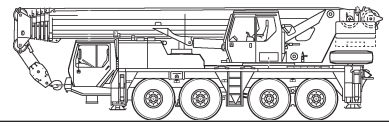
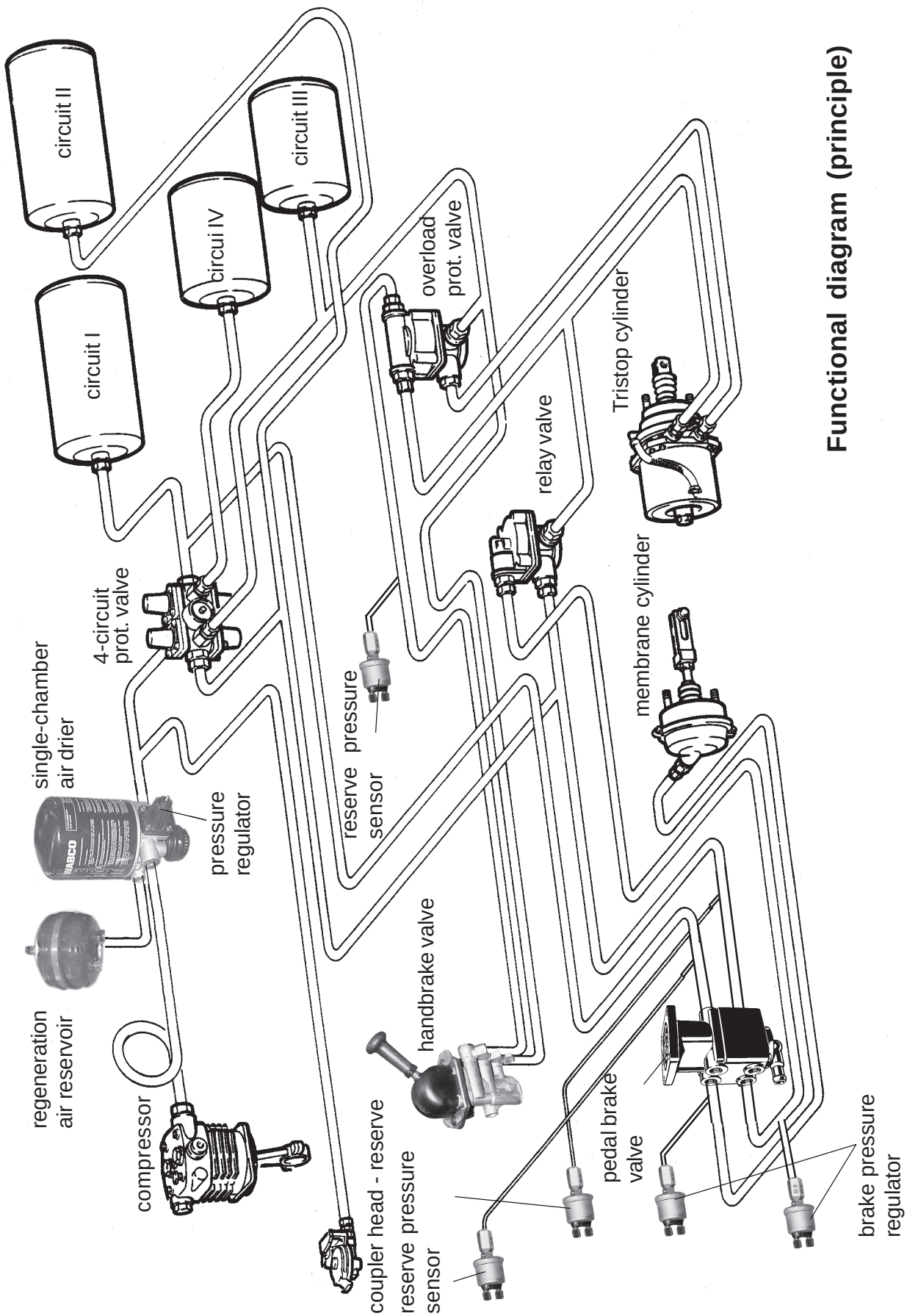


Pneumatic brake system

Functional diagram (principle)



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Contents OW

Functional outline on circuit diagram pneumatic system

Item	Designation	Function	s. fig.	Plan sheet
1	Compressor	Supply of pneumatic brake system and secondary consumers	9.1	3
1.1	Coupler head	Connection facility for external supply	9.7	3
2	Tyre inflation valve	Connection facility for tyre inflation hose (up to approx 11 bar)	9.2	3
3	Single-chamber air-drier	Drying of the air supplied by the compressor	9.2	3
3.1	Pressure regulator	Adjustment of the cut-off pressure 8,5 ± 0,2 bar	9.2	3
3.2	Heating cartridge (=F+F4-Y4)	In function upon engine "Start" below approx. 7 °C, cut-off at approx. 30 °C (thermostatic control)	9.2	3
4	Air reservoir (10 l)	Reservoir for the regeneration procedure in the air drier (3)	9.2	3
5	Four-circuit protection valve	Pressure protection for the intact service circuits at the failure of a circuit	9.16	3
6	Air reservoir (60 l)	Reservoir for service brake circuit I	9.17	4
7	Air reservoir (40 l)	Reservoir for service brake service II	9.17	4
8	Air reservoir (20 l)	Reservoir for handbrake circuit III	9.17	4
9	Air reservoir (20 l)	Reservoir for secondary consumer circuit IV	9.23	4
10	Pressure sensor (=H+H0-B5)	Sensor for the bar graph display of the reserve pressure of service brake circuit I.	9.5	5
11	Pressure sensor (=H+H0-B6)	Sensor for the bargraph display of the reserve pressure of service brake circuit II.	9.5	5
12	Pressure sensor (=P+P26-B7)	Sensor for the bar graph display for handbrake circuit III.	9.3	5
Service brake system				
13	Pedal brake valve	Control of the brake relay valves (17) for brake circuit I and (18) for brake circuit II	9.5	5
14	Pressure sensor (=H+H0-B8)	Sensor for the bar graph display for brake circuit I	9.5	5
15	Manometr. switch (=F+F4-S116)	Sensor for stop light indicator of the service brake operating point from 0,5 bar (Ö = break contact)	9.5	5
16	Pressure sensor (=F+F4-B9)	Sensor for bar graph display of the brake pressure for brake circuit II	9.3	5
17	Brake relay valve	Control of the service brake circuit I for axle 1	9.15	6
18	Brake relay valve	Control of the service brake circuit II for axle 2	9.17	6
19	Pressure relief valve	Reduction of the brake pressure at axle 1 (brake circuit I) to max. 7,5 bar	9.15	6
20	ABV solenoid valve (=F+F4-Y41)	Locking prevention of the left wheel at axle 1 during braking by modification of the brake pressure dependent on the control signals of the electronic	9.18	6
21	ABV solenoid valve (=F+F4-Y42)	Locking prevention of the right wheel at axle 1 during braking by modification of the brake pressure dependent on control signals of the electronic	9.21	6

Functional outline on the circuit diagram pneumatic system

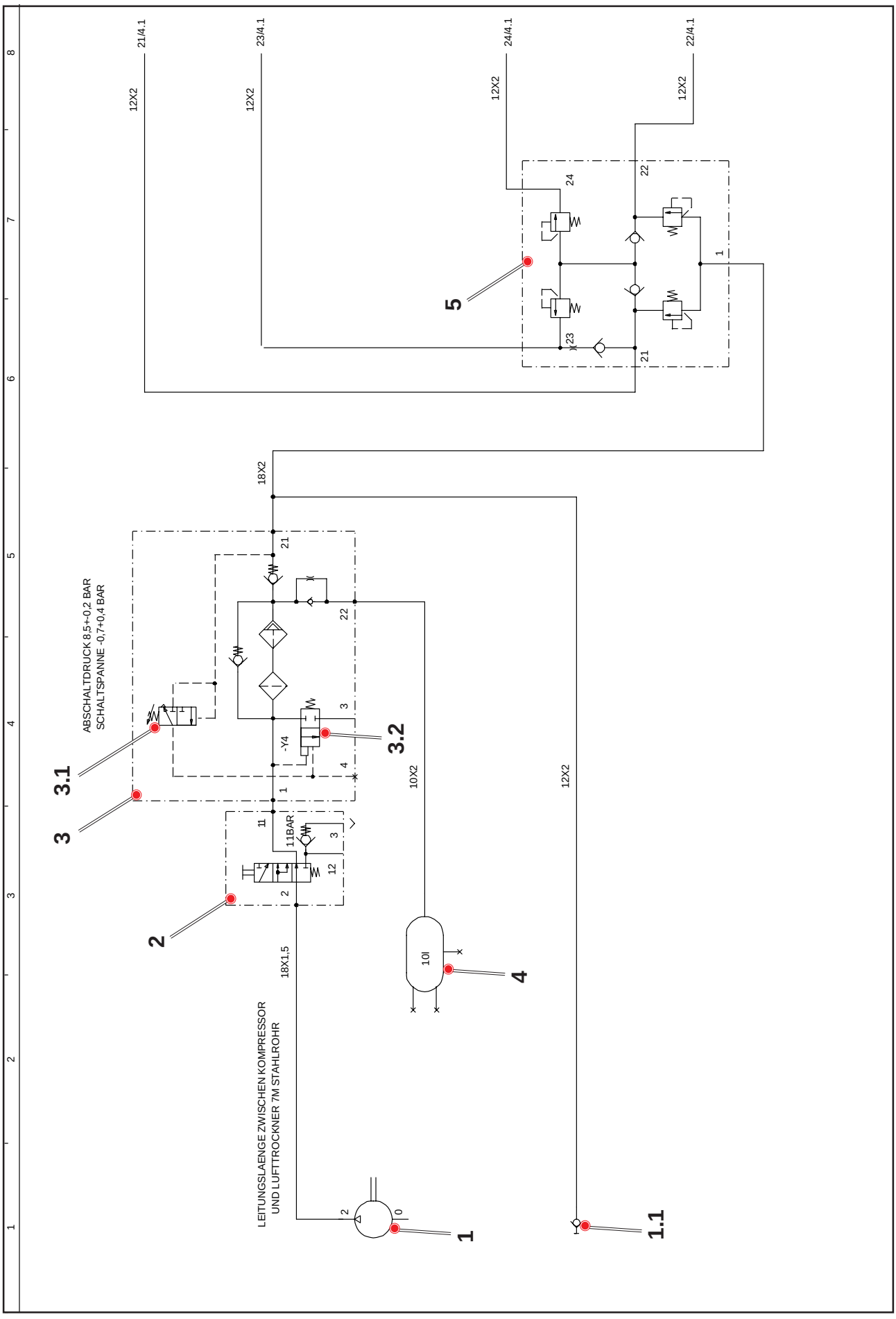
Item.	Designation	Function	s. fig.	Plan sheet
22	ABV solenoid valve (=F+F4-Y43)	Locking prevention of the left wheel at axle 2 during braking by modification of the brake pressure dependent on control signals of the electronic	9.19	6
23	ABV solenoid valve (=F+F4-Y44)	Locking prevention of the right wheel at axle 2 during braking by modification of the brake pressure dependent on control signals of the electronic	9.20	6
24	Diaphragm brake cylinder	Actuation of the wheel brakes on axle 1	9.24	6
25	Combined brake cylinders	Actuation of the wheel brakes via the diaphragm section of combined cylinders on axles 1 and 2	9.25	6
26	Shuttle valve	Control of the relay valves (17) and (18) of brake valve (13) or (50)	9.15/ 9.17	6
26A	Shuttle valve	Control of the combined brake cylinders (25) on axle 2 of relay valves (18) or ASR solenoid valve (49)	9.17	6
Handbrake system				
27	Handbrake valve	Control of the overload protection valves (29/30)	9.4	5
28	Control switch (=H+H0-S114)	Sensor for handbrake control operating point at 5.5 bar (S = make contact)	9.3	5
29	Overload protection valve	a) Deaeration of the spring-loaded section of the combined cylinders (25) of axle 2 at control by the handbrake valve b) A simultaneous actutation of both brake systems results in an aeration of the spring-loaded section to prevent brake force addition.	9.16	6
30	Overload protection valve	a) Deaeration of the spring-loaded section of the combined cylinders (25) of axle 1 at control by the handbrake valve b) as described at 29b)	9.15	6
31	Conduit filter	Filtering of the compressed air	9.23	7
32	Dir. solenoid valve (=F+F4-Y35)	Control of the working cylinders (33) at actuation "engine brake ON"	9.10	7
33	Working cylinder	Actuation of the locking flap in the exhaust pipe **by resilience** at function "engine brake ON"	9.1	7
34	Dir. solenoid valve (=F+F4-Y21)	Control of the working cylinder (35) at control "release of rear-axle lock"	9.10	7
35	Working cylinder with monitor. switch	Locking of rear-axle steering (locking) by resilience a) released (=F+F4-S131) b) locked (=F+F4-S151)	9.22	7
36	Dir. solenoid valve (=F+F4-Y7)	Control of working cylinders (37) at control "transv. differ. lock ON" (on axles 1 and 2)	9.10	7
37	Working cylinder with monitor. switch	Activation of the transv. differ. lock on axle 1 (-S122) and axle 2 (-S123)	9.13/ 9.14	7
38	Dir. solenoid valve (=F+F4-Y5)	Control of working cylinders (39) at actuation "all-wheel ON"	9.10	7

