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: FREIGHT WAGONS

Document developed by the OSJD-ERA Contact Group

2016

REVISIONS AND AMENDMENTS / РЕВИЗИИ И ВНЕСЁННЫЕ ИЗМЕНЕНИЯ

Revision and date / Ревизия и дата	**Chapters / Разделы**	**Remarks / Пояснения**	**Author /Автор**
0.01 04/06/2013		Setting up basic parameters to be analysed	VS
0.02 23/09/2013		Updating list of basic parameters to be analysed	VS
0.02 21/01/2014	all	Editing of the list of basic parameters to be analysed	VS
0.03 11/03/2014	all	Inclusion of submissions from the participants	VS
0.04 13/05/2014	all	Editing and translation of updated submissions from the participants	VS
0.05 08/09/2014	all	Translations and inclusion of information from delegations (UA, KZ)	VS
0.06 19/09/2014	all	Translations and inclusion of information from delegations (PL, MD)	VS
0.07 26/11/2014	all	Translations and inclusion of information from delegations (RU, BY, LV, LT)	VS
0.08 22/12/2014	all	General editing, draft conclusions	VS
0.09 17/04/2015	all	General editing, finalisation of the text for the final revision	VS
0.1 16/09/2015	all	update of references to standards	UA, RU
1.0 18/12/2015	all	General editing of the final version	VS

CONTENTS / СОДЕРЖАНИЕ

1. SCOPE OF THE DOCUMENT / ОБЛАСТЬ ПРИМЕНЕНИЯ ДОКУМЕНТА

The present document is drafted by the joint Contact Group of experts of the Organisation for cooperation of Railway (OSJD) and European Railway Agency (ERA) in the framework of colaboration between the abovementioned organisations focused on analysing of relationship between EU and non-EU railway system of 1520 mm track gauge, in accordance with Memorandums of Understanding for 2008 and later years.

The OSJD performed this work pursuant to its action plan for 2014 and the subsequent years.

The ERA performed this work pursuant to section 4.10 (Interconnection to a 1520/1524-mm Rail System) of the Mandate received by the Agency for Drafting Technical Specifications for Interoperability (TSI) and ERA Recommendation (ERA/REC/03-2008/INT от 17/11/2009) on Relationship with 1520/1524 mm Railway Network.

The Contact Group performed a comparative analysis of the existing technical specifications for the subsystem “freight wagons” (TSI WAG) and requirements used in the 1520 mm gauge rail systems of the members of OSJD. The analysis is limited to technical and operational aspects of the railway system and is aimed on facilitatation of technical and operational compatibility on the EU – CIS border.

The terms used in this document should not serve as legal references. The documents cited in tables of references for each parameter concerned should be consulted for precise content of the requirements.

The content (technical information) of this document may serve as a basis for reflecting the 'basic parameters' of the 1520 mm system in the EU TSIs to preserve the existing technical compatibility of the 1520 mm system at the CIS-EU border.

2. DEFINITIONS AND ABBREVIATIONS / ОПРЕДЕЛЕНИЯ И СОКРАЩЕНИЯ

Abbreviation	Definition
DSTU	State Standard of Ukraine
EN	European Standard
GOSNIIV	State Research Institute for Wagon Manufacturing (Russia)
GOST	Interstate Standard
LDZ	State joint stock company „Latvijas dzelzceļš (Latvia)
LG	Joint stock company „Lietuvos geležinkeliai“ (Lithuania)
LVS	Standard of the Republic of Latvia
NB	Safety Rules
RST	Rolling stock
TOR	Technical operation rules
RZD	Joint stock company „Russian Railways“
HCS	Heating control system
STP	Company standard
TSI	Technical specifications for interopebility
TSI WAG	Technical specifications for interopebility for the subsystem „freight wagons“
UIC	International Union of Railways (fr. - Union internationale des chemins de fer)
VNIIZhT	Russian Railway Research Institute

3. LIST OF BASIC PARAMETERS / СПИСОК ОСНОВНЫХ ПАРАМЕТРОВ

No.	*Title (English)*	*Title (Russian)*	*Paragraph No. according to WAG TSI (Commission Regulation (EU) No 321/2013)*
	Structures and mechanical part	***Конструкция и механическое оборудование***	
	Mechanical Interface	***Механическое взаимодействие***	
	End coupling	Концевое сцепное устройство	4.2.2.1.1.
	Inner coupling	Внутрисекционное сцепное устройство	4.2.2.1.2.
	Strength of unit	Прочность конструкции единицы ПС	4.2.2.2.
	Integrity of the unit	Целостность конструкции единицы ПС	4.2.2.3.
	Gauging and track interaction	***Габарит и воздействие на путь***	
	Gauging	Габарит	4.2.3.1.
	Compatibility with load carrying capacity of lines	Совместимость с грузоподъемностью линий	4.2.3.2.
	Compatibility with train detection systems	Совместимость с системами обнаружения поезда	4.2.3.3.
	Axle bearing condition monitoring	Контроль буксового узла	4.2.3.4.
	Running safety	Безопасность движения	4.2.3.5

	Safety against derailment running on twisted track	Устойчивость к сходу с рельсов при движении по переходным кривым и по пути с отклонениями в пределах допуска содержания пути	4.2.3.5.1.
	Running dynamic behaviour	Параметры динамики движения	4.2.3.5.2.
	Running gear	Ходовая часть	4.2.3.6.
	Structural design of bogie frame	Конструкция рамы тележки	4.2.3.6.1.
	Characteristics of wheelsets	Характеристики колесных пар	4.2.3.6.2.
	Characteristics of wheels	Характеристики колес	4.2.3.6.3.
	Characteristics of axles	Характеристики осей	4.2.3.6.4.
	Axle boxes / bearings	Буксовые узлы, подшипники	4.2.3.6.5.
	Variable gauge wheelsets	Колесные пары изменяемой ширины	4.2.3.6.6.
	Running gear for manual change of wheelsets	Ходовая часть вручную заменяемых колесных пар	4.2.3.6.7.
	Brake	***Тормоз***	
	General	Общие положения	4.2.4.1.
	Safety requirements	Требования безопасности	4.2.4.2.
	Functional and technical requirements	Функциональные и технические требования	4.2.4.3.
	General functional requirements	Общие функциональные требования	4.2.4.3.1.
	Brake performance	Тормозная эффективность	4.2.4.3.2.
	Service brake	Служебный тормоз	4.2.4.3.2.1.
	Parking brake	Стояночный тормоз	4.2.4.3.2.2.
	Thermal capacity	Термостойкость	4.2.4.3.3.

	Wheel slide protection (WSP)	Система противоюзной защиты	4.2.4.3.4.
	Environmental conditions	**Условия окружающей среды**	**4.2.5.**
	System protection	***Защита системы***	
	Fire safety	***Пожарная безопасность***	
	General	Общие положения	4.2.6.1.1.
	Functional and technical specification	Функциональные и технические спецификации	4.2.6.1.2.
	Barriers	Барьеры	4.2.6.1.2.1.
	Materials	Материалы	4.2.6.1.2.2.
	Cables	Кабели	4.2.6.1.2.3.
	Flammable liquids	Воспламеняющиеся жидкости	4.2.6.1.2.4.
	Protection against electrical hazards	***Защита от опасности поражения электрическим током***	
	Protective measures against indirect contact (protective bonding)	Средства защиты от непрямого контакта (защитные крепления)	4.2.6.2.1.
	Protective measures against direct contact	Средства защиты от прямого контакта	4.2.6.2.2.
	Attachment devices for rear-end signal	Крепежные приспособления для средств обозначения хвоста поезда	4.2.6.3.

4. ANALYSIS OF THE BASIC PARAMETERS / АНАЛИЗ ОСНОВНЫХ ПАРАМЕТРОВ

In the TSI WAG the following definitions are used:

(a) A unit is the generic term used to name the rolling stock. It is subject to the application of this TSI, and therefore subject to the EC verification procedure.

A unit can consist of:

- a wagon that can be operated separately, featuring an individual frame mounted on its own set of wheels or
- a rake of permanently connected elements, those elements cannot be operated separately or
- separate rail bogies connected to compatible road vehicle(s) the combination of which forms a rake of a rail compatible system.

(b) A train is an operational formation consisting of several units.

Kazakhstan, Russia, Ukraine:

Railway rolling stock unit – separate rolling stock object such as locomotive, freight wagon, passenger coach, multiple unit (or its section, coaches), special rolling stock.

Train – composed and coupled set of wagons/coaches with one or more operative locomotives or automotive coaches, having designated signals, also locomotives without wagons/coaches coupled, which are being sent or already situated in sections and automotive special rolling stock.

(Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011)

Poland:

Train – composition of freight (or passenger) vehicles or other railway transport means in combination with active locomotives or propelled vehicles – having designated signals and ready for departure or already moving.

4.2.2. Structures and mechanical parts / Конструкция и механическое оборудование

4.2.2.1. Mechanical Interface / Механическое взаимодействие

4.2.2.1.1. End coupling / Концевое сцепное устройство

The end coupling is the mechanical interface between units forming a train.

The coupling system shall be designed in a way that no human presence between the units to be coupled / uncoupled shall be required whilst either one unit is moving.

End couplings shall be resilient and capable of withstanding the forces in accordance with the defined design operating state of the unit.

Latvia, Lithuania, Poland:

TSI requirements applicable.

Russia, Moldova, Latvia, Lithuania, Belarus, Ukraine:

Railway rolling stock must be equipped with a coupling device, which prevents spontaneous uncoupling of rolling stock units and ensures unit's evacuation in emergencies.

Railway rolling stock must be equipped with the autocoupling device.

Rolling stock autocoupling device must include energy-absorbing apparatus.

Autocoupling device's coupling contour line must comply with GOST 21447-75.

Autocoupling device must ensure:
a) automatic coupling when vertical shift between longitudinal axis of autocouplers is from 0 to 140 mm, relative horizontal lateral shift of those axis is from 0 to 160 mm and the horizontal angle from 0° to 4,5º as well as angle 8° with relative horizontal shift of 40 mm which corresponds to wagon (carriage) coupling on reference curves;
b) coupled position of rolling stock while moving, including moving on defined circular and S-shape curves as well as with change of gradient 55 ‰ associated with 205 m radius of vertical curve;
c) uncoupling of rolling stock units in compressed and free states by external application of uncoupling actuator;
d) automatic recovery of coupling readiness after uncoupling and separation;
e) after mistaken uncoupling of units – recovery of coupling state by external action without separation;
f) visual inspection of the coupling device without human intervention between rolling stock units;
g) possibility to restrict vertical shifts.

The vertical shift of axles of autocouplers on both sides of rolling stock unit must not exceed 15 mm unless rolling stock design requires otherwise.

Except rear end coupling autocoupling devices of refrigerator wagons must be equipped with a clamp screw M 16x60 to prevent uncoupling.

The height *h* of autocoupler's axis from rail heads (measured in point *б* - crossover point of autocoupler's horizontal axis with vertical containing the front side of aligning beam) shall be:

for new produced and operated freight wagons, passenger carriages and locomotives (not loaded, without servicing) – not less than 1040 mm; not more than 1080 mm;

for currently operated freight wagons (loaded, serviced) – not less than 950 mm, passenger carriages and locomotives (loaded, serviced) – not less than 980 mm.

Deviation of autocoupler's head from its normal horizontal position must not exceed 3 mm, coupler's droop shall not exceed 10 mm. Deviation of autocoupler's head is defined by difference of autocoupler's heights, measured in point *a* (crossover point of autocoupler's horizontal axis with a plane of coupling) and point *б.*

Height difference between longitudinal axes of autocouplings in a freight train shall not exceed:

between wagons – 100 mm;

between a locomotive and the first loaded wagon – 110 mm.

Absorbing apparatus of autocoupling device must ensure absorption of longitudinal forces affecting the rolling stock. Based on a type of rolling stock, autocoupling must be equipped with absorbing apparatus of the following types:

- T1 absorbing apparatus with draft gear capacity of not less than 70 kJ for freight wagons dedicated for mass-cargo, including open-wagons, multi-purpose flat wagons, box wagons;

- T2 absorbing apparatus with draft gear capacity of not less than 100 kJ for tank-wagons, wagon dedicated for valuable and dangerous goods of classes 3, 4, 5, 8, 9 according to GOST 19433 classification, and for trunk line locomotives;

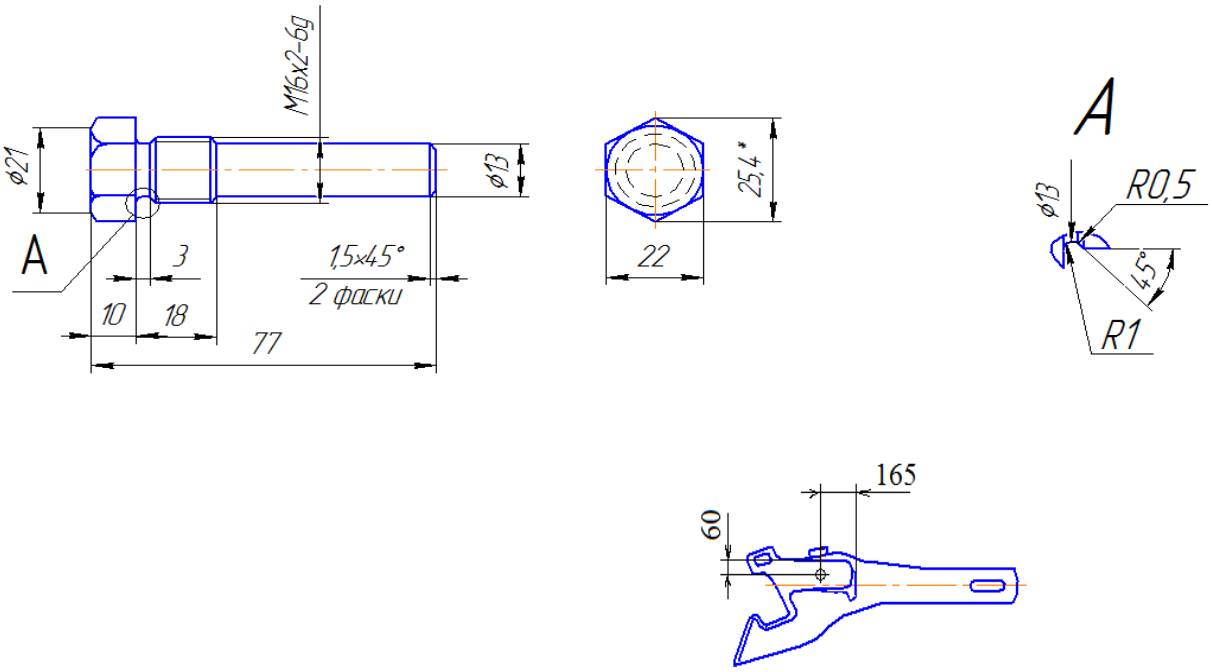
- T3 absorbing apparatus with draft gear capacity of not less than 140 kJ dedicated for gas and chemicals tank-wagons, wagons dedicated for especially dangerous goods of classes 1, 2, 6, 7 according to GOST 19433 classification, and for shunting locomotives.

Dimensions of absorbing apparatus must allow their mounting on the rolling stock complying with mounting dimensions set out in GOST 3475.

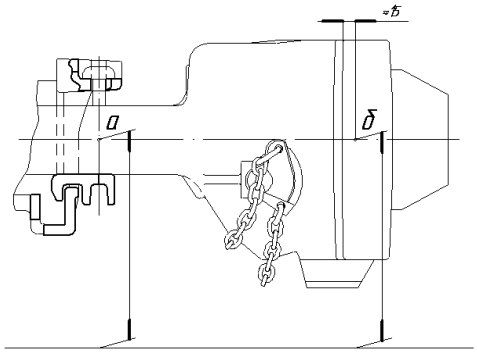
Table 1 - Reference curves

Transport operation	Estimated track section	Freight wagons, special rolling stock	
		length over pulling faces of couplers < 21 m	length over pulling faces of couplers ≥ 21 m
Automatic coupling	Circular curve and transition section between straight and curve sections without transition radii	135	250

Curving in coupled mode	Circular curve and transition section between straight and curve sections without transition radii	80	110
	S-shape curve without tangential path	120	160



Picture 1. Design and positioning of the clamp screw



Picture 2. Autocoupling device height difference above railhead

Belarus, Kazakhstan, Ukraine:

Railway rolling stock must be equipped with autocoupling.
Height of freight wagon autocoupling axis above the top of railheads shall be:
- empty – not exceeding 1080 mm;
- loaded – at least 950 mm.

Height difference between longitudinal axes of a freight train autocouplings must not exceed:
- between wagons – 100 mm;
- between a locomotive and the first loaded wagon – 110 mm.

Kazakhstan:
Automatic coupling fitness checks and coupling quality check are being done by a vehicle inspector responsible for the train's technical maintenance prior to departure.
Coupling of a locomotive or special rolling stock (if used as a locomotive) with the first wagon (carriage) of a train or self-propelling vehicle is being done by the driver of the locomotive or of the special rolling stock used as a locomotive. The driver is responsible for the coupling quality.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 22703-2012 "Cast parts for coupling and autocoupling devices of rolling stock. General technical conditions" GOST 3475-81 "Autocoupling device for 1520 (1524) track gauge rolling stock. Installation dimensions" GOST 21447-75 "Coupler contour line for autocoupling device. Dimensions" TOR Belarus For information: GOST R 54749-2011 "Coupling and autocoupling devices of rolling stock. Technical requirement and rules of acceptance"
Georgia	
Kazakhstan	TOR Kazakhstan (decision of the government of the Republic of Kazakhstan of 5 February 2013 No. 87, including relevant amendments)
Latvia	TSI WAG TOR Latvia
Lithuania	TSI WAG TOR Lithuania
Moldova	GOST R 54749-2011 "Coupling and autocoupling devices of rolling stock. Technical requirement and rules of acceptance"

	GOST 22703-2012 “Cast parts for coupling and autocoupling devices of rolling stock. General technical conditions” GOST 3475-81 “Autocoupling device for 1520 (1524) track gauge rolling stock. Installation dimensions” GOST 21447-75 “Coupler contour line for autocoupling device. Dimensions” TOR Moldova
Poland	TSI WAG
Russia	GOST 32913-2014 “Absorbing apparats for coupling and autocoupling devices of the railway rolling stock. Technical requirements and rules of acceptance” (replacing GOST 31240-2004, GOST 22253-76) TOR Russia Technical regulation of the Customs Union TR TS 001/2001 regarding safety of the railway rolling stock GOST R 54749-2011 “Coupling and autocoupling devices of rolling stock. Technical requirement and rules of acceptance” GOST 22703-2012 “Cast parts for coupling and autocoupling devices of rolling stock. General technical conditions” GOST 3475-81 “Autocoupling device for 1520 (1524) track gauge rolling stock. Installation dimensions” GOST 21447-75 “Coupler contour line for autocoupling device. Dimensions”
Slovakia	TSI WAG
Ukraine	GOST 22703-91 “Cast parts for coupling and autocoupling devices of rolling stock. General technical conditions” GOST 3475-81 “Autocoupling device for 1520 (1524) track gauge rolling stock. Installation dimensions” GOST 21447-75 “Coupler contour line for autocoupling device. Dimensions” For information: GOST 32913-2014 “Absorbing apparats for coupling and autocoupling devices of the railway rolling stock. Technical requirements and rules of acceptance” (replacing GOST 31240-2004, GOST 22253-76) GOST 22703-2012 “Cast parts for coupling and autocoupling devices

	of rolling stock. General technical conditions”

4.2.2.1.2. Inner coupling / Внутрисекционное сцепное устройство

The inner coupling is the mechanical interface between elements forming a unit.

The inner coupling shall be resilient and capable of withstanding the forces in accordance with the defined design operating state of the unit. The joint between two elements sharing the same running gear, is covered by point 4.2.2.2.

The longitudinal strength of the inner coupling(s) shall be equal to or higher than the one of the end coupling(s) of the unit.

Latvia, Lithuania, Ukraine:

TSI requirements applicable

Kazakhstan, Russia, Ukraine:

No specific requirements.

Belarus:

Not used Belarus Railway's wagon fleet.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	
Georgia	
Kazakhstan	
Latvia	TSI WAG
Lithuania	TSI WAG
Moldova	
Poland	TSI WAG
Russia	
Slovakia	TSI WAG
Ukraine	

4.2.2.2. Strength of unit / Прочность конструкции единицы ПС

The structure of a unit body, any equipment attachments and lifting and jacking points shall be designed such that no cracks, no significant permanent deformation or ruptures occur under the load cases defined in Chapter 5 of EN12663-2:2010. Joining techniques shall be deemed to be covered by the demonstration of conformity in accordance to point 6.2.2.1.

The demonstration of conformity is described in point 6.2.2.1.

The jacking positions shall be marked on the unit. The marking shall comply with point 4.5.13 of EN15877-1:2012.

Kazakhstan, Russia:

Requirements are defined in GOST 33211-2014 "Freight wagons. Requirements for strength and dynamic properties".

Assessment of strength is done in accordance with GOST (draft) "Freight wagons and passenger coaches. Strength and dynamic properties test methods".

Carbodies and wheel-sets are being designed for the most adverse possible combination of main and additional forces in accordance with 3 sets of design conditions.

1st set of design conditions contains relatively rare maximum loads resulting from backing and train departure, collision of wagons while shunting, including while releasing wagons from a shunting hump, low speed train emergency braking.

2nd set of designed conditions contains estimations of wagon components' strength against relatively rare loads (resulting from maintenance and repair, loading-unloading, wagon transportation in ferries or passage through retarding mechanism of the shunting hump).

3rd set of design conditions contains frequent combination of moderate loads resulting from train movement with allowed speeds up to design speed with regular service brakes, periodical pulls and pushes, normal functioning of wagon's mechanisms and parts.

The main requirement for strength estimation under the 1st set of design conditions is to prevent appearance of permanent deformations or destruction of elements and parts of the wagon when affected by maximum shock loads.

The main requirement for strength estimation under the 2nd set of design conditions is to ensure wagon's strength against relatively rear non-shock loads.

The main requirement for strength estimation under the 3rd set of design conditions is to prevent destruction of carbody resulting from Rankine pressure loads incurred by liquid, bulk or sliding freight in movement, also to ensure wagon's dynamic properties and resistance against derailment.

The final assessment of strength of running gear, centre bolster, longitudinal tie rod and side beams of wagon frame, tanks, restraints of wagon braces is made based on results of calculation of fatigue strength.

The structure of the rolling stock must have spaces for jacking. Places for lifting and jacking shall be marked in accordance with Album of “Signs and inscriptions for 1520 mm gauge freight wagon fleet” No. 632-2011 PKB CV. The contact surface of the place for jacking must prevent sliding of jack heads.

There shall be estimated places for lifting of any rolling stock unit by cranes of jacks in case of wheel-set derailment, as well as a possibility to transport the unit with a stuck wheel-set.

Belarus:

Assessment of the strength of unit is being performed in accordance with norms for calculation and design of vehicles, GOST R 53076-2008 (indicative), GOST 33211-2014 Freight wagons. Requirements for strength and dynamic properties.

The structure of the rolling stock must have spaces for jacking. The contact surface of the place for jacking must prevent sliding of jack heads.

There shall be estimated places for lifting of any rolling stock unit by cranes of jacks in case of wheel-set derailment, as well as a possibility to transport the unit with a stuck wheel-set.

Latvia, Lithuania:

"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996) are used to identify strength of a unit.

Ukraine:

Assessment of the strength of unit is being performed in accordance with Norms for calculation and design of unpowered new or renewed vehicles for 1520 mm railway network (VNIIV-VNIIZT, M.,1983)

Moldova, Ukraine:

The structure of the rolling stock must have spaces for jacking. The contact surface of the place for jacking must prevent sliding of jack heads.

There shall be estimated places for lifting of any rolling stock unit by cranes of jacks in case of wheel-set derailment, as well as a possibility to transport the unit with a stuck wheel-set.

