



EN-GB

OPERATING & MAINTENANCE INSTRUCTIONS

PENDULAR-AXLE LOW LOADER

3 AXLE LINES · HYDRAULIC SUSPENSION AND STEERING
TELESCOPIC WELL DECK – TYPE STUP3



DOCUMENT
UM-05

TYPE
STUP3

LANGUAGE
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FOREWORD

Thank you for choosing an STU pendular-axle low loader. It has been designed and built for heavy and long indivisible loads: its hydraulically suspended pendular axles distribute the load evenly on uneven roads, its hydraulic steering keeps the long combination on track, and its telescopic well deck adapts to the length of the load.

This manual is an integral part of the semi-trailer. It explains how the semi-trailer is built, how to couple, drive, load and operate it correctly, and how to keep it in a safe, roadworthy condition throughout its service life. Read it carefully before you use the semi-trailer for the first time and make sure that every driver, operator and workshop technician who works with it has read and understood the chapters that apply to them.

Your semi-trailer complies with the European whole-vehicle type-approval requirements of Regulation (EU) 2018/858 and the UN Regulations listed in its Certificate of Conformity (CoC). Safe operation, however, also depends on the people who use it. The instructions, warnings and limits in this manual exist to protect you, other road users and your investment.

If anything in this manual is unclear, or if your semi-trailer is fitted with equipment that is not described here, contact your STU dealer or STU directly before using it.

We wish you many safe and profitable kilometres.

STU Treyler Dorse İthalat İhracat Ltd. Şti.

Keep this manual with the semi-trailer. Store it in the document holder or in the cab of the towing vehicle so that it is always available. If the semi-trailer is sold, hired out or transferred, hand this manual over with it.

ABOUT THIS DOCUMENT

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TABLE 0.1 – REVISION HISTORY

REVISION	DATE	DESCRIPTION OF CHANGE
00	10/2026	First edition.

The information in this manual reflects the design of the semi-trailer at the date of publication. As part of continuous product development, STU reserves the right to change the design, equipment and specifications of its products without prior notice and without obligation to modify vehicles already delivered. Illustrations may show optional equipment or differ in detail from your semi-trailer; they are intended to explain principles.

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ABOUT THIS MANUAL



This chapter explains who this manual is written for, how it is organised and how the safety information in it is presented.

1.1 SCOPE

This manual applies to STU pendular-axle low loaders of the following type and variants:

TABLE 1.1 – TYPES AND VARIANTS COVERED BY THIS MANUAL

TYPE	VARIANT	AXLES	TYPICAL USE
STUP3	3-axle low loader (semi-trailer) with pendular axles and telescopic well deck	3 axle lines	Heavy and long indivisible loads – construction machinery, plant, transformers, steel structures – usually under special permit

The STUP3 differs from conventional semi-trailers in three important respects: its gooseneck is **hydraulic and detachable**, its axles are pendular axles with **hydraulic suspension**, they are **hydraulically force-steered**, and its well deck is **telescopic**. Read Chapters 6 to 11 carefully before operating these functions. Optional equipment is marked (*if fitted*).

The semi-trailer may also be fitted with components from third-party suppliers – axles, braking system, landing legs, king pin, pendular axles, hydraulic steering and suspension components, hydraulic power unit. Their own operating and maintenance instructions are part of the semi-trailer documentation and must also be observed. If those instructions contradict this manual on a component-specific point, the component manufacturer's instructions take precedence.

1.2 TARGET GROUPS

TABLE 1.2 – TARGET GROUPS

TARGET GROUP	REQUIRED QUALIFICATION	RELEVANT CHAPTERS
Owner / operator (fleet owner)	Responsible for organising safe use, training and maintenance	All chapters

Driver	Valid driving licence for the vehicle combination (category C+E or national equivalent); instructed on this semi-trailer	2 to 12
Operator of the hydraulic functions	Instructed in the suspension, steering and telescoping functions and their danger zones	2, 6 to 12, 15
Escort / banksman	Instructed in the signals and in the route and permit conditions	2, 5
Workshop technician	Trained commercial-vehicle technician; brake, hydraulic and electrical work only by qualified specialists	2, 13 to 16

1.3 SIGNAL WORDS AND SYMBOLS

Safety information in this manual is graded according to ISO 3864-2. The signal word tells you how serious the hazard is. Always read the complete safety message, not only the signal word.

DANGER



DANGER indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING



WARNING indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION



CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE



NOTICE indicates information considered important but not hazard-related – for example a risk of damage to the semi-trailer, the load or the environment.



Information provides useful tips, cross-references and background that help you work more efficiently.



Environment marks instructions that help you prevent pollution and dispose of materials correctly.

Other conventions used in this manual:

- Numbered steps (1, 2, 3 ...) must be carried out in the order shown.
- Bullet points list items that do not need to follow a particular order.
- Boxes ☐ in checklists are intended to be ticked off during an inspection.
- Item numbers in illustrations are referenced in the text, for example (*Figure 3.1, item 4*).

- Values marked with a highlighted field such as **value** are specific to the individual semi-trailer and must be taken from its statutory plate or Certificate of Conformity.

1.4 UNITS AND ABBREVIATIONS

All dimensions are given in millimetres (mm), masses in kilograms (kg) or tonnes (t), pressures in bar (1 bar = 100 kPa) and torques in newton metres (N·m), unless stated otherwise.

TABLE 1.3 – ABBREVIATIONS

ABBREVIATION	MEANING
ABS	Anti-lock braking system
CoC	Certificate of Conformity
CoG	Centre of gravity
EBS	Electronic braking system
GVW	Gross vehicle weight (technically permissible maximum laden mass)
LC	Lashing capacity (EN 12195)
PPE	Personal protective equipment
PREV	Park release emergency valve
RSS	Roll stability support
VIN	Vehicle identification number
PTO	Power take-off
HLP / HVLP	Hydraulic oils to ISO 6743-4 HM / HV

SAFETY

02

A pendular-axle low loader moves very heavy and very long loads. Its hydraulic suspension, steering and telescopic deck add functions – and hazards – that conventional semi-trailers do not have. Most serious accidents happen during loading, when extending or retracting the deck, during manual steering manoeuvres and when the vehicle exceeds its permitted dimensions or route conditions. Read this chapter in full before you work with the semi-trailer.

2.1 INTENDED USE

The STUP3 low loader is intended exclusively for the road transport of indivisible loads within the technically permissible masses and dimensions stated on the statutory plate and in the Certificate of Conformity – or within the higher values permitted by a special permit – with the deck extended only as far as the load requires.

Intended use also includes:

- coupling the semi-trailer only to a towing vehicle that is approved and suitable for the fifth-wheel load, the semi-trailer's gross vehicle weight and the king pin size fitted;
- complying with this manual and the instructions of the component suppliers;
- carrying out the inspections and maintenance described in Chapter 14 at the prescribed intervals;
- complying with the traffic, weights-and-dimensions, load-securing regulations of every country in which the semi-trailer is used, including any special permits required for abnormal loads.

2.2 FORESEEABLE MISUSE

Any use other than that described above is regarded as misuse. STU accepts no liability for damage resulting from misuse. Examples of foreseeable misuse are:

- exceeding the permissible payload, axle loads or fifth-wheel load, or loading in a way that does not respect the load-distribution limits;
- transporting persons or animals on the semi-trailer;
- extending or retracting the deck while it is laden;
- driving with the telescopic deck not locked with all locking pins;
- driving with the hydraulic suspension outside the ride-height range, or with the suspension circuits set for manoeuvring;
- driving at speed with the manual (auxiliary) steering engaged, or with the steering not centred and synchronised;

- driving on the road with the turntable locking pin inserted, or with the neck locks of the gooseneck open;
- driving, loading or unloading with the left and right suspension circuits connected;
- detaching or coupling the gooseneck with a load on the deck unless approved by STU;
- exceeding the axle loads or the deck load per metre, or loading the deck with point loads without load-spreading timbers;
- driving with the suspension raised or lowered out of the ride position;
- carrying out welding, drilling or other modifications to the chassis, running gear, braking system without the written approval of STU;
- operating the semi-trailer under the influence of alcohol, drugs or medication that impairs the ability to drive or work safely.

2.3 RESPONSIBILITIES OF THE OWNER / OPERATOR

The owner or operator of the semi-trailer must ensure that:

- only trained, authorised and suitably licensed persons drive, operate, load or maintain the semi-trailer;
- every person working with the semi-trailer has access to this manual and has been instructed in its content – and that this instruction is documented;
- the semi-trailer is presented for statutory periodic roadworthiness tests and maintained as described in Chapter 14;
- special permits for abnormal loads are obtained and their conditions – route, times, escorts, marking – are complied with;
- defects that affect safety are rectified immediately and the semi-trailer is withdrawn from service until the repair has been completed;
- the required personal protective equipment is provided and worn;
- national accident-prevention and occupational-safety regulations are observed.

2.4 GENERAL SAFETY RULES

Apply the following rules every day:

- Inspect the semi-trailer before every journey (see Section 5.1). Do not use a semi-trailer with a safety-relevant defect.
- Never leave the semi-trailer unattended unless the parking brake is applied and, when uncoupled, wheel chocks are in place.
- Never drive with the deck extension, the steering or the suspension in a manoeuvring setting, or with locking pins missing.
- Never stand under the deck or between the axles while the suspension or steering is operated.
- Make sure that the brake air lines, the EBS connector and the electrical connectors are correctly connected and that the compressed-air system holds pressure.
- Check that the fifth-wheel lock of the towing vehicle has fully engaged around the king pin.
- Wear the prescribed PPE (see Section 2.6).
- Check that all safety labels are present and legible (see Section 2.7).
- Never climb onto the semi-trailer when surfaces are wet, icy, oily or covered in mud without suitable footwear and extra care. Use the access steps and handholds provided.

2.4.1 COMPRESSED-AIR SYSTEM

- The pneumatic system operates at high pressure. Before working on it, switch off the engine of the towing vehicle and release the pressure from the semi-trailer circuit.
- When connecting the air lines, make sure that the couplings are clean and that no pressure is present in the lines being connected.
- Replace air hoses at least every five years, and immediately if they are damaged, porous or kinked.
- Work on the braking system may only be performed by qualified specialists authorised by the brake-system manufacturer.

2.4.2 TYRES AND WHEELS

- Secure the semi-trailer against rolling before working on wheels or tyres.
- Tyres and wheels may only be repaired or fitted by trained personnel using suitable tools and inflation cages.
- Wherever possible, change wheels with the semi-trailer unladen.
- Protect the tyres from direct sunlight if the semi-trailer is parked for long periods.

2.4.3 MAINTENANCE AND REPAIR

- Switch off the engine of the towing vehicle and remove the ignition key before any cleaning, maintenance or repair work.
- Support the chassis securely with axle stands of sufficient capacity before working underneath it. A jack alone is never sufficient.
- Lower all hydraulically operated parts to their rest position or support them mechanically, and depressurise the hydraulic system before working on it.
- Before welding on the semi-trailer, disconnect it from the towing vehicle, disconnect the EBS modulator and any on-board batteries or control units, and connect the welding earth as close as possible to the welding point.
- Replace bolts and nuts only with parts of the same size, property class and coating.
- Use only original STU spare parts or parts approved by STU.

2.5 DANGER ZONES

The following zones are danger zones in which persons may only be present when necessary and when the driver or operator can see them:

- **Between the towing vehicle and the semi-trailer** during coupling and uncoupling – risk of crushing.
- **Along the extension zone** of the telescopic deck while it is being extended or retracted – risk of crushing between the deck sections.
- **Beside the axles** while the steering or suspension is operated – wheels and pendular axles move suddenly.
- **Under and in front of the gooseneck and the deck front** while the gooseneck is lowered, raised, detached or coupled – risk of crushing.
- **Around the whole vehicle** during manual steering manoeuvres – the rear of the vehicle can swing out far beyond the normal swept path.
- **Around the rear overhang** when the vehicle is turning – the rear of the semi-trailer swings out.
- **Under the semi-trailer** whenever the suspension or a hydraulic function is being operated.

DANGER

Crushing hazard between towing vehicle and semi-trailer. Nobody may stand between the towing vehicle and the semi-trailer while the towing vehicle is moving or while the suspension is being adjusted. Use a banksman with an agreed set of signals if the driver cannot see the coupling area.

2.6 PERSONAL PROTECTIVE EQUIPMENT

Wear the following PPE when working with the semi-trailer, as required by the task and by the rules of the site:

TABLE 2.1 — PERSONAL PROTECTIVE EQUIPMENT

SYMBOL	PPE	REQUIRED FOR
	High-visibility vest	All work on public roads, on construction sites and at terminals
	Safety footwear	Coupling, loading, operation, maintenance
	Work gloves	Handling lashing equipment, couplings, hoses, maintenance
	Safety helmet	Loading with cranes, construction sites, telescoping operations
	Safety goggles	Working under the semi-trailer, cleaning, compressed-air and hydraulic work
	Hearing protection	Work in noisy environments, high-pressure cleaning
	Face shield	Grinding and high-pressure cleaning
	Respiratory protection	Painting, sand-blasting, working with solvents
	Welding helmet	Welding repairs (authorised workshops only)

2.7 SAFETY LABELS ON THE SEMI-TRAILER

Safety and information labels are attached at the relevant points of the semi-trailer. They must not be removed or painted over. Replace damaged or illegible labels immediately — replacement labels are available from STU. The labels fitted depend on the equipment of your semi-trailer.

TABLE 2.2 – SAFETY LABELS

NO.	LABEL	MEANING
1		General warning – observe the instructions in this manual
2		Danger of falling – do not stand on the edge of the deck
3		Crushing hazard when turning – keep clear of the area between towing vehicle and semi-trailer
4		Danger from moving load or moving parts – keep clear during loading, telescoping, steering and suspension movements
5		Electrical hazard – keep a safe distance from overhead power lines
6		Hand injury hazard – keep hands away from moving parts
7		Stop – function must be stopped before access
8		Emergency stop – location of the emergency stop button (hydraulic control)
9		Danger when turning – the rear overhang swings out
10		Keep a safe distance
11		Use wheel chocks when the semi-trailer is parked
12		Lubrication point – lubricate at the prescribed interval
13		Jacking point – place a jack only here
14		Check wheel-nut torque after the first 100 km and 200 km

15



Remove the ignition key of the towing vehicle before servicing

2.8 RESIDUAL RISKS

The semi-trailer has been designed and built according to the state of the art and the recognised safety rules. Nevertheless, some risks cannot be eliminated completely by design. They arise mainly from incorrect behaviour, lack of attention or lack of knowledge.

TABLE 2.3 – RESIDUAL RISKS AND PREVENTIVE MEASURES

RESIDUAL RISK	HOW TO AVOID IT
Crushing between towing vehicle and semi-trailer	Keep the coupling area clear; use a banksman; follow Section 4.3 exactly
Crushing at the telescopic deck	Keep everyone clear; operate only with a banksman; insert all locking pins (Chapter 11)
Loss of steering control	Centre and synchronise the steering before driving; use the auxiliary steering only at walking pace (Section 10.3)
Deck front dropping during gooseneck operation	Detach and couple only unladen, on firm ground; close and check the neck locks (Chapter 7)
Overturning with suspension circuits connected	Keep the 3-point support for all travel and loading (Chapter 9)
Vehicle grounding on crests and level crossings	Raise the suspension within its range; plan the route; check ground clearance (min. 200 mm at ride height)
Overturning in bends	Keep the load centre of gravity as low and central as possible; adapt speed, especially with high, liquid or swinging loads
Contact with overhead structures or power lines	Know the total height of the laden vehicle; plan the route; keep at least the safety distance prescribed by the network operator
Hydraulic or pneumatic fluid under pressure	Depressurise before work; never search for leaks with your hand
Falling from the semi-trailer	Use the access steps, ladders and handholds; keep surfaces clean; do not jump down

PRODUCT DESCRIPTION

This chapter gives an overview of the low loader's main assemblies, its identification plates, its technical data and its equipment.

3.1 OVERVIEW

The STUP3 is a low loader semi-trailer with a gooseneck, a low well deck that can be extended telescopically, and a rear bogie with three lines of pendular axles. Each pendular axle is suspended by a hydraulic cylinder and steered hydraulically, so that all wheels stay in contact with the road on uneven surfaces and the combination tracks accurately in bends.

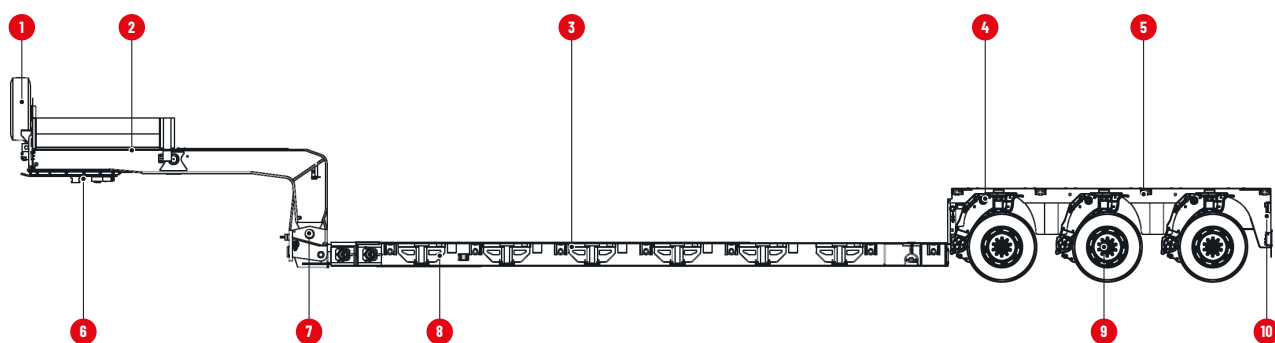


FIGURE 3.1 STUP3 pendular-axle low loader – main assemblies (deck retracted)

- | | |
|--|--|
| 1 Spare wheel | 2 Gooseneck with upper deck |
| 3 Telescopic well deck (loading bed) | 4 Hydraulic suspension cylinders |
| 5 Rear deck over the axle bogie | 6 King pin |
| 7 Neck joint (connection gooseneck – well deck) | 8 Lashing points along the well deck |
| 9 Pendular axles, hydraulically suspended and steered | 10 Rear lamp cluster and rear underrun protection |

3.2 MAIN ASSEMBLIES

3.2.1 GOOSENECK AND KING PIN

The hydraulic gooseneck connects the well deck to the towing vehicle. It carries the king pin (ISO 337 2" or ISO 4086 3½", approved to UN Regulation No. 55) with the steering turntable and steering wedge, the connection panel for air, electrics and hydraulics, the hydraulic control panel and – if fitted – the power unit. Two neck lift cylinders set the height of the deck front. The gooseneck can be **detached hydraulically**: the deck front is lowered to the ground, the gooseneck is driven away with the towing vehicle and machines can be driven onto the deck over the front. See Chapter 7.

3.2.2 TELESCOPIC WELL DECK

The well deck is a high-strength steel box structure with a built-in camber (approx. 30 mm) that compensates for deflection under load. It can be extended in two stages of 5,500 mm each, so that the loading length increases from 8,000 mm to 13,500 mm or 19,000 mm. Locking pins secure each telescopic stage. See Chapter 11.

