Shop Manual

H185S

HYDRAULIC SHOVEL

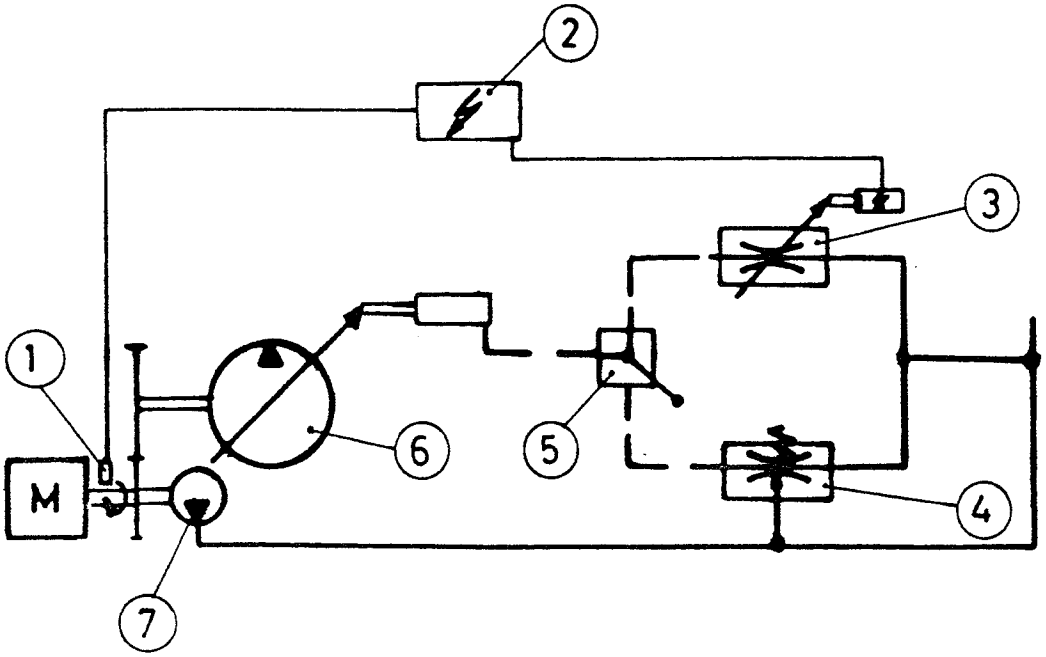
SERIAL NUMBER H185 6081

It is our policy to improve our products whenever it is possible and practical to do so. We reserve the right to make changes or improvements at any time without incurring any obligation to install such changes on products sold previously.

Due to this continuous program of research and development, revisions may be made to this publication. It is recommended that customers contact their distributor for information on the latest revision.

Printed in U.S.A.
Komatsu America Corp.

February 2005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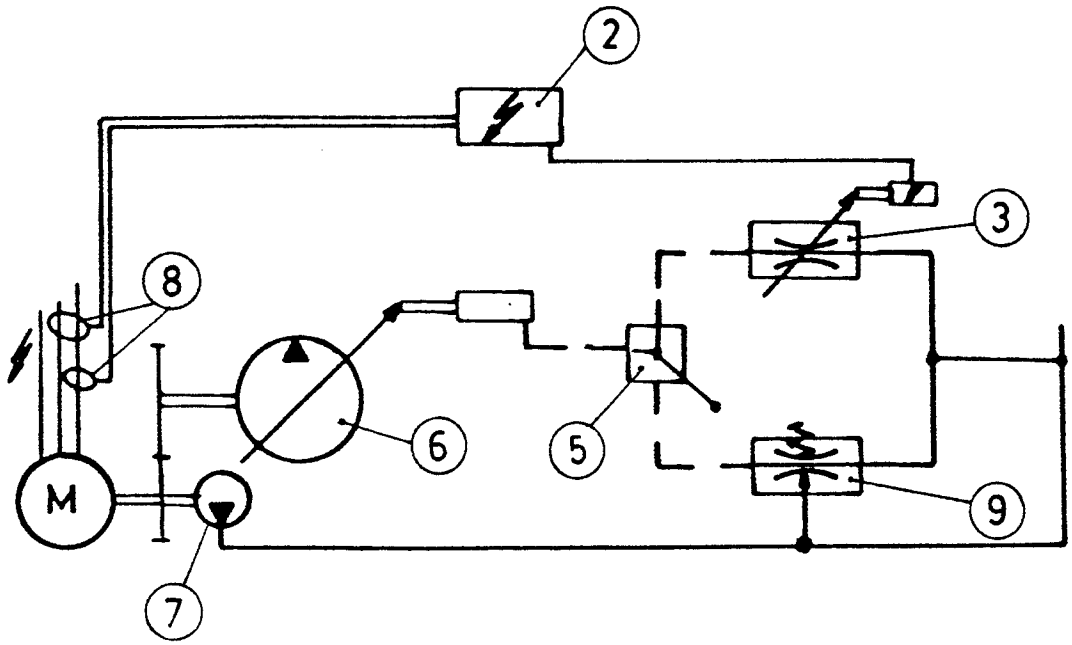
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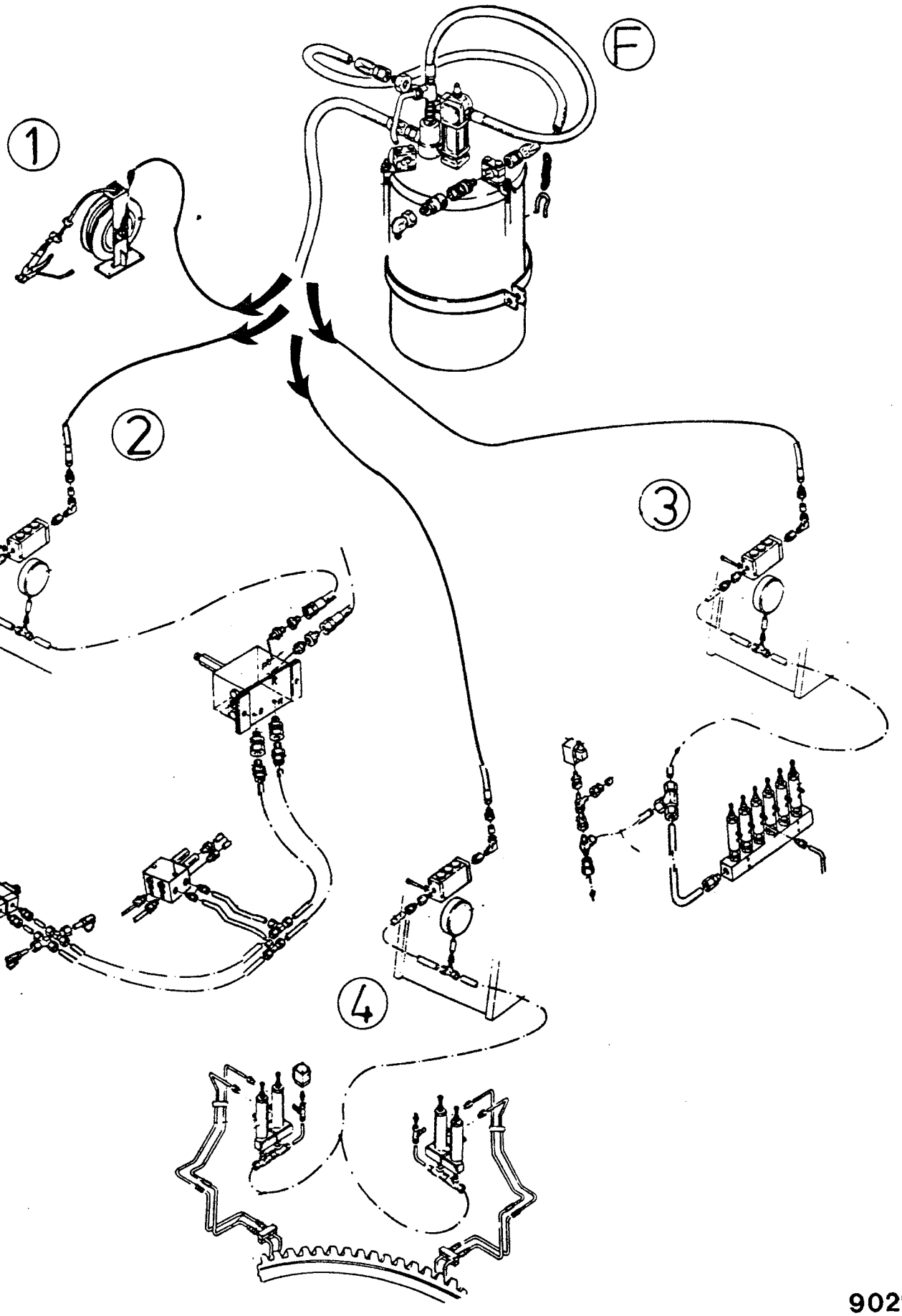

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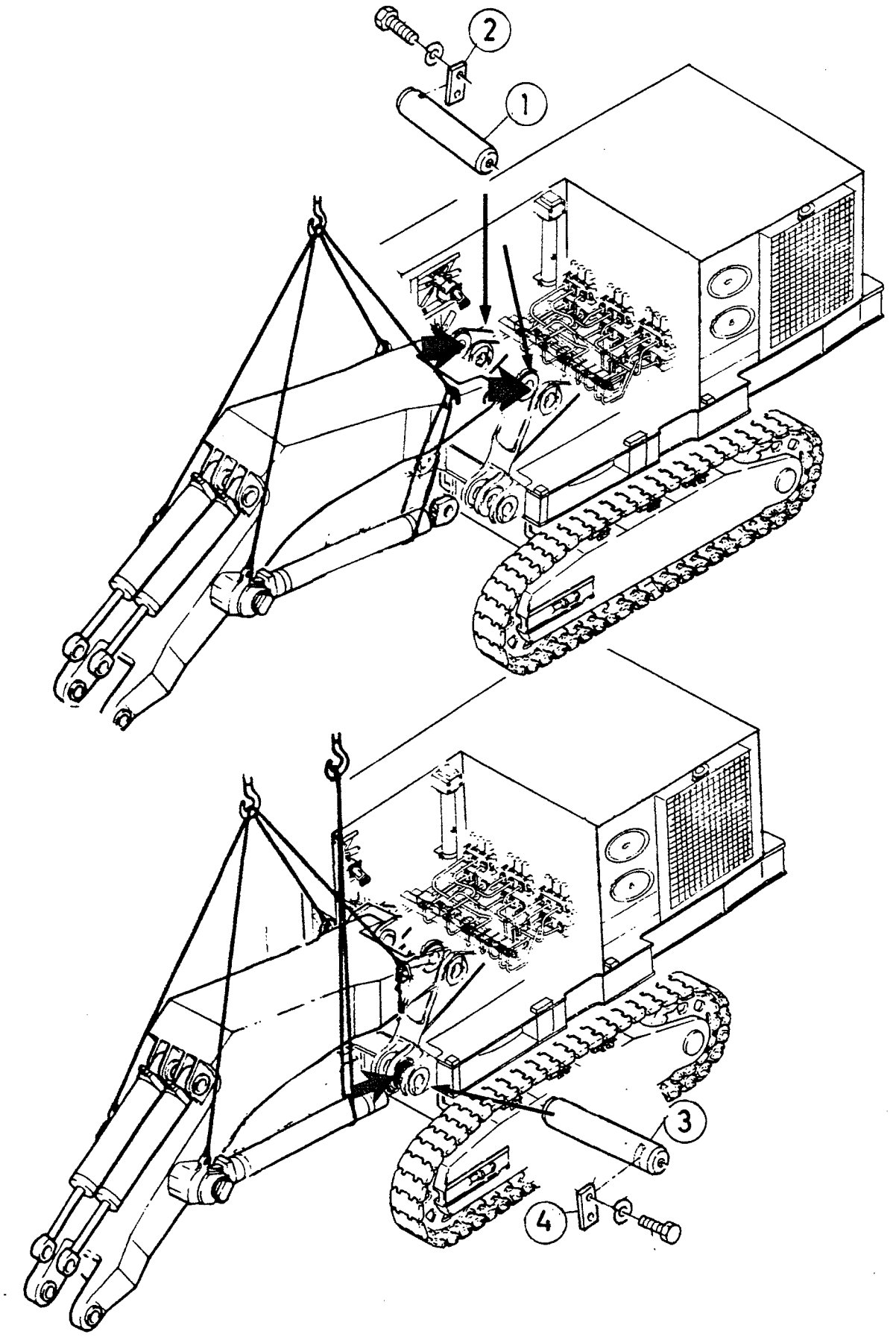
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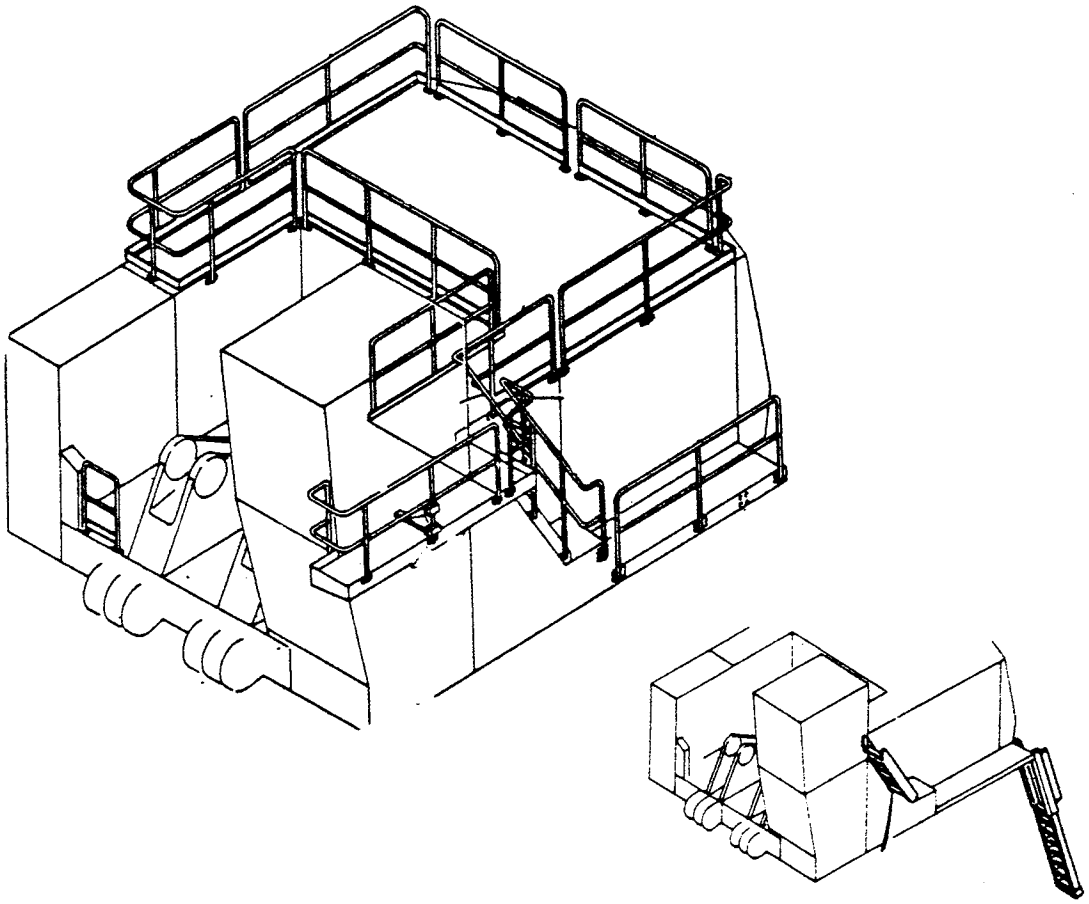