Functional outline on circuit diagram pneumatic system

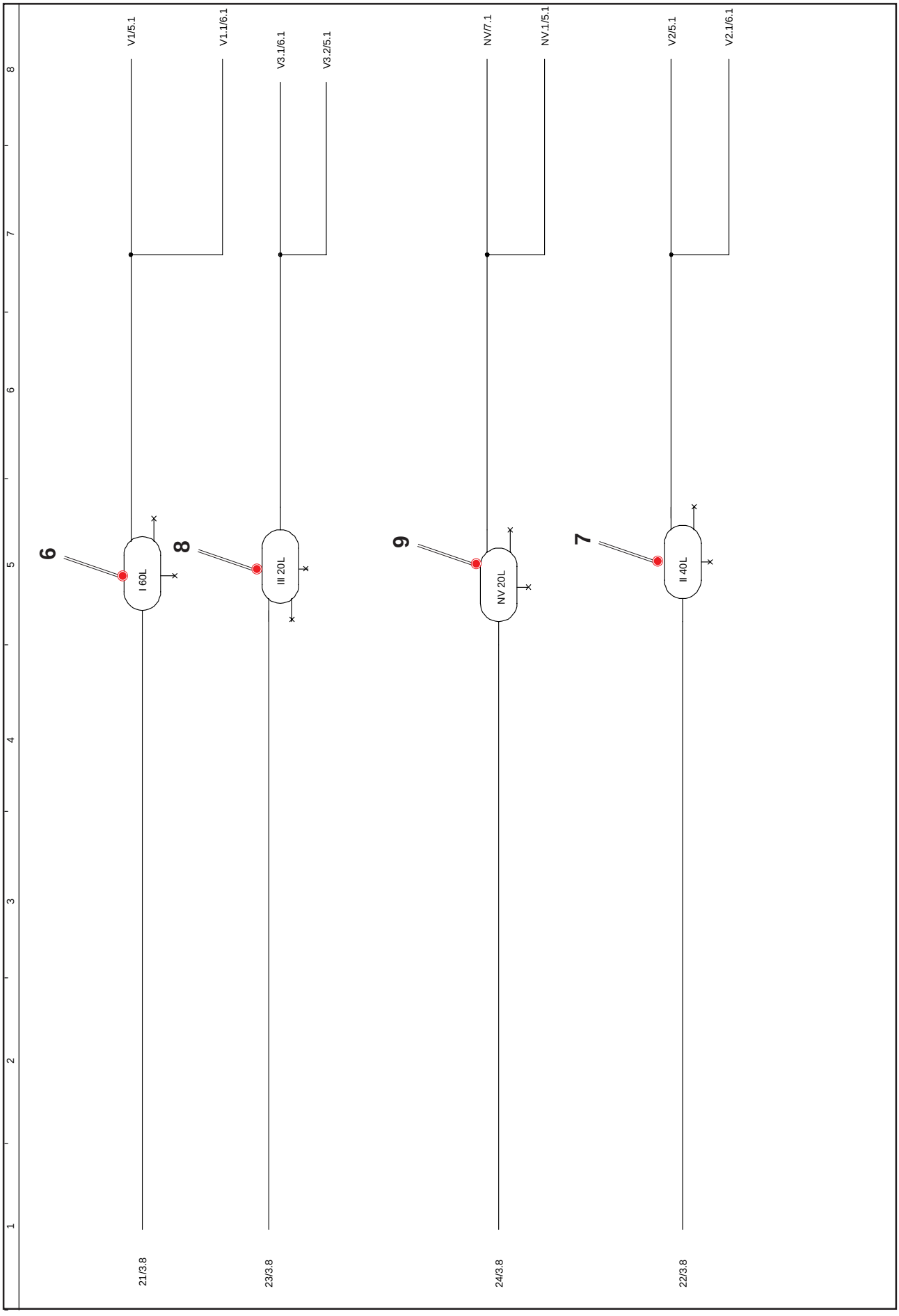
Item	Désignation	Function	s. fig.	Plan sheet
39	Working cylinder w. monitor. switch	All-wheel activation on axle 1 (-S139)	9.11	7
40	Dir. solenoid valve (=F+F4-Y9)	• Valve in neutral position (-Y9a) ⇒ axle locking valves in locked position, i.e. suspension locked • Valve activated (-Y9b) ⇒ axle locking valves released, i.e. suspension activated	9.9	7
41	Dir. solenoid valve (=F+F4-Y3)	Control of control cylinder (42) at inversion to superstructure (crane mode) - only possible at stopped engine and ignition "ON"	9.10	7
42	Control cylinder w. inductive sensor	Activation or deactivation of the hydraulic pump for crane mode (cylinder retracted = pump on) - functional control by proximity switch (-S121)	9.12	7
43	Directional valve (manual operated)	Manual control of working cylinder (44) for steering wheel-adjustment	9.6	5
44	Working cylinder	Adjustment of the stering wheel (reset of the cylinder by resilience)	9.6	5
45	Dir. solenoid valve (=H+H0-Y148)	Release of the handbrake by activation of the overload protection valves 29 and 30 by directional valve (48) and actuation of working cylinder (46) for the inversion to telesteering	9.3	5
46	Control cylinder	Engagement or disengagement of the pinion for telesteering	9.8	5
47	Dir. solenoid valve (=H+H0-Y2)	a) Solenoid (-Y2a) energized when switch on position superstructure and activation of directional valve (48) b) Solenoid (-Y2b) energized when switch on position carrier and activation of directional valve (48) for connection handbrake control circuit with the overlaod protection valves 29 and 30. c) Additional retraction of the control cylinder (42), i.e. cut-off of the pump superstructure.	9.3	5
48	Directional valve (pneumatic oper.)	Connection of the handbrake control circuit with the overload protection valves 29 and 30	9.3	5
49	ASR solenoid valve (=F+F4-Y149)	Release of the reserve air for the supply of ABV solenoid valves -Y43 and -Y44 compressed air in order to brake skidding wheel on axle 2 during the start or displacement	9.9	6
50	Pedal brake valve	Activation of the brake relay valves 17 and 18	9.28	8
51	Overflow valve	Supply of the ventilation of the control cabinet from approx. 7,5 bar	9.28	8
M1	Measuring point	Measuring connection for service brake pressure	9.24/ 9.25/ 9.27	6
M2	Measuring point	Measuring connection for handbrake pressure	9.25/ 9.26	6

Indication:
Item 40 see also at **suspension** (chapter: UW-12)

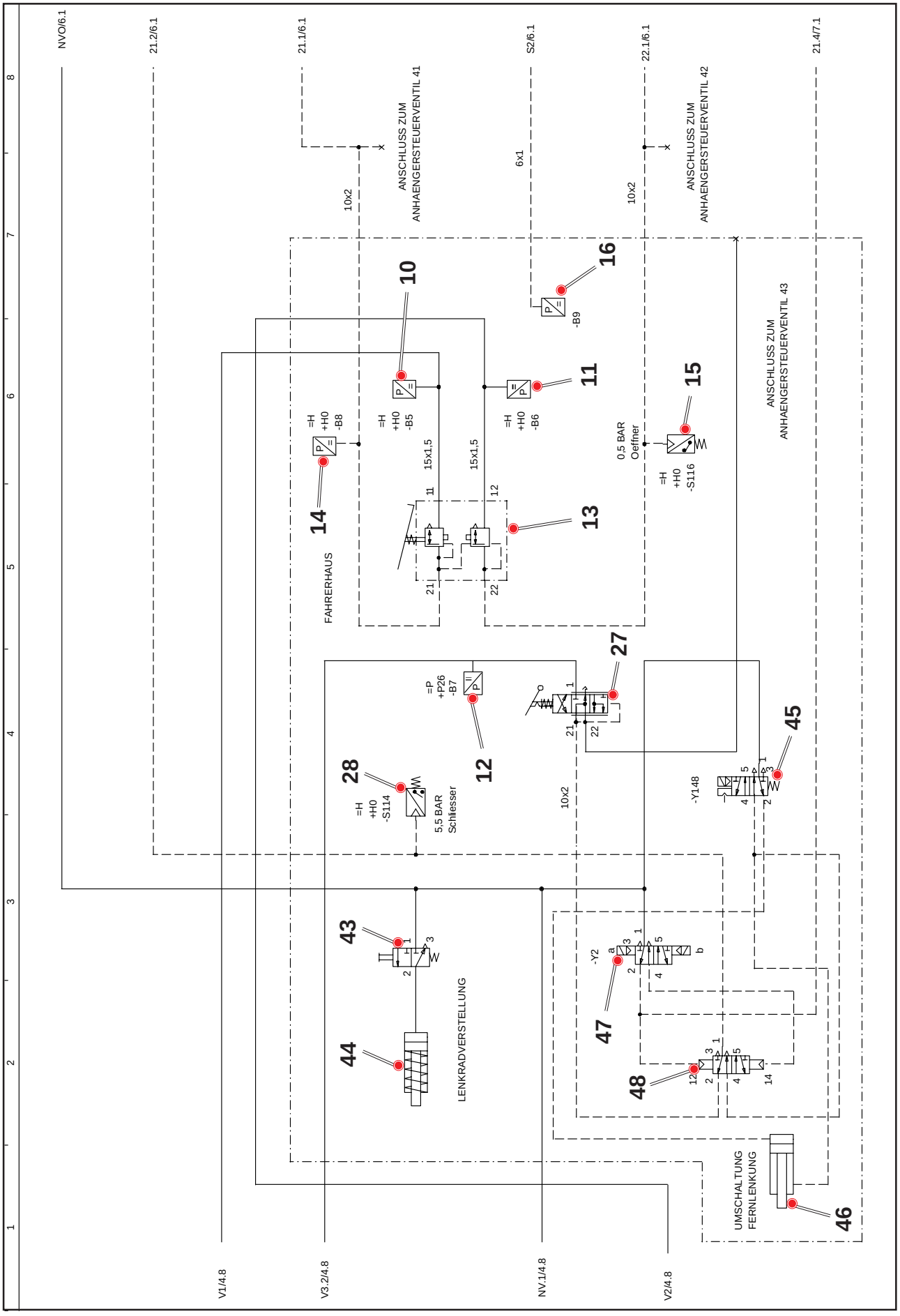
Circuit diagram pneumatic system Ident-No. 983377408 sheet 3



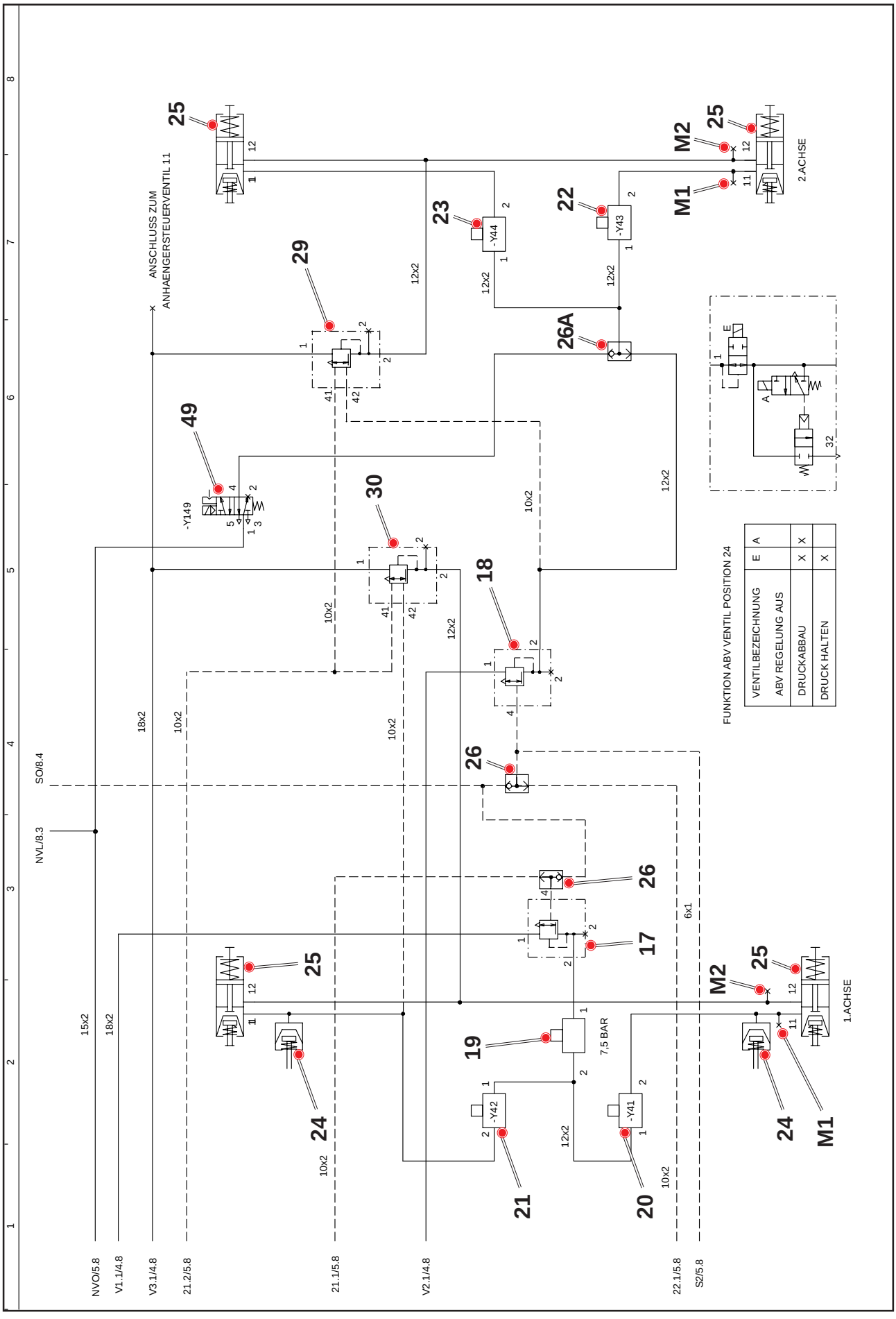
Circuit diagram pneumatic system Ident-No. 983377408 sheet 4



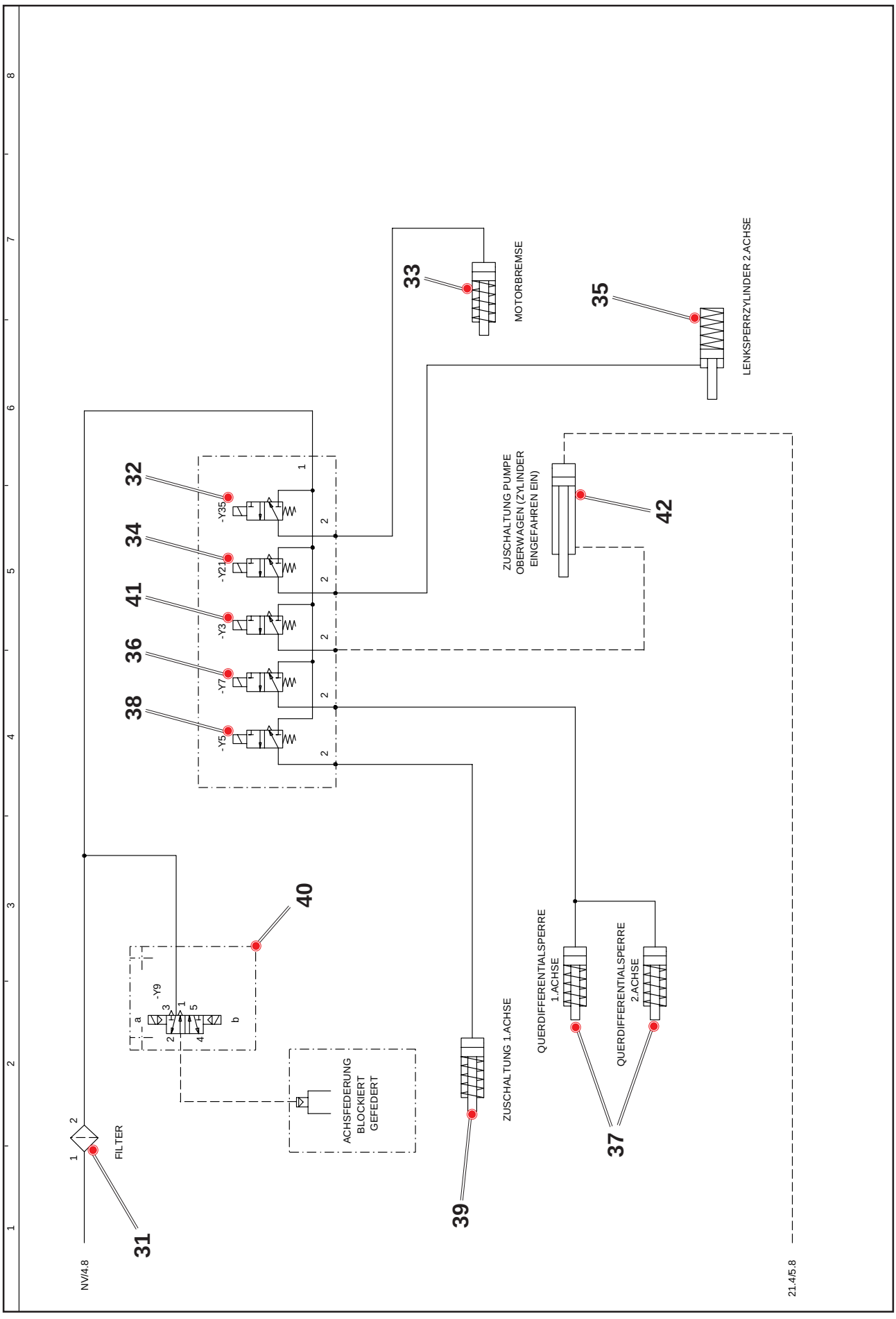
Circuit diagram pneumamtic system Ident-No. 983377408 sheet 5



