



# **SERVICE - INFORMATIONS**

# **POLAR EMC**

# **EM**

# **SD-P**

# **SD**

This SERVICE-INFORMATION is valid for all POLAR EMC machines

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(§ 15 d. Ges. vom 19. Juli 1901 und § 18 d. Ges. vom 7. Juni 1906)

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# 1. Checking of plugs and other connections

## 1.1 System-type Universal-Mate N Lok

1.1.1 Is number on pin housing plug the same as on the mating plug?

1.1.2 Are pin plug and mating plug correctly seated? The snap on provisions on the female plug housing have to snap over the ones at the pin housing.

1.1.3 Are the individual pins and mating hardware securely snapped into the plug housing?

If by chance some of them can be pulled out, using slight pulling force on the wires, then the little catch should be carefully opened a little more. Thereafter pins and female mating contact should be pushed back all the way into the housing to assure correct seating.

## 1.2 Plug connections on the plug-in cards

1.2.1 Before a machine is to go in operation (after installation is completed) remove all plug-in cards and terminal plug connectors on them individually. Reinsert and connect them again in a careful manner. This will help to clean all contact points and remove any possible build up of corrosion or oxidation from overseas shipment or prolonged storage of the machine.

# 2. Supply voltages

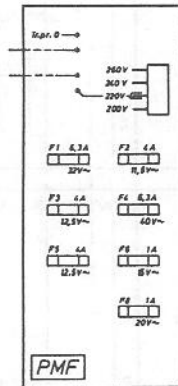
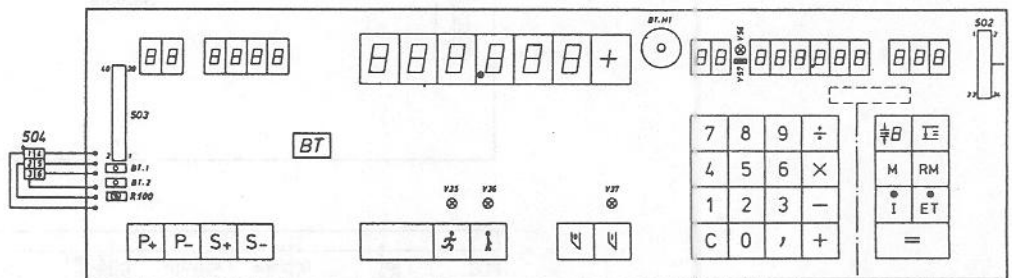
## 2.1 Key-board and display BT:

+ 9 Volt D.C.

Tolerance: 8,4 – 9,6 Volt D.C.

Check Point: Test jacks on (BT-board) left (BT1-2)

Fuse: F2 (PMF)



2.2 Key board BR: + 5 Volt D.C.  
Tolerance: 5,08 – 5,12 Volt D.C.  
Check Point: Test jacks on BR-board computer top (BR1-2)

2.3 CU-Unit: + 5 Volt D.C.  
Tolerance: 5,08 – 5,12 Volt D.C.  
Check Point: Test jacks card PS5 (PS5; 1 and 2)  
Fuse: F1 (PMF)

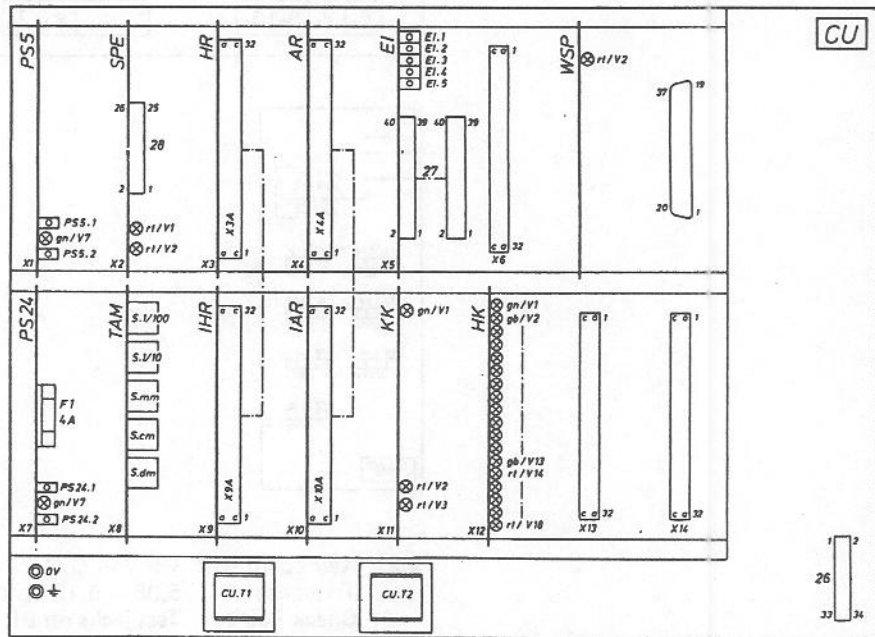
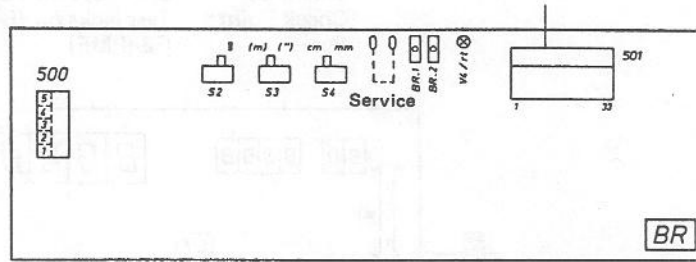
2.4 CU-Unit: + 24 Volt D.C.  
Tolerance: 23,8 – 24,2 Volt D.C.  
Check Point: Test jacks card PS24 (PS24; 1 and 2)  
Fuse: F1 (PMF) and F1 (PS24)

2.5 CU-Unit: + 42 Volt D.C.  
Tolerance: 42 – 58 Volt D.C.  
Check Points: Plug CU1 Pin 8 = 0 Volt, pin 9 = + 42 V  
Fuse: F4 (PMF)

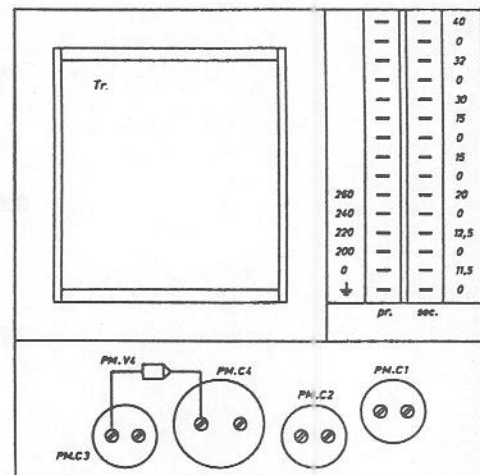
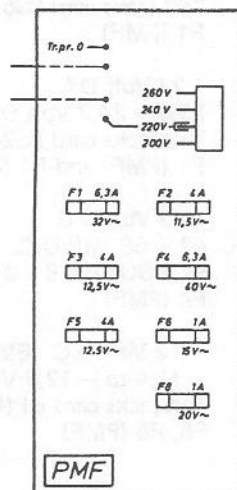
2.6 CU-Unit: - 12 Volt D.C. (EMC, EM)  
Tolerance: - 11,4 to - 12,6 Volt D.C.  
Check Points: Test jacks card EI (EI5 and 1)  
Fuse: F6, F8 (PMF)

- 2.7 CU-Unit: - 30 Volt D.C. EMC, EM  
 Tolerance: - ~~11,4 to - 12,6 Volt D.C.~~ **28,5 to - 31,5 V D.C.**  
 Check Points: Test jacks card EI (EI5 and 2)  
 Fuse: F6, F8 (PMF)
- 2.8 CU-Unit: - 12 Volt D.C. B (EMC, EM)  
 Tolerance: - 11,4 to - 12,6 Volt  
 Check Points: Test jacks card EI (EI5 and 3)  
 Fuse: F6, F8 (PMF)
- 2.9 CU-Unit: - 30 Volt D.C. B (EMC, EM) B = Buffered  
 Tolerance: - 30 to - 34 Volt D.C.  
 Check Points: Test jacks card EI (EI5 and 4)  
 Fuse: F6, F8 (PMF)

If any of these voltages is missing or the tolerance range is being exceeded, check the respective secondary voltages on the control transformers, rectifiers, charging capacitors and voltage stabilizing components.



PM

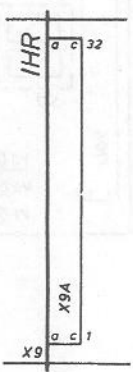
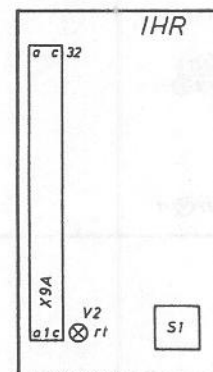
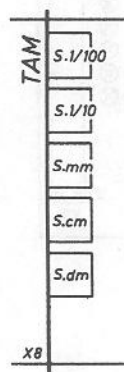
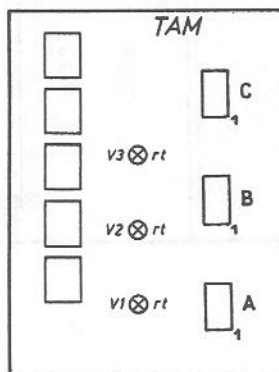
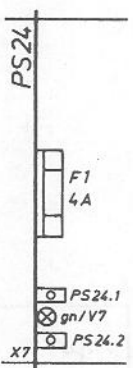
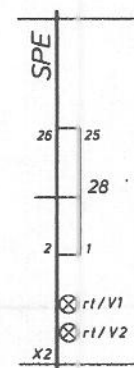
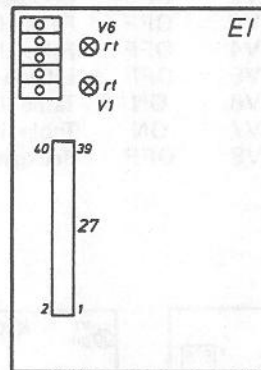
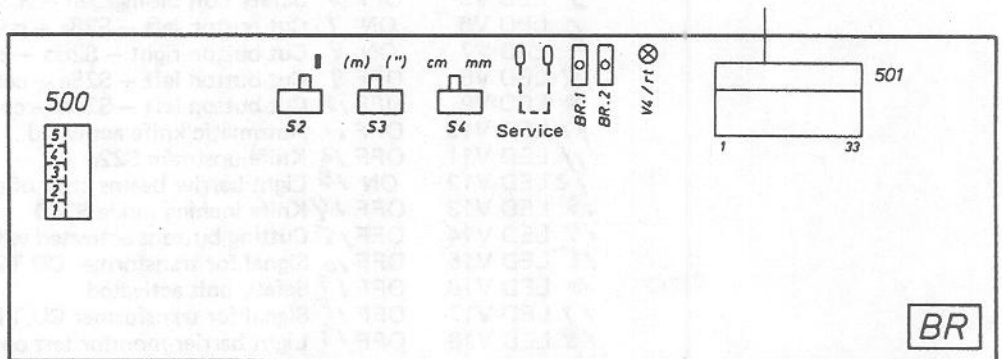


**3. Initial-Basic Condition of light diodes after machine is turned on**

**Position of machine Elements**

all operational devices inactive  
 knife in upper deadend position  
 clamp in upper resting position  
 backgauge not in range of limit switches  
 backgauge movement has not been started yet

	LED	Basic Signal	Function with LED ,on'
3.1 Card BR	LED V4	ON	+ 5,1 V existing for keyboard computer
3.2 Card PS5	LED V7	ON	+ 5,1 V existing for main computer, positioning computer
3.3 Card SPE	LED V1	OFF	Main computer in initial phase (is lit up for approx. 1 sec. after control voltage is turned on)
	LED V2	OFF	error signal in main computer
3.4 Card EI	LED V1	OFF	write or erasing access to the memory bank (is lit up for approx. 0,2 sec. after control voltage is turned on)
	LED V6	OFF	- 12 Volt or - 30 Volt missing
3.5 Card PS 24	LED V7	ON	+ 24 Volt existing
3.6 Card TAM	LED V1	ON or OFF	Flashing during backgauge movement
	LED V2	ON or OFF	Counting forward
	LED V3	OFF	will light up for approx. 0,5 sec. while passing reference point
3.7 Card IHR	LED V2	OFF	Air valve front table Y94a ,ON'



LED Basic Signal Function with LED 'ON'

3.8 Card IAR

LED V1	OFF	Cut buttons activated with in 0,5 sec.
LED V2	OFF	Lightbarrier monitor test completed
LED V3	ON	Safety bolt not activated
LED V4	ON	Gear limit switch S22b tripped
LED V5	ON	Clamp upper position b29 tripped.
LED V6	OFF	Footpedal S309 activated
LED V7	OFF	Forward switch S10 engaged
LED V8	OFF	Reverse switch S14 engaged
LED V9	OFF	Handwheel adjustment S18 engaged
LED V10	OFF	Air switch S89 engaged
LED V12	OFF	Locking valve Y315 activated
LED V19	OFF	+ 24 Volt on transformer CU.T2 – clamping –
LED V23	OFF	+ 24 Volt on transformer CU.T1 – cut –
LED V27	OFF	Air valve Y94 activated

3.9 Card KK

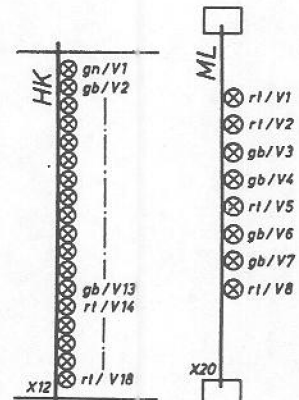
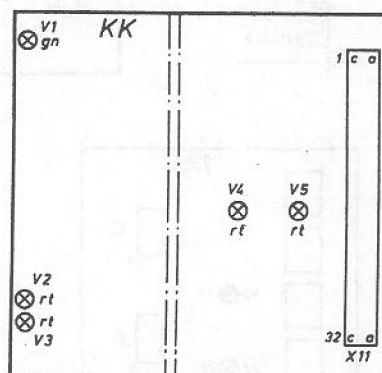
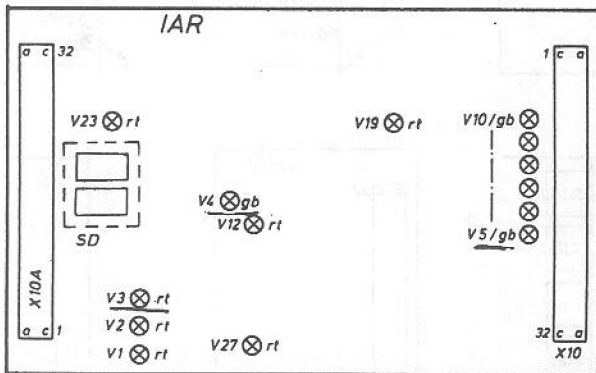
LED V1	ON	+ 12 Volt supply voltage existing
LED V2	OFF	Logic error cutting circuit – logic disagreement –
LED V3	OFF	Logic error cutting circuit – logic disagreement –
LED V4	OFF	Magnetic valve clamping Y27 activated
LED V5	OFF	Magnetic valve cutting Y33 activated

