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# TECHNICAL REFERENCE

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## HYDRAULIC STEERING

Vehicles with one hydraulic controllable (A6) axle



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## System overview

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In order to control the steerable axle three systems are involved.

1. Electronic control
2. Pneumatic interface and safety-lock
3. Hydraulic master and slave

The Electronic Control Circuit (ECC) is responsible for the overall control of the systems. Based on certain conditions, the ECC enables or disables steering of the axle.

The pneumatic system functions as interface between the electronic and the hydraulic systems as well as applying safety-lock on the axle when steering is inactive.

The hydraulic system performs the actual movements of the axle and consists of a closed hydraulic loop. There are no interconnections whatsoever between the hydraulic system concerning the steering and that of the vehicle.

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## Electronic Control Circuit (ECC)

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The Electronic Control Circuit is responsible for the controls and indicators of the axle. Five conditions are monitored in order to decide whether steering can or cannot be enabled on the axle.

### The five conditions monitored are:

1. Supply voltage must exceed + 20 volt.
2. The speed must be below a certain limit (app. 40 Km/h).

3. Hydraulic oil pressure, in the closed loop, must exceed 3 bar (normal pressure is 15 bar).
4. The bogie must be down.
5. The front wheels must reach the centre position.

When all conditions are met, steering will be active until the change of one, or more, of the signals 2, 3 or 4.

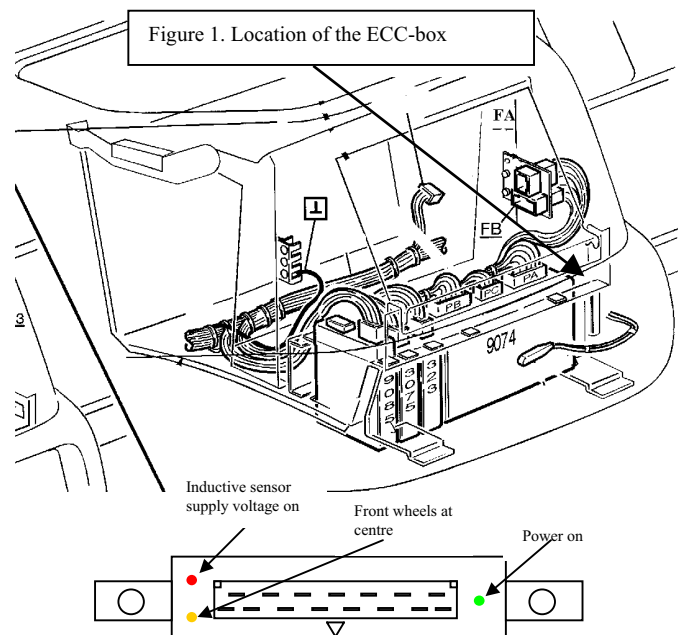


Figure 2. Front view of the ECC-box

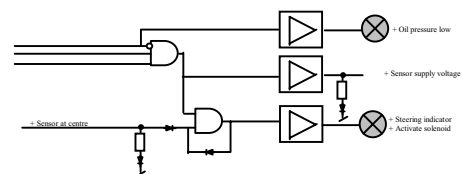


Figure 3. Schematic diagram of the ECC

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## User and service -indicators

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To facilitate the use and service of the system, two user indicators visible to the driver and three additional service indicators are controlled by the ECC.

The two user indicators, one green and one red, are located on the right hand side of the driver's dashboard. The red indicator goes on if the hydraulic pressure in the closed system falls below 3 bar. When the red indicator is on steering of the axle is prevented. The green indicator goes on when steering of the axle is active.

The three service indicators are located on the front of the box containing the ECC. Refer to *figure 1* to locate the electronic box. To the left of the connector are two LED's - the top one is red and the bottom one is yellow. To the right of the connector is one green LED. Refer to *figure 2* for the configuration of the service indicators.

The green LED is on whenever power is supplied to the electronic box. Power is supplied when ignition is turned on.

When conditions for steering are met, power is supplied to the inductive sensor mounted on the master-cylinder.

This is indicated by the red LED. The conditions are:

- Power is on and more than + 20 Volt.
- Hydraulic oil pressure is above 3 bar.
- The bogie is down.
- The speed is below the limit.

With power on the inductive sensor, the ECC is waiting for the signal indicating that the front wheels have reached the centre position. The yellow LED indicates the signal from the inductive sensor, and the signal turns on the steering and the green user steering-indicator.

All indicators should be considered in the event of a malfunction in the steering system.

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### **Pneumatic interface and safety-lock**

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The pneumatic system is utilised as the interface between the electronics and the closed hydraulic system. When steering conditions are met a solenoid is activated by the ECC thus feeding pilot air pressure to the hydraulic valve via the pneumatic valve. The pilot pressure acts as the switch turning the hydraulic valve on or off. When steering is inactive, the pneumatic system is responsible for keeping the axle locked in its centre position. A pneumatic cylinder, holding two inner pistons, is connected to the hydraulic slave cylinder. One piston is connected to the piston rod of the hydraulic slave cylinder and one is floating. To gain lock on the axle, air-pressure is supplied to both ends of the pneumatic cylinder at the same time as the enclosure between the two pneumatic pistons is vented through the air-vent/filter. The effects being that both pneumatic pistons are centred in a locked position, i.e. the axle is locked.

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### **Hydraulic system**

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The force needed to actually move the axle is supplied by the closed hydraulic system. A hydraulic cylinder, called the *hydraulic master cylinder*, is connected to the steering of the vehicle through the pitman arm. The movements induced by

the steering wheel are converted to flow of hydraulic oil in the closed loop of the hydraulic valve and hoses. When steering is activated, hydraulic oil flows from the hydraulic master cylinder through the hydraulic valve, hoses and pipes to the slave cylinder mounted on the axle, thus moving the inner piston and piston rod i.e. the axle. The hydraulic oil returns through the hydraulic valve all the way to the master cylinder compensating for the movement in the steering-rod. When steering is inactive the oil-flow from the master cylinder is shunted in the hydraulic valve preventing oil from entering the pipes and hoses leading to the slave cylinder.

Normal operating pressure in the closed hydraulic system is 15 bar. In the event that the pressure falls below 3 bar, the steering of the axle is disabled and the axle is locked in its centre position.

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## Venting the hydraulic system.

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Please read the entire procedure carefully through before performing any work on the vehicle.

Venting the hydraulic system involves pumping hydraulic oil into the system pushing all trapped air out through the drain-fittings located on the master and slave -cylinders.

This can be done using a hand pump and the appropriate oil. Using an automatic pump greatly reduces the workload while carrying out this task however.

### Tools needed:

Hydraulic pump.

Transparent drain tubing fitted with a connector.

A small transparent container to hold the oil drained from the system.

Hydraulic oil.

### Preparations

In order to vent the hydraulic system thoroughly both the front-axle and the hydraulic steerable axle need to be lifted off the ground. This will allow full movement of the axles. All wheels must be centred. The bogie-switch must be in the “bogie down” position. Ignition power must be on and in order to gain access to the hydraulic valve and the master cylinder, the driver’s cab must be tilted. During the process you can observe the “low pressure” indicator located on the right-hand side of the dashboard. This indicator will go on whenever the pressure in the closed system falls below app. 3 bar.

Drain the front air-tank, below the battery assy. fully, to prevent lock of the steerable axle.

### Procedure overview

Oil is pumped into the system through the hydraulic valve. While keeping the system pressurised at all times each of a total of five drains are vented. After venting four drains the procedure is repeated, this time moving the axles to their outer stops, pushing out all trapped air in the cylinders. Next the hydraulic valve is vented, the system is then refilled and pressure is set at 15 bar. The vehicle is taken out on a test drive after which the system is vented once more, while, at the same time, checking the function of the “oil pressure low” indicator and refilled to operating pressure.

### Venting procedure step by step.

#### Step 1

Connect the pump to the #1 inlet/drain located on the hydraulic valve (see figure 3) and apply pressure on the system. If you are using a manual pump be sure to keep pressure on the system during the entire process.

#### Step 2

Prepare the transparent drain tubing and container. Let the open end of the drain-tubing hang loose into the container.

Connect the connector-end of the drain tubing to drain #2 located on the master cylinder.

Let the oil drain until no more air-bubbles are observed.

#### Step 3

Repeat step 2 on drain #3 located on the master cylinder.

#### Step 4

Move to the slave cylinder and repeat step 2 on drains #4 and #5.

**Step 5**

Move back to the master cylinder and connect the drain tubing to the drain #2. With the drain tubing in place move the front wheels to a full “left turn” position. Leave the tubing on until no more air-bubbles are observed. Then move the front wheels to the full “right turn” position. Let the air drain until no more air-bubbles are observed. Repeat the process by turning the wheels to both outer stop-positions until no more air-bubbles are observed.

**Step 6**

Repeat step 5 on the drain #3.

