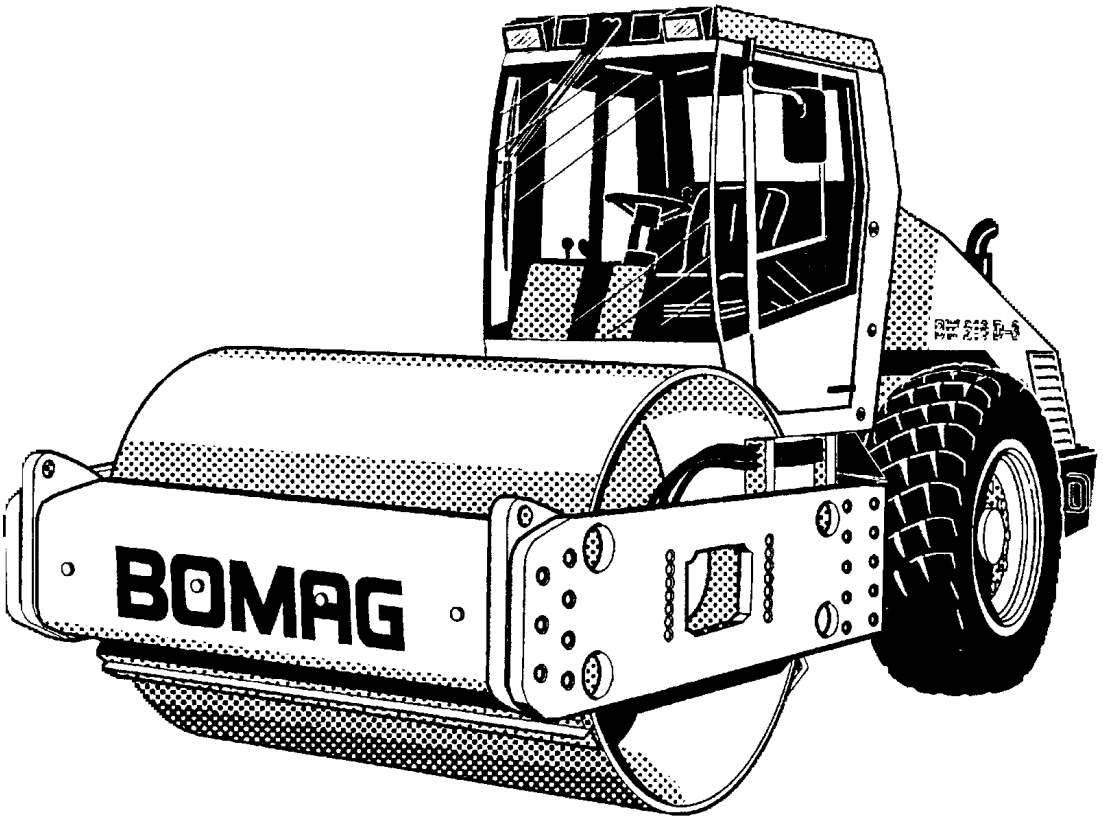
BOMAG

Training Manual



Single Drum Rollers

BW 216 D-3, BW 216 DH-3/PDH-3

BW 219 DH-3/PDH-3, BW 225 D-3/PD-3

Part-No. 008 098 29 4/2000

Displacement stage 1:	110 cm^3/U
Displacement stage 2:	40,3 cm^3/U
Perm. leak oil quantity:	2 l/min

Vibration pump:

Manufacturer:	Sauer-Danfoss
Type:	42R 041
System:	Axial piston-swash plate
Max. displacement:	41 cm^3/U
Starting pressure:	350+/-50 bar
Operating pressure, soil dependent:	ca.100 bar

Vibration motor:

Manufacturer:	Sauer-Danfoss
Type:	MMF 044
System:	Axial piston-swash plate
Displacement:	44 cm^3/U
Frequency:	30/36 Hz
Amplitude:	1,8/0,9 mm

Steering and charge pump:

Manufacturer:	Bosch
Type:	HY/ZFS11/16
System:	Gear pump
Displacement:	16 cm^3/U
Max. steering pressure:	225+/-15 bar

Steering valve:

Manufacturer:	Sauer-Danfoss
Type:	OSPC 500 ON
System:	Rotary valve

Rear axle:

Manufacturer:	Dana
Type:	CHC 193/51
Differential:	No-Spin
Degree of locking:	100 %
Reduction ratio:	65,08

Filling capacities:

Engine coolant:	20 l (50% Water, 50% Anti-freeze agent on Ethane-diol-basis)
Engine oil:	20 l (SAE 15W-40, API SJ/CF)
Hydraulic oil:	60 l (HVLP 46 VI 150)
Vibration bearing housing:	2x 1,8 l (SAE 15W-40, API SJ/CF)
Rear axle:	11 l (SAE 90 EP, API GL 5)
Rear axle wheel hubs:	2,9 l (SAE 90 EP, API GL 5)
Rear axle, transmission:	1,9 l (SAE 90 EP, API GL 5)
Reduction gear, drum:	2,8 l (SAE 90 EP, API GL 5)
AC refrigerant:	1100 g (R 134a)
Compressor oil (filling the system):	100 ml (PAG Öl)

Displacement stage 2:	27,5 cm^3/U
Perm. leak oil quantity:	2 l/min

Vibration pump:

Manufacturer:	Sauer-Danfoss
Type:	42R 041
System:	Axial piston-swash plate
Max. displacement:	41 cm^3/U
Starting pressure:	350+/-50 bar
Operating pressure, soil dependent:	ca.100 bar

Vibration motor:

Manufacturer:	Hydromatik
Type:	A2FM 45
System:	Axial piston-bent axe
Displacement:	45 cm^3/U
Frequency:	30/36 Hz
Amplitude:	1,8/0,9 mm

Steering and charge pump:

Manufacturer:	Bosch
Type:	HY/ZFS11/16
System:	Gear pump
Displacement:	16 cm^3/U
Max. steering pressure:	225+/-15 bar

Steering valve:

Manufacturer:	Sauer-Danfoss
Type:	OSPC 500 ON
System:	Rotary valve

Rear axle:

Manufacturer:	Dana
Type:	CHC 193/51
Differential:	No-Spin
Degree of locking:	100 %
Reduction ratio:	65,08

Filling capacities:

Engine coolant:	20 l (50% Water, 50% Anti-freeze agent on Ethane-diol-basis)
Engine oil:	20 l (SAE 15W-40, API SJ/CF)
Hydraulic oil:	60 l (HVLP 46 VI 150)
Vibration bearing housing:	2x 1,8 l (SAE 15W-40, API SJ/CF)
Rear axle:	11 l (SAE 90 EP, API GL 5)
Rear axle wheel hubs:	2,9 l (SAE 90 EP, API GL 5)
Rear axle, transmission:	1,9 l (SAE 90 EP, API GL 5)
Reduction gear, drum:	2,8 l (SAE 90 EP, API GL 5)
AC refrigerant:	1100 g (R 134a)
Compressor oil (filling the system):	100 ml (PAG Öl)

Displacement stage 1:	110 cm^3/U
Displacement stage 2:	27,5 cm^3/U
Perm. leak oil quantity:	2 l/min

Vibration pump:

Manufacturer:	Sauer-Danfoss
Type:	90R 055
System:	Axial piston-swash plate
Max. displacement:	55 cm^3/U
Starting pressure:	410+/-20 bar
Operating pressure, soil dependent:	ca.100 bar

Vibration motor:

Manufacturer:	Sauer-Danfoss
Type:	90M 055
System:	Axial piston-swash plate
Displacement:	55 cm^3/U
Frequency:	28/35 Hz
Amplitude:	2,14/1,21 mm

Steering and charge pump:

Manufacturer:	Bosch
Type:	HY/ZFS11/16
System:	Gear pump
Displacement:	16 cm^3/U
Max. steering pressure:	225+/-15 bar

Steering valve:

Manufacturer:	Sauer-Danfoss
Type:	OSPC 500 ON
System:	Rotary valve

Rear axle:

Manufacturer:	Dana
Type:	CHC 193/55
Differential:	No-Spin
Degree of locking:	100 %
Reduction ratio:	93,74

Filling capacities:

Engine coolant:	20 l (50% Water, 50% Anti-freeze agent on Ethane-diol-basis)
Engine oil:	20 l (SAE 15W-40, API SJ/CF)
Hydraulic oil:	60 l (HVLP 46 VI 150)
Vibration bearing housing:	2x 1,8 l (SAE 15W-40, API SJ/CF)
Rear axle:	11 l (SAE 90 EP, API GL 5)
Rear axle wheel hubs:	3,5 l (SAE 90 EP, API GL 5)
Rear axle, transmission:	1,9 l (SAE 90 EP, API GL 5)
Reduction gear, drum:	3,1 l (SAE 90 EP, API GL 5)
AC refrigerant:	1100 g (R 134a)
Compressor oil (filling the system):	100 ml (PAG Öl)

Displacement stage 1:	110 cm^3/U
Displacement stage 2:	44 cm^3/U
Perm. leak oil quantity:	2 l/min

Vibration pump:

Manufacturer:	Sauer-Danfoss
Type:	90R 055
System:	Axial piston-swash plate
Max. displacement:	55 cm^3/U
Starting pressure:	365+/-65 bar
Operating pressure, soil dependent:	ca.100 bar

Vibration motor:

Manufacturer:	Sauer-Danfoss
Type:	90M 075
System:	Axial piston-swash plate
Displacement:	75 cm^3/U
Frequency:	26/26 Hz
Amplitude:	2,0/1,1 mm

Steering and charge pump:

Manufacturer:	Bosch
Type:	HY/ZFS11/16
System:	Gear pump
Displacement:	16 cm^3/U
Max. steering pressure:	225+/-15 bar

Steering valve:

Manufacturer:	Sauer-Danfoss
Type:	OSPC 500 ON
System:	Rotary valve

Rear axle:

Manufacturer:	Dana
Type:	CHC 193/50
Differential:	No-Spin
Degree of locking:	100 %
Reduction ratio:	65,08

Filling capacities:

Engine coolant:	20 l (50% Water, 50% Anti-freeze agent on Ethane-diol-basis)
Engine oil:	20 l (SAE 15W-40, API SJ/CF)
Hydraulic oil:	60 l (HVLP 46 VI 150)
Vibration bearing housing:	2x 1,8 l (SAE 15W-40, API SJ/CF)
Rear axle:	11 l (SAE 90 EP, API GL 5)
Rear axle wheel hubs:	2,9 l (SAE 90 EP, API GL 5)
Rear axle, transmission:	1,9 l (SAE 90 EP, API GL 5)
Reduction gear, drum:	3,1 l (SAE 90 EP, API GL 5)
AC refrigerant:	1100 g (R 134a)
Compressor oil (filling the system):	100 ml (PAG Öl)

Maintenance work	Comment	Running-in inspect. (50 op. hours)	10 operat. hours	50 operat. hours	250 op. hours	500 op. hours	1000 op. hours	2000 op. hours	as required
Tighten the wheel nuts							X	X	
Check the ROPS							X	X	X
Change hydraulic oil and breather filter	min. every 2 years							X	X
Change the hydraulic oil filter	min. every 2 years and after repairs in the hydraulic system							X	X
Change the coolant	min. every 2 years							X	X
Clean, change the dry air filter element	min, 1 x year, safety cartridge min. every 2 years								X
Adjust the parking brake									X
Change the tires									X
Change the fresh air filter for the cabin									X
Retighten the screw connections	Observe the tightening torques								X
Engine conservation	Before shutting the engine down for a longer period of time								X

Note:

When changing filters use only the original filters specified in the spare parts catalogue for this machine. The use of incorrect filters (e.g. insufficient pressure resistance) can lead to severe damage on engine or hydraulic components.

The coolant for the water cooled engine must always be mixed with 40 to 50% of anti-freeze additive (even under hot environmental conditions) as a preventive measure against corrosion and cavitation. However, the additive proportion must not exceed 60%, since this would have an adverse effect on the cooling ability of the coolant.

Oil change intervals in the vibration housings: after 50 h, after 500 h, after 1000 h and then every 1000 h.

Determining the shim thickness for replacement of single injection pump

For the replacement of single injection pumps without any alterations to the crankshaft assembly of the engine, a simplified method can be applied to determine the thickness of the required shim. The column „EP“ on the engine type plate contains a code for the injection pump of each cylinder.

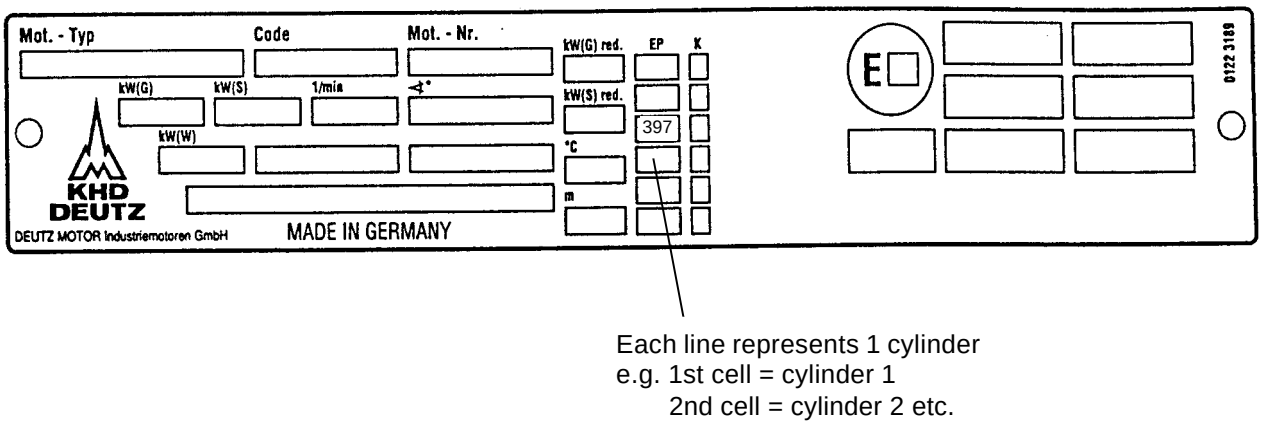


Fig. 7: Injection pump code BFM 1013

With the help of the „EP“-code the correct installation dimension „Ek“ can be taken from table 1.

Control rod travel

With the governor removed, the control rod is always pressed out by the compression spring to boost fuel position.

With the single injection pumps removed the free travel of the control rod must be min. 17 + 0.5 mm.

With the single injection pumps installed, the travel of the control rod „Y“ must be at least 16.8 mm.

The recess dimension „X“ between control rod in stop position and contact face of the governor on the timing chest cover must be between 0.3 - 1.3 mm.

Note:
It is absolutely necessary to indicate this recess dimension, thus determined when replacing or repairing the governor.