Poland:

TSI WAG requirements applicable

The aforementioned requirements are approved by the following documents:

Беларусь	Technical regulation of the Customs Union TR TS 001/2001 regarding safety of the railway rolling stock Art. 4, p. 62. Norms of calculations and design of unpowered railway vehicles of the 1520 mm network GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties” For information: GOST R 53076-2008 “Rail transport. Requirement for strength of carbody of the railway rolling stock”
Грузия	
Казахстан	Technical regulation of the Customs Union TR TS 001/2001 regarding safety of the railway rolling stock GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties”
Латвия	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)
Литва	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)
Молдова	GOST R 53076-2008 “Rail transport. Requirement for strength of carbody of the railway rolling stock”
Польша	TSI WAG
Россия	GOST R 53076-2008 “Rail transport. Requirement for strength of carbody of the railway rolling stock” GOST (draft) “Freight wagons and passenger coaches. Tests for strength and dynamic properties” (voted, under approval procedure) Technical regulation of the Customs Union TR TS 001/2001 regarding safety of the railway rolling stock
Словакия	TSI WAG
Украина	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1983) For information: GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties” GOST (draft) “Freight wagons and passenger coaches. Tests for strength and dynamic properties” (voted, under approval procedure)

4.2.2.3. Integrity of the unit / Целостность конструкции единицы ПС

The unit shall be designed so that all movable parts intended to close an aperture (access doors, tarpaulin, lids, hatches, etc.) are prevented against an unintentional movement of these parts.

Locking devices shall indicate their status (open/closed) and shall be visible outside the unit.

Russia:

GOST (draft) “Box wagons. General technical conditions”.

GOST (draft) “Flat wagons. General technical conditions”.

GOST (draft) “Open wagons. General technical conditions”.

GOST (draft) “Dump wagons. General technical conditions”.

GOST (draft) “Open hopper wagons for bulk freight transportation. General technical conditions”.

GOST 30243.3-2015 “Covered hopper wagons for bulk freight transportation. General technical conditions”.

GOST 30243.2-2015 “Covered hopper wagons for cement transportation. General technical conditions”.

GOST (draft) “Tank wagons. General technical conditions”.

GOST (draft) “Isothermical wagons. Safety requirements and test methods for heating-performance”.

GOST 33520-2015. “Transporter wagons. General technical conditions”.

Cargo safekeeping requirements while loading/unloading works are set out in GOST 22235-2010 “Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safekeeping during loading, unloading and shunting works”.

Load affecting the wagon and its elements while loading/unloading and shunting works must comply with norms for calculations and design of wagons.

Belarus, Moldova:

Requirements are set out in GOST 22235-2010 “Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safekeeping during loading, unloading and shunting works”.

Loads affecting wagons and their elements during loading, unloading and shunting must comply with norms for calculations and design of wagons.

Kazakhstan:

Requirements for locking devices (doors, tents, hoods, latches etc.) regarding an unintentional movement are set out in design documentation of the manufacturer.

Latvia, Lithuania, Poland:

TSI requirements applicable

Ukraine:

Loads affecting wagons and their elements during loading, unloading and shunting must comply with "Norms for calculation and design of unpowered new or renewed vehicles for 1520 mm railway network" (VNIIV-VNIIZT, M., 1983).

Requirements are set out in GOST 22235-76 "Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safe-keeping during loading-unloading and shunting works".

The aforementioned requirements are approved by the following documents:

Belarus	GOST 22235-2010 "Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safekeeping during loading, unloading and shunting works" Norms for calculation and design of unpowered new or renewed vehicles for 1520 mm railway network
Georgia	
Kazakhstan	Manufacturer's design documentation
Latvia	TSI WAG
Lithuania	TSI WAG
Moldova	GOST 22235-2010 "Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safekeeping during loading, unloading and shunting works" "Norms for calculation and design of unpowered new or renewed vehicles for 1520 mm railway network"
Poland	TSI WAG
Russia	GOST 22235-2010 "Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safekeeping during loading, unloading and shunting works" GOST (draft) "Freight wagons and passenger coaches. Tests for strength and dynamic properties (voted, under approval procedure)" GOST (draft) "Box wagons. General technical conditions"

	GOST (draft) “Flat wagons. General technical conditions” GOST (draft) “Dump wagons. General technical conditions” GOST (draft) “Open wagons. General technical conditions” GOST (draft) “Open 1520 mm track gauge hopper wagons for bulk freight transportation. General technical conditions” GOST 30243.3-2015 “Covered hopper wagons for bulk freight transportation. General technical conditions” GOST 30243.2-2015 “Covered hopper wagons for cement transportation. General technical conditions” GOST (draft) “Tank wagons. General technical conditions” GOST (draft) “Isothermical wagons. Safety requirements and test methods for heating-performance” GOST 33520-2015 “Transporter wagons. General technical conditions”
Slovakia	TSI WAG
Ukraine	GOST 22235-76 “Freight wagons of 1520 mm track gauge trunk railway lines. General requirements for freight safekeeping during loading, unloading and shunting works” “Norms for calculation and design of unpowered new or renewed vehicles for 1520 mm railway network” (VNIIV-VNIIZhT.M.1983) For information: GOST (draft) “Freight wagons and passenger coaches. Tests for strength and dynamic properties (voted, under approval procedure)” GOST (draft) “Box wagons. General technical conditions” GOST (draft) “Flat wagons. General technical conditions”

4.2.3. Gauging and track interaction / Габарит и воздействие на путь

4.2.3.1. Gauging / Габарит

This point concerns the rules for calculation intended for sizing the rolling stock to run on one or several networks without interference risk.

The compliance of a unit with the intended reference profile including the reference profile for the lower part shall be established by one of the methods set out in EN 15273-2:2009.

The kinematic method, as described in EN 15273-2:2009 shall be used to establish conformity, if any, between the reference profile established for the unit and the respective

target reference profiles G1, GA, GB and GC including those used for the lower part GIC1 and GIC2.

Russia, Kazakhstan:

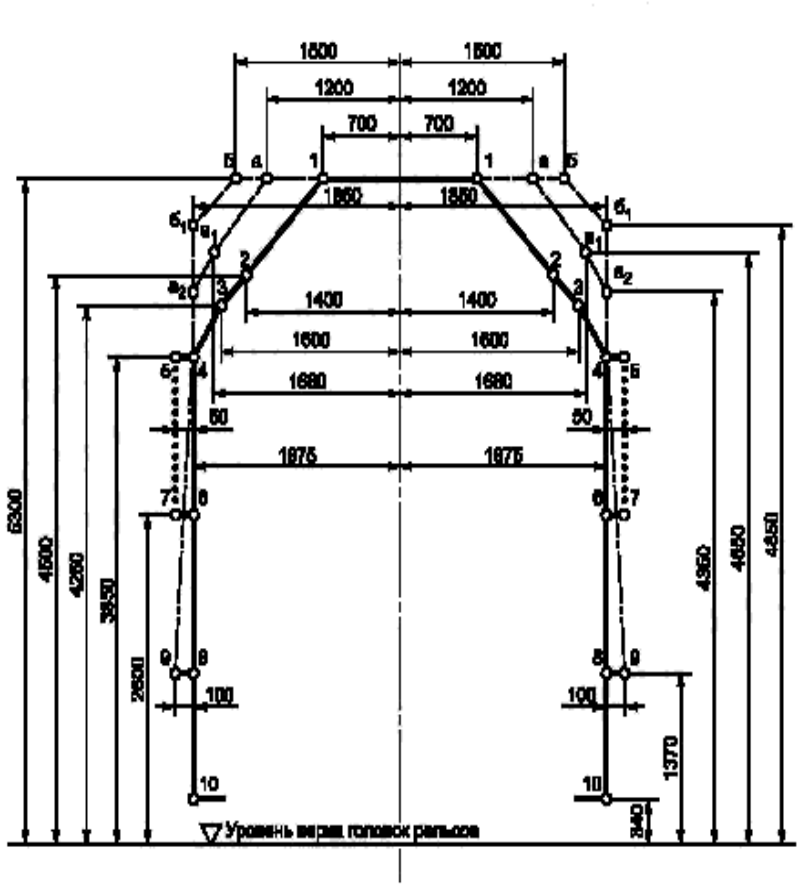
Calculations and design of structural clearance between constructions and rolling stock must comply with GOST 9238-2013 Railway rolling stock gauge and structural clearance of constructions.

Table 2. Legend and scope of application of rolling stock gauge:

Legend	Scope of application of rolling stock gauge
T	Static gauge for rolling stock admitted for circulation on public and non-public tracks of 1520 mm track gauge electrified railway lines as well as on other sections with structures and facilities which meet requirements of clearance gauges S and S_p
Тц (Tc)	Static gauge for tank wagons, dump wagons and other rolling stock admitted for circulation on public and non-public railway tracks provided that structures and facilities comply with reference contour to allow transit of wagons with T_c and T_{pr} gauge
Тпр (Tpr)	Static gauge for railway rolling stock admitted for circulation on main tracks of sections and stations as well as on other railway tracks where structures, facilities and intertrack areas comply with the reference contour indicated in GOST 9238-2013 (Annex G) or has a technological off-gauge properties
1-T	Static gauge for railway rolling stock admitted for circulation on all public and non-public railway tracks, external and internal tracks of production and transport enterprices of CIS countries and Georgia, Latvia, Lithuania, Estonia
1-BM (0-T) **(1-VM (0-T)**	Static gauge for railway rolling stock admitted for circulation on both 1520 mm and 1435 mm track gauge railway networks and used in international transportation in accordance with GOST 9238-2013 (Annex A)
0-BM (01-T) **(0-VM (01-T))**	Static gauge for railway rolling stock admitted for circulation on 1520 (1524) mm track gauge networks as well as on 1435 mm track gauge networks of International Union of Railways (UIC) with restrictions regarding separate sections in accordance with GOST 9238-2013 (Annex A)
02-BM (02-T) **(02-VM (02-T))**	Static gauge for railway rolling stock admitted for circulation on 1520 (1524) mm track gauge networks as well as on 1435 mm track gauge networks of Organisation for Cooperation of Railways (OSJD) with restrictions regarding separate sections in accordance with GOST 9238-2013 (Annex A)

03-ВМ (03-Т) **(03-VM (03-T))**	Static gauge for railway rolling stock admitted for circulation on all 1520 (1524) mm track gauge networks as well as on all 1435 mm track gauge networks of Europe and Asia countries for rolling stock admitted for circulation on all USSR 1520 (1524) mm track gauge railway network and all 1435 mm networks of European and Asian countries
03-ВМ$_k$	Kinematic gauge for railway rolling stock admitted for circulation on all 1520 (1524) mm track gauge networks as well as on all 1435 mm track gauge networks of Europe and Asia countries
ГЦ (GC)	Kinematic gauge for railway rolling stock set out as reference to achieve gauge compatibility within Trans-European high speed railway system
ГЦ$_{ru}$ (GC$_{ru}$)	Kinematic gauge for high-speed railway rolling stock for 1520 mm track gauge harmonised with GC gauge of the Trans-European high speed railway system

Gauge schemes

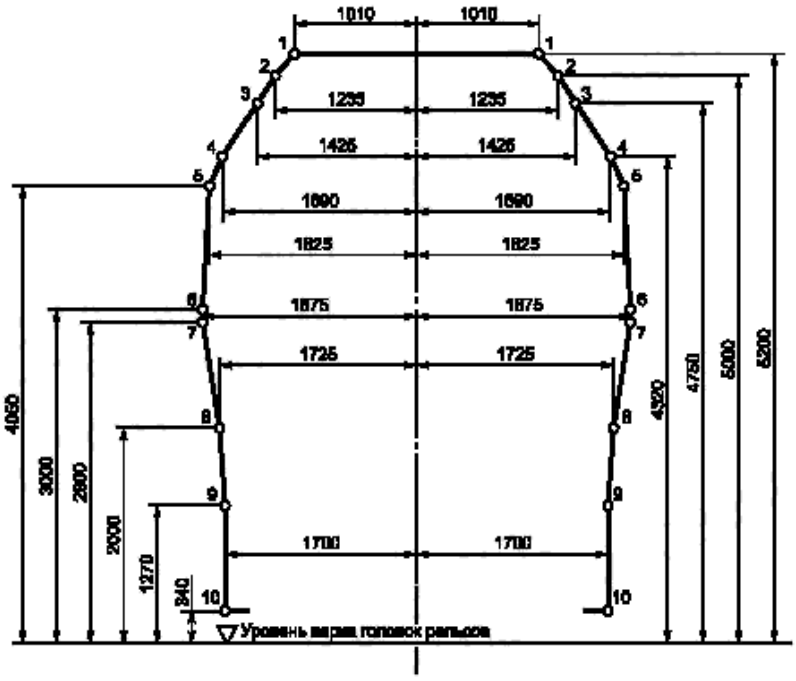


- - - - - - for rear-view equipment and mirrors only

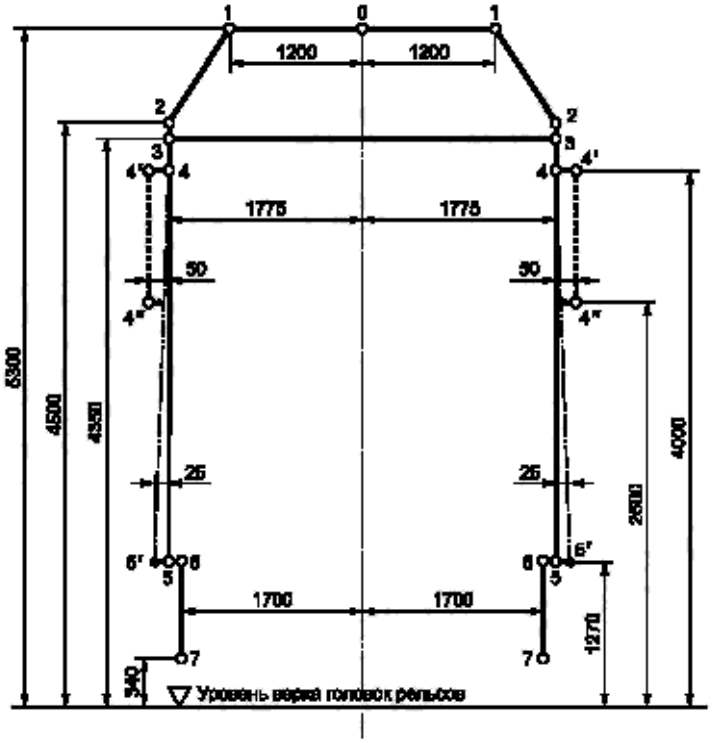
___ _ ___ - for appendaging parts: handrails, armrests, waterflow divertors, paravans etc. Open paravans shall match contours of signalling devices.

___ ___ ___ - contour used if agreed with infrastructure owner (manager)

Picture 3. Scheme of the Static Gauge T



Picture 4. Scheme of the Static Gauge T_c

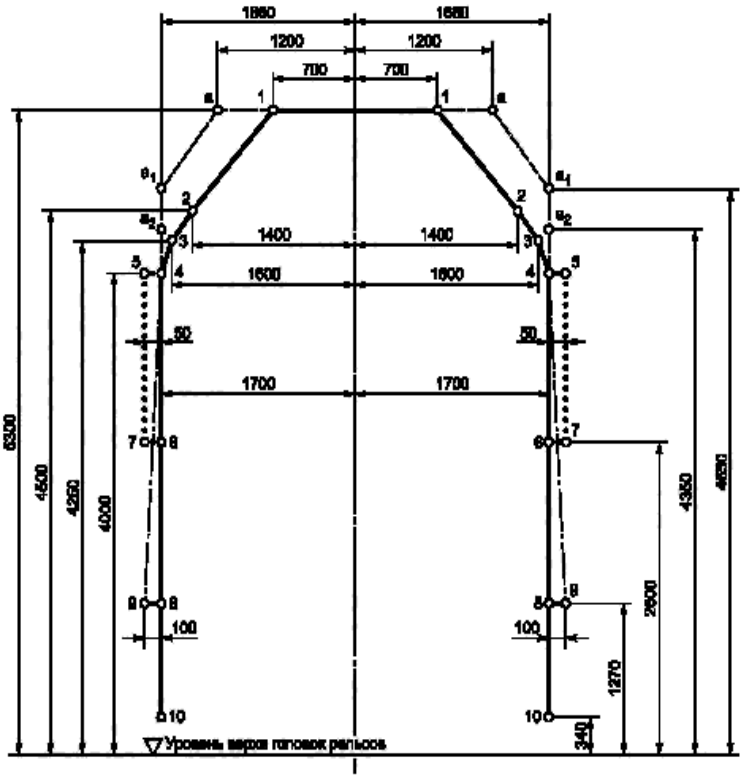


- - - - - - for rear-view equipment and mirrors

___ _ ___ - for armrests

Note: gauge contour lines 5-6-7 applies to rolling stock designed after entry into force of the standard GOST 9238-2013. In this case rolling stock width at the limits of points 5-7 shall not exceed 3250 mm.

Picture 5. Scheme of the Static Gauge T_{pr}

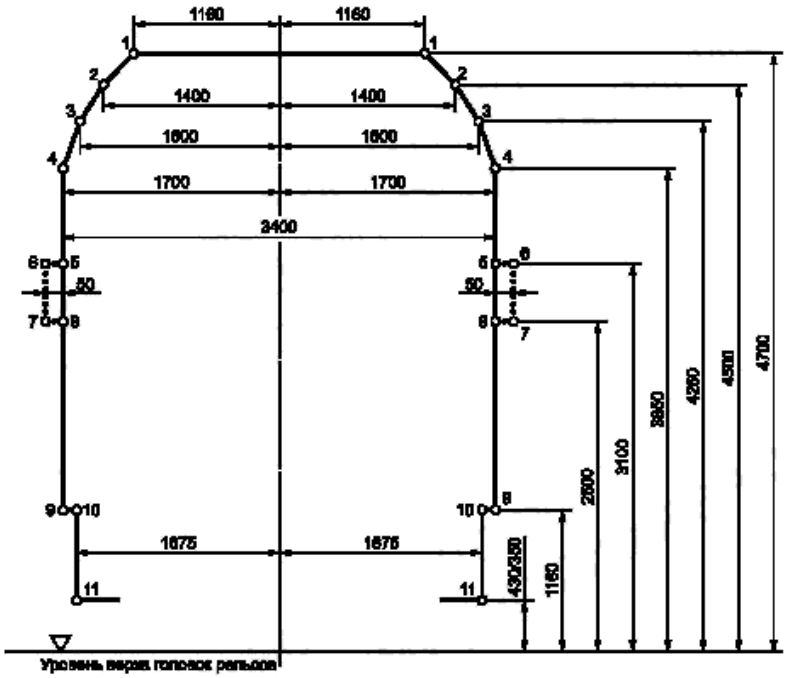


- - - - - only for signalling devices, rear-view mirrors in any position

___ _ ___ - for appendaging parts: handrails, armrests, waterflow divertors, paravans etc. Open paravans shall match contours of signalling devices.

___ ___ ___ - contour used if agreed with infrastructure owner (manager)

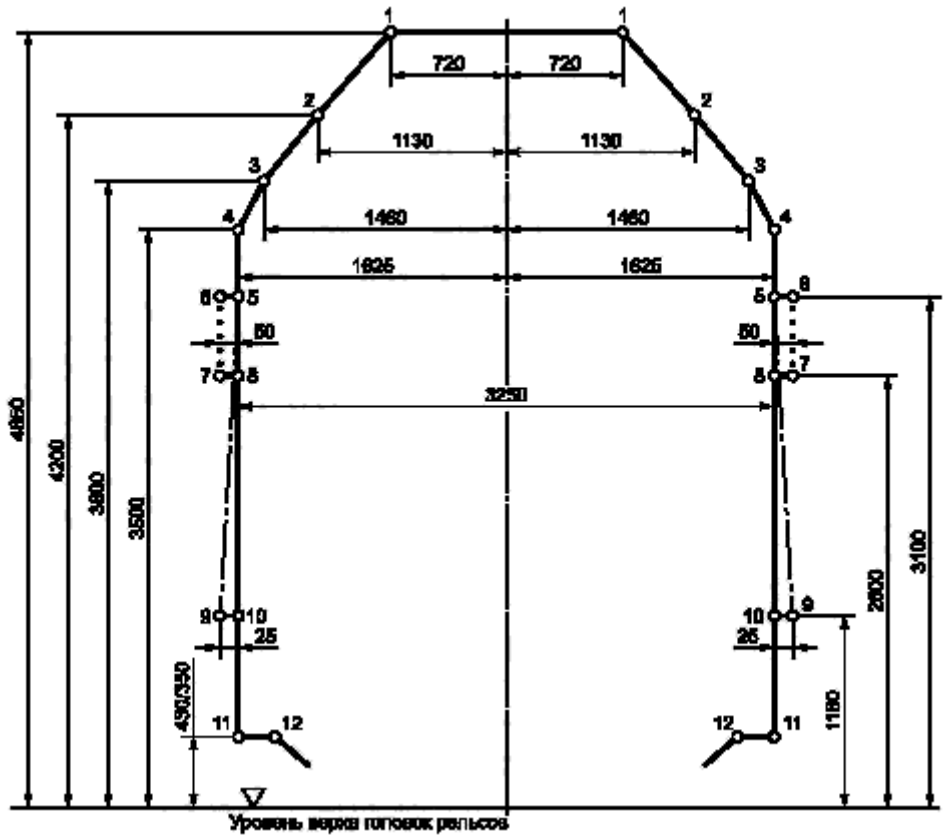
Picture 6. Scheme of the Static Gauge 1-T



Dimensions in decimals: in numerator – for railway rolling stock designed for international transportation, in denominator – for 1520 mm track gauge only

- - - - - - for signalling devices only

Picture 7. Scheme of the Static Gauge 1-VM

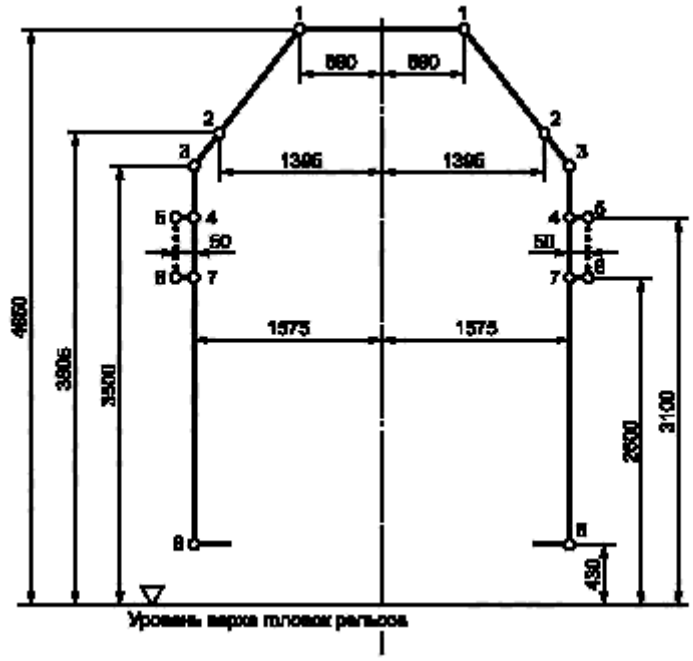


Dimensions in decimals: in numerator – for railway rolling stock designed for international transportation, in denominator – for 1520 mm track gauge only

