



DPC: 24 / 30493772 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 29 May 2024

Origin: International

Latest date for receipt of comments: 10 July 2024

Project No. 2024/01562

Responsible committee: GEL/9/3 Railway Electrotechnical Applications - Fixed Equipment

Interested committees:

Title: BS EN IEC 63488 Railway applications - Technical criteria for the coordinations in neutral-section passing system for train

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.
THIS DRAFT IS NOT CURRENT BEYOND 10 July 2024**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <http://standardsdevelopment.bsigroup.com>

Responsible Committee Secretary: Ms Bash Berry (BSI)

Direct tel: 0203 142 5620

E-mail: bash.berry@rssb.co.uk

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



9/3083/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 63488 ED1	
DATE OF CIRCULATION: 2024-05-24	CLOSING DATE FOR COMMENTS: 2024-08-09
SUPERSEDES DOCUMENTS: 9/2908/NP, 9/2929A/RVN	

IEC TC 9 : ELECTRICAL EQUIPMENT AND SYSTEMS FOR RAILWAYS	
SECRETARIAT: France	SECRETARY: Mr Denis MIGLIANICO
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☒ SAFETY	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE: Railway applications - Technical criteria for the coordinations in neutral-section passing system for train
--

NOTE FROM TC/SC OFFICERS:

1	FOREWORD.....	5
2	INTRODUCTION.....	7
3	1 Scope.....	8
4	2 Normative references	8
5	3 Terms, definitions and abbreviations	9
6	3.1 Terms and definitions.....	9
7	3.2 Abbreviations.....	14
8	4 General Conditions.....	15
9	4.1 Engineering conditions.....	15
10	4.2 Environmental conditions	15
11	4.3 Service life.....	16
12	4.4 Electromagnetic compatibility (EMC).....	16
13	4.5 System compatibility requirements.....	16
14	4.6 System reliability requirements	16
15	4.7 System operation requirements.....	16
16	5 Coordination requirements for NSP without power supply	16
17	5.1 General provisions.....	16
18	5.2 Functional principle.....	17
19	5.3 System configuration	17
20	5.4 Coordination of the train control mode	18
21	5.4.1 General requirements	18
22	5.4.2 Manual control mode	19
23	5.4.3 Automatic control mode	19
24	5.5 Technical requirements within NSP without power supply	19
25	5.5.1 Technical requirements for train control system	19
26	5.5.2 Technical requirements for train detection in automatic control mode.....	20
27	5.5.3 Technical requirements for neutral section arrangement of OCS	21
28	5.5.4 Technical requirements for the running speed of train in NSP	22
29	5.6 Coordination requirement of the key parameters in NSP	22
30	5.6.1 Train power-off section data for automatic control mode	22
31	5.6.2 Rail-side sign arrangement for NSP in manual control mode	22
32	5.6.3 Main circuit breaker opening and closing calculation controlled by TCS	
33	(signalling) in Automatic control mode	23
34	5.6.4 Main circuit breaker opening and closing controlled by ATP On-board in	
35	Automatic control mode	24
36	6 Coordination requirements for NSP without power supply by automatic power	
37	control on-board with ground pointing installations	24
38	6.1 Functional principle.....	24
39	6.2 System configuration	24
40	6.3 Particular requirements of subsystem interoperability	25
41	6.3.1 Coordination requirements for ground pointing signal.....	25
42	6.3.2 Coordination requirements for signal receivers on-board.....	25
43	6.3.3 Coordination requirements for control on-board by ATP	26
44	7 Coordination requirements for NSP with power supply by change-over auto-	
45	energizing	26
46	7.1 General provision.....	26
47	7.1.1 Functional principle.....	26
48	7.1.2 System configuration	27
49	7.1.3 General coordination requirement	28

