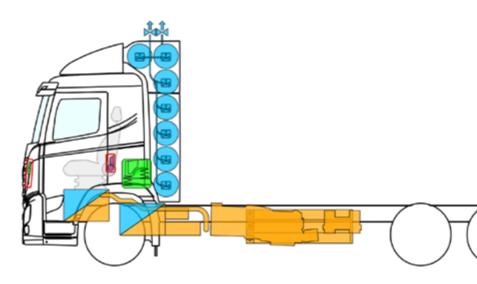
NOTES Training TECHNICAL ASSISTANCE TRUCKS AND BUSES

Mobile information system for the fast and safe evacuation of people from vehicle crashes.













Explanation of the topics to be covered.

1. Vehicle technology for truc

















Vehicle technology for trucks
Accident scenarios for trucks
Vehicle technology for buses









- 1. Vehicle technology for truc
- 2. Accident scenarios for truc
- 3. Vehicle technology for buse
- 4. Accident scenarios for bus







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Chapter 1 VEHICLE TECHNOLOGY FOR TRUCKS





- EU standard, up to a maximum of 40 tonnes
- Belgium, France, Italy, Germany and England allow 44 tonnes





• Agreements between countries sometimes allow higher masses • A steering axle may carry 8.5 tonnes of load, a driven axle 11.5 tonnes. Assume an average of 10 tonnes per axle, then you can estimate the right equipment and resources for it in case of an incident (lifting, hoisting, towing, etc).





- Maximum permitted length 25.25 metres
- An LHV is not a Road Train
- In the diagram the different options allowed.







 A combination of truck and trailer may not exceed 18.75 metres in length • A tractor unit-trailer combination may not exceed 16.50 metres in length • An LHV (Long Heavier Vehicle) is an extra-long truck combination



- Not welded, always bolted and stripped.





• The chassis frame (ladder chassis) forms the supporting structure of the truck • All components such as axles, engine, cabin, tanks, etc. are mounted onto this.

• The chassis frame also captures most of the impact energy in an accident





Self-supporting construction











- This suspension usually features air or spiral suspension
- the energy of the impact, to protect the cab.





• The shearing and tearing off of the cab suspension in an accident is designed to protect the driver. The chassis then slides forcibly under the cabin and nullifies







- Risk of cab tearing off in the event of major accidents
- Cab may be loose on chassis, be careful when opening doors

















If the cab had remained fixed here, there would be less chance of survival for



Cab torn off and moved after accident



















Cab suspension















Caution!





Cab suspension



- Cab without sleeping accommodation
- Dashboard and switches differ from those of passenger cars
- purpose.





• It is a good idea to take a look inside a cab. Use your own TS or HA for this







- This should not be used while driving
- Caution!
- Always check these areas after an accident!
- Lots of loose items in the cabin. (microwave, coffee machine)











Concept vehicle of a truck with crumple zone. (Scania)





 The maximum length of a truck combination is one reason trucks within Europe have few torpedo fronts. Outside Europe, cabin length is often not included in the vehicle length, where torpedo front cabs are much more common. The advantage of a torpedo front is that a crumple zone can also be applied.





- Depending on the model, driver seats in trucks and buses have:
- Mechanical, electrical and pneumatic adjustment options





 In technical assistance, pay attention to unexpected seat collapse, provide stabilisation blocks, or make deliberate use of the air suspension system.





of the steering column.





Adjustment options for the steering column on a truck or bus, sometimes a knob or handle, but it can also be a third foot pedal that controls the movement





- You can operate air suspension you know what you are doing!
- When you start lifting a vehicle with an active air suspension, you may cause unexpected movements because the air suspension system may start correcting/levelling itself.







You can operate air suspension from the chassis or from the cabin. Make sure

Air suspension



- Trucks with more than two axles may have a lift axle. This is raised when the vehicle is lightly loaded
- Please note: Elevated lift axles may sink automatically when turning off the ignition, or disconnecting the battery!
- Take great care if persons are trapped under the vehicle!
- When lifting cushions are used to lift the vehicle to free a victim under an axle, for example, the lifted axle may also AUTOMATICALLY start to lower when the pressure on the other axle increases! Make sure this does not hurt or trap anyone!









Chapter 2 ACCIDENT SCENARIOS FOR TRUCKS





Factors that determine the type of entrapment









Factors that determine the type of entrapment

Trucks - trucks









Factors that determine the type of entrapment

- Trucks trucks
- Speed, distance, type of truck and weight









Factors that determine the type of entrapment

- Trucks trucks
- Speed, distance, type of truck and weight









Factors that determine the type of entrapment

- Trucks trucks
- Speed, distance, type of truck and weight









Factors that determine the type of entrapment

- Trucks trucks
- Speed, distance, type of truck and weight









Always lock and stabilise, for your OWN safety.











Overturned truck

Type of truck



A





cident scenarios:



- Overturned truck
- Type of truck
- Cargo







cident scenarios:





- **Overturned truck**
- Type of truck
- Cargo
- Position





cident scenarios:



CRASH Recovery System[®]

- **Overturned truck**
- Type of truck
- Cargo
- Position
- Stability!

















Trucks - car

• Rear



A







Trucks - car

• Rear

• Side



A







- Trucks car
- Rear
- Side
- Between / under











Situation:

- Driver of tanker truck trapped Cargo is milk
- Front truck is empty Driver is unhurt
- Name points of interest: Safety
- Describe action plan and Plan+





Case study



crane early; often longer drive-up times and set-up time.





Many heavy tools and know-how required; if necessary and available, ask for





working environment and use Incident Management!



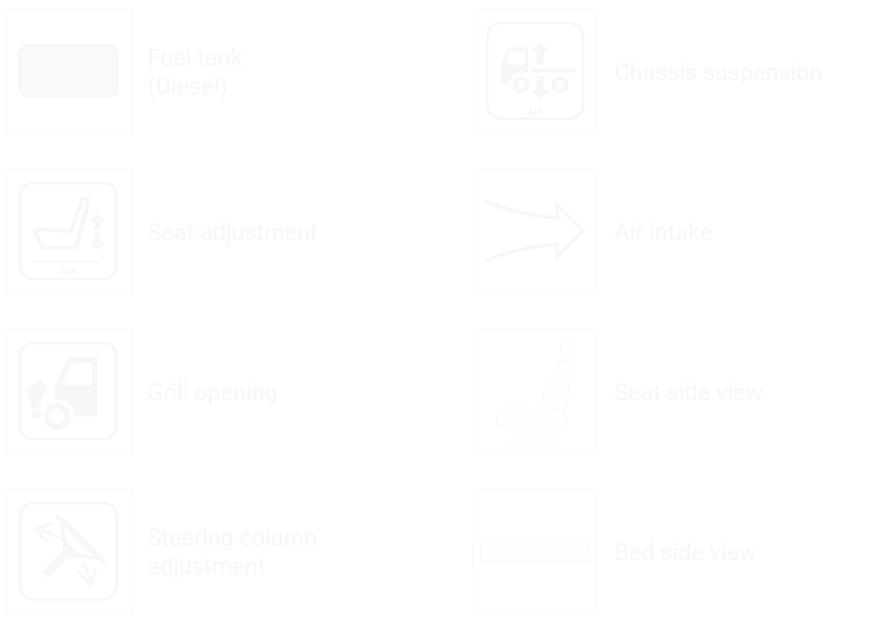




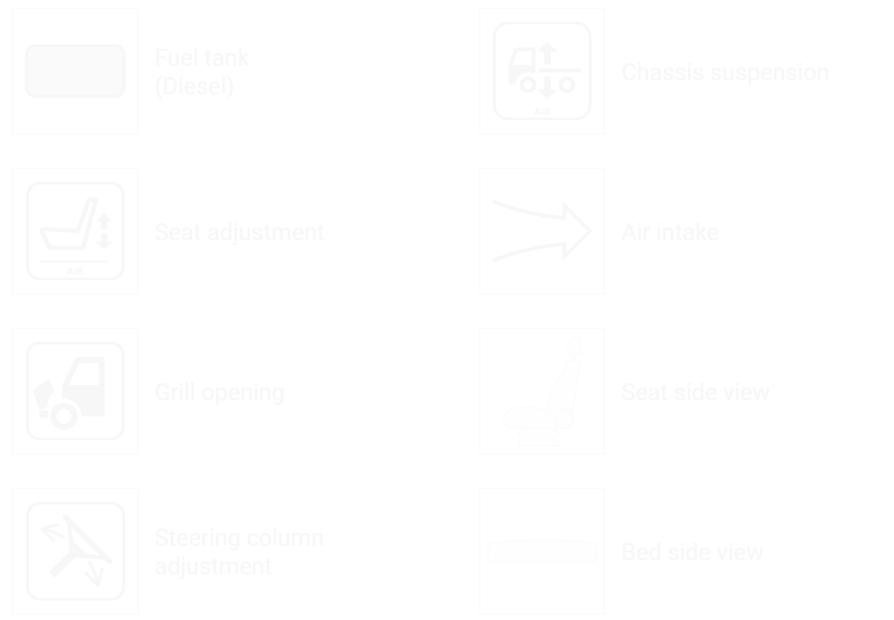
Special attention when fighting incidents on an N or A road, ensure a SAFE



