ANALYSIS OF DETERMINATIVE PARAMETERS FOR MAINTAINING THE TECHNICAL AND OPERATIONAL COMPATIBILITY OF THE 1520 mm AND 1435 mm GAUGE RAIL SYSTEMS AT THE COMMONWEALTH OF INDEPENDENT STATES (CIS)/EUROPEAN UNION (EU) BORDER.

SUBSYSTEM: CCS AND COMMUNICATIONS

The document is prepared by the OSJD-ERA Contact Group

2016

REVISIONS AND AMENDMENTS

Revision and date	Sections	Comments	Issuer
0.00/06/04/2010	All	Working document, application, parameter list, parameter analysis	VK
0.01/02/06/2010	2, 3, 4, 5	Working document following the 15th meeting from 31 May to 2 June 2010 in Warsaw	
0.02/07/10/2010	2, 3, 4, 5	Working document following the 16th meeting from 5 to 7 October 2010 in Lille	
0.03/16/02/2011	2, 5.1, 5.2	Working document following the 17th meeting from 16 to 18 February 2011 in Warsaw	
0.04/07/04/2011	2, 5.1, 5.2, 5.3	Working document following the 18th meeting from 5 to 7 April 2011 in Lille	
0.05/26/05/2011	2, 4, 5.1, 5.2, 5.3, 6	Working document following the 19th meeting from 24 to 26 May 2011 in Warsaw	
0.06/30/09/2011	All	Working document following the 20th meeting from 27 to 29 September 2011 in Lille	Chernov SV
0.07/25/01/2012	All	Working document following the 21st meeting from 24 to 26 January 2012 in Warsaw	Chernov SV
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1.01/20/04/2012	2, 5.1, 5.2, 5.3	Updated materials from the Republic of Kazakhstan were added	Chernov SV
1.02/25/05/2012	2, 5.2.1	Updated based on the materials of the Republic of Belarus and the Republic of Lithuania	Chernov SV
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	5	Editor's correction of the text based on the materials of the Republic of Belarus	
1.04/06/12/2015	2.1.7, 2.6.1, 2.6.6, 2.6.7, 2.6.23, 2.6.24, 2.6.28, 5.1.11, 5.2.1, 5.2.4.4	Updated in accordance with the new regulations adopted. Russia	Kudriavtsev, V. V.
1.05/ 10/02/2016	5	Final version editing	V. Smirnovas

CONTENTS

1 INTRODUCTION AND AREA OF APPLICATION OF THE DOCUMENT

This document was drawn up by the joint Contact Group of experts of the ORGANISATION FOR CO-OPERATION BETWEEN RAILWAYS (hereinafter referred to as OSJD) and the EUROPEAN UNIOIN AGENCY FOR RAILWAYS (hereinafter referred to as ERA) (hereinafter referred to as the Contact Group) within the co-operation of the above organisations to analyse the relations between the railway systems both within and outside the EU, with 1520 mm track gauge (1524 mm for Finland) in accordance with signed Memorandum of Understanding signed by them for year 2012.

OSJD performed this work based on the Programme of Actions for 2010 and subsequent years.

ERA worked based on Section 2.1 (TSI revision) of the Mandate issued to the Agency by the Decision of the European Commission of 29/04/2010 for the performance of the specific tasks in accordance with Directives 96/48/EC and 2001/16/EC.

The Contact Group performed an analysis of the existing specifications for the control-command and communications subsystem of the 1520 mm gauge rail system and defined the parameters essential for maintaining the compatibility of the 1520 mm gauge rail system at the CIS-EU border. The analysis is limited to the technical and operational aspects of the railway system.

This document defines specific requirements for the compatibility at the interfaces between trackside devices of the control-command and communications subsystem and other subsystems (mainly with the rolling stock subsystem, but not limited to it) for the 1520 mm gauge rail system. The document defines the application for each compatibility parameter at the interfaces.

The document reflects the technical requirements for the above parameters established by the current statutory acts within the 1520 mm track gauge area and provides a comparison of those requirements for the target values set forth for the "basic parameters" of the 1435 mm track gauge rail system in accordance with the TSI ‘Interfaces between track-side components of control- command and signalling subsystem and other subsystems’ being developed based Directive 2008/57/EC on the interoperability of the rail system within the Community.

The wording of this document is intended not only to reflect but also to generalise, insofar as possible, the technical requirements currently in effect in different countries. It shall not serve as regulatory references. For the precise wording of the requirements, use the documents provided in Section 2.

The materials (technical information) in this document may serve as the basis for reflecting the “basic parameters” of the 1520 mm gauge system in the EU TSI for maintaining the existing technical compatibility of the 1520 mm and 1435 mm gauge system at the CIS-EU border.

2 REGULATORY (BASIC) DOCUMENTS

No. Short document title	Full document title and its status (availability)
[1.] International / interstate documents	
[1.1] GOST 9036	GOST 9036-88 Solid-rolled wheels. Design and dimensions (Void as of 01/01/2012. Replaced with GOST 10791-2011)
[1.2] GOST 10791	GOST 10791-2011 Solid-rolled wheels. Specifications Effective date: 01/01/2012
[1.3] GOST 4835	GOST 4835-2013 Wheelsets for freight and passenger vehicles. Specifications
[1.4] GOST 11018	GOST 11018-2000 Traction railway stock for 1520 mm gauge railways. Wheelsets. General specifications (with amendment No 1 of 22 July 2015)
[1.5] GOST 398	GOST 398-2010 Rough tyres for railway rolling stock. Specifications
[1.6] GOST 9238	GOST 9238-2013 Construction and rolling stock clearance diagrams
[1.7] GOST 32144	GOST 32144-2013 Electric energy. Electromagnetic compatibility of technical equipment. Power quality limits in the public power supply systems
[1.8] GOST 22235	GOST 22235–2000 Freight vehicles for 1520 mm gauge main line railways. General requirements for safety in handling and shunting operations
[1.9] GOST 31334	GOST 31334-2007 Axles for rolling stock of 1520 mm gauge railway. Specifications
[1.10] GOST 4491	GOST 4491-86 Cast wheel centres for railway rolling stock of 1520 mm gauge. General specifications Revision 1 of 01/06/1998
[1.11] GOST 1205	GOST 1205-73 Cast iron brake shoes for vehicles and tenders of broad gauge. Construction and basic dimensions Revisions 1, 2, 3, 4 and 5 of 01/11/2033
[1.12] GOST 28186	GOST 28186-89 Brake shoes for motor vehicle of rolling stock. Specifications Re-issue of 01/01/2007.
[1.13] GOST 12252	GOST 12252-86 Angle modulation radio station of land mobile service. Types basic parameters, technical requirements and methods of measurement Re-issue of 25/09/1986.
[1.14] GOST 29205	GOST 29205-91 Electromagnetic compatibility of technical means. Man-made noise from electrical transport. Limits and test methods Re-issue of 01/11/2004.

No. Short document title	Full document title and its status (availability)
[1.15] GOST 29192	GOST 29192-91 Electromagnetic compatibility of technical means. Classification of technical means Approved and enacted by order of the USSR Standardisation and Metrology Commission No 2078 of 24/12/91 Re-issue of 01/01/2007.
[1.16] GOST 30249	Cast iron brake shoes for locomotives. Specifications Re-issue of 01/06/2005.
[1.17] TsV-3429	TsV-3429 Guideline for inspection, certification, repair and formation of vehicle wheelsets Approved by the USSR Deputy Minister for Railways A. Golovatiy on 31/12/1976. Partially replaced by TsV-944
[1.18] TsT-4351	TsT-4351 Guidelines for the formation, repair and maintenance of wheelsets of traction rolling stock for 1520 mm track gauge railways Approved on 31/12/1985 In Russia, partially repealed with the introduction of TsT-329.
[1.19] TsTD-5	TsTD-5 Sand for locomotive sandboxes Specifications Approved by the USSR Deputy Minister for Railways B. D. Nikiforov on 08/02/1989.
[1.20] TsSh-4783	TsSh-4783 Rules and limits for equipping main line and shunting locomotives, electric and diesel trains with radio communication and interference suppressing devices Approved by the USSR Deputy Minister for Railways V. S. Arkatov on 22/12/1989.
[1.21] CCS TSI	2012/88/EU Commission Decision of 25 January 2012 on the technical specification for interoperability relating to the control-command and signalling subsystems of the trans-European rail system (as amended*) **latest version available at the moment of publication of this Working Document:* *Commission Regulation (EU) 2016/919 of 27 May 2016* *on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union*
[1.22] Index 77	ERA/ERTMS/033281 Interfaces between control-command and signalling track-side and other subsystems (version 2.0 as of 12/05/2014 – mentioned in the Table A2 Annex A to TSI CCS (Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union)

No. Short document title	Full document title and its status (availability)
[1.23] TSI WAG	2006/861/EU Commission Decision of 28 July 2006 concerning the technical specification of interoperability relating to the subsystem rolling stock – freight wagons of the trans-European conventional rail system (as amended*) **latest version available at the moment of publication of this Working Document:* *Commission Regulation (EU) No 321/2013 (13 March 2013), amended by Commission Regulation (EU) No 1236/2013 (2 December 2013) and Commission Regulation (EU) No 924/2015 (8 June 2015)*
[1.24] TSI LOC&PAS	2011/291/EU Commission Decision of 26 April 2011 concerning a technical specification for interoperability relating to the rolling stock subsystem – 'Locomotives and passenger rolling stock' of the trans-European conventional rail system (as amended*) **latest version available at the moment of publication of this Working Document:* *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.*
[1.25] TSI RST	2008/232/EC Commission Decision of 21 February 2008 concerning a technical specification for interoperability relating to the rolling stock sub-system of the trans-European high-speed rail system *(at the moment of publication of this Working Document - repealed)*
[1.26] EIRENE FRS	
[1.27] EIRENE SRS	
[1.28] EN 50121-1	
[1.29] EN 50121-2	
[1.30] EN 50121-3-1	
[1.31] EN 50121-3-2	
[1.32] EN 50121-4	
[1.33] EN 50124-1	
[1.34] EN 50124-2	
[1.35] EN 50155	
[1.36] EN 50159-1	
[1.37] EN 50238	

No. Short document title	Full document title and its status (availability)
[1.38] TS 50238-2	
[1.39] TS 50238-3	
[1.40] OSJD R-809	R-809. OSJD. Electromagnetic compatibility of CCS microelectronic installations. 1st edition Approved at the meeting of experts of Commission V on 16/11/2001
[1.41] OSJD R-810	R-810. OSJD. Operational technical requirements for rail track circuits of sonic frequency. 1st edition Approved at the meeting of the OSJD Commission on Infrastructure and Rolling Stock on 30/10/2003
[1.42] OSJD R-811	R-811. OSJD. Recommendations for operational technical requirements for axle counters. 2nd edition Developed and approved at the meeting of experts of Commission V
[1.43] OSJD R-868	R-868. OSJD. Recommendations for the development of international automatic telephone network of OSJD member countries. 1st edition Approved at the meeting of the OSJD Commission on Infrastructure and Rolling Stock on 23-26/10/2010.
[1.44] OSJD R-875	R-875. OSJD. Recommendations for the development of train radio communication system for locomotives crossing the state borders Approved at the meeting of the Commission on Infrastructure and Rolling Stock on 15/11/2002.
[1.45] OSJD R-876	R-876. OSJD. Development of the operational communication system in the border railway areas of the OSJD member countries. 1st edition Approved at the meeting of the OSJD Commission on Infrastructure and Rolling Stock on 3-6/11/2008.
[1.46] OSJD O-890	O-890. OSJD. Technical regulations for routine maintenance of the railway telephone communication system of the OSJD member countries. Drafted at the meeting of the Temporary Working Group experts on 29-31 August 2000 in Kiev Approved at Conference of General Directors XVI on 23-27 April 2001 in Bratislava
[1.47] OSJD R-895/2	R-895/2. OSJD. Recommendations for the connection of the railway communication systems 1st edition. Approved at the meeting of the OSJD Commission on Infrastructure and Rolling Stock on 15/11/2022. 2nd edition. Approved at the meeting of the OSJD Commission on Infrastructure and Rolling Stock on 19-22 October 2010.

No. Short document title	Full document title and its status (availability)
[1.48] OSJD R-899	R-899. OSJD. IP connection addressing plan for interconnection of the railway data transfer systems of the OSJD member countries. 1st edition Approved at the meeting of the OSJD Commission on Infrastructure and Rolling Stock on 27-30 October 2003.
[1.49] ITU-T recommendation G.691	
[1.50] ITU-T recommendation G.702	
[1.51] ITU-T recommendation G.707	
[1.52] ITU-T recommendation G.783	
[1.53] ITU-T recommendation G.711	
[1.54] ITU-T recommendation G.712	
[1.55] ITU-T recommendation G.718	
[1.56] ITU-T recommendation G.720	
[1.57] ITU-T recommendation G.726	
[1.58] ITU-T recommendation G.727	
[1.59] ITU-T recommendation G.728	
[1.60] ITU-T recommendation G.729	
[1.61] ITU-T recommendation G.731	
[1.62] ITU-T recommendation G.732	
[1.63] ITU-T recommendation G.735	
[1.64] ITU-T recommendation G.736	
[1.65] ITU-T recommendation G.737	

No. Short document title	Full document title and its status (availability)
[1.66] ITU-T recommendation G.738	
[1.67] ITU-T recommendation G.739	
[1.68] ITU-T recommendation G.741	
[1.69] ITU-T recommendation G.751	
[1.70] ITU-T recommendation G.753	
[1.71] ITU-T recommendation G.754	
[1.72] ITU-T recommendation G.755	
[1.73] ITU-T recommendation G.957	
[2.] Documents of the Republic of Belarus	
[2.1] Law of the Republic of Belarus	On railway transport (of 6 January 1999)
[2.2] TOR of the Belarusian Railway	Technical operational regulations of the Belarusian Railway Approved by order of the Head of the Belarusian Railway No. 292N of 04/12/2002
[2.3] Signalling instructions on the Belarusian railways	Signalling instructions on the Belarusian railways Approved by order of the Head of the Belarusian Railway No. 293N of 04/12/2002
[2.4] STP 09150.19.019	STP 09150.19.019-2006 Operating requirements for train radio communications
[2.5] STP 09150.19.022	STP 09150.19.022-2006 Procedure for the maintenance of wired communication equipment on the Belarusian railways
[2.6] STP 09150.19.058	STP 09150.19.058-2007 Requirements for maintenance of control-command and signalling equipment
[2.7] STP 09150.19.059	STP 09150.19.059-2007 Operating requirements for documented voice recording systems
[2.8] STP 09150.19.065	STP 09150.19.065-2007 Requirements for the maintenance and repair of CCS equipment of the mechanised humps
[2.9] STP 09150.19.139	STP 09150.19.139-2010 Procedure and methods for the assessment of condition of vehicle retarders and determination of the period between repairs and remaining life
[2.10] STP 09150.19.148	STP 09150.19.148-2010 control-command and signalling equipment. Maintenance techniques

No. Short document title	Full document title and its status (availability)
[2.11] STP 09150.56.107	STP 09150.56.107-2009 Special self-propelled rolling stock. Requirements for operation and maintenance
[2.12] STP 09150.56.136	STP 09150.56.136-2010 Routine and prevention repairs of special rolling stock on the Belarusian Railways. General provisions
[2.13] BC Sh 010	BC Sh 010-96 Air lines of communication Maintenance techniques
[2.14] BC Sh 011	BC Sh 011-96 Main cable lines of communication of the railway Maintenance technology
[2.15] RD RB BCh 17.001	RD RB BCh 17.001-97 Guidelines for the formation, repair and maintenance of wheelsets of traction rolling stock for 1520 mm track gauge
[3.] Documents of the Republic of Latvia	
[3.1] TOR of Latvian Railway	Cabinet Regulations on Technical Operation No 724 of 03/08/2010
[3.2] S-108	S-108-1997 Shunting device for pump trolleys. Technical description and operation manual. Approved by the VAS LDz Infrastructure Director on 31/01/1997
[3.3] LVS 282	LVS 282:2015 Construction and rolling stock clearance diagrams for railways (National standard equivalent to GOST 9238)
[3.4] TA04	TA04-2010 Guidelines for the maintenance of the mechanised hump equipment Approved by order of the VAS LDz Technical Director No DT-2/32 of 19/04/2010.
[3.5] TA15	TA15-2005 Process charts for CCS equipment maintenance Approved by the VAS LDz Infrastructure Management Director on 16/09/2055
[3.6] No DR-19	DR-19/2000 Guidelines for the railway rolling stock brakes operation (based on the Guidelines for the rolling stock brakes operation on the railways of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277) Approved by the Rolling Stock Director on 27/07/2000.
[3.7] D-3/26	D-3/26-2011 Guidelines for the monitoring of the condition of the rolling stock travelling on the railway tracks of public infrastructure Approves by the instruction of the VAS LDz CEO of 20/01/2011
[3.8] No DR-71	DR-71/2005 Guidelines for the formation, repair and maintenance of wheelsets
[3.9] No DR-72	DR-72/2005 Guidelines for the monitoring of the quality of sandboxes on locomotives and multiple-unit rolling stock
[3.10] No DR-77	DR-77/2007 Guidelines for the lubrication of locomotives and multiple-unit rolling stock
[3.11] Axle counter manufacturer's instructions	Functional description of axle counter Az LM, ALCATEL, 2006

No. Short document title	Full document title and its status (availability)
[4.] Documents of the Republic of Lithuania	
[4.1] TOR of the Lithuanian Railways	ADV/001 Technical operation regulations of Lithuanian Railways Approved by order of the Minister for Transport of the Republic of Lithuania No. 297 of 20/09/1996.
[4.2] Lithuanian Railways signalling regulations	Railway signalling regulations Approved by order of the Minister for Transport of the Republic of Lithuania No 3-156 of 15/03/2011.
[4.3] AE/41	AE/41 Regulations for the construction, operation and repairs of overhead contact lines of electrified railways Approved by order of the LG Director General No 317 of 14/06/1999
[4.4] T/108	T/108 Guidelines for the formation, repair and maintenance of wheelsets of traction rolling stock for 1520 mm track gauge railways Approved by order of the LG Director General No 213 of 07/10/1999
[4.5] K-110	K-110 Guidelines for the operation of motor trolleys, petrol locomotives, motor vehicles and other special and light rolling stock Approved by order of the LG Director General No 82 of 23/03/2000
[4.6] 163/K	163/K Guidelines for the application of construction clearance Approved by order of the LG Director General No 456 of 66/11/2001
[4.7] I-291-04 NPTs	I-291-04 NPTs Technical guidelines for the design of automation, remote control and communication devices on railway transport, 2008г.
[5.] Documents of the Republic of Poland	
[5.1] Order of the Minister for Infrastructure of 12/10/2005	Order of the Minister for Infrastructure of 12 October 2005 'On the scope of testing required to obtain the release to service for the types of structures and equipment designed for railway movement, as well as types of railway vehicles'. Legislative Journal No r 212, 2005, item 1771, with later amendments
[5.2] Order of the Council of Ministers of 29/06/2005	Order of the Council of Ministers of 29 June 2005 'On national frequency assignment table' Legislative Journal No 134, 2005, item 1127, with later amendments
[5.3] DU 151	Du.151 Order of the Infrastructure Minister regarding technical requirements for railway construction
[5.4] Guidelines Ie-2	Ie-2 Guidelines for wired interstation and dispatch communication

No. Short document title	Full document title and its status (availability)
[5.5] Requirements for the safety of railway traffic control equipment	Requirements for the safety of railway traffic control equipment Task No 1060/23 Traffic Management and Power Supply Company, Warsaw, September 1997
[5.6] Development of limit values of interference to the railway traffic management, communication and traction vehicle equipment	Development of limit values of interference to the railway traffic management, communication and traction vehicle equipment Final report Task No 6915/23, Polish State Railways, Railway Transport Research Centre, Traffic Management Company, April 1999
[5.7] Job No. 4430/10	Job No. 4430/10. Limitation of time and noise parameters for CCS Railway Transport Institute, Traffic Management and IT Department Warsaw, September 2011
[5.8] Job No 3 LA/3/10	Job No LA/33/10. Tests of the public announcement equipment Automation and Telecommunications Laboratory, Warsaw, November 2010
[6.] Documents of the Russian Federation	
[6.1] TOR of Russian Railways	Regulations for technical operation of the railways of the Russian Federation approved by order of the Ministry of Transport of Russia No 286 of 21/12/2010
[6.2] GOST 31847-2012	GOST 31847-2012 Wheel sets for the special-purpose rolling stock General specifications
[6.3] GOST R 52920	GOST R 52920-2008 Wheelsets for the traction rolling stock Method of measuring the electrical resistance
[6.4] GOST R 53431	GOST R 53431-2009 Railway automation and remote control Terms and definitions Approved by the order Federal Agency for Technical Regulation and Metrology of 27/11/2009 No 523-ST
[6.5] GOST R 53953	GOST R 53953-2010 Railway telecommunication. Terms and definitions Approved by the order Federal Agency for Technical Regulation and Metrology of 24/11/2009 No 504-st

No. Short document title	Full document title and its status (availability)
GOST 33436.1-2015 (IEC 62236- 1:2008)	Electromagnetic compatibility of technical equipment. Railway applications Part 1: General
GOST R 55176.2 (IEC 62236-2:2008)	Part 2: Emission of the whole railway system to the outside world. Requirements and testing methods.
GOST R 55176.3.1 (IEC 62236-3-1:2008)	Part 3-1: Rolling stock. Requirements and testing methods.
GOST 33436.3-2-2015 (IEC 62236-3-2:2008)	Part 3-2: Rolling stock. Apparatus Requirements and testing methods
GOST 33436.4-1-2015	Part 4-1: Equipment and apparatus of railway automation and remote control. Requirements and testing methods.
GOST 33436.4-2-2015	Part 4-2: Emission and immunity of telecommunications apparatus. Requirements and testing methods.
GOST R 55176.5 (IEC 62236-5:2008)	Part 5: Emission and immunity of fixed power supply installations and apparatus. Requirements and testing methods.
[6.6] GOST 30804.4.30	GOST 30804.4.30-2013 Electric energy. Electromagnetic compatibility of technical equipment. Power quality measurement methods
[6.7] STO RZhD 1.07.001	STO RZhD 1.07.001-2007 Infrastructure of St. Petersburg - Moscow line for high-speed train traffic General technical requirements Approved by order of the First Vice-President of JSC RZD V. N. Morozov No 476r of 26/03/2007 Amendment No 1 approved by order No 1993r of 04/10/2007 Amendment No 2 approved by order No 705r of 01/04/2007
[6.8] STO RZhD 1.19.008	STO RZhD 1.19.008-2009 Railway automation and remote control systems of marshalling yards. Technical requirements Approved by order of the First Vice-President of JSC RZD V. B. Vorobyov No 1623r of 31/07/2007

No. Short document title	Full document title and its status (availability)
[6.9] NB ZhT TsT 01[1]	NB ZhT TsT 01-98 Diesel trains. Safety standards Approved by instruction of the Ministry of Railways No R-634u of 25/06/2003 and order of the Ministry of Railways No 522r of 27/05/2003.
[6.10] NB ZhT TsT 02	NB ZhT TsT 02-98 Diesel locomotives. Safety standards Approved by instruction of the Ministry of Railways No R-634u of 25/06/2003 and order of the Ministry of Railways No 522r of 27/05/2003
[6.11] NB ZhT TsT 03	NB ZhT TsT 03-98 Electric trains. Safety standards Approved by order of the Ministry of Railways No G-935u of 25/06/2003. With Amendment No 1 adopted by order of the Ministry of Railways of the Russian Federation No R-634u of 25/06/2003 With Amendments No 2 introduced by order of the Ministry of Transport of the Russian Federation No 22 of 11/02/2009
[6.12] NB ZhT TsT 04	NB ZhT TsT 04-98 Electric locomotives. Safety standards Approved by order of the Ministry of Railways No G-935u of 25/06/2003. With Amendment No 1 adopted by order of the Ministry of Railways of the Russian Federation No R-634u of 25/06/2003
[6.13] NB ZhT TsV-TsL 009	NB ZhT TsV-TsL 009-99 Safety standards. Composite brake blocks of railway rolling stock. Certification requirements Approved by order of the Ministry of Railways No G-307u of 22 March 1999 With Amendments No 1 introduced by order of the Ministry of Transport of the Russian Federation No 209 of 19/11/2009
[6.14] NB ZhT TsL-TsT 139	NB ZhT TsL-TsT 139-2003 Static traction and non-traction rolling stock converters. Safety standards Approved by order of the Ministry of Railways No R-634u of 25/06/2003 With Amendments No 2 introduced by order of the Ministry of Transport of the Russian Federation No 118 of 16/07/2009

[1]) Council for Rail Transport of the CIS States and associated Commonwealth members (heads of railway administrations of the Republic of Bulgaria, Georgia, Republic of Latvia, Republic of Finland) on 18-19 May 2011 in Helsinki adopted the following decision (minutes of the fifty fourth meeting of the Council, p. 34, item 1 on the agenda): "To extend the validity of the documents regulating the standards of safety on railway transport (NB ZhT) in the assessment of compliance of railway products as recommended regulatory documents for the railway administrations participating in the work of the Railway Transport Council (Appendix No 34)".

