



Specification sliding steps



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© SNCF-MOBILITES, Rail Delivery Group (RDG), Deutsche Bahn (DB),
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Issue Record

Issue	Date	Comments	Source
1	June 2016	First publication of the specification	EuroSpec working group "Requirements for sliding steps on trains"
1.1	December 2016	Typos and errors corrected.	Supplier feedback
2	April 2019	Second publication of the specification	EuroSpec working group "Requirements for sliding steps on trains"

Revision History

Version	Date	Change
2	April 2019	<ul style="list-style-type: none">- Text changed in all chapters due to change in EuroSpec members.- Content added to verification columns in chapter 6.- For changes in requirement text, see column "Change since last release" in chapter 6.

1 FOREWORD

EuroSpec is a group of European train operating companies providing harmonised product specifications for use in train procurement and refurbishment.

The main target is to improve the reliability and quality of trains by using common and standardised functional and non-functional specification and verification methods.

The benefits of using EuroSpec:

- Increase of reliability by sharing good practice and experience;
- Simplification of the tender process in time and cost as a result of fewer variations in requirements between tenders;
- Standardised products and cost reduction due to harmonisation of train operators' requirements.

The EuroSpec specifications comprise merged functional and product basic requirements. All EuroSpec specifications focus on technical aspects exclusively based on the existing national requirements.

A EuroSpec specification is a voluntary specification designed to be used within the European region. The primary field of application is the European rolling stock domain and all associated interfaces.

Regarding the hierarchy this common specification can be positioned as follows, in order of prevalence:

- EN standards
- UIC/ UNIFE Technical Recommendations (TecRecs)
- UIC Codes (leaflets)
- EuroSpec Specifications
- Company Specifications

2 INTRODUCTION

This document is a voluntary specification, produced by SNCF-MOBILITES, Rail Delivery Group (RDG), Deutsche Bahn (DB), Nederlandse Spoorwegen (NS), Österreichische Bundesbahnen (ÖBB) and Schweizerische Bundesbahnen (SBB).

Individual companies may choose to mandate it through internal instructions/procedures or contract conditions.

Purpose of this document

This document provides a voluntary specification for sliding steps for use by companies in the rail sector if they so choose.

The purpose of this document is to provide a common specification for sliding steps in rolling stock between train operators. This document is to replace individual company specific functional requirements and constitutes a common reference being used for tendering and verification.

Next to providing common requirements, the ambition of this document is to facilitate the cooperation between the operator, the system integrator and the sub-supplier. Operator experience shows that the communication between these parties is not always unambiguous. The communication can be facilitated by the following line of thought:

What is the functionality of an access/egress aid?

Functionality = mechanism + situation

The functionality of an access/egress aid is in fact a combination of:

- 1) the **mechanism (design)** of the system, e.g. sliding / rotating / folding / manual deployment / mobile ramp, and the difference in height to the train floor,

and

- 2) the **situation** which is encountered at each stop, due to the height of the platform. Refer to Figure 1. The platform may be at the same height as the train floor (A and F), or higher than the train floor (B, or lower (C, D and E).

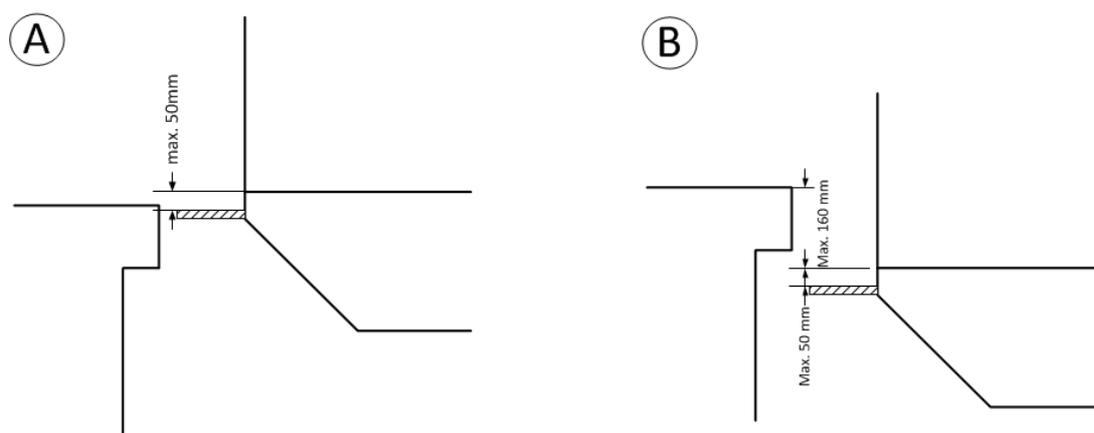


Figure 1: Platform situations encountered during operation

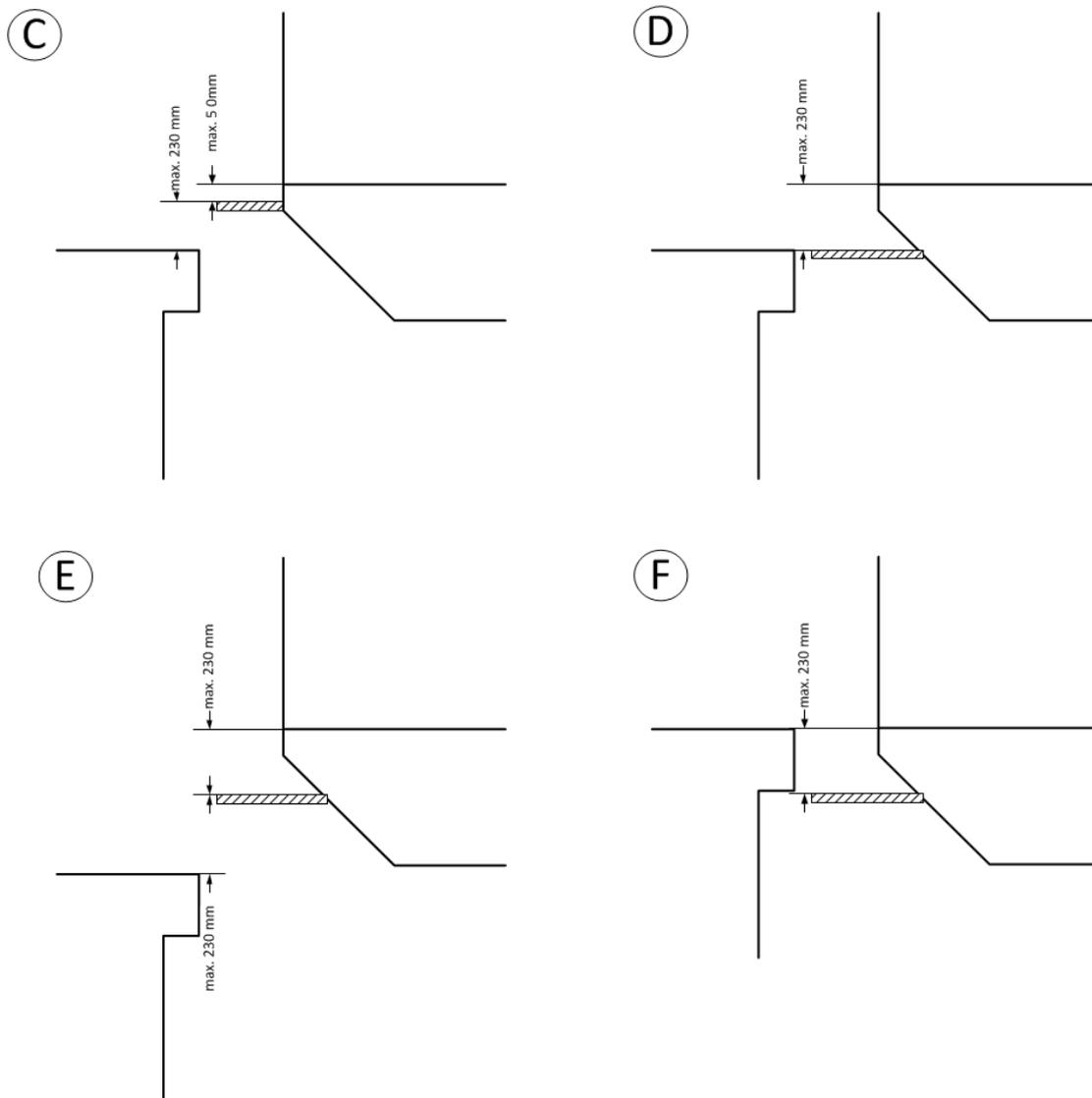


Figure 1, continued: Platform situations encountered during operation

While the mechanism (design) of the system is fixed, the situation may vary during operation due to different platforms. This results in different functionalities that the system has to provide.

The diagrams in figure 1 are provided to help the operator, system integrator and sub-supplier to keep in mind and take into account all scenarios that can occur during operation and facilitate the communication during the tender phase, the design phase and when reviewing the design.

Application of this document

- This specification is voluntary. Individual companies may however elect to mandate all or part of its use through company procedures or contract conditions. Where this is the case, the company concerned must specify the nature and extent of application.
- Specific compliance requirements and dates of application have therefore not been identified since these will be the subject of the internal procedures or contract conditions of those companies that choose to adopt this standard.

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Approval and authorisation of this document

- The content of this document was approved for publication by the technical bodies of SNCF-MOBILITES, Rail Delivery Group (RDG), Deutsche Bahn (DB), Nederlandse Spoorwegen (NS), Österreichische Bundesbahnen (ÖBB) and Schweizerische Bundesbahnen (SBB).

3 SCOPE

This specification is applicable to rolling stock that is equipped with sliding steps as defined in chapter 5.

