REPAIR AND MAINTANENCE INFORMATION

INDEX

OKTAR

ÜMİT MAKİNE İNŞAAT TAAHÜT NAKLİYE İMALAT İTHALAT
İHRACAT SAN. VE TİC. LTD.ŞTİ.

Doğankaya Mah. Organize Sanayi Bölgesi
1.Cad. No:31 İç Kapı:1 Bafra, Samsun
TURKEY

Telephone:
0362 544 11 11
0541 760 23 46
Email: info@umitmakine.com
Website: http://www.umitmakine.com/

Authorised Representative

Fahri KIR
38 rue Docteur Blanche
75016 PARIS
FRANCE
Telephone: +33 787 823 273
Email: f.kir00@gmail.com

The manufacturer is the type-approval holder for the O4 category semi-trailers described in this Repair and Maintenance Information (RMI) Manual.
All technical data and instructions provided herein are issued and controlled by the manufacturer in accordance with Regulation (EU) 2018/858, Annex X

SECTION 1

INTRODUCTION, IDENTIFICATION

This manual has been written to assist the operators of trailers in achieving the highest level of safety, performance, reliability, and dependability we build into every trailer. Periodic safety, maintenance inspections and service with authorized replacement parts is required to achieve the intended results. Careful and complete inspection and verification of the condition of the parts, components and mechanics of a trailer in accordance with this manual, as well as in accordance with the instructions of suppliers to **OKTAR** of the particular part or component. This inspection is essential each time a trailer is to be operated. DO NOT operate a trailer with un-repaired damaged components.

A. Purpose and Scope

This Repair and Maintenance Information (RMI) Manual provides the technical data, instructions, and maintenance procedures necessary to perform service operations on O4 category semi-trailers manufactured by OKTAR.

The document aims to ensure that independent repairers, authorised workshops, and technical services have equal and non-discriminatory access to essential repair and maintenance information, as mandated by Annex Xa to Regulation (EU) 2018/858.

The RMI content covers:

- General service and inspection operations;
- Disassembly, assembly, adjustment, and replacement procedures;
- Periodic maintenance intervals and checks;
- Identification of safety-related components;
- Specifications for tightening torques, tolerances, and wear limits;
- Lists of special tools and consumables.

This manual does **not** include design drawings or intellectual-property-sensitive data that are not necessary for repair or maintenance activities.

B. Product Identification

The information contained in this manual applies to O4 category semi-trailers approved under the following type-approval numbers:

Approval Number	Type	Commercial Name
e5**2018/858*00*???*00	***	OKTAR

****Note – Confidentiality Statement:***
The type-approval number and type designation shown in this document have been partially concealed for confidentiality and data protection reasons. The complete type-approval information is recorded in the manufacturer's database and is accessible only to authorized authorities, service providers, and relevant technical personnel. Upon request, this information may be disclosed by the manufacturer in accordance with the applicable legal procedures and authorization requirements.

Each vehicle identification plate and VIN correspond to the type-approved configuration recorded in the manufacturer's database. Any customer-specific adaptations (as referred to in Annex Xa § 3.2) are recorded separately and documented upon request.

C. General Responsibilities and Legal Notice

The information provided in this RMI Manual reflects the manufacturer's current product configuration and maintenance requirements.
Users of this document are responsible for applying the described procedures in accordance with professional workshop standards and applicable safety legislation.
Reproduction, translation, or distribution of this document, in whole or in part, is prohibited without prior written authorisation from the manufacturer.
The manufacturer reserves the right to update or amend the RMI content at any time to reflect design or regulatory changes.

SECTION 2

GENERAL MAINTENANCE AND WORKSHOP SAFETY INSTRUCTIONS

2.1 Purpose and Scope

This section provides the general safety requirements and good workshop practices to be observed during all maintenance, inspection, and repair operations on the semi-trailer.

The instructions herein are intended to prevent injury, environmental damage, and equipment malfunction, ensuring compliance with Regulation (EU) 2018/858 Annex X on workshop safety and maintenance information.

2.2 General Workshop Safety Rules

Qualified Personnel Only

Maintenance, repair, and inspection tasks shall be performed exclusively by qualified and authorized personnel who are familiar with the trailer design and technical documentation.

Personal Protective Equipment (PPE)

Personnel shall wear appropriate PPE at all times, including but not limited to:

- Safety shoes (EN ISO 20345 compliant)
- Safety gloves suitable for mechanical work
- Protective goggles or face shield when grinding, cutting, or working under the trailer
- Hearing protection when working near pneumatic or power tools
- Reflective vests in shared or open workshop environments

Prohibition of Unauthorized Activities

Smoking, open flames, or the use of spark-producing tools near flammable substances (e.g., lubricants, cleaning agents) is strictly prohibited.

2.3 Vehicle Preparation Before Maintenance

- Ensure the trailer is parked on level, stable ground.
- Engage the parking brake and chock all wheels to prevent movement.
- If maintenance requires detachment from the tractor, secure the trailer using landing legs and confirm proper stability.
- Depressurize air suspension and brake circuits before removing or disconnecting air lines.
- Disconnect electrical connectors before working on the electrical system to prevent short circuits or shocks.

2.4 Safe Use of Workshop Equipment

- Use only calibrated lifting devices, jacks, and supports suitable for the trailer's gross weight.
- Never work beneath a raised vehicle unless it is properly supported with approved stands.
- Do not exceed lifting capacities of workshop cranes or jacks.
- Ensure pneumatic tools operate at regulated air pressure to prevent accidents.
- Use torque wrenches where specified in the service manual (refer to Section 14 for torque values).

2.5 Handling of Components and Subsystems

- Always handle heavy or large components (axles, landing legs, rims, etc.) with mechanical assistance.
- Observe cleanliness when servicing the braking and air systems; contamination may result in malfunction or safety hazards.
- Ensure correct alignment and reinstallation of suspension and kingpin assemblies.
- Replace safety-critical fasteners (e.g., lock nuts, cotter pins) with new ones after disassembly.
- Dispose of replaced components according to environmental regulations.

2.6 Fire Safety and Hazardous Material Handling

- Keep suitable fire extinguishers (Class ABC) accessible within the workshop.
- Store flammable liquids and cleaning agents in approved safety containers.
- Avoid the use of high-pressure air to clean components — use low-pressure air or appropriate brushes.
- Collect and dispose of oil, grease, solvents, and brake fluid through licensed waste handlers in accordance with Directive 2008/98/EC on waste management.

2.7 Environmental and Cleanliness Requirements

- Maintain a clean working area at all times to prevent accidents.
- Prevent oil or chemical spills from entering drainage systems.
- Use drip trays under vehicle components when draining fluids.
- Segregate waste (metal, rubber, oil, filters) according to environmental management procedures (ISO 14001).

2.8 Electrical and Pneumatic System Safety

- Before working on the electrical system, disconnect the power supply from the towing vehicle.
- Never bypass fuses or relays.
- Avoid short circuits by isolating terminals.
- For pneumatic systems, relieve system pressure before disconnecting lines or valves.
- Ensure all fittings and couplings are reconnected securely and leak-tested after reassembly.

2.9 Safety Signage and Labels

- Observe all safety labels affixed to the trailer.
- Replace any damaged or missing labels immediately.
- Do not remove or obscure identification plates, VIN markings, or load rating labels.

2.10 Training and Emergency Preparedness

- All personnel must be trained in basic first aid and emergency evacuation procedures.
- Keep first aid kits and emergency contact information visible in the workshop.
- Emergency exits and routes must remain unobstructed at all times.

2.11 Compliance and Documentation

- All maintenance and workshop safety activities must comply with:
- Regulation (EU) 2018/858 – Annex X, Part B
- Directive 2009/104/EC – Use of Work Equipment
- ISO 45001 – Occupational Health and Safety Management
- Manufacturer’s internal safety procedures

SECTION 3

MAINTENANCE SCHEDULE AND SERVICE INTERVALS

3.1 Purpose and Scope

This section defines the regular maintenance schedule and service intervals required to ensure the safe and reliable operation of the semi-trailer. The maintenance intervals specified herein are based on normal operating conditions. Vehicles operated under severe conditions (e.g., heavy loads, poor road surfaces, extreme climates) require more frequent inspection and service.

The maintenance schedule shall be followed in accordance with the manufacturer's recommendations and applicable EU regulations (EU 2018/858 Annex X).

3.2 General Maintenance Principles

- All maintenance operations shall be performed by qualified personnel in accordance with the safety instructions outlined in Section 2.
- Use only approved replacement parts and lubricants conforming to the technical specifications provided in Section 14.
- Maintenance records must be documented in the “Record of Service and Inspection” (Section 16).
- Prior to any maintenance activity, ensure that the trailer is parked on level ground, securely braked, and isolated from the towing vehicle.

3.3 Maintenance Schedule Overview

Interval	Operating Time / Mileage	Main Tasks
Pre-Operation (Daily / Before Each Trip)	Each operation	- Visual inspection of lights, reflectors, tires, and brakes. - Check air lines and couplings for leakage. - Ensure suspension air pressure (if equipped) is within the recommended range. - Confirm landing legs and kingpin locking function properly.
First Service	After 1,000 km or 1 month (whichever occurs first)	- Inspect wheel nuts and torque to specified value. - Check brake adjustment and air system tightness. - Verify suspension mounting bolts. - Lubricate wheel bearings if applicable.
Periodic Service A	Every 10,000 km or 3 months	- Inspect brake linings, drums, and adjust if required. - Inspect and lubricate kingpin and fifth-wheel interface. - Check suspension components for wear or damage. - Verify lighting system and reflective markings. - Check wheel torque.
Periodic Service B	Every 40,000 km or 12 months	- Perform all tasks under Service A. - Replace air dryer cartridge (if equipped). - Drain air reservoirs. - Inspect and lubricate wheel bearings. - Inspect chassis and underbody for corrosion or cracks. - Check operation of rear underrun protection (RUPD).
Extended Service	Every 80,000 km or 24 months	- Complete Service B plus: - Replace brake linings if below wear limit. - Check and lubricate landing legs, pivot points, and locking pins. - Verify all torque values of suspension and coupling fasteners. - Update maintenance record.

3.4 Lubrication Schedule

Lubrication points are indicated in the “Annexes” (Section 17) with reference diagrams. Use only approved grease types suitable for the ambient temperature range (-30°C to +50°C).

Typical lubrication frequency:

- Kingpin: every 10,000 km or 3 months
- Landing legs: every 20,000 km or 6 months
- Wheel bearings: every 40,000 km or 12 months

3.5 Service Interval Adjustment

In case of severe operating conditions, the following reductions shall apply:

- Reduce standard intervals by 50% for operations on unpaved or corrosive environments.
- Reduce by 30% for frequent heavy-load or short-haul operations.

3.6 Maintenance Records and Verification

All completed maintenance tasks must be recorded in the “Record of Service and Inspection” section, signed by the responsible technician, and verified by the fleet operator. Non-compliance with the prescribed schedule may affect warranty validity and regulatory conformity.

3.7 Reference Documents

- Regulation (EU) 2018/858, Annex X (Repair and Maintenance Information)
- ISO 611:2017 – Road vehicles — Braking systems — Inspection and maintenance
- Manufacturer’s Technical Data Sheet (Section 14)

SECTION 4

SUSPENSION SYSTEM

4.1 Purpose and Scope

This section defines the inspection, maintenance, and service requirements for all suspension types installed on the semi-trailer:

- Air suspension systems

Proper maintenance of the suspension ensures stable handling, correct load distribution, and compliance with EU safety standards.
All procedures shall be performed by qualified personnel in accordance with the safety instructions defined in Section 2.

4.2 Description of the System

The trailer's suspension system connects the axle assemblies to the chassis and maintains the desired ride height and vehicle stability.
Depending on model specification, the trailer may feature:

1. **Air Suspension System** – utilizing air bellows, leveling valves, and shock absorbers to control ride height.

4.3 Safety Precautions

- Park the trailer on a level surface and apply wheel chocks.
- Always depressurize air or hydraulic systems before disconnecting lines or components.
- Support the chassis securely using approved stands. Never rely solely on air or hydraulic pressure.
- Do not work under an inflated or pressurized suspension.
- Hydraulic circuits may remain under residual pressure even when the system appears inactive — release pressure via service valves per manufacturer instructions.
- Wear protective goggles and gloves when handling hydraulic oil or compressed air components.

4.4 Inspection Intervals

Inspection Type	Interval	Inspection Points
Routine (Visual)	Every 10,000 km or 3 months	- Inspect air bellows for leaks or damage. - Check shock absorbers for oil leakage. - Examine hoses, pipes, and fittings for cracks, abrasion, or looseness. - Verify suspension alignment and ride height.
Detailed Inspection	Every 40,000 km or 12 months	- Measure nominal ride height per manufacturer specification. - Inspect all suspension bushings and torque arms for wear. - Check hydraulic reservoir level and oil condition. - Verify integrity of air/hydraulic control valves and return lines. - Check torque of fasteners (refer to Section 14).
Major Service	Every 80,000 km or 24 months	- Replace worn bushings, shock absorbers, or air/hydraulic components. - Drain and replace hydraulic fluid (if system-specific requirement applies). - Replace filters in hydraulic circuits (if equipped). - Inspect weld seams, brackets, and mountings for cracks or deformation. - Perform full ride height calibration and leak test.

4.5 Maintenance Procedures

4.5.1 Air Suspension

- Inspect air bellows for cracks, cuts, or bulging. Replace if deformation or leakage occurs.
- Clean bellows with mild detergent; avoid petroleum-based cleaners.
- Check leveling valve operation and linkage integrity.
- Verify air pressure supply and leak tightness at fittings.
- Inspect shock absorbers and replace if damping performance is inadequate.

4.6 Ride Height Adjustment

Air Suspension:

Adjust ride height by setting the leveling valve linkage to the nominal measurement between the chassis and axle centerline.

4.7 Torque Specifications

All torque values for suspension-related components (u-bolts, torque arm bolts, hanger mounts, and cylinder brackets) are provided in Section 14 – Technical Data and Specifications.
Always use calibrated torque wrenches.

4.8 Lubrication and Fluids

Component	Lubricant / Fluid Type	Interval
Air Suspension Pivots	Lithium-based NLGI 2 grease	Every 10,000 km

4.9 Post-Maintenance Checks

- Verify suspension height and alignment under load and unloaded conditions.
- Check for air or oil leaks in all systems.
- Conduct a dynamic test to confirm stability and damping function.
- Update maintenance record (Section 16).

4.10 Reference Standards

- Regulation (EU) 2018/858 Annex X – Repair and Maintenance Information
- ISO 611:2017 – Road Vehicles — Braking and Suspension Systems
- ISO 6743/4 – Classification of Hydraulic Fluids
- EN 14363 – Road Vehicle Dynamic Testing

SECTION 5

BRAKING SYSTEM

5.1 Purpose and Scope

This section describes the maintenance, inspection, and service requirements for the semi-trailer braking systems.
It covers the following configurations:

- **Air (Pneumatic) Brake System** – including service, parking (spring brake), and emergency circuits, as well as optional ABS/EBS systems.

Proper and regular maintenance of the braking system is essential for road safety, regulatory compliance, and optimal braking efficiency. All work must be performed by trained personnel following the safety instructions described in Section 2.

5.2 General Safety Precautions

1. Park the trailer on a flat, stable surface and chock all wheels.
2. Before working on the air system, disconnect the towing vehicle, release system pressure, and drain all air tanks completely.
3. When working on spring brake chambers, always use the designated manual release (caging) bolt to safely deactivate the spring prior to removal.
4. Before servicing hydraulic systems, relieve pressure from the lines and reservoirs. Do not disconnect any hydraulic hose under pressure.
5. Never check for leaks with hands — use paper or spray detergent solution. Hydraulic fluid under pressure can penetrate skin.
6. Use only clean, approved brake fluids or oils as specified in Annex A12.
7. Avoid inhaling brake dust; use vacuum cleaning or damp cloths, not compressed air.
8. After any maintenance, perform a functional brake test before releasing the trailer into operation.

5.3 System Description

5.3.1 Air (Pneumatic) Brake System

The system consists of:

- Air compressor and reservoirs (on towing vehicle)
- Supply and control lines (red/yellow)
- Brake chambers (service and spring type)
- Relay and protection valves
- ABS/EBS control unit and sensors (if equipped)
- Brake drums or discs with actuators

The system operates using compressed air to actuate service brakes and mechanical spring force for parking brakes.

5.4 Inspection Intervals

Inspection Type	Interval	Main Tasks
Pre-Operation (Daily)	Before each trip	- Check air pressure build-up and warning function. - Inspect air/hydraulic lines for leakage or damage. - Verify parking brake engagement and release. - Ensure brake lights and ABS warning lamp function.
Periodic Service A	Every 10,000 km or 3 months	- Drain air reservoirs. - Inspect hoses, valves, and fittings for tightness. - Check chamber mounting and pushrod travel. - Check hydraulic fluid level and cleanliness. - Verify caliper operation and pad wear.
Periodic Service B	Every 40,000 km or 12 months	- Perform full air-leak test (max loss: 0.2 bar/min). - Inspect relay and protection valves for function. - Replace air dryer cartridge (if applicable). - Replace hydraulic fluid (DOT 4 or ISO VG type, per Section 14). - Inspect and clean ABS/EBS sensors.
Major Service	Every 80,000 km or 24 months	- Replace brake linings and seals if worn beyond limits. - Replace flexible hoses showing aging or cracks. - Overhaul brake chambers and calipers as needed. - Test system response time and pressure build-up. - Conduct full road test and document results.

5.5 Maintenance Procedures

5.5.1 Air (Pneumatic) Brake System

(a) Air Reservoirs and Lines

- Drain all reservoirs through drain valves to remove moisture and oil.
- Inspect for corrosion or contamination.
- Replace filters or air dryer cartridges according to schedule.

(b) Brake Chambers

- Check pushrod stroke (should not exceed manufacturer's limit).
- Ensure return springs operate smoothly.
- Replace chambers showing leakage, deformation, or corrosion.

(c) Valves

- Inspect relay, check, and protection valves for external leakage.
- Verify proper switching by applying and releasing brake pedal several times.

(d) ABS/EBS Components

- Clean wheel speed sensors and tone rings; maintain 0.5–1.0 mm gap.
- Check wiring harness for damage or corrosion at connectors.
- Verify ABS warning lamp extinguishes after system check.

(e) Mechanical Components

- Inspect brake shoes/pads and drums/discs for wear or scoring.
- Replace linings below minimum thickness (see Section 14).
- Lubricate camshaft bushings with approved grease.

5.6 System Testing and Adjustment

Test Type	Procedure	Acceptance Criteria
Air Leak Test	Apply full brake, observe gauge pressure drop	Max 0.2 bar/min loss
Brake Force Test	Use roller brake tester	Balanced braking, ≥ 50% efficiency
ABS Function Test	Apply brakes on low-friction surface	Pulsating modulation, no lockup
Parking Brake Test	Apply spring brakes fully	Trailer must not move on 18% gradient

5.7 Lubrication and Cleaning

- Apply lithium-based grease on camshaft bushings and slack adjusters every 10,000 km.
- Keep braking surfaces and linings free from oil or grease.
- Clean drums and discs only with brake cleaner — never with fuel or oil products.

5.8 Post-Maintenance Verification

After completing maintenance:

- Re-pressurize or refill system as applicable.
- Check brake balance between axles.
- Confirm ABS/EBS warning light extinguishes.
- Conduct a static brake hold test and a short road test.
- Record all measurements and component replacements in Section 16 (“Record of Service and Inspection”).

5.9 Reference Standards

- **Regulation (EU) 2018/858**, Annex X – RMI
- **UN ECE R13** – Braking of Heavy Vehicles
- **ISO 611:2017** – Road Vehicle Brake System Maintenance
- **ISO 15484:2012** – Pneumatic Brake Line Connections
- **Manufacturer’s Technical Specifications** (Section 14)

SECTION 6

WHEEL BEARING LUBRICATION AND ADJUSTMENT

6.1 Purpose and Scope

This section provides the procedures for inspection, lubrication, and adjustment of wheel bearings on the semi-trailer axles.
Correct lubrication and adjustment ensure optimal bearing life, wheel stability, and safe braking performance.
Improper maintenance may lead to premature bearing wear, excessive temperature, or wheel detachment.

6.2 Safety Precautions

1. Park the trailer on a level, stable surface and chock all wheels.
2. Release the parking brake and, if possible, disconnect the trailer from the towing vehicle.
3. Use approved lifting equipment and axle stands with sufficient load capacity.
4. Do not work under a lifted axle unless securely supported.
5. Allow hub assemblies to cool before handling; recently operated wheels may be hot.
6. Always use clean tools and lint-free materials — contamination of bearings or grease must be avoided.
7. Dispose of used lubricants in accordance with local environmental regulations.

6.3 Bearing Types

Trailer axles may be equipped with one of the following bearing designs:

Type	Description	Lubrication Method
Tapered Roller Bearings	Two opposing cones and cups per wheel hub	Grease-lubricated
Compact Cartridge Bearings	Sealed, pre-lubricated unit with integrated spacer	Maintenance-free or grease-filled
Oil-Bath Bearings (if fitted)	Continuous lubrication by oil inside hub cavity	Gear oil (Annex A12)

6.4 Inspection Intervals

Inspection Type	Interval	Inspection Points
Routine (Visual)	Every 10,000 km or 3 months	- Check hub temperature by touch after operation. - Inspect for oil or grease leakage around hub caps. - Verify wheel end play visually (no wobble).
Detailed Inspection and Lubrication	Every 40,000 km or 12 months	- Remove hub cap and inspect bearing grease condition. - Clean and relubricate bearings with approved grease. - Check bearing surfaces for pitting, corrosion, or discoloration. - Measure end play and adjust as required.
Major Service	Every 80,000 km or 24 months	- Replace grease completely or renew oil (if oil-bath type). - Replace bearings or seals showing wear or scoring. - Verify torque of hub retaining nut and locking mechanism.

6.5 Lubrication Procedure (Grease-Packed Bearings)

1. **Disassembly**
    - Remove the hub cap, split pin, and retaining nut.
    - Carefully slide off the hub assembly; support its weight to prevent seal damage.
    - Remove bearings and clean all components with solvent; dry with lint-free cloth.
2. **Inspection**
    - Examine bearing rollers and races for scratches, pitting, or blue discoloration (sign of overheating).
    - Replace bearings showing any defect.
    - Inspect hub seal for cracks or hardening; replace if necessary.
3. **Greasing**
    - Use high-temperature lithium-complex NLGI Grade 2 wheel bearing grease (see Annex A12).
    - Pack grease evenly between rollers until fully coated.
    - Apply a thin layer of grease inside the hub cavity and on the seal lip.
4. **Reassembly**
    - Reinstall inner bearing and new seal.
    - Fit the hub onto the spindle carefully to avoid damaging the seal.
    - Insert outer bearing, washer, and retaining nut.

6.6 Bearing Adjustment (Tapered Bearings)

Step 1 – Preload Setting

- Tighten the adjusting nut to approximately 200–300 Nm while rotating the hub by hand to seat the bearings.