50	7.1.4	Overvoltage withstanding capacity in neutral section	29
51	7.2	Coordination among the change-over section.....	29
52	7.2.1	General.....	29
53	7.2.2	Considering only normal direction operation.....	30
54	7.2.3	Considering reverse direction operation as well	30
55	7.3	Coordination requirements of the operating process and control sequence of changeover system for neutral section in normal operation condition	30
57	7.3.1	Basic control sequences to switch power source to a neutral section with ACSS	30
59	7.3.2	Operation process to switch power source to a neutral section of the ACSS	33
60	7.3.3	Coordination requirements of the operation process with control sequences in normal direction	34
62	7.3.4	Coordination requirements of the operation process with control sequences in reverse direction	35
64	7.4	Requirements of power quality to traction units on neutral section	36
65	7.4.1	General requirements	36
66	7.4.2	Short interruption of power supply by changeover switch	36
67	8	Coordination requirements for NSP with power by continuous and flexible auto- energizing	37
69	8.1	General.....	37
70	8.1.1	Functional principle.....	37
71	8.1.2	System configuration	37
72	8.1.3	Basic functional requirements of system	38
73	8.1.4	General coordination requirement	39
74	8.2	Coordination requirements among the phase converting section	39
75	8.2.1	Geometry coordination	39
76	8.2.2	Time co-ordination	40
77	8.3	Coordination requirements of the operating process and control sequence of APCS for neutral section in normal operation condition	40
79	8.3.1	Operating process of the neutral section passing system with APCS	40
80	8.3.2	Coordination requirements of the control sequence during the operating process	41
82	8.4	Technical requirements for interoperability of train	42
83	8.4.1	General.....	42
84	8.4.2	Rolling Stocks	42
85	8.4.3	Train operation control	43
86	8.5	Technical requirements for interoperability of fixed installations	43
87	8.5.1	Traction Power Supply System (TPS)	43
88	8.5.2	The signalling and train detection system.....	44
89	8.6	Technical requirements for interoperability of communication.....	44
90	8.6.1	General.....	44
91	8.6.2	Monitoring, control and communication required information	44
92	8.6.3	Communication	45
93	8.7	Particular requirements of EMC and power quality	45
94	9	Protection and procedure requirements for operation in failure or emergency conditions	45
96	9.1	General.....	45
97	9.2	Protection requirements during normal operation or in failure.....	46
98	9.2.1	NSP without power supply	46
99	9.2.2	NSP with power supply by change-over auto-energizing	46

9.2.3 NSP with power supply by continuous and flexible auto-energizing	47
9.3 Emergency rescue measures in exceptional failure	48
10 Requirements for commissioning and running test	48
10.1 General provisions	48
10.2 Requirements for NSP without power supply	48
10.3 Requirements for NSP with power supply by change-over auto-energizing	49
10.4 Requirements for NSP with power supply by continuous and flexible auto-energizing	50
Annex A (informative) Guide of technical cooperation among subsystems in NSP	52
A.1 In NSP without power supply	52
A.2 In NSP with power supply	52
Annex B (informative) National coordination data in NSP without power supply	54
B.1 In China	54
Annex C (informative) Typical train operation data for NSP	57
Bibliography	58
Figure 1 – Examples of L_{pb} , L_{ne} , L_{nz} , and L_{nes} in NSP	10
Figure 2 – System configuration for the NSP without power supply	17
Figure 3 – Position diagram of balise in NSP	20
Figure 4 – System configuration of automatic power control on-board with ground pointing installations	24
Figure 5 – System Configuration in neutral section passing system of ACSS	28
Figure 6 – Basic control sequences to switch power source to a neutral section with ACSS	33
Figure 7 – Operating process of neutral section passing system with ACSS in Figure 5 (a)	34
Figure 8 – Control sequence in normal direction operation of ACSS	35
Figure 9 – Control sequence in reverse direction operation of ACSS	36
Figure 10 – System configuration of neutral section passing system using APCS	38
Figure 11 – Operating process of neutral section passing system with APCS	41
Figure 12 – Control sequence in normal direction operating process of APCS	42
Figure A.1 – Technical cooperation among subsystems in NSP without power supply	52
Figure A.2 – Technical cooperation among subsystems in NSP with power supply	53
Figure B.1 – Schematic diagram of NSP under condition II with long neutral zone	54
Figure B.2 – Schematic diagram of NSP under condition I with short neutral section	55
Table 1 – Test requirements for NSP without power supply	49
Table 2 – Test requirements for NSP with power supply by change-over auto-energizing	49
Table 3 – Test requirements for NSP with power supply by continuous and flexible auto-energizing	50
Table B.1 – Recommended coordinated distance or length under condition I	55
Table B.2 – Recommended coordinated distance or length under condition II	55
Table B.3 – Recommended calibration data of NSP under condition I and II	55
Table C.1 – Typical Train operation data for NSP	57