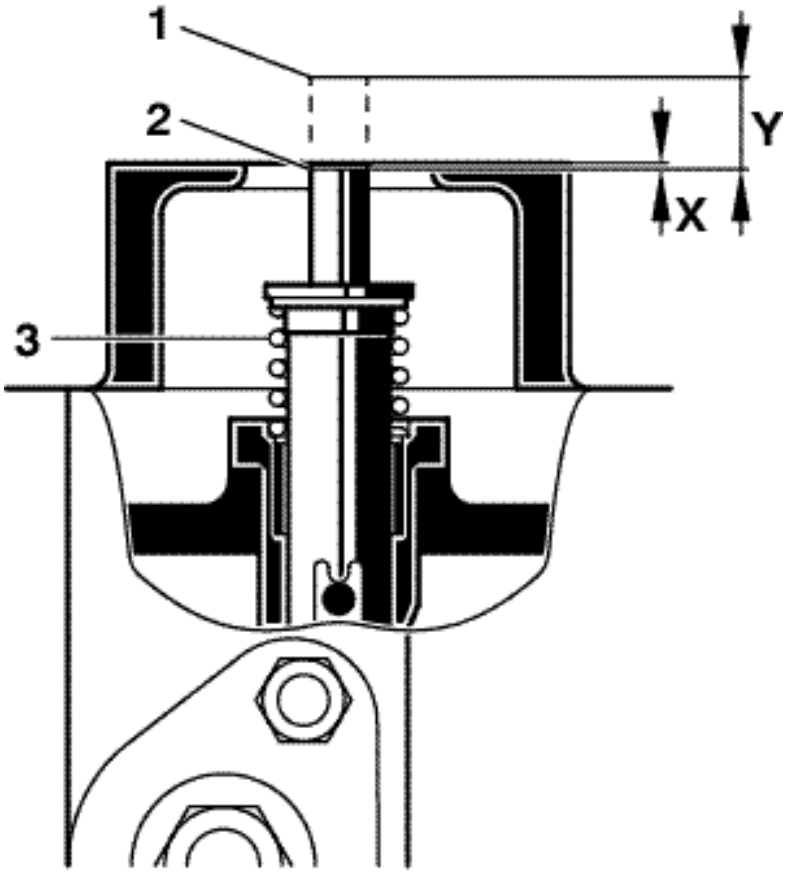


Fig. 13: Control rod travel

1 Full load + boost fuel
2 Stop position
3 Compression spring

X = 0.3 - 1.3 mm = recess dimension
Y = 16.8 mm (fitted injection pump)

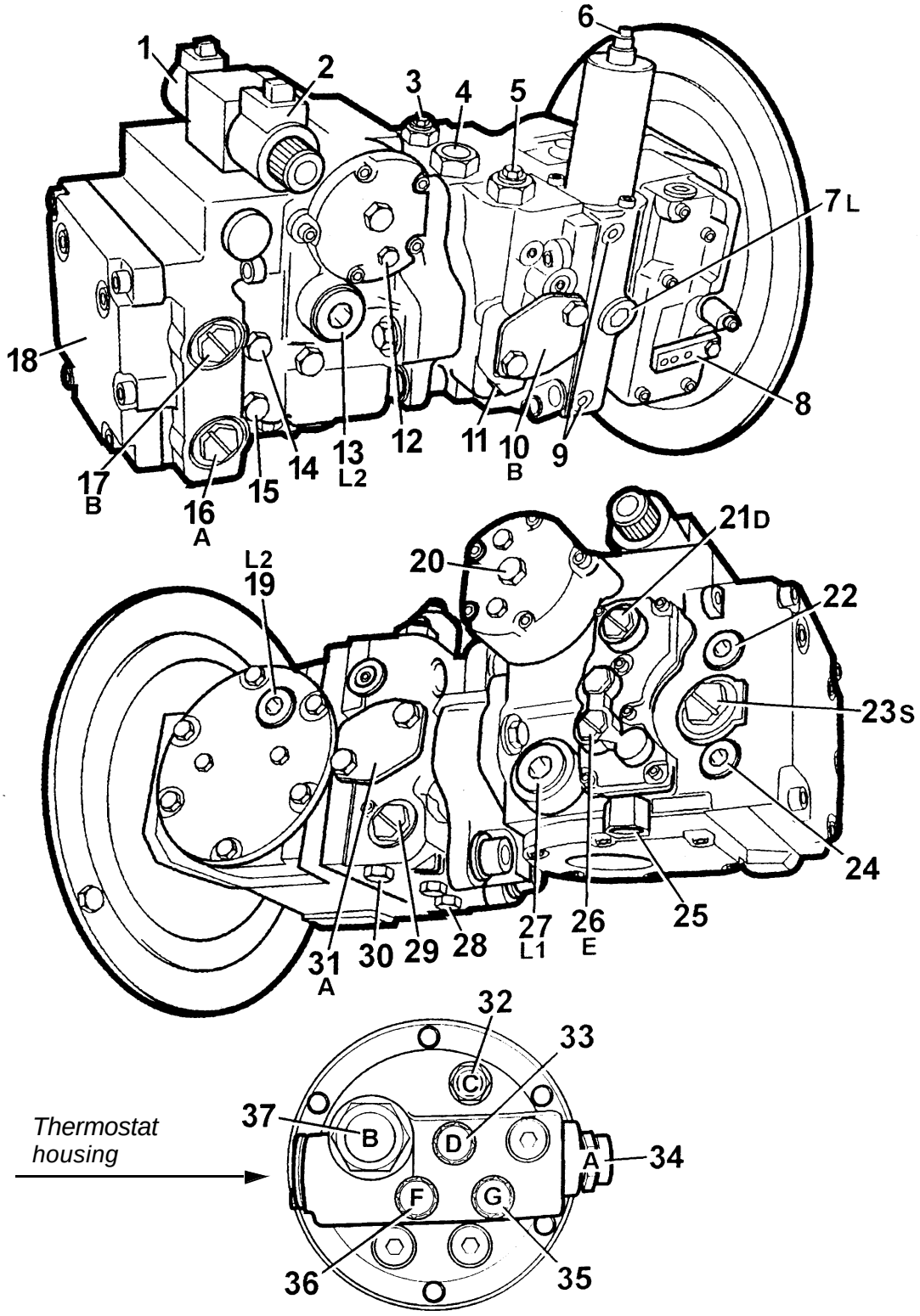


Fig. 7 Tandem pumpe with connections, BW 216

Charge pressure relief valve

The charge pressure relief valve is a fixed, direct acting valve and is part of the group of safety elements in a closed hydraulic cuircuit. This valve limits the pressure in the charge circuit to the value determined by the setting of this valve (approx. 29 bar).

The charge circuit has the function to compensate leakages and flushing quantities in the closed travel and vibration circuits and to provide the required pressure oil for the control of the travel and vibration pumps, the speed range selection and the actuation of the multi-disc brakes in the travel drives.

Since the entry of cooled and filtered oil is only possible in the low pressure side of a closed hydraulic circuit, the pressure in the low pressure side is almost identical with the charge pressure.

When the machine is parked on level ground with the engine running, both sides of the closed travel circuit will be under charge pressure.