Step 2 – Back-off Adjustment

- Loosen the nut completely, then retighten to 20–30 Nm, again rotating the hub.
- Finally, back off the nut by ¼ turn (90°) or to achieve a measured end play of 0.05–0.15 mm.

Step 3 – Locking

- Install the locking washer and castellated nut or retainer.
- Insert new cotter pin or locking device and bend ends securely.

Step 4 – Verification

- Rotate the hub: it must turn freely without noise or roughness.
- Check axial play with a dial indicator; readjust if outside tolerance.

6.7 Oil-Bath Bearing Service (If Equipped)

1. Drain used oil through the hub plug while warm.
2. Inspect oil for metal particles or discoloration.
3. Clean magnetic plug and refill with SAE 80W-90 gear oil up to the specified level mark.
4. Replace hub cap gasket and ensure leak-free sealing.
5. Check oil level every 10,000 km and top up if required.

6.8 Post-Maintenance Checks

- Spin the wheel manually to confirm smooth rotation and absence of grinding noise.
- Verify there is no oil or grease leakage after reassembly.
- Check wheel nut torque according to Annex A11.
- After a short test drive (approx. 5 km), check hub temperature — it should be warm but not excessively hot (<80°C).
- Record service details in Section 16 “Record of Service and Inspection.”

6.9 Reference Standards

- Regulation (EU) 2018/858 Annex X – RMI
- ISO 15243:2017 – Rolling Bearing Damage Classification
- ISO 281:2007 – Rolling Bearing Life Calculation
- ISO 6743-9 – Classification of Lubricating Greases
- Manufacturer’s Axle and Hub Technical Data (Section 14)

SECTION 7

ELECTRICAL SYSTEM

7.1 Purpose and Scope

This section describes the structure, inspection, and maintenance requirements of the semi-trailer's electrical system, which provides power distribution for lighting, braking control (ABS/EBS), and auxiliary equipment.
It applies to trailers equipped with 24 V (ISO 7638 / ISO 12098) and optionally 12 V circuits depending on market configuration.
All repair and maintenance activities must comply with applicable EU directives, electromagnetic compatibility (EMC) standards, and manufacturer technical data (see Section 14).

7.2 Safety Precautions

1. Disconnect the trailer from the towing vehicle before performing any electrical service.
2. Always isolate the power source before removing connectors or modules.
3. Avoid short circuits — never bypass fuses or relays.
4. Use insulated tools and gloves when testing live circuits.
5. Replace damaged cables immediately; never repair by twisting or taping.
6. Do not expose connectors to solvents or pressurized washing.
7. Observe polarity at all times; incorrect connection may damage EBS/ABS ECUs.
8. Dispose of electronic waste and used bulbs per environmental regulations (Directive 2008/98/EC).

7.3 System Description

The trailer electrical system typically includes the following components:

Component	Function
ISO 7638 Connector	Provides dedicated power and CAN communication for ABS/EBS.
ISO 12098 Connector	Supplies lighting and auxiliary functions.
Wiring Harness	Distributes power and signal between modules and lamps.
Fuse and Relay Box	Protects individual circuits from overcurrent.
ABS/EBS ECU and Sensors	Monitor wheel speed and control braking pressure electronically.
Side Marker Lamps, Tail Lamps, Indicators	Provide visibility and signaling in compliance with UNECE R48.
Reverse, Fog, and Clearance Lamps	Regulated auxiliary lighting functions.
Battery Supply (if self-powered units)	Powers lift axle controls or telematics devices.

WARNING!

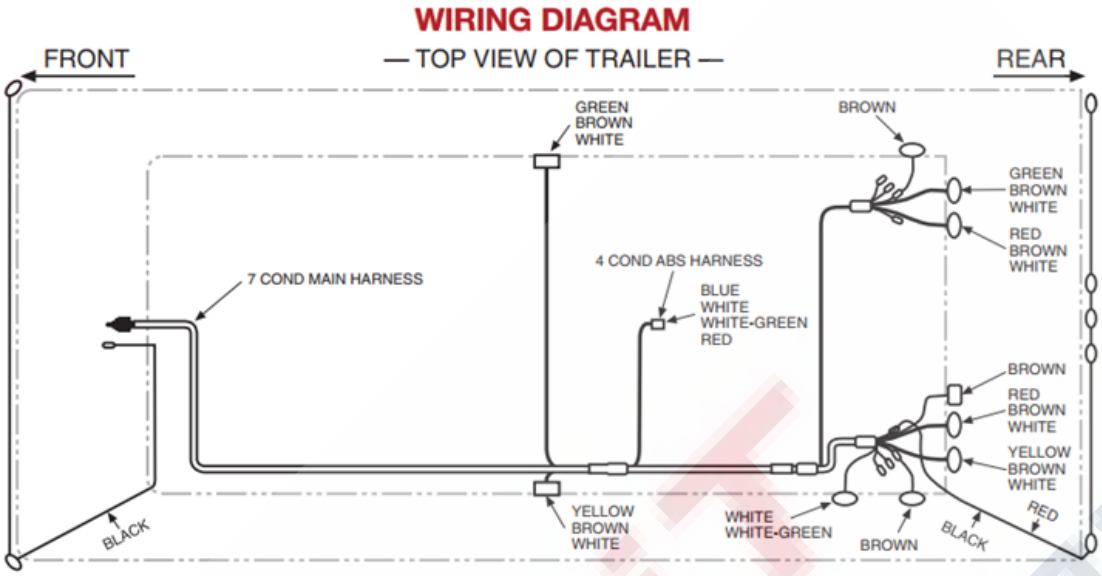
TRAILER IS EQUIPPED WITH ANTILOCK BRAKE SYSTEM (ABS). NO. 7 (BLUE) CIRCUIT IS RESERVED FOR CONTINUOUS POWER SUPPLY TO ABS. FOR MOST EFFECTIVE ABS OPERATION, TOWING VEHICLE MUST SUPPLY MINIMUM OF 10 AMPS AT 12.5 VOLTS TO NO. 4 (RED) & NO. 7 (BLUE) CIRCUITS.

PIN	COLOR	CIRCUIT
1	WHITE	GROUND RETURN TO TOWING VEHICLE
2	BLACK	CLEARANCE, SIDE MARKER & ID LAMPS
3	YELLOW	LEFT TURN SIGNAL & HAZARD LAMPS
4	RED	STOP LAMPS & ABS POWER
5	GREEN	RIGHT TURN SIGNAL & HAZARD LAMPS
6	BROWN	TAIL, LICENSE, CLEARANCE & SIDE MARKER LAMPS
7	BLUE	ABS CONTINUOUS SHARED POWER
	**J560 SOCKET**	FAILURE TO HEED THIS WARNING CAN RESULT IN PROPERTY DAMAGE, SERIOUS INJURY OR DEATH.

7.4 Inspection Intervals

Inspection Type	Interval	Tasks
Pre-Operation	Before each trip	- Check all lights for correct function. - Inspect cable strain relief and connector locking rings. - Verify ISO 7638 plug coupling is clean and secure. - Confirm ABS warning lamp test (lamp ON → OFF after system check).
Periodic Service A	Every 10,000 km or 3 months	- Inspect harness routing for chafing or abrasion. - Clean and lubricate connector pins with dielectric grease. - Check fuse ratings and replace blown fuses only with identical value. - Verify continuity of ground (earth) connections.
Periodic Service B	Every 40,000 km or 12 months	- Perform full function test of lighting and ABS/EBS systems. - Inspect lamp housings for water ingress. - Replace damaged grommets or cable clips. - Measure voltage drop at tail lamps (should not exceed 0.5 V).
Major Service	Every 80,000 km or 24 months	- Replace worn connectors or complete harness sections if insulation hardens or cracks. - Clean ECU connectors and apply protective dielectric compound. - Perform diagnostic scan using approved tool. - Check bonding and EMC shielding continuity.

7.5 Maintenance Procedures



7.5.1 Connectors and Harnesses

- Disconnect power and inspect male/female terminals for corrosion or pin deformation.
- Clean contacts with non-conductive electrical cleaner.
- Apply a thin film of dielectric grease to prevent oxidation.
- Ensure strain-relief clamps are tight and cables are not twisted.
- Replace connectors showing heat marks, melted insulation, or missing seals.

7.5.2 Lighting System

- Verify compliance with lighting configuration per UNECE R48 (side, rear, stop, indicator, fog, number-plate lamps).
- Replace defective bulbs or LED units with approved type and rating.
- Clean lamp lenses; ensure reflectors are intact.
- Check grounding continuity to chassis (max resistance < 0.1 Ω).
- After replacement, verify illumination pattern and intensity.

7.5.3 ABS / EBS System

- Check ISO 7638 connector pins for corrosion.
- Ensure wheel-speed sensor tips are clean; adjust air gap to 0.5 – 1.0 mm.
- Inspect modulator valve connectors and harness for secure fitting.
- Run a diagnostic scan to check fault codes; record any active DTCs.
- After service, perform system self-test: the warning lamp must turn OFF after ignition cycle.

7.5.4 Auxiliary Systems (if equipped)

- For lift axle control, telematics, or tire-pressure monitoring units:
    - Verify supply voltage (22 – 28 V).
    - Check signal communication (CAN or LIN) integrity.
    - Update firmware per manufacturer instruction when required.

7.6 Testing and Diagnostics

Test	Procedure	Acceptance Criteria
Continuity Test	Measure resistance of each circuit	≤ 1 Ω per line
Insulation Test	Apply 500 V DC between conductor and chassis	≥ 1 MΩ
Voltage Drop Test	Measure voltage between source and lamp terminal	≤ 0.5 V
CAN Communication Test	Use diagnostic tool on ISO 7638 port	Stable baud rate 250 kbit/s
ABS Warning Lamp Test	Key ON then vehicle start	Lamp ON → OFF after 2 s

7.7 Common Faults and Remedies

Symptom	Probable Cause	Corrective Action
Lamps flicker or dim	Poor ground or corroded connector	Clean, tighten ground point
ABS warning remains ON	Sensor air gap or broken wire	Adjust gap / replace cable
No power to rear lights	Blown fuse or broken main harness	Replace fuse / repair harness
Moisture in lamps	Damaged sealing gasket	Replace lamp housing
EBS fault code “Supply voltage low”	High resistance in supply circuit	Check ISO 7638 feed and connectors

7.8 Replacement Parts and Materials

Component	Specification / Standard
Bulbs / LEDs	UNECE R37 / R128 compliant
Connectors	ISO 7638-1 (ABS/EBS) / ISO 12098 (Lighting)
Cable Insulation	PVC 105 °C or XLPE automotive grade
Fuses	ISO 8820 blade type, per rated current
Grease for Terminals	Silicone dielectric grease, NLGI 0

7.9 Post-Maintenance Verification

1. Reconnect the trailer to the towing vehicle.
2. Verify all lighting and signalling functions.
3. Conduct a diagnostic self-test of ABS/EBS.
4. Check voltage at rear lamps (within ± 0.2 V of supply).
5. Confirm ISO connectors are securely latched and capped when uncoupled.
6. Record maintenance actions and diagnostic results in Section 16.

7.10 Reference Standards

- Regulation (EU) 2018/858 – Annex X (RMI)
- UNECE R48 – Installation of Lighting and Light-Signalling Devices
- ISO 7638 / ISO 12098 – Electrical Connections between Towing Vehicle and Trailer
- ISO 13297 – Electrical Testing Procedures
- EN 60068 – Environmental Test Methods for Electrical Components
- Manufacturer's Electrical Data Sheet (Section 14)

SECTION 8

RIM AND WHEEL INSPECTION AND MAINTENANCE

8.1 Purpose

This section explains how to inspect, maintain, and care for the rims and wheels of your semi-trailer. Regular inspection and maintenance help to ensure safe driving, long service life of the components, and compliance with EU road safety requirements.

8.2 Safety Instructions

Before performing any maintenance on the wheels or rims, always follow these precautions:

- Park the semi-trailer on level ground and apply the parking brake.
- Place wheel chocks under the tyres to prevent movement.
- Wear suitable protective gloves, goggles, and safety shoes.
- Never use damaged, cracked, or welded rims. Replace them immediately.
- Tighten all wheel nuts with a **torque wrench** according to the specified tightening torque provided by the manufacturer (normally between **650–700 Nm**).
- After refitting a wheel, recheck the nut torque after the first **50–100 km** of driving.

8.3 Inspection Schedule

The rims and wheels must be checked regularly as part of your maintenance program.

Inspection Type	Interval	What to Check
Visual Inspection	Every 10,000 km or before each trip	Look for cracks, rust, dents, or loose nuts.
Wheel Nut Torque Check	After the first 500 km and during each maintenance	Check and tighten nuts with a torque wrench.
Tyre and Rim Compatibility	Each time tyres are replaced	Make sure the tyre size and load rating match the rim type.
Corrosion and Paint Condition	Every 12 months	Check for damage to paint or coating, especially on steel rims.

8.4 Inspection Procedure

8.4.1 Removing the Wheel

1. Ensure the vehicle is securely parked and supported.
2. Loosen the wheel nuts slightly in a **cross pattern** before lifting the wheel.
3. Remove the nuts completely and take off the wheel using suitable lifting equipment.

8.4.2 Checking the Rim

- Inspect for **cracks, dents, or warping**.
- Make sure the rim is not bent or out of round (maximum runout: **2.0 mm**).
- Check the valve hole and bead seats for corrosion or air leaks.
- Clean the surface before reinstallation.

8.4.3 Checking the Wheel Bolts and Nuts

- Inspect for worn or rusty threads.
- Replace any damaged or corroded fasteners.
- Do not lubricate or grease the nuts unless specified by the manufacturer.
- Tighten in a cross pattern to the specified torque.

8.5 Tyre Size, Load Index, and Compatibility

Understanding tyre markings ensures correct matching between the rim and the tyre.

Example marking: 385/65 R22.5 160K

- **385** – Tyre width in millimetres
- **65** – Aspect ratio (sidewall height as a % of width)
- **R** – Radial construction
- **22.5** – Rim diameter in inches
- **160** – Load index (maximum load capacity per tyre)
- **K** – Speed symbol (maximum permissible speed)

Always use tyres with load and speed ratings that meet or exceed the trailer manufacturer's specifications.

8.6 Maintenance Tips

- Keep rims clean and free from mud or road salt to prevent corrosion.
- Always use **approved tyres and rims** suitable for your trailer type.
- Avoid curbs and impacts that may deform the rim.
- After washing the trailer, make sure no water remains trapped behind the hubcaps.
- Record all inspections and maintenance in the **Service Record (see Section 16)**.

8.7 Disposal and Recycling

When rims or tyres are replaced:

- Dispose of damaged rims and tyres through **authorised recycling or waste management services**.
- Do not discard wheels or tyres in regular waste containers.
- Follow local environmental regulations and waste disposal laws.

8.8 Documentation

Each service inspection should include:

- Date of inspection
- Name of technician or service company
- Torque values checked or adjusted
- Observed defects and corrective actions taken

SECTION 9

SIDE PANELS AND BODY COMPONENTS

9.1 Purpose

This section describes the inspection, maintenance, and care procedures for the **side panels and structural body components** of the semi-trailer.
Proper maintenance of these parts helps preserve the trailer's structural integrity, prevents corrosion, and ensures compliance with road safety and load security standards.

9.2 Safety Instructions

Before carrying out any work on the trailer body or side panels:

- Park the trailer on level ground and secure it against movement.
- Ensure that all loads are removed and that the trailer is empty.
- Use appropriate personal protective equipment (PPE), including gloves and eye protection.
- Avoid standing under raised or unsupported body components.
- When using tools such as grinders, drills, or welders, follow all safety procedures and local workshop safety regulations.

9.3 Components Covered

This section applies to the following components:

- Fixed and removable **side panels** (steel or aluminium)
- **Front bulkhead** and **rear frame sections**
- **Cross members** and **longitudinal beams** supporting the side structure
- **Side impact protection devices (Lateral Protection Devices - LPD)**, if fitted
- **Door frames**, hinges, and locking mechanisms

9.4 Inspection Schedule

The following inspection intervals should be respected to ensure proper condition of the trailer body.

Inspection Type	Interval	What to Check
Visual Inspection	Every 20,000 km or every 6 months	Check for dents, cracks, corrosion, or loose fasteners.
Structural Integrity	Annually	Inspect welds, joints, and frame connections for fatigue or distortion.
Fasteners and Hinges	Every 10,000 km or quarterly	Check bolts, rivets, and hinges for tightness and wear.
Paint and Coating	Annually	Inspect painted or galvanised surfaces for corrosion or peeling.

9.5 Inspection Procedure

9.5.1 Side Panels

- Inspect each panel for dents, cracks, or signs of impact damage.
- Check the panel mounting brackets and bolts for tightness and corrosion.
- Make sure seals and gaskets between panels are intact and provide adequate water resistance.
- For removable or foldable side panels, ensure locking mechanisms engage securely and operate smoothly.
- Replace any damaged or corroded components immediately.

9.5.2 Body Frame and Structural Members

- Visually check the longitudinal beams, cross members, and corner posts for cracks or deformation.
- Inspect welds and joints for fatigue or separation.
- If deformation or cracks are found, stop using the trailer until repairs are completed by qualified personnel.
- Check the mounting of accessories (such as toolboxes or spare wheel carriers) to ensure they are secure and do not damage the side structure.

9.5.3 Doors, Hinges, and Locks

- Verify that doors open and close smoothly without excessive force.
- Lubricate hinges and locks at least every six months or after washing with high-pressure water.
- Check rubber seals for wear or damage and replace them if they no longer provide a proper seal.
- Make sure door latches and locking bars engage completely when closed.

9.5.4 Side Impact Protection (if equipped)

- Check mounting brackets and fasteners for tightness.
- Inspect the protection bar for deformation or corrosion.
- Replace any damaged components that no longer meet dimensional or strength requirements according to Regulation (EU) 2019/2144 or equivalent standard.

9.6 Maintenance Recommendations

- Wash the trailer body regularly to remove road dirt, salt, and debris that can cause corrosion.
- Avoid using aggressive chemicals or high-pressure jets directly on seals and hinges.
- After each wash, inspect drainage holes and ensure they are not blocked.
- Repaint or touch up any areas where paint or galvanic coating has been damaged.
- For aluminium panels, use only manufacturer-approved cleaning and polishing products.
- Always record any inspection or repair work in the **Service Record (see Section 16)**.

9.7 Repair Guidelines

- Minor dents may be repaired by approved body repair methods.
- Cracks or structural damage must be repaired by certified welding personnel using compatible materials (e.g., same grade of steel or aluminium).
- Do not drill or modify structural elements without manufacturer approval, as this may affect homologation validity.
- Use only genuine replacement parts supplied or approved by the manufacturer.

9.8 Disposal and Environmental Considerations

- Dispose of damaged or replaced panels through authorised recycling facilities.
- Separate steel and aluminium components for proper recycling.
- Follow environmental regulations regarding paint residues, solvents, and other hazardous materials.

9.9 Documentation

Every inspection or repair of side panels and body components should be recorded, including:

- Date of work
- Name of technician or service workshop
- Type of inspection or repair performed
- Parts replaced or adjusted
- Observations or comments related to corrosion, cracks, or damage

SECTION 10

KINGPIN AND FIFTH-WHEEL INTERFACE

10.1 Purpose

This section provides guidance on the inspection, maintenance, and correct operation of the **kingpin and fifth-wheel coupling interface** of the semi-trailer.
Proper inspection and lubrication of this coupling system are essential for road safety, reliable articulation, and long-term component durability.

10.2 Safety Instructions

Before performing any inspection, cleaning, or maintenance on the coupling system:

- Park the semi-trailer on level ground and apply the parking brake.
- Ensure the towing vehicle is immobilised and the ignition is switched off.
- Use wheel chocks on both the tractor and trailer.
- Do not stand between the towing vehicle and the trailer during coupling or uncoupling.
- Always use appropriate personal protective equipment (PPE) such as gloves and safety shoes.
- Avoid using open flames or welding equipment near greased components.

10.3 Components Covered

This section applies to all parts forming the coupling interface between the semi-trailer and the towing vehicle:

- **Kingpin assembly** (forged or bolted type)
- **Mounting plate and reinforcement plate**
- **Fifth-wheel locking mechanism** (on tractor, for inspection reference)
- **Lubrication surfaces and contact plate area**
- **Safety latch or secondary locking mechanism**

10.4 Inspection Schedule

Inspection Type	Interval	What to Check
Visual Inspection	Every 10,000 km or monthly	Check kingpin and mounting plate for cracks, wear, and corrosion.
Dimensional Check	Every 12 months or 100,000 km	Measure kingpin diameter and check for oval wear.
Lubrication	Every 10,000 km or after each cleaning	Apply grease to kingpin and contact plate.
Bolt Tightness	Every 20,000 km or semi-annually	Check all bolts securing the kingpin and reinforcement plate.

10.5 Inspection Procedure

10.5.1 Kingpin

- Inspect the kingpin for visible wear, cracks, or deformation.
- Measure the kingpin's **wear diameter** at the contact area with the fifth-wheel jaws. The diameter must not be reduced by more than **1.0 mm** from the nominal size (usually **2" or 50.8 mm**).
- Check for ovalisation or flat spots. Replace the kingpin if outside the manufacturer's tolerances.
- Ensure that the retaining bolts (if bolted type) are tight and free of corrosion.

10.5.2 Mounting Plate

- Inspect for cracks, warping, or loose fasteners.
- Ensure the surface is flat and free from deep grooves or rust.
- Verify that the plate is securely welded or bolted to the chassis according to the manufacturer's design.
- Clean the contact surface before lubrication.

10.5.3 Lubrication

- Use **high-pressure lithium-based grease** or an equivalent approved lubricant.
- Apply grease evenly over the kingpin surface and the top plate of the trailer.
- Re-lubricate after washing or when the coupling area has been exposed to heavy rain or road salt.

10.5.4 Coupling and Locking Function Check

- Couple the trailer to the tractor following the operating procedure.
- Verify that the **locking jaws** of the fifth wheel fully engage around the kingpin.
- Ensure that the **safety latch or locking pin** engages correctly.
- Perform a **tug test**: apply light traction to ensure the connection is secure before driving.

10.6 Maintenance Recommendations

- Always keep the kingpin and top plate clean and well-lubricated.
- Avoid dry operation — insufficient lubrication increases wear and risk of coupling failure.
- Replace damaged, worn, or corroded kingpins immediately.
- Never weld or heat the kingpin to repair wear — it must always be replaced as a complete certified component.
- Use only **manufacturer-approved replacement parts** to maintain homologation compliance.
- Record all maintenance, inspections, and replacements in the **Service Record (see Section 16)**.

10.7 Dimensional Tolerances (Typical Values)

For reference, the following are standard limits for a 2” kingpin according to ISO 337 and ECE R55 standards:

Parameter	Nominal Size (mm)	Maximum Wear Limit (mm)
Kingpin Diameter	50.8	Minimum 49.8
Shoulder Height	12.0	±0.5
Engagement Length	89.0	±1.0

Note: Always verify values with the specific manufacturer’s data sheet for the installed kingpin type.