- - - - - - for signalling devices only

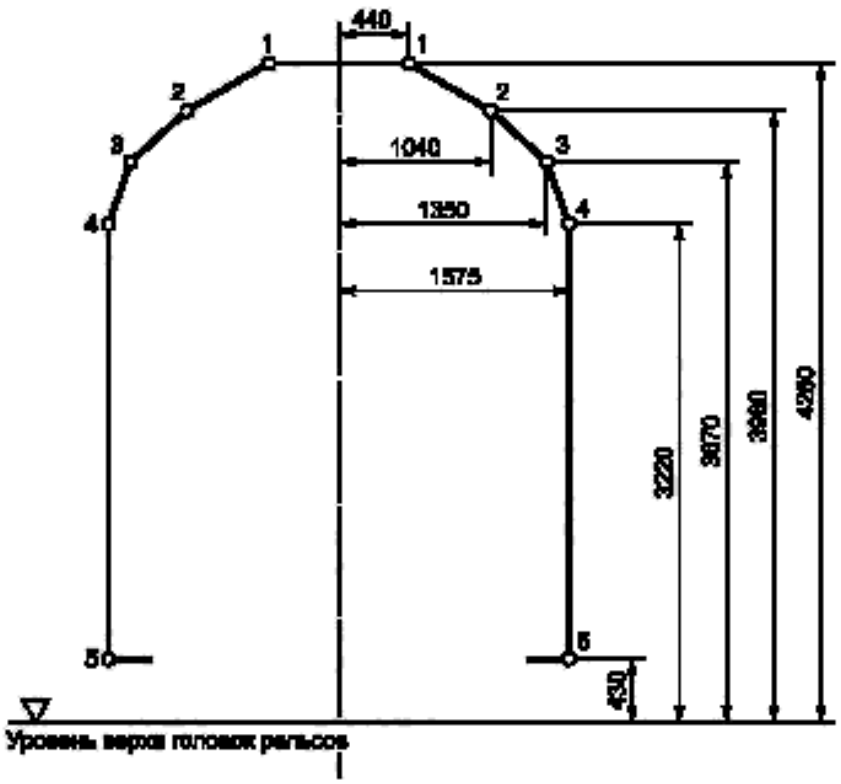
____ _ ____ - expansion of gauge for wagons produced before entry into force of GOST 9238-2013

Picture 8. Scheme of the Static Gauge 0-VM

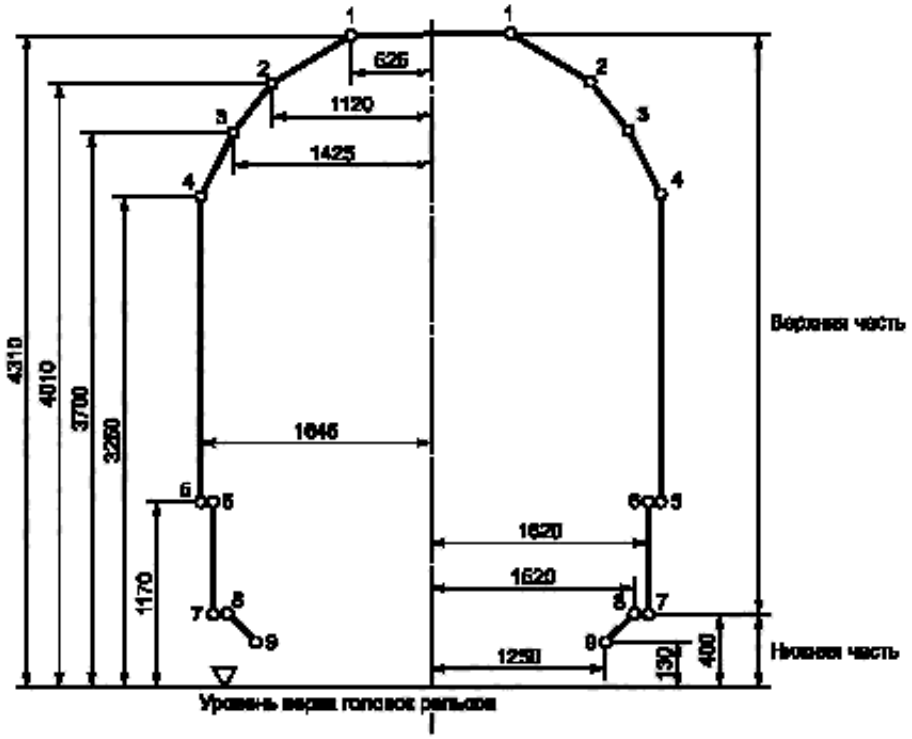


- - - - - - for signalling devices only

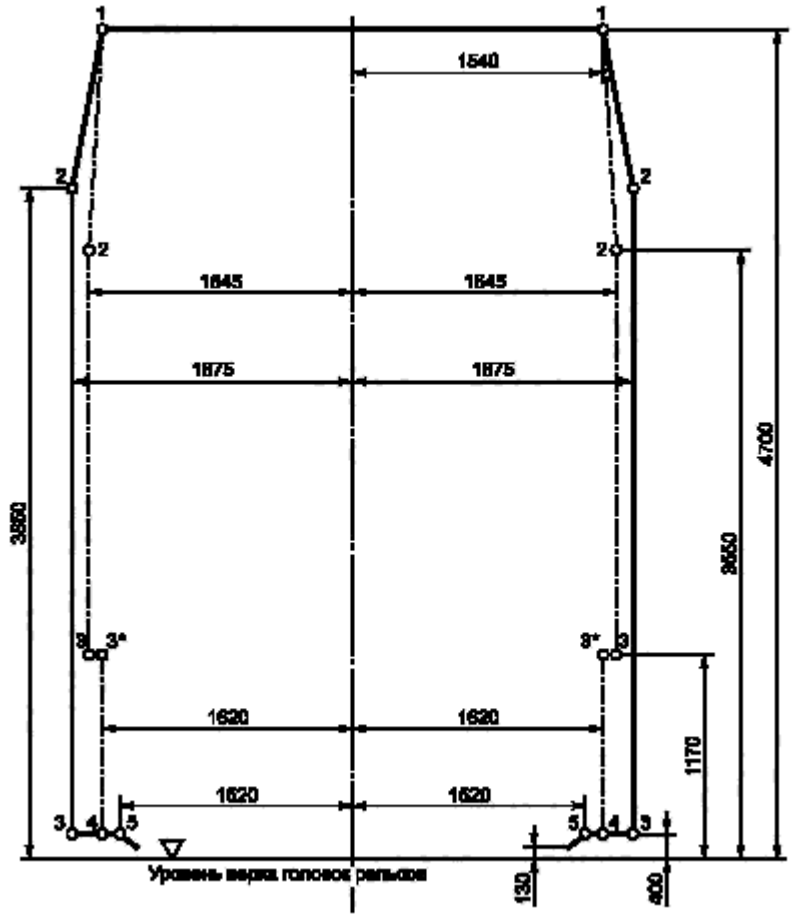
Picture 9. Scheme of the Static Gauge 02-VM



Picture 10. Scheme of the Static Gauge 03-VM_{st}



Picture 11. Scheme of the kinematic Gauge 03-VM_k



___ _ ___ - initial contour of GC gauge for 1435 mm track gauge high-speed Transeuropean railway lines

_____ - kinematic rolling stock gauge GC_{ru} for 1520 mm track gauge high-speed lines

Picture 12. Scheme of the gauge GC and harmonised gauge GC_{ru}

Belarus, Moldova:

Calculations and design of structural clearance between constructions and rolling stock must be in compliance with GOST 9238-83 “Structural clearance of constructions and rolling stock of 1520 (1524) mm track gauge” (under revision).

Latvia:

Gauge requirements - LVS 282:2013 “Structural gauge and clearance of the railway rolling stock”.

Lithuania:

Gauge requirements – 163/K “Structural gauge and clearance of the railway rolling stock”.

Ukraine:

Calculation and design are being made in accordance with DSTU B V.2.3-29 “Structural clearance of constructions and rolling stock of 1520 (1524) mm track gauge” (GOST 9238-83, MOD)

Poland:
TSI WAG requirements applicable

The aforementioned requirements are approved by the following documents:

Беларусь	GOST 9238-83 “Structural clearance of constructions and rolling stock of 1520 (1524) mm track gauge”
Грузия	
Казахстан	GOST 9238-2013 “Structural clearance of constructions and rolling stock”
Латвия	LVS 282:2013 “Structural clearance of constructions and rolling stock”
Литва	Rules for application of structural gauges 163/K (in accordance with GOST 9238-83, 1986)
Молдова	GOST 9238-83 “Structural clearance of constructions and rolling stock of 1520 (1524) mm track gauge” Informative: OSJD leaflet O-500 “General rules on gauges for rolling stock in interoperable international traffic”
Польша	TSI WAG
Россия	GOST 9238-2013 “Structural clearance of constructions and rolling stock”
Словакия	TSI WAG
Украина	DSTU B V.2.3-29:2011 “Structural clearance of constructions and rolling stock of 1520 (1524) mm track gauge” (GOST 9238-83, MOD) Informative: OSJD leaflet O-500 “General rules on gauges for rolling stock in interoperable international traffic”

4.2.3.2. Compatibility with load carrying capacity of lines / Совместимость с грузопропускной способностью линий

The vertical loading characteristics of the unit shall be determined in order to check compatibility with the load carrying capacity of lines.

The permissible payload a unit may carry, for axle loads up to and including 25t, shall be determined by application of clauses 6.1 and 6.2 of EN 15528:2008.

Belarus, Russia, Latvia, Lithuania, Kazakhstan, Moldova:

Railway rolling stock and its parts shall ensure:

- compliance with railway rolling stock gauge;
- technical compatibility with railway infrastructure;
- non-exceedance of loads per unit length, permissible track load forces, design axle loads;
- compliance with maximum permissible traction forces and rates of acceleration.

Ukraine:

Maximum static load of a wheel-set to rail shall not exceed norms set out in DSTU GOST 4835:2008 "Wheelsets of 1520 (1524) railway trunk-lines wagons. Technical conditions" (GOST 4835-2006, IDT)

Poland:

TSI WAG requirements applicable

The aforementioned requirements are approved by the following documents:

Belarus	GOST 22235-2010 "Freight wagons for 1520 mm gauge main line railways. General requirements for safety in loading-unloading and shunting operations" GOST 4835-2006 "Car wheelsets of 1520 mm gauge mainline railways. Specifications"
Georgia	
Kazakhstan	Technical regulation of the Customs Union TR TS 001/2001 regarding safety of the railway rolling stock (Art. 4, p. 5)
Latvia	TOR Latvia
Lithuania	TOR Lithuania
Moldova	GOST R 55050-2012 "Railway rolling stock. Permissible exposure norms to the railway track and test methods" GOST 4835-2006 "Car wheelsets of 1520 mm gauge mainline railways. Specifications"

Poland	TSI WAG
Russia	GOST R 55050-2012 “Railway rolling stock. Permissible exposure norms to the railway track and test methods” GOST R 55050-2012 “Railway rolling stock. Permissible exposure norms to the railway track and test methods”
Slovakia	TSI WAG
Ukraine	DSTU GOST 4835:2008 “Wheelsets of 1520 (1524) railway trunk-lines wagons. Technical conditions” (GOST 4835-2006, IDT)

4.2.3.3. Compatibility with train detection systems / Совместимость с системами обнаружения поезда

If the unit is intended to be compatible with one or more of the following train detection systems, this compatibility shall be established according to the provisions of the Commission Decision 2012/88/EU[1].

(a) Train detection systems based on track circuits.

(b) Train detection systems based on axle counters.

(c) Train detection systems based on loop equipment.

Russia:

Track vacancy control systems are used.

Belarus, Kazakhstan, Moldova, Russia:

In 1520 mm network the following train detection systems are used:

(a) Train detection systems based on track circuits.
(b) Train detection systems based on axle counters.

Automatic equipment to control technical condition of moving train comprise of stationary detection systems to identify certain malfunctions of rolling stock. These systems are additional measures to increase railway traffic safety level.

Trackside control equipment is being installed directly on tracks to read data from the rolling stock.

Latvia, Lithuania, Poland:

TSI requirements applicable.

[1] OJ L 51, 23.2.2012, p. 1. (p. 1 Official Journal No.51 of 23.2.2012)

The aforementioned requirements are approved by the following documents:

Belarus	Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train No. CV-CSh-453 Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50
Georgia	
Kazakhstan	CV-CSh/717-13 Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50
Latvia	TSI WAG
Lithuania	TSI WAG
Moldova	Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train No. CV-CSh-4712 Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50
Poland	TSI WAG
Russia	TOR Russia “Rules for installation, placing into service, technical maintenance and repair of rolling stock derailment control means” No. CV-CSh – 929 of 30.12.2012г Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50
Slovakia	TSI WAG
Ukraine	

4.2.3.4. Axle bearing condition monitoring / Контроль состояния буксового узла

It shall be possible to monitor the axle bearing condition either by

– line side detection equipment or

– on-board equipment.

If the unit is intended to be capable of being monitored by line side equipment on the 1435 mm track gauge network the unit shall be compliant with clauses 5.1 and 5.2 of EN 15437-1:2009 in order to ensure sufficient visibility.

For units intended to be operated on the networks with track gauges of 1524 mm, 1600 mm, 1668 mm, the corresponding values in table 3 referring to the parameters of the standard EN 15437-1:2009 shall be applied.

Table 3

Target and prohibitive zone for units intended to be operated on particular networks

	Y_{TA} [mm]	**W_{TA} [mm]**	**L_{TA} [mm]**	**Y_{PZ} [mm]**	**W_{PZ} [mm]**	**L_{PZ} [mm]**
1524 mm **(both areas are relevant)**	1080±35	≥50	≥200	1080±5	≥140	≥500
	894±2	≥14	≥200	894±2	≥28	≥500
1600 mm	1110±2	≥70	≥180	1110±2	≥125	≥500
1668 mm	1176±10	≥55	≥100	1176±10	≥110	≥500

The specifications of the design and the conformity assessment of on-board equipment is an open point in this TSI.

Russia:

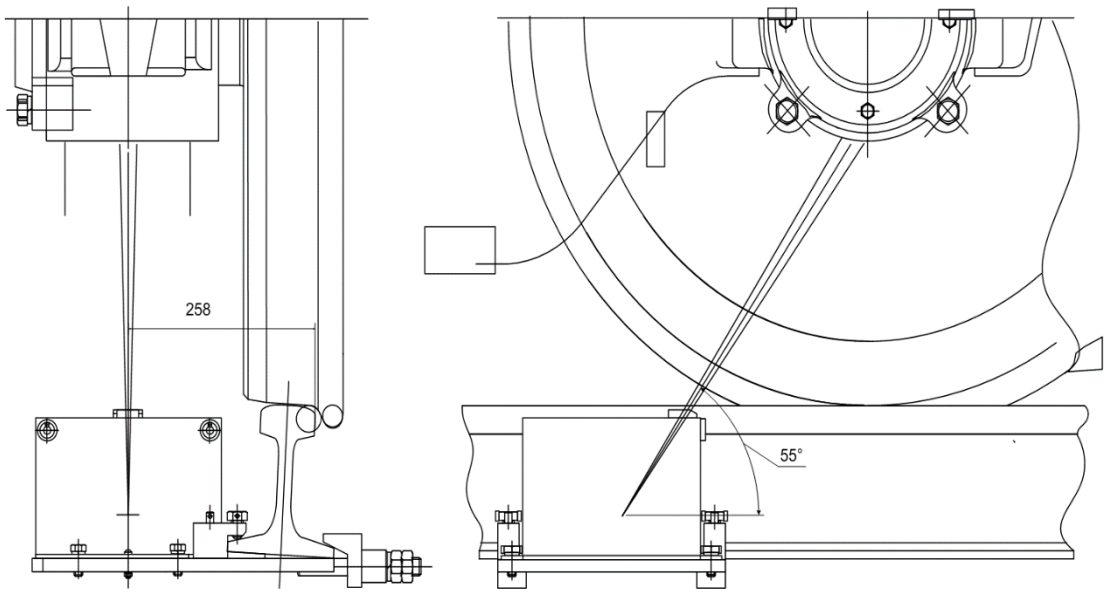
1. Maximum temperature of upper part of axle box and of the adapter shall not exceed 60ºC regardless of the ambient temperature.

2. KTSM-02 devices are used to monitor axle box warm-up.
Lower part of the axle box is being scanned at distance of 260 mm from interior edge of the railhead.
The following alarm system criteria are used:
- difference of temperature of axles-bearings of the same axle;
- absolute temperature of an axle-bearing to trigger “Alarm level 2” is 100º C.

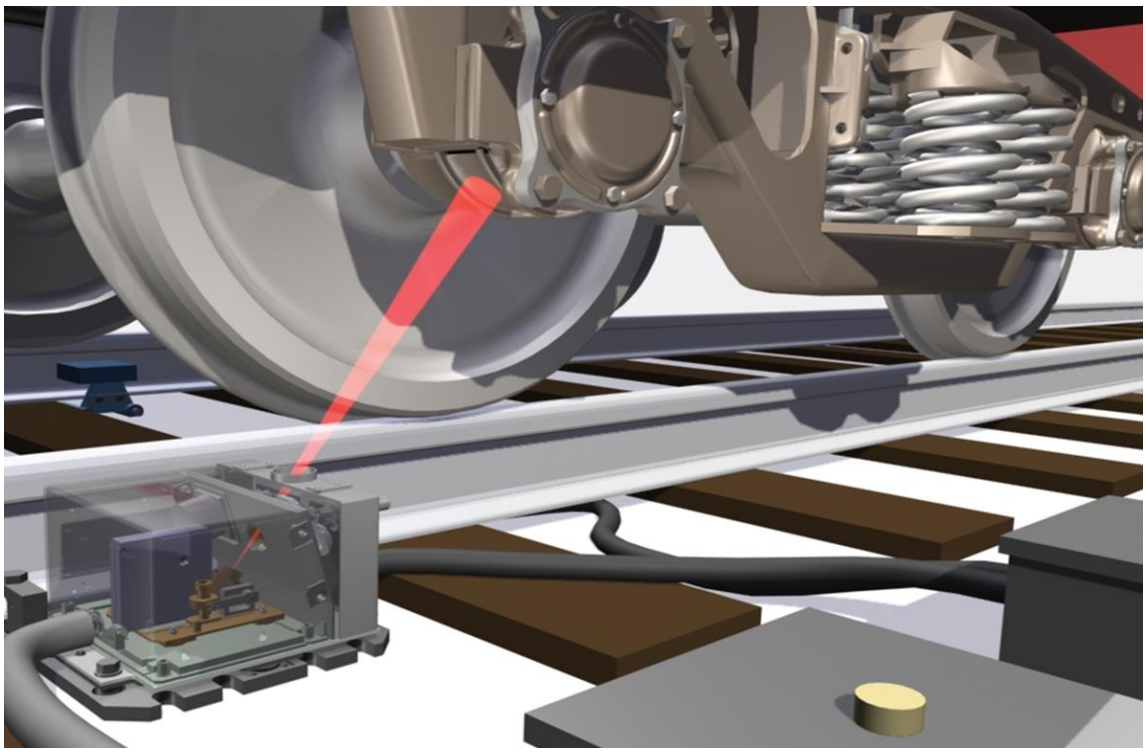
Threshold alarm values for KTSM-02 equipment are set in accordance to the Instructions 13.08.2013 №ISH-13159.

Table 4.

Alert type	*Temperature value in C°*					
	Pass. trains	Locomotives	*Freight train*			
			Transition station	High level tuning	Low level tuning	Basic maintenance rules
	Difference of temperatures of axle boxes of the same axle (Raxle)					
Alarm 0	–	28	28	28	25	20
Alarm 1	–	36	36	40	33	36
Alarm 2	–	40	40	44	40	40
	Relative axle box temperature (dTb)					
Alarm 0	60	50	50	50	50	50
Alarm 1	70	60	60	60	60	60
Alarm 2	80	70	70	70	70	70
	Absolute temperature (Tb)					
Alarm 2	100	100	100	100	100	100



Picture 13. “KMH-05 camera. Design drawing IN7.360.000.000.000MCh» (part of design documentation)



Picture 14. Orientation of KTSM-02 infrared trackside cameras

Belarus, Moldova:

Rolling stock control is performed according to company standard STP 09150.19.091-2008 using KTSM-01(01D), KTSM-02 equipment. All the equipment are connected to a centralised automatic rolling stock control system (ASK PS).

The following alarm criteria are applied when using KTSM-02:

- defference of temperatures of the axle boxes of the same axle;
- termerature difference on on side;
  - relative axle box temperature, i.e. axle box temperature disregarding outside air temperature;
  - absolute axle box temperature.

Latvia:

FUES devices are used to contrl axle box heating.

Maximum temperature of upper part of an axle box shall not exceed 50^{o} C notwithstanding ambient temperature.

Controlled range of train speeds – from 3 km/h to 400 km/h

Maximum axles measuring capacity – up to 1000

Diameter of controlled wheels – 250 – 2100 mm

Heated axle-boxes geometry:

Measuring zone center – 975 mm from track center

Distance to object – 430 mm above rail

Measuring beam diameter – 15-20 mm (depending on distance to object)

Measuring line width – 40-60 mm (depending on distance to object)

Measuring angle - 90^{o}

Kazakhstan:

In the territory of the Republic of Kazakhstan heating control systems (HCS) ape based on infrared emission of rolling stock parts are used to prevent heating of wheel-set axles boxes.

Depending on configuration rolling stock HCS may include the following subsystems:

- axle box heat control;
- stacked wheel-sets detection;
- drawn parts detection;
- wheel defects detection.

HCS must be supplemented by information centralisation systems (automatic central control systems).

The basic subsystem is axle box heat control.

Subsystems of HCS are being applied autonomously or in complexity in every HCS installation point.

Axle box heat control subsystem ensures detection of the axle box heat level (temperature) using infrared emission showing technical condition of axle bearers, information processing and detection of axle box malfunctions using certain criteria. Axle box heat signals "Alarm-0", "Alarm -1" or "Alarm-2" are being generated accordingly.

Moldova:

Technical maintenance of wheel-set with axle-boxes is done in accordance with Instructions for technical maintenance for wagons in operation.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.19.091-2008 "Means of automatic control of technical condition of rolling stock in a moving train. Deployment, installation and operation" CV-CL-408 "Instruction for technical maintenance of wagons in operation" Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway

	Transport Council. Protocol of 21-22 May 2009, No. 50 Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Georgia	
Kazakhstan	Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50 Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 "Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines", approved by the CIS Railway Transport Council. Protocol of 16-17 October 2012, No. 57 Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train No. CV-CSh/717-13
Latvia	LDZ Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train No. No. D-3/26-2011 of 20.01.2011.
Lithuania	LG Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train No I-922 of 25.11.2011.
Moldova	CV-CL-408 "Instructions for technical maintenance of wagons in operation"
Poland	
Russia	Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50 Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines, approved by the CIS Railway Transport Council. Protocol of 16-17 October 2012, No. 57 Instructions for deployment, installation and operation of means for automatic control of technical condition of rolling stock in a moving train No. CV-CSh– 929, approved 30.12.2012.
Slovakia	TSI WAG
Ukraine	

4.2.3.5. Running safety / Безопасность движения

The dynamic behaviour of a vehicle has a strong influence on safety against derailment, running safety and track loading.

Belarus, Kazakhstan, Russia:

Strength, resilence and technical condition of railway rolling stock and its elements must ensure safe train running with maximum speeds with tolerated limits.
Railway rolling stock and its elements must ensure:
a) maintenance of gauge and clearance of the rolling stock;
b) fulfilling operation conditions relevant to external climatic and mechanical impacts;
c) technical interoperability with rail transport iinfrastructure, other rolling stock operated in the same infrastructure;
d) reliability against derailment;
e) reliability against roll overs on a curve track;
f) reliability against spontaneous departure from the parking place;
g) coupling within a train to transmit dynamic forces in traction and braking modes;
h) allowed braking distance;
i) non-exeedance of maximum loads per unit length on railway tracks, estimated axle loads;
j) prevention of falling of rolling stock elements on tracks;
k) compliance with maximum allowed traction and braking forces, and maximum acceleration;
l) sanitary and ecological safety;
m) electromagnetic compatibility of electronic equipment with regard to safe operation of devices and equipment;
n) electromagnetic compatibility of electronic equipment with automatic and telemechanic, electric communication equipment of railway infrastructure;
o) fire safety requirements;
p) strength while maximum allowed loads and effects;
q) absence of plastic deformations from estimated longitudinal and vertical dynamic loads;
r) resistance to fatique while low-cycle and high-cycle modes of loading;
s) safety and reliability of electric equipment in all ranges of operation (when nominal and marginal ranges of electric supply);
t) structural safety of freight wagons, mail and luggage coaches while mechanical loading/unloading;
u) coupling of wagons while shunting using hump and/or moving along ferry ramped exit;
v) absence of abnormal contact between elements of rolling stock or with elements of infrastructure (unanticipated by design documentation);
w) coupling of rolling stock on curved tracks, possibility to run coupled or single wagons on non-public tracks;
x) compliance with requirements for energy efficience.