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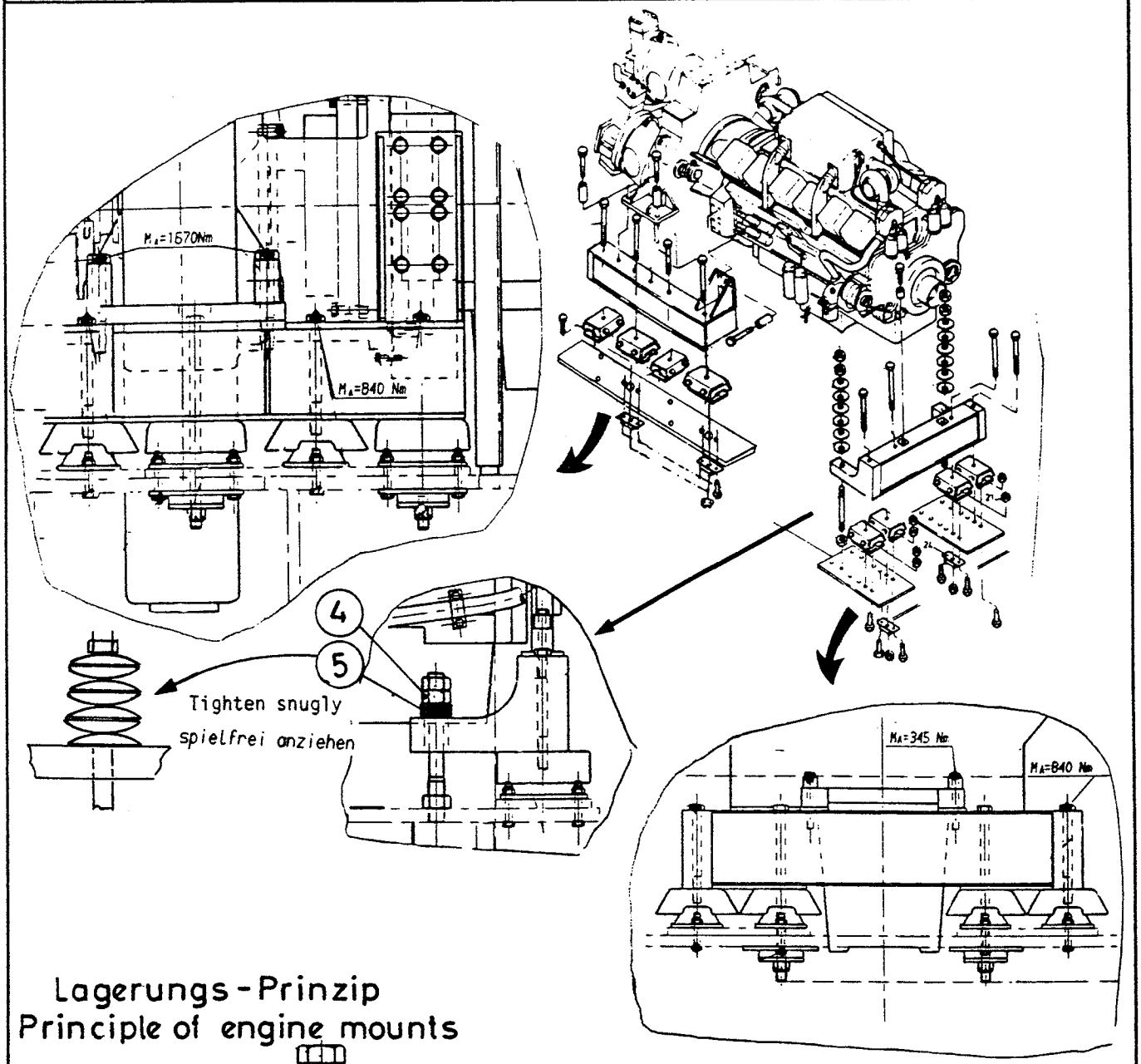
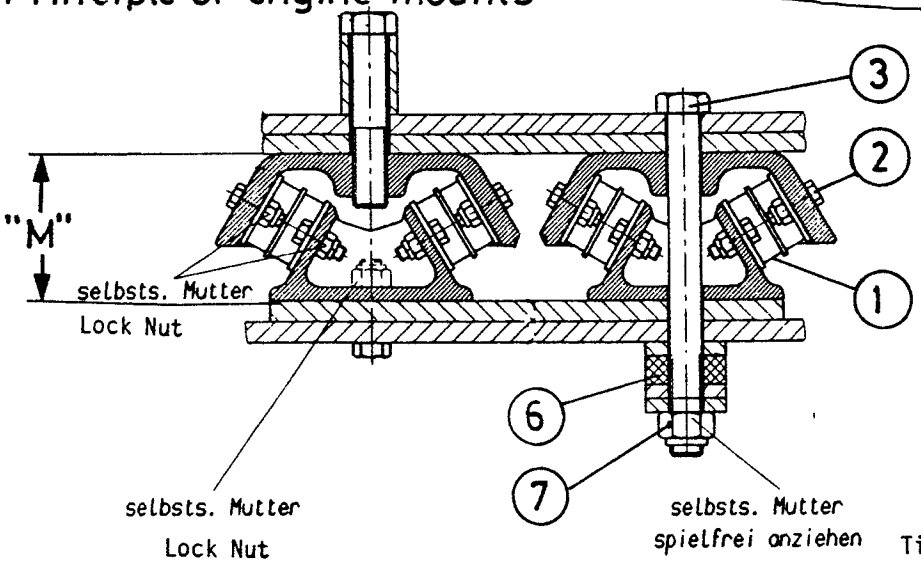


Lagerungs-Prinzip
Principle of engine mounts



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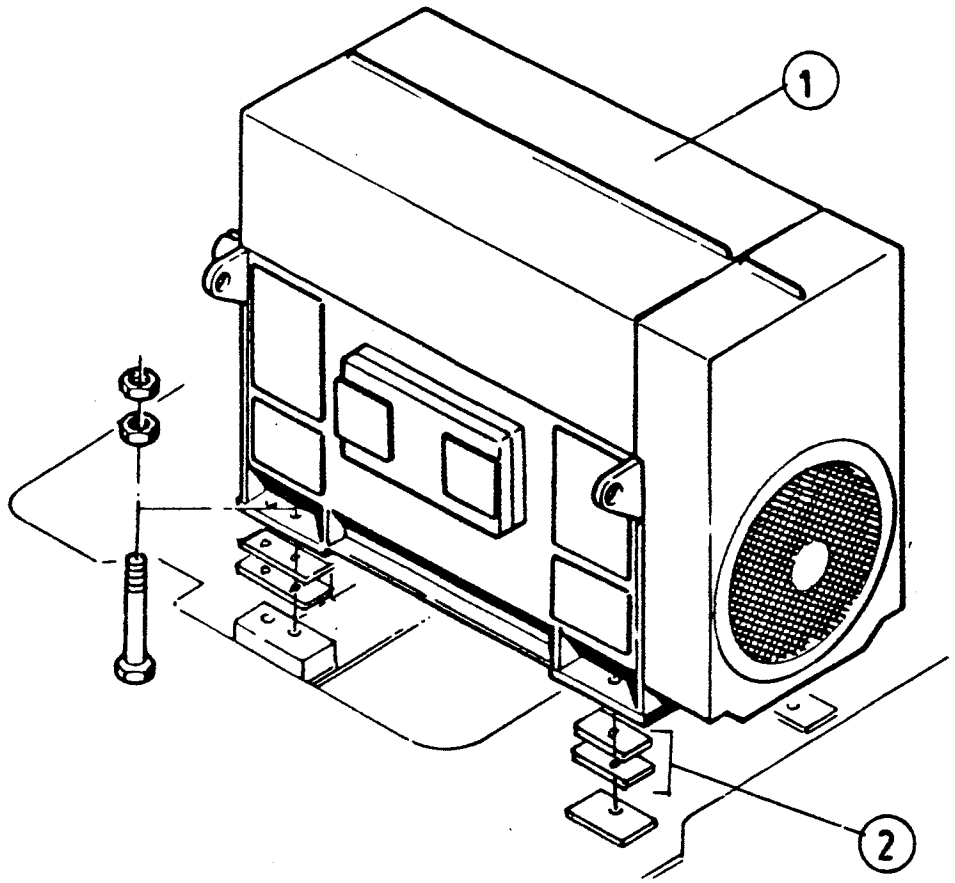

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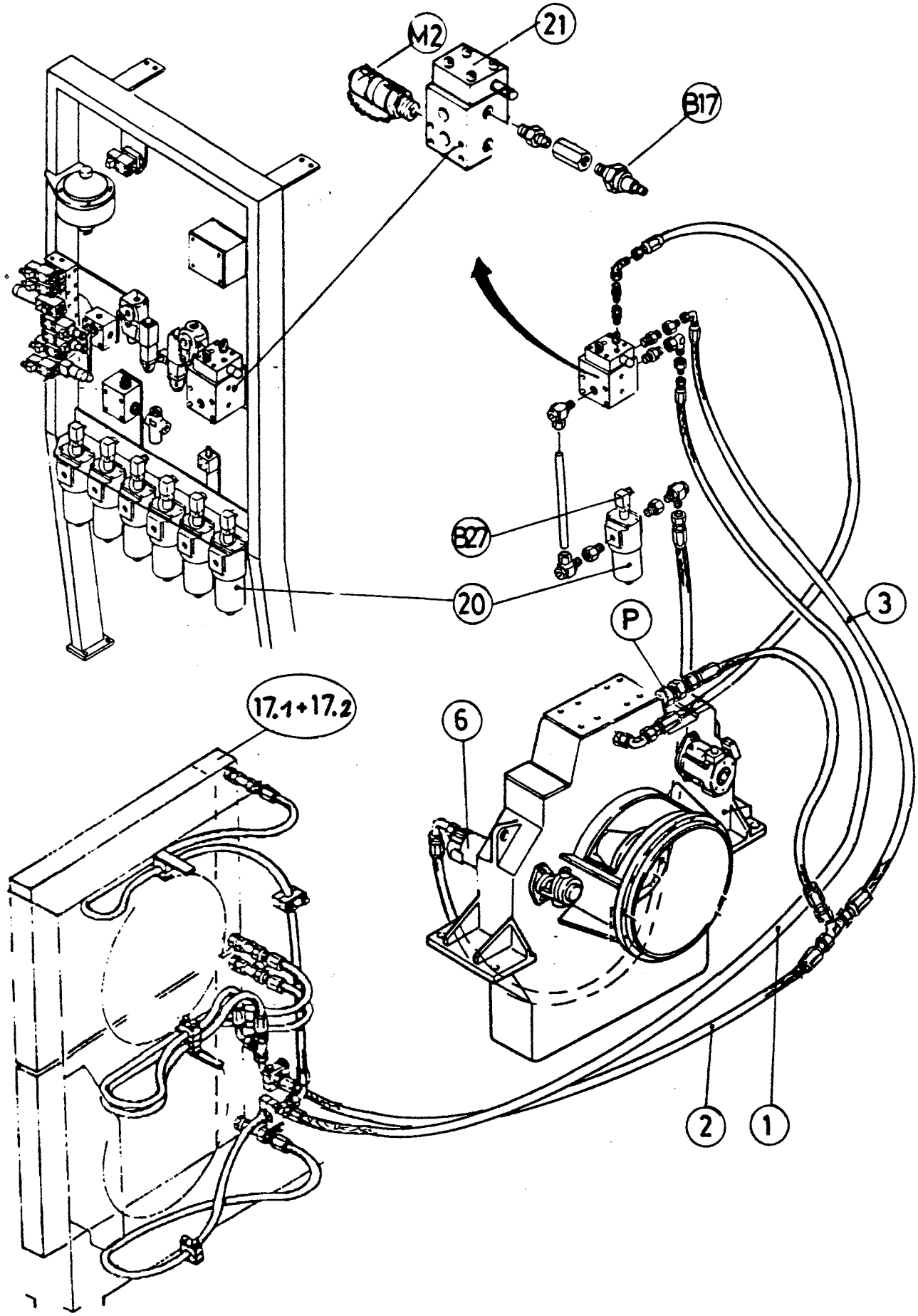

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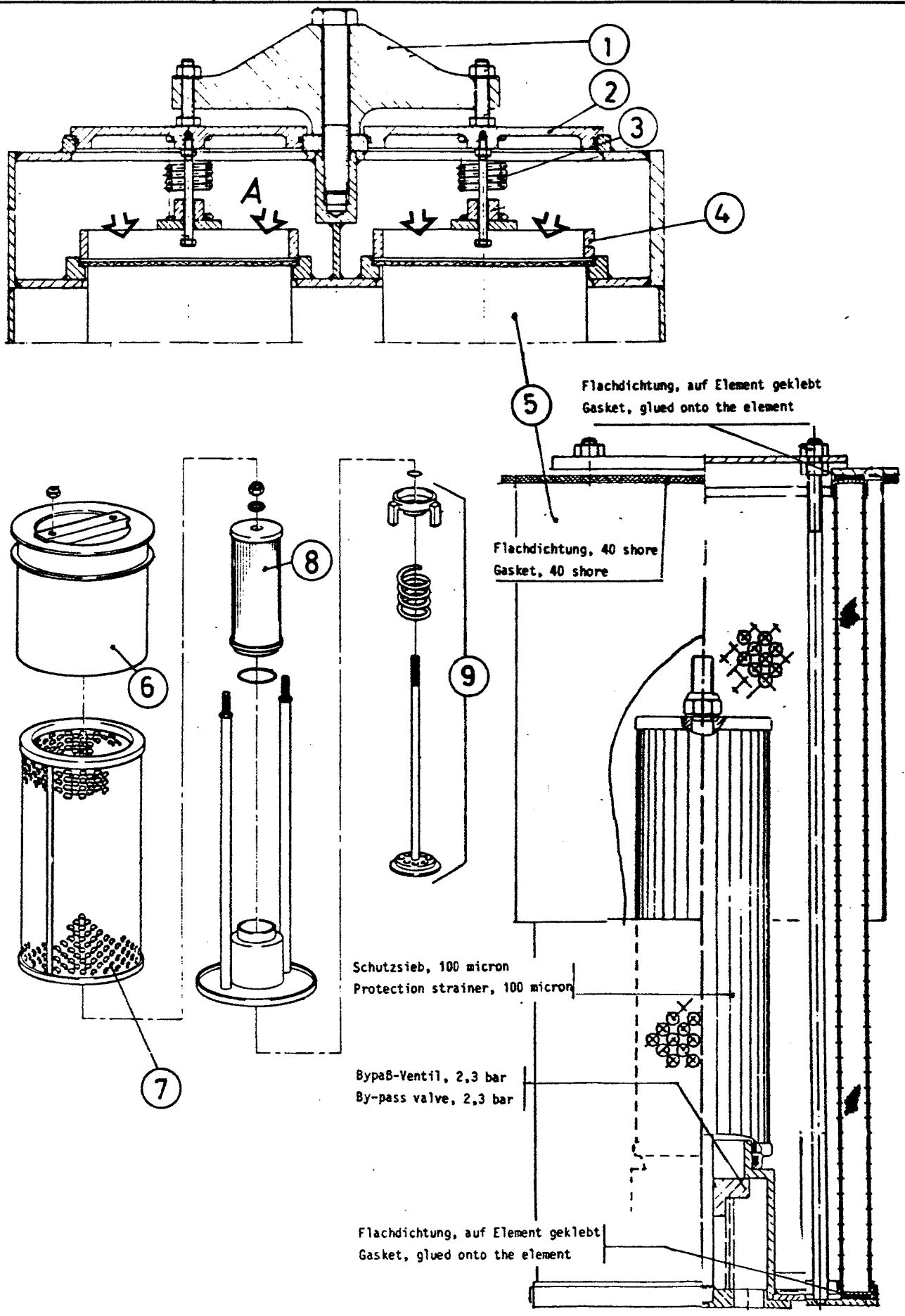