10.8 Replacement Requirements and D-Value Compliance

- In the event of a kingpin replacement, only install a kingpin that meets the vehicle manufacturer’s production criteria and the approved D-value for the specific trailer configuration.
- The coupling system rating is limited by its lowest-rated component (tractor fifth wheel or trailer kingpin).
- Do not fit a kingpin with a lower D-value than specified for the semi-trailer.
    - Example: If the trailer’s technical documentation requires a D-value of 160 kN, a kingpin rated below 160 kN must not be installed.
- Use only manufacturer-approved parts and record the replacement in the Service Record (see Section 16) and Technical Data (see Section 14).

10.9 Disposal and Environmental Considerations

- Used grease and worn kingpins must be disposed of in accordance with local environmental and waste regulations.
- Metal components should be sent to authorised recycling facilities.
- Do not discard grease-contaminated materials in general waste bins.

10.10 Documentation

Each service or inspection must be recorded in the maintenance log, including:

- Date and mileage
- Technician or workshop name
- Measurements and torque values recorded
- Observed wear or damage
- Corrective actions performed

SECTION 11

REAR IMPACT GUARD (RUPD)

11.1 Purpose

This section provides information on the inspection, maintenance, and replacement of the **Rear Impact Guard (RUPD)** fitted to the semi-trailer.
The RUPD is a critical safety component designed to prevent underrun accidents by stopping smaller vehicles from sliding beneath the rear of the trailer in a collision.
Regular inspection ensures that the device maintains its structural integrity and remains compliant with regulatory requirements.

11.2 Safety Instructions

Before carrying out any work on the rear impact guard:

- Park the trailer on a level surface and apply the parking brake.
- Ensure the trailer is unloaded and properly secured against movement.
- Wear suitable protective equipment (gloves, safety shoes, and goggles).
- Never work under a raised trailer without appropriate supports.
- Avoid using heat, welding, or cutting tools near the RUPD unless authorised by the manufacturer.

11.3 Components Covered

This section applies to the following elements of the Rear Impact Guard assembly:

- **Main horizontal impact beam (cross-member)**
- **Vertical or diagonal support brackets** connecting the beam to the chassis
- **Mounting bolts, welds, and brackets**
- **Reflective markings or lights** installed on or near the RUPD
- **Hinged or foldable sections**, if fitted for specific applications

11.4 Inspection Schedule

Inspection Type	Interval	What to Check
Visual Inspection	Every 10,000 km or every 3 months	Check for cracks, corrosion, or deformation on the cross-member and brackets.
Fastener Check	Every 20,000 km or every 6 months	Ensure all bolts and nuts are secure and not damaged.
Structural Integrity	Annually	Verify there are no weld cracks or distortions affecting strength or position.
Alignment Verification	Annually or after rear impact	Ensure height and positioning comply with homologated specifications.

11.5 Inspection Procedure

11.5.1 Visual and Structural Check

- Examine the **main horizontal beam** for cracks, dents, or significant corrosion.
- Inspect **mounting brackets** and **support arms** for signs of bending or fatigue.
- Check all **welds** for cracks or separation from the chassis.
- Replace any component that shows structural damage, excessive corrosion, or deformation.

11.5.2 Fasteners and Fixings

- Inspect all bolts, nuts, and washers securing the RUPD assembly.
- Ensure fasteners are tightened to the manufacturer's specified torque values.
- Replace any worn or corroded fasteners with components of the **same grade and specification**.

11.5.3 Position and Height Check

- Verify that the RUPD height and dimensions correspond to the **approved type** stated in the vehicle's homologation data.
- The distance between the ground and the lower edge of the RUPD should not exceed **550 mm** when the trailer is in its normal loaded condition (unless otherwise specified in the approval).
- Check the rearward projection and lateral positioning for compliance with regulatory values (width covering the rear track, correct horizontal alignment).

11.5.4 After Impact Inspection

- If the trailer has been involved in any **rear collision**, the RUPD must be inspected immediately.
- Replace the entire assembly if any deformation compromises its ability to meet strength or dimensional requirements.
- Do not attempt to straighten or weld damaged RUPD components.

11.6 Maintenance Recommendations

- Clean the RUPD regularly to remove dirt, mud, and road salt that may cause corrosion.
- Apply protective coating or paint to damaged surfaces after cleaning.
- Check reflective markings and lighting components periodically; replace them if faded or damaged.
- Avoid using the RUPD as a step, towing point, or load-bearing structure.
- Record all inspections, maintenance, and replacements in the **Service Record (see Section 16)**.

11.7 Replacement Requirements

- Only install RUPD components that comply with **ECE Regulation No. 58 (latest revision)** and the **manufacturer's approved design**.
- In case of full or partial replacement, ensure that the **mounting height, dimensions, and materials** match the original homologated configuration.
- Using unapproved or modified RUPD designs may invalidate the vehicle's type approval and compromise safety.

11.8 Disposal and Environmental Considerations

- Dispose of damaged or replaced RUPD parts through authorised metal recycling facilities.
- Remove paint and coatings as per local environmental regulations before recycling.
- Do not discard damaged metal parts in general waste.

11.9 Documentation

Each inspection or repair of the RUPD must be documented and retained as part of the trailer's maintenance history.
The record should include:

- Date and mileage
- Name of technician or service workshop
- Observed damage or corrosion
- Measurements and alignment results
- Repairs or replacements performed

SECTION 12

SUPPORT GEAR (LANDING LEGS)

12.1 Purpose

This section provides information on the inspection, operation, and maintenance of the **support gear (landing legs)** fitted to the semi-trailer.
Proper operation and regular maintenance of the landing legs ensure safe parking, loading, and uncoupling of the trailer, preventing damage to the chassis or risk of tipping.

12.2 Safety Instructions

Before using or servicing the landing legs:

- Park the trailer on **firm and level ground** and apply the parking brake.
- Ensure that the **tractor unit is fully uncoupled** before lowering the landing legs.
- Do not stand between the tractor and the trailer during coupling or uncoupling.
- Always operate the handle slowly and steadily to avoid sudden movement.
- Wear protective gloves and safety shoes during operation or maintenance.
- Never exceed the **permissible static and dynamic load capacity** of the landing legs.

12.3 Components Covered

This section applies to:

- **Landing leg assembly** (left and right)
- **Gearbox and handle mechanism**
- **Inner and outer tubes**
- **Mounting brackets and cross-shaft**
- **Sand shoes or baseplates**
- **Fasteners and reinforcement plates**

12.4 Inspection Schedule

Inspection Type	Interval	What to Check
Functional Check	Before each uncoupling	Verify smooth raising/lowering without abnormal noise or resistance.
Visual Inspection	Every 10,000 km or every 3 months	Inspect for corrosion, cracks, and deformation on tubes and brackets.
Gearbox and Handle	Every 6 months	Check for proper lubrication and absence of excessive play.
Fasteners and Brackets	Every 20,000 km or every 6 months	Ensure tightness and correct alignment of bolts and cross-shaft.
Full Lubrication	Annually	Apply grease to gears, shafts, and moving parts according to manufacturer’s instructions.

12.5 Operation Procedure

12.5.1 Lowering the Landing Legs

1. Ensure the trailer is parked securely and the load is evenly distributed.
2. Remove the handle from its storage position.
3. Engage the handle into the operating shaft.
4. Turn the handle in **low gear** for heavy load or **high gear** for light load.
5. Lower the legs until both feet (baseplates) contact the ground evenly.
6. Check stability before disconnecting the fifth wheel.

12.5.2 Raising the Landing Legs

1. After coupling the trailer to the tractor, raise the landing legs fully.
2. Switch to **high gear** for faster operation if available.
3. Ensure both legs are fully retracted and locked.
4. Return the handle to its **storage bracket** or clip.

12.6 Inspection and Maintenance

12.6.1 Visual Condition

- Inspect outer and inner tubes for cracks, bends, corrosion, or damage.
- Verify that both landing legs extend and retract evenly.
- Check for oil or grease leakage from the gearbox housing.

12.6.2 Gearbox and Operating Mechanism

- Rotate the handle through the full range of motion to confirm smooth gear engagement.
- Apply high-quality **multi-purpose grease** to the gearbox gears, shafts, and bearings.
- Inspect seals and bearings for wear. Replace if excessive play or noise is detected.

12.6.3 Mounting and Alignment

- Verify that the landing leg brackets are securely attached to the chassis longitudinal beams.
- Check cross-shaft alignment between the two legs — it must rotate freely without binding.
- Tighten all bolts to the specified torque in the manufacturer's maintenance data.

12.6.4 Sand Shoes / Baseplates

- Inspect for cracks, deformation, or missing pins.
- Clean any dirt or debris from around the pivot areas.
- Lubricate pivot points lightly to maintain smooth movement.
- Replace damaged or excessively worn baseplates immediately.

12.7 Maintenance Recommendations

- Clean the landing leg assemblies regularly, especially after use in mud, sand, or salted roads.
- Avoid high-pressure washing directly into the gearbox or seals.
- Lubricate all moving joints after cleaning or exposure to heavy rain.
- Replace any components that show signs of excessive corrosion or wear.
- Do not modify or weld any part of the landing leg structure without manufacturer approval.
- Always record inspection and maintenance activities in the **Service Record (see Section 16)**.

12.8 Replacement Requirements

- Only use **manufacturer-approved or equivalent certified landing legs** meeting the trailer's original specifications and static load capacity.
- If one leg or gearbox assembly is replaced, inspect the opposite leg to ensure synchronisation and alignment.
- The landing legs must meet or exceed the **design load rating** specified in the trailer's homologation data.
- Improper or mismatched components can cause instability or structural failure during operation.

12.9 Disposal and Environmental Considerations

- Dispose of old landing legs or metallic components at authorised recycling facilities.
- Collect and dispose of used grease or lubricants in accordance with environmental regulations.
- Do not discard mechanical parts or lubricants in general waste.

12.10 Documentation

Every inspection, maintenance, or replacement of landing legs must be recorded in the maintenance log, including:

- Date and mileage
- Technician or service workshop name
- Observations (corrosion, wear, damage)
- Parts replaced or lubricated
- Verification of correct operation after service

SECTION 13

LIGHTING AND REFLECTIVE MARKINGS

13.1 Purpose

This section provides instructions for the inspection, maintenance, and replacement of lighting equipment and reflective markings installed on the semi-trailer.
Proper functioning of lighting and visibility systems ensures compliance with road safety regulations and enhances visibility for other road users, especially during night-time and adverse weather conditions.

13.2 Safety Instructions

Before performing any inspection or maintenance on the lighting or reflective systems:

- Park the trailer on level ground and apply the parking brake; ensure the tractor is uncoupled if required.
- Disconnect or isolate the electrical supply where possible to avoid accidental short circuits.
- Do not use metal tools near live connectors; wear protective gloves and eye protection.
- After washing the trailer or using high-pressure jets, ensure all lamp housings are dry and sealed.
- When replacing lighting units or markings, ensure the trailer is stationary and power is off.

13.3 Components Covered – Mandatory Devices for O4 Semi-Trailer

For an O4 category semi-trailer, the following devices are mandatory under UNECE R48 and related lighting regulations:

- Rear tail lamps (one on each side)
- Rear stop (brake) lamps (one on each side)
- Rear direction indicator lamps (one on each side)
- Rear fog lamp(s) – as required for trailers over a certain mass.
- Reversing lamps (one or two, depending on vehicle type)
- Side marker lamps – amber, mounted along each side of the trailer, spaced according to length.
- Rear marker lamps – red, on each side of the rear of the trailer
- Side reflectors – amber reflectors on each side; for trailers longer than a defined length additional reflectors may be required.
- Rear reflectors – red reflectors on each side at the rear
- Conspicuity / contour markings – retro-reflective tapes along sides and rear of the trailer to outline its full length and width.
- Licence-plate illuminating lamp
- Wiring harnesses, connectors, mountings, lamp housings, seals and brackets that ensure alignment, height, spacing and correct function of all lighting and reflective devices

13.4 Inspection Schedule

Inspection Type	Interval	What to Check
Functional Check	Before each trip	All lamps (tail, stop, indicators, fog, reversing) operate correctly.
Visual Inspection	Every 10 000 km or every 3 months	Lamp lenses, reflectors, and markings for cracks, damage or missing parts.
Wiring & Connectors Inspection	Every 6 months	Check for corrosion, loose connections, broken insulation, secure routing.
Reflective Markings Inspection	Annually	Ensure tapes are intact, clean and correctly positioned; reflectors strongly visible.

13.5 Inspection and Maintenance Procedure

13.5.1 Lighting Units

- Switch on trailer lighting and verify operation of: tail lamps, stop lamps, direction indicators (left and right), reversing lamp(s), and fog lamp(s).
- Replace any defective lamp immediately. Only use lamps carrying correct approval marking (E-mark) for the function.
- Inspect lamp housings and lenses for cracks, water ingress, or looseness. Clean with mild detergent; avoid solvents that may damage plastic.
- Ensure mounting height and lateral placement conform with the trailer's approval / type-designation.

13.5.2 Wiring & Electrical Connections

- Inspect main trailer connector (e.g., 7-pin or 15-pin) for corrosion, bent pins or damage. Clean and apply dielectric grease where specified.
- Inspect wiring harness along chassis: check for abrasion, exposed wires, routing near moving or hot parts. Secure any loose cables.
- Ensure earth (ground) connections are clean, secure and free of corrosion.
- After any replacement or repair, test all functions to ensure correct operation and no unintended behaviour.

13.5.3 Reflectors and Conspicuity Markings

- Check side reflectors (amber) and rear reflectors (red) for cleanliness, absence of cracks and secure mounting.
- Verify conspicuity tapes along the sides and rear are intact, clean and properly aligned to the vehicle contour.
- For trailers of length greater than threshold (e.g., > 6 m), check spacing of side marker lamps and reflectors: distance between markers must not exceed 3 m (or 2 m for longer trailers) and each side must have a reflector no more than 1 m from the front/rear ends.
- Ensure height of reflectors and side marker lamps is within permitted range (minimum 0.25 m above ground; maximum usually 1.50 m, unless construction dictates up to 2.10 m).

13.6 Replacement Recommendations

- Use only **approved lighting units** (lamps and modules) with valid E-mark and appropriate function certification for heavy trailers.
- Ensure that any replacement lamp or module matches the original specification in terms of function, mounting position, and orientation.
- When replacing lighting units or reflective tapes, the replacement must meet or exceed the original approvals. Using non-compliant components may invalidate trailer's type approval.
- For conspicuity tapes, use correct class of retro-reflective material (e.g., Class C micro-prismatic) and correct colour (amber for sides, red for rear).
- After any replacement, retest the full lighting and marking system for functionality and visibility.

13.7 Maintenance Recommendations

- Keep all lighting and reflective devices clean and free from mud, road salt or debris to ensure maximum visibility.
- Avoid high-pressure jets directed at lamp connectors or sealed housings; water ingress may damage the unit.
- After washing the trailer, check reflective tapes and lamp lenses for water behind the surface or trapped moisture.
- Periodically check the tightness of lamp mountings and brackets, especially after heavy loading or vibration.
- Record all inspections, replacements and maintenance in the **Service Record (see Section 16)**.

13.8 Disposal and Environmental Considerations

- Dispose of used lamps, LED modules, wiring harnesses and mounting brackets via authorised recycling streams.
- Separate electrical/electronic components from general metal scrap and plastics.
- Dispose of reflective tape residues (adhesive backing, film) per local environmental regulations; do not discard in general waste.

13.9 Documentation

Each inspection, repair or replacement of lighting or reflective systems must be recorded, including:

- Date and mileage of the trailer at inspection
- Name of technician or service workshop
- Description of inspection or maintenance performed (which lamps, reflectors or tapes replaced)
- Any defects found and corrective actions taken
- Verification that all lighting/marking devices function correctly after maintenance

SECTION 14

TECHNICAL DATA AND SPECIFICATIONS

14.1 Purpose

This section provides the essential technical data and specifications for the semi-trailer.
The information supports safe operation, correct maintenance procedures, and verification of compliance with the manufacturer's design and homologation documentation.

14.2 Identification Data

Parameter	Description
Manufacturer Name	OKTAR, ÜMİT MAKİNE İNŞAAT TAAHÜT NAKLİYE İMALAT İTHALAT İHRACAT SAN. VE TİC. LTD.ŞTİ.
Manufacturer Address	Doğankaya Mah. Organize Sanayi Bölgesi 1.Cad. No:31 İç Kapı:1 Bafra, Samsun TURKEY
Vehicle Category	O4
Vehicle Type / Variant / Version	[Type designation as per CoC or Type Approval]
VIN (Vehicle Identification Number)	[VIN structure and location]
Type-Approval Number	[e.g., eXX*2018/858*XXXX*00]
Country of Manufacture	TÜRKİYE

14.3 Dimensional Data

Parameter	Value	Unit	Notes
Overall Length	[e.g., 13,600]	mm	Including RUPD
Overall Width	[e.g., 2,550]	mm	Mirrors excluded
Overall Height (Unladen)	[e.g., 4,000]	mm	Depending on tyre & suspension
Wheelbase	[e.g., 7,800]	mm	Axle 1–3
Kingpin Position (to front)	[e.g., 1,600]	mm	Centre of kingpin to front edge
Axle Track	[e.g., 2,040]	mm	Per axle
Ground Clearance (Unladen)	[e.g., 300]	mm	Under RUPD
Turning Radius (External)	[e.g., 12,500]	mm	As per ISO 6110

14.4 Mass Data

Parameter	Value	Unit	Notes
Maximum Technically Permissible Mass (MTM)	[e.g., 41,000]	kg	O4 category
Kingpin Load (Maximum)	[e.g., 14,000]	kg	For coupling with tractor
Axle Load (Per Axle)	[e.g., 9,000]	kg	As per axle manufacturer
Tare Weight (Unladen Mass)	[e.g., 5,000]	kg	Without cargo
Payload Capacity	[e.g., 30,000]	kg	MTM – tare weight

14.5 Coupling and Load Parameters

Parameter	Value	Unit	Notes
Kingpin Type	2” (50.8 mm)	—	ISO 337 / ECE R55 compliant
D-Value	[e.g., 160]	kN	Must match tractor fifth wheel rating
Vertical Load (S-Value)	[e.g., 15]	t	Maximum imposed load on tractor
Fifth-Wheel Height	[e.g., 1,150]	mm	Coupling plane height
Kingpin Mounting	Bolted / Welded	—	As per design approval
Brake Coupling Type	Dual-line (red/yellow)	—	ISO 1728 compliant
Electrical Connector	15-pin ISO 12098	—	24 V DC system

14.6 Axle and Suspension Data

Parameter	Value	Unit	Notes
Number of Axles	3	—	Fixed or liftable
Axle Manufacturer	[e.g., SAF / BPW]	—	As per build spec
Suspension Type	Air suspension	—	Automatic levelling
Axle Load Rating	[e.g., 9,000]	kg	Each axle
Brake Type	Disc / Drum	—	EBS controlled
EBS Type	ISO 7638 interface	—	With RSS (roll stability) if applicable
Tyre Size	[e.g., 385/65 R22.5]	—	As per Section 8.5
Rim Size	[e.g., 22.5 × 11.75]	—	Steel or aluminium

14.7 Braking System Specifications

Component	Specification
Service Brake	Dual-line pneumatic system with EBS (ISO 7638)
Parking Brake	Spring-type mechanical on rear axles
ABS / EBS	Compliant with ECE R13
Brake Lining Type	Non-asbestos, wear sensor equipped
Air Reservoir Capacity	[e.g., 80] L
Coupling Heads	Red (supply) / Yellow (control)

14.8 Electrical System

Parameter	Specification
System Voltage	24 V DC
Connector Type	15-pin ISO 12098 (main) + 2-pin ISO 3731 (optional)
Lighting Compliance	ECE R48 / R3 / R6 / R7 / R23 / R38 / R104
Wiring Protection	PVC-sheathed harness with sealed connectors
Battery (if equipped)	[e.g., 12 V – 90 Ah × 2, for lift axle or accessories]

14.9 Body and Chassis Data

Parameter	Specification
Chassis Type	Welded high-strength steel or aluminium main frame
Floor Type	Hardwood / steel chequer plate / composite panels
Side Panels	Aluminium / steel / curtain-sider type
Front Bulkhead Height	[e.g., 2,400] mm
Rear Frame	Integrated RUPD as per ECE R58
Corrosion Protection	Shot-blasted, zinc-primed, and painted (min. 80 µm)

14.10 Environmental and Operational Limits

Parameter	Limit / Range
Operating Temperature	−30 °C to +60 °C
Storage Temperature	−40 °C to +70 °C
Maximum Gradient (Uncoupling)	5 %
Maximum Side Slope (Parking)	2 %
Weather Resistance	Compliant with EN ISO 12944 corrosion class C3 / C4

14.11 Compliance and Certification

The semi-trailer complies with the following major directives and regulations:

- **Regulation (EU) 2018/858** – Framework for type approval

14.12 Notes for Maintenance Personnel

- Always refer to the **manufacturer's data plate** and **Certificate of Conformity (CoC)** before performing load, coupling, or dimension-related maintenance.
- Ensure all replacement parts and subassemblies conform to the technical specifications listed above or equivalent approved standards.
- Any deviation from these specifications may invalidate the vehicle's type approval and warranty coverage.

SECTION 15

SPECIAL TOOLS AND EQUIPMENT

15.1 Purpose

This section lists the **special tools, equipment, and measuring devices** required for correct servicing and maintenance of the semi-trailer.
Use of the correct tools ensures compliance with manufacturer specifications, prevents component damage, and supports safe and efficient maintenance procedures.