**Step 7**

Move to the slave cylinder and connect the drain tubing to drain #4. Repeat the process outlined in step 5 on drain #4. Leave the tubing on until no more air-bubbles are observed.

**Step 8**

Connect the drain tubing to drain #5 and repeat the process in step 5 on drain #5. Leave the tubing on until no more air-bubbles are observed.

**Step 9**

Increase the pressure in the system to 15 bar. Disconnect the pump from hydraulic valve and connect the drain tubing to the #1 inlet/drain instead. Leave the tubing on until no more air-bubbles are observed.

**Step 10**

Reconnect the hydraulic oil-pump to the #1 inlet/drain and apply full operating pressure (15 bar) on the system.

**Step 11**

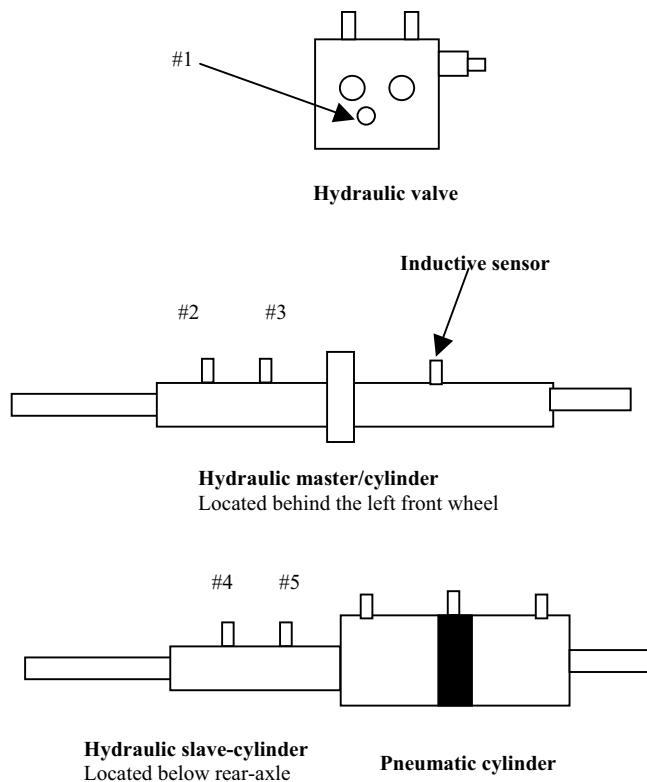
Bring the vehicle back to its normal

operating conditions and take it out for a functional test of the steering system. When returning from the test-drive repeat the draining of drains #2 to #5 with the axles in their centre position and the green “steering on” indicator on.

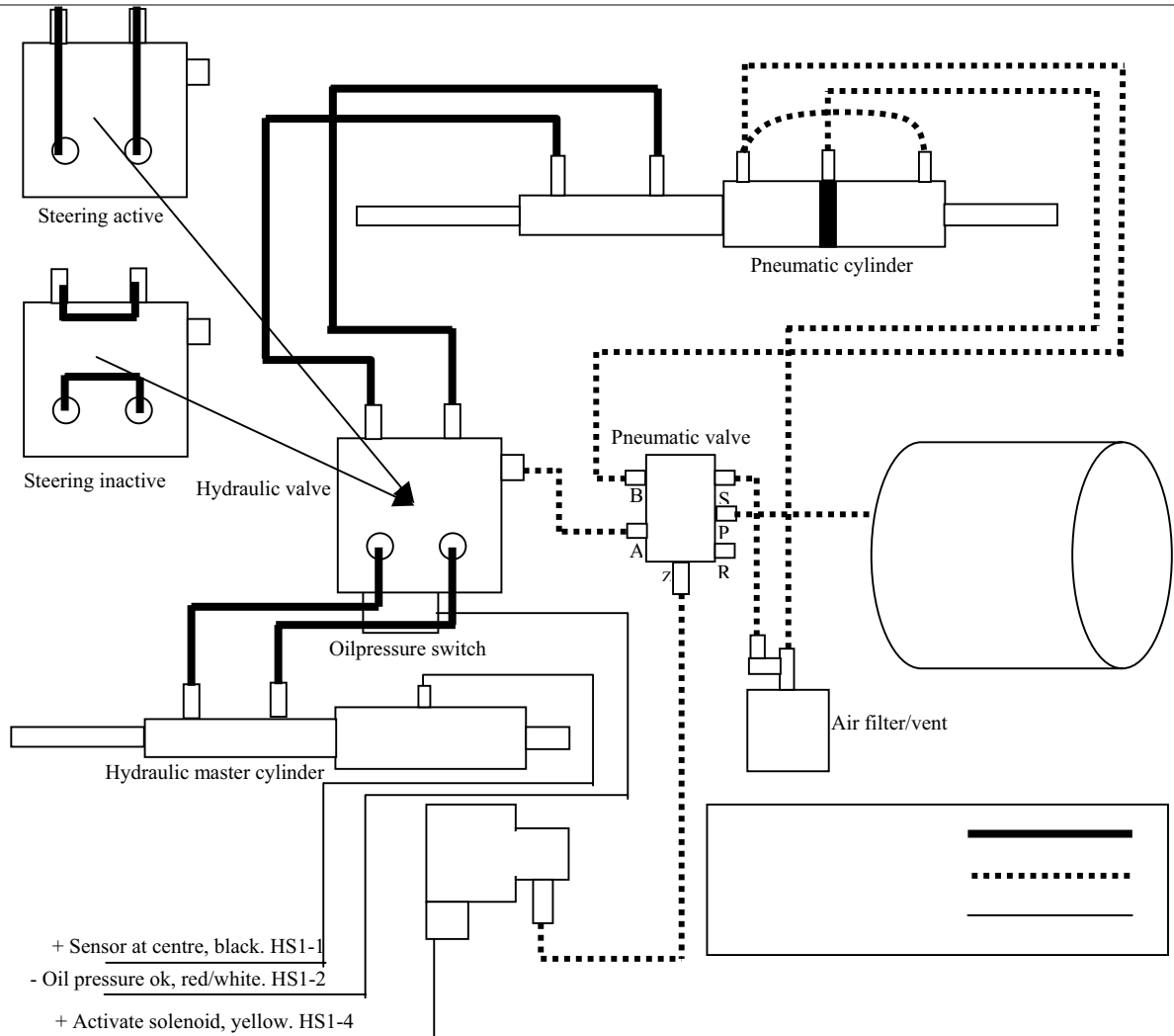
**Step 12**

Remove the hydraulic pump from inlet/drain #1 and connect the drain tubing to #1 instead. Observe that the “oil pressure low” indicator comes on and that the “steering on” indicator goes out when the pressure in the closed system falls below app. 3 bar.

Connect the hydraulic pump to inlet/drain #1 again and apply full operating pressure to the system (15 bar). This concludes the venting procedure.

**Location of connectors**

## Schematics - hydraulic and pneumatic control

**Circuit description:****Steering state:**

Once activated, the solenoid feeds air to the pneumatic valve ( $\rightarrow Z$ ) causing this to change state. As a result of this the air pressure from the supply tank is passed through to the hydraulic valve ( $P \rightarrow A$ ) and pressure is relieved from the rear axle pneumatic cylinder through the air filter ( $B \rightarrow S$ ). The Master cylinder is now in control of the rear axle.