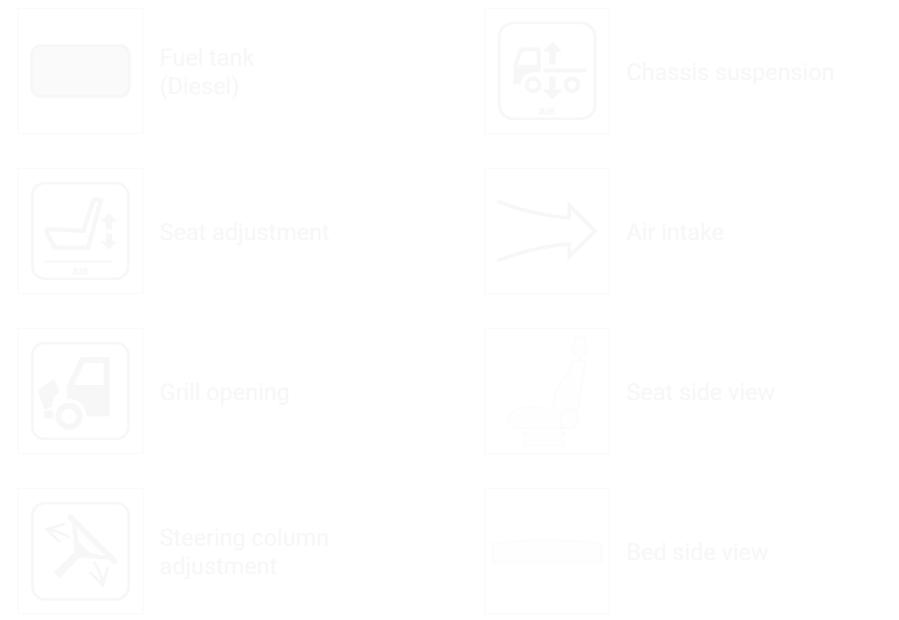




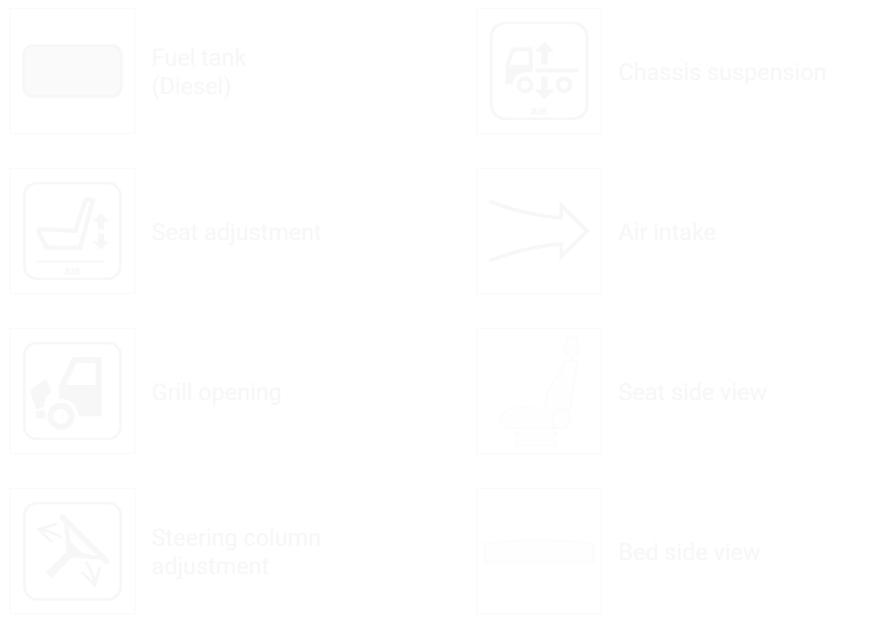






















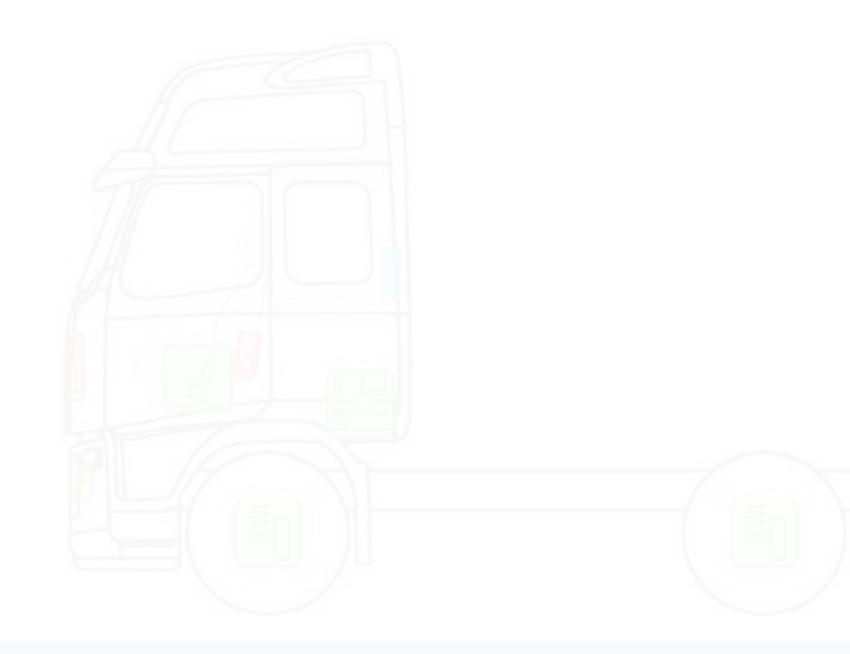




• Diesel tank, air tanks and 24V battery, also a main switch for the 24V system.



Air-suspension axles, cab and seats









supplying 230V for a coffee machine and microwave oven.







• Here you can see a piece of orange wiring; it is not a hybrid, but an inverter



- diesel engine!



• Two linked 12V batteries. CAUTION! High amperage available for starting the

• Disconnecting 1 battery terminal (always start with the -Min terminal) is also sufficient to power down the vehicle, but start with the main switch.





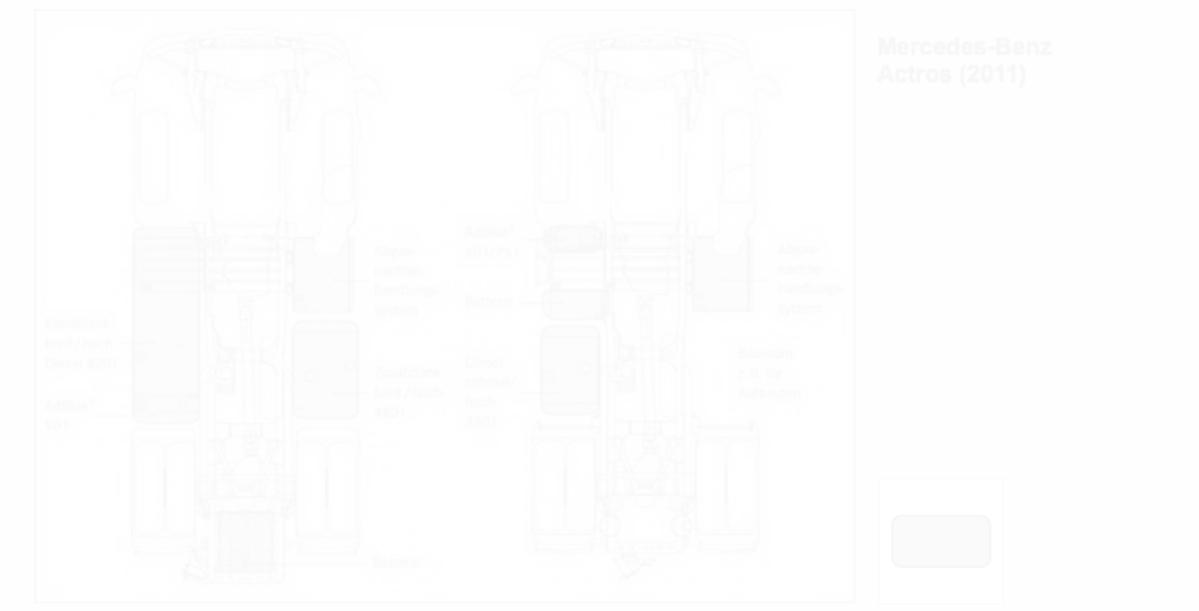




 Batteries are installed in various places, just where there is space for them when building the truck (tractor unit). This is also where the rear air tanks are located.



 Fuel quantity between 120 and 1 blue.







Fuel quantity between 120 and 1,500 litres possible, note also tanks with ad-

Fuel quantity



- For the driver and co-driver driving behind, this is a particularly nasty blow, on the loading floor of the vehicle in front.
- Beware of leaking liquids! Diesel makes the road surface very slippery and the road and verge need to be cleaned.



Bewa





re of leaking liquids!









Case study 2



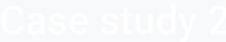
(tarpaulin).





Looking closely at this picture, here an access to the victim has been made by cutting a hole in the rear of the cab via the cargo box, through the front panel



















slips!





• Use an HV scaffold if available, ensure that the operator of the hydraulic tools is secured (held) by a colleague so that they do not fall off the platform if the tool





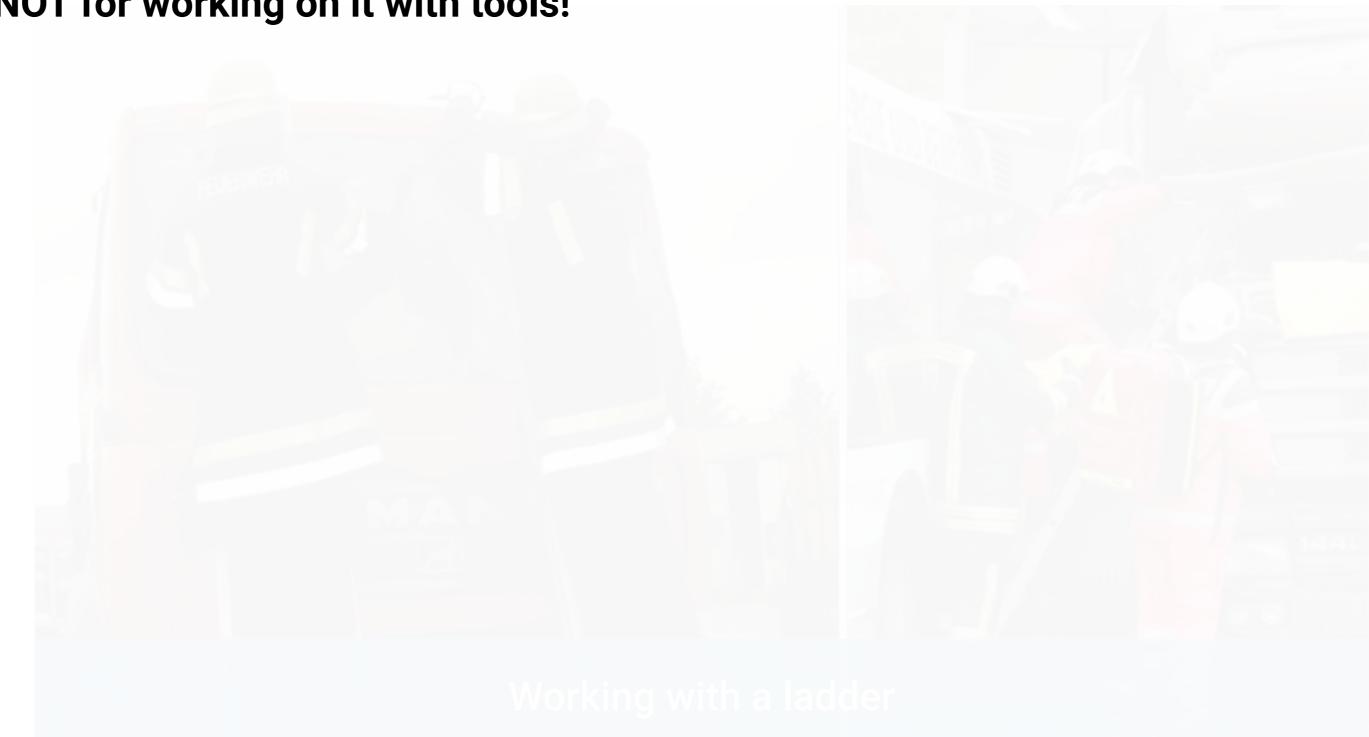
















• Working with a ladder is only for reconnaissance or climbing into the vehicle,



- door!





• Use straps to secure a cab. In the picture on the left, it's better to place the hook at the top of the rim (counteract the possibility of rolling due to the wheel). • You can use straps over a cab, but only if this does not impede the opening of a





likely...