3.10 Card HK

LED V1	ON	– 12 Volt supply voltage existing
LED V2	OFF	Retarding of cutting cycle completed
LED V3	ON	if backgauge position has been displayed
(Cut cycle release) LED V4	OFF	if no backgauge position visible at the display
LED V5	ON	Safety bolt in locking position – S.SBE –
LED V6	OFF	Safety bolt disengaged – S.SBA –
LED V7	ON	Cut button left – S28a – contact normally closed
LED V8	ON	Cut button right – S28b – contact normally
LED V9	OFF	Cut button left – S28a – contact normally open
LED V10	OFF	Cut button right – S28b – contact normally open
LED V11	OFF	Automatic knife activated
LED V12	OFF	Knife upstroke S22a
LED V13	ON	Light barrier beams clear of obstructions
LED V14	OFF	Knife inching mode S340
LED V15	OFF	Cutting buttons activated within 0,5 sec.
LED V16	OFF	Signal for transformer CU.T2 – clamping –
LED V17	OFF	Safety bolt activated
LED V18	OFF	Signal for transformer CU.T1 – cutting –
LED V19	OFF	Light barrier monitor test completed

3.11 Card ML

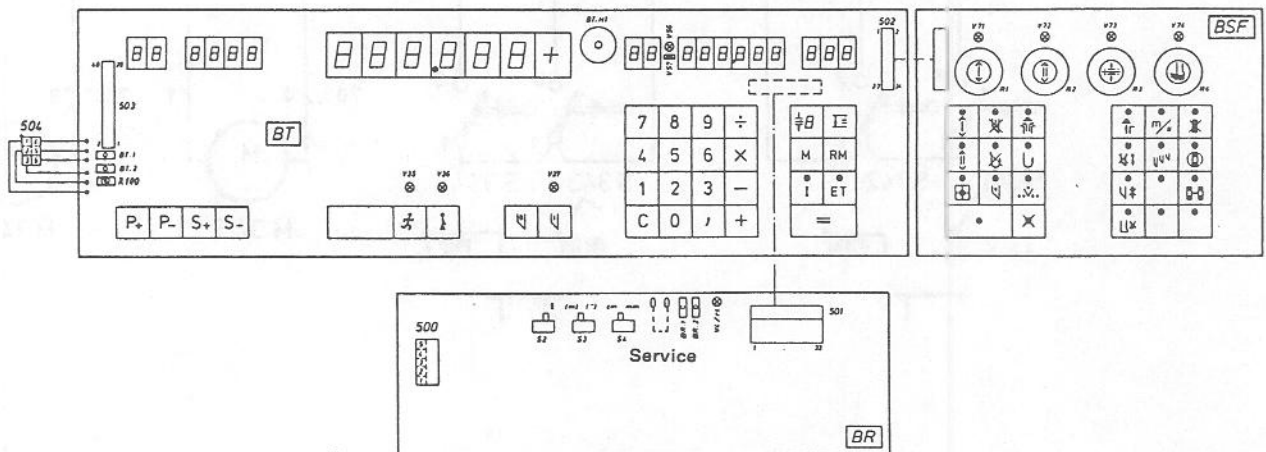
LED V1	OFF	Backgauge motor slow – K11M disenergized
LED V2	OFF	Backgauge motor forward – K15M disenergized
LED V3	OFF	False clamp plate II – S218 activated
LED V4	OFF	False clamp plate I – S6 activated
LED V5	OFF	Lifting solenoid for motorbrake on – Y17 – no brake action
LED V6	ON	Table limit switch front – OFF, if tripped
LED V7	ON	Table limit switch rear S13 – OFF, if tripped
LED V8	OFF	Backgauge motor ON



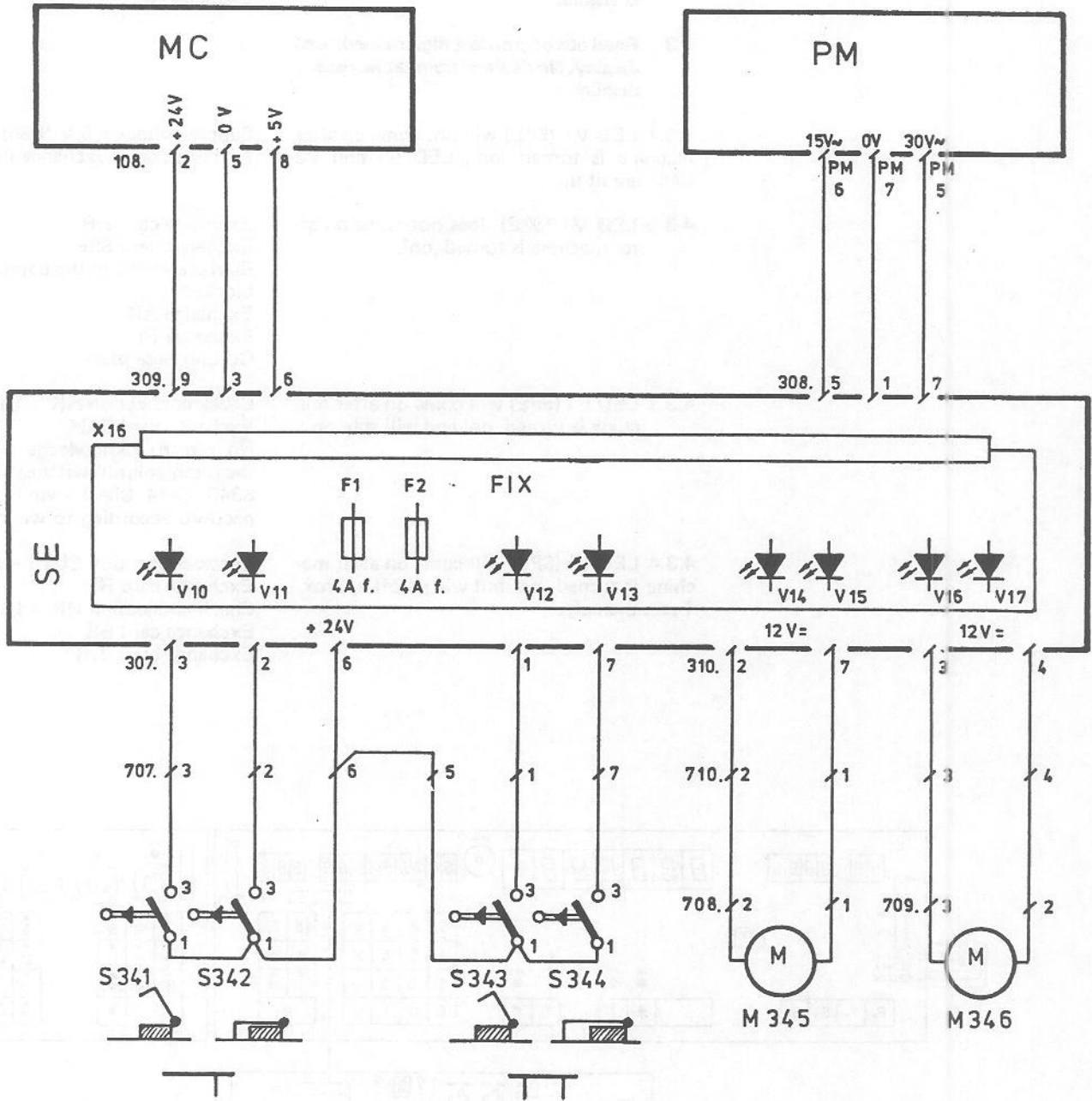
**4. After control voltage is turned on, all machine functions will be blocked**

No measurement displayed at the 'backgauge position display' positioning of backgauge toward the reference point not possible (on EMC, EM)

- |  |  |
|--|--|
| <p><b>4.1 No read out at backgauge position and keyboard displays. No decimal point at backgauge position display.</b></p>   | <p>Control voltage 9 Volt at the BT-board missing (Plug BT 502)</p>  |
| <p><b>4.2 Erroneous figures and symbols on all displays immediately after control voltage is turned on or 0 missing on last digit of keyboard display. Decimal point of backgauge position display is visible.</b></p> | <p>Control voltage + 5 V on computer should be checked.<br/>Check connection BT – BR (Flat wire harness)<br/>Exchange BR<br/>Exchange BT</p>   |
| <p><b>4.3 Read out of 0 on last digit of keyboard display. No decimal point at keyboard display.</b></p>   | <p>Supply voltage + 5 V (PS5) missing<br/>No reset signal, exchange PS5</p>  |
| <p><b>4.3.1 LED V1 (SPE) will not come on after machine is turned 'on', LED V1 and V2 (KK) are lit up.</b></p>   | <p>Exchange card HR<br/>Exchange card SPE<br/>Bus connection of the computer cards blocked<br/>Exchange AR<br/>Exchange EI<br/>CU-unit base plate</p>  |
| <p><b>4.3.2 LED V1 (SPE) does not come on after machine is turned 'on'.</b></p>  | <p>Exchange card HR<br/>Exchange card SPE<br/>Bus connection of the computer cards blocked<br/>Exchange AR<br/>Exchange EI<br/>CU-unit base plate</p>  |
| <p><b>4.3.3 LED V1 (SPE) will come on after machine is turned 'on' and will stay on</b></p>  | <p>Check connection HR – IHR<br/>Exchange card TAM<br/>No return acknowledge signal from the fixomat limit switches S341, S342, S343, S344. Check switches and connections according to wiring diagram</p> |
| <p><b>4.3.4 LED V1 (SPE) will come on after machine is turned 'on' but will go off approx. 1 sec. thereafter</b></p>   | <p>Check connection CU16 – BR500<br/>Exchange card HR<br/>Check connection HR – IHR<br/>Exchange card BR<br/>Exchange card IHR</p>   |



4.3.5 Control diagram: Fixomat



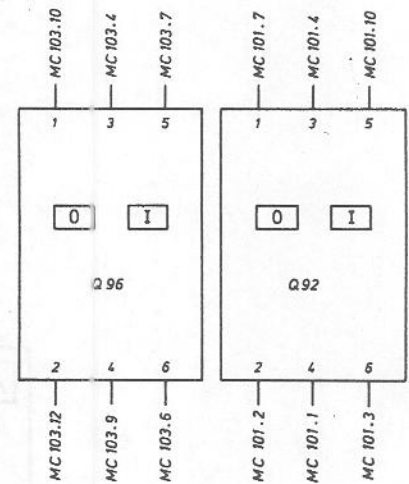
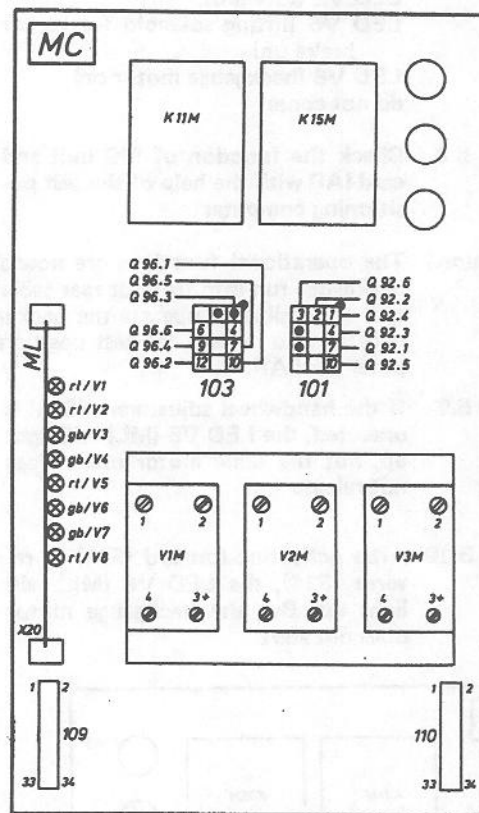
## 5. No Backgauge Movement

### 5.1 Conditions:

Decimal point in keyboard display is lit up  
 No error number read out within the keyboard display  
 Machine is not within a cut cycle (the decimal point in the keyboard display is not flashing)  
 Turn off backgauge automatic and automatic knife  
 Check overload switch Q96 for backgauge motor

### 5.2 In case optional equipment is installed

Turn off transomat 3BL  
 Fixomat in rest position (limit switch S341 and S343 activated)  
 Autotrim table closed (limit switch S364 activated)  
 On machines equipped with backgauge locking devise:  
 Turn off special hydraulic

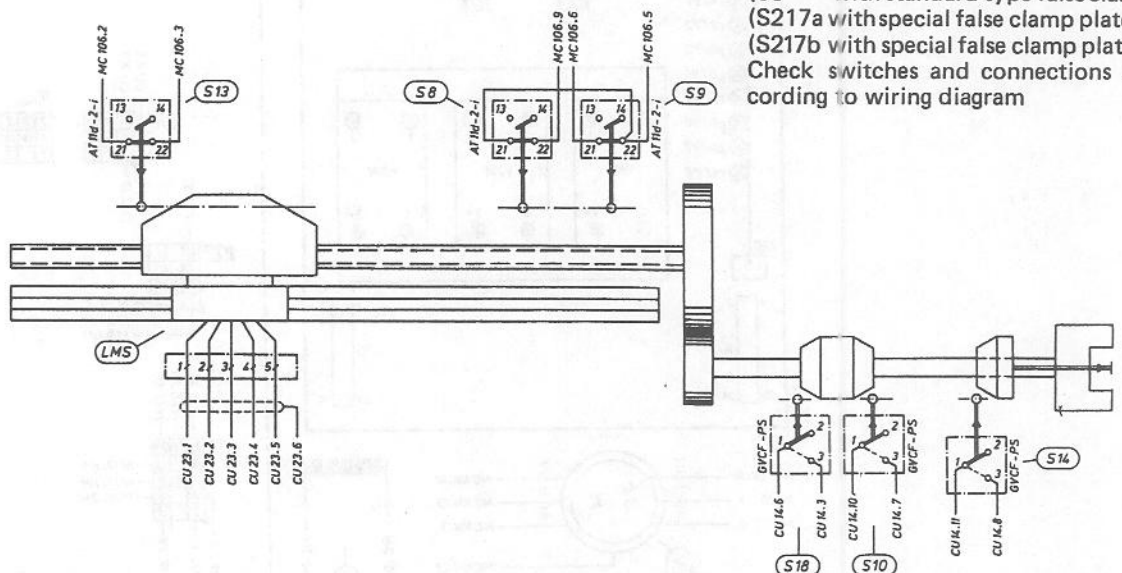


### 5.3 LED V7 (ML) OFF

Table limit switch rear (S13) tripped  
 check limit switch and connections according to wiring diagram

### 5.4 LED V6 (ML) OFF

Table limit switch front tripped (S9 without false clamp plate)  
 (S8 with standard type false clamp)  
 (S217a with special false clamp plate I)  
 (S217b with special false clamp plate II)  
 Check switches and connections according to wiring diagram



5.5 If handwheel for forward motion – S10 – or push button – S14 – for reverse backgauge movement is activated, the LED V7 respectively V8 (IAR) does not come on

Check switch S10, respectively S14 and related connections as per wiring diagram

5.6 If push button – S14 – for reverse is pushed, the light diodes on card ML LED V5 (lifting solenoid for motor brake on) LED V8 (backgauge motor on) do not come on

Machine size recognition on card IHR falsely adjusted  
connection CU 26 – MC 109 should be checked (flat wire harness)  
Check connection CU 2 – MC 108  
Exchange card IAR

5.7 In engaging handwheel S10 for forward motion, the light diodes on card ML LED V2 (forward) LED V5 (lifting solenoid for motor brake on) LED V8 (backgauge motor on) do not come

Check connection CU 26 – MC 109 (flat wire harness)  
Check connection CU 2 – MC 108  
Exchange card IAR

5.8 Check the function of MC unit and card IAR with the help of the test positioning computer

Card AR to be replaced by the test computer  
Connect test display to plug CU8

**Attention!** The operational functions are now similar to a SD-machine. Do not have the backgauge run into front or rear table limit switches.