Latvia, Lithuania, Moldova, Poland:

TSI requirements applicable

Ukraine:

Strength, resilence and technical condition of railway rolling stock and its elements must ensure safe train running with maximum speeds with tolerated limits set out by norms for calculation and design of unpowered new and renewed vehicles for 1520 mm railway network (VNIIV-VNIIZT, M.,1983).

The aforementioned requirements are approved by the following documents:

Belarus	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Georgia	
Kazakhstan	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Latvia	TSI WAG
Lithuania	TSI WAG
Moldova	
Poland	TSI WAG
Russia	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Slovakia	TSI WAG
Ukraine	Norms of calculations and design of new and upgraded unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1983)

4.2.3.5.1. Safety against derailment running on twisted track / Устойчивость к сходу с рельсов при движении по переходным кривым и по пути с отклонениями в пределах допуска содержания пути

The unit shall be designed to ensure safe running on twisted track, taking into account specifically the transition phase between canted and level track and cross level deviations.

The demonstration of conformity is described in point 6.2.2.2.

Russia:

Lateral load is perpendicular to longitudinal axis of wagon centreline and induced by centrifuginal force, wind pressure force and dynamic track-wagon interaction forces in horizontal plane. (Ch. IV "Wagons", Handbook for railways high education institutions by L.Shadur)

Longitudinal loads on a wagon consist of tensile and compression forces resulted from interaction between coupled wagons or locomotive while train running or shunting, as well as from longitudinal enertia forces (Ch. IV "Wagons", Handbook for railways high education institutions by L.Shadur).

Maximum rolling stock moving speeds are being identified considering dynamic indicators, strength of metalwork, impact on a track, acceleration on curved track, protection against wheel derailment and braking performance.

Stability against centrifuginal forces is tested using a test case where a combination of high lateral force from the leading wheel interaction with a track and low vertical force apllied on that wheel during emergency braking of a train on a curve track in accordance with p. 5.2. of GOST (draft) Freight wagons. Requirements for strength and dynamic properties.

Stability of wagon against centrifugal forces on curved track is defined according to in points 5.2.1 – 5.2.3 of GOST 33211-2014 Freight wagons. Requirements for strength and dynamic properties.

Stability against centrifugal forces is being assessed according to derailments stability coefficient defined in points 5.2.1 – 5.2.3 of GOST 33211-2014 Freight wagons. Requirements for strength and dynamic properties. Minimum allowed coefficient is 1,2.

In accordance with points 5.3.1. – 5.3.3. of GOST 33211-2014 "Freight wagons. Requirements for strength and dynamic properties", stability of wagon against overturning on curved track is defined according to design methods of estimation of minimum wagon weight and freight load distribution schemes according to operation documentation.

Stability of wagon against overturning is assessed using margin stability coefficient defined according to GOST 33211-2014 "Freight wagons. Requirements for strength and dynamic properties".

When checking overturning on external side of the curve margin stability coefficient must be at least 1,3; when checking overturning on internal side of the curve – at least 1,2.

Requirements for automatic coupling and passing curved track section in coupled state are being accepted in accordance with points 8.2 – 8.5 of GOST 33211-2014 "Freight wagons. Requirements for strength and dynamic properties" also taking into account requirements point 6.1 of GOST 22235.

Kazakhstan:

All the elements of wagons regarding strength, stability and technical condition must ensure safe and smooth train running.

All the elements of railway track (roadbed, track structure and structures) must ensure safe and smooth train running with speeds defined for a given section.

Dislocation and technical equipment of track facility workshops must provide necessary track, structures and installations maintenance to ensure given volumes of railway traffic with predefined speeds.

With regard to curves radius, conjunction of straight lines and curves, slope gradients railway track must comply with a line design and profile.

Stations, sidings, passing stations must be installed on horisontal ground. In some cases they can be dislocated on slopes less that 0,0015, in difficult geographic conditions – not exceeding 0,0025.

In especially difficult conditions on all types of sidings and passing stations oro n longitudinally or half-longitudinally oriented stations where maneuvring, uncoupling of locomotive or wagons, train spulit are not provided, slopes of more than 0,0025 within the station are allowed. In case of extension of recieving departure tracks in existing stations slopes exceeding 0,0025 (max 0,010) are allowed if measures against spontaneous departure of vehicles or trains have been taken.

Stations, sidings, passing station, newly built or renewed recieving departure tracks, where maneuvring, uncoupling of locomotive or wagons, train spulit are provided, shall have longitudinial profile with roposite evelevations towards limiting switches and have to in compliance with design references.

Refuge sidings, protection switches, derailing slippers, derailing switch balades, derailing swithes and stationary fastening installation are used to prevent wagons from departure to other tracks, recieving departure lines.

Stations, įsidings, passing stations, certain depots and turnout tracks shall be located on straight track sections. In difficult conditions it is allowed to located on curves of radius at least 1500 m. In especially difficul geographic conditions curve radius can be reduced up to 600 m, in mountain conditions – up to 500 m.

Schemes and profiles of trunk line and station tracks as well as access tracks owned by the National infrastructure operator and track concession holder are subject to periodical instrumental checks.

Instrumental checks, technical documentation, stations schemes shall be produced by National infrastructure operator and track concession holder.

Latvia, Lithuania:

Requirements of stability against derailment "Norms of calculations and design of unpowered railway vehicles of the 1520 mm network”

Ukraine:

Maximum rolling stock moving speeds are being identified considering dynamic indicators, strength of metalwork, track load, acceleration on curved track, protection against wheel derailment.

Poland:

TSI WAG requirements applicable

Moldova:

Maximum train speeds are set out by the designated central public authority subject to track design and types of rolling stock.

The aforementioned requirements are approved by the following documents:

Belarus	TOR Belarus Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50 GOST 33211-2014 Freight wagons. Requirements for strength and dynamic properties
Georgia	
Kazakhstan	GOST 33211-2014 "Freight wagons. Requirements for strength and dynamic properties" TOR Kazakhstan, approved by the decision of the Government of the Republic of Kazakhstan No. 87 of 5/02/2013 (as amended on 12.11.2013 г.)
Latvia	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network
Lithuania	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1996)
Moldova	TOR Moldova aso f 12/05/2005 No. 90 Chapter XVII section 5
Poland	TSI WAG
Russia	TOR Russia Instructions for technical maintenance of wagons in operation (Instructions for examiners of wagons), approved by the CIS Railway Transport Council. Protocol of 21-22 May 2009, No. 50 GOST 33211-2014 Freight wagons. Requirements for strength and dynamic properties
Slovakia	TSI WAG
Ukraine	Norms of allowed moving speeds of rolling stock on 1520 mm railway tracks of Ukrainian state railway administration (approved by the order of UZ No. 778 of 14.12.2010 – Kiev, 2011) TOR Ukraine as amended by the order No. 179 of 19.03.2002)

4.2.3.5.2. Running dynamic behaviour / Параметры динамики движения

The unit shall be designed to provide safe movement up to the maximum design speed.

The running dynamic behaviour of a unit shall be proven either by

– following the procedures set out in Chapter 5 of EN 14363:2005, or

– performing simulations using a validated model.

The demonstration of conformity is described in point 6.2.2.3.

For units equipped with running gear assessed on interoperability constituent level in accordance with point 6.1.2.1, a specific test or simulation on subsystem level is not required.

Belarus, Kazakhstan, Russia:

Dynamic properties of the wagon and dynamic forces (dynamic loads) affecting wagon frame and bogie frame are defined in accordance with p. 5.1.1.-5.1.8. of GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties”. Conformity of dynamic properties is assessed in accordance with p. 7.1.1. – 7.1.8. of GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties”

Latvia, Lithuania:
Running dynamic behaviour requirements - "Norms of calculations and design of unpowered railway vehicles of the 1520 mm network (GosNIIV-VNIIZT, 1996).

Ukraine:

Running dynamic parameters must comply with norms for calculation and design of unpowered new and renewed vehicles for 1520 mm railway network (VNIIV-VNIIZT, M.,1983).

Moldova, Poland:

TSI WAG requirements applicable

The aforementioned requirements are approved by the following documents:

Belarus	Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011 GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties”
Georgia	
Kazakhstan	Technical Regulation of the Customs Union “On railway rolling stock

	safety" TR TS 001/2011 GOST 33211-2014 "Freight wagons. Requirements for strength and dynamic properties"
Latvia	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1996)
Lithuania	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1996)
Moldova	
Poland	TSI WAG
Russia	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 GOST (draft) "Freight wagons. Requirements for strength and dynamic properties"
Slovakia	TSI WAG
Ukraine	Norms of calculations and design of new and upgraded unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1983)

4.2.3.6 Running gear / Ходовая часть

The running gear guarantees to carry and guide the unit safely as well as to transmit braking forces where so required.

Belarus, Moldova:

Durability, stability and dynamic properties of the bogies must comply with requirements for calculations and design of unpowered railway vehicles of the 1520 mm network and other requirements coordinated with a customer.

Russia, Kazakhstan:

Technical requirements for bogies of freight wagons are set out in GOST 9246-2004 "Two-axle 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions".

Table 5. Main parameters and dimensions of the bogies

Title	Characteristics for bogies of various types				
	1	2	3	4	5
Maximum design static load, kN (ts)	196 (20)	230,5 (23,5)	245 (25)	265 (27)	294 (30)

Wagon design speed, km/h	140	120	120	100	90
Minimum design wagon weight, 10^3 kg	21	21	21	24	24
Bogie weight, max kg	5000	5000	5300	5500	6000
Bogie inscribe gauge according to GOST 9238	02-VM				
Bogie wheelbase, mm	1800-1890				
Dimensions of centre bowl: diameter, mm depth, mm	$280^{+2}{}_{+0.5}$ 28-33	$300^{+2.2}{}_{+0.5}$ 28-33	$350^{+2.5}{}_{+0.5}$ 31-37	$380^{+3}{}_{+0.5}$ 31-37	$400^{+3}{}_{+0.5}$ 38-42
pivot diameter, mm	50				
Distance between longitudinal axes of side bearings, mm	1524±6				

Design of the bogie must ensure wagon track load indicators set out in GOST R 55050-2012 «Railway rolling stock. Norms of allowed track load and testing methods".

Latvia, Lithuania, Poland:

TSI requirements applicable

Ukraine:

Strength, resilence, dynamic properties of the bogies must comply with norms for calculation and design of unpowered new and renewed vehicles for 1520 mm railway network (VNIIV-VNIIZT, M.,1983).

The aforementioned requirements are approved by the following documents:

Belarus	GOST 9246-2004 "Two-axle 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions"
Georgia	
Kazakhstan	GOST 9246-2013 "Two-axle 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions"

Latvia	TSI WAG
Lithuania	TSI WAG
Moldova	GOST 9246-2004 “Two-axle 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions”
Poland	TSI WAG
Russia	GOST 9246-2013 “Two-axle 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions” GOST R 55050-2012 “Railway rolling stock. Permissible exposure norms to the railway track and test methods”
Slovakia	TSI WAG
Ukraine	Norms of calculations and design of new and upgraded unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1983)

4.2.3.6.1. Structural design of bogie frame / Конструкция рамы тележки

The integrity of the structure of a bogie frame, all attached equipment and body to bogie connection shall be demonstrated based on methods as set out in point 6.2 of EN 13749:2011.

The demonstration of conformity is described in point 6.1.2.1.

Belarus, Moldova:

General design drawing of the bogie must include:

- central swing suspension, located on two side frames connected by the bolster;
- shock absorbers;
- wheel-sets with axle bearings;
- braking equipment.

Russia, Kazakhstan:

GOST 9246-2013 “Two-axles 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions”.

Freight wagons’ bogies – frameless two-axle 3 elements bogies. The bogie must interact with wagon body through centre bowl unit, side bearings and connecting elements of a braking equipment.

Technical conditions for casted parts of freight wagons’ bogies are set out in GOST 32400-2013 “Casted side frame and truck bolster for railway freight wagon bogies. Technical conditions”

Latvia, Lithuania:

"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network"

Ukraine:

Must comply with Norms of calculations and design of unpowered railway vehicles of the 1520 mm network and other requirements coordinated with a customer.

Poland:

For rolling stock 1520 does not specify requirements.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 9246-2004 "Two-axles 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions"
Georgia	
Kazakhstan	GOST 32400-2013 "Casted side frame and truck bolster for railway freight wagon bogies. Technical conditions" GOST 9246-2013 "Two-axles 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions"
Latvia	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1996)
Lithuania	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1996)
Moldova	GOST 9246-2004 "Two-axles 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions"
Poland	TSI WAG
Russia	GOST 32400-2013 "Casted side frame and truck bolster for railway freight wagon bogies. Technical conditions" GOST 9246-2013 "Two-axle 3 elements bogies for 1520 mm gauge line freight wagons. Technical conditions"
Slovakia	TSI WAG
Ukraine	Norms of calculations and design of new and upgraded unpowered railway vehicles of the 1520 mm network (GosNiiV-VNIIZT, 1983)

4.2.3.6.2. Characteristics of wheelsets / Характеристики колесных пар

The wheelset assembly shall be able to transmit forces and torque between the fitted parts in accordance with the area of use.

The geometric dimensions of the wheelsets, as defined in figure 1, shall be compliant with limit values specified in table 3. These limit values shall be taken as design values and shall be stated as in-service limit values in the maintenance file described in section 4.5.

The demonstration of conformity is described in point 6.1.2.2.

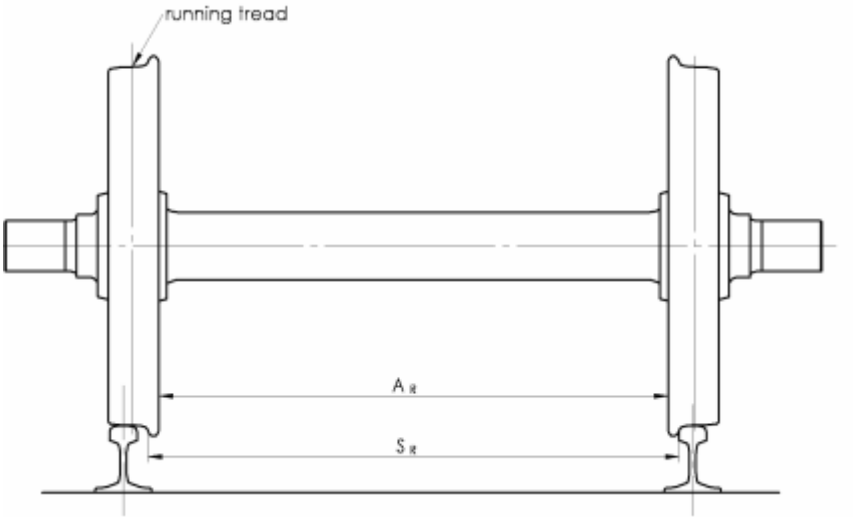


Figure 15. Symbols for wheelsets used in Table 6

Table 6. Limits of use of the geometric dimensions of wheelsets

Designation		**Wheel diam. /** D [mm]	**Minimum value /** [mm]	**Maximum value /** [mm]
1435 mm	Front-to-front dimension (S_R) $S_R = A_R+S_{d,left}+S_{d,\ right}$	$330 \leq D \leq 760$	1415	1426
		$760 < D \leq 840$	1412	1426
		$D > 840$	1410	1426
	Back to back distance / (A_R)	$330 \leq D \leq 760$	1359	1363

		760 < D ≤ 840	1358	1363
		D > 840	1357	1363
1524 mm	Front-to-front dimension / (S_R) $S_R = A_R+S_{d,left}+S_{d, right}$	400 ≤ D < 840	1492	1514
		D ≥ 840	1487	1514
	Back to back distance (A_R)	400 ≤ D < 840	1444	1448
		D ≥ 840	1442	1448
1600 mm	Front-to-front dimension (S_R) $S_R = A_R+S_{d,left}+S_{d, right}$	690 ≤ D ≤ 1016	1573	1592
	Back to back distance (A_R)	690 ≤ D ≤ 1016	1521	1526
1668 mm	Front-to-front dimension (S_R) $S_R = A_R+S_{d,left}+S_{d, right}$	330 ≤ D < 840	1648[2]	1659
		840 ≤ D ≤ 1250	1643[3]	1659
	Back to back distance (A_R)	330 ≤ D < 840	1592	1596
		840 ≤ D ≤ 1250	1590	1596

[2] Two-axle wagons with axle load up to 22.5t the value shall be taken as 1651 mm

[3] Two-axle wagons with axle load up to 22.5t the value shall be taken as 1651 mm

ERA:

Table 7. Limit values of the geometric dimensions of wheelsets

		Wheel diam. D [mm]	**Minimum value** [mm]	**Maximum value** [mm]
1520 mm	Front-to-front dimension (S_R) $S_R = A_R + S_{d,left} + S_{d,right}$	$400 \leq D \leq 1220$	1487	1509
	Back to back distance (A_R)	$400 \leq D \leq 1220$	1437	1443

Belarus:

Wheel-sets types RU1-950-G, RU1Sh-957-G, RV2Sh-957-G according to GOST 4835-2006, assembled using tyreless rolled wheels with running tread diameter D=957 mm.

Basic dimensions of wheel-sets are defined in GOST 4835-2006 “Wheel-sets for 1520 mm track gauge trunk line railway vehicles. Technical conditions.

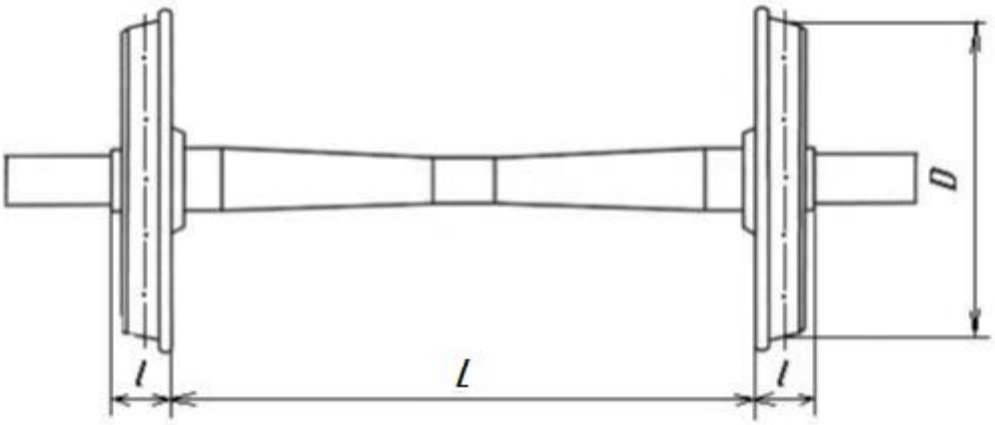
Table 8. Basic dimensions of wheelsets.

Basic dimensions, mm	Value
Distance between inner sides of wheel rims (L) of the same wheel-set, mm	1440^{+2}_{-1}
Difference of distances between inner side surfaces of wheel rims, max	1,5
Difference of wheel running tread diameters (D) of the same wheel-set, max:	1,0
Difference of distances from flat ends of shaft shoulders of wheel-seats to inner side surfaces of wheel rims, on both sides of the wheel-set, max	3,0
Deviation of axiality of tread surfaces of wheels from the axis of reference surface, max	1,0

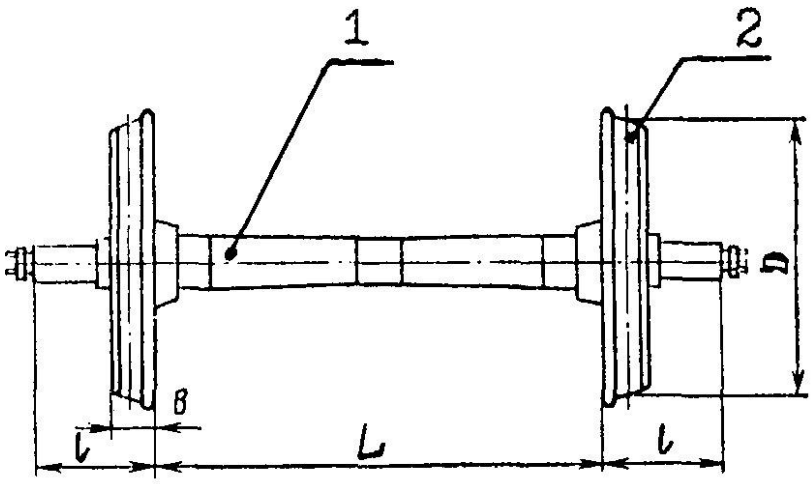
Russia, Kazakhstan, Latvia, Lithuania, Moldova, Ukraine:

Wheel-sets types RU1-950-G, RU1Sh-957-G, RV2Sh-957-G according to GOST 4835-2006, assembled using tyreless rolled wheels with running tread diameter D=957 mm (pic. 16 and 17).

A new standard - GOST 4835-2013 “Wheel-sets for railway wagons (carriages). Technical conditions” enters into force from 1 July 2014.



Picture 16. Type RU1Sh-957-G and type RV2Sh-957-G wheel-sets



1 - axle; 2 – rolled wheel

Picture 17. RU1-950-G type wheel-set

Table 9. Basic dimensions of wheelsets.

Basic dimensions, mm	Value
Distance between inner sides of wheel rims (L) of the same wheel-set	1440^{+2}_{-1}
Difference of distances between inner side surfaces of wheel rims of the same wheel-set, measured in four points, located in two mutually orthogonal planes, max	1,5
Difference of wheel running tread diameters (D) of the same	

wheel-set, max: - in case of recovery of wheel running tread configuration; - without recovery of wheel running tread configuration;	 0,5 1,0
Difference of distances from flat ends of shaft shoulders of wheel-seats (?) to inner side surfaces of wheel rims, on both sides of the wheel-set, max	3,0
Deviation of axiality of tread surfaces of wheels from the axis of reference surface, max	1,0

Table 10. Allowed operational tolerances for wheel-sets and their elements

Parameter	Limit dimensions and wear-out, mm
Even wheel roll, at least	9,0
Flange thickness	25,0…33,0
Rim thickness, at least	22,0
Wheel thickness in defected area of the running thread (cracks, flats, uneven roll), at least	22,0
Rim width (measured in marking free area)	126,0…133,0
Distance between inner sides surfaces of rims in a wheel-set (measured in load-free condition only)	1437,0…1443,0
Difference of distances between inner side surfaces of wheel rims of the same wheel-set, measured in four points, located in two mutually orthogonal planes (measures in load-free condition only), max	2,0

Operation prohibited in the following cases:

1) for speed up to 120 km/h:

- flange thickness more than 33 mm or less than 25 mm measured at 18 mm distance from the top of the flange;

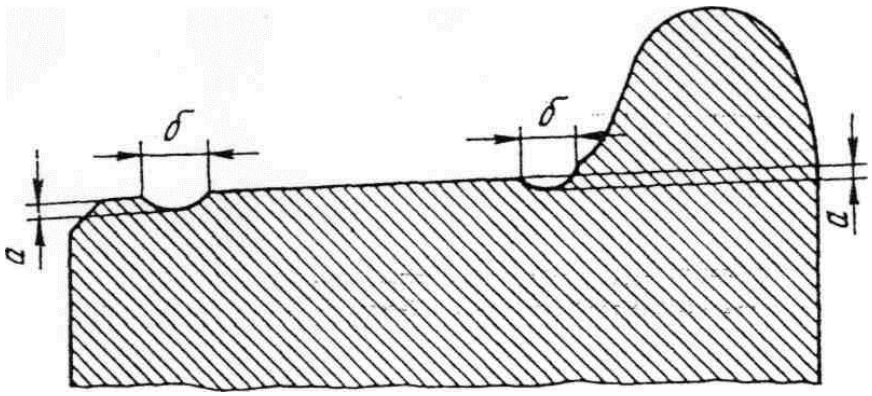
- for fraight traffic in international traffic flange thickness more than 33 mm or less than 24 mm measured at 18 mm distance from the top of the flange;

- uneven running thread roll (when detected) for freight wgons 2 mm and more

2) vertical flange worn sharp higher than 18 mm;

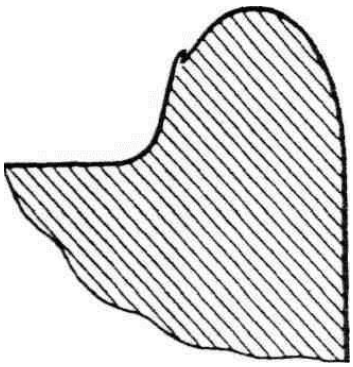
3) wheel flat (flat spot) on running thread more than 1 mm;

4) axle middle part fray deeper than 2,5 mm (5 mm diemeter);



Picture 18. Circular recess on running thread of the wheel

5) traces of contact with electrode or electric welding wire on any part of axle;
6) shift or weakness of shaft of the wheel-seat in shaft shoulder area of the axle;
7) running thread voids deeper than 10 mm or longer than 50 mm ;
8) circular recess on running thread of the wheel;
9) local expansion (crush) of wheel rim more than 5 mm;
10) exterior rim surface spalling including local circular flow spalling (along wheel radii) more than 10 mm;
11) running thread damage inflicted by shift of the metal higher then 1 mm;
12) flange worn sharp – projection;



Picture 19. Flange worn sharp

13) wheel rim width in the running thread less than 22 mm.