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS – TECHNICAL CRITERIA FOR COORDINATIONS
IN NEUTRAL SECTION PASSING SYSTEM FOR TRAIN****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of patents, which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 63488 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

198 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
199 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, and the
200 ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs. The
201 main document types developed by IEC are described in greater detail at
202 www.iec.ch/publications.

203 The committee has decided that the contents of this document will remain unchanged until the
204 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
205 specific document. At this date, the document will be

- 206 • reconfirmed,
- 207 • withdrawn,
- 208 • replaced by a revised edition, or
- 209 • amended.

210

INTRODUCTION

211 In almost 90% countries around the world, electrified railways are powered by the three-phase
212 or different frequencies from the AC industrial power grid. However, it is not possible to directly
213 connect traction power supplies between different phases, frequencies, or circuits. Therefore,
214 a neutral section in overhead contact line system (OCS) is specially set to isolate the energy of
215 different phases or circuits. This is widely used except for the railway with single-phase power
216 supply networks.

217 There are two train passing modes. Most countries using the passing mode by train powered
218 off and coasting through. The other one is train runs through with power by auto-energized
219 equipment in order to reduce the switch-off time near zero. In both modes, the information of
220 engineering parameters and control procedure should be confirmed dynamically as the
221 interface and co-ordinations of Infra parties.

222 This document provides main necessary coordination requirements for neutral section passing
223 system (NSP) beyond IEC 62313 and IEC 62486, including:

- 224 – train control and powering methods requirements;
- 225 – design and detection requirements of train location along the track;
- 226 – arrangement requirements of neutral section in phase break based on the track characters
227 (slope, curves, speed limitation, etc.);
- 228 – neutral section data in signaling system or train detection system along the track and on
229 board when train approaching or departure;
- 230 – on-board circuit breaker switching time and signaling data requirements for the “without-
231 power-supply” modes;
- 232 – switching time, power loads, etc. requirements of fixed installed energizing subsystems with
233 different principles for the “with-power-supply” modes;
- 234 – safety and protection requirements when failure of rolling-stock or fixed installations;
- 235 – etc.
- 236

RAILWAY APPLICATIONS – TECHNICAL CRITERIA FOR COORDINATIONS IN NEUTRAL SECTION PASSING SYSTEM FOR TRAIN

1 Scope

This document gives the coordination requirements among the subsystems of neutral-section passing system (NSP) for train in the AC electrified railway with overhead contact line system by 2 control categories including:

- without-power-supply: manual-control or auto-control on-board;
- with-power-supply: change-over auto-energizing with mechanical or electronic switch, or continuous and flexible auto-energizing with power converters, etc.

This document specifies the functional principles and structures of different NSPs, as well as the main technical requirements for co-ordinations control parameters and key data of the subsystems.

This document also gives the guidelines to test and commissioning requirements, the protection and emergency procedure requirements in case of subsystem failure in NSP.

NOTE This document also gives the reference to the co-ordination requirements of neutral section passing system between DC and AC railway.