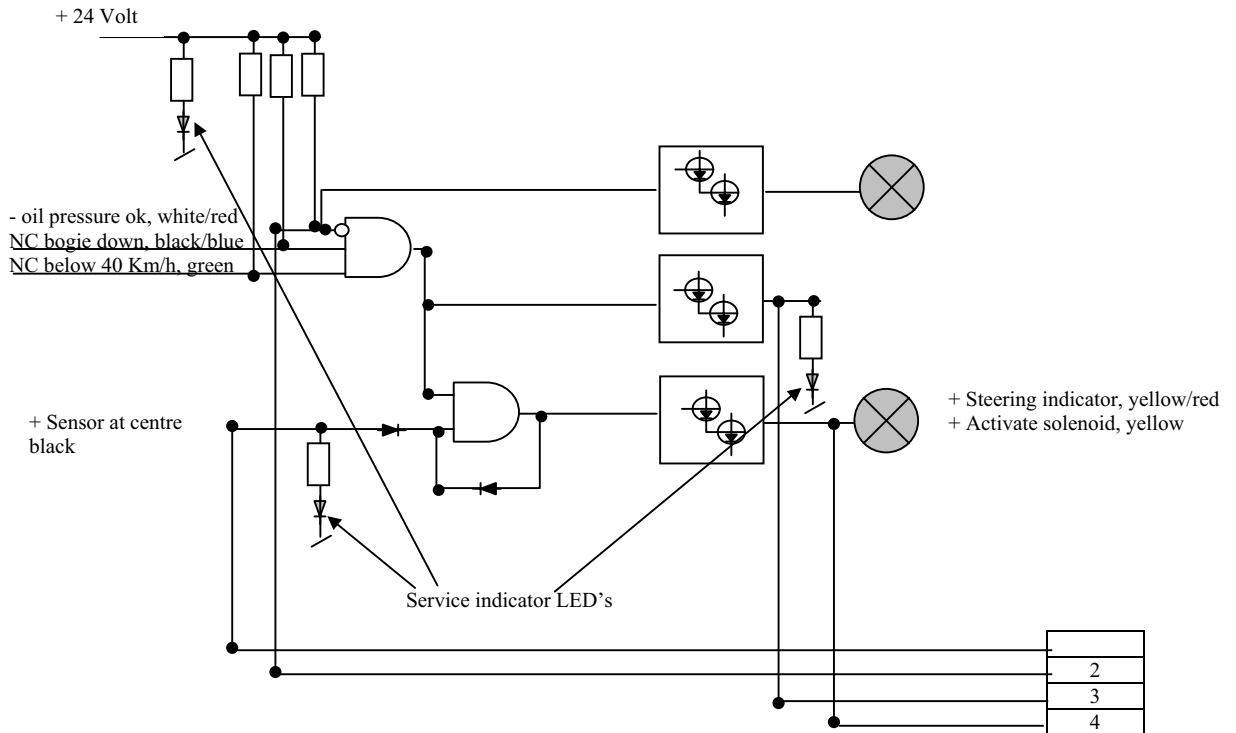
**Locked state:**

Dropping the line “+ Activate solenoid” from the ECC, causes the solenoid to depressurise the Z-inlet which in turn lets the pneumatic valve resettle to its inactive state. The effect of this being that air pressure to the hydraulic valve is vented ( $A \rightarrow R$ ), causing this to shunt hydraulic oil in a closed loop. Furthermore pressure is supplied to both ends of the rear axle pneumatic cylinder ( $P \rightarrow B$ ), and the enclosure between the two inner pistons is vented through the air filter, causing a firm lock of the rear-axle in its centre position. (Letters in parenthesis refer to the pneumatic valve connectors).

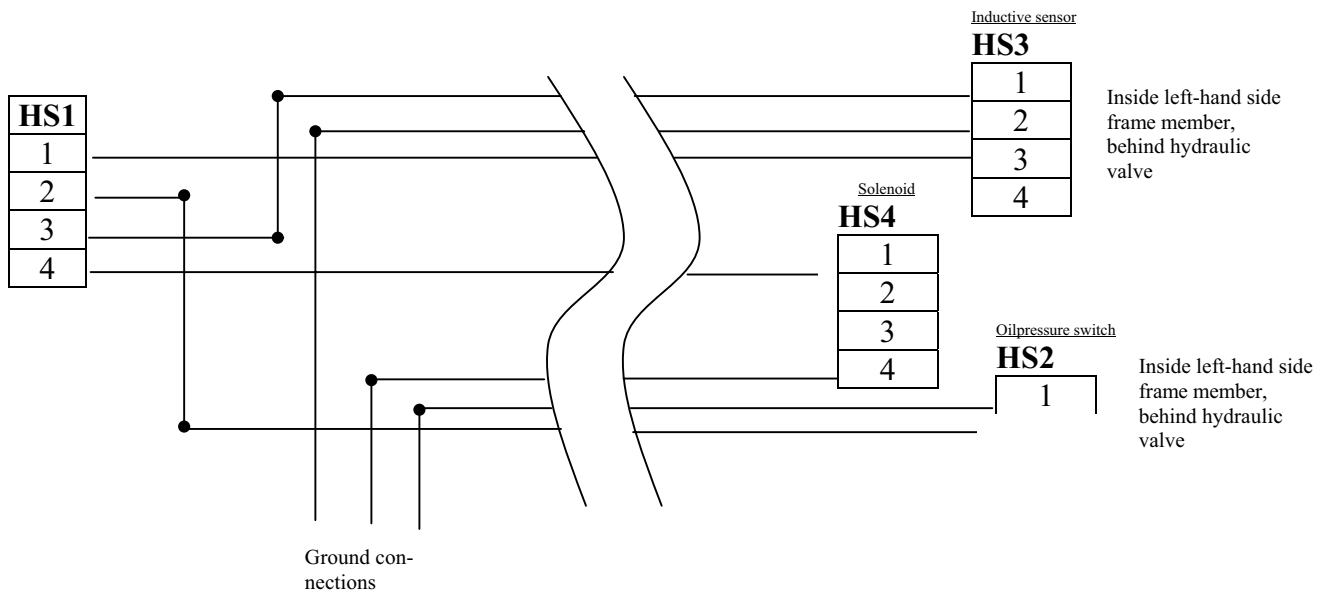


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## Electronic control circuit- logic diagram:

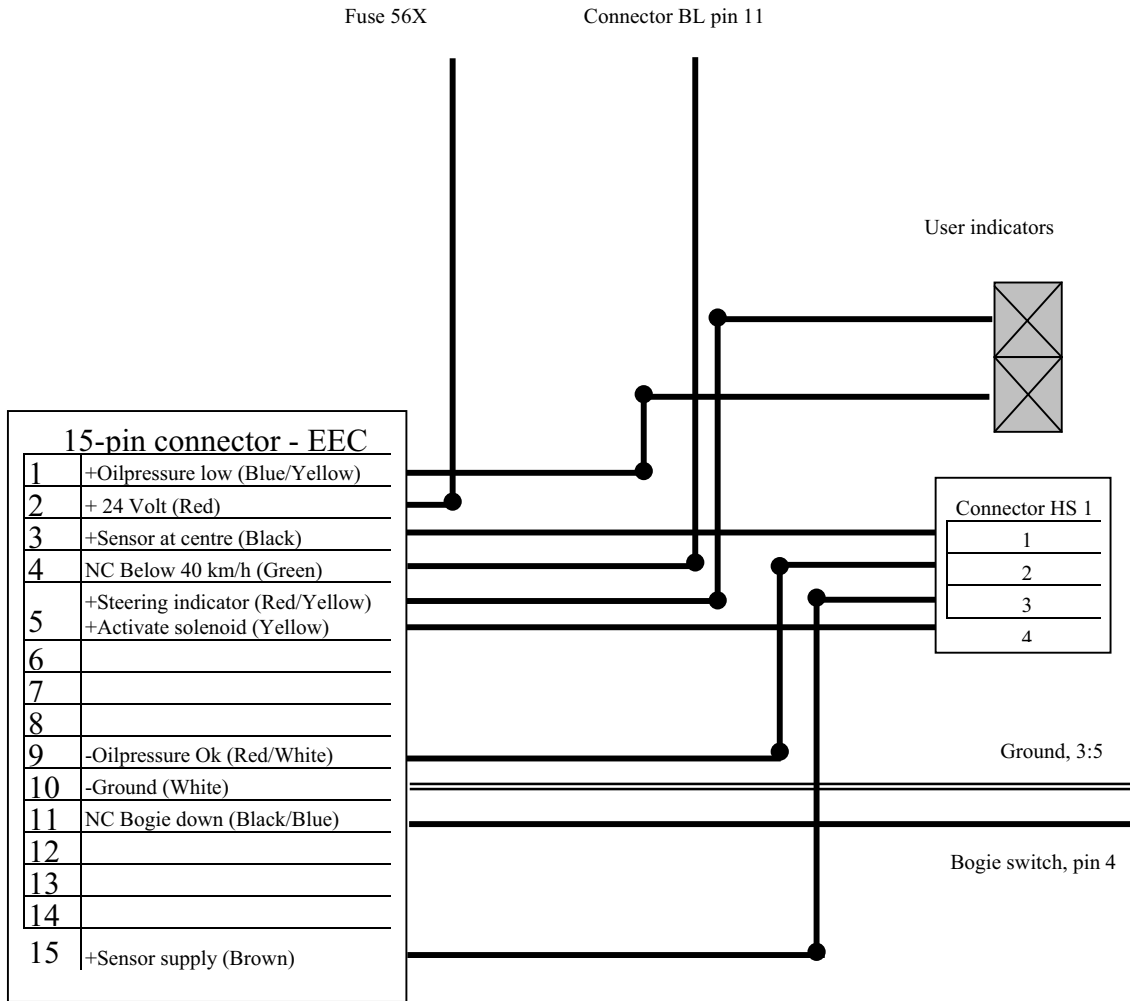


## External cable assy

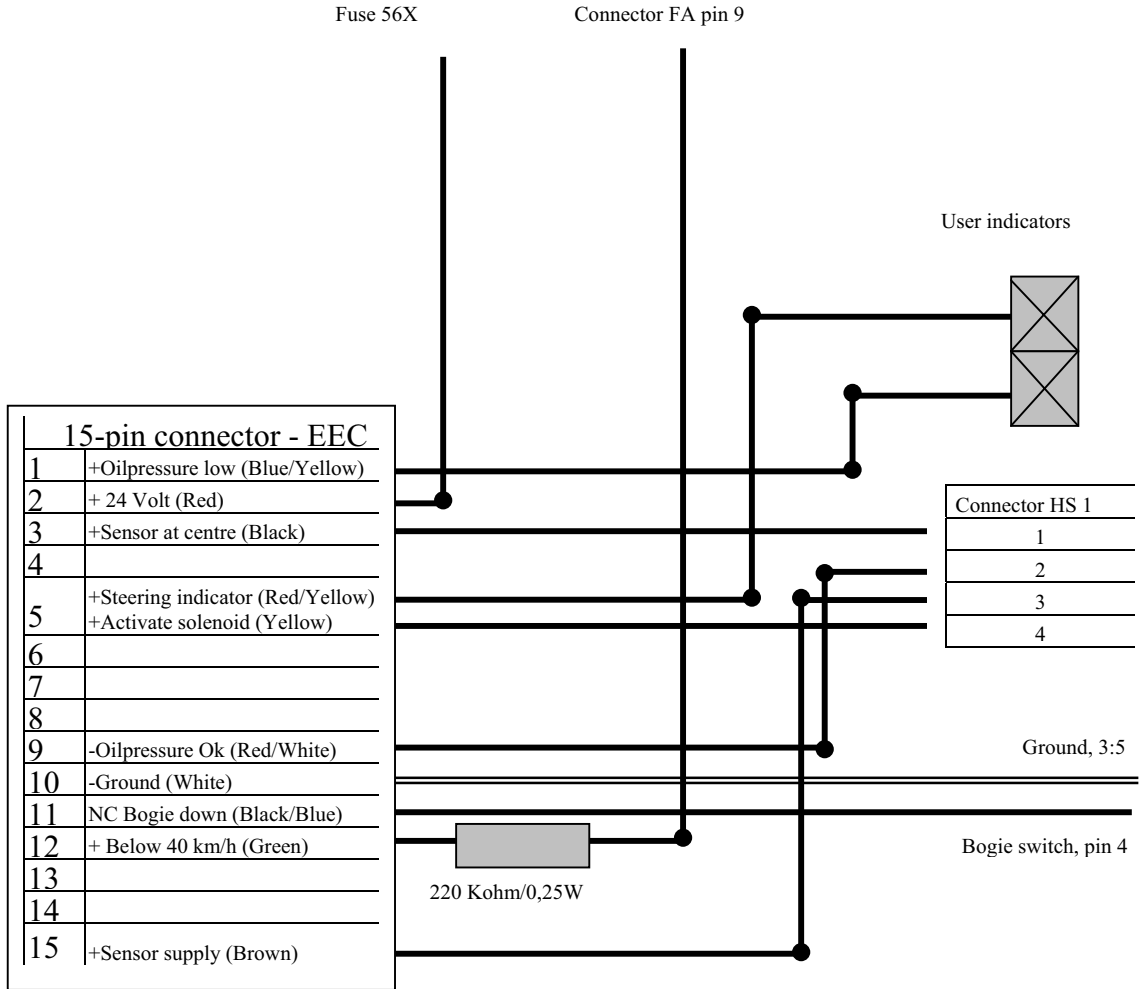


The external cable assy is entering the cab at the right-hand front of the vehicle behind the lower panel near the cab floor.

## Internal cable assembly – s version



## Internal cable assembly – p/g version



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**TROUBLESHOOTING GUIDE**


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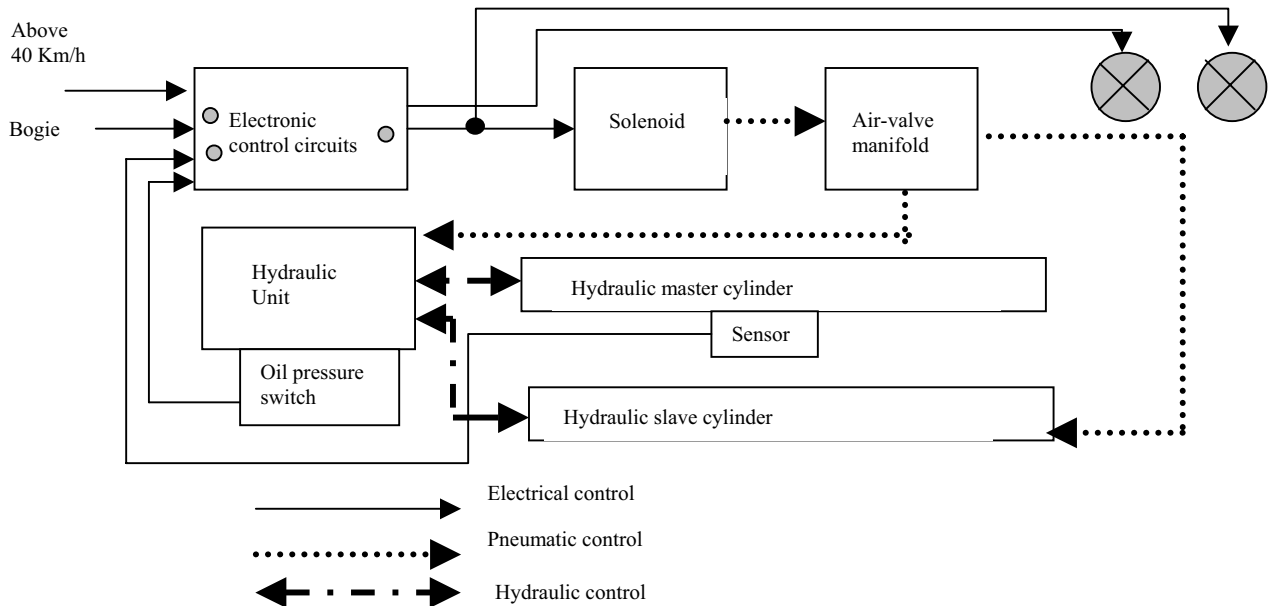


Figure 4. Schematic overview

### General information

Use all available information in the event of a malfunction in the systems. The guided troubleshooting will refer to all the schematics presented in this document. The schematic overview above represents the elements, controls and indicators related to the axle.

In order to gain hydraulic control of the axle, the following conditions must be met:

- The power supplied must exceed + 20 Volts
- Hydraulic oil pressure in the closed system must exceed app. 3 bar.
- The speed of the vehicle must be below a certain limit (app. 40 Km/h)
- The bogie must be down.

When all the conditions above are met, a signal from the inductive sensor, on the master cylinder, will signal the electronics to activate the steering on the axle as soon as the front wheels reach or pass the centreline.

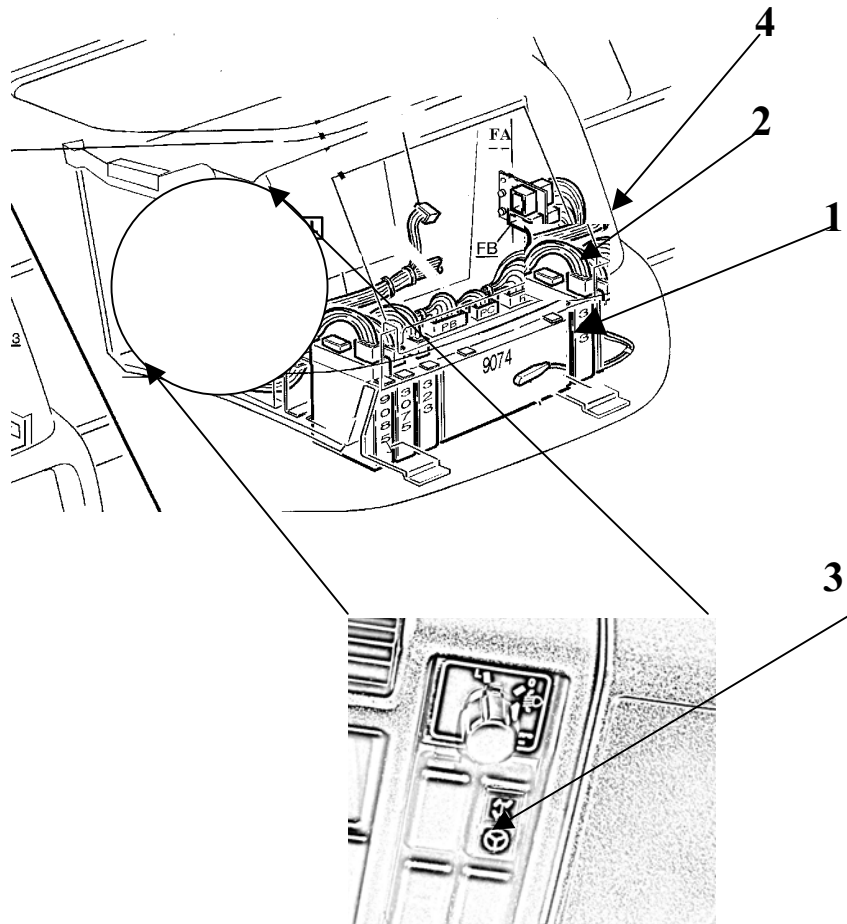
The indicators located on the driver's dashboard are referred to as the "User indicators" and the indicators located on the electronic control box are referred to as the "Service indicators".