No. Short document title	Full document title and its status (availability)
[6.15] TsV-944	TsV-944 Guideline for inspection, certification, repair and formation of vehicle wheelsets Approved by the Deputy Minister for Railways B. N. Pustov on 20/06/2003. In effect as of 01/01/2006 and partially replaces TsV-3429
[6.16] TsV-TsSh-453	TsV-TsSh-453 Guidelines for the layout, installation and operation of the equipment for automatic monitoring of the condition of travelling rolling stock Approved by the Deputy Minister for Railways of the Russian Federation A. N. Kondratenko on 30/12/1996 (As amended by Guidelines of the Ministry of Railways of Russia No 1234u of 20/10/1997 and No K-881u of 20/05/1999)
[6.17] TsT-329	TsT-329 Guidelines for the formation, repair and maintenance of wheelsets of traction rolling stock for 1520 mm track gauge railways Approved on 14/06/1995 Introduced on 15/05/1996 by order of the Minister for Railways A. N. Kondratenko No N-205u of 04/03/1996 and partially replaced TsT-4351 Amended by order of the Ministry of Railways of Russia No K-2273u of 23/08/2000
[6.18] NTP STsB/MPS	NTP STsB/MPS-99 Standards of process engineering of automation and remote control equipment on federal railway transport Approved by the Ministry of Railways of the Russian Federation No A-1113 of 24/06/1999
[6.19] Rules and standards for designing marshalling equipment	Rules and standards for designing marshalling equipment on 1520 mm gauge railways Approved by the Deputy Minister for Railways of the Russian Federation K. S. Zyabirov on 10/10/2003.
[6.20] Technical requirements for the lubrication materials for lubrication of the area of contact between the wheels and the rails	"Lubrication materials for lubrication of the area of contact between the wheels and the rails. Technical requirements" Appendix No 5 to order of JSC RZD No 375r of 24/10/2010 approved by the Senior Vice President V. A. Gapanovich
[6.21] Procedure for the approval of POL for use at JSC RZD	Procedure for the approval of POL for use at JSC RZD Approved by order of the Senior Vice President V. A. Gapanovich No 1735 of 19/08/2009
[6.22] Order No TsDI-220 of 23/06/2015	On approval of the list of railway automation and remote control systems, apparatus and equipment authorised for designing
[6.23] TOR of the Russian Railways, Appendix 7	Guidelines for signalling on railways of the Russian Federation Approved by order of the Ministry of Transport of Russia No 286 of 21/12/2010

No. Short document title	Full document title and its status (availability)
[6.24] TsRB-934	TsRB-934 Guidelines for maintenance and operation of special self-propelled rolling stock of the railways of the Russian Federation Approved by the First Deputy Minister for Railways of the Russian Federation V. N. Morozov (as amended by order of the Ministry of Railways No 759r of 27/08/2003)
[6.25] TsE-462	TsE-462 Regulations for the design of traction energy system of the railways Approved by No TsE-462 of 04/06/97 of the Ministry of Railways of the Russian Federation
[6.26] TsE-868	TsE-868 Regulations for the design and maintenance of overhead contact lines of electrified railways Approved by the First Deputy A. S. Misharin of the Ministry of Railways of the Russian Federation on 11/12/2001
[6.27] Order of JSC RZD No 939r of 17/04/2014	Guidelines for the operation of the control-command and signalling systems (CCS) Approved by JSC RZD order No 939r of 17/04/2014
[6.28] TsSh-762-10	TsSh-762-10 Guidelines for the operation of the control-command and signalling equipment and systems of mechanised and automated humps Approved by JSC RZD order No 2247r of 01/11/2010
[6.29]	Regulations for the protection of wired communication and wired broadcast equipment from the effects of the traction network of electrified AC railways Approved by order of the Ministry of Telecom on 28/10/87 and the Ministry of Railways on 21/10/87
[6.30]	Regulations for the protection of wired communication equipment from the effects of the traction network of electric DC railways Approved by order of the Ministry of Telecom on 13/09/67 and the Ministry of Railways on 27/05/68
[6.31]	Technical requirements for locomotive (mobile) radio unit designed for the use on the JSC RZD railways Approved by the JSC RZD Vice President V. A. Gapanovich on 22/12/2005
[6.32]	Locomotive-hauled passenger vehicles based on unified platforms. Technical requirements Approved by the JSC RZD Vice President M. P. Akulov on 31/10/2007
[7.] Documents of the Republic of Slovakia	
[7.1] No. 513/2009	Railway Act No 513/2009 of the Code
[7.2] No. 514/2009	Railway Transport Act No 514/2009 of the Code
[7.3] No. 350/2010	On construction and technical procedures on the railway. Announcement No 350/2010 of the Code

No. Short document title	Full document title and its status (availability)
[7.4] No. 351/2010	Resolution on transport procedure on the railways of the Ministry for Transport, Mail and Telecommunications of the Slovak Republic. Announcement No 351/2010 of the Code
[8.] Documents of Ukraine	
[8.1] TOR of the Ukrainian Railways	Technical operation regulations of the Ukrainian Railways Approved by order of the Ministry for Transport of Ukraine No 411 of 12/12/1996
[8.2] Standards of process engineering	Standards of process engineering of automation and remote control equipment on the Ukraine railway transport Approved by order No 105-Ts of 17/04/03
[8.3] DBN V.2.3-19	DBN V.2.3-19-2008 Transport structures. 1520 mm gauge railways. Engineering standards. (Соруди транспорту. Залізниці колії 1520 мм. Норми проектування) Approved by order of the Ministry of Regional Development and Construction No 42 of 26/01/2008
[8.4] TsSh/0031	TsSh/0031 Regulations for the operation of the telegraph service on railway transport of Ukraine Approved by order of the Ukrainian railways No 10-Ts of 27/01/2004
[8.5] TsSh/0032	TsSh/0032 Regulations for the operation of the intercity telephone service on the Ukraine railway transport Approved by order of the Ukrainian railways No 10-Ts of 27/01/2004
[8.6] Signalling instructions on the Ukrainian railways	Signalling instructions on the Ukrainian railways Approved by order of the Ministry of Transport and Communication of Ukraine No 747 of 23/06/2008
[8.7] TsSh/0044.	TsSh/0044 Main control-command and signalling objects. Symbols used when displaying information. SOU 35.0-00034045-001:2006 Approved by order of the Ukrainian railways No 219-Ts of 13/06/06
[8.8] TsE-0002	TsE-0002 Guidelines for the maintenance and repair of the power supply equipment of the control-command and signalling systems (CCS)
[8.9] DSTU 4151	DSTU 4151-2003 Sets of hardware of the train traffic control and management systems. Electromagnetic compatibility
[8.10] DSTU 4178	DSTU 4178-2003 Sets of hardware of the train traffic control and management systems. Functional safety and reliability
[8.11] TsTECH-0068	TsTECH-0068 Guidelines for the organisation of accelerated passenger train traffic on the Ukrainian railways. Requirements for the infrastructure and rolling stock Approved by order of the Ukrainian railways No 004-Ts of 16/01/2012

No. Short document title	Full document title and its status (availability)
[8.12] TsE-0023	TsE-0023 Regulations for the design and operation of overhead contact lines of electrified railways Approved by order of the Ukrainian railways No 546-Ts of 20/11/2007
[8.13] TsE-0009	TsE-0009 Regulations for the design of traction energy system of the Ukrainian railways Approved by order of the Ukrainian railways No 1010-TsZ of 24/12/2004
[8.14] NPAOP 40.1-1.21	NPAOP 40.1-1.21-98 Regulations for the safe operation of power equipment of the consumers
[8.15] Railway automation, remote control and communication products.	Railway automation, remote control and communication products. General technical conditions SOU 45.020-00034045-002:2006 Approved by order of the Ukrainian railways No 360-Ts of 13/10/2006
[8.16] Guidelines for the use of ERS pantographs in different operating conditions	Guidelines for the use of electric rolling stock pantographs in different operating conditions Approved by order of the Ukrainian railways No 789/TsZ of 12/10/2007
[8.17] VBN V.2.3-2	VBN V.2.3-2-2009 Transport structures. Electrification of railways. Engineering standards In effect as of 01/01/2010
[8.18] TsSh-0052	TsSh-0052 Regulations for the operation of train radio communication, order No 452-Ts of 24/09/07
[8.19] TsSh-0058	TsSh-0058 Rules for the design and calculation of train radio communication Approved by order of the Ukrainian railways No 340-Ts of 09/06/2009
[8.20] TsSh-0060	TsSh-0060 Guidelines for the maintenance of control-command and signalling (CCS) equipment Approved by order of the Ukrainian railways No 090-TsZ of 07/10/2009 As amended by No 005-TsZ of 10/01/2011
[8.21] DSTU 4049	DSTU 4049-2001 Locomotive-hauled passenger vehicles. Safety requirements
[8.22] TsT-0052	Guidelines for the preparation for the operation and maintenance of electric locomotives in winter conditions
[8.23] TsT-TsV-TsL-0015	Guidelines for the rolling stock brakes operation on the Ukrainian railways
[8.24] TsT-0034	TsT-0034 Sand for locomotive sandboxes. Specifications
[8.25] TsT-0156	Guidelines for the installation of the automated driving microprocessor sets on series ELP 2T and EPL 9T electric locomotives

No. Short document title	Full document title and its status (availability)
[9.] Documents of the Republic of Estonia	
[9.1] TOR of the Estonian Railways	Technical operation regulations of the Estonian Railways Approved by order of the Ministry of Transport and Communication No 39 of 09/07/1999
[9.2] Signalling instructions on the Estonian Railways	Signalling instructions (Appendix 1 to the TOR of the Estonian Railways) Approved by order of the Ministry of Transport and Communication No 39 of 09/07/1999
[9.3] V-007	V-007 Guidelines for the formation and maintenance of railway rolling stock wheelsets
[9.4] V-012	V-012 Guidelines for the formation and maintenance of locomotive and multiple-unit train wheelsets
[9.5] TOR and construction of contact lines	Regulations for the operation and construction of overhead contact lines of electrified railways Appendix to the Regulations for business activities in railway infrastructure (drafted by the Infrastructure Manager and approved by the Technical Supervision Department of the Republic of Estonia) Approved by AS Eesti Raudtee Infrastructure Director, no 9-1/23 of 30/09/2002
[10.] Documents of the Republic of Kazakhstan	
[10.1] Law of the Republic of Kazakhstan	Law of the Republic of Kazakhstan on Railway Transport No 266 of 08/12/2001
[10.2] TOR of the Kazakhstan Railways	TOR of railway transport Approved by the Ministry of Transport of Kazakhstan, No 261 of 10/05/2011
[10.3] SI of the Kazakhstan Railways	Signalling instructions on railway transport. Approved by the Ministry of Transport of Kazakhstan, No 209 of 18/04/2011
[10.4] TsSh-NTP/6-02	Standards of process engineering of automation and remote control equipment No 256-Ts of 23/04/2003
[10.5] TsTP 2000	Sand for sandboxes (specification)
[10.6] TsP -272-05	Guidelines for maintenance and operation of special self-propelled rolling stock of the main railway network of the Republic of Kazakhstan
[10.7] AOT/484-09	Guidelines or the use of lubricants on locomotives and multiple-unit rolling stock
[10.8] TsT/228-04	Cast iron brake blocks for locomotives
[10.9] TsSh/4121	Regulations for the protection of wired communication and wired broadcast equipment from the effects of the traction network of electrified AC railways of the Ministry of Transport of Kazakhstan No 493 of 18/06/1997

No. Short document title	Full document title and its status (availability)
[10.10] TsSh-4783	Rules and limits for equipping main line and shunting locomotives, electric and diesel trains with radio communication and interference suppressing devices of the Ministry of Transport of Kazakhstan No 493 of 18/06/1997
[10.11] TsSh/720-1	Guidelines for the maintenance of control-command and signalling (CCS) equipment of the Ministry of Transport of Kazakhstan No 238-1 of 29/07/2003
[10.12] TsT -329/271-05	Guidelines for the formation, repair and maintenance of wheelsets of traction rolling stock for 1520 mm track gauge railways of the Ministry of Transport of Kazakhstan No 208-TsT of 17/05/2005

3 ACRONYMS, TERMS AND DEFINITIONS

Acronym	Definition
ABCS	RS automated brake control system
AC	Alternating current
ALS	Automatic cab signalling
AxC	Axle counter (type of a track vacancy detector of the CCS subsystem)
CCS	Control-command and signalling
CCS on/b	CCS on-board
CCS t/s	CCS track-side
DC	Direct current
DSTU	National Standardisation System of Ukraine
EMC	Electromagnetic compatibility
EN	European standard
ENE	Energy subsystem
ERS	Electric rolling stock powered from contact network
GOST	Interstate standard
GOST R	National standard of the Russian Federation
IL	Inductive Loops (type of a train detection system)
INF	Infrastructure subsystem
LDz	Latvian Railways
LG	Lithuanian Railways
LOC	Locomotive as a part of the rolling stock subsystem
LVS	Latvian National Standard
MPS	Ministry of Railways
OCN	Operational communication network
OPE	Operation subsystem
OTRS	Reverse traction rail network
PAS	Passenger vehicles as a part of the rolling stock subsystem
PN	Polish standard
RS	Rolling stock
RS	Rolling stock subsystem
RST	High speed electric trains as a part of the rolling stock subsystem
TC	Track circuit (type of a track vacancy detector of the CCS subsystem)
TOR	Technical operational regulations

TSI	Technical Specification for Interoperability
TSI	Technical Specification for Interoperability
TsNII	Central Science and Research Institute
TsRB	Traffic Safety Department (Russian Federation) Chief Administration of Traffic Safety and Environmental Protection (Ukraine)
TSS	Traction substation
WAG	Freight wagons as a part of the rolling stock subsystem
WS	Wheelset

Term	**Definition**
Automatic cab signalling as an independent signalling and communication system	a system where the train movement on a block is controlled by cab signalling and the marked block borders are the interstation points
Block	a part of an interstation section during automatic blocking or automatic locomotive signalling used as an independent means of signalling and communication and limited by intermediate lights (block boundaries) or an intermediate light (block boundary) and a station.
Air gap (isolating joint)	an isolating anchor section joint made on a contact network dividing the contact network into two sections. When an electric vehicle passes over the air gap, electric connection occurs in the contact network section
Main track	section tracks and station tracks, which are immediate extension of adjacent sections and usually not diverging on switches.
Station duty officer	an assistant of the station master who solely manages receipt, departure and transit of trains and other rolling stock movements on the main and receiving and departure tracks of the station (and in the absence of the shunt controller position, on other tracks too)
Railway rolling stock	locomotives, freight wagons, locomotive hauled passenger vehicles and multiple-unit rolling stock, as well as other railway rolling stock designed for carriage and infrastructure functioning
Public railway tracks	railway tracks on territories of the railway stations open for receiving and departure of train, receiving and issuing freights, luggage and freight-luggage, serving passengers and performing marshalling and shunting operations, as well as railway tracks connecting such stations
Radiated interference	freely propagating electromagnetic interference
Industrial interference	electromagnetic interference generated by equipment Note: Industrial interference does not include interference generated by radiation of output tracts of transmitters
Quality of current collection	a parameter allowing to determine the possibility of prolonged transmission of current via gliding contact between a contact wire and a pantograph.
Overhead line	system of wires transmitting electric current to a consist and suspended on insulated support structures ensuring the required position of the contact wire
Conductive interference	electromagnetic interference propagating via conductors

Term	Definition
Contact network	a total of wires, structures and equipment ensuring transmission of electric energy from traction substations to pantographs of rolling stock
Locomotives	electric locomotives, diesel locomotives, gas turbine locomotives and steam engines
Shunting train	a group of vehicles coupled with each other and a locomotive performing shunting
Multiple-unit rolling stock	motor and trailer vehicles that form multiple-unit trains (electric trains, diesel trains, motor vehicles)
Neutral section	a section of a contact wire between two air sections (isolating joints), which are normally not under voltage. A neutral section is installed to isolate adjacent sections of the contact line during passage of an electric rolling stock pantograph
Special track signs	signs indicating right of-way line boundary, switch number, passenger building axis, signs on roadway track buildings, round curve start and end as well as easement start and end stakes, concealed subgrade constructions, highest water mark and maximum wave height stakes
Section	a part of a railway line limited by adjacent stations, crossing loops, passing stations or track posts
Crossing	a place where railway is crossed by motorways or tram lines at the same level
Train	a formed and coupled consist of vehicled with one or more working locomotives or motor vehicles, which have signals installed. Locomotives without vehicles attached, motor vehicles and special self-propelled rolling stock going to a section are considered trains
Signal	a visual or audio signal relaying a particular order
Signal sign	a visual sign used to give orders or instructions to a specific category of workers. Signal signs include fouling marks, signs marking boundaries of a railway station, whistle post, switching power supply in and off, etc.
Station	a separation point with a layout that allows receiving, departure, crossing and passing of trains, receiving and issuing freights, serving passengers and, in the presence of developed track facilities, shunting operation for formation and breaking trains and technical operations with the trains.
Switch	a part of switch point consisting of stock rails, tongues and switching mechanism. If a moveable point frog is present, the frog is also included in the term ‘switch’
Electromagnetic compatibility of equipment	ability of a device to function with the specified quality in the specified electromagnetic environment without generating inadmissible electromagnetic interference for other equipment

4 LIST OF DETERMINATIVE PARAMETERS

This list presents the determinative parameters for maintaining the technical and operational compatibility of the CCS and Communication subsystem of the 1520 mm and 1435 mm gauge rail systems at the border of the CIS and EU. This list has been drafted based on ERA document ERA/ERTMS/033281 'Interfaces between Control-Command and Signalling track-side and other subsystems', hereinafter referred to as CCS TSI Index 77, updated and adapted taking into account the specifics of 1520 mm gauge railways[1].

Table 1

Index	Parameter name in Russian	Parameter name in English in accordance with Commission Regulation (EU) 2016/919
1.	**Конструкция и эксплуатация единицы ПС**	**Vehicle design and operation**
1.1	**Определения**	**Definitions**
1.2	**Расстояния между осями и вынос для единицы ПС**	**Axle distances**
1.2.1	Максимальное расстояние между осями	Maximum distance between axles
1.2.2	Минимальное расстояние между осями (1)	Minimum distance between axles (1)
1.2.3	Минимальное расстояние между осями (2)	Minimum distance between axles (2)
1.2.4	Минимальное расстояние между осями (3)	Minimum distance between axles (3)
1.2.5	Расстояние (вынос) между крайней выступающей точкой единицы ПС и осью ближайшей колесной пары на новых высокоскоростных линиях (1)	The distance between the end of train and first axle on new high-speed lines (1)
1.2.6	Расстояние (вынос) между крайней выступающей точкой единицы ПС и осью ближайшей колесной пары на других линиях не высокоскоростных (2)	The distance between the end of train and first axle on other lines (2)
1.3	**Геометрия и свойства колеса и пространство между колесами**	**Wheel geometry and properties, distance between the wheels**
1.3.1	Минимальная ширина обода колеса	Minimum width of the rim
1.3.2	Минимальный диаметр колеса	Minimum wheel diameter

[1]) In the final revision of the CCS TSI, the list of parameters and their names may differ from the ones in this document. Parameters 1.6.2, 1.11, 2.1 and 3.1–3.4 in Section 3 are additionally provided for consideration as proposed by members of the Contact Group.

Index	Parameter name in Russian	Parameter name in English in accordance with Commission Regulation (EU) 2016/919
1.3.3	Минимальная толщина гребня	Minimum flange thickness
1.3.4	Высота гребня	Flange height
1.3.5	Пространство между колесами, свободное от металла и индуктивных компонентов	Metal and inductive component free space between wheels
1.3.6	Материал колеса	Wheel material
1.4	**Применение устройств подачи песка**	**Use of sanding equipment**
1.4.1	Максимальное количество подаваемого песка	Maximum sand output
1.4.2	Характеристики песка.	Characteristics of sand
1.5	**Бортовые устройства для смазки гребня колес**	**On-board flange lubrication**
1.6	**Применение тормозных колодок из композитных и других материалов**	**Use of brake blocks made of composite and other materials**
1.6.1	Применение тормозных колодок из композитных материалов	Use of composite brake blocks
1.6.2	Применение тормозных колодок из чугуна	Use of cast iron brake blocks
1.7	**Масса единицы ПС**	**Vehicle mass**
1.7.1	Осевая нагрузка	Axle load
1.7.2	Масса металла единицы ПС	Vehicle metal mass
1.8	**Применение вспомогательных шунтирующих устройств**	**Use of shunt assisting devices**
1.9	**Электрическое сопротивление между колесами**	**Electric impedance between wheels**
1.10	**Комбинация свойств ПС для обеспечения требуемой динамики сопротивления шунта**	**Combination of rolling stock characteristics for the purpose of adequate dynamic shunting impedance**
1.11	**Применение специальных устройств СЦБ**	**Use of special CCS devices**

2.	**Электромагнитная совместимость**	**Electromagnetic compatibility**
2.1	**Область действия. Классификация**	**Scope. Classification**
2.2	**Электромагнитные поля**	**Electromagnetic fields**

Index	Parameter name in Russian	Parameter name in English in accordance with Commission Regulation (EU) 2016/919
2.2.1	Частотное регулирование Предельно допустимые нормы помехоэмиссии единицы ПС и параметры оценки соответствия Оценка превышений установленных предельно допустимых норм Метрологические требования	Frequency management Vehicle emission limits and evaluation parameters Evaluation of exceedances of limits Measurement requirements
2.3	**Полное сопротивление единицы ПС**	**Vehicle impedance**
2.4	**Наведенные помехи**	**Conducted interference**
2.4.1	Постоянный ток и низкочастотные составляющие тягового тока: Постоянная составляющая тока тяги ПС	DC and low frequency components of traction current: Constant component of RS traction current
2.4.2	Постоянный ток и низкочастотные составляющие тягового тока: Низкочастотные составляющие тока тяги ПС	DC and low frequency components of traction current: Low frequency components of RS traction current
2.4.3	Низкочастотные составляющие обратного тока вспомогательного оборудования ПС	Low frequency components of reverse current of the RS auxiliary equipment
2.4.4	25kV AC, 50Hz Предельные нормы электромагнитных помех для тягового электроснабжения	25 kV AC 50 Hz The electromagnetic interference limit levels for traction power supply
2.4.5	3kV DC Предельные нормы электромагнитных помех для тягового электроснабжения	3kV DC The electromagnetic interference limit levels for traction power supply
2.5	**Применение магнитных/ индукционных тормозов**	**Use of magnetic / eddy current brakes**

3.	**ДОПОЛНЕНИЕ СПИСКА ОПРЕДЕЛЯЮЩИХ ПАРАМЕТРОВ. Железнодорожная электросвязь**	
3.1	**Наведенные помехи**	**Conducted interference**
3.1.1	Уровни гармонических составляющих тока потребляемого ПС в полосе частот 300-3400 Гц	Levels of harmonics in the current consumed by RS in the 300-3400 Hz frequency band
3.1.2	Уровни электромагнитного влияния на системы фиксированной железнодорожной электросвязи	Levels of electromagnetic effect on railway stationary telecommunication systems
3.1.3	Уровни напряженности поля радиопомех в диапазоне частот 0,15 - 300 МГц	Level of radio interference field strength in 0.15-300 MHz frequency range

Index	Parameter name in Russian	Parameter name in English in accordance with Commission Regulation (EU) 2016/919
3.1.4	Уровни напряженности поля радиопомех в диапазоне частот технологической радиосвязи и передачи данных	Level of radio interference field strength in operational radio communication and data frequency range
3.2	**Стыки фиксированных сетей и систем**	**Interfaces between stationary networks and systems**
3.2.1	Стык транспортных сетей железных дорог сопредельных государств	Interface between transport networks of railways of adjacent countries
3.2.2	Стык сетей оперативно-технологической связи железных дорог сопредельных государств	Interface between operational communication of railways of adjacent countries
3.2.3	Стык сетей общетехнологической телефонной связи железных дорог сопредельных государств	Interface between generic telephone communication of railways of adjacent countries
3.3	**План адресации IP-соединений для объединения железнодорожных сетей передачи данных обще-технологического назначения сопредельных государств**	**IP connection addressing plan for interconnection of the generic railway data transfer systems of adjacent countries**
3.4	**Параметры средств технологической радиосвязи, применяемых на участках колеи 1520 мм и 1435 мм на границе СНГ-ЕС**	**Parameters of the operational radio communication systems used on 1520 mm and 1435 mm gauge track blocks and the CIS-EU border**

The list of the determinative parameters is limited by the compatibility requirements at the interfaces between trackside devices of the track section vacancy/occupancy detection systems (also called train detection systems) and other subsystems (mainly with Rolling Stock subsystem, but not limited to it), but is updated with the compatibility requirements for the railway telecommunication devices used on 1520 mm gauge railways.

The train detection systems, which are a trackside part of the CCS subsystem, shall ensure detection of an RS or a vehicle under the conditions determined by these requirements. In turn, the requirements of this document have been determined based on the requirement for compatibility of various types of track-side equipment of the CCS system when used in adjacent infrastructures.

Currently, two types of train detection systems with track-side sensor devices are used on the 1520 mm gauge railways:

1. wheels for axle counters;
2. shunts for track circuit.

The Table below identifies both the application of the parameters in question for different types of track-side CCS devices and interfaces with the respective subsystems of the railway transport system.

Table 2

Parameter		Interfaced subsystems							
Index	**Name**	**CCS on/b**	**Rolling Stock (RS)**				**ENE**	**INF**	**OPE**
			WAG	PAS	LOC	RST			
1.	Vehicle design and operation								
1.1	Definitions								
1.2	Axle distances								
1.2.1	Maximum distance between axles - TC - AxC			X X					X (new RS and infrastructure maintenance)
1.2.2	Minimum distance between axles (1): - TC - AxC			X					X (train formation and infrastructure maintenance)
1.2.3	Minimum distance between axles (2): - TC - AxC			X					
1.2.4	Minimum distance between axles (3): - TC - AxC			X					
1.2.5	The distance between the end of train and first axle: - on new high-speed lines (1)			X					
1.2.6	- other, non-high-speed, lines (2)		X						
1.3	Wheel geometry and properties, distance between the wheels								
1.3.1	Minimum width of the rim: - TC - AxC			X					X (WS inspection)
1.3.2	Minimum wheel diameter: - TC - AxC			X					
1.3.3	Minimum flange thickness: - TC - AxC			X					
1.3.4	Flange height: - TC - AxC			X					
1.3.5	The space around wheels free from metal and inductive components: - TC - AxC			X					X (train composition and inspection of the composition)
1.3.6	Wheel material: - TC - AxC			X (electric conductor) X (soft ferromagnetic material)					

Parameter		Interfaced subsystems							
Index	Name	CCS on/b	Rolling Stock (RS)				ENE	INF	OPE
			WAG	PAS	LOC	RST			
1.4	Use of sanding equipment								
1.4.1	Maximum sand output: - TC - AxC				X				X (use of the device)
1.4.2	Characteristics of sand: - TC - AxC				X				X (equipment of traction RS)
1.5	On-board flange lubrication: - TC - AxC				X				X (use of the device)
1.6	Use of brake blocks made of composite and other materials								
1.6.1	Use of composite brake blocks: - TC - AxC			X					X (RS and TC inspection)
1.6.2	Use of cast iron brake blocks: - TC - AxC		X						X (RS and TC inspection)
1.7	Vehicle mass								
1.7.1	Axle load: - TC - AxC			X					X (control)
1.7.2	Vehicle metal mass: - TC - AxC - for IL (not used on 1520 mm gauge railways)			X					
1.8	Use of shunt assisting devices: - TC - AxC				X				X (heath monitoring and use)

Parameter		Interfaced subsystems							
Index	**Name**	**CCS on/b**	**Rolling Stock (RS)**				**ENE**	**INF**	**OPE**
			WAG	PAS	LOC	RST			
1.9	Electric impedance between wheels:								
	- TC				X				X (corrosion control of the wheel/rail contact surface)
	- AxC								
1.10	Combination of rolling stock characteristics for the purpose of adequate dynamic shunting impedance:								
	- TC								X
	- AxC								
1.11	Use of special CCS devices:								
	- vehicle retarders on humps		X					X	X (sorting and composition of train, positioning on tracks, gauge and RS derailment control)
	- gauge control devices				X			X	
	- RS derailment control devices				X			X	
	- stationary braking devices			X				X	

2.	Electromagnetic compatibility								
2.1	Scope. Classification								
2.2	Electromagnetic fields								
2.2.1	Frequency management. Vehicle emission limits and evaluation parameters. Evaluation of exceedances of limits. Measurement requirements:								
	- TC								
	- AxC	X (emissions of Eurobalise antenna)			X				
2.3	Vehicle impedance:								
	- TC					X			X (use of twin or more ERS within a single traction section)
	- AxC								
2.4	Conducted interference								
2.4.1	DC and low frequency components of traction current. - Constant component of RS traction current:								
	- TC					X		X	X (OTRS component

Parameter		Interfaced subsystems							
Index	**Name**	**CCS on/b**	**Rolling Stock (RS)**				**ENE**	**INF**	**OPE**
			WAG	PAS	LOC	RST			
	- AxC						X		health monitoring)
2.4.2	- Low frequency components of RS traction current: - TC - AxC				X				
2.4.3	Low frequency components of reverse current of the RS auxiliary equipment: - TC - AxC			X					
2.4.4	The electromagnetic interference limit levels for traction power supply 25 kV AC, 50 Hz: - TC - AxC						X X		X (use of twin or more ERS within a single traction section)
2.4.5	3 kV DC: - TC - AxC						X X		
2.5	Use of magnetic / eddy current brakes			X					X (use of the brakes)

5 ANALYSIS OF DETERMINATIVE PARAMETERS

5.1 *VEHICLE DESIGN AND OPERATION*

Parameters in this Section specify interoperability at the interfaces between different types of track-side components (TC, AxC, IL) of the CCS subsystem and Rolling Stock, Infrastructure and Operation subsystems of the railway transport system.

5.1.1 Definitions

Belarus

On the Belarusian Railways, terms and definitions set out in the TOT of the Belarusian Railways, the Law on Railway Transport, Signalling Instructions of the Belarusian Railways are used in the CCS and communication applications.

Kazakhstan

On the main network of the Republic of Kazakhstan, the terms set out in the Law on Railway Transport, TOR of the Kazakhstan Railways SI of the Kazakhstan Railways Kazakhstan are used in the CCS and communication applications.

Lithuania

On the Lithuanian Railways, the terms and definitions set out in the Law on Railway Transport, TOR of the Republic of Lithuania, Signalling Instructions on the Lithuanian Railways and other documents of the signalling and communication service are used in the CCS and communication applications.

Latvia, Lithuania, Poland, Slovakia, Estonia

CCS TSI

For the definition of the longitudinal vehicle dimensions, Fig. 1 (which shows an example for a three-axle twin-bogie vehicle), applies, where:

a_i is the distance between following axles, where i = 1, 2, 3, …, n-1, and n is total number of axles of the vehicle;

b_x is the distance from first axle (b1) or last axle (b2) to the nearest end of the vehicle, i.e. nearest buffer/nose;

L is the total length of the vehicle.

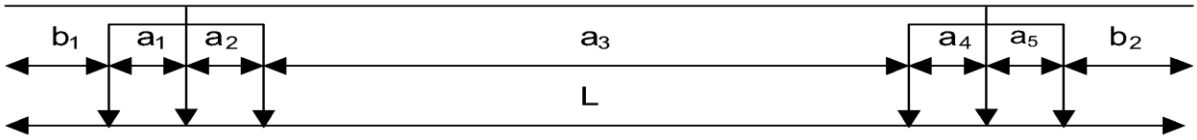


Fig. 1 Longitudinal vehicle dimensions

If more vehicles are connected in a consist, the characteristics stated in the remainder of this section 3.1 (5.1 for this document) and related to ai apply to the relevant distance of the axles belonging to each vehicle individually, while the characteristics related to bx only apply to the two ends of the complete consist (train).

For definition of wheel dimensions Fig. 2 applies, where:

D is the wheel diameter;
B_R is width of the rim;
S_d is thickness of the flange measured at the line 10 mm above the running tread as given in Fig. 2;

S_h is height of the flange.

Other dimensions in Fig. 2 are not relevant in this document.

Note: The designations used in this subsection are used further in the document.

Russia

The terms and definitions forming a CCS and communication terminology base are given in the TOT of the Russian Railways, GOST R 53431, GOST R 53953 and Section 3 of this document.