This document does not deal with:

- the mechanical contact interaction between pantograph and overhead contact line, which is dealt with in IEC 62486.
- the interface between rolling stock and electrical fixed installations for traction, in the frame of “power supply” qualities, which is dealt with in IEC 62313.
- detail requirements of each equipment itself, which are dealt with relevant equipment standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60850, *Railway applications – Supply voltages of traction systems*

IEC 60913, *Railway applications – Fixed installations – Electric traction overhead contact lines*

IEC 62236 (all parts), *Railway applications – Electromagnetic compatibility*

IEC 62313, *Railway applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock*

IEC 62486, *Railway applications – Current collection systems – Technical criteria for the interaction between pantograph and overhead contact line (to achieve free access)*

IEC 62497-1, *Railway applications – Insulation coordination –Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*



277 IEC 62497-2, *Railway applications – Insulation coordination – Part 2: Overvoltages and related*
278 *protection*

279 IEC 62498 (all parts) *Railway applications – Environmental conditions for equipment*

280 **3 Terms, definitions and abbreviations**

281 For the purposes of this document, the terms and definitions given in IEC 60050, IEC 60850,
282 IEC 60913, IEC 62313, IEC 62427, IEC 62486 and the following apply.

283 ISO and IEC maintain terminology databases for use in standardization at the following
284 addresses:

- 285 • IEC Electropedia: available at <https://www.electropedia.org/>
- 286 • ISO Online browsing platform: available at <https://www.iso.org/obp>

287 **3.1 Terms and definitions**

288 **3.1.1**

289 **neutral section**

290 section of a contact line provided with a sectioning point at each end to prevent successive
291 electrical sections differing in voltage, phase or frequency being connected together by the
292 passage of current collectors

293 [SOURCE: IEC 60050-811:2017 811-36-16]

294 **3.1.2**

295 **phase break**

296 It is composed of a section of catenary with insulated overlap or section insulators to prevent
297 pantograph from connecting catenary with different voltages, phases or frequencies. The
298 phase break length is referred as L_{pb} , referring to Figure 1.

299 **3.1.3**

300 **neutral section length**

301 L_{ns}

302 The length of section between two ends of overhead contact system in phase break of neutral
303 section, referred as, is used as the calibration base of neutral section passing system.

304 When phase break with overlaps is adopted, L_{ns} is the distance between far end boundaries of
305 insulator on non-contacted overhead contact line (OCL)s at outermost transfer position
306 located in both insulated overlaps. When phase break with section insulators is adopted, L_{ns} is
307 the distance between end boundaries of the phase break device, referring to Figure 1.

308 **3.1.4**

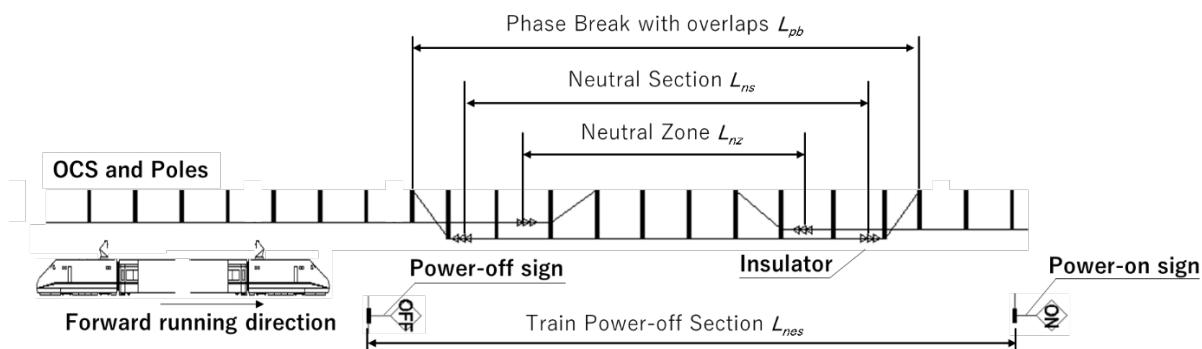
309 **neutral zone**

310 When there is no other fixed installation equipment, a section in the neutral section that catenary
311 do not supply power to train, the length of it is referred as L_{nz} . When phase break with overlaps
312 is adopted, L_{nz} is given as the distance between the near end boundaries of insulator on non-
313 running line at inner transfer column located in both insulated overlaps, referring to Figure 1.