15.2 General Workshop Equipment

The following basic workshop equipment is required for routine servicing and inspections:

Equipment	Purpose / Use	Specification or Standard
Hydraulic Floor Jack / Axle Lift	Raising and supporting axles or suspension	Capacity ≥ 20 t, EN 1494 compliant
Safety Stands	Supporting raised trailer during wheel or brake service	Adjustable, load rated
Torque Wrench	Tightening wheel nuts, suspension bolts, and coupling elements	Range 200–1,000 Nm, calibrated
Pneumatic or Electric Impact Wrench	Fast removal of wheel nuts and bolts	Use only under supervision; final tightening by torque wrench
Tyre Pressure Gauge	Checking and adjusting tyre inflation pressure	Range up to 12 bar, EN 837 compliant
Grease Gun	Lubrication of kingpin, suspension, and support gear	Compatible with high-pressure lithium grease
Multimeter	Electrical system testing (voltage, resistance, continuity)	24 V DC systems
Brake Test Stand	Measuring brake performance and efficiency	Roller brake tester certified for trailers
Air Pressure Gauge	Monitoring brake circuit pressure	Range 0–12 bar
Lighting Tester	Functional and alignment check for lighting system	For 24 V trailer systems
Workshop Safety Equipment	PPE, wheel chocks, warning signs	Mandatory for all maintenance tasks

15.3 Special Tools (Manufacturer-Specific)

The following tools are specific to the semi-trailer design or to certain sub-systems:

Tool Name	Purpose / Function	Remarks
Kingpin Wear Gauge	Measuring kingpin diameter and ovalisation	According to ISO 337 / ECE R55
Suspension Height Gauge	Checking ride height for air suspension	For calibration of levelling valve
Brake Lining Wear Gauge	Measuring brake lining thickness without disassembly	Suitable for disc or drum brake systems
EBS Diagnostic Interface (Laptop/Tool)	Reading and clearing fault codes; system calibration	Compatible with WABCO / Knorr / Haldex EBS
Landing Leg Alignment Bar	Synchronisation of twin-leg operation	Used during replacement or overhaul
Rim Run-Out Dial Indicator	Checking wheel and rim concentricity	Max deviation ≤ 2.0 mm
Wheel Nut Torque Checker	Quick verification of torque value	Periodic roadside or workshop use
Lighting Connector Test Plug	Checking continuity and pin assignment of ISO 12098 socket	Verifies full 24 V lighting circuit
Axle Hub Puller	Removing hub assemblies without damage	According to axle supplier instructions
Seal Press Tool	Installing hub or bearing seals accurately	Prevents leakage and misalignment

15.4 Recommended Measuring and Calibration Devices

Device	Purpose	Calibration Frequency
Calibrated Torque Wrench	Ensures correct tightening torque	Every 12 months
Digital Vernier / Micrometer	Dimension checks of pins, bolts, and bushings	Every 12 months
Pressure Gauge (Air System)	Brake circuit verification	Every 6 months
EBS Diagnostic Equipment	System check and calibration	Software updates as required
Axle Alignment Equipment	Wheel tracking and geometry checks	Every 12 months or after repairs

15.5 Storage and Maintenance of Tools

- Keep all tools in clean, dry, and locked storage to prevent corrosion or contamination.
- Calibrate torque wrenches and pressure gauges regularly according to workshop quality procedures (ISO 9001 or equivalent).
- Replace damaged or worn tools immediately.
- Maintain electronic diagnostic devices with updated software and approved cables.
- Keep copies of calibration certificates for inspection or audit.

15.6 Optional Equipment for Enhanced Diagnostics

For workshops with advanced maintenance capacity, the following optional tools are recommended:

- **Infrared Thermometer:** To check bearing or brake temperature during maintenance.
- **Laser Ride-Height Gauge:** For precise suspension level measurement.
- **Hydraulic Jacking Beam:** For fast axle lifting on inspection pits.
- **Wireless Torque Logger:** For digital record of torque application.
- **Ultrasonic Thickness Gauge:** For checking structural corrosion on chassis beams.

15.7 Safety Recommendations for Tool Use

- Always use tools in accordance with manufacturer instructions and safety data.
- Inspect each tool before use; never use damaged equipment.
- Ensure lifting devices are rated for the full trailer or axle load.
- When using pneumatic tools, regulate pressure to prevent over-tightening.
- Maintain a clean, well-lit, and unobstructed workspace during maintenance operations.

15.8 Documentation

All inspections, calibrations, and repairs of tools and diagnostic equipment must be recorded, including:

- Tool name and serial number
- Calibration date and next due date
- Workshop or technician responsible
- Remarks on tool condition or replacement

SECTION 16

RECORD OF SERVICE AND INSPECTION

16.1 Purpose

This section provides the standard framework for recording **all maintenance, inspection, and repair activities** carried out on the semi-trailer throughout its service life.
A complete and accurate service record ensures regulatory compliance, supports warranty validity, and helps maintain the trailer in safe operating condition.

16.2 Scope

This section applies to:

- All scheduled maintenance and safety inspections (e.g., brakes, suspension, lighting, body structure).
- Repairs or replacements of mechanical, pneumatic, or electrical components.
- Periodic safety checks as required by national regulations or fleet maintenance programmes.
- Calibration, lubrication, and adjustment activities performed by authorised service centres.

16.3 Responsibilities

- The **trailer owner or operator** is responsible for maintaining the service record and ensuring all entries are accurate and up to date.
- The **service workshop or technician** must complete all relevant fields after each maintenance activity.
- Records must be stored securely and made available for inspection by authorities or technical auditors upon request.

16.4 Recording Method

Service records may be maintained in **printed form** or in **digital format** using an approved fleet maintenance system.
Each entry must contain the following minimum information:

Field	Description
Date of Service	Day/Month/Year of inspection or maintenance
Odometer Reading (if available)	Trailer mileage or operating hours
Type of Service	Scheduled maintenance, repair, inspection, or modification
Section Reference	Related RMI section (e.g., 8.4 – Rim Inspection, 10.5 – Kingpin Maintenance)
Description of Work Performed	Detailed summary of tasks carried out and findings
Parts Replaced	List of parts/components and part numbers used
Technician / Workshop Name	Name and signature or digital ID of person responsible
Torque / Calibration Values (if applicable)	Measured values during service
Remarks / Observations	Additional notes, defects found, or corrective actions
Next Scheduled Service	Recommended date or distance for next inspection

16.5 Example – Service Record Table

Date	Mileage (km)	Service Type	Section Ref.	Description / Findings	Parts Replaced	Technician Name & Signature
2025-05-20	45 000	Periodic Maintenance	8.4	Wheel nut torque checked (680 Nm) – OK	None	[Name/Stamp]
2025-07-15	59 000	Repair	11.5	RUPD left bracket replaced due to deformation	RUPD Bracket PN-11-B	[Name/Stamp]
2025-09-10	71 000	Annual Inspection	10.5 / 13.5	Kingpin lubricated; fog lamp replaced (E13-Mark)	Lamp PN-13-F	[Name/Stamp]

16.6 Retention and Verification

- Service records must be retained for **at least 10 years** or for the entire operational life of the trailer (whichever is shorter).
- The trailer manufacturer or authorised representative may review the records to verify compliance with maintenance requirements.
- National road authorities may request service documentation during inspections or type-approval conformity checks.

16.7 Digital Recordkeeping (Optional)

If an electronic maintenance tracking system is used:

- The system must include time stamps, technician identification, and data integrity safeguards.
- Records must be exportable in PDF or CSV format for audit purposes.
- All digital entries must match the fields defined in Table 16.4.
- Back-ups must be stored securely in accordance with GDPR and company data-retention policies.

16.8 Importance of Accurate Records

Maintaining a full service history provides the following benefits:

- Demonstrates compliance with EU Regulation (EU) 2018/858 and national roadworthiness rules.
- Ensures warranty and extended maintenance contract validity.
- Helps identify recurring component issues and schedule preventive maintenance.
- Increases trailer resale value and operational reliability.

16.9 Certification of Maintenance Activities

Each page or digital entry in the service record must be validated by the service provider with:

- Name and position of responsible person.
- Signature (handwritten or digital).
- Workshop identification number (if applicable).
- Date of validation.

16.10 Manufacturer's Note

Failure to maintain and update the service record in accordance with this section may:

- Lead to loss of warranty coverage.
- Invalidate type-approval conformity for critical components.
- Compromise operational safety and liability compliance under EU vehicle regulations.

SECTION 17

ANNEXES (DRAWINGS, DIAGRAMS, TABLES)

Annex Code	Description	Associated RMI Section(s)
A1	Trailer General Arrangement Drawing	Sections 1, 14
A2	Chassis and Frame Assembly Diagram	Sections 4, 9, 14
A3	Axle and Suspension Layout (Air Suspension System)	Section 4
A4	Pneumatic Brake System Schematic	Section 5
A5	Electrical Wiring Diagram (24 V System)	Sections 7, 13, 14
A6	Rim and Wheel Assembly Reference Table	Section 8
A7	Kingpin and Fifth-Wheel Interface Drawing	Section 10
A8	Rear Impact Guard (RUPD) Assembly and Mounting Dimensions	Section 11
A10	Lighting and Reflective Marking Layout (ECE R48-Compliant)	Section 13
A11	Torque Specification Table	All applicable sections
A12	Lubrication Points and Greasing Schedule	Sections 4, 8, 10, 12
A13	Maintenance Checklist Template	Section 16

Annex Content Guidelines

A1 – Trailer General Arrangement Drawing

Provides an overall view of the semi-trailer, including key dimensions, axle locations, coupling position, and frame outline.
Used for verifying compliance with **maximum length, width, and height** as specified in Section 14.

A2 – Chassis and Frame Assembly

Detailed drawing showing main longitudinal beams, cross members, and mounting brackets.
Includes welding reference points and torque values for bolted connections.

A3 – Axle and Suspension Layout

Diagram illustrating air suspension bellows, levelling valves, shock absorber positions, and air supply lines.
Identifies ride-height measurement points and levelling-valve adjustment instructions.

A4 – Pneumatic Brake System

Schematic showing dual-line brake circuits, reservoirs, relay valves, and EBS module connection points.
Includes colour coding for **supply (red)** and **control (yellow)** lines and ISO 1728 interface references.

A5 – Electrical Wiring Diagram

Full 24 V circuit layout including lighting, EBS, and auxiliary systems.
Pin configuration of ISO 12098 connector and cable routing through the chassis.
Fuse and relay identification list with current ratings.

A6 – Rim and Wheel Reference Table

Contains rim and tyre compatibility data, load-index references, and tightening torque values for wheel nuts.
Cross-referenced with Section 8.5 for tyre markings and compatibility.

A7 – Kingpin and Fifth-Wheel Interface

Technical drawing of the kingpin mounting plate and attachment bolts.
Includes D-value, vertical load, and positional tolerances (as per ECE R55).

A8 – Rear Impact Guard (RUPD)

Dimensional drawing indicating guard height, projection, and lateral coverage in accordance with ECE R58.
Identifies attachment points and fastener specifications.

A10 – Lighting and Reflective Marking Layout

Layout diagram showing the position of all mandatory lamps and reflective markings according to **UNECE R48** for O4 semi-trailers.
Includes height limits, lateral distances, and reflector placement.
Specifies lamp colour and E-mark references.

A11 – Torque Specification Table

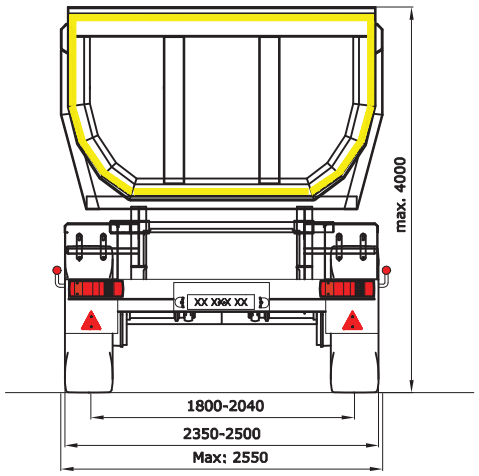
Provides standard tightening torques for main assemblies:

A12 – Lubrication Points and Greasing Schedule

Lists lubrication intervals and grease types for suspension, kingpin, landing legs, and wheel hubs.
Specifies lithium-based EP2 grease, applied every 10 000 km or monthly.