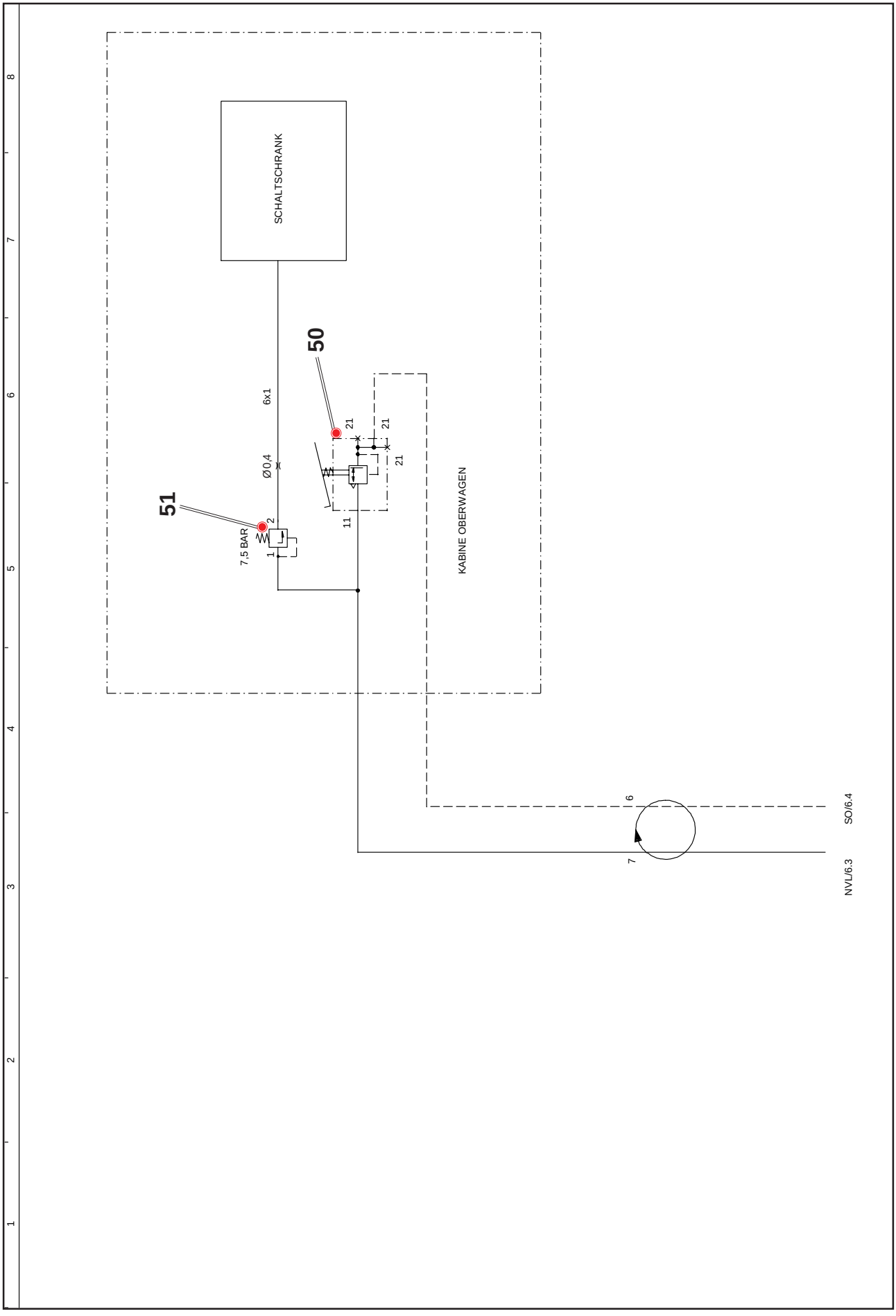
Circuit diagram pneumatic system Ident-No. 983377408 sheet 6



Circuit diagram pneumatic system Ident-No. 983377408 sheet 7

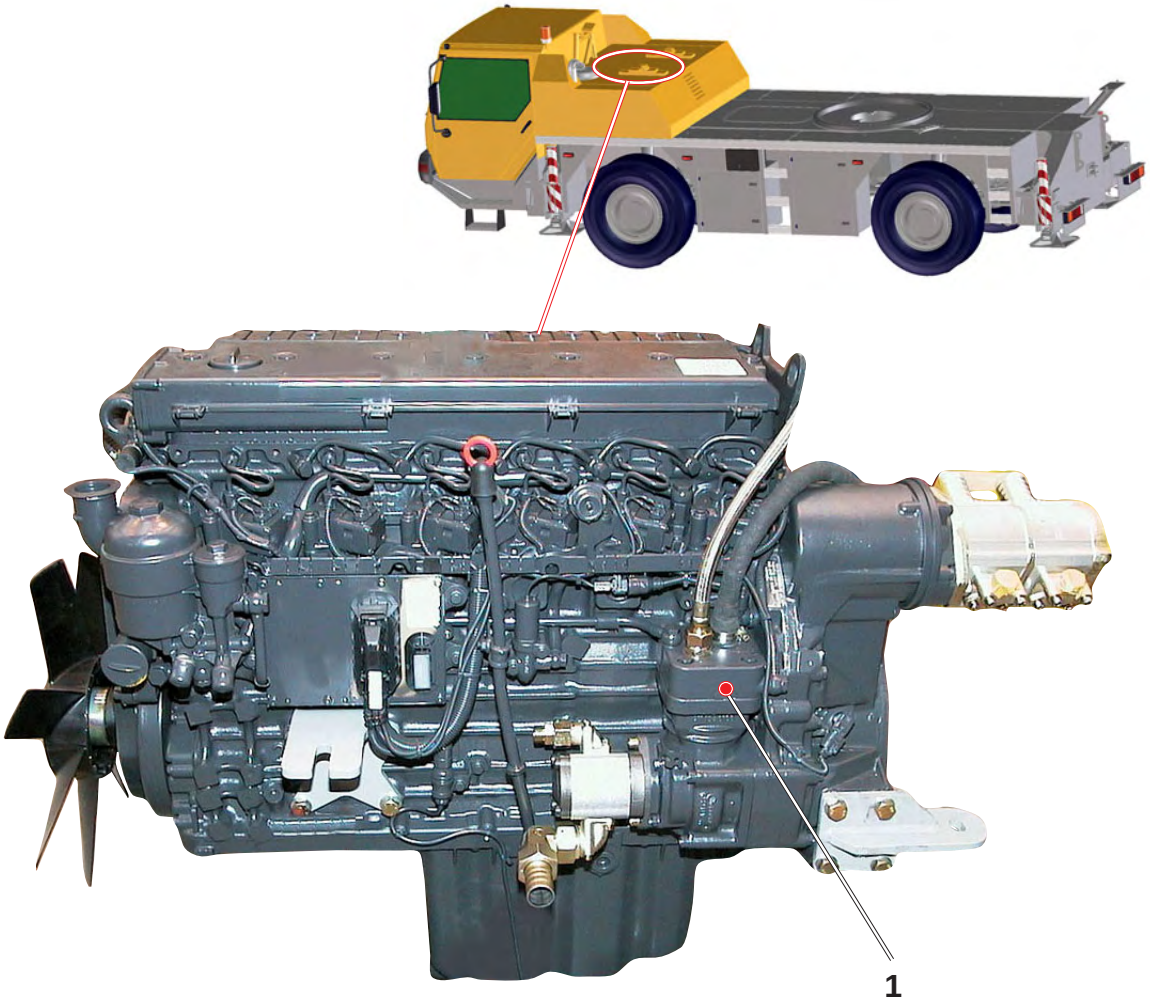


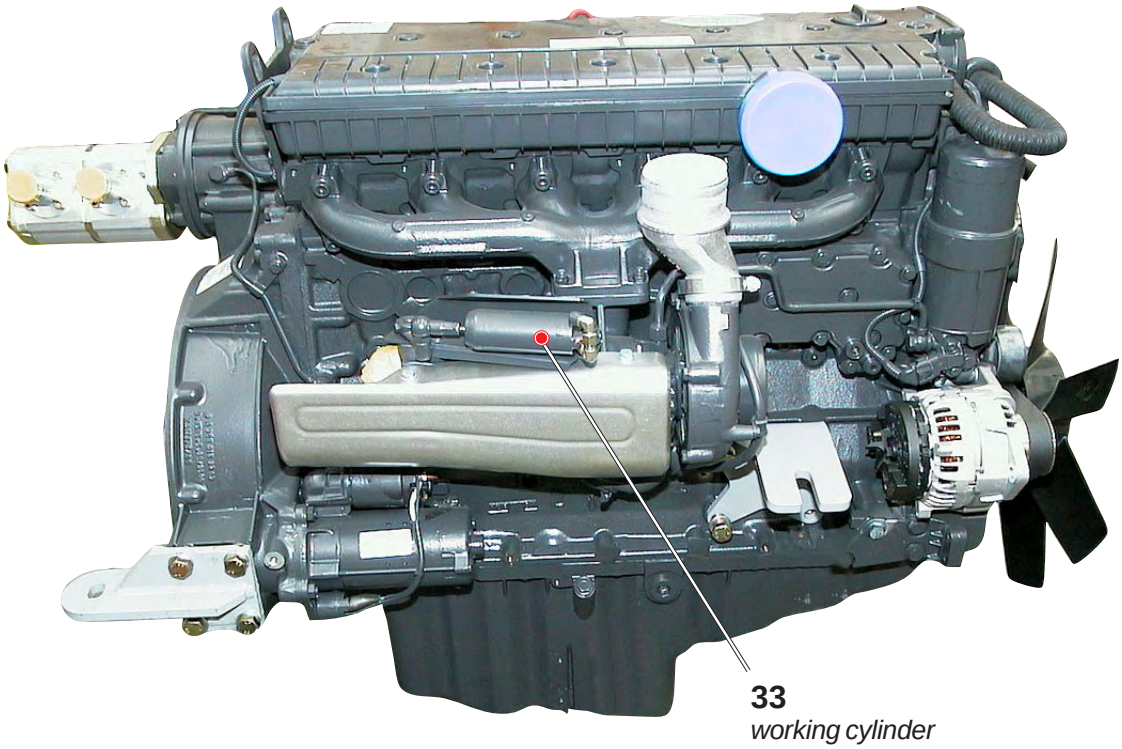
Circuit diagram pneumatic system Ident-No. 983377408 sheet 8



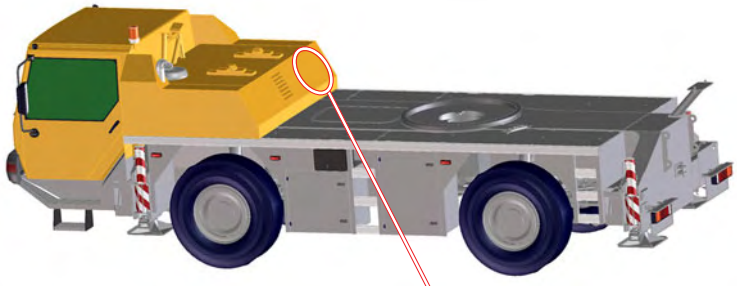
Outline of components - pneumatic system

9.1

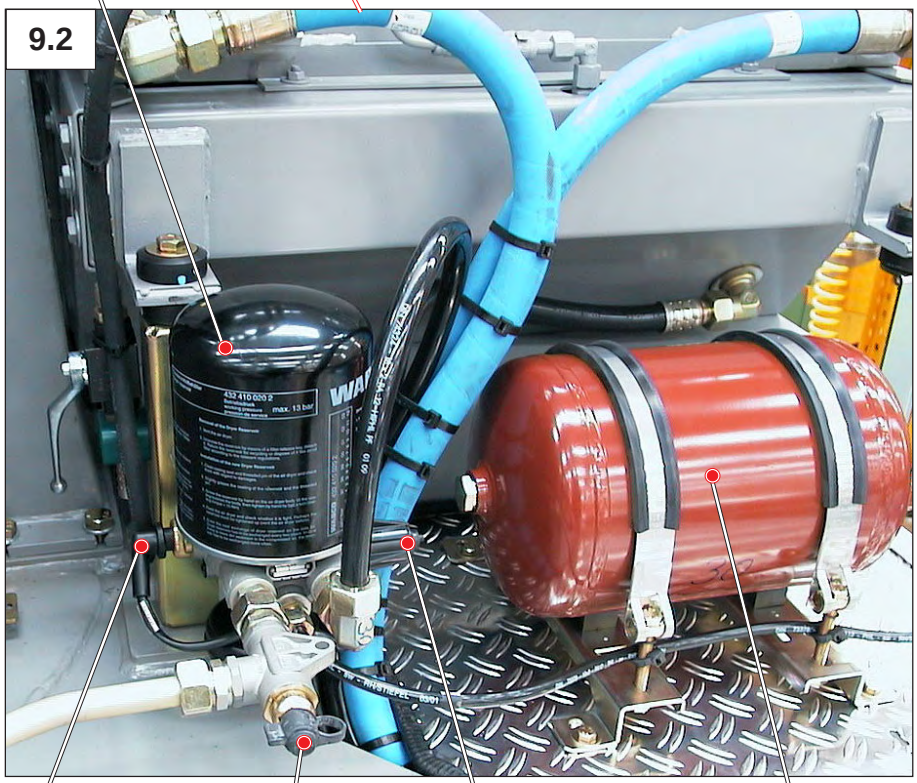




Outline of components - pneumatic system



3
single-chamber air-drier



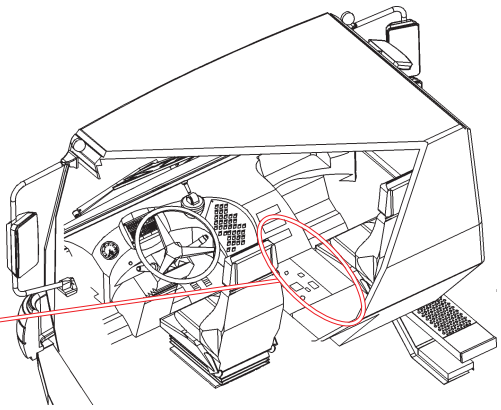
3.2
heating cartridge -Y4

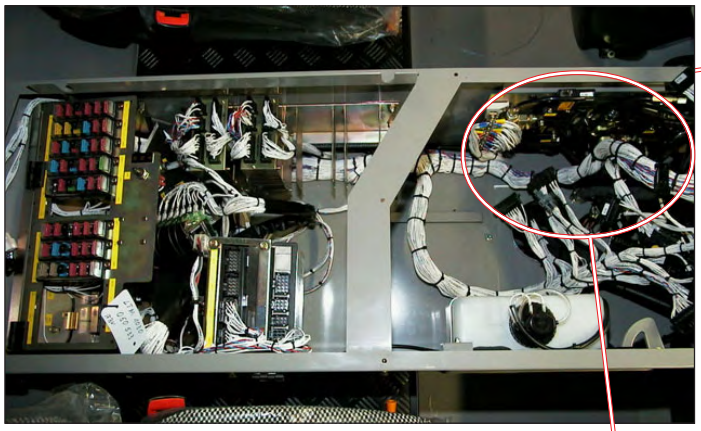
2
tyre inflation valve

3.1
pressure regulator

4
air reservoir

Outline of components - pneumatic system

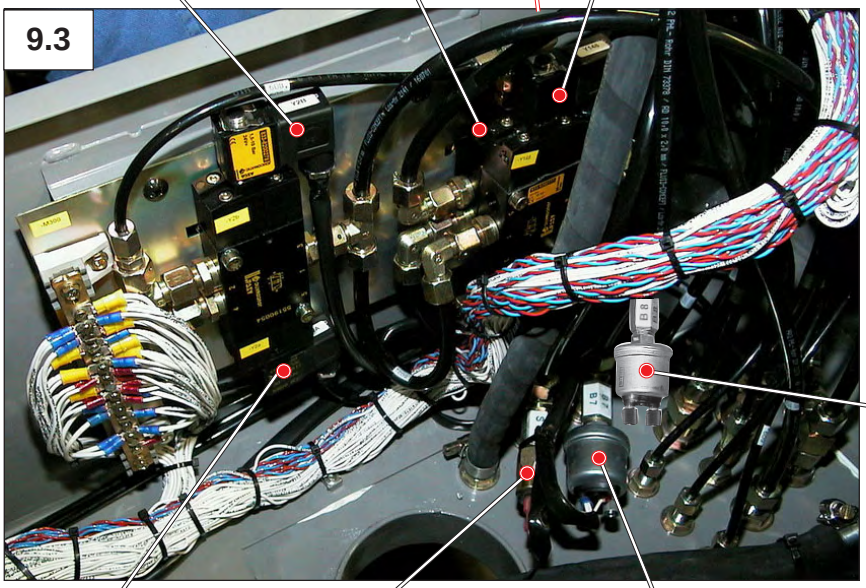




47
-Y2b
inversion
UW mode

48
directional valve
(pneumatic
oper.)