Ukraine

No data

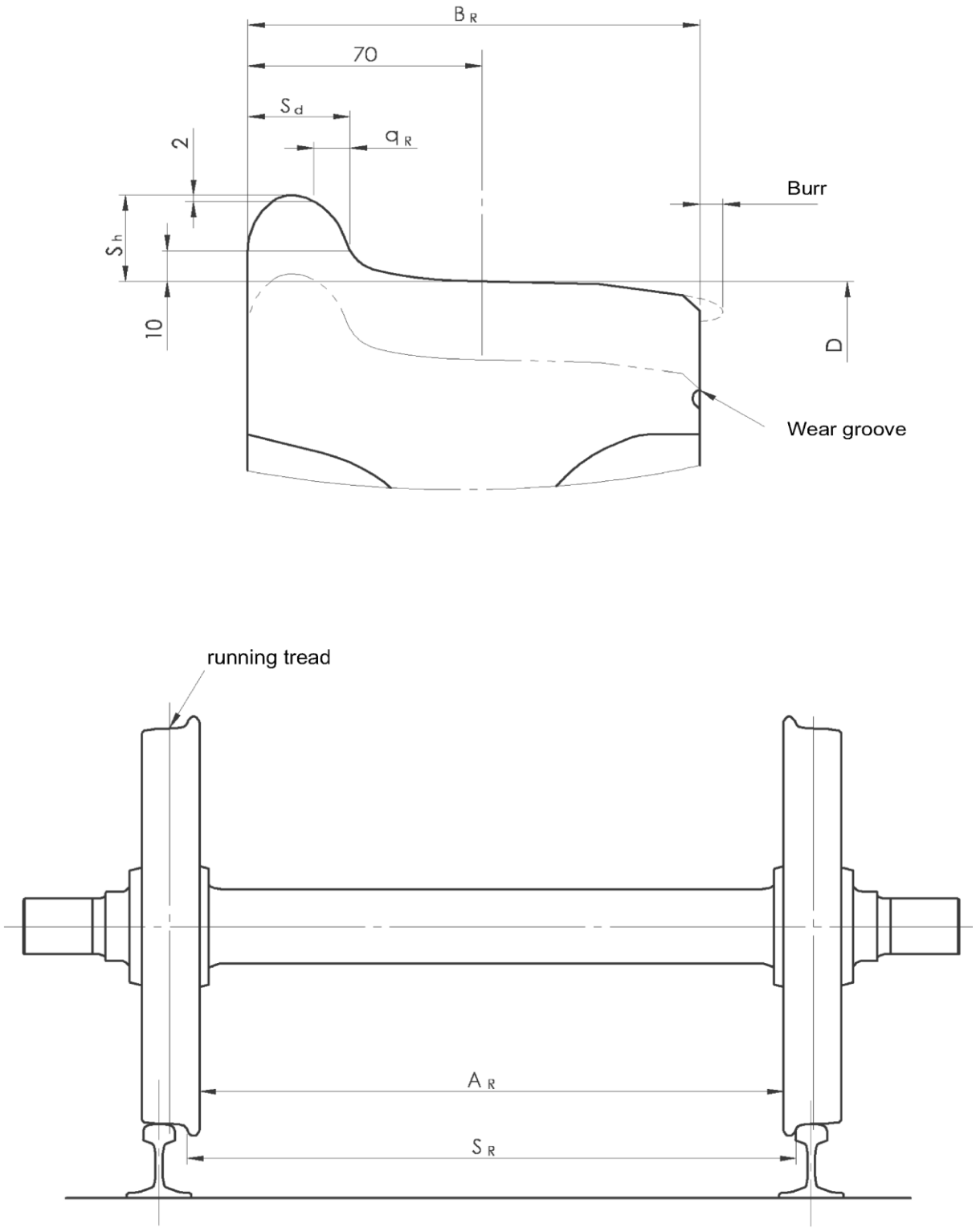


Fig. 2: Wheel and wheelset dimensions

5.1.2 Axle distances

5.1.2.1 *Maximum axle distance*

The parameter specifies interoperability at the interfaces between the track-side components (TC and AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS (TC, AxC) ← → RS

CCS t/s (TC, AxC) ← → OPE

The parameter specifies the ratio between the maximum axle distance of an individual vehicle or train and the minimum section length of the train detection system at the interfaces.

On the one side of the interfaces the parameter specifies the requirement for all vehicle types (including special and newly developed vehicles) allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it specifies the requirement for the minimum length of the track sections of the train detection system taking into account the area where shunt is insensitive (see p 5.1.2.4) and for all operational conditions, including repairs and upgrade of the infrastructure elements of the subsystems of the railway transport system.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm)

Harmonised parameter for 1520 mm track gauge:

The distance a_i (Fig. 1) does not exceed 19,000 mm.

Justification:

This requirement is related to the minimum length of a signalling section, so that a vehicle or consist does not bridge it, making the train detection system report it as ‘unoccupied’.

Belarus, Kazakhstan, Russia, Ukraine,

At the interface with RS the parameter is not regulated and is not specified in the TC engineering documentation. In reality, current value of the parameter for the TC (long vehicles) does not exceed 19,000 mm.

At the interfaces with CCS t/s for the track section vacancy detection system in the condition of the train and shunting work, the parameter is not regulated either. In reality, currently for the track section vacancy detection systems the minimum section length based on TC is 25 m.

For the hump shunting operations, the minimum TC length is regulated:

- isolated switch section 11,375 mm for the P50 1/6 switch points (symmetrical);

Note: In reality, switch section control devices based on TC with minimum length of 10 m may still be in use on the humps.

- interswitch section 4,500 mm.

Under operational conditions, to avoid false detection of a free track section due to a short TC when a long car is passing, the train detection system is equipped with pedals, radio sensor for the detection of the free section (RTD-S) and inductive wired sensors for the detection of the vehicle metal mass.

At the interface with OPE the parameter regulated the interaction of short TC with additional track sensors for reliable detection of vehicles by the track-side component of the CCS subsystem in the marshalling yards.

Poland, Slovakia (1435 mm)

CCS TSI

The distance ai (Fig. 1) does not exceed 17,500 mm for the existing lines and 20,000 mm for new lines.

Justification:
This requirement is related to the minimum length of a signalling section. Adjacent wheelsets of a vehicle or train cannot be outside that section, otherwise the train detection system may generate a free section signal.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	ERA ERTMS …. (same for 1435 and 1520) CCS TSI (Index 77)
Lithuania	TSI CCS (Index 77)
Poland	CCS TSI
Russia	STO RZD 1.19.008 (p. 7.2) TsSh-762-10 (p. 5.3 and 5.4) Rules and standards for designing marshalling equipment (p. 8.6)
Slovakia	CCS TSI
Ukraine	Not regulated
Estonia	TSI CCS (Index 77)

Conclusion: In the OSJD countries, which are not members of the EU, the parameter is not regulated (in reality 19,000 mm value is used). The parameter is partially regulated in Russia.

As a part of the revision of the CCS TSI for the 1520 mm gauge railways of the EU countries, the parameter ‘Maximum axle distance’ 19,000 mm was specified.

5.1.2.2 Minimum axle distance (1)

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the relation between the minimum axle distance of an individual vehicle or train and the maximum sensitivity (resolution) and speed of the axle count sensor of the train detection system at the interfaces.

On the one side of the interfaces the parameter specifies the requirement for all vehicle types (including special and newly developed vehicles) allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it indirectly specifies the requirement for the confidence value and maximum resolution of the train detection system within the vehicle speed allowed on the railway line in the operational conditions.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm)

Harmonised parameter for 1520 mm track gauge:

For the maximum speed v lower or equal to 350 km/h:

The distance a_i (Fig.1) is $a_i \geq v \times 7.2$ (where v is in km/h and distance a_i is in mm) and $a_i \geq 500$ mm; this value applies jointly with the minimum wheels size (see 5.1.3.2).

Justification:

Axle counter systems have to be able to distinguish the detection of an axle by 2 subsequent counters with sufficient resolution; otherwise the result will be a count error.

Belarus, Kazakhstan, Russia, Ukraine,

At the interface with RS the parameter is regulated by recommendations OSJD R-811 (p. 3.1.5), which specifies that track sensor of the axle counted shall reliably perform with the minimum axle distance 500 mm at speeds from 0 to 350 km/h.

At the OPE interface the parameter is checked and controlled in accordance with the guidelines using simple length measurements for both vehicle and train.

Poland, Slovakia (1435 mm)

TSI CCS Index 77

If the maximum speed V is less than or equal to 350 km/h, the distance ai (Fig. 1) is determined as ai ≥ V x 7.2 (where v is in km/h and distance ai is in mm); this value applies jointly with the minimum wheels size (see 5.1.3.2).

These requirements are approved by the following documents:

Belarus	OSJD R-811 (p. 3.1.5)
Kazakhstan	OSJD R-811 (p. 3.1.5)
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	TSI CCS Index 77
Russia	OSJD R-811 (p. 3.1.5)
Slovakia	CCS TSI
Ukraine	OSJD R-811 (p. 3.1.5)
Estonia	TSI CCS Index 77

Conclusion: For OSJD 1520 mm gauge railways the parameter 'Minimum axle distance (1)' equal to 500 mm is specified by OSJD memo R-811.

As a part of the revision of the CCS TSI for the 1520 mm gauge railways of the EU countries, the parameter 'Minimum axle distance (1)' 500 mm was specified.

5.1.2.3 Minimum axle distance (2)

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the relation between the minimum axle distance of an individual vehicle or train and the maximum sensitivity (resolution) and speed of the axle count sensor of the train detection system at high-speed transit over 350 km/h at the interfaces.

On the one side of the interfaces the parameter specifies the requirement for the ultra-high-speed vehicle allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it indirectly specifies the requirement for the confidence value and maximum resolution of the train detection system within the vehicle speed range allowed in the operational conditions.

Belarus, Kazakhstan, Russia, Ukraine,

The parameter is not regulated.

Latvia, Lithuania, Poland, Slovakia, Estonia (1435 mm and 1520 mm)

Harmonised parameter:

For the maximum speed v higher than 350 km/h, the distance a_i (Fig. 1) is at least:

[open point]

Justification:

Axle counter systems have to be able to distinguish the detection of an axle by 2 subsequent counters with sufficient resolution; otherwise the result will be a count error.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	TSI CCS Index 77
Russia	Not regulated
Slovakia	TSI CCS Index 77
Ukraine	Not regulated
Estonia	TSI CCS Index 77

Conclusion: This parameter value remains in the EU countries an open point. In the OSJD countries, which are not the EU members, the parameter is not regulated.

Note: The Contact Group proposes for the ERA and OSJD experts to make proposals and consider introducing a standard parameter.

5.1.2.4 Minimum axle distance (3)

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS

CCS t/s (TC) ← → OPE

The parameter specifies the ratio between the minimum axle distance of an individual vehicle or train and the allowed insensitivity area between adjacent TC at the interfaces.

On the one side of the interfaces the parameter specifies the requirement for all vehicle types (including special and newly developed vehicles) allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it specifies the requirement for the maximum length of the area where the TC shunt of the train detection system is insensitive for all operational conditions, including repairs and upgrade of the infrastructure elements of the subsystems of the railway transport system.

Belarus, Kazakhstan, Russia

At the RS interface the parameter is indirectly regulated by the process engineering standards NTP STsB/MPS (TsSh-NTP/6-02 for Kazakhstan) as a requirement for the TC design. For the TC based train detection devices, irrespective of the vehicle speed, the allowed gap on the isolating joints on the opposite 1520 mm track rails does not exceed 1.9 m (area where the shunt is not sensitive). At the same time, a vehicle with a large minimum distance between the outer axles will be reliably detected by the TC based block control system.

At the OPE interface, the parameter shall be checked and monitored using simple measurement of the TC isolating joints gap of the CCS subsystem with RS type tolerance for the infrastructure in operation.

Ukraine

No data

Latvia, Lithuania, Poland, Slovakia, Estonia (1435 mm and 1520 mm):

The distance between the first and the last axle L is ($b_1 + b_2$) (Fig. 1) minimum 3,000 mm.

Justification:

The electrical joints between adjacent track circuits may have an area where the detection of an axle of a vehicle is not ensured.

These requirements are approved by the following documents:

Belarus	NTP STsB/MPS (p. 3.32 informative)
Kazakhstan	TsSh-NTP/6-02
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	NTP STsB/MPS (p. 3.32)
Slovakia	CCS TSI
Ukraine	No data
Estonia	TSI CCS Index 77

Conclusion: The minimum axle distance (3) parameter is regulated in Belarus, Kazakhstan and Russia and is 1,900 mm. Harmonised parameter for the EU countries is at least 3,000 mm.

Note: The Contact Group proposes for the ERA and OSJD experts to consider introducing a single standard parameter.

5.1.2.5 Distances between end of train and first axle on new high speed lines

The parameter specifies interoperability at the interfaces between the track-side components (TC and AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC, AxC) ← → RS (LOC, PAS, RST)

CCS t/s (TC, AxC) ← → OPE

The parameter specifies the distance (allowed distance) between the end of an individual vehicle and first axle on the interfaces on the new high-speed lines.

On the one side of the interfaces the parameter specifies the requirement for specific vehicle types (including newly developed) allowed for the operation on the high-speed railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it specifies the requirement for the minimum distance of the limit post and the track block boundary controlled by the train detection system is insensitive for all operational conditions, including repairs and upgrade of the infrastructure elements of the high-speed railway system.

Belarus, Kazakhstan, Russia, Ukraine,

The parameter is not regulated.

Latvia, Lithuania, Poland, Slovakia, Estonia (for 1520 mm and 1435 mm):

The distance b_x (Fig. 1) does not exceed 5,000 mm.

Justification:

A train detection system shall be able to detect:
- the first axle before the nose of the train reaches a danger point ahead;
- the last axle until the tail of the train has passed the danger point.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	Not regulated
Slovakia	CCS TSI
Ukraine	Not regulated
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways, the parameter 'Distances between end of train and first axle on new high speed lines' is not regulated (except railway network of the EU countries where this distance is specified by CCS TSI Index 77 and is 77 ≤ 5,000 mm).

Note: The Contact Group urges the regulatory authorities of the OSJD countries, which are not members of the EU, to consider introducing a standard parameter similar to the one in the CCS TSI Index 77, i.e. 5,000 mm.

5.1.2.6 The distance between the end of train and first axle on other lines.

The parameter specifies interoperability at the interfaces between the track-side components (TC and AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC, AxC) ← → RS (WAG, LOC, PAS)

CCS t/s (TC, AxC) ← → OPE

The parameter specifies the distance (allowed distance) between the end of an individual vehicle and first axle on the interfaces on other lines.

On the one side of the interfaces the parameter specifies the requirement for specific vehicle types (including special and newly developed RS) allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it specifies the requirement for the minimum distance of the limit post and the track block boundary

controlled by the train detection system is insensitive for all operational conditions, including repairs and upgrade of the infrastructure elements of the subsystems of the railway transport system.

Belarus, Kazakhstan, Russia, Ukraine

At the RS interface, the parameter is indirectly regulated by the TOR of the Russian Railways and process engineering standards NTP STsB/MPS as a requirement for the isolating TC joints at the station receiving and departure tracks and the installation of special signs.

In accordance with the TOR of the Russian Railways, signal signs, such as fouling marks, installed in the middle of intertrack spacing are used at the switch points and on other spots on the track. At the station tracks rolling stock shall be positioned within the area marked by the fouling marks.

On the 1520 mm gauge railways, typical TC are used for the train detection in the CCS equipment. Where the track is divided into electrically isolated sections, the isolating joints are usually installed in the area between the intermediate, entry, exit, route and shunting lights. In accordance with NTP STsB/MPS, isolating joints are installed on the station receiving and departure tracks at least 3.5 m away from a fouling mark. Axle counter sensors are also installed in accordance with this requirement.

In accordance with the TOR of the Russian Railways, at the interface with OPE, the arriving train must be stopped between the exit signal and fouling mark of the receiving track and where there is no exit signal, between the fouling marks. When driving the train, where a stop is required, the driver and driver's assistant must stop the train without passing the exit light (where it's absent, the fouling mark) of the receiving track.

Thus, to ensure train traffic safety, the minimum distance from the end of the vehicle to first wheelset axle should not exceed 3.5 m.

Latvia, Lithuania, Poland, Slovakia, Estonia:

1520 mm: The distance b_x (Fig. 1) does not exceed 5,000 mm.

1435 mm: The distance b_x (Fig. 1) does not exceed 4,200 mm.

Justification:

The train detection system shall be able to detect:

- the first axle before the nose of the train reaches a danger point ahead
- the last axle until the tail of the train has passed the danger point

These requirements are approved by the following documents:

Belarus	TOR of the Belarusian Railways NTP STsB/MPS (informative)
Kazakhstan	TOR of the Kazakhstan Railways

Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	TOR of the Russian Railways p. 3.33, p. 15.21, p. 16.11, p. 16.38 NTP STsB/MPS p. 3.1, 3.32
Slovakia	CCS TSI
Ukraine	TOR of the Ukrainian Railways
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways, the parameter 'The distance between the end of train and first axle on other line' specifies the distance (allowed distance) and does not exceed 3500 mm.

5.1.3 *Wheel geometry*

On the 1520 mm gauge railways, wheels are used in:

- WS for locomotives and multiple-unit RS (traction RS) for the 1520 mm gauge track with the speed not exceeding 200 km/h in accordance with GOST 11018;
- WS for freight wagons and passenger vehicles, trailer vehicles of electric and diesel locomotives of main 1520 mm gauge railways with design speed depending on type of vehicles up to 160 km/h in accordance with GOST 4835 with solid-rolled wheels to GOST 10791;
- driven and non-driven WS for special purpose RS made in Russia: petrol locomotives, motor trolleys, special motor vehicles, railway construction vehicles for the construction, repair and maintenance of the railway tracks in accordance with design speed up to 120 km/h in accordance with GOST 31847-2012 (Russia).

Wheel geometry and wheel rim profile parameters must comply with GOST 10791 and/or GOST 11018.

5.1.3.1 Minimum wheel rim width

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the interrelation between the minimum width of the rim and the ability of the axle counter to detect the wheel on the interfaces reliably.

On the one side of the interfaces the parameter specifies the requirement for all types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable

standard; on the other side of the interfaces it indirectly specifies the minimum sensitivity of the trackside axle counter sensors for all allowed speeds, possible sensor positions on the Sensor-Rail-Wheel system and operational conditions.

Belarus, Kazakhstan, Russia, Ukraine

The following rim (flange) width requirements are established for the interface with RS:

- for locomotive - 140 mm (p. 4.4.1 GOST 11018) with rim width tolerances +3 mm and -2 mm (p. 4.4.2 of GOST 11018); in accordance with p. 4.3.2.2 of GOST 11018 the wheel rim width difference cannot exceed 3 mm.
- for multiple-unit rolling stock- 130 mm (p. 4.4.1 GOST 11018) with rim width tolerances +3 mm and -1 mm (p. 4.4.2 of GOST 11018); in accordance with p. 4.3.2.2 of GOST 11018 the wheel rim width difference cannot exceed 3 mm.
- for freight wagons and passenger vehicles, trailer vehicles of electric and diesel locomotives – 130 mm with tolerance of +3 mm (Fig. A1-A4 of Appendix A to GOST 10791 or parameter L2 of Appendix 3 to TsV-944);
- for special rolling stock (p. 4.7.1 of GOST 31847-2012):

1. where 130 mm vehicle wheels with tolerance +3 mm are used (according to p. 4.4.1 of GOST 31847-2012, the wheel must comply with the requirements of GOST 10791);
2. where 140 mm locomotive wheels with tolerance +3 mm and -2 mm are used (p. 4.7.2 of GOST 31847-2012);
3. in accordance with p. 4.4.3 of GOST 31847-2012 the wheel rim width difference cannot exceed 2 mm.

GOST 9036 allows to make customised solid-rolled wheels with rim width 135±1 mm (note 1, drawing 1).

In the interface with OPE, the TOR of the Russian Railways and TsT-329 specify damage and wear threshold for different types of rolling stock wheelsets in the operational conditions. TsV-944 prohibits putting the vehicles into service and allowing them to be used in trains, if they have any of the following wheelset wear or damage:

p. 4.1 k) – surface chipping on the outer rim surface, including local chipping of the flange more than 10 mm deep (radial), if the width of the remaining rim at the site of the chipping is less than 120 mm;

p. 4.1 n) – the width of the rim is less than 126 mm.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm):

Harmonised parameter:

The dimension B_R (Fig. 2) is (this value is in line with what specified for geometrical characteristics of wheels in the ‘Locomotives and Passenger rolling stock’ and in the ‘Freight wagons’ TSIs)

Track gauge [mm]	Wheel diameter D [mm]	Width of the rim B_R [mm]
1520	$400 \leq D \leq 1220$	126 to 146

Poland, Slovakia (1435 mm):

Track gauge [mm]	Wheel diameter D [mm]	Width of the rim B_R [mm]
1435	$D \geq 330$	133 to 140

Justification:

The detection field of the axle counter is influenced by the wheel which passes. The rim width has to be big enough to influence the field sufficiently in order to ensure appropriate detection.

These requirements are approved by the following documents:

Belarus	GOST 10791 GOST 11018 TsV-3429 GOST R 51775 (informative)
Kazakhstan	GOST 10791 GOST 11018 GOST R 51775 (informative) TsT -329/271-05
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	GOST 10791 GOST 11018 (with amendment No 1 of 22 July 2015) GOST 31847-2012TsV-944 (list n), p. 4.1) TsV-3429 (list s), p 4.1) TsT-329 KMBSh 6671.20.001 RE Guidelines for the operation, maintenance and repair of wheelsets of 1520 mm gauge RS
Slovakia	CCS TSI
Ukraine	DSTU GOST 11018 GOST 10791 VND 32.0.07.001-2001 Guidelines for the formation, repair and maintenance of wheelsets of traction RS for 1520 mm gauge track railways
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways, the parameter 'Minimum wheel rim width' is specified by Index 77 and equals 126 mm; for Poland and Slovakia (1435 mm) – 133 mm.

5.1.3.2 Minimum wheel diameter

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the interrelation between the minimum wheel diameter and the ability of the axle counter to detect the wheel on the interfaces reliably.

On the one side of the interfaces the parameter specifies the requirement for all types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it indirectly specifies the minimum sensitivity of the trackside axle counter sensors for all allowed speeds, possible sensor positions on the Sensor-Rail-Wheel system and operational conditions.

Latvia, Lithuania, Poland, Slovakia, Estonia

Harmonised parameter:

For the minimum speed v, the dimension D (Fig. 2) is at least

Speed v [km/h]	Diameter D (mm)
$v \leq 100$	330
$100 < v \leq 250$	150 + 1.8 x v
$250 < v \leq 350$	50 + 2.2 x v
$350 < v$	[open point]

Justification:

The length of the influence of the detection field of the axle counter is related to the wheel diameter.

Belarus, Kazakhstan, Russia, Ukraine,

The following wheel diameter requirements are established for the interface with RS:

- for the precision class 2 wheels for the wheelsets of locomotive hauled freight wagon and passenger vehicle bogies, passenger, trailer vehicles of electric and diesel locomotives – 957 mm with the tolerance range of 14 mm; precision class 2 wheels with other designs and dimensions for the wheelsets of the passenger, freight and shunting locomotive bogies, motor vehicles of electric and diesel trains, special railway rolling stock in accordance with its design documentation approved by the owner of the infrastructure are allowed (p. 5.1 of GOST 10791)
- for the wheels for newly made wheelsets of locomotive and multiple-unit rolling stock for the 1520 mm gauge railways used at travelling speed not exceeding 200 km/h – in accordance with GOST 9036 and GOST 10791 (p. 4.3 of GOST 11018);
- for the wheels for newly made wheelsets with axle units of freight wagons and passenger vehicles, trailer vehicles of electric and diesel trains for the main 1520 mm gauge railways (GOST 4835);
- for the wheels of driven and non-driven wheelsets for special purpose rolling stock: petrol locomotives, motor trolleys, special motor vehicles, railway construction vehicles for the construction, repair and maintenance of the railway tracks – 600, 650,710,860, 950, 957 and 1050 mm (p. 4.7.1 of GOST 31847-2012);
- for the wheels of the wheelsets of main 1520 mm (1524 mm) gauge railway vehicles (except wheelsets of special vehicles and motor and trailer vehicles of electric and diesel trains) – 950 mm with tolerance of +14 mm (957 mm with tolerance of ± 7 mm) and 1050 mm with tolerance of +14 mm (Appendix 3 to TsV-944);
- for the wheels of the wheelsets of all types of locomotives and multiple-unit rolling stock for the 1520 mm gauge railways in operation – 950, 1050, 1220 and 1250 mm (TsT-329, Table 2).

Standards of allowable wear of the wheel during their operation and repair are set for the interface with OPE.

On the other side of the interfaces, the OSJD recommendations R-811 (p. 3.1.4) establish that the track axle counter sensor must reliably work with the minimum wheel diameter of 335 mm at the maximum speed of 160 km/h and the minimum wheel diameter of 470 mm at the maximum speed of up to 350 km/h.

These requirements are approved by the following documents:

Belarus	GOST 10791 GOST 11018 OSJD R-811 (p. 3.1.4)
Kazakhstan	OSJD R-811 (p. 3.1.4) GOST 10791 GOST 11018 GOST R 51775 (informative) TsT -329/271-05

Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	OSJD R-811 (p. 3.1.4) CCS TSI
Russia	GOST 10791 GOST 11018 with amendment No 1 of 22 July 2015 GOST 4835-2013 GOST 31847-2012 TsB (Appendix 3) TsT-329 (Table 2) OSJD R-811 (p. 3.1.4)
Slovakia	OSJD R-811 (p. 3.1.4) CCS TSI
Ukraine	GOST 10791 GOST 11018 OSJD R-811 (p. 3.1.4)
Estonia	TSI CCS Index 77

Conclusion: For the OSJD 1520 mm gauge railways outside the EU, the parameter 'Minimum wheel diameter' is regulated by OSJD memo R-811 and equals 335 mm at maximum speed up to 160 km/h and 470 mm at speeds from 160 km/h to 350 km/h. For the EU countries using 1520 mm gauge track, the value of this parameter is set by Index 77 and equals 330 mm.

Note: Members of the Contact Group urge the ERA experts to consider the possibility to set the quantitative standard for the possible (same as in France) instead of the functional dependence proposed in CCS TSI and to study the possibility of setting a single parameter standard.

5.1.3.3 Minimum flange thickness

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of 'Rolling Stock' subsystem and 'Operation' subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the interrelation between the minimum flange thickness and the ability of the axle counter to detect the wheel on the interfaces reliably.

On the one side of the interfaces the parameter specifies the requirement for all types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it indirectly specifies the minimum sensitivity of the trackside axle counter sensors for all allowed speeds, possible sensor positions on the Sensor-Rail-Wheel system and operational conditions.

Belarus, Kazakhstan, Russia, Ukraine

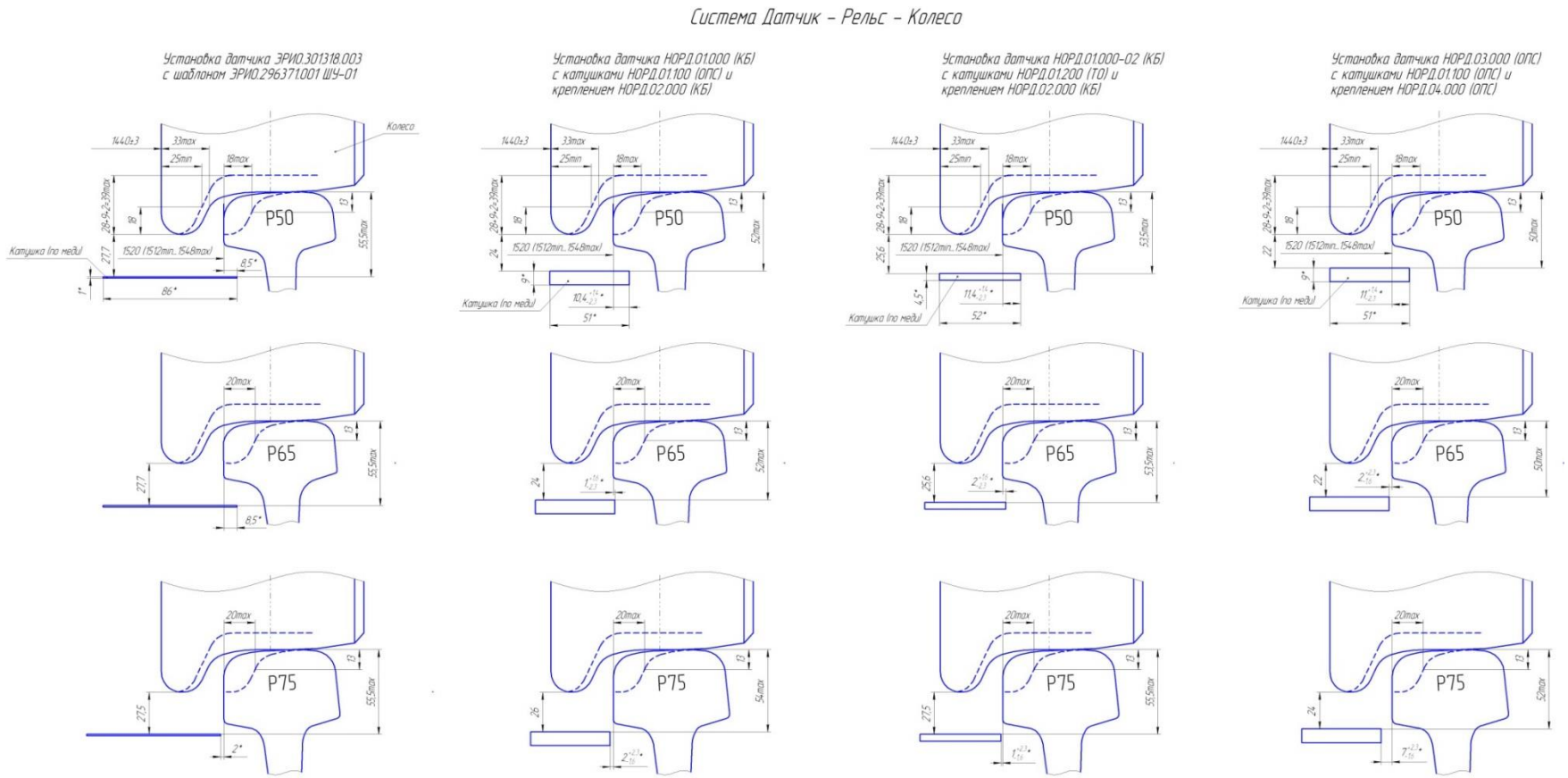
The following flange thickness requirements are established for the interface with RS:

- for the wheels for newly made wheelsets of locomotive and multiple-unit rolling stock for the 1520 mm gauge railways used at travelling speed not exceeding 200 km/h – 33 mm with tolerance of -0.5 mm (GOST 11018, Fig. 3 and 4);
- for the wheels for newly made wheelsets of freight wagon and passenger vehicle bogies – 33 mm (GOST 9036, drawing 3);
- for the wheels for newly made wheelsets for special purpose rolling stock made in Russia – in GOST 9036 and GOST 11018 (p. 4.7.2 of GOST 31847-2012).