This specification is an add-on to the Technical Specifications of Interoperability (TSI). In addition to this specification additional operator specific specifications might be defined. The specification contains requirements at system level of the sliding step and its interfaces, and unifies the requested performances of the different operators.

This specification is not intended to block innovation or to prevent improvement. For this purpose each requirement is followed by a rationale.

If applicable, the requirements are referenced to the EN 15380 structure. It is foreseen that more requirement sets and European standards will make use of this common reference structure.

4 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. ENs are developed by CEN¹ or CENELEC², UIC leaflets are developed by UIC³ and are made available from their members.

For all references in the text or in a requirement, only the edition cited applies.

TSI Loc & Pas	COMMISSION REGULATION (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock — locomotives and passenger rolling stock' subsystem of the rail system in the European Union.
TSI PRM	COMMISSION REGULATION (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility.
EN 14752	Railway applications - Bodyside entrance systems for rolling stock
EN 16584-1	Railway applications - Design for PRM Use - General requirements - Part 1: Contrast
EN 16584-3	Railway applications - Design for PRM Use - General requirements - Part 3: Optical and friction characteristics
EN 16586-1	Railway applications - Design for PRM use - Accessibility of persons with reduced mobility to rolling stock - Part 1: Steps for access and egress
EN 16586-2	Railway applications - Design for PRM use - Accessibility of persons with reduced mobility to rolling stock - Part 2: Boarding aids
EN 50155	Railway applications - Electronic equipment used on rolling stock
EN 50125-1	Railway applications - Environmental conditions for equipment – Part 1: Rolling stock and on-board equipment.
PD CEN/TR 16251	Railway applications - Environmental conditions - Design guidance for rolling stock
EN 15663	Railway applications – Vehicle reference masses

¹ Comité Européen de Normalisation / European Committee for Standardization - www.cen.eu

² Comité Européen de Normalisation Électrotechnique / European Committee for Electrotechnical Standardization - www.cenelec.eu

³ Union internationale des chemins de fer / International Union of Railways - www.uic.org

EN 60529	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989 + A1:1999)
EN 60812	Failure modes and effects analysis (FMEA and FMECA)
European Qualification Framework (EQF)	https://ec.europa.eu/ploteus/

5 TERMS, DEFINITIONS AND ABBREVIATIONS

Cassette	A self-contained construction, in which all parts of the sliding step system are located, except the step control unit and the out-of-service device.
Final position	For each cycle, the position in y-direction where step movement is completed and the step is secured. This can be anywhere between positions A and D (see Figure 5).
Override protection	A component of the sliding step which prevents the sliding step from extending to a position where it could be stuck.
Sliding step	A sliding step is a bridging plate as defined in EN14752:2015, with the addition that the sliding step only moves in the horizontal (y-direction), see figure 2, and performs no rotation- or folding move.
Sliding step out of service	A mode of the sliding step where: <ul style="list-style-type: none">• the sliding step has been retracted automatically or manually,• the sliding step is in position D (see figure 5),• extension is mechanically inhibited,• any signal for extension is ignored, and• the limit switch of the step is bridged (refer to SLST.52 and SLST.53).
Sliding step secured	A mode of the sliding step where: <ul style="list-style-type: none">• the sliding step has retracted automatically,• the sliding step is in position D (see figure 5),• extension is mechanically inhibited, and• any signal for extension is ignored until the step is released.

6 SPECIFICATIONS

This chapter contains the requirements and their objectives. Means of compliance are included to describe how compliance to the requirement will be verified.

Further information can be found in the document “EuroSpec Requirements Management” at www.eurospec.eu.

The columns of the specification are defined as follows:

ID

Unique Identification of the requirement

Requirement classification

To differentiate between the requirements with regard to relevance and legal status:

- Requirement (RE - mandatory),
- Design Recommendation (DR),
- Optional Requirement (OR; to be indicated by the operator whether the requirement is applicable),
- Operator Choice (CH; necessary input to be provided by the operator).

For an overview of all requirements with classification OR and CH in this specification, refer to table 1 in section 7.2.

Requirement-text

Description of the requirement

Rationale

Reason to state the requirement

Product element EN 15380-2

Link between requirement and the product element of the EN 15380-2

Change since last release

To provide traceability between the issued versions of this requirement:

No change (-), Changed, Minor Change (i.e. updated references or improved text), New, Removed.

Verification columns

Means of compliance per point of time.

In addition to appendix II of the EuroSpec Requirement Management V2.0 (available at www.eurospec.eu), the following means of compliance are used in this specification:

Means of compliance	Explanation
Statement	A statement by the system integrator that the requirement will be complied with.
Concept description	A document typically produced by the system integrator, showing how this aspect of the sliding step is included in the surrounding structure and vehicle architecture, how interfaces are realised etc.
Technical description	A detailed system description typically produced by the sliding step supplier

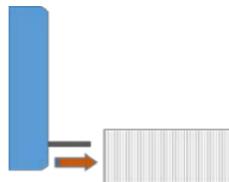
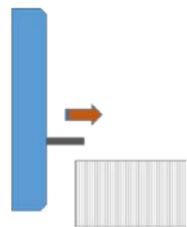
<p>Type test</p>	<p>NB: the notation in the verification columns is as follows:</p> <p>“AAA – BBB – CCC” where</p> <ul style="list-style-type: none"> – AAA can be a test <u>specification</u> or <u>protocol</u> as defined below; – BBB is the name of the type test, e.g.: <ul style="list-style-type: none"> • Functional (Fct) test • Climate test • Endurance test • Vibration test • Waterproof test • Pressure test • Electromagnetic compatibility test – CCC indicates whether the test is to be carried out on system level (i.e. on the mock-up or prototype, indicated by “Mock-up/PT”) or on train level (indicated by “Train”). <p>As an example: if “<i>Type Test Specification - Fct-Test - Mock-up/PT</i>” is stated in the column Design Review for a given requirement, the Supplier shall provide during the design review a test specification which shows that (and how) a functional test will be carried out on system level to verify the requirement.</p>
<p>Test specification</p>	<p>Document describing the test steps and pass/fail criteria (i.e. the empty document)</p>
<p>Test protocol</p>	<p>Document containing the test results (i.e. test specification + test observations + conclusions)</p>
<p>Surface sample</p>	<p>Physical sample</p>
<p>Diagnosis message</p>	<p>Message to inform train driver or maintenance staff</p>
<p>Operation manual</p>	<p>Manual for train guard and/or train driver</p>
<p>Installation instruction</p>	<p>Instruction to be used by maintenance staff for installation purposes</p>
<p>Installation drawing</p>	<p>Drawing to be used by maintenance staff for installation purposes</p>
<p>Maintenance manual</p>	<p>Manual to be used by maintenance staff</p>
<p>Cleaning instruction</p>	<p>Instruction for cleaning staff</p>

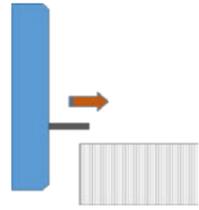
ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.147		1) Introduction								
SLST.1	INFO	This specification is an addition to EN 14752:2015 and TSI PRM and contains specific items which operators encounter during the operation.	Scope of EuroSpec Sliding Steps.	N-D	Minor change	n/a	n/a	n/a	n/a	n/a
SLST.148		2) Definitions and standards								
SLST.2	INFO	A sliding step is a bridge plate as defined in EN14752:2015, with the addition that the sliding step only moves in the horizontal direction, and performs no rotation- or folding move.	EuroSpec has to be consistent with other existing norms.	N-D	No change (-)	n/a	n/a	n/a	n/a	
SLST.3	INFO	The coordinate system used to indicate directions throughout this specification is shown in Figure 2.	Easy readability.	N-D	No change (-)	n/a	n/a	n/a	n/a	
SLST.4	RE	The sliding step shall comply with EN 14752:2015.	Consistent with SLST.1.	N-D	Minor change	Concept description in line with EN.	Drawing(s). 3D-model(s). Concept description. Type test specification FAI.	Type test protocol FAI. Type test specification FII.	Type test protocol FII.	
SLST.5	RE	The sliding step shall comply with EN 16584-1:2017.	Norm is not yet mandatory in TSI PRM.	N-D	Minor change	Concept description in line with EN.	Drawing(s). 3D-model(s). Concept description. Type test specification FAI.	Type test protocol FAI. Type test specification FII.	Type test protocol FII.	
SLST.6	RE	The sliding step shall comply with EN 16584-3:2017.	Norm is not yet mandatory in TSI PRM.	N-D	Minor change	Concept description in line with EN.	Drawing(s). 3D-model(s). Concept description. Type test specification FAI.	Type test protocol FAI. Type test specification FII.	Type test protocol FII.	
SLST.145	RE	The sliding step shall comply with EN 16586-1:2017.	Norm is not yet mandatory in TSI PRM.	N-D	New	Concept description in line with EN.	Drawing(s). 3D-model(s). Concept description. Type test specification FAI.	Type test protocol FAI. Type test specification FII.	Type test protocol FII.	
SLST.146	RE	The sliding step shall comply with EN 16586-2:2017.	Norm is not yet mandatory in TSI PRM.	N-D	New	Concept description in line with EN.	Drawing(s). 3D-model(s). Concept description. Type test specification FAI.	Type test protocol FAI. Type test specification FII.	Type test protocol FII.	
SLST.144	RE	The sliding step shall comply with EN 50155:2017.	To ensure adequate quality of electronic components.	N-D	New	Concept description in line with EN.	Drawing(s). 3D-model(s). Concept description. Type test specification FAI.	Type test protocol FAI. Type test specification FII.	Type test protocol FII.	