45
-Y148
parking brake OW,
1=released, 0=applied



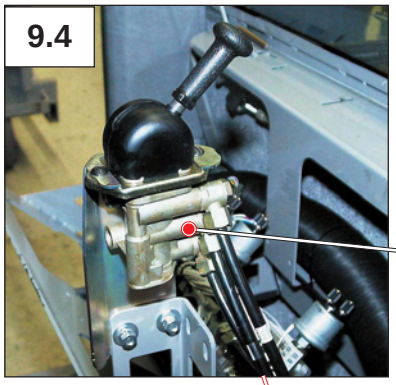
16
pressure sensor -
B9 service brake
circuit 2

47
-Y2a
inversion
OW mode

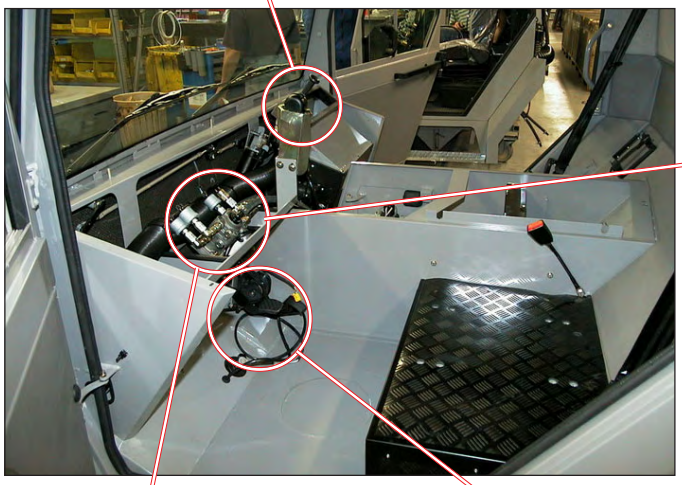
28
manometr. switch -
S114
parking brake
(at p < 5,5bar
brake applied)

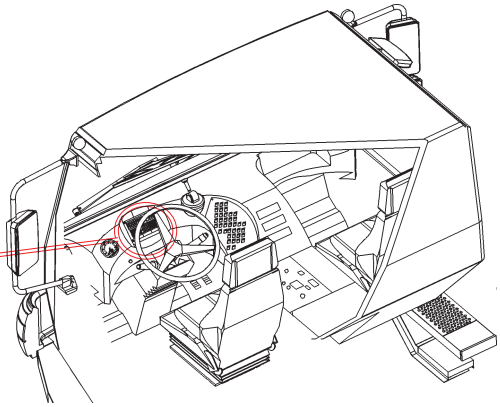
12
pressure sensor -B7
supply parking brake circuit 3

Outline of components - pneumatic system



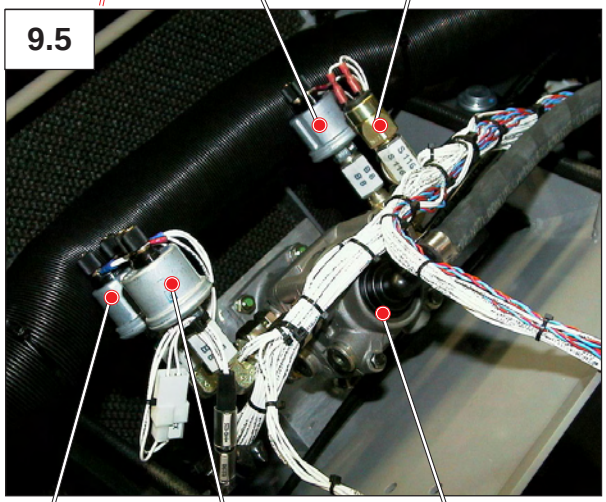
27
handbrake valve

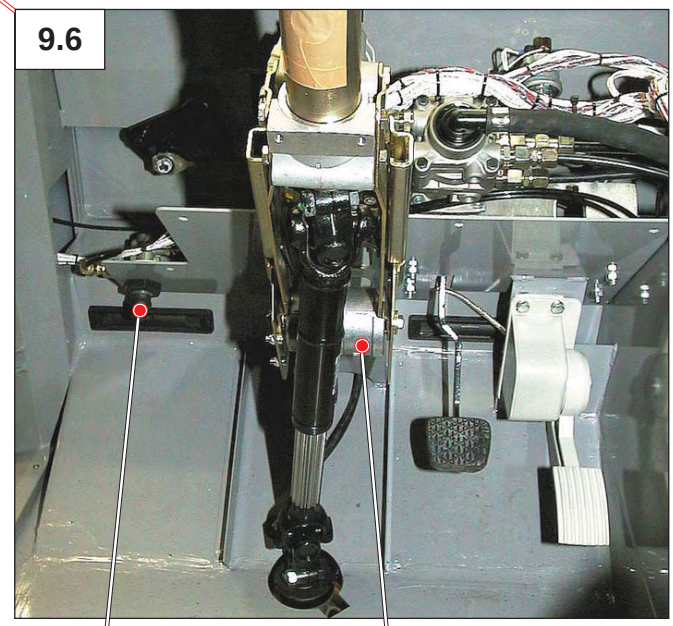




14
-B8
pressure sensor service brake circuit 1

15
-S116
pressure switch stop light ON





10
-B5
pressure sensor supply service brake circuit 1

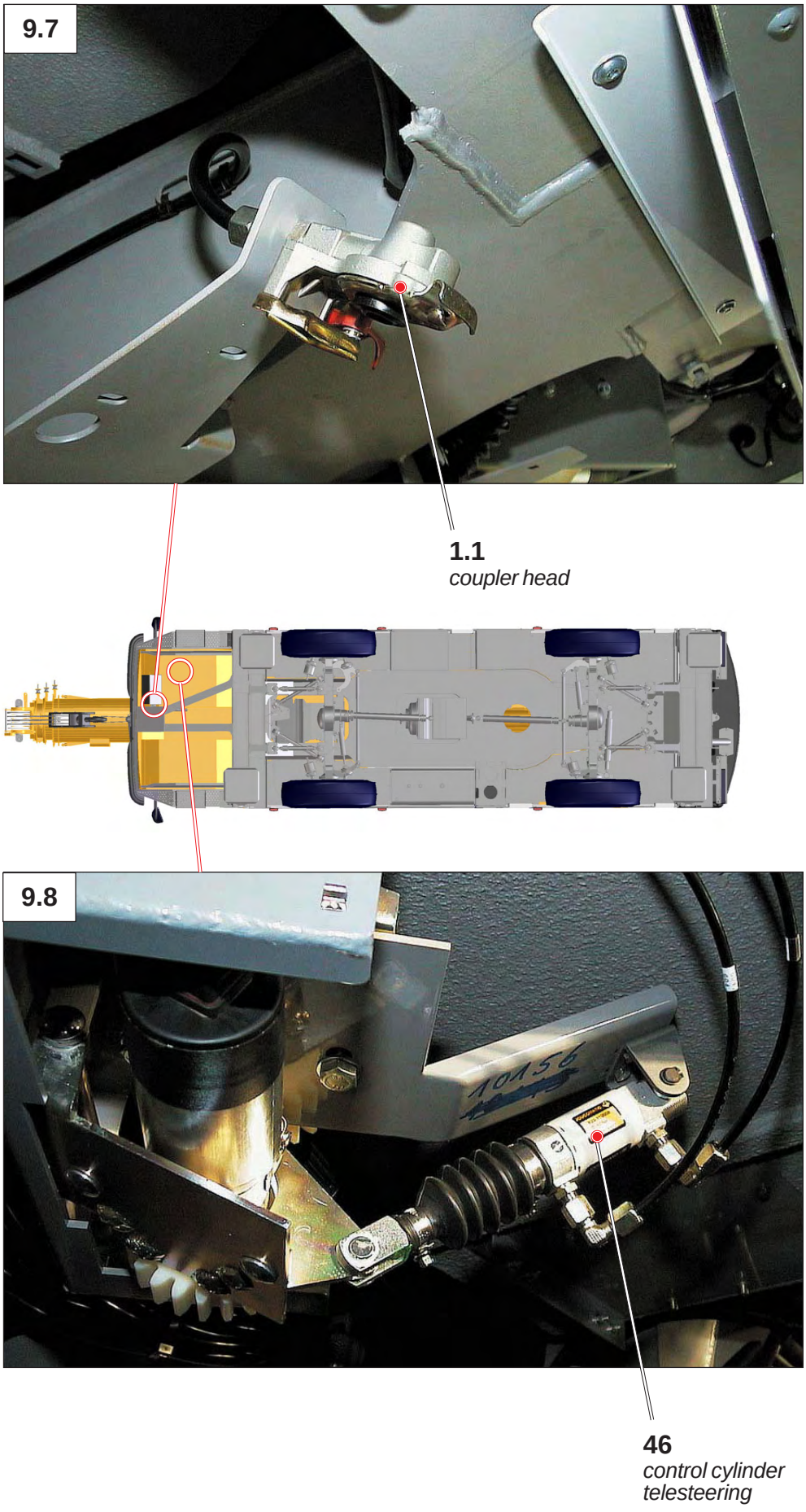
11
-B6
presure sensor supply service brake circuit 2

13
pedal brake valve

43
directional valve steering wheel adjustment

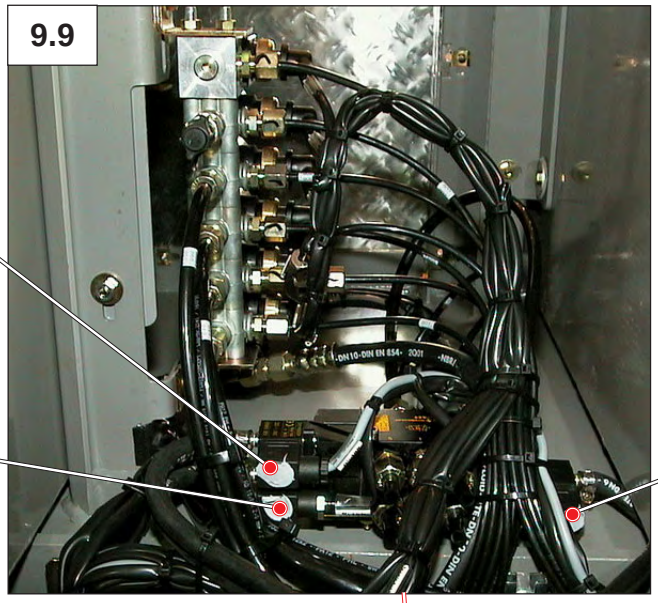
44
working cylinder steerijg wheel adjustment