A13 – Maintenance Checklist Template

Printable form for scheduled inspections, including sections for brakes, suspension, lighting, body, and coupling components.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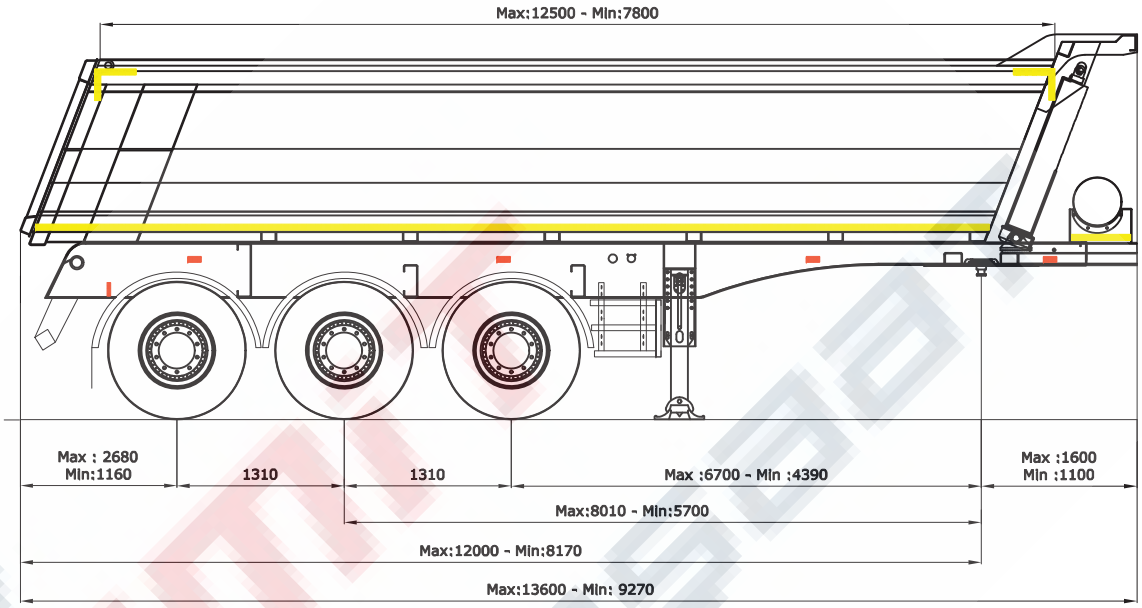
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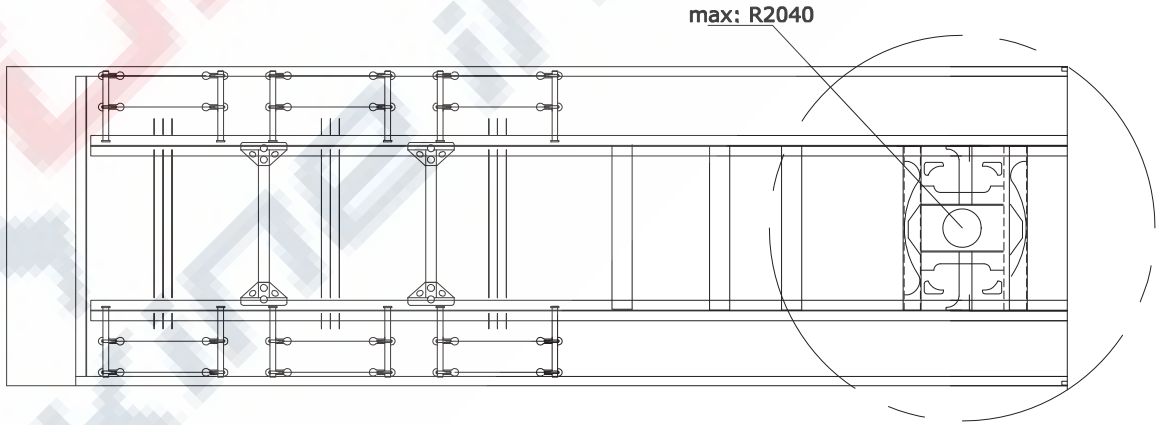
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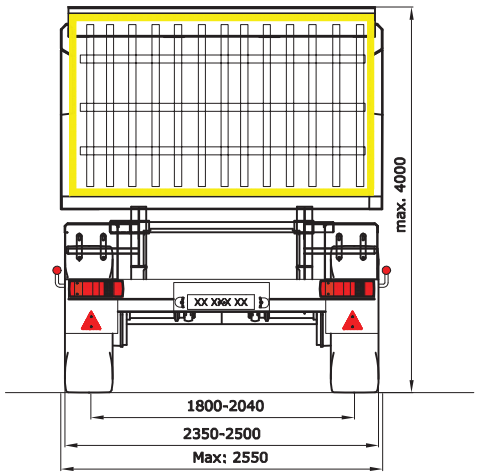
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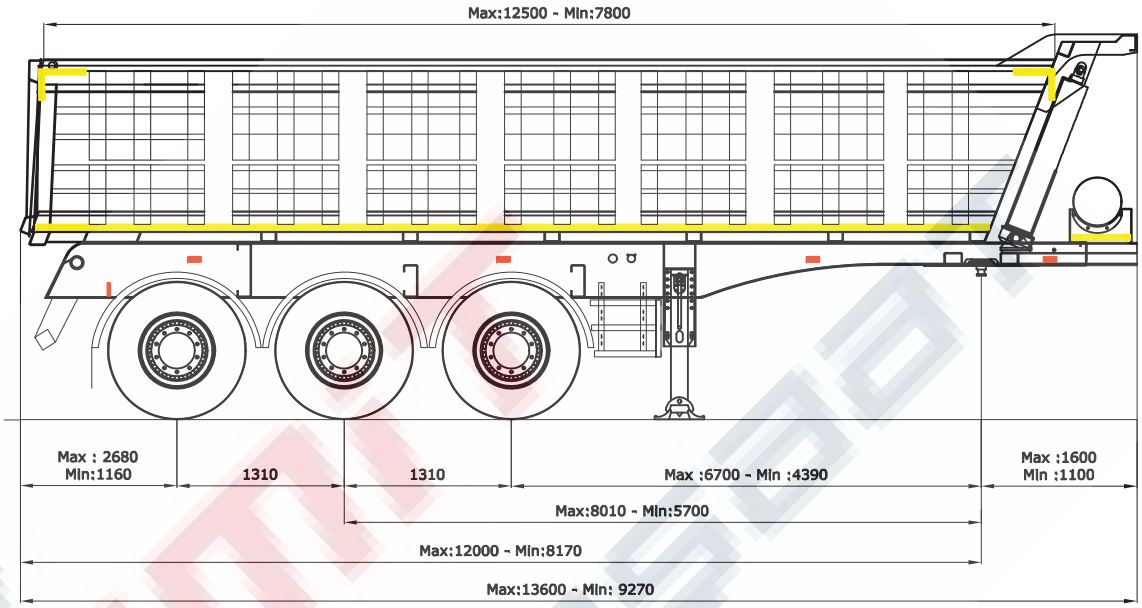
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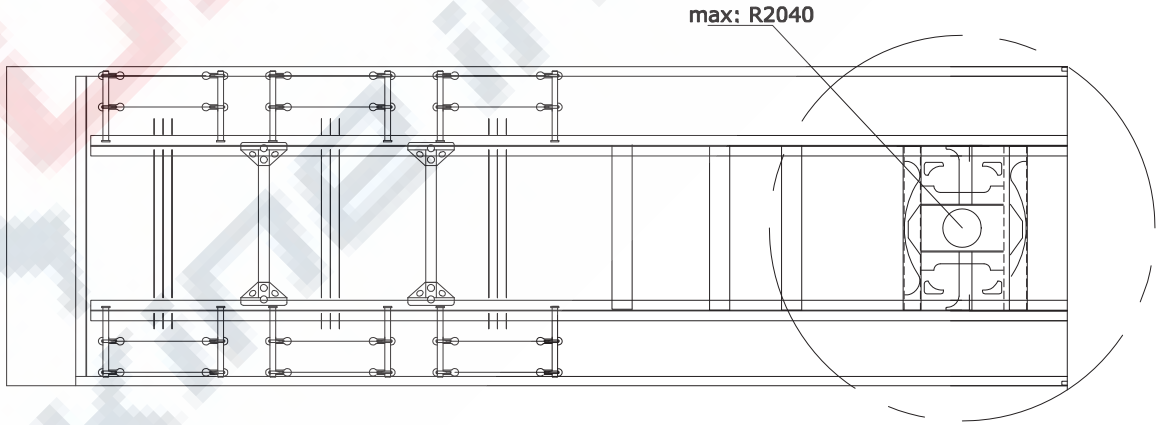
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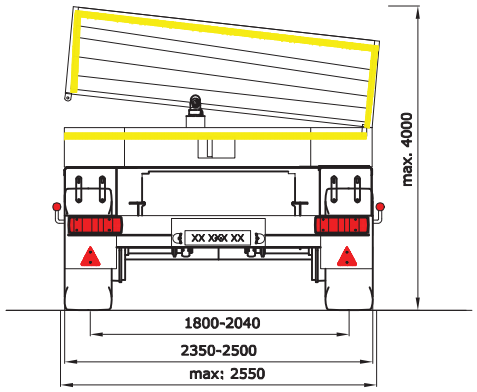
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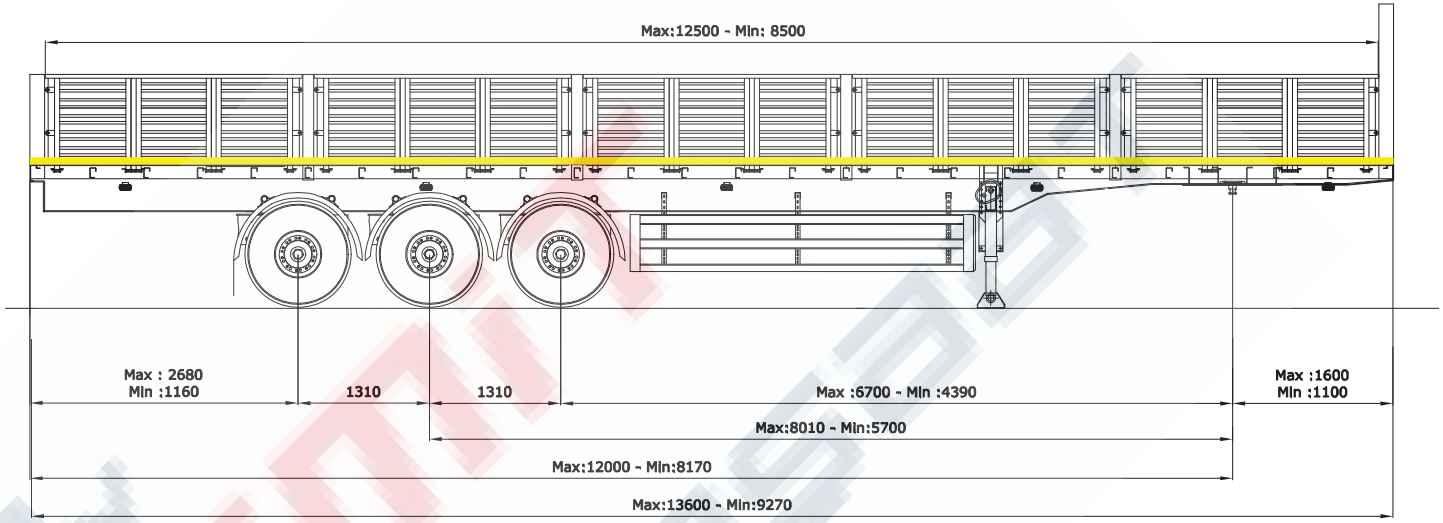
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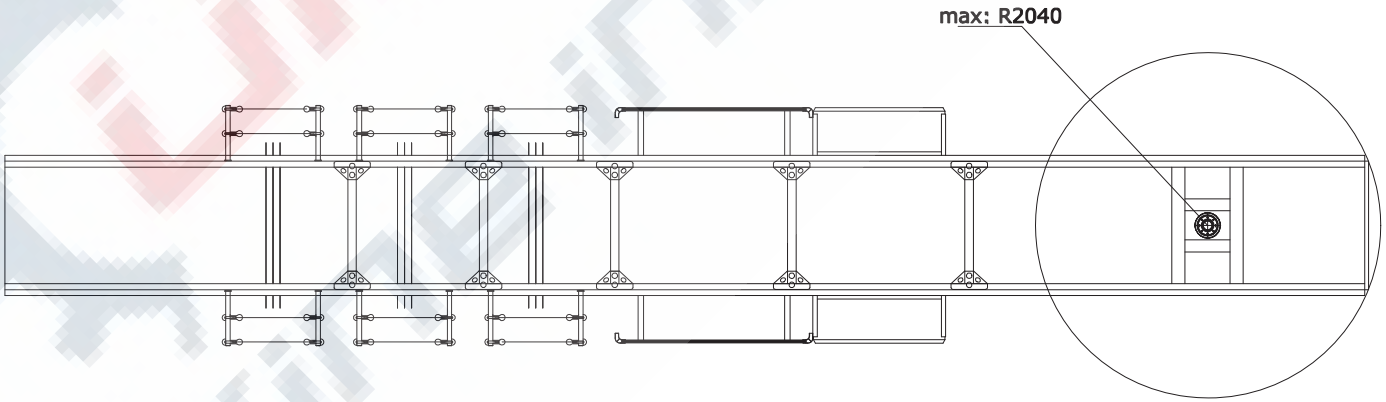
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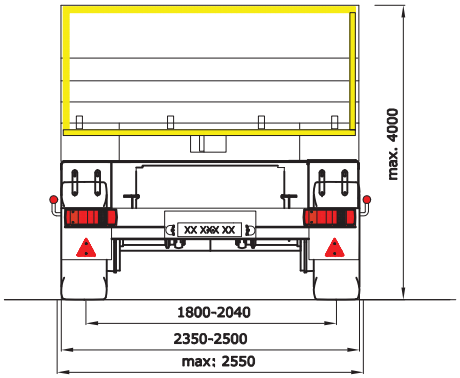
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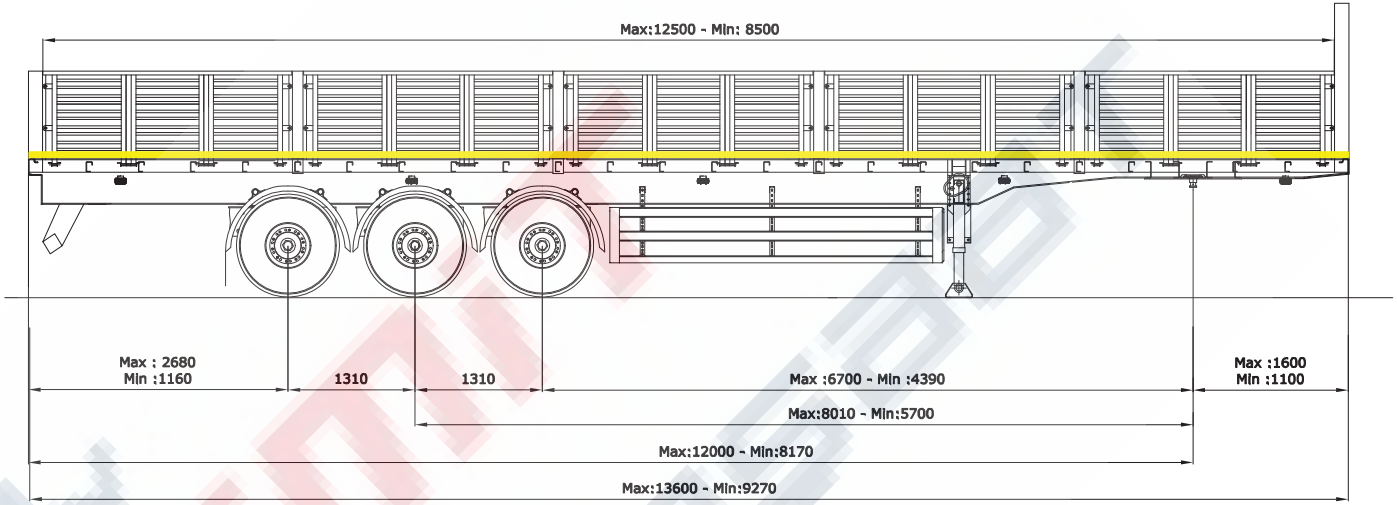
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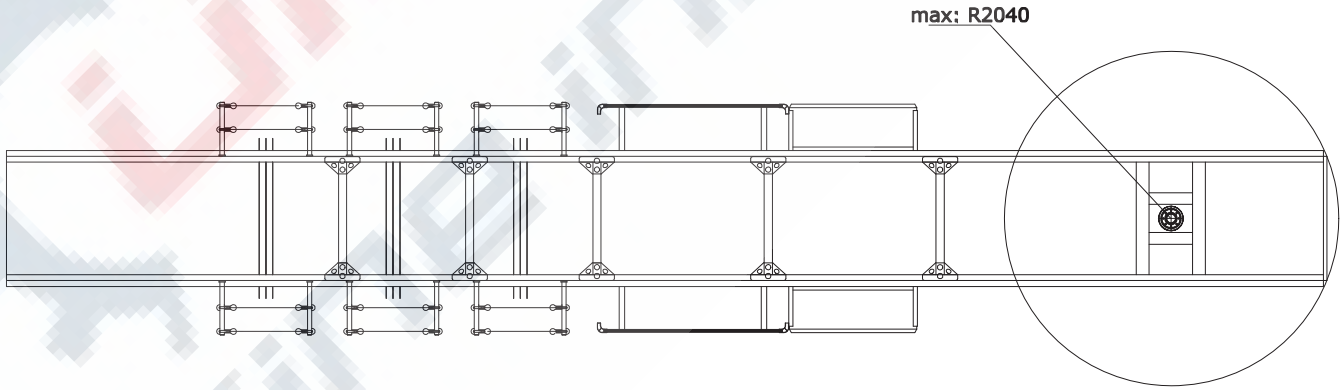
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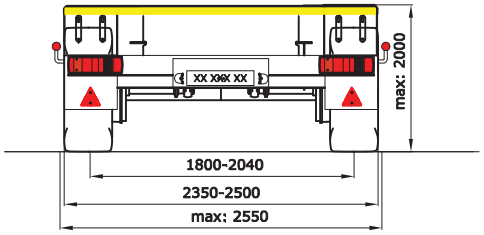
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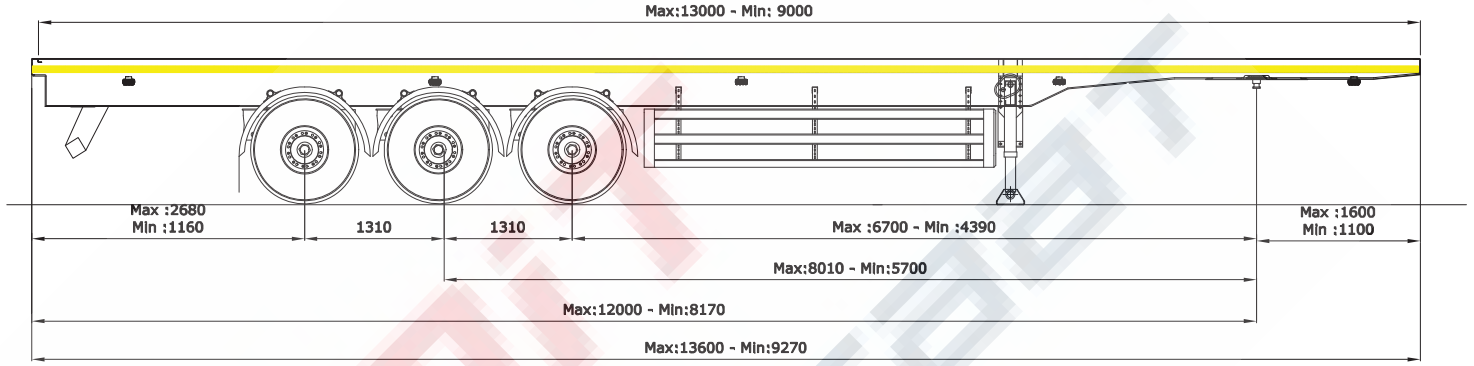
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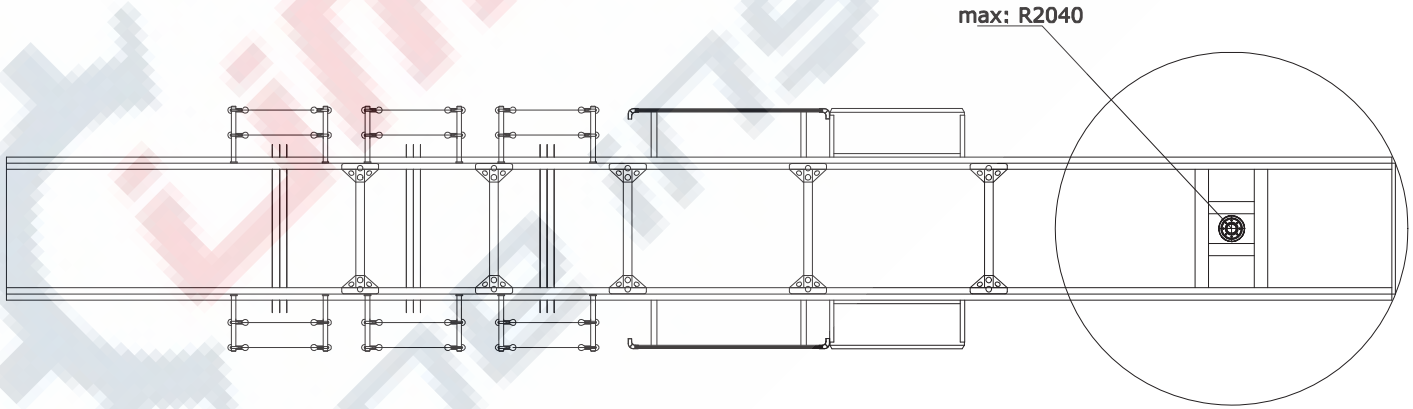
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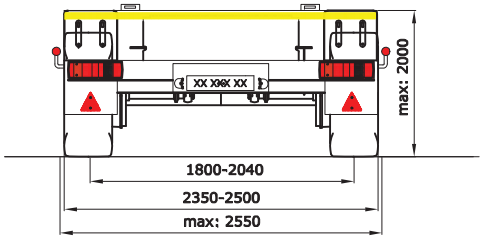
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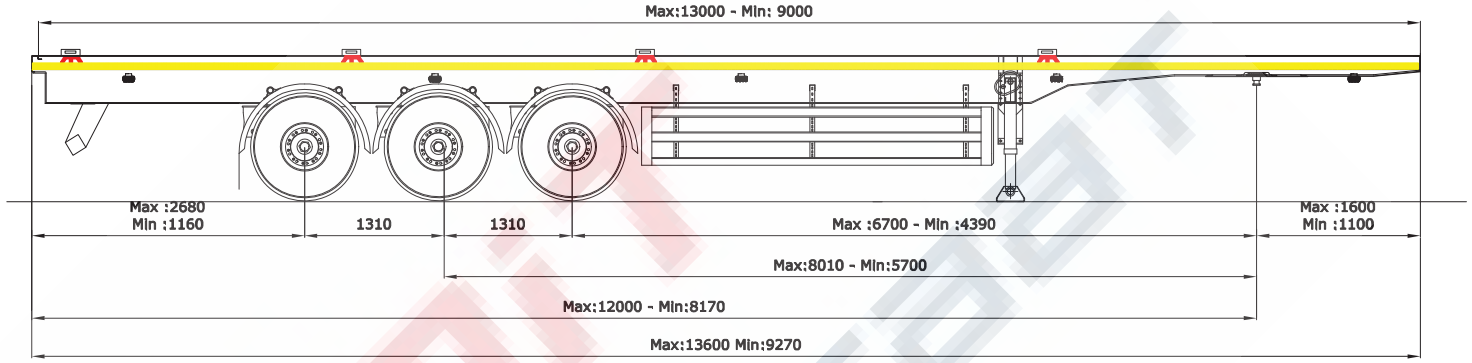
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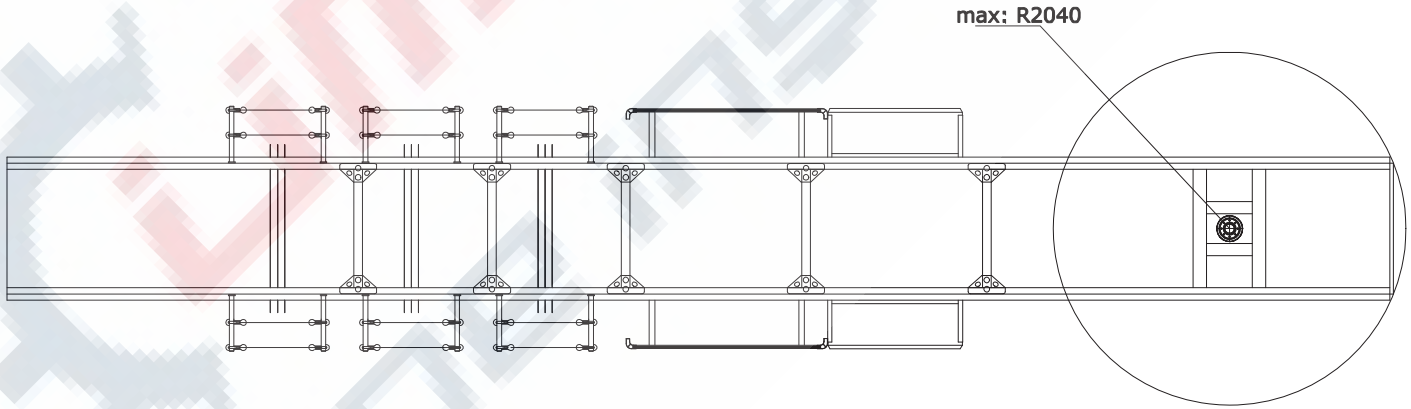
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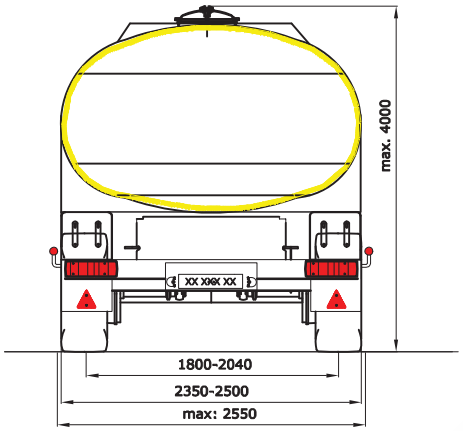
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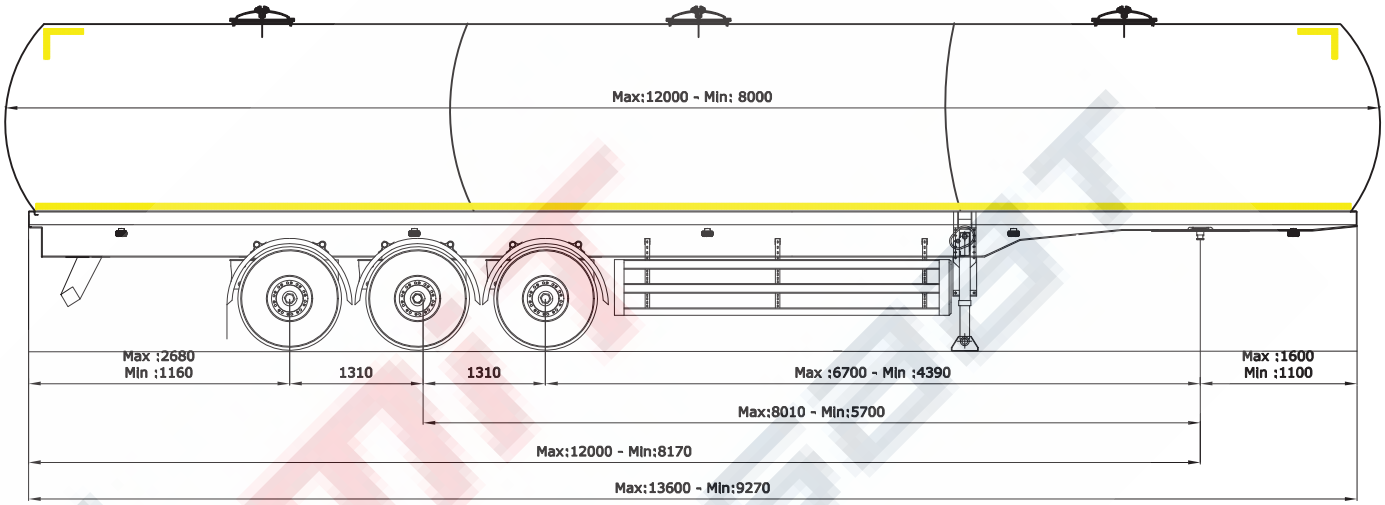
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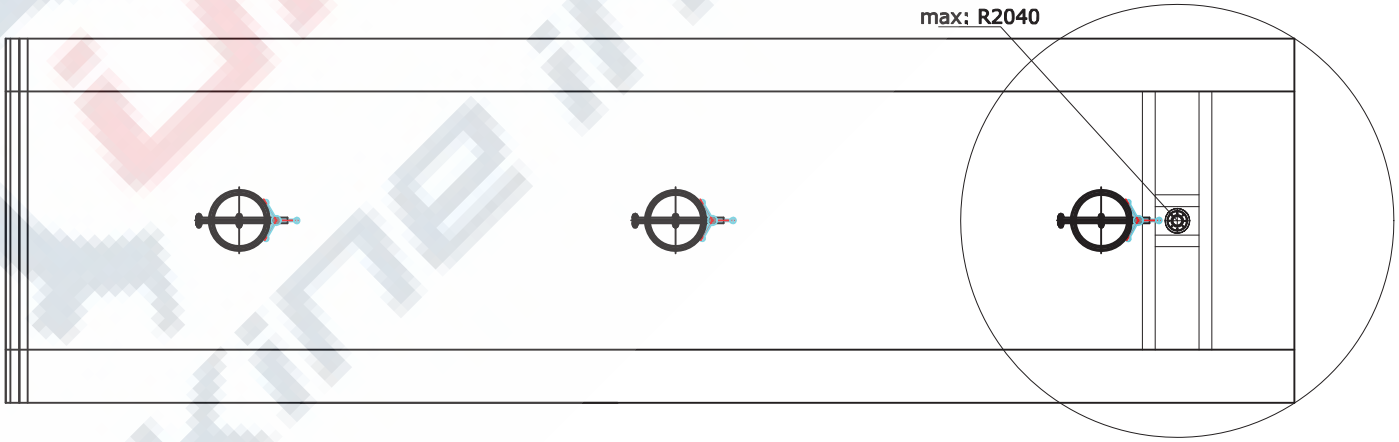
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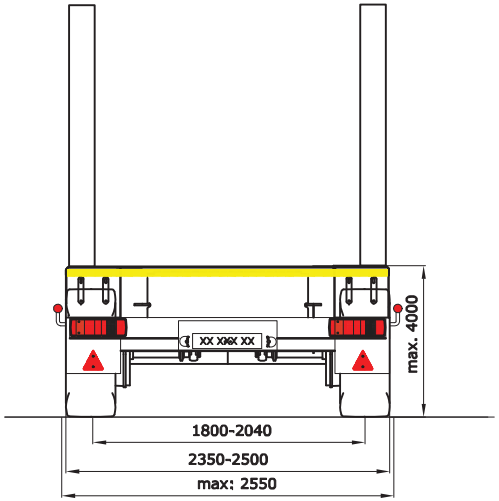
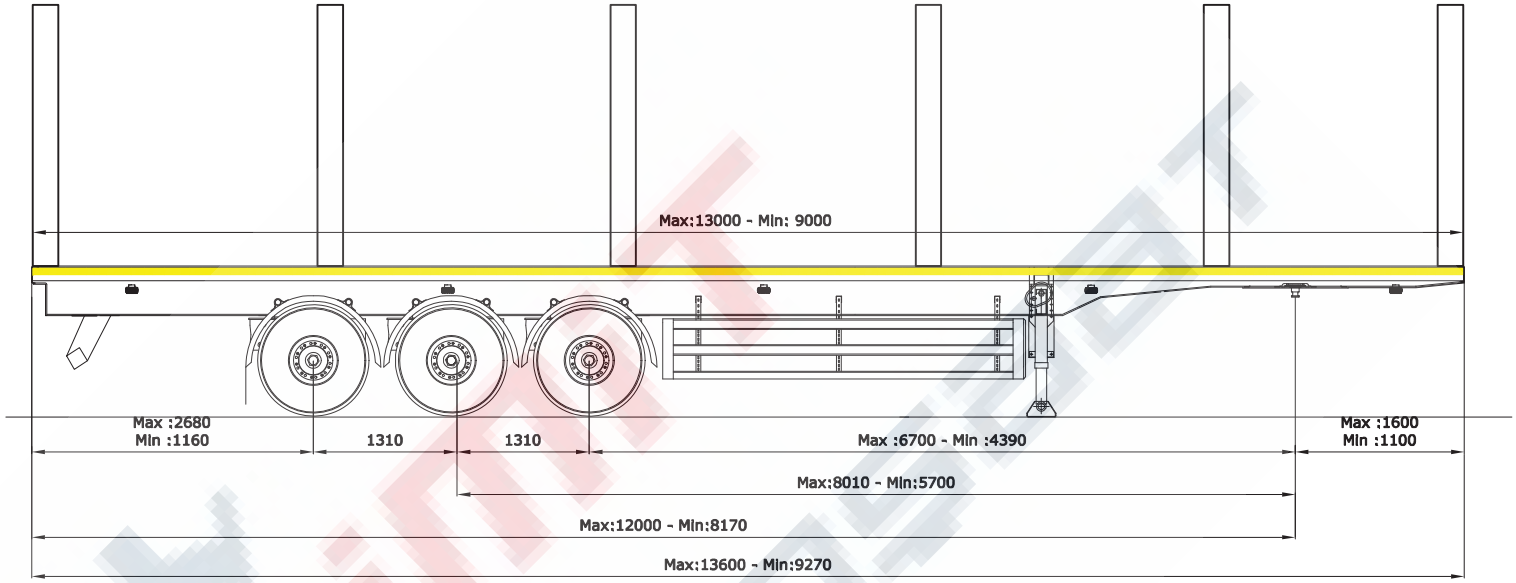
VARIANT: T07