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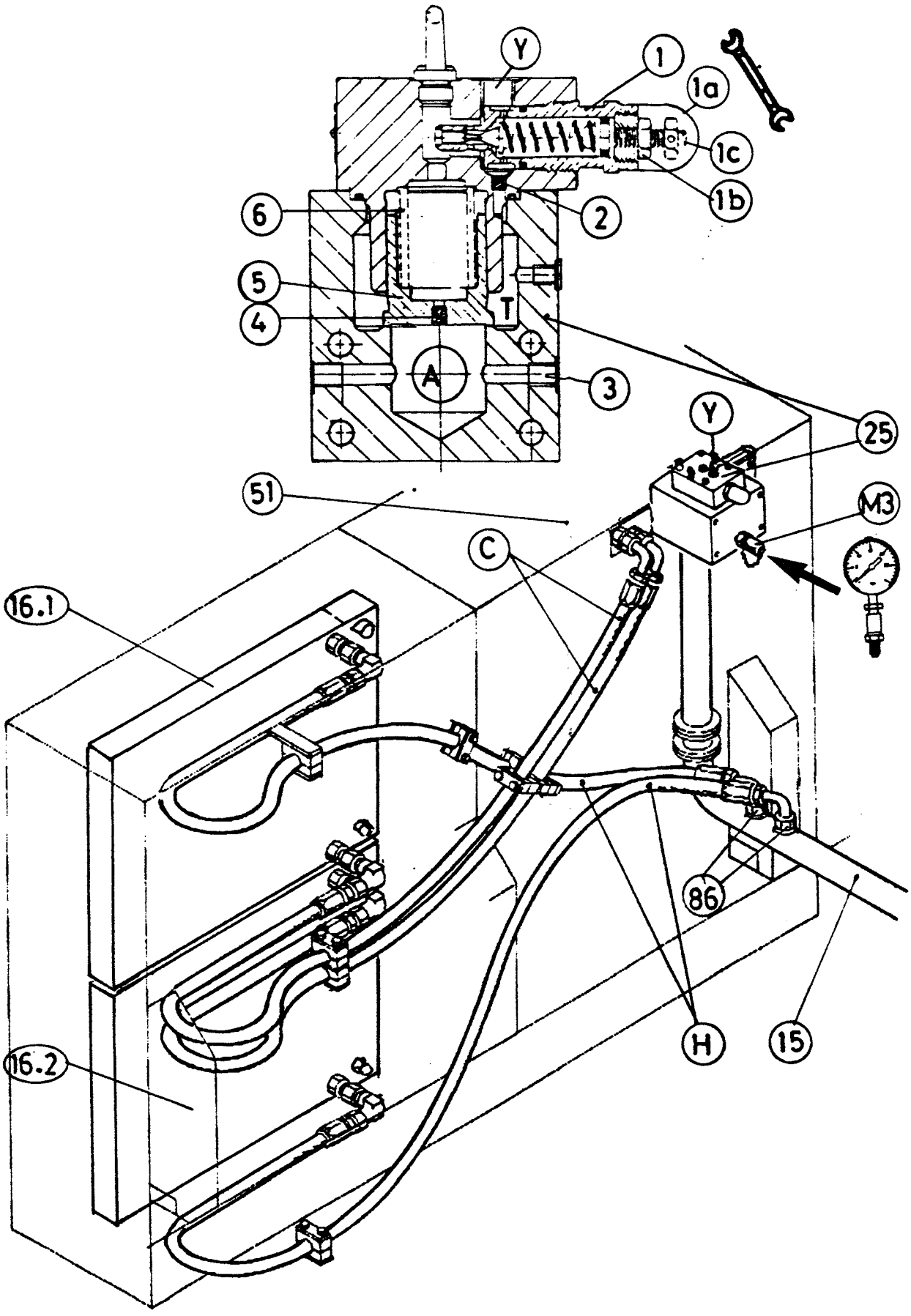

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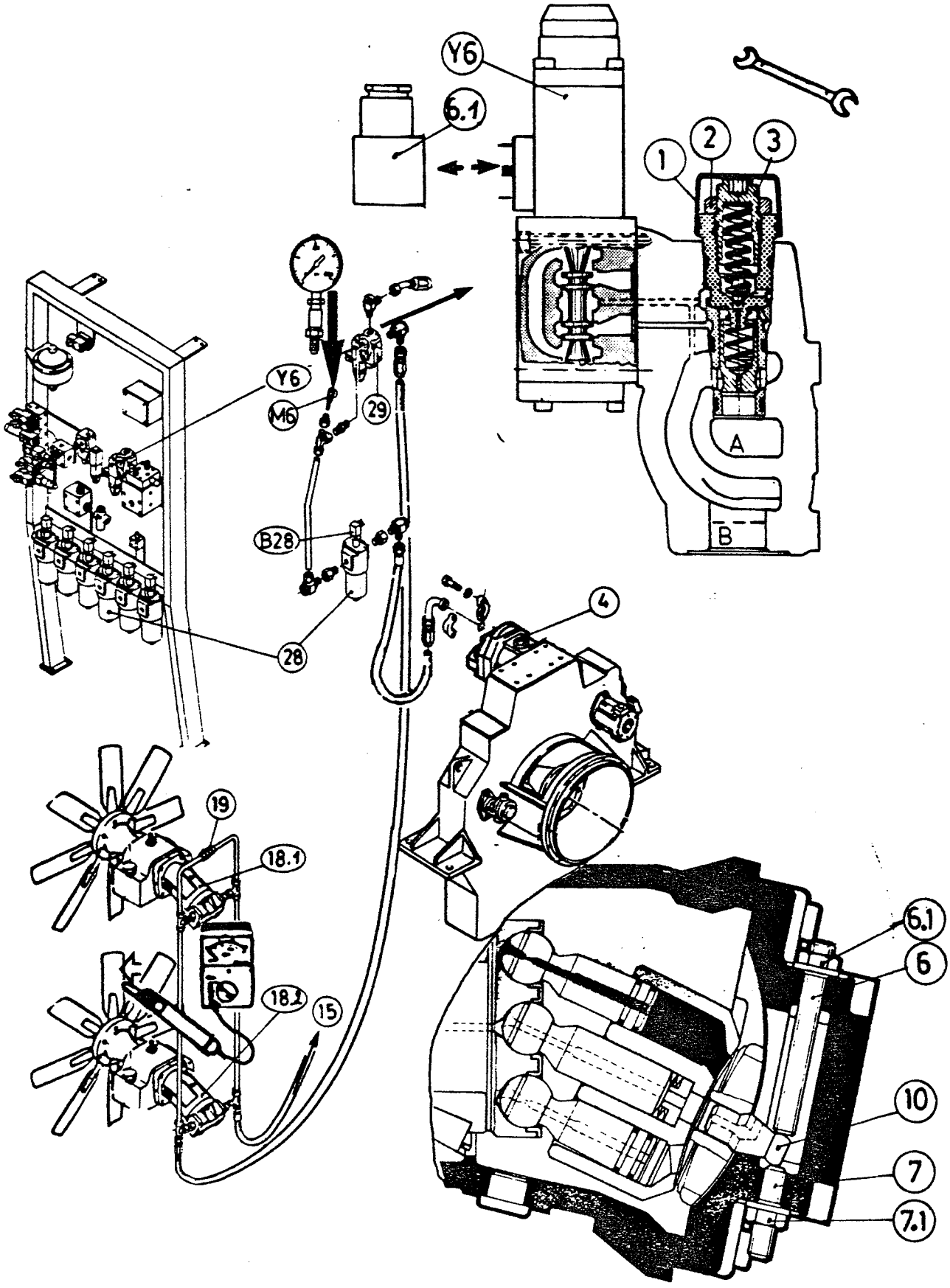

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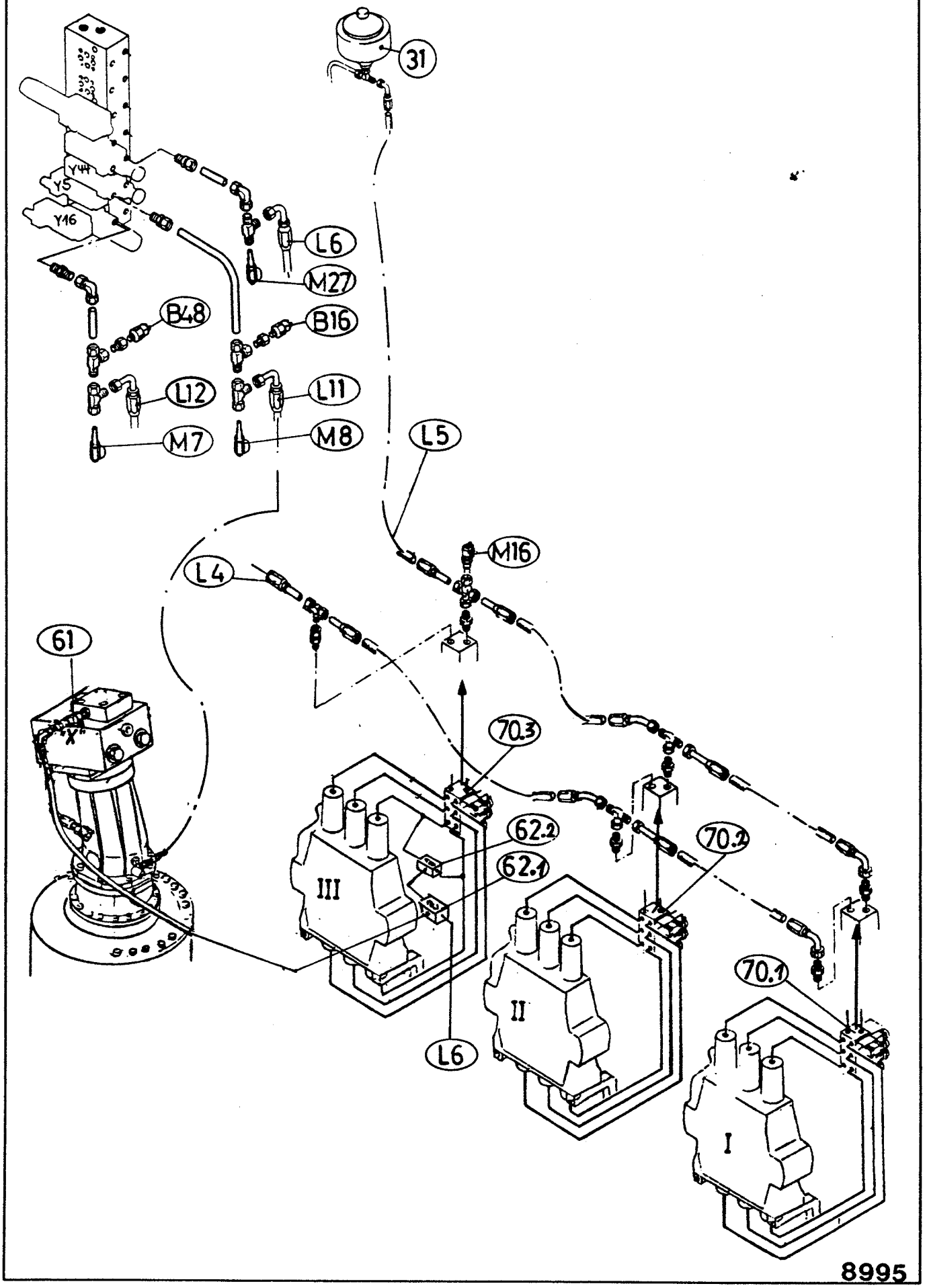

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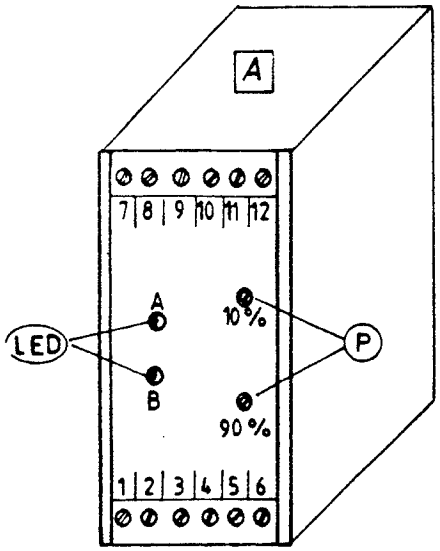
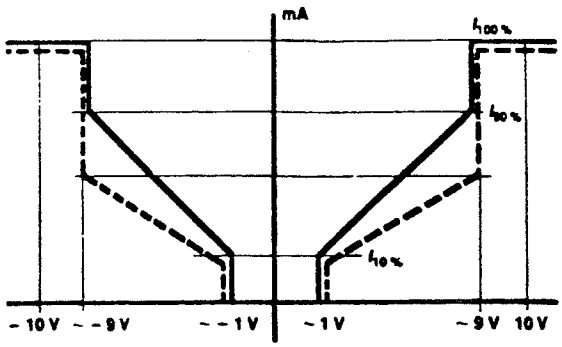


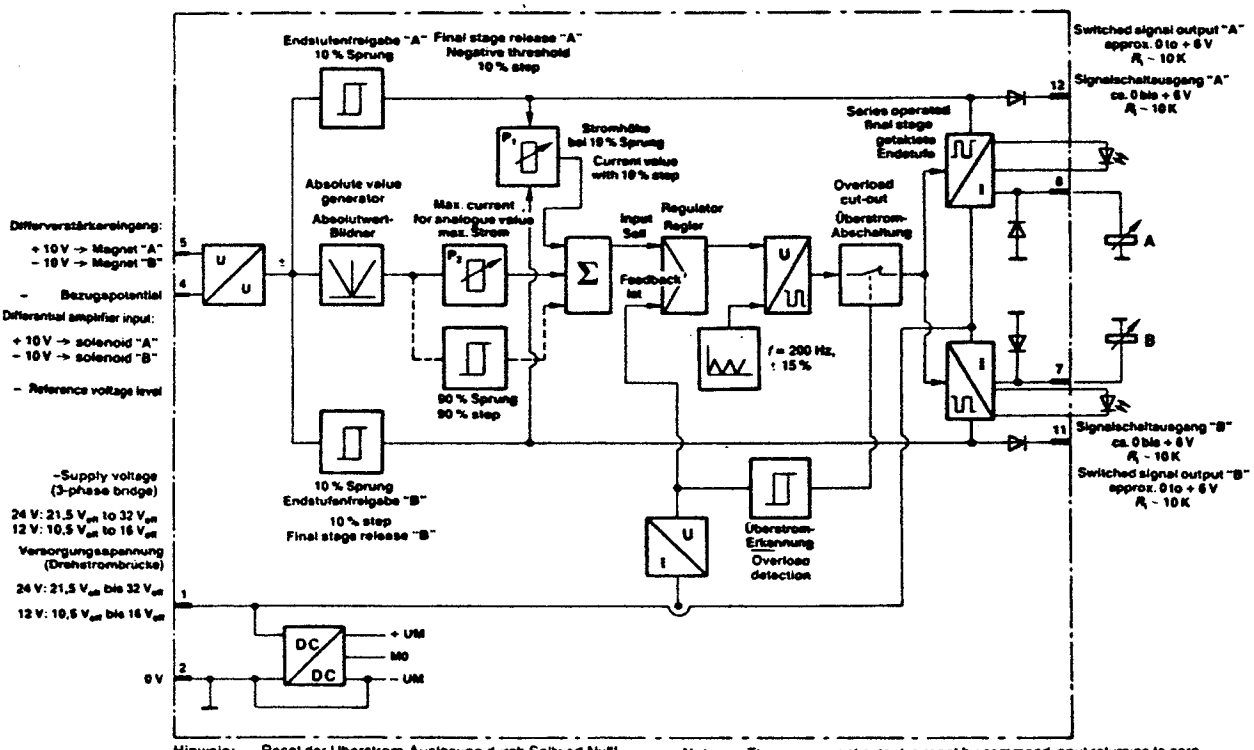
Control curve — proportional zum Hebelweg
Steuerkennlinie — proportional to lever movement



$I_{10\,\%}$ and $I_{90\,\%}$ are set externally via trim potentiometers. (P)
$I_{10\,\%}$ und $I_{90\,\%}$ sind über Trimmpotentiometer von außen einstellbar.

Terminal Wiring Klemmenbelegung

Versorgungsspannung / Supply voltage	$+U_v$	4	7	Output solenoid "B" Ausgang Magnet "B"
	0 V	2	8	Output solenoid "A" Ausgang Magnet "A"
Differenzverstärkereingang / Differential amplifier input	NC	3	9	NC
– Bezugspotential – Reference voltage level		1	10	NC
+ 10 V → Magnet "A" + 10 V → solenoid "A" – 10 V → Magnet "B" – 10 V → solenoid "B"		5	11	to switched signal output "B" zum Signalschaltausgang "B"
	NC	6	12	to switched signal output "A" zum Signalschaltausgang "A"



Hinweis: – Reset der Überstrom-Auslösung durch Sollwert Null!
– Bei 12 V-Ausführung kein Verpolungsschutz!

