-Req	Locked as part of a main route	RLP156 •*all moveable elements in the route*
Stat71-Req	Locked as part of a shunting route	RLP156 •*all moveable elements in the route*
Stat72-Req	Locked as part of an overlap	RLP156 •*all moveable elements in the route*
Stat73-Req	Locked as flank protection	RLP156 •*all moveable elements in the route*
Stat82-Com	**3.2 Key-locked Moveable Elements**	
Stat84-Req	Released	KLP47 A key-locked moveable element shall be 'released' if all the following conditions are satisfied:

		KLP106 A key-locked point on the line shall be 'released' for movements from the line to the side track if all the following conditions are satisfied: KLP147 A key-locked point on the line shall be 'released' for movements from the side track to the line if the following conditions are satisfied: KLP157 A key-locked point on the line shall be 'released' if all the following conditions are satisfied: KLP278 A key-locked point on the line shall be 'released' if the following conditions are satisfied:
Stat83-Req	Not released	KLP58 A 'released' key-locked moveable element shall become not 'released' if:
Stat85-Req	Key in place	KLP181 •*'in place' if the key is held in its key box*
Stat283-Req	Key not in place	KLP182 •*not 'in place' if the key is removed from its key box*
Stat284-Req	Detected right	KLP19 A key-locked moveable element shall be assigned as 'detected' in an end position if all the following conditions are satisfied:
Stat286-Req	Detected left	KLP19 A key-locked moveable element shall be assigned as 'detected' in an end position if all the following conditions are satisfied:
Stat331-Req	Detected on rail	KLP19 A key-locked moveable element shall be assigned as 'detected' in an end position if all the following conditions are satisfied:
Stat332-Req	Detected off rail	KLP19 A key-locked moveable element shall be assigned as 'detected' in an end position if all the following conditions are satisfied:
Stat285-Req	Not detected	KLP19 A key-locked moveable element shall be assigned as 'detected' in an end position if all the following conditions are satisfied:
Stat333-Req	Blocked	KLP203 A key-locked moveable element shall be 'blocked' if all the following conditions are satisfied: KLP209 A key-locked moveable element shall become not 'blocked' if all the following conditions are satisfied:
Stat89-Req	Failed	KLP28 A key-locked moveable element shall be assigned as 'failed' while the element is not released if:
Stat289-Com	**3.2.1 Locking**	

Stat369-Req	Locked	RLP156 •*all moveable elements in the route*
Stat290-Req	Locked as part of a main route	RLP156 •*all moveable elements in the route*
Stat291-Req	Locked as part of a shunting route	RLP156 •*all moveable elements in the route*
Stat292-Req	Locked as part of an overlap	RLP156 •*all moveable elements in the route*
Stat293-Req	Locked as flank protection	RLP156 •*all moveable elements in the route*
Stat370-Req	**3.2.2 Route blocking**	
Stat373-Req	Route blocked	KLP229 Route blocking shall be applied to a point if all the following conditions are satisfied: KLP233 Route blocking shall be removed from a point if a request 'Remove route blocking' is received from the signaller.
Stat91-Com	**3.3 Point handles**	
Stat93-Req	Point handle not in place	PPt345 The position of the point handle in a case for an assigned area shall be detected.
Stat94-Com	***4 Signal***	
Stat322-Req	Failed	Sig441 A signal shall be assigned as 'failed' if:
Stat303-Req	Dark	Sig56 A signal shall be assigned as 'dark' if:
Stat351-Req	Filament failure	Sig57 If the signal lamp is lit with an auxiliary element while the main element is defective, a status 'Filament failure' shall be generated.
Stat376-Req	Lamp failure	Sig574 If the signal lamp is defective, a status 'Lamp failure' shall be generated.
Stat426-Req	Failed lamp position	Sig335 If the signal lamp is defective, the lamp position information status shall be generated.
Stat95-Com	**4.1 Main signal**	
Stat298-Req	Proceed aspect	Sig137 A main signal shall display a 'proceed' aspect if:
Stat299-Req	Stop aspect	Sig133 A main signal shall display a 'stop' aspect unless:
Stat300-Req	Drive on sight aspect	Sig152 A main signal shall display a 'drive on sight' aspect if:
Stat337-Req	Cancelled aspect	Sig393 A main signal shall display a 'cancelled' aspect if:
Stat339-Req	Auxiliary aspect	Sig649 A main signal shall be set to display an 'auxiliary' aspect if:

Stat380-Req	Blocked	Sig41 A signal shall be 'blocked' if all the following conditions are satisfied: Sig47 A signal shall become not 'blocked' if a request 'Unblock signal' is received from the signaller.
Stat422-Req	All auxiliary aspects off	Sig586 While all 'auxiliary' aspects are not displayed, an indication 'All auxiliary aspects off' shall be indicated to the signaller.
Stat128-Com	**4.2 Shunting signal**	
Stat306-Req	Proceed aspect	Sig222 A shunting signal shall display a 'proceed' aspect if:
Stat307-Req	Stop aspect	Sig218 A shunting signal shall display a 'stop' aspect unless:
Stat308-Req	Proceed with caution aspect	Sig225 A shunting signal shall display a 'proceed with caution' aspect if:
Stat309-Req	Cancelled aspect	Sig229 A shunting signal shall display a 'cancelled' aspect if:
Stat381-Req	Blocked	Sig41 A signal shall be 'blocked' if all the following conditions are satisfied: Sig47 A signal shall become not 'blocked' if a request 'Unblock signal' is received from the signaller.
Stat379-Req	**4.3 Line Block Signal**	
Stat382-Req	Proceed aspect	Sig281 A block signal shall display a 'proceed' aspect if:
Stat383-Req	Stop aspect	Sig278 A block signal shall display a 'stop' aspect unless:
Stat385-Req	Signal set to stop by signaller	Sig73 A signal shall be set to a 'stop' aspect immediately if a request 'Set signal to stop' is received from the signaller.
Stat384-Req	Blocked	Sig41 A signal shall be 'blocked' if all the following conditions are satisfied: Sig47 A signal shall become not 'blocked' if a request 'Unblock signal' is received from the signaller.
Stat145-Com	**4.4 Other signals**	
Stat430-Req	Proceed with caution indicator on	Sig690 A proceed with caution indicator shall display an 'on' indication if:
Stat334-Req	**4.5 Route blocking-signals**	
Stat335-Req	ARS blocking on a signal	Sig360