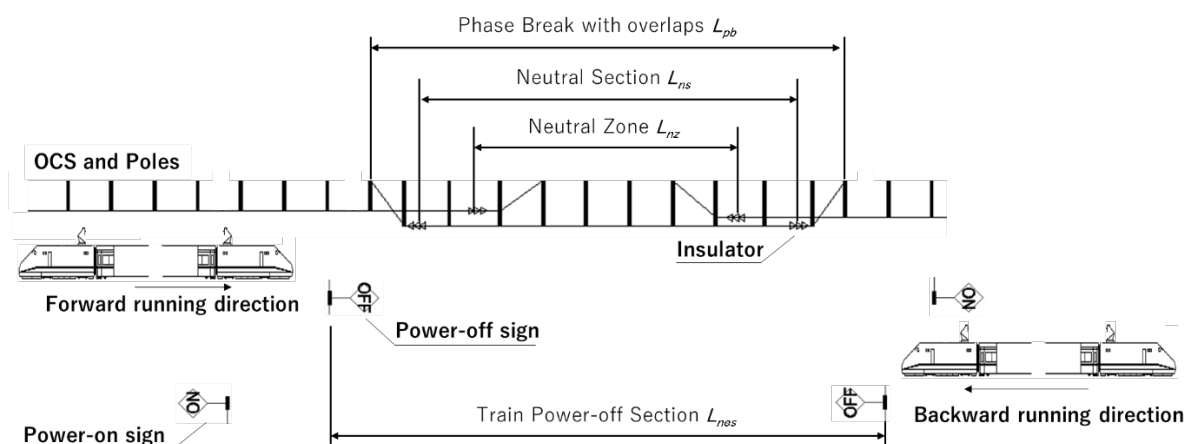
314 **3.1.5**

315 **train power-off section**

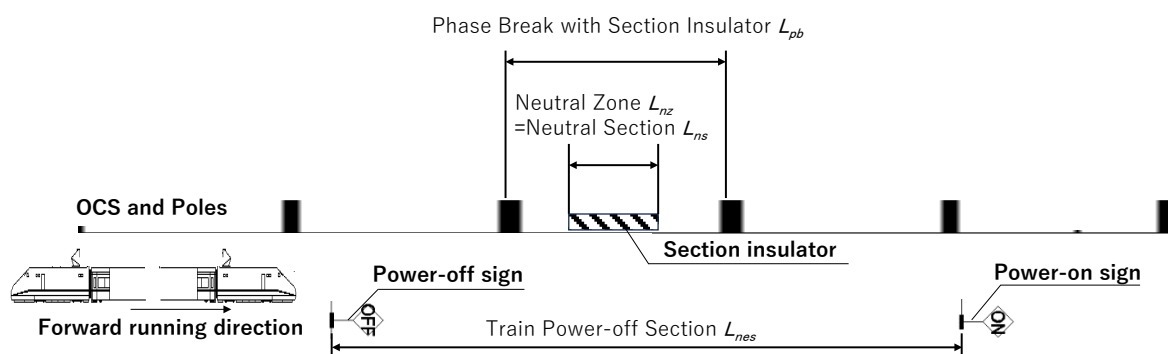
316 In the data calibration of train control system or on-board control system from the signalling
317 system, a minimum section in which the train running through the neutral section without power
318 consumption by powering off the on-board circuit breakers, which length is referred as L_{nes} ,
319 referring to Figure 1.



