



**EULYNX Initiative**



**Europe's Rail Joint Undertaking**

## **Interface specification SDI-LS**

Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Release information	1
1.2	Impressum	1
1.3	Purpose	1
1.4	Applicable standards and regulations	2
1.5	Applicable documents	2
1.6	Appendices	2
1.7	Terms and abbreviations	2
1.8	Variability management	2
1.9	Definition of object types	2
<b>2</b>	<b>Telegram SDI</b>	<b>2</b>
2.1	Definition of columns	2
2.2	Telegrams SDI-LS	3
2.2.1	Enumeration	4
2.2.2	Light Signal class diagram	5

Interface specification SDI-LS										
ID	Type	Requirement	Meaning	Model Type	Data Type	Trigger	Attribute Type	Sampling	Optionality	Func. Pkg.
Eu.SDI-LS.1	Head	<b>1 Introduction</b>								
Eu.SDI-LS.2	Head	<b>1.1 Release information</b>								
Eu.SDI-LS.3	Info	[Eu.Doc.78] Interface specification SDI-LS CENELEC Phase: 5 Version: 4.2 (0.A) Approval date: 29.05.2024								
Eu.SDI-LS.4	Info	<b>Version history</b>								
Eu.SDI-LS.225	Info	version number: 3.0 (0.A) date: 16.05.2022 author: Filip Giering review: CCB changes: EULS-384, EULS-386								
Eu.SDI-LS.226	Info	version number: 3.1 (0.A) date: 08.06.2023 author: SDI task force review: changes: EULS-398, EULS-400, EULS-401, EULS-406, EULS-418								
Eu.SDI-LS.292	Info	version number: 4.0 (0.A) date: 27.06.2023 author: SDI task force review: TACS Mirror Group changes: EULS-422, EULS-424, EULS-426								
Eu.SDI-LS.323	Info	version number: 4.1 (0.A) date: 01.04.2024 author: SDI task force review: cluster changes: EULS-434, EULS-435, EULS-436, EULS-460, EULS-461, EULS-462								
Eu.SDI-LS.338	Info	version number: 4.2 (0.A) date: 20.06.2024 author: SDI task force review: TACS Mirror Group changes: EULS-471, EULS-479, EULS-480								
Eu.SDI-LS.7	Head	<b>1.2 Impressum</b>								
Eu.SDI-LS.8	Info	Publishers: <b>Europe's Rail Joint Undertaking</b> <a href="https://rail-research.europa.eu">https://rail-research.europa.eu</a>  <b>EULYNX Initiative</b> <a href="https://eulynx.eu/">https://eulynx.eu/</a>								
Eu.SDI-LS.9	Info	Responsible for this document: EU-Rail System Pillar Trackside Assets Control and Supervision domain								
Eu.SDI-LS.10	Info	<p>This document is drafted by and belongs to EU Rail.</p> <p>EU Rail encourages the distribution and re-use of this document, the technical specifications and the information it contains. EU Rail holds several intellectual property rights, such as copyright and trade mark rights, which need to be considered when this document is used.</p> <p>EU Rail authorizes you to re-publish, re-use, copy and store this document without changing it, provided that you indicate its source and include the following mention [EU Rail trade mark, title of the document, year of publication, version of document].</p> <p>EU Rail makes no representation or warranty as to the accuracy or completeness of the information contained within these documents. EU Rail shall have no liability to any party as a result of the use of the information contained herein. EU Rail will have no liability whatsoever for any indirect or consequential loss or damage, and any such liability is expressly excluded.</p> <p>You may study, research, implement, adapt, improve and otherwise use the information, the content and the models in this document for your own purposes. If you decide to publish or disclose any adapted, modified or improved version of this document, any amended implementation or derivative work, then you must indicate that you have modified this document, with a reference to the document name and the terms of use of this document. You may not use EU Rail's trade marks or name in any way that may state or suggest, directly or indirectly, that EU Rail is the author of your adaptations. EU Rail cannot be held responsible for your product, even if you have used this document and its content. It is your responsibility to verify the quality, completeness and the accuracy of the information you use, for your own purposes.</p>								
Eu.SDI-LS.11	Head	<b>1.3 Purpose</b>								
Eu.SDI-LS.12	Info	This document specifies the diagnostic messages (data point IDs and values) as parts of the telegram contents of the standardised diagnosis interface for a communication between the Subsystem - Maintenance and Data Management and Subsystem – Light Signal (SDI-LS).								