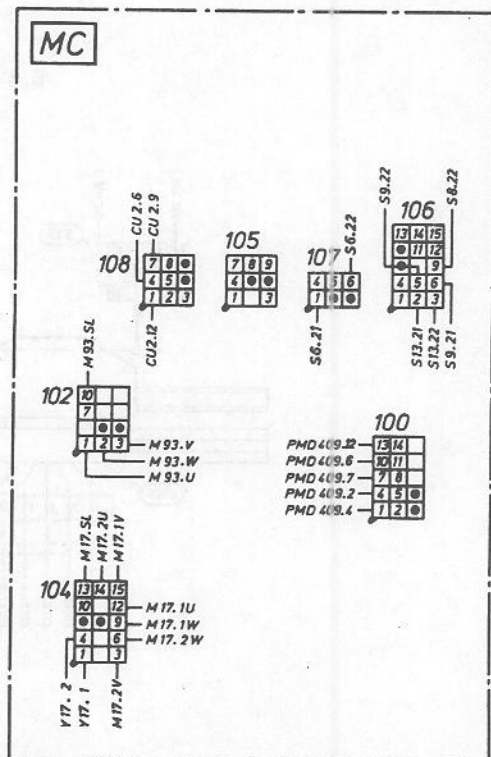
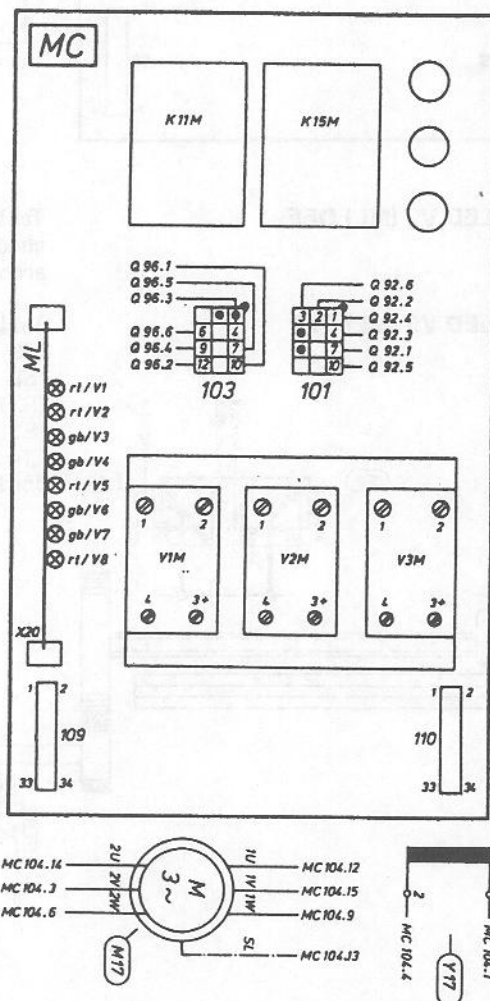
If it is possible to operate the backgauge with the use of handwheel, it will be necessary to replace the test positioning computer by a new positioning computer card AR.

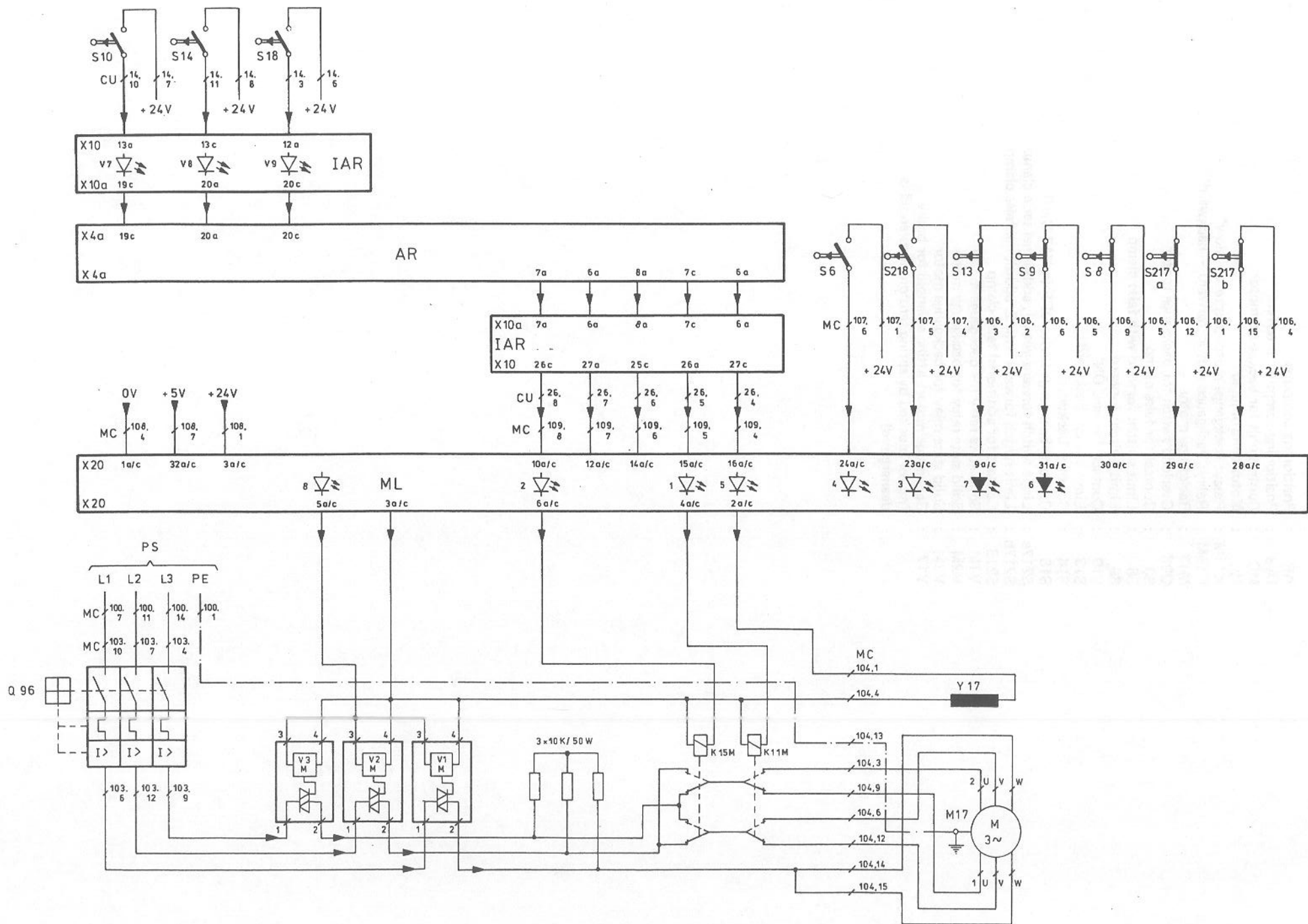
5.9 If the handwheel adjustment (S18) is operated, the LED V5 (ML) will light up, but the table motor brake does not release

Check connection table motor brake (Y17) – plug MC 104  
Brake coil open wire  
Brake system mechanically blocked  
Exchange card ML

5.10 After activating forward (S10) or reverse (S14), the LED V8 (ML) will light up. But the backgauge motor does not start

Interruption within cable to motor or plug MC 104  
Missing power supply on MC-unit  
Solid state relays (V1M, V2M or V3M) do not switch properly  
Exchange card ML  
Check motor





### 5.8.1 Control circuit for backgauge motor and brake

- AR : Positioning computer
- IAR : Positioning computer interface
- MC : Control unit for backgauge motor
- ML : Motor control logic
- K11M : Relay: Backgauge motor ,express – slow'
- K15M : Relay: Backgauge motor ,forward – backward'
- M17 : Backgauge motor
- Q96 : Overload switch for backgauge motor
- S6 : Contact for false clamp
- S8 : Limit switch: forward with false clamp
- S9 : Limit switch: forward
- S10 : Contact ,forward ON'
- S13 : Limit switch: backward
- S14 : Contact: backward
- S18 : Contact: backgauge brake OFF (= Y17 ON!)
- S217a : Limit switch forward with 1. additional false clamp
- S217b : Limit switch forward with 2. additional false clamp
- S218 : Contact for additional false clamp
- V1M : Solid state relay for backgauge motor
- V2M : Solid state relay for backgauge motor
- V3M : Solid state relay for backgauge motor
- Y17 : Backgauge motor: lifting solenoid for brake  
(motor blocked by spring tension, if solenoid is deenergized)

## 6. No Reference Point

### 6.1 Conditions:

While scanning for reference point, backgauge will travel full length of table without stopping at the reference point

### 6.2 The LED V3 (TAM) does not flash when backgauge travels within the middle third of travel length

Check connections and cable between length measuring system and CU-unit  
Exchange card TAM  
Exchange cpl. length measuring system

### 6.3 The LED V3 (TAM) is flashing when backgauge moves within the middle third of travel length. But backgauge does not stop

Exchange card TAM  
Exchange card AR

## 7. Difference between displayed measurement and actual backgauge position

Connect counter monitor to card TAM plug ABC

### 7.1 Measurement displayed at counter monitor differs from actual backgauge position

Check connections between length-measuring system and CU-unit  
Exchange length measuring system  
Exchange card TAM

### 7.2 Difference between display on counter monitor and backgauge position display is more than $\pm 0,1$ mm

Exchange card TAM  
Exchange card AR

## 8. Problems of clamp functions

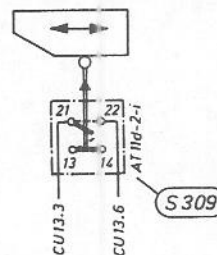
### Conditions:

Machine is not in cutting cycle (decimal point in the keyboard display does not flash)

### 8.1 The clamp will not move downward despite of activating pedal

#### 8.1.1 LED V6 (IAR) — S309 — does not come on when pedal is operated

Check switch S309 and connection according to wiring diagram

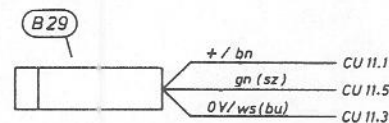


#### 8.1.2 LED V12 (IAR) — locking valve — does not come on when pedal is operated

Check connection AR — IAR (flat wire harness)  
Exchange card IAR  
Exchange card AR

### 8.2 After releasing pedal, the clamp will not return to the upper resting position

Check switch b29 and its connection according to wiring diagram (LED V5 IAR)



### 8.3 After the clamp has returned to the upper resting position, the locking valve is not switched off (LED V12 IAR remains on)

Switch S309 still in closed position  
Switch b29 does not acknowledge the resting position of the clamp

## 9. Problems on function cycle clamping and cutting

### Conditions:

Backgauge position at the digital display  
 Autom. backgauge switched off  
 All special functions switched off  
 Light barrier not interrupted  
 Backgauge motor off

### If so equipped:

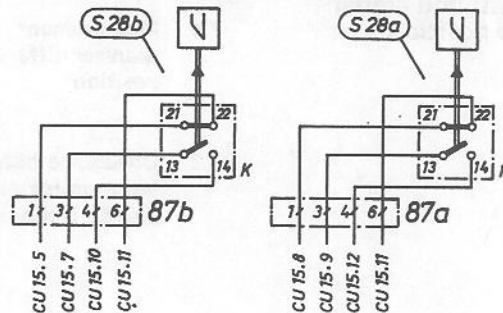
Retractable side gauge in resting position  
 Special hydraulic units not turned on

(In case of an error message at the display, see chapter 11 – error detection signals)

### 9.1 Check contacts of both cut buttons

Check cut buttons and connections according to wiring diagram

Cut button left – normally closed contact – S28a – LED V6 HK  
 Cut button right – normally closed contact – S28b – LED V7 HK  
 Cut button left – normally open contact – S28a – LED V8 HK  
 Cut button right – normally open contact – S28b – LED V9 HK



### 9.2 LED V3 HK does not light up (no release of cut)

Exchange card AR  
 Exchange card HR  
 Exchange card SPE

### 9.3 After activating cut buttons the LED's V14 – V15 HK are lit up but LED V4 or V5 KK do not light up

Cutting circuit transformer CU.T1 or CU.T2 are defect  
 Exchange CU-unit  
 Exchange card KK

### 9.4 After activating cut buttons the LED V4 KK will light up, but the magnetic valve Y27 – clamping – will not close

Check magnetic valve – Y27 – and related connections according to the wiring diagram

### 9.5 After activating cut buttons the LED V5 KK will light up, but the magnetic valve Y33 – cutting – will not close

Check magnetic valve – Y33 – and related connection according to wiring diagram

### Only on machines with electro-magnetic clutch:

Relais K21a and K21b are not energized

Check connection SCU6 – SCU30  
 Exchange card KUP  
 No contact between carbon brushes and conductor rings