Ukraine:

Wheel-sets types RU1Sh-957-G, RV2Sh-957-G according to GOST 4835-2006, assembled using tyreless rolled wheels with running tread diameter 957 mm are used on rail network.

Parameters monitored:

Distance between inner sides of wheel rims (L) of the same wheel-set (min 1439 mm, max 1442 mm);

Difference of distances between inner side surfaces of wheel rims - max 1,5 mm;

Difference of wheel running tread diameters of the same wheel-set, max 1,5 mm;

Difference of distances from flat ends of shaft shoulders of wheel-seats to inner side surfaces of wheel rims, on both sides of the wheel-set, max 3.0 mm;

Deviation of axiality of tread surfaces of wheels from the axis of reference surface, max 1,0 mm.

Latvia:

Table 11. Basic dimensions of wheelsets:

Wheel-sets		Wheel diameter D [mm]	Min. value for wheelset [mm]		Max. value for wheelset [mm]	
			new	in operation	**new**	in operation
RU1-950-G RU1Sh-957-G, RV2Sh-957G	Front-to-front dimension (S_R) $S_R = A_R+S_{d,left}+S_{d,right}$	D = 950, 957	**1487**	1485	**1508**	1509
	Back to back distance		**1439**	1437	**1442**	1443

Poland:

TSI WAG requirements applicable. For rolling stock 1520 does not specify the requirements for the boundary parameters.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 4835-2006 “Wheel-sets for 1520 mm track gauge trunk line

	railway vehicles. Technical conditions.
Georgia	
Kazakhstan	GOST 4835-2013 “Wheel-sets for 1520 mm track gauge trunk line railway vehicles. Technical conditions” (instead of 4835-2006)
Latvia	“Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines”, approved by the CIS Railway Transport Council. Protocol of 16-17 October 2012, No. 57
Lithuania	Instruction for inspection, examination, repair and forming of wheelsets V/74 (LG 1998-05-20 No.151)
Moldova	GOST 4835-2006 “Wheel-sets for 1520 mm track gauge trunk line railway vehicles. Technical conditions”
Poland	TSI WAG
Russia	GOST 4835-2013 “Wheel-sets for 1520 mm track gauge trunk line railway vehicles. Technical conditions” (instead of 4835-2006)
Slovakia	TSI WAG
Ukraine	DSTU GOST 4835:2008 “Wheel-sets for 1520 mm track gauge trunk line railway vehicles. Technical conditions” (GOST 4835-2006. IDT)”

4.2.3.6.3. Characteristics of wheels / Характеристики колес

The geometrical dimensions of the wheels as defined in Figure 20 shall be compliant with limit values specified in table 12.

Table 12

Limits of use of the geometric dimensions of wheels

Designation		**Wheel diam. /** D [mm]	**Minimum value /** [mm]	**Maximum value /** [mm]
1435 mm	Width of the rim (B_R) (with maximum BURR of 5 mm)	$D \geq 330$	133	140
	Thickness of the flange (S_d)	$330 \leq D \leq 760$	27,5	33
		$760 < D \leq 840$	25	33
		$D > 840$	22	33
	Height of the flange (S_h)	$330 \leq D \leq 630$	31,5	36
		$630 < D \leq 760$	29,5	36

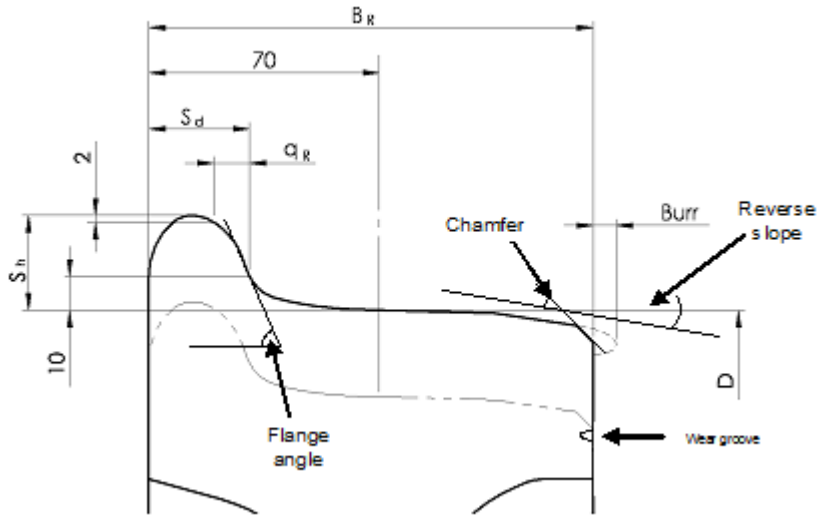
		D > 760	27,5	36
	Face of the flange (q_R)	D ≥ 330	6,5	-
1524 mm	Width of the rim (B_R) (with maximum BURR of 5 mm)	D ≥ 400	134	140
	Thickness of the flange (S_d)	400 ≤ D < 760	27,5	33
		760 ≤ D < 840	25	33
		D ≥ 840	22	33
	Height of the flange (S_h)	400 ≤ D < 630	31,5	36
		630 ≤ D < 760	29,5	36
		D ≥ 760	27,5	36
	Face of the flange (q_R)	D ≥ 400	6,5	-
1600 mm	Width of the rim (B_R) (with	690 ≤ D ≤ 1016	137	139
	Thickness of the flange (S_d)	690 ≤ D ≤ 1016	26	33
	Height of the flange (S_h)	690 ≤ D ≤ 1016	28	38
	Face of the flange (q_R)	690 ≤ D ≤ 1016	6,5	-
1668 mm	Width of the rim (B_R) (with maximum BURR of 5 mm)	D ≥ 330	133	140
	Thickness of the flange (S_d)	330 ≤ D ≤ 840	27,5	33
		D > 840	22 (PT); 25 (ES)	33
	Height of the flange (S_h)	330 ≤ D ≤ 630	31,5	36
		630 ≤ D ≤ 760	29,5	36
		D > 760	27,5	36

	Face of the flange (q_R)	$D \geq 330$	6,5	-

These limit values shall be taken as design values and shall be stated as in-service limit values in the maintenance file described in section 4.5.

Picture 20

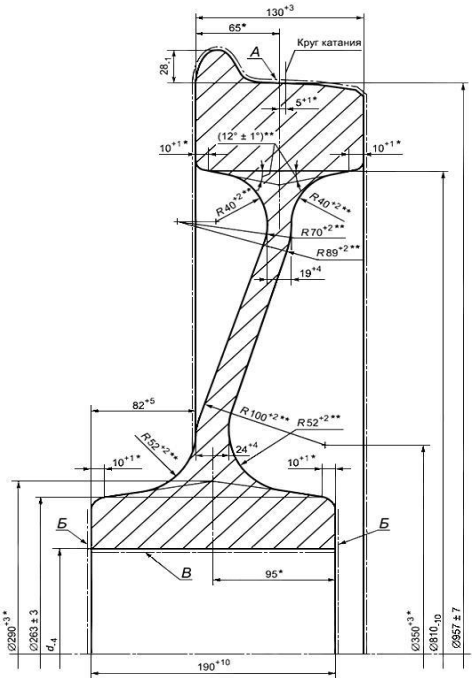
Symbols for wheels used in table 12



The mechanical characteristics of the wheels shall ensure the transmission of forces and torque as well as the resistance against thermal load where so required in accordance with the area of use.

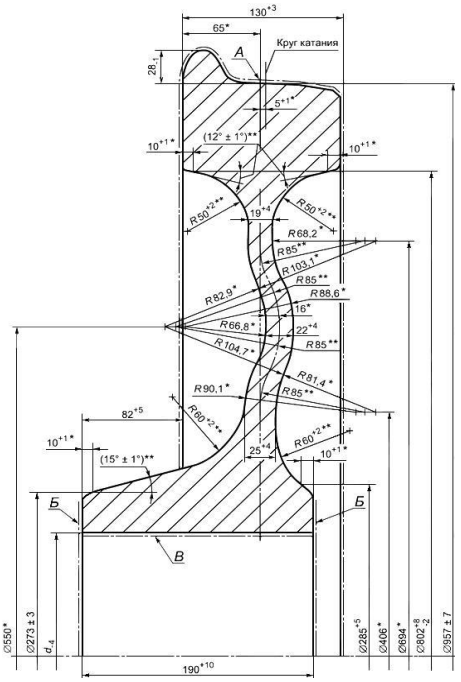
Russia, Belarus, Kazakhstan, Latvia, Lithuania, Moldova, Poland, Slovakia, Ukraine:

Technical requirements are set out in GOST 10791-2011 “Rolled wheels. Technical conditions”.



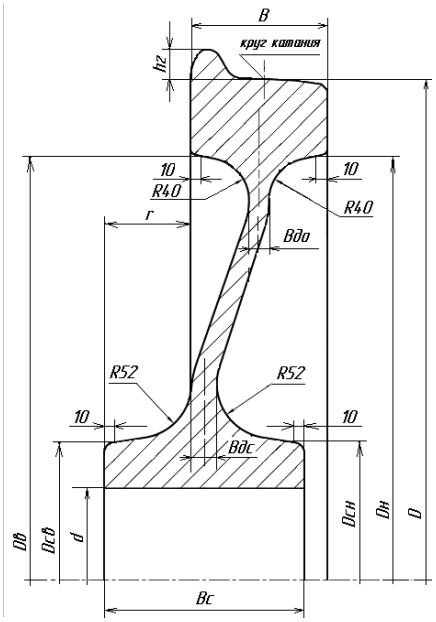
Pic. 21

Cone-and-plate rim rolled wheel with running tread diameter 957 mm



Pic. 22

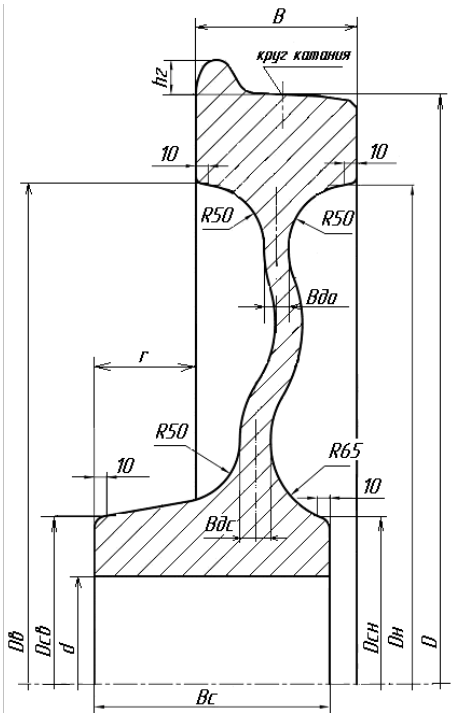
Curved rim rolled wheel with running tread diameter 957 mm



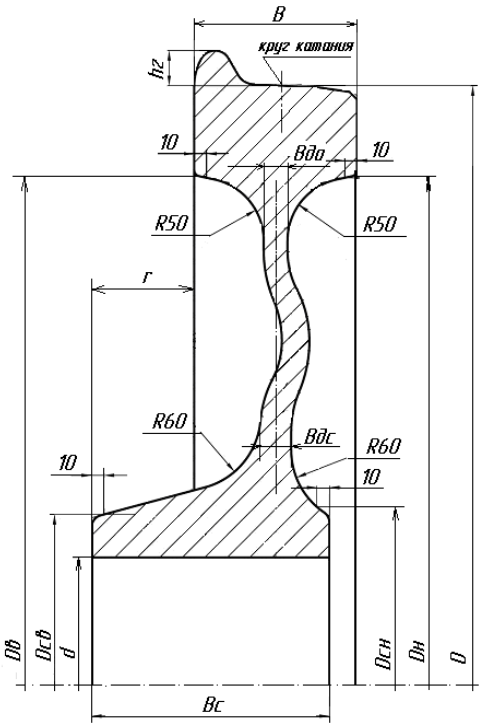
Indicator	Nominal size, mm	Deviation limit
Diameter along the running thread, ***D***	957	±7
Diameter of internal wheel rim surface on external side of the wheel, ***Dн***	810	-10
Diameter of internal wheel rim surface on internal side of the wheel, ***Dв***	810	-10
Wheel rim width, ***B***	130	+3
Flange height, ***hг***	28	-1
Wheel hob external surface diameter from external side of the wheel, ***Dсн***	263	±3
Wheel hob external surface diameter from internal side of the wheel, ***Dсв***	263	±3
Wheel axle seat diameter, ***d***	175 190	-4 -4
Wheel hob length, ***Bc***	190	+10
Distance from hob face to side surface of the wheel rim from internal side of the wheel, ***r***	82	+5
Wheel plate thickness at wheel rim, ***Вдо*** *	19	+4
Wheel plate thickness at wheel hob, ***Вдс***	24	+4

*) for wheels produced:
- before 1988 – 17^{+3} мм,
- in 1988 - 2011- 19^{+3} мм,
- from 2011 – 19^{+4} мм

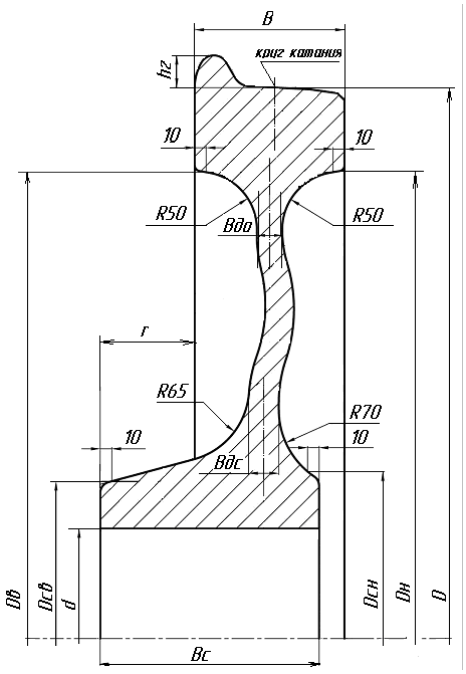
Picture 23. Cone-and-plate rolled wheel design and basic dimensions



Indicator	Nominal size, mm	Deviation limit
Diameter along the running thread, ***D***	957	±7
Diameter of internal wheel rim surface on external side of the wheel, ***Dн***	802	+8 -2
Diameter of internal wheel rim surface on internal side of the wheel, ***Dв***	802	+8 -2
Wheel rim width, ***B***	130	+3
Flange height, ***hг***	28	-1
Wheel hob external surface diameter from external side of the wheel, ***Dсн***	273	±3
Wheel hob external surface diameter from internal side of the wheel, ***Dсв***	273	±3
Wheel axle seat diameter, ***d***	190 205	-4 -4
Wheel hob length, ***Вс***	190	+10
Distance from hob face to side surface of the wheel rim from internal side of the wheel, ***r***	82	+5
Wheel plate thickness at wheel rim, ***Вдо ****	20	+4
Wheel plate thickness at wheel hob, ***Вдс***	25	+6

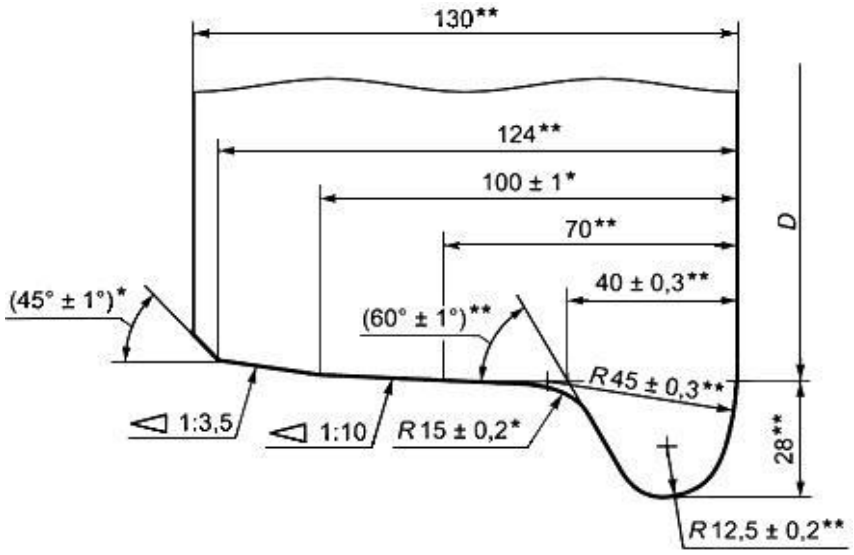


Indicator	Nominal size, mm	Deviation limit
Diameter along the running thread, ***D***	957	±7
Diameter of internal wheel rim surface on external side of the wheel, ***Dн***	802	+8 -2
Diameter of internal wheel rim surface on internal side of the wheel, ***Dв***	802	+8 -2
Wheel rim width, ***B***	130	+3
Flange height, ***hг***	28	-1
Wheel hob external surface diameter from external side of the wheel, ***Dсн***	285	+5
Wheel hob external surface diameter from internal side of the wheel, ***Dсв***	273	±3
Wheel axle seat diameter, ***d***	190 205	-4 -4
Wheel hob length, ***Вс***	190	+10
Distance from hob face to side surface of the wheel rim from internal side of the wheel, ***r***	82	+5
Wheel plate thickness at wheel rim, ***Вдо ****	19	+4
Wheel plate thickness at wheel hob, ***Вдс***	25	+4

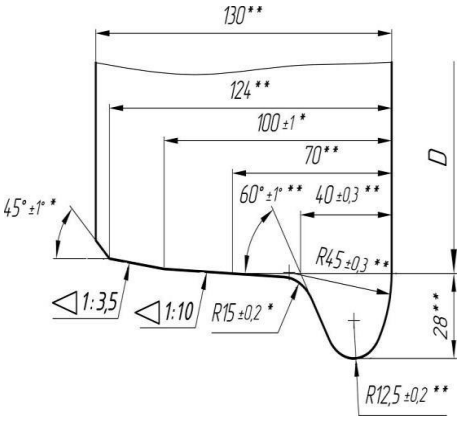


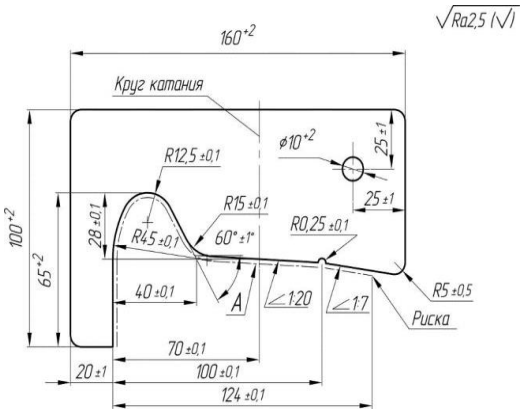
Picture 24. Design and basic dimensions of rolled wheeles with curvilinear rim

Indicator	Nominal dimensions, mm	Maximum deviation
Diameter along the running thread, ***D***	957	±7
Diameter of internal wheel rim surface on external side of the wheel, ***Dн***	810	-10
Diameter of internal wheel rim surface on internal side of the wheel, ***Dв***	810	-10
Wheel rim width, ***B***	130	+3
Flange height, ***hг***	28	-1
Wheel hob external surface diameter from external side of the wheel, ***Dсн***	290	±3
Wheel hob external surface diameter from internal side of the wheel, ***Dсв***	273	±3
Wheel axle seat diameter, ***d***	190 205	-4 -4
Wheel hob length, ***Bc***	190	+10
Distance from hob face to side surface of the wheel rim from internal side of the wheel, ***r***	82	+5
Wheel plate thickness at wheel rim, ***Вдо ****	22	+4
Wheel plate thickness at wheel hob, ***Вдс***	25	+6



Picture 23. Wheel rim profile





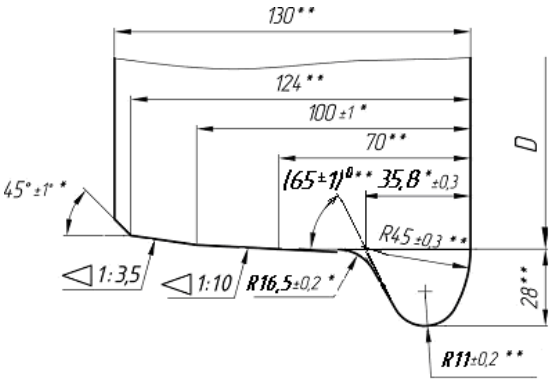
* Referential dimensions

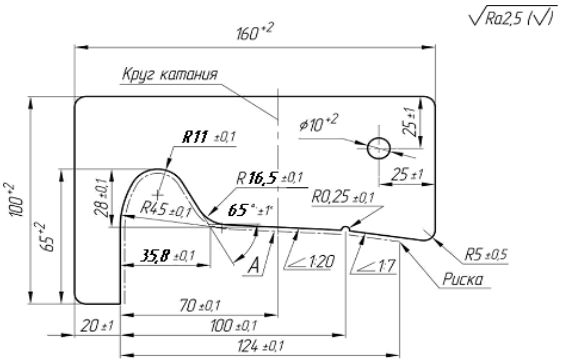
** Dimensions are insured by tools

Surface roughness parameter

A – Ra ≤ 1,25 mkm

Wheel running thread profile with initial flange thickness 33,0 mm according to GOST 10791 and maximum test gauge





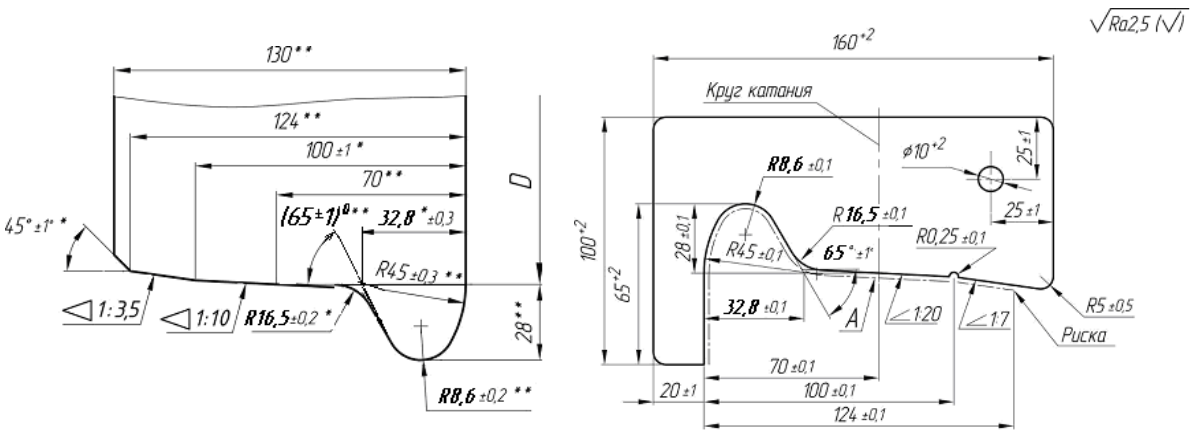
*Informational dimensions

** Dimensions are insured by tools

Surface roughness parameter

A – Ra ≤ 1,25 mkm

Maintenance wheel running thread profile with initial flange thickness 30,0 and maximum test gauge



* Informational dimensions

** Dimensions are insured by tools

Surface roughness parameter

A – Ra ≤ 1,25 mkm

Wheel running thread profile with initial flange thickness 27,0 and maximum test gauge

Latvia:

Table 13. Basic dimensions of wheels

Designation	**Wheel diam.** D [mm]	**Minimum value [mm]**	**Maximum value [mm]**
Width of the rim (BR+Burr)	**D=950, 957**	**130**	**135**
Thickness of the flange (Sd)		**24**	**33**
Height of the flange (Sh)		**27**	**28**

Poland:

TSI WAG requirements applicable. For rolling stock 1520 mm, requirements for the boundary parameters are not specified.