Cabs can tear off or slide, however, when there is a rigid cargo behind the cab, a loading crane, or as pictured here a sea container, you as a driver are less











• Breaking out a door is done by catching the door with a line so that it does not







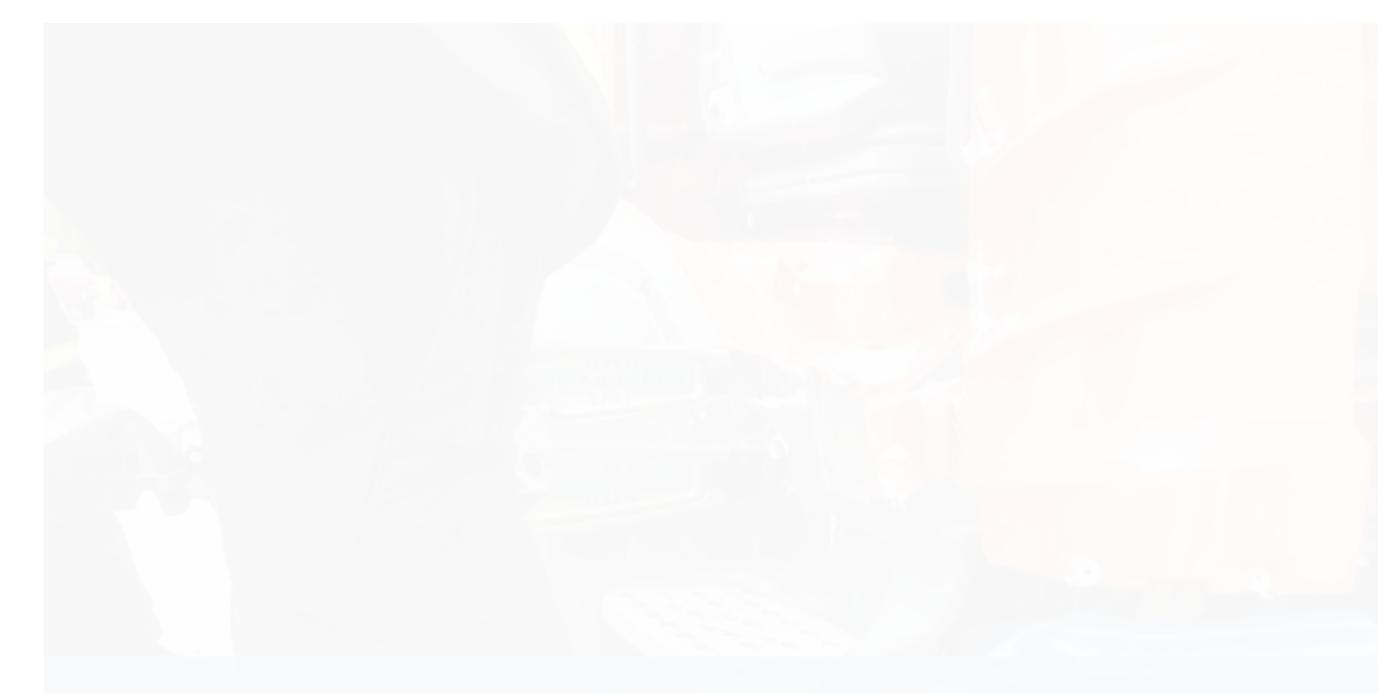




 You can choose to weaken the A-pillar in the floor or in the corner. A ram should be secured with a line to prevent it from falling if space arises anywhere.









Cutting



g technology for cabs











- ALWAYS cut using the hard protective plates, NOT visible here.
- The handle in the cab can be cut away with the pedal cutter.

















- the ram.
- support point yourself!





• Use the ram angle bracket, otherwise place the ram on the edge where the door rubber is clamped. However, remove the door rubber FIRST, against sliding of

• If you do not use the ram corner support and press on the B-pillar as visible here, be careful NOT to press through the material! Then you will weaken the











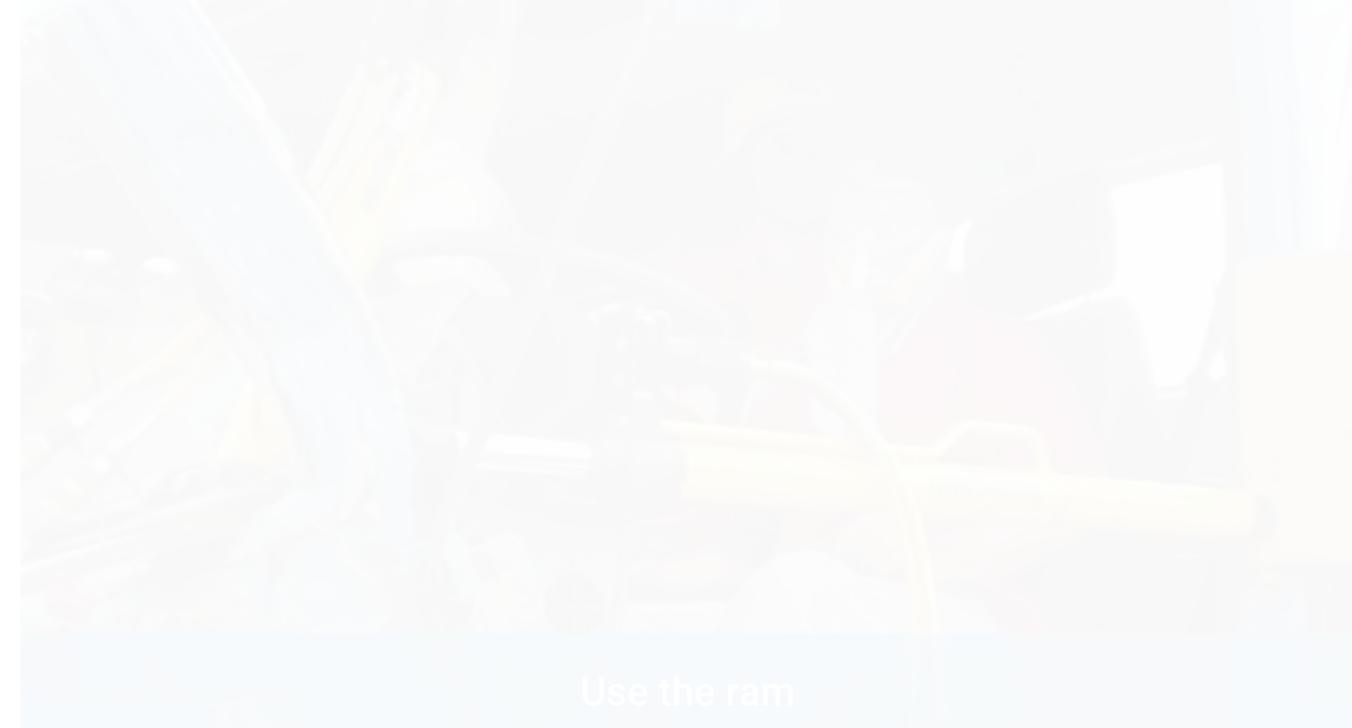
- Using wood between the ram and the drop-off point at this location is NOT recommended, due to sliding of the wood.
- What is very nicely depicted in this arrangement is that you can ram at two angles at once. Do secure the rams with a line; if using one ram creates space on the second ram, it will fall on the street and may injure someone or the ram may malfunction.















tension strap to secure the front.





• When you have pushed a front away, by letting the ram go back slightly, you can see whether the front is not springing back. If it is springing back, you can use a





good outlet for the ram.





There are also reinforcements in the dashboard. You can often find them by pulling out the radio, for example, or pulling open the air ducts. The metal is a





This means pushing the cabin back into its former shape before the collision. Then there should be enough room to free the victim.

You have to think creatively here, the cab itself is in a different position on the chassis. Also note in such a case that the cab is completely detached from its fixing points! Make sure you have straps.







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A large spreader is used here, so pay attention to the ram's release as well.



See next slide

ACCIDENT SCENARIOS FOR TRUCKS









Here you can see an example of a was started to obtain space.

Then a short ram, then the longer ram and a second ram. Truck accidents require a lot of tools, knowledge and hands.





Here you can see an example of a cab where the space is so small that a spreader





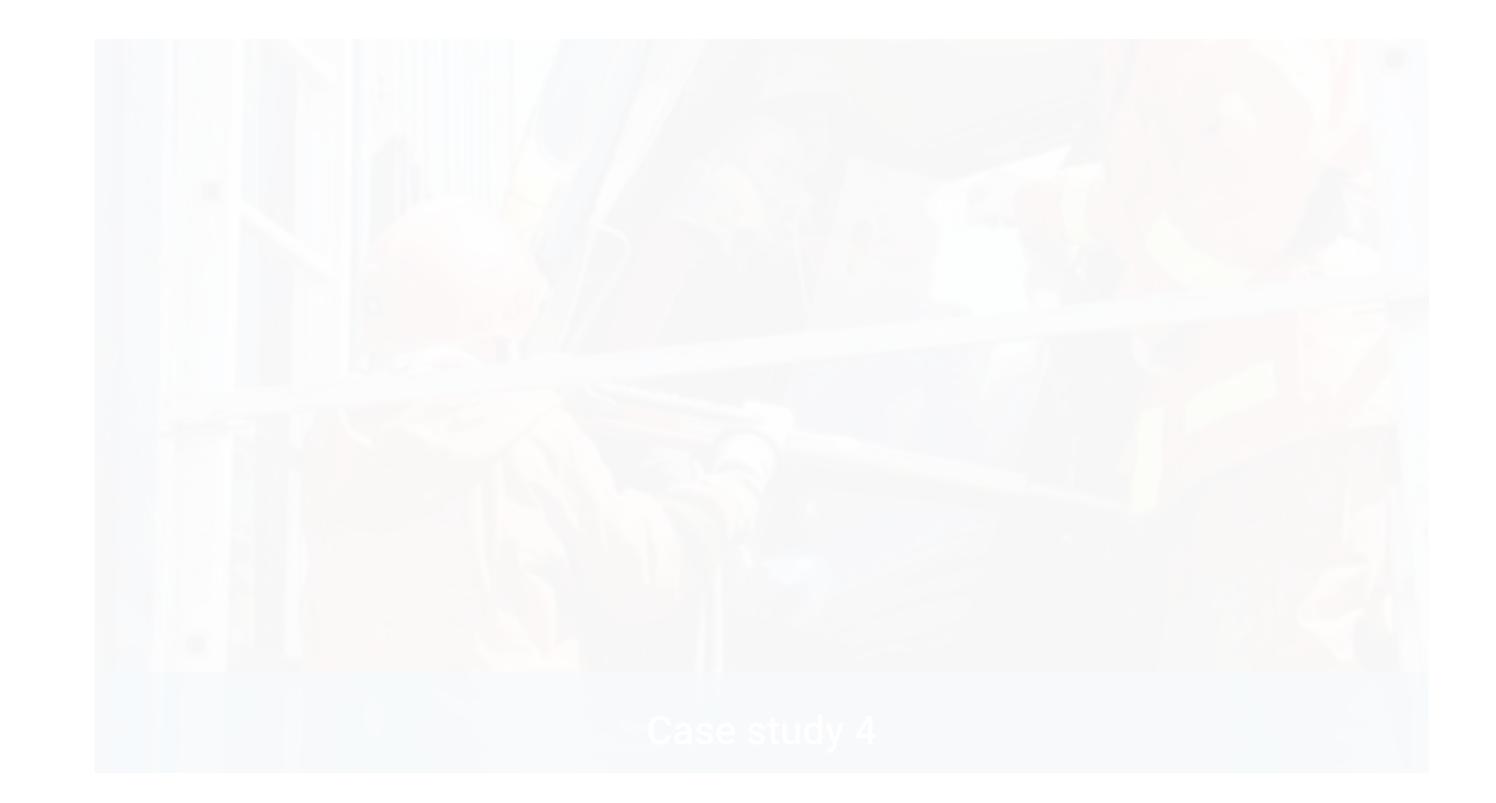
























Chapter 3 VEHICLE TECHNOLOGY BUSES





City buses

Regional buses

Coaches



Diffe





rent types of buses



- Safe mode of transport
- Focus on active safety
- Focus on active safety
- Limited use of passive safety devices!









- Various wide and low styles
- Also as an articulated bus
- Up to 126 passengers
- Non-adjustable seats
- Safety systems mostly missing
- More and more alternatively powered vehicles
- the CRS.





• Large glass surfaces (bonded windows, as part of the rigidity of the body)

For many regional buses, separate information by region has been entered into



- Narrow entrance with several steps
- Maximum 105 passengers
- Adjustable seats (with lap belt since 1999)
- Large glass surfaces with a high sill
- Table or other special installations
- Toilets and sleeping areas often available
- Diesel propulsion only
- Large luggage compartment
- Double decker















Chassis



Trusses, particularly strong and li See CRS info.





Trusses, particularly strong and light, only lift below the jacking points!







See CRS info.

High floor with plenty of cargo space underneath. Many gas springs present.





Trusses, particularly strong and light, only lift below the jacking points!