max. 4000
1800-2040
2350-2500
max: 2550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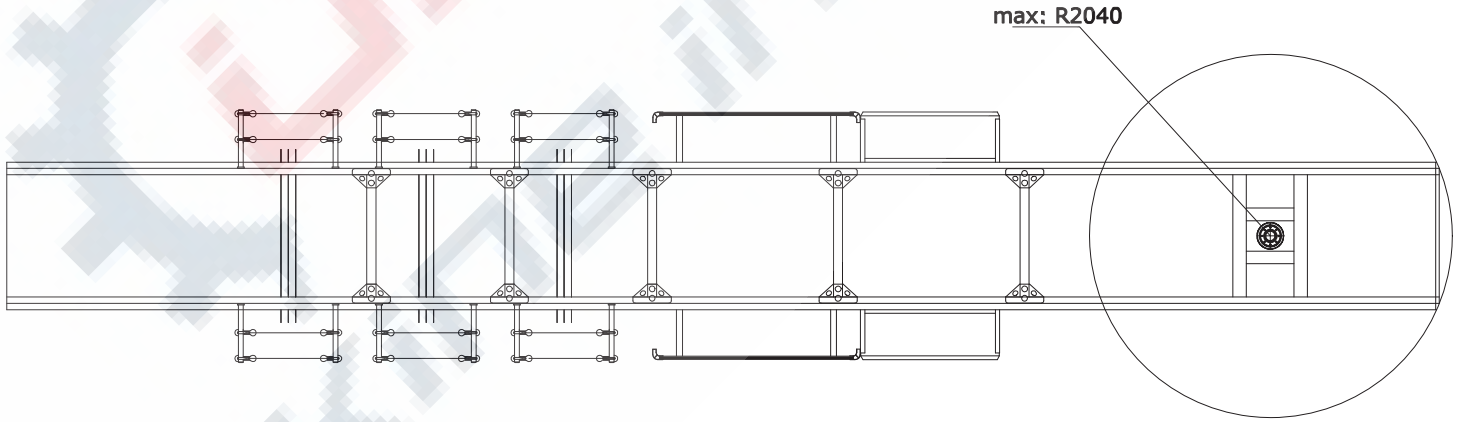
Max :2680
Min :1160
1310
1310
Max :6700 - Min :4390
Max :1600
Min :1100
Max:8010 - Min:5700
Max:12000 - Min:8170
Max:13600 - Min:9270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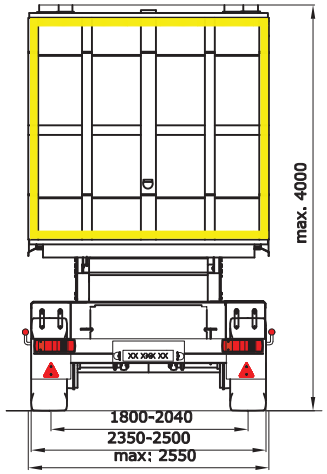
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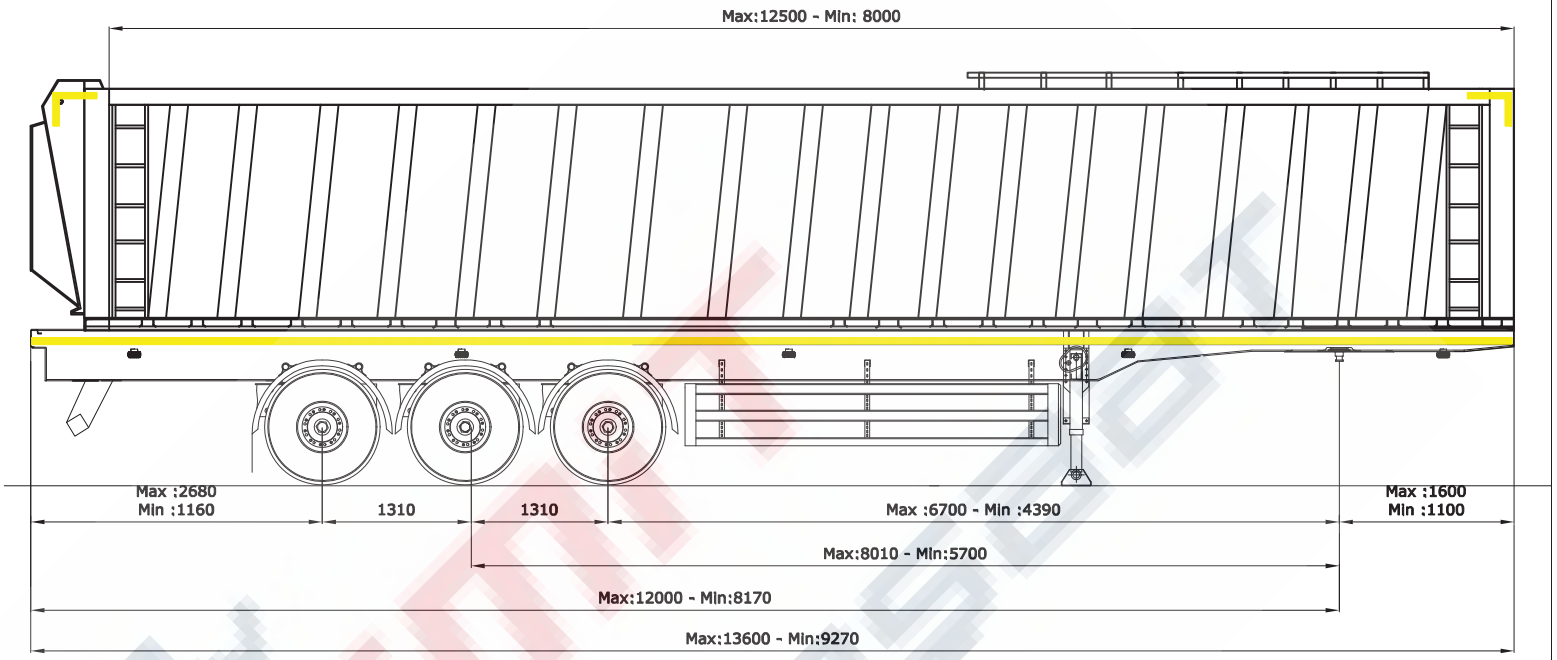
1800-2040
2350-2500
max: 2550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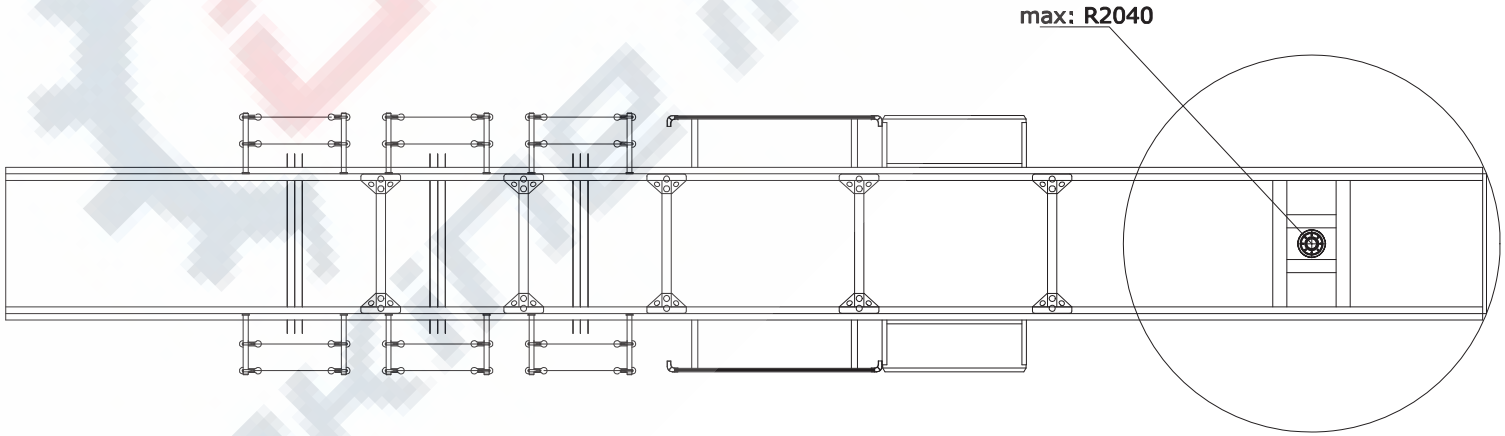
Max :2680
Min :1160
1310
1310
Max :6700 - Min :4390
Max :1600
Min :1100
Max:8010 - Min:5700
Max:12000 - Min:8170
Max:13600 - Min:9270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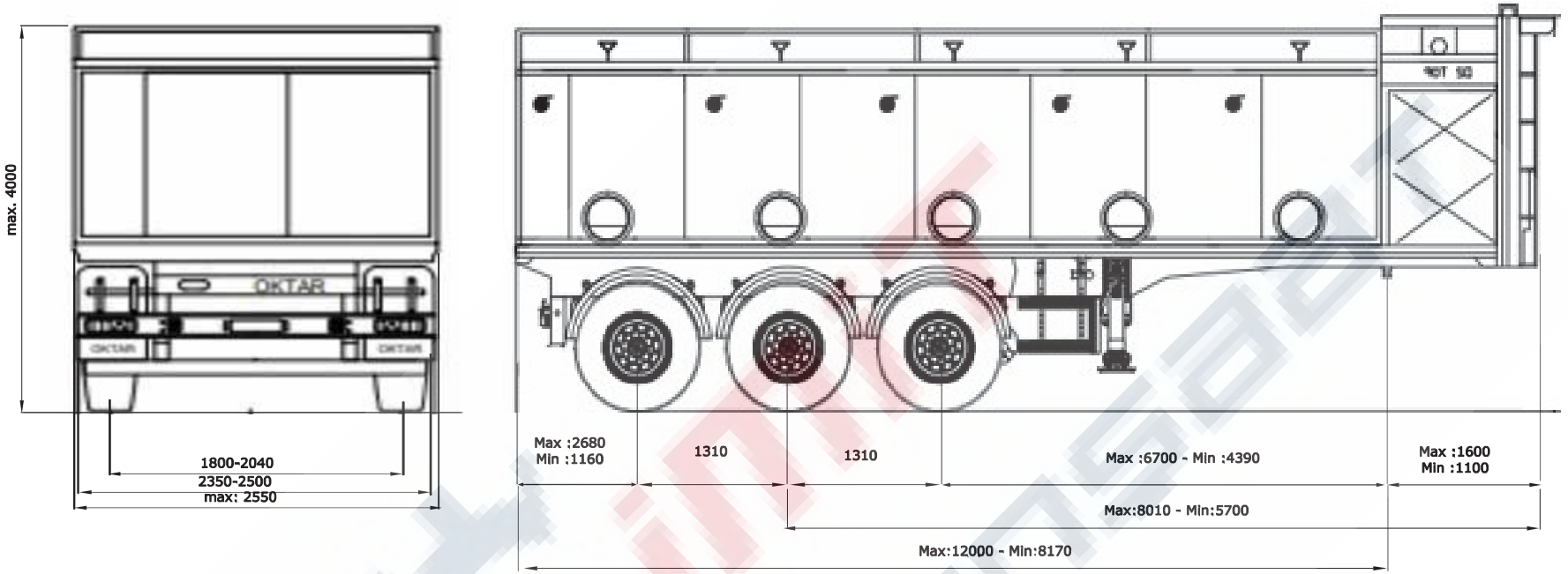
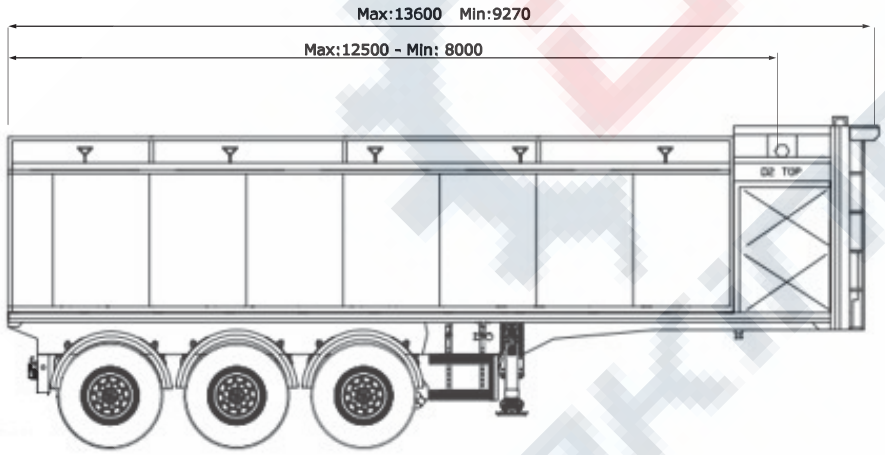
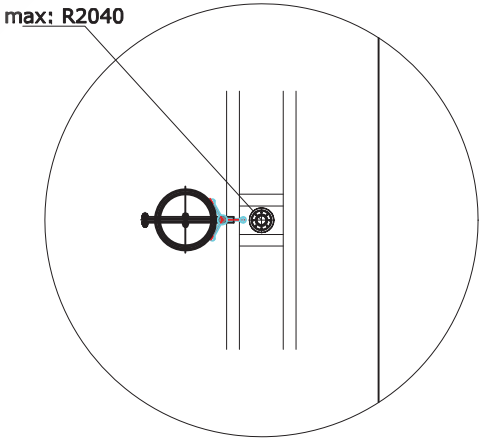
VARIANT: T11


max. 4000
OKTAR
1800-2040
2350-2500
max: 2550
Max :2680
Min :1160
1310
1310
Max :6700 - Min :4390
Max :1600
Min :1100
Max:8010 - Min:5700
Max:12000 - Min:8170


Max:13600 Min:9270
Max:12500 - Min: 8000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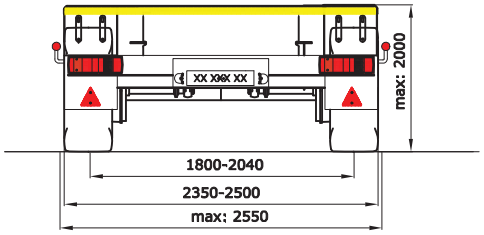
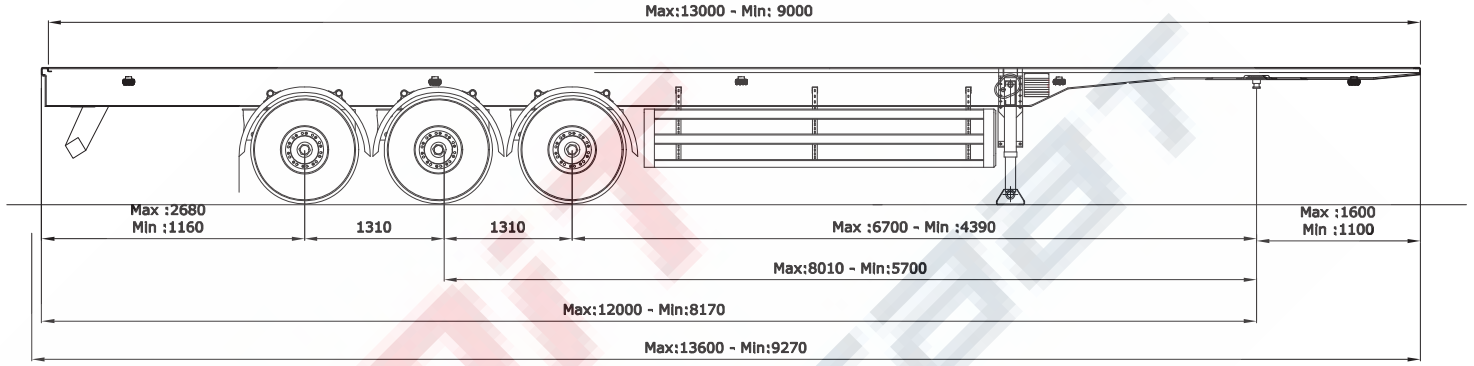

XX XXX XX
max: 2000
1800-2040
2350-2500
max: 2550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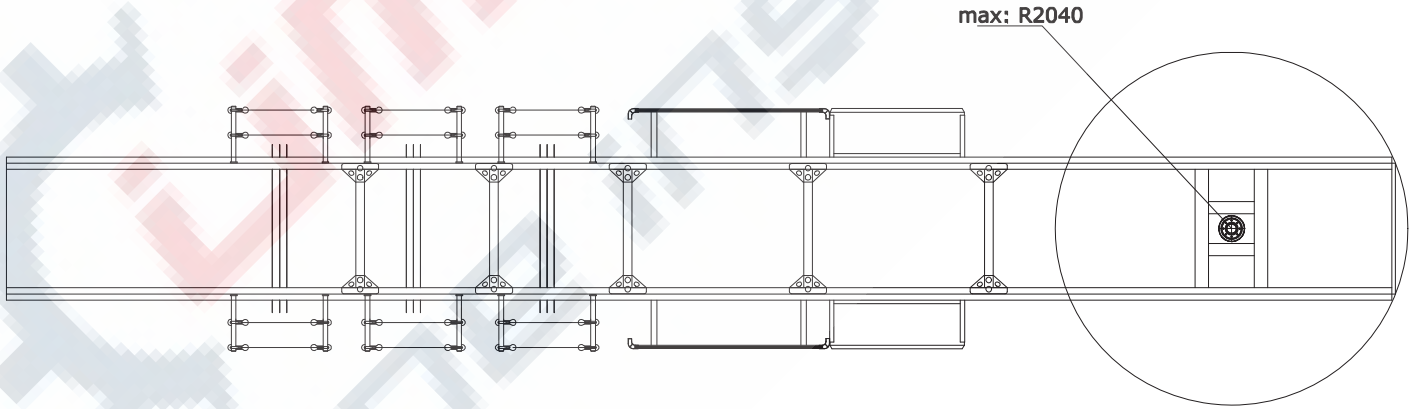
Max :2680
Min :1160
1310
1310
Max :6700 - Min :4390
Max :1600
Min :1100
Max:8010 - Min:5700
Max:12000 - Min:8170
Max:13600 - Min:9270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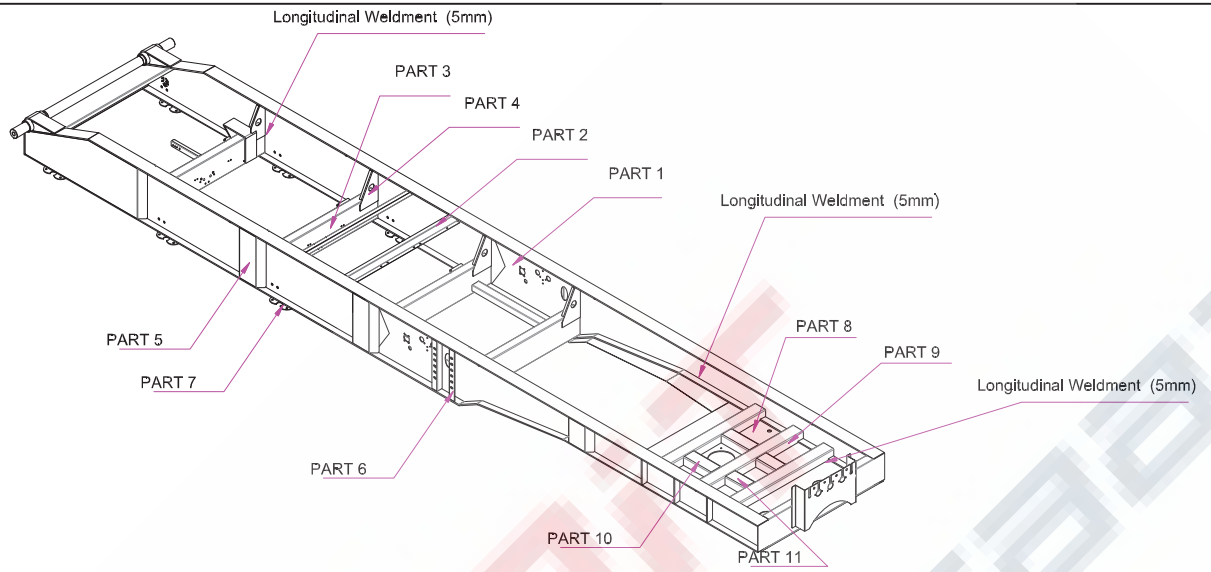
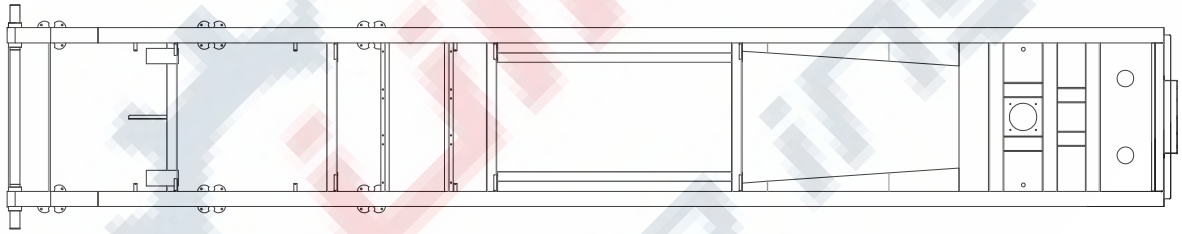
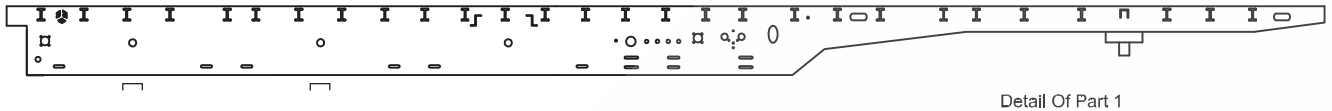
VARIANT: TXX

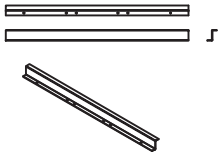




DETAIL A-A SECTION



Detail Of Part 1
Meterial: S355 JO



Detail Of Part 2
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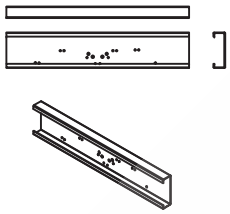

Detail Of Part 3
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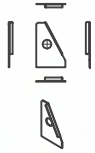

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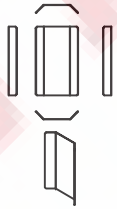
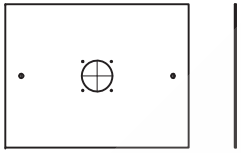