The following requirements are established for the interface with OPE. TOR of the Russian Railways, TsV-944 and TsT-329 establish damage and wear thresholds for the wheelsets during operation. Freight wagons, passenger vehicles and locomotives with flange thickness less than 25 mm cannot be put into operation and allowed to be used in the trains on public rail tracks.

On the other side of the interfaces, the flange thickness from 23 mm to 33 mm is allowed in accordance with the guidelines for the operation of axle counters.

The drawings below show the geometry of the maximum allowable wear of the flange, rail head and axle counter sensor position in the Sensor-Rail-Wheel system.



Примечание.
1. *Размеры для справок.
2. Колесо подвижного состава.
3. Катушки даны в размеры обмоток, по меди.
4. Вертикальный размер от головки рельса до катушки включает – установочный размер с допуском, толщину корпуса над катушкой и толщину щечки каркаса катушки, при ее наличии.
4. Во всех вариантах отсутствует регулировка датчика по боковому износу рельса.
5. Допуски на изготовление катушек, корпусов и креплений не учитывались.
6. В датчиках проекта "Нордик" при установке присутствует горизонтальное перемещение катушек связанное с перемещением крепления датчика и вызванное допуском на толщину пера рельса.

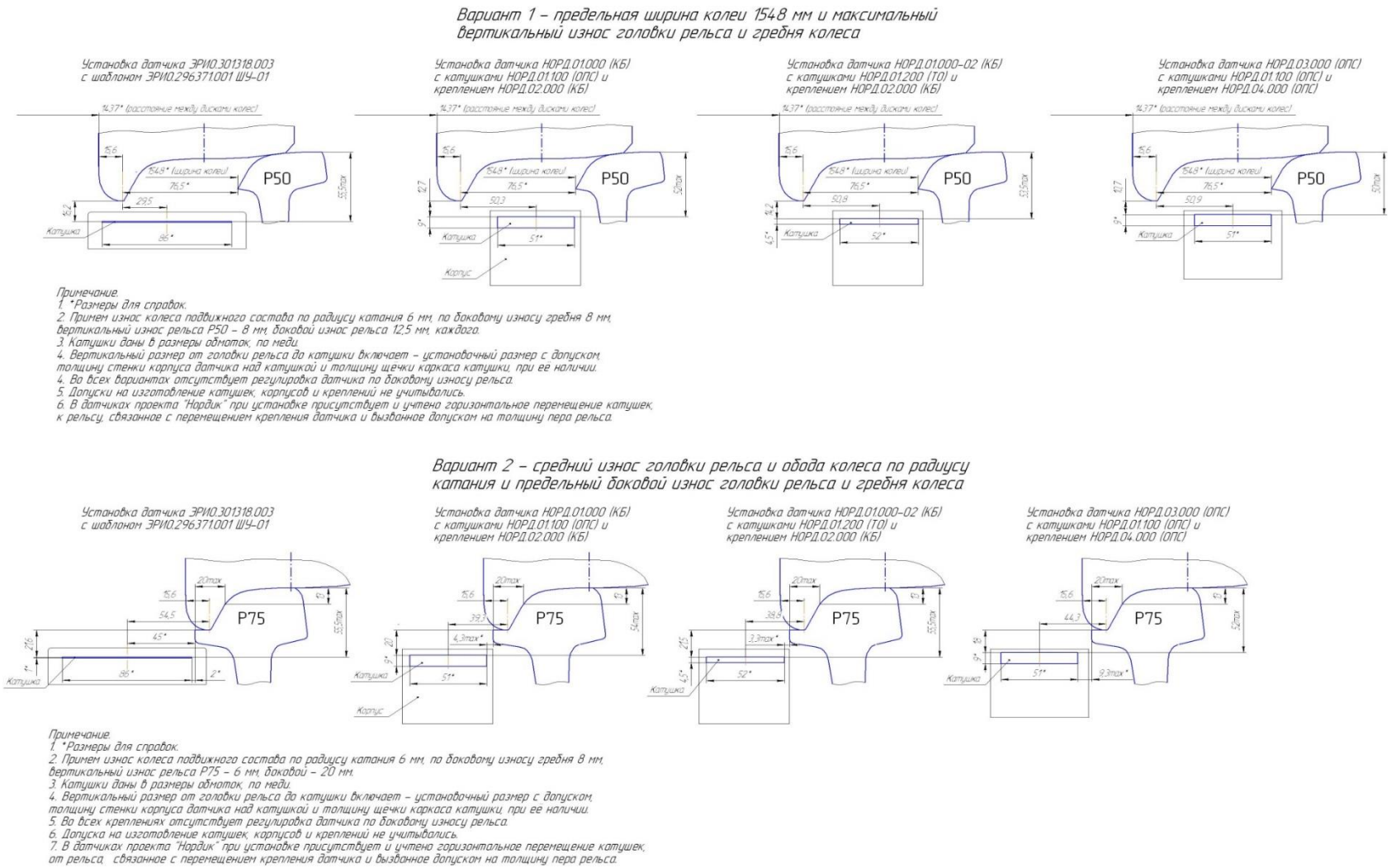


Fig. 3. Geometry of the maximum allowable wear of the flange, rail head and axle counter sensor position in the Sensor-Rail-Wheel system

Latvia, Lithuania, Poland, Slovakia, Estonia:

Harmonised parameter:

The dimension S_d (Fig. 2) is (this value is in line with what specified for geometrical characteristics of wheels in the 'Locomotives and Passenger rolling stock' and in the 'Freight wagons' TSIs)

Flange thickness as a function of the wheel diameter D

Track gauge [mm]	**Wheel diameter D [mm]**	**Flange thickness S_d [mm]**
1520	$400 \leq D \leq 1220$	21 to 33
1435	$330 \leq D \leq 760$	27.5 to 33
	$760 \leq D \leq 840$	25.0 to 33
	$D \geq 840$	22.0 to 33

Justification:

The detection field of the axle counter is influenced by the wheel which passes. The flange thickness has to be big enough to influence the field sufficiently to ensure appropriate detection.

These requirements are approved by the following documents:

Belarus	TOR of the Belarusian Railway RD RB BCh 17.001 TsV-3429
Kazakhstan	TOR of the Kazakhstan Railways GOST 11018 GOST 9036 TsT -329/271-05
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	TOR of the Russian Railways (list b), p. 10.3) GOST 11018 (with amendment No 1 of 22 July 2015) GOST 9036 TsV-944 (Table 1, list g) p. 4.1) TsV-3429 (Table 1, list g) p. 4.1) TsT-329 (p. 3.5.1)
Slovakia	CCS TSI

Ukraine	GOST 11018 GOST 9036 Guidelines for the formation, repair and maintenance of wheelsets of traction RS for 1520 mm gauge track railways
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways of the EU countries, the value of the parameter 'Minimum flange thickness' is set by the CCS TSI Index 77 and equals 21 mm; for Belarus, Kazakhstan, Russia and Ukraine the regulated value of the parameter is 25 mm.

5.1.3.4 Flange height

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the interrelation between the flange height and the ability of the axle counter sensor to detect the wheel on the interfaces reliably.

On the one side of the interfaces the parameter specifies the requirement for all types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it indirectly specifies the minimum sensitivity of the trackside axle counter sensors for all allowed speeds and sensor positions on the Sensor-Rail-Wheel system and operational conditions.

Belarus, Kazakhstan, Russia, Ukraine

The following nominal flange height requirements are established for the interface with RS:

- for locomotives – up to 30 mm (GOST 11018, Fig. 3);
- for multiple-unit rolling stock – up to 28 mm (GOST 11018, Fig. 3);
- for locomotive hauled freight wagons and passenger vehicles, trailer vehicles of electric and diesel trains and track machines and special railway rolling stock – up to 28 mm (GOST 10791, Appendix B, Fig. B.1 and B.3) or 28 mm with tolerance of -1 mm.

For the interface with OPE, Guidelines TsV-944 regulate wear of vehicle wheelsets. Operation of the freight wagons and movement in the trains is allowed in case of:

- uniform wear up to 9 mm;
- irregular wear up to 2 mm;
- wheel flat up to 1 mm and up to 2 mm (on the way to a repair station).

Taking into account possible worst combination of wear and damage, the maximum flange height can be calculated as:

28 + 9 + 2 + 2 = 41 mm.

The minimum flange height can be calculated as:

28 - 1 = 27 mm.

Instructions TsT-329 of the Russian Railways establish damage and wear thresholds for the wheelsets of traction rolling stock and prohibits locomotives with flange height over 37 mm and under 27 mm from movement in the trains.

Geometry of maximum allowable wear of the wheel flanges and rail head, and the position of the sensor in the Sensor-Rail-Wheel system during operation is shown in the drawings in p. 5.1.3.3. When installing axle counters, allowable rail head wear threshold in the operating condition should be taken into account.

Latvia, Lithuania, Poland, Slovakia, Estonia

Harmonised parameter:

The dimension S_h (Fig. 2) is (this value is in line with what specified for geometrical characteristics of wheels in the 'Locomotives and Passenger rolling stock' and in the 'Freight wagons' TSIs):

Flange height as a function of the wheel diameter D

Track gauge [mm]	**Wheel diameter D [mm]**	**Flange height S_d [mm]**
1520	$400 \leq D \leq 1220$	28 to 32
1435	$330 \leq D \leq 630$	31.5 to 36
	$630 \leq D \leq 760$	29.5 to 36
	$D \geq 760$	27.5 to 36

Justification:

The detection field of the axle counter is influenced by the wheel which passes. The flange height has to be big enough to influence the field sufficiently to ensure appropriate detection.

These requirements are approved by the following documents:

Belarus	GOST 11018 GOST 10791 TsV-3429 (p. 4.1, list v); Table 1, list a); parameter h in the table in Appendix 3)
Kazakhstan	GOST 11018 GOST 10791 TsT -329/271-05
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77

Poland	CCS TSI
Russia	GOST 11018 (with amendment No 1 of 22 July 2015)GOST 10791 TsV-944 (p. 4.1, list e); table 1, list g) TsV-3429 (p. 4.1, list v); Table 1, list a); parameter h in the table in Appendix 3) TsT-329 (p. 3.5.1)
Slovakia	CCS TSI
Ukraine	TOR of the Ukrainian Railways GOST 11018 GOST 10791
Estonia	TSI CCS Index 77

Conclusion: for the 1520 mm gauge railway in OSJD countries, which are not members of the EU, the parameter 'Flange height' is set within the 27 to 41 mm range. In the EU countries using 1520 mm gauge track, this parameter is set by the CCS TSI Index 77 to 28-32 mm range.

5.1.3.5 *Metal and inductive components-free space between wheels*

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (AxC) ← → RS

CCS t/s (AxC) ← → OPE

The parameter specifies the interrelation between the rolling stock space where only wheels and their parts can be located (gearboxes, braking mechanisms, sand delivery pipes or non-ferromagnetic components) and the ability of the axle counter sensor to detect a wheel on the interfaces reliably. The parameter determines the effect of the RS metal components installed between the wheels of adjacent axles on the track axle count systems.

On the one side of the interfaces the parameter specifies the requirement for all types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interfaces it indirectly specifies the requirement for the ability of the trackside sensors of the axle count systems to reliably distinguish between the wheel and other rolling stock parts which may be installed in the space between the wheels of adjacent axles in all operating conditions.

Latvia, Lithuania, Poland, Slovakia, Estonia

Harmonised parameter:

For freight wagons: only wheels and their parts (gearboxes, brake parts, sanding tube) or non-metallic and non-inductive components are permitted to be mounted in the sensitive area of Fig. 4.

For other vehicles: the possibility and conditions to install equipment in the sensitive zone of Fig. 4 are: [open point]

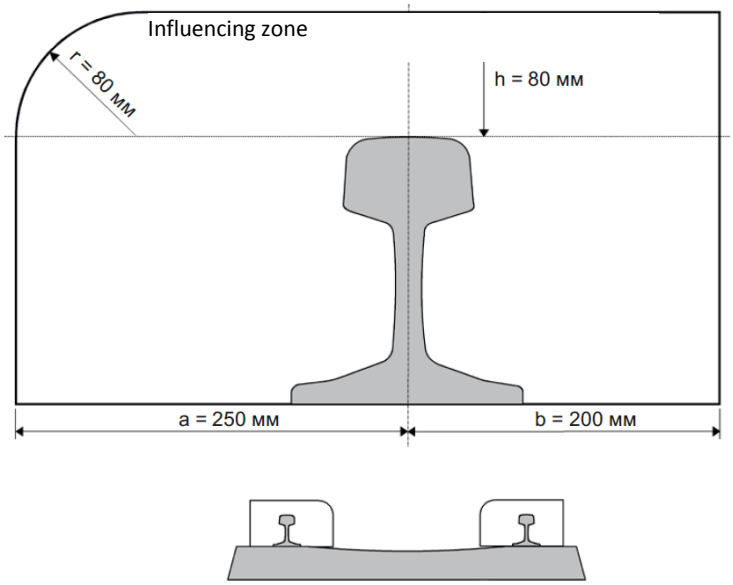


Fig. 4. Sensitive area

Justification:

The principle of axle counters is based on the distortion of an electromagnetic field. The distortion should occur only with the passage of the wheel and not with the passage of surrounding parts of rolling stock, like other ferromagnetic components or inductive coils.

Note:

The requirements of Fig. 4 can be respected by freight wagons; in case of locomotives it may be necessary to install equipment (e.g., brakes) in the area forbidden by Fig. 4.

Belarus, Kazakhstan, Russia, Ukraine,

The parameter is not regulated.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	Not regulated
Slovakia	CCS TSI

Ukraine	Not regulated
Estonia	TSI CCS Index 77

Conclusion: The parameter 'Metal and inductive components-free space between wheels' is not regulated, except partial regulation on the EU railways. To be studied.

Note: According to the CCS TSI Index 77, the restrictions for the freight wagons are set, but they are not yet clear for locomotives and passenger vehicles; further study of the state of the matter in the EU and the CIS is proposed. The ERA and OSJD are invited to consider the matter in order to propose a standard parameter.

5.1.3.6 *Wheel material*

The parameter specifies interoperability at the interface between the track-side components (TC and AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS t/s ← → RS

The parameter specifies the interrelation between physical properties of the wheel material and the ability of the axle counter sensor to detect the wheel on the interface reliably and the ability of the TC based train detection system sensor to detect shunt on the interface reliably.

On the one side of the interface the parameter specifies the requirement for all types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the applicable standard; on the other side of the interface it indirectly specifies the requirement for the electrical and magnetic properties of the wheel material for reliable train detection by different types of track CCS devices regardless of the speed and operating conditions.

Latvia, Lithuania, Poland, Slovakia, Estonia

Harmonised parameter:

The wheels have ferromagnetic characteristics and are electrically conducting.

Justification:

This characteristic is necessary to generate the distortion of the electromagnetic field of axle counters, to ensure appropriate detection.

Belarus, Kazakhstan, Latvia, Lithuania, Russia, Ukraine, Estonia

On the 1520 mm gauge railway wheels made of steel are used. The material of the rim of a solid-rolled wheel or tyre has properties of a soft ferromagnetic material.

Poland, Slovakia 1435

CCS TSI

The wheels have electromagnetic properties ($\mu_r > 300$) and electric conductivity

Justification.
This characteristic is necessary to generate the distortion of the electromagnetic field of axle counters, to ensure appropriate detection.

These requirements are approved by the following documents:

Belarus	GOST 10791 GOST 9036 GOST 398
Kazakhstan	GOST 10791 GOST 9036 GOST 398
Latvia	TSI CCS Index 77 GOST 9036 (informative) GOST 398 (informative)
Lithuania	TSI CCS Index 77 GOST 9036 (informative) GOST 398 (informative)
Poland	CCS TSI
Russia	GOST 10791 GOST 9036 GOST 398 GOST 11018
Slovakia	CCS TSI
Ukraine	GOST 10791 GOST 9036 GOST 398
Estonia	TSI CCS Index 77 GOST 9036 (informative) GOST 11018 (informative)

Conclusion: On the 1520 gauge track railway, there is a common requirement that the RS wheels must be conductive and have ferromagnetic properties.

5.1.4 *Use of sanding equipment*

The issue of sand delivery is considered from the point of view of ensuring wheel/track adhesion in the RS traction and braking modes, and not from the point of view of effect on the functioning of the track circuits of the block vacancy/occupancy detection systems.

5.1.4.1 *Maximum amount of sand*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS (LOC, RST)

CCS t/s (TC) ← → OPE (LOC, RST)

The parameter specifies the quality of electrical contact (connection) between the wheel and the rail when using maximum amount of sand and the ability of the TC to detect rolling stock on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for the specific RS types allowed for operation and their operation rules; on the other side of the interfaces it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt reliably for all modes of application of the sand delivery devices in the operating conditions.

Belarus, Kazakhstan, Latvia, Lithuania, Russia, Ukraine, Estonia

The following sand output standards are established for the interface with RS.

The parameter is determined by terms of reference and repair manual for a particular locomotive series. It is determined by the value of the delivery speed from 1.2 to 1.5 kg/min for the front wheelsets and the value of the delivery speed from 0.7 to 1.2 kg/min for all other wheelsets for passenger and freight locomotives respectively.

Normally each end traction axle of a bogie is equipped with its own sand delivery device.

On the interface with OPE, the instructions and the TOR of the Russian Railways do not allow putting into operation any locomotives, multiple-unit or special self-propelled rolling stock that have any faults in the sand delivery system and establish the following regulations related to the use of the sand delivery devices:

- in case of a single locomotive, sand delivery under the wheelset is not allowed if the speed is under 10 km/h;
- after emergency braking of a single locomotive, it should travel to the tracks free from sand.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm)

Harmonised parameter: open point.

Poland

For the railway network controlled by PKP PLK, there are no official internal requirements regulating sand parameters in the sandboxes of the vehicles.

Poland, Slovakia (1435 mm)

If there is an automated sanding system, the driver can disable it.

The allowed amount of sand for the sanding devices in 30 s is:

1. For the speed V < 140 km/h; 400 g + 100 g
2. For the speed V > 140 km/h; 650 g + 150 g

The number of working sanding devices shall not exceed:

1. For multiple-unit trains with distributed sanding devices: the first and the last vehicles, as well as middle vehicles with at least 7 intermediate axles which are not sanded between two sanding devices. It is allowed to couple such multiple-unit trains and use all sanding devices on the ends of the couplings.
2. For locomotive hauled trains

a. For emergency and working braking: all available sanding devices

b. In other cases: maximum 4 devices for sanding the rail.

This parameter shall be taken into account jointly with 5.1.4.2 (Characteristics of sand).

Justification:

Sand is applied to the tracks for better braking and traction performance.

Sand can create an isolating layer between the wheels and rails increasing the contact resistance, with risk of not detecting trains on tracks equipped with track circuits.

These requirements are approved by the following documents:

Belarus	TOR for traction RS, instruction manual
Kazakhstan	TsTP 2000
Latvia	TSI CCS Index 77 No DR-19
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	TOR of the Russian Railways (p 12.4) TsTD-5
Slovakia	CCS TSI
Ukraine	TsT-0052 TsT-TsV-TsL-0015
Estonia	TSI CCS Index 77

Conclusion: On the 1520 mm gauge railways, the parameter ‘Maximum sand output’ is regulated (except Kazakhstan). In reality, Latvia and Lithuania apply operation standards appropriate for specific rolling stock.

Note: The Contact Group proposes for the ERA and OSJD experts to consider introducing a single parameter standard on the interfaces.

5.1.4.2 *Sand characteristics*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS (LOC, RST)

CCS t/s (TC) ← → OPE (LOC, RST)

The parameter specifies the quality of connection between the wheel and the rail when using the sand with the set characteristics and the ability of the TC to detect rolling stock on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for the specific RS types allowed for operation and their operation rules; on the other side of the interfaces it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt reliably for all modes of application of the devices to apply sand with the set characteristics in the operating conditions.

Belarus, Kazakhstan, Latvia, Lithuania, Russia, Ukraine

The following sand characteristics are established for the interface with RS.

In the operating conditions, regular or high quality sand is used for the locomotive sandboxes in accordance with TsTD-5 (or similar requirements in Latvia and Lithuania). The regular or high quality sand shall satisfy the requirements in respect of granularity, mineralogical and chemical composition and moisture content.

Granularity, same as quartz content, is the main indicator of the quality of the sand and is characterised by the distribution of grains by size expressed in percentage of the total mass of the sand. The size of the granules in the regular and high quality sand shall comply with Table 1.

Table 1

Quality of sand	Regular size (inside) of the screen mesh side, mm					Flour particles, max	
	2.0	1.0	0.5	0.2	0.1	Residue in a basin*	Clay component
Regular	Should not be present	Max 10	Max 30	Min 30	Max 25	7.0	3.0
High	Should not be present	Max 10	Max 30	Min 35	Max 25	4.0	1.0

Mineralogical composition of the regular and high quality sand for locomotives shall satisfy the requirements of Table 2.

Table 2

Quality of sand	Grain content in the washed sand, %	
	Quartz, min	Feldspar and other minerals and rock, not exceeding
Regular	75	25
High	90	10

Chemical composition of the regular and high quality sand for locomotives shall satisfy the requirements of Table 3.

Table 3

Quality of sand	Loss by calcination, max, %	Silicon dioxide (silica) SiO2, min, %	Aluminium oxide (alumina) Al2O3, max, %	Other sand components: CaO; MgO; (K2O+Na2O), etc., max, %
Regular	1	85	5	9
High	1	92	3	4

Sand characteristics testing techniques in accordance with p. 3 of the specification TsTD.

The instructions regulate the rules of furnishing traction RS with sand with the set characteristics at the interface with OPE.

Poland (1435 and 1520 mm)

For the operations using traction media, use quartz sand containing at least 90% and the content of other mineral at least 10% and the grain size (grain diameter) from 0.5 to 1 mm.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm)

Harmonised parameter:

The characteristics of sand applied to the tracks are: [open point]

This parameter shall be taken into account jointly with 5.1.4.1 (Maximum amount of sand).

This parameter is to enable the margins related to contact resistance between wheels and rails to be taken into account for the use of track circuits.

Justification:

The composition of the sand which is used is relevant for the risk of not detecting trains on tracks equipped with track circuits.

These requirements are approved by the following documents:

Belarus	TsTD-5
Kazakhstan	TsTP 2000
Latvia	TSI CCS Index 77 No DR-72

Lithuania	TSI CCS Index 77 Local guidelines (based on TsTD-5 parameters)
Poland	CCS TSI
Russia	TsTD-5 (p. 3)
Slovakia	CCS TSI
Ukraine	TsT-0034
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways the parameter is regulated in each country by regulatory documents with similar requirements.

Note: The Contact Group proposes for the ERA experts to take the standard accepted in the OSJD countries as basis for creating the standard parameter in the CCS TSI.

5.1.5 *On-board flange lubrication*

On the 1520 mm gauge railways the RS flange lubrication is used to lower the coefficient of friction between the side of the wheel and the rail and is regulated to ensure wheel/rail adhesion and allowable chemical and physical impact on humans and the environment.

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS (LOC, RST)

CCS t/s (TC) ← → OPE (LOC, RST)

The parameter specifies the quality of connection between the wheel and the rail when using on-board flange lubricators with the set characteristics of the lubricant and the ability of the TC to detect shunt on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for the specific RS types allowed for operation and their operation rules; on the other side of the interfaces it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt reliably for all modes of application of the on-board flange lubricators in the operating conditions.

Belarus, Russia

At the interface with RS the parameter is regulated by p. 7 of the document ‘Technical requirements for lubricants for the lubrication of the wheel and rail contact area’, which sets the requirements for the lubricant applied by the on-board lubricator. By the impact on human body, the lubricant shall belong to Hazard Class 4 (low).

Tests to allow lubricants for use are regulated by the document ‘Procedure for the approval of POL for use at JSC RZD’.

At the interface with OPE the parameter is regulated by the rules of the use of on-board lubricators to prevent the effect on the operation of TC of the CCS subsystem. After the passage of a locomotive or a multiple-unit rolling stock equipped with on-board flange lubricator, the lubricant shall distribute uniformly along the side of the rail head without being pushed onto the tread surface.

Kazakhstan

Regulated by AOT/484-09.

Lithuania, Latvia, Poland, Slovakia, Estonia

Harmonised parameter:

If the train is equipped with the flange lubrication devices, they can be enabled/disabled.

Justification:

Lubricant can create an isolating film between wheels and rails increasing the contact resistance, with risk of not detecting trains on tracks equipped with track circuits.

Latvia

The parameter is regulated by the lubrication guidelines for locomotives and multiple-unit RS No - 77/2007

Ukraine

Regulated by TsT-0156.

These requirements are approved by the following documents:

Belarus	Manufacturers' manuals, passport and operation documents for the lubricators and lubricants Technical requirements for the lubrication materials for lubrication of the area of contact between the wheels and the rails (p. 7 informative)
Kazakhstan	AOT/484-09
Latvia	TSI CCS Index 77 No DR-77/2007
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	Technical requirements for the lubrication materials for lubrication of the area of contact between the wheels and the rails (p. 7)
Slovakia	CCS TSI
Ukraine	TsT-0156
Estonia	TSI CCS Index 77

Compliance assessment methods

Belarus	Procedure for the approval of POL for use at JSC RZD (informative)

Kazakhstan	No data
Russia	Procedure for the approval of POL for use at JSC RZD
Ukraine	No data

Conclusion: For the 1520 mm gauge railways, the parameter is regulated in Belarus, Latvia, Russia and Ukraine by regulatory documents with similar requirements. The CCS TSI contains functional requirement to the manageability of the on-board flange lubricators.

Note: The Contact Group proposes for the ERA experts to take the standard accepted in the OSJD countries as basis for creating the standard parameter in the CCS TSI.

5.1.6 Use of brake blocks made of composite and other materials

5.1.6.1 *Use of composite brake blocks*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS

CCS t/s (TC) ← → OPE

The parameter specifies the quality of connection between the wheel and the rail when applying composite brake blocks and the ability of the TC to detect rolling stock on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for all RS types allowed for operation and their operation rules; on the other side of the interfaces it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt reliably for all modes of application of the composite brake blocks in the operating conditions.

Belarus, Russia

At the interface with RS the parameter is regulated by NB ZhT TsV-TsL 009.

At the interface with OPE the parameter is not regulated, but we should not that no cases of loss of the shunt sensitivity of the CCS subsystem track circuit caused by the use of the composite brake blocks on the rolling stock have been observed.

Kazakhstan,

No data.

Latvia, Lithuania, Poland, Slovakia, Estonia

Harmonised parameter:

The vehicles use brake blocks assessed for the effects on the contact resistance between wheel and rail.

Justification:

Composite brake blocks can create an isolating film between wheels and rails increasing the contact resistance, with risk of not detecting trains on tracks equipped with track circuits.

Appendix G to the TSI 'Freight wagons' contains the list of the composite brake block types approved for the use in the cross-border service

Ukraine

Composite brake blocks are made based on their manufacturers' terms of reference and their compliance is verified by the certification authority of Ukraine.

These requirements are approved by the following documents:

Belarus	NB ZhT TsV-TsL 009 (informative) GOST (draft, in development by the Belarusian Railways)
Kazakhstan	No data
Latvia	TSI CCS Index 77 NB ZhT TsV-TsL 009 (informative)
Lithuania	TSI CCS Index 77
Poland	TSI CCS Index 77
Russia	NB ZhT TsV-TsL 009 GOST (draft, in development by the Belarusian Railways)
Slovakia	TSI CCS Index 77
Ukraine	Technical specifications of manufacturer
Estonia	TSI CCS Index 77

Conclusion: On the 1520 mm gauge railways, the parameter 'Use of composite brake blocks' is regulated (except Kazakhstan).

5.1.6.2 Use of cast iron brake blocks

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS (WAG, PAS)

CCS t/s (TC) ← → OPE

The parameter specifies the quality of connection between the wheel and the rail when applying cast iron brake blocks and the ability of the TC to detect shunt on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for specific RS types allowed for operation and their operation rules; on the other side of the interfaces it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt reliably for all modes of application of the cast iron brake blocks in the operating conditions.

Belarus, Russia, Ukraine

At the interface with RS the parameter is regulated by GOST 1205, GOST 28186 and GOST 30249.

Belarus, Latvia, Lithuania, Russia, Ukraine

At the interface with OPE the parameter is not regulated, but we should note that:

- no cases of loss of the shunt by the sensor of a TC based block occupancy detection system of the CCS subsystem caused by the use of cast iron brake blocks have been observed (Latvia);
- there have been instances of shunting the isolating joints of adjacent TC of the CCS subsystem by cast iron dust from the brake blocks.