3.2.3 PENDULAR AXLES

Each axle line consists of two pendular axles (left and right). Each pendular axle turns on its own slewing ring for steering, is carried by a swing arm with its own hydraulic suspension cylinder and swings about a longitudinal pendulum bearing, so that its wheels follow the camber of the road. See Chapter 8.

3.2.4 HYDRAULIC SUSPENSION

The suspension cylinders are linked into two hydraulic circuits – left and right – which, together with the king pin, form a stable **3-point support** and share the load evenly between the axle lines. The total stroke of 600 mm allows the rear deck to be raised by up to 400 mm or lowered by up to 200 mm from the ride height of 1,200 mm. Pressure gauges show the load on each side. See Chapter 9.

3.2.5 STEERING

All pendular axles are steered hydraulically. During normal driving, the steering is **forced**: a steering wedge in the fifth-wheel slot turns the steering turntable, and two closed, pre-charged hydraulic circuits transmit the articulation angle to the axles, which steer in proportion. For manoeuvring, the axles can additionally be steered with the auxiliary steering. See Chapter 10.

3.2.6 HYDRAULIC SUPPLY AND CONTROLS

The hydraulic functions are supplied by the towing vehicle's PTO or by an on-board power unit (*if fitted*) and operated from the control panel on the gooseneck or by radio remote control (*if fitted*). See Chapter 6.

3.2.7 BRAKING SYSTEM

The low loader has a dual-line compressed-air braking system with EBS, ABS and RSS according to UN Regulation No. 13. Spring brake chambers act as the parking and emergency brake. See Section 5.3.

3.2.8 ELECTRICAL SYSTEM AND PROTECTIVE DEVICES

24 V lighting according to UN Regulation No. 48 with extension cables for the telescopic deck; rear underrun protection to UN Regulation No. 58; lateral protection or the applicable exemption for low loaders as stated in the CoC.

3.3 IDENTIFICATION

3.3.1 VEHICLE IDENTIFICATION NUMBER (VIN)

The 17-character VIN begins with STU's world manufacturer identifier (WMI). It is stamped into the right-hand front side member of the chassis. The VIN identifies the semi-trailer throughout its life – quote it in every enquiry and spare-parts order.

3.3.2 STATUTORY PLATE

The statutory plate is riveted to the right-hand front of the chassis. It shows, among other data:

- manufacturer's name and EU type-approval number;
- VIN;
- technically permissible maximum laden mass of the semi-trailer;
- technically permissible maximum mass on the coupling point (king pin);
- technically permissible maximum mass on each axle or axle group.

NOTICE



Never remove or alter the statutory plate or the VIN. Doing so invalidates the type approval and the registration of the semi-trailer. If the plate is damaged, order a replacement from STU quoting the VIN.

3.3.3 TYPE, VARIANT AND VERSION

Under Regulation (EU) 2018/858, each semi-trailer belongs to a **type**, a **variant** and a **version**:

TABLE 3.1 – TYPE, VARIANT AND VERSION

LEVEL	DEFINED BY (EXAMPLES)
Type	Manufacturer, vehicle category (O4), concept of the trailer (semi-trailer), number of axles, essential chassis construction
Variant	Chassis design, stage of completion, bodywork code
Version	Number and position of lift and steering axles, technically permissible maximum laden mass

The type, variant and version of your semi-trailer are given in its Certificate of Conformity (CoC).

3.4 TECHNICAL DATA

The values below are the nominal values of the standard STUP3, taken from the STU type drawing. The binding values for an individual low loader are those on its statutory plate and in its Certificate of Conformity (CoC) – and, for abnormal transport, in the special permit.

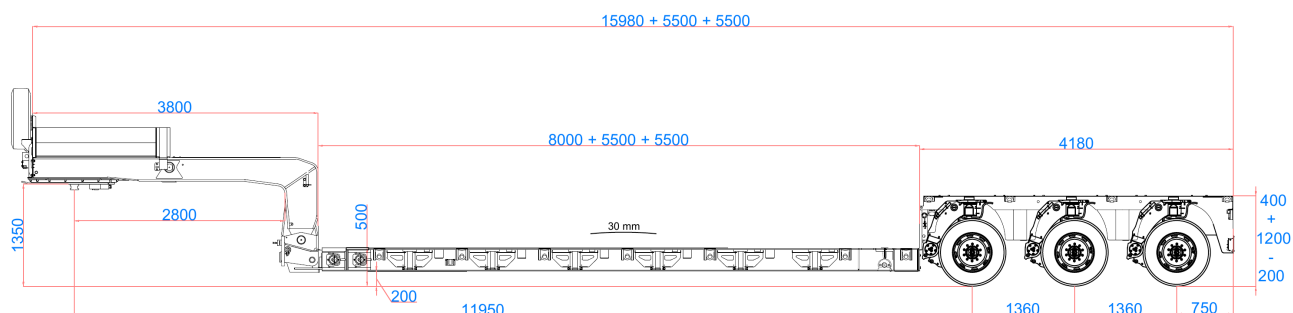

FIGURE 3.2 STUP3 — main dimensions (mm); telescopic extension 2 × 5,500 mm

TABLE 3.2 — TECHNICAL DATA (NOMINAL VALUES)

SPECIFICATION	UNIT	STUP3
Number of axle lines	—	3 (pendular axles)
Vehicle category	—	O4
Overall length — retracted / extended once / fully extended	mm	15,980 / 21,480 / 26,980
Well-deck length — retracted / extended once / fully extended	mm	8,000 / 13,500 / 19,000
Gooseneck length	mm	3,800
King pin to gooseneck rear end	mm	2,800
King pin to first axle (retracted)	mm	11,950 (+ 5,500 per extension)
Axle spacing	mm	1,360
Last axle to rear	mm	750
Rear bogie section length	mm	4,180
Coupling (king pin) height	mm	1,350
Well-deck height / ground clearance	mm	500 / 200
Rear deck height (ride height) and stroke	mm	1,200, +400 / -200
Deck camber (unladen)	mm	approx. 30
Overall width	mm	TBC
Unladen mass / max. laden mass	kg	TBC
Technically permissible axle load per axle line	kg	TBC
Suspension	—	Hydraulic, 2 circuits, 3-point support; stroke 600 mm

Steering	—	Hydraulic forced steering (steering wedge, 2 closed circuits) with auxiliary steering; steering angle up to 55–60°
Gooseneck	—	Hydraulic, detachable, with neck lift cylinders and hydraulic neck locks
Supply voltage	V	24

3.5 STANDARD EQUIPMENT

- Detachable hydraulic gooseneck with king pin, steering turntable and steering wedge, neck lift cylinders, neck locks, landing legs and spare wheel
- Hydraulic control panel with pressure gauges for suspension and steering, and hand pump
- Telescopic well deck, 2 × 5,500 mm, with locking pins
- Three lines of hydraulically suspended pendular axles with 3-point support
- Hydraulic forced steering with auxiliary steering for manoeuvring
- EBS with ABS and RSS, spring-brake parking brake
- 24 V LED lighting with extension cables and side marker lamps
- Lashing points along the deck
- Wheel chocks, toolbox, user manual and warranty certificate

3.6 OPTIONAL EQUIPMENT

- On-board hydraulic power unit (diesel or electric) with radio remote control
- Front loading ramps for use with the gooseneck detached
- Deck widening (outriggers), excavator-arm trough, wheel recesses
- Electronic forced steering
- Abnormal-load equipment: marker boards, beacons, extension lighting

COUPLING AND UNCOUPLING



Coupling and uncoupling are among the most hazardous everyday tasks with a semi-trailer. Follow the sequences in this chapter exactly, every time.

WARNING



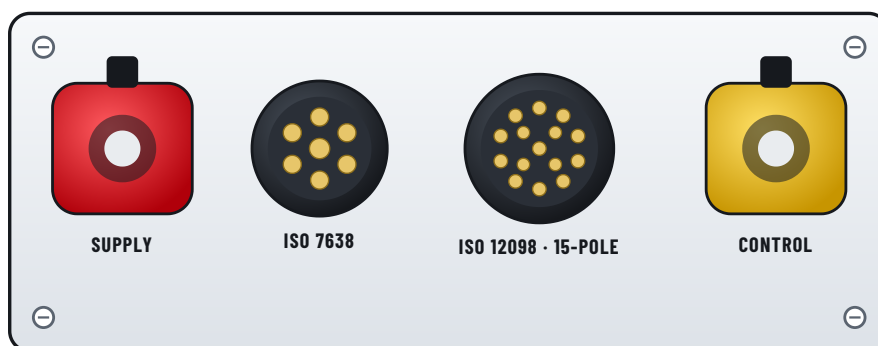
Risk of crushing. Make sure that nobody is between the towing vehicle and the semi-trailer during coupling and uncoupling. Apply the parking brake of the semi-trailer and place wheel chocks before you start.

4.1 REQUIREMENTS FOR THE TOWING VEHICLE

Only couple the semi-trailer to a towing vehicle that:

- is approved for the gross combination weight and for the fifth-wheel load of the semi-trailer;
- has a fifth wheel to UN Regulation No. 55 that matches the king pin size (2" or 3½") of the semi-trailer;
- has a fifth-wheel height that suits the coupling height of the semi-trailer (1,350 mm) so that the semi-trailer is approximately level when coupled;
- provides a compressed-air supply of at least 6.5 bar at the supply coupling (red), and an ISO 7638 EBS connector;
- provides the electrical connections required by the semi-trailer (15-pole ISO 12098, or 7-pole ISO 1185 / ISO 3731); for forced steering, the steering wedge or steering connection specified by STU; for the hydraulic functions, a PTO hydraulic system with the required oil flow and pressure **TBC** unless an on-board power unit is fitted;
- has sufficient clearance between the rear of the cab (or accessories) and the semi-trailer front at full articulation.

4.2 CONNECTIONS BETWEEN TOWING VEHICLE AND SEMI-TRAILER



FRONT VIEW · LAYOUT MAY VARY BY SPECIFICATION

FIGURE 4.1 Connection panel – front view (layout may vary with the specification)

TABLE 4.1 – CONNECTIONS BETWEEN TOWING VEHICLE AND SEMI-TRAILER

CONNECTION	COLOUR / STANDARD	FUNCTION
Supply line coupling	RED · ISO 1728	Compressed-air supply to the semi-trailer reservoir; emergency braking when disconnected
Control line coupling	YELLOW · ISO 1728	Pneumatic brake control signal
EBS connector	7-pin · ISO 7638	Power supply and CAN data for the EBS
Lighting connector	15-pole · ISO 12098	Lighting, reversing signal, lift-axle and diagnostic functions
7-pole connectors <i>(if fitted)</i>	BLACK 24N · ISO 1185 / WHITE 24S · ISO 3731	Alternative lighting supply for towing vehicles without a 15-pole socket
Hydraulic couplings	RED pressure / BLUE return / steering lines <i>(as fitted)</i>	Power supply for suspension, steering and telescoping from the towing vehicle (PTO) or connection of the on-board power unit
Steering connection <i>(if fitted)</i>	Steering wedge / steering rod or electronic steering signal	Transmits the articulation angle to the forced-steering system

4.2.1 EBS CONNECTOR ISO 7638 (7-PIN)

TABLE 4.2 – PIN ASSIGNMENT ISO 7638

PIN	WIRE COLOUR	FUNCTION
1	Red	+24 V permanent supply (solenoid valves)
2	Black	+24 V switched supply (ECU, via ignition)
3	Yellow	Earth for pin 2 (electronics)

4	Brown	Earth for pin 1 (solenoid valves)
5	White	Warning lamp
6	White / green	CAN High (ISO 11992)
7	White / brown	CAN Low (ISO 11992)

4.2.2 LIGHTING CONNECTORS

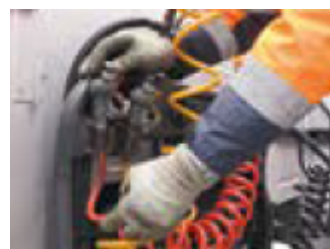
TABLE 4.3 – PIN ASSIGNMENT OF THE LIGHTING CONNECTORS

FUNCTION	7-POLE BLACK ISO 1185 (24N)	7-POLE WHITE ISO 3731 (24S)	15-POLE ISO 12098
Direction indicator, left	3	—	1
Direction indicator, right	5	—	2
Rear fog lamp	—	7	3
Earth	1	1	4
Position / tail lamp, left	2	—	5
Position / tail lamp, right	6	—	6
Stop lamps	4	—	7
Reversing lamp	—	3	8
Permanent supply +24 V	—	4	9
Brake-lining wear indicator ¹	—	—	10
Spring-brake status ¹	—	—	11
Lift-axle control (if fitted)	—	6	12
Earth for pins 9 – 12	—	—	13
Trailer brake control / data ¹	7	—	14, 15
Free	—	2, 5	—

¹ Not available on every semi-trailer. Always check the wiring diagram supplied with your semi-trailer before making any changes to the electrical system.

4.2.3 HANDLING THE LINE COUPLINGS

- Before connecting, check that the coupling heads and seals are clean and undamaged.
- Connect the **yellow** control line first, then the **red** supply line. When disconnecting, disconnect the **red** line first.
- After disconnecting, close the coupling heads on the semi-trailer with their protective caps and hang the lines of the towing vehicle in their holders. Dirt entering the lines can damage the EBS modulator and valves.
- Route the lines and cables so that they cannot rub, kink or become trapped at full articulation.


FIGURE 4.2 Close the protective cap after disconnecting

FIGURE 4.3 Connect lines without twisting or stretching them

4.3 COUPLING

Before coupling, check that the king pin, the king pin plate and the fifth wheel are clean, undamaged and lubricated, and that the locking mechanism of the fifth wheel is open.

- 1 Position the towing vehicle in a straight line in front of the semi-trailer, on firm and level ground.
- 2 Make sure that the semi-trailer's parking brake is applied and that wheel chocks are in place.
- 3 Adjust the height of the towing vehicle's air suspension (or the semi-trailer's landing legs) so that the fifth-wheel plate is slightly below the king pin plate – the semi-trailer should be lifted slightly as the tractor reverses under it, by approximately 20 – 50 mm.
- 4 Reverse slowly and in a straight line until the king pin engages in the fifth-wheel lock. Do not ram the semi-trailer.
- 5 Get out of the cab and check visually that the lock has fully closed around the king pin and that the safety device is engaged. Follow the instructions of the fifth-wheel manufacturer.
- 6 Perform a **pull test**: with the semi-trailer parking brake still applied, try to pull forward gently in a low gear. The semi-trailer must not separate.
- 7 Connect the air lines, the EBS connector and the electrical connectors (Section 4.2), the hydraulic couplings and the steering connection.
- 8 Raise the landing legs fully using the crank in high-speed gear (Section 4.6) and stow the crank handle in its holder.
- 9 Remove the wheel chocks and stow them in their holders.
- 10 Release the parking brake of the semi-trailer (Section 4.5).
- 11 Carry out the pre-departure inspection (Section 5.1), including a lighting check and a brake test at low speed.



FIGURE 4.4 Raise the landing legs until the feet are clear of the ground (approx. 50 mm), then fully retract them before driving off

4.4 UNCOUPLING

WARNING



Risk of tipping. Only uncouple a laden semi-trailer if the load is positioned so that the semi-trailer cannot tip forwards or backwards, and only on firm, level ground that can carry the landing-leg loads. Never uncouple a laden semi-trailer on soft ground.

- 1 Park the combination in a straight line on firm, level ground.
- 2 Apply the parking brake of the towing vehicle and place the wheel chocks in front of and behind the semi-trailer wheels.
- 3 Lower the landing legs until the feet are approximately 50 mm above the ground, then switch to the low-speed gear and lower them until they carry part of the semi-trailer's weight.
- 4 Disconnect the red supply line first – the spring brakes are applied automatically. Then disconnect the yellow control line, the EBS connector and the electrical connectors, the hydraulic couplings and the steering connection. Fit the protective caps.
- 5 Lower the towing vehicle's air suspension until the fifth-wheel plate is free of the king pin plate.
- 6 Open the fifth-wheel lock according to the fifth-wheel manufacturer's instructions.
- 7 Drive the towing vehicle slowly forward out from under the semi-trailer, without touching it.

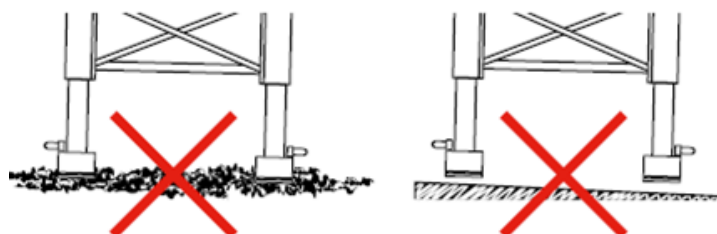


FIGURE 4.5 Do not land the legs on soft or uneven ground – use load-spreading plates if necessary

4.5 PARKING BRAKE AND PREV VALVE

The semi-trailer is fitted with a combined park-release emergency valve (PREV) on the front chassis. It has two push-buttons:

TABLE 4.4 – CONTROLS OF THE PREV VALVE

BUTTON	COLOUR	FUNCTION
Parking brake	Red	Pull out: parking brake applied (spring brakes exhausted). Push in: parking brake released — only possible when the reservoir pressure is sufficient.
Shunting / release	Black	Push in: releases the emergency brake after the supply line has been disconnected so that the semi-trailer can be shunted with a shunting vehicle. Pull out: normal operating position.



FIGURE 4.6 Park release emergency valve (PREV) — example

- When the **red supply line is disconnected**, the semi-trailer brakes are applied automatically (emergency braking function).
- To release the parking brake for driving, the reservoir pressure must be at least 6.5 bar; with less than approx. 4 bar the service brake cannot be released.
- Always pull out the red button before uncoupling and before leaving a coupled semi-trailer.

WARNING



Uncontrolled rolling. Pushing in the black button releases the brakes of an uncoupled semi-trailer. Only do this when the semi-trailer is coupled to a shunting vehicle with a working brake and nobody is near the wheels.

4.6 LANDING LEGS

The two landing legs support the front of the semi-trailer when it is uncoupled. They are connected by a cross-shaft and operated with a crank handle on one side. The gearbox has two speeds:

TABLE 4.5 – LANDING-LEG GEARS

GEAR	SELECTION	USE
High speed	Pull the crank handle out	Raising or lowering the legs without load (to bridge the gap to the ground)

Low speed

Push the crank handle **in**

Lifting or lowering the semi-trailer under load

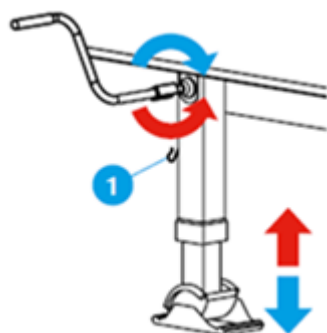


FIGURE 4.7 Remove the crank from its holder



FIGURE 4.8 High speed — pull out

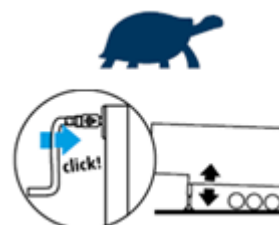


FIGURE 4.9 Low speed — push in

- Change gear only when the legs are not under load. Turning the crank slightly makes it easier to engage the gear.
- Beware of kick-back of the crank handle when the legs take up load.
- Do not drive with the legs partially extended. Always stow the crank in its holder before driving off.
- On soft ground, place load-spreading plates under the feet.