(a) NSP with insulated overlaps on railway where trains can run in only forward direction



(b) NSP with insulated overlaps on railway where trains can run in forward direction and backward direction



(c) NSP with neutral section insulator on railway where trains can run in only forward direction

Figure 1 – Examples of L_{pb} , L_{ne} , L_{nz} , and L_{nes} in NSP

3.1.6

changeover section

a section with a neutral section that can be automatically energized through fixed installed power supply equipment (disconnecter, circuit breaker, converters etc.), to ensure the train can be continuously electrified during the passage of neutral section.

3.1.7**neutral section passing system****NSP**

an integrated system to ensure and enable trains to pass normally through a neutral section mitigating degradation of the level of service and safety, while with power supply from OCS via current collection, or without power supply.

3.1.8**changeover switch**

switch to change power source from one feeding section to the other for supplying power to a neutral section in the changeover section.

3.1.9**feeding section**

electric section of the route fed by individual track feeder switches within the area supplied by one or more substations

[SOURCE: IEC 60050-811 811-36-25]

3.1.10**train detection**

recognition of the presence or absence of any train on a defined section of the track or at a given point

Note 1 to entry: Train detecting is performed by track circuit system, axel counter, or traction current detection, etc.

[SOURCE: IEC 60050-821 821-03-51, modified – “safe” has been deleted and Note 1 to entry has been added.]

3.1.11**current collector****pantograph**

equipment fitted to a vehicle and intended to collect current from a contact wire or conductor rail

[SOURCE: IEC 60050-811 811-32-01]

3.1.12**contact line**

conductor system for supplying electric energy to vehicles through current-collecting equipment

Note 1 to entry: This includes all current-collecting conductors and conducting rails or bars, including the following:

- reinforcing feeders;
- cross-track feeders;
- disconnectors;
- section insulators;
- over-voltage protection equipment;
- supports that are not insulated from the conductors;
- insulators connected to live parts;
- dropper;
- auxiliary catenary wire;
- stitch wire;

but excluding other conductors, such as the following:

- along-track feeders;
- earth wires and return conductors.

375 [SOURCE: IEC 60050-811 811-33-01]

376 **3.1.13**

377 **overhead contact line**

378 **catenary**

379 contact line placed above or beside the upper limit of the vehicle gauge and supplying vehicles
380 with electric energy through roof-mounted current collection equipment

381 [SOURCE: IEC 60050-811 811-33-02]

382 **3.1.14**

383 **ground magnetic sensor**

384 a magnet as the train detection installation on the ground, installed on one side of the sleeper
385 adjacent to the rail, through which the on-board induction signal receivers obtain its magnetic
386 flux density and recognize the train location to a neutral section

387 **3.1.15**

388 **normal position**

389 predetermined position to which equipment is set

390 [SOURCE: IEC 60050-821 821-01-33]

391 **3.1.16**

392 **reverse position**

393 position opposite to the normal position

394 [SOURCE: IEC 60050-821 821-01-34]

395 **3.1.17**

396 **traction unit**

397 locomotive, motor coach or train-unit

398 [SOURCE: IEC 60050-811 811-02-04]

399 **3.1.18**

400 **train set**

401 combination of vehicles coupled together, including banking locomotives

402 **3.1.19**

403 **insulated overlap**

404 sectioning point formed by overlapping the ends of adjacent sections of contact line

405 Note 1 to entry: Insulation between the two sets of contact line equipment is normally provided by a suitable air
406 gap.

407 [SOURCE: IEC 60050-811 811-36-14]

408 **3.1.20**

409 **section insulator**

410 sectioning point formed by insulators inserted in a continuous run of a contact line, with skids
411 or similar equipment to maintain continuous electrical contact with the current collector

412 [SOURCE: IEC 60050-811 811-36-15]

413 **3.1.21**

414 **vacuum switch**

415 switch within switchgear in which the contacts open and close within a highly evacuated
416 envelope

3.1.22**semiconductor switch**

switch within switchgear designed to make and break the current in an electric circuit by means of the controlled conductivity of a semiconductor

Note 1 to entry: There can be mechanical contacts associated with these semiconductor devices.

