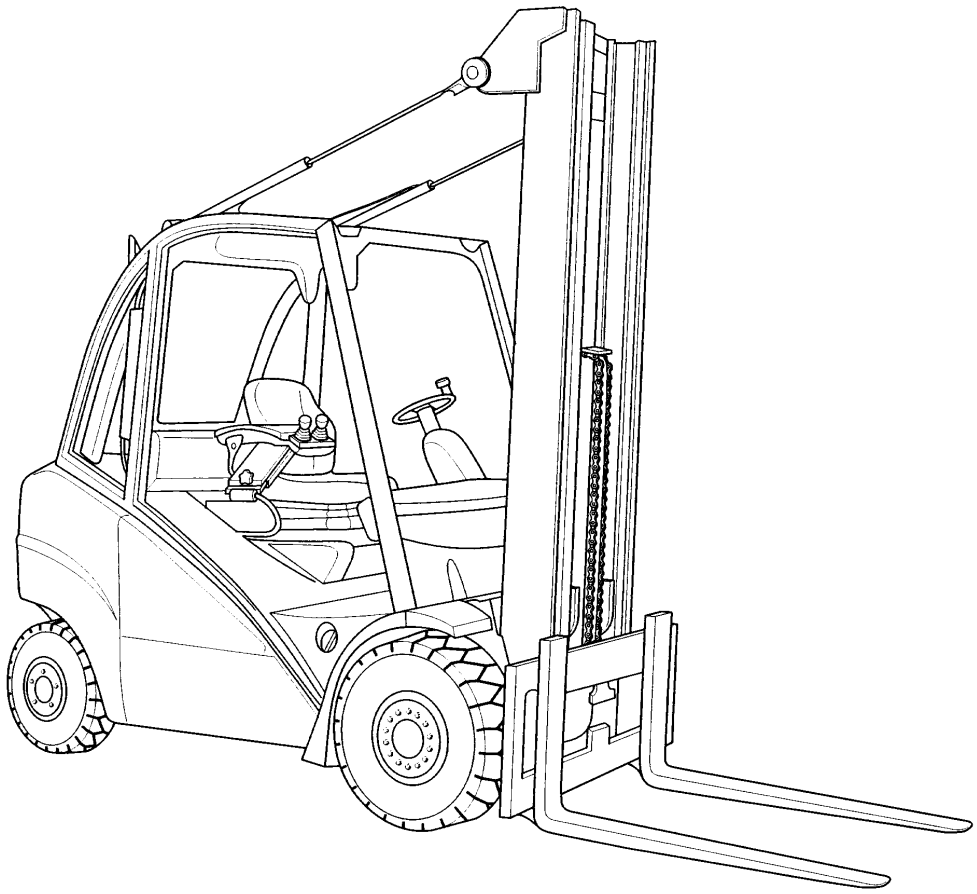
Service Training

Linde IC Engined Truck

H30D H30T H35D H35T

Series 393



Edition 01/2005

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- Editorial changes as well as corrections and additions in the module "Standardised measured value blocks"
- VW terms for components removed and replaced by Linde terms.
- Changes in Chapter 1: Standardised measured value blocks - measured value block 01 amended.
- Mixer basic setting revised.
- Changes in Chapter 2: Sealing of oil motor HMF 550 R corrected. Tighten groove nut at 1300±50 Nm. Groove nut key 000 941 8010 changed to 000 941 7000.
- Setting of charge pressure valve changed to $p = 18.0^{+0.5}$ bar.
- Setting of discharging valve changed to p = 13 bar.
- **Attention**: Hydraulic circuit diagram still outdated!
- Changes in Chapter 7: Pressure settings on the control valve for standard, duplex and triplex lifting scaffolds changed.
- Layout plans of piping systems corrected
- Changes in Chapter 8: Charts of screw-in depths for mechanical adjustment of tilt cylinders changed
- Changes in Chapter 9: Circuit diagrams corrected and amended.

The Company

Everything began in the year 1904. Carl von Linde and Hugo Güldner founded the "Güldner Motorenwerke", the precursor of our company. No-one could imagine how dynamically this business would expand in the decades to follow. Today Linde Material Handling has over seven factories in Germany, France and Great Britain and a production site in China. More than 600 patents - many of them milestones in material handling engineering - attest to unrivalled innovative power, the basis for the success today and tomorrow.