Double-decker articulated buses can carry more than 100 people.







uble-decker buses



Chapter 4 ACCIDENT SCENARIOS BUSES







Often many seriously injured victims, multiple fatalities at the same time.





Д





ccident scenario



• Type of bus

Trajectory of the bus



Д





ccident scenario



- Type of bus
- Trajectory of the bus
- Tilted







ccident scenario





Discuss in the group:

options, solutions, risks and concerns.

Coach with 40 passengers off the road and overturned in a ditch

Name points of interest: Safety

Describe action plan and Plan+























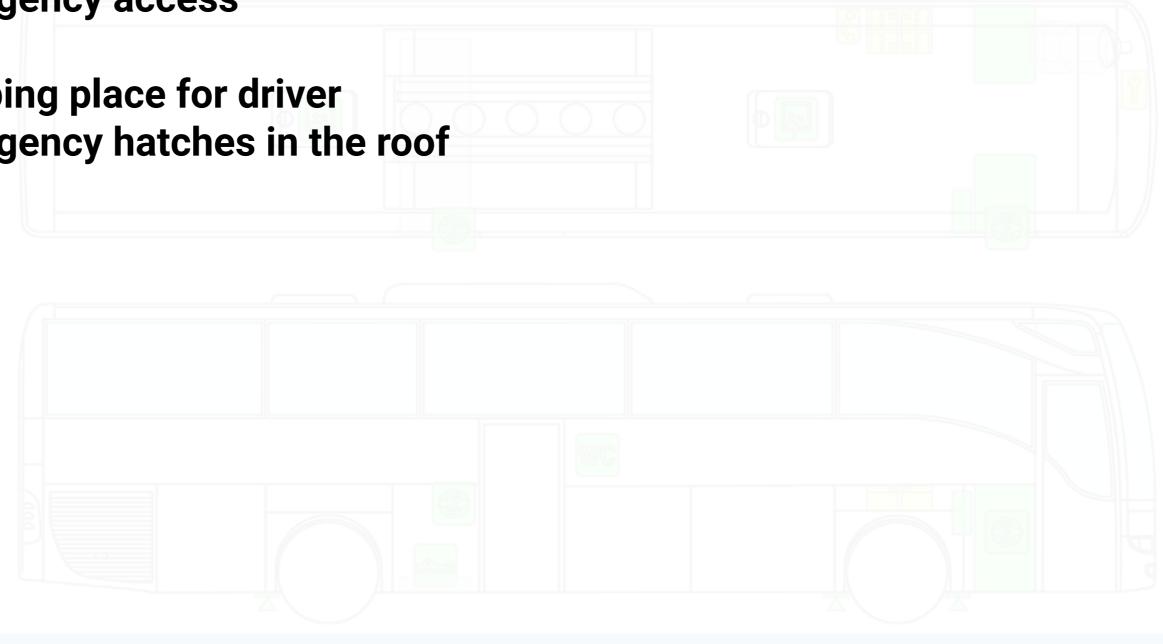






Ask what meaning the symbols on the bus have, ask what they see:

- Emergency access
- WC
- Sleeping place for driver
- Emergency hatches in the roof





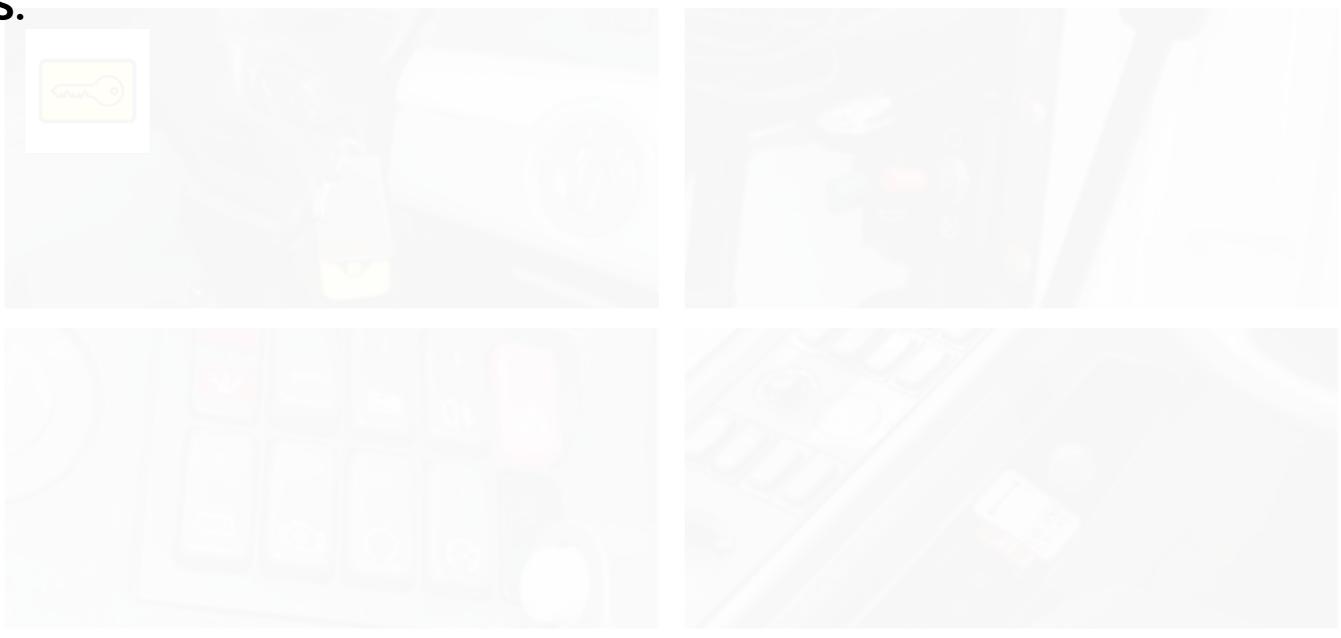






Various methods to switch off, deactivate the bus, follow the instructions in the CRS.



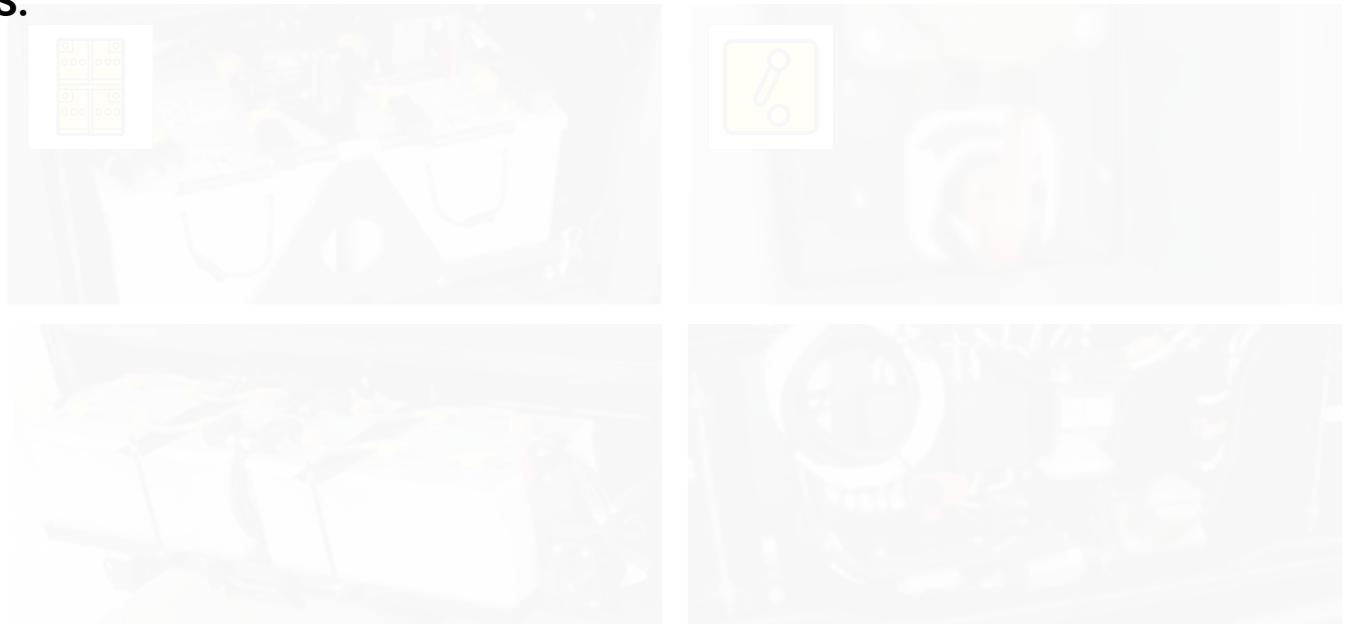


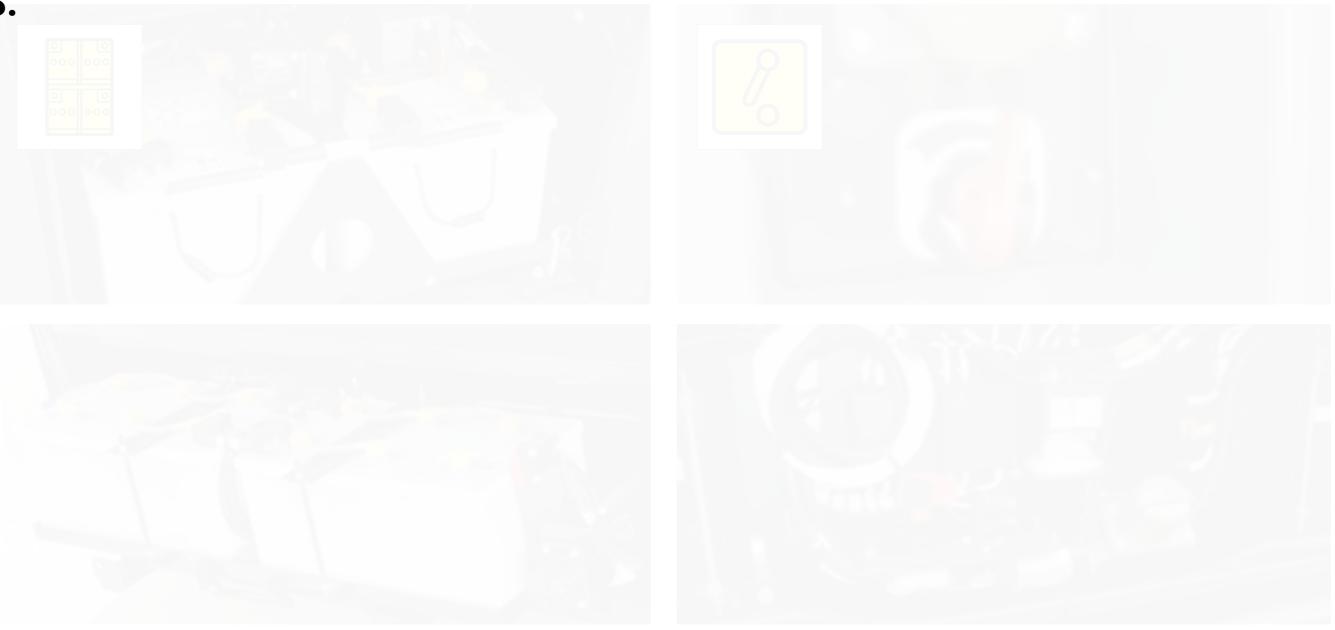






Locations of the main switches for the 24V battery pack are also indicated in the CRS.