3.1.23**substation control system**

system for controlling equipment in a substation including changeover switches and main circuit breakers connected with a traction circuit

3.1.24**short interruption <of supply voltage>**

the disappearance of the supply voltage for a time interval whose duration is between two specified limits

[SOURCE: IEC 60050:161 161-08-20, modified - Note has been deleted.]

3.1.25**interruption of supply**

the loss of supply to one or several consumers

[SOURCE: IEC 60050:603 603-05-11]

3.1.26**interruption duration**

the time from the beginning of an interruption of supply to a consumer until supply has been restored

[SOURCE: IEC 60050-603 603-05-23]

3.1.27**total switching duration****total converting duration**

duration from detecting train to the end of automatic energizing process

3.1.28**normal operation condition**

traffic operating to the design timetable and train formation used for power supply fixed installation design

Note 1 to entry: Standard rules may vary depending on the infrastructure manager's policy

[SOURCE: IEC 62313:2009]

3.1.29**abnormal operating condition**

either higher loads or outage of power supply equipment outside the design standard

Note 1 to entry: Under these conditions, traffic may not operate to the design table.

[SOURCE: IEC 62313:2009]

3.1.30**normal direction operation**

operation in the direction predetermined by the design of fixed installations

3.1.31**reverse direction operation**

operation in the opposite direction to the normal direction

3.1.32**permission**

communication by telephone or by telegraph, or the control of an appropriate apparatus, carried out in order to authorize a given action

[SOURCE: IEC 60050-811, 811-01-19]

3.1.33**signalling system, <for railways>**

system to ensure the safe movement of trains by means of one or more of the following:

- lineside indications,
- wayside/onboard data exchange,
- indications given in the driver's cab

[SOURCE: IEC 60050-821 821-01-03]

3.1.34**power off****power-off**

includes "power-off" in automatic control mode, and "power-off" or "coasting" in manual control mode, usually with a track-side sign as followings.

- "power-off": indicates the train is successfully powered off without current collection;
- "coasting": in manual control mode, indicates the train has successfully stopped powering / regenerating manually by driver without opening main circuit breaker. Auxiliary power current including HVAC (heating, ventilation, and air conditioning) and lighting collection through pantograph continues while coasting.

3.1.35**power on****power-on**

includes "power-on" in automatic control mode, and "power-on" or "repowering" in manual control mode, usually with a track-side sign as followings.

- "power-On": indicates the switching on process started at last current collecting pantograph in forward running direction, to ensure all current collecting pantographs has passed through neutral section and could be safely switched on.
- "repowering": in manual control mode, indicates the train is successfully resume powering / regenerating manually by driver. Main circuit breaker remains closed.

3.2 Abbreviations

NSP	neutral section passing system
OCL	overhead contact line
OCS	overhead contact line system
EMU	electric multiple unit
TPS	traction power supply
ATP	automatic train protection system (IEV 821-08-01)
TCS	train control system
ETCS	European train control system

502	CTCS	Chinese train control system
503	RBC	radio block centre
504	HSL	high speed line
505	ACSS	auto-energizing change-over switch system
506	APCS	auto-energizing power converter system
507	POC	point of connection
508	TPSO	Traction Power Supply network Operator
509	TCC	Train Control Centre

510 **4 General Conditions**

511 **4.1 Engineering conditions**

512 Neutral section passing system (NSP) is consist of the following engineering subsystems which
513 shall be associated with:

- 514 – train: pantograph arrangement, main circuit breaker opening and closing condition, on-
515 board control measures, traction power supply voltages, protections, etc.,
- 516 – traction power supply (TPS) system: phase break arrangement of overhead contact line
517 system (OCS), substation locations, power supply voltages and currents, protections,
518 dispatching measures, etc.,
- 519 – signalling system: signalling control modes, signalling points, speed limits point, etc.,
- 520 – railway line: parameters including slope, curve, cants, speed limits calculation, etc.,
- 521 – railway stations or tunnels or depot: locations, length, speed limits, etc.