4.7 WHEEL CHOCKS

Two wheel chocks are supplied with the semi-trailer in holders on the chassis. Use them every time the semi-trailer is uncoupled, even on level ground, and whenever it is being loaded, unloaded or operated.



FIGURE 4.10 Wheel chocks in their holders



FIGURE 4.11 Place the chocks in the possible rolling direction

CAUTION



Do not forget the wheel chocks. After coupling, remove the chocks and return them to their holders before driving off. A chock left on the road is a serious hazard to other road users.

DRIVING AND OPERATION

05

A pendular-axle low loader is usually driven as an abnormal-load combination: long, heavy and sometimes wide. This chapter covers the checks and driving practices that apply to the STUP3; the hydraulic functions are described in Chapters 6 to 10.

5.1 PRE-DEPARTURE INSPECTION

Carry out this walk-round inspection before every journey and after every loading operation. Do not drive off until every item is in order.

- ☐ Fifth-wheel lock closed and secured; pull test carried out
- ☐ Landing legs fully raised; crank stowed
- ☐ Air lines, EBS connector and electrical connectors connected, routed without chafing
- ☐ No audible air leaks; reservoir pressure built up (at least 6.5 bar)
- ☐ Parking brake released; brake test at walking pace successful
- ☐ No EBS / ABS warning lamp lit in the cab after the system check
- ☐ Wheel chocks removed and stowed in their holders
- ☐ Gooseneck: neck hooks seated, neck locks closed and indicated as locked (Chapter 7)
- ☐ Hydraulic suspension at ride height in the 3-point support; pressures within the limits (Chapter 9)
- ☐ Steering: turntable locking pin removed; pre-charge pressure correct; centred, synchronised and switched to forced steering (Chapter 10)
- ☐ Telescopic deck locked with all locking pins; extension marker boards and lighting fitted if extended
- ☐ Load secured (Chapter 12); special permit, escorts and marking as required
- ☐ All lamps, indicators, stop lamps and reflectors working, clean and undamaged
- ☐ Tyres: correct pressure, no visible damage, sufficient tread depth
- ☐ Wheel nuts present and tight; no rust streaks around the nuts
- ☐ Mudguards and spray-suppression flaps secure
- ☐ Number plate fitted, clean and legible
- ☐ Total height, width and length of the laden vehicle known and within the permitted limits or the special permit

5.2 DRIVING BEHAVIOUR

5.2.1 GENERAL

- Adapt your speed to the load, the road, the weather and the traffic. A laden combination needs considerably longer braking distances than a solo vehicle.
- Accelerate and brake smoothly. Abrupt manoeuvres cause the load to shift and put extreme stress on the semi-trailer and on the load restraint.
- Reduce speed well before bends and roundabouts. Tall loads significantly increase the risk of overturning; the hydraulic suspension in 3-point support increases stability, but does not remove this risk.
- Drive with escort vehicles where the permit requires it. Agree the radio channel and signals before the journey.
- Approach bends wide and slowly; the forced steering reduces, but does not eliminate, the swept path of the rear axles.
- On crests, ramps and level crossings, check the ground clearance of the well deck (200 mm at ride height). Raise the suspension within its range only at walking pace and return it to ride height afterwards.

5.2.2 TURNING AND MANOEUVRING

- The rear overhang of the semi-trailer swings out when turning. Watch both sides of the vehicle in your mirrors.
- Do not exceed the maximum articulation angle. The front of the semi-trailer and the cab can collide.

DANGER



Overhead power lines and structures. Contact with, or even approaching, an overhead power line can be fatal. Know the total height of the laden vehicle with the suspension at ride height and plan the route accordingly. Observe all height restrictions for bridges, tunnels, gantries and overhead lines.

5.2.3 DIMENSIONS AND WEIGHTS

- The laden vehicle must comply with the maximum dimensions and weights applicable in each country of travel (within the EU, Directive 96/53/EC and the corresponding national rules).
- If the load exceeds these limits, an abnormal-load or special-transport permit is required and its conditions – route, times, escort vehicles, marking – must be followed. In Great Britain, for example, movements of abnormal indivisible loads are governed by the Road Vehicles (Authorisation of Special Types)(General) Order 2003.
- Mark loads that project beyond the sides or the rear of the vehicle in accordance with the applicable regulations.

5.3 BRAKING SYSTEM

The semi-trailer is braked by the towing vehicle's brake pedal via the dual-line compressed-air system and the EBS. The EBS:

- adjusts the brake pressure to the load (load-sensing) automatically;
- prevents the wheels from locking (ABS);
- applies the semi-trailer brakes automatically if there is a risk of the semi-trailer rolling over in a bend (RSS).

These systems support the driver but do not override the laws of physics. The driver remains fully responsible for driving at a speed appropriate to the conditions.

WARNING



Loss of braking performance. The EBS connector (ISO 7638) must be connected whenever the semi-trailer is driven. Without it, ABS and RSS do not work and the brake force may not be correctly distributed. If the EBS / ABS warning lamp in the cab stays on after the system check, or comes on while driving, drive carefully to the nearest suitable stopping place and have the fault rectified by a brake specialist.

- If the air pressure in the supply line drops, the semi-trailer brakes are applied automatically.
- Brake work may only be carried out by authorised specialists of the brake-system manufacturer.

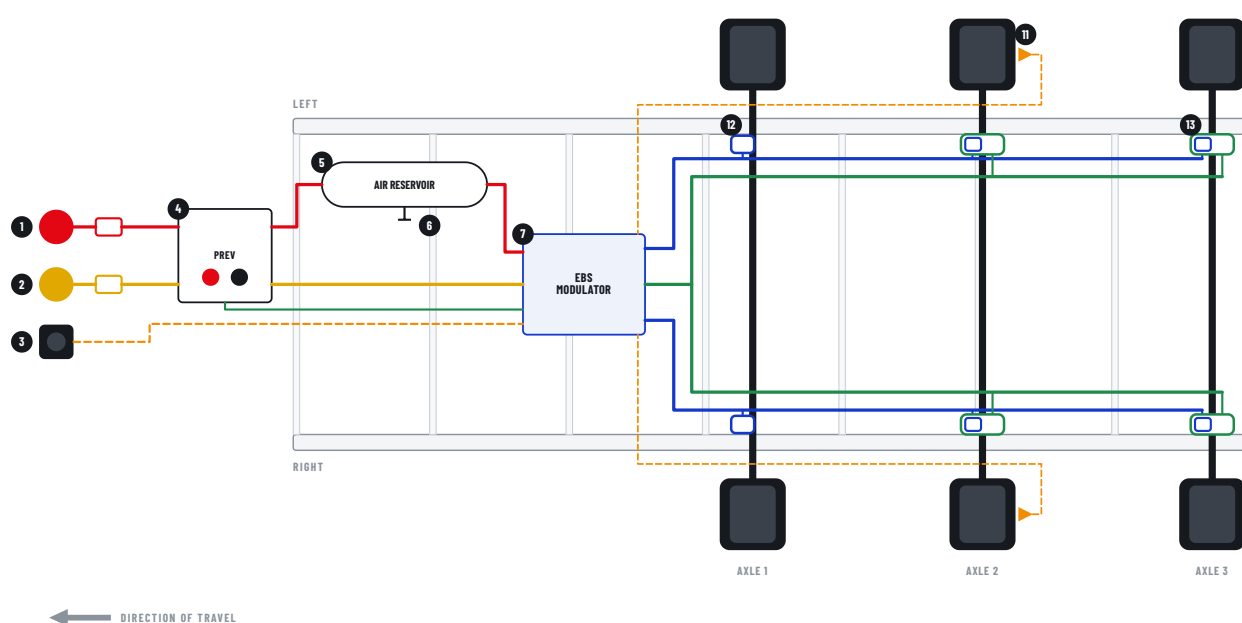


FIGURE 5.1 Braking system – STUP3, EBS layout (schematic, top view; the pendular axles are suspended hydraulically, not by air). Red: supply · Yellow: control · Blue: service brake · Green: spring brake · Grey: air suspension · Orange: electrical

TABLE 5.1 – LEGEND OF THE BRAKING-SYSTEM SCHEMATIC

NO.	COMPONENT
1	Supply line coupling – RED, with line filter
2	Control line coupling – YELLOW, with line filter
3	ISO 7638 EBS connector
4	Park release emergency valve (PREV)
5	Air reservoir
6	Drain valve
7	EBS modulator
11	ABS wheel-speed sensors

- | | |
|----|----------------------------------|
| 12 | Service brake chamber |
| 13 | Combination spring brake chamber |



System layout. The schematic follows the standard architecture of the WABCO TEBS E and Knorr-Bremse TEBS G2 trailer EBS families. The exact make, valve types, number of modulated channels and sensor positions of your semi-trailer are given in the brake-system documentation and on the EBS plate on the chassis.

HYDRAULIC SYSTEM – SUPPLY AND CONTROLS

Four functions of the STUP3 are hydraulic: the detachable gooseneck, the suspension of the pendular axles, the steering and – if fitted – the ramps and accessories. This chapter describes where the hydraulic power comes from, how the controls are arranged and the rules that apply to every hydraulic operation. The individual functions are described in Chapters 7 to 10.

DANGER



Sudden movement of axles, gooseneck and deck. When a hydraulic function is operated, the wheels, the pendular axles, the gooseneck and the deck move with great force. Nobody may be under the deck, under the gooseneck, between the axles or beside the wheels. Operate the hydraulic functions only with a clear view of the whole vehicle, or with a banksman who can see the danger zone and is in direct contact with the operator.

6.1 OVERVIEW OF THE HYDRAULIC CIRCUITS

The hydraulic system is divided into separate circuits. Each circuit has its own task and its own valves, so that a fault in one circuit does not affect the others.

TABLE 6.1 – HYDRAULIC CIRCUITS OF THE STUP3

CIRCUIT	TASK	SUPPLIED BY	CHAPTER
Gooseneck circuit	Lifts and lowers the gooseneck, adjusts the front deck height, opens and closes the neck locks	Power supply (PTO or power unit)	7
Suspension circuits – left and right	Carry the load on the pendular axles; raise, lower and level the rear of the deck	Power supply via the suspension valve block	9
Steering circuits – circuit 1 and circuit 2	Transmit the articulation angle from the steering turntable to the pendular axles (closed circuits)	Closed circuits; pre-charged and corrected from the power supply or the hand pump	10
Auxiliary functions (<i>if fitted</i>)	Ramps, deck widening, winch	Power supply	12

6.2 HYDRAULIC POWER SUPPLY

The hydraulic power is supplied by one of the following, depending on the specification of your low loader:

- **Towing vehicle (PTO / “wet kit”)** – a pump driven by the power take-off of the towing vehicle supplies oil through quick couplings on the gooseneck: a pressure line (P), a return line (T) and, where specified, a leakage-oil line (L). Required supply: flow **TBC** l/min at a pressure of at least **TBC** bar; the towing vehicle’s system must have its own pressure-relief valve.
- **On-board power unit (if fitted)** – a diesel or electro-hydraulic power unit on the gooseneck with its own reservoir, filter and pressure-relief valve. An electric power unit takes its current from the towing vehicle through a heavy-duty cable (NATO socket) or from on-board batteries.
- **Hand pump** – a manually operated pump on the control panel for emergency operation and for small corrections of the steering circuits (pre-charge, synchronisation). The hand pump is always available, even when the engine is switched off.

6.2.1 CONNECTING THE HYDRAULIC SUPPLY

- 1 Switch off the PTO or the power unit. Relieve the pressure in the coupling lines by operating the control levers back and forth.
- 2 Clean the couplings on both sides with a lint-free cloth. Dirt that enters the system destroys valves and seals.
- 3 Connect the couplings: **P to P, T to T, L to L**. The couplings are coded by colour or size **TBC** so that they cannot be interchanged.
- 4 Connect the return line first and disconnect it last. A blocked return line pressurises the whole system and can burst the reservoir or the seals.
- 5 Fit the dust caps of the uncoupled halves together and stow the hoses on their holders so that they cannot chafe or drag.

WARNING



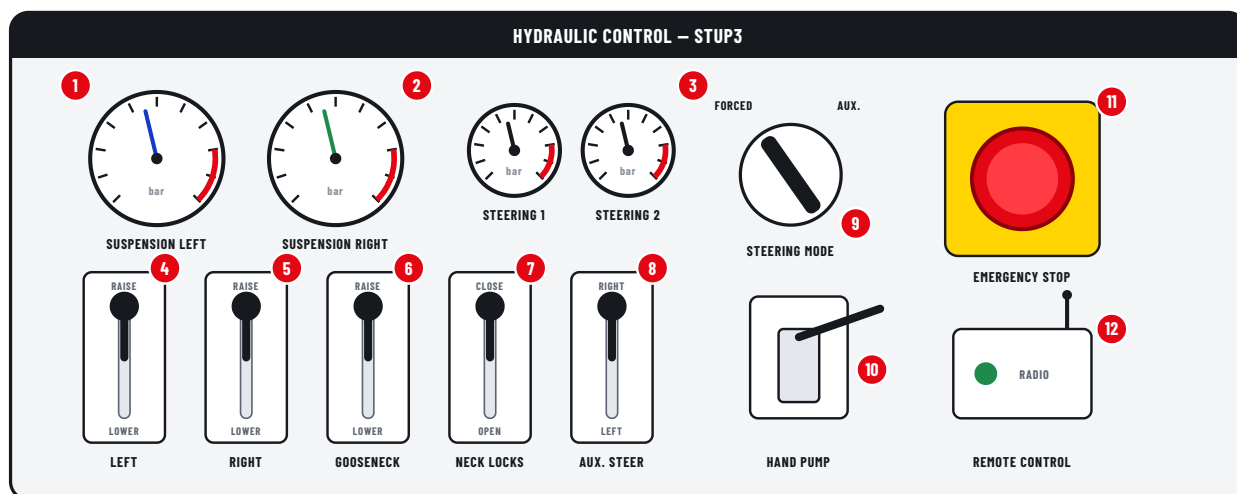
Return line not connected. Never operate the hydraulic system with the return line disconnected or with a coupling not fully engaged. The pressure builds up in the return side of the system and can damage the reservoir, seals and cylinders.

6.2.2 HYDRAULIC OIL

Use only the oil specified on the power unit or the reservoir label – normally a mineral hydraulic oil HLP 46 (ISO 6743-4 HM, DIN 51524-2). For use in cold climates, use an oil of class HVLP (ISO 6743-4 HV). Never mix oils of different types or manufacturers. If the oil is supplied by the towing vehicle, its oil must be of the same type and cleanliness as the oil in the low loader.

6.3 CONTROL PANEL

The hydraulic functions are operated from the control panel on the **left side of the gooseneck**. Stand at the control panel so that you can see the part of the vehicle you are moving. The layout below is typical; the actual panel may vary with the specification.



TYPICAL LAYOUT – CHECK THE SYMBOL PLATES ON YOUR PANEL

FIGURE 6.1 Hydraulic control panel – typical layout

- | | |
|--|---|
| 1 Pressure gauge – suspension circuit LEFT | 2 Pressure gauge – suspension circuit RIGHT |
| 3 Pressure gauges – steering circuits 1 and 2 (pre-charge pressure) | 4 Lever – suspension LEFT: raise / hold / lower |
| 5 Lever – suspension RIGHT: raise / hold / lower | 6 Lever – gooseneck: raise / hold / lower |
| 7 Lever – neck locks: open / close | 8 Lever – auxiliary steering: left / hold / right |
| 9 Selector – steering mode (forced steering / auxiliary steering) | 10 Hand pump with selector valve |
| 11 Emergency stop | 12 Remote-control receiver and status lamp (if fitted) |

The levers are of the spring-return type: when released, they return to the centre position (“hold”) and the function stops. Never wedge or tie a lever in an operating position.

TABLE 6.2 – CONTROL LEVER POSITIONS (CHECK THE SYMBOL PLATE ON YOUR PANEL)

LEVER POSITION	FUNCTION
Pushed (towards the vehicle)	Raise / extend / steer right – see the symbol plate on each lever
Centre	Hold – the cylinders are hydraulically locked
Pulled (away from the vehicle)	Lower / retract / steer left

6.4 RADIO REMOTE CONTROL (IF FITTED)

The radio remote control duplicates the functions of the control panel so that the operator can stand where he or she has the best view of the movement – for example beside the axles when steering, or in front of the deck when the gooseneck is coupled.

- Every function only works while the **enabling button** (dead-man button) is pressed together with the function button.
- If the radio signal is lost, the battery is flat or the transmitter is switched off, all functions stop immediately.

- The emergency-stop button on the transmitter stops all hydraulic functions. Unlock it by turning it before restarting.
- Only one transmitter may be paired with the receiver. Store the transmitter so that unauthorised persons cannot use it; remove its key when not in use.
- Charge the transmitter battery daily during use; keep the spare battery charged.

WARNING


Operating the wrong vehicle or the wrong function. Before every operation, check on the transmitter display that it is paired with this low loader. Never operate a function you cannot see.

6.5 RULES FOR EVERY HYDRAULIC OPERATION

- 1 Park on firm, level ground; apply the parking brake of the towing vehicle and of the low loader; place the wheel chocks.
- 2 Clear the danger zone and keep it clear. Use a banksman.
- 3 Start the power supply and let the oil warm up for a few minutes in cold weather.
- 4 Operate the levers slowly and smoothly. Watch the movement and the pressure gauges; stop immediately if the movement is jerky, if noise occurs or if a pressure rises suddenly.
- 5 Operate only one function at a time unless this manual describes a combined operation.
- 6 After the operation, return all levers to “hold”, switch the steering mode to forced steering (unless manoeuvring) and switch off the power supply.

CAUTION


Pressure-relief valves. The pressure-relief valves protect the system against overload. They are set and sealed by STU. Never adjust them. If a function stops at the relief pressure, the cause is an overload or an obstruction – remove the cause, do not increase the pressure.

6.6 EMERGENCY STOP AND EMERGENCY OPERATION

- Press the emergency-stop button on the panel or on the transmitter to stop all hydraulic functions at once. The cylinders stay hydraulically locked in their current position.
- If the power supply fails, the suspension and the gooseneck stay in their position because the check valves on the cylinders hold the oil. Do not drive on until the supply is restored, unless the vehicle is at ride height and the steering is centred.
- Emergency lowering is possible with the emergency-lowering valve **location TBC**. Open it only slowly and only when the danger zone is clear: the deck lowers under its own weight and the weight of the load.
- The hand pump can be used to raise a function slowly or to correct the steering circuits without engine power.