Interface specification SDI-LS										
ID	Type	Requirement	Meaning	Model Type	Data Type	Trigger	Attribute Type	Sampling	Optionality	Func. Pkg.
Eu.SDI-LS.31	Info	This document contains the Subsystem - Light Signal specific diagnostic messages. The specifications defined in this document shall be complemented by the generic specification defined in Interface specification SDI Generic [Eu.Doc.94].								
Eu.SDI-LS.33	Info	Some items, referring to "interface-related" functionality of the communication partners, have been added to this specification as information, providing an overview only. In any case these are subject to appropriate systems (national) specification.								
Eu.SDI-LS.14	Info	This document is intended for the following users: <ul style="list-style-type: none"><li>• safety authorities</li><li>• infrastructure managers</li><li>• safety assessors</li><li>• signalling system suppliers</li><li>• validators</li></ul>								
Eu.SDI-LS.227	Info	This document is applicable for both the EU-Rail System Pillar target architecture and the EULYNX architecture. The document is delivered as a single specification fitting both the System Pillar documentation sets and the EULYNX documentation sets. EU-Rail System Pillar is the technical authority for this document.								
Eu.SDI-LS.15	Head	<b>1.4 Applicable standards and regulations</b>								
Eu.SDI-LS.16	Info	The applicable standards and regulations used in EULYNX are listed in the EULYNX Reference Document List [Eu.Doc.12].								
Eu.SDI-LS.34	Info	The references listed in the EULYNX Reference Document List [Eu.Doc.12] shall be considered where they are indicated as being applicable to SDI in the “Applies to” column of the EULYNX Reference Document List [Eu.Doc.12].								
Eu.SDI-LS.17	Head	<b>1.5 Applicable documents</b>								
Eu.SDI-LS.18	Info	The current versions of documents used as input or related to this document are listed in the EULYNX Documentation Plan [Eu.Doc.11]. The relationships between the documents are displayed in the Appendix A1 Documentation plan and structure [Eu.Doc.11_A1].								
Eu.SDI-LS.19	Head	<b>1.6 Appendices</b>								
Eu.SDI-LS.20	Info	- <i>intentionally left blank</i> -								
Eu.SDI-LS.21	Head	<b>1.7 Terms and abbreviations</b>								
Eu.SDI-LS.22	Info	The terms and abbreviations are listed in the EULYNX Glossary [Eu.Doc.9].								
Eu.SDI-LS.23	Head	<b>1.8 Variability management</b>								
Eu.SDI-LS.24	Info	This document describes harmonised requirements. Variability management is not applicable.								
Eu.SDI-LS.25	Head	<b>1.9 Definition of object types</b>								
Eu.SDI-LS.26	Info	The following definition for object types is applied in this document:								
Eu.SDI-LS.27	Info	<ul style="list-style-type: none"><li>• "Req" - This denotes a mandatory requirement.</li></ul>								
Eu.SDI-LS.28	Info	<ul style="list-style-type: none"><li>• "Info" - This denotes additional information to help understand the specification. These objects do not specify any additional requirements.</li></ul>								
Eu.SDI-LS.29	Info	<ul style="list-style-type: none"><li>• "Head" - This denotes chapter headings.</li></ul>								
Eu.SDI-LS.37	Head	<b>2 Telegram SDI</b>								Basic LS
Eu.SDI-LS.224	Req	All references to [Eu.Doc.94] refer to Interface specification SDI Generic version 4.2 (0.A).								Basic LS
Eu.SDI-LS.38	Info	This chapter defines the diagnostic messages - specifically the data points and values applied in the SDI-LS telegrams. The generic data points are defined in [Eu.Doc.94].								Basic LS
Eu.SDI-LS.223	Info	The defined diagnostic messages are mandatory only when the physical interfaces related to the specific diagnostic message are available on the Subsystem – Light Signal.								Basic LS