		Blocking of automatic route setting shall be applied to a signal if the following conditions are satisfied:
Stat336-Req	Route blocking on a signal	Sig364 Route blocking shall be applied to a signal if the following conditions are satisfied:
Stat150-Com	***5 TVP section***	
Stat386-Req	No electrification on TVP section	TVP143 A TVP section without electrification shall be detected.
Stat151-Com	**5.1 Occupation**	
Stat152-Req	Not occupied	TVP16 •*not 'occupied' if there are no vehicles present on the TVP section*
Stat153-Req	Occupied	TVP57 A TVP section shall be assigned as 'occupied' if any of the following conditions are satisfied:
Stat154-Req	Failed	TVP43 A TVP section shall be assigned as 'failed' if a failure state is detected from the TVP section.
Stat340-Req	Blocked	TVP84 'Track blocking' shall be applied to a TVP section if all the following conditions are satisfied:
Stat155-Com	**5.2 Locking**	
Stat387-Req	Locked in a route	RLP154 •*all TVP sections in the route*
Stat157-Req	Locked as part of main route	RLP154 •*all TVP sections in the route*
Stat158-Req	Locked as part of shunting route	RLP154 •*all TVP sections in the route*
Stat159-Req	Locked as part of overlap	RLP154 •*all TVP sections in the route*
Stat435-Req	**5.3 Diamond Crossing**	
Stat436-Req	Branch of diamond crossing occupied	TVP117 While a TVP section associated with a diamond crossing is 'occupied', a branch of the diamond crossing shall be assigned as occupied if: TVP129 If one of the branches of the diamond crossing is not assigned as occupied while its associated TVP section is 'occupied', both branches shall be assigned as occupied.
Stat437-Req	Fouled	TVP64 •*diamond crossings*
Stat174-Com	***6 Line block***	
Stat176-Req	Direction inbound	LBl176 •*inbound*
Stat177-Req	Direction outbound	LBl175 •*outbound*

Stat180-Req	No direction (neutral)	LBl177 •*neutral* LBl263 •*neutral, if the line block type is automatic line block*
Stat183-Req	Request to change direction	LBl73 •*the setting of a route which requires the use of the line block* LBl74 •*a request 'Reverse travel direction' received from the signaller* LBl209 •*a request 'Emergency reverse travel direction' received from the signaller*
Stat198-Req	Line block out of sequence	LBl56 A TVP section in the line block shall be designated as 'out of sequence' if:
Stat390-Req	Failed	LBl152 A line block shall be assigned as 'failed' if any of the following conditions is satisfied:
Stat207-Com	***7 Level crossing***	
Stat421-Req	Level crossing not activated	LCr319 •*'activated' when the level crossing is activated* LCr750 •*level crossing not activated*
Stat343-Req	Level crossing activated	LCr319 •*'activated' when the level crossing is activated*
Stat392-Req	Activation request present from an activation zone	LCr674 An activation request shall be generated for the level crossing if: LCr683 An activation request shall be generated for a level crossing located in the overlap and not simultaneously in the route body if:
Stat393-Req	Manual request present for all tracks	LCr534 An activation request shall be generated for the level crossing for all tracks if:
Stat394-Req	Manual request present for all tracks from level crossing operator	LCr536 An activation request shall be generated for the level crossing for all tracks if: LCr713 •*a request 'Request activation-all tracks' from the local level crossing operator is present*
Stat397-Req	Manual request present for an individual track	LCr310 An activation request shall be generated for the level crossing for an individual track if:
Stat346-Req	Failed non-critical	LCr316 •*'failed non-critical' when a failure is present that would not endanger the road traffic*