⁴ First Article Inspection
⁵ First Integration Inspection

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.149		3) Functional & performance requirements								
SLST.7	INFO	This section contains the requirements regarding the primary functionalities of the sliding step: extension, retraction, platform detection and obstacle detection (sections 3.1), 3.2) and 3.3)). Furthermore, the requirements for the case when the sliding step has to be taken out of service are stated in section 3.4). Lastly, the requirements regarding the load detection functionality of the sliding step are stated in section 3.5). The operator is to indicate whether this section is applicable.	n/a	N-D	No change (-)	n/a	n/a	n/a	n/a	
SLST.150		3.1) Extension								
SLST.8	RE	Upon receiving an extension signal from the corresponding door control unit, the sliding step(s) shall start to move without delay to its/their extended position.	"Signal from the corresponding door control unit" marks a clear system boundary. The trigger for this system may vary depending on the operator & type of operation. Examples of triggers: Do all steps extend? Is an additional local command 'open door' required (given by the passenger)? Automatic opening of wheelchair doors?	N-D	No change (-)	Statement.	Technical description. Concept description.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.9	CH	When a door is released, the sliding step shall either a) extend when an additional local command is given (e.g. passenger push button) <i>or</i> b) extend without an additional local command. This setting shall be adjustable in the step control unit during the lifetime of the train.	Requirement to internal design of step control unit. It is useful to be able to change the logic during the lifetime of the train without having to replace the step control unit. E.g. when train is operated in different region or with different operation type.	N-D	Minor change	If specified by operator: statement. If not specified by operator: concept descr.	Concept description.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.10	CH	When extending, the sliding step shall perform one of the following sequences: a) step extends; door starts moving when step has reached its final position. <i>or</i> b) step extends; door starts moving such that a clear width of $x \leq 400$ mm is reached when the step has reached its final position.	Subject is mentioned in TSI and EN, explicitly mentioned here to indicate that a choice must be made by the operator.	N-D	Minor change	If specified by operator: statement. If not specified by operator: concept descr.	Concept description.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.11	RE	The sliding step shall extend to its final position (including reversal if required by type of system) within $t \leq 3$ s under the following conditions: <u>Measurement boundaries</u> - a platform at distance 300 mm; - start of measurement: incoming signal into step; - end of measurement: outgoing signal from step. <u>Measurement conditions</u> - Normal weather conditions, i.e. no ice. - For steps without contactless platform detection: step shall touch platform with edge, not with override protection.	To minimize the time taken for step movement. A reference measurement that shall be fulfilled by all steps regardless of stroke length, type of obstacle detection and reversing behaviour. This is the only way to have one common requirement.	N-D	Minor change	Statement.	Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.12	RE	The sliding step, while extending, shall move with a mean speed of at least 0.1 m/s.	For sliding steps (and doors), there is a relation between weight, speed and maximum touching force. This speed is technically feasible. A lower speed is undesirable. SLST.12 ensures that steps which can fulfil SLST.11 in < 3 s are not unnecessarily slow.	N-D	No change (-)	Statement.	Type Test Specification - Fct-Test - Mock-up/PT. Technical description.	Type Test Protocol - Fct-Test - Mock-up/PT.		

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.13	CH	When a sliding step reaches its maximum stroke without detecting an obstacle or a platform during extension, the sliding step shall a) retract to an extension distance of y_{ed} mm <i>or</i> b) retract by a distance of y , mm.	This is the definition of the "perfect extension", i.e. an extension without obstacle detection. The behaviour of the step depends on the operator, type of operation and infrastructure. It may be required that the step retracts to prevent contact with the platform, due to movement of the train with changing loads (up, down, and tilting). Or it may be required that the step does not retract ($y_r = 0$), for example in case of a very low platform where the step is used to minimize the vertical distance.	N-D	Minor change	Statement.	Type Test Specification - Fct-Test - Mock-up/PT. Technical description.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.151		3.2) Retraction								
SLST.14	RE	Upon receiving a retraction signal from the corresponding door control unit, the sliding step(s) shall immediately start to move into its/their retracted position.	"Signal from the corresponding door control unit" marks a clear system boundary. The trigger for this system may vary depending on the operator & type of operation. The intention is to ensure communication between door and step without unnecessary delays, also in case of different suppliers for door and sliding step.	N-D	Minor change	Statement.	Technical description. Concept description.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.15	CH	When retracting, the sliding step shall perform one of the following sequences: a) door closes; step begins to retract when the door is completely closed. <i>or</i> b) door closes; when the door opening reaches a clear width of $x \leq 400$ mm the step begins to retract.	Subject is mentioned in TSI and EN, explicitly mentioned here to incite that a choice must be made by the operator.	N-D	Minor change	If specified by operator: statement. If not specified by operator: concept descr.	Concept description.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.16	RE	The sliding step, while retracting, shall move with a mean speed of at least 0.1 m/s.	Consistent with SLST.12. This speed is technically feasible. A lower speed is undesirable. There is a relation between weight, speed and maximum touching force.	N-D	No change (-)	Statement.	Type Test Specification - Fct-Test - Mock-up/PT. Technical description.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.152		3.3) Obstacle and platform detection								
SLST.17	RE	The sliding step shall have obstacle detection by contact (e.g. motor current, sensitive edge).	Obstacle detection by contact is required. Refer to requirements in section 3.3.1.	N-D	No change (-)	Concept descr.	Technical descr.	Installation drawing, if applicable. Instruction for installation, removal, exchange, if applicable.		
SLST.18	RE	The obstacle detection functionality is always active while the step is extending or retracting.	Safety.	N-D	No change (-)	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.19	RE	The obstacle detection by motor current shall always have the highest priority (e.g over platform detection).	Safety.	N-D	Changed	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.20	CH	The sliding step shall have the following platform detection system(s): a) platform detection by contact (motor current, sensitive edge, ...) <i>and/or</i> b) contactless platform detection (infra-red, laser, ultrasound, ...).	Applied technology depends on train type, type of service and operator philosophy. For a), refer to requirements in section 3.3.1. For b), refer to requirements in section 3.3.2.	N-D	No change (-)	Concept descr.	Technical descr.	Installation drawing, if applicable. Instruction for installation, removal, exchange, if applicable.	Functional breakdown diagram.	
SLST.21	INFO	The technology of the platform detection system depends on the type of train operation and the level of autonomy required.	Applied technology depends on train type and type of service.	N-D	No change (-)	n/a	n/a	n/a	n/a	n/a

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.22	CH	The obstacle detection system and platform detection system may be the same system.	Not all operators distinguish between obstacle detection and platform detection.	N-D	No change (-)	Concept descr.	Technical descr.			
SLST.153		3.3.1) Obstacle and/or platform detection by contact								
SLST.23	INFO	A threshold value y_{thr} for the extension distance can be set by the operator. Depending on whether the threshold value is reached or not, a specific response of a sliding step may be required, taking into account different train types, types of operation and distance between car body and platform. See requirements SLST.24, .25, .115, .26.	Explanation of the concept of a threshold value which can be set by the operator. This concept is used throughout this section of the EuroSpec. Refer to figure 5.	N-D	Changed	n/a	n/a	n/a	n/a	n/a
SLST.24	CH	When a sliding step is extended by $> y_{thr}$ mm and detects a platform or an obstacle, the step shall start the following cycle: - the step movement stops; - the step retracts by y_r mm; - after a waiting time of x seconds, the sliding step starts to extend again. After X cycles, the sliding step retracts completely.	 SLST.24 and SLST.25 take into account that the reaction of the step to obstacle/platform detection depends on the distance the step has already extended at the moment of detection.	N-D	Minor change	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.25	CH	When a sliding step is extended by $< y_{thr}$ mm and detects a platform or an obstacle, the step shall start the following cycle: - the step movement stops; - the step retracts by y_r mm; - after a waiting time of x seconds, the sliding step starts to extend again. After X cycles, the sliding step retracts completely.	SLST.24 and SLST.25 take into account that the reaction of the step to obstacle/platform detection depends on the distance the step has already extended at the moment of detection.	N-D	Minor change	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.115	OR	When a sliding step is extended by $> y_{thr}$ mm and detects by contact that it is overriding a platform edge, the sliding step shall retract by y_r mm and stop.	 Different train types and types of operation ask for a specific response of a step after override detection. NB For systems where detection by sensitive edge or overrun protection cannot be distinguished, SLST.24 is sufficient.	N-D	New	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		