Today, the Linde plant II in 63701 Aschaffenburg is one of the largest and most modern production facilities in the world. New assembly structures with only one direction of flow, trolleys without drivers, new supply systems, vacuum filling of the working hydraulics: The points were set correctly from the start to achieve maximum productivity and quality. The distances are short, as one might expect. In the entire assembly process, a Linde fork truck only travels approx. 2000 metres. It is therefore one of the fastest even before it sees the light of day.

People are always at the centre of our work, no matter what we plan, no matter what we do. On the one side are our employees, who receive a lot of room for development. On the other side are our customers. They measure us on the basis of productivity and quality, but also on the basis of service and flexibility. We provide this worldwide in cooperation with our marketing and service organisations. With vehicles which, in the final analysis, are nothing else than the technical answer to their needs. Closeness to the customer is more than a word in this respect. It is lived reality.

Linde is one of the world's leaders in the sectors of material handling technology and hydraulics. The primary aim of our efforts is to offer our clients a convincing value for their money.Our decades of experience in material flow and the synergetic benefits of a large company allow us to tap new potential again and again. The most recent example is the Linde 39X with hydrostatic direct drive. A fork truck which links the fascination of technology and economy as no other forklift does.

We want to achieve a lot. We will give everything to achieve it. To be in a strong position in tomorrow's market you need more than yesterday's success. You need to be willing to work on yourself permanently. In research and development. In operations. And last, but not least, in service. In this respect, we have created the best conditions with our main plants in Aschaffenburg and the plants in Kahl, Weilbach and Ballenstedt.

Bruno Kulick
Management

Structure of the training document

This training document is based on the related seminar in the training centre and supplements it. The training document alone and without the accompanying training is not suited for self-study.

In order to allow you find the answer to problems at hand in the training document in case of a necessary repair, we want to give you some information on how and where you can find the desired information.

The training document is divided into numbered main sections. These main sections are again divided into subsections which in turn are also divided into more detailed subsections of the related section. The numbers and headings of the main sections and the subsections comply with internal guidelines and are retained for reasons of standardizations and continuity.

Overview of the main sections and (summarised) their content:

Section	Content
00	Product information Diagnosis
01	Motor Internal combustion engine Electric motor
02	Gearbox Hydrostatic drive axle Mechanical drive axle Drives
03	Body Chassis Operator's compartment
04	Running gear Steering system Mechanical guidance Inductive guidance Wheels and tyres Brake system

Section	Content
05	Controls Controls - general Display elements
06	Electrical / electronic installation Electrical / electronic installation - general Electronic controls
07	Hydraulic system Working hydraulics Hydraulic controls Valves
08	Load lifting system Load lifting system - general Mast Cylinders Fork carriage Attachments
09	Options and accessories Options and accessories - general

The training document has a modular structure, it does **not** successively describe the structure of the truck.This means that individual "modules" are strung together as independent units. This is another reason why training in a our training centre is indispensable.

We point out that a list of all the special tools and test equipment used for this vehicle, including part number, use and illustration, can be retrieved in the diagnostic software "Truck Expert" according to type.

With the introduction of the new form of the training documents in the year 2004, we have made a new index. This index should also make it easier to find the desired information fast. In this connection we would like to ask you to inform us under the e-mail address "service.training@linde-mh.de" if you miss an entry in the index or if you discover a technical or formal error. We are also not free of errors and mistakes and we are thankful for any support.

Thank you very much in advance for your assistance and cooperation.

Explanation of the levels of danger notices

This document contains danger notices depicted using international pictograms in the following levels and using the syntax "Description of Danger" with the possible consequences, as long as they do not already ensue from the type of danger, and "Avoiding Danger" with explanations on how to avoid danger.

DANGER

There is direct danger to life or the danger of severe, life-threatening injuries and/or significant property damage. Description of cause of danger.

Description on how to avoid the existing danger.

WARNING

There is risk of severe injuries or large-scale property damage. Description of the risk of injury or the significant property damage.

Description on how to avoid the risk of injury or significant property damage.

CAUTION

Non-compliance may result in damage to or destruction of the material.

Description of how to avoid possible damage or destruction.

NOTE

Special attention should be paid to technical interconnections which might not be apparent even to a specialist.

ENVIRONMENT NOTE

Follow the notices indicated here since non-compliance may lead to environmental damage.