DANGER

Stored energy. Accumulators and locked cylinders keep the system under pressure even when the power supply is switched off. Before working on the hydraulic system, lower all functions onto their mechanical stops or supports and relieve the pressure as described in Chapter 15. Never loosen a fitting under pressure and never search for leaks with your hand – an oil jet under pressure can penetrate the skin.

DETACHABLE HYDRAULIC GOOSENECK

The hydraulic gooseneck connects the low loader to the towing vehicle, sets the height of the front of the deck and – when detached – turns the front of the well deck into a loading ramp. Machines that cannot be lifted by crane can then be driven onto the deck over the front, without long rear ramps and without driving over the pendular axles.

7.1 CONSTRUCTION AND FUNCTION

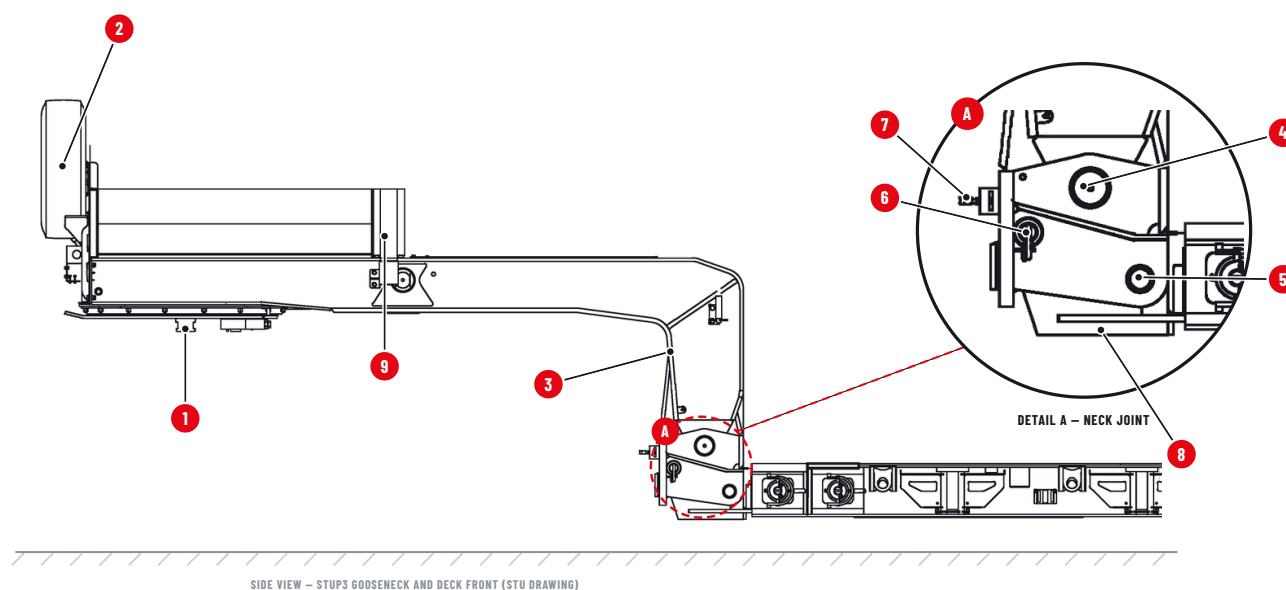


FIGURE 7.1 Detachable hydraulic gooseneck – side view from the STU drawing, with detail A of the neck joint

- | | |
|--|---|
| <p>1 King pin with steering turntable and steering wedge</p> <p>3 Neck lift cylinders (left and right, inside the neck)</p> <p>5 Lower neck joint — bore of the neck lock bolt</p> <p>7 Connection point for air, electrical, hydraulic and steering lines</p> <p>9 Landing legs of the gooseneck</p> | <p>2 Upper deck of the gooseneck with spare wheel and control panel</p> <p>4 Upper neck joint — neck hooks seated on the hook pins of the well deck</p> <p>6 Neck lock with mechanical safety catch and position indicator</p> <p>8 Front support plate of the well deck (ground contact when detached)</p> |
|--|---|

The gooseneck hangs on two **hook pins** at the front of the well deck. Two **neck lift cylinders** between the gooseneck and the deck turn the deck about these pins: extending them raises the front of the deck, retracting them lowers it. In the travel position, the **neck locks** — hydraulically operated locking bolts with a mechanical safety catch — lock the gooseneck to the deck so that the load path does not depend on the oil pressure in the lift cylinders.

All connections between the gooseneck and the rear part of the vehicle — the brake air lines, the EBS and lighting cables, the hydraulic lines of the suspension and the lines of the two steering circuits — pass through a coupling point at the neck joint. The steering lines are fitted with **leak-free (dry-break) couplings** and shut-off valves, so that the steering circuits keep their oil and their zero position while the gooseneck is detached.

TABLE 7.1 — GOOSENECK DATA

DATA	VALUE
Gooseneck length / king pin to rear end	3,800 mm / 2,800 mm
Coupling (king pin) height, laden	1,350 mm
Front deck height adjustment by the neck cylinders	TBC mm
Maximum load that may be on the deck while detaching or coupling	Deck unladen unless STU has approved otherwise in writing TBC
Permissible load on the deck front when it stands on the ground	TBC t
Front loading angle (deck front on the ground)	TBC °

7.2 ADJUSTING THE DECK HEIGHT WHILE COUPLED

When the gooseneck is coupled, the neck lift cylinders also set the height of the front of the well deck. Together with the suspension of the pendular axles, which sets the height of the rear (Chapter 9), the deck can be raised, lowered and levelled lengthways.

- For road travel, the deck must be at its **travel position**: neck cylinders at the travel mark **TBC**, neck locks closed, deck parallel to the road.
- To cross an obstacle at walking pace, the front of the deck may be raised within the range of the neck cylinders — but only with the neck locks in the position permitted by the specification **TBC**. Return to the travel position immediately afterwards.
- Never drive on the road with the neck locks open or with the indicator not showing “locked”.

7.3 DETACHING THE GOOSENECK

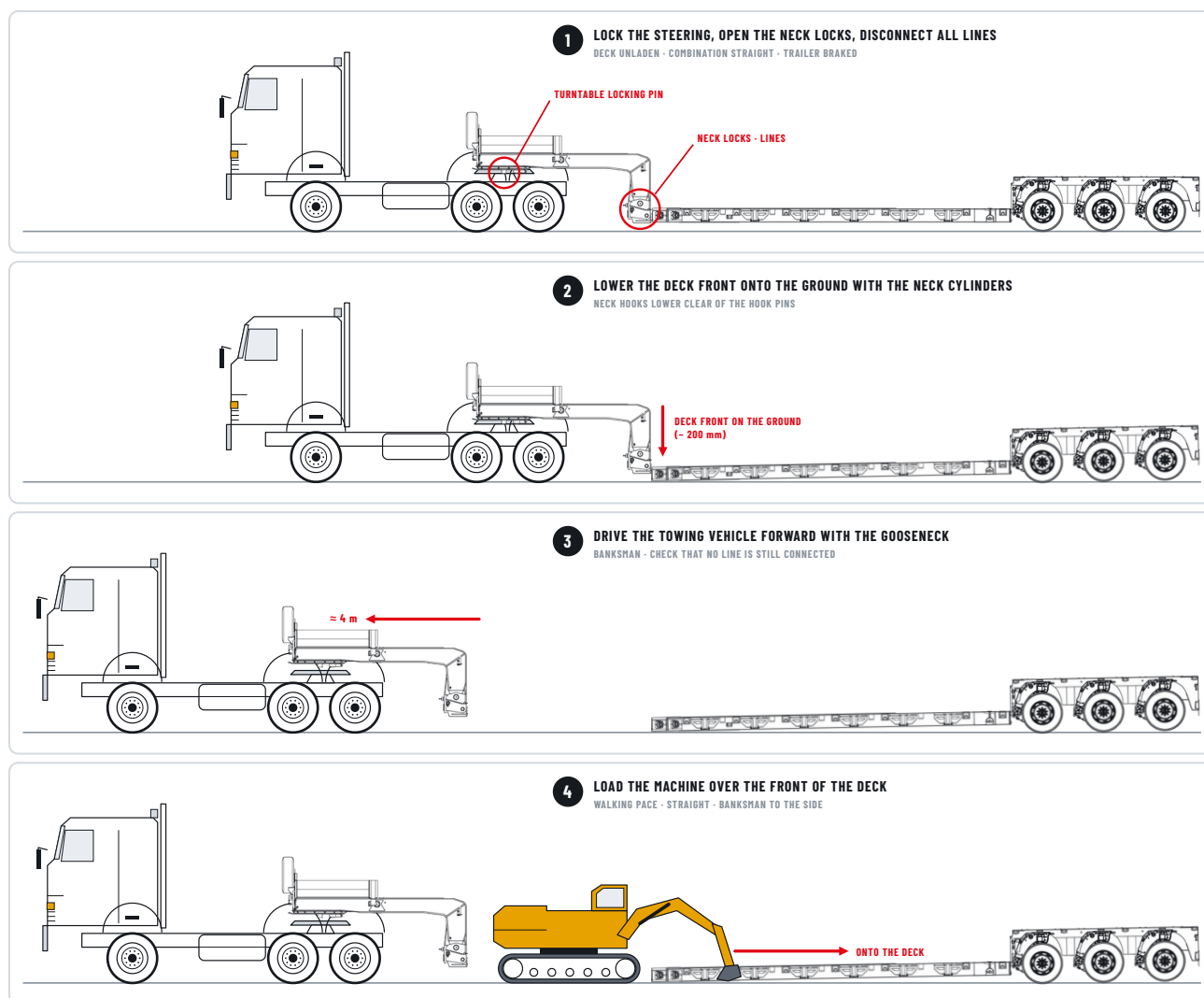


FIGURE 7.2 Detaching the gooseneck and loading over the front – sequence (STU drawing with schematic towing vehicle and machine)

7.3.1 PREPARATION

- ☐ Deck **unladen**, all loose items removed (unless loading with the gooseneck detached has been approved for this load)
- ☐ Combination parked in a **straight line** on firm, level, load-bearing ground with enough free space in front of the low loader
- ☐ Steering centred and synchronised (Section 10.5) – the axles point straight ahead
- ☐ Suspension at ride height in the travel setting
- ☐ Parking brake of the towing vehicle applied; wheel chocks placed behind the rear wheels of the low loader
- ☐ Hydraulic supply connected and running (Section 6.2)
- ☐ Danger zone around the gooseneck and the deck front cleared; banksman in position

7.3.2 PROCEDURE

- 1 **Lock the steering.** Insert the turntable locking pin (Section 10.2) and close the shut-off valves of both steering circuits at the neck joint. The pressure gauges of the steering circuits must keep their pre-charge pressure.
- 2 **Relieve the neck locks.** Raise the front of the deck slightly with the neck lift cylinders until the locking bolts are free of load.
- 3 **Open the neck locks.** Release the mechanical safety catches, then move the lever “neck locks” to OPEN. Check on the position indicators that **both** bolts are fully retracted.
- 4 **Disconnect the lines at the neck joint** in this order: steering lines (dry-break couplings), suspension hydraulic lines, electrical cables (EBS, lighting), air lines. Fit all dust caps and stow the lines on the holders of the gooseneck. When the air lines are disconnected, the spring brakes of the pendular axles apply automatically.
- 5 **Lower the deck front to the ground.** Retract the neck lift cylinders slowly until the front support plates of the deck stand firmly on the ground and the cylinders are free of load. Watch the support plates: on soft ground, place load-spreading plates under them first.
- 6 **Disengage the hooks.** Continue to operate the lever “gooseneck — lower” until the neck hooks have lowered clear of the hook pins. Check visually on both sides that the hooks are free.
- 7 **Drive away.** Drive the towing vehicle with the gooseneck forward slowly in a straight line, guided by the banksman, until there is enough room for loading. Watch that no line or cable is still connected.
- 8 **Secure the gooseneck.** Raise the gooseneck to its transport position on the towing vehicle **or lower it onto its landing legs if it is to be parked.** Switch off the hydraulic supply.

DANGER



Crushing and falling parts. Never stand under the gooseneck, between the gooseneck and the deck or in front of the deck front while the gooseneck is being lowered, raised or moved. The deck front and the gooseneck can drop suddenly if a hose bursts or a hook slips off its pin.

WARNING



Deck front on soft ground. The deck front transmits its whole weight to the ground through the support plates. On soft or uneven ground it can sink or tilt. Detach only on firm, level ground and use load-spreading plates where necessary.

7.4 LOADING OVER THE FRONT

- 1 Check that the deck front stands firmly on the ground, the axles are braked and the wheel chocks are in place.
- 2 Fit the front loading ramps or ramp extensions (*if fitted*) and secure them against slipping.
- 3 Drive the machine onto the deck slowly, at walking pace, in a straight line and guided by a banksman who stands to the side — never in front of the machine.
- 4 Position the machine so that its centre of gravity is within the permitted zone of the load-distribution diagram once the gooseneck has been coupled again. Lower attachments (buckets, booms) onto the deck.
- 5 Secure the machine against rolling (parking brake, chocks) before coupling the gooseneck; lash it completely before the vehicle is moved (Chapter 12).

NOTICE



Coupling the gooseneck with a load on the deck subjects the hooks, the neck cylinders and the deck front to high forces. Do it only if the specification and the load-distribution diagram permit it for the mass concerned **TBC**; otherwise load the deck after coupling, using the rear or a crane.

7.5 COUPLING THE GOOSENECK

- 1 Connect the hydraulic supply and start it. Lower the gooseneck so that the neck hooks are **below** the level of the hook pins.
- 2 Reverse the towing vehicle slowly in a straight line, guided by the banksman, until the hooks are exactly under the hook pins. The towing vehicle and the deck must be in line – the steering of the low loader is locked and cannot compensate for any offset.
- 3 Apply the parking brake of the towing vehicle.
- 4 **Engage the hooks.** Raise the gooseneck slowly until both hooks are fully seated on the hook pins. Stop and check both sides.
- 5 **Raise the deck.** Continue to raise with the neck lift cylinders until the deck front is at the travel position and the locking bolts are aligned with their bores.
- 6 **Close the neck locks.** Move the lever “neck locks” to CLOSE. Check on both indicators that the bolts are fully extended, then engage the mechanical safety catches.
- 7 **Reconnect the lines** in the reverse order: air lines, electrical cables, suspension lines, steering lines. Clean every coupling before connecting it.
- 8 **Release the steering.** Open the shut-off valves of the steering circuits and remove the turntable locking pin. Check the pre-charge pressure of both steering circuits (Section 10.4).
- 9 Raise or lower the front landing legs fully, remove the wheel chocks and carry out the function checks below.

7.5.1 CHECKS AFTER COUPLING

- ☐ Both neck hooks seated; both neck locks closed and indicators showing “locked”; safety catches engaged
- ☐ All lines connected; no line taut, kinked or chafing at the neck joint
- ☐ Brake test: the low loader brakes when the towing vehicle brakes; EBS warning lamp goes out
- ☐ Lighting test, including the extension lighting
- ☐ Steering: pre-charge pressure in both circuits; axles straight with the combination straight
- ☐ Deck parallel to the road at ride height; suspension pressures plausible

WARNING



Driving with the neck locks open. If the neck locks are not closed, the deck hangs only on the hooks and the lift cylinders. A hose failure can then drop the front of the deck onto the road. Never move the vehicle on a road before the neck locks are closed and indicated as locked.

PENDULAR-AXLE MECHANISM

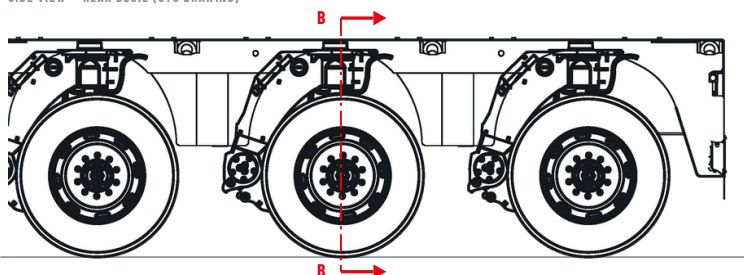


The pendular axle is the heart of the STUP3. Unlike a rigid axle, every half axle line can move in three ways – up and down, side to side and around its steering axis – so that all wheels stay on the road and share the load evenly, even on cambered, uneven or twisting roads.

8.1 CONSTRUCTION

Each of the three axle lines consists of two pendular axles – one on the left and one on the right of the central chassis beam. The pendular axles are identical and interchangeable **TBC**.

SIDE VIEW – REAR BOGIE (STU DRAWING)



PENDULAR AXLE – KEY DATA

Axle lines / pendular axles	3 / 6
Suspension stroke	600 mm
Ride height (rear deck)	1,200 mm
Raise / lower from ride height	+400 / -200 mm
Steering angle	up to 55-60° *
Pendulum angle	± ... ° *

* to be confirmed by STU for your vehicle

SECTION B-B – REAR VIEW OF ONE AXLE LINE (SCHEMATIC)

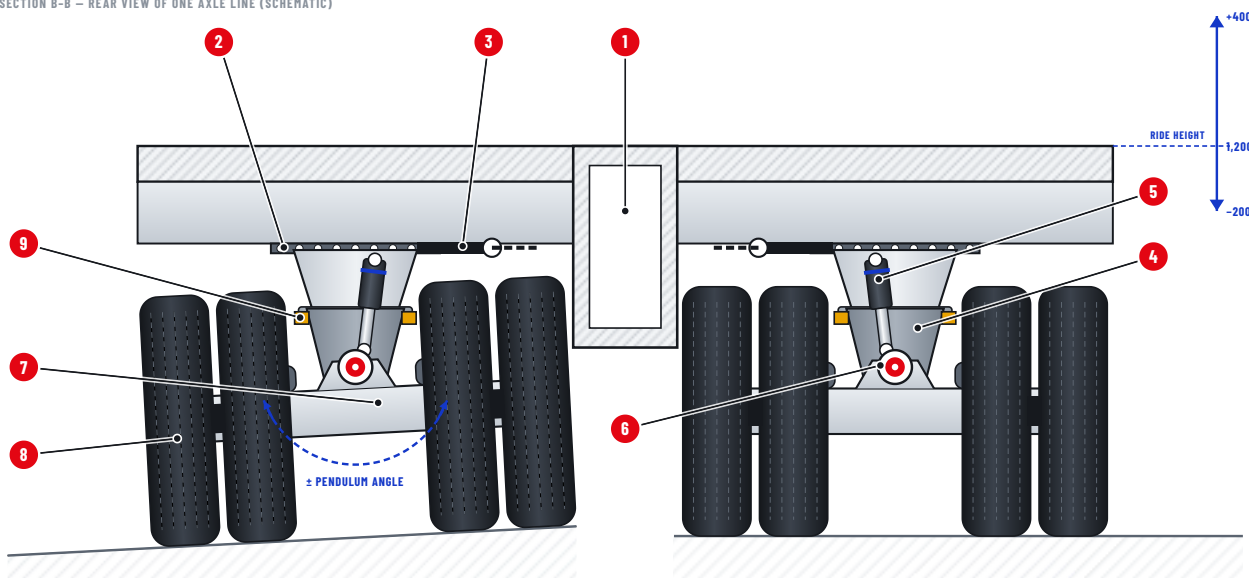


FIGURE 8.1 Pendular axle – side view of the rear bogie (STU drawing) and section B-B through one axle line (schematic rear view)

- | | |
|--|---|
| 1 Central chassis beam (rear bogie) | 2 Slewing ring / steering bearing – vertical steering axis |
| 3 Steering lever, connected to the steering cylinder and track rods | 4 Swing arm (rocker), hinged to the steering bearing housing |
| 5 Hydraulic suspension cylinder | 6 Pendulum bearing – longitudinal pivot of the axle beam |
| 7 Pendular axle beam with wheel hubs and brakes | 8 Twin wheels |
| 9 Mechanical stops (upper and lower end of the stroke) | |

TABLE 8.1 – MOVEMENTS OF THE PENDULAR AXLE

MOVEMENT	COMPONENT	PURPOSE	RANGE
Vertical stroke	Swing arm with suspension cylinder	Raises and lowers the deck; equalises the load between the axle lines of one circuit	600 mm in total: ride height 1,200 mm, +400 / -200 mm
Pendulum movement	Axle beam on the pendulum bearing	Lets the wheels of one pendular axle follow the transverse slope and camber of the road, so that the inner and outer wheels carry the same load	± TBC°
Steering	Slewing ring with steering lever	Steers each pendular axle about its own vertical axis	up to 55-60°

8.2 HOW THE PENDULAR AXLE WORKS

Load equalisation along the vehicle. All suspension cylinders of one side are connected to the same hydraulic circuit. When one wheel rises over a bump, its cylinder pushes oil to the other cylinders of the circuit, which extend: the deck stays level and the load on each axle line stays the same. The axle lines of one side therefore act like a single, very long “hydraulic balance beam”.