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SLST.26	OR	When a sliding step is extended by $< y_{thr}$ mm and detects by contact that it is overriding a platform edge, the sliding step shall retract by y_r mm and stop.	 <p>Different train types and types of operation ask for a specific response of a step after override detection.</p> <p>NB For systems where detection by sensitive edge or overrun protection cannot be distinguished, SLST.24 is sufficient.</p>	N-D	Changed	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.27	RE	Under no circumstances shall the sliding step come to rest on the platform top surface (e.g. despite varying inclination, load, wheel diameter, ...).	The supplier must take into account all encountered platform heights and distances, and the design of the sliding step (such as dimensions of overrun protection). This requirement is related to SLST.24, SLST.25, SLST.115 and SLST.26.	N-D	Changed	Concept descr.	FMEA. Concept description. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		
SLST.28	RE	When a sliding step retracts and detects an obstacle by e.g. motor current, the step shall: - stop the step movement; - extend by y_e mm (≥ 0); - after a waiting time of x seconds, start to retract again. After X cycles, the sliding step shall stay in its position and give a diagnosis message.	Detection of e.g. stones when retracting.	N-D	No change (-)	Statement.	Technical descr. Concept description (diagnosis). Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.	Diagnosis message in driver's cab.	
SLST.154		3.3.2) Contactless platform detection								
SLST.29	RE	The sliding step shall recognize by means of a contactless sensor system how far it shall extend.	Choice for this system is made in SLST.20 if applicable. Section 3.3.2 is n/a for all operators.	N-D	No change (-)	Concept descr.	Technical descr.			
SLST.116	RE	The sliding step shall detect a platform in horizontal ($\pm y$) and vertical ($\pm z$) direction.	Principal functionality of a contactless detection system.	N-D	New	Concept descr.	Technical descr.			
SLST.117	CH	When a sliding step detects a platform in horizontal ($\pm y$) direction, the sliding step shall extend and stop without reversing, y mm in front of the platform.	In order to create level access.	N-D	New	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.118	CH	For the case when a sliding step is extended by $< y_{thr}$ mm and detects a platform in vertical ($\pm z$) direction, the reaction of the sliding step shall be discussed between operator and supplier, based on the applicable drawings in Figure 1.	This case is likely to be encountered in reality, but the level of detail is too high to be covered by one general requirement. Therefore, the discussion must take place in the design phase. The drawings in Figure 1 can help to support the discussion.	N-D	New	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.119	CH	When a sliding step is extended by $> y_{thr}$ mm and detects a platform in vertical ($\pm z$) direction, the sliding step shall retract and stop in front of the platform edge.	Best combination of short extension time and comfortable access/egress situation.	N-D	New	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.120	RE	If no platform has been detected in vertical ($\pm z$) direction, SLST.13 is applicable.	No additional requirement necessary for contactless detection.	N-D	New	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.121	CH	If the contactless platform detection system is out of order the extension width of the nearest neighbouring system minus y mm shall be adopted.	1) Passenger-friendly and operation-friendly solution. 2) A sliding step must be able to communicate appropriately.	N-D	New	Statement.	Technical descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	

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SLST.30	CH	The driver can overrule the contactless platform detection functionality by giving the command: a) "do not extend steps"; <i>or</i> b) "extend sliding step to an extension distance of y_{ed} mm".	Driver shall have the possibility to give a command to not extend or extend by a predefined distance set per train set. In this case, the step intelligence is deliberately disregarded. Required due to safety reasons in some exceptional situations (e.g. exceptional stop in tunnel).	N-D	Minor change	Statement.	Technical descr. Concept descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.31	CH	When a sliding step detects by contactless platform detection that it is overriding a platform edge, the sliding step shall retract by y_r mm and stop.	replaced by SLST.117, SLST.118, SLST.119.	N-D	Removed	n/a	n/a	n/a	n/a	n/a
SLST.155		3.4) Step out of service								
SLST.32	INFO	The out-of-service device is accessible to train staff. By operating this device, the out-of-service mechanism inside the step cassette is activated.	n/a	N-D	No change (-)	n/a	n/a	n/a	n/a	n/a
SLST.33	RE	Each sliding step shall have an out-of-service device to lock a sliding step manually out of service.	Each step can be put out of service separately.	N-D	No change (-)	Statement.	Technical descr. Concept descr.		Operating manual.	
SLST.34	CH	The out-of-service device shall be located: a) inside the train <i>or</i> b) outside the train; <i>or</i> c) inside and outside.	a) staff do not have to leave train to an unsafe situation; b) in order not to have leak in pressure-tight train; useful on crowded trains; c) flexibility (outside may be difficult to access when at platform).	N-D	No change (-)	If specified by operator: statement. If not specified by operator: concept descr.	Concept descr. Drawings.		Inspection.	
SLST.35	RE	If placed inside the train, the out-of-service device shall be located at a height between 400 mm and 600 mm above the floor level.	Addition to TSI requirement. Very long Bowden cables should not be used. Device shall not be in the floor, nor near passenger push buttons.	N-D	No change (-)	Statement.	Concept descr. Drawings.		Inspection.	
SLST.36	RE	The operating torque of the out-of-service device shall be ≤ 10 Nm.	Equal to force to operate external emergency device for doors (EN 14752:2015 - section 5.5.3.2.2).	N-D	Minor change	Statement.	Technical descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.37	RE	The out-of-service device shall have the positions 'automatic operation', 'manual operation', 'out-of-service'.	Clear definition of 3 required positions.	N-D	No change (-)	Statement.	Technical descr.			
SLST.38	RE	The positions shall be located around the out-of-service device as shown in figure 3.	Standardization; same arrangement as for door locking device.	N-D	Minor change	Statement.	Technical descr. Drawing.		Inspection.	
SLST.39	RE	With the out-of-service device in position "manual operation", the sliding step shall be retractable manually without any tools.	To avoid having to take the train out-of-service. Also used for maintenance purposes.	N-D	No change (-)	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT. Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.40	RE	For a sliding step with width $x \leq 1300$ mm, the operating force to manually push in the sliding step shall be lower than 150 N.	For doors, it is 150 N as well. Based on supplier feedback for V1, SLST.40 has been amended and SLST.122 been added for wider doors.	N-D	Changed	Statement.	Technical descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.122	RE	For a sliding step with width $x > 1300$ mm, the operating force to manually push in the sliding step shall be as low as possible and subject of discussion between the operator and the supplier.	For larger steps, 150 N can probably not be achieved, but the force should be as low as possible.	N-D	New	Statement.	Technical descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.41	RE	The position 'out-of-service' shall not be accessible when the sliding step is not fully retracted.	Locking mechanism shall always ensure a retracted and secured position in the position 'out-of-service'.	N-D	No change (-)	Statement.	Technical descr. Concept descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.42	CH	The out-of-service locking mechanism shall always ensure a safe retracted position in the position 'out of service'. The out-of-service locking mechanism shall be: a) based on the main locking mechanism <i>or</i> b) different and fully independent from the main locking mechanism.	Objective: locking device shall always ensure a retracted position in the position 'out-of-service', to avoid unnecessarily taking a train out of service. At this point, the required design solution is operator-specific.	N-D	No change (-)	If specified by operator: statement. If not specified by operator: concept descr.	Technical descr. Concept descr. FMEA. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT.		

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SLST.43	OR	Optional: With respect to wheelchair user access, a sliding step which is out-of-service inhibits the extension of the sliding step on the opposite side of the carriage.	To prevent wheelchairs users from getting in, and consequently not being able to get out at the next station. Note: an operational procedure to assist wheelchair users already on board will need to be available.	N-D	No change (-)	Statement.	Concept descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.44	RE	Under the following conditions, taking the sliding step out-of-service (i.e. unlocking, manual retraction, locking) shall take no longer than 10 s: - no cant; - no winter weather; - step level is aligned with platform level.	In order not to affect the operation. The 10 s refers to the technical actions, assuming that: - everything is ready for the actions to be carried out; - train staff does not have to physically move to a different standing/kneeling position in between the actions.	N-D	Changed	Statement.	Operating instruction.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.45	RE	In an area not visible to passengers (e.g. inner side of the door post, cover of the door drive etc.) a well-structured, easy to understand instruction on how to lock the step out-of-service shall be attached.	To prevent secondary failures due to incorrect operation.	N-D	No change (-)	Statement.	Drawing. Operating instruction.			
SLST.46	OR	Optional: The supplier shall make the instruction on how to take the sliding step out-of-service available (also) for use on the portable device carried by the train staff, e.g. the ticket control device.	Sliding step prepared for the future.	N-D	No change (-)	Statement.	Concept descr.			
SLST.156		3.5) Load detection								
SLST.47	INFO	Rules of national authorities or the type of train service may require the sliding step to have a vertical load detection system.	EN 14752:2015 leaves open whether the load detection system is used.	N-D	Minor change	n/a	n/a	n/a	n/a	n/a
SLST.48	RE	The vertical load detection system shall detect when a static weight (as specified in annex J.3 of EN 14752:2015) is present on the sliding step surface.	Functionality of vertical load detection.	N-D	Minor change	Statement.	Technical descr.			
SLST.49	RE	When a static weight is detected, the vertical load detection system shall give a signal to the door control unit.	To reset door opening time.	N-D	No change (-)	Statement.	Technical descr. Concept descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Mock-up/PT.		
SLST.50	RE	The vertical load detection functionality shall be switched off when the sliding step is moving.	To avoid passengers playing with the step.	N-D	No change (-)	Statement.	Technical descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Mock-up/PT.		
SLST.51	RE	The vertical load detection functionality shall be switched off for the central closing procedure.	Vertical load detection switched off during central closing to prevent grit stuck in gap from blocking step movement.	N-D	No change (-)	Statement.	Technical descr. Concept descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.157		4) Interface requirements								
SLST.52	CH	The sliding step shall indicate the status "retracted" by means of a limit switch. The status "secured" shall be a) included in the same limit switch <u>or</u> b) indicated by means of a second path, being a limit switch, relay or motor current.	Option a), the 2-in-1 solution, is not acceptable for all operators at this point in time.	N-D	No change (-)	If specified by operator: statement. If not specified by operator: concept descr.	Concept descr. Wiring diagram. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Specification - Fct-Test - Mock-up/PT.		
SLST.53	CH	The limit switch(es) "retracted and secured" of the sliding step shall a) be connected in series to the safety loop of the door system or b) be part of (an) additional safety loop(s), independent from the safety loop of the door system.	This requirement is classified as CH because option a), the 2-in-1 solution, is not acceptable for all operators at this point in time. Explanation for option b): Additional safety loops can be used to provide side-specific status information about the sliding step. Some operators are using 4 separate safety loops (doors & steps, left & right).	N-D	Changed	If specified by operator: statement. If not specified by operator: concept descr.	Concept descr. Wiring diagram.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	