Ukraine:

Wheels are being produced in compliance with requirements of DSTU GOST 10791:2006 “Rolled wheels. Technical conditions” according to approved design and technology documentation.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 10791-2011 “Rolled wheels. Technical conditions”
Georgia	
Kazakhstan	GOST 10791-2011 “Rolled wheels. Technical conditions”
Latvia	“Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines”, approved by the CIS Railway Transport Council. Protocol of 16-17 October 2012, No. 57
Lithuania	Instruction for inspection, examination, repair and forming of wheelsets V/74 (LG 1998-05-20 No.151)
Moldova	GOST 10791-2011 “Rolled wheels. Technical conditions”
Poland	TSI WAG
Russia	GOST 10791-2011 “Rolled wheels. Technical conditions” GOST 4835-2013 “Wheel-sets for 1520 mm track gauge trunk line railway vehicles. Technical conditions.
Slovakia	TSI WAG
Ukraine	DSTU GOST 10791:2006 “Rolled wheels. Technical conditions”

4.2.3.6.4. Characteristics of axles / Характеристики осей

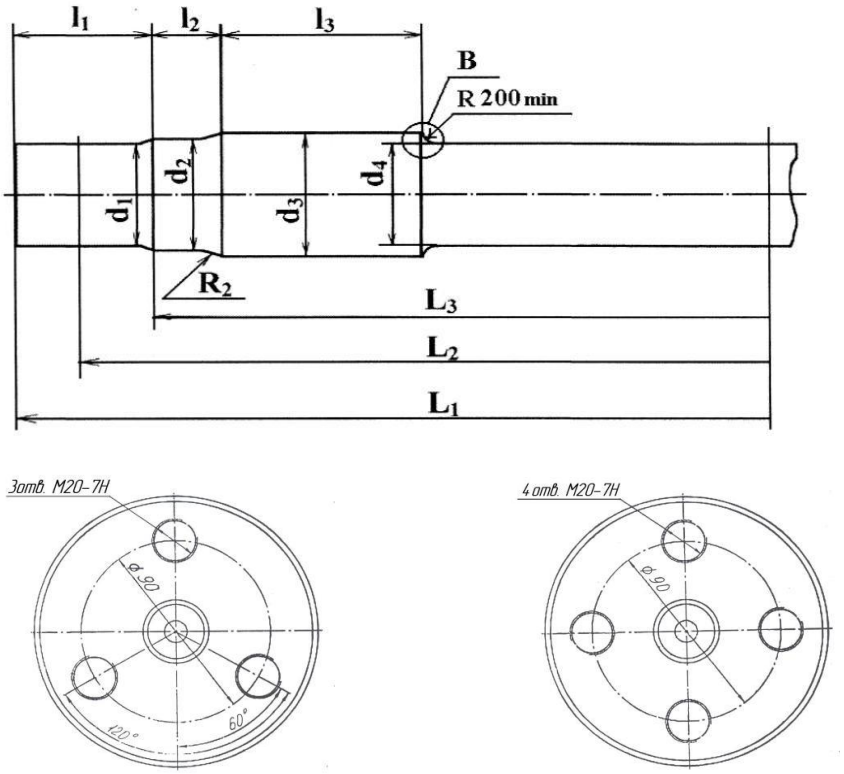
The characteristics of the axle shall ensure the transmission of forces and torque in accordance with the area of use.

The demonstration of conformity is described in point 6.1.2.4.

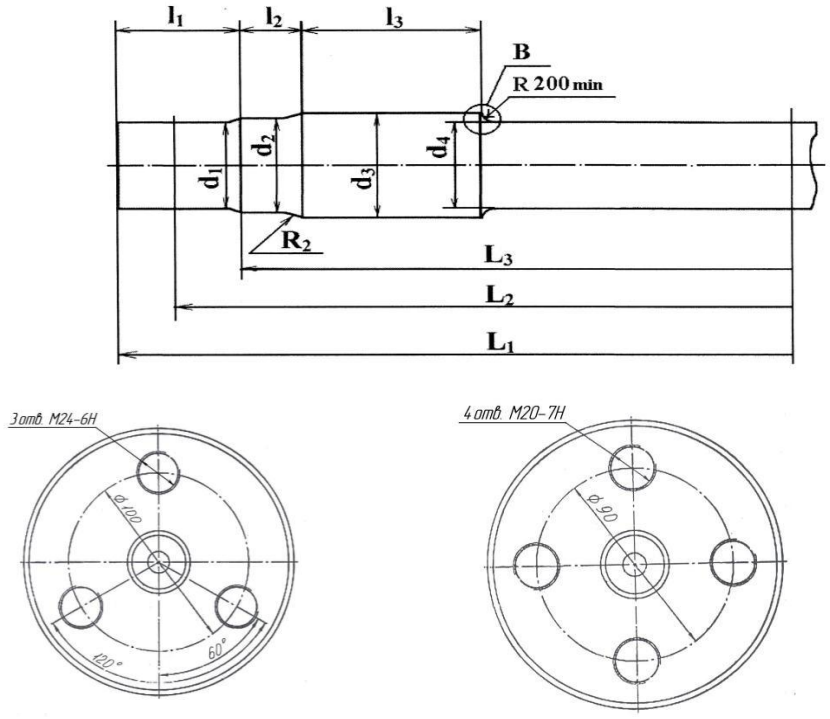
The traceability of axles shall take into accounts the findings of the ERA Task force on Freight Maintenance (see *“Final report on the activities of the Task Force Freight Wagon Maintenance”* published on the ERA website http://www.era.europa.eu).

Belarus, Kazakhstan, Latvia, Lithuania, Moldova, Russia, Ukraine:

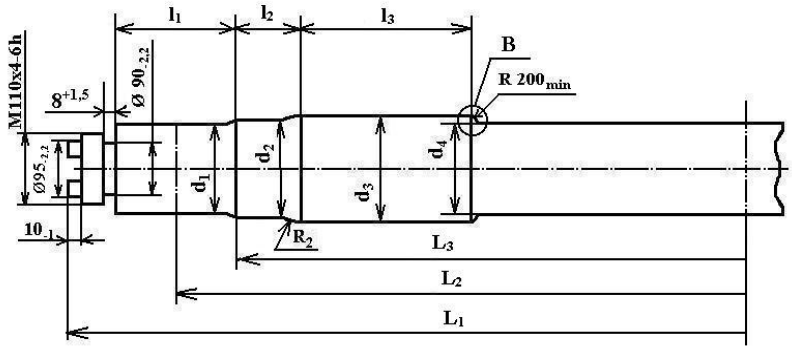
Basic dimensions of axles of wheel-sets in accordance with GOST 33200-2014 “Railway rolling stock axles. General technical conditions” are shown in pictures 24-26 and Table 14.



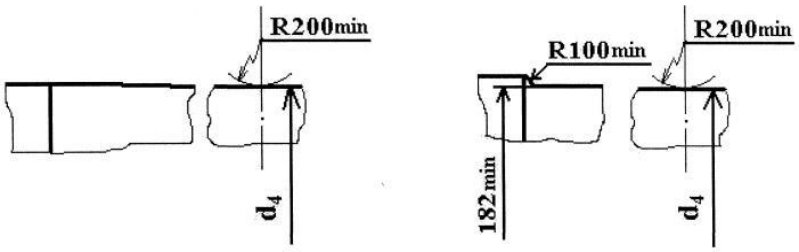
Picture 24. RU1Sh type axle



Picture 25. RV2Sh type axle



Picture 26. RU1 type axle



versions of unit B

version 1 version 2

Table 14. Basic dimensions of axles

Title of indicator	Axle type					
	RU1		RU1Sh		RV2Sh	
	Reference dimension, mm	Maximum deviation	Reference dimension, mm	Maximum deviation	Reference dimension, mm	Maximum deviation
d_1	130	+ 0,052 + 0,025	130	+ 0,052 + 0,025	150	+ 0,090 + 0,065
d_2	165 [1)]	+ 0,20 + 0,12	165 [1)]	+ 0,20 + 0,12	185	+ 0,165 + 0,091
d_3	194 [2)]	+ 2,0 - 0,5	194 [2)]	+ 2,0 - 0,5	210 [2)]	+ 2,0 - 0,5
d_4	172 [3)]	+ 3,0	172 [3)]	+ 3,0	180	+ 3,0

R_2	25	-	25	-	25	-
l_1	176	+ 1,0 - 0,5	190 [4)]	+ 1,0 - 0,5	210	-
l_2	76	± 1,0	76	± 1,0	71	+ 0,5 - 1,5
l_3 [5)]	250 min	-	250 min	-	250 min	-
L_1	2294	+ 1,0 - 3,0	2216	+ 1,0 - 3,0	2246	+ 1,0 - 3,0
L_2	2036	-	2036	-	2036	-
L_3	1836	± 1,0	1836	± 1,0	1826	± 1,0

1) – maximum allowed deviation $^{+\,0,12}_{-\,0,10}$

2) – maximum allowed deviation $^{+\,4,0}_{-\,0,5}$

3) – for unit B versions 1 or 2 $=165^{+5,0}$ mm

4) – reference dimension

5) – for axles with conic middle part l_3=265 mm.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 31334-2007 “Railway rolling stock axles. Technical conditions” GOST 33200-2014 “Railway rolling stock axles. General technical conditions”
Georgia	
Kazakhstan	GOST 31334-2007 “Railway rolling stock axles. Technical conditions” GOST 33200-2014 “Railway rolling stock axles. General technical conditions”

Latvia	"Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines", approved by the CIS Railway Transport Council. Protocol of 16-17 October 2012, No. 57
Lithuania	Instruction for inspection, examination, repair and forming of wheelsets V/74 (LG 1998-05-20 No.151)
Moldova	GOST 22780-93 "Railway rolling stock axles. Types, paremeters and dimensions". GOST 31334-2007 "Railway rolling stock axles. Technical conditions"
Poland	TSI WAG
Russia	GOST 31334-2007 "Railway rolling stock axles. Technical conditions" GOST 33200-2014 "Railway rolling stock axles. General technical conditions"
Slovakia	TSI WAG
Ukraine	DSTU GOST 22780-93 "Railway rolling stock axles. Types, paremeters and dimensions" DSTU GOST 31334-2007 "Railway rolling stock axles. Technical conditions"

4.2.3.6.5. Axle boxes / bearings / Буксовые узлы, подшипники

The axle box and the rolling bearing shall be designed with consideration of mechanical resistance and fatigue characteristics. Temperature limits reached in service relevant for the hot box detection shall be defined.

The demonstration of conformity is described in point 6.2.2.4.

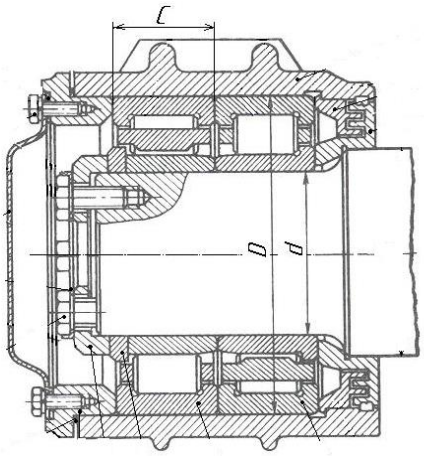
Belarus, Russia, Kazakhstan, Latvia, Lithuania, Moldova, Ukraine:

Function of axle-boxes are to transmit gross gravitation force from wagon body to the axle neck of a wheel-set, to connect of wheel-sets with bogie frame, to restrict longitudinal and transversal displacements of wheel-sets against bogie frame and to protect axle necks from damage and contamination.

Basic requirements for axle-boxes: reliability and durability in existing operational conditions during identified life-span; light dead weight; interchangeability and unification of parts; easy mounting (dismounting) during repair and proper hermetic sealing of the axle-box.

Designs of bearers and axle box types:

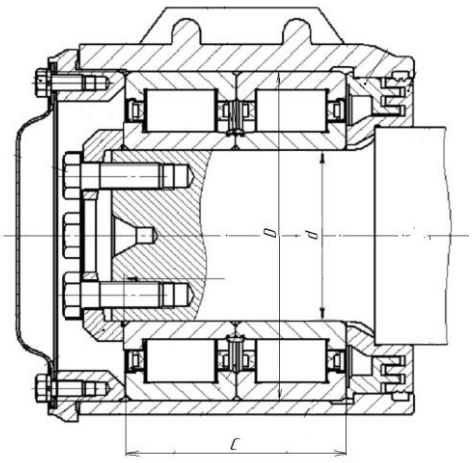
1. Cylindrical roller bearers in gauge dimensions 130x250x80 mm in compliance with GOST 520, GOST 18572 are being installed into the axle box.



Basic dimensions of cylindrical roller bearers

Gauge dimensions of the bearer, mm	Wheel-set type	Bearer loader type	Basic dimensions		
			d	D	C
130x250x80	RU1Sh-957-G	Axle box body	130	250	80

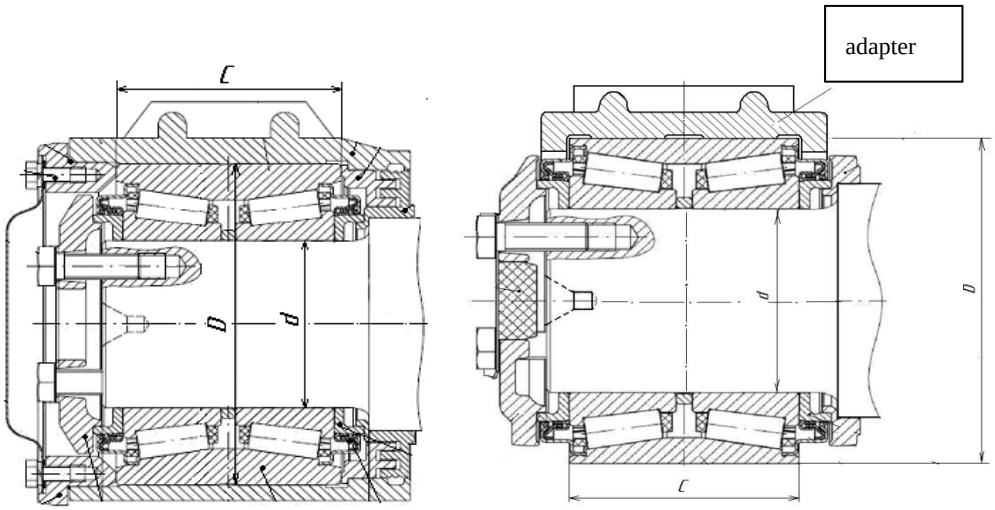
2. Dual bearer in gauge dimensions 130x250x160 mm connected by an inner ring inside the axle box body.



Basic dimensions of dual bearings

Gauge dimensions of the bearer, mm	Wheel-set type	Bearing loader type	Basic dimensions, mm		
			d	D	C
130x250x80	RU1Sh-957-G	Axle box body	130	250	160

3. Cartridge type bearing in gauge dimensions 130x250x160 mm in standard axle box body and for applicable adapter in gauge dimensions 130x250x160 mm, 130x230x150 mm и 150x250x160 mm.



Basic dimensions of cartridge type bearing

Gauge dimensions of the bearer, mm	Wheel-set type	Bearing loader type	Basic dimensions, mm		
			d	D	C
130x250x80	RU1Sh-957-G	Axle box body	130	250	160
130x250x80	RU1Sh-957-G	Adapter	130	250	160
130x230x150	RU1Sh-957-G	Adapter	130	230	150
150x250x160	RV2Sh-957-G	Adapter	150	250	160

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines NB ZhT CV-CL 014-2003 “Axle bearings for railway rolling stock”
Georgia	
Kazakhstan	GOST 18572-81 “Rolling bearings with cylindrical rollers for railway

	rolling stock axles boxes. Basic dimensions"
Latvia	"Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines", approved by the CIS Railway Transport Council. Protocol of 16-17 October 2012, No. 57
Lithuania	Instructive guidelines for operation and repair of wagon axle boxes with rolling bearings V/177 (LG 2003-04-24 Nr. I-183)
Moldova	Guidelines regarding repair and technical maintenance of wheelsets with axle boxes of wagons for 1520 (1524) mm track gauge trunk railway lines NB ZhT CV-CL 014-2003 "Axle bearings for railway rolling stock"
Poland	TSI WAG
Russia	GOST 18572-81 "Rolling bearings with cylindrical rollers for railway rolling stock axles boxes. Basic dimensions" GOST (draft) "Rolling bearings. Cylindrical rollers bearings for railway and metro rolling stock. Technical conditions" (replacing NB ZhT CV-CL 014-2003, ST SSFZhT CT-CL-CV 137)
Slovakia	TSI WAG
Ukraine	GOST 18572-81 "Rolling bearings with cylindrical rollers for railway rolling stock axles boxes. Basic dimensions"

4.2.3.6.6. Variable gauge wheelsets / Колесные пары изменяемой ширины

This requirement is applicable to units equipped with variable gauge wheelsets with changeover between two track gauges.

The changeover mechanism of the wheelset shall ensure the safe locking

– of the wheels and

– of the corresponding brake equipment

in the correct intended axial position considering the dynamic effects in accordance with the design operating state of the unit.

The conformity assessment of the requirements specified in this point is an open point.

Belarus, Kazakhstan, Latvia, Lithuania, Ukraine, Moldova:

Until now variable gauge wheel-sets were applicable on 1520 mm freight wagons.

Standards for variable gauge wheel-sets are not available.

Russia:

Requirements for variable gauge wheel set are set out in GOST 4835-2013.

Poland:

TSI WAG requirements applicable. No requirements.

The aforementioned requirements are approved by the following documents:

Belarus	-
Georgia	
Kazakhstan	Variable gauge wheelsets are not used in the territory of the Republic of Kazakhstan
Latvia	-
Lithuania	
Moldova	
Poland	- / TSI WAG
Russia	GOST 4835-2013 “Wheelsets for freight and passenger car. Technical conditions”
Slovakia	TSI WAG
Ukraine	

4.2.3.6.7. Running gear for manual change of wheelsets / Замена тележек, колесных пар

The requirement is applicable to units prepared to run on different track gauges, by means of a physical change of wheelset.

The unit shall be equipped with a locking mechanism in order to ensure the correct position of its brake equipment in the different configurations considering the dynamic effects in accordance with the design operating state of the unit.

The demonstration of conformity is described in point 6.2.2.5.

Belarus, Kazakhstan, Latvia, Lithuania, Ukraine, Moldova:

Not applicable for freight traffic.

Standards for variable gauge wheel-sets are not available.

Russia, Belarus, Kazakhstan:

GOST 4835-2013.

Ukraine:

Not applicable

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	
Georgia	
Kazakhstan	Standards for variable gauge wheelsets do not exit
Latvia	
Lithuania	
Moldova	
Poland	TSI WAG
Russia	
Slovakia	TSI WAG
Ukraine	

4.2.4. Brake / Тормоз

4.2.4.1 General / Общие положения

The purpose of the train brake system is to ensure that

– the train's speed can be reduced,

– the train's speed can be maintained on a slope

– the train can be stopped within the maximum allowable braking distance and that

– the train can be immobilised.

Primary factors that influence the braking performance and the braking process are

– the braking power,

– the train mass,

– the speed,

– the allowable braking distance,

– the available adhesion and

– the track gradient.

The brake performance of a train is derived from the individual brake performance of each unit in the train.

Latvia:

Depending on braking means equipped on a rolling stock, infrastructure manager defines:

- the single minimum brake application fore each 100 t of train weight;

- maximum guided gradient (exceeding braking path) depending on maximum speed defined by traffic timetable;

- corelation between trains running speed, value of gradient, brake application and braking path;

- design values and other data required for braking estimations as well as for fitting trains with handbrakes;

- braking systems, rules for brakes application for trains and estimated values defining brake application for an axle.

RU sets out the rules of operation (use) of rolling stock braking means, ensuring safe train operation, sufficient braking performance (efficiency) and braking smoothness, taking into account particularities of routes involved, track scheme and longitude profile as well as equipment of railway infrastructure. These rules to be coordinated with IM.

Train's automatic brakes must ensure braking pressure which guarantees train stop in emergency braking situation not exceeding the braking path defined by infrastructure manager.

Lithuania:

Depending on braking means equipped on a rolling stock infrastrukture manager defines:

- the single minimum brake application fore each 100 t of train weight;

- maximum guided gradient (exceeding braking path) depending on maximum speed defined by traffic timetable;

- corelation between trains running speed, value of gradient, brake application and braking path;

- design values and other data required for braking estimations as well as for fitting trains with handbrakes;

- braking systems, rules for brakes application on trains and estimated values defining brake application on an axle.

These norms and data are set out in train timetable.

The infratrusture manager defines maximum guided braking and train speeds per every section.

Belarus, Kazakhstan, Moldova, Russia:

Freight wagons must be equipped with automatic brakes. Freight wagons' automatic brakes must be controllable and reliably operative in different operation conditions must ensure smooth braking and train stop in case of uncoupling or abruption of brake line as well as in case of emergency brake valve is used.

Freight wagons‘ automatic brakes must ensure braking pressure which guarantees train stop in emergency braking situation not exceeding the braking path defined estimated data approved by norms and rules.

Freight wagons ‘automatic brakes must ensure application of different braking modes depending on wagon load, train length and track profile.

Railway rolling stock shall be equipped with automatic brakes ensuring deceleration and stop of a train within estimated braking path limits.

Ukraine:

Ukraine can join the TSI text

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	TOR Belarus
Georgia	
Kazakhstan	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 TOR Kazakhstan
Latvia	TOR Latvia
Lithuania	TOR Lithuania
Moldova	TOR Moldova
Poland	TSI WAG
Russia	p.p. 15, 16 Annex 5, TOR Russia Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Slovakia	TSI WAG
Ukraine	OSJD leaflet O+R 540 "Technical requirements for rolling stock brakes circulating in freight trains with speeds up to 120 km/h and in passenger trains with speeds up to 200 km/h" – approved by the OSJD Conference of Directors General, october 1999 R 549/3 Metod for calculation of brakes of 1520 mm track gauge

	freight wagons – approved by the Meeting of the OSJD Commission for infrastructure and rolling stock, 10.11.2005. GOST (draft) "Braking systems for railway freight wagons. Technical requirements and rules for calculation" TOR Ukraine Norms of calculations and design of unpowered railway vehicles of the 1520 mm network

4.2.4.2. Safety requirements / Требования безопасности

The braking system contributes to the safety level of the railway system. Therefore the design of the braking system of a unit has to undergo a risk assessment in accordance with Commission Regulation (EC) No 352/2009[4] considering the hazard of complete loss of the brake capability of the unit. The severity level shall be deemed as catastrophic when

– it affects the unit alone (combination of failures) or,

– it affects the brake capability of more than the unit (single fault).

The fulfilment of the conditions of C.9 and C.14 of Appendix C is presumed to be in conformity with this requirement.

Russia, Kazakhstan:

Requirements for design of mechanical part of brakes: GOST (draft) „Freight wagons braking systems. Technical requirements and rules on calculation".

Design of braking equippment shall ensure imperviousness of connection spots, bodies, hoods, pistons and other parts, as well as tightness of locking devises in accordance with design documentation for the particular model.

