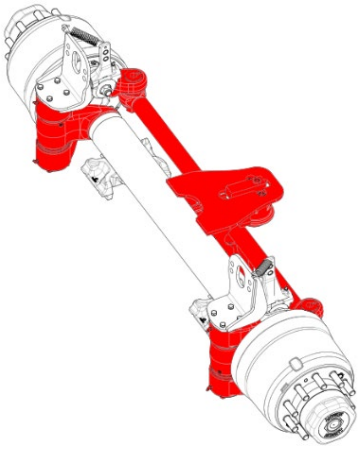
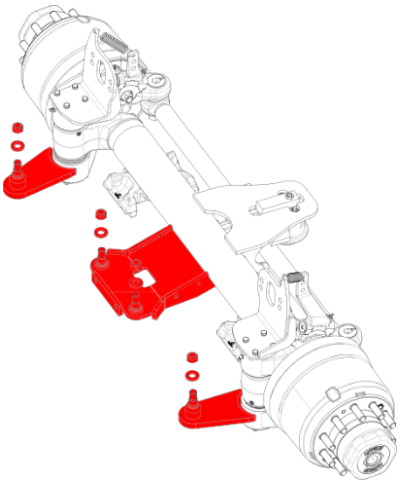
Self-steering axles K2, K3 and GH7 12010

Self-steering axle:



Self-steering axle with hydraulic additional steering:



Mode of operation

To produce a steering angle with the self-steering axle, the steering knuckle pin (pivot point) is set with an offset to the front towards the centre of the axle. This offset causes the lateral forces acting on the wheels to steer the wheels when driving in curves. To achieve uniform turning of the wheels, the steering arms are connected to the direction bar.

During the transition from driving the curve to driving straight ahead, the lateral forces decrease and the wheels go back to the straight-ahead position. This process is supported by the stabilisation bellow, which is pressurised with compressed air between 1 and 6 bar, depending on the load status of the vehicle. The stabilisation bellow also prevents wobbling of the wheels.

To drive in reverse, the self-steering axle must be locked in the straight-ahead position. This is achieved by actuating the locking cylinder. When the lock is activated, the turned self-steering axle normally moves through the neutral position after a few metres on firm ground and is locked.

For the self-steering axle with hydraulic additional steering, the advantage of friction steering is used for driving straight ahead. When driving in reverse, the advantage of hydraulic steering is used. Here, the lock is actively suspended when driving in reverse. A turning angle sensor on the vehicle records the steering angle and transmits it to the hydraulic additional steering, so that a tighter radius can be achieved when driving in reverse during shunting operations.

General information

- In general, the vehicle manufacturer is responsible for checking the overall system for freedom of movement at the minimum/maximum driving, slack adjuster, and angular position with its mounting components after installing the self-steering axle (with hydraulic additional steering).
- The vehicle manufacturer and the supplier of the actuation for the self-steering axle or hydraulically supported self-steering axle must comply with the legal provisions according to StVZO (German Road Traffic Licensing Regulations) §32d, ECE R79 and observe the national regulations.
- Each vehicle manufacturer is responsible for the design of the stabilisation systems. With this guideline, gigant is giving a recommendation for possible systems. Due to the high diversity of models, gigant cannot guarantee that the suggested systems will work properly in all vehicle types. For specific vehicle types, road tests can be required to verify the driving stability.
- The steering angle of the self-steering axles is adjusted at the factory for the steering angle specified in the axle drawing according to the combination of track, spring centre, standard brake cylinder, and tyre suggestion, and is aligned to a toe-in of 5 ± 1 mm/m.
- The chassis must be adjusted according to the combination of spring centre, track, brake cylinder, suspension type, axle, steering angle and tyres (released, if necessary).
- The stabilisation bellow, which guides the wheels back to the straight-ahead position after driving a curve and stabilises driving straight ahead, must be pressurised with air pressure adapted to the load status. In doing so, the air pressure in an empty state should not fall below 1 bar and should be of approx. 6 bar in a loaded state.