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SLST.54	INFO	An additional safety loop is used to provide side-specific status information about the sliding step.	Included in the rationale of SLST.53.	N-D	Removed	n/a	n/a	n/a	n/a	n/a
SLST.55	CH	The edge of the sliding step in retracted and secured position shall be located between 0 and 60 mm from the car body, measured horizontally from point A, provided this position is within the gauge. Refer to figure 4.	To prevent train surfing; EN too vague (shifting the responsibility to operators).	N-D	Minor change	Drawing.	Drawing. 3D-drawing.		Inspection.	
SLST.56	RE	The driver shall have the possibility to deactivate any entrance (i.e. door and step) from the driver's cab after the door is closed and locked and the sliding step is retracted and secured.	E.g. for metro/suburban operation where the driver is alone, or for the first and last door of coupled trains if they are too long for the platform.	N-D	No change (-)	Statement.	Concept descr. Operating manual/ visualisation of display.	Type Test Specification - Fct-Test - Train.	Type Test Protocol – Fct-Test - Train. Operating manual.	
SLST.57	RE	Authorized personnel shall be able to adjust the sliding step parameters in table 2 without a software update.	The general rationale is standardisation and being able to do more adjustments than can be done currently without the help of the supplier. Unforeseen operational issues can be fixed immediately. Specifically: 4: If a difference in extension distance is required for PRM and normal doors, this parameter means that the same (long stroke) step can still be fitted at all doors, which is favourable in terms of maintainability. 5 & 6: useful parameters if test in climatic chamber reveals that initially the ice cannot be broken. The parameter can be changed and the test repeated.	N-D	Minor change	Concept.	Technical descr. Concept descr. Maintenance manual.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.158		5) Physical requirements								
SLST.58	RE	Any height difference in the step surface design shall not exceed 15 mm.	Definition of the shape of sliding steps, based on meeting with "PRM representatives" who have a more restrictive requirement than TSI. Undesired step surface design: 	N-D	Changed	Statement.	Drawing.	Inspection.		
SLST.59	RE	The supplier shall provide drawings showing the platform and the extended step on both sides of the train: - for a straight track; - for a curve radius R=300m and maximum cant; - for a curve radius R=500m and maximum cant.	Experience with various projects shows that it is almost impossible to obtain these drawings later during a project.	N-D	No change (-)	Drawings.	Drawings.			
SLST.60	RE	When the sliding step is extended, clacking noises shall not occur when somebody steps on the sliding step surface.	Customer perception.	N-D	No change (-)	Statement.	Concept descr. Type Test Specification - Fct-Test - Mock-up/PT.	Type Test Protocol - Fct-Test - Mock-up/PT. Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.159		6) Aspect requirements								
SLST.160		6.1) Failure behaviour								
SLST.61	RE	In case of a single failure, the sliding step shall remain retracted and secured while the train is in operation.	Supplier has to prove that there have to be at least two failures for the step to extend unintentionally.	N-D	No change (-)	Concept descr.	Technical descr. FMEA.			

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SLST.161		6.2) Resistance to weather and external influences								
SLST.62	INFO	This section describes the environment that the sliding step is exposed to while performing the functionalities as described in chapter 3. The measures to be taken to ensure operation are stated.	n/a	N-D	No change (-)	n/a	n/a	n/a	n/a	n/a
SLST.63	RE	The sliding step shall function reliably in the specified temperature range in accordance with EN 50125-1:2014 and EN 50155:2017.	Minimum operating conditions under which the system has to function.	N-D	Minor change	Statement.	Technical descr. Type Test Specification - Climate-Test - Mock-up/PT (SLST.64, SLST.123, SLST.124, SLST.125). Type Test Specification - Endurance-Test - Mock-up/PT.	Type Test Protocol - Climate-Test - Mock-up/PT (SLST.64, SLST.123, SLST.124, SLST.125). Type Test Protocol - Endurance-Test - Mock-up/PT. Type Test Specification - Climate-Test - Train (SLST.64, SLST.123, SLST.124, SLST.125).	Type Test Protocol - Climate-Test - Train (SLST.64, SLST.123, SLST.124, SLST.125).	
SLST.123	RE	The operation of the sliding step at minimum temperatures shall be tested in accordance with CEN/TR 16251:2016, section 6.14.3.1.	Verification of SLST.63.	N-D	New	Statement.	Type Test Specification - Climate-Test - Mock-up/PT.	Type Test Protocol - Climate-Test - Mock-up/PT.		
SLST.124	RE	The operation of the sliding step with wet snow shall be tested in accordance with CEN/TR 16251:2016, section 6.14.3.2.	Verification of SLST.63.	N-D	New	Statement.	Type Test Specification - Climate-Test - Mock-up/PT.	Type Test Protocol - Climate-Test - Mock-up/PT.		
SLST.64	RE	The operation of the sliding step with ice shall be tested in accordance with CEN/TR 16251:2016, section 6.14.3.3, applying an ice layer of 3 mm.	Verification of SLST.63. This could be done at the small climate chambers run by the suppliers.	N-D	Minor change	Statement.	Type Test Specification - Climate-Test - Mock-up/PT.	Type Test Protocol - Climate-Test - Mock-up/PT.		
SLST.125	RE	The operation of the sliding step with ice shall be tested in accordance with CEN/TR 16251:2016, section 6.14.3.3, applying an ice layer on the entire surface of the vehicle doors, with 3 mm thickness at 1 m above the step surface.	In addition to SLST.64. The supplier is challenged to limit water accumulation at step height by design.	N-D	New	Statement.	Type Test Specification - Climate-Test - Mock-up/PT.	Type Test Protocol - Climate-Test - Mock-up/PT.		
SLST.126	RE	The operation of the sliding step at maximum temperatures shall be tested: - opening - closing - obstacle detection - manual retraction.	In order to cover the other end of the temperature spectrum, which is not described by CEN/TR 16251:2016. The test also serves to discover potential expansion effects with an impact on smooth running.	N-D	New	Statement.	Type Test Specification - Climate-Test - Mock-up/PT.	Type Test Protocol - Climate-Test - Mock-up/PT.		
SLST.65	RE	To avoid blockage by freezing due to sticking of rubber seals exposed to the external environment, silicone material shall preferably be used for these seals.	Objective is to break ice, not to achieve a specific force. Silicone material has better performance with frost. If not possible for technical reasons, other material may be used.	N-D	No change (-)	Statement.	Technical description.		Type Test Protocol - Climate-Test - Train.	
SLST.66	RE	The operation of sliding steps shall not be affected by grit (i.e. sand, salt or chippings) used on platforms when slippery.	Grain size and type of grit varies per operator.	N-D	Minor change	Concept descr.	Drawings. Technical descr. Concept descr.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.67	INFO	The supplier can request a sample of the operator's specific grit.	To give the supplier the opportunity to test during construction phase.	N-D	No change (-)	n/a	n/a	n/a	n/a	n/a
SLST.68	RE	The sliding step in the retracted position shall be sealed tight against ingress of drifting snow.	To avoid blockage.	N-D	No change (-)	Statement.	Drawings. Concept description.	Type Test Specification - Climate-Test - Train. Type Test Specification - Water-Test - Train.	Type Test Protocol - Climate-Test - Train. Type Test Protocol - Water-Test - Train.	

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SLST.69	RE	Ingress of water into the drive system and into the step control unit for any position of the sliding step shall be prevented.	Objective: Water should not get into the rotating or moving parts of the steps or in the switches.	N-D	No change (-)	Statement.	Drawings. 3D-drawing. Technical descr. Concept descr.	Type Test Specification - Water-Test - Train. Inspection.	Type Test Protocol - Water-Test - Train.	
SLST.70	RE	The sliding step in the retracted position shall be water tight, under any operating condition of the train, in +x and -x direction, including cant.	To prevent moisture from entering the step cassette and reaching the step components.	N-D	No change (-)	Statement.	Drawings. 3D-drawing. Technical descr. Concept descr.	Type Test Specification - Water-Test - Train; also refer to SLST.72. Inspection	Type Test Protocol - Water-Test - Train.	
SLST.71	RE	The sliding step in the retracted position shall be water tight in train washing plants, with the train passage performed in +x and -x direction.	To prevent moisture from entering the step cassette and reaching the step components.	N-D	No change (-)	Statement.	Drawings. 3D-drawing. Technical descr. Concept descr.	Type Test Specification - Water-Test - Train; also refer to SLST.72. Inspection	Type Test Protocol - Water-Test - Train.	
SLST.72	RE	The water tightness required in SLST.70 and SLST.71 shall be demonstrated according to EN 14752:2015, Annex B, with the train passage performed in +x and -x direction.	Test specified in EN 14752:2015 for doors is suitable for steps, too.	N-D	Minor change	Statement.		Type Test Specification - Water-Test - Train.		
SLST.73	RE	If a sliding step is not capable of fulfilling the requirements of water & snow tightness (SLST.68, SLST.70, SLST.71) due to its design type, then water entering the vehicle shall be drained adequately.	= requirement for doors (EN 14752:2015, section 4.10.2).	N-D	Changed	Concept descr.	Drawings. 3D-drawing. Technical descr. Concept descr.	Type Test Specification - Water-Test - Train. Inspection.	Type Test Protocol - Water-Test - Train.	
SLST.74	RE	The sliding step cassette shall be sealed tight against floor cleaning agents.	To prevent aggressive liquids from entering the step cassette and reaching the step components.	N-D	No change (-)	Statement.	Drawings. 3D-drawing. Technical descr. Concept descr.	Type Test Specification - Interior cleaning-Test - Train.	Type Test Protocol - Interior cleaning-Test - Train.	
SLST.162		6.3) Resistance against deformation								
SLST.75	RE	When a sliding step is used, no permanent deformation shall occur when a force of 1000 N is applied on either side of the sliding step, in x-direction.	Deformation in direction perpendicular to sliding step movement not covered by EN. Deformation in the horizontal plane must be prevented, to ensure that the sliding step will always extend and retract correctly and to prevent rotation and plastic deformation in time. The 1000N has been based on expert judgement.	N-D	No change (-)	Statement.	Calculation. Simulation. Type Test Specification - Load test - Mock-up/PT.	Type Test Protocol - Load test - Mock-up/PT. Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train.	
SLST.76	RE	While extended, the sliding step shall stay in position under a force of up to 1200 N exerted on the edge of the sliding step in positive and negative y-direction.	Objective: 1) Demonstrate that in the extended position, pushing and pulling on the front edge (e.g. by misuse or accidentally during maintenance) does not have an influence on the stability, i.e. the step should not move more than x mm from the position it has relative to the platform. 2) Application of force shall not have an influence on functionality afterwards. Force is defined to design the sliding step and its required strength at the extended position.1200 N is a measure for verification.	N-D	Minor change	Statement.	Calculation. Simulation. Type Test Specification - Load test - Mock-up/PT.	Type Test Protocol - Load test - Mock-up/PT. Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train.	
SLST.127	RE	The sliding step shall support being used repeatedly by a person with a heavy wheelchair (300 kg in total), driving at 3 km/h, without any loss of functionality.	A case which is likely to occur in reality, with a height difference of up to 60 mm. This is especially relevant for steps driven by a spindle which may bend under the force.	N-D	New	Statement.	Calculation. Simulation.	Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train.	