Outline of components - pneumatic system



Outline of components - pneumatic system

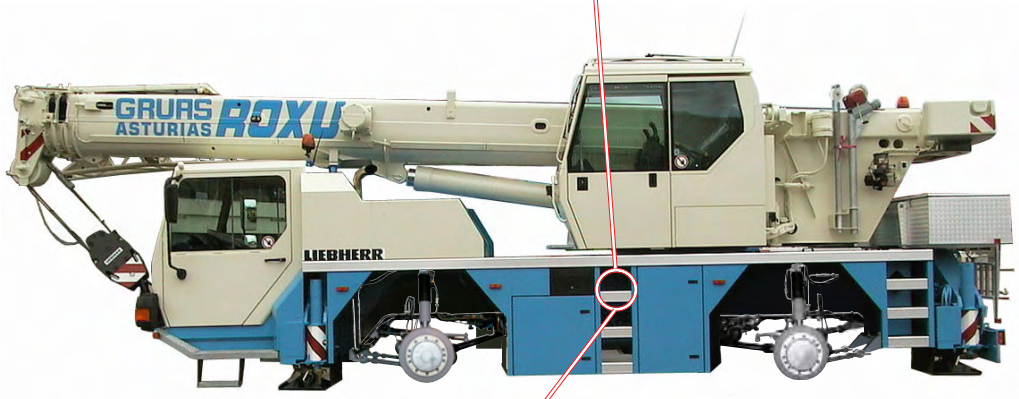
9.9



49
-Y149
control valve ASR braking the skidding wheel on axles 1+2

40
-Y9b
suspension, 1 = activated

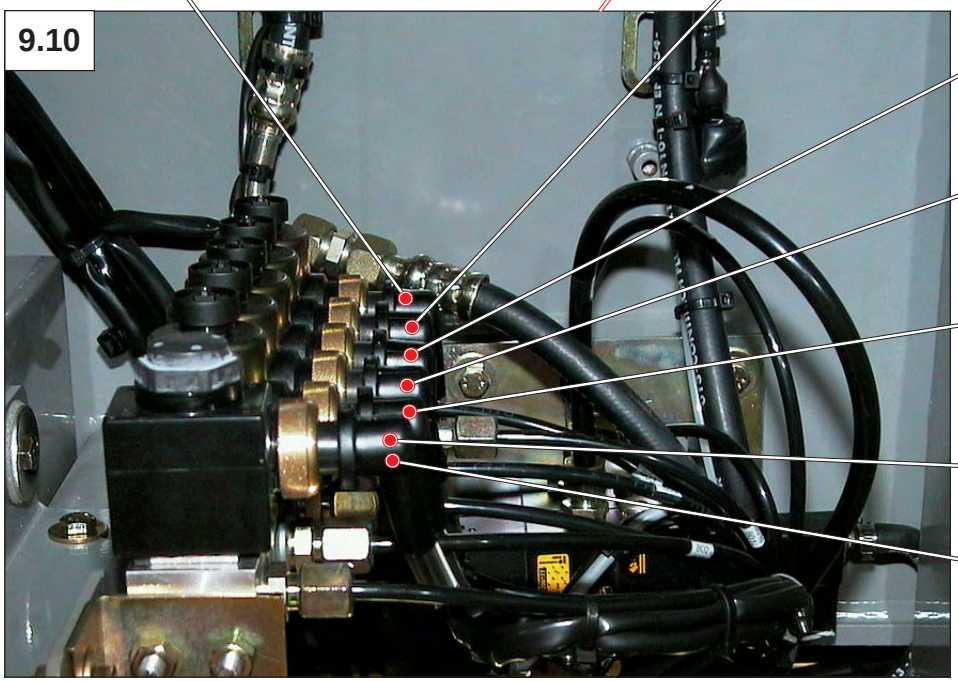
40
-Y9a
suspension, 1 = locked



38
longit. differential (activation axle 1)
-Y5

36
transv. differential axles 1 + 2, ON
-Y7

9.10



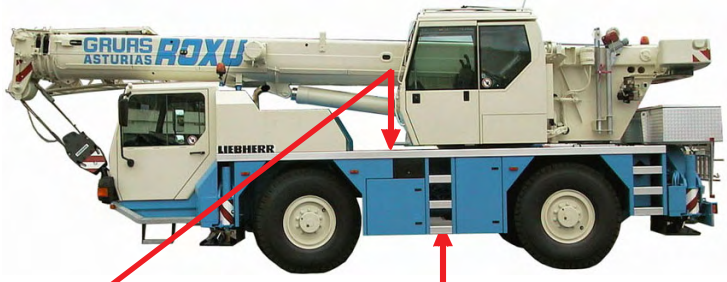
41
-Y3
crane hydraulics
1 = ON, 0 = OFF

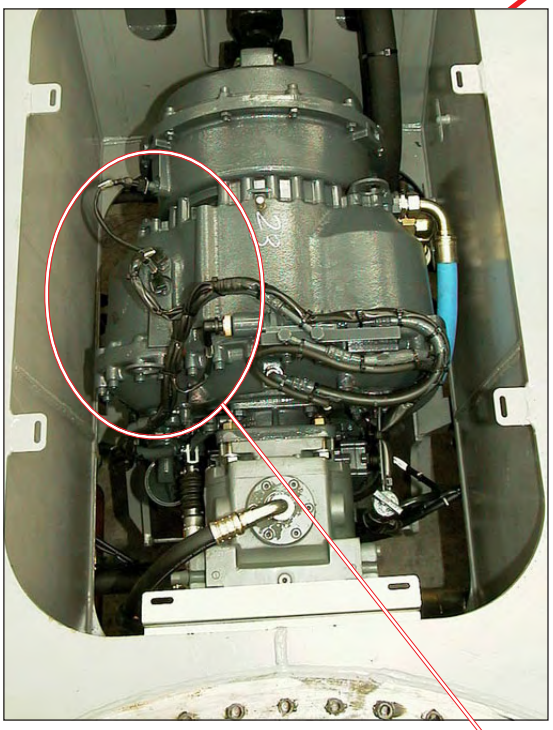
34
-Y21
rear-axle release
1 = released

32
-Y35
exhaust retarder,
1 = ON, 0 = OFF

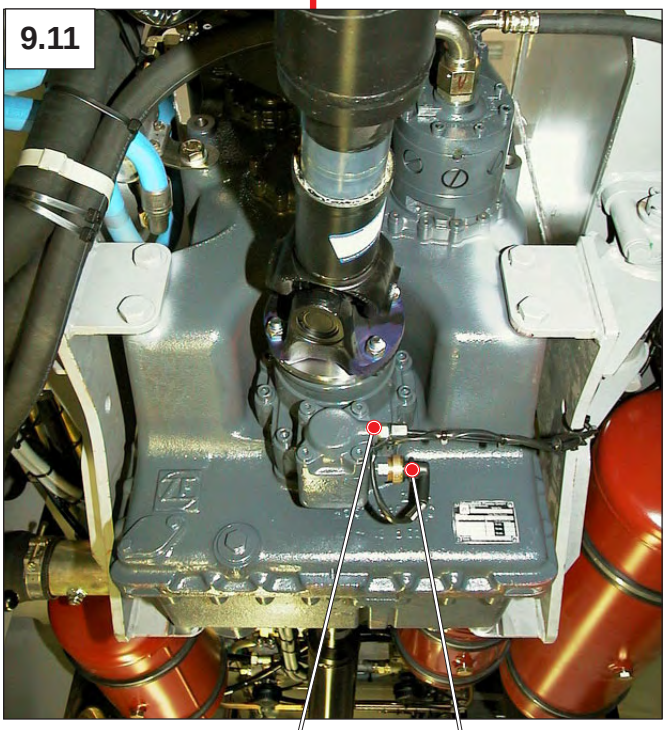
-Y1
air flap engine (optional)
and / or
-Y40
axle oscillation (optional)

Outline of components - pneumatic system





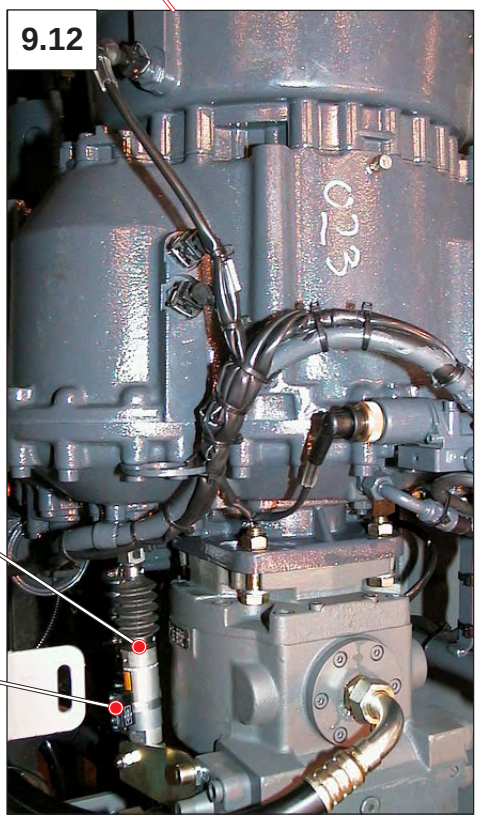
9.11



39
working cylinder activation axle 1

-S139
contact switch axle 1 activated
1 = ON / 0 = OFF

9.12



42
activation / deactivation of crane hydraulic pump

-S121
Reed switch acknowledgement crane hydraulics ON

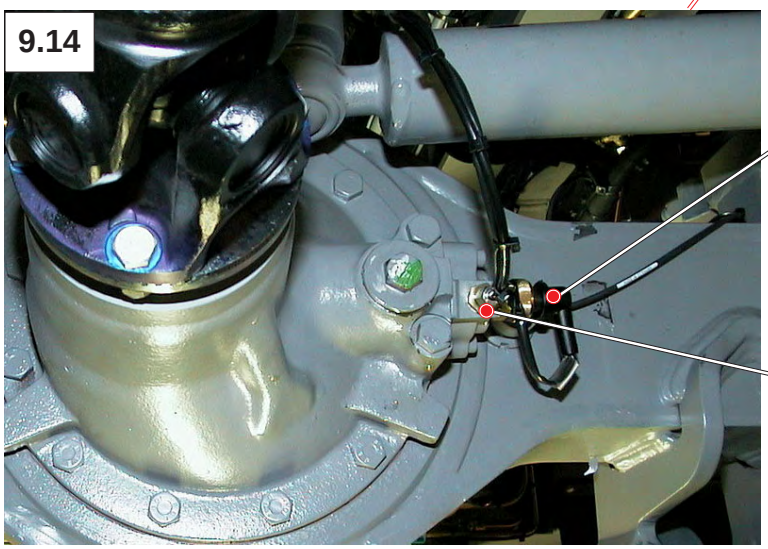
Outline of components - pneumatic system

37
working cylinder activation transv.differential lock axle 2

9.13

-S123
contact switch transv. differential lock axle 2,
1 = ON / 0 = OFF

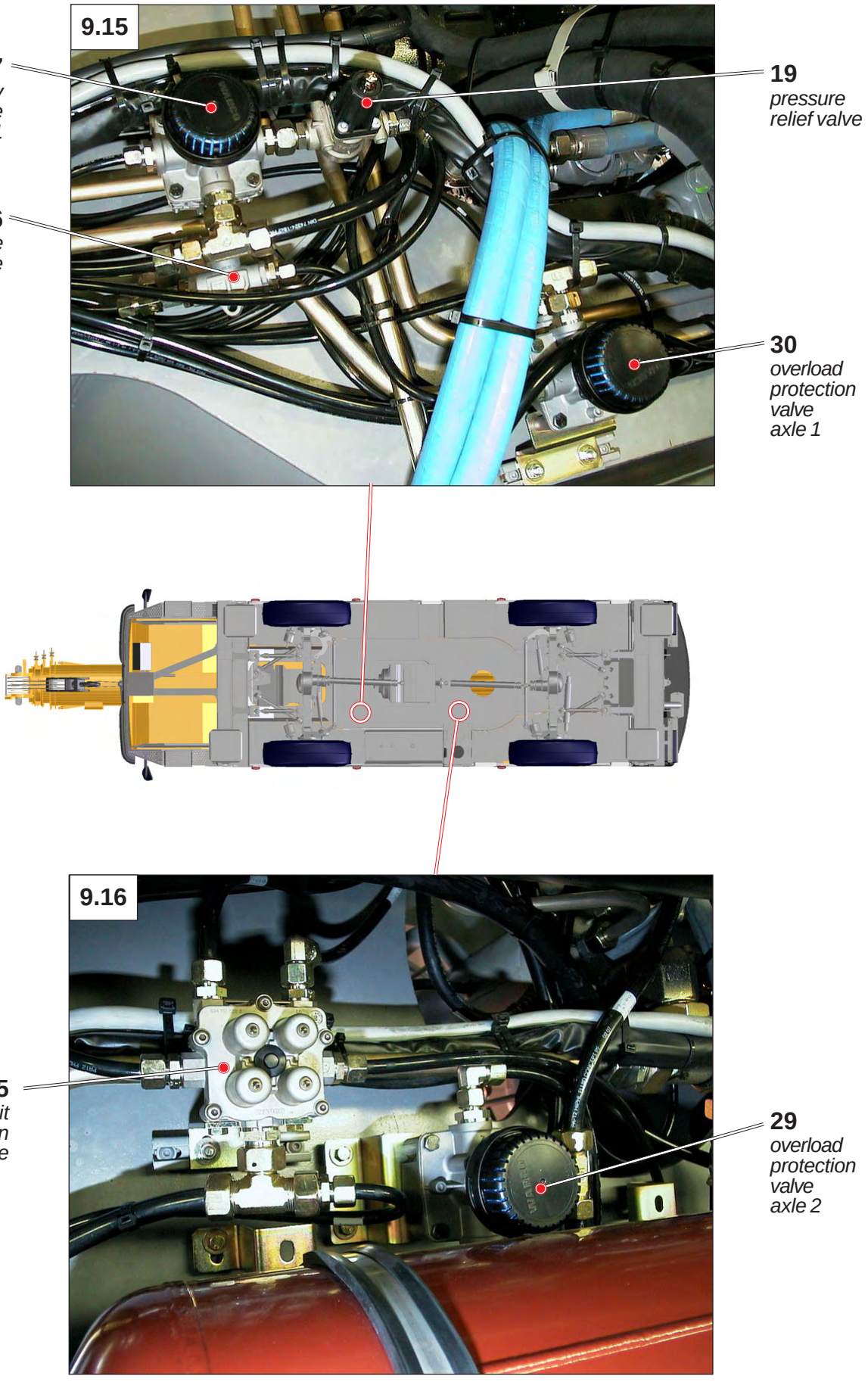
9.14



-S122
contact switch transv. differential lock axle 1,
1 = ON / 0 = OFF

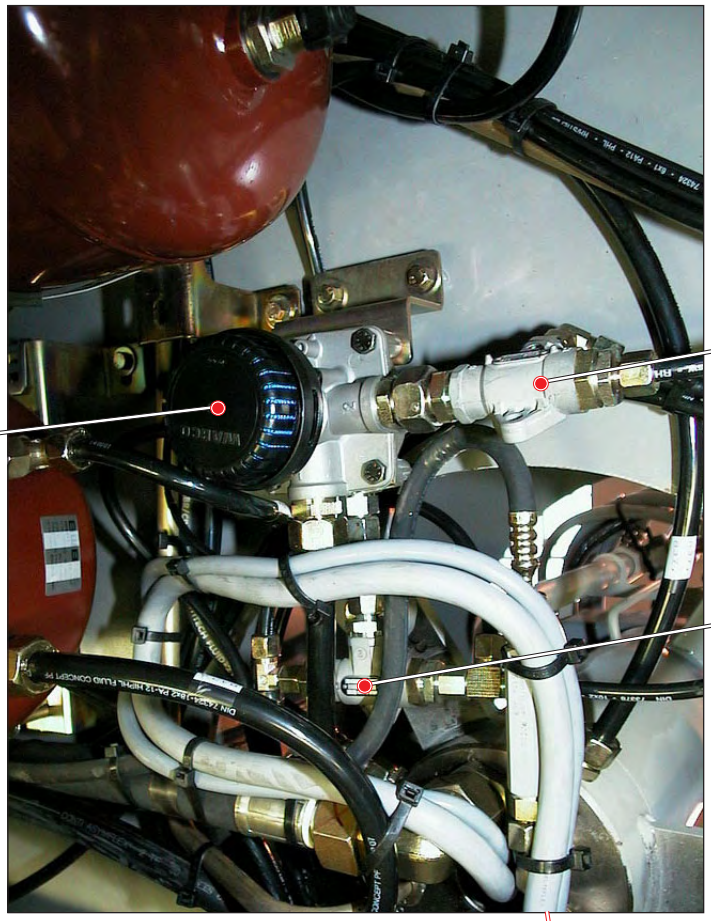
37
working cylinder activation transv. differential lock axle 1