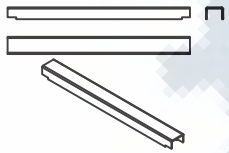
Detail Of Part 5
Meterial: S355 JO

Detail Of Part 6
Meterial: S355 JO

Detail Of Part 7
Meterial: S355 JO



Detail Of Part 8
Meterial: S355 JO

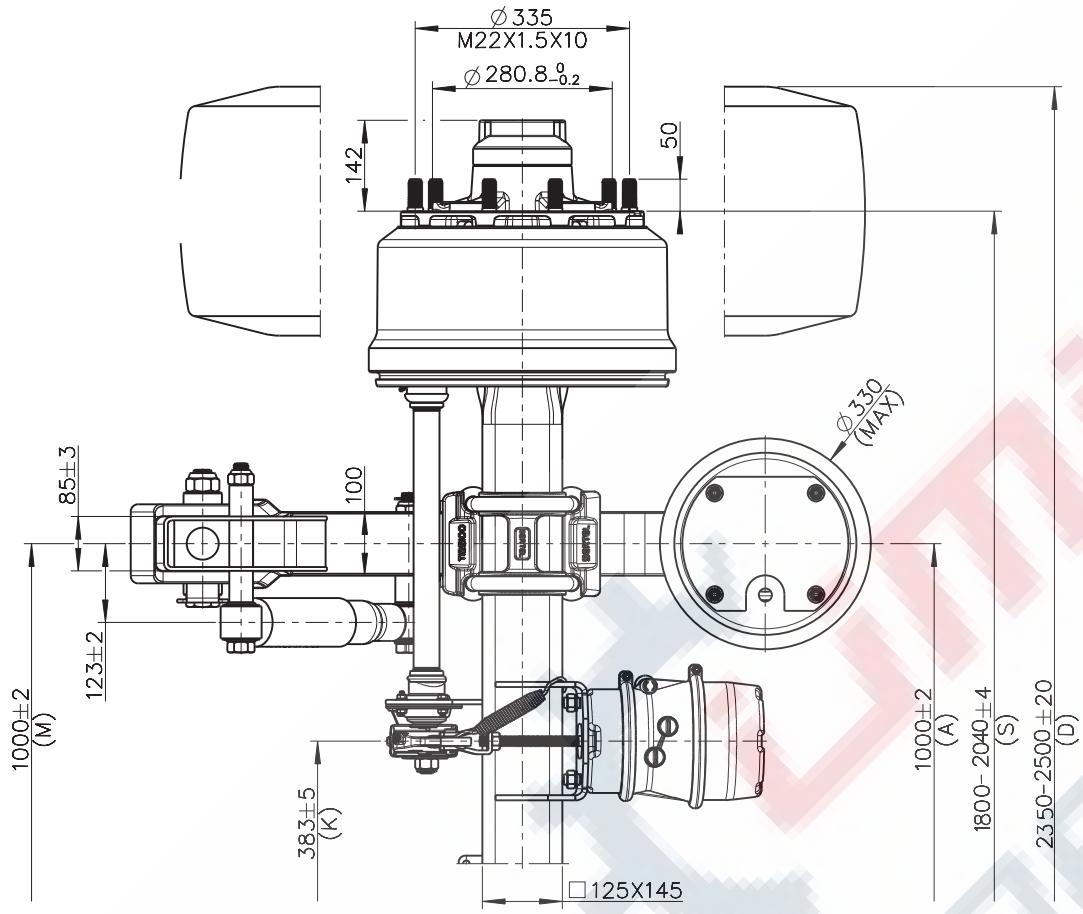


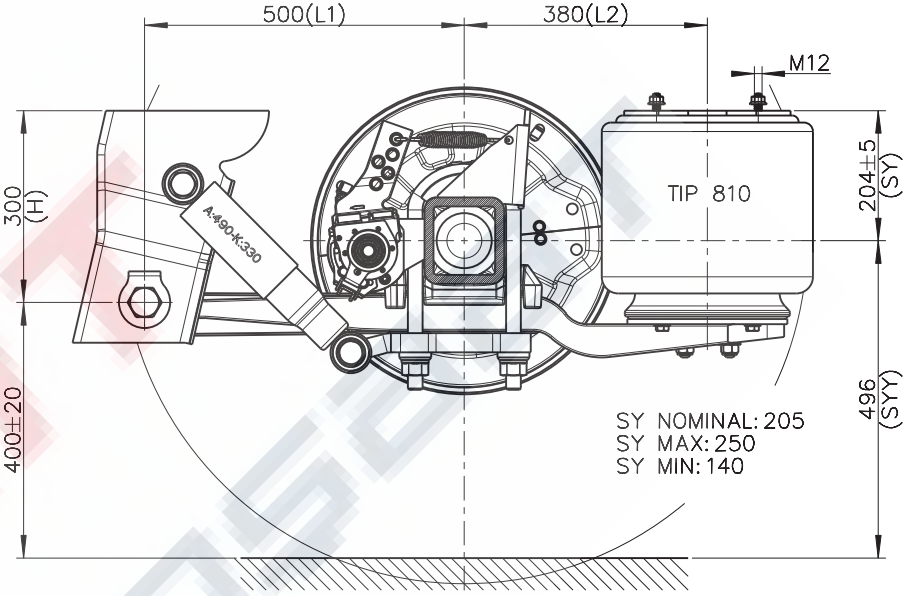
Detail Of Part 9
Meterial: S355 JO

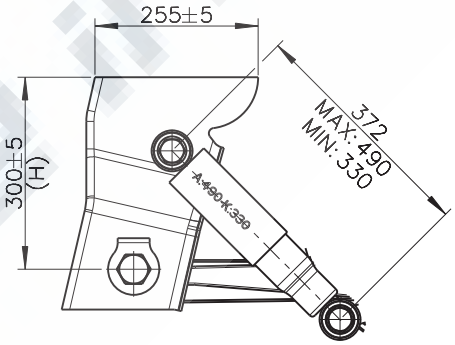
Detail Of Part 10
Meterial: S355 JO

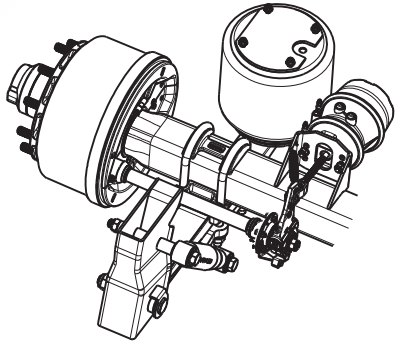
Detail Of Part 11
Meterial: S355 JO

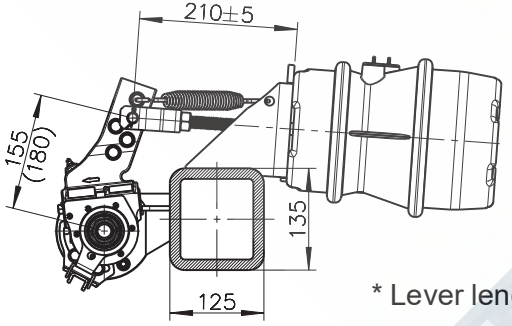
DETAIL A-A SECTION





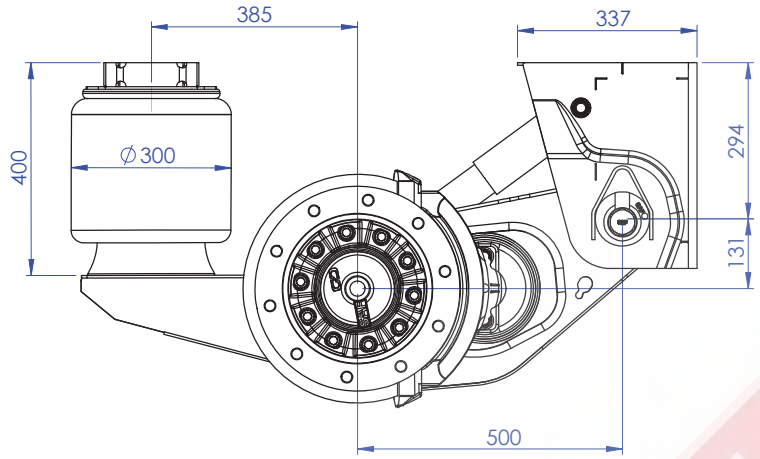


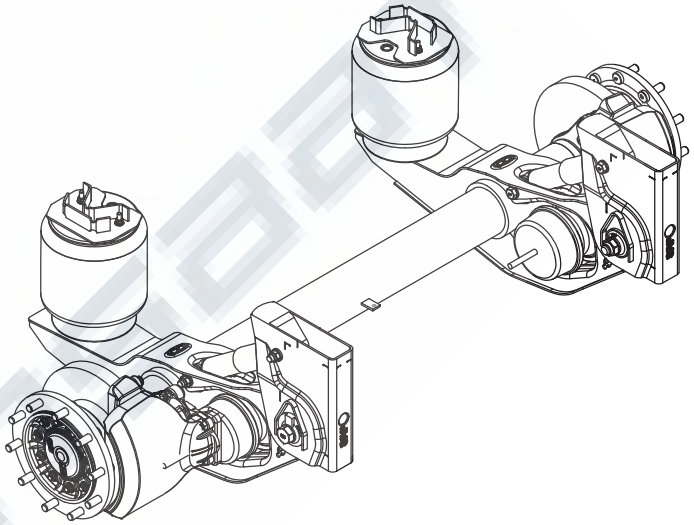


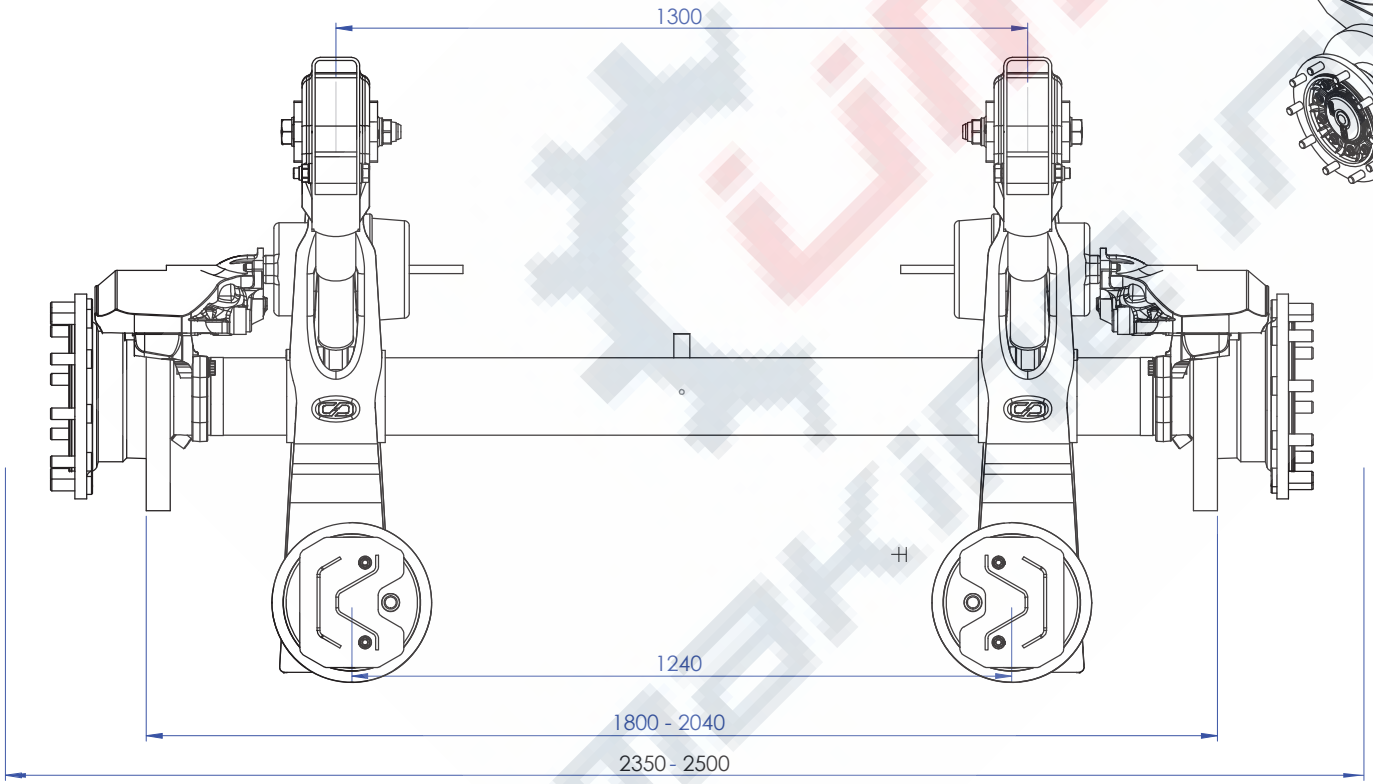


* Lever length is variable acc to brake calculation

Suspension dimensions with disc brake

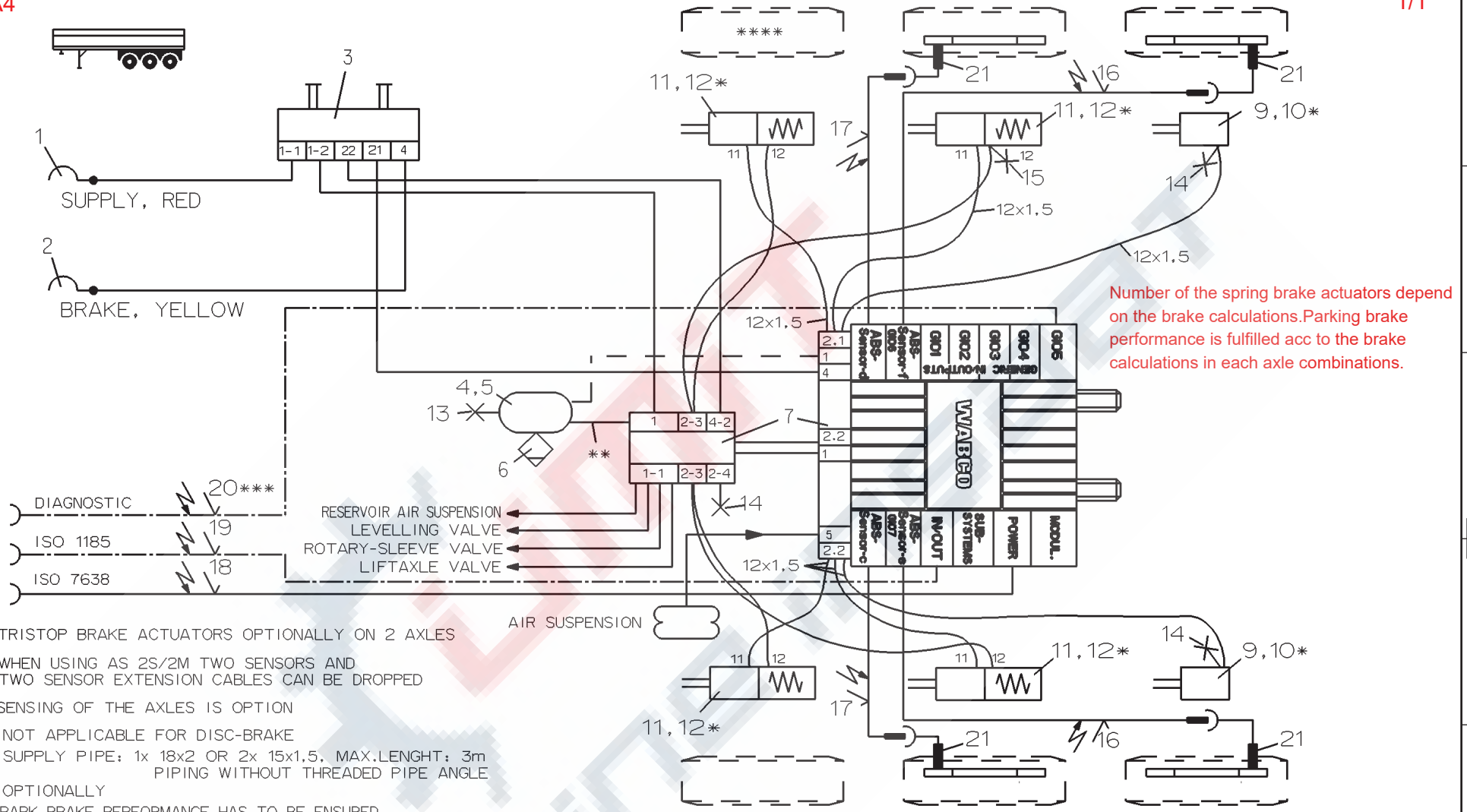






Annex A4

1/1



Number of the spring brake actuators depend on the brake calculations.Parking brake performance is fulfilled acc to the brake calculations in each axle combinations.

-TRISTOP BRAKE ACTUATORS OPTIONALLY ON 2 AXLES

-WHEN USING AS 2S/2M TWO SENSORS AND TWO SENSOR EXTENSION CABLES CAN BE DROPPED

-SENSING OF THE AXLES IS OPTION

* NOT APPLICABLE FOR DISC-BRAKE

** SUPPLY PIPE: 1x 18x2 OR 2x 15x1,5. MAX.LENGHT: 3m
PIPING WITHOUT THREADED PIPE ANGLE

*** OPTIONALLY

**** PARK BRAKE PERFORMANCE HAS TO BE ENSURED IN THE CASE OF A LIFTED AXLE

Pos.	Pcs.	Denomination		Product Identification No.	Pos.	Pcs.	Denomination		Product Identification No.
12	4	KIT	*	423 903 532 2					
11	4	TRISTOP BRAKE ACTUATOR		925 0					
10	2	KIT	*	423 000 ... 2					
9	2	BRAKE CHAMBER		423 10. ... 0	21	4	ABS-SENSOR		441 032 8.. 0
8					20	1	DIAGNOSTIC CABLE	***	449 611 000 0
7	1	TRAIL.-MODULATOR W.EXTENSION MODUL		480 102 ... 0	19	1	24N-CABLE		449 349 000 0
6	1	DRAIN VALVE		934 300 001 0	18	1	SUPPLY (POWER) CABLE		449 173 000 0
5	2	HOSE CLAMP		451 999 ... 2	17	2	EXTENSION CABLE FOR SENSOR		449 723 000 0
4	1	AIR RESERVOIR		950 0	16	2	EXTENSION CABLE FOR SENSOR		449 723 000 0
3	1	PARK-RELEASE-EMERG.-VALVE (PREV)		971 002 9.. 0	15	1	TEST CONNECTION		463 703 036 0
2	1	COUPLING HEAD W.INT. LINE FILTER		952 201 001 0	14	3	TEST CONNECTION		463 703 120 0
1	1	COUPLING HEAD W.INT. LINE FILTER		952 201 002 0	13	1	TEST CONNECTION		463 703 115 0

Date	Signature
Drawn	
06-12-04	APITHY
Checked	
06-12-04	GROSSK.
Expert	
BURMESTER	

WABCO

TRAILER - EBS E

FOR 3-AXLES-SEMITRAILER

4S/2M OR 2S/2M - WITH EXTENSION MODUL -

Mass	Scale	Material No.	Date of first issue:2006-12-04		
			Doc.Code	Language	Sheet
KG		841 701 110 0	002	EN	1/1
Size	CAD System				
A 3	Pro/E	ECN-No. 123543 / Revision C / Techn. Resp. 4990	Replacement for		

100mm

Aansluitschema 15-polige stekker (ISO 12098)

1	L	Knipperlamp links	geel
2	R	Knipperlamp rechts	groen
3		Mistachterlamp	blauw
4	31	Massa (voor pin 1-3 & 5-12)	wit
5	58L	Achter-, contour-, breedte- en kentekenlamp links	zwart
6	58R	Achter-, contour-, breedte- en kentekenlamp rechts	bruin
7	54	Remlichten	rood
8		achteruitrijlamp	roze
9	30	Constante voeding (+24V)	oranje
10		Sensor voor remvoeringsslijtage	grijs
11		Indicatie veerbelaste rem	wit/zwart
12		aslift functie	wit/blauw
13	31	Massa voor datakabels (voor pin 14 & 15)	wit/rood
14		CAN H	wit/groen
15		CAN L	wit/bruin

This diagram illustrates the standard 15-pin electrical connection (ISO 12098) between a towing vehicle and a semi-trailer. It defines the pin numbering, assigned lighting or auxiliary functions, and conventional wire colour codes for the 24 V system.
The ISO 12098 standard ensures compatibility of electrical circuits for braking, lighting, and communication between vehicles and trailers.

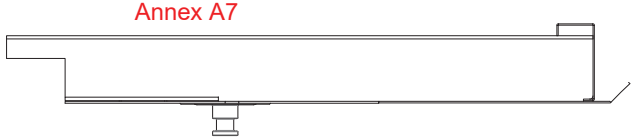
Source: Adapted from Tralert B.V., "Aansluitschema 15-polige stekker (ISO 12098)," https://www.tralert.com

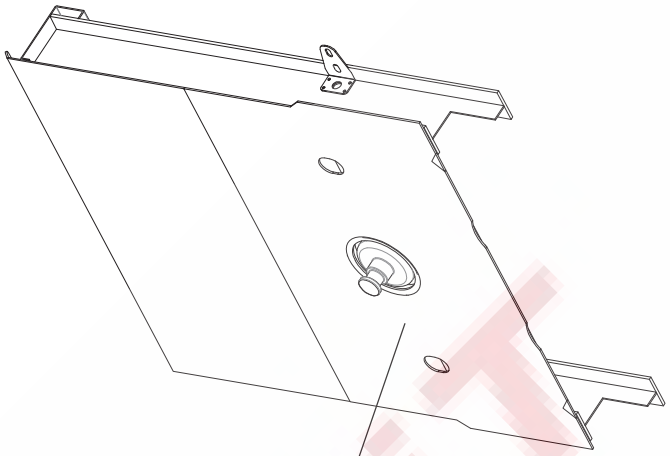
Used for informational and homologation reference purposes only.

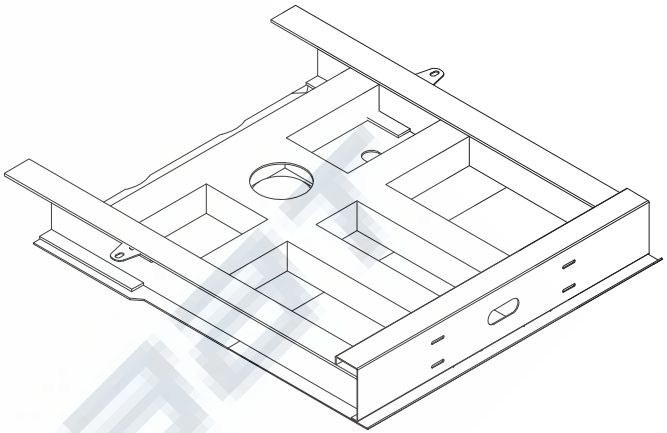
Tyre size designation	Load-capacity index	Speed category symbol ([80])	Wheel rim size(s)	Wheel off-set(s)	Rolling resistance coefficient (RRC)
385/65 R22,5	164 / -	K	11,75x22,5”	ET 0 or ET 120	Max 6,5 N/kN
385/55 R22,5	160 / -	K	11,75x22,5”	ET 0 or ET 120	Max 6,5 N/kN
275/70 R22,5	- / 14	J	11,75x22,5”	ET 0 or ET 120	Max 6,5 N/kN
295/60 R22,5	- / 14	K/L	11,75x22,5”	ET 0 or ET 120	Max 6,5 N/kN
285/70 R19,5	- / 14	K	8,25x19,5”	ET 0 or ET 120	Max 6,5 N/kN
265/70 R19,5	- / 14	K	7,50x19,5”	ET 0 or ET 120	Max 6,5 N/kN
245/70 R19,5	- / 14	K	7,50x19,5”	ET 0 or ET 120	Max 6,5 N/kN
(C3 tyre RR Stage 2 Max. 6.5 N/kN and Rolling sound level for normal tyre stage 2 Max. 73 dB)					
Minimum load-capacity index	load and speed index will be chosen by the manufacturer in accordance with the max. vehicles speed and max. techn. axle capacity				
Minimium speed category symbol					

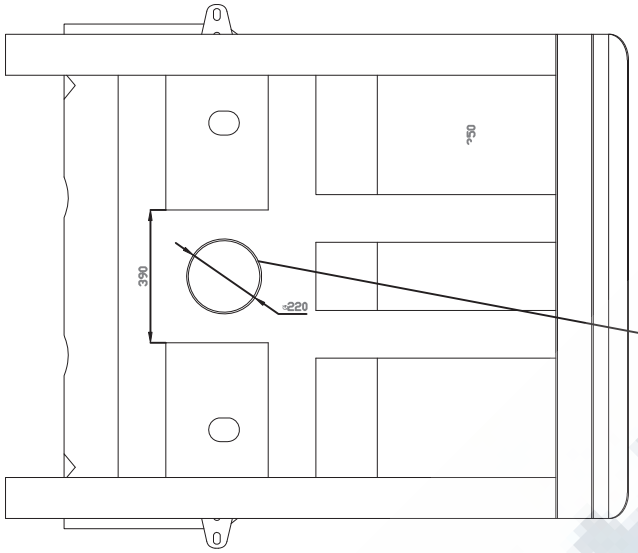
This table provides the approved tyre and rim combinations applicable to the semitrailer range covered by this RMI document.
It defines the permissible wheel rim dimensions, offsets, and associated tyre specifications in accordance with Regulation (EU) 2018/858 and the applicable UNECE Regulations (e.g. R54, R142) as well as the ETRTO Standards Manual (latest edition).