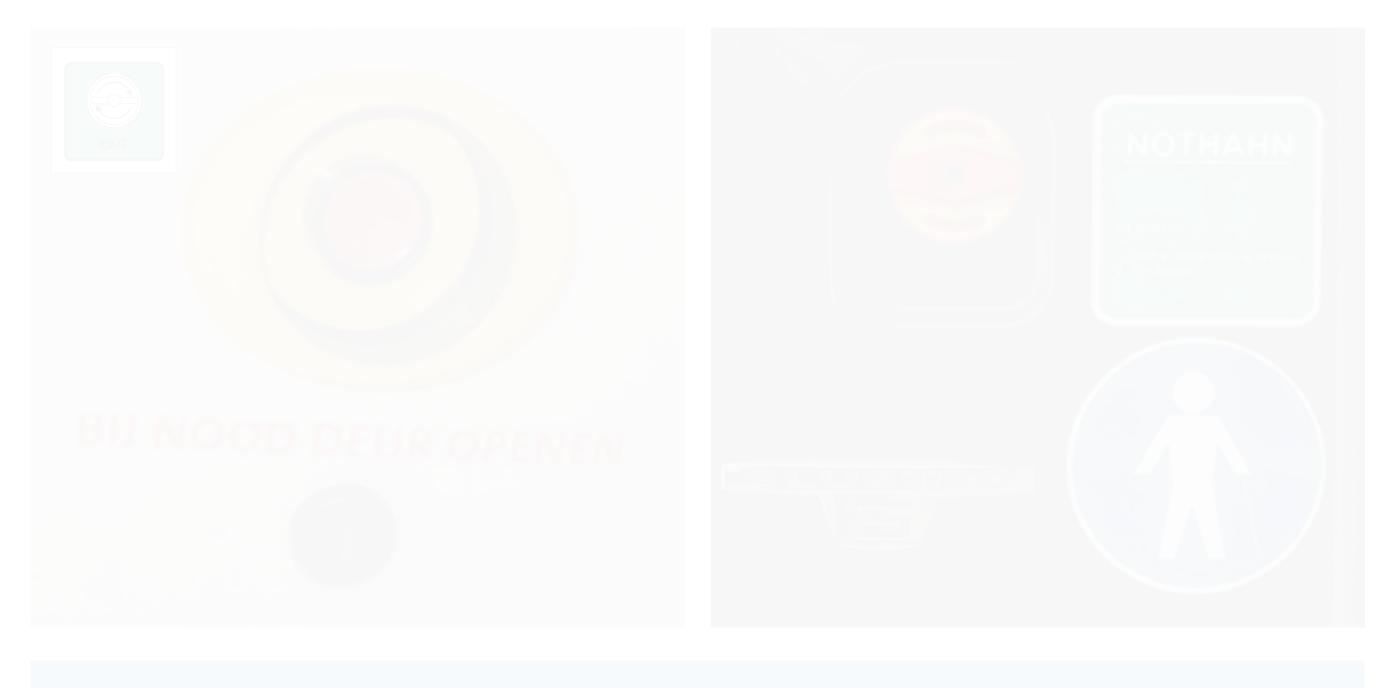








Control buttons to provide access to the bus from outside in case of emergency.







ergency exit door





Escape hatches in the roof of the bus.









The space of this toilet is not generous, but it is an additional consideration as a location for post-incident reconnaissance.















With a coach, it is important to also scout for a possible sleeping driver after an incident. Often the access via the stairs to the toilet is at the rear exit.



Buses have a supply of clean drin dirty and sewage water.



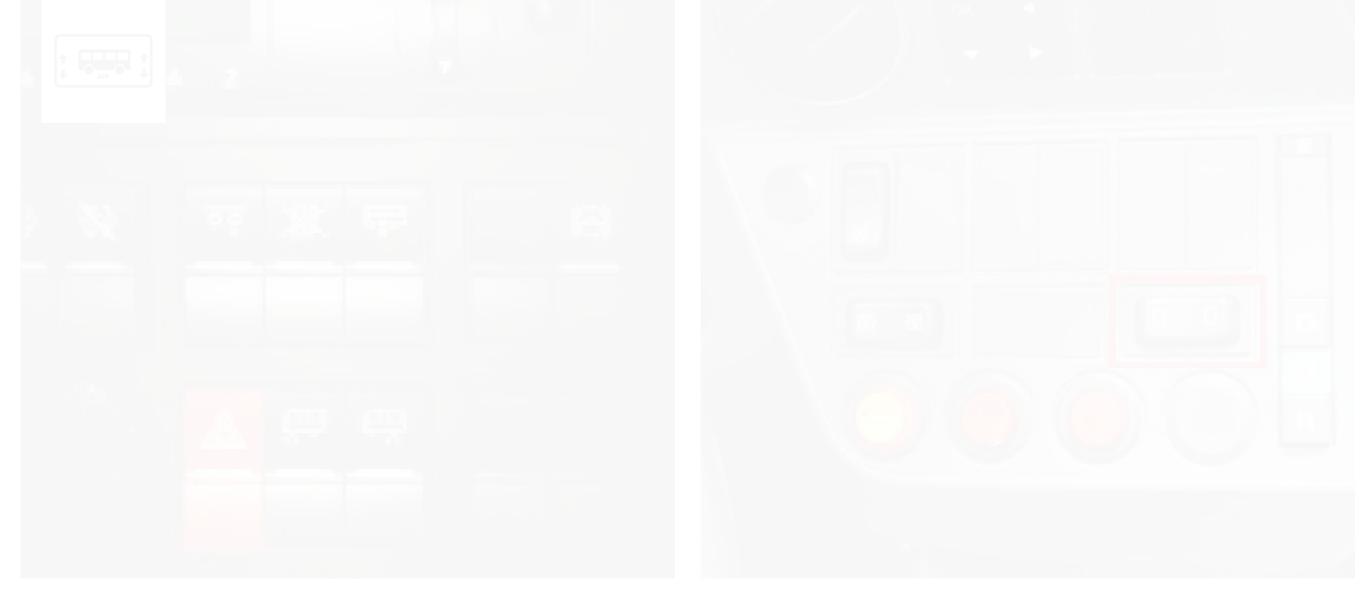


Buses have a supply of clean drinking water on board, in addition to a tank for





Buses sometimes have a kneeling function, which allows them to adjust the boarding height, DO NOT use if someone is under the vehicle.





Ch



assis suspension



- Stabilising the vehicle
- suspension during lifting
- Use prescribed lift points from the CRS whenever possible





Switch off main battery to disable air suspension; this prevents activation of air







Chapter 5 ALTERNATIVE PROPULSION





- Natural gas (CNG/LNG)
- Hybrid
- Electric
- Hydrogen



Engine types









- Mainly methane/natural gas
- Flammable gas
- Storage at a temperature of -162 °C
- Gas cooled to liquid, 1/600 of original volume
- warmed to ambient temperature
- Mist formation due to freezing water particles in the air
- explosively.





Vapours remain on the ground due to cold temperature, lighter than air when

 Odourless (no THT or mercaptan added; this would crystallise due to the cold) Do NOT use water jets on leaking liquid! With the temperature difference of -162 <->10 degrees, this would create a very intense gas formation. There is also the risk of ice forming on the puddle of LNG liquid, which can then expand



- Mainly methane
- Flammable gas
- Lighter than air
- Fragrance added (it is just natural gas)
- Storage under a pressure of 200 bar in the cylinders



Compressed natural gas (CNG)



al gas) bar in the cylinders



LNG

- LNG is stored in double insulated stainless steel tanks
- off when the pressure rises due to heating of the tank

CNG

- minutes; watch out for flash fires!





• LNG is fitted with a blow-off line behind the cabin (on a tractor unit) this blows

• CNG is stored in pressurised cylinders (similar to breathing air cylinders) CNG cylinders are fitted with pressure relief valves and fuses; the fuse opens the valve at a temperature of 110 degrees, the cylinder will then blow out in 2-3