- With the air suspension, the stabilisation bellow is often directly supplied with compressed air from the air suspension. With the mechanical suspension, a separate compressed air supply must be ensured. This should take place through a pressure regulator, which is regulated by a control arm according to the load status.
- The circuit of the locking unit for the self-steering axle must be designed such that when there is a pressure loss, the stabilisation or locking unit engages the locking block in the locking unit. . This is generally achieved when the lock goes into the locked position without air supply.
- The actuation pressure for the locking cylinder of the lock must be between 6 and 8 bar
  (Attention: Air pressure above 8 bar can cause damage to the locking cylinder).
- The locking unit can be actuated in different ways:
  - Engaging the reverse gear
    Before the lock is triggered by engaging the reverse gear, the vehicle must be aligned straight ahead so that the locking block can engage.
    If the vehicle is not aligned straight, the turned self-steering axle normally moves through the neutral position after a few metres on firm ground and is locked. On uneven ground or when the steering angle is too big, the wheels might go to the steering stop and be blocked when driving in reverse. In this case, the vehicle must be pulled straight immediately to prevent damage to the steering system etc.
  - Engaging the reverse gear and switch in the driver's cab
    Before the lock is triggered by engaging the reverse gear or by the switch in the driver's cab, the vehicle must be aligned straight ahead so that the locking block can engage.
    The switch in the driver's cab is a useful supplement to avoid repeated locking and unlocking when manoeuvring or to activate the lock before driving in reverse in tight situations.
    Recommendation:
    The switch for activating the lock should always be installed in conjunction with a control lamp!
  - Automatic control for the self-steering axle with hydraulic additional steering
    With the automatic control of the self-steering axle with hydraulic additional steering, the control must ensure that the lock is deactivated before driving in reverse to prevent damage to the steering system etc.
- The locking unit must be deactivated above a speed of 10 km/h straight ahead, regardless of the type of control. A permanent lock is allowed only in the exceptional case of a pressure loss in the stabilisation or locking unit. In this case, gigant recommends visiting a specialist workshop promptly.

1. Circuits

The circuit examples listed in the following serve as a reference. It is important that the circuits are optimally configured for the vehicle type and that the contents listed under the "General information" point are taken into account.

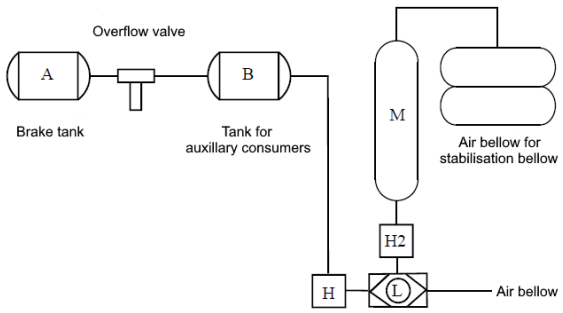
1.1. Stabilisation unit

Suggestion for stabilisation system, ratio of rigid axles to self-steering axles > 1.

1.1.1. Air suspension

H is a pressure limiter for limitation to 1 bar. L is a 2-way valve. The pressure in the stabilisation bellow corresponds either to that of the air bellow (air bellow pressure > 1 bar to max. 6 bar) or to the pressure supplied by the pressure limiter H (air bellow pressure < 1 bar). H2 limits the maximum pressure to 6 bar.

Scheme – Compressed air regulation in the stabilisation bellow:



Special cases:

- In certain cases where the pressure in the air bellows (empty or under load) is **always** between the values required by the stabilisation bellow (>1 bar and max. 6 bar), the limitation valve H, H2 the 2-way valve L, and tank M can be omitted. The stabilisation bellow is connected directly to the air bellow of an air suspension.
  Remark: Check the behaviour of the self-steering axle when the vehicle is unloaded and loaded!

- For special vehicles where the load on the self-steering axle is constant, it is possible to install a pressure limiter that ensures compliance with the limit values (>1 bar, max. 6 bar).
  Remark: Check the behaviour of the self-steering axle when the vehicle is unloaded and loaded!

- Ratio of rigid axle to self-steering axle = 1
  For this variation, please consult with gigant – Trenkamp & Gehle GmbH.

1.1.2. Mechanical suspension

H is a pressure limiter that is actuated using a control arm suspended on the axle. The deflection of the springs directly actuates the arm and causes a change in pressure in the stabilisation bellow within the limit values (>1 bar, max. 6 bar).