Eu.SDI-LS.230	Head	<b>2.1 Definition of columns</b>								
Eu.SDI-LS.231	Info	<b>Model Type:</b> Column that marks whether an entry is a model class (Class), a diagnostic data point (Attribute), an enumeration header (ValueType (Enumeration)) or an enumeration value (Enumeration Literal).								Basic LS
Eu.SDI-LS.232	Info	<b>Data Type:</b> Column that indicates the data type for the diagnostic data points. Enumeration values are defined in the section 'Enumeration'.								Basic LS
Eu.SDI-LS.233	Info	<b>Trigger:</b> Column that indicates the precision of data that shall be provided by the back-end to the OPC UA server on a subsystem. It represents the minimum level of change of the measures or reported value that shall trigger an update of the data point on the OPC UA server. For discrete data types (Boolean, enumeration, string), any change shall trigger an update on the OPC UA server. This is expressed as 'current value' in the column. For data that is part of an event class, the value 'on event' is used.								Basic LS
Eu.SDI-LS.234	Info	<b>Attribute Type:</b> Column that indicates the type of diagnostic information contained in the data point. Values are: <b>raw data:</b> uninterpreted data that is measured. <b>diagnosis:</b> an attribute with discrete values (enumeration or Boolean) that interprets the status of a system. There must be a table that directly links diagnostic enumeration values to statusTechnical values of that system.								Basic LS

ID	Type	Requirement	Meaning	Model Type	Data Type	Trigger	Attribute Type	Sampling	Optionality	Func. Pkg.
		<b>configuration:</b> data that is not measured but often set by the manufacturer or operator; it describes characteristics of the system. <b>counter:</b> diagnostic information that counts occurrences of a specific data measurement or event.								
Eu.SDI-LS.337	Info	<b>Sampling:</b> Column that indicates the required sampling interval of the data point, that is how often the OPC UA Server determines the values for an attribute, provided by the back-end. Value in milliseconds.								Basic LS
Eu.SDI-LS.235	Info	<b>Optionality:</b> Column that indicates whether a diagnostic data point is mandatory inside the model class, or optional. The diagnostic data of optional attributes may be required by national specifications. If an equipment or subsystem has the capability to collect and report the related diagnostic data, it must be reported in this data point. Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications.								Basic LS
Eu.SDI-LS.39	Head	<b>2.2 Telegrams SDI-LS</b>								
Eu.SDI-LS.236	Req	LightPoint	LightPoint denotes the entire installed unit in the signal screen, which consists of optics, lamps and other associated electronic elements.	Class						Basic LS
Eu.SDI-LS.237	Req	counterLightDurationDay	Total illumination time of the light point in Day mode since the last reset in seconds. The counter must also be reset when the physical device that implements the LightPoint is replaced.	Attribute	counterLightDurationDay : Long	>= 3600s	counter	1000	Mandatory	Basic LS
Eu.SDI-LS.238	Req	counterLightDurationNight	Total illumination time of the light point in Night mode since the last reset in seconds. The counter must also be reset when the physical device that implements the LightPoint is replaced.	Attribute	counterLightDurationNight : Long	>= 3600s	counter	1000	Mandatory	Basic LS
Eu.SDI-LS.240	Req	statusTechnical	Indicates the generic technical status of the light Point. Note: Enumeration values defined in in Interface specification SDI Generic [Eu.Doc.94].	Attribute	statusTechnical : StatusTechnical	Current value	diagnosis	1000	Mandatory	Basic LS