The load-capacity index and speed category symbol values shall be selected by the manufacturer according to the maximum technical axle load and maximum design speed of the vehicle.
All listed combinations are compliant with the rolling resistance and external rolling noise requirements defined for C3 tyres – Stage 2.

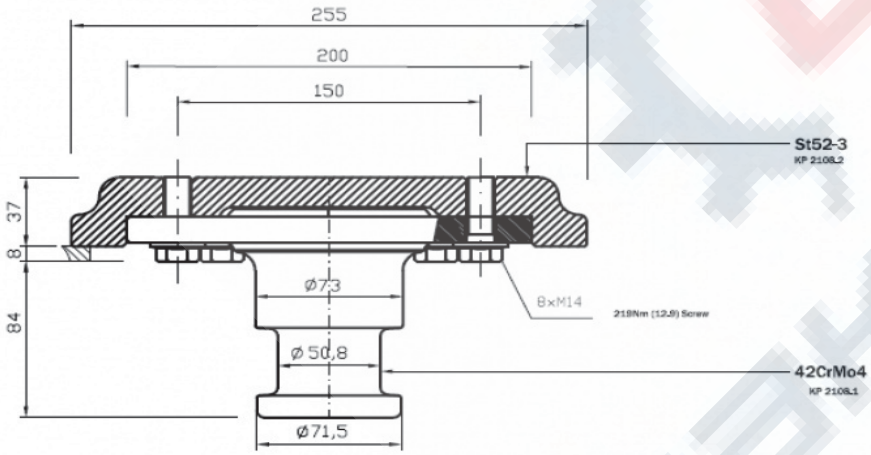




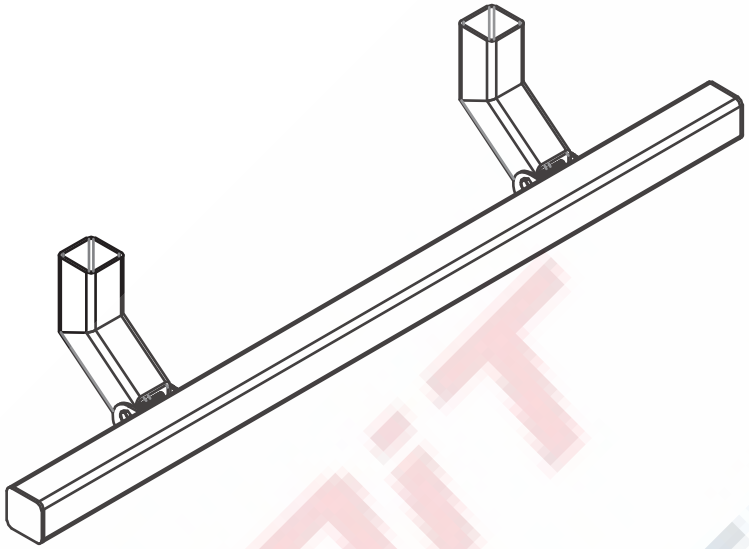


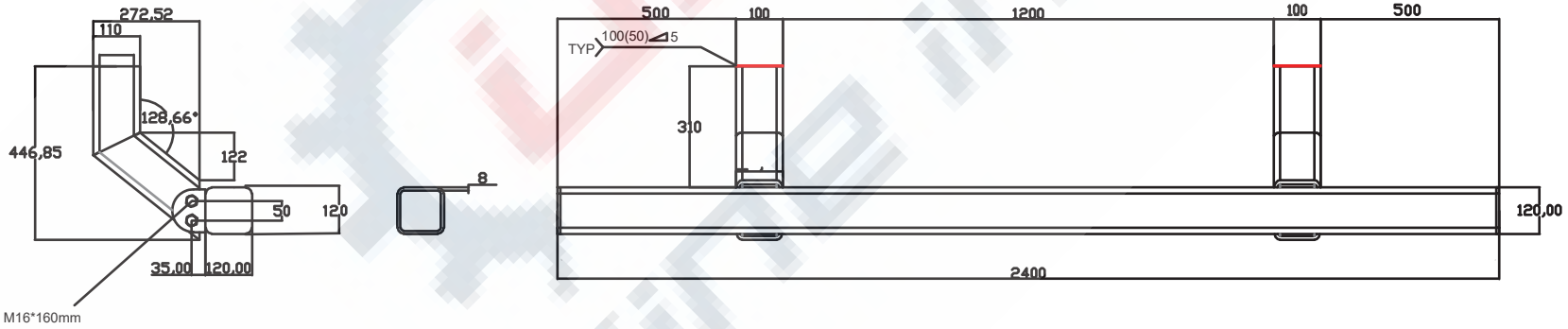


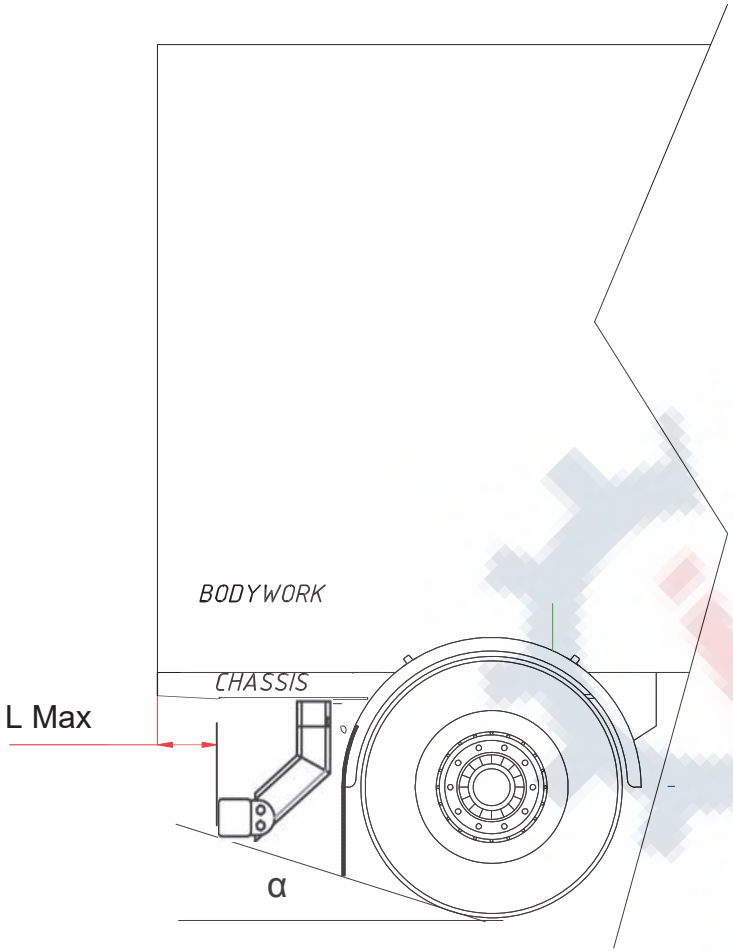
Circumferential Weldment = 5mm



	Make	Type	Aproval No	Class	Max D Value (kN)
1	Jost	KZ10	E1 55R-01 0145	H50-X	162-170
2	OMS	KP-2100	E20 55R-01 3753	H50-X	190
3	OMS	3.5* KINGPIN	E20 55R-01 3510	S	260
4	ÇAYIROVA	066B	E11 55R-01 10706	H50-X	175
5	SAF	50S15	E1 55R-01 2289	H50-X	165
6	Maxiforge	MF-1712-2.0-12	E11*55R01/06*11361*00	H50-X	152

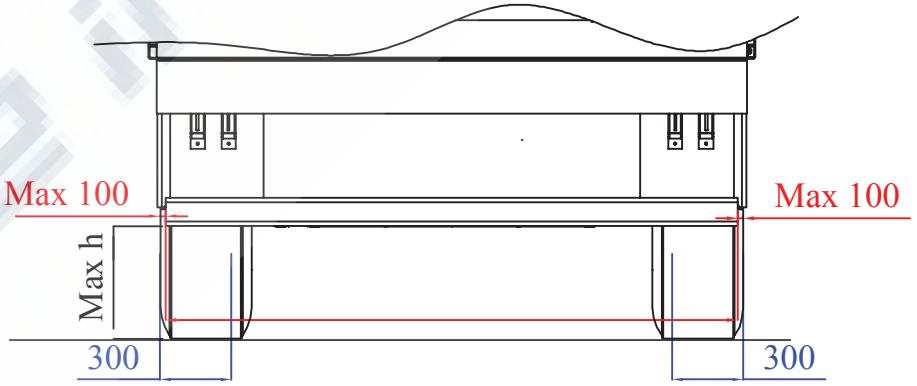


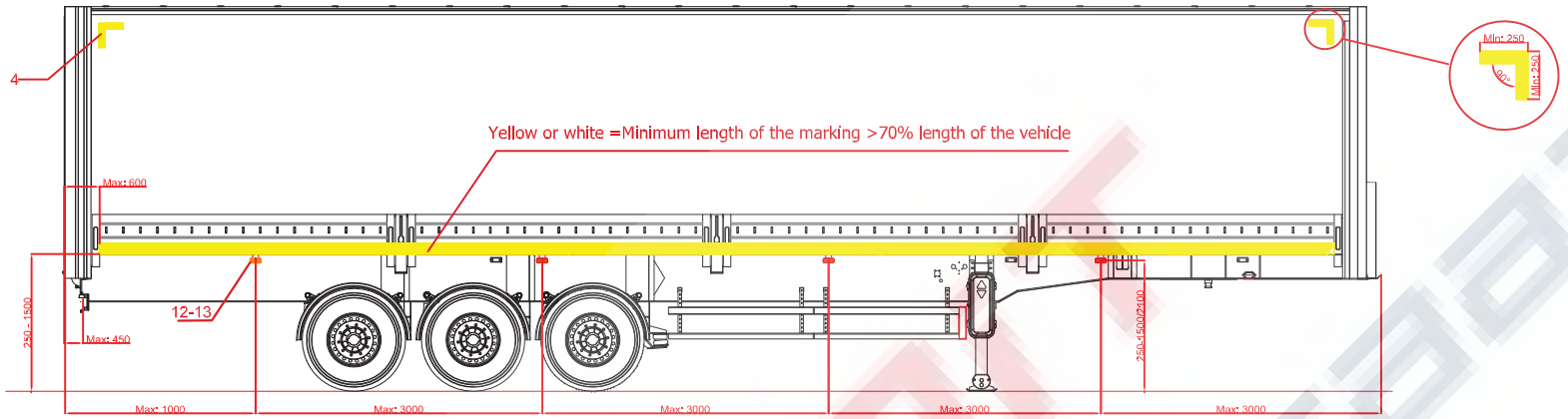

272,52
110
128,66°
446,85
122
50
120
35,00
120,00
M16*160mm
8
500
100
100(50)
5
TYP
1200
100
500
310
120,00
2400



Variant	Lmax Before forces are applied	Lmax After forces are applied
T01 (tipper)	300 mm	400 mm
All except T01	200 mm	300 mm

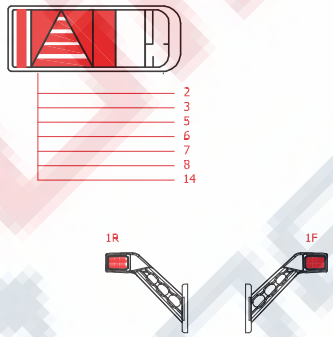
	Hmax	α (ISO 612:1978)
Hydraulic Suspension Hydropneumatic Suspension Pneumantic Suspension	450 mm	> 8°
	550 mm	≤8°

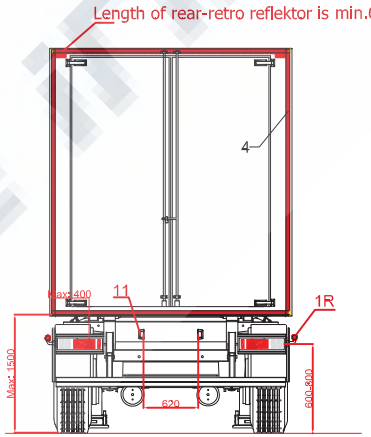




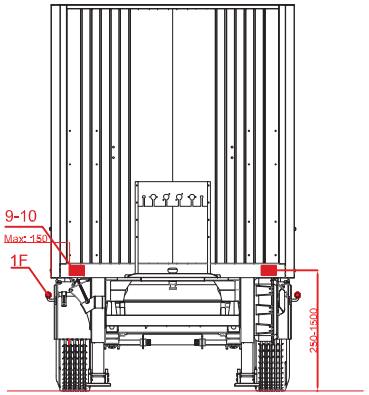
1End out–line marker lamp
(F: Front, R: Rear)
2 Rear Direction Indicator Lamp
3 Stop Lamp
4 Reflector ribbon
5 Rear Position Lamp
6 Rear Fog Lamp
7 Reversing Lamp
8 Triangular Rear Retro–Refteclor
9 Front Position Lamp
10 Front Retro–Reflector, Non triangular
11 Rear Registration Plate Lamp
12 Side Marker Lamp
13 Side Retro–Reflector, Non triangular
14 Hazard Warnlng Slgnal

In the case of bodywork of vehicle does not allow to put light signalling equipments within 1500 mm height from ground,its allowed to put 2100 mm height from ground for installation





Rear view



Front view

Note : The installation of lighting system is same for left hand side of vehicle.

No	Component	Subsystem / Sistem	Thread Size	Torque Value (Nm)	Tolerance (±%)	Tightening Method	Lubrication / Notes	Standard / Reference
1	Wheel nuts (Steel rim)	Axle / Wheel	M22×1.5	600	±10	Torque wrench	Dry threads only	ETRTO, ISO 6789
2	Wheel nuts (Aluminium rim)	Axle / Wheel	M22×1.5	650	±10	Torque wrench	Use washer, recheck after 50 km	ETRTO, ISO 6789
3	Hub bearing nut	Axle hub	M36×2.0	350	±5	Torque wrench	Lubricated threads	ISO 4109
4	Brake caliper mounting bolts	Brake system	M16×2.0	260	±5	Torque wrench	Use thread locker (Loctite 243 or equivalent)	ISO 4109
5	Air chamber mounting nuts	Brake system	M12×1.75	90	±10	Torque wrench	—	ISO 898-1
6	Slack adjuster fixing bolt	Brake linkage	M10×1.5	65	±10	Torque wrench	—	OEM spec
7	Suspension arm main bolt	Suspension	M24×3.0	720	±10	Hydraulic torque tool	Tighten on ground position	ISO 4109
8	Air spring top fixing nut	Suspension	M16×2.0	210	±10	Torque wrench	—	OEM spec
9	Shock absorber top bolt	Suspension	M16×2.0	180	±10	Torque wrench	—	ISO 4017
10	King pin fixing bolts	Fifth wheel coupling	M20×2.5	480	±10	Torque wrench	Tighten crosswise	UNECE R55, ISO 4109
11	Landing leg upper mounting bolt	Chassis / Support leg	M16×2.0	250	±10	Torque wrench	—	OEM spec
12	Landing leg lower mounting bolt	Chassis / Support leg	M20×2.5	380	±10	Torque wrench	—	OEM spec
13	Cross member to frame bolts	Chassis	M16×2.0	230	±10	Torque wrench	—	ISO 898-1
14	Rear underrun protection bolts	Safety equipment	M20×2.5	460	±10	Torque wrench	Apply anti-corrosion grease	UNECE R58
15	Mudguard mounting bolts	Body / Fenders	M8×1.25	25	±10	Torque wrench	Do not overtighten	OEM spec
16	Side guard brackets	Safety equipment	M12×1.75	100	±10	Torque wrench	—	UNECE R73
17	Tail lamp bracket bolts	Lighting system	M6×1.0	10	±15	Torque wrench	—	ISO 4014
18	Electrical connector clamp	Electrical system	M5×0.8	5	±15	Hand tool	Do not use power tools	OEM spec
19	Rear door hinge bolts	Body / Door system	M10×1.5	55	±10	Torque wrench	Apply light grease	OEM spec
20	Spare wheel carrier bolts	Chassis accessory	M12×1.75	120	±10	Torque wrench	—	OEM spec

No	Component / Bileşen	Subsystem / Sistem	Lubrication Point / Yağlama Noktası	Lubricant Type / Yağ Tipi	Specification / Standard	Interval / Periyot	Application Method / Uygulama Yöntemi	Remarks / Açıklama
1	Wheel hub bearings	Axle / Wheel	Inner and outer bearing races	Lithium-based grease	ISO 6743-9: L-XBCEB2	Every 12 months or 100,000 km	Grease gun or during hub service	Replace during bearing overhaul
2	Brake camshaft bushings	Brake system	Camshaft bush fitting	Multipurpose EP grease	NLGI Grade 2	Every 3 months or 25,000 km	Grease nipple	Apply until fresh grease appears
3	Slack adjuster (manual or automatic)	Brake linkage	Adjustment lever pivot	EP lithium grease	ISO 6743-9: L-XBCEB2	Every 6 months or 50,000 km	Grease nipple	Do not over-grease; avoid rubber seal damage
4	Suspension arm bushings	Suspension	Pivot pin and bushing area	Heavy-duty lithium complex grease	NLGI 2, ISO 12924	Every 6 months or 50,000 km	Grease gun	Check bushing condition
5	Air suspension height valve linkage	Suspension control	Lever joint and link pin	Silicone-based lubricant	OEM spec	Every 12 months	Brush or spray	Do not use mineral oils
6	Kingpin (fifth wheel interface)	Coupling system	Kingpin surface and neck	Graphite or MoS_2 grease	ISO 6743-9: L-XBGHB2	Every 2 weeks or before coupling	Brush or hand apply	Apply thin uniform layer
7	Landing leg gear mechanism	Support leg	Internal gear set	Multipurpose lithium grease	NLGI Grade 2	Every 12 months	Grease nipple or manual	Clean old grease before refill
8	Landing leg screw spindle	Support leg	Threaded spindle and nut	EP grease	ISO 6743-9	Every 6 months	Grease gun	Operate leg to distribute grease
9	Fifth wheel plate (tractor coupling)	Coupling interface	Contact surface	Graphite or molybdenum disulfide grease	ISO 6743-9	Before each operation	Brush or spatula	Clean prior to new application
10	Rear door hinges	Body / Door system	Hinge pin	Light mineral oil	ISO VG 68	Every 3 months	Brush or oil can	Wipe excess oil
11	Stabilizer and anti-roll bar joints	Suspension	Spherical joint ends	EP lithium grease	ISO 6743-9: L-XBCEB2	Every 6 months	Grease nipple	Check for play during greasing
12	Support leg pivot points	Chassis	Pivot bearing area	EP2 grease	NLGI Grade 2	Every 6 months	Grease gun	Grease until slight purge
13	Rear underrun protection hinges	Safety equipment	Pivot bolts	Multipurpose grease	NLGI Grade 2	Every 12 months	Grease nipple	Check torque of fixing bolts
14	Door lock mechanism	Body / Accessory	Locking lever and latch	Silicone spray lubricant	OEM spec	Every 3 months	Spray	Avoid overspray on seals
15	EBS valve linkage (if mechanical)	Brake control	Mechanical linkage pivot	Light synthetic oil	ISO VG 46	Every 12 months	Brush	Use sparingly

No	System / Sistem	Component / Bileşen	Inspection Task / Kontrol İşlemi	Method / Yöntem	Frequency / Periyot	Check Result / Kontrol Sonucu
1	Axle & Wheel	Wheel nuts, rims, tyres	Check torque, cracks, wear, tyre pressure	Visual + Torque wrench	Daily / Before trip	☐ OK ☐ NOK
2	Brake System	Brake linings, drums/discs	Check lining wear, cracks, leakage	Visual	Monthly / 10,000 km	☐ OK ☐ NOK
3	Brake System	Air chambers, hoses	Inspect for leaks or damage	Leak test + Visual	Monthly	☐ OK ☐ NOK
4	Suspension	Air springs, shock absorbers	Check leakage, mounting bolts	Visual	Quarterly / 25,000 km	☐ OK ☐ NOK
5	Suspension	Bolts and bushings	Check torque, cracks, play	Torque wrench	Every 6 months	☐ OK ☐ NOK
6	Coupling Device	Kingpin	Inspect wear, lubrication	Visual + Vernier	Every 3 months	☐ OK ☐ NOK
7	Coupling Device	Fifth wheel plate	Clean and re-grease	Cleaning + Brush	Every 2 weeks	☐ OK ☐ NOK
8	Landing Legs	Gear mechanism, screws	Check function, lubricate	Operate + Grease	Every 6 months	☐ OK ☐ NOK
9	Chassis	Frame and crossmembers	Check cracks, corrosion	Visual	Every 12 months	☐ OK ☐ NOK
10	Chassis	Fasteners and brackets	Check for loosening or corrosion	Torque check	Every 6 months	☐ OK ☐ NOK
11	Lighting / Electrical	Lamps, reflectors, connectors	Check operation, cleanliness	Functional test	Monthly	☐ OK ☐ NOK
12	Brake / EBS System	Sensors and wiring	Check damage, secure fitting	Visual + Diagnostic tool	Every 6 months	☐ OK ☐ NOK
13	Body / Structure	Doors, hinges, locks	Check operation, lubrication	Visual + Manual	Quarterly	☐ OK ☐ NOK
14	Safety Equipment	Rear underrun, side guards	Check fixation, deformation	Visual	Every 12 months	☐ OK ☐ NOK
15	Tyres	Tyre pressure, tread depth	Check pressure and wear pattern	Gauge + Visual	Weekly	☐ OK ☐ NOK
16	Air System	Reservoirs, valves	Drain condensation, check leaks	Manual + Visual	Monthly	☐ OK ☐ NOK
17	Paint & Coating	Chassis surfaces	Check corrosion, paint damage	Visual	Every 12 months	☐ OK ☐ NOK
18	Greasing Points	All lubrication points	Verify lubrication performed	Checklist cross-ref	As per A12	☐ OK ☐ NOK