Stat355-Req	Failed critical	LCr317	•*'failed critical' when a failure is present that could endanger the road traffic*
Stat354-Req	Level crossing secured	LCr315	•*'secured' when the level crossing is secured for the road traffic*
Stat396-Req	Level crossing activated by local switch	LCr749	•*level crossing activated by local switch*
Stat400-Req	Level crossing out of use	LCr712	•*level crossing detected out of use*
Stat401-Req	Backup power low	LCr625	•*backup power of the level crossing low*
Stat402-Req	Running on backup power	LCr578	•*level crossing operating on backup power*
Stat404-Req	Communication failure	LCr579	•*a communication failure with the level crossing*
Stat405-Req	Level crossing activated too long	LCr621	•*a level crossing activated longer than a configured time*
Stat215-Com	**7.1 Barriers**		
Stat216-Req	Barriers open	LCr709	•*barriers of the level crossing detected open*
Stat218-Req	Barriers closed	LCr624	•*barriers of the level crossing not detected closed*
		LCr710	•*barriers of the level crossing detected closed*
Stat399-Req	Barriers failed	LCr711	•*barriers of the level crossing detected failed*
Stat219-Com	**7.2 Warning lights**		
Stat221-Req	Warning lights on	LCr708	•*warning lights of the level crossing activated*
Stat398-Req	Warning lights disturbed	LCr622	•*warning lights of the level crossing disturbed*
Stat350-Req	Warning lights failed	LCr623	•*warning lights of the level crossing failed*
Stat315-Com	***8 Lockable and Detection Devices***		
Stat352-Req	**8.1 Detection Device**		
Stat317-Req	Device detected in position	LDv128	•*'in position' if the supervised position or status is detected*
Stat316-Req	Device not detected in position	LDv129	•*not 'in position' if the supervised position or status is not detected*
Stat353-Req	**8.2 Lockable Device**		
Stat356-Req	Device detected in position	LDv128	•*'in position' if the supervised position or status is detected*
		LDv192	•*'in position' if the open gate position is detected*
Stat357-Req	Device not detected in position	LDv129	

		•*not 'in position' if the supervised position or status is not detected* LDv190 •*not 'in position' if neither gate position is detected*
Stat318-Req	Device released	LDv47 A lockable device shall be 'released' if all of the following conditions are satisfied: LDv140 A lockable device located in a block section shall be 'released' if all of the following conditions are satisfied:
Stat319-Req	Device not released	LDv146 A 'released' lockable device shall become not 'released' if:
Stat360-Req	Device blocked	LDv158 A lockable device shall be 'blocked' if all the following conditions are satisfied: LDv160 A lockable device shall become not 'blocked' if a request 'Remove blocking' is received from the signaller.
Stat432-Req	Device detected closed	LDv193 •*'closed' if the closed gate position is detected*
Stat439-Req	Device failed	

1.4 Driving Values

DrV52-Com	***1 Moveable elements***	
DrV53-Com	**1.1 Powered Moveable Elements**	
DrV54-Com	**1.1.1 General**	
DrV55-Req	Move	PPt66 A powered moveable element shall be moved by 'automatic operation' if all the following conditions are satisfied: PPt81 A powered moveable element shall be moved by 'manual operation' if all the following conditions are satisfied: PPt96 A powered moveable element shall be moved by 'manual operation' from an LPCP if all the following conditions are satisfied: PPt114 A powered moveable element with a 'trailed' status shall be moved by 'manual operation' if all the following conditions are satisfied: PPt464 A powered moveable element with its associated TVP section 'occupied' shall be moved by 'manual operation' if all the following conditions are satisfied: PPt563 A powered moveable element shall be moved automatically to its configured default position if all the following conditions are satisfied: PPt659 A powered moveable element shall be moved by 'manual operation' from the maintainer if all the following conditions are satisfied:
DrV82-Com	**1.2 Key-locked Moveable Elements**	
DrV84-Req	Release	KLP47 A key-locked moveable element shall be 'released' if all the following conditions are satisfied: KLP106 A key-locked point on the line shall be 'released' for movements from the line to the side track if all the following conditions are satisfied: KLP147 A key-locked point on the line shall be 'released' for movements from

		the side track to the line if the following conditions are satisfied: KLP157 A key-locked point on the line shall be 'released' if all the following conditions are satisfied: KLP278 A key-locked point on the line shall be 'released' if the following conditions are satisfied:
DrV83-Req	Not release	KLP58 A 'released' key-locked moveable element shall become not 'released' if:
DrV94-Com	***2 Signal***	
DrV95-Com	**2.1 Main signal**	
DrV298-Req	Display proceed aspect	Sig137 A main signal shall display a 'proceed' aspect if: Sig445 •*the signal shall display the next more restrictive 'proceed' aspect if such an aspect is permitted* Sig461 •*the signal shall automatically display a 'proceed' aspect* Sig542 •*the main signal associated with the shunting signal shall automatically display a 'proceed' aspect when the shunting signal displays the 'proceed' aspect*
DrV299-Req	Display stop aspect	LCr658 A signal shall be maintained at a 'stop' aspect until its signal delay timer expires. LCr706 The route entry signal shall be maintained at a 'stop' aspect until its signal delay timer expires. LCr789 All protecting signals of the level crossing shall be set to display a 'stop' aspect if a request 'Auxiliary deactivation-all tracks' is received from the signaller. Sig63 •*the signal shall be set to a 'stop' aspect* Sig73 A signal shall be set to a 'stop' aspect immediately if a request 'Set signal to stop' is received from the signaller. Sig74

		All signals within the supervised area shall be set to 'stop' aspects immediately if a request 'Set all signals to stop' is received from the signaller. Sig77 If a sub-route signal in a main route is set to a 'stop' aspect by the signaller, all sub-route signals and the route entry signal of that route shall be set to a 'stop' aspect. Sig133 A main signal shall display a 'stop' aspect unless: Sig337 If a signal lamp of the 'expect stop' aspect becomes defective on a distant signal, the main signal in rear shall be set to a 'stop' aspect. Sig369 If a signal lamp of the 'cancelled' aspect becomes defective, the signal shall be set to a 'stop' aspect. Sig447 •*the main signal associated with the shunting signal shall be set to a 'stop' aspect* Sig449 •*the signal shall be set to a 'stop' aspect if more restrictive 'proceed' aspects are not available* Sig530 •*the signal shall be set to a 'stop' aspect* Sig544 •*the signal shall be maintained at a 'stop' aspect for the remainder of the route life cycle* Sig588 A main signal displaying an 'auxiliary' aspect shall set to a 'stop' aspect a route entry signal, if the signal displaying an 'auxiliary' aspect is:
DrV300-Req	Display drive on sight aspect	Sig152 A main signal shall display a 'drive on sight' aspect if: Sig545 •*the signal shall display a 'drive on sight' aspect if a request 'Reclear signal' is received from the signaller* Sig546 •*the signal shall automatically display a 'drive on sight' aspect*
DrV337-Req	Display cancelled aspect	Sig393