Eu.SDI-LS.241	Req	statusTechnicalManufacturerSpecificMessage	Must be used by the supplier to describe the reasons for a StatusTechnical != OK, that cannot be explained by existing datapoints (NOT including IM and manufacturer specific diagnostic messages). This Information MUST be provided from the supplier. This should provide flexibility for future uses. Multiple states can be indicated at the same time if multiple diagnosis have not been included in the model during the design phase. The supplier specific reason may not overlap with reasons already covered in other attributes.	Attribute	statusTechnicalManufacturerSpecificMessage : MultiStateDiscreteTypeSupplier	Current value	diagnosis	1000	Optional	Basic LS
Eu.SDI-LS.298	Req	logicalLightPointStatus	Current logical status of the light point.	Attribute	logicalLightPointStatus : LogicalLightPointStatus	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.320	Req	label	It is assigned to all classes representing physically identifiable entities. This string, corresponding to a physically identifiable label, facilitates consistent reference between the physical entities in the field and their digital representations within the model.	Attribute	label : String	Current value	configuration	1000	Optional	Basic LS
Eu.SDI-LS.242	Req	LightPointMatrix	Matrix display for displaying a letter or a number.	Class						Basic LS
Eu.SDI-LS.244	Req	valueCurrent	The displayed value, e.g. a letter for the direction or the speed. If no value is displayed, "none" must be transmitted.	Attribute	valueCurrent : String	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.245	Req	LightPointSingleFilament	Filament of a conventional lamp.	Class						Basic LS
Eu.SDI-LS.246	Req	filamentStatus	Status of the lamp filament.	Attribute	filamentStatus : FilamentStatus	Current value	diagnosis	1000	Mandatory	Basic LS
Eu.SDI-LS.247	Req	role	Describes whether a filament is main or auxiliary.	Attribute	role : LampWireRole	Current value	configuration	1000	Mandatory	Basic LS
Eu.SDI-LS.248	Req	LightPointSingleLamp	Lamp with conventional filaments.	Class						Basic LS
Eu.SDI-LS.249	Req	LightPointSingleLED	Light point LED (Light Emitting Diode): LightPointSingleLED shall be used for single LightPoints consisting of several LEDs.	Class						Basic LS
Eu.SDI-LS.250	Req	degenerationGrade	The degree of degeneration of the light point in %. 100% means: all LEDs failed; 0% means: no LED failed.	Attribute	degenerationGrade : Real	1%	diagnosis	1000	Mandatory	Basic LS
Eu.SDI-LS.251	Req	isElectronicFailure	True: There is a failure in the electronics of the light point.	Attribute	isElectronicFailure : Boolean	Current value	diagnosis	1000	Mandatory	Basic LS
Eu.SDI-LS.252	Req	numberOfDefectLEDs	Number of defective LEDs in the light point.	Attribute	numberOfDefectLEDs : Integer	Current value	raw data	1000	Optional	Basic LS
Eu.SDI-LS.253	Req	pNumberOfLEDs	Total number of LEDs in the light point.	Attribute	pNumberOfLEDs : Integer	Current value	configuration	1000	Optional	Basic LS
Eu.SDI-LS.254	Req	LightSignal	The class represents the Subsystem - Light Signal.	Class						Basic LS
Eu.SDI-LS.255	Req	isLuminosityChangeable	True: Luminosity is changeable.	Attribute	isLuminosityChangeable : Boolean	Current value	configuration	1000	Mandatory	Basic LS
Eu.SDI-LS.256	Req	luminosityCommanded	Reports the luminosity currently commanded by the electronic interlocking.	Attribute	luminosityCommanded : NightDay	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.257	Req	luminosityCurrent	Reports the currently indicated luminosity.	Attribute	luminosityCurrent : NightDay	Current value	diagnosis	250	Mandatory	Basic LS

ID	Type	Requirement	Meaning	Model Type	Data Type	Trigger	Attribute Type	Sampling	Optionality	Func. Pkg.