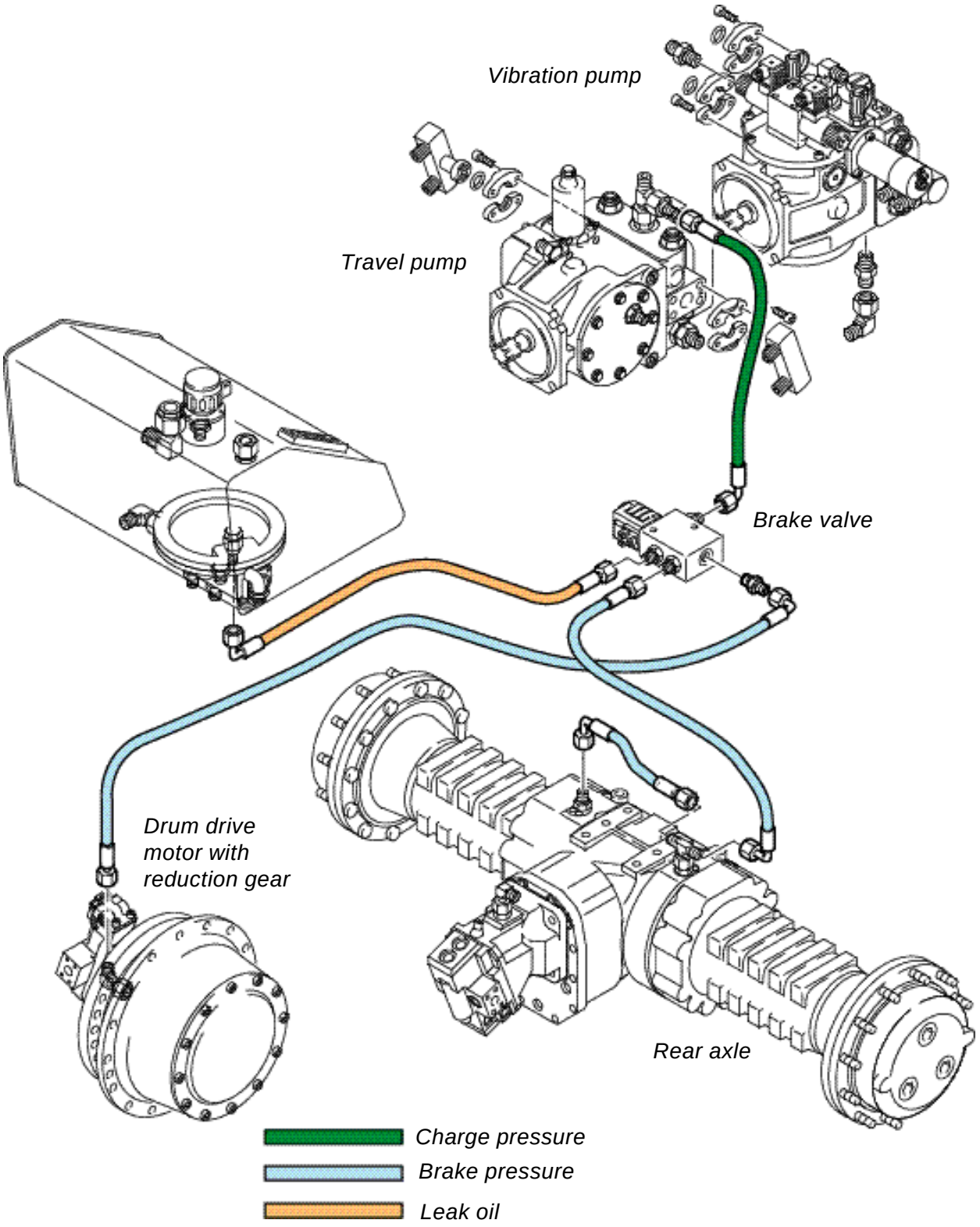


Fig. 21 Routing of hoses, brake syystem BW 219 DH-3/PDH-3 / BW 225 D/PD-3

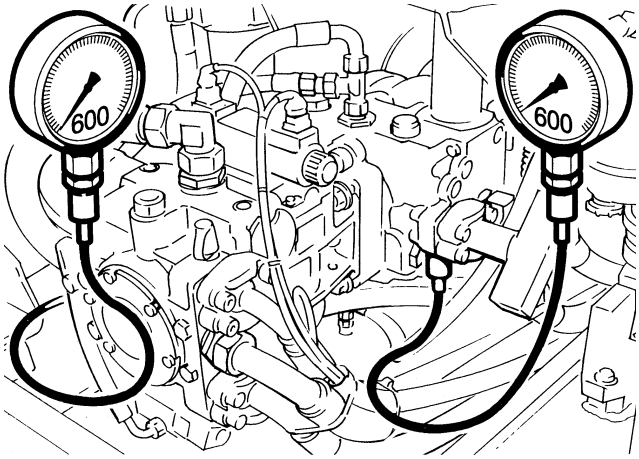
Fig. F4:

Adjusting the mechanical neutral position

If te machine does still move after connecting the control chambers, the mechanical neutral position of the pump nees to be adjusted.

- Connect 600 bar pressure gauegs to the high pressure test ports.
- Pull the plug off the brake solenoid valve and block the drum.
- Run the engine with maximum speed.
- Read the pressure gauges and adjust the mechanical neutral position by turning the adjustment screw mechanische on the control cyloinder (see illustration), until the pressure readings are identical on both sides (charge pressure).

For a more accurate reading repeat this test and adjustment procedure with two 60 bar pressure gauges.



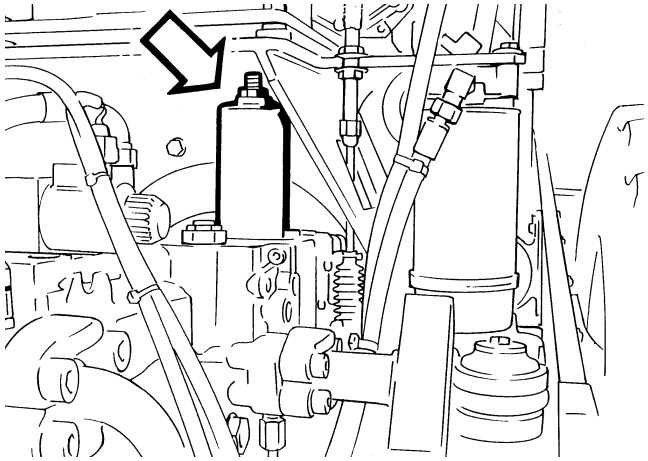


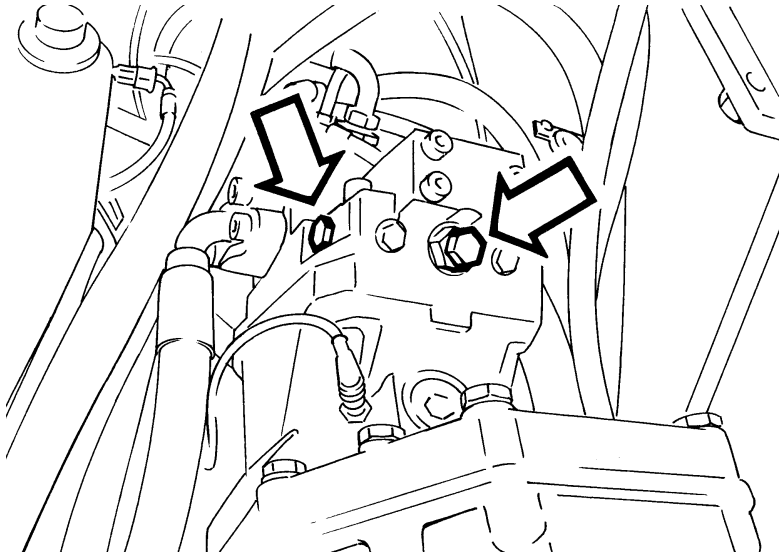
Fig. F14:

Checking the flushing valves on axle and drum drive motors

In case of a faulty flusing valve a too high oil quantity may be flushed out, so that the chharge circuit will no longer be able to replace this quantity. The charge pressure will drop and important machine functions are no longer possible.

- Pull the valve spool out of the flushing valve.
- Check for mobility and wear.

Replace a defective flushing valve immediately.



During each revolution the pistons move through their upper and lower dead centers back to their initial positions. Between the two dead centers each piston performs a full working stroke. During this stroking movement oil is sucked in from the low pressure side and pressed out again through the slots in the valve plate (8) into the high pressure side. The oil quantity depends on the piston area and the length of the working stroke.

During the suction stroke the oil is drawn into the piston chamber, i.e. the charge pressure in the low pressure side presses it in. On the opposite side the piston presses it out into the high pressure side of the closed circuit.