Kazakhstan,

Regulated by TsT/228-04.

Latvia

Regulated by No DR-19.

Poland, Slovakia

The parameter is regulated by TSI WAG.

Estonia

No data

These requirements are approved by the following documents:

Belarus	GOST 1205 GOST 28186 GOST 30249
Kazakhstan	TsT/228-04 GOST 1205 GOST 28186 GOST 30249
Latvia	No. DR-19
Lithuania	LG technical documents
Poland	TSI WAG

Russia	GOST 1205 GOST 28186 GOST 30249
Slovakia	TSI WAG
Ukraine	GOST 1205 GOST 28186 GOST 30249
Estonia	No data

Conclusion: On the 1520 mm gauge railways, the parameter 'Use of cast iron brake blocks' is regulated (except Estonia).

Note: The Contact Group proposes for the ERA experts to consider the possibility of including the parameter in the CCS TSI as a special case for 1520 mm gauge railway.

5.1.7 *Vehicle mass*

5.1.7.1 *Axle load*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS t/s (TC) ← → RS

CCS t/s (TC) ← → OPE

The parameter specifies the quality of electrical contact (connection) between the wheel and the rail depending on the axle load and the ability of the TC to detect rolling stock on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for all RS types allowed for operation and their operation rules; on the other side of the interface it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt irrespective of the speed and the operating conditions.

Belarus, Russia

At the interface with RS the parameter is regulated by the safety standards NB ZhT TsT 03 setting the average statistic load from vehicle wheels on the rails (only for electric motor vehicles) to ensure their compatibility with the track circuits of the CCS subsystem on low-density lines of at least 55 kN (11 tf per axle).

At the interface with OPE the parameter is regulated by the instruction TsRB-934, according to which movement of any special self-propelled rolling stock (small locomotive, motor trolley, special motor vehicles, railway construction vehicle), which can be operated in a single-vehicle composition, with axle load of at least 10 ts on the blocks equipped with track circuits is not allowed.

Kazakhstan, Ukraine

No data.

Lithuania

The parameter is regulated by the instruction K-100: 10 t.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm):

Harmonised parameter for 1520 mm gauge – open point.

Poland, Slovakia (1435 mm):

The axle load is:

1. at least 3.5 t for vehicles with more than 4 axles and brake blocks,
2. at least 4 t for vehicles with 4 axles and brake blocks,
3. at least 5 t generally for vehicles (not included in categories 1 and 2)

Justification:

A minimum axle load will activate pedals and treadles. Also, minimum axle load will have a beneficial effect on the resistance between wheel and track, which is important for the operation of track circuits. Brake blocks acting on the surface of wheels contribute to keep them clean and limit the increase of contact resistance.

These requirements are approved by the following documents:

Belarus	STP 09150.56.107 STP 09150.56.136 TsRB-934 (p. 3.4 informative)
Kazakhstan	No data
Latvia	S-108
Lithuania	K-110
Poland	CCS TSI
Russia	NB ZhT TsT 03 (p. 1.2 of Table 1) TsRB-934 (p. 3.4)
Slovakia	CCS TSI
Ukraine	No data
Estonia	No data

Conclusion: For the 1520 mm gauge railways in Belarus and Russia, the ‘Axle load’ parameter shall be at least 10 tf (11 tf for electric motors vehicles), at least 10 tf in Lithuania, at least 11 tf in Latvia, at least 3.5 tf in Poland and Slovakia (1435 mm). According to the CCS TSI, the harmonised value of the ‘Axle load’ parameter for 1520 mm gauge track is an open point.

Note: The ERA and OSJD experts are invited to consider the possibility of introducing common harmonised standard parameter for the 1520 mm gauge track.

5.1.7.2 *Vehicle metal mass*

The parameter specifies interoperability at the interface between the track-side components (IL) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS t/s (IL) ← → RS

The parameter specifies the interrelation between the vehicle metal mass and the ability of the inductive loop based train detection system to detect a moving vehicle at the interface.

On the one side of the interface the parameter establishes the requirement for all RS types allowed for operation on the infrastructure with IL components of the CCS subsystem; on the other side of the interface it indirectly establishes the requirement to the ability of the IL component to detect RS reliably.

Belarus, Kazakhstan, Latvia, Lithuania, Russia, Slovakia, Ukraine, Estonia (1520 mm):

On the 1520 mm gauge railways, the vacancy/occupancy detection systems affected by vehicle metal mass of a vehicle (loops) are not used.

The parameter is not regulated.

Note for Russia: At the switch blocks of shunting stations, inductive wired sensors for the detection of the vehicle metal mass are used as an additional tool for the control of passage of a vehicle over the track vacancy control sections based on short TC. The rules and standards of operation such track-side components of the CCS subsystem are regulated.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm)

CCS TSI: Harmonised parameter for 1520 mm: no requirement.

Poland, Slovakia (1435 mm):

Harmonised parameter for 1435 mm:

In the following, 'length' refers to the direction in parallel to the track and 'width' refers to the direction orthogonal to the track.

The description of this parameter is done with reference to the figure below:

a: section (distance) between the inner axles of two adjacent bogies or wheelsets

b: section (distance) between the first (respectively the last) axle and the nearest end of the vehicle (excluding the coupling systems)

c: distance between top of rail and vehicle floor (bottom side)

d: distance between adjacent conducting cross connections / length of short circuit rings (electrically conducting loops) formed by frame beams and conducting cross connections

e: distance of adjacent longitudinal frame beams

f, g, h: dimensions of electrically connected conducting components (X)

i, k: dimensions of short circuit rings (electrically conducting loops) formed by electrically connected conducting components (X)
o: distance between adjacent short circuit rings
p: distance between short circuit rings and adjacent wheelsets
x: conductive constituents mounted below vehicle floor

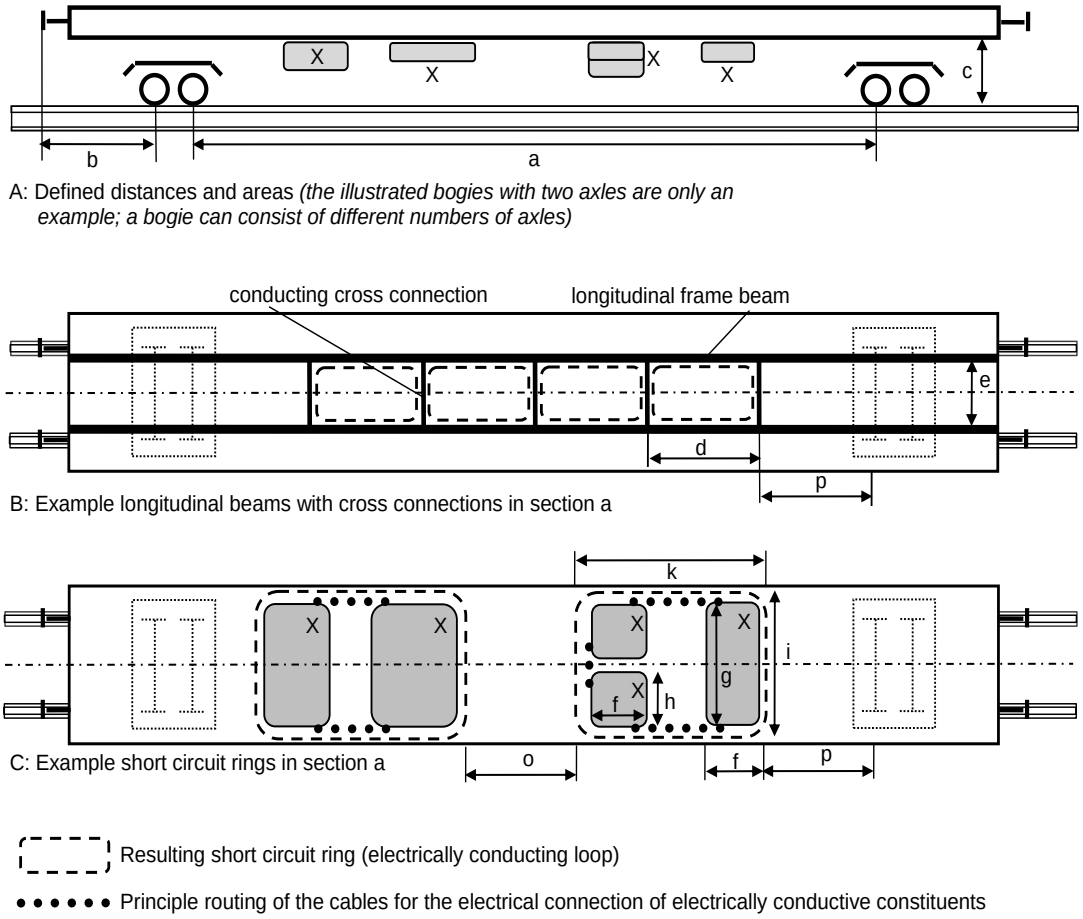


Fig. 5: Vehicle layouts

For the scope of this parameter, the vehicle is subdivided in different sections as shown in Figure 5A: a central section (a), two outer sections (b) and the sections of the bogies or single wheelsets. The parameter is respected when the design of the vehicle is such that at least one of the conditions 1, 2 or 3 is fulfilled in section (a) and section (b) and condition 4 is fulfilled in the sections of bogies or single wheel sets (in case of vehicles without bogies):

1. The distance (c) between rail level and vehicle floor (bottom side) is less than 1.06 m and the vehicle has a metal floor over its full length (excluding the coupling systems) with the minimum width of 2 m and with conductivity greater than 1 m/(Ω mm2).

2. The vehicle has constructive structures at least inside the sections (a) and (b) consisting of longitudinal frame beams situated symmetrically on both sides with the minimum distance (e) of 1.0 m.

These are electrically connected with conducting cross connections at a distance (d) less than or equal to 3 m to form short circuit rings (electrically conducting loops) as illustrated in Figure 5B, showing an example for the section (a).

The electrical resistance to direct current generated by the short circuit rings is lower than 1 Ω.

The distance (o) between adjacent short circuit rings does not exceed 3 m. The distance (p) between a short circuit ring and an adjacent wheelset of a bogie does not exceed 3 m, the distance to a single wheelset does not exceed 1.5 m.

The distance between rail level and short circuit rings on the bottom side of the vehicle is at least 1.06 m.

3. The vehicle has electrically conducting components (X) mounted below the floor at least inside the sections (a) and (b). These are electrically connected to form short circuit rings (electrically conducting loops) as illustrated in Figure 5C, showing an example for the section (a). The dimensions of the components satisfy at least one of the following conditions:

a) minimum width (g) of 2 m and minimum longitudinal length (f) of 1 m,

b) minimum width (h) of 1 m and minimum longitudinal length (f) of 1 m on both long sides of the vehicle.

The electrical connection is done so as the short circuit ring length (k) is equal or exceeds 2.5 m, but less or equal than 3 m with the minimum width (i) of 2 m. Figure 5C shows basic cable installation.

Conductivity of the conducting components is greater than 1 m/(Ω mm2). The electrical resistance to direct current generated by the short circuit rings is lower than 1 Ω.

The distance (o) between adjacent short circuit rings does not exceed 3 m. The distance (p) between a short circuit ring and an adjacent wheelset of a bogie does not exceed 3 m, the distance to a single wheelset does not exceed 1.5 m.

The distance between rail level and short circuit rings on the bottom side of the vehicle is at least 1.06 m.

4. Bogies consist of metal parts with conductivity greater than 1 m/(Ω mm2). Load bearing metal parts of the bogie frame are electrically connected and have electrical resistance to DC lower than 1 Ω. The distance between rail level and the bottom side of the bogie frame is less than 1.06 m.

Or, if these requirements are not satisfied, conditions 1, 2 or 3 in the section of the bogie shall be satisfied as the minimum requirement.

Justification:

This parameter specifies the minimum requirements for the metal structures of a vehicle ensuring its detection by track-side inductive loops

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	Not regulated
Lithuania	Not regulated
Poland	TSI CCS Index 77
Russia	TsSh-762-10 (p. 5.4)
Slovakia	TSI CCS Index 77
Ukraine	Not regulated
Estonia	Not regulated

Conclusion: For the 1520 mm gauge railways the parameter is not regulated, as inductive loops are not used in the CCS systems.

5.1.8 *Use of shunt assisting devices*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of specific types of Rolling Stock subsystem:

CCS t/s ← → RS (LOC)

CCS t/s (TC) ← → OPE

The parameter specifies the quality of connection between the wheel and the rail depending on the axle load and the procedure of use of shunting assisting devices and the ability of the TC to detect rolling stock shunt on the interfaces reliably.

On the one side of the interfaces the parameter establishes the requirement for the specific RS types allowed for operation and their operation rules; on the other side of the interface it indirectly establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt irrespective of the axle load, speed and the operating conditions.

Belarus, Kazakhstan, Russia

At the interface with RS the parameter is regulated by the safety standards NB ZhT TsT 03 setting the average static load from vehicle wheels on the rails (only for electric motor vehicles) to ensure their compatibility with the track circuits of the CCS subsystem on low-density lines of at least 55 kN (11 tf per axle).

At the interface with OPE the parameter is regulated by the instruction TsRB-934, according to which movement of any special self-propelled rolling stock (small locomotive, motor trolley, special motor vehicles railway construction vehicle) with axle load of at least 10 tf on the blocks equipped with track circuits is allowed, if it's equipped with shunting devices. The driver of such special self-propelled rolling stock cannot go out to the line, if the shunting device is absent or faulty or if there is no record

of inspection of the performance of the shunting device in the report of the annual inspection of the special self-propelled rolling stock.

Ukraine

No data.

Latvia

Special self-propelled rolling stock and rail buses with axle load at least 11 t must use shunt assisting devices.

For electric motor vehicles and motor vehicles, which can be used in a single-vehicle consists, shunt assisting devices must be used where the load is under 16 t per axle to ensure compatibility with the track circuits on low-density lines.

Lithuania

Special self-propelled rolling stock and rail buses with axle load at least 10 t must have shunting assist devices to ensure secure detection of track circuit occupancy.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm)

CCS TSI: Harmonised parameter for 1520 mm gauge – open point.

Poland, Slovakia (1435 mm)

The use of shunting assisting devices is not required.

Justification:

Shunt assisting devices are not necessary for the operation of track circuits.

These requirements are approved by the following documents:

Belarus	STP 09150.56.136 TsRB-934 (p. 3.4 – informative)
Kazakhstan	TsP -272-05 (p. 31)
Latvia	TSI CCS Index 77 S-108
Lithuania	TSI CCS Index 77 K-110
Poland	CCS TSI
Russia	NB ZhT TsT 03 (p. 1.2 of Table 1) TsRB-934 (p. 3.4)
Slovakia	CCS TSI
Ukraine	No data
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways, the parameter 'Use of shunt assisting devices' is regulated (except Kazakhstan and Ukraine). Shunt assisting devices shall be used for special self-propelled rolling stock with axle load at least 10 t (11 t for), at least 11 t per axle (16 t per axle for) for motor vehicles in single-vehicle consists. For Poland and Slovakia, there is no need to use any shunt assisting devices in the 1435 mm network.

5.1.9 *Impedance between wheels*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← → RS

CCS t/s (TC) ← → OPE

The parameter specifies the interrelation between the quality of a vehicle shunt and the ability of the track circuit to detect the wheelset shunt at the interfaces.

On the one side of the interfaces the parameter establishes the requirement for all RS types allowed for operation and their operation rules; on the other side of the interfaces it establishes the requirement for the ability of the trackside sensors of the TC based system to detect the shunt for all operating conditions.

Belarus, Kazakhstan, Russia, Ukraine,

At the interface with RS, the parameter is regulated by GOST 11018, according to which (p. 4.4.14) electric resistance of a wheelset shall not exceed 0.01 Ohm.

On the other side of the interface, taking into account that electric resistance of a train shunt is the sum of resistance of the wheelsets and transient resistance between the rail tyres and rails, TC shunt sensitivity is regulated – maximum resistance of the resistor is at least 0.06 Ohm and when is it switched on between the rails, reliable detection is ensured.

At the interface with OPE, the parameter is regulated by the railway operation regulations TsSh-720-09. Periodic control of the TC shunt sensitivity is established where the application of 0.06 Ohm a test shunt switches the track circuit from vacant to occupied state.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm and 1435 mm):

The electrical resistance between the running surfaces of the opposite wheels of a wheelset does not exceed 0.05 Ohm, measured by a voltage between 1.8 VDC and 2.0 VDC (open circuit).

Justification:

A track circuit is only able to detect rolling stock if the impedance between rails does not exceed a certain value, given by the impedance of the opposite wheels of the wheelsets and the contact resistance at the wheel-rail surface.

The interface requirement given here is only related to the electrical resistance between the running surfaces of the opposite wheels of a wheelset.

Note:

Operational rules may apply to ensure that a sufficiently low value of the contact resistance is maintained during service: see 5.1.4 (Use of sanding equipment), 5.1.5 (On board flange lubrication) and 5.1.6 (Use of composite brake blocks) in this document.

These requirements are approved by the following documents:

Belarus	GOST 11018 (p. 4.4.14) GOST R 52920 (informative)
Kazakhstan	GOST 11018 (p. 4.4.14) TsSh/720-1
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77 GOST 11018 (informative)
Poland	TSI CCS Index 77
Russia	GOST 11018 with amendment No 1 of 22 July 2015 (p. 4.4.14) GOST R 52920 JSC RZD regulation No. 939r as of 17.04.2014
Slovakia	TSI CCS Index 77
Ukraine	DSTU GOST 11018 (p. 4.4.14) TsSh-0060
Estonia	TSI CCS Index 77 GOST 11018 (informative)

Conclusion: The parameter is regulated on the 1520 mm gauge railways.

5.1.10 *Combination of rolling stock characteristics for the purpose of adequate dynamic shunting impedance*

The parameter specifies interoperability at the interface between the track-side components (TC) of the CCS subsystem and the Operation subsystem:

CCS t/s (TC) ← → OPE

The parameter specifies the interrelation of the rules for the application of the combination of RS properties to ensure the required shunt resistance dynamics and the TC ability to detect wheelset shunt of a vehicle in the operating conditions.

Belarus, Kazakhstan, Latvia, Lithuania, Russia, Ukraine, Estonia

There is no document at the national level regulating application of the parameter in the operating conditions.

Latvia, Lithuania, Poland, Slovakia, Estonia (1520 mm and 1435 mm)

Rules for the combination of the characteristics listed above (p. 5.1.2-5.1.9) for trains and consists should ensure the correct operation of the train equipped with such detection systems: [open point]

Note:

these are not additional conditions for the approval of rolling stock. These rules must be evaluated when checking the compatibility with the infrastructure, without the necessity of tests.

Justification:

These rules refer to possible conditions / limitations for the use of vehicles and consists on lines where track circuits are installed. Operation of track circuits relies on the contact resistance between wheels and rails that is influenced by the combination of several factors. The dynamic shunt behaviour differs from the static shunt behaviour. Even for vehicles or consists compliant with the single parameters defined in this specification, rules for the vehicles or consists may be necessary to cover this.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	TSI CCS Index 77
Lithuania	TSI CCS Index 77
Poland	CCS TSI
Russia	Not regulated
Slovakia	CCS TSI
Ukraine	Not regulated
Estonia	TSI CCS Index 77

Conclusion: For the 1520 mm gauge railways of the OSJD countries, which are not members of the EU, the parameter is not regulated. For the EU countries with 1520 mm gauge track, the parameter value is an open point. It should be studied and, possibly, will require additional research.

Note: The Contact Group addresses the ERA and OSJD experts asking for proposals to standardise the parameter.

5.1.11 Use of special CCS devices

On the 1520 mm gauge railways, in addition to the vacancy/occupancy control devices, a number of track-side CCS devices designed to interact with rolling stock parts are used. These include:

1. RS gauge control devices –
   - RS derailment control devices (UKSPS);

- gauge control devices (KGU) and

2. CCS devices interacting with RS –
   - vehicle retarders on humps;
   - stationary braking devices (UTS);

The parameter specifies interoperability at the interfaces between the track-side special devices of the CCS subsystem and components of different types of Rolling Stock subsystem, Infrastructure subsystem and Operation subsystem.

CCS t/s ← → RS

CCS t/s ← → INF

CCS t/s ← → OPE

Note: For more details on the parameter application see Table 2, p. 4.

The parameter specifies interrelation between the quality indicators of functioning the subsystems at the interfaces and the railway as a whole depending on reliable performance of the special CCS track-side devices.

Belarus, Kazakhstan, Russia, Ukraine

At the interface with RS the parameter 'Use of special CCS devices' is regulated by GOST 9238. The use of the CCS actuation devices (UTS and vehicle retarders) interacting with RS wheels is regulated by GOST 10791, GOST 11018, GOST 31847-2012 (Russian Federation) and STO RZD 1.19.008 (JSC RZD).

In accordance with GOST 9238:

- Figure 6 shows the outline which cannot be crossed by any of the vehicle retarder parts in any position of the retarder, including operating (retarded);
- Figure 7 shows the outline which cannot be crossed by any of the vehicle retarder parts in its non-operating position (released).

5.2.2 Нижние очертания габаритов приближения строений *C* и $C_п$ для горочных вагонных замедлителей, в том числе нового типа TW—EF и TW—F, должны соответствовать указанным на рисунках

Fig. 6.

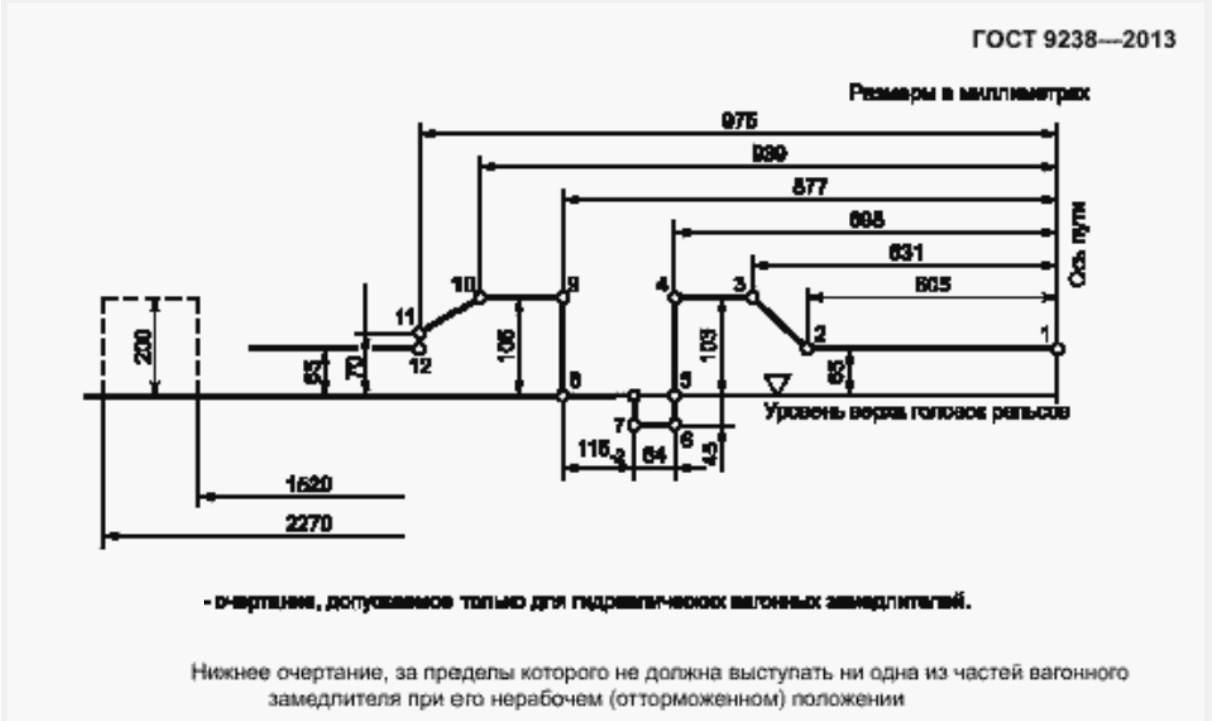


Fig. 7.

At the interface with INF, the use of the special CCS devices is regulated by NTP STsB/MPS and instruction 1247/1612, namely:

- UKSPS is installed on approaches to the stations and artificial structures (p. 10.8 of the instruction) and is designed for automatic detection of the parts extending beyond the bottom RS dimension for the RS derailment control on the trains and stopping the train in front of the station or artificial structure;

- KGU is installed on artificial structures, such as bridges and tunnels (p. 10.9 of the instruction);
- vehicle retarders are installed in hump yards during their automation (p. 9 of the instruction);
- UTS are installed at the stations for train anchorage on the tracks (p. 1.6.5 of the instruction).

The TOR of the Russian Railways (p. 3.1) requires installing KGU, public address systems and protecting signals and obstruction lights and establishes supervision procedure for them.

At the interface with OPE, the use of special CCS devices is regulated by the following documents.

Use of vehicle retarders in the hump yards is regulated by GOST 22235, and in accordance with p. 2.7.2 the retarders shall:

- comply with requirements of the GOST 9238 for vehicles with any categories and number of axles released from the hump yards;
- ensure interaction of braking system with one or two wheels of vehicle wheelset simultaneously;
- during deceleration of the vehicles ensure pressure force within the range of triple load on the wheel from vehicle mass, but not exceeding 147 kN (15 tf);
- allow speed of entry of cuts of vehicles of any weight category to an actuated retarder for retarders T-50, RNZ-2, RNZ-2M, PNZ-1 and PGZ up to 6.5 m/s (23.4 km/h); KNP-5 and KV - up to 7 m/s (25.2 km/h); all VZPG modifications - up to 8 m/s (28.8 km/h); all VZP modifications - up to 8.5 m/s (30.6 km/h);
- at air pressure 0.65 MPa (6.5 kgf/cm2) ensure tyre pressure on the lateral surfaces of the wheels within the following range: T-50 - (85±5) kN [(8.7±0.5) tf], KNP-5 - (125±5) kN [(12.8±0.5) tf], VZPG and RNZ-2 - not exceeding 147 kN (15.0 tf).

Speed of a vehicle coming onto a brake shoe when vehicles are released from the hump cannot exceed 4.5 m/s (16.2 km/h). Speed of a vehicle coming into its parking braking position when manual brake shoes are used for vehicle deceleration are released from the hump cannot exceed 4.5 m/s (16.2 km/h).

Operation of the special CCS devices is regulated by JSC RZD Regulation No. 939r as of 17.04.2014 (Russian Federation), TsSh-762-10 and other applicable guidelines.

Estonia

No data.

Latvia

In accordance with LVS 282:2015:

- Figure 8 shows the outline, which cannot be crossed by any of the vehicle retarder parts in any position of the retarder, including operating (retarded);

- Figure 9 shows the outline, which cannot be crossed by any of the vehicle retarder parts in its non-operating position (released).

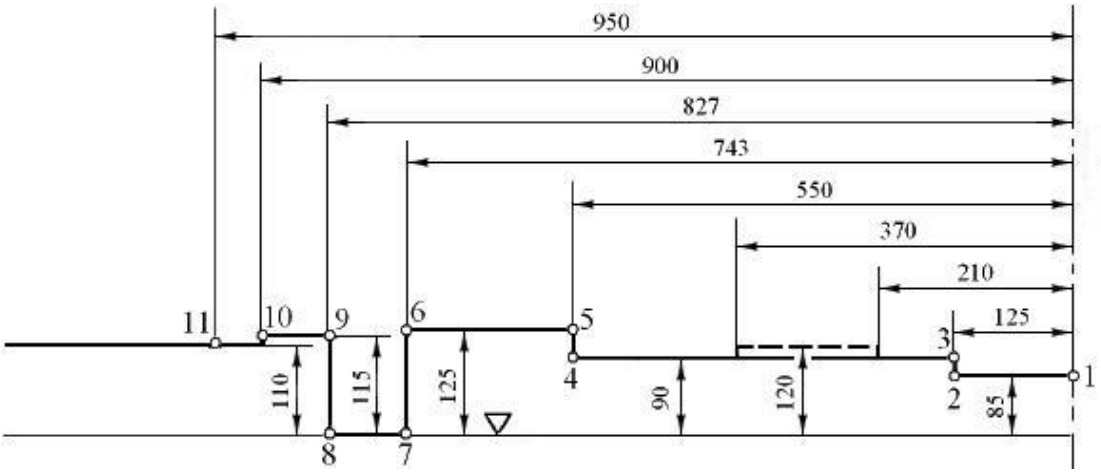


Fig. 8

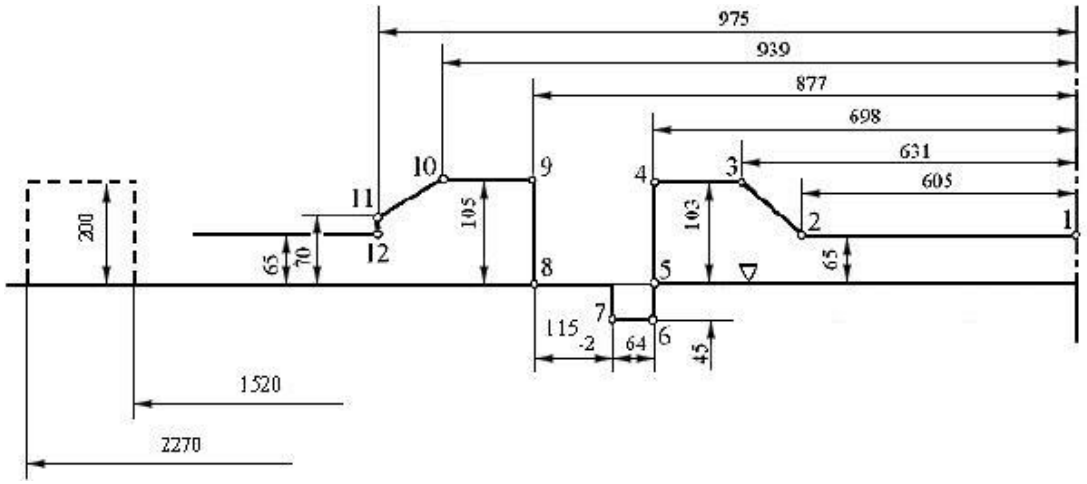


Fig. 9

Lithuania

The parameter is regulated by the instruction 163/K and the guidelines for maintenance of vehicle retarders SIEMENS MSR32.