Belarus, Moldova:

See general safety requirements – 4.2.3.5

Latvia, Lithuania:

Requirements for design of mechanical part of automatic brakes - "Norms of calculations and design of unpowered railway vehicles of the 1520 mm network" (GosNiiV-VNIIZT, 1996).

Ukraine:

TSI text is in principle acceptable.

[4] OJ L 108, 29.04.2009, p.4.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 TOR Belarus Norms of calculations and design of unpowered railway vehicles of the 1520 mm network
Georgia	
Kazakhstan	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 Norms of calculations and design of unpowered railway vehicles of the 1520 mm network GOST 30467-97 "Executive devices and the accessories of rolling stock beakes equipment. General requirements for safety" GOST (draft) "Parking brake for railway rolling stock (automatic and manual). Technical condition" GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation"
Latvia	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network
Lithuania	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network
Moldova	TOR Moldova Norms of calculations and design of unpowered railway vehicles of the 1520 mm network
Poland	TSI WAG
Russia	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 TOR Russia Norms of calculations and design of unpowered railway vehicles of the 1520 mm network GOST 30467-97 "Executive devices and the accessories of rolling stock beakes equipment. General requirements for safety"

	GOST (draft) “Parking brake for railway rolling stock (automatic and manual). Technical condition” GOST (draft) “Braking systems for freight wagons. Technical requirements and rules for calculation”
Slovakia	TSI WAG
Ukraine	GOST (draft) “Braking systems for freight wagons. Technical requirements and rules for calculation”

4.2.4.3. Functional and technical requirements / Функциональные и технические требования

4.2.4.3.1. General functional requirements / Общие функциональные требования

The brake equipment of the unit shall provide the functions of braking such as the application and the release of the brake, upon a transmitted signal. The brake shall be

– continuous (the brake application or release signal is transmitted from a central command to the whole train by a control line),

– automatic (an inadvertent disruption of the control line shall lead to brake activation on all units of the train bringing each part to stand still),

– disengageable, which enables its release and isolation.

Russia, Kazakhstan, Moldova:

General requirements cover:

- Requirements for materials, reliability, personnel occupational safety, marking, transportation.

- climatic conditions of operation, parameters and dimensions of wagons, gauge, strength of wagon parts, parameters of the critical units (bogies, autocoupling devices, braking equipment etc.), design of wagon body, paint, types, methods and periodicity of control checks, design of particular elements.

Automatic brakes of the railway rolling stock shall have necessary capacity and reliability in different operation conditions, shall ensure braking smoothness and train stop in case of failure of integrity of braking pipe as well as in case of spontaneous uncoupling of rolling stock units.

Automatic brake equipment shall comply with defined traffic safety rules and be controllable in temperature range from +55oC to -55oC as well as remain operational in case of temporary increases of temperature up to +80oC.

General requirements for rolling stock braking equipment are defined in Rules on railway rolling stock brake operation (No. CT-CV-CL-VNIIZhT/227).

Литва, Польша, Украина:

Возможно применение ТСИ.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	TOR Belarus
Georgia	
Kazakhstan	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Latvia	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network
Lithuania	TSI WAG
Moldova	TOR Moldova
Poland	TSI WAG
Russia	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 TOR Russia, Annex 5 Norms of calculations and design of unpowered railway vehicles of the 1520 mm network GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" GOST (draft) "Parking brake for railway rolling stock (automatic and manual). Technical condition" Rules for technical maintenance of braking equipment and brakes control for railway rolling stock
Slovakia	TSI WAG
Ukraine	OSJD leaflet O+R 540 "Technical requirements for rolling stock brakes circulating in freight trains with speeds up to 120 km/h and in passenger trains with speeds up to 200 km/h" – approved by the OSJD Conference of Directors General, October 1999 GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" GOST (draft) "Braking systems for railway rolling stock. Test methods"

	TOR Ukraine Norms of calculations and design of unpowered railway vehicles of the 1520 mm network

4.2.4.3.2. Brake performance / Тормозная эффективность

Russia, Moldova:

Train equipment with brakes, automatic brakes checks, braking smoothness and controllability of brakes by the train driver taking into account valid speed indication records is performed in accordance with Rules on technical maintenance of braking equipment and railway rolling stock brakes control.

Train or unit's braking performance is a capacity to reduce speed and is a result of availability of braking energy for train or unit's deceleration within defined limits; braking performance also a result of effect of other factors involved in energy transformation and takeoff, including resistance of the train.

Braking performance effectiveness assessment criteria is compliance of actual braking path with the estimated one, depending on initial speed prior braking and slope.

Effectiveness of the wagon's braking system is calculated according to methods set out in point 10.3 of GOST (draft) "Freight wagons. Technical requirements for braking systems".

Belarus, Kazakhstan:

Automatic brake test, braking smoothness and validity of brakes control by driver in accordance with speed measuring tape.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038-2006 "Rules for operation of brakes of rolling stock on Belarus railway" Informative: CT-CV-CL-VNIIZhT/277 "Instruction for operation of railway rolling rolling stock brakes"
Georgia	
Kazakhstan	Rules for operation of brakes of rolling stock VNIIZhT – approved by the 48th meeting of the CIS Council for Railway Transport, May 2008
Latvia	Rules of the Infrastructure Manager LDZ for operation of railway

	rolling stock brakes, No. DR19/2000
Lithuania	Rules for operation of brakes of rolling stock R/86 (LG 1997-10-21 No. 297)
Moldova	CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes”
Poland	TSI WAG
Russia	Rules for technical maintenance of braking equipment and brakes control for railway rolling stock Draft GOST “Braking systems for freight wagons. Technical requirements and rules for calculation”
Slovakia	TSI WAG
Ukraine	OSJD leaflet O+R 540 “Technical requirements for rolling stock brakes circulating in freight trains with speeds up to 120 km/h and in passenger trains with speeds up to 200 km/h” – approved by the OSJD Conference of Directors General, October 1999 R 549/3 “Metod for calculation of brakes of 1520 mm track gauge freight wagons” – approved by the Meeting of the OSJD Commission for infrastructure and rolling stock, 10.11.2005. GOST (draft) “Braking systems for freight wagons. Technical requirements and rules for calculation” Norms of calculations and design of unpowered railway vehicles of the 1520 mm network

4.2.4.3.2.1. Service brake / Рабочий тормоз

The brake performance of a train or a unit is its ability to decelerate. It is the result of the braking power available to decelerate the train or unit within defined limits and all factors involved in the conversion and dissipation of energy including train resistance.

The brake performance of a unit shall be calculated in accordance with one of the following documents:

– EN 14531-6:2009 or

– UIC 544-1:2012.

The calculation shall be validated by tests. Brake performance calculation in accordance with UIC 544-1 shall be validated as set out in UIC 544-1:2012.

Russia, Kazakhstan:

Freight wagon brakes are designed in accordance with GOST (draft) “Braking systems for railway freight wagons. Technical requirements and rules for calculation”.

Automatic brake: equipment which shall ensure automatic train stop in case of disconnection of disruption of air hose and/or in case of application of emergency brake (emergency brake valve).

Automatic brake shall ensure possibility of application of different braking modes depending on rolling stock load, train length and track profile.

Belarus, Moldova:

Freight wagon braking system is designed in accordance with "Norms of calculation and design of unpowered railway vehicles of the 1520 mm network of Railways Transport Ministry"

Poland, Ukraine:

TSI provisions are in principle acceptable.

The aforementioned requirements are approved by the following documents:

Belarus	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network Informative: CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes”
Georgia	
Kazakhstan	CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes” GOST (draft) “Braking systems for freight wagons. Technical requirements and rules for calculation” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Latvia	"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)
Lithuania	"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)
Moldova	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network Informative: CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes”

Poland	TSI WAG
Russia	Rules for technical maintenance of braking equipment and brakes control for railway rolling stock GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Slovakia	TSI WAG
Ukraine	OSJD leaflet O+R 540 Technical requirements for rolling stock brakes circulating in freight trains with speeds up to 120 km/h and in passenger trains with speeds up to 200 km/h – approved by the OSJD Conference of Directors General, October 1999 R 549/3 "Metod for calculation of brakes of 1520 mm track gauge freight wagons" – approved by the Meeting of the OSJD Commission for infrastructure and rolling stock, 10.11.2005. GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" Norms of calculations and design of unpowered railway vehicles of the 1520 mm network

4.2.4.3.2.2. Parking brake / Стояночный тормоз

A Parking Brake is a brake used to prevent parked rolling stock moving under the specified conditions taking into account the place, wind, gradient and rolling stock loading state, until intentionally released.

If the unit is equipped with a parking brake, the following requirements shall be met:

– the immobilisation shall remain until intentionally released.

– where it is not possible to identify the state of the parking brake directly, an indicator showing the state shall be provided on both sides on the outside of the vehicle.

– the minimum parking brake performance, considering no wind, shall be determined by calculations as defined in the standard clause 6 of EN 14531-6:2009.

– the minimum performance of the parking brake shall be marked on the unit. The marking shall comply with clause 4.5.25 of EN 15877-1:2012. The parking brake of a unit shall be designed considering a wheel/rail (steel/steel) adhesion factor not higher than 0,12.

Russia, Kazakhstan:

All railway rolling stock shall be equipped with parking brakes. According to standards part of produced freight wagons shall be equipped with brake platforms with and parking brake.

A parking brake is dedicated for prevention of movement of a parked rolling stock taking into account location, wind, inclination and load ratio until intentional discharge.

Unit, equipped with parking brake must maintain immobility until intentional discharge of parking brake.

Design of freight wagon parking brake is performed in accordance with GOST (draft) "Automatic and manual parking brake for railway rolling stock. Technical requirement".

Parking brake shall guarantee estimated braking pressure and maintain railway unit hold within the allowed range of limits.

Parking brake must perform controllable hold still of the rolling stock or forced stop in case of failure of the main braking system.

Parking brake of rolling stock admitted for operation on the whole railway network shall be designed to maintain fully loaded rolling stock on hold on a slope not less than 30 ‰.

Parking brake of a special rolling stock shall be designed to maintain fully loaded rolling stock on hold on a slope not less than 40 ‰.

Parking brake must ensure zero-fault functioning in all allowed states of a friction couple.

Released parking brake shall not affect functioning of the main braking system.

Recurrence of parking brake technical maintenance and repair shall be the same as recurrence of maintenance and repair of the rolling stock it is installed on.

Design parameters of parts of the parking brake and its fastening elements are defined considering their strength agains maximum possible forces emerging in operation.

Parking brake wheel shall be equipped with measure which prevents it from spontaneous spin.

Design of braking equippment shall ensure imperviousness of connection spots, bodies, hoods, pistons and other parts, as well as tightness of locking devises in accordance with design documentation for the particular model.

Climatic version of parking brakes must comply with GOST 15150 requirements corresponding to "moderate and cold climate" category 1.

Other climatic versions of parking brakes are allowed on request of a customer.

Design of freight wagon parking brakes shall ensure zero-fault functioning in case of temperature variations when defrosting frozen freight.

Belarus, Moldova:

A parking brake is dedicated for prevention of movement of a parked rolling stock taking into account location, wind, inclination and load ratio until intentional discharge.

Unit, equipped with parking brake must maintain immobility until intentional discharge of parking brake.

Parking brake must be designed taking into account friction between the wheel and the rail.

Freight wagon parking brake is designed in accordance with "Norms of calculation and design of unpowered railway vehicles of the 1520 mm network of Railways Transport Ministry"

Poland, Ukraine:

TSI WAG requirements applicable.

Эти требования утверждены следующими документами:

Belarus	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network Informative: CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes”
Georgia	
Kazakhstan	CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes” GOST (draft) “Parking brake for railway rolling stock (automatic and manual). Technical condition” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Latvia	"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)
Lithuania	"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)
Moldova	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network Informative: CT-CV-CL-VNIIZhT/277 “Instruction for operation of railway rolling rolling stock brakes”
Poland	TSI WAG
Russia	Rules for technical maintenance of braking equipment and brakes control for railway rolling stock GOST (draft) “Parking brake for railway rolling stock (automatic and manual). Technical condition” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Slovakia	TSI WAG
Ukraine	OSJD leaflet O+R 540 “Technical requirements for rolling stock brakes circulating in freight trains with speeds up to 120 km/h and in passenger trains with speeds up to 200 km/h” – approved by the OSJD Conference of Directors General, October 1999 R 549/3 “Metod for calculation of brakes of 1520 mm track gauge

	freight wagons" – approved by the Meeting of the OSJD Commission for infrastructure and rolling stock, 10.11.2005. GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" GOST (draft) "Parking brake for railway rolling stock (automatic and manual). Technical condition" Norms of calculations and design of unpowered railway vehicles of the 1520 mm network

4.2.4.3.3. Thermal capacity / Термостойкость

The brake equipment shall be able to withstand one emergency brake application without any loss of brake performance due to thermal or mechanical effects.

The braking power, the unit is capable to withstand without any adverse loss of brake performance due to thermal or mechanical effects, shall be defined and expressed in terms of speed and brake application time (**+ Ukraine, Latvia**).

The demonstration of conformity is described in point 6.2.2.6.

A slope of 21 ‰ at 70 km/h during 40 km may be considered as the reference case for the thermal capacity which results in a braking power of 45 kW per wheel during 34 minutes for a nominal wheel diameter of 920 mm and an axle load of 22.5 t.

Belarus, Russia, Kazakhstan, Moldova:

Braking energy, which the unit can withstand without negative consequences for its braking performance due to thermal or mechanical impacts, is calculated and expressed in values of speed and brake application time. (+Latvia)

Calculation of brake exists for 3 types of braking /blocks allowed for application on freight wagons operated on Russian public network: composite TIIR-300, composite FRITEKS-970/2 and grey cast iron standard /blocks.

Requirements for design and dimensions of grey cast iron blocks are set out in GOST 1205-73 "Grey cast iron brake blocks for broad gauge wagons and tenders. Design and basic dimensions".

Technical requirements for grey cast iron blocks are set out in GOST (draft) "Grey cast iron brake blocks for railway rolling stock. General technical requirements" (will replace GOST 1205-73, GOST 28186-89, GOST 30249-97, OST 32.194, NB ZhT TM 02-98).

Latvia:

Minimum dimensions of composite and grey cast iron /blocks is defined by the infrastructure manager - LDZ Instructions on railway rolling stock brake operation No. DR19/2000.

Poland, Ukraine:

TSI text in principle is applicable.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038-2006 "Rules for operation of brakes of rolling stock on Belarus railway" Informative: CT-CV-CL-VNIIZhT/277 "Instruction for operation of railway rolling rolling stock brakes" GOST (draft) "Composite brake blocks for railway rolling stock. Technical conditions"
Georgia	
Kazakhstan	CT-CV-CL-VNIIZhT/277 "Instruction for operation of railway rolling rolling stock brakes" GOST 1205-73 "Cast brake blocks for wagons/carriages and tenders of broad gauge railways. Design and basic dimensions" GOST (draft) "Cast brake blocks for railway rolling stock. General technical conditions" (replacing GOST 1205-73, GOST 28186-89, GOST 30249-97, OST 32.194, NB ZhT TM 02-98) GOST (draft) Composite brake blocks for railway rolling stock. Technical conditions GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" Technical requirements. Typical calculation for brakes of freight and isotermical wagons of Ministry of Railways of Russia, VNIIZhT, 1996)
Latvia	Rules of the Infrastructure Manager LDZ for operation of railway rolling stock brakes, No. DR19/2000
Lithuania	Instruction for operation of brakes of rolling stock R/86 (LG 1997-10-21 No. 297)
Moldova	Informative: CT-CV-CL-VNIIZhT/277 "Instruction for operation of railway rolling rolling stock brakes" GOST (draft) "Composite brake blocks for railway rolling stock.

	Technical conditions"
Poland	TSI WAG
Russia	Rules for technical maintenance of braking equipment and brakes control for railway rolling stock GOST 1205-73 "Cast brake blocks for wagons/carriages and tenders of broad gauge railways. Design and basic dimensions" GOST (draft) "Cast brake blocks for railway rolling stock. General technical conditions" (replacing GOST 1205-73, GOST 28186-89, GOST 30249-97, OST 32.194, NB ZhT TM 02-98) GOST (draft) "Composite brake blocks for railway rolling stock. Technical conditions" GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" Technical requirements. Typical calculation for brakes of freight and isotermical wagons of Ministry of Railways of Russia, VNIIZhT, 1996
Slovakia	TSI WAG
Ukraine	R 549/3 "Method for calculation of brakes of 1520 mm track gauge freight wagons" – approved by the Meeting of the OSJD Commission for infrastructure and rolling stock, 10.11.2005. GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" Norms of calculations and design of unpowered railway vehicles of the 1520 mm network

4.2.4.3.4. Wheel slide protection (WSP) / Система противоюзной защиты

Wheel slide protection (WSP) is a system designed to use the maximum available adhesion by decreasing, holding or increasing the brake force to prevent wheel sets from locking and uncontrolled sliding. Thereby the stopping distance shall be optimized

If an electronic WSP-control is used negative effects caused by malfunctions of WSP shall be reduced by suitable system design processes and technical configuration.

The WSP shall not alter the functional characteristics of the brakes. The vehicle's air equipment shall be dimensioned such that the air consumption of the WSP does not impair the performance of the pneumatic brake. The design process of the WSP shall take into account that the WSP has no detrimental effect on the constituent parts of the vehicle (brake gear, wheel tread, axle boxes, etc.).

The following types of units shall be fitted with WSP:

– Equipped with all types of brake block, for which the maximum mean utilisation of adhesion is greater than 0,12.

– Equipped with disc brakes only and/or with composite brake blocks, for which the maximum mean utilisation of adhesion is greater than 0,11.

Belarus, Russia, Latvia, Lithuania, Kazakhstan, Moldova, Ukraine:

Not applicable for freight wagons.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	
Georgia	
Kazakhstan	
Latvia	
Lithuania	
Moldova	
Poland	TSI WAG
Russia	GOST (draft) "Wheel slide protection devices for railway rolling stock. General technical conditions"
Slovakia	TSI WAG
Ukraine	OSJD leaflet O+R 540 "Technical requirements for rolling stock brakes circulating in freight trains with speeds up to 120 km/h and in passenger trains with speeds up to 200 km/h" – approved by the OSJD Conference of Directors General, October 1999 R 549/3 "Method for calculation of brakes of 1520 mm track gauge freight wagons" – approved by the Meeting of the OSJD Commission for infrastructure and rolling stock, 10.11.2005 Norms of calculations and design of unpowered railway vehicles of the 1520 mm network Informative: GOST (draft) "Braking systems for freight wagons. Technical requirements and rules for calculation" GOST (draft) "Braking systems for railway rolling stock. Automatic pressure regulation controller for power pneumatic unit. Safety requirements and control methods"

	GOST (draft) “Wheel slide protection devices for railway rolling stock. General technical conditions”

4.2.5. Environmental conditions / Условия окружающей среды

The design of the unit, as well as its constituents shall take into account the environmental conditions to which this rolling stock will be subjected to.

The environmental parameters are described in the clauses below. For each environmental parameter, a nominal range is defined, which is the most commonly encountered in Europe, and is the basis for the interoperable unit.

For certain environmental parameters ranges other than the nominal one are defined. In that case, a range shall be selected for the design of the unit.

For the functions identified in the clauses below, design and/or testing provisions taken to ensure that the rolling stock is meeting the TSI requirements in this range shall be described in the technical file.

Depending on the ranges selected and on provisions taken (described in the technical file), appropriate operating rules could be necessary when the unit designed for the nominal range is operated on a particular line where the nominal range is exceeded at certain periods of the year.

The ranges, if different from the nominal one, to be selected to avoid any restrictive operating rule(s) linked to environmental conditions, are specified by the Member States and are listed in section 7.4.

The unit and its constituents shall be designed under consideration of one or several of the following external air temperature ranges:

– T1: -25°C to +40°C (nominal),

– T2: -40°C to +35°C and

– T3: -25°C to +45°C.

The unit shall meet the requirements of this TSI without degradation for snow, ice and hail conditions as defined in clause 4.7 of EN 50125-1:1999, which correspond to the nominal range.

Where more severe ‘snow, ice and hail’ conditions than considered in the standard are selected, the unit and its constituents shall then be designed to meet TSI requirements considering the combined effect with low temperature according to the temperature range chosen.

In relation with the temperature range T2 and with the severe conditions for snow, ice and hail, the provisions taken to meet TSI requirements in these severe conditions shall be identified and verified, in particular design and/or testing provisions considering the following functions:

– Coupling function restricted to the resiliency of couplings.

– Brake function, including brake equipment.

The demonstration of conformity is described in point 6.2.2.7.

Belarus, Russia, Kazakhstan, Moldova, Ukraine:

Requirements for climatic versions of rolling stock – GOST 15150-69 "Machines, devices and other technical items. Versions for different climatic areas. Categories, conditions of operation, storage and transportation with regard to environmental factors."

Railway rolling stock and its parts must sustainably function within allowed range of temperatures and maintain functioning in case of short-term increase of temperature within allowed limits.

Freight wagons are produced in UHL (moderate and cold climate) version – for operation in moderate and cold macroclimatic regions of category 1 – open air operation (effect of totality of climatic factors common for the particular climatic region) according to GOST 15150-69.

Climatic version of parking brakes shall comply with requirements of version UHL category 1 of GOST 15150.

Values of ambiance temperature of operation according to UHL category 1

Climatic version and category	Ambiance temperature of operation, ºC			
	operational		ultimate limit	
	upper	lower	upper	lower
UHL1	+40	-60	+45	-70

Latvia, Lithuania, Poland:

TSI requirements may be applicable.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 15150-69 "Machines, instruments and other technical products. Modifications for different climatic regions. Categories, operation, storage and transportation conditions as to environment climatic aspects influence"
Georgia	

Kazakhstan	GOST 15150-69 (amendment No 5 approved by the Order of Rosstandart No. 1231-st of 27.11.2012) “Machines, instruments and other technical products. Modifications for different climatic regions. Categories, operation, storage and transportation conditions as to environment climatic aspects influence” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Latvia	TSI WAG
Lithuania	TSI WAG
Moldova	GOST 15150-69 “Machines, instruments and other technical products. Modifications for different climatic regions. Categories, operation, storage and transportation conditions as to environment climatic aspects influence”
Poland	TSI WAG
Russia	GOST 15150-69 (amendment No 5 approved by the Order of Rosstandart No. 1231-st of 27.11.2012) “Machines, instruments and other technical products. Modifications for different climatic regions. Categories, operation, storage and transportation conditions as to environment climatic aspects influence” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Slovakia	TSI WAG
Ukraine	

4.2.6. System protection / Защита системы

4.2.6.1. Fire safety / Пожарная безопасность

4.2.6.1.1. General / Общие положения

All significant potential fire sources (high risk components) on the unit shall be identified. The fire safety aspects of the unit design shall be aimed at preventing a fire from occurring, limiting the effects if a fire occurs.

The goods carried on the unit are not part of the unit and do not have to be taken into account in the conformity assessment.

Latvia:

TSI requirements may be applicable.

Russia, Kazakhstan:

General fire safety requirements are set up by CUO-112 “Rules on fire safety for railway transport”.

General requirements – GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”.

Belarus:

Requirements – GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”
Georgia	
Kazakhstan	Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011 GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”
Latvia	TSI WAG
Lithuania	
Moldova	
Poland	TSI WAG
Russia	Railway transport fire safety rules CUO-112 Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011 GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”
Slovakia	TSI WAG
Ukraine	

4.2.6.1.2. Functional and technical specification / Функциональные и технические спецификации

4.2.6.1.2.1. Barriers / Огнезащитные (огнеупорные) барьеры

In order to limit the effects of fire, fire barriers with integrity of at least 15 minutes shall be installed between the identified potential fire sources (high risk components) and the carried load.

The demonstration of conformity is described in point 6.2.2.8.1.

Belarus, Russia, Kazakhstan, Ukraine:

Fire safety and fire spreading restriction measures are defined in GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”.