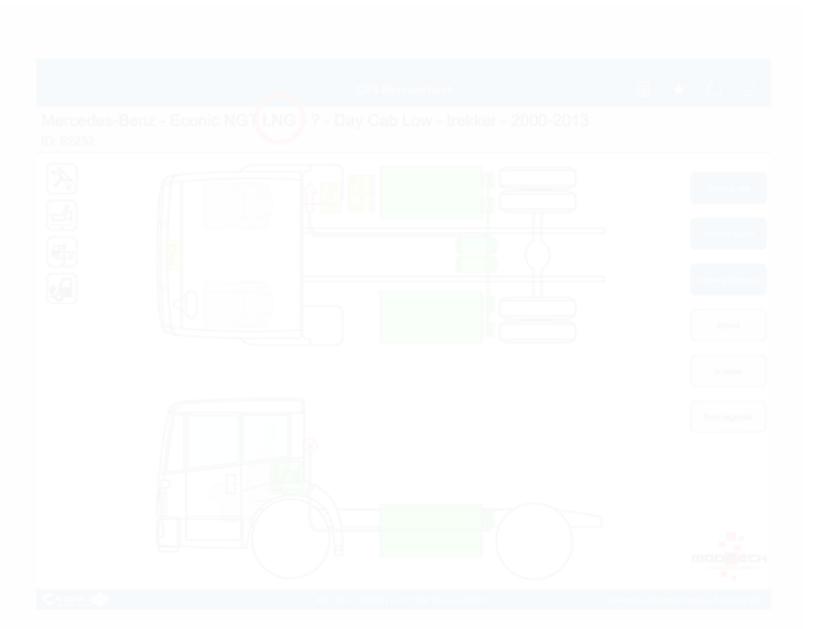


Storage of LNG / CNG



Difference







Storage of LNG / CNG



Difference



Storage of LNG / CNG



Difference







Storage of LNG / CNG



Difference

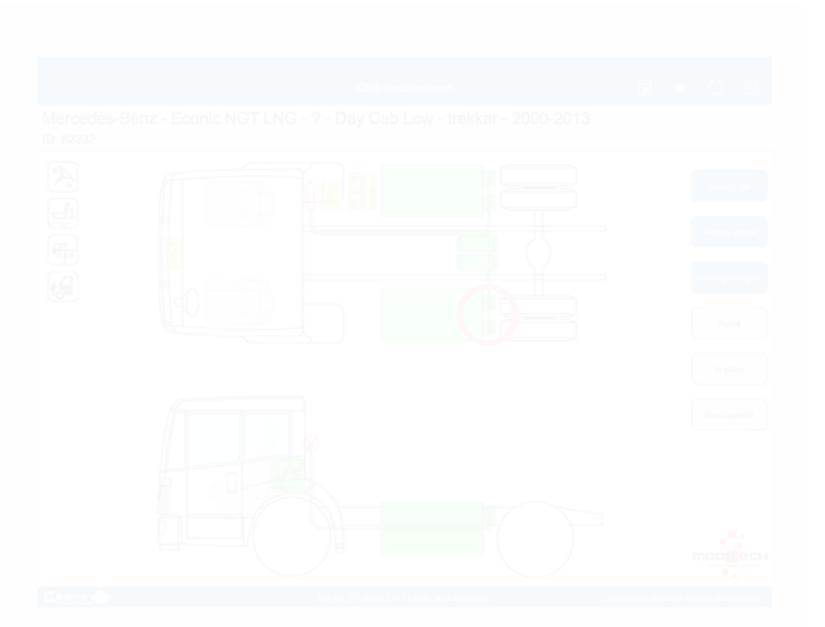


- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line



Difference







- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line



Difference





- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line



Difference



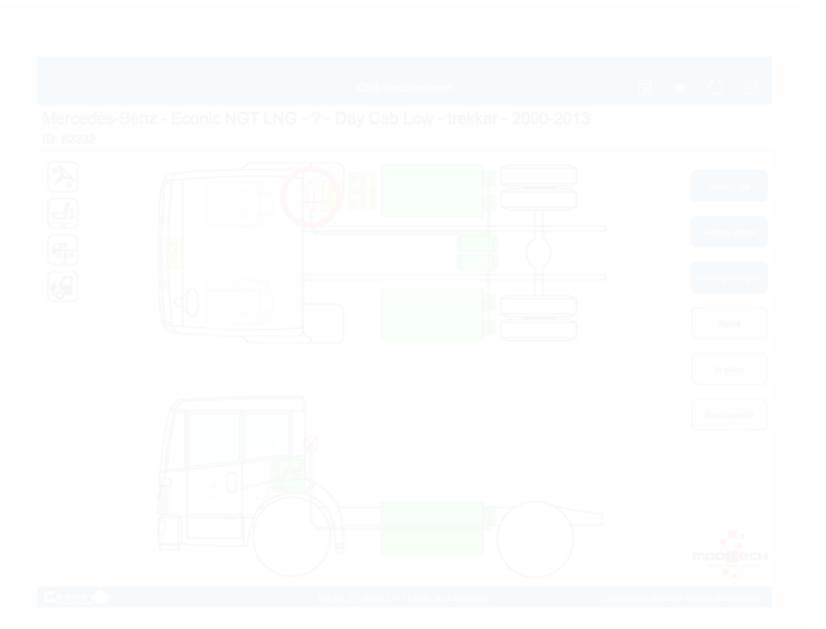


- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line



Difference







- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line



Difference

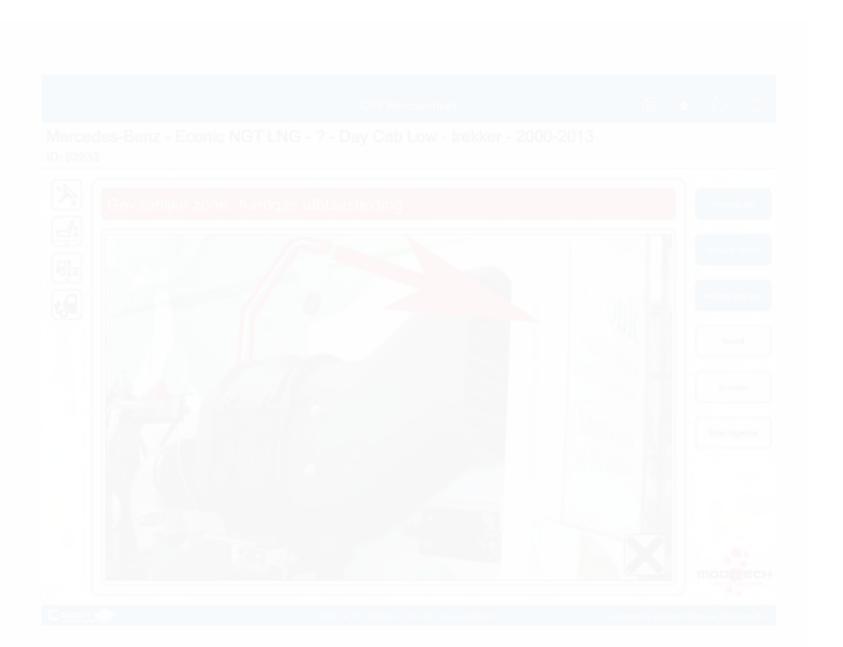




- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line



Difference



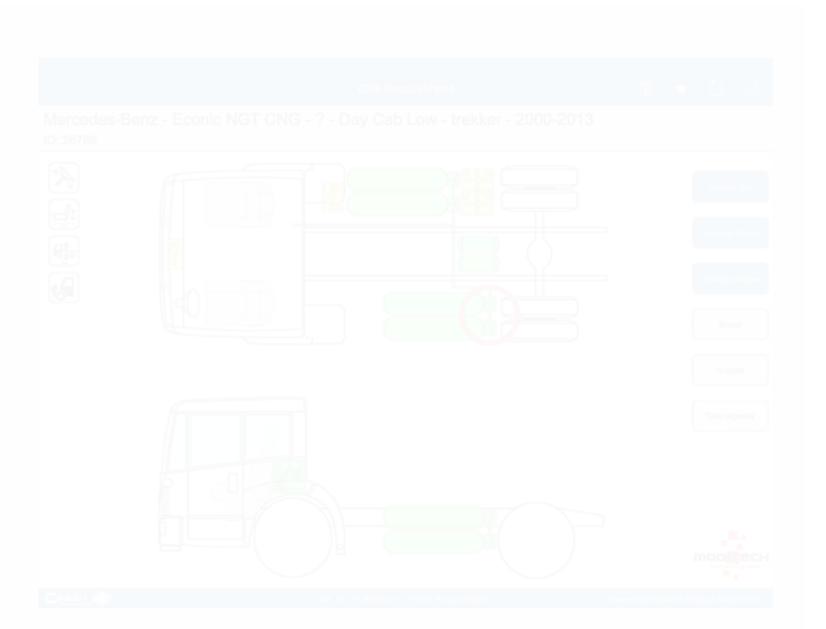


- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line
- Safety of CNG



Difference







- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line
- Safety of CNG



Difference





- Storage of LNG / CNG
- Safety of LNG (pressure) / blowoff line
- Safety of CNG



Difference





Examples of various burning CNG vehicles

















- High-voltage components on the roof or chassis
- due to lack of airbag system or inertial switch





• Energy storage in a battery (Li-ion) or ultracapacitor (note: acetonitrile) • High-voltage 'orange' cable, sometimes routed in roof pillars (buses) In case of accidents, the high-voltage system may not automatically switch off,



Different symbols in hybrid and electric drives















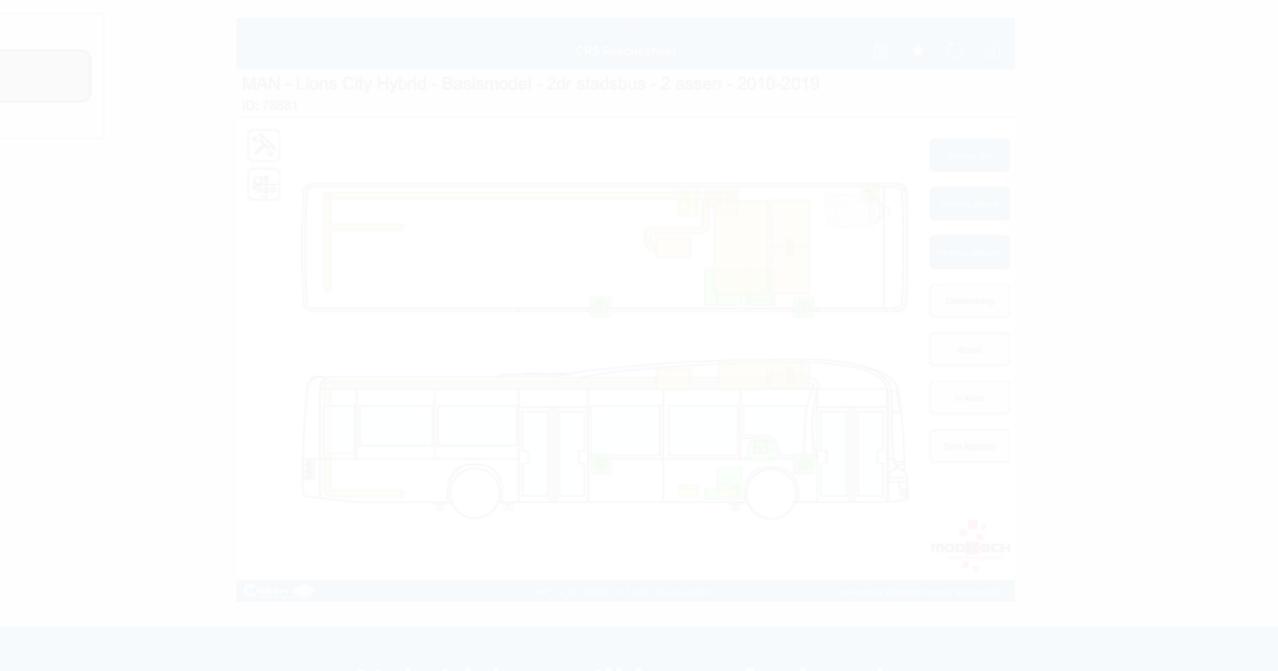








Some electric buses do have a fuel tank, this is for heating in the bus.



ALTERNATIVE DRIVES



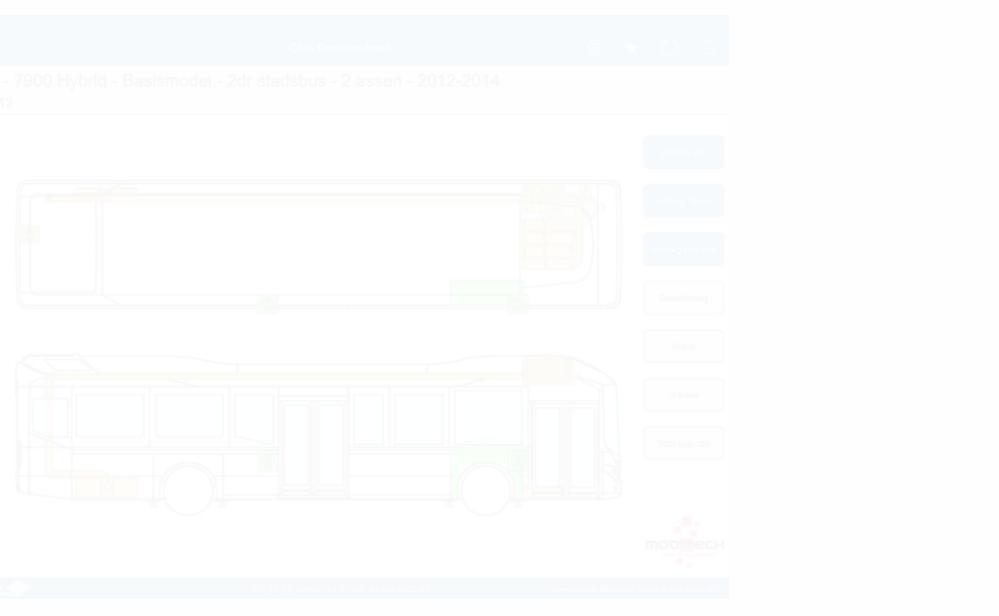


but still has a fuel tank























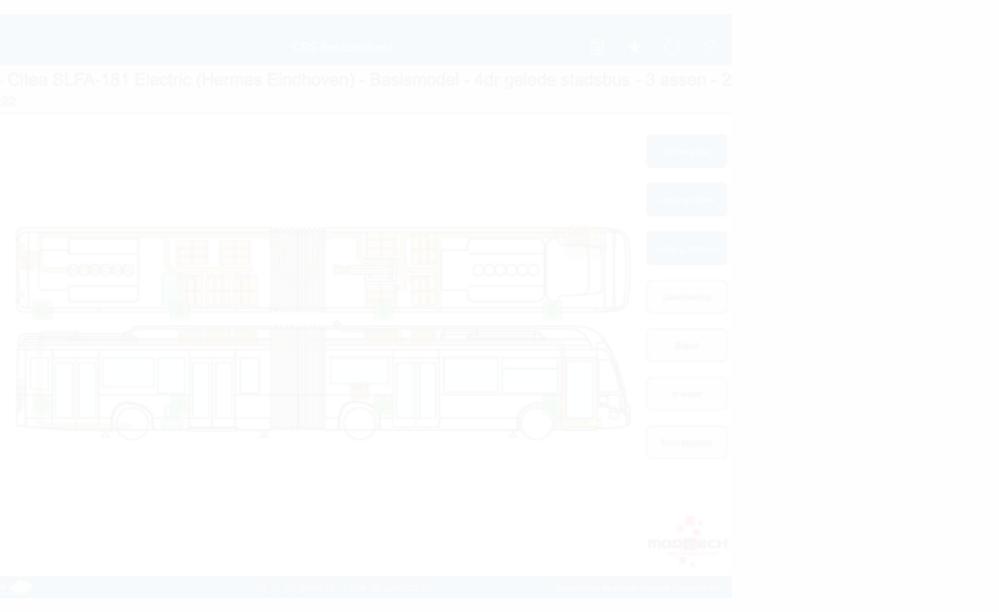




The same electric, but much longer.