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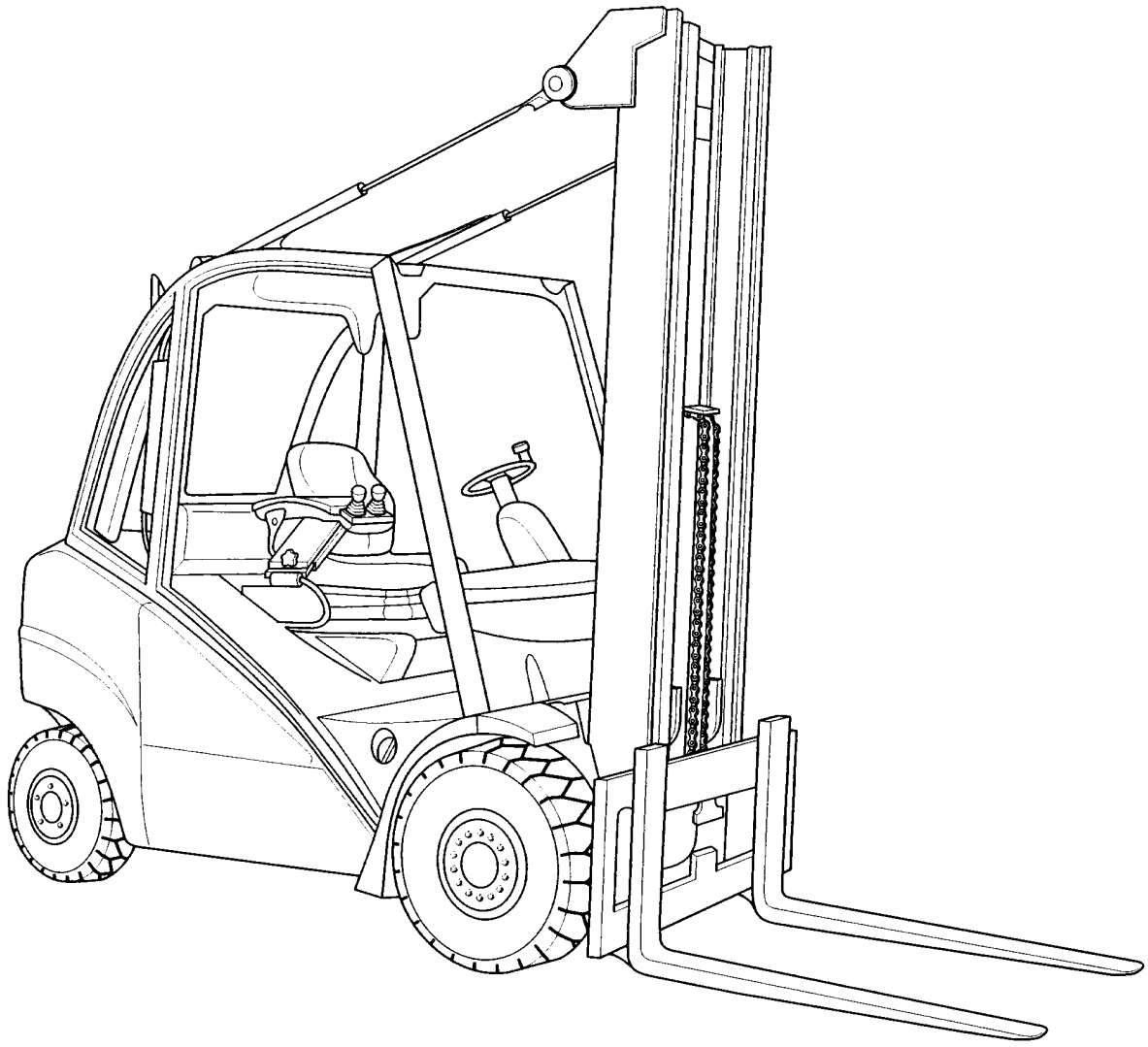
The truck



The H 30 and H 35 trucks represent the next generation of IC-engined Linde fork trucks.The truck is perfectly tailored to the driver. Its operating comfort ensures little fatigue when working, protects the driver's health, thus allowing high productivity. Its superior economy comes from its low fuel consumption, low service costs and high re-sale value at the end of its period of use.The low driving noise and pollutant emissions, which are well below the specified limits, make the truck environment-friendly and protect the driver and environment.

Other highlights are:

- Excellent operator's workplace for greatest possible performance of driver and truck.
- Unique shock-absorption system reduces roadway and load impacts before they are transmitted to the truck and driver.
- Maintenance-free hydrostatic direct drive with a high degree of efficiency from Linde.
- Modern, economical engines with low emissions.
- Overhead tilt cylinder for higher residual load capacities and more precise load handling.
- Linde dual pedal for faster and safe working.