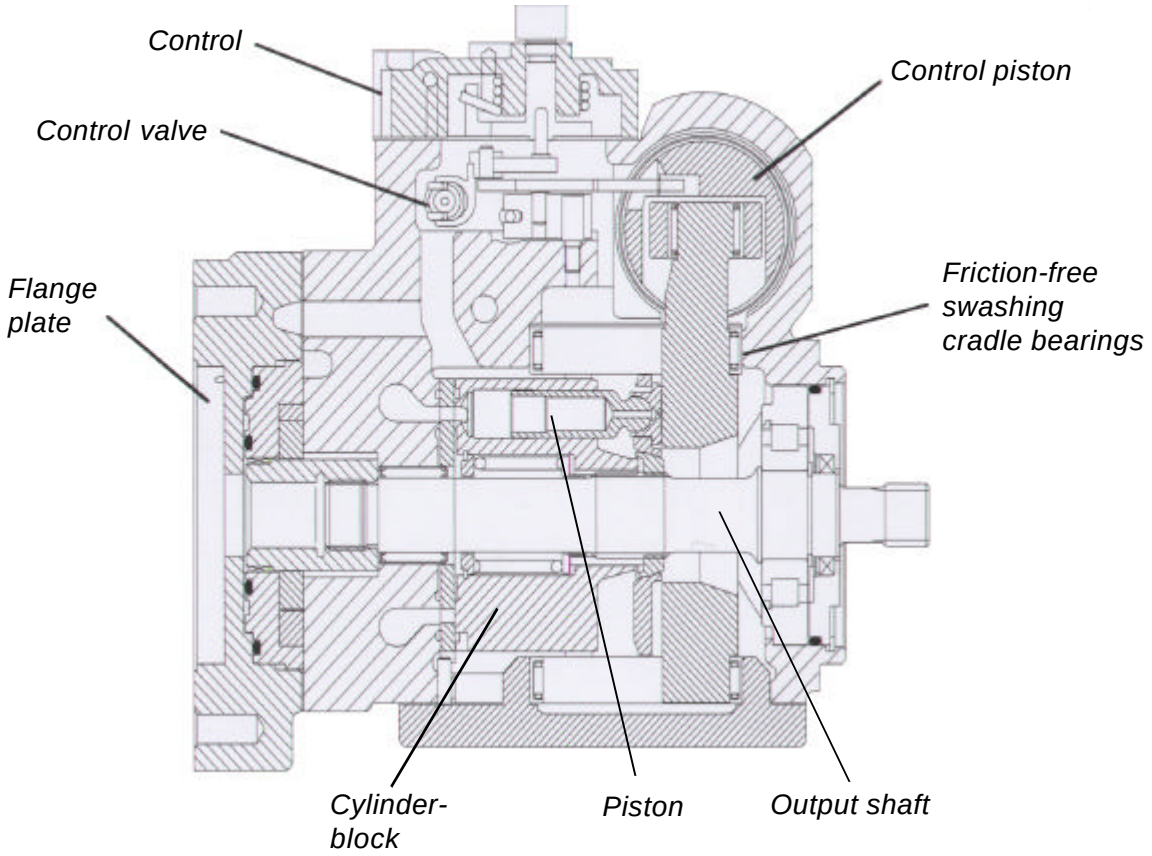


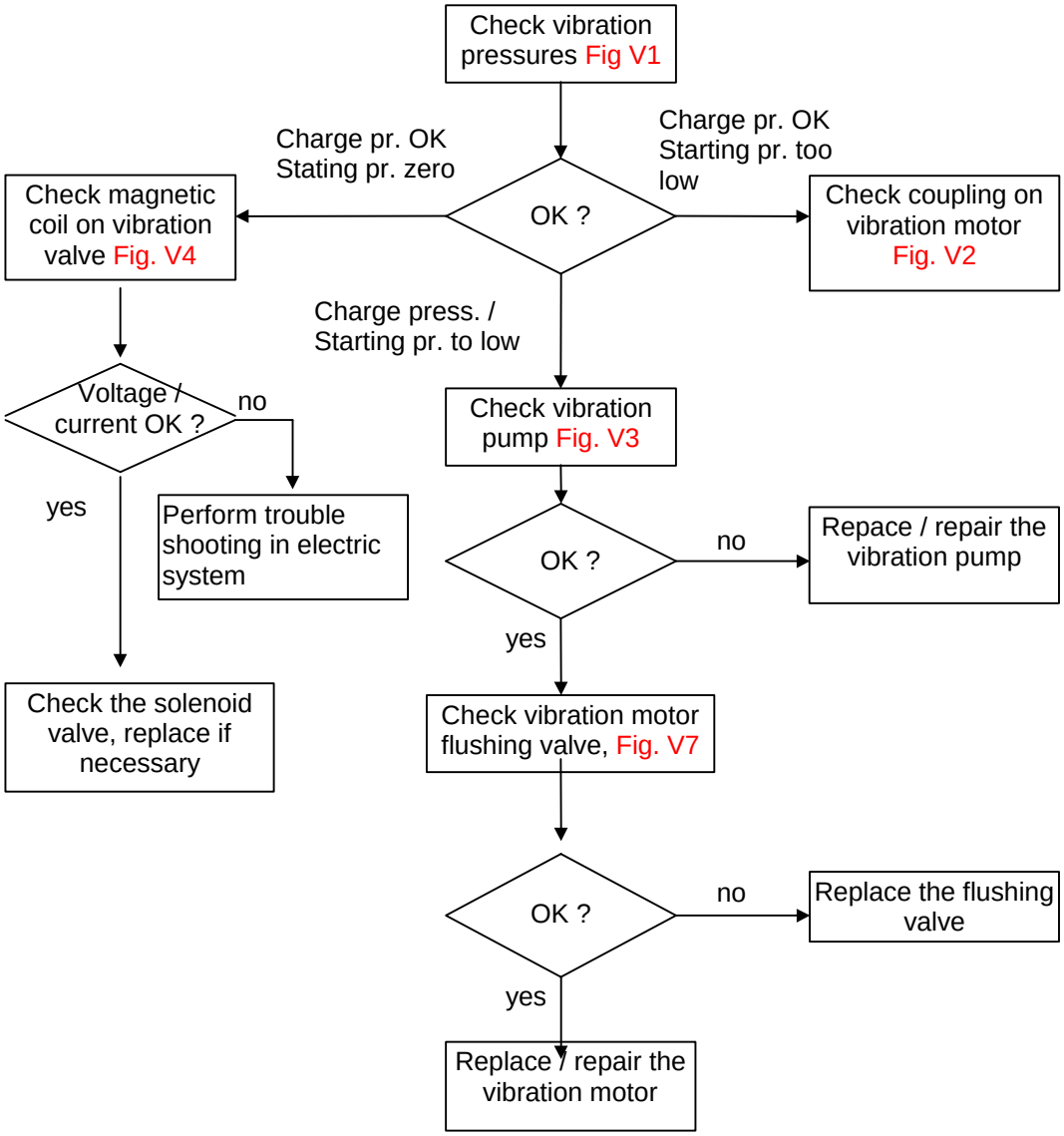
Fig. 7 Cross-sectional view of vibration pump BW 216

Control

The electric-hydraulic displacement control (remote control) converts the electric input signal into a load dependent output signal. Since the pump is not fitted with a proportional control, but with a 12 Volt solenoid valve, the pump will always be fully actuated to either side.

High pressure protection

No vibration (travel system OK)



Steering

The single drum rollers BW 216 D-3, BW 216 DH-3/PDH-3/BW 219 DH-3/PDH-3 and BW 225 D-3/PD-3 are equipped with a hydrostatically operated articulated steering system.

The steering system consists mainly of:

- the steering/charge pump,
- the steering valve,
- the steering cylinders and
- the pressure resistant connecting hoses.