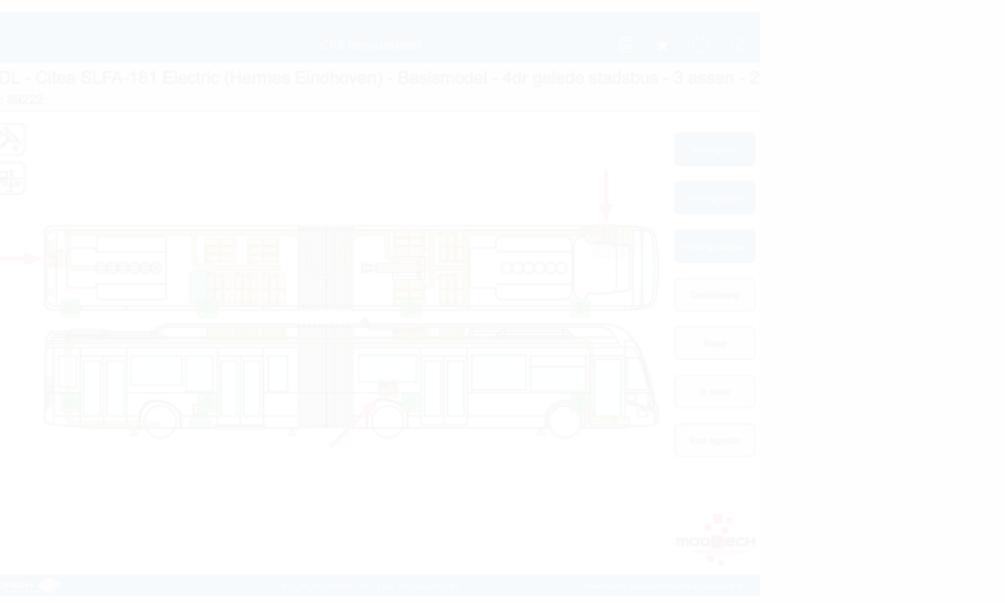


















DRIVES

ALTERNATIVE

Deactivation according to the steps described in the CRS





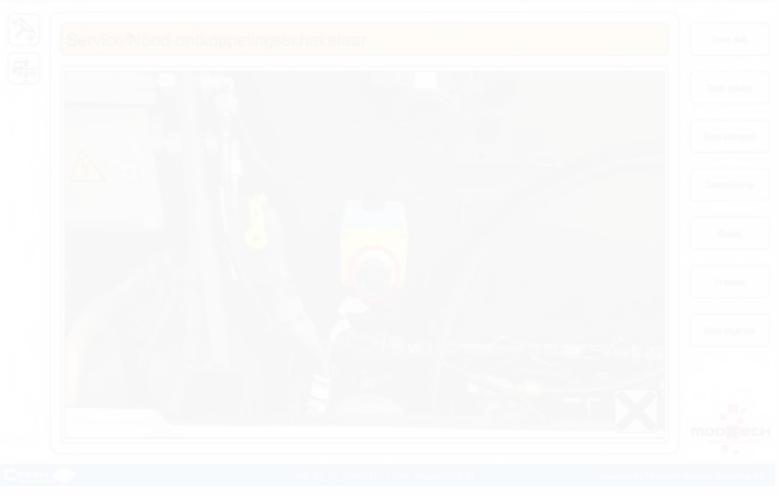


ectric - Deactivate





VDL - Citea SLFA-181 Electric (ID: 89222







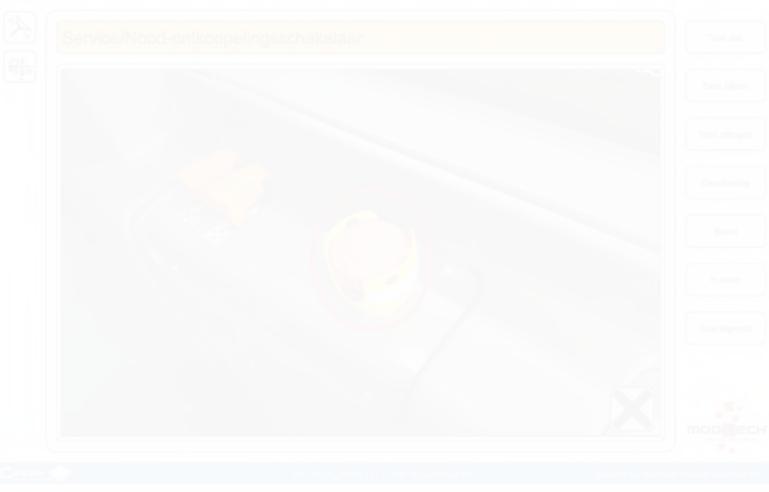
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ectric - Deactivate





VDL - Citea SLFA-181 Electric (ID: 89222







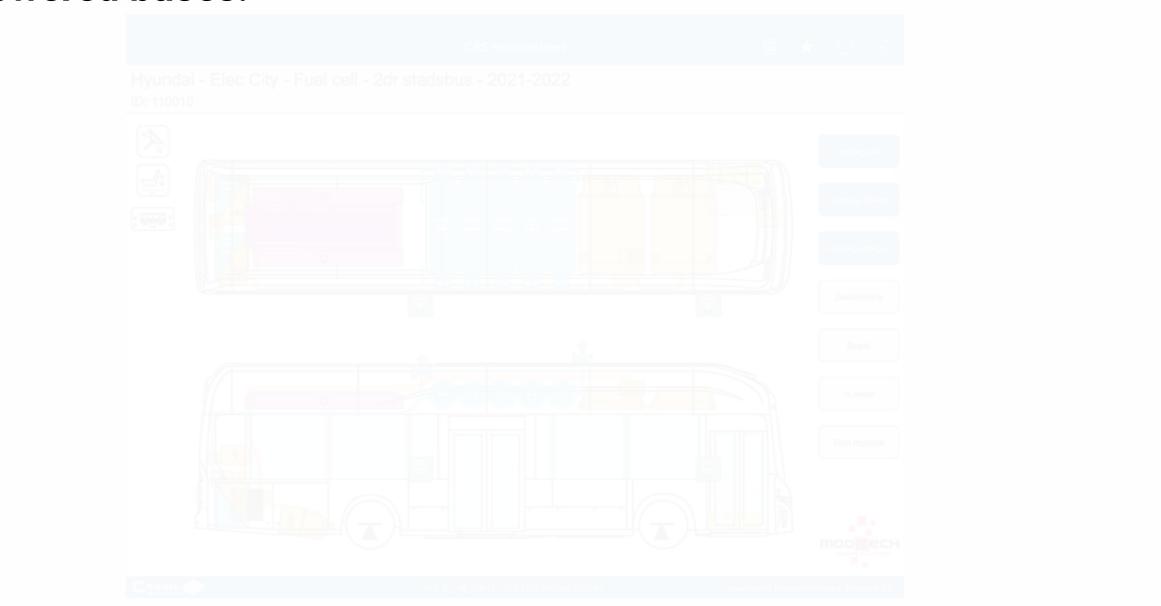
CRS Rescuesheet

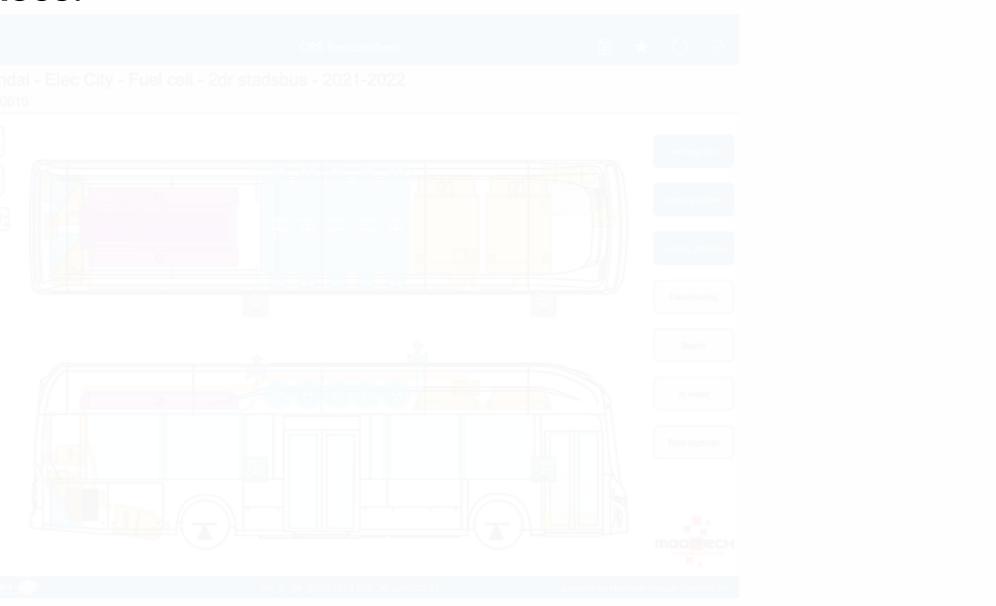
os Eindhovon) - Basismodol - 4dr golodo stadsbus - 3 asson

ectric - Deactivate



This and the following slides describe the information for the deactivation of hydrogen-powered buses.











Compressed hydrogen gas 350 bar.



Hy







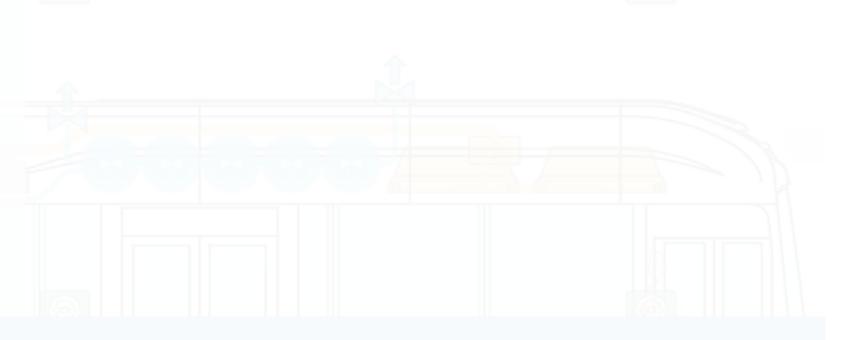


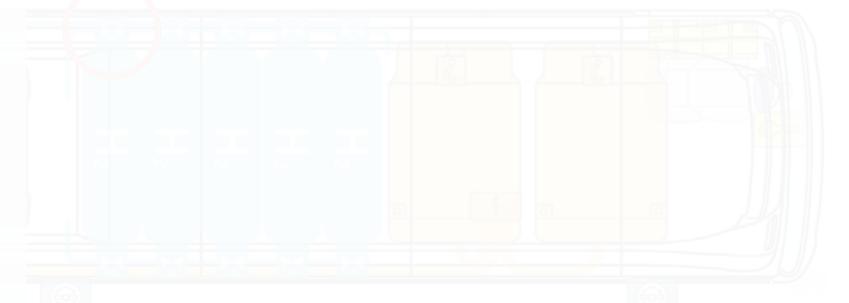
Compressed hydrogen gas 350 bar

This symbol indicates the safety valve.