### 9.6 Check functions of cards IAR, HK and KK using the test positioning computer

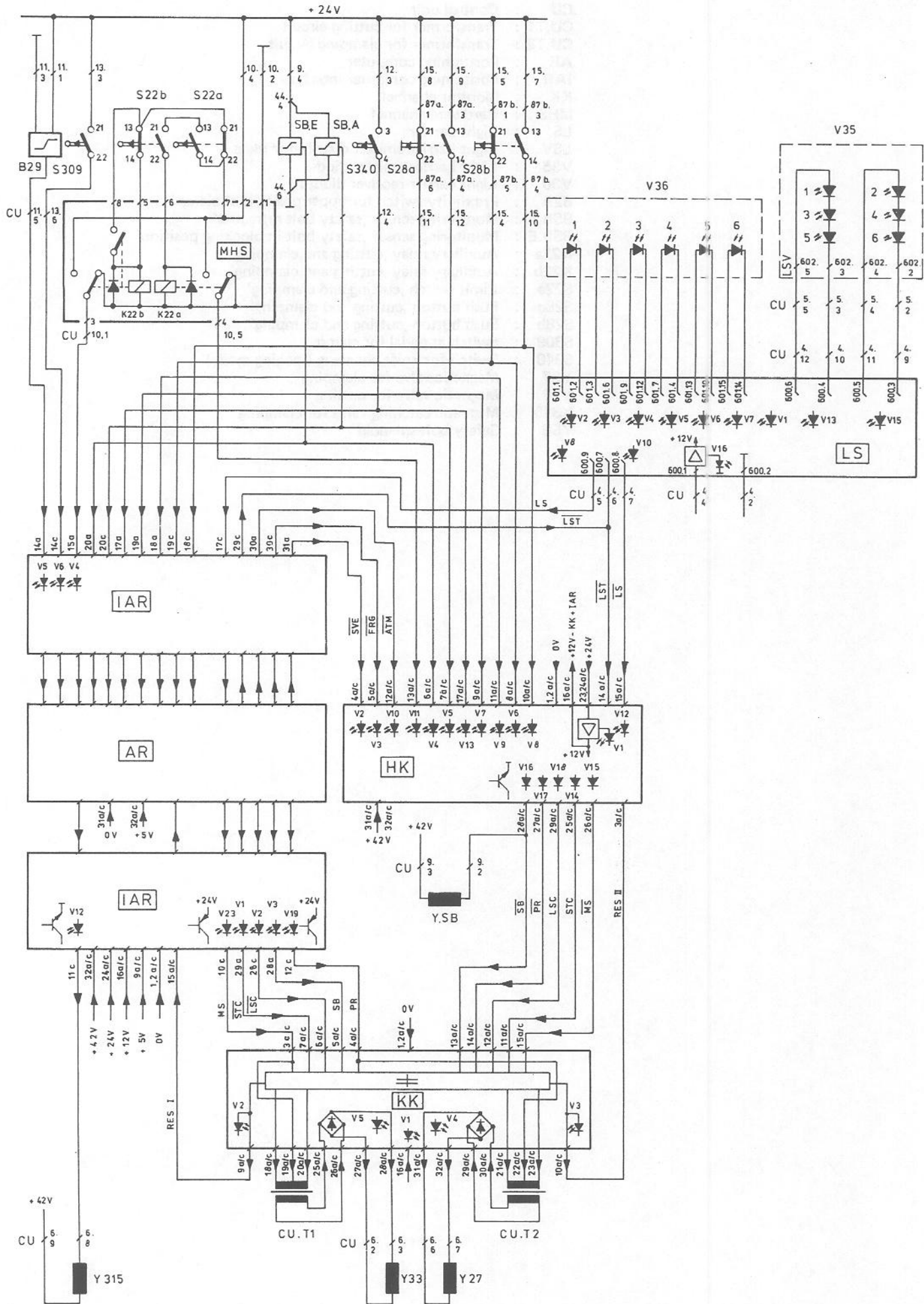
Replace card AR by test positioning computer  
 Test display to be connected to plug CU 8

**Attention!** All operational functions are now similar to the SD-machine, do not run backgauge into the range of front or rear limit switch.

Bring backgauge to scan reference point

If it is now possible, in this position, to operate clamp and knife cycle properly, then a new positioning computer card (AR) should be replacing the test positioning computer

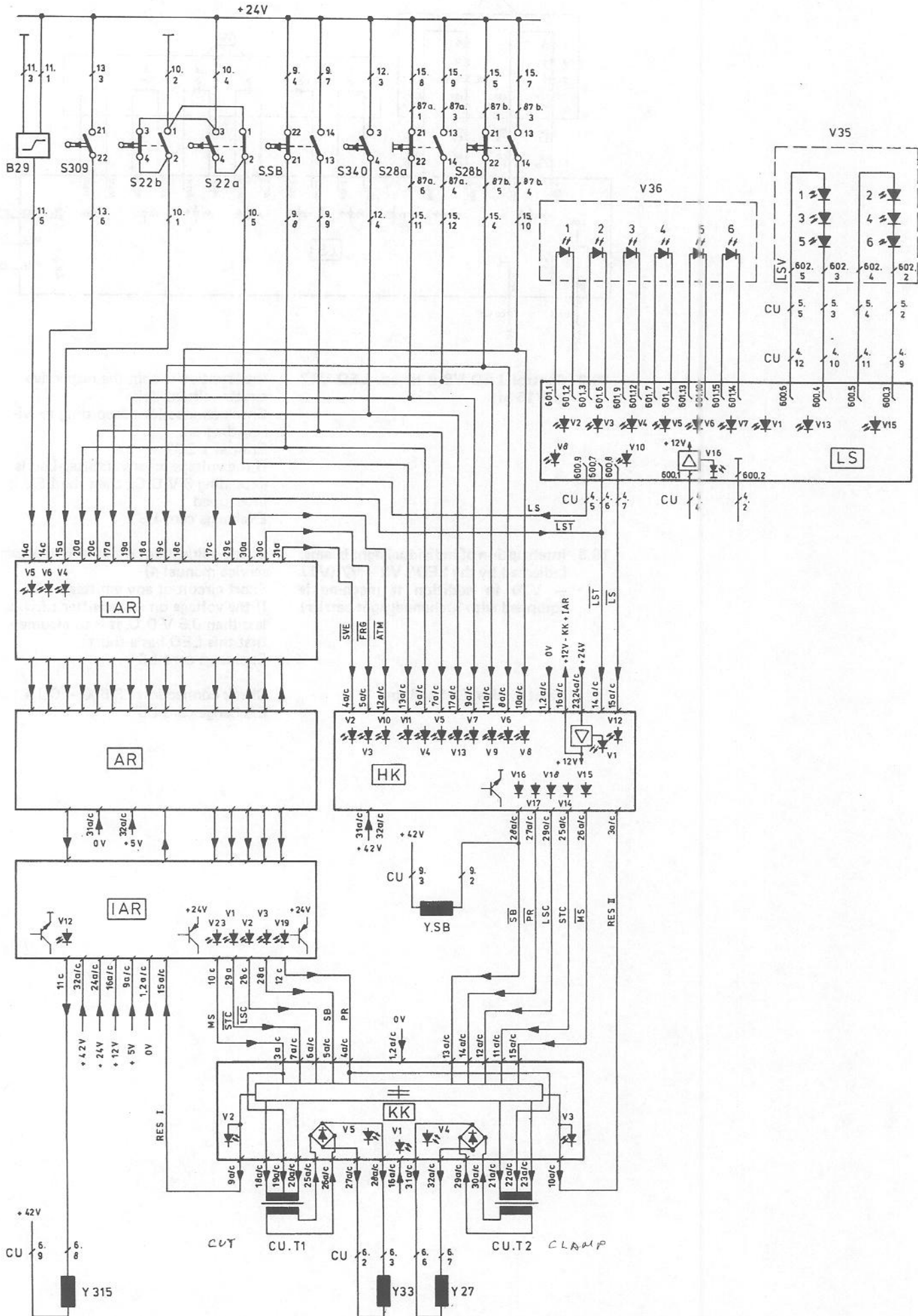
9.3.1 Control diagram for cutting and clamping circuitry EMC, EM, SD-P, SD after mach.-no. 5232530



### 9.3.1 Control circuit for cutting and clamping EMC, EM, SD, SD-P

CU : Control unit  
CU.T1 : Transformer for cutting circuit  
CU.T2 : Transformer for clamping circuit  
AR : Positioning computer  
IAR : Positioning computer interface  
KK : Monitor channel  
MHS : Hardware channel  
LS : Light barrier  
LSV : Light barrier emitter distributor plate  
V35 : Light barrier emitter diodes  
V36 : Light barrier receiver diodes  
B29 : Proximity switch for upper position of clamp  
BSB.A : Monitoring sensor ,safety bolt retracted'  
BSB.E : Monitoring sensor ,safety bolt in blocking position'  
K22a : Auxiliary relay ,cutting and clamping'  
K22b : Auxiliary relay ,cutting and clamping'  
S22a : Limit switch ,cutting and clamping'  
S28a : Push button ,cutting and clamping'  
S28b : Push button ,cutting and clamping'  
S309 : Switch at pedal for clamp  
S340 : Switch for knife changing (inching mode)  
Y27 : Magnetic valve for clamping  
Y33 : Magnetic valve for cutting  
Y315 : Magnetic catching valve for clamping  
YSB : Safety bolt solenoid

9.3.1 Control diagram for cutting and clamping circuitry EMC, EM, SD-P, SD





11. Error detection signals	Meaning:	Remedy:
11.1 Dashes in the digital display program number and storage space (EM, EMC)	The computer control system is recognizing an error with the program memory bank as soon as machine is turned on. The complete data of the memory bank can be erased by activating the key 'Erasing'. If however the same error will appear again, the following should be done:	Check supply voltages on card EI (see chapter 2) Check connection card EI – CU baseplate (flat wire harness) Exchange interchangeable memory bank (WSP) Exchange card EI
Only on 76 EM:	In program no. 0 a special size false clamp plate has been stored, either being smaller than 1,8 cm or larger than 35 cm	See error no. –68–
11.2 Number –02– (EM, EMC)	Error in data exchange between main computer and keyboard computer Main computer signals more than 3 repeat demands	Check connection plug BR 500 – CU16 Exchange card BR Exchange card HR Exchange card SPE
11.3 Number –03– (EM, EMC)	Error in data exchange between main computer and keyboard computer Keyboard computer receives more than 3 erroneous signals	Check connection plug BR 500 – CU16 Exchange card HR Exchange card SPE Exchange card BR
11.4 Number –04– (EM, EMC)	Keyboard computer does not receive acknowledgement from main computer	Check connection plug BR 500 – CU16 Exchange card HR Exchange card SPE Exchange card BR
11.5 Number –05– (EM, EMC)	Error within analog-digital converter of card BR	Exchange card BR
11.6 Number –06–, –08–, –09–, –10– (EM, EMC)	Error in data exchange between keyboard computer and main computer	Check connection plug BR 500 – CU16 Exchange card BR Exchange card HR Exchange card SPE
11.7 Number –39– (only 76 EM, SD)	Preset measurement of reference point is larger than 76 cm or smaller than 7 cm. The erroneous measurement will be shown flashing in the backgauge position display	Set reference point measurement correctly on the card TAM Exchange card AR Exchange card TAM Exchange CU-unit
11.8 Number –49– (only 76 EM, SD)	Error in the cross total of all Eprom data	Check and compare the Eprom-versions of cards AR and KDI for conformity Exchange card KDI Exchange card AR
11.9 Number –57– (only 76 EM, SD)	Error in memory component of card KDI	Exchange card KDI
11.10 Number –58–, –59– (only 76 EM, SD)	Error in memory components of card AR	Exchange card AR
11.11 Number –67– (only EMC)	Fixomat limit switch S341 and S342 or S343 and S344 are activated simultaneously	Check switches and connections according to wiring diagram Exchange card FIX Check connection CU-unit – MC-unit (flat wire harness) Check connection MC-unit – SE-unit (flat wire harness) Exchange card IHR
11.12 Number –68– (only 76 EM)	In program no. 0 the measurement for a special size false clamp plate has been stored, either being smaller than 1,8 cm or larger than 35 cm	Turn off machine. Put to rest special false clamp plate on switch S6. Attach service jumper to card IAR. Turn on machine. Erase complete memory storage by using key 'Program erasing' and key 'Erase' insert correct size of special false clamp plate into program no. 0 of memory bank (see service-manual 4).

11.13 Number -69- (EM, EMC)

Meaning:

During a read - write - or erase-function within the program memory bank a data error was discovered

Remedy:

If dashes are visible within the program number and storage space displays after the machine was turned 'off' and 'on' again see chapter 11.1

If the same problem comes back:  
Check supply voltage on card EI (see chapter 2)  
Check connection between card EI - CU baseplate (flat wire harness)  
Exchange interchangeable memory bank (WSP)  
Exchange card EI

11.14 Number -80- (EM, EMC)

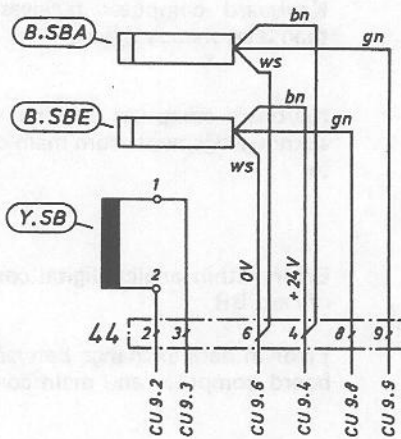
Error in data exchange between main computer and positioning computer

Exchange card AR  
Exchange card HR

11.15 Number -81-

The monitor switch of safety bolt is acknowledging both endstops at the same time

Check switch S.SB  
Check connection S.SB - CU 9  
On machines with proximity switches monitoring the safety bolt:  
Check supply voltage for the switches (plug 44)  
Check connection IAR - AR. (flat wire harness)  
Exchange card IAR  
Exchange card AR



11.16 Number -82-

During activating of locking valve - Y315 - the control transistor on card IAR does not function

Check connection IAR - AR (flat wire harness)  
Exchange card IAR  
Exchange card AR

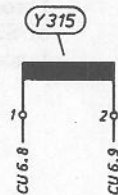
11.17 Number -83-

The light barrier does not react to the test signal before cutting cycle starts with the output condition 'interrupted'

Check adjustment of light barrier (see service manual 4)  
Check connection CU 4 - LS 600  
Check connection IAR - AR (flat wire harness)  
Protect receiver side of light barrier against excessive stray light  
Exchange card LS  
Exchange card IAR  
Exchange card AR

11.18 Number -84-

While locking valve - Y315 - is switched off, the voltage of + 42 V D.C. is missing on the Control line for the locking valve (plug 6.8)



Check supply voltage + 42 V D.C. on locking valve  
Check connection CU 6 - locking valve - Y315  
Check resistance of coil - Y315 - for open circuit  
Check connection IAR - AR  
Exchange card IAR  
Exchange card AR

11.19 Number -85-

During a cutting cycle the control channel (card KK) will register discrepancies more than 3 times at the logic outputs between the 2 cutting circuit channels (hardware channel and positioning computer)

Check basic condition of all light diodes on card HK and IAR  
Check adjustment of limit switches S22a and S22b at the gear box (see service manual 4)  
Check adjustment of light barrier (see service manual 4)  
Exchange card HK  
Exchange card IAR  
Exchange card AR  
Exchange card KK

11.20 Number -86-	Meaning:	Remedy:
	A static discrepancy does exist between the output of both cutting circuit channels (hardware channel and positioning computer )LED V2 and V3 KK are lit up permanently	<p>Check voltage + 42 V on plug CU 9.2 (safety bolt)</p> <p>Check basic conditions of LED's V14 - V18 HK (see chapter 3.10). If one of these LED's is lit up:</p> <p>Exchange card HK</p> <p>Check basic condition of LED's V1 - V3, V19 and V23 IAR (see chapter 3.8). If the basic condition is not in agreement as per chapter 3.8:</p> <p>Exchange card IAR</p> <p>Check connection AR - IAR (flat wire harness)</p> <p>Exchange card AR</p> <p>Exchange card KK</p>
11.21 Number -87-	Normally open and normally closed contact of a cut button are simultaneously closed.	<p>Check buttons S28a and S28b and connections according to wiring diagram</p> <p>Exchange card IAR</p> <p>Check connection AR - IAR (flat wire harness)</p> <p>Exchange card AR</p>
11.22 Number -88-	The safety bolt, without being activated, has left the locking position or is not returning to the locking position within 2 sec. after cutting cycle completion. Knife is not in the uppermost position.	<p>Check safety bolt for mechanical stiffness in its movement</p> <p>Check monitor switch S.SB and connections according to wiring diagram (see chapter 11.15)</p> <p>Exchange card IAR</p>
11.23 Number -89-	The normally open contact of one of the cut buttons is in closed position when the control voltage is turned ,on'	<p>Check cut buttons and connections according to wiring diagram (see chapter 9.1)</p>
11.24 Number -90-	The normally closed contact of one of the cut buttons is not in the closed position	<p>Check cut buttons and connections according to wiring diagram (see chapter 9.1)</p>
11.25 Number -92-	After safety bolt is activated, the unlocked position is not acknowledged within 2 seconds	<p>Check safety bolt for mechanical stiffness in its movement</p> <p>Check monitor switch S.SB and connections according to wiring diagram (see chapter 11.15)</p>

## 12. Summary of Adjustment and Measurement Specification Mechanical

### 12.1 Clutch air gap

Hydraulic clutch (92/115/137/155)  
0,4 – 0,8 mm

Elektro-magnetic clutch (76)

0,2 – 0,4 mm

Inside air gap between drive wheel and brake disc during engaged position 0,2 – 0,4 mm

### 12.2 Motor brake (table drive)

Machine models 76/92/115/137/155 should have inside air brake disk and magnetic coil carrier during engaged position. In the disengaged position the air gap between brake disc and clutch lining is 0,2 mm

Brake on model 92/115/137/155 EMC = 16 Nm, EM = 16 Nm, SD = 8 Nm, brake impuls on model 76 EM = 8 Nm, SD = 4 Nm

### 12.3 Gear play on gear unit (to assure total cutting)

The most max. admissible tooth play for model 76 = 65 mm, 92 = 70 mm, 115 = 100 mm, 137 = 120 mm, 155 = 140 mm measured on the outside diameter of the drive wheel.