Symptom	Check and repair
<p>No error indications, but steering is inactive - no steering indicator.</p>	<p>Ignition power is off.</p> <p>You are running at a speed above the limit, or the bogie is raised.</p> <p>The front wheels have not reached/passed the centreline.</p> <p>Check for a defect in the voltage supply. The voltage supplied to the electronic box must exceed app. + 20 Volts.</p> <p>If power is missing check for a blown fuse. If the fuse blows again, check for any shorts in the internal and external cabling. If no shorts are present replace the electronic box. If a blown fuse is replaced check out the functions of the entire steering-system before releasing the vehicle to normal service!</p> <p>Check the green service indicator "Power on"; if off and the power supplied is ok, replace the electronic box.</p> <p>Check for a missing ground to the electronics.</p> <p>Check the red service indicator "Inductive sensor supply voltage on". If on check that the yellow service indicator "Front wheels at centre" lights up whenever the steering wheels passes through the centreline. If you do not have a centreline indication check all connections in the internal and external cabling concerning the inductive sensor, repair as needed. If the cabling is ok and the error persists then replace the inductive sensor. ATTENTION! The adjustment of the inductive sensor is critical. If you are not familiar with the procedure, contact OA Opbyg A/S for information.</p> <p>If the red service indicator "Inductive sensor supply voltage on" is missing it indicates that one of the signals - oil pressure ok, below 40 Km/h or bogie down - is missing. Check internal and external cabling; repair as needed. If the error persists, replace the electronic box.</p> <p>Check for a blown bulb in the red user indicator and replace. In the case of a "low oil pressure" indication go to the step "Error indicator "Oil pressure low" on".</p>
<p>No error indications. Steering indicator missing with steering active</p>	<p>Check for a blown bulb in the green user indicator. Replace and repair as needed.</p>
<p>No error indications. Steering indicator on, but steering is not active.</p>	<p>Check internal and external cabling regarding the solenoid. Check for voltage on pin 1 of the solenoid. Check for ground on pin 4 on the solenoid. Check that the solenoid is energised, if not replace the solenoid. Check that pilot air pressure is present on the control inlet of the hydraulic unit. If present replace the hydraulic unit. If not present, check that air pressure is present on the Z inlet of the air valve/manifold. If present replace the air valve/manifold.</p>

<p>Error indicator "oil pressure low" on. Steering not active.</p>	<p>Check the oil pressure in the hydraulic unit. If the oil pressure is below app. 3 bar, the system has a leakage. Check all hoses and pipes giving special attention to all connections. Repair any leakage found. Refer to the procedure "Venting the hydraulic system" to bring the vehicle back to operating conditions following any repair.</p> <p>If the oil pressure is ok then check internal and external cabling concerning the connections to the oil pressure switch, repair as needed.</p> <p>If pin 9 on the ECC 15-pin connector is at ground level and the red "oil pressure low" error indicator is on replace the electronic box. The signal can easily be checked on the red/white wire of HS1 pin 2. See the connections on the internal cable assembly diagram on page 10.</p>
<p>Other malfunction in the control systems.</p>	<p>Check internal and external cabling and connectors. Replace electronic box. Contact OA Opbyg A/S.</p>

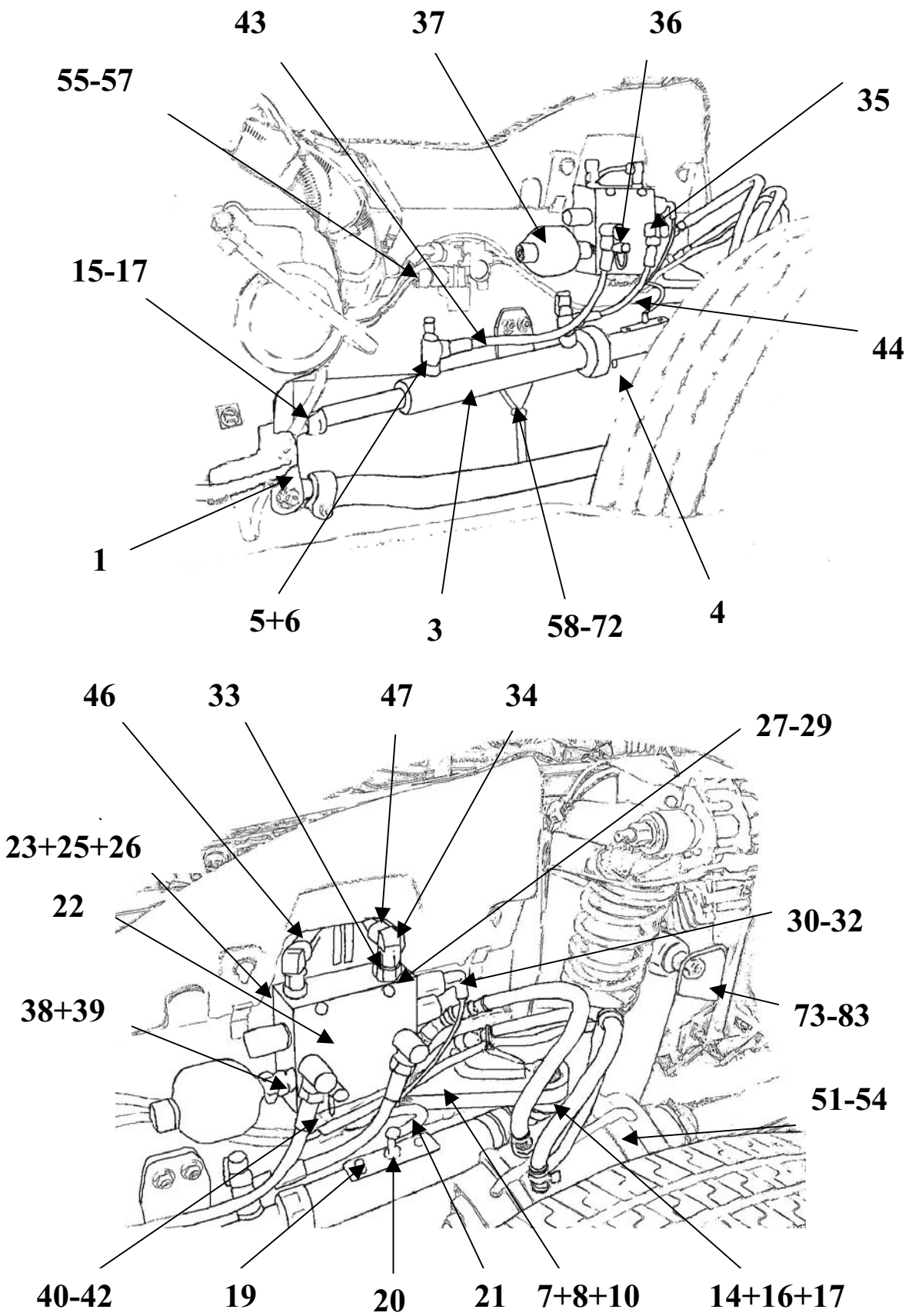
**Parts index numbers and locations**

**Electronic control circuit**



Index	Total	Name	Part number	Remarks
1	1	ECC box	12006	Vehicles with std. Gearbox
1	1	ECC box	12007	Vehicles with power/gear - Tronic
2	1	Internal cable assy	12010	Vehicles with std. Gearbox
2	1	Internal cable assy	12010P	Vehicles with power/gear - Tronic
3	1	Indicator lamps	12005	Single bulb 27 SWF 596 710
4	1	External cable assy.	12004	Running behind panels to the body builder entry hole.