Outline of components - pneumatic system



Outline of components - pneumatic system

9.17

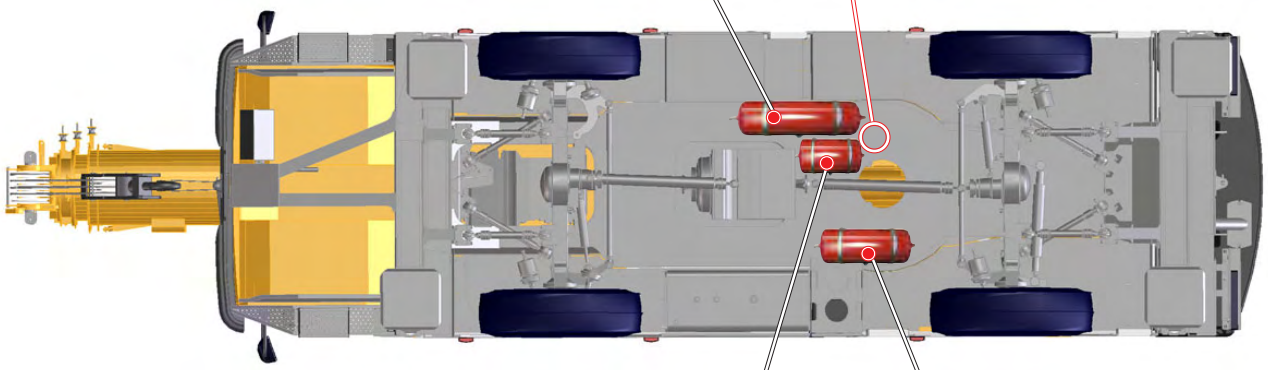


18
brake relay valve axle 2

26A
shuttle valve

26
shuttle valve

6
air reservoir 60l



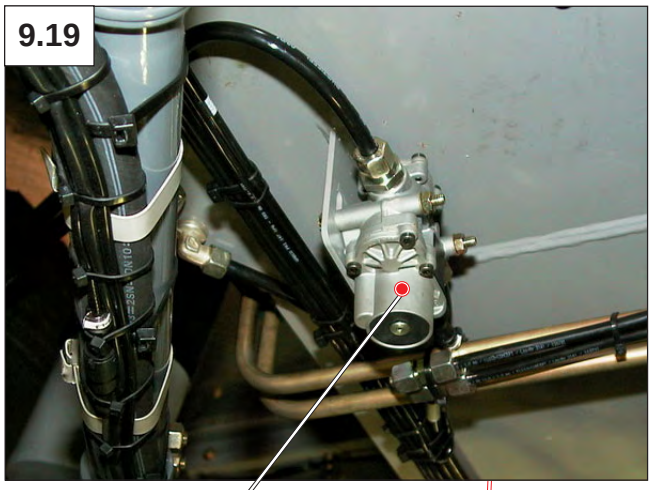
8
air reservoir 20l

7
air reservoir 40l

Outline of components - pneumatic system

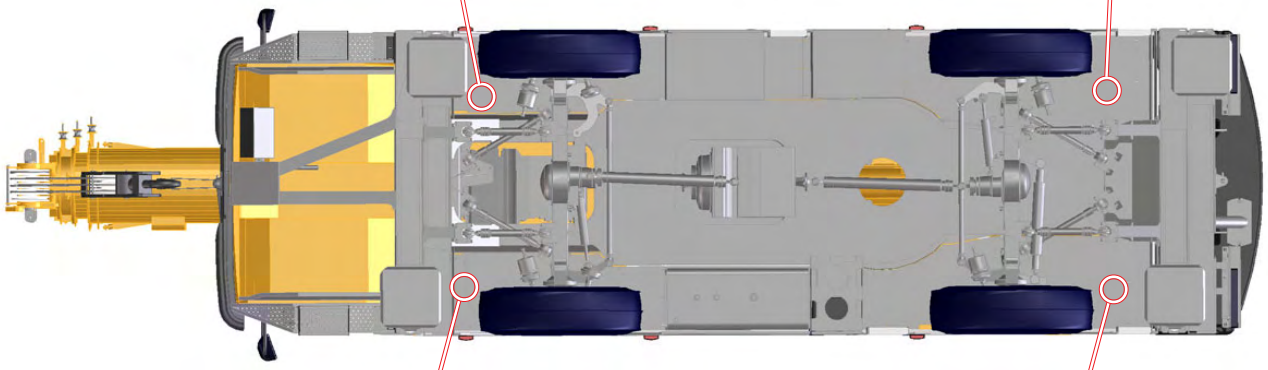
9.18

9.19

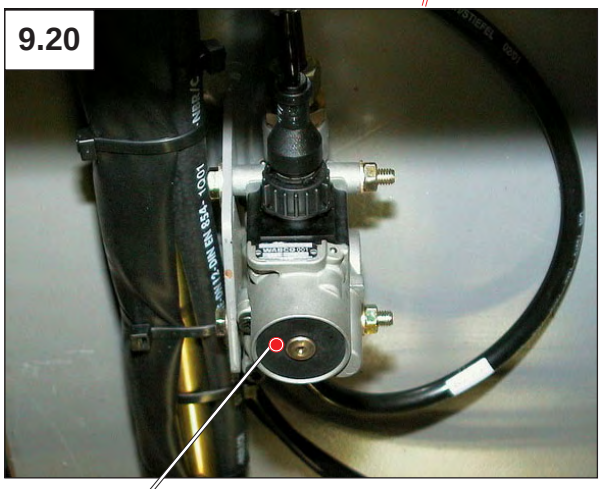


20
ABV control device -Y41
axle 1 left
(wheel A)

22
ABV control device -Y43
axle 2 left
(wheel C)



9.20



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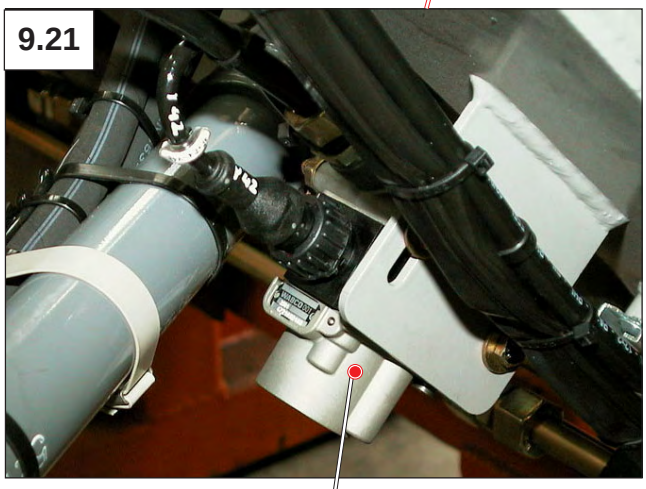
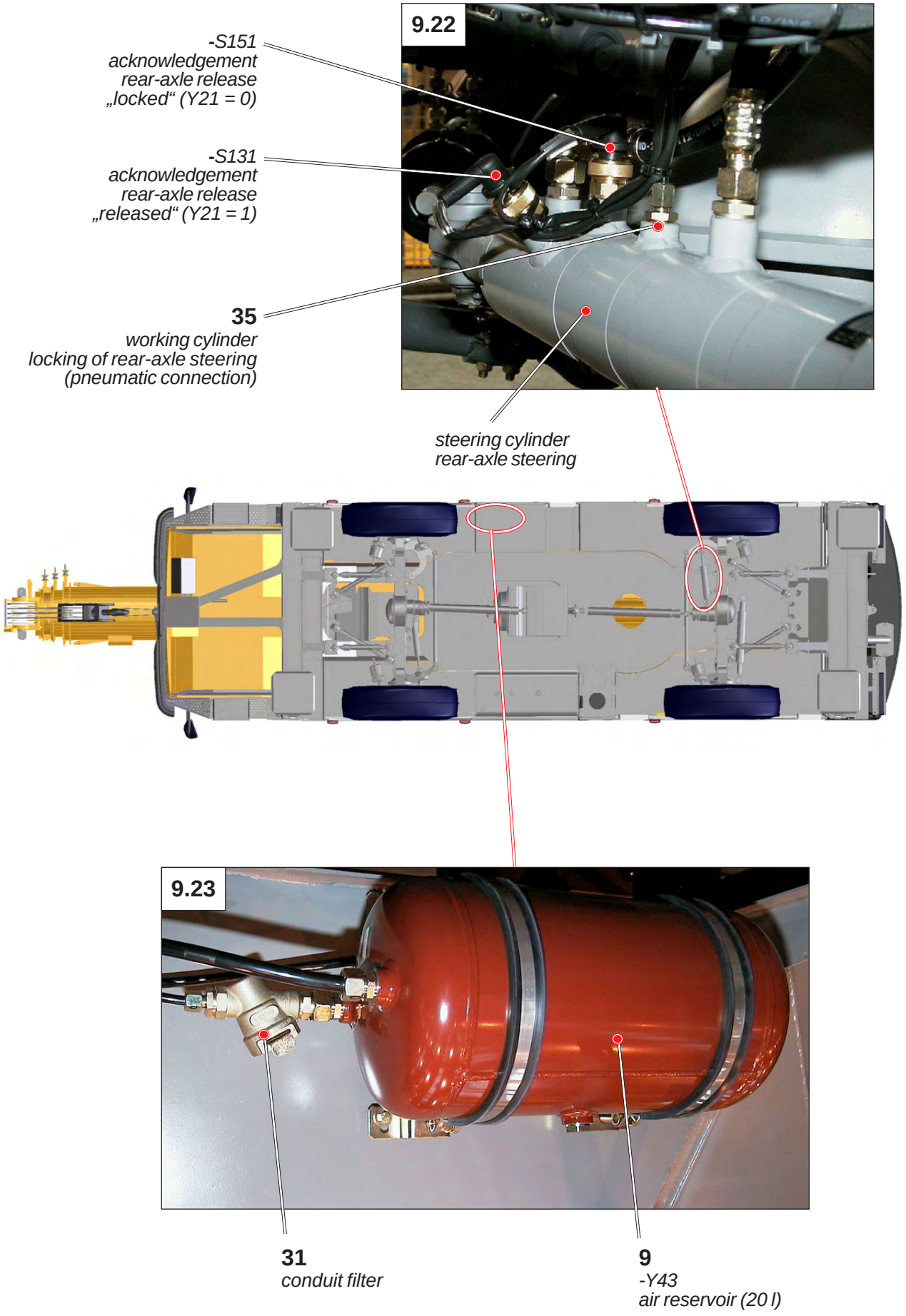


23
ABV control device -Y44
axle 2 right
(wheel D)

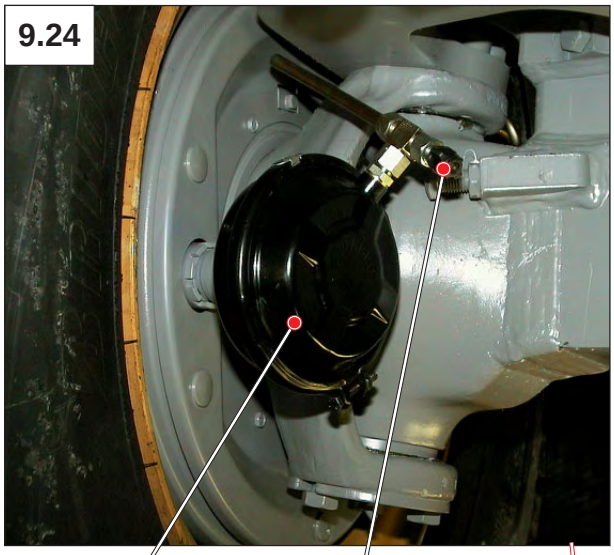
21
ABV control device -Y42
axle 1 right
(wheel B)

Outline of components - pneumatic system



Outline of components - pneumatic system

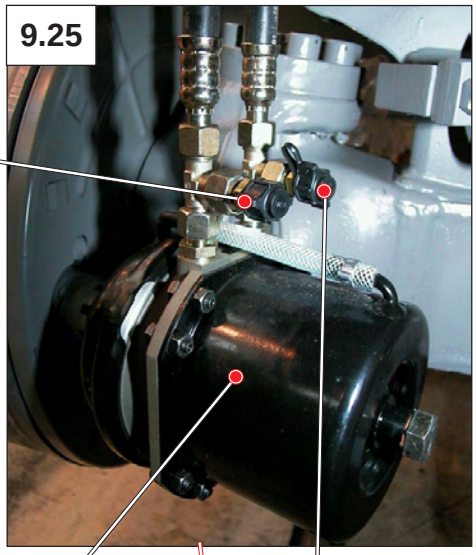
9.24



24
diaphragm brake cylinder

M1
measuring point service brake pressure

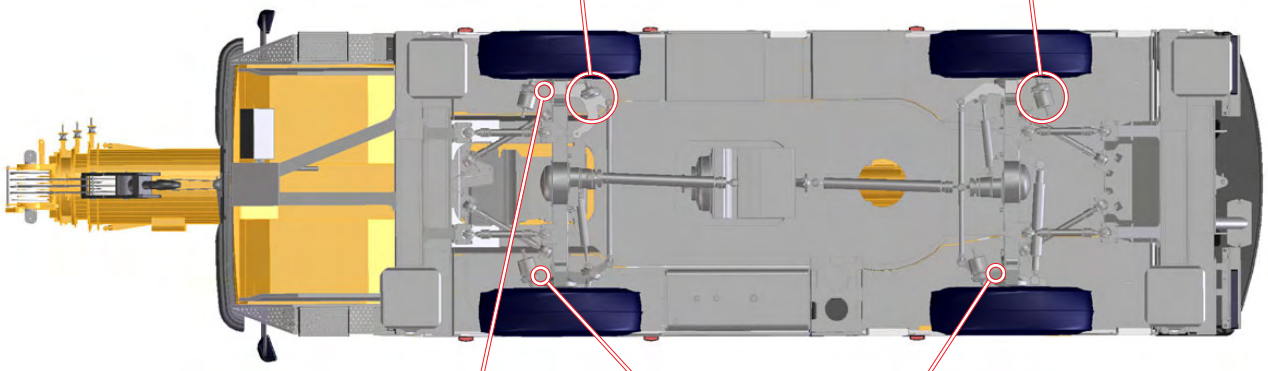
9.25



M2
measuring point brake locking pressure

25
combined brake cylinder

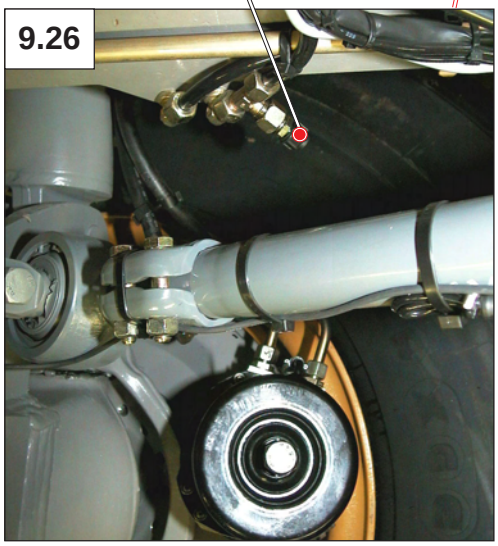
M1
measuring point service brake pressure



M2
measuring point parking brake pressure

M1
measuring point service brake pressure

9.26



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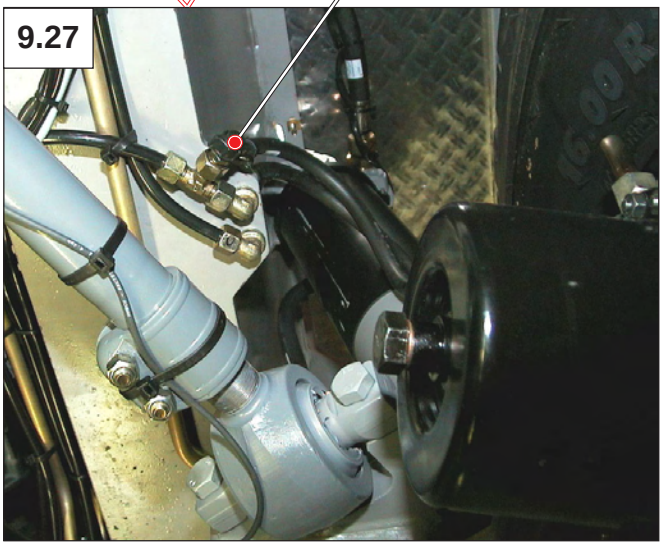
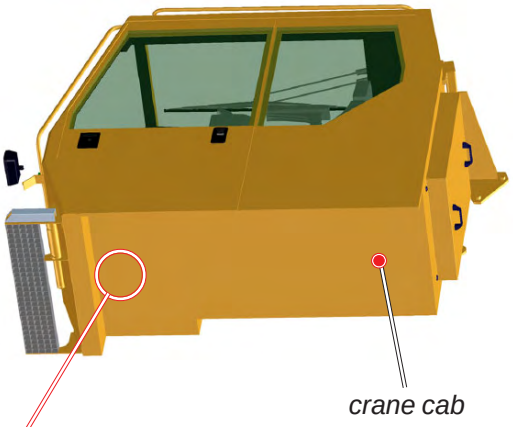
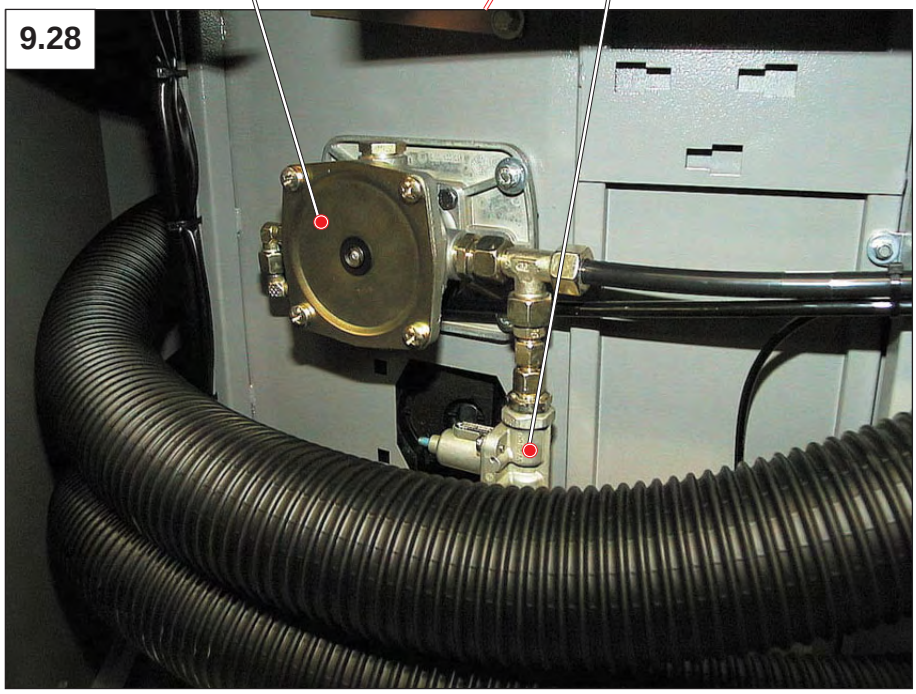