### 12.4 Backgauge afterrun

Generally from 0,3 – 0,6 mm

### 12.5 V-belt tension

Correct V-belt tension is present if the belt can be pressed down approx. 10 mm, using modest finger pressure.

## 13. Hydraulic

### 13.1 Motion speed of clamp

92 = 1.2 – 1.3 sec.

115 = 1.7 sec.

135 = 1.7 sec.

155 = 1.9 sec.

### 13.2 Clutch pressure

92 = 65 bar

115 = 70 bar

137 = 70 bar

155 = 90 bar

### 13.3 Clamp pressure on manometer gauge:

76 = min. 18 bar – max. 125 bar

92 = min. 30-32 bar – max. 115 bar

115 = min. 30-32 bar – max. 95 bar

137 = min. 30-32 bar – max. 95 bar

155 = min. 30-32 bar – max. 120 bar

on clamp:

76 = 150 – 2200 daN

92 = 150 – 3000 daN

115 = 200 – 4000 daN

137 = 200 – 4000 daN

155 = 200 – 5600 daN

### 13.4 Safety pressure

On manometer gauge:

92 = 16 bar

115 = 18 bar

137 = 18 bar

155 = 18 bar

On clamp:

50 daN

50 daN

50 daN

50 daN

### 13.5 Switch over pressure

76 = 15 bar

92 = 30-32 bar

115 = 35 bar

137 = 35 bar

155 = 35 bar

### 13.6 Temperature

All pressures should be set and corrected with the operating temperature between 40 – 50°C.

### 13.7 Oil capacity within the pillar frame tank

76	=	6 liter
92	=	17 liter
115, 137, 155	=	33 liter
with lift	=	36 liter
137 and 155		
w. retr. side gauge	=	35 liter
w. lift and retr. side gauge	=	38 liter

### 13.8 Adjustment of clamp pressure

Set min. pressure approx. 2 bar lower on the hydr. control block. After this adjust the minimum pressure according to the pre-tension of the return spring.

## 14. Capacity (pile height)

### Capacity according to pile height

Knife bevel 22° gray card board 2 mm thickness

with models	76 = 110 mm
	92 = 110 mm
	115 = 165 mm
	137 = 165 mm
	155 = 165 mm

#### 14.1 Guiding gibs

Max play 0.05 mm

#### 14.2 Knife carrier

Max. play 0.05 mm, to be checked between knife carrier and frame and between knife carrier and front plate.

#### 14.3 Space between knife and clamp lip

115/127/155 = 0.3 – 0.35 mm ± 0.05  
76/92 = 0.25 – 0.3 mm ± 0.05  
to be checked under full clamp pressure.

#### 14.4 Foot pedal for clamp movement

Model 92/115/137/155  
Upper top position 0.0 – 0.1 mm between adjusting cam and plunger  
Lower bottom position plunger pushed in 8 mm

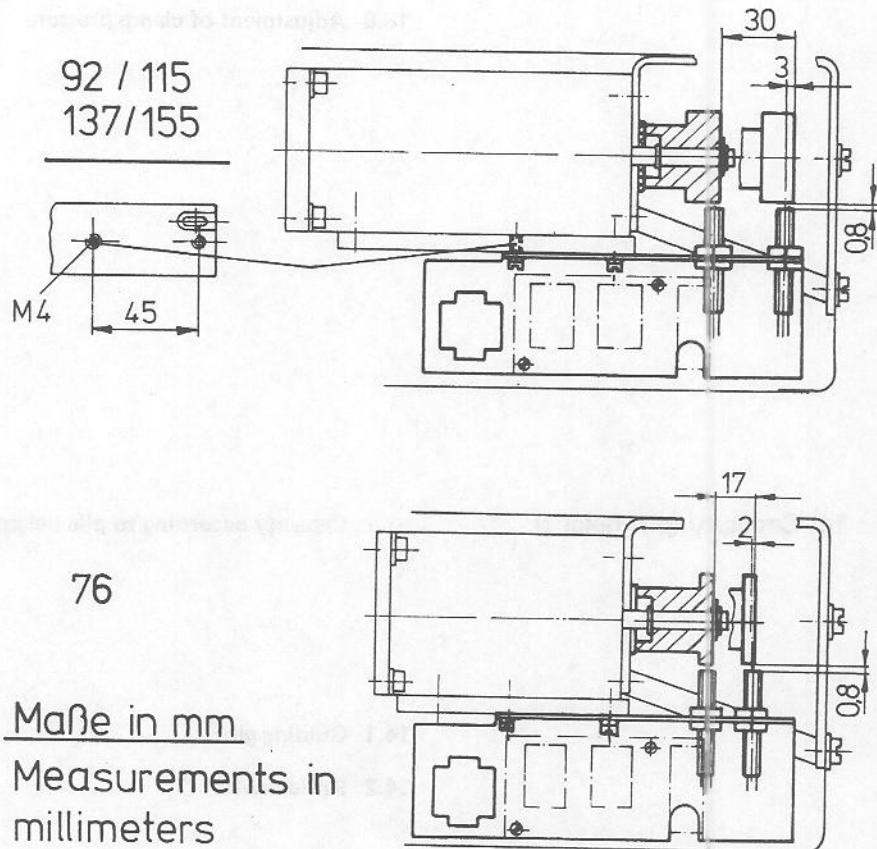
## 15. Proximity Switch on SB

Beginning with series 7/82 model 76 mach.-no. 5261001 all safety bolts have been furnished with 2 approach switches. The full travel way of the approach switch is reached, if the switch cylinder is covering half of the respective switch.

The distance switch cylinder – switch should be adjusted to 0.8 mm.

The same arrangement is furnished to model 115 EMC II beginning with mach.-no. 5232530

Approach switches replacing switches AT 11d 1-i AT



Maße in mm  
Measurements in  
millimeters

## 16. Adjustment Specifications

### Adjustment of reference measurement

Before the reference point is adjusted it is essential that the over-under cut as well as the parallel cut has been accurately established. The adjustment of the reference point will bring the display measurement of the 'is' display in coordination to the exact measurement between back of knife (cutting line) and front part of the backgauge rakes.

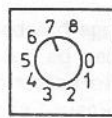
For the purpose of prescanning the reference point a middle value of the total backgauge travel distance is being inserted to the codier switches on the left side of card TAM.

On the model 155 EMC this measurement value is approx. 77.5 cm.  
On the model 115 EMC this measurement value is approx. 57.5 cm.

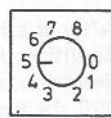
In case that this measurement value had been already inserted previously and only a check or correction should take place then the basic adjustment is not needed anymore.

The final and exact adjustment should be done as follows:

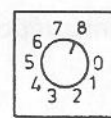
A small pile of min. 3 cm height is to be cut on one side. The backgauge is now to be moved forward to an even measurement, e.g. 10 cm. The second side is then cut after the pile was turned 180° and carefully aligned against the backgauge. The pile is now measured with a pocket calliper for size. The result for instance, let say is 8.358 cm, which means the strip is smaller than the measurement on the digital display. Now the difference between these two values have to be established



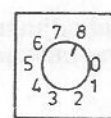
dm



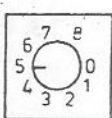
cm



mm



1/10mm



1/100mm

$$\begin{array}{r} 10,000 \text{ cm} \\ - 8,385 \text{ cm} \\ \hline 1,615 \text{ cm} \end{array}$$

Since this measurement value of 1.615 cm represents a smaller strip against the existing display reading the correction has to be made by subtraction of this amount from the setting of the align switches (in case the cutted strip was larger than the display read out, this difference then has to be added to the align switches settings).

$$\begin{array}{r} 77,500 \quad (\text{value setting}) \\ - 1,615 \\ \hline \end{array}$$

75.885 (new value to be set at the codier switches (see picture))

The align switches have to be corrected in such a way that the new value reads 75.885.

After the correction has been made bring backgauge beyond the midway distance in order to read out the new reference point and establish the effectiveness of the correction adjustment.

An additional checking of the measurement by cutting 3 equal strips as suggested in the service handbook 2 should be followed.

During the adjustment and correction of the reference measurement point it is advisable to use only the standard feature to operate the backgauge.

#### Checking mechanical play of table spindle

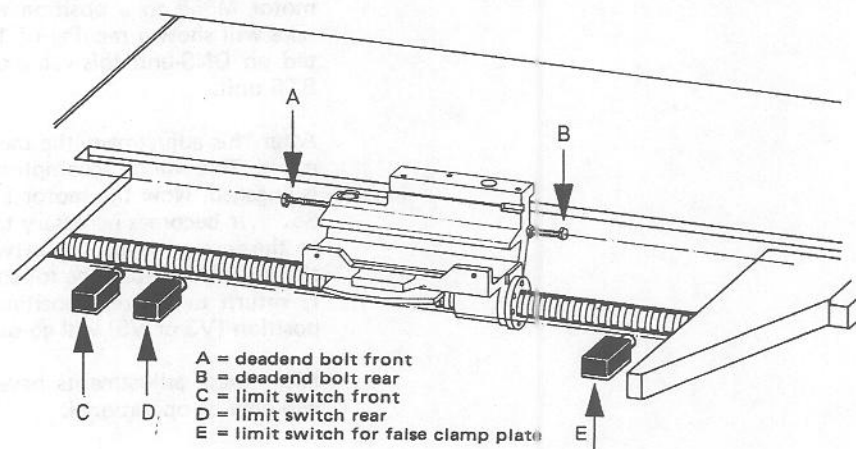
Press in handwheel until clutch engagement takes place. Turn left and right and observe digital display indication of 0.01 mm.

## 17. Table limit switches

### Checking table and false clamp plate limit switches (Safety disconnection) (Basic measurement has to be set accurately)

#### Limit switch and dead stop adjustment on table:

In order to correctly position the limit switches on the table as well as having the proper measurement for the dead end stop bolts on the backgauge sledge for the various models the following chart can be used for this purpose. The respective measurement in metric and inch, could be read off from position display.



Typ	front stop screw A		front limit switch C		front software limit		limit switch for false clamp D		software limit for false clamp		rear software limit		rear limit switch E		rear stop screw B	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
76	16	0,630	18	0,708	18	0,708	68	2,677	70	2,755	760	29,921	771	30,354	772	30,393
92	19,5	0,768	24	0,944	25	0,984	88	3,464	90	3,543	920	36,220	935	36,811	945	37,205
115	19,5	0,768	24	0,944	25	0,984	88	3,464	90	3,543	1150	45,275	1165	45,886	1175	46,259
115 with swivel backgauge	21,5	0,846	24	0,944	25	0,984	88	3,464	90	3,543	1150	45,275	1165	45,886	1175	46,259
137	20	0,787	24	0,944	25	0,984	88	3,464	90	3,543	1370	53,937	1465	57,677	1475	58,070
137 with swivel backgauge	22	0,866	24	0,944	25	0,984	88	3,464	90	3,543	1370	53,937	1465	57,677	1475	58,070
155	29,5	1,116	34	1,338	35	1,378	118	4,645	120	4,724	1550	61,023	1565	61,614	1575	62,008
155 with swivel backgauge	29,5	1,116	34	1,338	35	1,387	118	4,645	120	4,724	1550	61,023	1565	61,614	1575	62,008
155 with 2 mtr. table	29,5	1,116	34	1,338	35	1,387	118	4,645	120	4,724	2000	78,740	2015	79,330	2025	79,724

## 18. Electrical adjustment instruction for tilting backgauge

After the backgauge has been mounted to the table, the electrical adjustment of tilting device can be started. Between backgauge and table an angle of  $90^\circ$  should exist and to be verified using a precise square. In case the angle is over,  $90^\circ$  then the backgauge can be moved with switch S5, which is located on the BTF part and motor M358 to bring the backgauge to a  $90^\circ$  position toward the table. If the angle is under  $90^\circ$ , then the switch S3 and motor M358 is to be used to establish  $90^\circ$  position between backgauge and table. After the  $90^\circ$  position is mechanically assured, the electrical adjustment procedure can be started.

Connect a digital test meter (e.g. model Normatest D 1210) with a range of 20 V— between checkpoint M3 (+) and M5 (—) on the DNS-unit. Use the potentiometer RN, located on the backgauge (unlock same for adjustment purpose) until the test meter shows a reading of 2.15 V. After this voltage reading is established, secure the potentiometer again and make sure during the locking that a value of  $2.90 \text{ V} \pm 0.02$  is retained. Remove test lead from check point M5 (—) and connect same to check point M4. The voltage range on the digital meter should be set to 2 V—. By means of turning potentiometer R44 the equalization between these 2 points should be found. In other words the potentiometer should be turned as long as necessary to get a reading of 0.000 ( $\pm 0.001$ ) on the digital test meter. The switching cam for limit switch S351 is now to be turned until the switch is triggered. The display in the BTF unit having shown before a value of 0.0 will go out and the light diode V4 will come on. Before the full range of the tilting of the backgauge both ways is adjusted and set an indicator should be attached to the center rake of the backgauge and being adjusted to a medium value of approx. 3.0 mm.