Note: – The over current cutout is reset by command input returning to zero
– No reverse polarity protection in 12 V model

8999

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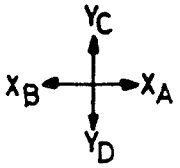
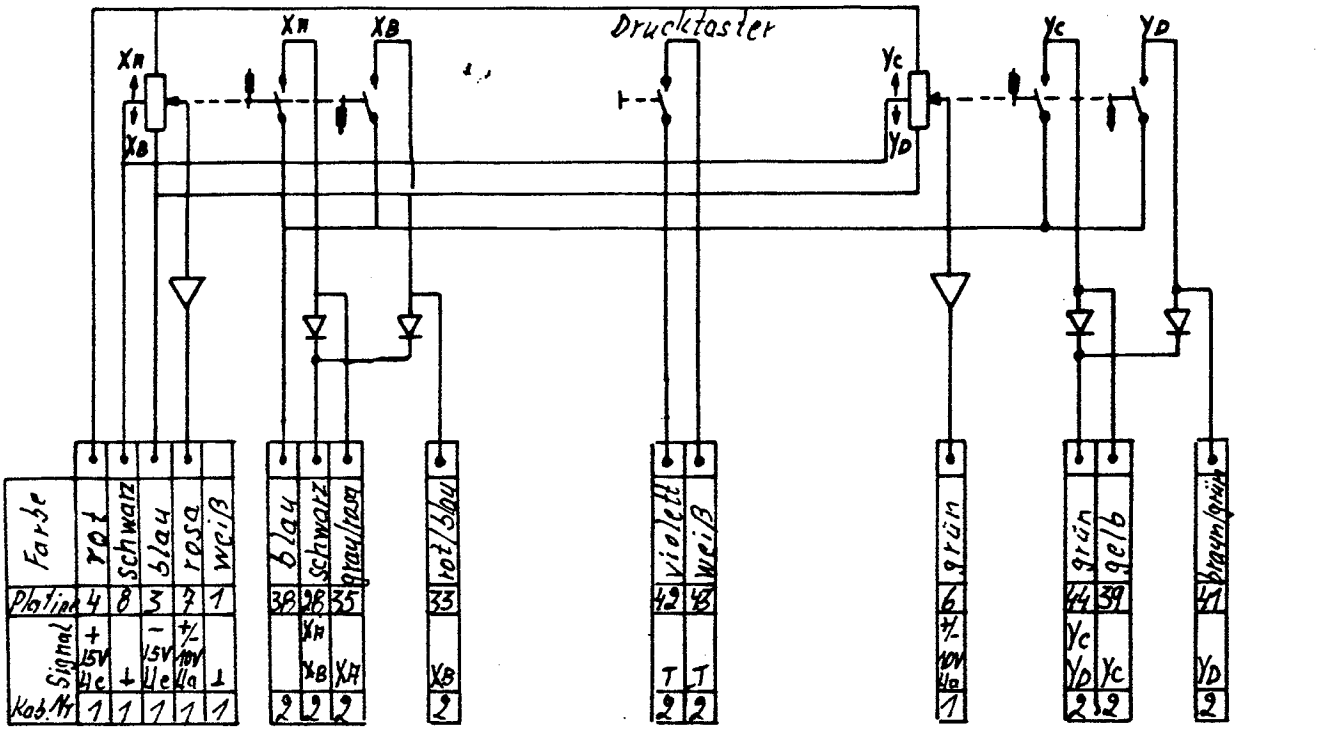
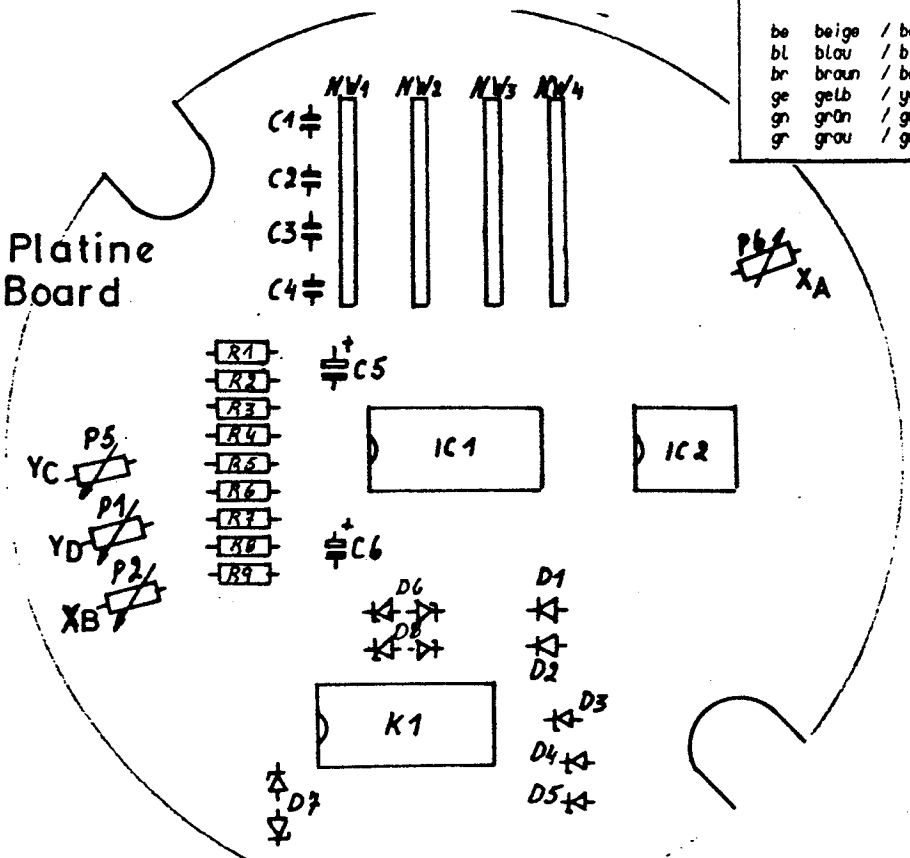
Anschlußbild
Connections





Farbbezeichnung / Description of Colour

be	beige	/ beige	or	orange	/ orange
bl	blau	/ blue	rs	rosa	/ pink
br	braun	/ brown	rt	rot	/ red
ge	gelb	/ yellow	sw	schwarz	/ black
gn	grün	/ green	vio	violett	/ violet
gr	grau	/ grey	ws	weiß	/ white



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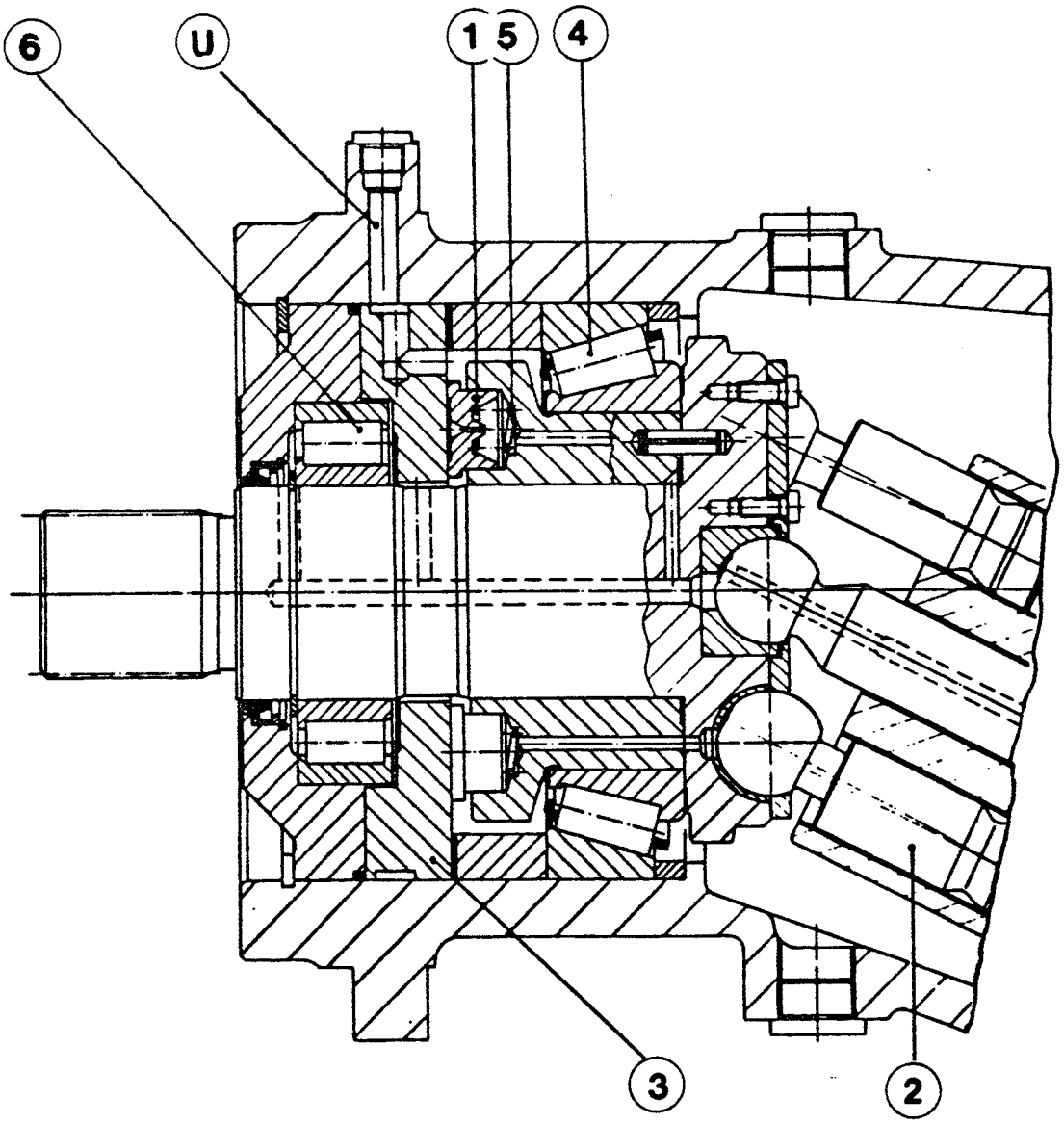

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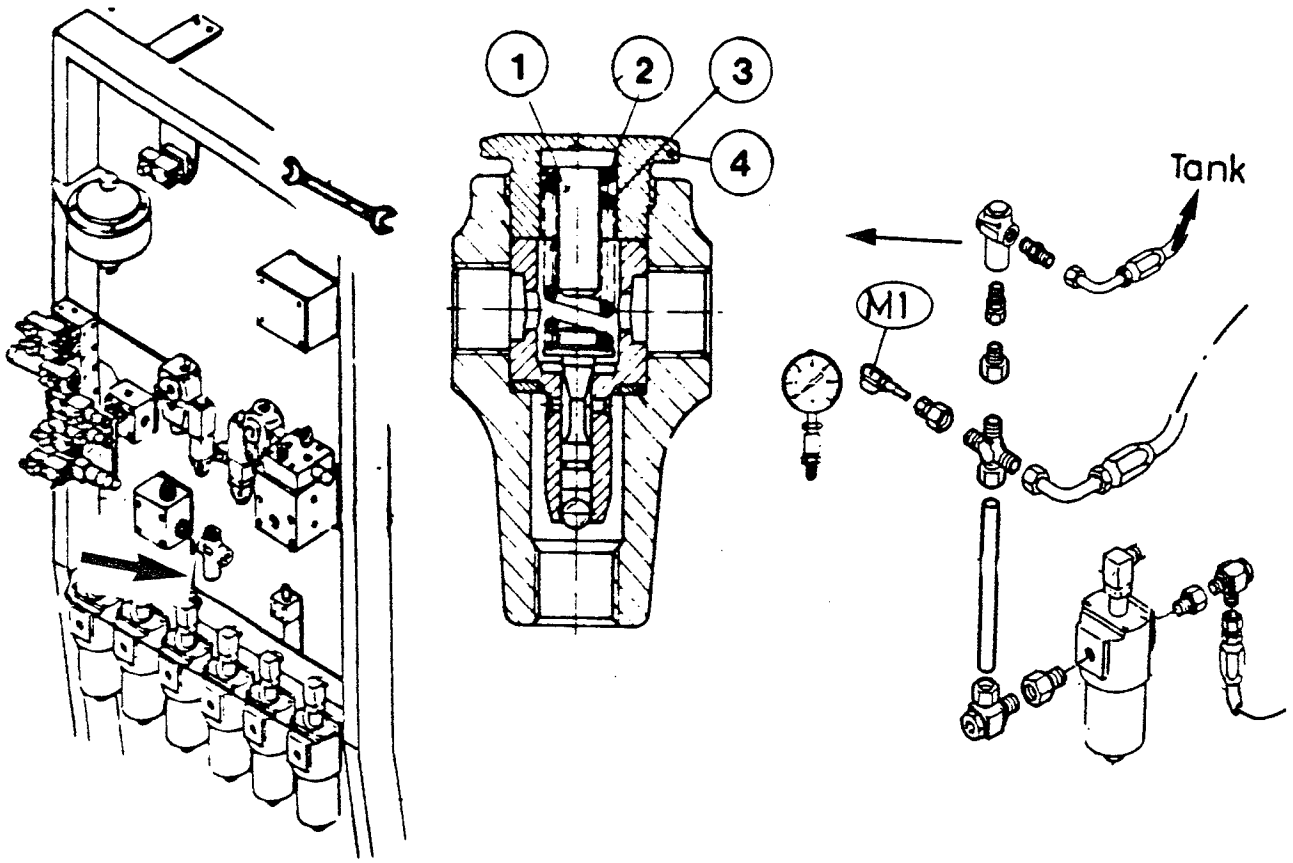

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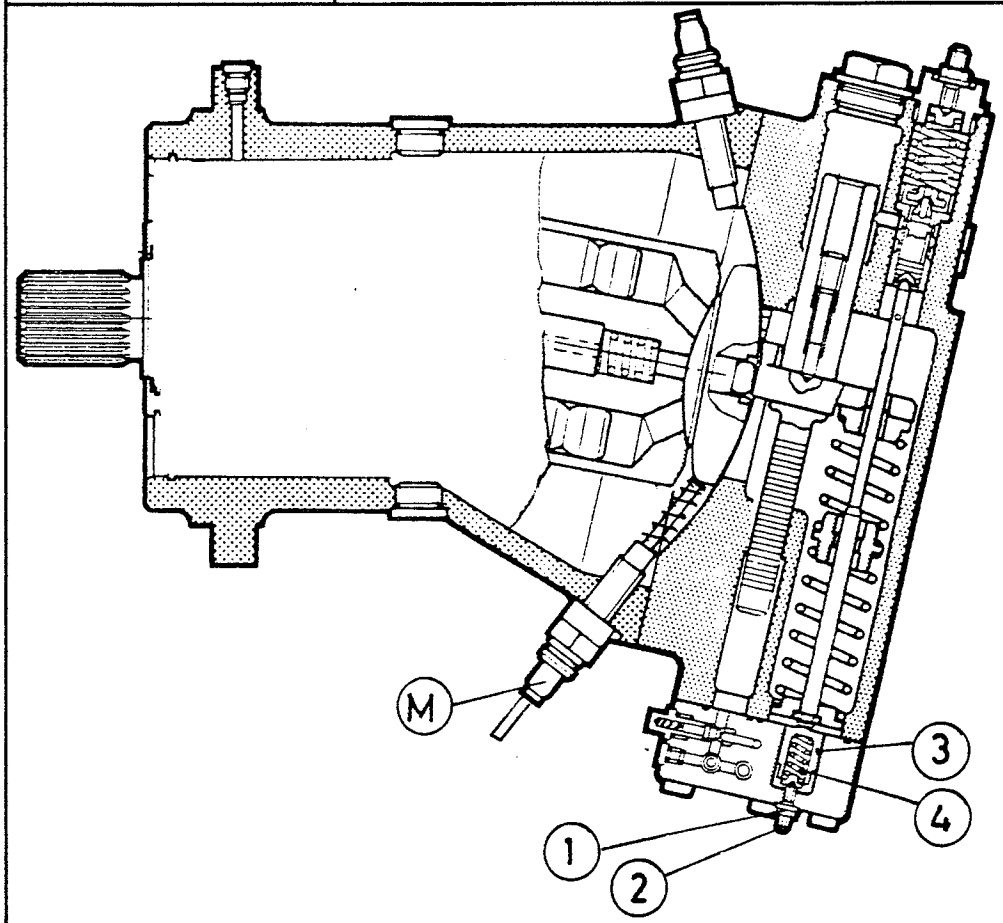