522 All these engineering subsystems in NSP shall co-ordinate with each other and shall be
523 considered in construction and operation period, and the working conditions of subsystems
524 shall be specified by users or operators.

525 The relevant engineering subsystems shall cooperate in calculation of train operation (including
526 the arrangement of signal, operation parameters of ordinary train and electric multiple unit (EMU)
527 train, on-board equipment parameters, etc.), route selection and station location (including the
528 curve super elevation and slope parameters of the line, etc.) , traction power supply scheme
529 (including substation layout, phase break layout and type selection, etc.), train control system
530 and other technical aspects to complete the evaluation and confirm all system functions and
531 requirements.

532 During the dynamic acceptance test, the normal operation under automatic control, backup
533 manual control in emergency and rescue under failure, shall be simulated to verify, evaluate
534 and optimize the function of passenger train neutral-section passing system with no power
535 supply or with power supply by the designed operation principles.

536 **4.2 Environmental conditions**

537 System stable operation environmental conditions, including ambient temperature, relative
538 humidity, altitude, dirt, seismic intensity, wind, rain, lightning, ice, sunlight radiation, train
539 operation vibration, etc., shall comply with IEC 62498 (all parts) or national standards, special
540 use (such as high altitude need to reduce the capacity of use, etc.) of the environmental
541 conditions can be determined by the user.

542 The subsystems in the NSP shall be adapted to outdoor operation on various railway lines and
543 to the safe driving requirements of each running direction and the maximum running speed of
544 various running trains on the line determined by the user.

4.3 Service life

The service life of the subsystems in the NSP is in accordance with the user-defined railway operating life regulations.

NOTE A designed value of 30 years under maintainable conditions is recommended.

The service life of the key equipment onboard or fixed-installations shall be determined by consultation between the manufacturer and the railway operator based on operating frequency.

4.4 Electromagnetic compatibility (EMC)

The electromagnetic compatibility of the subsystem in NSP shall meet the requirements in relative parts of IEC 62236 (all parts), and the system device or equipment should conform to the provisions of the relevant national specifications for the corresponding electrical equipment if applicable.

4.5 System compatibility requirements

The subsystem arrangement and mode of a neutral section passing system shall consider the compatible requirements of traction power supply, train operation, signal device arrangement, line longitudinal slope, turnout layout, bridge and tunnel location, catenary emergency repair, etc. Then optimize and verify the design, and carry out integrated commissioning. The dynamic acceptance stage of system commissioning should be further verified and improved according to the actual transportation needs of end users.

Refer to Annex A for guide of mutual compatibility of technical work among different subsystems in a neutral section passing system. Clause A.1 is for the mode of without power supply. Clause A.2 is for the mode of with power supply.

4.6 System reliability requirements

Coordination measures shall be taken to ensure the safety and reliability of train passing through neutral section without power supply or with power supply, and to avoid train get stuck in the non-energized section in signalling system when it passes through the neutral section, in normal operation or emergency running conditions.

The distance from neutral section to the nearest signal point shall be decided according to the train length, the braking distance of emergency stop, basic wind resistance of the train, the acceleration performance and the gradient.

4.7 System operation requirements

The pantograph arrangement and operation requirements of running trains shall comply with the neutral section according to IEC 62486 and national standards or laws.

The power supply capacity on-board should meet the reliability requirements of normal operation of lighting, ventilation and other facilities, while the train passes through neutral section.

5 Coordination requirements for NSP without power supply

5.1 General provisions

The neutral section passing system without power supply mode is used on many railways. It shall be selected and designed during the engineering period. It may also be used for some emergencies of NSP with power supply as specified in Clause 7 or Clause 8.