In case of turn and tilting backgauge equipment it is essential to select the tilting mode, i.e. the switch S1 should be engaged in order to have the upper portion of the display P1 lit up.

The motor M358 is now to be engaged via the switch S3 until the indicator instrument shows a reading of  $0.5 \text{ mm} \pm 0.02$ . The light diode V3 will come on after the limit switch S351 for the zero position is not engaged any more.

The display on the BTF unit is being adjusted by the potentiometer R42, which is located on the DNS-unit, to a value of 0.5. After this adjustment a mechanical limitation of the backgauge movement is necessary and attained by turning the cam until limit switch S349 is engaged. Now the motor M358 can not be started up any more with switch S3. After the adjustment for one direction is finished the other direction adjustment for tilting can proceed.

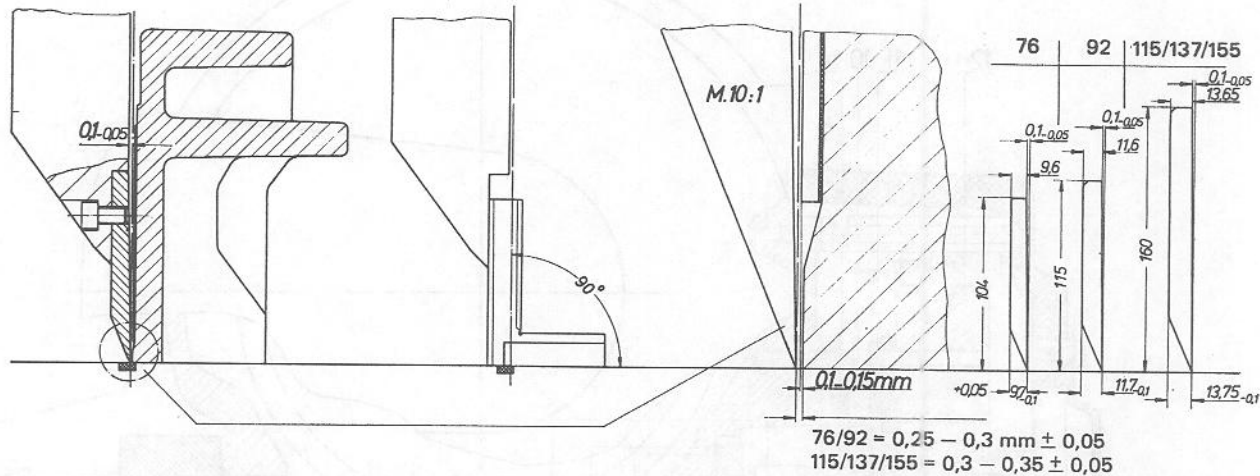
The motor M358 is being controlled by switch S5 bringing the backgauge away from the cam for limit switch S349 via the zero position into the opposite direction. The light diodes will light up in the sequence V3, then V4 and at the end V5. The backgauge is now moved into tilting motion with switch S5 and motor M358 to a position where the indicator instrument on the backgauge rake will show a reading of  $1.7 \text{ mm} \pm 0.02$ . Using the potentiometer R43 located on DNS-unit this value of 1.7 mm is now transferred to the display on the BTF unit.

After this adjustment the mechanical movement of the backgauge has to be limited. This will be accomplished by turning the cam until the limit switch S350 is engaged. Now the motor M358 can not be started up any more with switch S5. It becomes necessary to bring the backgauge from one end limit position to the zero position, i.e. between backgauge and table was a  $90^\circ$  position, then the switch S4 should be touched only once and the backgauge will automatically return to the zero position. The indication display for the individual range position (V3 or V5) will go out and the light diode V4 to come on.

After these adjustments have been properly performed, the tilting backgauge will now be operational.

**19. Cutting and clamping**  
**76, 92, 115, 137, 155**  
**cutting faults (mechanically)**

It is essential to check first the condition of knife, knife carrier and clamp before searching for the source of cutting problems (see illustration)



**19.1 Machine does not cut through pile i. e. the knife becomes stuck in the pile.**

**Meaning:**

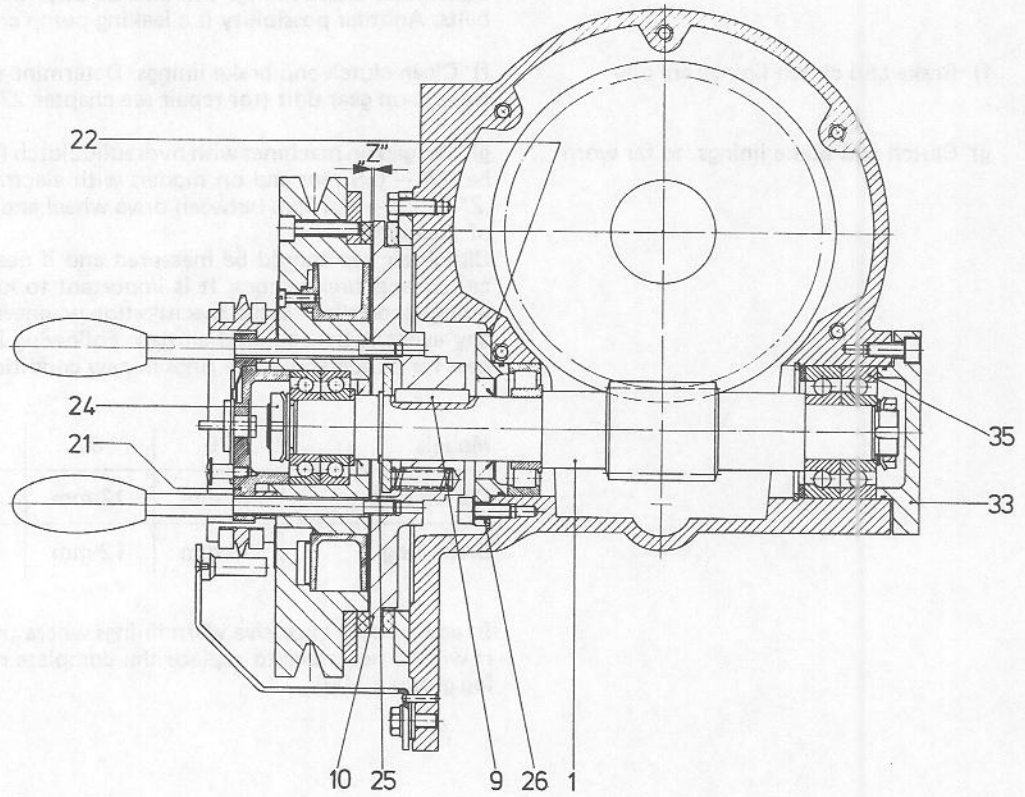
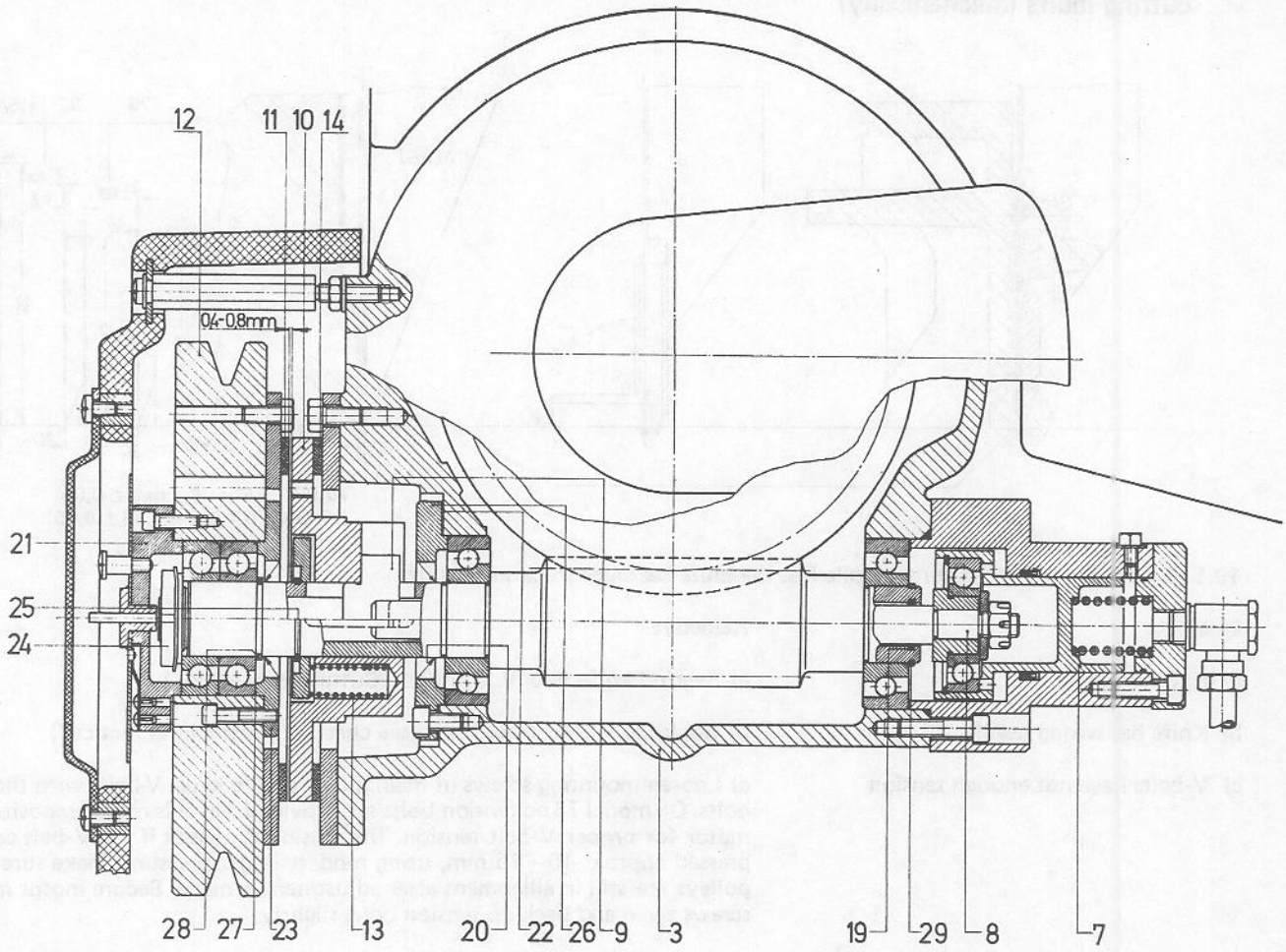
- a) Knife is blunt
- b) Knife has wrong bevel
- c) V-belts have not enough tension
- d) V-belts are worn or frayed
- e) V-belts are oily
- f) Brake and clutch linings are oily
- g) Clutch and brake linings to far worn

**Remedy:**

- a) Regrind knife (see IP 5/76 and „Cutting in Practise“)
- b) Use knife with correct bevel (see chart in „Cutting in Practice“)
- c) Loosen mounting screws of main motor and readjust V-belts with the tension bolts. On model 76 no tension bolts are provided. On this model reposition main motor for proper V-belt tension. The tension is correct if the V-belt can be depressed approx. 10 - 15 mm, using modest finger pressure. Make sure that the pulleys are still in alignment after adjustment is made. Secure motor mounting screws again and back up tension bolts slightly.
- d) Before fitting new V-belts check alignment of pulleys (most often not aligned pulleys are the cause for excessive belt wear). Fit new V-belts and adjust for proper tension (V-belts: see spare parts catalog group 10.01).
- e) It is usually not easy to determine whether V-belts are too oily since the oil is seeping into the belts. However, it is a good practice to replace the V-belts if there is a reason to believe that they are oily. Clean pulleys and search for oil leakage. A possibility is that the gear unit loses oil and if this is the case the clutch and brake linings will also be oily. Caution during oil change, cover V-belts. Another possibility is a leaking pump contributing to oily V-belts.
- f) Clean clutch and brake linings. Determine cause of oil substance. Possible oil leakage on gear unit (for repair see chapter 22.1).
- g) The gap on machines with hydraulic clutch for model 92/115/137/155 should be 0.4 – 0.8 mm and on models with electro-magnetic clutch (76) the air gap „Z“ is 0.2 – 0.4 mm between drive wheel and brake disc in energized condition of the clutch.  
 Clutch air gap should be measured and if needed restored using alu foils under clutch and brake shoes. It is important to keep the total thickness (shoe and lining) according to the specification whenever foils are added. Domineering in any event is the required air gap. Following is a chart of shoe and lining thickness for clutch and brake rings in new condition:

Models	76	92	115	137	155
Clutch ring	13 mm	12 mm	14 mm	15 mm	18,5 mm
Brake ring	13 mm	12 mm	14 mm	15 mm	18.5 mm

In case of very excessive worn linings where the lining thickness is down to 1mm it will be necessary to replace the complete rings (for parts see spare part catalog group 30.00)



**Meaning:**

h) The cutting material is too hard

**Remedy:**

h) Reduce pile height e. g. hard PVC can not be cut in the same pile height as it is possible with normal writing paper. Or card board of 1 mm thickness can be cut even when the allowable pile height is used, but the same card board with a thickness of 3 – 4 mm can not be cut in a high pile.

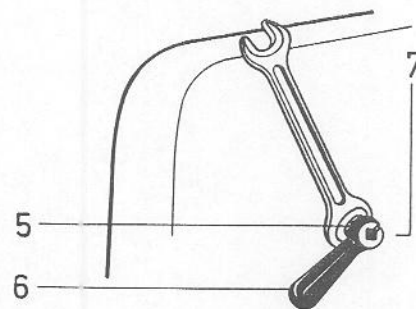
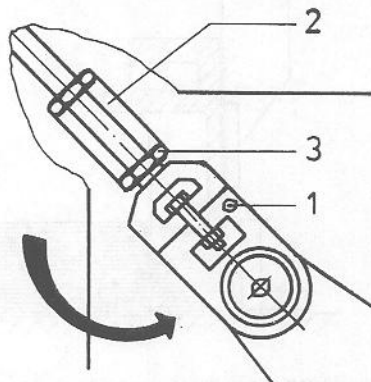
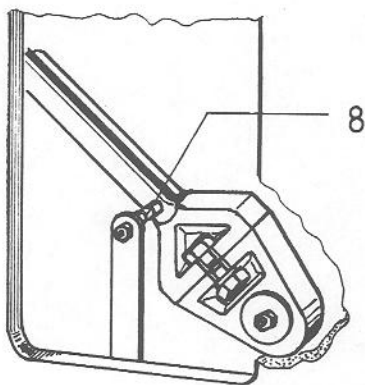
The last bottom sheet is cut only on the left side or not cut thru at all

a) Cutting stick is cut on too deep

Reverse cutting stick or exchange same (see operation manual)

b) Knife is not adjusted parallel to cutting stick

First note the basic position of the left eccentric handle for knife carrier adjustment. The correct position is adjusted as follows: Standing in back of the machine and turning the eccentric handle clockwise will move the knife carrier somewhat up or down. Note the position of the handle when the knife carrier is in the uppermost position. Now turn the handle approx. 90° the same way clockwise. Lock the eccentric bolt now in this zero-position. In order to bring the knife parallel to the table proceed as follows: Remove the lid and inch down the knife to the lower most dead point. Observe the zero-indicator (1). If the knife is not parallel to the table surface, unlock lock nut (5) of the right eccentric bolt (7) on the rear of the frame. Turn the handle (6) until the knife is parallel to the table surface (cutting stick). Secure lock nut (5). Now adjust the knife carrier with the adjusting nut (2) in such a way that the knife will cut a single sheet of paper right thru over the full width of the table. The adjusting nut (2) should then be secured by the lock nuts (3).