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.77	RE	When retracted, the sliding step shall resist: - 1200 N force in opening direction (positive y-direction); - dynamic and aerodynamic forces during operation (refer to annex F of EN 14752:2015); without loss of functionality after the forces have occurred.	The sliding step must remain retracted during all train movements. The value was chosen because it is the same as in SLST.76 (extended step) and hence both functionalities may be realized by means of the same component.	N-D	Changed	Statement.	Calculation. Simulation. Type Test Specification - Load test - Mock-up/PT.	Type Test Protocol - Load test - Mock-up/PT Type Test Specification - Load test - Train	Type Test Protocol - Load test - Train	
SLST.78	INFO	Requirements SLST.79 to SLST.82 are only applicable if the surface of the sliding step cassette is part of the standing area, i.e. the vehicle floor.	n/a	N-D	No change (-)	n/a	n/a	n/a	n/a	n/a
SLST.79	RE	When a distributed load of 7 kN/m ² is applied on the entire surface of the sliding step cassette, the step shall extend or retract normally.	Case of overloaded train. Value 7 kN/m ² corresponds to maximum value stated in EN 15663:2017.	N-D	Changed	Statement.	Calculation. Simulation.	Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train	
SLST.80	RE	A distributed load of 7 kN/m ² applied on the entire surface of the sliding step cassette shall not lead to permanent deformation.	Case of overloaded train. Value 7 kN/m ² corresponds to maximum value stated in EN 15663:2017.	N-D	Changed	Statement.	Calculation. Simulation.	Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train	
SLST.81	RE	When a load of 2.5 kN is applied on a 100 x 200 mm area, at any point of the sliding step cassette surface, the step shall extend or retract normally.	Case of heavy person standing on one leg.	N-D	No change (-)	Statement.	Calculation. Simulation.	Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train	
SLST.82	RE	A load of 2.5 kN applied on a 100 x 200 mm area at any point of the sliding step cassette surface shall not lead to permanent deformation.	Case of heavy person standing on one leg.	N-D	No change (-)	Statement.	Calculation. Simulation.	Type Test Specification - Load test - Train.	Type Test Protocol - Load test - Train	
SLST.163		6.4) Resistance against misuse			New					
SLST.128	OR	A functionality test of the sliding step shall include at least the following cases of misuse: a) Frequently pressing the open button while the step is still extending, checking whether this causes a delay in the door opening process. b) Blocking step retraction several times and then troubleshooting with staff, checking whether train staff is able to solve the problem. c) Testing the sensitivity and reaction of the vertical load detection functionality. d) Intentionally blocking the overrun protection during extension.	Based on operator experience from FAIs and type tests. The goal is to evaluate and improve the system behaviour based on these results.	N-D	New	Statement.		Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.164		7) Design requirements								
SLST.165		7.1) General requirements								
SLST.83	RE	The sliding step shall have an electric drive system.	Advantages w.r.t. pneumatic systems: - better safety performance; - cheaper; - higher energy efficiency.	N-D	No change (-)	Statement.	Technical description.			
SLST.84	CH	The sliding step shall have a step surface with: a) 15 x 15 mm grid; <i>or</i> b) chequered plate; <i>or</i> c) rough surface in accordance with EN 16584-3:2017.	Operator must specify, as different operators have different experiences with e.g. snow or sand.	N-D	Changed	If operator chooses: statement. If operator doesn't choose: concept descr.	Drawing. Technical description. Surface sample.			
SLST.166		7.2) Design for maintainability								
SLST.85	RE	The sliding step cassette containing all the step components shall be an exchangeable unit.	Good maintainability.	N-D	No change (-)	Statement.	Concept description. Maintenance instruction.	Type Test Specification - Maintainability-Test - Train.	Type Test Protocol - Maintainability-Test - Train.	
SLST.86	RE	The connection between sliding step cassette and vehicle shall be a detachable connection.	With the designs currently available, the connection and its surrounding is frequently damaged when removing the cassette. This is undesirable.	N-D	Minor change	Statement.	Concept description. Maintenance instruction.	Type Test Specification - Maintainability-Test - Train.	Type Test Protocol - Maintainability-Test - Train.	

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.87	RE	All sliding steps on the same train shall use the same components and systems. Exceptions shall be brought to the attention of the operator during the design phase.	Standardisation. Reducing the variety of components is in fact applicable to all systems of the train but stated here explicitly.	N-D	No change (-)	Statement.	Part lists. Drawings.			
SLST.88	RE	All components shall be exchangeable separately in situ. The step drive shall not be considered as 1 component, hence all individual components shall be exchangeable in situ.	Depending on the overhaul and maintenance concept, and depending on the task, repairs are carried out in situ or at a depot. The design of the sliding step should allow for both options.	N-D	No change (-)	Concept descr.	Concept description. Maintenance instruction. Type Test Specification - Maintainability-Test - Mock-up/PT.	Type Test Protocol - Maintainability-Test - Mock-up/PT.		
SLST.89	RE	Exchange of the limit switch shall not require readjustment of the switch nor other step components.	Easy exchange of components.	N-D	No change (-)	Statement.	Concept description. Maintenance instruction. Type Test Specification - Maintainability-Test - Mock-up/PT.	Type Test Protocol - Maintainability-Test - Mock-up/PT.		
SLST.90	RE	Exchange of components shall be possible without special tools.	Standardisation.	N-D	No change (-)	Statement.	Technical descr. Maintenance description. Type Test Specification - Maintainability-Test - Mock-up/PT.	Type Test Protocol - Maintainability-Test - Mock-up/PT.		
SLST.91	RE	All step components to be accessed during maintenance shall be accessible within 60 s, by one person and without special tools.	Good accessibility of components.	N-D	No change (-)	Statement.	Technical descr. Maintenance description.	Type Test Specification - Maintainability-Test - Train.	Type Test Protocol - Maintainability-Test - Train.	
SLST.92	RE	After maintenance, the original state of the sliding step shall be restorable within 60 s, by one person and without special tools.	Addition to SLST.91.	N-D	No change (-)	Statement.	Technical descr. Maintenance descr.	Type Test Specification - Maintainability-Test - Train.	Type Test Protocol - Maintainability-Test - Train.	
SLST.93	RE	At least the following components shall be durably labelled with at least the manufacturer's name, the product name and the part/order number of the component: - drive system(s) - locking system(s) - step cassette(s) - step(s).	Traceability of components, facilitate procurement.	N-D	No change (-)	Statement.	Drawings.	Inspection.		
SLST.94	RE	The component label shall only be visible to maintenance personnel.	Passenger perception.	N-D	No change (-)	Statement.			Inspection.	
SLST.95	RE	The component label shall be visible without disassembly or removal of the component.	Improved maintainability.	N-D	No change (-)	Statement.			Inspection.	
SLST.96	RE	In case contrasting bands are glued, they shall be glued on a dismountable component, so they can be replaced in less than 10 minutes.	Colour wears off quickly. Removal by scratching off in situ takes too long in case of glued bands.	N-D	Minor change	Statement.	Technical descr. Maintenance description. Type Test Specification - Maintainability-Test - Mock-up/PT.	Type Test Specification - Maintainability-Test - Mock-up/PT.		
SLST.167		7.3) Moisture resistant design								
SLST.97	RE	The sliding step cassette shall prevent the accumulation of fluids inside the cassette.	A dry cassette interior is the most desirable situation.	N-D	No change (-)	Concept descr.	Drawings. Technical descr.	Type Test Specification - Water-Test – Train. Inspection.	Type Test Protocol - Water-Test - Train.	
SLST.98	RE	If drainage holes are necessary, they shall be located such that water cannot enter the sliding step cassette through them due to e.g. overpressure.	Prevention of moisture accumulation may be (but does not have to be) realized by planning drainage holes.	N-D	No change (-)	Concept descr.	Drawings. Technical descr.	Type Test Specification - Water-Test – Train. Inspection.	Type Test Protocol - Water-Test - Train.	
SLST.99	RE	The wiring of the electrical components shall be placed such a way that water is prevented from entering electrical components.	Water and electricity do not go together. The requirement is non-functional as it is derived from operator experience.	N-D	No change (-)	Statement.	Drawings. 3D-drawing. Technical descr. Concept descr.	Type Test Specification - Water-Test – Train. Inspection.	Type Test Protocol - Water-Test - Train.	