Load equalisation across the axle. The axle beam can swing about the pendulum bearing. On a cambered road or over a kerb, the outer and inner wheels of one pendular axle adjust to the road surface and carry the same load. Tyre wear and point loads on the road are reduced.

Large steering angle. Because each pendular axle turns about its own slewing ring, independently of its neighbour, much larger steering angles are possible than with conventional steered axles. The rear of the combination can follow the towing vehicle closely, even with the deck extended.

NOTICE



The pendular axles can move only within their mechanical stops. If an axle reaches a stop while driving – for example on a very steep crest or with the suspension raised to its limit – the hydraulic load equalisation stops working for that axle and the load is no longer shared evenly. Keep the suspension near ride height and observe Section 9.2.

8.3 RULES FOR OPERATING THE PENDULAR AXLES

- Drive only with the suspension within its stroke and at ride height whenever possible. The full stroke is intended for obstacles, loading and levelling at walking pace.
- Avoid kerbs and potholes when cornering at full steering angle; the side force on the tyres and the steering is then at its highest.
- Never steer the axles on the spot under full load on a dry, rough surface (“dry steering”) except when absolutely necessary – it causes high tyre wear and high loads on the steering bearings. Roll the vehicle at least slightly while steering.
- Keep the pendulum bearings, swing-arm pivots and steering bearings lubricated (Section 14.3) and inspect them as described in Chapter 15.
- Do not jack the vehicle at the pendular axle beam or the swing arm. Use only the jacking points marked on the chassis.

8.4 WORKING ON A PENDULAR AXLE

Before working on a pendular axle, on its wheels or under the rear bogie:

- 1 Unload the vehicle. Park in a straight line with the steering centred and locked (Section 10.2).
- 2 Lower the suspension onto its lower mechanical stops, or support the chassis beam securely on axle stands of sufficient capacity.
- 3 Switch off the hydraulic supply and relieve the pressure in the suspension circuit concerned (Chapter 15).

- 4 Close the shut-off valve of the suspension cylinder concerned (*if fitted*), so that the other cylinders of the circuit do not move when this cylinder is disconnected.

DANGER



Movement of the other axles. When a cylinder of a circuit is disconnected or relieved, all other cylinders of that circuit lower. Never work on one axle while the circuit is under pressure and the chassis is not supported.

HYDRAULIC SUSPENSION

The hydraulic suspension carries the load, keeps the deck level and lets the operator raise, lower and level the vehicle. Set correctly, it makes the long, heavy combination stable on the road; set wrongly, it can make it tip over. Read this chapter before you operate a suspension valve.

9.1 PRINCIPLE AND SUPPORT CONFIGURATION

The six suspension cylinders of the pendular axles are connected to **two hydraulic circuits**: the three cylinders of the left side form circuit LEFT, the three cylinders of the right side form circuit RIGHT. Within a circuit, the oil – and therefore the load – is shared equally between the cylinders.

Together with the king pin, which carries the front of the vehicle on the towing vehicle, the two circuits form a **3-point support**: the vehicle stands on three points like a three-legged stool. A three-legged stool cannot rock, and every point carries a defined share of the load.

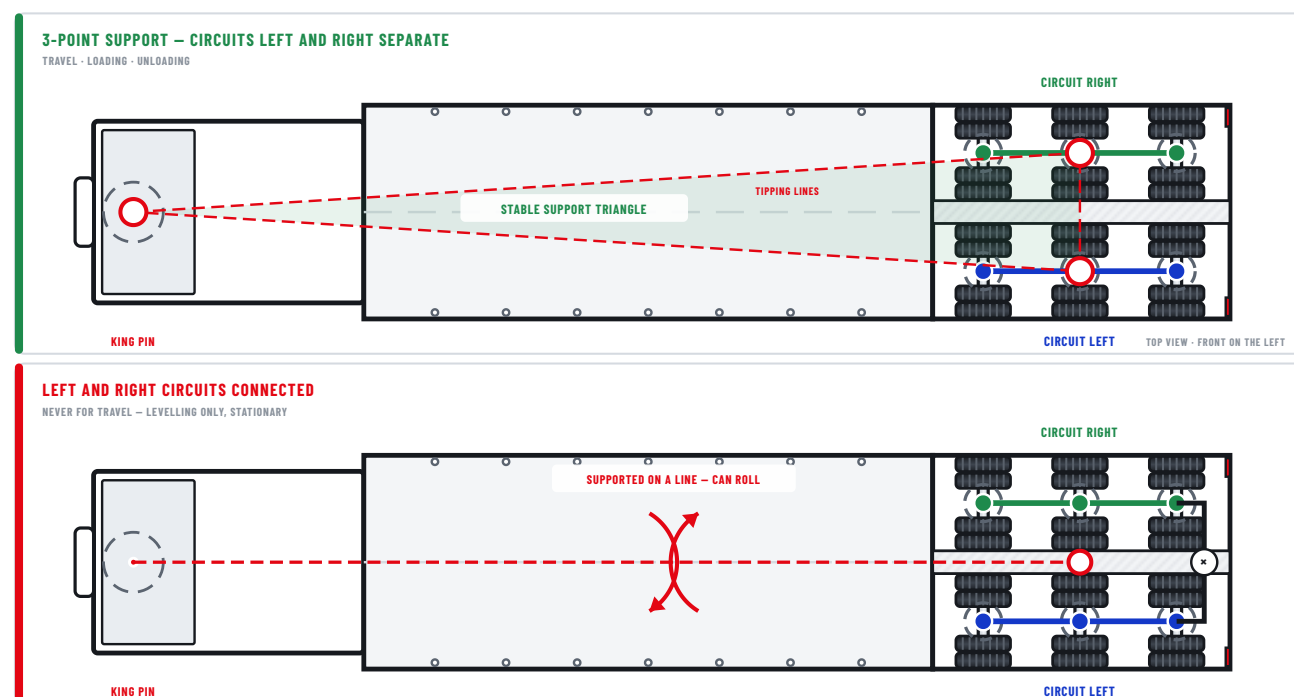


FIGURE 9.1 Support configurations (top view) – 3-point support for travel; left and right circuits connected only for levelling when stationary

TABLE 9.1 – SUSPENSION SETTINGS

SETTING	CIRCUIT VALVES	USE	STABILITY
3-point support – LEFT and RIGHT separate	Cross-connection valve CLOSED	Road travel and all normal operations	High – the tipping line runs from the king pin to the left and right support points of the bogie
Single circuit – LEFT and RIGHT connected	Cross-connection valve OPEN	Only for the procedure “equalise left and right” when stationary and unladen TBC	Low – the bogie can roll sideways; never drive or load in this setting
Circuits shut off	Shut-off valves CLOSED	Parking, maintenance, long stops	Cylinders hydraulically locked

DANGER


Overturning. Drive, load and unload only with the suspension in the **3-point support** (cross-connection valve closed). With the left and right circuits connected, the deck can roll sideways under a load whose centre of gravity is high or off-centre, and the vehicle can overturn.

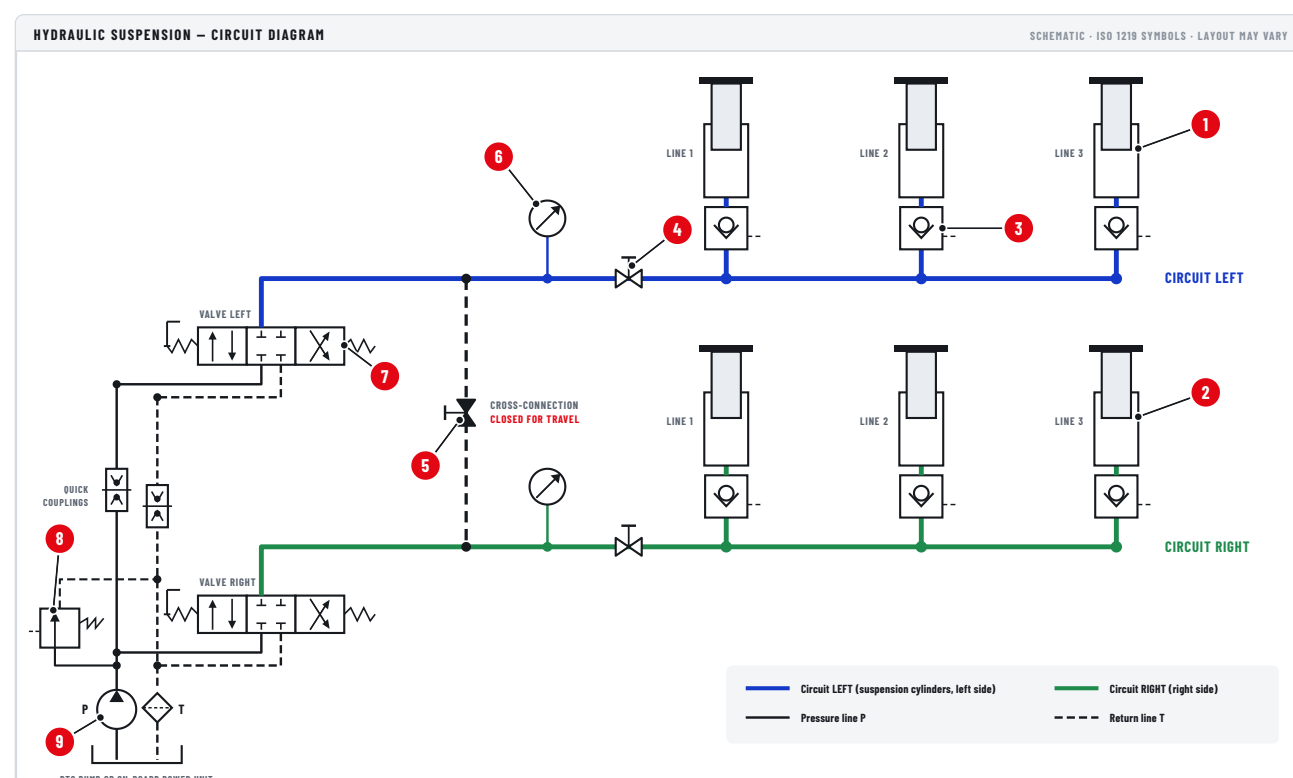


FIGURE 9.2 Hydraulic suspension – circuit diagram (ISO 1219 symbols)

- | | |
|--|---|
| 1 Suspension cylinders, circuit LEFT (axle lines 1-3) | 2 Suspension cylinders, circuit RIGHT (axle lines 1-3) |
| 3 Pipe-rupture / load-holding valves on each cylinder | 4 Shut-off valves of the circuits |
| 5 Cross-connection valve LEFT / RIGHT (closed for travel) | 6 Pressure gauges LEFT and RIGHT |
| 7 Control valve block: raise / hold / lower per circuit | 8 Pressure-relief valve |
| 9 Supply from the power unit or PTO (P, T) | |

9.2 RIDE HEIGHT

The ride height of the rear deck is **1,200 mm** above the road. The ride-height mark on the **rear bogie** shows whether the deck is at ride height; check it with the vehicle standing on level ground.

TABLE 9.2 – SUSPENSION POSITIONS

POSITION	HEIGHT OF REAR DECK	USE
Highest	1,600 mm (+400)	Crossing obstacles, crests and level crossings at walking pace; changing a wheel
Ride height	1,200 mm	Road travel
Lowest	1,000 mm (-200)	Passing under low structures at walking pace; loading over the rear

At ride height, the suspension has stroke reserve in both directions, so that the pendular axles can follow the road. At the upper or lower limit, there is no reserve: the next bump is transmitted directly to the deck, the load is no longer shared and the cylinders and stops are overloaded.

9.3 RAISING, LOWERING AND LEVELLING

9.3.1 RAISING AND LOWERING

- 1 Observe the rules for hydraulic operation (Section 6.5). Stop the vehicle or drive at walking pace only.
- 2 Check that the cross-connection valve is closed and the circuit shut-off valves are open.
- 3 Operate the levers "suspension LEFT" and "suspension RIGHT" **together**, so that both sides move evenly. Watch the deck and the ride-height mark.
- 4 Release the levers at the required height. The cylinders are held hydraulically.
- 5 Return to ride height as soon as the obstacle has been passed.

9.3.2 LEVELLING ACROSS THE VEHICLE

On a transverse slope (for example on a cambered site road), the deck can be levelled by raising the lower side or lowering the higher side:

- 1 Stop the vehicle. The load must be lashed.
- 2 Operate the lever of one side only, in short steps, while watching a spirit level or plumb line on the deck.
- 3 Do not exceed a height difference of **TBC** mm between the sides.
- 4 Before driving on to level ground, level the deck back to ride height on both sides.

9.3.3 LEVELLING ALONG THE VEHICLE

The front of the deck is raised and lowered with the neck lift cylinders (Section 7.2), the rear with the suspension. Use both together to keep the deck level lengthways, for example when loading on a slope.

9.4 READING THE PRESSURE GAUGES – LOAD CHECK

The pressure in a suspension circuit is proportional to the load it carries. The gauges therefore show the load on each side of the bogie and whether the load is centred.

Axle-line load per side (approximate):

$$F[\text{kg}] \approx p[\text{bar}] \times A[\text{cm}^2] \times n \times i \times 1.02$$

where p is the gauge pressure, A the piston area of one suspension cylinder, n the number of cylinders in the circuit (3) and i the lever ratio of the swing arm (cylinder force to wheel force). For the STUP3: piston diameter **TBC** mm, $A = \text{TBC}$ cm², $i = \text{TBC}$.

TABLE 9.3 – PRESSURE AND LOAD (VALUES TO BE CONFIRMED BY STU FOR YOUR VEHICLE)

GAUGE PRESSURE (EACH SIDE)	LOAD CARRIED BY THE BOGIE (BOTH SIDES)
Unladen: approx. TBC bar	approx. TBC t
50 % of max. axle load	approx. TBC bar
100 % of max. axle load – maximum permitted pressure	TBC bar

- **Difference between LEFT and RIGHT.** With a centred load, both gauges show nearly the same pressure. A difference of more than 10 % means that the load's centre of gravity is off-centre – re-position the load. A difference that grows during the journey indicates a leak or a shifting load: stop and check.
- **Maximum pressure.** Never exceed the maximum pressure shown above. A higher pressure means the axles are overloaded.
- The gauge reading is a check, not a weighing. For the special permit and for enforcement, axle loads must be determined by an approved weighing method.

9.5 PARKING AND LONG STOPS

- For short stops, leave the suspension at ride height.
- For long stops, or before working under the vehicle, lower the suspension onto its lower mechanical stops or support the chassis on blocks, then close the circuit shut-off valves.
- Over long periods, the deck can sink slightly because of temperature changes and normal internal leakage. Check the ride height before every journey.

WARNING



Opening valves under load. Never open the cross-connection valve or a shut-off valve while the vehicle is laden and standing on uneven ground, or while it is moving. The load redistributes instantly and the deck can drop or roll to one side.

HYDRAULIC STEERING MANAGEMENT

10

All six pendular axles of the STUP3 are steered hydraulically. The steering system makes a low loader of 16 to 27 metres manoeuvrable – but only if it is centred, pre-charged and synchronised. This chapter explains how the steering works, how to operate its modes and how to keep it in its zero position.

10.1 HOW THE FORCED STEERING WORKS

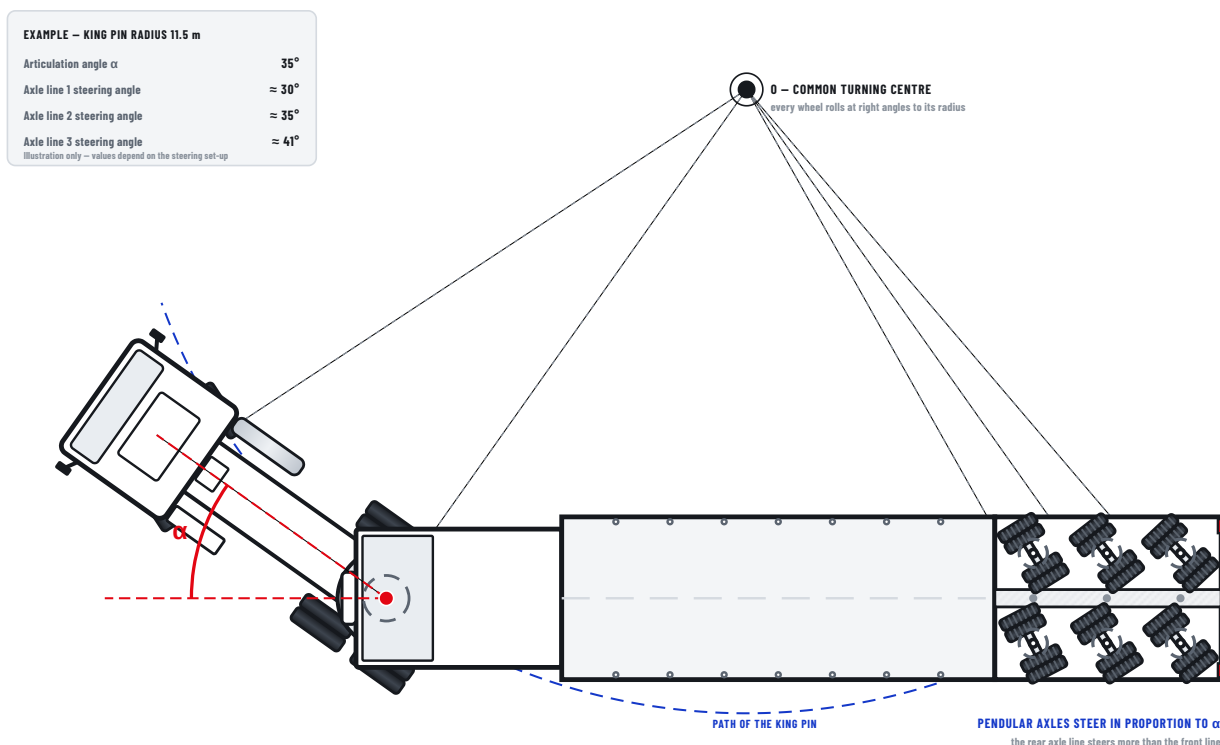


FIGURE 10.1 Forced steering geometry (top view, example) – all wheels of the combination turn about a common centre O; the pendular axles steer in proportion to the articulation angle α

The steering is a **hydraulic forced steering** (also called command or positive steering). It uses no electronics and needs no external power while driving:

- 1 The **steering wedge** under the gooseneck engages in the slot of the towing vehicle's fifth-wheel coupling. When the combination turns, the wedge turns the **steering turntable** around the king pin by the articulation angle α .
- 2 The turntable moves two double-acting **master cylinders** (steering transmitters) in the gooseneck.
- 3 The oil displaced by the master cylinders flows through **two closed steering circuits** to the **slave cylinders** (steering receivers) on the rear bogie. In each circuit, oil that leaves one cylinder enters the other – the volume is constant.
- 4 The slave cylinders turn the steering levers of the pendular axles. Track rods connect the pendular axles of each axle line, and the axle lines with each other, so that each axle steers by the angle its geometry requires – the rear axle line steers more than the front one.