Design of operator's compartment

The operator's workplace is designed according to the latest findings in ergonomics. It has a low access, which can be viewed from above. The large cabin space with a generous footwell and a interior design corresponding to automotive standards imparts a pleasant spatial feeling. The Linde Load Control provides precise and relaxed operation of all mast functions consisting of two control levers, which are integrated in

an individually adjustable armrest. The Linde dual-pedal control stands for fatigue-free driving with increased productivity. The feet always relaxed on the pedals and allow fast reversing without shifting with short pedal strokes.Due to the rubber-mounted drive axle, road bumps reach the driver only to a small extent, thus reducing body stress. The extremely low noise level is easy on the driver and environment. The steel overhead guard safeguards against falling loads. The anti-glare indicators, gauges and switches are installed in the canopy console of the truck are easily accessible. They allow a narrow steering wheel cover and a good view forward. Along with the frame construction, these features allow excellent all-round visibility.

Chassis

The overhead guard and frame form a unit: the Linde ProtectorFrame. This design provides greatest possible stability and safety. The wide-opening bonnet and service covers make all components easily accessible and therefore easy to service. The otherwise closed chassis prevents dust and foreign particles from penetrating the assemblies and reduces noises.

Engine

The diesel and LPG engines installed are equipped with sophisticated engine technology. The benefits are: high torque, fuel economy, low exhaust emissions (NO_x, CO, HC), minimal soot emissions (diesel) and low noise levels.

Drive

The Linde hydrostatic drive stands for know-how and quality developed and produced by Linde. As a fully automatic drive, it allows sensitive, smooth driving and fluent reversing without delay. The drive has proven itself to be rugged under a great variety of duties and extreme conditions. The Linde hydrostatic drive does not need a clutch, differential and drum brakes.

Electronics / electrical system

The control electronics for the traction and lift hydraulics, the Linde Truck Control (LTC), has numerous advantages: sensitive, smooth driving and reversing and the automatic control of the engine speed depending on the particular demand of the hydraulic system. This means the engine is always running at the lowest possible speed. This minimises fuel consumption, noise and exhaust gas emissions, making life easier for the driver and the environment. Beyond this, the service engineer can also adjust the truck performance to the particular application. A self-test of the truck facilitates the processing of servicing. All safety-related truck components such as microprocessors exist twice and monitor each other. This provides the greatest possible functional reliability. The control unit is protected from spray water and dust in the sealed enclosure. All the electronic/electric components are also protectively mounted in the centre, but also easily accessible behind the operator's seat. Each strand of the cable connectors are sealed and are therefore safeguarded against foreign particles and moisture.

Steering

The on-demand hydrostatic steering is sensitive and nearly without any play. In conjunction with the ergonomic, small steering wheel, it permits easy and precise steering. The tilt angle of the steering wheel is adjustable.

Mast

The top-mounted tilt cylinders allow the use of slim mast channels and they provide safety through good visibility of load and environment. The top-mounted tilt cylinders also allow a full load capacity up to high lift heights with a high residual capacity. The rubber mounting of the bearings reduces impacts and vibrations and increases the comfort of the driver. The free-view masts are available as standard, duplex or triplex types. If attachments are used in conjunction with duplex and triplex masts, the hose reel mounted inside permits good visibility through the mast and protects the hoses from wear and tear. Maintenance-free mast and tilt cylinder bearings reduce the costs of ownership. Thanks to the electronic limitation of the tilt angle, the mast slides gently and silently to the end positions.