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.100	RE	The water and dust tightness level of switches and control equipment of the sliding step shall be at least IP 66 as defined in EN 60529:2000.	Water and electricity do not go together. The requirement is non-functional as it is derived from operator experience.	N-D	Minor change	Statement.	Technical descr. Data sheet.	Inspection (incl. installation).		
SLST.168		8) Diagnosis								
SLST.101	RE	In single and multiple train formations, each sliding step shall generate status information (out of service, extended, retracted) which is accessible for local use or network systems.	Operator may have requirements for the visualisation of information for the driver and train staff. The actual interface is out-of-scope and therefore not mentioned here.	N-D	No change (-)	Statement.	Technical descr.	Type Test Specification - Diagnosis-Test - Train.	Type Test Protocol - Diagnosis-Test - Train.	
SLST.102	RE	The sliding step control unit shall not be part of the central train network.	Undesired system architecture (authorisation!).	N-D	No change (-)	Statement.	Technical descr. Concept description.			
SLST.103	CH	The sliding step control unit shall: a) be integrated into the door control unit or b) communicate directly with the door control unit.	Option a), the 2-in-1 solution, is not acceptable for all operators at this point.	N-D	Minor change	If operator chooses: statement. If operator doesn't choose: concept descr.	Technical descr. Concept description.			
SLST.104	RE	The sliding step shall have the interfaces to be integrated into the diagnostic architecture of the vehicle.	Step and vehicle should follow the same logic.	N-D	No change (-)	Statement.	Technical descr. Concept description.			
SLST.105	RE	The system shall record for each sliding step: - number of operation cycles (continuous); - number of operation cycles, resettable by maintenance staff; - number of operation cycles between malfunctions; - number of operation cycles without malfunctions since the last software update; - operating hours (day and time); - average number of reversions.	To follow RAMS performance and (later) allocate a malfunction to an amount of cycles. "Malfunction" to be defined by operator.	N-D	No change (-)	Statement.	Technical description.	Type Test Specification - Diagnosis-Test - Train.	Type Test Protocol - Diagnosis-Test - Train.	
SLST.106	RE	The system shall measure per cycle for each sliding step, but record only when out of range: - the motor current curve (actual and target values); - the motor voltage curve (actual and target values); - the path-time-curve (actual and target values); - the activation of switches.	To ensure the step is prepared for future developments regarding preventive/condition-based maintenance. If these maintenance philosophies are to be applied, the range / tolerance limits will have to be set to a narrow value. However, this level of detail goes beyond the scope of a joint specification and will need to be discussed and agreed in the design phase.	N-D	Changed	Statement.	Technical description.	Type Test Specification - Diagnosis-Test - Train.	Type Test Protocol - Diagnosis-Test - Train.	
SLST.107	RE	The maintenance staff shall be able to (de)activate the following functionality: The system shall record the final position of each sliding step per cycle.	To ensure the step is prepared for future developments regarding preventive/condition-based maintenance. This functionality is to be switched on by maintenance staff (thus standard setting is "off").	N-D	Minor change	Statement.	Technical description. Maintenance instruction.	Type Test Specification - Diagnosis-Test - Train.	Type Test Protocol - Diagnosis-Test - Train.	
SLST.108	RE	The supplier shall determine the parameters to be transmitted for diagnostic purposes together with the operator.	Standardisation.	N-D	No change (-)	Statement.	List of parameters.			
SLST.109	RE	The sliding step shall give information to the train network about any unexpected movement in extending direction, while the train is running, or in stations. The driver shall be informed immediately in case of: - steps extending while train is running. - steps extending on the wrong side when the train stops at a station. Note: The wrong side is the opposite of the authorized side, given by a system or a driver command. The supplier shall agree with the operator how this information is presented to the driver and/or train staff.	Make sure that the non-exit side of the train is safely closed. Unexpected behaviour, case 1: step extends unexpectedly.	N-D	No change (-)	Statement.	Technical description.	Type Test Specification - Diagnosis-Test - Train.	Type Test Protocol - Diagnosis-Test - Train.	

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.110	RE	The sliding step shall give information to the train network about unexpected behaviour in stations. The driver shall be informed immediately when a sliding step does not extend on the authorized side. The supplier shall agree with the operator how this information is presented to the driver and/or train staff.	Unexpected behaviour, case 2: step does not extend despite authorisation.	N-D	No change (-)	Statement.	Technical description.	Type Test Specification - Diagnosis-Test - Train.	Type Test Protocol - Diagnosis-Test - Train.	
SLST.169		9) Maintenance requirements								
SLST.111	RE	The sliding step shall fully extend or retract when a local command is given by authorized personnel (e.g. for cleaning or maintenance purposes). The exact function shall be defined with the operator in the design phase.	Functionality depends on maintenance and cleaning concept of the operator. The supplier must take this into account in the early stages of the design.	N-D	No change (-)	Concept descr.	Concept descr. Cleaning instructions. Maintenance instructions.	Type Test Specification - Fct-Test - Train.	Type Test Protocol - Fct-Test - Train.	
SLST.114	RE	The supplier shall provide an illustrated spare parts catalogue with engineering drawings of all spare parts.	Useful for maintenance organisation of the operator.	N-D	No change (-)	Statement.		Draft version.	Approved version.	
SLST.129	RE	The supplier shall provide a parts list, indicating which components are - rotables to be refurbished by the supplier - rotables to be refurbished by the operator's maintenance organisation - wearing parts.	Relevant input for the maintenance organisation of the operator.	N-D	New	Statement.		Draft version.	Approved version.	
SLST.130	INFO	Maintenance schedules are getting more and more advanced. The operator wants to achieve a smooth integration of the sliding step in their maintenance schedule, and understand the considerations that lead to the maintenance instructions.	Explanation why this chapter has been extended compared to V1.	N-D	New	n/a	n/a	n/a	n/a	n/a
SLST.131	RE	The supplier shall state the assumed parameters for 'step cycles per year', 'running km per year' and 'lifetime of cars', as required by the operator or the operating profile.	Inspection and exchange intervals depend on the operational profile of the train. This requirement is a check whether the supplier's assumptions regarding the train operation are correct.	N-D	New	Statement.	Techn. description.			
SLST.112	RE	The supplier shall supply complete maintenance instructions for all maintenance activities during the life of the sliding step, including: - the replacement interval of the rubber parts; - adjustment/tensioning of the belt.	From operator experience, the two specific cases are interesting: - Rubber parts are considered the most vulnerable. - Method and tooling must be suitable for the specific installation situation of the belt. The sliding step shall be designed to facilitate maintenance and to align with the existing maintenance regime of the operator. Detailed maintenance instructions includes all preventive- and corrective maintenance activities, including replacement of broken components caused by vandalism.	N-D	Changed	Statement.		Draft maintenance instructions.	Approved maintenance instructions.	
SLST.132	RE	Where the supplier states that no revision is required for a component during the lifetime of the sliding step, the supplier shall support this statement by means of a calculation or another relevant document.	Based on experience with components which needed replacement despite expected eternal lifetime.	N-D	New	Statement.	Calculation, if applicable.			
SLST.133	RE	The supplier shall state the required time (man-hours) for all corrective maintenance activities.	Relevant input for the maintenance organisation of the operator.	N-D	New	Statement.	Maintenance instructions.	Type Test Specification - Maintenance Test - Train.	Type Test Protocol - Maintenance Test - Train.	
SLST.134	RE	For preventive maintenance tasks, the supplier shall state tool requirements, maintenance intervals and required time (man-hours) in table 3, taking into account the instructions in SLST.135.	Relevant input for the maintenance organisation of the operator.	N-D	New	Statement.	Maintenance instructions.	Type Test Specification - Maintenance Test - Train.	Type Test Protocol - Maintenance Test - Train.	

ID	Requirement classification	Requirement text	Rationale	Product element EN 15380-2	Change since last release	Verification				
						Offer of Tenderer(s)	Design Review	FAI ⁴	FII ⁵	Take-over
SLST.135	INFO	Instructions for requirement SLST.134: - supplier to tick the applicable boxes; - supplier to complete column 2 if necessary; - tool requirements includes necessary supporting tasks such as opening panels, isolating etc. - the same necessary supporting tasks shall be included in the required time (man-hours).	n/a	N-D	New	n/a	n/a	n/a	n/a	n/a
SLST.113	RE	The supplier shall provide the result of life endurance testing of: - the limit switch; - the motor; - the sensors of the contactless platform detection system, if applicable.	The results of these tests can be taken into account by the operator when writing the maintenance plan.	N-D	No change (-)	Statement.	Endurance test protocols.			
SLST.136	RE	The supplier shall state the required skill level required for all maintenance activities, in accordance with the European Qualification Framework (EQF).	Relevant input for the maintenance organisation of the operator (planning & costs).	N-D	New	Statement.	Maintenance instructions.			
SLST.170		10) RAMS requirements			New					
SLST.137	RE	To demonstrate safety, at least the step-related top events from section 4.8 of EN 14752:2015 shall be covered in a fault tree analysis.	Section 4.8 of EN14752:2015 is not yet mandatory but is considered a good starting point for the safety analysis.	N-D	New	Statement.	Fault tree analysis (draft).	Fault tree analysis (final version).		
SLST.138	INFO	A failure is defined as an event resulting in the sliding step not being able to extend or retract as intended, and attributed to one of the following causes: - technical failure of a sliding step component; - jamming due to objects (ice, grit).	Definition of 'failure', relevant for the following requirements.	N-D	New	n/a	n/a	n/a	n/a	n/a
SLST.139	RE	The supplier shall carry out a FMECA based on EN 60812:2018, including unambiguous statements on failure frequencies, probability of discovery and failure consequences.	Relevant insight for the operator and maintenance organisation of the operator.	N-D	New	Statement.	FMECA (draft).	FMECA (final version).		
SLST.140	RE	For all components of the sliding step where failure has an impact on safety of humans or operational safety, the supplier shall define the necessary measures, based on the FMECA.	Relevant insight for the operator and maintenance organisation of the operator.	N-D	New	Statement.	FMECA (draft).	FMECA (final version).		
SLST.141	RE	The supplier shall provide a table with descriptions of faults and failures which can be encountered by train staff and maintenance staff, including instructions for remedial actions.	An overview of all potential problems, how to discover and solve them, helps minimizing the impact of failures on operations.	N-D	New	Statement.	Maintenance instructions. Train staff operating handbook.	Type Test Specification - Maintenance Test - Train. Type Test Specification - Fct Test - Train.	Type Test Protocol - Maintenance Test - Train. Type Test Protocol - Fct Test - Train.	
SLST.142	OR	Optional: The mean number of cycles between failure of the sliding step shall be X cycles. (Alternatively: mean distance between failure, X km.)	As a guarantee for reliability. For definition of failure, refer to SLST.138.	N-D	New	Statement.	Calculation. Results of endurance tests.			
SLST.143	INFO	Verification of SLST.142 takes place in the warranty phase.	n/a	N-D	New	n/a	n/a	n/a	n/a	n/a