Outline of components - pneumatic system



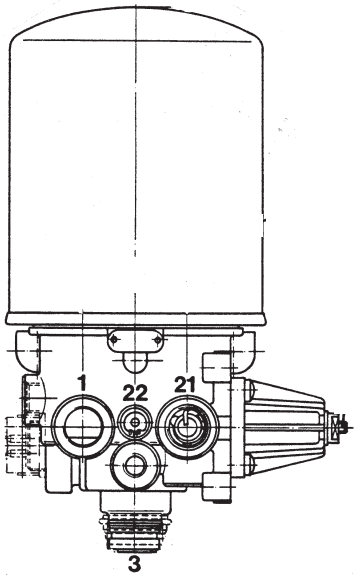
50
pedal brake valve

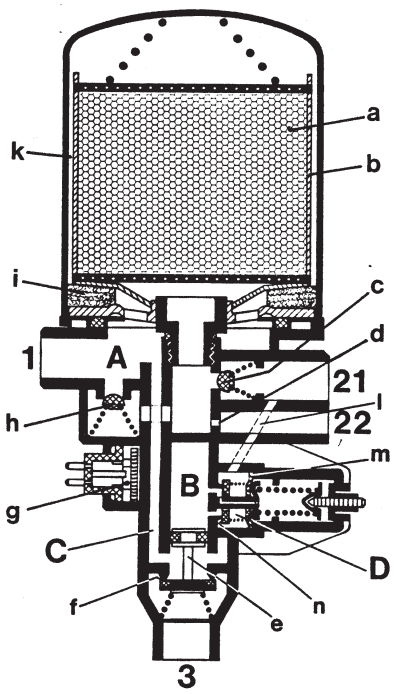
51
overflow valve



Pneumatic components

Air drier





Operation method

During the delivery phase, the air supplied by the compressor passes via connection **1** into compartment "**A".** There, the condensation water generated due to the decline in temperature is collected and flows through channel "**C"** to the outlet (f).

Via fine filter (i) incorporated into the cartridge and ring compartment (k), the air passes to the top side of the granulates cartridge (b). During the passage through the granulates (a), the humidity is extracted from the air and absorbed by the surface of the granulates (a). The dried air passes via check valve (c), connection **21,** and the downstream braking devices to the air reservoirs. Simultaneously, dried air also passes via throttling port (d) and connection **22** to the generation reservoir.

When attaining the cut-off pressure of the system, compartment **"D"** is aerated via the hole (l) and acts on the diaphragm (m). Upon surmounting of the resilience, inlet (n) opens and the actual pressure acting on piston (e) opens outlet (f).

The air supplied by the compressor now passes via compartment **"A",** channel **"C"** and ventiduct **3** into the open. Piston (e) simultaneously also takes over the function of a pressure relief valve. At overpressure, piston (e) opens automatically outlet (f),

If the reserve pressure declines in the system due to air consumption, inlet (n) is closed and the pressure of compartment **"B"** is reduced via the venting of the pressure regulator. Outlet (f) is closed and the drying procedure restarts.

Due to the installation of a heating cartridge (g) into the area of piston e, a functional failure due to the formation of ice is prevented during extreme conditions.

Should a passage of air through the cartridge no longer be possible due to, e.g. the clogging of the filter, valve (h) is opened and the air arrives undried to connection **21.** During "normal“ operation, valve (h) is permanently closed.

Maintenance indications

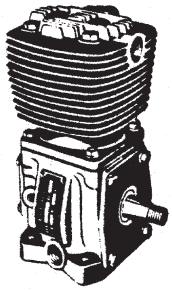
During operation in clean air, the granulates are practically indefinitely usable. so that the replacement cycle depends to a great degree on the condition of the air supplied by the compressor. Comprehensive experience with commercial vehicles have proved that the replacement of the granulates after approx.two years is sufficient.

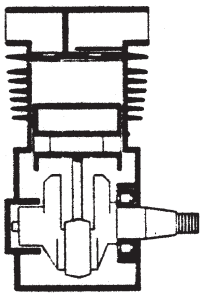
Warning: During maintenance, the air-drier must be pressureless.

For the replacement of the granulates cartridge (WABCO), some former versions require the safety screw at the front of the housing to be turned out of the h ousing for approx. 7 mm at first.

Subsequently, the cartridge can be screwed off the housing by turning left (if necessary, by ribbon wrench Ø 160 mm).Before the insertion of the new cartridge, sligtly lubricate the annular sealing. Tightening torque of the cartridge 20 Nm, (retighten safety screw if existing).

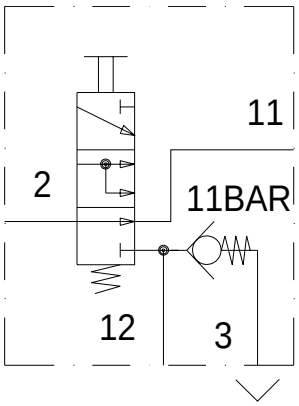
Pneumatic components





Compressor

Function
Generation of compressed air. The drive is performed by spur pinions through the crankshaft. Lubrication by circulation of the oil.

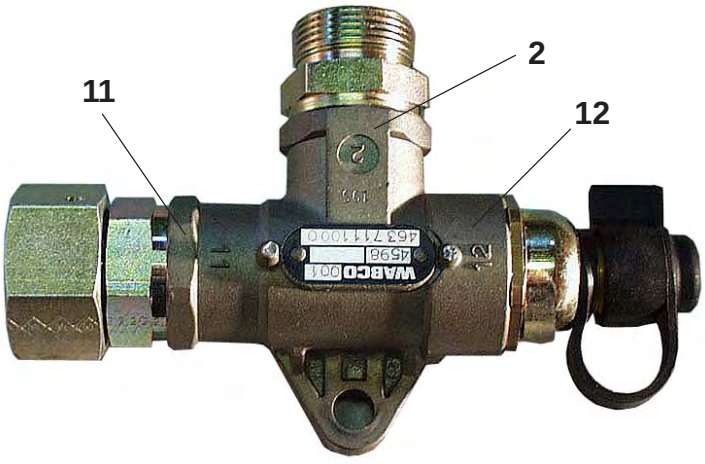


Tyre inflation valve

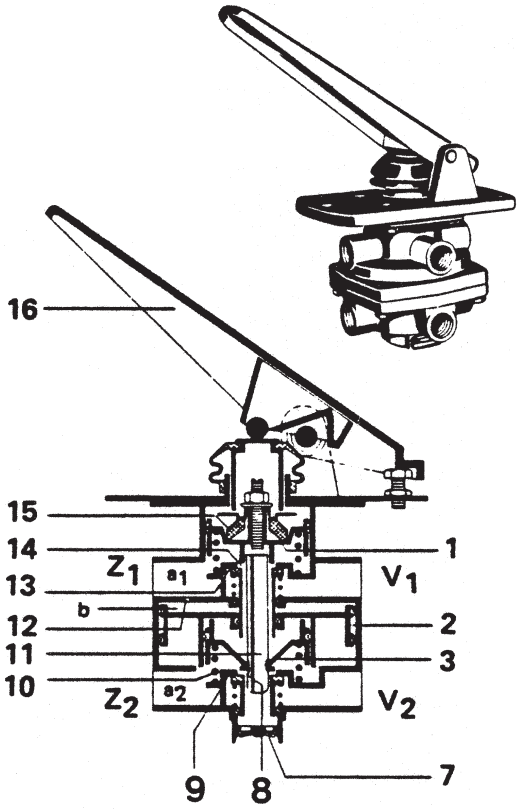
Function
Connection facility for tyre inflation hose (up to approx. 11 bar)

Connections

2	=	Connection - compressor
11	=	Connection - air-drier
12	=	Tyre inflation connection
3	=	Venting



Pneumatic components



Pedal brake valve

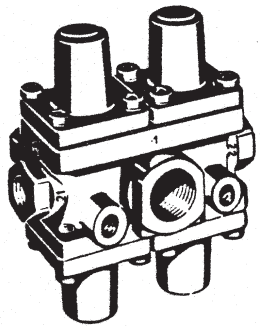
Function
Sensitive aeration and deaeration of the dual circuit brake system of the carrier.

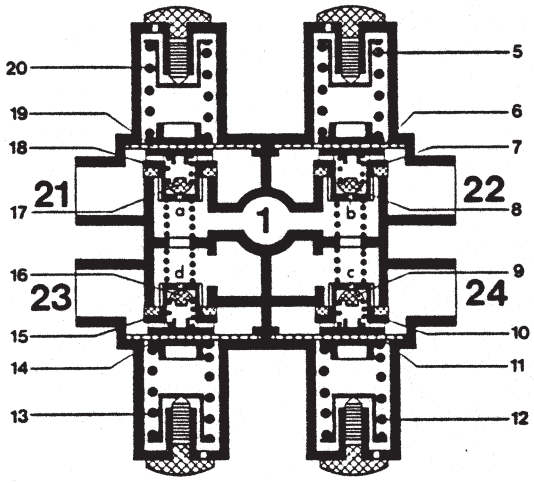
Connections

V1(11)	=	Connection - reserve circuit brake circuit I
V2(12)	=	Connection - reserve circuit brake circuit II
Z1(21)	=	Connection - control circuit brake circuit I
Z2(22)	=	Connection - control circuit brake circuit II

Set up

1	Graduating piston	12	Hole
2	Relay piston	13	Inlet
3	Piston	14	Outlet
7	Venting valve	15	Rubber holder
10	Spring	16	Pedal
11	Plunger rod		





4-circuit protection valve

Function
Pressure protection for the functioning service circuits at a failure of one or various circuits in a 4-circuit pneumatic brake system.
The 4 cicuits are connected in parallel and an equal refilling of all 4 circuits takes place. The 4-circuit protection valve is provided with bypass bores in all 4 circuits which ensure a refilling of the brake system from 0 bar on at a failure of a circuit.

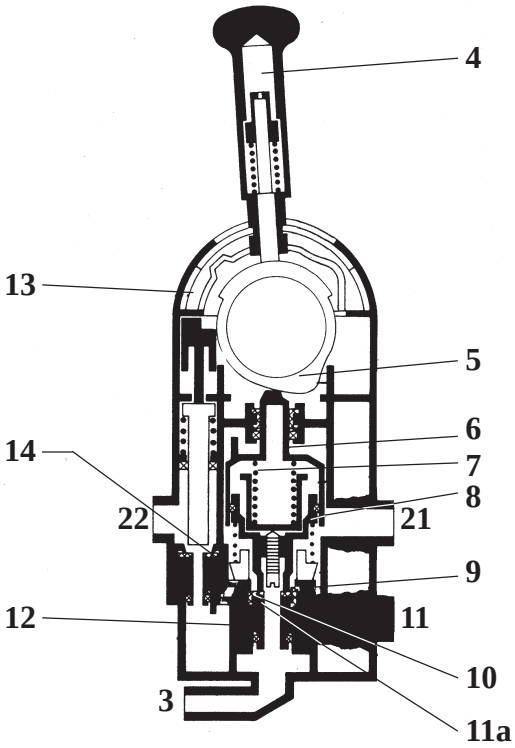
Connections of the reserve circuits

1	=	Connection of pressure regulator or frost protection pump respectively
21	=	Connection - service brake circuit I
22	=	Connection - service brake circuit II
23	=	Connection - service brake circuit III
24	=	Connection - second. cons. circuit IV

Set up

5	Pressure spring	13	Pressure spring
6	Diaphragm	14	Diaphragm
7	Valve	15	Valve
8	Check valve	16	Check valve
9	Check valve	17	Check valve
10	Valve	18	Valve
11	Diaphragm	19	Diaphragm
12	Pressure spring	20	Pressure spring

Pneumatic components

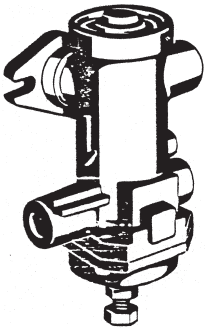


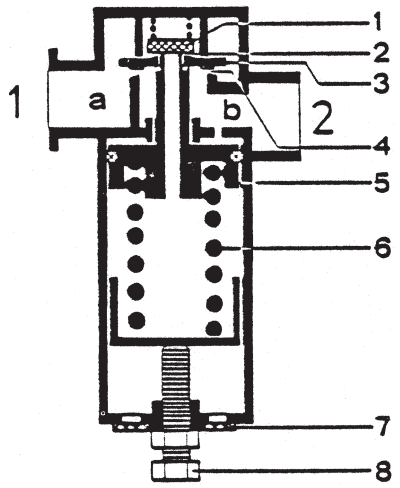
Handbrake valve

Function
Sensitive graduable actuation of the auxiliary brake and actuation of the parking brake in conjunction with the spring-loaded cylinders. Automatic release of the trailer auxiliary brake when applying the parking brake of the carrier

Connections
11 = Reserve circuit - handbrake circuit III
21 = Control circuit - handbrake circuit III
22 = Control circuit - trailer control valve
3 = Venting

Set up
4 Hand lever
5 Cam
6 Piston
7 Graduating spring
8 Graduating piston
9 Input valve
10 Output valve
11a Valve body
12 Spring
13 Cam plate
14 Output valve





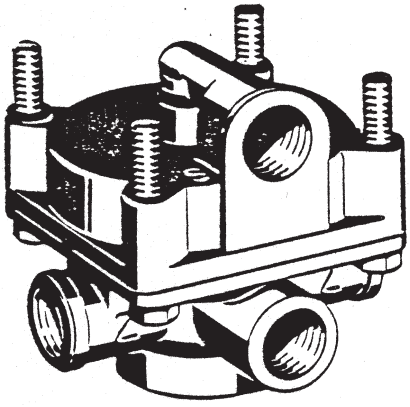
Pressure relief valve

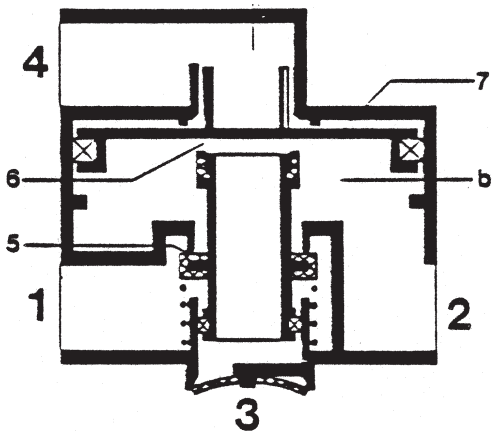
Function
Limitation of the output pressure.