Front axle

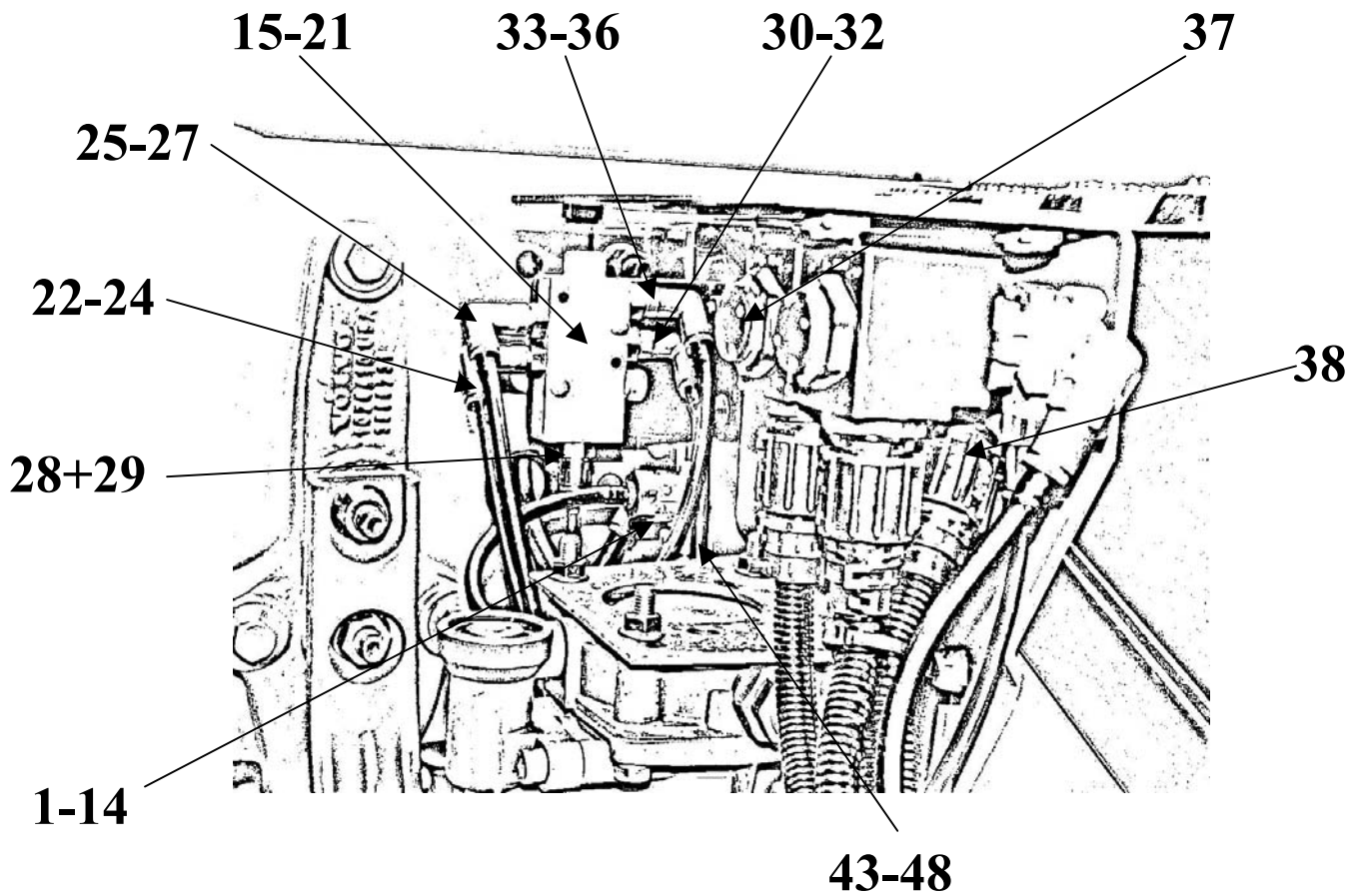




Index	Total	Name	Part number	Remarks
1	1	Pitman-arm (spring suspension)	10A0178	
1	1	Pitman-arm (air suspension)	10A0179	
3	1	Cylinder (Master)	10A0186	
4	1	Air-filter	01P6M-BAA1	Mounted on the cylinder
5	2	Banjo fitting - M18x1,5/15	V 977998	Mounted on the cylinder
6	2	Test fitting - M12x1,5	V 1594061	Mounted on the cylinder
7	1	Bracket for the master-cylinder	10A0205	(spring suspension)
8	7	Bolt – Flange-bolt 14x50	V 966360	(spring suspension)
	1	Allen-bolt (U.S) - 14x50	70AN10414050	(spring suspension)
10	7	Nut – Flange-nut M14	V 979231	(spring suspension)
7	1	Bracket for the master-cylinder	10A0204	(air suspension, long cab)
8	6	Bolt – Flange-bolt 14x70	V 966364	(air suspension, long cab)
10	6	Nut for the bracket - M14	V 979231	(air suspension, long cab)
7	1	Bracket for the master-cylinder	10A0206	(air suspension, short cab)
8	3	Bolt – Flange-bolt 14x50	V966360	(air suspension, short cab)
8	4	Bolt – Flange-bolt 14x60	V966362	(air suspension, short cab)
10	7	Nut for the bracket - M14	V979231	(air suspension, short cab)
14	1	Ball-joint 1:10	V 1606980	
15	1	Ball-joint 1:10		Special ball-joint with 2 tracks
16	2	Nut for ball-joint	V 191029	
17	2	Split pin for nut - 5x50mm	70AN89405050	
18	1	Bracket for inductive sensor		Mounted on cylinder
19	2	Flange-bolt M6x10	V 945358	Mounted on cylinder
20	1	Inductive sensor	0117201	
21	1	Cable for inductive sensor	12001	
22	1	Hydraulic valve	10A0185	
23	1	Bracket for hydraulic valve (spring suspension)	10A0196	
23	1	Bracket for hydraulic valve (air suspension)	10A0197	
25	2	Bolt for bracket – flange-bolt M14x40	V 966359	
26	2	Nut for bracket - M14	V 979231	
27	2	Bolt for hydraulic valve - M6x75	V 955283	
28	2	Washer for hydraulic valve - M6	70AN82106	
29	2	Nut for hydraulic valve - M6	V 949278	
30	1	Air fitting - M10x1	V 969323	Mounted on the hydraulic valve
31	1	Air fitting - 6mm	V 976444	
32	1	Air fitting - angled	V 976958	Mounted on the hydraulic valve
33	2	Hydraulic fitting - M18x1,5/12	69GA12LM18	Mounted on the hydraulic valve
34	2	Hydraulic fitting - 12mm	69SV12L	Mounted on the hydraulic valve
35	2	Banjo fitting - M18x1,5/15	V 948349	Mounted on the hydraulic valve
36	1	Test fitting - M12x1,5	V 1594061	Mounted on the hydraulic valve
37	1	Oil-reservoir - 0,32liter / 12 bar	69OLM-0/12	Mounted on the hydraulic valve
38	1	Nipple for oil reservoir - 1/2"	6901BP08	Mounted on the hydraulic valve
39	2	Gasket - 1/2"	69DOW12	Mounted on the hydraulic valve
40	1	Pressure switch - 1/4" - 1-10 bar	12002	
41	1	Gasket - 1/4"	69DOW14	Mounted on the hydraulic valve
42	1	Angled nipple - 1/4"		Mounted on the hydraulic valve
43	1	Hydraulic hose - 3/8"x400	69HS0400	
44	1	Hydraulic hose - 3/8"x215	69HS0215	Spring suspension
44	1	Hydraulic hose - 3/8"x230	69HS0230	Air suspension
46	1	Hydraulic pipe - FM7	698601-4	5700200A

47	1	Hydraulic. pipe - FM7	698601-1	570017OA
46	1	Hydraulic pipe - FM12	698601-3	570019OA
47	1	Hydraulic pipe - FM12	698601-2	570018OA
48	1	Bracket – 3 holes	V 965563	
49	1	Bracket - 2 holes	V 965560	
50	2	Flange-bolt - M8x40	V 947760	
51	1	Brake-cylinder bracket - left	V 1629073	Only for spring suspension
52	1	Brake-cylinder bracket – right	V 1629074	Only for spring suspension
53	1	Brake-hose	V 976464	Only for spring suspension
54	2	Brake-arm	V 1628586	Only for spring suspension
55	1	Air fitting	V 976952	
56	1	Air fitting	V 969328	
57	1	Air fitting	V 976446	
58	1	Bracket for stabiliser		Changed V1078569 (spring suspension)
59	3	Allen-bolt (US) 16x50	70AN10416050	(spring suspension)
60	2	Allen-bolt (US) 16x60	70AN10416060	(spring suspension)
61	2	Washer - Ø16	70AN87616	(spring suspension)
62	5	Flange-nut - M16	V 946673	(spring suspension)
63	1	Reinforcement bracket	10A0067	(air suspension)
64	1	Bracket	10A0068	(air suspension)
65	2	Allen bolt - M16x80	70AN10016080	(air suspension)
66	2	Skive - Ø16	70AN82116	(air suspension)
67	2	Allen-bolt (U.S) 14x30	70AN10414030	(air suspension)
68	1	Flange-bolt - M14x30	V966356	(air suspension)
69	2	Flange-bolt - M14x40	V966358	(air suspension)
70	2	Flange-nut - M16	V946673	(air suspension)
71	3	Flange-nut - M14	V971100	(air suspension)
72	2	Flange-nut - M14	V979231	(air suspension)
73	1	Shock absorber bracket upper - narrow	10A0193	(spring suspension)
74	1	Shock absorber bracket upper - wide	10A0194	(spring suspension)
75	1	Shock absorber bracket lower	10A0190	(spring suspension)
76	1	Standoff	V 1075704	(spring suspension)
77	1	Pin for standoff	V 948073	(spring suspension)
78	4	Flange-bolt - M14x50	V 966360	(spring suspension)
79	4	Flange-nut - M14	V 979231	(spring suspension)
80	1	Shock absorber bracket upper	10A0081	(air suspension-long cab)
81	4	Bolt for shock absorber - M14x70	V 966364	(air suspension-long cab)
82	1	Standoff	10A0177	(air suspension-long cab)
83	1	Shock absorber bracket lower		(air suspension-long cab)