		A main signal shall display a 'cancelled' aspect if: Sig457 •*the signal shall automatically display a 'cancelled' aspect*
DrV339-Req	Display auxiliary aspect	Sig397 A main signal shall display an 'auxiliary' aspect if: Sig649 A main signal shall be set to display an 'auxiliary' aspect if:
DrV128-Com	**2.2 Shunting signal**	
DrV306-Req	Display proceed aspect	Sig222 A shunting signal shall display a 'proceed' aspect if: Sig461 •*the signal shall automatically display a 'proceed' aspect* Sig541 •*the shunting signal associated with the main signal shall automatically display a 'proceed' aspect when the main signal displays the 'proceed' aspect* Sig547 •*the shunting signal associated with the main signal shall automatically display a 'proceed' aspect*
DrV307-Req	Display stop aspect	LCr706 The route entry signal shall be maintained at a 'stop' aspect until its signal delay timer expires. LCr789 All protecting signals of the level crossing shall be set to display a 'stop' aspect if a request 'Auxiliary deactivation-all tracks' is received from the signaller. Sig68 •*the signal shall be set to a 'stop' aspect* Sig73 A signal shall be set to a 'stop' aspect immediately if a request 'Set signal to stop' is received from the signaller. Sig74 All signals within the supervised area shall be set to 'stop' aspects immediately if a request 'Set all signals to stop' is received from the signaller. Sig76 If the route entry signal of a main route is set to a 'stop' aspect by the

		signaller, all sub-route signals within that route shall be set to a 'stop' aspect. Sig77 If a sub-route signal in a main route is set to a 'stop' aspect by the signaller, all sub-route signals and the route entry signal of that route shall be set to a 'stop' aspect. Sig218 A shunting signal shall display a 'stop' aspect unless: Sig336 •*the shunting signal associated with the main signal shall be set to a 'stop' aspect* Sig369 If a signal lamp of the 'cancelled' aspect becomes defective, the signal shall be set to a 'stop' aspect. Sig531 •*the shunting signal associated with the main signal shall be set to a 'stop' aspect* Sig588 A main signal displaying an 'auxiliary' aspect shall set to a 'stop' aspect a route entry signal, if the signal displaying an 'auxiliary' aspect is:
DrV308-Req	Display proceed with caution aspect	Sig225 A shunting signal shall display a 'proceed with caution' aspect if:
DrV309-Req	Display cancelled aspect	Sig90 If a signal displaying a 'cancelled' aspect was set to a 'stop' aspect by the signaller, the signal shall be maintained at a 'stop' aspect unless all the following conditions are satisfied: Sig229 A shunting signal shall display a 'cancelled' aspect if: Sig457 •*the signal shall automatically display a 'cancelled' aspect*
DrV379-Req	**2.3 Line Block Signal**	
DrV382-Req	Display proceed aspect	Sig281 A block signal shall display a 'proceed' aspect if: Sig302 If a block signal was set to a 'stop' aspect by the signaller, the block signal shall be maintained at a 'stop' aspect unless the following conditions are satisfied:

		Sig534 •*the signal shall display the next more restrictive 'proceed' aspect if such an aspect is permitted* Sig682 •*the signal shall automatically display a 'proceed' aspect if the signal is a block signal*
DrV383-Req	Display stop aspect	LCr658 A signal shall be maintained at a 'stop' aspect until its signal delay timer expires. LBl87 •*setting the block signals opposing the requested block travel direction to a 'stop' aspect* LBl93 •*maintaining all block signals in the new block travel direction at a 'stop' aspect, if the line block type is route initiated line block* LBl134 A block signal shall be replaced to a 'stop' aspect by vehicle movement if: LBl243 •*setting the block signals opposing the requested block travel direction to a 'stop' aspect, if the line block is configured to set opposing block signals to a 'stop' aspect and the line block type is automatic line block* Sig73 A signal shall be set to a 'stop' aspect immediately if a request 'Set signal to stop' is received from the signaller. Sig278 A block signal shall display a 'stop' aspect unless: Sig535 •*the signal shall be set to a 'stop' aspect if more restrictive 'proceed' aspects are not available* Sig536 •*the signal shall be set to a 'stop' aspect*
DrV446-Req	Display drive on sight aspect	Sig561 A block signal protecting a block section with a key-locked point shall display a 'drive on sight' aspect if:
DrV441-Req	Display dark aspect	LBl206 •*setting the block signals opposing the requested block travel direction to a 'dark' aspect, if the line block type is automatic line block*