Circuit connections
1 = High pressure
2 = Low pressure

Set up
1 Valve
2 Input
3 Valve
4 Input
5 Piston
6 Pressure spring
7 Venting valve
8 Setting screw

Pneumatic components





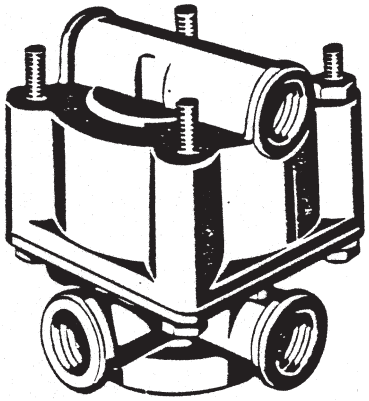
Relay valve (brake relay valve)

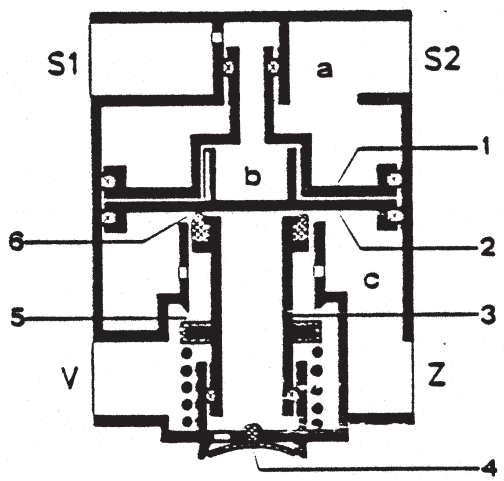
Function
Quick aeration and deaeration of pneumatic devices and reduction of the response and threshold time on pneumatic brake systems.

Connections
1 = Connection - reserve circuit brake circuit I or II
2 = Connection - brake circuit (diaphragm cylinder) brake circuit I or II
4 = Connection - control circuit (pedal brake valve) brake circuit I or II

Set up

3	Venting valve	6	Output
5	Input	7	Piston





Relay valve (overload protection valve)

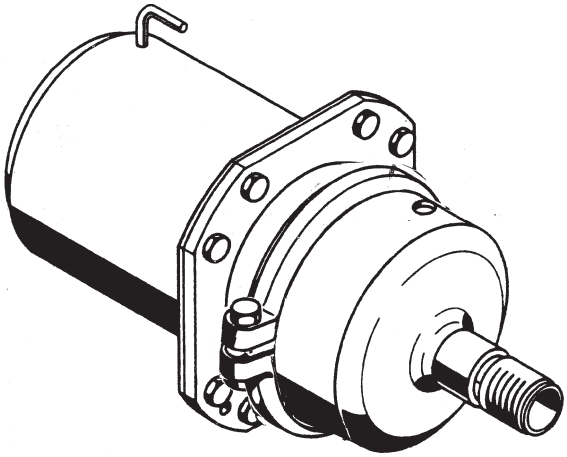
Function
Prevention of a force addition in combined spring-loaded diaphragm cylinders (Tristop cylinder) at simultaneous actuation of the service and parking brake system, thus overload protection of the mechanic transmission device. Moreover, quick aeration and deaeration of the spring-loaded cylinder.

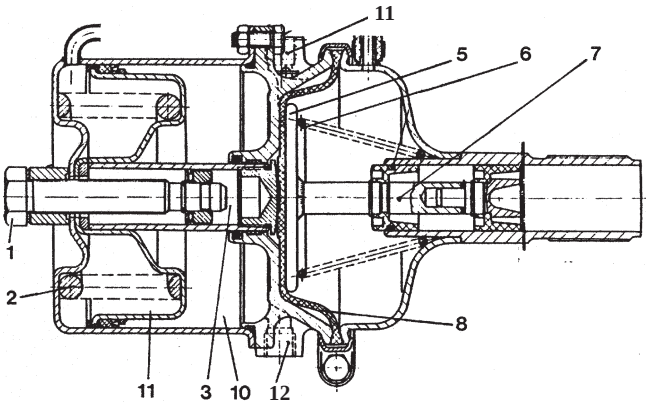
Connections
V(1) = Connection - res. circuit brake circuit III
Z(2) = Connection - spring reservoir circuit
S1(41) = Connection - brake ciruit(diaphragm cylinder) - brake circuit I or II
S2(42) = Connection - control circuit (of handbrake valve) brake ciruit III

Set up

1	Piston	4	Venting valve
2	Piston	5	Input
3	Valve body	6	Output

Pneumatic components





Tristop brake cylinder

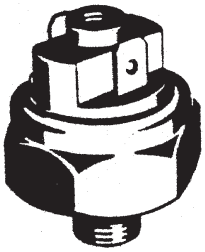
Function
Combined spring-loaded diaphragm cylinders serve for the generation of the brake force for the wheel brakes. They consist of diaphragm section for the service brake system and the spring-loaded section for the auxiliary and parking brake system. Particular features are overtravel and mechanic release device for the spring-loaded section.

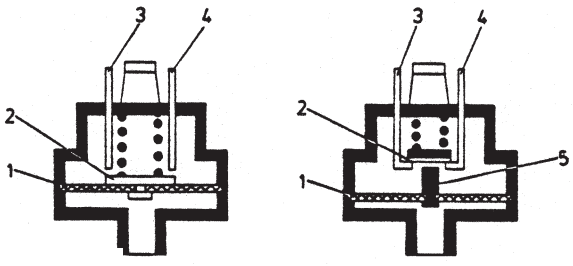
Remark
At pressureless pneumatic system, the brake applied by resilience can be released by turning the setting screw (1) to the left.

Connections
11 = Conection - brake circuit circuit I or II
12 = Connection - spring-loaded section

Set up

Tristop cylinder		diaphragm cylinder	
1	Setting screw (release device)	5	Piston
		6	Spring
2	Spring	7	Piston rod
3	Piston rod	8	Diaphragm
10	spring-loaded cylinder		
11	Piston		





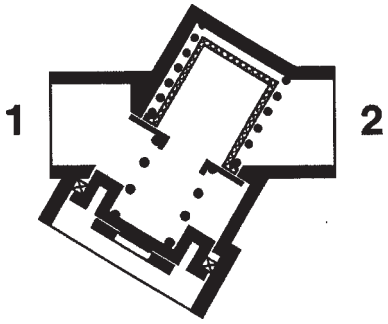
make-break switch tripping switch

Pneumatic switch

Function
Dependent on the version, cut-in or cut-off of electric devices or pilot lamps.

Set up
1 Diaphragm
2 Contact plate
3 Terminal
4 Terminal
5 Plunger

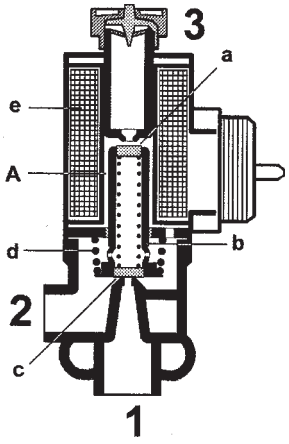
Pneumatic components



Conduit filter

Function
Protection of the pneumatic brake system against clogging

Connection
1 = Compressed air input
2 = Compressed air output

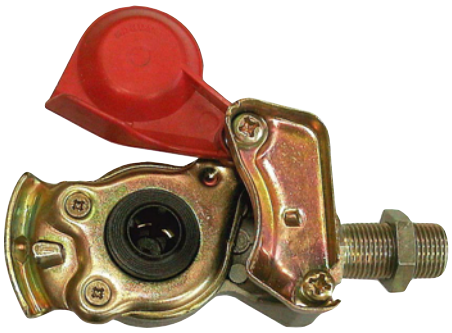


3/2 way solenoid valve

Function
Aeration of a working circuit when applying current to the solenoid.

Connections
1 = Compressed air input
2 = Compressed air output
3 = Deaeration
4 = Connector connection

Aufbau
a = Output
b = Armature
c = Input
d = Pressure spring
e = Solenoid

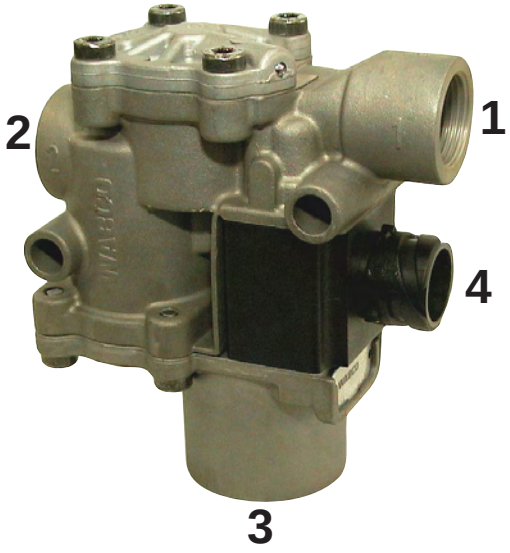


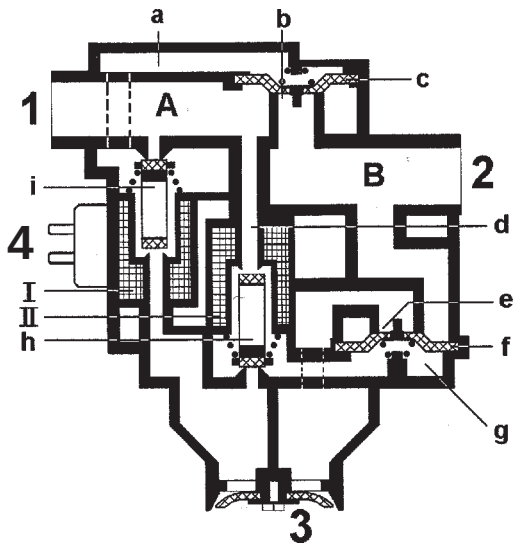
Coupler head

Function
Connection of the pneumatic brake system of the carrier with the brake system of the trailer..

Pneumatic components

ABV solenoid control valve





Function
The solenoid control valve has the function **to increase, to decrease** or **to maintain** the pressure in the brake cylinders within milliseconds during a braking procedure dependent on the control signals of the electronics**.**

Connections
1 = Compressed air from compressor
2 = Compressed air to the brake cylinder
3 = Deaeration
4 = Connector connection

Set up
I = Valve solenoid
II = Valve solenoid
a = Pilot-control chamber
b = Input
c = Diaphragm
d = Bore
e = Output
f = Diaphragm
g = Pliot-control chamber
h = Valve
i = Valve

Identification of the device connections on pneumatic brake systems

The connections of the devices are identified by digits. The digits of the connection identification indicate the function of the connection on the device. The identification consists of a one- to two-digit number.

The significations of the first digit are as follows:

	former designation		
0		-	Intake connection
1	(V)	-	Energy admission (input)
2	(Z)	-	Energy discharge (output)
3		-	Connection - atmosphere
4	(S)	-	Control connection (input)
5		-	free
6		-	free
7		-	Anti-freeze connection
8		-	Lubrication oil conn. } at compressor
9		-	Cooling water conn. } at compressor

A second digit is indicated, when various equal connections, e.g. at the existance of multi-circuits.

The signification of the second digit has been selected continuously, starting with 1.

Excepted from free selection are the numbers:

81 Lubrication oil input
82 Lubrication oil output
91 Coolong water input
92 Cooling water output

Various identical connections, coming from one chamber, are not different. They have got the identical identification.

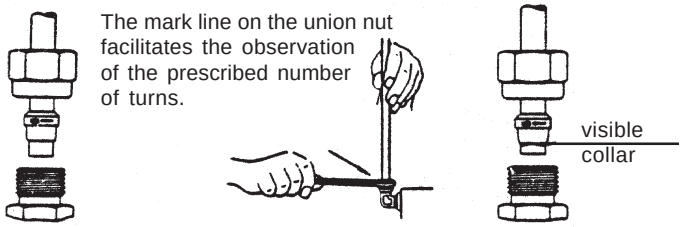
If one connection must deal with various functions, it is identified by two -first- digits.
These are seperated from one another by a hyphen (e.g. 1-2 tyre inflation connection - pressure regulator).

The identification is located at the devices adjacent to the connections and also on the brake schéma adjacent to the identified conduit connections.

Indications for the installation of pipework and joints (Wabco-Tecalan-Plastic Pipes)

Socket joints

For pipes with an outside diameter of up to 10 mm, it is advisable to screw the appropriate muffs of the socket joints into the respective devices and to perform the installation of the pipework directly at the fitting location. The pipe end equipped with the plug-in socket, with union nut and cutting ring is directly inserted into the threaded muff, and the union nut screwed manually onto the cutting ring up to the limit stop.

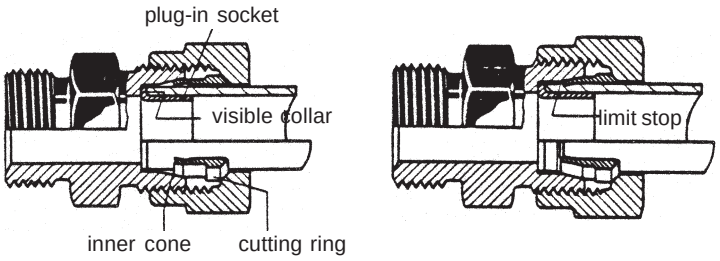


Subsequently, press the pipe against the limit stop in the threaded muff and tighten the union nut by the tightening torques stated on the following table. The pipe must not rotate during this procedure.

Table of the permissible tightening torques

Pipe dimensions	Tightening torques	Tear-off forces
6 x 1	13 to 14 Nm	at 13 Nm = 460 N
8 x 1	15 to 18 Nm	at 15 Nm = 580 N
10 x 1	20 to 35 Nm	at 20 Nm = 870 N
12 x 1,5	20 to 40 Nm	at 30 Nm = 1200 N

By falling short of the tightening torques stated on the table, the tear-off forces are reduced - by exceeding them, the plug-in socket collapses.



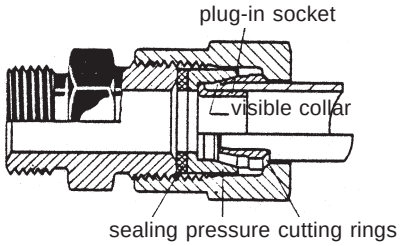
before tightening of the union nut

upon tightening of the union nut

If the tightening torque cannot be measured during fitting of the union nut, tighten the union nut with a spanner by 1 1/2 to 1 3/4 turns. An intact thread is the precondition for this.
It is recommended to re-loosen the union nut in order to check whether a visibly warped collar is filling the space in front of the cutting edge of the cutting ring.

Butt joints

Butt joints are prepared in the same manner as described under socket joints. However, a pressure ring and a sealing ring must be applied in addition.



upon tightening of the union nut

Table of the permissible tightening torques

Pipe dimension	Tightening torques	Tear-off forces
15 x 1,5	30 to 45 Nm	at 30 Nm = 2100 N
18 x 2	40 to 60 Nm	at 40 Nm = 2450 N

Bending of the plastic pipes

The pipe can be bent cold by considering the following bending radii. As it has the tendency, however, to return into its original position, it must be retained before and after each bending.

Do not fall short of the minimum bending radii (see following table) due to the danger of collapse.

Pipe dimensions	Min. bending radius
Ø 6 x 1	30 mm
Ø 8 x 1	40 mm
Ø 10 x 1	60 mm
Ø 12 x 1,5	60 mm
Ø 15 x 1,5	90 mm
Ø 18 x 2	110 mm