Eu.SDI-LS.258	Req	operationalIdentifier	Operational identifier of the connected subsystem (see Eu.SAS.1784 in [Eu.Doc.16]).	Attribute	operationalIdentifier : Byte [20]	Current value	configuration	1000	Mandatory	Basic LS
Eu.SDI-LS.259	Req	signalInformationAdditionalCommanded	Reports the additional signal information currently commanded by the electronic interlocking. Corresponds to Bytes 49 until 60 of the telegram Cd_Indicate_Signal_Aspect.	Attribute	signalInformationAdditionalCommanded : Byte [12]	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.260	Req	signalInformationAdditionalCurrent	Reports the additional signal information currently indicated by the light signal. Corresponds to Bytes 49 until 60 of the telegram Msg_Indicated_Signal_Aspect.	Attribute	signalInformationAdditionalCurrent : Byte [12]	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.261	Req	signalVectorCommanded	Reports the signal aspect currently commanded by the electronic interlocking. Corresponds to bytes 43 until 48 of the telegram Cd_Indicate_Signal_Aspect.	Attribute	signalVectorCommanded : Byte [6]	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.262	Req	signalVectorCurrent	Reports the signal aspect currently indicated by the light signal. Corresponds to Bytes 43 until 48 of the telegram Msg_Indicated_Signal_Aspect.	Attribute	signalVectorCurrent : Byte [6]	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.321	Req	label	It is assigned to all classes representing physically identifiable entities. This string, corresponding to a physically identifiable label, facilitates consistent reference between the physical entities in the field and their digital representations within the model.	Attribute	label : String	Current value	configuration	1000	Optional	Basic LS
Eu.SDI-LS.264	Req	LightSignalAdjacentOutputChannel	Output channel to the adjacent system Eurobalise or Legacy train protection system.	Class						Option LS4 Option LS5
Eu.SDI-LS.265	Req	interfaceConnectionStatus	Mandatory in case the adjacent train control element is type 1 Eurobalise.	Attribute	interfaceConnectionStatus : InterfaceConnectionStatus	Current value	diagnosis	1000	Mandatory	Option LS4
Eu.SDI-LS.266	Req	statusTechnical	Indicates the generic technical status of the output channel to the adjacent system. Note: Enumeration values defined in Interface specification SDI Generic [Eu.Doc.94].	Attribute	statusTechnical : StatusTechnical	Current value	diagnosis	1000	Mandatory	Option LS4 Option LS5
Eu.SDI-LS.267	Req	statusTechnicalManufacturerSpecificMessage	Must be used by the supplier to describe the reasons for a StatusTechnical != OK, that cannot be explained by existing datapoints (NOT including IM and manufacturer specific diagnostic messages). This Information MUST be provided from the supplier. This should provide flexibility for future uses. Multiple states can be indicated at the same time if multiple diagnosis have not been included in the model during the design phase. The supplier specific reason may not overlap with reasons already covered in other attributes.	Attribute	statusTechnicalManufacturerSpecificMessage : MultiStateDiscreteTypeSupplier	Current value	diagnosis	1000	Optional	Option LS4 Option LS5
Eu.SDI-LS.322	Req	label	It is assigned to all classes representing physically identifiable entities. This string, corresponding to a physically identifiable label, facilitates consistent reference between the physical entities in the field and their digital representations within the model.	Attribute	label : String	Current value	configuration	1000	Optional	Option LS4 Option LS5
Eu.SDI-LS.268	Req	LightSignalAdjacentTrainControlElements	Representation of the adjacent system.	Class						Option LS4 Option LS5
Eu.SDI-LS.269	Req	trainProtectionName	Name of the Legacy Train Protection System.	Attribute	trainProtectionName : String	Current value	configuration	1000	Optional	Option LS5
Eu.SDI-LS.270	Req	type	Describes whether the adjacent system is a Eurobalise or a Legacy Train Protection System.	Attribute	type : LightSignalAdjacentTrainControlSystem	Current value	configuration	1000	Mandatory	Option LS4 Option LS5
Eu.SDI-LS.293	Req	Indicator	A switchable frame that shows supplementary aspect information to a signal (for example route indicator, platform indicator).	Class						Basic LS
Eu.SDI-LS.295	Req	indicatorStatus	Current status of the indicator.	Attribute	indicatorStatus : IndicatorStatus	Current value	diagnosis	250	Mandatory	Basic LS
Eu.SDI-LS.319	Req	label	It is assigned to all classes representing physically identifiable entities. This string, corresponding to a physically identifiable label, facilitates consistent reference between the physical entities in the field and their digital representations within the model.	Attribute	label : String	Current value	configuration	1000	Optional	Basic LS
Eu.SDI-LS.271	Head	<b>2.2.1 Enumeration</b>								
Eu.SDI-LS.272	Req	FilamentStatus	Enumeration: Status of the filament	ValueType (Enumeration)						Basic LS
Eu.SDI-LS.275	Req	Unknown	0: The status unknown is used when the state is not yet established e.g. if connection to the system is lost	Enumeration Literal						Basic LS
Eu.SDI-LS.274	Req	Ok	1: Functioning according to specifications	Enumeration Literal						Basic LS
Eu.SDI-LS.273	Req	Failure	2: Not functioning	Enumeration Literal						Basic LS
Eu.SDI-LS.276	Req	InterfaceConnectionStatus	Enumeration: Status of the output channel forming the interface connection to the adjacent system	ValueType (Enumeration)						Option LS4
Eu.SDI-LS.280	Req	Unknown	0: The status unknown is used when the state is not yet established e.g. if connection to the system is lost	Enumeration Literal						Option LS4
Eu.SDI-LS.277	Req	Ok	1: Functioning according to specifications	Enumeration Literal						Option LS4
Eu.SDI-LS.279	Req	ShortCircuit	2: A short circuit fault is detected in the output channel	Enumeration Literal						Option LS4
Eu.SDI-LS.278	Req	OpenCircuit	3: The interface connection is broken due to an open circuit	Enumeration Literal						Option LS4

ID	Type	Requirement	Meaning	Model Type	Data Type	Trigger	Attribute Type	Sampling	Optionality	Func. Pkg.