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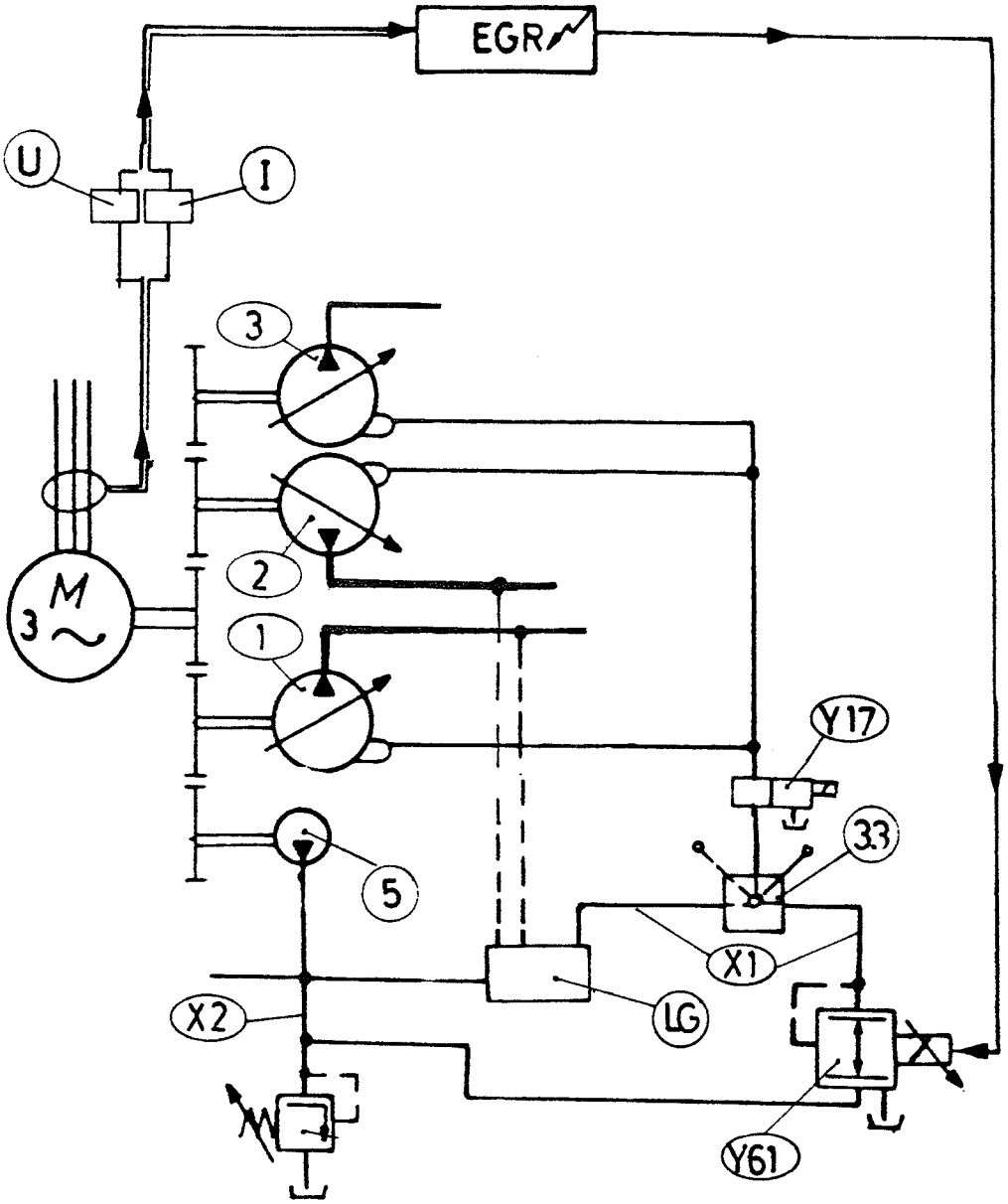

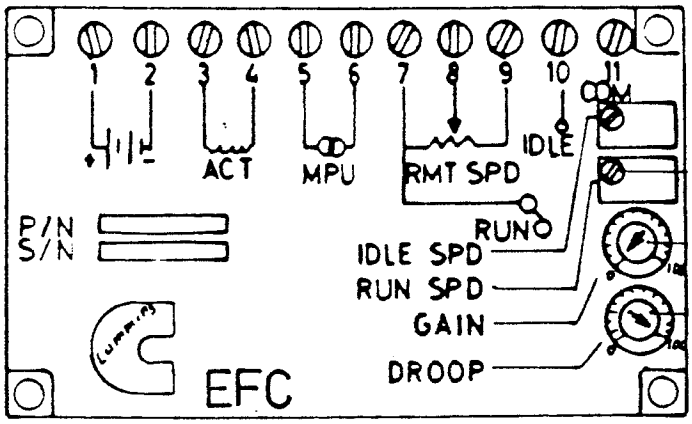
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2
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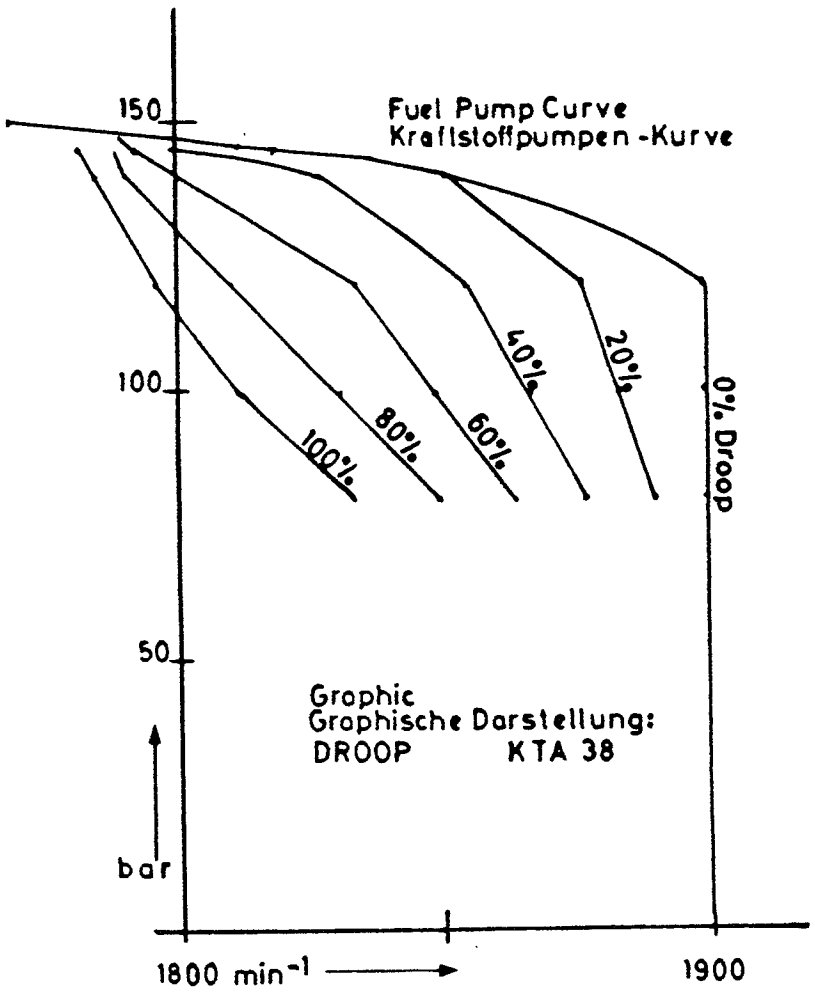
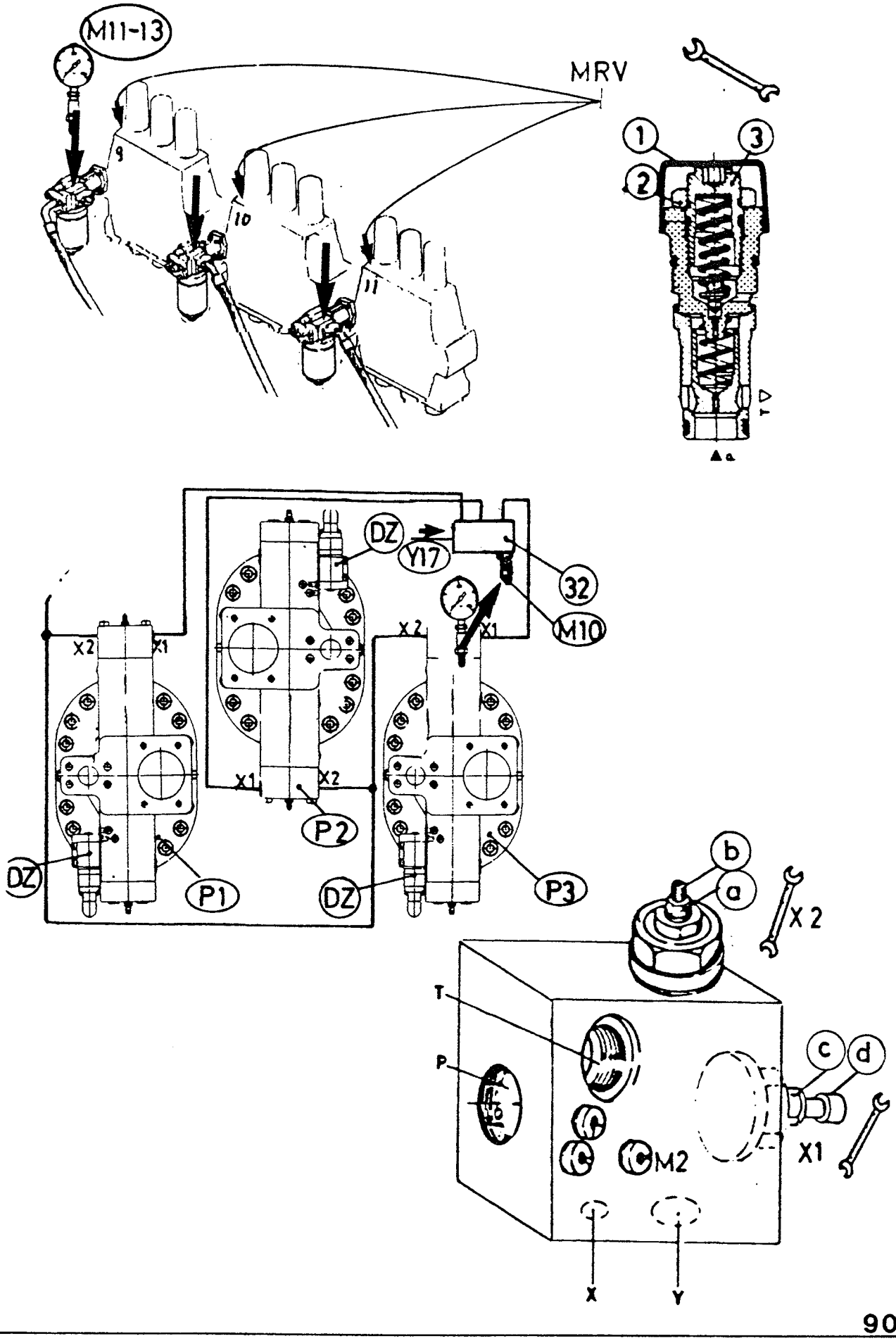
10
11
ACT
MPU
RMT SPD
IDLE
RUN
P/N
S/N
IDLE SPD
RUN SPD
GAIN
DROOP
EFC


150
100
50
Fuel Pump Curve
Kraftstoffpumpen -Kurve
100%
80%
60%
40%
20%
0% Droop
Graphic
Graphische Darstellung:
DROOP KTA 38
bar
1800 min-1
1900


M11-13
MRV
1
2
3
9
10
11
DZ
Y17
32
M10
X2
X1
P2
P1
P3
b
a
X 2
T
P
c
d
M2
X1
X
Y

Cont'd.

9051

Determination of the Peak point (corner value)

1. Move the change over "Hydraulic / Electronic " regulation into position, "Hydraulic Regulation".
2. Connect the gauges to check points (M11 - M13 and M10).
3. Start motor.
4. Set the MRV individually to appr. 120 bar * thus that the motor gets not overloaded at the following test.

* Altering the MRV-Setting:
- Remove dust cap (1).
- Loosen lock nut (2).
- Turning the set screw (3) cw will increase the pressure
  " " " ccw will decrease the pressure.

5. Set the X1-pressure to 25 bar ** thus the pumps remains in Q-max at the following test. For the X1-reading operate Y17, by pushing on the rubber cap by hand.

** Altering the X1-Setting:
- Srew off box nut (1).
- Loosen the lock nut (2).
- Turning the set screw (3) ccw will increase the pressure
  " " " cw will decrease the pressure.

6. Create max. load on pumps (e.g. stall out boom and stick cylinder), and increase slightly the pressure at all 3 MRV equally till the ampmeter shows the max. value given on the motor type plate.

   Attention:

   The X1-pressure must be due the above test allways at least 17 bar, increase it if necessary.

   Record the main relief pressure for lateron settings and secure valve setting.

   Or re-set valves to 310 bar fi no other settings required.
7. Set X1-pressure to 20 bar with no load on the motor.

DETAILED EXPLANATION FOR THE ELECTRONIC REGULATION FOR MACHINES WITH DIESEL ENGINE DRIVE

9016

Legend:

EPM-Module, Powersupply +/- 15V and +5V	(1)
ERM-Module, RPM/Current converter	(2)
ELL-Module, PID-Regulator	(3)
Capacitor-Module	(4)
Voltage/Current converter	(5)
Proportional solenoid valve	(6)
RPM sensor, Magnet Pick-Up (MPU)	(7)

The **Power Supply EPM** (1) transformes the $24V_{DC}$ battery voltage into positive/negative $15V_{DC}$ and positive $5V_{DC}$ which is the supply voltage for the ERM and the ELL Mudule.
The LEDs besides the terminal are indicating the funtioning.
The +/- $15V_{DC}$ and the $+5V_{DC}$ voltage is the supply (operation) voltage for the ERM and the ELL Module.
The **Capacitor Module** (4) is also fed with $24V_{DC}$ from the battery. The unit is used to smooth (filter) the battery voltage for the amplifier module (5).

Function:

The ERM-Modul (2) receives the by the MPU produced AC Voltage of at least 10Veff. The frequency of the AC-Voltage gets converted into a proportional DC-Voltage and transferd to the ELL-Module (3).
This **INPUT SIGNAL** is the information about the load to the engine and serves the ELL-Module to create the **ACTUAL VALUE.**
With this Input Signal the **ACTUAL VALUE** is created.
The **ELL-Module** compares the ACTUAL VALUE with a pre-set **NOMINAL VALUE** and produces a suitable current signal for the proportional amplifier module (5).
The proportional amplifier transmitts the amplifiered signal to the proportional solenoid valve (6). The valve reduces proportional to the current signal the pilot pressure (X2-presure) into the X1-Pressure for the pump governors.

ADJUSTMENTS / CHECKS FOR THE ELECTRONIC REGULATION

II CHECKS / FUNCTION TEST / FAULTFINDING AT JOBSIDE

Assumed all parts of the regulation system are installed into the machine and the wiring is done according to the diagram.

Datas and Hints:

ERM - Module

Table to determine the **Output Signal Voltage:**

Speed	Frequency	Output signal voltage
2400 rpm	5680 Hz	0 Volt
1800 "	4260 "	5 "
1200 "	2840 "	10 "

Formula how to calculate the output signal voltage:

$U_{Outp.}$ (Volt) = (2400 - n) / 120 (n = rated speed)

Example: Rated speed 1800 rpm:

(2400 - 1800) / 120 = 5 Volt

ELL - Module

Supply voltages:

Terminal	Voltage	Terminal	Voltage
31	+ 15 Volt	32	- 15 Volt
33	+ 5 Volt	34	GND (Ground)

Pre-Adjustments: (Engine switched OFF)

1. O-Potentiometer: 9.14 V Terminal 35 / 34(GND)
2. S-Potentiometer: 5.00 V Terminal 44 / 34(GND)
3. I-Part and D-Part switched OFF
4. Cable at terminal 42 disconnected
5. Connect test lead from EVV-Module to Terminal 42
6. Adjust with EVV-Modul 7.00 Volt Terminal 45 / 34(GND)
7. S-Potentiometer: 5.00 V Terminal 44 / 34(GND)
8. P-Potentiometer: 6.48 V Terminal 35 / 34(GND)

VT 11015-Module (Voltage / Current Converter)

Input voltage	Output Current	Potentiometer
1.5 V	200mA	R1
9.0 V	450mA	R2

Proportional Valve:

Characteristic: 0····· 700 mA = 0····· 25 bar.