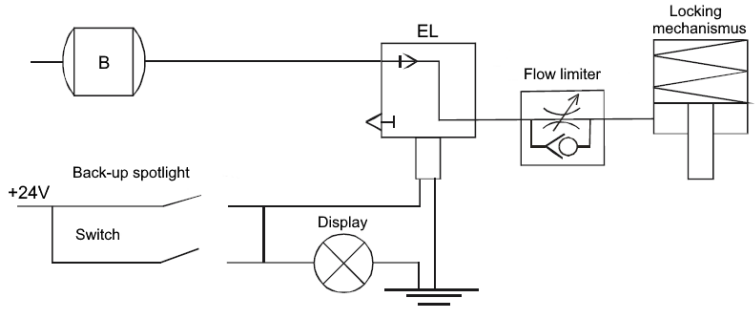
Remark: The 2-way valve (L) as well as the air bellow connection is no longer required for this application of the scheme shown under 1.1.1.

1.2. Locking unit

This suggested scheme can be used for the air suspension as well as for the mechanical suspension.

Scheme – System lock:

The compressed air travels directly from tank B through the voltage-actuated 3/2 solenoid valve (EL) and the flow limiter in the locking cylinder of the lock. The piston is retracted and the lock is free to move. If the voltage is removed from the valve, the 3/2 solenoid valve (EL) is closed and the spring force of the locking cylinder presses the piston out. This process is slowed down by the flow limiter.



Example: Actuation via the back-up spotlight

As soon as the reverse gear is engaged, the contact for the back-up spotlight, which actuates the 3/2 solenoid valve (EL) with voltage, is closed. A control lamp in the driver's cab lights up and the solenoid valve closes the compressed air supply from the tank (B). The spring of the locking cylinder presses the piston with the locking block into the locked position (locking cylinder is no longer pressurised). A flow limiter slows down the pressure reduction and prevents damage to the mechanism in case of a collision (axle not in straight-ahead position) between the locking block and the locking plate.

Remark:
This switch is an active safety mechanism. If the pressure drops in the supply system or if the supply line is defective, the self-steering axle will be automatically locked and can therefore still be used as a rigid axle.

Recommendation:
Parallel to the switch via the back-up spotlight, it is recommended to install a second switch in the driver's cab to prevent repeated locking and unlocking when manoeuvring for longer periods of time.

2. Toe-in

The toe-in is set at the factory at 5 mm ± 1 mm (0°17´ ± 4´).

If adjustment measures still need to be performed at a later time (e.g. after repairs), the following points must be observed:

! **The toe-in must be set on level solid ground!**

! **The system must be pressurised with compressed air!**

The locking unit must be unlocked!

The stabilisation bellow must be pressurised with 3 bar of compressed air!

! **For self-steering axles with hydraulic additional steering, the system must be depressurised!**

! **If necessary, disassemble the wheels!**

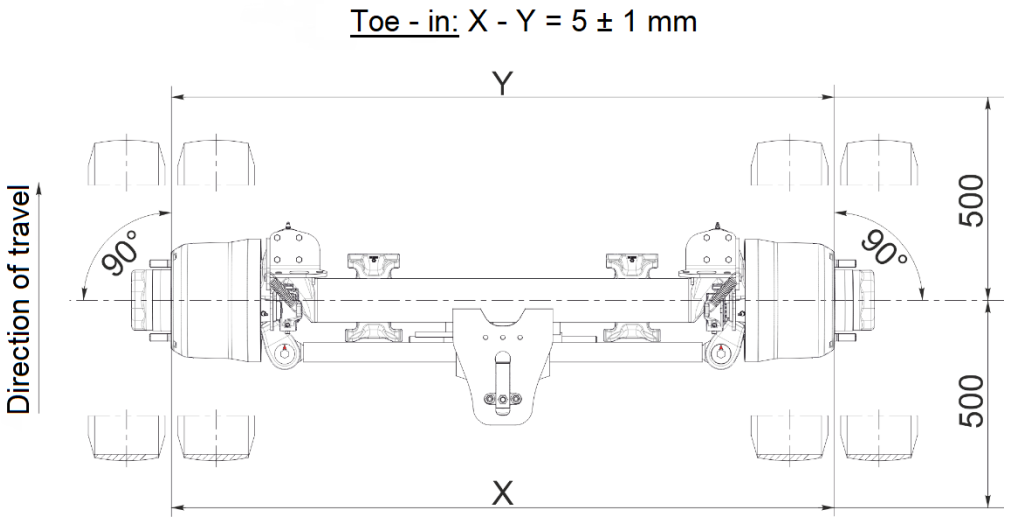
1. Slightly loosen the nuts of the eccentric bolts