Eu.SDI-LS.281	Req	LampWireRole	Enumeration: Role of one filament within the lamp	ValueType (Enumeration)						Basic LS
Eu.SDI-LS.283	Req	MainFilament	1	Enumeration Literal						Basic LS
Eu.SDI-LS.282	Req	AuxiliaryFilament	2	Enumeration Literal						Basic LS
Eu.SDI-LS.284	Req	LightSignalAdjacentTrainControlSystem	Enumeration: Type of adjacent system	ValueType (Enumeration)						Option LS4 Option LS5
Eu.SDI-LS.285	Req	Eurobalise	1	Enumeration Literal						Option LS4
Eu.SDI-LS.286	Req	LegacyTrainProtectionSystem	2	Enumeration Literal						Option LS5
Eu.SDI-LS.287	Req	NightDay	Enumeration: Luminosity value (day or night)	ValueType (Enumeration)						Basic LS
Eu.SDI-LS.290	Req	Unknown	0: The status unknown is used when the state is not yet established e.g. if connection to the system is lost	Enumeration Literal						Basic LS
Eu.SDI-LS.288	Req	Day	1	Enumeration Literal						Basic LS
Eu.SDI-LS.289	Req	Night	2	Enumeration Literal						Basic LS
Eu.SDI-LS.315	Req	IndicatorStatus	Enumeration: Status of the indicator	ValueType (Enumeration)						Basic LS
Eu.SDI-LS.318	Req	Unknown	0: The status unknown is used when the state is not yet established e.g. if connection to the system is lost	Enumeration Literal						Basic LS
Eu.SDI-LS.317	Req	Off	1	Enumeration Literal						Basic LS
Eu.SDI-LS.316	Req	On	2	Enumeration Literal						Basic LS
Eu.SDI-LS.331	Req	LogicalLightPointStatus	Enumeration: Value of the logical output channel	ValueType (Enumeration)						Basic LS
Eu.SDI-LS.335	Req	Unknown	0: The status unknown is used when the state is not yet established e.g. if connection to the system is lost	Enumeration Literal						Basic LS
Eu.SDI-LS.333	Req	SwitchedOff	1	Enumeration Literal						Basic LS
Eu.SDI-LS.334	Req	SwitchedOn	2	Enumeration Literal						Basic LS
Eu.SDI-LS.332	Req	Flashing	3	Enumeration Literal						Basic LS
Eu.SDI-LS.291	Head	2.2.2 Light Signal class diagram								
Eu.SDI-LS.336	Info	In the class diagram, classes presented in yellow indicate classes from the generic SDI model and are covered in [Eu.Doc.94]. Classes presented in blue are specific classes and covered in this document.								Basic LS
Eu.SDI-LS.263	Info	Light Signal class diagram See Figure 1 on page 6.	The class diagram represents the static structure of the Subsystem - Light Signal from the point of view of diagnostics.	Class Diagram						Basic LS

Figure 1: From object 263 on page 5.