---

continued

Cont'd.:

Measure the voltage for the X1-Pressure (where the pumps are just in Q-max position) between the terminal (35 to 34) and check if, by turning the O-Potentiometer, a voltage from 5 up to 10 V is adjustable. Then set the potentiometer to the pre-set voltage range, given on page 10. (Example 9.14V for 15.5 bar)

Pre-Setting the P-Part
Adjust with the S-Potentiometer 5V, measured between terminal (44 and 34GND).
The setting of O-Potentiometer remains.

Connect a test lead from the Service Modul (EVV) positive terminal to the terminal (42) of the ELL Modul.
Increase with the EVV-Potentiometer the voltage as long as at terminal (45 to 34GND) for the ACTUAL Value, 7V is present.
Now must be at the output terminal (35) a voltage of 6.48V
If the voltage is not 6.4V adjust it with the P-Potentiometer to 6.48V.

If one of these adjustments is not possible, or remains one of the adjusted voltages not constant, the ELL-Modul is defect.

If the adjustments have been succesfull, shift the switches for the D and I-Part into ON position and re-connect the cables (35 u. 42). I-Part and D-Part functions and some other Modul functions can be tested only by a TEST-DATA-RECORDING System. If any malfunction is suspected in the I and/or D-Part of the Modul, carry out a test run with an other Modul, if posssible.

ADJUSTMENTS / CHECKS FOR THE ELECTRONIC REGULATION 9044

I NORMAL ADJUSTING PROCEDURE

Assumed all parts of the system are installed into the machine and the wiring is done according to the circuit diagram.

Basic adjustment for the amplifier module VT

Note:

The following adjustment has to be done at operating temperature for the first initiation of the machine and whenever the amplifier or the solenoid have been replaced.

1. Disconnect the cable (4) at terminal 5 of the module.
2. Join with a test lead the terminal (7*) and terminal 5 of the module.
3. Open the terminal (6*) and connect the meter.(Must be set to read mAmps)
4. Adjust with the (in the X2-box installed) Service Module "EVV" potentiometer **1.5Volt** and adjust with the potentiometer **R1 200 mA output current** for the proportional solenoid valve.
5. Adjust with the Service Module potentiometer **9V** and adjust with the potentiometer **R2 450 mA output current** for the proportional solenoid valve.
   Repeat the setting because each R1 and R2 setting influences each other.
6. Remove test lead and re-connect the cable (4) to terminal 5.
7. Close the terminal (6) and remove meter.

* Both terminals are inside the X2-Box, exact terminal number can be found in the electric circuit diagram.

continued

Cont'd:

9020

TESTING AND SETTING FOR THE COMPLETE REGULATION.

The ELL Module up till now has beens pre-set only and must be be final set at operating temperature in accordenance with the specific operating circumstances.
When the system gets loaded the **ACTUAL Value** can be monitored (seen) by a Voltmeter connected to terminal 45 of the ELL Modul. At power peaks, that means the **ACTUAL Value** is greater than the **NOMINAL Value** the yellow LED (x) of the ELL must light up.

The regulation dynamics can be influenced with the "P"-Potentiometer.
If while digging the system is jerking, the "P"-Potentiometer can be turned in steps of 1/4 turns counter clock wise, until a jerkless operation is possible.
If while digging the system is not jerking, turn the "P"-Potentiometer clock wise, until just no more jerks, under any circumstances, occur while digging. The power peaks are then as small as possible.

After the setting is finished, seal all potentiometers with Silicone. Remove the "Idle Time" elimination (see page 5).

Cont'd.:

X1-Pressure set potentiometer test

a. Measure the voltage for the X1-Pressure (where the pumps are just in Q-max position) between the terminal (35 to 34), record it and check if, by turning the O-Potentiometer, a voltage from 5 up to 10 V is adjustable. Then set the potentiometer to the pre-set (recorded) voltage range. (Example 9.14V for 15.5 bar)
(In case of a doubt see page 5).

Testing the function of the P-Part

b. Measure the voltage between 44 and 34 and record it.
Adjust with the S-Potentiometer 5V, measured between terminal (44 and 34).
The setting of the O-Potentiometer remains.
Disconnect the cables at terminal 42 and 43. Connect a test lead from the Service Modul (EVV) positive terminal to the terminal (42) of the ELL Modul and bridge terminal 42 with terminal 43.
Increase with the EVV-Potentiometer the voltage as long as at terminal (45 to 34) for the ACTUAL Value, 7V is present.
Now must be at the output terminal (35) a voltage 5.12V less than the voltage reading between 35 and 34 at step a.
Example: The reading a. was 9.14V 9.15-5.12 = 4.02V.
If the voltage is not correct adjust it with the P-Potentiometer to a voltage which is 5.12V less.
If one of these adjustments is not possible, or remains one of the adjusted voltages not constant, the ELL-Modul is defect.
If the adjustments have been succesfull, shift the switches for the D and I-Part into ON position and re-connect the cables (35, 42, 43). Re-set the "S" poti to the at step b. recorded value. I-Part and D-Part functions and some other Modul functions can be tested only by a TEST-DATA-RECORDING System. If any malfunction is suspected in the I and/or D-Part of the Modul, carry out a test run with an other Modul, if posssible.

REMOTE CONTROL, CONTROL BLOCKS AND DISTRUBITOR MANIFOLD ARRANGEMENT 9056

Legend:

Note:

When ever possible the code numbers out of the circuit diagram are used.

Control blocks	(9 - 11)
Return oil collector tube	(15)
Distubitor manifold	(57)
Compensation line A / O	(E1)
Compensation line B / N	(E2)
Compensation line F / H	(E3)
Compensation line G / J	(E4)
Connection for the lines to the rotary distributor (Travel)	(F)
Connection for the lines to the Slew motor.	(D)
Collector line for the external pilot oil dump.	(L10)
Flow restrictor blocks with line relief valve and pressure check point	(63.1 - 63.6)
Anti cavitation valve blocks	(64.1 - 64.4)
Remote control valve sets	(70.1 - 70.3)
Pilot pressure check point	(M16)

More in detail on the next pages.

PILOT OPERATED PRESSURE RELIEF VALVE, (1 + 2) 9059

Task:

The pilot operated pressure relief valve limits the maximum operating pressure and protects pump and users from overloading.

The valve has an "opening characteristic". That means, that in case of contamination after the response procedure no further pressure increase is possible and damages are avoided.

Design:

Dust cap	(8)
Adjustment screw	(9)
Lock nut	(10)
Spring, pilot part	(11)
Poppet	(12)
Nozzle boring	(13 + 16)
Spring, main cone	(14)
Main valve cone	(15)
Pilot oil dump to tank	(17)
Main return line to tank	(T)
Circuit pressure	(P)

Function:

The circuit pressure P forces with the force F1 on the piston surface A of the main valve cone (15).
Because there is via the nozzle boring (16) the same pressure on the back side of the main cone, this results together with the spring force (14) in a force F2 which keeps the main cone closed.
Via the nozzle boring (13) the circuit pressure is in front of the poppet (12). Increases the circuit pressure to the set value of the spring (11), the poppet opens against the force of the spring (11).
This causes that force F2 decreases and there is no more balance condition between F1 and F2. Valve cone (15) is moved upwards by the higher force F1. That means there is now a direct connection from port P to (T).

PROPORTIONAL SOLENOID VALVE

9065

Function:

In unoperated condition the control spool (3) is held in the neutral or starting position by re-set springs.

The control spool (3) is directly operated by the proportional solenoid (6).

If the solenoid is energized, it produces a force to operate the control spool (3) via the pressure measuring spool (4) and moves the spool to the left. Oil flows from P to A. As pressure in A increases, it passes via the radial borings in the control spool (3) to the inner end of the pressure measuring spool (2).

The force generated by the pressure now works against the solenoid force and pushes the control spool (3) to the right (closing direction) until a balance is achieved between the two forces. In order to achieve this, the pressure measuring spool (2) moves to the left until it is supported by the pin (7).

When the force balance is achieved, the connection between P and A is interrupted and the pressure in line A is held constant.

Any reduction in the solenoid force leads to the pressure force exceeding the solenoid force on the control spool (3). The control spool is then moved to the right causing a connection from A to T allowing the pressure to fall until a balance is re-established at a lower level.

At rest, when the solenoid is de-enrgized, ports A and B are open to tank, whilst port P is blocked from both ports A and B.

Attention

In order to achieve optimum functioning of the valve, it must be bled when commisioning:

- Supply pressure to the valve
- Remove plug 5
- When no more air bubbles appear srew in plug 5.

VALVES AND PRESSURE CHECK POINTS

9068

SRV	Loader Bucket Attachment	Back Hoe Attachment
66.1+66.2	L.h. Travel motor	identical
66.3	Boom cylinder piston side	identical
66.4	Boom cylinder rod side	identical
66.5	Stick cylinder rod side	Stick cylinder piston side
66.6+66.7	R.h. travel motor	identical
67	Clam cylinder piston side	----------
66.8	----------	Bucket cylinder piston side
66.9	Boom cylinder rod side	identical
66.10	Bucket cylinder rod side	Bucket cylinder piston side
66.11	Stick cylinder rod side	Stick cylinder piston side

ACV	Back Hoe Attachmnet	Loader Bucket Attachment
68.1+68.2	L.h. travel motor	identical
68.3+68.4	R.h. travel motor	identical

Pressure check points	Location	For the valves
M11	HP-Filter control block 9	MRV and SRV 66.2 - 66.5
M12	HP-Filter control block 10	MRV and SRV 66.6 - 66.9 + 67
M13	HP-Filter control block 11	MRV and SRV 66.10 - 66.11
M17	Manifold section B	SRV 63.1
M19	Manifold section D	SRV 63.2
M20	Manifold section E	SRV 63.3
M21	Manifold section G	SRV 63.4
M22	Manifold section J	SRV 63.5
M23	Manifold section N	SRV 63.6

Cont'd.:

Signal flow for boom "Lowering" 9073

Control lever E19 in direction Y_C, green (gn) cabel to next terminal and then via cabel (L14) to the proportional amplifiers A8 and A12 terminals 5.

From: A8.7/8 to the proportional solenoid valve Y64

A12.7/8 to the proportional solenoid valve Y68

At the same time, because the signal for the direction Y_C is positive,

from: A8.9 to the directional solenoid valve Y23

A12.9 to the directional solenoid valve Y31

Pilot pressure oil flow "Boom Lowering" 9074

The energized Y23 and Y 31 connects the P-Line (L5) of the remote control manifolds (70.1 + 70.2) with the pilot pressure ports 4 resp. 2, so that the pilot pressure created by the proportional solenoids (Y64 + Y68) reaches the pilot pressure ports b2/9 resp. b3/10 of the control blocks and displaces the spools.

High presssure oil flow "Boom Lowering"

The oil flows from port B2/9 to the distributor manifold (57) section A and from port B3/10 to section O.

From here the oil flows to the boom cylinder rod side.

The balancing line bewteen the sections are installed to ensure that volume and pressure are balanced.

The oil from the cylinder piston side flows to the sections B + N. Caused by the function of the restrictor blocks (63.1 + 63.6), the check valve closes, the oil must flow through the adjustable throttle to the control blocks port A2/9 resp. A3/10.

By the restrictors the lowering motion gets restricted.*

continued

Cont'd.

9077

Service Line Relief Valves* for the loader bucket.

Cylinder piston side = 63.2, check point M 19.

Cylinder rod side = 66.10, check point M 13.

1. Connect the gauge to the required check point.
2. Start motor (Diesel engine keep at maximum RPM).
3. Extend cylinder to full or retract to minimum for the valve bejng tested until the hydraulic system stalls.
4. Increase slowly the MRV-pressure while observing the pressure gauge. Gauge value must remain at 350bar $\pm$ 5bar. If the gauge shows a smaller or greater value the SRV must be adjusted.**

How to adjust the MRV "B + C":

a. Remove protective cap (1).
b. Loosen locknut (2).
c. Adjust srew (3) -clockwise to increase pressure, counterclockwise to decrease pressure.
d. Tighten locknut (2) and replace cap (1).

5. Re-set MRV to 310bar $^{+}$ 5 bar after the check / adjustment is finished.

* Note:

It is important that the complete valve is firmly screwed (with 300Nm) into the control block. Otherwise, the internal sealing is not properly which results in loud flow noises and a not proper adjustable valve.

** A faulty Anti Cavitation Valve (64.3) can influence the SRV pressure setting. Repair or replace faulty valve if necessary.

continued

SLEW CIRCUIT 9081

Legend:

Main hydraulic pump	(3)
Control block	(11)
High pressure filter	(14)
Return oil pipe	(15)
Back pressure valve	(25)
Leak oil (case drain) filter	(50.1)
Return oil filters	(50.2 - 50.4)
Slew motor	(60)
Slew brake valve	(61)
Slew gear	(G)
Pilot pressure line from the solenoid valve Y44, footbrake	(L6)
Case drain line	(L7)
External dump line	(L8)
Pilot pressure line to the house brake	(L11)
Lines to the cooler	(K)

Brief description

The slew motor (60) is driven by the pump (3).
The oil flows from the pump through the filter (14) to the control block (11).
From the control blocks the oil returns via the return oil pipe (15) to tank whenever the spool of the control block is in neutral.
On its way to tank the oil must pass the back pressure valve (25) and the return oil filters (50.2 - 50.4).
The function of the back pressure valve (25) ensures enough oil supply for the anticavitaion valves and that enough oil is forced through the oil coolers.
(see chapter 3.1 page 2)

continued

Slew gear house brake

9085

The Spring Loaded Multi-disk Brake is a safety brake; applied by spring force and released by oil pressure.

Legend:

Disk carrier	(1)
Housing	(2)
Quad-Rings	(3)
Springs	(4)
Oil filler and level plug	(5)
Oil drain plug	(6)
Thrust washer	(7)
Seeger clip ring	(8)
Inner disks (lamellars)	(9)
Outer disks	(10)
Oil pressure port	(11)
O-Ring	(12)
Seeger clip ring	(13)
Thrust washer	(14)
Piston	(15)
Radial seal rings	(16)

Function:

Brake applied:

The outer disks (10) engaged to the housing (2) by serration and the inner disks (9) in serration connection with the carrier (1) are pressed together by the springs (4). This results in a fixed connection between housing (2) and carrier (1).

Brake released:

Oil pressure via port (11) reaches the bottom of the piston (15) and forces the piston upwards against the thrust washer (14).

This function eliminates the spring force onto the disks thus the brake is released.

The releasing pressure is 18 - 20 bar, the maximum permissible pressure 60 bar.

This is a so named "Wet Brake" because the brake housing is filled with gear oil. The oil must be filled in up to the edge of the thread of the filler and level plug (5).

Cont'd. 9092

Low pressure check / adjustment (Slewing down path)
(with still diconnected pilot pressure line)

8. Actuate either l.h. or r.h. rotation until the hydraulic system stalls and hold the lever.
   a) loosen lock nut (3) and turn out set screw (4) until 150 $^{+}5$ bar is reached.
   b) Tighten lock nut (3).
   c) Recheck pressure setting.
9. Re-connect the pilot pressure line.

Note:

- For laterone pressure checks the steps 2 + 3 must not be done.
- The slowing down path may be extendet, means the low pressure may be decreased, a little; e.g. for greater operating radius such as at strip mining. But a little only otherwise disturbance due slewing will occur.
- The slowing down path may be shortend, means the low pressure may be increased appr. 20bar; but not more because that means greater shocks in the systems which will shorten the life time of the components.

Max. foot brake pressure 9095

1. Connect the gauge to the check point M27.

Note:

From Serial Nr. 06085 up the pressure check point M27 is located close to the pressure increasing valve, means near the brake valve.