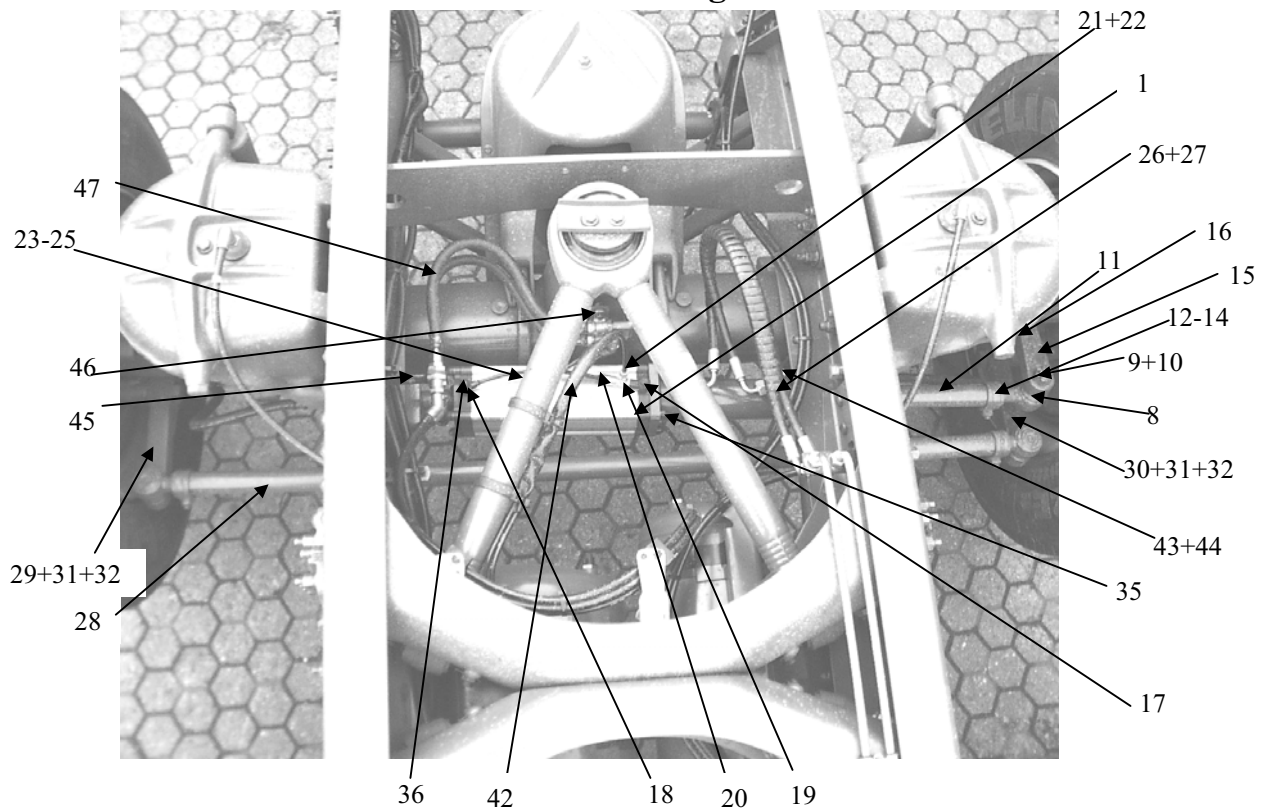
### Battery assy.



Index	Total	Name	Part number	Remarks
1	1	Bracket for silencer	10A0198	
2	1	Silencer	V 1096335	
3	1	Bolt for bracket - M8x20	V 946173	
4	1	Nut for bracket - M8	V 945408	
5	1	Fitting	V 966424	
6	1	Nut	V 957020	
7	1	Fitting	V 966454	
8	1	Nut	V 945958	
9	1	Rubber seal	V 943924	
10	1	Fitting	V 968696	
11	1	Fitting	V 976445	
12	1	Fitting	V 976958	
13	1	Fitting	V 969326	

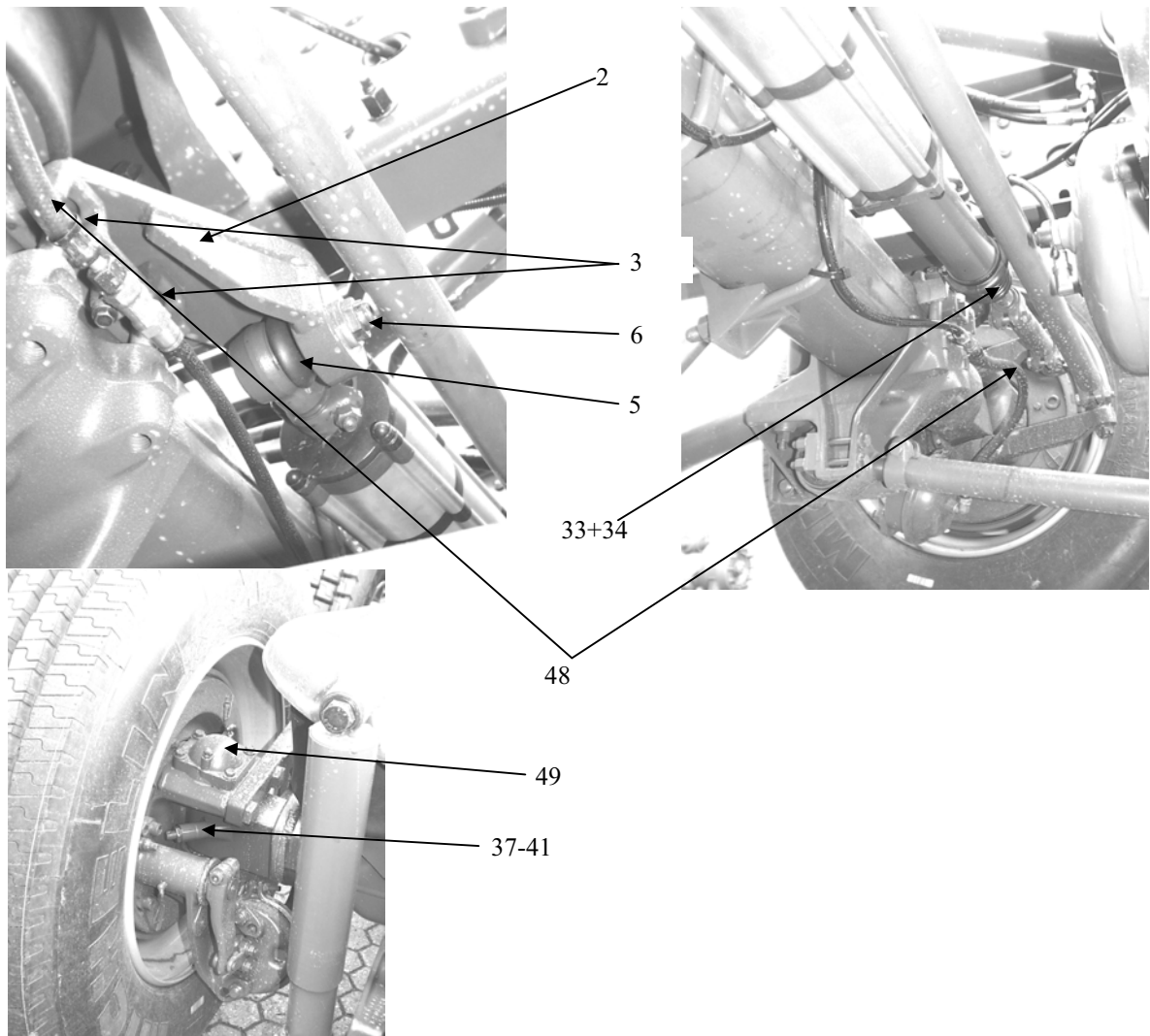
14	1	Fitting	V 976445	
15	1	Air valve		
16	1	Bracket for air valve	10A0199	Mounted on air valve
17	2	Bolt for bracket - M8x20	V 946173	
18	2	Nut for bracket - M8	V 945408	
19	2	Nut for valve - M5x35	70AN16705035	Mounted on air valve
20	2	Washer for valve - M5	70AN82105	Mounted on air valve
21	2	Nut for valve - M5	70AN17905	Mounted on air valve
22	1	Fitting - valve-outlet A	V 969323	Mounted on air valve
23	1	Fitting - valve -outlet A	V 976958	Mounted on air valve
24	1	Fitting - valve - outlet A	V 976444	
25	1	Fitting - valve - outlet B	V 969323	Mounted on air valve
26	1	Fitting - valve - outlet B	V 976958	Mounted on air valve
27	1	Fitting - valve - outlet B	V 976445	
28	1	Fitting - valve - Inlet Z	V 968694	
29	1	Fitting - valve - Inlet Z	V 976444	Mounted on hose
30	1	Fitting - valve - Inlet P	V 969323	Mounted on air valve
31	1	Fitting - valve - Inlet P	V 976958	Mounted on air valve
32	1	Fitting - valve - Inlet P	V 976445	
33	1	Fitting - valve - outlet S	V 969323	Mounted on air valve
34	1	Fitting - valve - outlet S	V 976958	Mounted on air valve
35	1	Fitting - valve - outlet S	V 976445	Mounted on hose
36	1	Copper spacer - Ø10 (Valve - outlet S)	03-17	Mounted on air valve
37	1	Solenoid	V 1078316	
38	1	Plug for connector	V 1079283	
	3m	Air hose - 6mm	62PR06	
	10m	Air hose - 8mm	62PR08	Depending on the length of the vehicle.
43	1	Fitting	V 966454	
44	1	Nut	V 945958	
45	1	Rubber seal	V 943924	
46	1	Fitting	V 976445	
47	1	Fitting	V 976958	
48	1	Fitting	V 969326	