On model 76 the procedure is as follows:

Turn pressure retarding all the way toward the stop. Inch knife downwards to the lower dead point. Remove lid and observe marker (8). If the knife is not parallel to the table surface then loosen up lock nut (5) of the eccentric bolt (7) on the rear side of the frame and turn handle (6) until the knife is adjusted properly. Secure lock nut again.

c) Guiding gibs have play

c) If the knife still does not cut thru, especially on the left side, even if the adjustment was made correctly then it has to be assumed that the gibs have excessive play (usually the left guiding gib). Inch down the knife carrier until the knife is approx. 5 mm away from the table. Remove frame cover and check the gap between guiding gib and slot groove by means of a feeler gauge. If the play exceeds 0.05 mm new guiding gibs will be required. Replacement guiding gibs can be furnished in oversizes of 0.2 – 0.3 and 0.4 mm. The replacement guiding gibs should be oversized of about 0.1 mm above the measured play.

Dismantling of the knife carrier:

Take out the knife and bring knife carrier to the upper position. Place wooden blocks left and right of the table supporting the knife carrier and have them projecting about 50 cm in front of the cutting line. Move knife carrier down by hand until resting on the wooden blocks. Disconnect power line to the cutter. Remove frame cover and also on the right side the cover for main switch and cables. Loosen up cable brackets. Pull up cable for false clamp plate limit switch and loose cable to the proximity switch. Remove cover from both light barrier housings unplug cable and put thru opening of frame. Completely dismantle holding block of the pressure regulating device. Sheet metal cover on front frame and main switch to be taken off from bracket remove front frame. Observe location and amount of space foils (make sketch), since they have to get back to the same location later on.

Open the front plate from right to left, but leave the left portion of front plate resting on the frame. Support the right side of front plate to prevent it from falling over. Attention! Please make sure that the wires and cable still on the left side are not pinched during the front plate move. Remove end washer from crank shaft. Insert a pipe or wooden beam of approx. 1 m length into the top opening of the knife carrier. An assistance should stand on the rear table of the machine to support the upright standing knife carrier with the wooden beam or pipe. The knife carrier is now slowly forced away from the frame until it stays clear of the guiding gibs. At this time the knife carrier can be laid down forward onto the wooden blocks. Clean guiding gibs and slots for parallelness, using the old guiding gib and feeler gauges. If necessary file and scrape the slots to

**Meaning:**

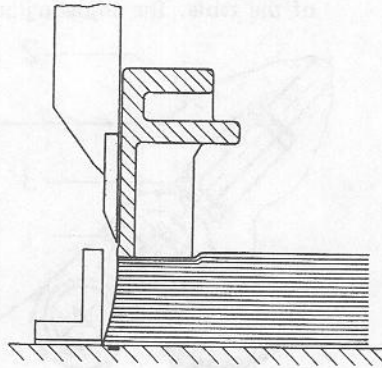
**Remedy:**

make them absolutely parallel. After this the new guiding gib has to be fitted. A feeler gauge of 0.03 mm should not pass thru between gib and slot in order to have a proper gib fitting. Before assembling the guiding gibs apply a liberal amount of Lubral BS 21 or Lithium Multi Purpose Grease NLGI class 2 to these parts. The assembly of all parts has to be done in the reverse procedure to the above dismantling. Do not forget the spacer foils and its proper location. After assembling front plate check the play of the knife carrier. First in the upper position then with the knife carrier in the lower position. In both instances measure with a feeler gauge of 0.05 mm between guiding gib and slot wall as well as knife carrier and frame guiding surface. The feeler gauge should just barely enter the gap.

If necessary add or remove spacer foils to obtain the proper ease of movement. As a final test make a full turn of the knife carrier by hand.

**19.2 Overcut**

(The knife moves forward as it is going thru the pile so that the lower sheets of the pile are longer in size. This is especially true with hard and thin type cutting material)



a) Knife, table or backgauge

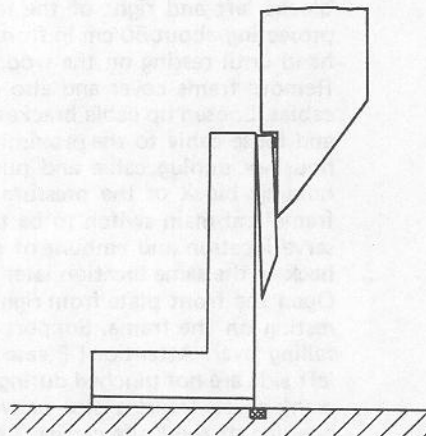
a) Whether knife or table and backgauge is causing the overcut can easily be determined. Take a new cutting stick and make a cutting cycle without any paper to be cut. The cutting stick will be marked by the knife edge. Now load the machine with a pile of art paper approx. 100 mm in height and make a cut. If the cutting stick now receives a second line being in front of the first marking then the knife is the reason for the overcut.

b) Knife is blunt

b) Knife to be sharpened (see IP 5/76 and brochure „Cutting in Practice“)

c) Knife has burrs and is not properly seated in knife carrier

c) Remove burrs by means of a file and clean knife seating area on the knife carrier



**Meaning:**

d) Knife has counter bevel caused by faulty honing

**Remedy:**

d) Regrind knife until counter bevel disappears (see also IP 5/67 and brochure „Cutting in Practice“).



e) Rear of knife is bowed

e) Replace with new knife.



f) Wrong knife bevel

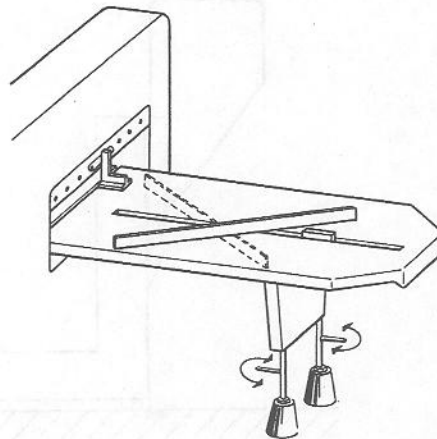
f) Use knife with correct bevel (see brochure „Cutting in Practice“).

g) Clamping pressure too high

g) Readjust pressure on pressure regulating valve.

h) The table is not square to the knife carrier

h) Inch the knife carrier down to the lower dead end position. Use a square or frame water level (side length of 100 mm or 4") against the rear side of the knife carrier and onto the table surface for proper adjustment of the table. Turning the table support stands will move table up or down. Maximum discrepancy on squareness is 0.03 mm.

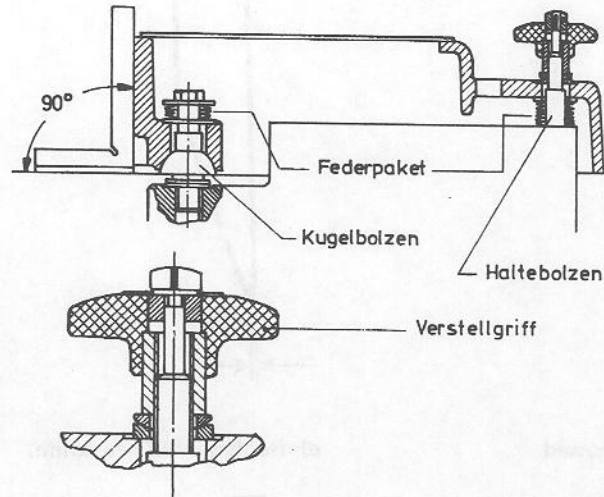


**Meaning:**

i) The backgauge is not square to the table

**Remedy:**

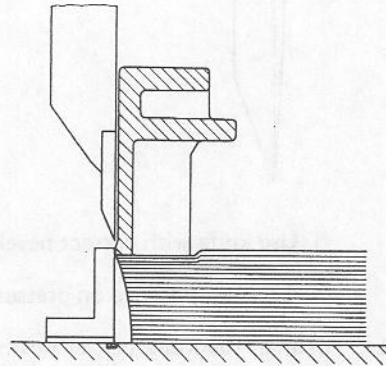
i) Place a square on the table in front of the backgauge. Loosen one of the side locking bolts on the rear of the backgauge as well as the rear top bolt. Turn the adjusting knob until the backgauge is square to the table. Secure the bolts.



k) Knife carriers play

k) Bring knife carrier into upper position and lower position when checking for possible play. A feeler gauge of 0.05 mm should be used for the measurement between knife carrier and frame guiding surface as well as front plate guiding surface. The feeler gauge should just hardly go into these spaces. To restore a correct spacing remove or add spacer foils as needed.

**Undercut**

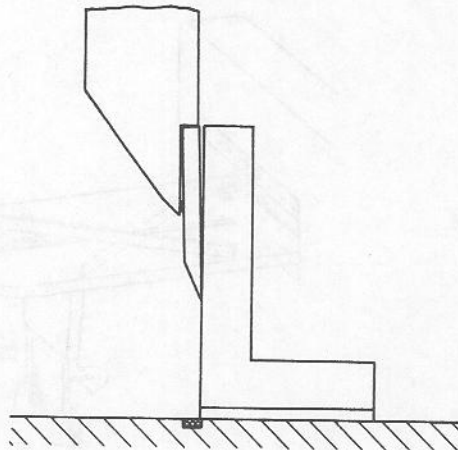


a) Knife is blunt

a) Regrind knife (see IP 5/67 and brochure „Cutting in Practice“)

b) Knife has burrs and is not properly seated in knife carrier

b) File down the burrs and clean surface where the knife is to be mounted against.



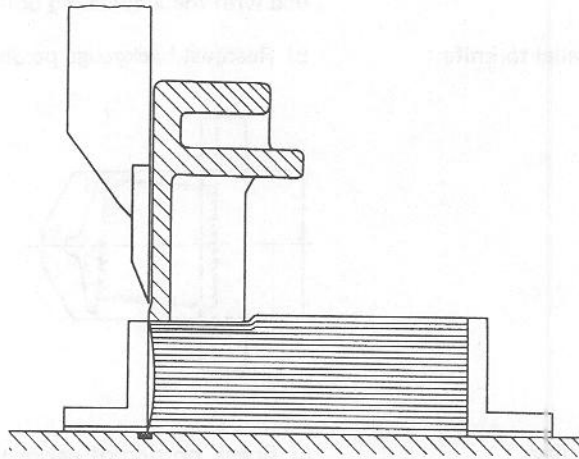
c) Wrong knife bevel

c) Use knife with a correct bevel (see brochure „Cutting in Practice“)

**Meaning:**

**Hollow cutting surface**

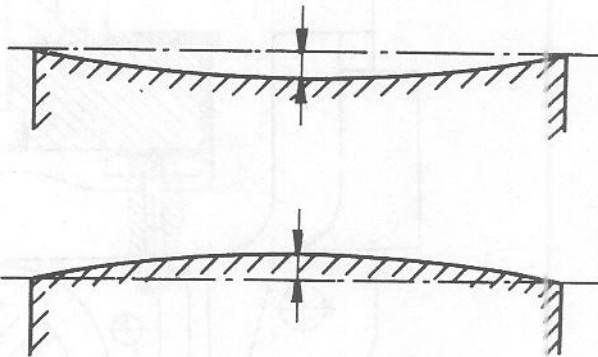
**Remedy:**



- a) Knife bevel too slender
- b) Clamp pressure too low
- c) Incorrect knife seating

- a) Use knife with a wider bevel (see brochure „Cutting in Practice“)
- b) Readjust clamp pressure on regulating valve.
- c) Recheck knife screws for tightness

**19.3 Bow or hollow cut**

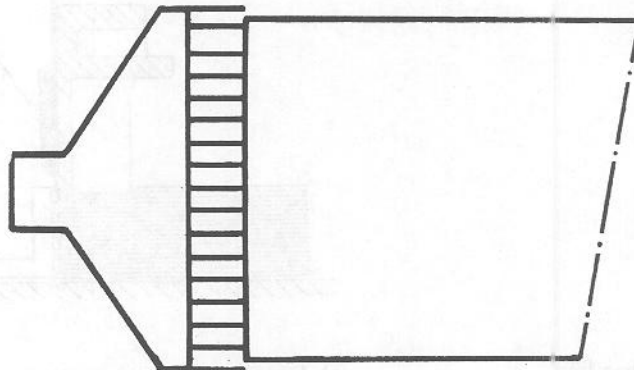


- a) The cutting material is uneven in height
- b) The cutting material is wavy

a) Use of the flex. false clamp plate required. This plate will equalize differences up to 4 mm. If the differences in height are very close together it will be advisable to use strips of felt under neath the false clamp plate or to glue felt directly underneath the clamp at the respective area.

b) The wavy paper is being pushed backwards at the time of clamping and will return after the cut. The result will be a hollow cut. To prevent this problem or reduce it to a minimum only one solution is possible. Reduce the clamping pressure as far down as possible and start trimming the pile from the center.

**19.4 Slanting cut**

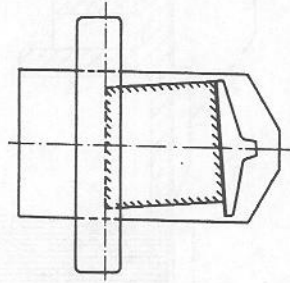


**Meaning:**

- a) Table is not square to the knife carrier
- b) Backgauge not parallel to knife

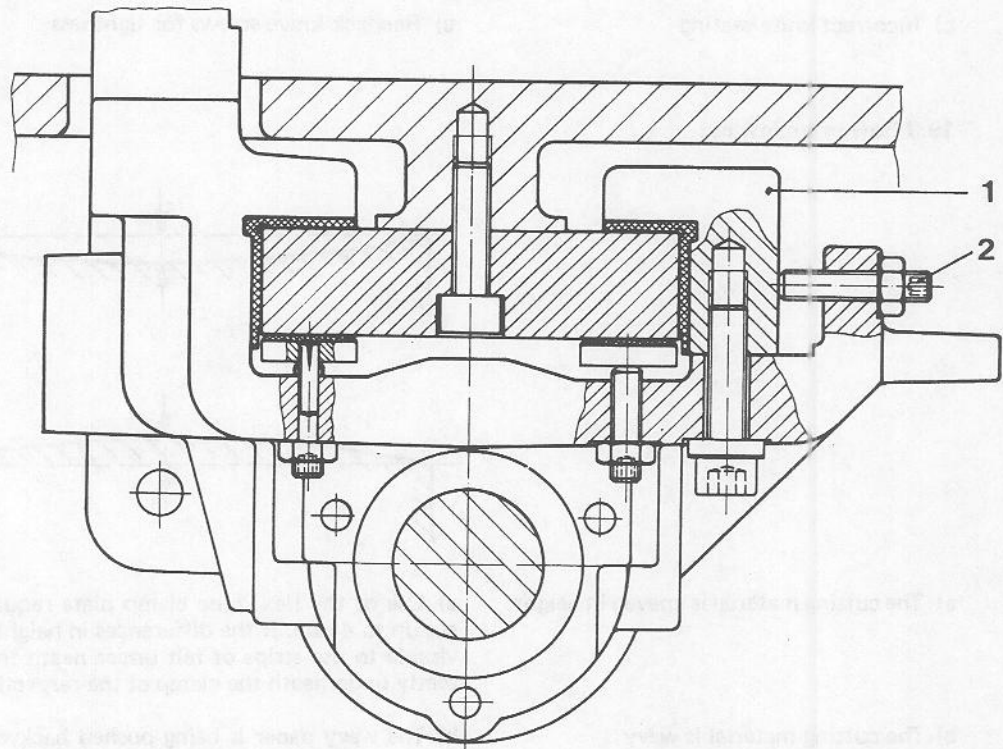
**Remedy:**

- a) On all models a readjustment for squareness of table to cutting line is provided with the 2 adjusting bolts on the frame.
- b) Readjust backgauge parallel to knife.