2. Start motor (Diesel engine keep at maximum RPM).
3. Depress fully the foot brake pedal and read the pressure.
   The pressure must be 19 $\pm$1 bar.
   If adjustment is required:
   Alter the position of the potentiometer R2 of the amplifier A16 as long as the pressure is 19 $\pm$1 bar.

Note:

Basic adjustment for A16 see chapt.4.4 page 5.

Cont'd. 9083

Function.

The pressure oil inlet (A or B) and consequent oil outlet (B or A) determine the output drive direction of the drive flange (1).
Via the control lense (9) the oil is directed to the cylinder bores.
The piston (6) is moved from the lower (7b) to the upper dead point (7a) by means of the force acting on it and causes the drive flange to rotate. On further rotation of the drive flange (additional pistons are pressurized) this piston is moved towards the lower dead point again and oil of the cylinder chamber is forced out through the kidney formed openings of the control lense. This oil is fed back to the tank via the return line.

If the supply and return line gets changed it changes the output drive direction of the drive flange.
By means of the angled arrangement of the cylinder (8) (bent axis design), a certain piston stroke is produced which results in a fixed displacement per revolution of the drive flange. According to the size of the applied flow this therefore produces a specific output speed.
The output torque at the drive flange is dependent on the size of the motor and the required operating pressure.
The port (3) is provided for an external bearing lubrication at extreme operating conditions.

DETAILED EXPLANATION FOR "TRAVELLING FORWARD" 9098

Electrical signal flow

Two signals are sent out at the same time from this control lever unit because it is installed 45° turned to the left opposed the two others.

Y_C, green (gn) cable and X_A, pink (rs) cable.

Both cables continue via the next terminals and the NC-contacts* of K63a to the proportional amplifiers A7 + A10 terminal 5.

* Forward travelling only can be done with the foot pedal units E23 + E24 as well. The change over is done by a dash board switch and the relay K63a.
When selecting "Travelling by Pedals" the contacts of the relay K63a changes their position and the signals to the amplifiers coming now from the pedal units, cables yellow/brown (ge/bn).

From: A7.7/8 to the proportional solenoid valve Y63
A10.7/8 to the proportional solenoid valve Y66

At the same time, because the signals for the direction Y_C+X_A are positive,

from: A7.9 to the directional solenoid valve Y21
A10.9 to the directional solenoid valve Y26

Pilot pressure oil flow "Travelling Forward" 9099

The energized Y21 and Y26 connects the P-Line (L5) of the remote control manifolds (70.1 + 70.2) with the pilot pressure ports 6 resp. 5, so that the pilot pressure created by the proportional solenoids (Y63 + Y66) reaches the pilot pressure ports b1/9 resp. a1/10 of the control blocks and displaces the spools.

High presssure oil flow "Travelling Forward"

The oil flows from port B1/9 to the rotary distributor (58) port A and further on to the l.h. travel motor (59.1) port A.

From the opposite port B the oil returns via port C of the rotary distributor to the port A1 of the control block 9.

continued

ADJUSTMENTS FOR THE TRAVEL CIRCUIT 9101

Note:
It is important that the complete MRV-valve and the SRV-valve is firmly (with 300Nm) tightened.
Otherwise, the internal sealing is not properly which results in loud flow noises and a not propper adjustable valve.

Primary valves (A)

1. Connect pressure gauge to check points M11 + M12
   for the r.H. motor to check point M12
   for the l.H. motor to check point M11

   Further procedure see page 1 chapt. 6.3.

Secondary valves (66.1/2 + 66.7/8)

1. Connect pressure gauge to check point (M11 / M12)
   for the right side motor at check point M12
   for the left side motor at check point M11
2. Unplug the solenoid valve Y16 to keep the parking brake applied.
3. Start motor (Diesel engine keep at max. RPM).
4. Engage desired travel motion and hold the lever in final position to built up max. pressure.
5. Increase slowly the MRV-pressure while observing the pressure gauge. Gauge value must remain at 350bar $\pm$ 5bar.
   If the gauge shows a smaller or greater value the SRV must be adjusted.**

   Note:
   A faulty Anti Cavitation Valve (68.1 - 68.4) can influence the SRV pressure reading / setting. Repair or replace faulty valve if necessary.

* **How to adjust the MRV "A":**
   a. Remove protective cap (1).
   b. Loosen locknut (2).
   c. Adjust srew (3) -clockwise to increase pressure, counterclockwise to decrease pressure.
   d. Tighten locknut (2) and replace cap (1).

** **How to adjust the SRV:**
   a. Remove protective cap (1).
   b. Loosen locknut (2).
   c. Adjust srew (3) -clockwise to increase pressure, counterclockwise to decrease pressure.
   d. Tighten locknut (2) and replace cap (1).

6. Re-set MRV to 310bar $^{+}$ 5 bar and re-plug the solenoid valve Y16.

Cont'd.: 9104

Function at "Feathering":

The tensioning cylinders 94.1 - 94.4) are moved in by the external force, the resulting force closes the none return valves (91.1 + 91.2) and opens the none return valves (92.1 + 92.2), thus the connection to the relief valve remains.

A certain amount from the displaced oil of the tensioning cylinders is taken from the pressure accumulators (93.1 + 93.2).

The precharge pressure of 215 bar increases, max. up to the relief valve (87) setting.

Decreases the external force, the oil gets pushed back by the accumulator pressure into the tensioning cylinders.

In case the displaced oil (via the relief valve) is more than the accumulator can take, oil is added from the pilot pressure circuit (L12), as soon as the pressure in the lines to the tensioning cylinder is lower as the pilot pressure.

Operation / Maintenance see SERVICE LITERATURE chapt. 6.6

Accumulator check see SERVICE BULLETIN 21-~~280~~ 426.

Chapter

Cont'd.: 9109

Procedure:

I. 1. Start engine and run with low idle.

2. At the flow regulator:

a. Take off protective cap (1.1).

b. Loosen lock nut (1.2).

c. Adjustment with screw (1.3)* the required rpm:
1500 rpm for 50 Hz 1800 rpm for 60Hz.

* Note:
Clockwise = more speed
Anti clockwise = less speed

3. Repeat the check with engine at high idle, the rpm must be appr. the same if the pump regulation system works.* If necessary re-adjust the rpm.

* Note:
The pump regulation can operate only if the orifice (item 85 in the hydraulic circuit diagram) is installed.

4. Switch off the engine.

II. 1. Disconnect the oil supply line (D) to the hydraulic motor and close it with a suitable blanking plug.

2. Take off protective cap (1) of valve 77.

3. Loosen lock nut (2).

4. Back-off the set screw (3) fully to release the spring tension !! This is done as a precaution!!

5. Start engine and run with max. speed.

6. Adjust with the set screw (3 of valve 77) 200bar.

7. Switch off the engine and re-connect the hydraulic hose to the hydraulic motor.

8. Start the engine, run it with max. rpm and check once more the the generator speed which must be as follows:
1500 R.P.M. - 50 Hz equipment
1800 R.P.M. - 60 Hz equipment

9. Re-adjust if necessary.

continued

Cont'd.:

Pressure check points:

M1	Pump bearing lubrication
M2	Lube oil pressure for pump distr. gear lubrication
M3	Back pressure for cooling system
M4	Return oil chamber pressure
M5	X2-pressure / pilot pressure
M6	Cooler fan drive
M7	X2-pressure / travel house brake
M8	X2-pressure / slew house brake
M9	Air condition compressor drive *
M10	X1-pressure for pump regulation
M11	At the filter of the pump 1, main relief pressure
M12	At the filter of the pump 2, main relief pressure
M13	At the filter of the pump 3, main relief pressure
M14	Case drain oil chamber pressure
M15	Generator drive *
M16	Pilot pressure in front of the remote control
M17	Booom cylinder piston side
M18	----------
M19	Bucket cylinder piston side LBA or bucket cyl. rod end BHA
M20	Clam cylinder rod end LBA or bucket cyl. rod end at BHA
M21	Stick cylinder piston side LBA or rod end at BHA
M22	Stick cylinder piston side LBA or rod end at BHA
M23	Boom cylinder piston side
M24.1 + 2	Pressure at the crawler tensioning cylinder
M25	L.H. slewing
M26	R.H. slewing
M27	For pilot pressure when using the foot brake
M28	
M29	Operating pressure, central lubrication pump *
M30	Operating pressure, ring gear teeth lubrication pump *
M31.1 + 2	Pressure inside crawler tensioning cylinder

* option

Symbols

2276

31) Rectifier bridge	32) Thermal overload limit	33) Phase, 4-wire-system
34) Current transformer	35) Undervoltage relay	36) Junction of conductors
37) Voltage transformer	38) Temperatur relais	39) Junction
40) Circuit interrupter	41) Contactor	42) Terminal
43) Circuit-breaker, three phase	44) Generator (G)-Motor (M)	45) Terminal
46) Thermal overload protection	47) 3-phase-motor	48) Earthing, ground, general
49) Magnetic overcurrent protection	50) 3-phase squirrel cage	51) Plug and socket
52) Slipping motor	53) Fuse with bolted contacts	54) 3-phase squirrel cage induction motor in Star-delta starting
55) Thermal overload relay	56) Two speed motor (tapped windings) (for ex. 8 to 4 poles)	

Cont'd:

9120

(4) Section C/D 1-4 sheet 06

The components have a letter an a number prefix, and these are indentified below in rows A and B.
Components are depicted in a system unique to VDE/IEC (Association of German Electrical Engeneers DIN 40710-40716 and the International Electrical Commission) or to Demag standart.

K43 = Adjustable switching unit RH 31
Gearoil temperature monitoring

B49 = Temperatur sender TH31, gearoil temperature

X2.78 / 79 = Terminal box (strip) X2, terminals 78 + 79

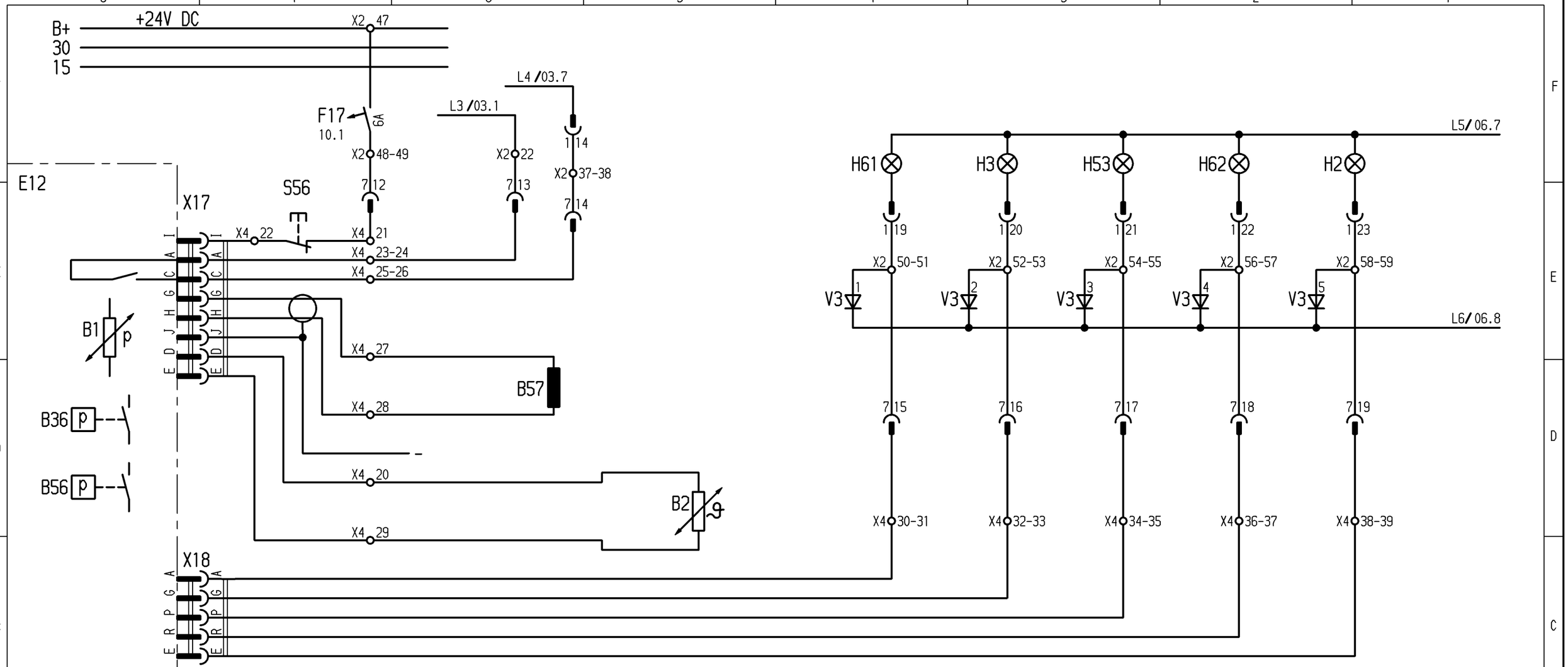
6.13 / 14 = Plug connector 6, Stift 13 + 14

X3.14 / 15 = Terminal box (stip) X3, terminals 14 + 15

Function:

As soon as there is $24V_{DC}$ at terminal 1 + 2 of K43 the contact 6 changes to 5, assumed the gearoil temperature is less than at K43 pre-adjusted.
The actual temperature is monitored by the temperature probe B49. Its resistance between the terminal 3 + 4 varies with the temperature.
As soon as the temperature reaches the pre-adjusted value the relay in K43 is de-energized and its contact 6 changes to 7 thus the monitor light H57 gets GND and the operator gets informed that the gearoil temperature is too high.
After the temperature de-creases the relay in K43 gets energized and interrupts the connection 6 to 7 and the light H57 is off.

continued



Engine Saver

				Drehzahl	Kühlwasser-temperatur	Kurbelwel-lengehäuse-druck	Kühlwasser-druck	Öldruck	
B1	Öldruck	B56	Kühlwasserdruck						
B2	Kühlwassertemperatur	B57	Drehzahlsensor						
B36	Kurbelwellengehäusedruck								

engine saver

				speed sensor	coolant temperature	crankcase pressure	coolant pressure	engine lube oil pressure	
B1	engine lube oil pressure	B56	coolant pressure						
B2	coolant temperature	B57	speed sensor						
B36	crankcase pressure								

	Datum	Name	Wiederholverwendung Typ	Ident-Nr.	F
Bearb.	2-JUL-91	THERMANN	.	.	.
Gepr.	.	.	.	.	.
Abt.:	8122		.	.	.
Norm	.		.	.	.
SIA	Datum	.			

Vordruck f. Schaltpläne | Computererstellte Zeichnung (CAD)

Elektroplan

Bau Nr.: .