The steering pump delivers the hydraulic oil from the hydraulic oil tank to the steering valve and the connected steering unit. If the steering is not operated the complete oil flow will be directly guided through the fine filter to the charge ports for the closed hydraulic circuits for travel and vibration systems.

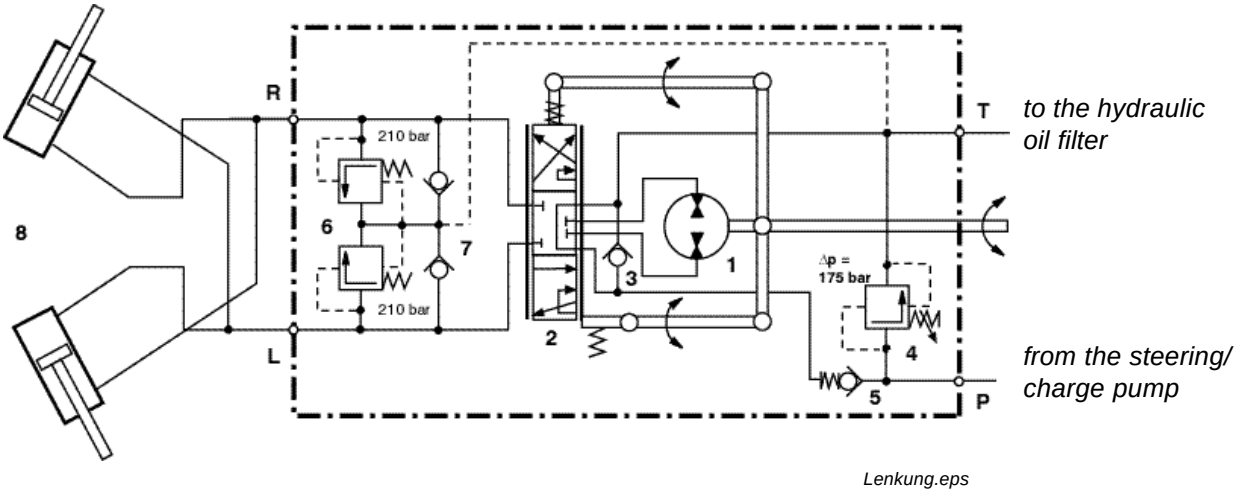
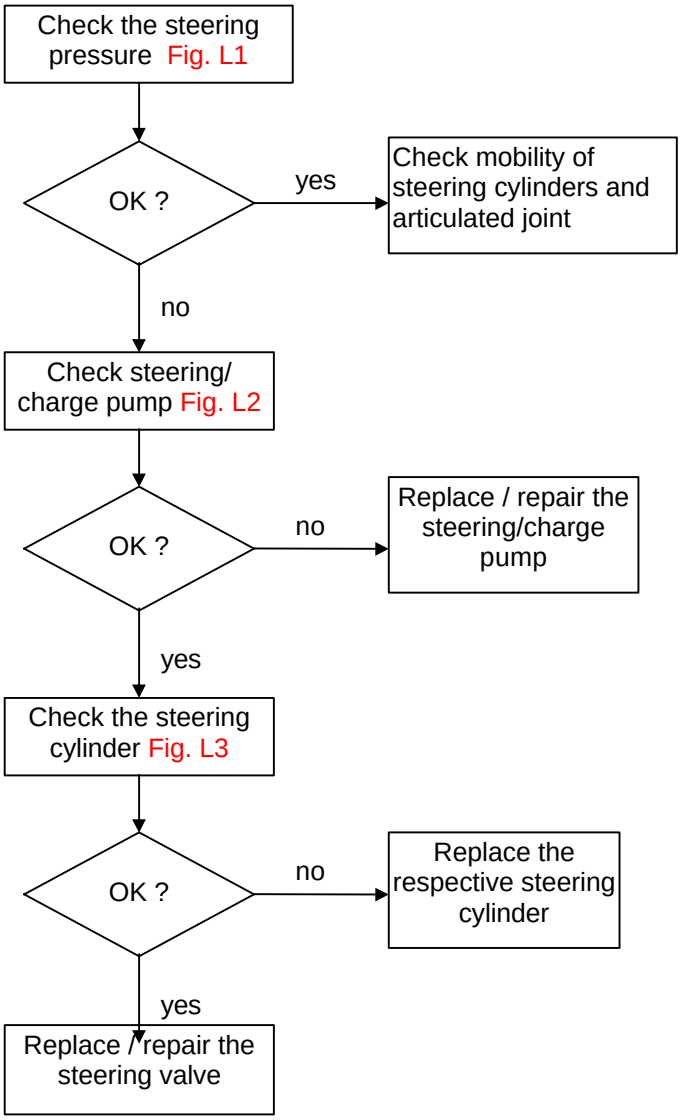


Fig. 1 Hydraulic diagram steering

1 Rating pump
2 Distributor valve
3 Anti-cavitation valve
4 High pressure relief valve
5 Non-return valve
6 Shock valves
7 Anti-cavitation valves
8 Steering cylinders

No steering function / steering sticky / end stops are not reached (travel system OK)



Fault monitoring board (Fig. 4)

Ignition on, engine at rest

When switching the ignition on, the program is reset to a defined initial condition.

As a self-testing function all warning and control lights will light up for a moment.

Should a fault occur already at this stage, the respective indicator light will continue to light.

Warning buzzer (H07:22) and shut-down relay (K22:40) (Fig. 3) remain deactivated, because there is no oil pressure yet. If the time between „ignition on“ and „starting“ was too long, starting would not be possible.

Engine running

The fault monitoring board is active, warning buzzer and shut-down relay are enabled.

Within the determined times all sender signals must change to the respective potential for the condition „OK“. If not the following lights will light:

- the signal fields,
- the warning buzzer is activated
- and the shut-down relay will be switched after the predetermined time.

Engine stalled, ignition on

The fault monitoring board remains active, warning buzzer and shut-down relay will be activated after predetermined time periods.

To reach a clearly defined initial condition the ignition must be switched off for a moment before starting a new starting process.