Brake

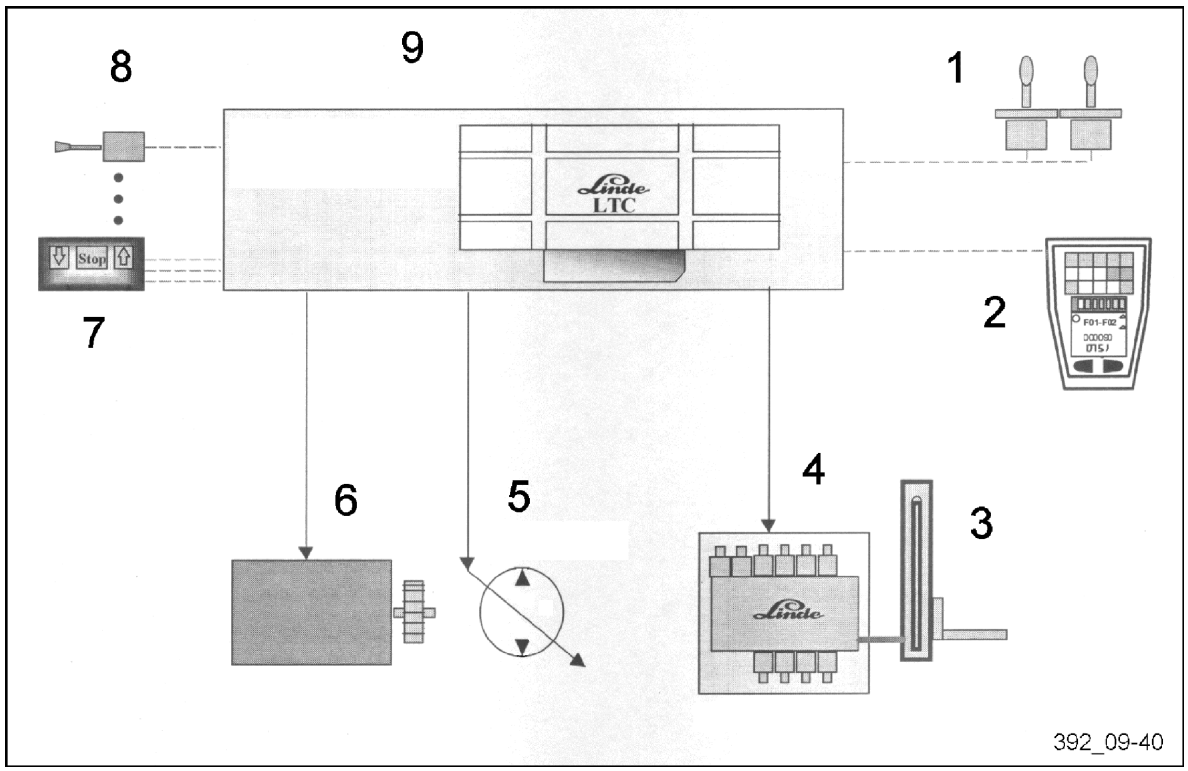
The truck can be braked safely in three ways:

- Gentle, hydrostatic braking (as soon as the accelerator is released) for wear-free deceleration in everyday operation.
- Emergency braking by depressing the brake pedal (hydrostatic braking as well as added

deceleration by maintenance-free multiple disc brake).

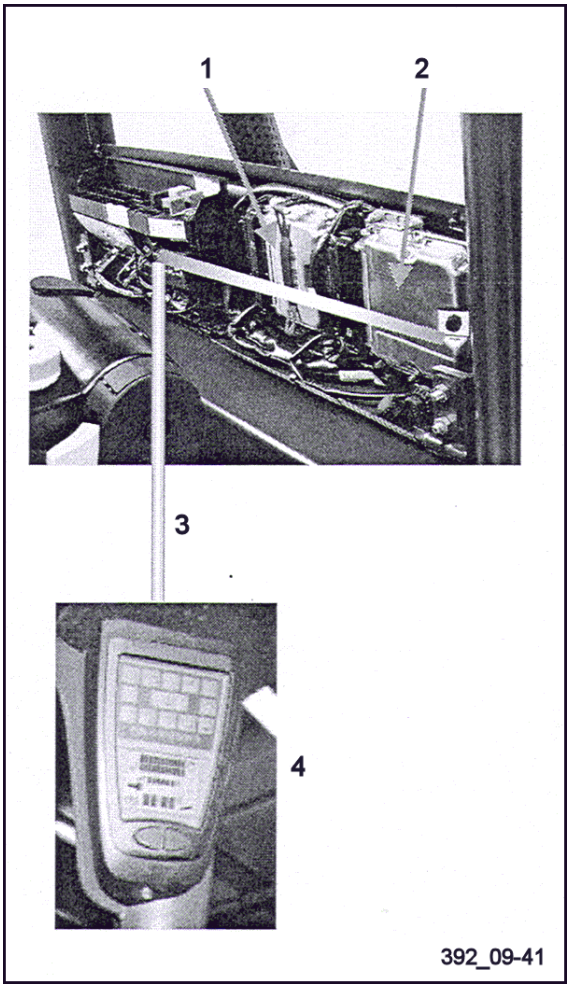
- Automatic application of the parking brake when the engine of the vehicle is shut off.