### Rear steering axle

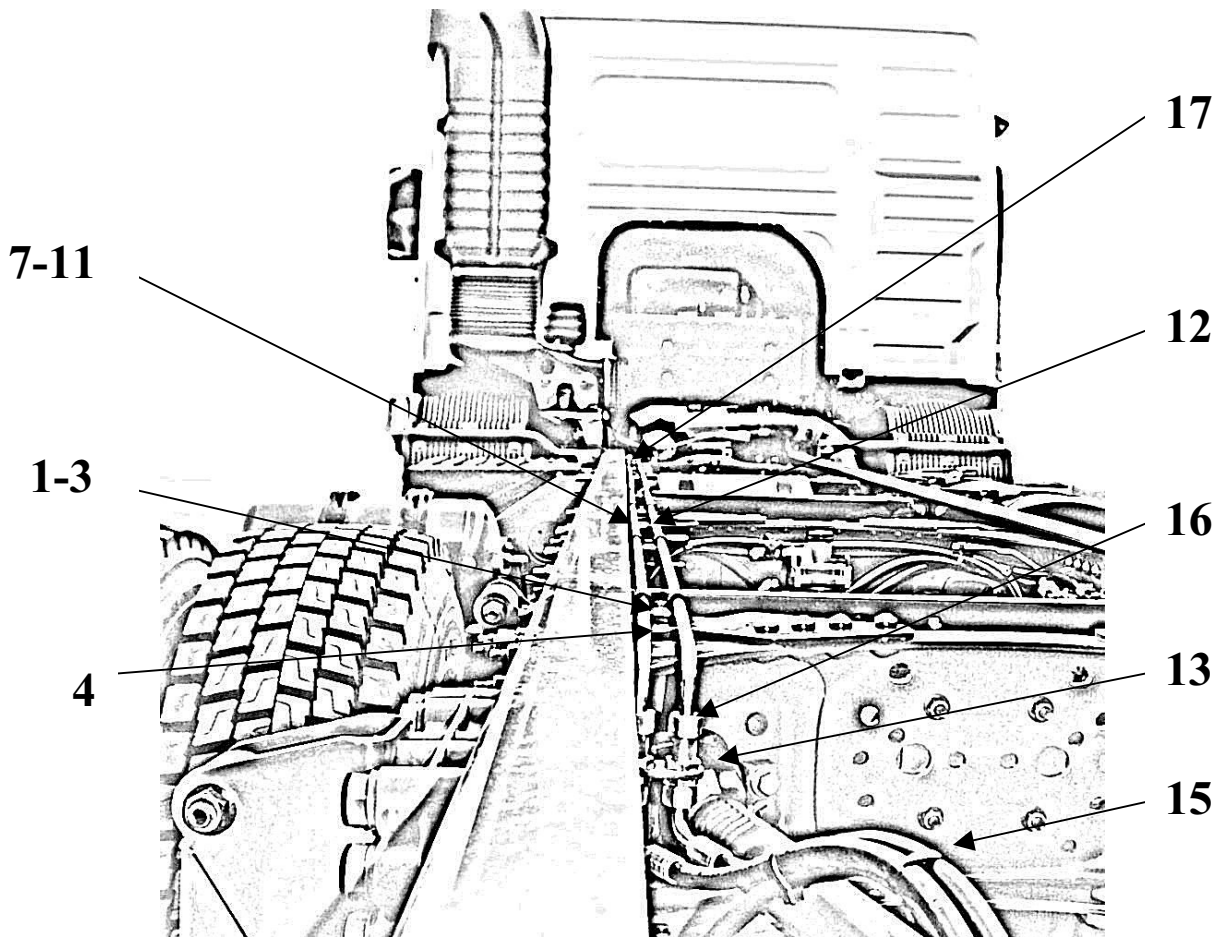


Index	Number	Name	Part number	Remarks
1	1	Pneumatic cylinder	10A0187	
2	1	Bracket for cylinder	10A0289	
3	2	Bolts for bracket - M20x160	V978956	
4	1	A6 Axle	10A0296	
5	1	Ball joint 1:6	V 3987648	
6	1	Nut – self retaining	V 981956	
8	1	Ball joint 1:6	V 3988968	
9	1	Nut	V 10506	
10	4	Split pin - 4x32mm	70AN89404032	
11	1	Interconnecting pipe for ball joint		V 1628207
12	2	Clip	V 1695141	Mount. on interconnecting pipe
13	2	Bolt	V 1698048	Mount. on interconnecting pipe
14	2	Nut	V 1695142	Mount. on interconnecting pipe
15	1	Steering rod	10A0290	
16	1	Bolt for steering rod	V 1586061	
17	1	Banjo fitting	01PTFA4-1/4	Mounted on cylinder
18	1	Banjo fitting	01PTFA4-PB	Mounted on cylinder
19	1	L-fitting	011/4MRO434	Mounted on cylinder
20	1	Quick connector	01F4PB8-1/4	Mounted on cylinder
21	1	Nut	01F4MB8-1/4	Mounted on cylinder
22	1	Brass fitting 8mm	01T23VB6	Inside air hose
23	1	Fitting	V 976445	
24	1	Fitting	V 976958	Mounted on cylinder
25	1	Fitting	V 969326	Mounted on cylinder
26	2	Hydraulic hose 3/8"x740	69HS740	
27	1M	Cover	13SPF15	
28	1	Tracking arm	V 3986450	

29	1	Bracket f. track. arm right	12A0025	
30	1	Bracket f. track. arm left	12A0026	
31	2	Bolt for bracket	V1586463	
32	2	Bolt for bracket	V1586464	
33	1	Protective rubber cab for cylinder	35V6-69	Mounted on cylinder
34	2	Tie wraps	40EV1770	Mounted on cylinder
35	8	Nut cap - M8	V 1568477	
36	2	Nut cap - M10	V	Mounted on cylinder
37	2	Stop bolt	V 1614359	
38	2	Bushing for stop bolt (short)	10A0075	
39	2	Bushing for stop bolt (long)	4943178	
40	2	Flange-bolt - M12x100	V 965197	
41	2	Nut for stop bolt	V 955793	
42	1M	Cover	40LF18	Mounted on air hoses
43	2	Banjo fittings - M18x1,5/15	V977998	Mounted on cylinder
44	2	Test fittings - M12x1,5	V1594061	Mounted on cylinder
45	1	Bracket for brake hoses	10A0295	
46	1	Bracket for brake hoses	10A0296	
47	2	Brake hoses	V1075004	
48	2	Brake hoses	V 976464	
49	1	Steering knuckle assy.	V1607404	
50	1	Repair set f. steering knuckle	V3090266	



## Pipes and hoses



Index	Total	Name	Part number	Remarks
1	8	Support	V 965566	
2	8	Flange-bolt - M14x40	V 966358	
3	8	Flange-nut - M14	V 979231	
4	3	Spacer - 8mm	990000002	
4	1	Spacer - 10mm	990000004	
4	6	Spacer - 20mm	990000003	
7	25	Pipe support - 12mm	01-14	D11
8	15	Washer - Ø6	70AN82606	
9	1	Flange-bolt M6x25	V 947542	
10	9	Flange-bolt M6x35	V 965212	
11	10	Flange-nut M6	V 945407	
12	2	Hydraulic-pipes 12mm	56HYDG12	Depending on the length of the vehicle
13	1	Bracket for fittings	10A0200	
14	5	Volvo tie wraps	V 978435	
15	100	Tie wraps	40EV1770	
16	2	Fittings - M12	69SF12L	
17	2	Fittings - 12L	69G12L	

OA OPBYG A/S DENMARK has released this document.  
The circuitry described is subject to change without further notice. Any questions regarding this document and the systems described should be addressed to OA Opbyg A/S at the address stated on the front page.

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