Hy









Compressed hydrogen gas 350 bar.

After clicking on the safety valve, important information follows.



Hy



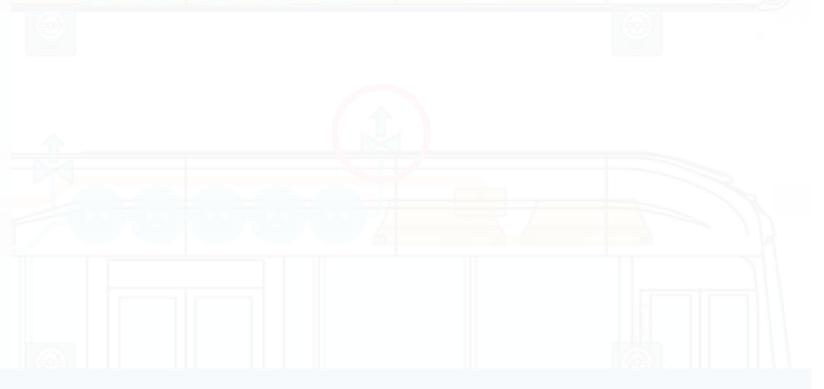


Compressed hydrogen gas 350 bar.

This symbol indicates the blowoff opening and direction.



Hy









Compressed hydrogen gas 350 bar.

After clicking on the symbol, important information follows.



Hy





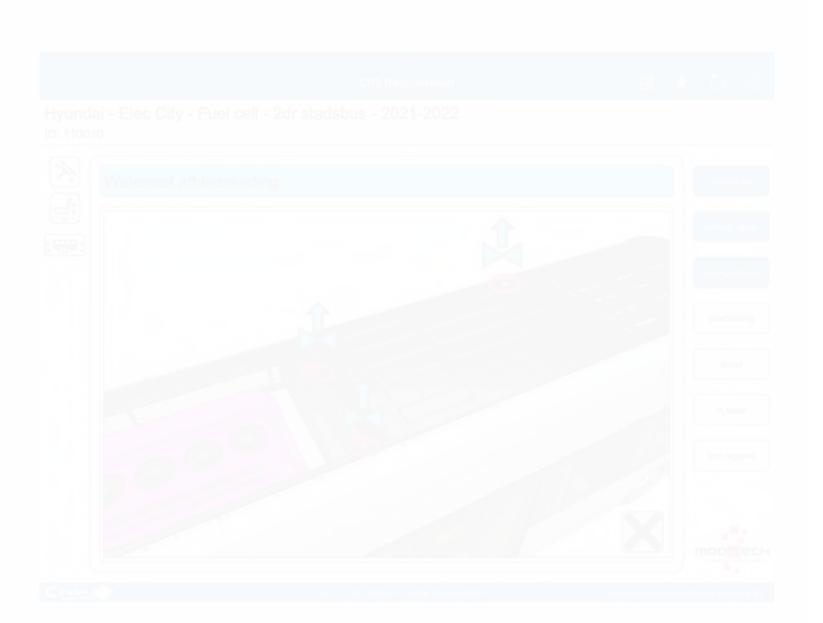
Compressed hydrogen gas 350 bar.

After clicking on the symbol, important information follows.



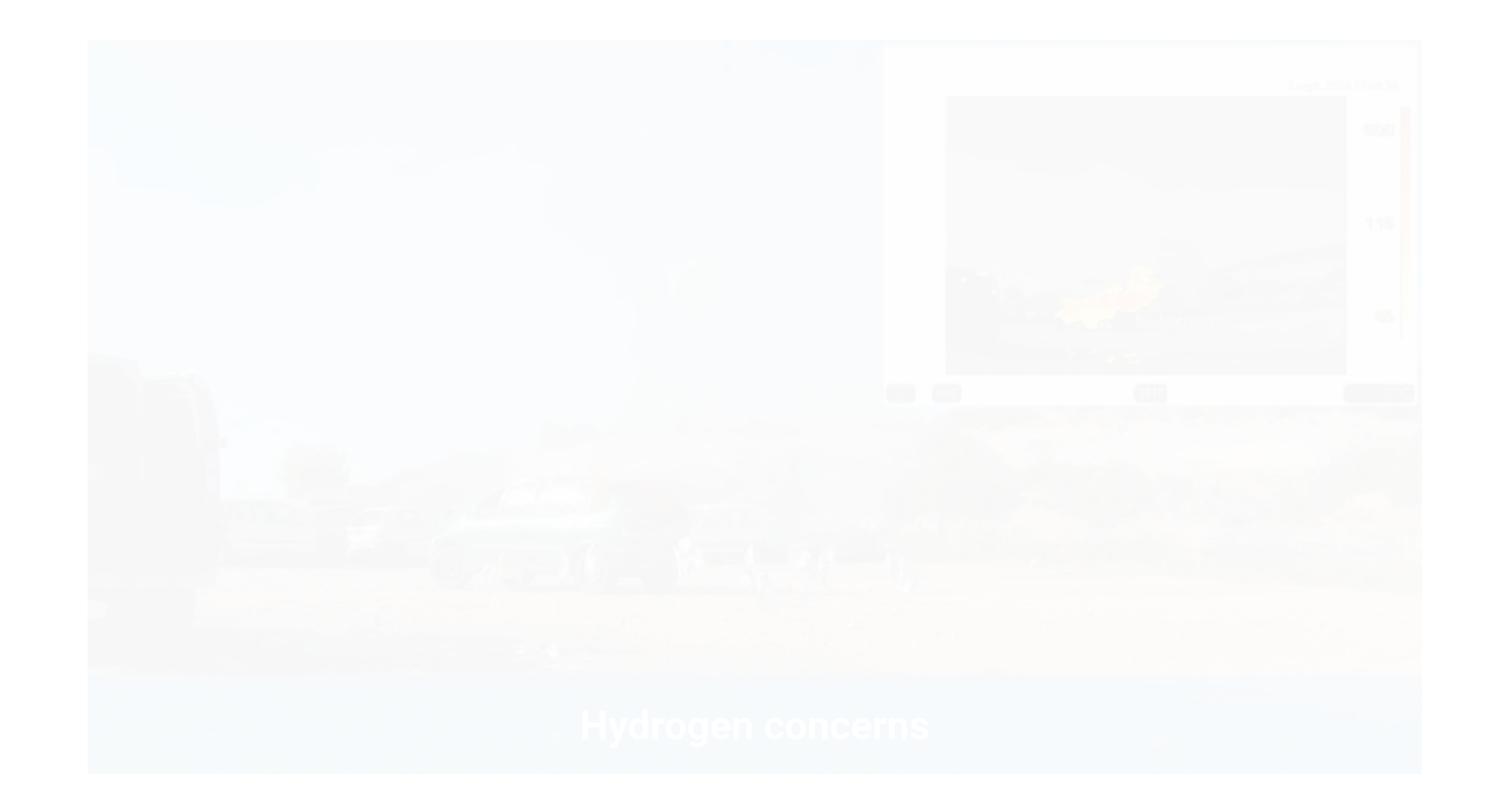
Hy















Suffocation hazard



H







Suffocation hazard

Highly flammable



H







Suffocation hazard

Highly flammable

High pressure









Suffocation hazar

Highly flammable

High pressure

No flames visible











Suffocation hazard

Highly flammable

High pressure

No flames visible

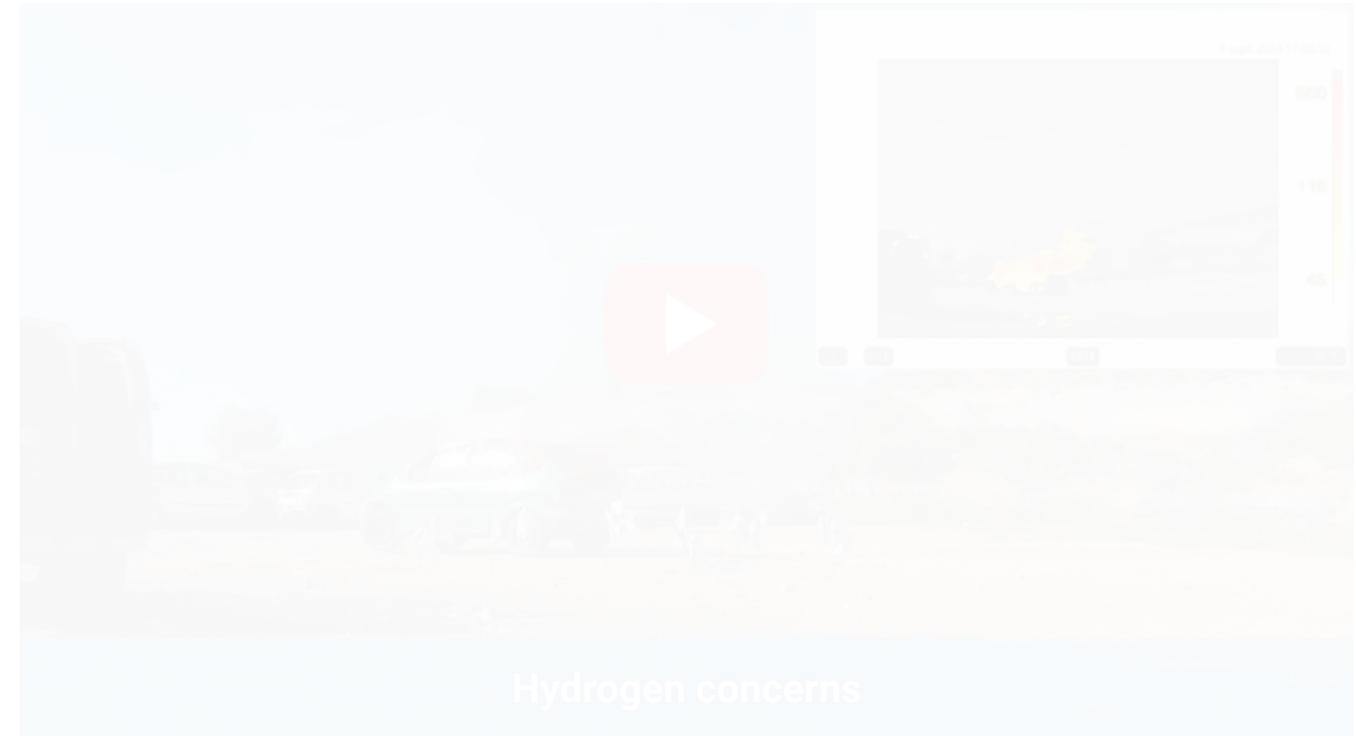
High temperature 2,000 degrees

























CRASH Recovery System[®] After the US and Canada, Tesla has added a few European countries w the Semi truck with a range of 800 can be ordered, the Netherlands be one of them.











After the US and Canada, Tesla has added a few European countries w the Semi truck with a range of 800 can be ordered, the Netherlands be one of them.

In the Netherlands, the first transp company has already made the lea by placing a pre-order. Breytner in Rotterdam is leading the way.





Future?







emi acceleration: ose and Personal





THANK YOU FOR YOUR ATTENTION!

CRASH Recovery System® For more information about Moditech website and social media channels:

WWW.MODITECH.COM

WWW.FACEBOOK.COM/MODITECHRESCUE

WWW.LINKEDIN.COM/COMPANY/MODITECHRESCUE

WWW.INSTAGRAM.COM/MODITECHRESCUE

Moditech Rescue Solutions B.V. Koningspade 16-B, 1718 MN Hoogwoud, The Netherlands | info@moditech.com | +31 (0) 226 412 900



and the Crash Recovery System, please visit our