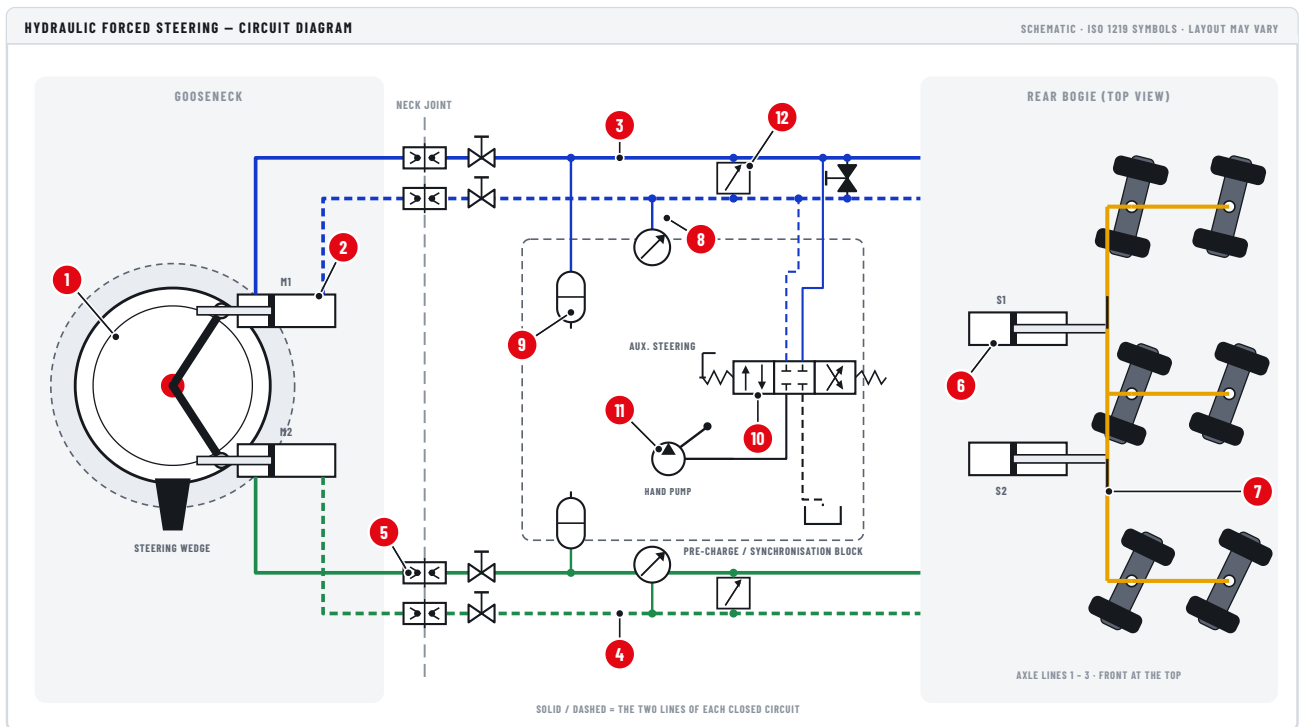


FIGURE 10.2 Hydraulic forced steering – circuit diagram (ISO 1219 symbols)

- | | |
|---|---|
| 1 Steering turntable with steering wedge | 2 Master cylinders (steering transmitters) on the gooseneck |
| 3 Steering circuit 1 | 4 Steering circuit 2 |
| 5 Dry-break couplings and shut-off valves at the neck joint | 6 Slave cylinders (steering receivers) on the rear bogie |
| 7 Track rods and steering levers of the pendular axles | 8 Pressure gauges of circuits 1 and 2 |
| 9 Accumulators (keep the pre-charge pressure) | 10 Synchronisation valves / auxiliary steering valve block |
| 11 Hand pump and supply from the power unit | 12 Pressure-relief valves (overload protection) |

Both circuits are kept under a **pre-charge pressure**. The pre-charge makes the closed circuits stiff, so that the axles follow the turntable exactly and do not drift. Accumulators compensate for the expansion of the oil with temperature. The pressure-relief valves open if an axle is blocked – for example by a kerb – so that the steering is not damaged.

TABLE 10.1 – STEERING DATA

STEERING DATA	VALUE
---------------	-------

Steering type	Hydraulic forced steering, two closed circuits, with auxiliary steering
Steering connection	Steering wedge for the fifth-wheel slot type TBC
Maximum articulation angle (turntable stop)	TBC °
Maximum steering angle of the pendular axles	55–60 °
Pre-charge pressure (cold, axles straight)	TBC bar – tolerance TBC bar
Opening pressure of the steering relief valves	TBC bar (set by STU)

10.2 STEERING TURNTABLE AND STEERING WEDGE

The steering wedge must fit the slot of the fifth-wheel coupling without play. A loose wedge causes the axles to “hunt” and the rear of the vehicle to weave.

- **Before coupling**, the turntable must be centred and pinned with the **turntable locking pin**, so that the wedge enters the fifth-wheel slot straight. Couple as described in Section 4.3.
- **After coupling**, remove the turntable locking pin and stow it in its holder. Check that the wedge sits fully in the slot and that the fifth-wheel lock is closed.
- **Before uncoupling** and before detaching the gooseneck, park in a straight line and insert the turntable locking pin.
- Never drive on the road with the turntable locking pin inserted – the steering is then locked and the bogie is dragged sideways in bends, overloading the tyres, the axles and the fifth wheel.

WARNING



Fifth-wheel coupling not suitable. Use only fifth-wheel couplings with a slot that matches the steering wedge, and never use a fifth wheel with a steering-wedge function of its own that is locked or worn. Check the wedge and the slot for wear at every coupling.

10.3 STEERING MODES

TABLE 10.2 – STEERING MODES

MODE	HOW THE AXLES ARE STEERED	PERMITTED USE
Forced steering	By the articulation angle only (steering wedge)	Road travel at any speed
Auxiliary steering	By the articulation angle plus an additional angle set by the operator	Manoeuvring at walking pace only
Steering locked	Turntable pinned, circuits shut off	Coupling, uncoupling, detaching the gooseneck, maintenance

10.3.1 FORCED STEERING (ROAD TRAVEL)

Forced steering is the **only** mode permitted for road travel. Select it with the steering-mode selector and check that:

- the turntable locking pin has been removed;
- both steering circuits show the pre-charge pressure;
- with the combination standing straight, all wheels point straight ahead (synchronised).

10.3.2 AUXILIARY STEERING (MANOEUVRING)

In tight bends, at site entrances or when reversing into a narrow position, the forced steering alone may not be enough. With the auxiliary steering, the operator adds an extra steering angle: oil is pumped into one steering circuit and released from the other, which turns all axles further than the articulation angle requires.

- 1 Stop the combination. Agree the manoeuvre and the signals with the driver and the banksman.
- 2 Switch the steering mode to **auxiliary steering** and start the hydraulic supply.
- 3 While the combination moves at walking pace, steer the axles with the lever “auxiliary steering” or with the remote control. Operate in short steps and watch the rear of the vehicle – it moves sideways much faster than the operator expects.
- 4 After the manoeuvre, straighten the combination and steer the axles back until they are in line with the vehicle again.
- 5 **Synchronise** the steering (Section 10.5) and switch back to **forced steering**.
- 6 Check the alignment on a short, slow straight run before driving at normal speed.

DANGER



Rear of the vehicle swinging out. With the auxiliary steering, the rear of the vehicle can move sideways by several metres. Nobody may stand within the swept area of the bogie and the rear overhang. The operator of the auxiliary steering must have a clear view or be guided by a banksman who can see the whole rear of the vehicle.

WARNING



Auxiliary steering at speed. Never drive faster than walking pace with the auxiliary steering engaged, and never drive on the road with the axles not centred. The vehicle then no longer follows the towing vehicle, it can leave its lane and the tyres are destroyed within a short distance.

10.3.3 ELECTRONIC STEERING (IF FITTED)

If your low loader is fitted with electronic forced steering, an angle sensor at the king pin replaces the mechanical steering wedge, and an electronic control unit steers the axles through proportional valves. The steering then also depends on the vehicle speed, and special modes (for example “rear axles only” for manoeuvring) are available through the remote control. Follow the separate operating instructions of the steering-system manufacturer **TBC**. If the system reports a fault, stop and follow the fault instructions; the system normally steers the axles back to the straight-ahead position and locks them.

10.4 PRE-CHARGE PRESSURE

Check the pre-charge pressure of both steering circuits **before every journey**, with the combination standing straight and the oil cold:

- Both gauges must show the specified pre-charge pressure within the tolerance (Table “Steering data”).
- If the pressure is too low, top up the circuit with the hand pump or the power unit through the charging valve as described on the instruction plate of the control panel **TBC**. If a circuit repeatedly loses pressure, it is leaking – have it repaired before driving.

- If the pressure is too high (for example after the vehicle has stood in the sun), relieve it to the specified value with the relief screw of the charging valve.
- A pressure that changes noticeably while driving straight shows that the circuits are not in balance — stop and synchronise.

10.5 SYNCHRONISING THE STEERING (ZERO POSITION)

Over time, and after every use of the auxiliary steering, the axles can move away from the zero position of the turntable. The steering must then be **synchronised**: the axles are brought back to straight-ahead while the turntable is in its centre position.

- 1 Drive the combination forwards in a straight line for at least **50 m** on level ground and stop without steering.
- 2 Check that the turntable is in its centre position: the zero marks on the turntable and on the gooseneck must be aligned.
- 3 Check the axles: the pointers on the steering bearings must be on their zero marks, or — without pointers — a cord stretched along the tyres of each side must touch all tyres evenly.
- 4 If an axle line is not straight, select the steering mode “auxiliary steering” and move the axles with small steps of the auxiliary steering lever until all pointers are on zero. **Open / close the synchronisation valves as described on the instruction plate.**
- 5 Check and correct the pre-charge pressure of both circuits (Section 10.4).
- 6 Switch back to forced steering and check the result on a slow straight run: the tyres must not scrub and the bogie must run in the track of the towing vehicle.

NOTICE



If the axles cannot be synchronised, if they leave the zero position again within a short distance or if the two circuit pressures differ by more than the tolerance, the steering system contains air or is leaking. It must then be bled and checked by a trained technician (Chapter 15).

10.6 DRIVING WITH THE STEERED AXLES

- **Bends.** Approach slowly and wide. The forced steering keeps the bogie close to the track of the towing vehicle, but the rear overhang and — with the deck extended — the middle of the deck still cut in. Plan the route with a swept-path analysis for long loads.
- **Articulation limit.** Never exceed the maximum articulation angle of the turntable. At the stop, the steering wedge and the fifth wheel are overloaded and can be damaged. Avoid jack-knifing when reversing.
- **Reversing.** The forced steering also steers when reversing. Reverse slowly and with a banksman; correct with the auxiliary steering where needed.
- **Slippery roads.** On ice, snow or wet grass the steered axles can slide outwards. Reduce speed accordingly.
- **Kerbs and obstacles.** Do not hit kerbs with the steered wheels — the relief valves will open, the axles will leave the zero position and must be synchronised.

TELESCOPIC WELL DECK

11

The well deck can be extended in two stages of 5,500 mm each to carry long loads. Extending and retracting are done with the low loader **unladen**, using the towing vehicle to pull or push the front section while the rear bogie is braked.

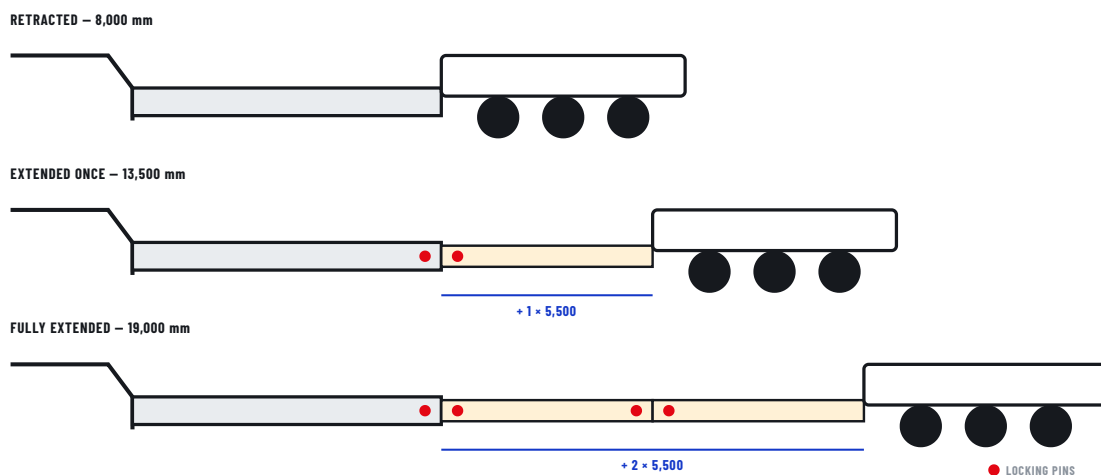


FIGURE 11.1 Telescopic well deck – retracted, extended once and fully extended (schematic)

DANGER



Crushing between the deck sections. Nobody may stand along the extension zone, on the deck or between the telescopic sections while the deck is being extended or retracted. Keep hands away from the locking-pin holes.

11.1 EXTENDING THE DECK

- 1 Park the combination unladen in a straight line on firm, level ground with sufficient free space in front.
- 2 Set the suspension to ride height and the steering to the straight-ahead position.
- 3 Apply the low loader's parking brake (PREV red button pulled out), so that the rear bogie is braked while the towing vehicle can move.

- 4 Clean and lubricate the telescopic guides if necessary.
- 5 Remove the locking pins of the stage to be extended and stow them in their holders.
- 6 Pull forward slowly with the towing vehicle, guided by a banksman, until the pin holes of the required extension position are aligned.
- 7 Insert **all** locking pins of that stage and secure them with their safety clips.
- 8 Release the parking brake briefly and pull gently to check that the stage is locked.
- 9 Connect the extension cables for the lighting and fit the side marker lamps, marker boards and any additional lighting required for the length of the vehicle.
- 10 For the second stage, repeat steps 3 to 9.

11.2 RETRACTING THE DECK

- 1 Unload the low loader completely and remove all loose items from the deck.
- 2 Disconnect the extension cables where required.
- 3 Apply the low loader's parking brake.
- 4 Remove the locking pins of the stage to be retracted.
- 5 Reverse slowly with the towing vehicle, guided by a banksman, until the stage is fully retracted and the pin holes of the retracted position are aligned.
- 6 Insert and secure all locking pins.

WARNING



Telescoping a laden deck. Never extend or retract the deck while it carries a load. The guides and locking pins are not designed for it, and the load can shift or fall.

11.3 DRIVING WITH THE DECK EXTENDED

- Observe the dimensions and conditions of the special permit; fit the "long vehicle" or abnormal-load marking required.
- The swept path increases considerably. Plan the route, use escort vehicles where required and use the auxiliary steering for tight manoeuvres (Section 10.3).
- Check the locking pins at every stop.

LOADING, LOAD SECURING AND UNLOADING

12

The STUP3 is designed for heavy and long indivisible loads. The well deck is low but not supported in the middle – the load must be placed and distributed so that the deck, the gooseneck and the pendular axles are each loaded within their limits.

12.1 PLANNING THE LOAD

Before loading, determine the mass, the dimensions, the centre of gravity and the lashing points of the load, and the resulting total height, width and length of the combination. Check that the special permit covers them.

- Distribute the load so that the permissible king pin load and axle-line loads are not exceeded. A load-distribution diagram for your low loader, showing the permissible payload as a function of the position of the load's centre of gravity and of the deck extension, is available from STU on request.
- Place the centre of gravity on the longitudinal centre line.
- The well deck is designed for distributed loads. Concentrated loads must be placed on load-spreading timbers or steel beams laid across the deck's longitudinal beams. Permissible load per metre of deck: **TBC** t/m.
- On an extended deck, place the load so that the extended section is not overloaded; the permissible payload may be lower with the deck extended – see the load-distribution diagram.

12.2 LOADING METHODS

- **By crane or lifting equipment** – the usual method for long loads. Lower the load slowly onto the timbers; keep everyone out from under the load.
- **Self-propelled machines** – drive on **over the front** with the gooseneck detached (Section 7.4) – the preferred method, because the machine does not have to climb over the rear bogie – or over suitable loose ramps at the rear of the bogie. For rear loading, lower the suspension to the lowest position and raise it to ride height afterwards.

⚠ DANGER



Load sliding or tipping during loading. Load only with the combination standing straight on firm, level ground, with the parking brake applied and the wheel chocks in place. Keep the suspension circuits in the 3-point setting.

12.3 LOAD SECURING

The load restraint must withstand the inertia forces of EN 12195-1: 0.8 g forwards, 0.5 g rearwards and 0.5 g sideways (0.7 g for loads at risk of tipping).

- Use direct lashing with chains (EN 12195-3) or web lashings (EN 12195-2) attached to the lashing points of the deck.
Lashing-point capacity: **LC = ... daN per point.**
- Block the load against movement where possible; use anti-slip mats under the load and the timbers.
- For very heavy loads, calculate the load securing according to EN 12195-1 or have it planned by a qualified load-securing specialist.
- Check the tension of all lashings after the first kilometres and at every stop.