		LBl259 All block signals in a consecutive route line block type shall be set to display a 'dark' aspect if: LBl274 •*setting the block signals opposing the requested block travel direction to a 'dark' aspect except the last signal in the line block*
DrV436-Req	**2.4 Distant Signal**	
DrV438-Req	Display expect proceed aspect	Sig164 A distant signal shall display an 'expect proceed' aspect if: Sig539 •*the distant signal shall display the next more restrictive 'expect proceed' aspect if such an aspect is permitted*
DrV439-Req	Display expect stop aspect	Sig161 A distant signal shall display an 'expect stop' aspect if: Sig540 •*the distant signal shall be set to an 'expect stop' aspect if more restrictive 'expect proceed' aspects are not available* Sig598 •*the signal shall be set to an 'expect stop' aspect*
DrV440-Req	Display dark aspect	Sig157 •*be set to display 'dark' aspect*
DrV437-Req	**2.5 Signal Repeater**	
DrV443-Req	Display indicating proceed aspect	Sig173 A signal repeater shall indicate the appropriate aspect of:
DrV444-Req	Display indicating stop aspect	Sig173 A signal repeater shall indicate the appropriate aspect of:
DrV445-Req	Display indicating drive on sight aspect	Sig152 A main signal shall display a 'drive on sight' aspect if:
DrV145-Com	**2.6 Other signals**	
DrV149-Req	Display departure indicator on	Sig480 A departure indicator shall display an 'on' indication if:
DrV338-Req	Display departure indicator off	Sig482 A departure indicator shall display an 'off' indication if:
DrV427-Req	Indicator for tunnels - 'G' indication on	Sig491 An indicator for tunnels shall display a 'G' indication if:
DrV428-Req	Indicator for tunnels - 'X' indication on	Sig490 An indicator for tunnels shall display an 'X' indication if:
DrV433-Req	Display indicator for slopes - 'L' indication on	Sig487 An indicator for slopes shall display an 'L' indication if:
DrV434-Req	Display indicator for slopes - 'H' indication on	Sig488

		An indicator for slopes shall display an 'H' indication if:
DrV430-Req	Display proceed with caution indicator indication on	Sig690 A proceed with caution indicator shall display an 'on' indication if: Sig699 •*the associated indicators shall be set to an 'on' indication*
DrV459-Req	Display proceed with caution indicator indication off	Sig689 A proceed with caution indicator shall display an 'off' indication if: Sig698 •*the associated indicators shall be set to an 'off' indication*
DrV447-Req	Display route indicator indication on	Sig566 A route indicator shall display an 'on' indication if: Sig699 •*the associated indicators shall be set to an 'on' indication*
DrV448-Req	Display route indicator indication off	Sig564 A route indicator shall display an 'off' indication if: Sig698 •*the associated indicators shall be set to an 'off' indication*
DrV449-Req	Display insufficient braking distance indicator indication on	Sig656 An insufficient braking distance indicator shall display an 'on' indication if:
DrV450-Req	Display insufficient braking distance indicator indication off	Sig654 An insufficient braking distance indicator shall display an 'off' indication if:
DrV451-Req	Display distant insufficient braking distance indicator indication on	Sig663 A distant insufficient braking distance indicator shall display an 'on' indication if:
DrV452-Req	Display distant insufficient braking distance indicator indication off	Sig661 A distant insufficient braking distance indicator shall display an 'off' indication if:
DrV453-Req	Display undesignated track indicator indication on	Sig670 An undesignated track indicator shall display an 'on' indication if:
DrV454-Req	Display undesignated track indicator indication off	Sig668 An undesignated track indicator shall display an 'off' indication if:
DrV455-Req	Display stop aspect on track obstruction signal	Sig622 A track obstruction signal shall display a 'stop' aspect if the signal is being used as a main route exit signal.
DrV456-Req	Display no aspect on track obstruction signal	Sig620 A track obstruction signal shall be set to display no aspect if the signal is not used in a route.
DrV457-Req	Display staff crossing signal	Sig631

	indication on	A staff crossing signal shall display an 'on' indication if no routes are set over a staff crossing.
DrV458-Req	Display staff crossing signal indication off	Sig630 A staff crossing signal shall display an 'off' indication if a route is set over a staff crossing.
DrV460-Req	Display position indicator indication on	Sig699 •*the associated indicators shall be set to an 'on' indication* Sig702 A position indicator shall display an 'on' indication if:
DrV461-Req	Display position indicator indication off	Sig698 •*the associated indicators shall be set to an 'off' indication* Sig707 A position indicator shall display an 'off' indication if:
DrV150-Com	***3 TVP section***	
DrV435-Req	Reset axle count value	TVP29 An output to reset the axle count value of a TVP section shall be generated if:
DrV207-Com	***4 Level crossing***	
DrV421-Req	Activate level crossing	LCr304 A level crossing shall be activated while at least one of the following types of activation requests is present:
DrV343-Req	Deactivate level crossing	LCr325 An activated level crossing shall be deactivated if all of the activation requests for the level crossing have been removed.
DrV315-Com	***5 Lockable and Detection Devices***	
DrV318-Req	Device release	LDv47 A lockable device shall be 'released' if all of the following conditions are satisfied: LDv140 A lockable device located in a block section shall be 'released' if all of the following conditions are satisfied:
DrV319-Req	Device not release	LDv146 A 'released' lockable device shall become not 'released' if:

1.5 Detected Values

DeV52-Com	***1 Moveable elements***	
DeV53-Com	*1.1 Powered Moveable Elements*	
DeV55-Req	Detected right	PPt50 •*the element is detected in a position not corresponding with the requested position* PPt59 •*the moveable element becomes 'detected' in the requested position* PPt440 •*the interlocking system has been re-started and the element is detected in a position not corresponding with the last known position of the element* PPt572 •*the position of the element is detected*
DeV56-Req	Detected left	PPt50 •*the element is detected in a position not corresponding with the requested position* PPt59 •*the moveable element becomes 'detected' in the requested position* PPt440 •*the interlocking system has been re-started and the element is detected in a position not corresponding with the last known position of the element* PPt572 •*the position of the element is detected*
DeV323-Req	Detected on rail	PPt50 •*the element is detected in a position not corresponding with the requested position* PPt59 •*the moveable element becomes 'detected' in the requested position* PPt440 •*the interlocking system has been re-started and the element is detected in a position not corresponding with the last known position of the element* PPt572 •*the position of the element is detected*
DeV324-Req	Detected off rail	PPt50

		•*the element is detected in a position not corresponding with the requested position* PPt59 •*the moveable element becomes 'detected' in the requested position* PPt440 •*the interlocking system has been re-started and the element is detected in a position not corresponding with the last known position of the element* PPt572 •*the position of the element is detected*
DeV57-Req	Not detected	PPt49 •*the element was requested to move and no position was detected before the operation timer expired* PPt51 •*the element is not detected in a position while the element was not requested to move* PPt290 •*the element becomes not detected in a position while the element was not requested to move*
DeV60-Req	Trailed	PPt478 •*trailed status is detected from the interface with field elements*
DeV436-Req	Not trailed	PPt308 •*trailed status is not detected from the interface with field elements*
DeV82-Com	*1.2 Key-locked Moveable Elements*	
DeV85-Req	Key in place	KLP181 •*'in place' if the key is held in its key box*
DeV283-Req	Key not in place	KLP182 •*not 'in place' if the key is removed from its key box*
DeV284-Req	Position detected	KLP22 •*the corresponding position of the element is detected, if a point detector is used*
DeV286-Req	Position not detected	KLP35 •*the position of the element is not 'detected', if a point detector is used*
DeV91-Com	*1.3 Point handles*	
DeV93-Req	Point handle not in place	PPt345 The position of the point handle in a case for an assigned area shall be detected.
DeV94-Com	***2 Signal***	
DeV322-Req	Signal failure	Sig23 The interlocking system shall detect signal failure information (e.g., short circuits, broken wires, earth leakage, external voltage present). Sig60

		•*signal failure information is detected (short circuits, broken wires, earth leakage, external voltage present)*
DeV351-Req	Filament defective	Sig57 If the signal lamp is lit with an auxiliary element while the main element is defective, a status 'Filament failure' shall be generated.
DeV376-Req	Lamp defective	Sig58 •*a signal lamp on the signal is defective*
DeV150-Com	***3 TVP section***	
DeV153-Req	Occupied	TVP17 •*'occupied' if there is a vehicle present on the TVP section* TVP107 •*the TVP section is detected 'occupied'* TVP113 •*the TVP section becomes detected 'occupied' and then not 'occupied'*
DeV152-Req	Not occupied	TVP16 •*not 'occupied' if there are no vehicles present on the TVP section* TVP111 •*the TVP section is detected not 'occupied' following the reset* TVP113 •*the TVP section becomes detected 'occupied' and then not 'occupied'*
DeV154-Req	Failed	TVP43 A TVP section shall be assigned as 'failed' if a failure state is detected from the TVP section.
DeV386-Req	No electrification on TVP section	TVP143 A TVP section without electrification shall be detected.
DeV435-Req	Axle count value	TVP23 The interlocking system shall be able to indicate the axle count value for a TVP section if the TVP section is equipped with an axle counting system.
DeV207-Com	***4 Level crossing***	
DeV343-Req	Level crossing activated	LCr319 •*'activated' when the level crossing is activated*
DeV354-Req	Level crossing secured	LCr315 •*'secured' when the level crossing is secured for the road traffic*
DeV346-Req	Level crossing failed non-critical	LCr316 •*'failed non-critical' when a failure is present that would not endanger the road traffic*
DeV355-Req	Level crossing failed critical	LCr317 •*'failed critical' when a failure is present that could endanger the road traffic*
DeV437-Req	Vehicle in an activation zone	LCr430 Vehicles in an activation zone shall be detected.

DeV405-Req	Level crossing activated too long	LCr621 •*a level crossing activated longer than a configured time*
DeV221-Req	Warning lights on	LCr708 •*warning lights of the level crossing activated*
DeV398-Req	Warning lights disturbed	LCr622 •*warning lights of the level crossing disturbed*
DeV350-Req	Warning lights failed	LCr623 •*warning lights of the level crossing failed*
DeV216-Req	Barriers open	LCr709 •*barriers of the level crossing detected open*
DeV218-Req	Barriers closed	LCr710 •*barriers of the level crossing detected closed*
DeV403-Req	Barriers not closed	LCr624 •*barriers of the level crossing not detected closed*
DeV399-Req	Barriers failed	LCr711 •*barriers of the level crossing detected failed*
DeV402-Req	Running on backup power	LCr578 •*level crossing operating on backup power*
DeV401-Req	Backup power low	LCr625 •*backup power of the level crossing low*
DeV404-Req	Communication failure	LCr579 •*a communication failure with the level crossing*
DeV400-Req	Level crossing out of use	LCr712 •*level crossing detected out of use*
DeV438-Req	Level crossing obstruction detector failed	LCr762 •*level crossing obstruction detector failed*
DeV315-Com	***5 Lockable and Detection Devices***	
DeV317-Req	Device detected in position	LDv128 •*'in position' if the supervised position or status is detected*
DeV316-Req	Device not detected in position	LDv129 •*not 'in position' if the supervised position or status is not detected*
DeV432-Req	Device detected closed	LDv193 •*'closed' if the closed gate position is detected*
DeV439-Req	***6 Other Detected Values***	
DeV440-Req	LPCP failed	LSA99 •*the LPCP associated with the local shunting area is not 'failed'*

2. Functional interfaces derived from the UML interlocking model.

2.1 Introduction

In this section, we deal with key functional interfaces from a modeling perspective. To do so, we identify the elements/concepts permitting the interlocking system to communicate with the outside world. The source is the Euro-Interlocking xUML model, from which the various events are extracted and classified in categories.