   SW 36

   ! If necessary, detach the eccentric bolt with a plastic hammer!

2. Adjust the eccentric bolts with the arrow parallel to the forward direction of travel
3. Set the toe-in with a hexagon socket to 5 mm ± 1 mm (0°17´ ± 4´), as shown in the Figure!

   S 22



Recommendation:
The toe-in should be adjusted using an alignment gauge!

4. Tighten the locknuts of the eccentric bolts

   SW 36

   550 Nm ± 25 Nm

   Do not warp the eccentric bolt!

5. After adjusting the toe-in, the track adjustment of the axle set (axle with suspension) must be performed in the same way as for rigid axles.

Attention: gigant self-steering axles may not have a negative track (toe-out)!

3. Steering angle

As standard, the steering angle for the self-steering axles is set as shown in the set drawing. The pre-setting results from the calculation of the clearance, taking into account the suggested tyres and using a standard brake cylinder.

Note:
Observe the max. tyre width (width under load) and the dimensions of the brake cylinder according to the manufacturer specifications to prevent collisions with other components.

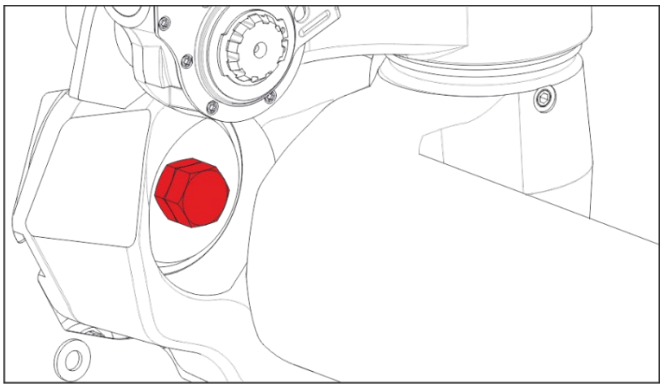
In case your vehicle design differs from our assumptions and you must change the steering stop, this can be done by adjusting the stop bolt fixed with a locknut.

! The vehicle must be in the driving height setting!

As a rule of thumb, the following can be assumed for a M20 bolt with 1.5 mm thread pitch:

1 x 360° rotation of the bolt ~ 1° change in angle

To be able to change the steering angle, the lock must be unlocked and the stabilisation bellow must be depressurised (axles with hydraulic additional steering must also be depressurised). When loosening/tightening the counternut, make sure that the stop bolt is not warped!



Note:
At a steering angle > 21°, 1 or 2 washers ø37 x ø21 x 4 mm are used to compensate the distance instead of the counternut. In this case, the stop bolt must be tightened by hand!

Important: The stop bolt may not be removed and must always be countered with the nut and tightened by hand!

After changing the steering angle, the freedom of movement to the left and right must be checked by turning the self-steering axle! In doing so, the max. deflection must also be observed!

We recommend using an alignment gauge to check the evenly changed steering angle on both sides.

New	without	Document created, replaces ST232 – 2	2020.07.06	HU
Change number	Index	Change description	Date	Signature

Created/reviewed:		Approved:	
2020.07.06	HU	2020.07.06	DZ
Date	Signature	Date	Signature

These installation instructions are a part of our terms and conditions of sale and delivery. Failing to observe them means that we will not be able to accept any claims in the event of damage. The prescribed axle loads may not be exceeded. Observe changes to the centre of gravity heights and instructions on the installation drawings. When dimensioning, it should be considered that, with a semitrailer, the coupling load must be stabilised via the saddle coupling of the tractor. Ensure that there is sufficient space for the tyres and the axle components, especially when the vehicle is lowered.