Slovakia

Only vehicle retarders are used on the Railways of the Slovak Republic. The requirements are regulated by TSI WAG document.

Poland

There are no applicable requirements for the equipment of 1520 gauge hump yards.

These requirements are approved by the following documents:

Belarus	GOST 10791 GOST 11018 GOST 22235 (p. 2.72) GOST 9238 STP 09150.19.065 STP 09150.19.139
Kazakhstan	GOST 9238 GOST 10791 GOST 11018 TsSh/720-1
Latvia	LVS 282
Lithuania	163/K Guidelines for vehicle retarder maintenance MSR32 SIEMENS
Poland	Not regulated at the national level
Russia	GOST 10791 GOST 11018 (with amendment No 1 of 22 July 2015) GOST 31847-2012GOST 22235 (p. 2.7.2) GOST 9238 STO RZhD 1.19.008 (p. 7.7) TOR of the Russian Railways (p 3.1) Instruction 1247/1612 NTP STsB/MPS JSC RZD Regulation No. 939r as of 17.04.2014 TsSh-762-10 (p. 11 and 12 of Appendix 1)
Slovakia	TSI WAG, appendix 3, clause 3.2.3
Ukraine	GOST 10791 GOST 11018 GOST 22235 (p. 2.72) GOST 9238
Estonia	No data

Conclusion: The parameter ‘Use of special CCS devices’ is regulated on the 1520 mm gauge railways.

Note: The Contact Group proposes for the ERA experts to consider the possibility of including the parameter in the CCS TSI as an open point for the 1520 mm gauge railway.

5.2 *ELECTROMAGNETIC COMPATIBILITY*

5.2.1 Application area and classification

Belarus, Kazakhstan, Latvia, Russia, Ukraine

The concept of ensuring EMC defines the requirement for interference emission and immunity of a device in relation to its environment. Within a consistent approach to ensuring EMC, measures are determined to ensure EMC of the track-side components of the CCS subsystem with other railway system subsystems.

External interferences affect performance of the CCS subsystem track-side components, which are considered as interference receivers. Functioning Power Supply and Rolling Stock subsystems, as well as the on-board parts of the Power Supply and CCS and Communication subsystems of the railway system in their modes and operating conditions generate electromagnetic interference and are considered as sources of interference for the track-side components of the CCS and Communication subsystem. Interaction between the sources and receivers of interference is considered as a connection of the source of interference to the receiver of interference. The EMC concept covers conductive (capacitive, inductive and wired) and radiating connections, to ensure EMC, regulation of the interaction is required for all types of connections of track-side components of the CCS subsystem with all other components of the railway system subsystems.

The scope of the parameters described in this Section concerns electromagnetic compatibility of ERS (electric train, electric locomotive, self-propelled electric consists) when it is crossing the CIS-EU border and travels on the 1520 mm gauge rail infrastructure and is limited to the ERS connection points with appropriate inputs/outputs of the power supply system. The points of connection of the ERS with the power supply system are pantograph and wheels. At the same time ERS should not adversely affect the functioning of the used TC devices, trackside part of the ALS and SAUT devices, systems and railway telecommunication lines.

The scope of this document is limited by regulation and analysis of the parameters characterising different types of connections carrying the effect of both ERS in general and its component on the track-side components of the CCS and Communication subsystem. This document provides the analysis of EMC parameters taking into account ERS mobility, diverse interference from the components on board ERS and their modes of operation.

The document does not cover track-side components of the CCS and Communication subsystem as a source of interference assuming their minor effect on ERS, Power Supply subsystem and the environment.

GOST 29192 establishes classification of devices generating electromagnetic interference and susceptible to its effects and list of types of EMC characteristics.

In accordance with GOST 29192, Table 2, p. 2.2.4, components of the Power Supply subsystem as sources of interference can be included in the 'Main contact networks and traction substations of railway transport' sub-class (class p. 2.2 'High-voltage overhead power lines and their equipment' of category p. 2 'Equipment of power network').

In accordance with GOST 29192, Table 2, p. 2.5.6, ERS components as sources of interference can be included in sub-class 'Electrified transport supplied from contact network and its electrical traction devices' (class p. 2.5 'Receivers of electric energy' category p 2 'Power network equipment').

In accordance with GOST 29192, Table 2, electronic RS equipment as sources of interference can be included in different classes and sub-classes of category p. 4 ‘Signalling and information circuit equipment’ (p. 4.1.2, 4.1.3, 4.1.4, 4.2.11 and other), and RS communication electronic equipment as sources of interference can be additionally included in classes ‘Signal parameter converters’, ‘Switching and connecting devices of signal transmission channels’ and ‘Master and reference frequency generation equipment’ (p. 4.2.1-4.2.14, 4.3.1–4.3.3, 4.4.1 and 4.4.2).

The following list of the recommended types of EMC characteristics for the purposes of specification of their interferences with track-side components of the CCS subsystem is provided for the standardisation and specification of the listed equipment as a source of interference.

LIST 1			
acc. to GOST 29192		**Source of interference and emitting equipment**	**Parameter type number**
Class	**Sub-class**		
High-voltage overhead power lines and their equipment	Main contact networks and traction substations of railway transport	Traction current of a section of the power supply system contact network	3.1, 3.3 and 3.4
		Reverse traction current of power supply network	
Receivers of electric energy	Electrified transport supplied from contact network and its electrical traction devices	Rolling stock traction current, traction converters and current collecting devices	3.1 and 3.3
		Auxiliary converters (auxiliary power supply systems, heating power supply and their reverse currents) of rolling stock	
Start and end of line converters of electric signals	End of line converters and electric actuating mechanisms and devices	RS electromagnetic and eddy current brakes devices	3.1, 3.3 and 3.4
Start and end of line converters of electric signals Signal parameter converters		On-board electronic equipment	2.1-2.3, 3.1, 3.3, 3.4
Signal parameter converters Switching and connecting devices of signal transmission channels Master and reference frequency generation equipment		Communication electronic equipment on board RS, including operational radio communication	1.1, 2.1-2.3, 3.1, 3.3, 3.4

In accordance with GOST 29192, Table 2, p. 4.1.1, track-side CCS components can be included in sub-class ‘Primary electric transmitters (sensors)’ (class p. 4.1 ‘Signalling and information circuit equipment’) for the standardisation and certification of which the following list of types of EMC characteristics is recommended.

In accordance with GOST 29192, Table 2, p. 4, RS electronic equipment as receivers of interference can be included in different sub-classes of the category ‘Signalling and information circuit

equipment' (p. 4.1.2, 4.1.3, 4.1.4, 4.2.11 and other) and RS communication electronic equipment as receivers of interference can be additionally included in classes 'Signal parameter converters', 'Switching and connecting devices of signal transmission channels' and 'Master and reference frequency generation equipment' (p. 4.2.1-4.2.14, 4.3.1–4.3.3) for the standardisation and certification of which the following list of types of EMC characteristics is recommended.

The following list of the recommended types of EMC characteristics for the purposes of specification of their interferences with components of the CCS subsystem is provided for the standardisation and specification of the listed equipment as a receiver of interference.

LIST 2			
acc. to GOST 29192		**Track-side CCS and communication equipment exposed to electromagnetic interference (interference receivers)**	**Parameter type number**
Class	**Sub-class**		
Start and end of line converters of electric signals	Primary electric transmitters (sensors)	Apparatus and elements of track circuits	4.7-4.9
		Apparatus of track device ALS and SAUT	
		Track axle counter apparatus	
Start and end of line converters of electric signals Signal parameter converters		Track electronic CCS apparatus	4.7-4.9
Signal parameter converters Switching and connecting devices of signal transmission channels		Trackside communication apparatus, including operational radio communications	4.2, 4.5-4.9

For the listed equipment (lists 1 and 2), the list of types of EMC characteristics in accordance with GOST 29192, Table 1, is provided in the following table.

EMC parameter	**EMC parameter type**	**Type number**
Fundamental oscillation (radiation)	Frequency instability	1.1
Unwanted oscillation in the output of RF signal transmission circuit or unwanted oscillation via antenna	Out-of-band oscillation (radiation)	2.1
	Unwanted oscillation (radiation)	2.2
	Noise oscillation (radiation)	2.3
Industrial interference	Radiated interference	3.1
	Conductive interference in power supply and earthing circuits	3.3
	Conductive interference in control, signal, measurement and protection circuits	3.4

EMC parameter	EMC parameter type	Type number
Susceptibility	Amplitude characteristic based on useful signal	4.2
	Susceptibility based on output intermodulation	4.5
	Susceptibility based on cross distortions	4.6
	Susceptibility to external electromagnetic fields penetrating enclosures	4.7
	Susceptibility based on power supply and earthing circuits	4.8
	Susceptibility based on control, signal, measurement and protection circuits	4.9

On railways of Belarus, Russia and Ukraine, the following types of track circuits equipment and ALS devices are used:

No	Track circuit type	Traction current	Signal receivers
1.	Section code track circuits 50 Hz	Direct	TC, ALSN
2.	Section code track circuits 50 Hz	Direct	TC
3.	Double rail phase-sensitive track circuits 25 Hz	Direct	TC
4.	Single rail phase-sensitive track circuits 50 Hz	Direct	TC
5.	Single rail phase-sensitive track circuits 50 Hz with track relay ANVSh2 or NMVSh2	Direct	TC
6.	Section code track circuits 25 Hz	Variable	TC, ALSN
7.	Double rail phase-sensitive track circuits 25 Hz	Variable	TC
8.	Single rail phase-sensitive track circuits 25 Hz	Variable	TC
9.	Audio frequency track circuits in frequencies in the range of 420-780 Hz	Any	TC
10.	Audio frequency track circuits in frequencies in the range of 4.5-5.5 kHz	Any	TC
11.	Track circuits with code signal overlapping ALS-EN with frequency 175 Hz	Any	ALS-EN

Belarusian Railways use track devices of axle counter system UPK SO, Uralzheldoravtomatizatsiya, Russia

Russian and Ukrainian railways use the following types of axle counter track devices:

No	Axle counter type	Operating frequency range, kHz	Conditions of use
1.	ESSO axle counter, NPTs Promelectronica, Russia	50-200	Any type of traction
2.	Az S 350 U, Siemens axle counter	43	Any type of traction
3.	UKSPO axle counter, Uralzheldoravtomatizatsiya, Russia	160-200	Any type of traction
4.	SKPU axle counter, SATEP, Ukraine	50-200	Any type of traction

Russian and Ukrainian railways use the following types of SAUT track devices:

No	Type of automatic braking system device	Operating frequencies, kHz	Conditions of use
1.	SAUT-Ts	19,6; 23; 27; 31	Any type of traction
2.	SAUT-TsM	19,6; 23; 27; 31	Any type of traction
3.	SAUT-TsM-NSP	19,6; 23; 27; 31	Any type of traction

In the main network the Republic of Kazakhstan, ESSO axle counter by NPTs Promelectronica, Russia and PTE-2000 balises by Bombardier are used.

In Russia, electromagnetic compatibility of equipment is regulated by GOST 33436.x-x series of standards, which, while being modified from IEC 62236-xx and EN 50121-xx standards take into account the specifics of the aforementioned equipment used on railways in Belarus, Russia and Ukraine.

Lithuania

On railways in the Republic of Lithuania, the following types of track circuits equipment and ALS devices are used:

No	Track circuit type	Traction current	Signal receivers
1.	Section code track circuits 50 Hz	Diesel locomotive traction	TC, ALSN
2.	Section code track circuits 25 Hz	Variable	TC, ALSN
3.	Audio frequency track circuits in frequencies in the range of 420-780 Hz	Variable or Diesel locomotive traction	TC

No	Track circuit type	Traction current	Signal receivers
4.	Station phase-sensitive track circuits 25 Hz	Variable	TC
5.	Section phase-sensitive track circuits 25 Hz	Variable	TC

On railways of the Republic of Lithuania, the following types of axle counter track devices are used:

No	Axle counter type	Operating frequency range, KHz	Conditions of use
1.	ESSO axle counter, NPTs Promelectronica, Russia	50-200	Any type of traction
2.	DSS, Tiefenbach axle counter	38-42	Any type of traction
3.	ACS 2000, Frauscher axle counter	250	Any type of traction
4.	SOL-1d, BT ZWUS axle counter	20.74-23.08	Any type of traction

Poland

National regulations do not provide detailed requirements for electromagnetic compatibility. The order of the Minister of Infrastructure of 12 October 2005 highlights the necessity to perform electric impact tests, including electromagnetic compatibility. These tests are mandatory for railway traffic control equipment (Section 3, paragraph 1 'e'), telecommunications equipment (Section 3, paragraph 1 'b'), railway vehicles (Section 4, paragraph 1 'r'), passenger vehicle (Section 4, paragraph 2 'r'), special vehicle (Section 4, paragraph 4 and 'y'), auxiliary vehicle (Section 4, paragraph 5 'u'). The order does not list documents regulating the tests, but only states that the compliance with the requirements specified in the respective Polish or European standards for this type of equipment should be tested.

Experience shows that in the tests performed by organisations authorised in the area of railway traffic management and BKDP equipment the following documents are taken into consideration:

1. order of the Minister for Infrastructure of 12 October 2005 [5.1] ;
2. requirements for the safety of railway traffic control equipment [5.5] ;
3. development of limit values of interference to the railway traffic management, communication and traction vehicle equipment [5.6] ;
4. Job No. 4430/10 [5.7] .

These documents indicate the need for the application of the following standards:

- CENELEC: EN 50121-1, EN 50121-2;
- PN-EN 50121-3-1:2010, PN-EN 50121-3-2:2009, PN-EN 50121-4:2008, PN-EN 50124-1:2007, PN-EN 50124-2:2007, PN-EN 50155:2007, PN-EN 50238-1, PN-EN 50238-2.

Slovakia

From the point of view of the general electromagnetic compatibility (EMC) requirements for rolling stock, requirements set out in the applicable CENELEC standards apply:

EN 50121-1, EN 50121-2, EN 50121-3-1, EN 50121-3-2; EN 50121-4:2008, EN 50124-1:2007; EN 50124-2:2007, EN 50155:2007.

From the point of view of equipping most of railway lines in the Slovak Republic, the following revision of Resolution No 351/2010 with the requirements apply:

Rolling stock should not be a source of interference current for track circuit exceeding the set limit in the frequency ranges: 20-30 Hz, 44-56 Hz, 64-86 Hz, 257-282 Hz, 375-425 Hz. Based on analysis and test of compatibility if the rolling stock with the track circuits in individual frequency ranges carried out by an authorised person, infrastructure manager establishes on which sections that rolling stock can be allowed for operation.

Estonia

No data.

These requirements are approved by the following documents:

Belarus	GOST 29192 STP 09150.19.065 STP 09150.19.148
Kazakhstan	OSJD R-810 GOST 29192
Latvia	OSJD R-809 OSJD R-810 EN 50121-4
Lithuania	OSJD R-809 OSJD R-810 EN 50121-4 EN 50159-1 I-291-04 NPTs
Poland	EN 50121-1 EN 50121-2 PN-EN 50121-3-1:2010 PN-EN 50121-3-2:2009 PN-EN 50121-4:2008 PN-EN 50124-1:2007 PN-EN 50124-2:2007 PN-EN 50155:2007 PN-EN 50238-1 PN-EN 50238-2 Order of the Minister for Infrastructure of 12/10/2005 Job No. 4430/10
Russia	OSJD R-810 GOST 29192 GOST 33436.x-xTsV-TsSh-453

Slovakia	EN 50121-1 EN 50121-2 EN 50121-3-1 EN 50121-3-2 EN 50121-4:2008 EN 50124-1:2007 EN 50124-2:2007 EN 50155:2007 Resolution No 351/2010
Ukraine	GOST 29192
Estonia	no data

Conclusion: The parameter is regulated for 1520 mm gauge tracks (except Estonia)

5.2.2 *Electromagnetic fields*

5.2.2.1 *Frequency management*

Vehicle emission limits and evaluation parameters

Evaluation of exceedances of limits

Measurement specification

The parameter specifies interoperability at the interfaces between the track-side components (AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Component on/b subsystem:

CCS t/s (AxC) ← RS (LOC, PAS, RST)

CCS t/s (AxC) ← CCS on/b

The parameter regulates characteristics of source of interference at the interfaces.

Belarus, Kazakhstan, Latvia, Lithuania, Poland, Russia, Slovakia, Ukraine, Estonia

No document regulating the parameter at the national level.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	Not regulated
Lithuania	Not regulated
Poland	Not regulated
Russia	Not regulated
Slovakia	Not regulated
Ukraine	Not regulated

Estonia	Not regulated

Conclusion: The parameter is not regulated on the 1520 mm gauge railways. To be studied.

Note: The Contact Group invited the OSJD countries to study the experience of standardisation and use of the regulator proposed in CCS TSI and consider the possibility of joining the standardisation methodology.

5.2.3 *Vehicle impedance*

The parameter specifies interoperability at the interfaces between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC) ← RS (LOC, RST)

CCS t/s (TC) ← OPE

This parameter specifies the quality of connection at the interface between different components of the Rolling Stock subsystem and track-side components (TC) of the CCS subsystem and the TC ability to detect vehicle wheelset shunt reliably.

At the interfaces the parameter establishes the requirement for specific types of vehicles allowed to operate on the railway sections whose CCS infrastructure complies with the established specifications limiting the effect on the TC based trackside sensors in the operating conditions.

Determinative parameter

Conductive connection: The minimum value of full electric resistance (impedance) of a vehicle between pantograph and ERS wheels

Type and nature of effect – Movement with changing traction mode results in change of ERS and OTRS impedance and fluctuation of resistance of mechanical contacts of wheel/rail and contact network/pantograph systems, which leads to change in traction current value and emission of interference. Crossing of the boundary (interface) of two adjacent sections of the TC based track section vacancy control system through ERS impedance and contact network causes their closing (crossover effect). The minimum ERS impedance value affects the traction current harmonics, the degree of impact of the crossover effect, the value and asymmetry of reverse traction current, which affect reliability of the TC based section vacancy control system (saturation of the impedance bond core). The effect is intensified in trains with double traction or if supplying two or more ERS units within one traction section of a traction substation.

Belarus, Kazakhstan, Latvia, Lithuania, Russia, Ukraine, Estonia

The parameter is not regulated.

Poland, Slovakia

CCS TSI. Open point.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	Not regulated
Lithuania	Not regulated
Poland	CCS TSI (open point)
Russia	Not regulated
Slovakia	CCS TSI (open point)
Ukraine	Not regulated
Estonia	Not regulated

Conclusion: The parameter is not regulated on the 1520 mm gauge railways. Open point. Requires further studies.

Note: The Contact Group asks the ERA and OSJD experts to study the experience of the standardisation of the parameter in some countries of the EU (Belgium) and give their proposals.

5.2.4 *Conducted interference*

5.2.4.1 DC and low frequency components of traction current: *DC and low frequency components of traction current*

The parameter specifies interoperability at the interfaces between the track-side components (TC, AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS t/s ← RS (LOC, RST)

CCS t/s ← INF

CCS t/s ← ENE

CCS t/s (TC) ← OPE

This parameter regulates the source of interference at the interfaces.

At the interfaces the parameter establishes the requirement for the components of the Power Supply and Infrastructure subsystems and specific types of vehicles allowed for the operation on the railway sections whose CCS infrastructure complies with the established specifications limiting the effect on the trackside sensors of the CCS subsystem in the operating conditions.

Determinative parameter

Source of interference: The maximum value of the direct current component of the ESR traction current and short circuit current of contact network to the tracks or ground.

Type and nature of effect – trunking reverse traction current of one or more ERS units within the same traction section (feeder zone) may lead to saturation of impedance bond core of the track circuit, but asymmetry (inequality) of traction current components in rail tracks may create interference from traction current harmonics, which may cause malfunction of the TC based section vacancy/occupancy control system, transient short-circuit current of contact network of ENE subsystem to the rails or ground and may lead to failure of the AxC based section vacancy/occupancy control system.

Belarus, Kazakhstan, Latvia

Not regulated.

Lithuania, Poland, Slovakia, Ukraine, Estonia

No data.

Russia

At the interface with RS and INF, the parameter is partially regulated by the requirements of ST RZD 1.07.001 for OTRS, standard for engineering and construction of different types of TC based reverse traction network and regulations for the construction and operation TsE-868. OTRS infrastructure elements shall create electrically continuous circuit and ensure thermal resistance during passage of traction current. Each section of traction track circuit shall have two-way tap for traction current and short-circuit current.

Regulations TsE-868 for lines with traffic speed up to 200 km/h set forth that the limit value of the reverse traction current asymmetry in double rail track circuits cannot exceed 120 A DC or 12A AC.

Standard STO RZD 1.07.001 for St. Petersburg - Moscow line with traffic speed up to 250 km/h sets forth that reverse traction (track) network shall ensure passage of traction current from all trains present in the feeder zone and traction current asymmetry in each track circuit shall be under 6%, but not more than 200 A.

In reality current asymmetry in the rails on the sections with DC traction can reach 10-12% (different resistance of the rails due to failure of joint connectors, their increased resistance or poor electrical contact in one of the impedance bond bridges).

At the interface with ENE the parameter is not regulated.

Short circuit in contact network (for example, primary winding of ERS transformer) shall result in reliable tripping by feeder switches at the substations, sectioning posts or parallel connection points within 100 ms. In such cases ERS shall be switched off automatically. In case of short circuit in the circuits connected to the secondary winding of the ERS transformer, the main ESR switch shall be activated. In such cases, AxC of the CCS subsystem in the short-circuited feeder zone shall be resistant to short circuit current impulse.

These requirements are approved by the following documents:

Belarus	Not regulated
Kazakhstan	Not regulated
Latvia	Not regulated
Lithuania	No data
Poland	No data
Russia	NTP STsB/MPS (p. 3) STO RZD 1.07.001 (p. 7.5) TsE-868 (p. 2.21)
Slovakia	No data
Ukraine	No data
Estonia	No data

Conclusion: The parameter is partially regulated in Russia on the 1520 mm gauge railways. Requires further studies.

Note: The Contact Group asks the ERA and OSJD experts to study the German experience and give their proposals to standardise the parameter.

5.2.4.2 DC and low frequency components of traction current: *DC and low frequency components of traction current*

The parameter specifies interoperability at the interface between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS t/s ← RS (LOC, RST)

This parameter specifies the source of interference at the interface.

At the interface the parameter establishes the requirement for specific types of vehicles allowed to operate on the railway sections whose CCS infrastructure complies with the established specifications limiting the effect on the TC based trackside sensors of the CCS subsystem in the operating conditions.

Determinative parameter

Source of interference: Levels of harmonic components of RS traction current with frequencies coincide with the operating frequencies of the CCS devices.

Type and nature of the effect – occurrence of low frequency components in RS traction current from the operation of traction converters, pantographs and quality of current collection in the conditions of normal extreme operation (including icing, high RS travelling speed, etc.) with frequency from 1 Hz to 10 Hz flowing in the rails and affecting the operation of track-side CCS devices.

Belarus, Kazakhstan, Russia, Ukraine

In accordance with NB ZhT TsT 03, Table 1, p. 4.1., and NB ZhT TsT 04, limit level of the unwanted effect from ERS track current interference on track circuits and track signalling devices is regulated. The documents establish the maximum level of unwanted effect of the ERS electrical equipment on track circuits and track signalling devices (input current harmonic components).

Power supply system	**Nominal signal current frequency, Hz**	**Allowable interference level from traction current of electric locomotive**	
		Frequency band, Hz	**Effective value of harmonics current in case of continuous effect (over 0.3 c), A, not exceeding**
1. Direct current 3 kV	50	46-54 40-46 54-60	1.3 5.0 5.0
	25	21-29 19-21 29-31	1.0 (1.9)* 11.6 11.6
2. Alternating current 25 kV 50 Hz	25	21-29 15-21 29-35	1.0 4.1 4.1
	75	65-85	4.1
	4500 5500	4462.5-4537.5 5462.5-5537.5	0.2 0.2
3. Direct current 3 kV and alternating current 25 kV 50 Hz	175	167-184	0.4
	420 480 580 720 780	408-432 468-492 568-592 708-732 768-792	0.35 0.35 0.35 0.35 0.35
	4545 ** 5000 5555 **	4507.5-4582.5 4962.5-5037.5 5517.5-5592.5	0.2 0.2 0.2

Notes:
*) In parentheses there is a value specified for electric trains equipped with a device for controlling harmonic component with frequency of 25 Hz for uniform reduction of the traction power if the limit value is exceeded.
**) For AC trains, the compliance inspection in the frequency bands 4545, 5555 Hz is performed if there are appropriate records in their technical documentation and official confirmation of the operator company of availability of track circuits with the appropriate frequency bands at the test facility.

Ukraine's note

Electromagnetic compatibility parameters of the CCS devices are regulated by DSTU 1514. RS shall not have interfering effect on track circuits of the CCS devices, automatic locomotive signalling devices (ALSN) and radio communication equipment.

Level of interfering effect of electrical equipment of locomotive on track circuit and track signalling devices:

Signal current frequency, Hz	Transmission band, Hz	Allowable interference level, A
25	19 ÷ 21	4.1
	21 ÷ 29	1.0, dangerous
	29 ÷ 31	4.1
175	167 ÷ 184	0.4
Note: The limit time of the interference effect after which there is a possibility of a dangerous or unwanted effect on the operation of the track circuit is: - for acoustic frequency track circuits and track circuits with permanent power supply – 0.1 c; - for code track circuits – 0.3 s.		

Lithuania, Slovakia, Estonia

No data.

Latvia

Recommendations OSJD R-809, OSJD R-810 and standard EN 50121-4 are used.

Axle counter Az LM is used on the Latvian railways, which in accordance with the requirements of the EN50121-4 and manufacturer's specifications has the following characteristics:

Feeder emission:	150 kHz-30 MHz, criterion A;
Enclosure emission:	30 MHz-1000 MHz, criterion B;
Electrostatic charge:	8 kV, criterion A;
Electromagnetic fields (AM):	(80 MHz-1000 MHz), 20 V/m, criterion A;
Electromagnetic fields (PM):	(900 MHz +/- 5 MHz, 1.89 GHz +/- 10 MHz), 20 V/m, criterion A;
Failure:	2 kV, criterion A;
Overvoltage:	criterion A.

Poland

No document adopted at the national level

These requirements are approved by the following documents:

Belarus	OSJD R-809 OSJD R-810 NB ZhT TsT 03, Table 1, p. 4.1 (Appendix A, p. A.38.1 – informative)
Kazakhstan	OSJD R-809 OSJD R-810 NB ZhT TsT 03, Table 1, p. 4.1 (Appendix A, p. A.38.1 and p. A.38.2)
Latvia	OSJD R-809 OSJD R-810 EN 50121-4 Axle counter manufacturer's instructions

Lithuania	OSJD R-809 OSJD R-810
Poland	OSJD R-809 OSJD R-810 Not regulated at the national level
Russia	OSJD R-809 OSJD R-810 NB ZhT TsT 03, Table 1, p. 4.1 (Appendix A, p. A.38.1 and p. A.38.2)
Slovakia	OSJD R-809 OSJD R-810
Ukraine	OSJD R-809 OSJD R-810 DSTU 4049 TOR of the Ukrainian Railways (p. 6.50) DSTU 4151
Estonia	OSJD R-809 OSJD R-810

Conclusion: The parameter is regulated on the 1520 mm gauge railways.

5.2.4.3 Low frequency components of reverse current of the RS auxiliary equipment

The parameter specifies interoperability at the interface between the track-side components (TC) of the CCS subsystem and components of different types of Rolling Stock subsystem:

CCS t/s (TC) ← RS (PAS, LOC, RST)

This parameter specifies the source of interference at the interface.

At the interface the parameter establishes the requirement for specific types of vehicles allowed to operate on the railway sections whose CCS infrastructure complies with the established specifications limiting the effect on the TC based trackside sensors of the CCS subsystem in the operating conditions.

Determinative parameter

Source of interference: level of harmonic component of reverse current of auxiliary converters, generators and heating systems or passenger rolling stock over a single-wire of double wire line with frequency coinciding with the frequencies of the CCS and communication devices.

Type and nature of effect – excitement in feeding network with interfering currents from auxiliary RS converters with frequencies from 1 Hertz to 10 kHz, which flow via contact wire or tracks (or only via tracks) and may have a dangerous or interfering effect on the performance of the CCS devices and interfering effect on communication devices.

Belarus, Russia, Ukraine

The parameter is regulated by NB ZhT TsL-TsT 139.