2.2 The events

Several types of events were used in order to model the complete functionalities of a conventional interlocking system. They are located in the “Events” package as shown below on the left, containing “commands”, “detected values”, “initial”, “internal commands” and “statuses”.

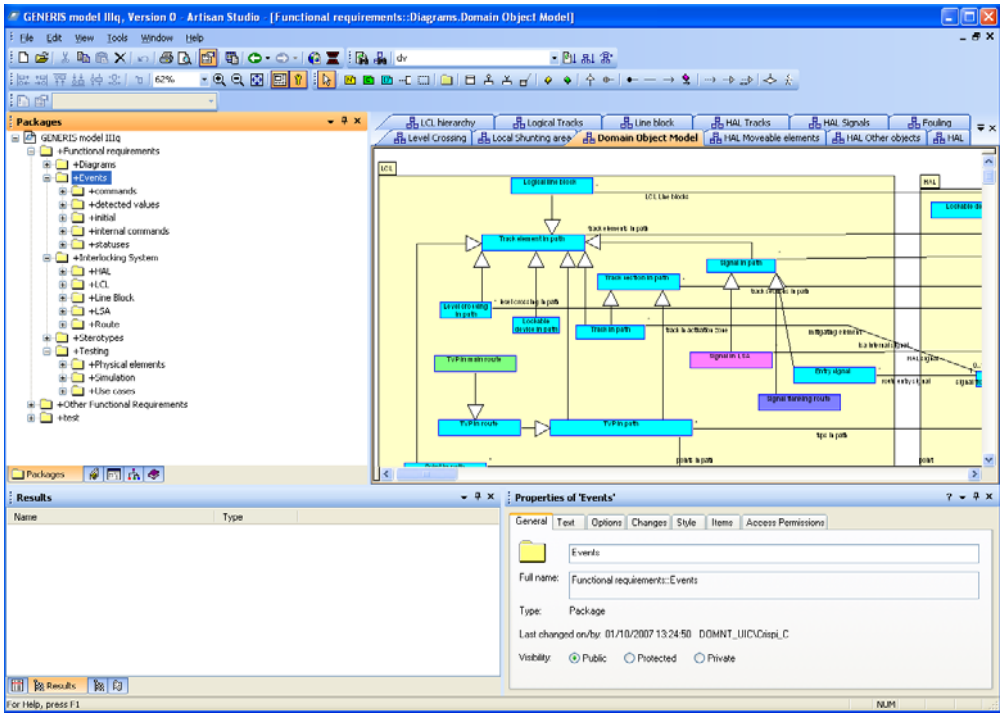


Figure 1 Overview of package items sorted.

The events “internal commands” and “initial” are not of interest for this document.

The “commands” are sent by the actors such as the signaller to the interlocking system. The commands are identified by the stereotype <c>. Within the commands package, the commands that are very specific to some countries are gathered in the corresponding directory. The statuses refer to the information communicated by the interlocking system to the actors; their stereotype is <s>.

There is another type of event that is called “detected value”: these are the values detected by the interlocking system from the elements it controls. Their stereotype is <dv>. Finally, we have the driving values by which the interlocking physically acts on an element, identified by their stereotype <pe> for “physical event”.

Once collected, these various events were classified by type of element or concept to which they refer in a table. For instance, the status <s> “stop aspect” sits in the “Signal” column, whereas the command <c> “reverse travel direction” sits in the “Line block” column.

That led to two sheets, the first containing the commands of 12 elements: level crossing, line block, lockable device, local shunting area (LSA), moveable element, signal, key-locked point, route, derailer, point, TVP (Train Vacancy Proving section), axle counter.

Level crossing	Line block	Lockable device	LSA	Moveable element	Signal
<c> Activate for all tracks	<c> Block line block	<c> Block lockable device	<c> Block LSA	<c> Cancel blocking of moveable element	<c> Cancel blocking of signal
<c> Deactivate for all tracks	<c> Reset line block	<c> Cancel lockable device release	<c> Return LSA	<c> Block moveable element	<c> Reclear signal
<c> Disable level crossing	<c> Reverse travel direction	<c> Release device	<c> Set up LSA	<c> Move element from LPCP	<c> Replace signal
<c> Enable level crossing	<c> Cancel blocking of line block	<c> Cancel blocking of lockable device	<c> Withdraw LSA	<c> Enable automatic movement	<c> Set cancelled aspect
<c> Failure override	<c> Permit travel direction reversal	<c> Return lockable device	<c> Emergency locally release	<c> Disable automatic movement	<c> Block signal
			<c> Cancel blocking of LSA		
			<c> Emergency cancel		

Table 1 The list of commands (I).