LTC - basic structure



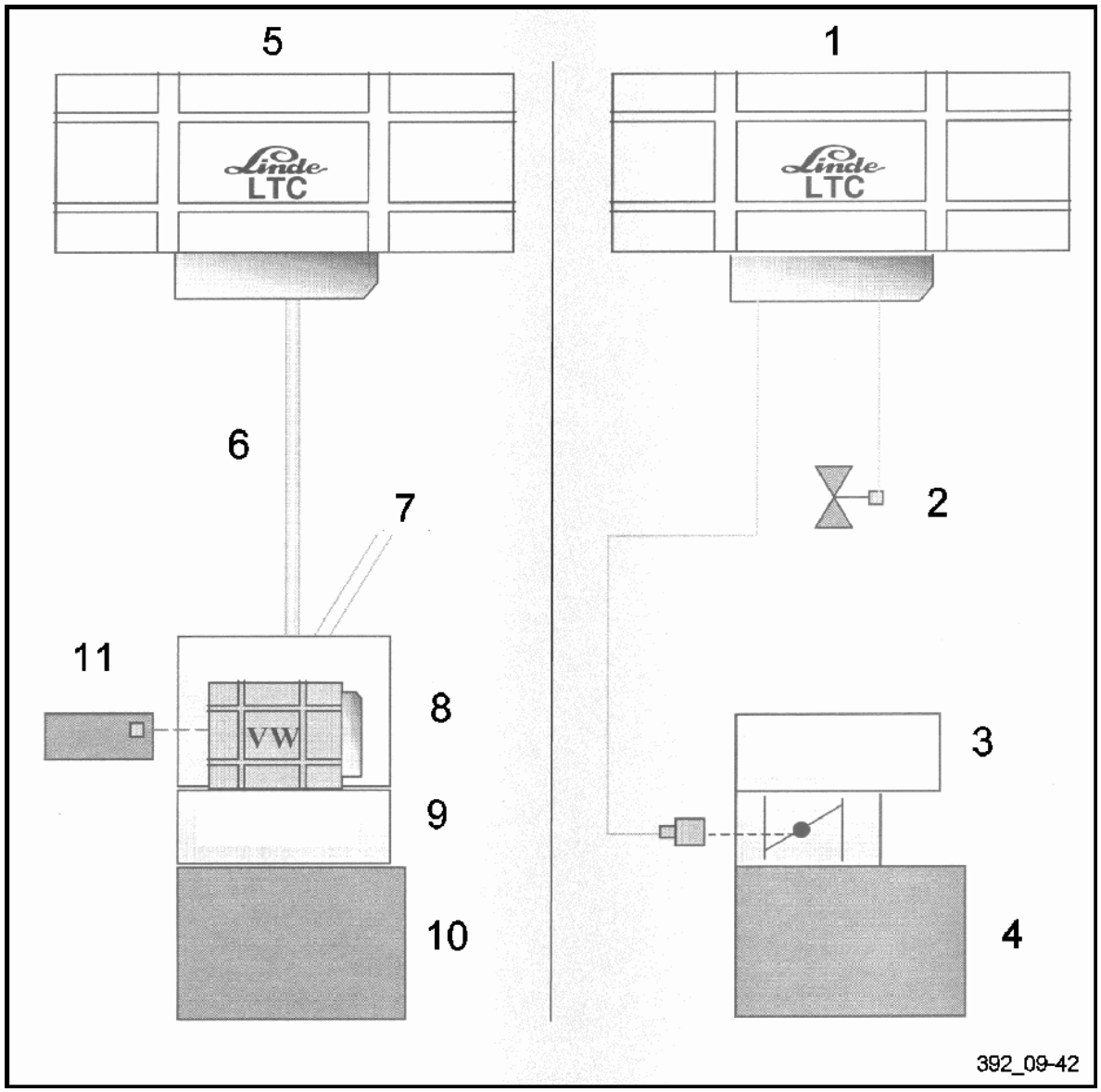
1	Joysticks	6	Internal combustion engine
2	Display	7	Pedal group
3	Mast	8	Directional control switch
4	Directional control valve block	9	Integrated traction/lift control
5	Traction pump		

System communication - overview and position of modules ▷



1 VW module
2 LTC module
3 CAN bus (communication)
4 Display

LTC modules - difference between diesel and LPG trucks



1	LP gas, no engine diagnosis	7	VW diagnosis (ISO)
2	LPG shut-off valve	8	engine control
3	Ignition control unit	9	Injection system
4	Internal combustion engine	10	Internal combustion engine
5	Diesel, with engine diagnosis	11	Immobilizer
6	CAN bus		

Engine electronics - overview