12.4 AFTER LOADING

- ☐ Load secured; loose items removed from the deck
- ☐ Gooseneck coupled, neck locks closed and indicated as locked
- ☐ Suspension at ride height in the 3-point setting; pressures plausible, within the maximum and similar left and right (Section 9.4)
- ☐ Steering centred, synchronised and pre-charged; turntable locking pin removed; forced steering selected
- ☐ Telescopic stages locked with all pins; extension lighting and marking fitted
- ☐ Total height, width and length measured and within the special permit

12.5 UNLOADING

- 1 Park on firm, level ground in a straight line; apply the parking brake and place the wheel chocks.
- 2 Check that the load has not shifted and cannot move when the lashings are released.
- 3 Release the lashings one at a time.
- 4 Unload with lifting equipment or drive the machine off over the ramps.
- 5 Clean the deck; retract the deck if required (Chapter 11).

DELIVERY AND COMMISSIONING

13

A correct handover and a careful first few hundred kilometres lay the foundations for a long and trouble-free service life.

13.1 HANDOVER

The semi-trailer is delivered fully assembled and ready for operation, with the standard equipment listed in Section 3.5. Optional equipment is supplied as ordered.

At handover, the dealer or STU representative will introduce the new owner to the design and operation of the semi-trailer, its safety devices, the maintenance requirements and the warranty conditions. The owner should check that:

- ☐ The semi-trailer is complete and undamaged and all standard and ordered equipment is present
- ☐ The VIN on the chassis and on the statutory plate matches the VIN in the CoC and the warranty certificate
- ☐ The Certificate of Conformity, this user manual and the component manufacturers' documentation have been handed over
- ☐ The warranty certificate has been completed and signed (Appendix D)
- ☐ The handover and the instruction of the driver(s) and operator(s) have been recorded (Appendix C)

13.2 COMMISSIONING

Before the first journey, and before every use after a long period out of service:

- 1 Familiarise yourself with the names and positions of the main assemblies (Section 3.1).
- 2 Check the tyre pressures (Section 14.6).
- 3 Couple the semi-trailer to a suitable towing vehicle (Chapter 4).
- 4 With the engine of the towing vehicle switched off and the parking brake applied, check the electrical and pneumatic connections for correct function and leaks.
- 5 Check that all lamps work.
- 6 Check the hydraulic functions: raising and lowering of the suspension, the steering in both directions and its return to the centre position, and the telescopic extension and locking pins.
- 7 Release the parking brake and carry out a brake test at low speed.

13.3 RUNNING-IN

During the first operating period, components settle and must be checked:

TABLE 13.1 – RUNNING-IN CHECKS

WHEN	CHECK
After the first 100 km (laden)	Re-tighten the wheel nuts to the specified torque (Section 14.6)
After 200 km	Re-tighten the wheel nuts again
After the first 1,000 km	Check the wheel-bearing play; check the brake adjustment; check the U-bolts / axle fixings to the axle manufacturer's specification
After the first 1,000 km	Check the steering geometry and the zero position; check the pendular axle fixings
After 1 month	Check all bolted joints on the running gear, the king pin and the landing legs

NOTICE



Wheel nuts settle. New wheels, and wheels that have been refitted, settle on the hub during the first kilometres. Re-tightening the wheel nuts after 100 km and 200 km is essential – loose wheel nuts can lead to the loss of a wheel. This also applies after every wheel change.

New brake linings and pads reach their full performance only after they have bedded in. Brake gently and progressively during the first 1,000 km where traffic allows, and avoid long periods of continuous braking.

MAINTENANCE AND SERVICING

14

Regular inspection and maintenance keep the semi-trailer safe, roadworthy and in compliance with the type approval – and they are a condition of the warranty. Small defects found early are quick and inexpensive to correct.

14.1 SAFETY DURING MAINTENANCE

WARNING



Risk of injury from moving parts and stored energy. Before any maintenance work: park the semi-trailer on firm, level ground; apply the parking brake and place the wheel chocks; switch off the engine of the towing vehicle and remove the key; lower the suspension onto its mechanical stops or support the deck on blocks; retract and pin the deck; depressurise the pneumatic and hydraulic systems before opening them. Never work under a semi-trailer that is supported only by its suspension or a jack – always use axle stands of sufficient capacity.

- Wear the PPE listed in Section 2.6: at least safety footwear, gloves and safety goggles.
- Work on brakes, hydraulics and electronics may only be carried out by qualified specialists.
- Use only original STU spare parts or parts approved by STU. Order spare parts quoting the VIN.
- Dispose of used oils, greases, filters, batteries and cleaning agents in accordance with environmental regulations.
- Record every maintenance operation in the maintenance log (Appendix B).

14.2 MAINTENANCE SCHEDULE

The intervals below apply to normal operating conditions. Under severe conditions – construction sites, off-road use, high-pressure cleaning, de-icing salt, extreme temperatures – shorten the intervals. Where a component manufacturer specifies shorter intervals, those apply.

TABLE 14.1 – MAINTENANCE SCHEDULE (● = CARRY OUT)

ASSEMBLY / TASK	DAILY	WEEKLY	MONTHLY	3 MONTHS OR 25,000 KM	ANNUALLY
COUPLING AND CONNECTIONS					

Air couplings: clean, seals intact, protective caps present	●		
Electrical and hydraulic connectors: damage, corrosion, leaks	●		
Steering connection / steering wedge: wear, play		●	
King pin and king pin plate: clean, lubricate, check for damage		●	
King pin wear check (Section 14.9)			●
PENDULAR AXLES, STEERING AND BRAKES			
Tyres: visual check for damage; twin tyres not touching	●		
Tyre pressure		●	
Wheel nuts: check for tightness and rust streaks	●		
Wheel hubs: heating and grease leakage after a journey	●		
Suspension cylinders: leaks, piston rods	●		
Steering cylinders and track rods: leaks, play		●	
Pendulum bearings, steering knuckles: lubricate		●	
Steering pre-charge pressure	●		
Steering geometry / zero position: check and synchronise			●
Brake linings / pads: wear		●	
Brake adjustment (slack adjusters)			●
Wheel-bearing play			●
Wheel-bearing grease change (or per axle manufacturer)			●
Brake test on roller dynamometer			●
PNEUMATIC SYSTEM			
Air leaks (listen)	●		
Drain the compressed-air reservoir		●	
Air lines and hoses: chafing, porosity		●	
HYDRAULIC SYSTEM			
Hydraulic oil level		●	
Hoses and fittings: leaks, chafing		●	
Accumulators (if fitted): pre-charge pressure			●
Hydraulic oil and filter change			●
GOOSENECK			
Neck hooks, hook pins and neck locks: function, wear, cracks		●	
Neck lift cylinders and lines at the neck joint: leaks		●	

Crack inspection of neck and deck front (workshop)


TELESCOPIC DECK AND CHASSIS

Locking pins and pin holes: wear, deformation



Telescopic guides and wear pads: clean and lubricate



Lighting, extension cables, marker boards



Deck, lashing points: damage, cracks



Chassis welds and structure: cracks, deformation, corrosion



Landing legs: function and lubrication



Paint damage: repair



14.3 LUBRICATION

Proper lubrication is one of the most important factors for the service life of the semi-trailer's moving parts.


FIGURE 14.1 Lubrication points – STUP3

TABLE 14.2 – LUBRICATION CHART

POINT	LOCATION	LUBRICANT	INTERVAL
A	King pin and king pin plate	Fifth-wheel grease or graphite grease	Weekly / after cleaning
B	Suspension cylinder pivots	Multi-purpose lithium grease (NLGI 2)	Weekly
C	Pendulum bearings, steering knuckles and track-rod ends	Per axle manufacturer	Weekly / per axle manufacturer
D	Telescopic guides and wear pads	Grease suitable for sliding surfaces (per STU)	Monthly and before extending
E	Neck hooks, hook pins, neck locks and neck-cylinder pins	Multi-purpose lithium grease (NLGI 2)	Weekly / before detaching
F	Slewing rings (steering bearings) and swing-arm pivots	Per axle manufacturer	Weekly
G	Steering turntable and steering wedge	Fifth-wheel grease	Weekly

–	Wheel bearings	High-temperature wheel-bearing grease per axle manufacturer	Annually or per axle manufacturer
–	Locks, hinges, toolbox, locking pins	Multi-purpose grease or spray lubricant	Monthly

Rules for lubricating:

- Clean grease nipples before applying the grease gun.
- Pump in grease until fresh grease emerges from the bearing gap; wipe off the old grease that is pushed out.
- Leave a small amount of grease on the nipple head as protection.
- Do not over-lubricate brake components – grease on linings or discs severely reduces braking performance.
- Never drive without hub caps. Dirt and water entering the hub will destroy the wheel bearings.

14.4 RUNNING GEAR

14.4.1 WHEEL-BEARING PLAY

Check the wheel-bearing play after the first 1,000 km and then at the intervals in Section 14.2. Many modern axles have maintenance-free, pre-adjusted hub units – in that case follow the axle manufacturer's instructions and do not attempt to adjust them.

For adjustable taper-roller bearings:

- 1 Couple the semi-trailer, apply the towing vehicle's parking brake and chock the wheels on the opposite side.
- 2 Raise the axle with a jack placed under the axle beam close to the wheel until the tyre is clear of the ground. Support the axle securely on an axle stand.
- 3 Check for play by rocking the wheel at the top and bottom. If the play is excessive, remove the hub cap and the axle-nut locking device.
- 4 Turn the wheel and at the same time tighten the axle nut until the wheel just begins to drag.
- 5 Back off the axle nut to the next locking position (typically $\frac{1}{6}$ to $\frac{1}{3}$ of a turn), as specified by the axle manufacturer.
- 6 Secure the nut with a new locking device; refit the hub cap with a new seal.
- 7 Check that the wheel turns freely without noticeable drag, apart from light contact of the brake linings.
- 8 After a short test drive, check the hub temperature by hand. A hub that is clearly hotter than the others indicates incorrect adjustment, contaminated grease or bearing damage.

14.4.2 SUSPENSION

- Check the suspension cylinders of every pendular axle for leaks and damage to the piston rods.
- Check the pendular axle pivots (pendulum bearings) and the steering knuckles for play; lubricate them at the intervals in Section 14.3.
- Check the ride height and the even distribution of the suspension pressures (pressure gauges per circuit) with the vehicle unladen and laden.

14.5 BRAKES

14.5.1 PNEUMATIC SYSTEM

- Drain condensed water from the compressed-air reservoir weekly – pull or tilt the drain valve while the reservoir is under pressure. Clean the drain valve before winter.
- If oil or a large quantity of water comes out, the air supply from the towing vehicle is not clean and dry; have the towing vehicle's air dryer checked. Damage caused by contaminated compressed air is not covered by the warranty.
- Find leaks by listening for hissing, or by applying soapy water to the connections. Replace leaking seals, lines and components.
- The operating pressure of the dual-line system is approximately 6.5 – 8.5 bar.

14.5.2 BRAKE ADJUSTMENT AND WEAR

- Check the brake linings / pads for wear monthly and replace them in axle sets when the wear limit is reached.
- The semi-trailer is normally fitted with automatic slack adjusters. Check their function every 3 months: the stroke of the brake chamber push rod must stay within the axle manufacturer's limits. Do not use automatic slack adjusters to adjust the brakes manually except during brake re-lining.
- After new linings or pads have been fitted, bed them in and re-check the adjustment.
- Have the brakes checked annually on a roller brake tester. Under UN Regulation No. 13, the service brake of a semi-trailer must achieve a braking rate of at least 45 % of the permissible load, and the parking brake must be able to hold the laden semi-trailer on an 18 % gradient. The difference in braking force between the left and right wheels of an axle must not exceed the limit set by the periodic-inspection rules in force.

WARNING



Brake failure. Work on the braking system – including the EBS – may only be carried out by trained specialists using the brake manufacturer's diagnostic equipment. Never cage a spring brake chamber or open a brake valve without following the manufacturer's instructions.

14.6 WHEELS AND TYRES

14.6.1 TYRES

Use only tyres of the size, load index, speed category and type approved for the semi-trailer (see the CoC). Do not mix tyres of different sizes or construction on one axle.

TABLE 14.3 – APPROVED TYRE SIZES AND RECOMMENDED INFLATION PRESSURES (COLD TYRES, MAXIMUM LOAD) – THE SIZES APPROVED FOR YOUR SEMI-TRAILER ARE LISTED IN ITS CoC

TYRE SIZE	LOAD INDEX	SPEED SYMBOL	INFLATION PRESSURE
Size as stated in the CoC (twin or single tyres, small-diameter)	TBC	TBC	TBC

- Check the tyre pressure weekly with a calibrated gauge, with the tyres cold. Observe the tyre manufacturer's recommendations.

- Correct tyre pressure prevents irregular wear and tyre failure, and reduces fuel consumption.
- Check tyres daily for cuts, bulges, embedded objects and exposed cords. Minimum tread depth: as required by national law (in the EU generally 1.6 mm; national rules may be stricter).



FIGURE 14.2 Check the pressure with a calibrated gauge



FIGURE 14.3 Gauge in good condition (left) – damaged gauge (right)

14.6.2 WHEEL NUTS

TABLE 14.4 – WHEEL-NUT TIGHTENING TORQUES – ALWAYS CHECK THE VALUE SPECIFIED BY THE AXLE MANUFACTURER

THREAD	TIGHTENING TORQUE
M18 × 1.5	330 – 370 N·m
M20 × 1.5	450 – 550 N·m
M22 × 1.5	600 – 660 N·m
M24 × 1.5	820 – 960 N·m

- Tighten wheel nuts diagonally in several stages using a calibrated torque wrench.
- Re-tighten after 100 km and again after 200 km following every wheel change.
- Do not lubricate the threads unless the axle manufacturer specifies it.

14.6.3 WHEEL ALIGNMENT

Correct axle alignment ensures that the semi-trailer follows the towing vehicle in a straight line, minimises tyre wear and rolling resistance and saves fuel. Have the axle alignment checked whenever uneven tyre wear is found, after an accident and after work on the suspension.

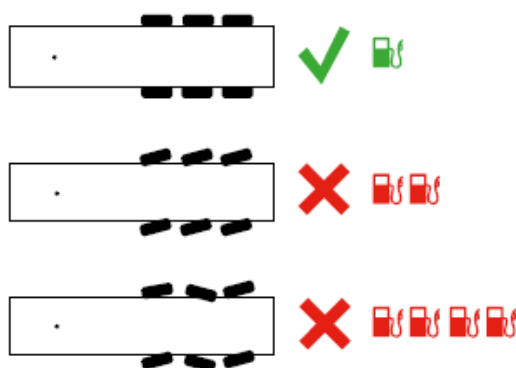


FIGURE 14.4 Correct and incorrect axle alignment

14.7 HYDRAULIC SYSTEM

- Check the oil level in the hydraulic reservoir weekly with the suspension at ride height and the steering centred. Use only the oil specified on the power unit, typically HLP 46 (ISO 6743-4 HM); in cold climates HVLP.
- Change the hydraulic oil and filters at least annually.
- Bleed the steering and suspension circuits after any work on them and re-synchronise the steering. Detailed service instructions for the hydraulic system, the pendular axles and the gooseneck are given in Chapter 15.
- Check hoses and cylinders for leaks and damage. Replace hydraulic hoses at the latest six years after their date of manufacture, including a maximum of two years' storage, or immediately if they are damaged.
- Keep hydraulic couplings clean and closed with their dust caps when not in use.

WARNING



Hydraulic oil under pressure. Escaping hydraulic oil can penetrate the skin and cause serious injury. Never feel for leaks with your hand. Lower all hydraulically operated parts and depressurise the system before opening any hydraulic connection. If oil penetrates the skin, seek medical help immediately.

14.8 ELECTRICAL SYSTEM

- Check all lamps daily. Replace defective lamps and lenses at once.
- When replacing lamps or lighting components, check that the connections and lens seals are watertight.
- Keep connectors clean and protect the contacts with a suitable contact spray.
- Before welding, disconnect the EBS modulator, control units and the batteries.

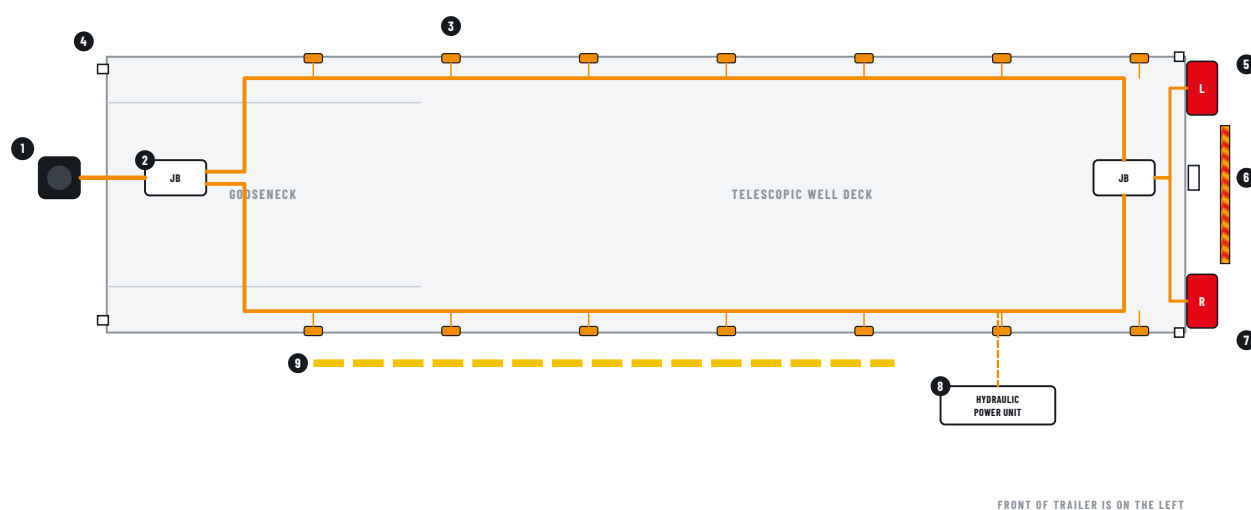


FIGURE 14.5 Lighting installation – schematic top view

- | | |
|--|---|
| 1 15-pole socket ISO 12098 (7-pole sockets optional) | 2 Junction boxes (front and rear) |
| 3 Side marker lamps — amber, at intervals of max. 3 m | 4 Front position lamps — white |
| 5 Rear lamp clusters, left and right | 6 Number-plate lamp |
| 7 End-outline marker lamps | 8 Hydraulic power unit / control (if fitted) |
| 9 Retro-reflective conspicuity marking (UN R104) | |

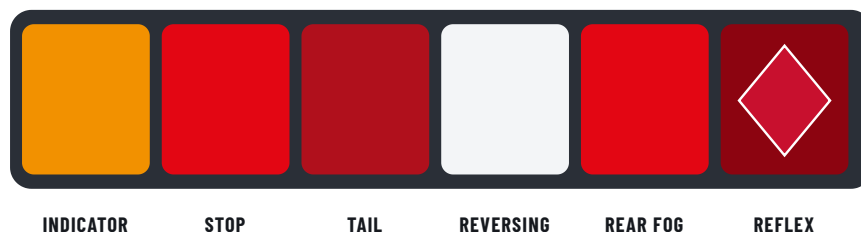


FIGURE 14.6 Rear lamp cluster — typical function layout

14.9 KING PIN

The king pin is a safety-critical component approved under UN Regulation No. 55.