Key-locked point	Route	Derailer	Point	TVP	Axle counter
<c> Cancel key release	<c> Cancel residual route	<c> Move derailer	<c> Move occupied point	<c> Reset track sequence	<c> Reset axle counter

Key-locked point	Route	Derailer	Point	TVP	Axle counter
<c> Emergency key release	<c> Cancel route		<c> Move point	<c> Activate crossing for this track	<c> Reset acknowledge
<c> Release key	<c> Emergency cancel		<c> Move trailed point	<c> Deactivate crossing for this track	
<c> Block moveable element	<c> Set DOS route		<c> Set route blocking	<c> Set route blocking on a TVP	
<c> Cancel blocking of moveable element	<c> Set route		<c> Remove route blocking	<c> Remove route blocking from a TVP	
				<c> Override TVP	

Table 2 The list of commands (II).

The second sheet contains the statuses, detected values and physical events of 12 elements: level crossing, line block, lockable device, LSA, moveable element, signal, derailer, point, diamond crossing, LPCP, track and TVP and a column containing the statuses applicable to several elements.

Applicable to several elements (point, TVP…)	**Derailer**	**Point**	**Diamond crossing**	**LPCP**	**Track and TVP**
<s> Blocked	<s> Derailer closed	<s> Flank locked	<s> Left leg MR locked	<dv> LPCP failed	<dv> Occupied
<s> Main route locked	<s> Derailer open	<s> Fouled	<s> Left leg occupied	<dv> LPCP functioning	<dv> Not occupied
<s> Not flank locked	<dv> Derailer off rail	<s> Point failed	<s> Left leg overlap occupied		<dv> TVP not detected
<s> Not locked	<dv> Derailer on rail	<s> Point left	<s> Left leg SR occupied		<dv> TVP failed
<s> Not occupied	<dv> Detected trailed	<s> Point locally released	<s> Right leg MR locked		
<s> No overlap locked		<s> Point not failed	<s> Right leg occupied		
<s> Not blocked		<s> Point not locally released	<s> Right leg overlap locked		
<s> Occupied		<s> Point right	<s> Right leg SR locked		
<s> Overlap main route locked		<s> Point trailed			
		<s> Point undetected			
		<dv> Detected left			
		<dv> Detected right			
		<dv> Out of correspondence			
		<dv> Occupied			
		<dv> Not occupied			

Table 3 The list of statuses, detected values and driving values (I).

Level crossing	Line block	Lockable device	LSA	Moveable element	Signal
<s> Level crossing blinking	<s> Line block blocked	<s> Lockable device blocked	<s> Local shunting area blocked	<s> Element available	<s> Proceed caution
<s> Level crossing closed	<s> Line block change direction	<s> Lockable device in position	<s> Local shunting area failed	<s> Left key in place	<s> Proceed full
<s> Level crossing failed	<s> Line block direction changed	<s> Lockable device not blocked	<s> Local shunting area functioning	<s> Left key removed	<s> Signal blocked
<s> Level crossing not blinking	<s> Line block direction even	<s> Lockable device not in position	<s> Local shunting area not blocked	<s> Right key in place	<s> Signal cancelled
<s> Level crossing not failed	<s> Line block direction odd	<s> Lockable device not released	<s> Local shunting area not released	<s> Right key removed	<s> Signal dark
<s> Level crossing open	<s> Line block failed	<s> Lockable device released	<s> Local shunting area released	<dv> Derailer off rail	<s> Signal failed
<dv> Crossing activated	<s> Line block neutral	<dv> Device closed		<dv> Derailer on rail	<s> Signal functioning
<dv> Crossing closed	<s> Line block not blocked	<dv> Device open		<dv> Out of correspondence	<s> Signal not blocked
<dv> Crossing secured	<s> Line block not failed			<dv> Detected trailed	<s> Stop aspect
<dv> Crossing open	<dv> Line block direction undefined			<dv> Left key in place	<dv> Signal failed
<dv> Crossing failed non-critical				<dv> Right key in place	<dv> Signal functioning
<dv> Crossing failed critical				<dv> Left key removed	<dv> DOS aspect corrected
<dv> Crossing not failed				<dv> Right key removed	<dv> Stop aspect defective
<dv> Crossing out of use				<pe> Closing	<dv> Cancelled aspect defective
<pe> Close lx				<pe> Moving left	<dv> Proceed aspect defective
<pe> Open lx				<pe> Moving right	<dv> Cancelled aspect corrected
				<pe> Opening	<dv> DOS aspect defective
					<dv> Proceed aspect corrected
					<dv> Signal dark
					<dv> Stop aspect corrected
					<pe> Display cancel
					<pe> Display DOS
					<pe> Display proceed
					<pe> Display stop

Table 4 The list of statuses, detected values and driving values (II).

2.3 Conclusion

We extracted all the events that are functionally interfacing the interlocking model with the outside world, together with the elements they refer to.

The Euro-Interlocking project being driven by the railways, only the networks for which their written requirements reached a certain level of maturity and stability could be modeled. Therefore, the xUML model was built on the basis of the functional requirements of a smaller number of railways than the one for which the capturing is currently on-going. Furthermore, the commands and statuses mentioned here do not yet take in account the ERTMS environment. For these reasons, the lists given in this section are likely to evolve during INESS.

Section 4 – Conclusions

During this task D.1.3, we proposed two independent ways for functional interfaces identification. To a certain degree, we noticed some convergence especially for the functionalities that allow the interlocking system to control the elements on the field.

However, “Functional interfaces” being a formal module on its own, we are aware that as the capturing will progress, these functionalities will be completed both in the requirements database and in the model with:

- pure ERTMS functionalities, where new field elements will be added (ex: balise);
- possible modification of complex and critical concepts such as route and local shunting area setting, using, release , etc.