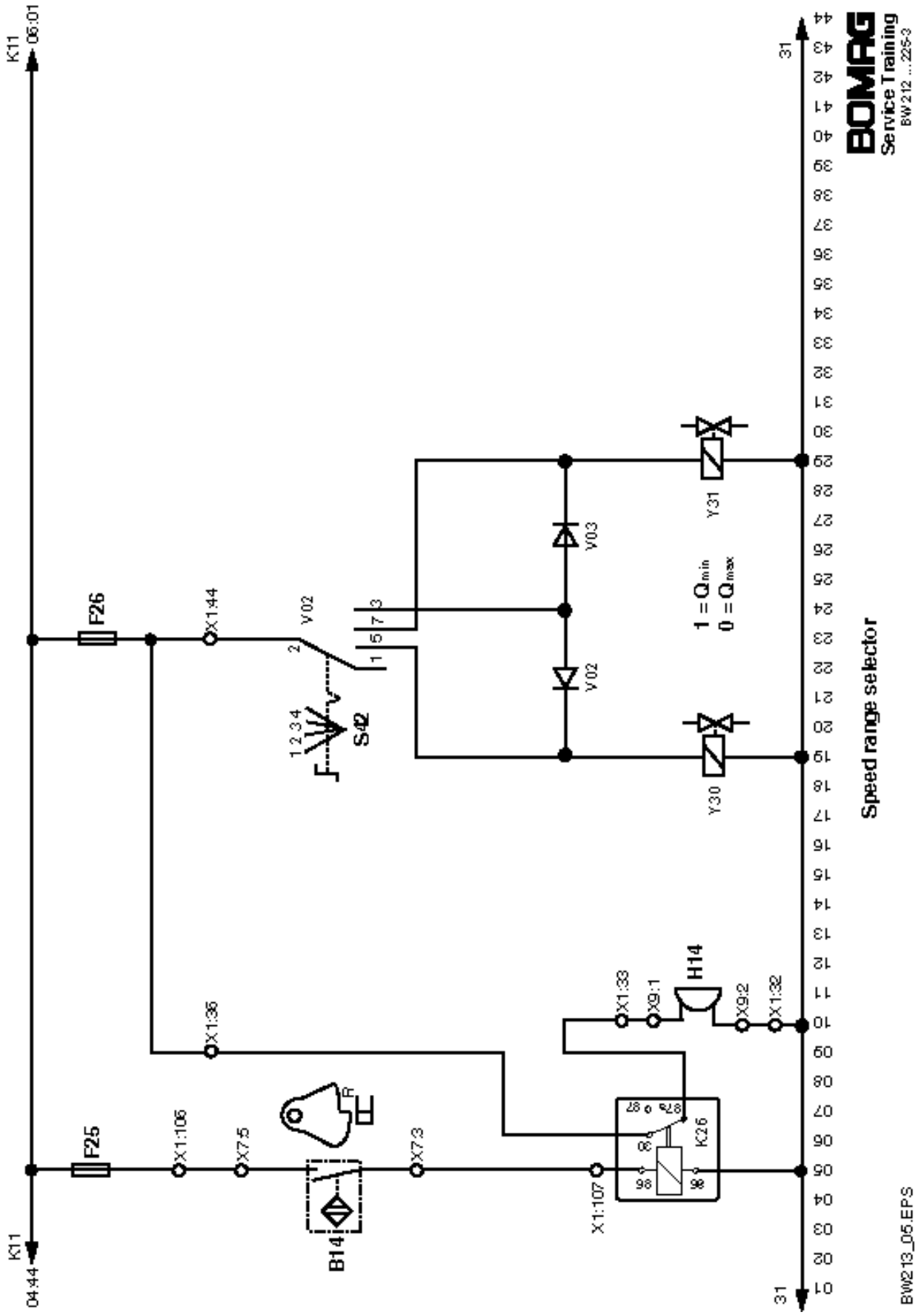
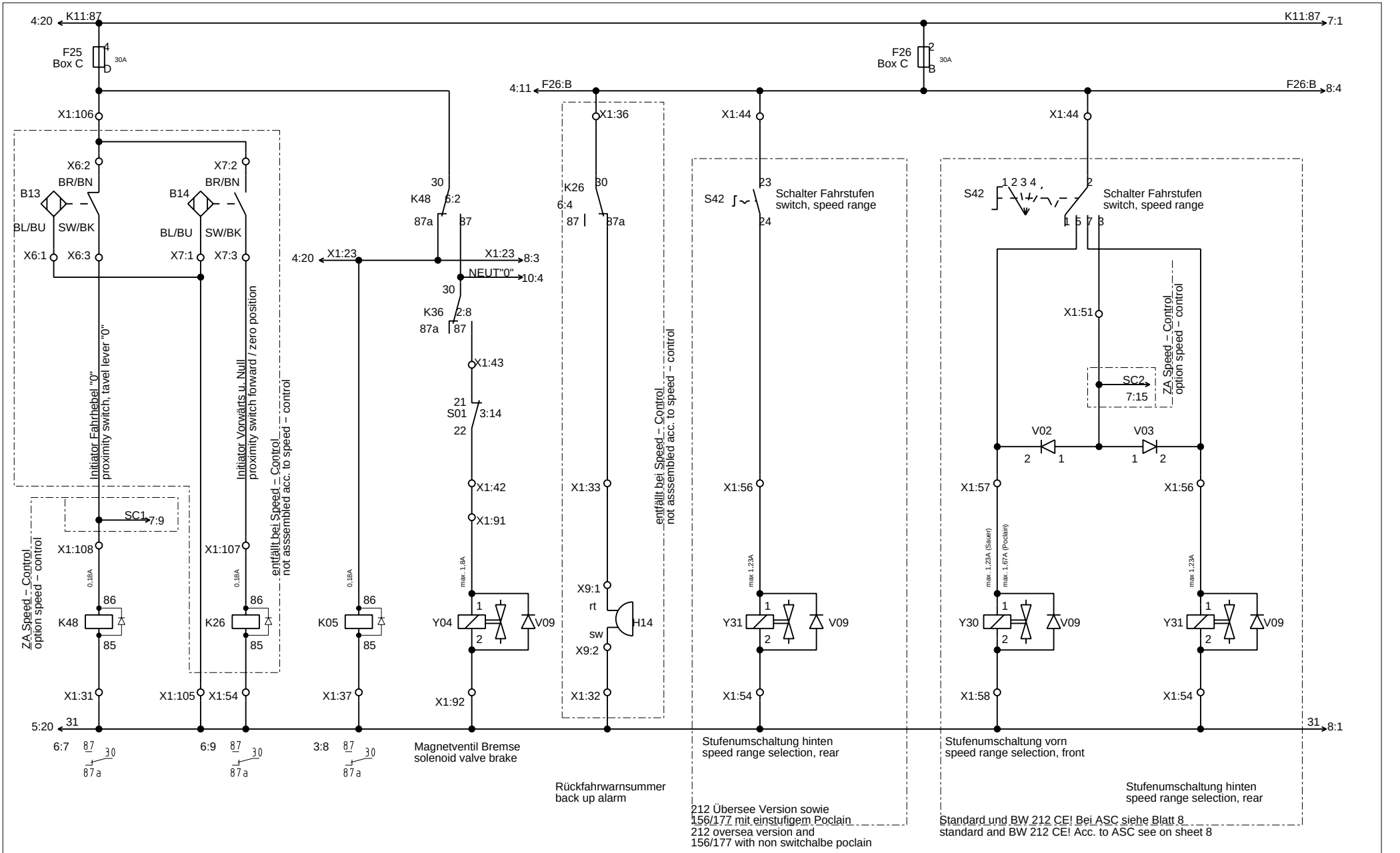

K11
06:01
K11
04:44
F26
F25
X1:44
X1:36
X1:106
X7:5
X7:3
B14
S42
1 2 3 4
Y02
Y03
Y31
Y30
1 = Qmin
0 = Qmax
K26
X1:107
X1:33
X9:1
H14
X9:2
X1:32
31
31
Speed range selector
BOMAG
Service Training
BW 212 ...225-3
BW213_05.EPS

Fig. 7:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

BOMAG GMBH BOPPARD

Gez.: 29.05.2000
Name: Werner

Gepr.: 29.05.2000
Name: Seis

Fahren, Bremse, Fahrstufen
driving, brake, speed ranges

Seite: 11 von: 1
page: from:

582 700 70

Ers.f.:
Replaces:

Blatt Nr.: 006
sheet no.:

BOMAG

BOMAG GMBH BOPPARD

Gez.: 29.05.2000
Name: Wemer

Gepr.: 29.05.2000
Name: Seis

Bauteilliste
component listing

Seite: 1 von: 9
page: 1 from: 9

Ers.f.:
Replaces:

Blatt Nr.: 101
sheet no.:

582 700 70

Name	Bl.	Pf.	Benennung	title	TYP
A01	012	6	Intervallschalter Berieselungssystem	Interval switch, sprinkler system	
A02	013	17	Blinkrelais	Indicator relay	
A05	005	9	Elektronik Geschwindigkeitsanzeige	Electronic system, speedometer	MODUL
A06	005	4	Elektronik Frequenzanzeige vorne	Electronic system, frequency meter, fr.	MODUL
A08	010	18	Elektronik Omegameter	Electronic system, Omegameter	
A12	014	17	Radio	Radio	
A15	004	13	Platine Ueberwachungsmodul	Printed circuit board, monitoring module	
A16	005	14	Elektronik Tachograph	Electronic system, tachograph	
A17	007	11	Elektronik Geschwindigkeitskontrolle	Electronic, speed control	
A23	002	8	Platine Generator	Printed circuit,generator	
A33	010	7	Zentralplatine Kopplung Verdichtungskomponenten	Connection dircuit board, compac. components	
A35	010	14	Versorgungsplatine	Suppling circuit board	
A36	008	2	Elektronik Antischlupfregelung	Elektronic antispin control	
A37	009	11	Elektronik Variomatic	Elektronic variomatic	
A44	010	5	Zusatzelektronik	Additional control unit	
A46	009	2	Modul Variomatik	Modul, variomatik	
A51	005	17	Platine Frequenzanzeige	Circuit board,frequenzy meter	
A54	015	6	Modul Pumpenansteuerung	Modul pump control	
B03	004	19	Unterdruckschalter Luftfilter	Vacuum switch, air cleaner	
B06	004	15	Druckschalter Motoroel	Pressure switch, engine oil	
B11	004	1	Signalhorn	Warning horn	MAX. 5A
B11	004	3	Signalhorn	Warning horn	MAX. 5A
B13	006	2	Naeherungsinitiator Fahrhebel links	Proximity switch, travel lever, lh.	
B14	006	4	Naeherungsinitiator Fahrhebel rechts	Proximity switch, travel lever, rh.	
B16	005	3	Aufnehmer Vibrationsfrequenz vorne	Transducer, vibration frequency, front	
B21	004	18	Differenzdruckschalter Hydr.−Oelfilter	Pressure diff. switch, hydr. oil filter	
B29	014	5	Raumthermostat	Room thermostat	
B51	014	17	Lautsprecher Radio	Speaker radio	
B51	014	18	Lautsprecher Radio	Speaker radio	
B53	004	16	Temperaturgeber Kuehlmittel	Temperature switch, collant	
B54	003	5	Temperaturgeber Starthilfe	Temperature switch, starting assistance	
B55	004	19	Kuehlmittelstand Ausgleichsbehaelter	Coolant charge expansion tank	
B57	008	9	Neigungssensor Stufenumschaltung	Slope sensor, speed range selection	
B59	008	11	Aufnehmer Bandagengeschwindigkeit	Sensor, drum speed	
B60	007	15	Aufnehmer Achsgeschwindigkeit	Sensor, axle speed	
B60	008	12	Aufnehmer Achsgeschwindigkeit	Sensor, axle speed	
B60	010	3	Aufnehmer Achsgeschwindigkeit	Sensor, axle speed	
B61	009	7	Aufnehmer Verstellzylinder	Sensor, ajustable zylinder	
B62	009	9	Beschleunigungsaufnehmer	Acceleration sensor	
B62	009	10	Beschleunigungsaufnehmer	Acceleration sensor	
B62	010	9	Beschleunigungsaufnehmer	Acceleration sensor	
B62	010	9	Beschleunigungsaufnehmer	Acceleration sensor	
B62	010	18	Beschleunigungsaufnehmer	Acceleration sensor	
B75	014	5	Kuehlmitteldruck	coolant pressure	
E01	013	12	Beleuchtung Tankanzeige	Illumination, level gauge	
E02	013	14	Beleuchtung Temperaturanzeige	Illumination, temperature gauge	
E03	013	14	Beleuchtung Drehzahlmesser	Illumination, rpm meter	
E04	011	13	Beleuchtung Geschwindigkeitsanzeige	Illumination, speedometer	
E05	011	12	Beleuchtung Frequenzanzeige vorne	Illumination, frequency gauge, front	
E05	013	16	Beleuchtung Frequenzanzeige vorne	Illumination, frequency gauge, front	
E07	010	17	Beleuchtung Omegameter	Illumination, Omegameter	
E07	011	12	Beleuchtung Omegameter	Illumination, Omegameter	
E08	013	18	Blinkleuchte vorne links	Indicator, front, lh.	MAX. 1,75A
E09	013	18	Blinkleuchte hinten links	Indicator, rear, lh.	MAX. 1,75A
E10	013	19	Blinkleuchte vorne rechts	Indicator, front, rh.	MAX. 1,75A
E11	013	19	Blinkleuchte hinten rechts	Indicator, rear, rh.	MAX. 1,75A
E12	013	6	Parkleuchte links	Parking light, lh.	MAX. 0,42A
E13	013	5	Schlussleuchte links	Tail light, lh.	MAX. 0,42A
E14	013	6	Parkleuchte rechts	Parking light, rh.	MAX. 0,42A
E15	013	7	Schlussleuchte rechts	Tail light, rh.	MAX. 0,42A
E16	013	2	Scheinwerfer links	Head light, lh.	MAX. 4,6A
E17	013	2	Scheinwerfer rechts	Head light, rh.	MAX. 4,6A
E22	013	13	Beleuchtung Temperaturanzeige Hydr.−oel	Illumination, temp. gauge, hydraulic oil	
E23	013	11	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	MAX. 4,6A
E23	014	16	Arbeitsscheinwerfer vorne links	Working head light, front, lh.	4,6A
E25	013	12	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	MAX. 4,6A
E25	014	17	Arbeitsscheinwerfer vorne rechts	Working head light, front, rh.	4,6A
E27	013	10	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	MAX. 4,6A
E27	014	15	Arbeitsscheinwerfer hinten links	Working head light, rear, lh.	4,6A
E28	013	10	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	MAX. 4,6A
E28	014	16	Arbeitsscheinwerfer hinten rechts	Working head light, rear, rh.	4,6A
E29	014	7	Innenleuchte Kabine	Inside light, cabin	1,3A
E30	002	12	Heizgeraet	Heating unit	MAX.20A/NENN2A
E32	013	9	Kennleuchte	Warning light	
E32	014	20	Kennleuchte	Warning light	5A
E41	013	4	Umrissleuchte vorne links	Contour illumination front, lh.	MAX. 0,42A
E42	013	4	Umrissleuchte hinten links	Contour illumination rear, lh.	MAX. 0,42A
E43	013	7	Umrissleuchte vorne rechts	Contour illumination front, rh.	MAX. 0,42A
E44	013	8	Umrissleuchte hinten rechts	Contour illumination rear, rh.	MAX. 0,42A
E45	013	13	Beleuchtung Oeldruckanzeige	Illumination oil pressure indicator	
E46	013	15	Beleuchtung Voltmeter	Illumination volt meter	
E54	013	16	Beleuchtung Vektoranzeige	Illumination vector indicator	
F00	002	3	Hauptsicherung Batterie	Fuse, main, battery	125A
F02	014	19	Ersatzsicherung	Fuse, spare	
F03	007	2	Sicherung Vibration	Fuse, vibration	30A
F05	002	19	Sicherung Steckdose	Fuse, socket	30A
F06	012	6	Sicherung Berieselung	Fuse, sprinkler system	30A
F07	013	12	Sicherung Warnblinker	Fuse, hazard light	15A
F08	013	13	Sicherung Blinker u. Arbeitsscheinw.	Fuse, indicators a. work. head light	15A
F09	013	5	Sicherung Park− u. Schlussl. links	Fuse, parking and tail light, lh.	15A
F10	013	7	Sicherung Park− u. Schlussl. rechts	Fuse, parking and tail light, rh.	15A
F11	013	2	Sicherung Scheinwerfer links	Fuse, head light, lh.	15A
F13	003	5	Sicherung Startschalter	Fuse, starter switch	30A
F14	003	14	Sicherung Hubmagnet Motor	Fuse, shut off solenoid, engine	30A
F17	014	17	Sicherung Radio	Fuse, radio	
F18	013	4	Vorsicherung Arbeitsscheinw. vorne	Primary fuse, work. head light, fr.	30A