- Keep the king pin and the king pin plate clean and lubricated.
- Check the king pin every 3 months with a king pin gauge. Replace the king pin if its diameter at the locking zone falls below **49.0 mm** (2" king pin) or **86.0 mm** (3½" king pin), or if it is cracked, bent or otherwise damaged — or earlier if the king pin manufacturer specifies stricter limits.
- Check the tightness of the king pin fixing bolts to the manufacturer's specified torque.
- Only replace the king pin with an approved king pin of the same type and fix it with new bolts.



FIGURE 14.7 King pin (example)

14.10 BOLT TIGHTENING TORQUES

Check bolted joints regularly and re-tighten if necessary. Unless a different value is specified for a particular joint, use the following torques for metric coarse-thread bolts:

TABLE 14.5 — GENERAL TIGHTENING TORQUES

THREAD	PROPERTY CLASS 8.8	PROPERTY CLASS 10.9	PROPERTY CLASS 12.9
M6	9.9 N·m	14 N·m	17 N·m

M8	24 N·m	34 N·m	41 N·m
M10	48 N·m	68 N·m	81 N·m
M12	85 N·m	120 N·m	145 N·m
M14	135 N·m	190 N·m	225 N·m
M16	210 N·m	290 N·m	350 N·m
M18	290 N·m	400 N·m	480 N·m
M20	400 N·m	570 N·m	680 N·m
M22	550 N·m	770 N·m	920 N·m

14.11 CLEANING AND CORROSION PROTECTION

- Clean the semi-trailer regularly, particularly after use on construction sites and in winter when de-icing salt is used.
- When using a high-pressure washer, keep a distance of at least 30 cm and do not aim the jet directly at bearings, seals, air bellows, valves, electrical connectors, the EBS modulator, hydraulic valves and the telescopic guides or labels.
- Use only cleaning agents that are suitable for painted steel and plastic components.
- Repair paint damage promptly: clean and degrease the damaged area, apply primer and top coat of the same colour and film thickness.



Protect the environment. Clean the semi-trailer only at washing bays with an oil separator. Collect used oils, greases, hydraulic fluid and contaminated cleaning materials and dispose of them through an authorised waste-disposal company.

HYDRAULICS, PENDULAR AXLES AND GOOSENECK – SERVICE

15

This chapter supplements the general maintenance chapter with the inspections and service work specific to the hydraulic system, the pendular axles, the steering and the detachable gooseneck. Work marked **(W)** may only be carried out by a workshop trained in hydraulic heavy-haulage running gear.

15.1 RELIEVING THE HYDRAULIC PRESSURE

Before opening any part of the hydraulic system:

- 1 Unload the vehicle, park it in a straight line, centre the steering and insert the turntable locking pin.
- 2 Lower the suspension onto its lower mechanical stops, or support the chassis securely on axle stands. Lower the front of the deck onto supports or couple it to the towing vehicle with the neck locks closed.
- 3 Switch off the power supply and remove the key; disconnect the PTO couplings.
- 4 Operate all control levers back and forth several times to relieve the residual pressure in the valve block.
- 5 For the steering circuits **(W)**: relieve the pre-charge pressure through the charging valve and isolate the accumulators as described in the hydraulic diagram. Accumulators remain charged with nitrogen – never open an accumulator.
- 6 Loosen fittings slowly and with a cloth over them; collect the oil.

15.2 INSPECTION AND SERVICE INTERVALS

TABLE 15.1 – INSPECTION AND SERVICE INTERVALS – HYDRAULICS, PENDULAR AXLES, STEERING AND GOOSENECK (● = INTERVAL; SHORTEN THE INTERVALS UNDER SEVERE CONDITIONS)

COMPONENT / TASK	DAILY	WEEKLY	3 MONTHS	12 MONTHS
SUSPENSION CYLINDERS				
Leaks, damage and corrosion of the piston rods; cylinder mountings	●			
Sinking test (Section 15.3)			●	
PENDULUM BEARINGS, SWING-ARM PIVOTS				
Lubricate		●		
Check play (Section 15.4)			●	
SLEWING RINGS / STEERING BEARINGS				
Lubricate		●		
Check fixing bolts for tightness (W)				●
STEERING				
Pre-charge pressure of both circuits	●			
Track rods, ball joints, steering levers: play, damage, split pins		●		
Steering cylinders: leaks, mountings		●		
Zero position / synchronisation; tyre-wear pattern			●	
Accumulator nitrogen pre-charge (W)				●
STEERING WEDGE AND TURNTABLE				
Wear of the wedge, play in the turntable, locking pin		●		
GOOSENECK				
Neck hooks and hook pins: wear, cracks, deformation		●		
Neck locks: function, indicator, safety catches	●			
Neck lift cylinders: leaks, mountings, pins		●		
Crack inspection of the neck, hooks and deck front (W)				●
COUPLINGS AT THE NECK JOINT				
Clean, seals, dust caps; leak-free couplings without oil loss	●			
HYDRAULIC HOSES				
Chafing, cracks, bulges, leaks at fittings		●		

Replace (Section 15.5)(W)

 as
required

OIL AND FILTERS			
Oil level	●		
Filter indicator / filter change		●	●
Oil change and oil analysis (W)			●
POWER UNIT (IF FITTED)			
Engine oil, fuel, battery; manufacturer's instructions	●		
REMOTE CONTROL (IF FITTED)			
Function of the emergency stop and the enabling button	●		

15.3 SINKING TEST OF THE SUSPENSION

The sinking test shows whether the suspension cylinders and valves hold their oil.

- 1 Raise the laden or unladen vehicle to ride height on level ground, with the cross-connection valve closed.
- 2 Mark the height of the deck above a fixed reference at each corner of the bogie, and note the gauge pressures.
- 3 Leave the vehicle for **1** hour without operating the hydraulics, at a constant temperature.
- 4 Measure again. If the deck has sunk by more than **TBC** mm, or one side has sunk more than the other, a cylinder seal or a valve is leaking – have it checked (W).

15.4 CHECKING THE PLAY OF THE PENDULAR AXLES

- 1 Raise the bogie with the suspension until the wheels of the axle line concerned are just off the ground, or jack it at the marked jacking points; support it on axle stands.
- 2 Rock each pendular axle by hand or with a lever at the wheels: vertically (swing-arm pivots), around the longitudinal axis (pendulum bearing) and around the vertical axis (steering bearing, track-rod ends).
- 3 Any clearly perceptible play, knocking noise or rust trace at a bearing must be measured by a workshop (W) and the bearing bushes or bolts replaced if the limit of the axle manufacturer is exceeded **TBC**.

15.5 HYDRAULIC HOSES

- Replace hydraulic hoses as soon as they show damage, cracks, bulges, leaks or exposed reinforcement – and in any case after a service life of **6 years** including a maximum storage time of 2 years (manufacturing date on the hose fitting), in line with the recommendations of ISO 8331 and DIN 20066.
- Use only hoses of the same type, pressure rating and length. Lay them without twisting and with the original clamps and chafe guards.
- After replacing a steering or suspension hose, the circuit must be bled and – for the steering – synchronised and pre-charged (W).

15.6 BLEEDING THE CIRCUITS (W)

Air in the circuits makes the suspension soft and the steering imprecise. Bleeding is necessary after any work on the circuits, after a hose failure and when the steering cannot be synchronised.

- **Suspension:** raise and lower the bogie several times over the full stroke with the circuits open; open the bleed screws at the highest points of the cylinders until oil without bubbles emerges.
- **Steering:** steer the axles several times to both stops with the auxiliary steering while bleeding the slave cylinders at their highest points; then synchronise and pre-charge the circuits.
- Top up the oil after bleeding and check all fittings for leaks.

15.7 HYDRAULIC OIL AND FILTERS

- Check the oil level weekly with the suspension at ride height, the gooseneck in the travel position and the steering centred.
- Change the return-filter element when the filter indicator shows red, and at least every 12 months.
- Change the oil every 12 months or when an oil analysis shows contamination, water or ageing. Recommended cleanliness class: ISO 4406 **18/16/13** or better.
- Fill new oil only through a filter. Collect used oil and filters and dispose of them through an authorised waste-disposal company.

15.8 TIGHTENING TORQUES

TABLE 15.2 – TIGHTENING TORQUES – PENDULAR AXLES (THE AXLE MANUFACTURER'S VALUES TAKE PRECEDENCE)

CONNECTION	TORQUE
Slewing-ring (steering bearing) bolts	TBC Nm
Pendulum-bearing bolts / nuts	TBC Nm
Swing-arm pivot bolts	TBC Nm
Suspension-cylinder pins (retaining bolts)	TBC Nm
Track-rod ends	TBC Nm
Wheel nuts	See Section 14.6

TROUBLESHOOTING

16

The table below lists common faults, their likely causes and the remedy. If a fault cannot be clearly identified or rectified, or if it affects the brakes, the coupling, the hydraulic system or the structure of the semi-trailer, contact an authorised workshop or STU.

TABLE 16.1 – FAULT-FINDING TABLE

FAULT	POSSIBLE CAUSE	REMEDY
Brake drums / discs overheat	Brakes incorrectly adjusted; slack adjuster faulty; brake sticking	Check the adjustment and the slack adjusters; have the brake overhauled
Wheel hub overheats	Wheel-bearing play too small; grease contaminated or insufficient; bearing damaged	Adjust the bearing play; renew the grease; replace damaged bearings
Grease on brake linings	Hub seal damaged, worn or incorrectly fitted	Replace the seal; clean the brake; replace contaminated linings; adjust the bearings
Uneven braking, semi-trailer pulls to one side	Linings contaminated or worn; brakes incorrectly adjusted; brake chamber faulty	Inspect and clean or replace the linings; adjust; replace faulty components
Insufficient braking performance	Brakes out of adjustment; linings glazed or worn; low air pressure; EBS fault	Check the air supply (≥ 6.5 bar); have the brakes and EBS checked by a specialist
Parking brake cannot be released	Insufficient reservoir pressure; supply line not connected; red PREV button pulled out	Connect the supply line; build up pressure; push in the red button (Section 4.5)
EBS / ABS warning lamp lit	ISO 7638 connector not connected or damaged; sensor or modulator fault	Check the connector and cable; have the fault memory read by a brake specialist
Air leak at couplings or connections	Loose connection; damaged seal	Tighten or replace the connection or seal
Air leak at a valve or brake chamber	Worn seals; mechanical damage	Replace the seals or the complete component
Lights do not work	Bulb or LED unit defective; fuse; connector corroded; cable damaged	Replace the lamp; check the fuse; clean the connector; repair the cable

Gooseneck hooks do not engage or release	Towing vehicle not in line; deck front not lowered far enough; hooks dirty or deformed	Align the towing vehicle; lower further; clean and inspect the hooks
Neck locks do not close / indicator not "locked"	Locking bolts not aligned with their bores; deck not at travel position; locks dirty	Adjust the deck height with the neck cylinders; clean and lubricate the locks
Deck front sinks while driving	Neck lift cylinder or valve leaking; neck locks open	Stop; check the neck locks; have the cylinder checked
Suspension pressure LEFT and RIGHT very different	Load off-centre; cross-connection valve open; leak in one circuit	Re-position the load; close the valve; check for leaks
Suspension pressure above the maximum	Bogie overloaded; suspension at a mechanical stop	Reduce or re-position the load; return to ride height
Deck sinks when parked	Internal leakage of a cylinder or valve; temperature drop	Carry out the sinking test (Section 15.3); have the leak repaired
Steering pre-charge pressure too low / falling	Leak in a steering circuit or coupling; accumulator faulty	Top up the pre-charge; find and repair the leak; check the accumulators
Bogie weaves or does not run in the track	Steering not synchronised; steering wedge loose in the fifth-wheel slot; air in the circuits	Synchronise; check the wedge and the slot; have the circuits bled
Steering does not move / bogie dragged sideways	Turntable locking pin inserted; shut-off valves at the neck joint closed	Remove the pin; open the valves
No hydraulic function	Supply not running; return line not connected; emergency stop pressed; remote control not paired	Check the supply and couplings; unlock the emergency stop; pair the transmitter
Vehicle not level / one side low	Suspension circuit leaking; circuit valve not in the travel setting; air in the system	Check the circuit valves and gauges; level the vehicle; have the leak repaired
Rear axles do not follow the towing vehicle	Steering not synchronised; leak in a steering circuit; steering connection worn	Stop; centre and synchronise the steering; check for leaks
Steering hard or jerky	Air in the steering circuits; low oil level	Top up oil; bleed the circuits
Deck does not extend / retract	Locking pins not fully removed; trailer brake not applied; guides dry or dirty	Remove all pins; apply the trailer brake; clean and lubricate the guides
Uneven tyre wear	Incorrect tyre pressure; axle misalignment; overloading	Correct the pressure; have the alignment checked; observe the axle loads
Landing legs hard to operate	Lack of lubrication; bent spindle; gear not fully engaged	Lubricate; check for damage; engage the gear correctly

STORAGE, DECOMMISSIONING AND DISPOSAL

17

17.1 TEMPORARY STORAGE

If the semi-trailer is taken out of service for a longer period:

- 1 Clean the semi-trailer thoroughly and repair any paint damage.
- 2 Park it on firm, level, well-drained ground — preferably under cover.
- 3 Retract the deck and insert all locking pins; lower the suspension to its mechanical stops or support the deck on blocks.
- 4 Support the chassis so that the tyres are relieved of load, or check the tyre pressure monthly. Protect the tyres from direct sunlight.
- 5 Drain the compressed-air reservoir.
- 6 Lubricate all lubrication points and protect bright metal parts and exposed cylinder rods with a corrosion inhibitor.
- 7 Disconnect on-board batteries (*if fitted*) and keep them charged.
- 8 Secure the semi-trailer against unauthorised use and against access by children.
- 9 Protect the piston rods of the suspension and steering cylinders with a suitable preservative.

Before putting the semi-trailer back into service, carry out the commissioning procedure in Chapter 13.

17.2 DISPOSAL

At the end of its service life, the semi-trailer must be disposed of in an environmentally responsible manner.

- Hand the semi-trailer over to an authorised end-of-life vehicle treatment facility.
- The certificate of destruction issued by the facility is required to de-register the semi-trailer.
- Drain hydraulic oil, lubricants and other fluids beforehand and dispose of them separately.
- Steel, aluminium, timber, rubber and plastic components can be recycled.



Recycling. Most of the semi-trailer's mass is steel and can be recycled almost completely. Usable components may be reconditioned and reused, provided they are inspected and approved for further use.

WARRANTY

18

18.1 WARRANTY PERIOD

TABLE 18.1 – WARRANTY PERIODS

WARRANTY	SCOPE	PERIOD
Standard warranty	Defects in material and workmanship of the semi-trailer	12 months from the date of delivery
Production (structural) warranty	Chassis and welded structure	24 months or 250,000 km from the date of delivery, whichever comes first
Paint warranty	Coating system (provided by the paint supplier)	24 months from the date of delivery

18.2 WARRANTY PROCEDURE

- Warranty claims must be notified to STU **before** any repair is carried out. Repairs that have not been notified and approved in advance will not be accepted.
- Warranty repairs must be carried out by an STU-authorised service partner or a workshop approved by STU in writing.
- Only original STU parts or parts from STU-approved suppliers may be used.
- Replaced parts must be kept by the authorised service partner for 180 days and made available to STU on request. Parts replaced under warranty must then be scrapped so that they cannot be re-used.
- STU reserves the right to inspect the semi-trailer before and during the repair.
- A warranty repair does not extend or renew the warranty period of the semi-trailer.
- Warranty claims can only be made by the owner of the semi-trailer or by a party acting on the owner's behalf.
- Invoices for approved warranty work must quote the STU authorisation number and the VIN.
- The general terms and conditions of STU apply. The full warranty terms are available from STU and at www.stutrailer.com.

18.3 EXCLUSIONS

The following are **not** covered by the warranty:

- wear parts and consumables, such as tyres, brake linings and pads, brake drums and discs, air bellows, bulbs, timber flooring, filters, oils and greases;
- damage caused by improper use, overloading, accidents, abnormal driving behaviour or operation under abnormal conditions;
- damage caused by inadequate or incorrect maintenance, or by contaminated compressed air from the towing vehicle;
- damage caused by modifications or repairs not approved by STU;
- consequential and indirect costs, including recovery, towing, replacement vehicles, semi-trailer hire, transport costs, call-out charges, subsistence, loss of revenue and damage to the load;
- routine maintenance costs.

STU may refuse a warranty claim if the warranty conditions or the general terms and conditions have not been observed.

APPENDICES

19

19.1 APPENDIX A – TRAILER DATA SHEET

Complete this sheet at handover from the statutory plate and the Certificate of Conformity.

TABLE 19.1 – TRAILER DATA

ITEM	VALUE
VIN	
Type / variant / version	
EU type-approval number	
Number of axles / lift axle / steering axle	
Technically permissible max. laden mass	kg
Permissible mass on the king pin	kg
Permissible axle / axle-group load	kg
Unladen mass	kg
King pin size	2" ☐ 3½" ☐
Tyre size	
Axle make and type	
Brake system make and type	
Date of first registration	
Registration number	

19.2 APPENDIX B – MAINTENANCE LOG

TABLE 19.2 – MAINTENANCE LOG

DATE	KM READING	WORK CARRIED OUT	WORKSHOP / NAME	SIGNATURE

19.3 APPENDIX C – HANDOVER AND INSTRUCTION RECORD

The undersigned confirm that the semi-trailer identified below has been handed over complete and in working order, and that the persons named have been instructed in its safe operation, loading, load securing and maintenance on the basis of this user manual.

TABLE 19.3 – HANDOVER DATA

ITEM	DETAILS
VIN	
Date of handover	
Dealer / STU representative	
Customer	
Persons instructed	

Signature – dealer / STU

Signature – customer

19.4 APPENDIX D – WARRANTY CERTIFICATE

TABLE 19.4 – MANUFACTURER

MANUFACTURER	
Name	STU Treyler Dorse İthalat İhracat Ltd. Şti.
Address	Fevzi Çakmak Mah. 10664 Sk. No: 30 / 1, Karatay / Konya, Türkiye
Telephone	+90 541 336 63 77
E-mail	info@stutrailer.com
Website	www.stutrailer.com

TABLE 19.5 – AUTHORISED PARTNER

AUTHORISED PARTNER / DEALER	
Name	
Address	

Telephone

E-mail

TABLE 19.6 – PRODUCT

PRODUCT	
Trade name	STU pendular-axle low loader
VIN	
Date of delivery	
Customer name	

Stamp and signature — authorised partner

Signature — customer

**READ THIS MANUAL BEFORE USE.
KEEP IT WITH THE LOW LOADER AT
ALL TIMES.**



STU TREYLER DORSE İTHALAT İHRACAT LTD. ŞTİ.

Fevzi Çakmak Mah. 10664 Sk. No: 30 / 1

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