The allowable level of interfering effect of electrical equipment of a passenger vehicle with a high-voltage converter on performance of the track circuit and ALS devices:

Signal current frequency, Hz	**Transmission band, Hz**	**Allowable interference level, mA**
25	19 to 21	240
	21 to 29	60
	29 to 31	240
50	42 to 46	100
	46 to 54	24
	54 to 58	100
175	167 to 184	40
420	408 to 432	50
480	468 to 492	50
580	568 to 592	50
720	708 to 732	50
780	768 to 792	50
4545	4508 to 4583	30
5000	4963 to 5038	30
5555	5518 to 5593	30

Kazakhstan, Lithuania, Poland, Slovakia, Estonia

No data.

Latvia

Not regulated.

These requirements are approved by the following documents:

Belarus	NB ZhT TsL-TsT 139
Kazakhstan	No data
Latvia	Not regulated
Lithuania	No data
Poland	No data
Russia	NB ZhT TsL-TsT 139
Slovakia	No data
Ukraine	NB ZhT TsL-TsT 139
Estonia	No data

Conclusion: The parameter is regulated in Belarus, Russia and Ukraine.

5.2.4.4 *25kV AC, 50Hz Electromagnetic interference limits for traction current*

The parameter specifies interoperability at the interfaces between the track-side components (TC and AxC) of the CCS subsystem and components of the Power Supply subsystem and Operation subsystem:

CCS t/s (TC, AxC) ← ENE

CCS t/s (TC, AxC) ← OPE

This parameter specifies the source of interference at the interface.

At the interfaces the parameter specifies the requirement for the Power Supply subsystem limiting the effect on the trackside sensors of the CCS subsystem in the operating conditions.

Determinative parameter

Source of interference: The current waveform distortion factor and harmonic voltage component factor values in the elements of the traction power supply systems.

Type and nature of effect – generation in the contact networks of traction power supply systems of harmonics divisible by the main harmonic of the 50 Hz feeding network whose level may affect performance of the CCS and communication devices.

Belarus, Kazakhstan, Russia, Ukraine

At the interface with ENE, the harmonic voltage component factor values of the traction power supply systems on 1520 mm gauge railways is regulated by GOST 32144.

Table 1. Value of aggregate harmonic voltage component factors, in percentage

Normally allowable value at U_{nom}, kV				**Limit value at U_{nom}, kV**			
0.38	6-25	35	110 - 220	0.38	6-25	35	110 - 220
8.0	5.0	4.0	2.0	12.0	8.0	6.0	3.0

Table 2. Value of n harmonic voltage component factor, in percentage

Odd harmonics, not divisible by 3, at U_{nom}, kV					**Odd harmonics, divisible by 3 *), at U_{nom}, kV**					**Even harmonics at U_{nom}, kV**				
n	0.38	6-25	35	110-220	n	0.38	6-25	35	110-220	n	0.38	6-25	35	110-220
5	6.0	4.0	3.0	1.5	3	5.0	3.0	3.0	1.5	2	2.0	1.5	1.0	0.5
7	5.0	3.0	2.5	1.0	9	1.5	1.0	1.0	0.4	4	1.0	0.7	0.5	0.3
11	3.5	2.0	2.0	1.0	15	0.3	0.3	0.3	0.2	6	0.5	0.3	0.3	0.2
13	3.0	2.0	1.5	0.7	21	0.2	0.2	0.2	0.2	8	0.5	0.3	0.3	0.2
17	2.0	1.5	1.0	0.5	>21	0.2	0.2	0.2	0.2	10	0.5	0.3	0.3	0.2

Odd harmonics, not divisible by 3, at U_{nom}, kV					**Odd harmonics, divisible by 3 *), at U_{nom}, kV**					**Even harmonics at U_{nom}, kV**				
n	0.38	6-25	35	110-220	n	0.38	6-25	35	110-220	n	0.38	6-25	35	110-220
19	1.5	1.0	1.0	0.4						12	0.2	0.2	0.2	0.2
23	1.5	1.0	1.0	0.4						>12	0.2	0.2	0.2	0.2
25	1.5	1.0	1.0	0.4										
>25	1.5	1	1	0.4										

n is the number of harmonic component of current

*) Normally allowable values given or n equal to 3 and 9 pertain to single-phase electric networks. In three-phase 3-wire electric networks these values are taken at 50 per cent of those given in the Table.

Limit value of the n harmonic voltage component factor is calculated by the formula:

$$K_{U(n)} = 1.5 \times K_{U(n)\text{norm}}$$

where $K_{U(n)\text{norm}}$ is normally allowable n harmonic voltage component factor value determined using Table 2.

At the interface with OPE, the methods of assessment of compliance with the quality parameters of electric energy in common connection points in the operating conditions are regulated by GOST 30804.4.30. In the Russian Federation, methods of measurement of quality parameters of electric energy are regulated by GOST 30804.4.30.

Lithuania, Slovakia, Estonia

No data.

Latvia

Not applied

Poland

No document adopted at the national level.

These requirements are approved by the following documents:

Belarus	GOST 13109 (Tables 1 and 2, p. 5.4)
Kazakhstan	GOST 13109 (Tables 1 and 2, p. 5.4)
Latvia	Not applied
Lithuania	No data
Poland	Not regulated at the national level
Russia	GOST 32144 (Tables 1-5)
Slovakia	No data
Ukraine	GOST 13109

Estonia	No data

Compliance assessment methods

Belarus	GOST 13109 (p. 6)
Kazakhstan	GOST 13109 (p. 6)
Latvia	Not applied
Lithuania	No data
Poland	Not regulated at the national level
Russia	GOST 30804.4.30
Slovakia	No data
Ukraine	GOST 13109
Estonia	No data

Conclusion: The parameter is regulated in Belarus, Kazakhstan, Russia and Ukraine.

Note: The Contact Group proposes for the ERA experts to take the standard accepted in the OSJD countries as basis for creating the standard parameter in the CCS TSI.

5.2.4.5 *3kV DC Electromagnetic interference limits for traction current*

The parameter specifies interoperability at the interfaces between the track-side components (TC and AxC) of the CCS subsystem and components of the Power Supply subsystem and Operation subsystem:

CCS t/s (TC, AxC) ← ENE

CCS t/s (TC, AxC) ← OPE

This parameter specifies the source of interference at the interfaces.

At the interfaces the parameter specifies the requirement for the Power Supply subsystem limiting the effect on the trackside sensors of the CCS subsystem in the operating conditions.

Determinative parameter

Source of interference: The harmonic voltage component factor values in the elements of the traction power supply systems.

Type and nature of effect – generation in the feeding networks of traction power supply systems of harmonics divisible by the main harmonic of the feeding network whose level may have dangerous or interfering effect on the performance of the CCS devices and interfere with operation of the communication devices outside the working frequency range of those devices.

Belarus, Kazakhstan, Russia, Ukraine

The parameter is regulated, see p. 5.2.4.4.

Lithuania, Slovakia, Estonia

No data

Latvia

Not regulated

Poland

No document adopted at the national level.

These requirements are approved by the following documents:

Belarus	GOST 13109
Kazakhstan	GOST 13109
Latvia	Not regulated
Lithuania	no data
Poland	Not regulated at the national level
Russia	GOST 32144
Slovakia	no data
Ukraine	GOST 13109
Estonia	no data

Conclusion: The parameter is regulated in Belarus, Kazakhstan, Russia and Ukraine.

Note: The Contact Group proposes for the ERA experts to take the standard accepted in the OSJD countries as basis for creating the standard parameter in the CCS TSI.

5.2.5 *Use of magnetic/ eddy current brakes*

Currently, the requirements for this parameter are not regulated in any country. Currently, magnetic/eddy current brakes are not widely used in the 1520 mm system.

The parameter specifies interoperability at the interfaces between the track-side components (TC, AxC) of the CCS subsystem and components of different types of Rolling Stock subsystem and Operation subsystem.

CCS t/s (TC, AxC) ← RS (PAS, LOC, RST)

CCS t/s (TC, AxC) ← OPE

The parameter regulates the effect of the source of interference when magnetic/eddy current brakes are used on the ability of the CCS subsystem components to detect RS at the interfaces.

At the interfaces the parameter establishes the requirement for specific types of vehicles allowed to operate on the railway sections whose CCS infrastructure complies with the established specifications limiting the effect on the CCS subsystem trackside sensors in the operating conditions.

Determinative parameter

Electromagnetic interference, effect of which depends on the quality of electric brakes in operating conditions (including icing, high speed, etc.).

Type and nature of effect – effect of alternating electric field on track circuit devices, axle counter sensors and other trackside CCS devices, axle counter sensors and other trackside CCS devices.

Belarus, Russia

At the interface with RS, magnetic/eddy current brakes can be used on high-speed and ultra-high-speed ERS upon approval of the infrastructure owner. Use of electromagnetic track brakes is regulated by the requirements 'Locomotive hauled passenger vehicles based on unified platforms. Technical requirements'.

At the interface with OPE the parameter is partially regulated by the rules of operation and maintenance of electromagnetic track brakes and control thereof on trains in accordance with the ‘Guidelines for operation of brakes on the passenger trains travelling at speed up to 200 km /h inclusive’ and the requirements ‘Locomotive hauled passenger vehicles based on unified platforms. Technical requirements'.

Kazakhstan, Lithuania, Slovakia, Ukraine, Estonia

No data.

Latvia

Not applied

Poland

Not present on the existing locomotives. For newly built locomotives, if applicable, we will require it in accordance with TSI LOC&PAS.

These requirements are approved by the following documents:

Belarus	Guidelines for operation of brakes on the passenger trains travelling at speed up to 200 km /h inclusive (informative)
Kazakhstan	No data
Latvia	Not applied
Lithuania	No data
Poland	TSI LOC&PAS
Russia	Guidelines for operation of brakes on the passenger trains travelling at speed up to 200 km /h inclusive

	Locomotive-hauled passenger vehicles based on unified platforms. Technical requirements
Slovakia	No data
Ukraine	No data
Estonia	No data

Conclusion: The parameter is not regulated on the 1520 mm gauge railways (except Belarus and Russia). Requires further studies.

Note: The Contact Group addresses the ERA and OSJD experts asking for proposals to standardise the parameter.

5.3 ADDITION OT THE LIST OF DETERMINATIVE PARAMETERS Railway telecommunications

Poland, Slovakia

Poland applies order of the Cabinet of Ministers of 29/06/2005 to railway communications. The experience of the Automation and Telecommunications shows that tests performed by organisations authorised in the area of communication systems take into account Job No LA/33/10. This document indicates the need for the application of the following standards:

- PN-EN 60068-2-1:2009 Environmental testing – Part 2-1: Tests – Test A: Cold;
- PN-EN 60068-2-2:2009 Environmental testing – Part 2-2: Tests – Test B: Dry heat;
- PN-EN 60068-2-6:2008 Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal);
- PN-EN 60068-2-27:2009 Environmental testing – Part 2-27: Tests – Test Ea and guidance – Shock;
- PN-EN 60068-2-30:2008 Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 12 hour cycle);
- PN-IEC 1180-1:1996/Ap1:1999 High-voltage test techniques for low-voltage equipment – definitions, test and procedure requirements
- PN-EN 61000-4-2:1999 Electromagnetic compatibility (EMC) – Testing and measurement techniques – Electrostatic discharge immunity test – Basic EMC publication;
- PN-EN 61000-4-3:2007 Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test;
- PN-EN 61000-4-4:2010 Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test – Basic EMS publication;
- PN-EN 61000-4-5:2010 Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test;
- PN-EN 61000-4-6:2009 Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances induced by radio-frequency fields;
- PN-EN 61000-4-11:2005 Electromagnetic compatibility (EMC) – Testing and measurement techniques – Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests;
- PN-EN 61000-6-2:2008 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments;
- PN-EN 61000-6-4:2008 Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments;
- PN-EN 50121-4:2008 Railway applications – Electromagnetic compatibility – Part 4: Emission and immunity of the signalling and telecommunications apparatus;
- PN-EN 55011:2007 Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement

Note: Slovakia

The above standards apply in Slovakia. Different system of communication between trains and track posts are used for transport management on the railways of the Slovak Republic. In accordance with CCS TSI, GSM-R will be gradually introduced for the railway transport management.

Russia

In the Russian Federation, railway telecommunications are organised based on equipment complying with the requirements of technical regulations and TOR of the Russian Railways.

5.3.1 Conducted interference

5.3.1.1 Levels of harmonics in the current consumed by RS in the 300-3400 Hz frequency band

This parameter regulates source of interference at the interface between Rolling Stock subsystem and track-side components of stationary railway telecommunications.

Determinative parameter

Source of interference: Allowable levels of harmonics in the ERS traction current in the 300-3400 Hz frequency band

Type and nature of effect – harmonic components occurring in current consumed by ERS has interfering effect on two-wire overhead and cable stationary communication lines operating at audio frequencies (300-3400 Hz).

Belarus, Kazakhstan, Russia, Ukraine

Rated level of interfering voltage in communication control circuit cannot exceed 1 MV from electric trains (NB ZhT TsT 03, Table 1, p. 4.2) and 1.2 MV from electric locomotives (NB ZhT TsT 04, Table 1, p. 4.2).

Lithuania, Slovakia, Estonia

No data.

Latvia

Not regulated

Poland

Not regulated at the national level.

These requirements are approved by the following documents:

Belarus	NB ZhT TsT 03 (p. 4.2, Table 1 – informative) NB ZhT TsT 04 (p. 4.2, Table 1 – informative)
Kazakhstan	NB ZhT TsT 03 (p. 4.2, Table 1) NB ZhT TsT 04 (p. 4.2, Table 1) TsSh/4121
Latvia	Not regulated

Lithuania	No data
Poland	Not regulated at the national level
Russia	NB ZhT TsT 03 (p. 4.2, Table 1) NB ZhT TsT 04 (p. 4.2, Table 1)
Slovakia	No data
Ukraine	Regulations for the protection of wired communication and wired broadcast equipment from the effects of the traction network of electrified AC railways Regulations for the protection of wired communication equipment from the effects of the traction network of electric DC railways
Estonia	No data

Conclusion: The parameter is regulated on the 150 mm gauge railways in Belarus, Kazakhstan, Russia and Ukraine.

5.3.1.2 Levels of electromagnetic effect on railway stationary telecommunication systems

The parameters specify the source of interference at the interfaces between the track-side components of stationary railway telecommunication and the Rolling Stock and Power Supply subsystems

Determinative parameters

Source of interference: Allowable levels of interfering and dangerous electromagnetic effects

Type and nature of effect – DC and AC traction network, ERS with thyristor converters and passenger vehicles with high-voltage static converters, automatic block signalling feeder lines, high-voltage power feeder lines of non-traction consumers, overhead high-voltage and ultra-high-voltage lines have electromagnetic effect on performance of the railway stationary telecommunication system.

Belarus, Russia, Ukraine

Standardisation of all interfering effects from all interference sources is carried out for two-wire circuits of stationary communication overhead and cable lines operating at 300-3400 Hz. Allowable interfering effect limits are determined by allowable ratio between noise voltage and useful signal voltage in a communication line.

Induced noise voltage U*n* from all sources of interference in LF telephone communication channels cannot exceed the values given in Table 1.

Table 1

Communication circuit	**U_n, mV**	**Length of the section to which the standard applies**	**Circuit point, to which the standard applies**
Operational controller communication	1.0	Length of control circle	Switch input at relative signal level of -13.9 dB (1.6 Np)
Section	1.0	Length of section between stations	Line terminals of a telephone

Communication circuit	**U_n, mV**	**Length of the section to which the standard applies**	**Circuit point, to which the standard applies**
Interstation	2.25	The same	The same
Station by station	1.5	Length of control circle	Switch input at relative useful signal level of -6.95 dB (0.8 Np)

Allowable values of noise voltage apply to circuit terminals with wave resistance 600 Ohm, terminated at the ends to approved load.

From the standard of aggregate allowable value of interfering voltage shown in Table 1, 0.6 U*n* are assigned to the power lines and 0.8 U*n* to all other sources effecting the traction network.

Division of the allowable noise voltage limit 0.8 U*n* between individual sources (traction substations, ERS, passenger vehicles, etc.) is made taking into account quadratic addition of interferences from the sources generating induced interference via traction network.

Dangerous effect of AC traction on the wired communication lines manifests itself as voltages dangerous to service personnel and communication equipment in the housing-earth and wire-earth system.

On stationary railway communication line routes passing close to electrified AC railway, no special protection measures are taken, if the wire-earth system satisfies the conditions of Table 2.

Table 2

Parameter	**Traction network mode**				
	short circuit				**forced**
	at duration of traction substation OFF max, c				
	0.1	0.15	0.3	0.6	-
Allowable voltage	500	450	310	160	36

Notes:

- Forced traction network mode is the mode where one of the traction substations is off and its load is taken by the adjacent substation,
- short circuit mode is the emergency mode of the traction network where the contact line current flows to earth (rails).

Dangerous voltages in single-wire circuits from DC traction cannot exceed the values shown in Table 3.

Allowable dangerous voltage values in single-wire circuits:

Table 3

Communication line type		**Allowable voltage, V**
Overhead	with wooden supports, including reinforced concrete elements	60
	with reinforced concrete or metal elements	36
Cable	main or local wired communication	36

Kazakhstan, Lithuania, Slovakia, Estonia

No data.

Latvia

Not regulated.

Poland

The parameter is regulated by the instruction Ie-2.

These requirements are approved by the following documents:

Belarus	BC Sh 010 BC Sh 011
Kazakhstan	TsSh/4121
Latvia	not regulated
Lithuania	No data
Poland	Guidelines Ie-2
Russia	Regulations for the protection of wired communication and wired broadcast equipment from the effects of the traction network of electrified AC railways (Section 3) Regulations for the protection of wired communication equipment from the effects of the traction network of electric DC railways (Section III)
Slovakia	No data
Ukraine	Regulations for the protection of wired communication and wired broadcast equipment from the effects of the traction network of electrified AC railways (Section 3) Regulations for the protection of wired communication equipment from the effects of the traction network of electric DC railways (Section III)
Estonia	No data

Conclusion: The parameter is regulated on the 150 mm gauge railways in Belarus, Russia and Ukraine.

5.3.1.3 Level of radio interference field strength in 0.15-300 MHz frequency range

This parameter regulates source of interference at the interface between Rolling Stock subsystem and track-side components of operational radio communication and data transfer.

Determinative parameter

Source of interference: Allowable levels of intensity of radio noise field occurring when RS equipment is working.

Type and nature of effect – interfering effect on the reception of radio and television signals.

Belarus, Lithuania, Russia, Ukraine

The standards are regulated:

- for electric trains, allowable level of quasi-peak values of intensity of the radiated radio noise field NB ZhT TsT 03, Table 1, p. 4.3 and GOST 29205 for the established mode of traction engines GOST 29205, p. 1.1. curve 2 and for transition mode (acceleration, braking, recuperative braking) in the frequency range 0.15--30 GOST 29205, p. 1.1, curve 4;
- for the established electric locomotive mode, the allowable levels of quasi-peak values of intensity of the radiated radio noise field GOST 29205, p. 1.1, curve 1.

Kazakhstan, Slovakia, Estonia

No data.

Latvia

Level of intensity of industrial nose field generated by ERS shall comply with GOST 29205.

Poland

No document adopted at the national level.

These requirements are approved by the following documents:

Belarus	NB ZhT TsT 03 (p. 4.3 of Table 1, p. A.40 appendix A - informative) GOST 29205
Kazakhstan	No data
Latvia	GOST 29205 (informative)
Lithuania	GOST 29205
Poland	Not regulated at the national level
Russia	NB ZhT TsT 03 (p. 4.3 of Table 1) GOST 29205
Slovakia	No data
Ukraine	GOST 29205
Estonia	No data

Compliance assessment methods

Belarus	GOST 29205 (p. 2)
Kazakhstan	No data
Latvia	GOST 29205 (p. 2 – informative)
Lithuania	GOST 29205
Poland	Not regulated at the national level
Russia	GOST 29205 (p. 2)

Slovakia	No data
Ukraine	GOST 29205 (p. 2)
Estonia	No data

Conclusion: The parameter is regulated on the 150 mm gauge railways in Belarus, Latvia, Lithuania, Russia and Ukraine.

5.3.1.4 Level of radio interference field strength in operational radio communication and data frequency range

This parameter regulates source of interference at the interface between Rolling Stock subsystem and track-side components of operational radio communication and data transfer.

Determinative parameter

Source of interference: Allowable level of intensity of radio noise field occurring when RS equipment is working.

Type and nature of effect – interfering effect on the work of operational radio communications and data transfer.

Belarus, Kazakhstan, Russia

For operational radio communications and data, the parameter is regulated: for electric trains by national NB ZhT TsT 03 (p. 4.4 of Table 1) and TsSh 4783 (p. 2.4), for electric locomotives NB ZhT TsT 04 (p. 4.4 of Table 1), for diesel trains NB ZhT TsT 0q (p. 4.2 of Table 1), for diesel locomotives NB ZhT TsT 02 (p. 4.3 of Table 1).

Type of moving object	**Allowable radio noise level, dB, at frequency**			
	2.1 MHz	**153.0 MHz**	**2.1 MHz**	**153.0 MHz**
	parked		**moving**	
Electric rolling stock:				
- 3 kV DC	45	18	58	30
- 25 kV AC 50 Hz	46	26	60	46
- main and shunting diesel locomotives, diesel trains and rail buses	30	14	40	26
Note: 1 μV is assumed as 0 dB				

Lithuania, Poland, Slovakia, Estonia

No data.

Latvia

Not regulated

Ukraine

Simplex train and stationary station radio communication devices shall work at 2.13 MHz (2.15 MHz), 151.725-156.0 MHz.

For Ukrainian railways the requirements are approved by the regulations TsSh-0058.

These requirements are approved by the following documents:

Belarus	NB ZhT TsT 01 (p. 4.2 of Table 1 – informative) NB ZhT TsT 02 (p. 4.3 of Table 1 – informative) NB ZhT TsT 03 (p. 4.4 of Table 1, Appendix A, p. A.41.1 – informative) NB ZhT TsT 04 (p. 4.4 of Table 1 – informative)
Kazakhstan	TsSh-4783
Latvia	Not regulated
Lithuania	No data
Poland	No data
Russia	NB ZhT TsT 01 (p. 4.2, Table 1) NB ZhT TsT 02 (p. 4.3, Table 1) NB ZhT TsT 03 (p. 4.4 of Table 1, Appendix A, p. A.41.1) NB ZhT TsT 04 (p. 4.4, Table 1) TsSh 4783 (p. 2.4)
Slovakia	No data
Ukraine	TsSh-0058
Estonia	No data

Compliance assessment methods

Belarus	NB ZhT TsT 01 (p. 4.2 of Table 1 – informative) NB ZhT TsT 02 (p. 4.3 of Table 1 – informative) NB ZhT TsT 03 (p. 4.4 of Table 1, Appendix A, p. A.41.2 – informative) NB ZhT TsT 04 (p. 4.4 of Table 1 – informative)
Kazakhstan	No data
Latvia	No document regulating the parameter
Lithuania	No data
Poland	No data
Russia	NB ZhT TsT 01 (p. 4.2, Table 1) NB ZhT TsT 02 (p. 4.3, Table 1) NB ZhT TsT 03 (p. 4.4 of Table 1, appendix A, p. A.41.2) NB ZhT TsT 04 (p. 4.4, Table 1)
Slovakia	No data
Ukraine	TsSh-0058
Estonia	No data

Conclusion: The parameter is regulated on the 150 mm gauge railways in Belarus, Russia and Ukraine.

5.3.2 Interfaces between stationary networks and systems

5.3.2.1 Interface between transport networks of railways of adjacent countries

Belarus, Latvia, Russia

Connection of roadway constructions of the railway communication transport network at the level of two bordering countries is organised using fibre optic and symmetrical copper communication cable.

Connection of optic networks of adjacent countries is organised at the level of tributary endings of near-border multiplexers (ADM) with synchronous digital hierarchy SDH (standardised by recommendations ITU-T G.691, G.707, G.783, G.957).

Transport network between near-border ADM multiplexers is developed using SDH or PDH technology (ITU-T recommendations G.702, G.711, G.712, G.718, G.720, G.726 - G.729, G.731, G.732, G.735 - G.739, G.741, G.751, G.753 - G.755) depending on the rate of the information exchange between the telecommunications networks of adjacent countries.

Connection of the telecommunications networks at the SDH or PDH joint level rules out the possibility of network control signals passing into adjacent network.

Latvia note: additionally, *ETHERNET* connection can be created

Kazakhstan, Lithuania, Slovakia, Ukraine, Estonia

No data.

Poland

The connection on the border of the two countries is ensured by copper cable (in the frequency range of 300-3400 Hz) or using fibre optic cables. At the same time 3 Mbit/s SDH ITU.T - G.703 hierarchy multiplexers are used.

These requirements are approved by the following documents:

Belarus	OSJD R-895/2 (p. 2.1 and 2.2)
Kazakhstan	OSJD P-895/2
Latvia	OSJD P-895/2
Lithuania	OSJD P-895/2
Poland	OSJD P-895/2 Not regulated at the national level
Russia	OSJD R-895/2 (p. 2.1 and 2.2)

Slovakia	OSJD P-895/2
Ukraine	OSJD P-895/2
Estonia	OSJD P-895/2

Conclusion: The parameter is regulated on the 1520 mm gauge railways.

5.3.2.2 Interface between operational communication of railways of adjacent countries

Belarus, Latvia, Russia

For operational management of train traffic and carriage between near-border stations in adjacent countries, the connection of the operative communication networks (OCN) shall be performed at the level of controller communication and interstation telephone communication (ITC). Connection of other OCN types designed for the management of current contents of the near-border railway infrastructure shall be performed based on individual agreements on the connection and interaction of these networks.

Using the connection at the level of train controller communication, train controllers in adjacent countries manage the station duty officers of the near-border stations, and ITC ensures communication between the station duty officers of the near-border stations.

The connection of the digital OCN networks based on different types of equipment, but the same principles, is ensured using two (primary and backup) E1 channels between near-border OCN digital switching stations or between the managing and near-border executing station of the railways in adjacent countries.

Possible format of the interaction protocol establishing the procedure for the informational and logical interaction via common signalling channel between OCNs of adjacent countries is provided in Table 1.

Table 1

Connecting message structure		**Byte number**
Protocol discriminator		1 (F2H)
Type of message (primitive command/identification)		5
Sender's address	Station number (within the dispatch circle)	4
Time slot number in E1 stream, which contains the information on the number the dispatch circle. Time slots from 1 to 15 and from 17 to 30 are used. Time slot 31 is for routine maintenance.		2
Backup		3

Connecting message structure		Byte number
Recipient's address (virtual number used to organise incoming and outgoing addressing recoding tables of different manufacturers of the operational communication equipment. It is advisable for an object number to begin with 1 and the total number of objects not to exceed 2048 (to save memory resources).	Object number or group number	6-7

Where digital and analogue OCN networks are joined, the connections shall be established by the OCN signalling adopted for the digital network using converters of digital call code to tone signals, which are adopted at every railway station of adjacent countries, for the transmission of a selective call.

For the connection with 2-wire analogue controller communication lines, the OCN equipment shall use special manageable 2-wire terminals ensuring connection, amplification and correction of the amplitude-frequency line distortions.

Connection of analogue OCN systems can be arranged using operational communication switchboards and physical cable and overhead communication line circuits using LF and AF channels.

LF channels shall have the following parameters:

- useful frequency range with cable communication lines with copper wires, from 300 to 3400 Hz;
- useful frequency range with overhead lines, from 300 to 2400 Hz;
- transmission levels 5.2 dB in the entire frequency range;
- minimum reception level minus 15 dB at 800 Hz;
- limit attenuation value max 20 dB at 800 Hz.

Standards of interfering voltage U*n* at the LF channel inputs on operational communication switchboards of adjacent near-border stations are given in Table 1 of Section 5.3.1.2.

AF channels of analogue systems shall have standardised parameters.

Kazakhstan, Lithuania, Slovakia, Ukraine, Estonia

No data.

Poland

No document adopted at the national level

These requirements are approved by the following documents:

Belarus	STP 09150.19.022 OSJD R-895/2 OSJD R-895 (p. 3, 6-8)
Kazakhstan	OSJD R-895/2 OSJD R-876
Latvia	OSJD R-895/2 OSJD R-876
Lithuania	OSJD R-895/2 OSJD R-876
Poland	OSJD R-895/2 OSJD R-876 Not regulated at the national level
Russia	OSJD R-895 (p. 3, 6-8)
Slovakia	OSJD R-895/2 OSJD R-876
Ukraine	OSJD R-895/2 OSJD R-876
Estonia	OSJD R-895/2 OSJD R-876

Conclusion: The parameter is regulated on the 150 mm gauge railways. Requires additional study and development of technical solutions for the connection of the OCN based on different types of equipment and technologies (TDM with group channel, TDM PBX, IP, tone selective call over LF channels, etc.).

5.3.2.3 Interface (connection) between generic telephone communication of railways of adjacent countries

Belarus

Regulated by STP 09150.19.022 and OSJD O-890.

Kazakhstan, Lithuania, Slovakia, Ukraine, Estonia

No data.

Latvia

Not regulated

Poland

No document adopted at the national level

Russia

Connection of generic telephone communication of the railways of adjacent countries designed for the general management of technological processes is performed at the level of main automatic switching nodes.

Connection between digital nodes of automatic switching of different countries is performed via E1 level digital transfer channels via digital connection lines.