Latvia:

Requirements not available

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”
Georgia	
Kazakhstan	GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”
Latvia	Not regulated
Lithuania	
Moldova	
Poland	TSI WAG
Russia	Railway transport fire safety rules CUO-112 GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”
Slovakia	TSI WAG
Ukraine	GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements”

4.2.6.1.2.2. Materials / Материалы

All permanent materials used on the unit shall have limited ignitability and flame spread properties, unless

– the material is separated from all potential fire risks on the unit by a fire barrier and the safe application is supported by a risk assessment or

– the component has a mass <400g, and is located within a horizontal distance of ≥40 mm and a vertical distance of ≥400 mm to other non-tested components.

The demonstration of conformity is described in point 6.2.2.8.2.

ERA:

NOTE: Does not cover tank wagons and other unit for transportation of dangerous good (RID).

Belarus, Russia, Kazakhstan:

"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network of Railways Transport Ministry".

Calculations of fire and explosion hazard indicators of substances and materials is being done according to GOST 12.1.044-89 “Fire and explosion hazard of substances and materials. List of indicators and definition methods”.

Materials and substances used for finishing internal surfaces of service and auxiliary premises of isotermical wagons must not exceed maximum allowed fire break-up and spreading risk factors as well as fire factors dangerous for humans;

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network GOST 12.1.044-89 “Fire and axplosion hazard safety of substances and materials. Nomenclature of properties and designation methods” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Georgia	
Kazakhstan	GOST 12.1.044-89 “Fire and axplosion hazard safety of substances and materials. Nomenclature of properties and designation methods” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Latvia	"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network” (GosNiiV-VNIIZT, 1996)

Lithuania	"Norms of calculations and design of unpowered railway vehicles of the 1520 mm network" (GosNiiV-VNIIZT, 1996)
Moldova	
Poland	TSI WAG
Russia	Norms of calculations and design of unpowered railway vehicles of the 1520 mm network GOST 12.1.044-89 "Fire and axplosion hazard safety of substances and materials. Nomenclature of properties and designation methods" Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Slovakia	TSI WAG
Ukraine	

4.2.6.1.2.3. Cables / Кабели

The selection and installation of electrical cables shall take into account their fire behaviour properties.

The demonstration of conformity is described in point 6.2.2.8.3.

Latvia:

According to requirements defined by a customer.

Russia, **Kazakhstan:**

GOST R 54965-2012 "Cables and flexes for railway transport rolling stock. General technical requirements".

Electric conductors of cables and flexes shall be made of copper wire. Copper wire can be tinned or untinned. Cores of the cables and flexes shall comply with class 5 according to GOST 22483.

Electric conductor core shall be coated by isolation. Isolation shall be attached tightly to the electric conductor core however not welded to it.

Isolation shall not have pockets or foreign inclusions, the surface shall not nave dimples reducing thickness of isolation below a minimum value as well as thickenings increasing the diameter of single core flex above its maximum value.

Surface of the isolation must not contain cracks.

Isolated cores of multiple conductor cables shall be stranded and shall have identification colour and digital marking. It is allowed to use marking pairs in every lay-up of the cable. In this case colour of isolation of marking pairs shall differ from each other and from colour of isolation of the other cores of the lay-up.

Electrical resistance of conductor core of cables and flexes against direct current (DC) defined for length of 1 km and temperature of 20 °C shall comply to GOST 22483, unless otherwise requested by technical requirements for cables and flexes of particular models.
Cables and flexes should be resistant to vibration and comply with GOST 17516.1 for class M27.
Cables and flexes shall be resistant to repetitive mechanical shock (12000 shocks) with shock acceleration peak value 220 m/s with impact duration from 2 to 30 ms.
Cables and flexes should be resistant to bending, bending with torsion and pearcing.

Cables and flexes shall be resistant to low ambiance temperature up to minus 50 °C (climatic version U (moderate)), minus 60 °C – for UHL (moderate cold climate) and HL (cold climate) and minus 10 °C – for T (tropical climate).

Cables and flexes shall be resistant to impact of ambiance temperature not less than 70 °C. Temperature values should comply with those indicated in technical conditions for cables and flexes of particular models.
Cables and flexes hall be resistant to change of ambiance temperature. Values of increased/decreased temperatures shall comply with those indicated in technical conditions for cables and flexes of particular models.
Cables and flexes shall be resistant to impact of ambiance humidity up to 100% combined with temperature of 25 °C. Cables and flexes shall be ozone-resistant.

Cables and flexes shall be resistant to rain, dynamic abrasive impact of dust, resistant to rime frost, resistant to impact of lubricating oils according to GOST 12337 and diesel fuel according to GOST 305.

Lifespan of cables and flexes in hardwiring shall not be less than 30 years. Lifespan in case of attachment to actuated collectors shall be defined in technical conditions for cables and flexes of particular models.

Cables and flexes shall not proliferate fire in case of bunch wiring according to category A set out in GOST R 53315, must have low smoke- and gas emission complying with GOST R 53315.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 33326 – 2015 “Cables and wires for railway rolling stock. General technical conditions”
Georgia	
Kazakhstan	GOST 33326 – 2015 “Cables and wires for railway rolling stock. General technical conditions”
Latvia	Manufacturer’s documentation
Lithuania	
Moldova	

Poland	TSI WAG
Russia	GOST 33326 – 2015 “Cables and wires for railway rolling stock. General technical conditions”
Slovakia	TSI WAG
Ukraine	Informative: GOST 33326 – 2015 “Cables and wires for railway rolling stock. General technical conditions”

4.2.6.1.2.4. Flammable liquids / Воспламеняющиеся жидкости

The unit shall be provided with measures preventing a fire from occurring and spreading due to leakage of flammable liquids or gases.

The demonstration of conformity is described in point 6.2.2.8.4.

Russia, Moldova, Kazakhstan:

Fire prevention methods and measures according to GOST 12.1.044-91 “Fire safety. General requirements”.

Isothermal wagons must be equipped with fire alarm systems, firefighting facilities, dedicated places for fire extinguishers and firefighting inventory.

Isotermical wagons equipped with independent power plant must be fitted with spark prevention measures.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	
Georgia	
Kazakhstan	GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Latvia	Manufacturer’s documentation
Lithuania	
Moldova	GOST 12.1.004-91 “System of occupational safety standards. Fire

	safety. General requirements”
Poland	TSI WAG
Russia	GOST 12.1.004-91 “System of occupational safety standards. Fire safety. General requirements” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Slovakia	TSI WAG
Ukraine	

4.2.6.2. Protection against electrical hazards / Защита от опасности поражения электрическим током

4.2.6.2.1. Protective measures against indirect contact (protective bonding) / Средства защиты от непрямого контакта (контурное заземление)

The impedance between vehicle body and the running rail shall be low enough to prevent hazardous voltages between them.

Units shall be bonded in accordance with the provisions as described in clause 6.4 of EN 50153:2002.

Russia, Kazakhstan:

Metal cover of electrical equipment as well as fencings (including pipes), electrical conductor fastening structures which may occur under limit exceeding voltage in case of malfunctions shall be bonded to the body of the rolling stock.

Requirements to ensure protection from indirect contact with electric conductors are set out in Chapter 6 of GOST R 54799-2011 “Railway rolling stock. Requirements for protection against electrical hazard”.

Belarus:

Requirements – GOST 12.1.019-79 “System of occupational safety standards. Electrical protection. General requirements and types of protection”, GOST 12.4.026 -76 “System of occupational safety standards. Colour signals and safety signs”.

Poland:

TSI WAG requirements applicable.

Эти требования утверждены следующими документами:

Belarus	GOST 12.1.019-79 “System of occupational safety standards. Electrical protection. General requirements and types of protection” GOST 12.4.026 -76 “System of occupational safety standards. Colour signals and safety signs”

	Informative: GOST R 50571.3-94 “Protection from electrical hazard”
Georgia	
Kazakhstan	GOST R 50571.3-94 “Protection from electrical hazard” GOST R 54799-2011 “Railway rolling stock. Requirements for protection from electrical hazard” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Latvia	Manufacturer’s documentation
Lithuania	
Moldova	
Poland	TSI WAG
Russia	GOST R 50571.3-94 “Protection from electrical hazard” GOST R 54799-2011 “Railway rolling stock. Requirements for protection from electrical hazard” Technical Regulation of the Customs Union “On railway rolling stock safety” TR TS 001/2011
Slovakia	TSI WAG
Ukraine	

4.2.6.2.2. Protective measures against direct contact / Средства защиты от прямого контакта

The electrical installations and equipment of a unit shall be designed so as to protect persons from electric shock.

The unit shall be designed so that direct contact is prevented following the provisions set out in clause 5 of EN 50153:2002.

Russia, Kazakhstan:

Unprotected (uninsulated) parts of electrical equipment of the railway rolling stock that are under voltage must be protected from accidental access to them by maintenance personnel and (or) passengers.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	

Georgia	
Kazakhstan	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011
Latvia	Manufacturer's documentation
Lithuania	
Moldova	
Poland	TSI WAG
Russia	Technical Regulation of the Customs Union "On railway rolling stock safety" TR TS 001/2011 GOST R 54799-2011 "Railway rolling stock. Requirements for protection from electrical hazard"
Slovakia	TSI WAG
Ukraine	

4.2.6.3. Attachment devices for rear-end signal / Крепежные приспособления для средств обозначения хвоста поезда

On all units designed to receive a rear-end signal, two devices at the end of the unit shall provide for the installation of two lamps or two reflective plates as set out in Appendix E on the same height above rail not higher than 2000 mm. The dimensions and clearance of these attachment devices shall be as described in chapter 1 of ERA technical document ERA/TD/2012-04/INT version 1.0 of 04.06.2012 published on the ERA website (http://www.era.europa.eu).

Belarus, Russia, Latvia, Ukraine, Lithuania, Moldova, Kazakhstan:

Presence of mounting brackets for mounting of signalling lights on the last wagon of a train.

Poland:

TSI WAG requirements applicable.

The aforementioned requirements are approved by the following documents:

Belarus	TOR Belarus Signalling instructions for Belarus railways
Georgia	
Kazakhstan	
Latvia	TOR Latvia
Lithuania	
Moldova	

Poland	TSI WAG
Russia	Signalling instructions for Russian railways, Annex 7 to TOR Russia
Slovakia	TSI WAG
Ukraine	TOR Ukraine Signalling instructions for Ukrainian railways

CONFORMITY ASSESSMENT AND EC VERIFICATION / ОЦЕНКА СООТВЕТСТВИЯ И ВЕРИФИКАЦИЯ ЕС

Interoperability constituent / Элемент интероперабельности

The conformity assessment of an interoperability constituent shall be performed in accordance with the module(s) described in table 8.

Table 8

Modules for conformity assessment of interoperability constituents

Module CA1	Internal production control plus product verification by individual examination
Module CA2	Internal production control plus product verification at random intervals
Module CB	EC-Type examination
Module CD	Conformity to type based on quality management system of the production process
Module CF	Conformity to type based on product verification
Module CH	Conformity based on full quality management system
Module CH1	Conformity based on full quality management system plus design examination

These modules are specified in detail in the Commission Decision 2010/713/EU.

Russia:

Railway rolling stock and their structural parts conformity assessment shall be performed in accordance with Customs Unioin Technical Regulation “On railway rolling stock safety” TR TS 001/2011 from entry into force.

Rules on admission (GOST 31313 Freight wagons repaired in maintenance or in overhaul repair, or overhaul repair with extension of life-cycle):

Wagon’s compliance with requirements set out by technical conditions and design documentation shall be tested in accordance with GOST 15.309 «Products design and launching into manufacturing system. Tests and admission of production». Repaired and newly produced parts, units, aggregates are submitted to pre-installation and pre-starage tests and checks. Amount, nature and procedure of tests and checks have to comply with standards, technical conditions, design, maintenance, operation and technological documentation. In accordance with GOST 24297 “On-receipt inspection of products”, on-receipt inspection of

incoming materials and parts is being done to verify their compliance with standards, technical cnditions, certificates and other supplyer's documentation. During the maintenance of critical units and parts non-destructive control methods shall be used.

Control methods:

Control of production and maintenance of parts of wagons shall be performed during production process in compliance with control actions set out by technological processes. Admission of maintained wagons shall be performed in accordance with requirements of GOST 15.601 "Products design and launching into manufacturing system. Technical maintenance and repair of mechanical equipment" and in accordance with reference documents and guidelines based on requirements for certification.

5. COMPARISON WITH TARGET PARAMETERS FOR 1435 MM SYSTEM / СРАВНЕНИЕ С ЦЕЛЕВЫМИ ЗНАЧЕНИЯМИ СИСТЕМЫ КОЛЕИ 1435 ММ

5.2.2. Scope and definition of subsystem / Область применения и описание подсистемы

Definition of “unit”

TSI definition of “unit” does not completely match the definition used in OSJD 1520 mm area (for example in Russia, Kazakhstan and Ukraine). Analysis of differences allows to assume that definition provided by OSJD members would still allow placing into service and operation of (1) a rake of permanently connected **elements** which cannot be operated separately or (2) **separate rail bogies connected to compatible road vehicle(s)** the combination of which forms a rake of a rail compatible system, although this kind of railway rolling stock is not used on OSJD public lines 1520 mm ralway lines.

5.2.2.1.1. End coupling / Концевое сцепное устройство

Considering the fact that automatic coupling is used throughout OSJD 1520 mm area, it is believed that TSI WAG functional requirement for the coupling system to be be designed in a way that no human presence between the units to be coupled / uncoupled shall be required whilst either one unit is moving coincides with the requirement used in OSJD 1520 mm system. The same reuirement applies to the wagons equiped with two kinds of coupling devices which may be used in cross-border operations.

Technical requirements for autocoupling devices used in OSJD 1520 mm networks derive from GOST standards and national rules on technical operation.

In OSJD 1520 mm area the rolling stock with other types of couplers (e.g. UIC coupling system) should be fitted with adapters for the coupling system in accordance with GOST.

For all members of the Contact Group, the height from the rail head to automatic coupler centreline shall be:

- empty – not exceeding 1080 mm;
- loaded – at least 950 mm.

5.2.2.1.2. Inner coupling / Внутрисекционное сцепное устройство

Based on information provided by OSJD delegations, units fitted with inner coupling as decribed in TSI WAG are not in use on OSJD 1520 mm public network.

5.2.2.2. Strength of unit / Прочность конструкции единицы ПС

According to information provided by OSJD delegations, the wagon must withstand a set of predefined load cases. These load cases consider both static and dynamic loads. The compliance to this requirement is demonstrated by calculation and tests.

In OSJD 1520 mm area requirements regarding strength of unit are believed to be harmonised to a significant extent.

Further detailed comparison between the GOST (draft) standard and the EN 12663-2:2010 is needed to determine which requirement is more stringent.

5.2.2.3. Integrity of the unit / Целостность конструкции единицы ПС

In the OSJD 1520 mm area the requirement for presence and proper functioning of locking devices (including prevention of unintentious opening or movement) are unified and mandatory.

5.2.3. Gauging and track interaction / Габарит и воздействие на путь

5.2.3.1. Gauging / Габарит

Requirements for gauge are harmonised throughout OSJD 1520 mm area. The following clearance gauges are applied: T, Tc, Tpr, 1-T, 1-VM, 0-VM, 02-VM, 03-VM and 03-VMk in accordance with GOST 9238 or similar national requirements.

5.2.3.2. Compatibility with load carrying capacity of lines / Совместимость с грузопропускной способностью линий

Requirements existing in OSJD 1520 mm system coincide in their purpose with those set out in TSI WAG. At the same time, comparing to TSI WAG, OSJD 1520 mm requirements address wider range of parameters to be taken into account to determine compatibility with load carrying capacity of lines.

5.2.3.3. Compatibility with train detection systems / Совместимость с системами обнаружения поезда

The purpose of the train detection systems in OSJD 1520 mm area – support of traffic safety – coincide with the purpose of such systems in EU. At the same time, requirements for such systems in OSJD 1520 mm area and the EU are different in their content.

5.2.3.4. Axle bearing condition monitoring / Контроль состояния буксового узла

General purpose of requirements for axle bearing condition monitoring is ensuring the traffic safety.

Requirements for this parameter vary throughout the OSJD 1520 mm area. Different monitoring systems are used; the alarm thresholds are triggered at different temperatures measured in different points.

5.2.3.5. Running safety / Безопасность движения

Requirements used in OSJD 1520 mm area are comparable to the requirements of TSI WAG. As a rule they are based on standards, harmonised international documents and national rules of operation.

5.2.3.5.1. Safety against derailment running on twisted track / Устойчивость к сходу с рельсов при движении по переходным кривым и по пути с отклонениями в пределах допуска содержания пути

Requirements used in OSJD 1520 mm area are comparable to the requirements of TSI WAG. As a rule they are based on standards, harmonised international documents and national rules of operation.

5.2.3.5.2. Running dynamic behaviour / Параметры динамики движения

In a number of OSJD members requirements of OSJD 1520 mm area coincide with relevant TSI WAG provisions in their approach to the subject as both are intended to be linked to standardisation information: wagon dynamic properties indicators and dynamic forces (dynamic stresses) impacting wagon body frame and a bogie are defined in points 5.1.1-5.1.8 and 7.1.1-7.1.8 of GOST 33211-2014 “Freight wagons. Requirements for strength and dynamic properties” (enters into force 01/11/2015 in Russia).

Other international technical documents (Norms for calculation and design of new and renewed unpowered vehicles for 1520 mm railway network) should also be considered in this respect.

5.2.3.6. Running gear / Ходовая часть

Требования к ходовой части на пространстве ОСЖД 1520 мм стандартизированы.

Requirements for running gear in OSJD 1520 mm area is standardized.

5.2.3.6.1. Structural design of bogie frame / Конструкция рамы тележки

Requirements for this parameter are presumably the same in all OSJD 1520 mm area because the same standards for the calculation and assessment of the strength of the bogie structure are used.

Design of the bogie for rolling stock of 1520 mm area does not include a frame (except isotermic rolling stock), therefore application of EN 13749 for bogies of rolling stock of 1520 mm area for the teime being is impossible.

5.2.3.6.2. Characteristics of wheelsets / Характеристики колесных пар

Requirements for wheel sets are identical in the OSJD 1520 mm area.

For wheelsets in the OSJD 1520 mm area, the “front-to-front dimension” is a non-mandatory parameter and is not controlled neither in production nor in operation; however “back-to-back dimension” is controlled as well as the parameter “thickness of the flange";

5.2.3.6.3. Characteristics of wheels / Характеристики колес

Requirements for wheel sets are identical in the OSJD 1520 mm area.

The minimum value of the height of the flange in the OSJD 1520 mm area is equal to 27-28 mm; maximum value for the new wheels, as well as the minimum and maximum values in operation are non-mandatory; in this case, the parameter that affects traffic safety is “thickness of the wheel rim”.

In the majority of networks of the OSJD 1520 mm area, the minimum value of the thickness of the flange, measured at a distance of 18 mm from the top of the flange, is 32 mm (new wheel); compliance with requirements during the operation is controlled by a acceptance stencil and does not have a numeric expression (acceptable/unacceptable condition only).

In the majority of networks of the OSJD 1520 mm area, the face of the flange in operation and production are supervised by the corresponding acceptance stencils.

5.2.3.6.4. Characteristics of axles / Характеристики осей

Requirements for this parameter are identical and standardised for all the OSJD 1520 mm area. It is recommended to set out harmonised text, table and figures.

5.2.3.6.5. Axle boxes / bearings / Буксовые узлы, подшипники

In OSJD 1520 mm area axleboxes and axle bearings are believed to be fully standardised. Existing range of options include one design for axlebox and three designs of bearings (one is directly fitted into the axlebox and the other two are fitted into the axlebox with an adaptor).

5.2.3.6.6. Variable gauge wheelsets / Колесные пары изменяемой ширины

At present, variable gauge wheelsets are not used for freight wagons of OSJD 1520 mm area. Technical requirements for variable gauge wheelsets of 1520 mm vehicles are defined by GOST 4835-2013.

5.2.3.6.7. Running gear for manual change of wheelsets / Замена тележек, колесных пар

For the part of the OSJD 1520 mm area technical requirements for variable gauge wheelsets of 1520 mm vehicles are defined by GOST 4835-2013.

5.2.4. Brake / Тормоз

5.2.4.1 General / Общие положения

Functional requirements for braking system coincides in most of the OSJD 1520 mm networks.

Freight wagons' automatic brakes must be controllable and reliably operative in different operation conditions, must ensure smooth braking and train stop in case of uncoupling or abruption of brake line as well as in case of emergency brake valve is used.

5.2.4.2. Safety requirements / Требования безопасности

In OSJD 1520 mm area relevant safety requirements are harmonised throughout the networks due to application of the same technical documents.

5.2.4.3. Functional and technical requirements / Функциональные и технические требования
5.2.4.3.1. General functional requirements / Общие функциональные требования
5.2.4.3.2. Brake performance / Тормозная эффективность
5.2.4.3.2.1. Service brake / Рабочий тормоз

In OSJD 1520 mm area relevant safety requirements are harmonised throughout the networks by application of the same technical documents.

5.2.4.3.2.2. Parking brake / Стояночный тормоз

Functional requirement for the parking brake in the OSJD 1520 mm area coincide with functional requirements of TSI WAG.

Given the high degree of standardization and existing interchangeability of wagons, the requirements for the parking brake are the fully harmonized throughout the OSJD 1520 mm area.

5.2.4.3.3. Thermal capacity / Термостойкость

Given the high degree of standardization and existing interchangeability of wagons throughout the OSJD 1520 mm area, the requirements for the thermal capacity are the fully harmonized throughout the OSJD 1520 mm area.

5.2.4.3.4. Wheel slide protection (WSP) / Система противоюзной защиты

According to information provided, WSP is not used for freight wagons of OSJD 1520 mm area.

5.2.5. Environmental conditions / Условия окружающей среды

Given the high degree of standardization and existing interchangeability of wagons throughout the OSJD 1520 mm area, the requirements for climatic conditions are the fully harmonized throughout the OSJD 1520 mm area.

Climatic requirements used in OSJD 1520 mm area are stricter comparing to those defined by TSI WAG.

5.2.6. System protection / Защита системы
5.2.6.1. Fire safety / Пожарная безопасность
5.2.6.1.1. General / Общие положения
5.2.6.1.2. Functional and technical specification / Функциональные и технические спецификации
5.2.6.1.2.1. Barriers / Огнезащитные (огнеупорные) барьеры
5.2.6.1.2.2. Materials / Материалы
5.2.6.1.2.3. Cables / Кабели
5.2.6.1.2.4. Flammable liquids / Воспламеняющиеся жидкости

Requirements throughout OSJD 1520 mm area contain detailed technical provisions and are standardized to a significant extent.

5.2.6.2. Protection against electrical hazards / Защита от опасности поражения электрическим током
5.2.6.2.1. Protective measures against indirect contact (protective bonding) / Средства защиты от непрямого контакта (контурное заземление)
5.2.6.2.2. Protective measures against direct contact / Средства защиты от прямого контакта

Requirements for this parameter are harmonised throughout OSJD 1520 mm area. The requirements for the 1520 mm gauge system shall be described by relevant standards, as well as by other normative safety documents, or by equivalent national documents of OSJD countries.

5.2.6.3. Attachment devices for rear-end signal / Крепежные приспособления для средств обозначения хвоста поезда

Requirement for OSJD 1520 mm area coincide in its purpose, at the same time the content of the requirement differs from requirement apllied in 1435 mm area due to harmonised operational rules in the field of train visibility.

CONFORMITY ASSESSMENT AND EC VERIFICATION / ОЦЕНКА СООТВЕТСТВИЯ И ВЕРИФИКАЦИЯ ЕС

Latvia, Lithuania, Poland, Slovakia, Estonia, Ukraine apply module conformity assessment system according to European Commission Decision 2010/713/EU.

Customs Union Member States don't use module conformity assessment system according to European Commission Decision 2010/713/EU.

6. LIST OF DELEGATIONS / СПИСОК ДЕЛЕГАЦИЙ

The following delegations have participated in the work on the document:

– Republic of Belarus
– Georgia
– Republic of Kazakhstan
– Republic of Latvia
– Republic of Lithuania
– Republic of Moldova
– Republic of Poland
– Russian Federation
– Slovak Republic
– Ukraine
– Organisation for Co-Operation Between Railways (OSJD)
– European Railway Agency (ERA)