KOMATSU MINING GERMANY

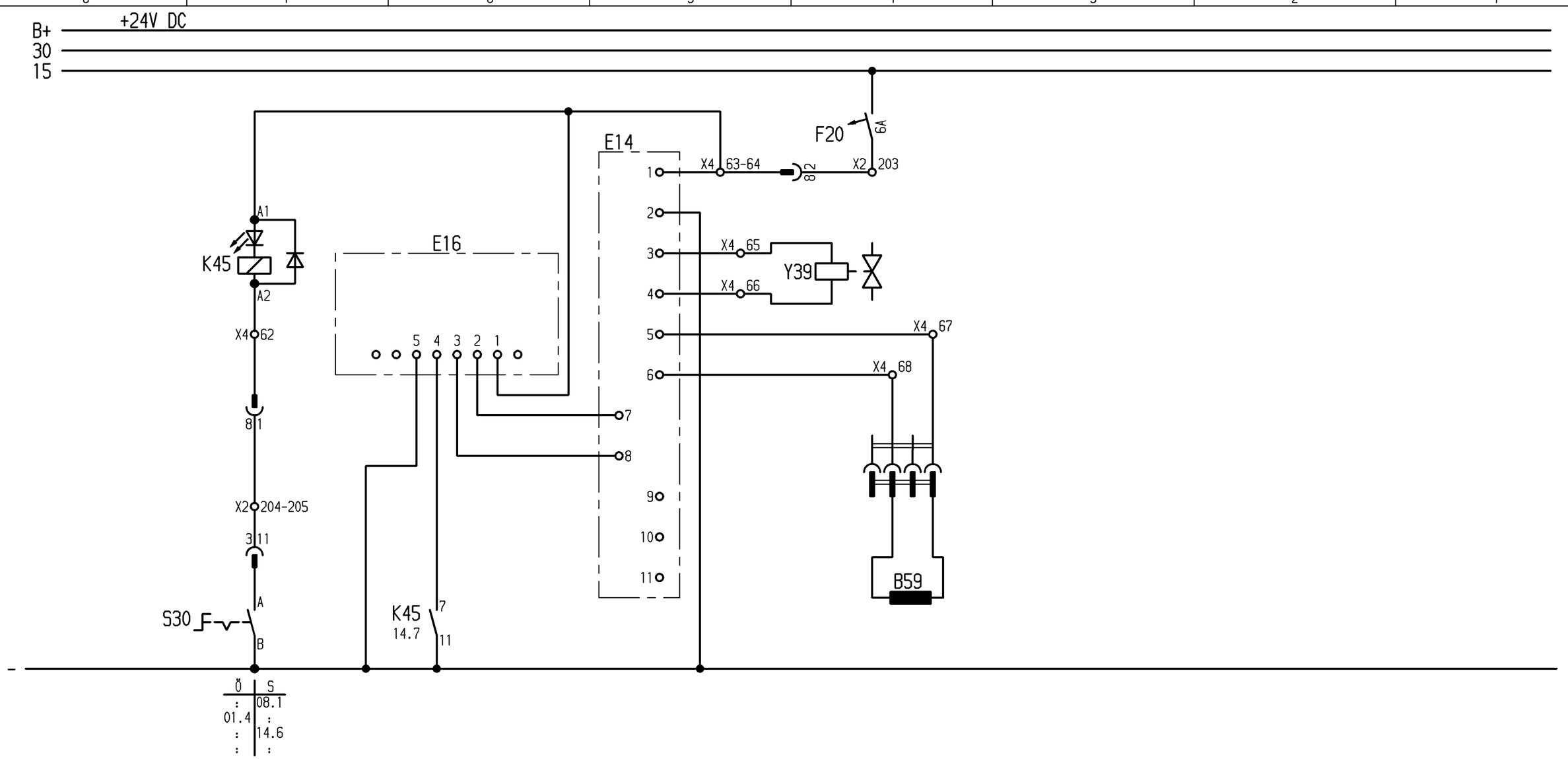
Erstverwendung | Typ H185 | Ident-Nr. . | F .

ÄM-Nr. . | Name . | Datum .

Ident-Nr.: 494 031 40

Format A3 | Blatt/Blätter 04/ .

Entstanden aus: . | Ersatz für: . | Ersetzt durch: .



Drehzahlschaltung				
Hoher Leerlauf	Ramp Generator	Steuergerät	Actuator	Magnetic Pick up
switching off engine rpm				
high idle	ramp generator	control unit	actuator	magnetic pick up

	Datum	Name	Wiederholverwendung Typ	Ident-Nr.	F
Bearb.	2-JUL-91	THERMANN	.	.	.
Gepr.	.	.	.	.	.
Abt.:	8122		.	.	.
Norm	.		.	.	.

Vordruck f. Schaltpläne | Computererstellte Zeichnung (CAD)

Elektroplan

Bau Nr.: .

KOMATSU MINING GERMANY

Baumaschinen

Erstverwendung | Typ H185 | Ident-Nr. . | F .

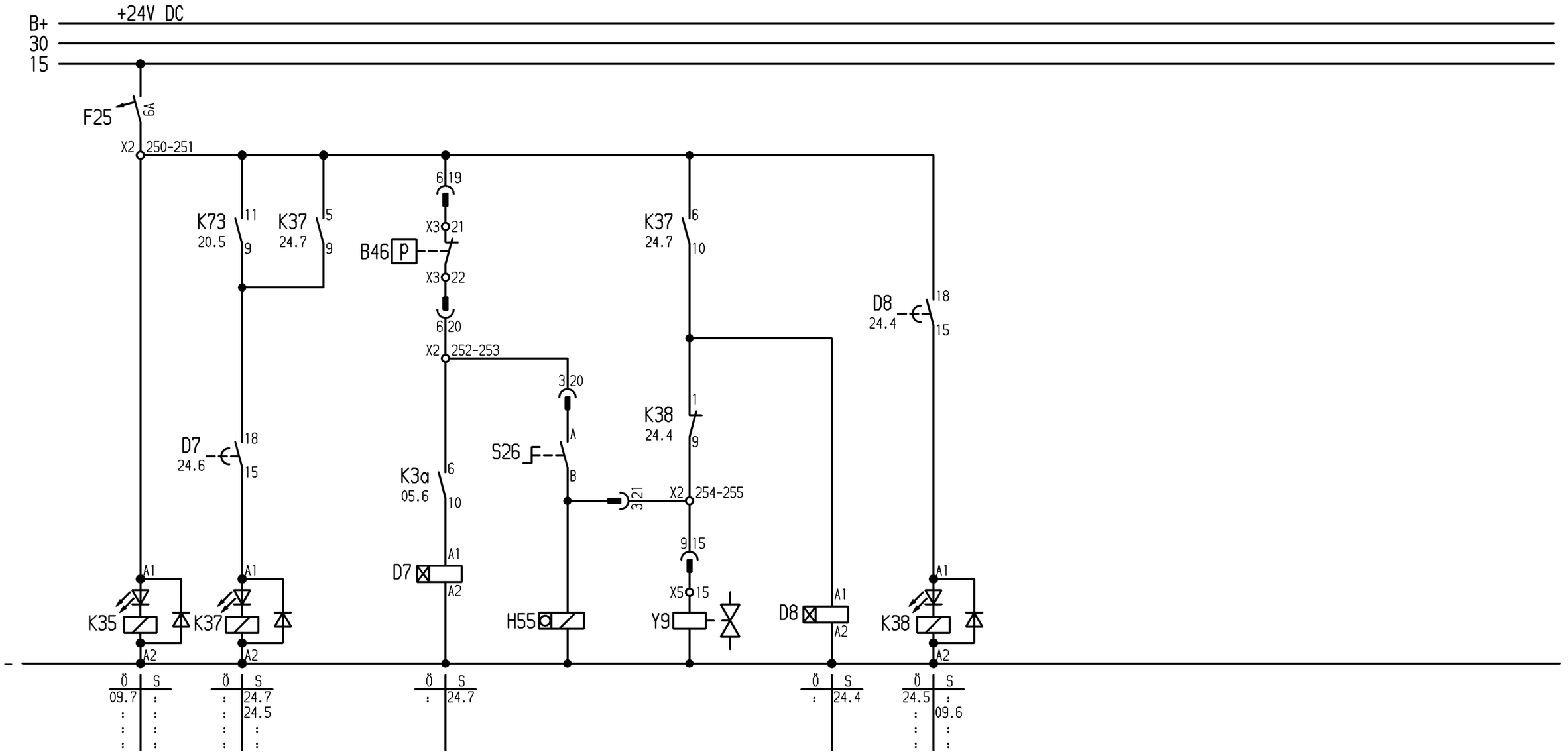
ÄM-Nr. . | Name . | Datum .

Ident-Nr.: 494 031 40

Format A3 | Blatt/Blätter 14/.

Entstanden aus: . | Ersatz für: . | Ersetzt durch: .

SIA | Datum . | 7 | 6 | 5



Drehkranz Sprühanlage

D7 : Grundeinstellung 1-10min
D8 : Grundeinstellung 1-10min

slewring spray system

D7 : basic adjustment 1-10min
D8 : basic adjustment 1-10min

	Datum	Name	Wiederholverwendung Typ	Ident-Nr.	F
Bearb.	2-JUL-91	THERMANN	.	.	.
Gepr.	.	.	.	.	.
Abt.:	8122		.	.	.
Norm	.		.	.	.

Vordruck f. Schaltpläne | Computererstellte Zeichnung (CAD)

Elektroplan

Bau Nr.: .

KOMATSU MINING GERMANY

Erstverwendung	Typ	Ident-Nr.	F
	H185	.	.

ÄM-Nr.	Name	Datum
.	.	.

Ident-Nr.: 494 031 40

Format: A3

Blatt/Blätter: 24/ .

Entstanden aus: .

Ersatz für: .

Ersetzt durch: .

SIA | Datum . | 7 | 6 | 5

Zielbezeichnung Description: Bauteil Component	Zielbezeichnung Description: nächster Klemmpkt. Next Terminal Contact	Steckverbindung Connector	Kabel Cable: Nr. No.	Kabel Cable: Farbe/ Querschn. Colour/ Section	Klemmen-Nr. Terminal-No. X2	Kabel Cable: Farbe/ Querschn. Colour/ Section	Kabel Cable: Nr. No.	Steckverbindung Connector	Zielbezeichnung Description: nächster Klemmpkt. Next Terminal Contact	Zielbezeichnung Description: Bauteil Component
.	S20.B	3.8	.	bl 1	181	bl 1	.	.	K23.2/K24.2/K24a.2	.
.	.	.	.	.	182	bl 2.5	.	.	F7	.
.	.	.	.	.	183	bl 1	.	.	K23.1	.
.	.	.	.	.	184	bl 1	.	.	K23.6	.
.	.	.	.	.	185	bl 1	.	.	K23.11	.
.	h48	3.9	.	bl 2.5	186	bl 1	.	.	K23.3	.
.	.	.	.	.	187	bl 1	.	.	K23.7	.
.	.	.	.	.	188	bl 1	.	.	K23.9	.
.	.	.	.	.	189	bl 2.5	.	.	F7a	.
.	.	.	.	.	190	bl 1	.	.	K24a.1	.
.	.	.	.	.	191	bl 1	.	.	K24a.6	.
.	.	.	.	.	192	bl 1	.	.	K24a.11	.
.	H49	3.10	.	bl 2.5	193	bl 1	.	.	K24a.3	.
.	.	.	.	.	194	bl 1	.	.	K24a.7	.
.	.	.	.	.	195	bl 1	.	.	K24a.9	.
.	.	.	.	.	196	bl 2.5	.	.	F8	.
.	.	.	.	.	197	bl 1	.	.	K24.1	.
.	.	.	.	.	198	bl 1	.	.	K24.6	.
.	.	.	.	.	199	bl 1	.	.	K24.11	.
H50	X7.1	12.1	.	bl 2.5	200	bl 1	.	.	K24.3	.
.	.	.	.	.	201	bl 1	.	.	K24.7	.
.	.	.	.	.	202	bl 1	.	.	K24.9	.
E14/E16/K45	X4.63	8.2	.	bl 1	203	bl 1	.	.	F20	.
K45.A2	X4.62	8.1	.	bl 1	204	.	.	.	.	.
.	S30.A	3.11	.	bl 1	205	.	.	.	.	.
.	.	.	.	.	206	.	.	.	.	.
.	.	.	.	.	207	.	.	.	.	.
.	.	.	.	.	208	bl 2.5	.	.	F26	.
.	.	.	.	.	209	bl 1	.	.	K67.1	.
.	.	.	.	.	210	bl 1	.	.	K67.6	.

Kabelliste
List of Cables

Nr. No.	Typ Type	Einbauort Location	Ident-Nr. Item No.

Farbbezeichnung / Description of Colour

be	beige	/ beige	or	orange	/ orange
bl	blau	/ blue	rs	rosa	/ pink
br	braun	/ brown	rt	rot	/ red
ge	gelb	/ yellow	sw	schwarz	/ black
gn	grün	/ green	vio	violett	/ violet
gr	grau	/ grey	ws	weiß	/ white

	Datum	Name	Wiederholverwendung Typ	Ident-Nr.	F
Bearb.	2-JUL-91	THERMANN	.	.	.
Gepr.	.	.	.	.	.
Abt.:	8122		.	.	.
Norm	.		.	.	.

Vordruck f. Klemmenpläne | Computererstellte Zeichnung (CAD)

Klemme Terminal: X2 | Einbauort Location: Kabinenuntersatz / cab support

Bau Nr.: .

Erstverwendung | Typ: H185 | Ident-Nr.: . | F: . | ÄM-Nr.: . | Name: . | Datum: .

KOMATSU MINING GERMANY

Ident-Nr.: 494 031 40

Format: A3 | Blatt/Blätter: 34/.

Entstanden aus: . | Ersatz für: . | Ersetzt durch: .

Zielbezeichnung Description: Bauteil Component	Zielbezeichnung Description: nächster Klemmpkt. Next Terminal Contact	Steckverbindung Connector	Kabel Cable: Nr. No.	Kabel Cable: Farbe/ Querschn. Colour/ Section	Klemmen-Nr. Terminal-No. X4	Kabel Cable: Farbe/ Querschn. Colour/ Section	Kabel Cable: Nr. No.	Steckverbindung Connector	Zielbezeichnung Description: nächster Klemmpkt. Next Terminal Contact	Zielbezeichnung Description: Bauteil Component
.	R3/G5	.	.	bl 16	1	bl 16	.	.	F1.Ein	.
K44	X2.1-2	.	.	bl 2.5	2	bl 16	.	.	F1.Aus	.
30	X2.3-4	.	.	bl 2.5	3	.	.	.	.	.
.	M1.50a	.	.	bl 2.5	4	bl 6	.	.	K1.87a	.
.	M2.50a	.	.	bl 2.5	5	.	.	.	.	.
.	S3	.	.	bl 2.5	6	bl 6	.	.	K1.30	.
K3.9	X2.17	.	.	bl 1	7	bl 1	.	.	K45.2	.
.	R3.B	.	.	bl 1	8	bl 1	.	.	F10.1	.
.	R3.L	.	.	bl 1	9	bl 1	.	.	F10.2	.
P1.B+	X2.8	.	.	bl 1	10	bl 1	.	.	F10.3	.
P1.L+	X2.10	.	.	bl 1	11	bl 1	.	.	F10.4	.
.	G5.W	.	.	bl 1	12	.	.	.	.	.
.	P7.W	.	.	bl 1	13	.	.	.	.	.
S33a.2	X2.397	.	.	bl 1	14	bl 1	.	.	S33b.1	.
.	Y1	.	.	bl 1	15	bl 1	.	.	S33b.2	.
.	.	.	.	.	16	.	.	.	.	.
.	.	.	.	.	17	.	.	.	.	.
.	.	.	.	.	18	.	.	.	.	.
.	.	.	.	.	19	.	.	.	.	.
.	E12/B2	.	.	bl 1	20	.	.	.	.	.
F17	X2.49	.	.	bl 1	21	bl 1	.	.	S56	.
.	E12	.	.	bl 1	22	bl 1	.	.	S56	.
F12	X2.22	.	.	bl 1	23	.	.	.	.	.
.	E12	.	.	bl 1	24	.	.	.	.	.
S36	X2.38	.	.	bl 1	25	.	.	.	.	.
.	E12	.	.	bl 1	26	.	.	.	.	.
.	E12/B57	.	.	bl 1	27	.	.	.	.	.
.	E12/B57	.	.	bl 1	28	.	.	.	.	.
.	E12/B2	.	.	bl 1	29	.	.	.	.	.
H61	X2.51	.	.	bl 1	30	.	.	.	.	.

Kabelliste
List of Cables

Nr. No.	Typ Type	Einbauort Location	Ident-Nr. Item No.

Farbbezeichnung / Description of Colour

be	beige	/ beige	or	orange	/ orange
bl	blau	/ blue	rs	rosa	/ pink
br	braun	/ brown	rt	rot	/ red
ge	gelb	/ yellow	sw	schwarz	/ black
gn	grün	/ green	vio	violett	/ violet
gr	grau	/ grey	ws	weiß	/ white

	Datum	Name	Wiederholverwendung Typ	Ident-Nr.	F
Bearb.	2-JUL-91	THERMANN	.	.	.
Gepr.	.	.	.	.	.
Abt.:	8122		.	.	.
Norm	.		.	.	.

Vordruck f. Klemmenpläne | Computererstellte Zeichnung (CAD)

Klemme Terminal: X4 | Einbauort Location: Motor engine

Bau Nr.: .

KOMATSU MINING GERMANY Bodmesch Hilden

Erstverwendung | Typ: H185 | Ident-Nr.: . | F: .

ÄM-Nr.: . | Name: . | Datum: .

Ident-Nr.: 494 031 40

Format: A3 | Blatt/Blätter: 44/.

Entstanden aus: . | Ersatz für: . | Ersetzt durch: .

SIA | Datum: . | 7 | 6 | 5