Digital connection lines are integrated into switching systems at A interface (recommendation series Q.512O with the following parameters:

- signal speed at receipt– 2048 kbit/s ± $50*10^{-6}$, signal speed at transfer – 2048 kbit/s with accuracy determined by the station generator;
- used line code – HDB3;
- pulse shape shall comply with the template given in Fig. 15 ITU-T G.703;
- measurement load resistance shall be 75 Ohm for coaxial lines, 120 Ohm for symmetrical lines (this resistance is for the interface between the terminal line set and terminal set of the switching system);
- nominal peak sending voltage is 1.5±0.15 V for coaxial lines, 3±0.3 V for symmetrical lines; peak pause voltage is 0 V±0.12 V for coaxial lines, 0±0.3 V for symmetrical lines.
- nominal pulse duration measured at 0.5 of amplitude value is 244 ± 25 ns;
- input resistance of the interface shall be 75 Ohm (120Ohm for symmetrical lines). Reflection attenuation shall be:
  - in frequency range from 51 to 102 kHz – min 12 dB;
  - in frequency range from 102 to 2048 kHz – min 18 dB;
  - in frequency range from 2048 to 3072 kHz – min 14 dB;
- phase jitter on the output of the terminal set of the switching systems at the interface with the connection PCM-line shall not exceed 0.05 of a single interval;
- digital signal on the input of the receiving part shall comply with the aforementioned requirements taking into account the parameters determined by attenuation of connection couples (attenuation value at 1024 Hz shall be within 0 dB to 6 dB);
- effect of interference noise with signal/noise ratio over 18 dB on incoming PCM-signal shall not generate errors or other failures in the switching system equipment.

The number of digital connection lines between the main (trunk) automatic switching nodes is determined taking into account both terminal and transit telephone load.

Total load between adjacent automatic switching nodes is calculated by the formula:

$$Y_{A-B} = Y_{AB}^{0} + \sum_{i=1}^{n} Y_{imp}^{B} + \sum_{i=1}^{m} Y_{imp}^{A},$$

where Y_{AB}^{o} is the terminal connection load;

Y_{imp}^{B} - transit load from node A through node B;

Y_{imp}^{A} - transit load from node B through node A/

Taking into account that bundles of digital connection lines are not blocked, Erlang tables are used for the calculation of the number of the connection lines.

Call losses are assumed to be equal to 1% (in accordance with ITU-T recommendations).

Digital signalling QSIG (recommendation Q.931 ITU-T) or SS7 ETSI ISUP is used as a digital signalling system between switching nodes

These requirements are approved by the following documents:

Belarus	STP 09150.19.022 OSJD O-890
Kazakhstan	OSJD R-895/2 OSJD R-868
Latvia	OSJD R-895/2 OSJD R-868
Lithuania	OSJD R-895/2 OSJD R-868
Poland	OSJD R-895/2 OSJD R-868 Not regulated at the national level
Russia	OSJD R 895/2 (p. 2.3) OSJD R-868 (p. 4.3.2, 6.1.2, 6.1.3, 8)
Slovakia	OSJD R-895/2 OSJD R-868
Ukraine	OSJD R-895/2 OSJD R-868
Estonia	OSJD R-895/2 OSJD R-868

Conclusion: The parameter is regulated on the 1520 mm gauge railways.

5.3.3 IP connection addressing plan for interconnection of the generic railway data transfer systems of adjacent countries

Belarus

Regulated by OSJD R-899.

Kazakhstan, Lithuania, Slovakia, Ukraine, Estonia

No data.

Latvia

Not regulated

Poland

Not regulated at the national level.

Russia

For the purposes of uniting the generic railway data transfer systems of adjacent countries (for exchange of information between the administrations), EURADAT addressing plan has been taken as a basis.

IP addressing of internal railway networks:

IP network	172.26.x.y
Network mask	255.255.255.0
where	x is the country code in accordance with memo O 920, y is an index from 1 to 254.

IP addressing for the connection between routers of the railways of adjacent countries:

IP network:	172.26.103.y
Network mask:	255.255.255.252
Backup network:	172.26.104.y

These requirements are approved by OSJD memo R-899 (p. 1).

These requirements are approved by the following documents:

Belarus	OSJD R-899
Kazakhstan	OSJD R-899 OSJD O 920
Latvia	OSJD R-899 OSJD O 920
Lithuania	OSJD R-899 OSJD O 920
Poland	OSJD R-899 OSJD O 920 Not regulated at the national level
Russia	OSJD R-899 (p 1) OSJD O 920
Slovakia	OSJD R-899 OSJD O 920
Ukraine	OSJD R-899 OSJD O 920
Estonia	OSJD R-899 OSJD O 920

Conclusion: The parameter is regulated on the 150 mm gauge railways in Belarus and Russia.

5.3.4 Parameters of the operational radio communication systems used on 1520 mm and 1435 mm gauge track blocks and the CIS-EU border

Belarus

Regulated by STP 09150.19.019 and OSJD R-875.

Kazakhstan, Lithuania, Slovakia, Ukraine, Estonia

No data.

Latvia, Russia

Locomotives operating on 1520 mm and 1435 mm gauge sections at the CIS/EU border shall be equipped with operational communication devices appropriate for the infrastructure of the sections. Types of radio equipment shall be approved separately for each section.

Below are the standard main parameters of stationary and locomotive operational communication radio stations in the near-border areas.

1. Train radio communication in hectometre radio frequency band:
   - transmitter power 12 W;
   - frequency modulation, maximum deviation 25 kHz;
   - main train radio channel frequency 2130 kHz;
   - receiver sensitivity at signal/noise ratio 12 dB (SINAD), 1/2 emf) max 5 μV;
   - use of selective calls:
     driver – 1000 Hz;
     station duty office – 1400 Hz;
     train controller – 700 and 2100 Hz.
2. Train radio communication in ultrashort radio frequency range:
   - transmitter power 10 W;
   - frequency modulation, maximum deviation 5 kHz;
   - working frequency range 51.7-1540 and 155.0-1560 MHz;
   - frequency spacing 25 kHz;
   - main train radio channel frequency 151.825 kHz;
   - receiver sensitivity at signal/noise ratio 12 dB ((SINAD), 1/2 emf) max 0.5 μV;
   - work with open channel without using selective and individual calls.

These parameters are set forth by GOST 12252 (Table 2) and 'Technical requirements for locomotive (mobile) radio unit designed for the use on the JSC RZD railways'.

3. GSM-R operational radio communication system.

Parameters of stationary and locomotive GSM-R equipment shall satisfy the requirements of EIRENE project FRS and SRS. Necessary organisational and technical activities shall be carried out to ensure operation of the locomotive radio stations in the GSM-R system in the near-border areas of adjacent countries.

Technical solutions for the construction of operational radio communications (digital, GSM-R and analogue) in the near-border area require additional development.

Poland

Operational communication devices are used in accordance with the permits issued by the Electronic Administration for the use of the frequency range 150 MHz (in increments of 25 kHz, F3 modulation, using frequency-selective call).

These requirements are approved by the following documents:

Belarus	STP 09150.19.019 OSJD R-875
Kazakhstan	OSJD R-875
Latvia	OSJD R-875
Lithuania	OSJD R-875
Poland	OSJD R-875 Not regulated at the national level
Russia	GOST 12252 (Table 2) Technical requirements for locomotive (mobile) radio unit designed for the use on the JSC RZD railways OSJD R-875 EIRENE FRS EIRENE SRS
Slovakia	OSJD R-875
Ukraine	OSJD R-875
Estonia	OSJD R-875

Conclusion: The parameter is regulated, but requires further studies and technical solutions.

6 APPENDICES

6.1 LIST OF THE CONTACT GROUP MEMBERS

In accordance with memo records from meetings 15 to 22 of the ERA/OSJD Contact Group on "OSJD/ERA cooperation for the analysis of interaction between the systems within and outside the EU with 1435 mm and 1520/1524 mm track gauge"

6.2 LIST OF QUESTIONS REQUIRING ADDITIONAL STUDY

See proposals in the Appendix 'List of issues and open questions in the document "Analysis of the basic parameters for maintaining the technical and operational compatibility of the 1520 mm and 1435 mm gauge rail systems at the Commonwealth of Independent States (CIS)/European Union (EU) border"'. Subsystem: CCS and communications (version 1.03 of 31.08.2012)

List of problems and open points of the

"Analysis of the basic parameters for maintaining the technical and operational compatibility of the 1520 mm and 1435 mm gauge rail systems at the CIS-EU border. Subsystem: Control, Command and Signaling (version 1.03 of 31.08.2012) requiring additional decisions or study

Перечень проблем и открытых вопросов

документа «Анализ параметров, являющихся определяющими для сохранения технической и эксплуатационной совместимости железнодорожной системы колеи 1520 мм и 1435 мм на границе СНГ-ЕС. Подсистема: СЦБ и связь» (Версия 1.03 от 31.08.2012 года),
которые требуют решения или дополнительного изучения

1. Цель: взаимное сближение и гармонизация нормативной базы ОСЖД и ЕЖДА /

   Objective: mutual approximation and harmonisation of OSJD and EU legislation

2. Проблемные и открытые вопросы

   Problems and open points

Таблица 1/ *Table 1*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
1. Конструкция и эксплуатация единицы ПС / *Design and operation of RS unit*					
1.2.1	Максимальное расстояние между осями *Maximum axle distances*	Проблема - установление единой нормы. *Problem – determination of single normative value* ЕЖДА: для существующих линий - 17 500 мм для новых линий - 20 000 мм (норма). *ERA: for existing lines – 17 500 mm* *for new lines – 20 000 mm (normative value)* ОСЖД: не нормирован (практически 19 000 мм) *OSJD: no value set (de facto 19 000 mm)* Для решения проблемы или присоединения к норме ТСИ необходимо для коридоров совместимости проверить отсутствие: – в инфраструктуре СЦБ путевых участков систем обнаружения поезда с расстоянием меньшим или равным норме; – подвижного состава (включая специальный ПС в процессе техобслуживания и ремонта) с расстоянием равным или большим норме. *To resolve a problem or accept TSI value for interoperability corridors there should be a verification of absence:*		X Подлежит изучению *To be studied*	ОСЖД составить перечни: – участков пути (на перегонах и станциях всех типов); – подвижного состава включая специальный ПС во всех режимах его работы, не соответствующих норме и рассмотреть т/э расчета возможности поэтапного присоединения к единой норме *OSJD to create lists of:* – *track sections (and stations of all types);* – *RS (including special RS) in all operational modes* *which don't comply with normative value and evaluate technical elements to estimate the possibility of gradual acceptance of normative value*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
		– *train detection systems with distance ≤ normative value in the CCS infrastructure of track sections* – *RS (including special RS under maintenance or repair) with distance ≥ normative value.*			
1.2.2	Минимальное расстояние между осями (1) (до 350 км/ч) *Minimal axles distances (1)* *(up to 350 km/h)*	Проблема – необоснованный эмпирический подхода к нормированию. ЕЖДА: ai ≥ V x 7,2 ОСЖД: 500 мм *Problem – unjustified empirical approach to regulation* *ERA: ai ≥ V x 7,2* *OSJD: 500 mm*	X		ЕЖДА провести анализ свойств используемых датчиков систем СО и установить количественные нормы параметра *ERA should analyse properties of detectors used in train detection systems and set up quantitative values of the parameter*
1.2.3	Минимальное расстояние между осями (2) (свыше 350 км/ч) *Minimal axles distances (1)* *(> 350 km/h)*	Проблема - предложение нормы. ЕЖДА: Открытый вопрос ОСЖД: Открытый вопрос *Problem – introduction of normative value.* *ERA: open point* *OSJD: open point*	X	X	ОСЖД и ЕЖДА дать предложения по нормированию параметра *OSJD and ERA should give proposals for the normative value of the parameter*
1.2.4	Минимальное расстояние между осями (3) (зона нечувствительности) *Minimal axles distances (1)* *(> 350 km/h)*	Проблема - установление единой нормы. ЕЖДА: 3 000 мм ОСЖД: 1 900 мм *Problem – introduction of single value.* *ERA: 3 000 mm* *OSJD: 1 900 mm*	X	X	ОСЖД и ЕЖДА рассмотреть возможность установления единой нормы параметра *OSJD and ERA should assess the possibility to set a single value of the parameter*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
	Расстояние (вынос) между крайней выступающей точкой единицы ПС и осью ближайшей колесной пары: *Distance between outer point of rolling stock and axle of the closest wheelset:*				
1.2.5	- на новых высокоскоростных линиях (1) *- on new high-speed lines (1)*	Проблема – присоединение к норме ТСИ СЦБ. ЕЖДА: не более 5 000 мм ОСЖД: не нормирован *Problem – acceptance of TSI CCS requirements* *ERA: less than 5 000 mm* *OSJD: not specified*		X	ОСЖД рассмотреть возможность присоединения к норме ТСИ СЦБ при строительстве новых высокоскоростных линий *For OSJD to evaluate the possibility to accept TSI CCS requirement while constructing new high-speed lines*
1.2.6	- на других линиях не высокоскоростных (2) *- on other non-high-speed lines (2)*	Проблема - установление единой нормы. ЕЖДА: для существующих линий - не более 4 200 мм; для новых (модернизируемых) линий – не более 5 000 мм ОСЖД: не более 3 500 мм Для решения проблемы и присоединения к норме ТСИ СЦБ необходимо для коридоров совместимости проверить техническую возможность приведения инфраструктурных элементов СЦБ к норме ТСИ *Problem – setting out the single requirement* *ERA: for existing lines – less than 4 200 mm;* *OSJD: less than 3500 mm* *To resolve the problem and accept TSI CCS requirements it is necessary to evaluate technical possibilities to adjust infrastructure elements to the requirements of TSI.*	X	X Подлежит изучению *To be assessed*	ЕЖДА описать особый случай для стран ОСЖД ж.д. колеи 1520 мм. ОСЖД для коридоров совместимости составить: – перечень и количество объектов, где существуют технические проблемы; – обоснование экономической целесообразности поэтапного приведения к норме ТСИ СЦБ *For ERA to describe a special case for OSJD countries with 1520 mm gauge.* *OSJD: to develop for OSJD interoperability corridors:* - *list and quantity of objects with existing technical problems;*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
					- *economical evaluation of the need of gradual adjustment to TSI CCS requirements*
1.3.1	Минимальная ширина обода колеса *Minimal wheel rim width*	Проблема – предложение необоснованной нормы со стороны ЕЖДА. ЕЖДА: 133 мм ОСЖД: 126 мм *Problem – unjustified requirement proposed by ERA.* *ERA: 133 mm* *OSJD: 126 mm*	X		ЕЖДА провести анализ свойств используемых датчиков систем СО и дать т/экономическое расчет мероприятий, связанных с установлением нормы – 126 мм, т.к. предложение ЕЖДА неприемлемо для ОСЖД *For ERA to analyse characteristics of train detection system detectors being used and make an economic evaluation of actions with regard to acceptance of value – 126 mm. Current ERA proposal is not acceptable for OSJD.*
1.3.2	Минимальный диаметр колеса *Minimal diameter of the wheel*	Проблема – необоснованный эмпирический подхода к нормированию ЕЖДА: 330 мм при скоростях до 100 км/ч D = 150 + 1,8 x V при 100 <V ≤ 250 км/ч D = 50 + 2,2 x V при 250 <V ≤ 350 км/ч ОСЖД: 330 мм при скоростях до 160 км/ч 470 мм при скоростях свыше 160 км/ч и до 350 км/ч	X		ЕЖДА провести анализ свойств используемых датчиков систем СО и рассмотреть возможность установления единых количественных норм *ERA should analyse properties of detectors used in train detection systems to assess a possibility to setu p sigle*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
		Problem – unjustified empirical approach to development of the requirements *ERA: 330 mm for speed up to 100 km/h* *D = 150 + 1,8 x V while 100 <V ≤ 250 km/h* *D = 50 + 2,2 x V while 250 <V ≤ 350 km/h* *OSJD: 330 mm for speed up to 160 km/h* *470 mm for speed from 160 to 350 km/h*			*qualitative requirements*
1.3.3	Минимальная толщина гребня *Minimal thickness of the flange*	Проблема - установление единой нормы. ЕЖДА: 20,0 мм, если диаметр D > 840 мм 27,5 мм, если диаметр D ≤ 840 мм ОСЖД: 25 мм (Латвия -20 мм, Литва – 21 мм) *Problem – set out of the single requirement* *ERA: 20,0 mm, when diameter D > 840 mm* *27,5 mm, when diameter D ≤ 840 mm* *OSJD: 25 mm (Latvia -20 mm, Lithuania – 21 mm)*	X	X	ОСЖД и ЕЖДА рассмотреть возможность установления единой нормы *OSJD and ERA to study the possibility to set out the single requirement*
1.3.4	Высота гребня *Flange height*	Проблема – расширение нормативной области параметра ЕЖДА: 27,5 – 36 мм ОСЖД: 27 – 41 мм для вагонов 27 – 37 мм для тягового ПС *Problem – extension of the requirement for the parameter* *ERA: 27,5 – 36 mm*	X		ЕЖДА рассмотреть возможность расширения диапазона норм параметра *ERA should evaluate the possibility to extend values of the parameter*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
		OSJD: 27 – 41 mm for wagons/coaches *27 – 37 mm for traction units*			
1.3.5	Пространство между колесами, свободное от металла и индуктивных компонентов *Space between wheels free of metal and inductive components*	Проблема - предложение нормы. ЕЖДА: Открытый вопрос ОСЖД: Открытый вопрос *Problem – proposal for the requirement*	X	X Подлежит исследованию *To be researched*	ОСЖД и ЕЖДА дать предложения по нормированию параметра (в особенности для локомотивов и пассажирских вагонов). *OSJD and ERA to develop requirement for the parameter (especially for locomotives and passenger carriages)*
1.4.1	Максимальное количество подаваемого песка *Maximum volumes of sanding*	Проблема – гармонизация с нормой ТСИ СЦБ ЕЖДА: 0,8 + 0,2 кг/мин для скоростей до 140 км/час 1,3 + 0,3 кг/мин для скоростей свыше 140 км/час ОСЖД: 1.2 – 1,5 кг/мин для передних КП 0,7 – 1,2 кг/мин для последующих КП *Problem – harmonisation with TSI SSC requirement* *ERA: 0,8 + 0,2 kg/min for speeds up to 140 km/h* *1,3 + 0,3 kg/min for speeds more than 140 km/h* *OSJD: 1.2 – 1,5 kg/min for front end RS* *0,7 – 1,2 kg/min for the consecutive RS*		X	ОСЖД рассмотреть условия применения устройств подачи песка тягового ПС и допустимость гармонизации национальной нормы с нормой ТСИ СЦБ *For OSJD to investigate conditions of sanding for traction unit and possibility to harmonise national requirements with TSI CCS.*
1.4.2	Характеристики песка *Characteristics of sand*	Проблема - установление в ТСИ СЦБ нормы, принятой в странах ОСЖД ЕЖДА: Открытый вопрос	X		ЕЖДА для ТСИ СЦБ рассмотреть возможность принятия за основу нормы, принятой в странах ОСЖД

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
		ОСЖД: Нормирован песок нормального и повышенного качества *Problem – introducing in TSI CCS requirements similar to those used in OSJD MS* *ERA: open point* *OSJD: Sand of normal of higher quality is required*			*For ERA to evaluate possibility to introduce requirements similar to those used in OSJD countries.*
1.5	Бортовые устройства для смазки гребня колес *On-board flange lubrication equipment*	Проблема - установление в ТСИ СЦБ нормы, принятой в странах ОСЖД ЕЖДА: Открытый вопрос ОСЖД: Нормированы качество смазки, порядок допуска и применения *Problem – setting up TSI CCS requirements similar to OSJD* *ERA: open point* *OSJD: existing requirements for the quality of lubricants, rules on access and application*	X		ЕЖДА для ТСИ СЦБ рассмотреть возможность принятия за основу нормы, принятой в странах ОСЖД *For ERA to investigate possibility to introduce requirements based on experience of OSJD countries.*
1.7.1.1	Осевая нагрузка *Axle load*	Проблема - установление единой гармонизированной нормы. ЕЖДА: не менее: - 5 Тс, как правило, для единиц ПС с 2-мя осями и более; - 4 Тс для единиц ПС с 4-мя осями и	X	X Подлежит изучению *To investigate*	ЕЖДА описать особый случай для ж.д. колеи 1520 мм и дать пояснения (тех. информацию) по предлагаемой норме ОСЖД изучить опыт нормирования ЕЖДА и для коридоров

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
		тормозными колодками; - 3,5 Тс для единиц ПС с более чем 4-мя тормозными колодками. ОСЖД: не менее 10 Тс (11 Тс для электромотрис); 16 Тс – для Латвии *Problem – setting of single harmonised requirement*			совместимости представить: – перечень объектов и условий для гармонизации с нормой ЕЖДА; – т/экономическое обоснование поэтапного приведения к норме ТСИ СЦБ *For ERA to describe a special case for 1520 mm railway system together with clarifications (technical information) on the introduced requirement* *For OSJD to study ERA experience in requirements development and to provide for interoperability corridors:* - *objects and conditions for harmonisation with EU requirements* - *Technical-economic justification of gradual acceptance of TSI CCS requirement*
1.7.1.2	Масса металла единицы ПС *RS unit metal weight*	Проблема - предложение нормы. ЕЖДА: Открытый вопрос ОСЖД: Не регламентирован и не применяется *Problem – introduction of requirement*	X		ЕЖДА дать предложения по нормированию параметра (с учетом парка ПС стран ОСЖД) *For ERA to propose a requirement for*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
		ERA: open point *OSJD: not regulated, not applicable*			*the parameter (taking into account rolling stock used in OSJD counties)*
1.8	Применение вспомогательных шунтирующих устройств *Application of bypass equipment*	Проблема - установление единой гармонизированной нормы. ЕЖДА: нет необходимости применения ОСЖД: не менее 10 Тс (11 Тс для электромотрис); 16 Тс – для Латвии *Problem – setting up a harmonised requirement.* *ERA: no need for application* *OSJD: not less than 10 tf (11 tf for motrices)* *16 tf – for Latvia*	X	X	Предложения см. п.1.7.1.1 *For proposals see p. 1.7.1.1*
1.9	Электрическое сопротивление между колесами *Electrical impedance between wheels*	Проблема - установление единой гармонизированной нормы. ЕЖДА: не более 0,05 Ом ОСЖД: не более 0,01 Ом *Problem – development of a harmonised requirement.* *ERA: less than 0..05 ohm* *OSJD: less than 0.01 ohm*	X	X	ОСЖД и ЕЖДА рассмотреть возможность гармонизации нормы параметра. ЕЖДА и ОСЖД дополнительно уточнить спецификацию параметра для случая применения ПС с колёсными парами без общей оси. *For ERA and OSJD to evaluate possibility to harmonise requirement for the parameter* *For ERA and OSJD to additionally specify the parameter for rolling stock*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
					with wheel-sets without common axle
1.10	Комбинация свойств ПС для обеспечения требуемой динамики сопротивления шунта *Combination of rolling stock properties to ensure required bypass impedance(resistance?) dynamics*	Проблема - предложение нормы. ЕЖДА: Открытый вопрос ОСЖД: Открытый вопрос *Problem – introduction of a requirement* *ERA: open point* *OSJD: open point*	X	X Подлежит исследованию *To be researched*	ОСЖД и ЕЖДА дать предложения по нормированию параметра. *For ERA and OSJD to propose a requirement for the parameter*
1.11	Применение специальных устройств СЦБ *Application of special CCS equipment*	Проблема - установление в ТСИ СЦБ нормы, принятой в странах ОСЖД ЕЖДА: не применяются ОСЖД: нормирован *Problem – introduction of OSJD used requirement in TSI CCS.* *ERA: not applicable* *OSJD: applicable*	X		ЕЖДА рассмотреть возможность включения параметра в ТСИ СЦБ как специфичного (особого случая) для ж.д. колеи 1520 мм. *For ERA to evaluate possibility to introduce in TSI CCS a parameter as a specific case for 1520 mm system*
2. Электромагнитная совместимость / *Electromagnetic compatibility*					
2.2.1	Частотное регулирование *Frequency regulation* Предельно допустимые нормы помехоэмиссии единицы ПС и параметры оценки соответствия	Проблема – присоединение к норме ТСИ СЦБ. ЕЖДА: нормы + методология ОСЖД: Открытый вопрос *Problem – adoption of TSI CCS requirement* *ERA: requirements + methodology*		X Подлежит изучению *To be researched*	ОСЖД изучить опыт нормирования и применения предлагаемого ЕЖДА регулятора и рассмотреть возможность присоединения к методологии нормирования ТСИ СЦБ.

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
	Limits of emission of rolling stock unit and parameters for verification of conformity Оценка превышений установленных предельно допустимых норм *Verification of surpassing of limits* Метрологические требования *Metrological requirements*	*OSJD: open point*			*For OSJD to investigate an experience of development and application of TSI requirement and evaluate possibility to adopt TSI CCS requirement.*
2.3	Полное сопротивление единицы ПС *Full impedance of rolling stock unit*	Проблема - предложение нормы. ЕЖДА: Открытый вопрос ОСЖД: Открытый вопрос *Problem – introduction of requirement* *ERA: open point* *OSJD: open point*	X	X Подлежит исследованию *To be researched*	ОСЖД и ЕЖДА дать предложения по нормированию параметра *For Era and OSJD to propose requirements for the parameter*
2.4.1	Постоянная составляющая тока тяги ПС *Direct component of RS traction current*	Проблема - создание нормативной базы. ЕЖДА: Открытый вопрос ОСЖД: Нормирован частично *Problem – creation of requirements database* *ERA: open point* *OSJD: partially covered by requirements*	X	X Подлежит исследованию *To be researched*	ОСЖД и ЕЖДА принять участие в создании нормативной базы и дать предложения по нормированию параметра *For ERA and OSJD to participate in development of the requirements database and propose requirements for*

Индекс ***Index***	**Наименование параметра** ***Parameter***	**Описание проблемы или открытого вопроса** ***Description of a problem or open point***	**Уровень решения** ***Level of decision***		**Предложение РФ** ***Proposal by RF***
			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
					the parameter
2.4.2	Низкочастотные составляющие тока тяги ПС *Low frequency components for RS traction current*	Проблема - создание нормативной базы. ЕЖДА: Открытый вопрос ОСЖД: Нормирован *Problem – development of requirements database* *ERA: open point* *OSJD: requirements*	X		ЕЖДА рассмотреть возможность включения параметра в ТСИ СЦБ как специфичного (особого случая) для ж.д. колеи 1520 мм. *For ERA to evaluate possibility to introduce in the TSI CCS a parameter as a specific case for 1520 mm system*
2.4.3	Низкочастотные составляющие обратного тока вспомогательного оборудования ПС *Rolling stock auxiliary equipment reverse current's low frequency components*	Проблема - создание нормативной базы. ЕЖДА: Открытый вопрос ОСЖД: Нормирован *Problem – development of requirements database* *ERA: open point* *OSJD: requirements*	X		ЕЖДА рассмотреть возможность включения параметра в ТСИ СЦБ как специфичного (особого случая) для ж.д. колеи 1520 мм. *For ERA to evaluate possibility to introduce in the TSI CCS a parameter as a specific case for 1520 mm system*
2.4.4	25kV AC, 50Hz Предельные нормы электромагнитных помех для тягового электроснабжения *25kV AC, 50Hz limits of electromagnetic emissions for traction power supply*	Проблема - создание нормативной базы. ЕЖДА: Открытый вопрос ОСЖД: Нормирован *Problem – development of requirements database* *ERA: open point* *OSJD: requirements*	X		ЕЖДА для ТСИ СЦБ рассмотреть возможность принятия за основу нормы, принятой в странах ОСЖД *For ERA to evaluate possibility to use OSJD requirements as a background for the TSI CCS.*
2.4.5	3kV DC Предельные нормы электромагнитных помех для	Проблема - создание нормативной базы.	X		ЕЖДА для ТСИ СЦБ рассмотреть

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			ЕЖДА ***ERA***	**ОСЖД (РЖД)** ***OSJD (RZD)***	
	тягового электроснабжения *3kV DC limits for electromagnetic emissions for traction power supply*	ЕЖДА: Открытый вопрос ОСЖД: Нормирован *Problem – development of requirements database* *ERA: open point* *OSJD: requirements*			возможность принятия за основу нормы, принятой в странах ОСЖД *For ERA to evaluate possibility to use OSJD requirements as a background for the TSI CCS.*
2.5	Применение магнитных/ индукционных тормозов *Use of magnetic/eddy-current brakes*	Проблема - предложение нормы. ЕЖДА: Открытый вопрос ОСЖД: Открытый вопрос *Problem – development of requirements database* *ERA: open point* *OSJD: open point*	X	X Подлежит исследованию *To be researched*	ОСЖД и ЕЖДА дать предложения по нормированию параметра *For ERA and OSJD to propose requirements for the parameter*
3. Железнодорожная электросвязь / *Railway electric communication*					
3	Все *All*	Проблема - создание нормативной базы. ЕЖДА: Открытый вопрос ОСЖД: Нормирован *Problem – development of requirements database* *ERA: open point* *OSJD: requirements*	X		ЕЖДА для ТСИ СЦБ рассмотреть возможность принятия за основу нормы, принятой в странах ОСЖД *For ERA to evaluate possibility to use OSJD requirements as a background for the TSI CCS.*

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