7 APPENDIX

7.1 Excel version

The Excel document “Sliding Steps V2.0” with all attributes is available on request (see contact on the EuroSpec website).

7.2 Referenced tables

Table 1: List of requirement ID’s or sections where operator input is required.

CH	OR	Optional sections
SLST.9	SLST.26	section 3.3.2)
SLST.10	SLST.43	section 3.5)
SLST.13	SLST.46	
SLST.15	SLST.115	
SLST.20	SLST.128	
SLST.22	SLST.142	
SLST.24		
SLST.25		
SLST.26		
SLST.30		
SLST.34		
SLST.42		
SLST.52		
SLST.53		
SLST.55		
SLST.84		
SLST.103		
SLST.117		
SLST.118		
SLST.119		
SLST.121		

Table 2: List of settable parameters [SLST.57]

	Parameter	Description	Value range	Also refer to ID
1	X	Number of reversal attempts	$0 \leq X \leq \infty$	SLST.25, SLST.28
2	t	The time the sliding step remains extended in case of automatic door closing while at the platform	$0 \leq t \leq \infty$	-
3	y_{thr}	Threshold extension distance	$0 \leq y_{thr} \leq y_{stroke}$	SLST.23, SLST.24, SLST.25
4	y_{max}	Maximum extension distance	$0 \leq y_{max} \leq y_{stroke}$	Rationale of SLST.57
5	v_1	Movement speed for step extension distance $y < 50$ mm	$v_1 \geq v_2$	-

6	v_2	Movement velocity for step extension distance $y > 50$ mm (taking into account the max. forces specified in EN14752, section 5.4.2)	$v_2 \geq 0.1$ m/s	-
7	y_{ed}	<p>Fixed extension distance</p>	$0 \leq y_{ed} \leq y_{stroke}$	SLST.13 SLST.30
8	y_r	<p>For each detection method/direction: retraction distance after obstacle or platform detection</p>	$0 \leq y_r \leq y_{stroke}$	SLST.24, SLST.26, SLST.25, SLST.31, SLST.115

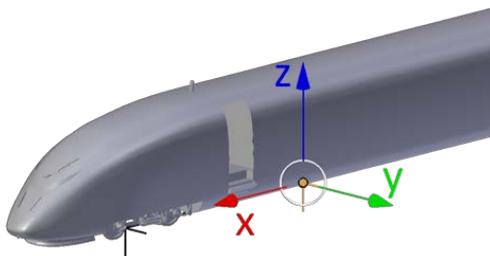
Table 3: Preventive maintenance task table [SLST.134]

Preventive maintenance task	Relevant component(s)/function(s)	Tool requirements	Frequency (cycles or time)	Time required (man-hours)
Functional check	<ul style="list-style-type: none"> <input type="checkbox"/> Extension <input type="checkbox"/> Retraction <input type="checkbox"/> Obstacle and/or platform detection <input type="checkbox"/> Put out-of-service <input type="checkbox"/> Vertical load detection <input type="checkbox"/> Emergency device <input type="checkbox"/> Switching and locking function of safety switch + actuator <input type="checkbox"/> Water drain 			
Visual inspection for damage	<ul style="list-style-type: none"> <input type="checkbox"/> Frame and housing components <input type="checkbox"/> Toothed belt <input type="checkbox"/> Chain 			

	<input type="checkbox"/> Step surface <input type="checkbox"/> Signal strip <input type="checkbox"/> Rubber end profile <input type="checkbox"/> Rubber buffer <input type="checkbox"/> Guide tracks <input type="checkbox"/> Electrical plugs <input type="checkbox"/> Electrical wires <input type="checkbox"/> Screwed connections			
Check condition	<input type="checkbox"/> Water drain			
Check for dirt	<input type="checkbox"/> Redirecting roller <input type="checkbox"/> Step surface <input type="checkbox"/> Location where sliding step emerges from cassette <input type="checkbox"/> Signal strip <input type="checkbox"/> Profile roller <input type="checkbox"/> Guide tracks			
Check for corrosion	<input type="checkbox"/> Electrical plugs <input type="checkbox"/> Screwed connections <input type="checkbox"/> Chain <input type="checkbox"/> Pulleys <input type="checkbox"/> Axes <input type="checkbox"/> Gear wheels <input type="checkbox"/> Step surface			
Check for wear	<input type="checkbox"/> Toothed belt <input type="checkbox"/> Chain <input type="checkbox"/> Redirecting roller <input type="checkbox"/> Profile roller <input type="checkbox"/> Guide tracks <input type="checkbox"/> Electrical plugs <input type="checkbox"/> Electrical wires <input type="checkbox"/> Screwed connections <input type="checkbox"/> Rubber seals <input type="checkbox"/> Plastic guides			
Check for tight fit	<input type="checkbox"/> Rubber end profile <input type="checkbox"/> Rubber buffer <input type="checkbox"/> Electrical plugs <input type="checkbox"/> Screwed connections			
Check for smooth movement	<input type="checkbox"/> Cover plate <input type="checkbox"/> Manual retraction <input type="checkbox"/> Profile roller <input type="checkbox"/> Drive (motor power)			
Check for clearance	<input type="checkbox"/> Around actuator			

Check attachment/mounting	<input type="checkbox"/> Safety switch & actuator <input type="checkbox"/> Step cassette on frame			
Check for noise emission	<input type="checkbox"/> Drive			
Grease	<input type="checkbox"/> Various components			
Clean	<input type="checkbox"/> All components			
Measure	<input type="checkbox"/> Belt tension			
Adjust	<input type="checkbox"/> Belt tension			
Disassemble	<input type="checkbox"/> Sliding step to component level			
Replace components	<input type="checkbox"/> Rubber <input type="checkbox"/> Running parts <input type="checkbox"/> Drive <input type="checkbox"/> Switches <input type="checkbox"/> Bearings			

7.3 Referenced figures



x = vehicle body longitudinal axis
y = vehicle body transverse axis
z = vehicle body vertical axis

Figure 2: Coordinate system with reference axes

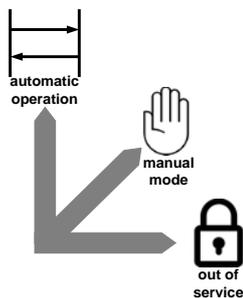


Figure 3: Positions of out-of-service device

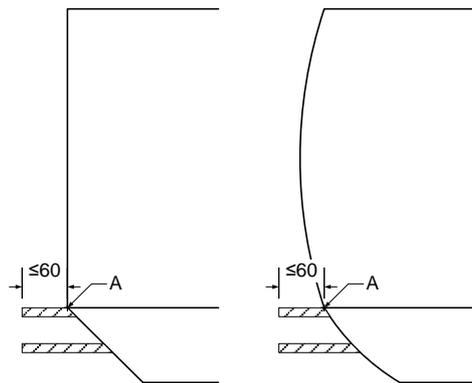


Figure 4: Location of the measurement point A

The point A illustrated in figure 4 is the starting point for measuring the length of the sliding step, regardless of whether the sliding step is at this level, or if the car body is curved.

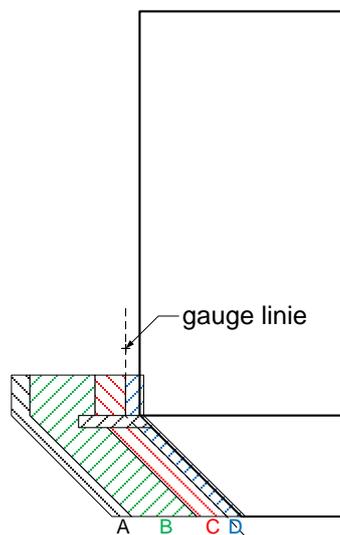


Figure 5: Positions of the sliding step

- **A** maximum stroke of the sliding step
- **B** range between minimum and maximum usable extension distance
- **C** minimum usable extension distance (y_{thr})
- **D** retracted and secured

8 BIBLIOGRAPHY

Not applicable.

EuroSpec

“EuroSpec” stands for European Specifications for railway rolling stock. The activity is an initiative of several European train operating companies (TOC). The main focus is on trains consisting of self-propelled carriages, using electricity as the motive power (EMU).

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