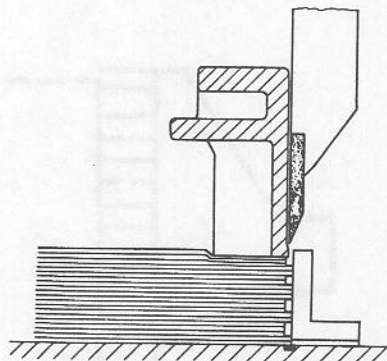


- c) Sledge guiding has play

- c) Check on side of backgauge whether the backgauge has excessive play forward or reverse. Adjust side ledge (1) by means of screws (2) to take out play. Also check contact area of adjusting screws (2) for proper seating. The sledge unit has to be adjusted for easy movement but without play.



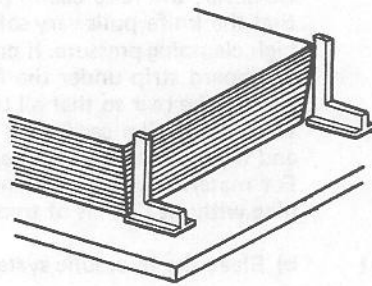
**19.5 Stepped cuts**



- a) Clamp pressure too low
- b) Unsuitable knife bevel

- a) Increase clamping pressure.
- b) Use knife with correct knife bevel (see brochure „Cutting in Practice“)

**19.6 Warped cutting surface**



a) Differences in pile height causing unequal clamping

a) Flexible false clamp plate

b) Knife has burrs or is seated improperly in knife carrier

b) File away burrs and clean area where knife is to be seated.

**19.7 Notched cutting surface**

a) Knife bevel to slender

a) Replace with knife having wider bevel (see brochure „Cutting in Practice“).

b) Knife steel to hard (when cutting hard material the knife made of hard steel has the tendency to break out)

b) Use normal type knife

c) Foreign matter in cutting material

c) Exchange knife and check cutting material.

**19.8 Rough and fused together cutting surface or cut thru of last sheets with a bang**

a) Knife blunt

a) Exchange knife and cutting stick

**19.9 Cut surface is shiny and dark on some spots**

a) Knife blunt

a) Exchange knife and cutting stick

b) Knife is ground crowned

b) Replace with new knife.

c) Knife has burrs and is improperly seated in knife carrier

c) File away burrs on knife and clean knife area on the knife carrier.

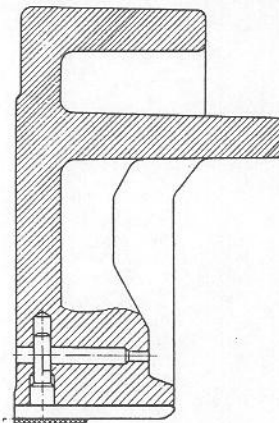
d) Knife has counter bevel as a result from wrong honing

d) Re grind bevel of knife until counter bevel has been removed (see also IP 5/67 and brochure „Cutting in Practice“).

**19.10 The knife is pulling sheets out from under the clamp**

a) The cutting material is soft and spongy

a) Because of the high air volume of the soft material the clamping pressure has to be set at the higher range, in order to get the air out of the pile and to prevent the knife from pulling. To prevent the fingers of the clamp from leaving impressions on the material it is advisable to use the false clamp plate.



**Meaning:**

**Remedy:**

However, the false clamp plate reduces the surface pressure and it can happen that the knife pulls very soft cutting material from under the clamp despite of a high clamping pressure. If problems like this should occur glue a 4 – 5 mm thick cardboard strip under the front third of the false clamp plate slanting the strip toward the rear so that all the pressure is actually at the very area where the cut takes place. The cardboard should protrude a little from the false clamp plate and will be cut off at the very first cutting cycle.

For material with a soft and spongy character the optional equipment „Clamping without Cut“ is of tremendous help to press the air out of the pile.

b) Clamping pressure build up is retardet

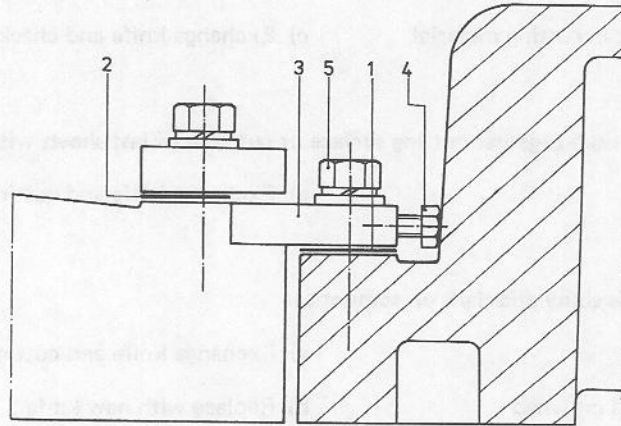
b) Bleed the hydraulic system (see chapter 21.2)

c) Space between knife carrier

c) Check space between knife carrier and clamp during full clamping pressure having a pile of paper under the clamp. Remove V-belts from drive pulley and run machine with hydr. pump belt only. Bring knife carrier down to height of clamp by means of the 2 clutch T-handles. Have the assistant press the cutting buttons for the check procedure.

The admissible space:  $76/92 = 0.25 - 0.3 \text{ mm} \pm 0.05$   
 $115/137/155 = 0.3 - 0.35 \text{ mm} \pm 0.05$  (see picture point 19)

If the space is found to be too large spacer foils (1) have to be removed in order to restor the correct spacing.



## 20 Knife and clamp

### 20.1 Knife carrier is running against guiding gibs at the top

#### Meaning:

- a) The connecting rod has been wrongly adjusted

#### Remedy:

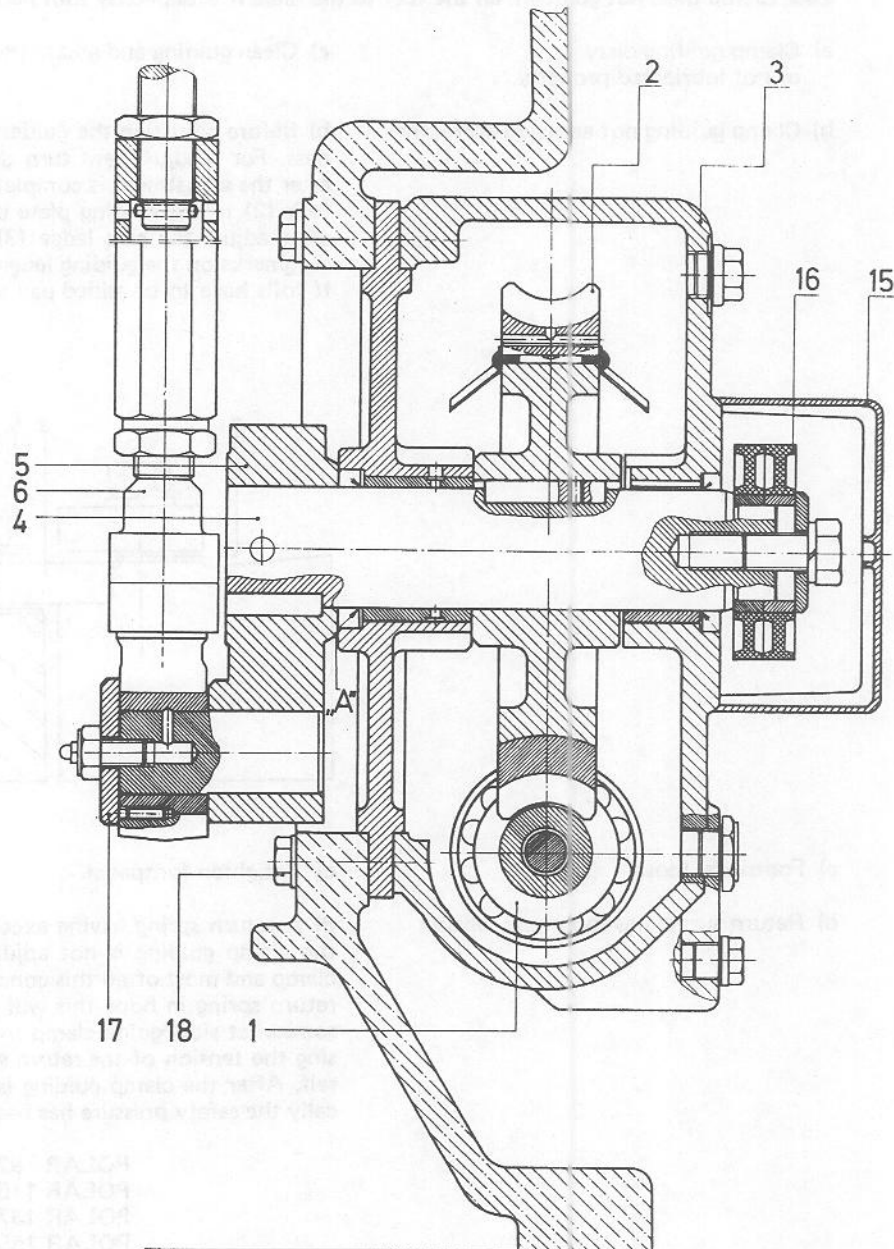
a) If the connecting rod had been screwed out too far the possibility exists that the knife barrier is running against the left guiding gib when coming to the top position. The following damages can occur:

Bending of connecting rod, bending of crank shaft, burring of the left side guiding gib or bending of the excentric bolt.

An exact investigation is absolutely necessary to prevent further damage to vital parts. Check and measure alignment between crank arm (5) and gear lid at position „A“ (see picture) in upper most position of knife as well as knife in lowest position.

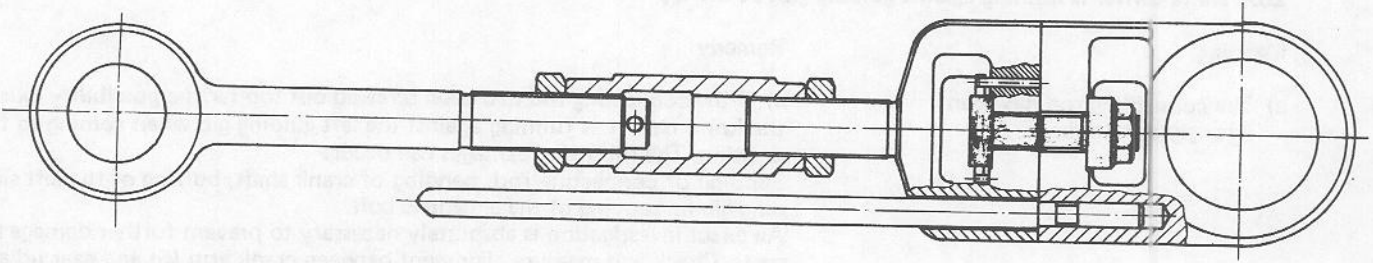
If there is a difference of more than 0.1 mm the crank shaft is bent and the gear has to be exchanged. The exchange of the crank shaft (4) can be done by qualified personnel of any POLAR agency if a hydraulic press is available. In all other cases the crank shaft has to be exchanged at our factory.

If a crank shaft is bent it also will be necessary to exchange the guiding gibs since these parts most likely have become damaged and this may lead to a seizing of the gibs. If the shear pins are breaking for no apparent reason then it can be assumed that a bent crank shaft is the cause. Removal of guiding gibs and knife carrier see under point 19.1. The connecting rod can be removed without dismantling of the front plate. The connecting rod bolts have inside thread and can be removed after the safety plates are taken off.



Meaning:

Remedy:



During repair work it is necessary to bring the turnbuckle onto the lower connecting rod part (exception on 92) as per specification

POALR 92 = 2 turns to upper part  
POLAR 115 = 4 turns to lower part  
POLAR 137 = 4 turns to lower part  
POLAR 155 = 1.5 turns to lower part

After the adjustment it will be necessary to bring the knife carrier up to the upper dead point in order to check the free movement of the right excentric bolt.

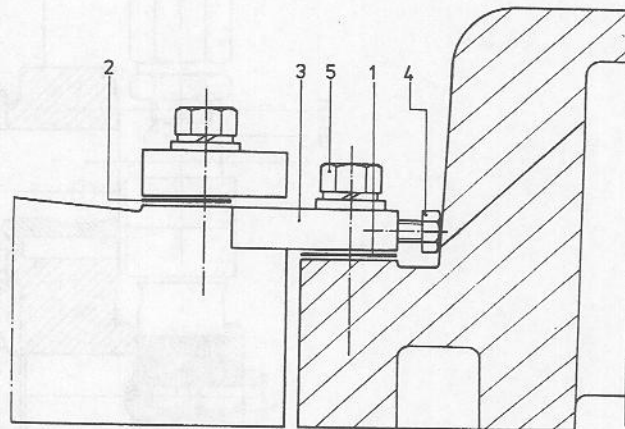
### 20.2 Clamp does not go down all the way to the table if actuated by foot pedal

a) Clamp guiding dirty or not lubricated properly

a) Clean guiding and grease (see operating manual)

b) Clamp guiding not adjusted correctly

b) Before adjusting the guides bring clamp to the table and check for parallelness. For readjustment turn the excentric bolts in the clamp and secure same after the adjustment is completed. If the guiding of the clamp is still to stiff add foils (2) to the guiding plate until the clamp moves freely without play. Thereafter adjust the side ledge (3) with the adjusting screw (4). Pay attention to dragmarks on the guiding ledge (3) after tightening the screws (5). If foils have to be added pay attention to the air gap between knife and clamp.



c) Footpedal loose

c) Retighten footpedal.

d) Return spring has too much tension

d) A return spring having excessive tension is usually the reason to believe that the clamp guiding is not adjusted properly and holding back the descending clamp and most often this condition is worsened by giving more tension to the return spring in hope this will let the clamp go down faster. In case there is a somewhat slow going clamp movement check first the clamp guiding by releasing the tension of the return spring and free up any stiffness on the guiding itself. After the clamp guiding is mechanically in proper condition and hydraulically the safety pressure has been checked out on

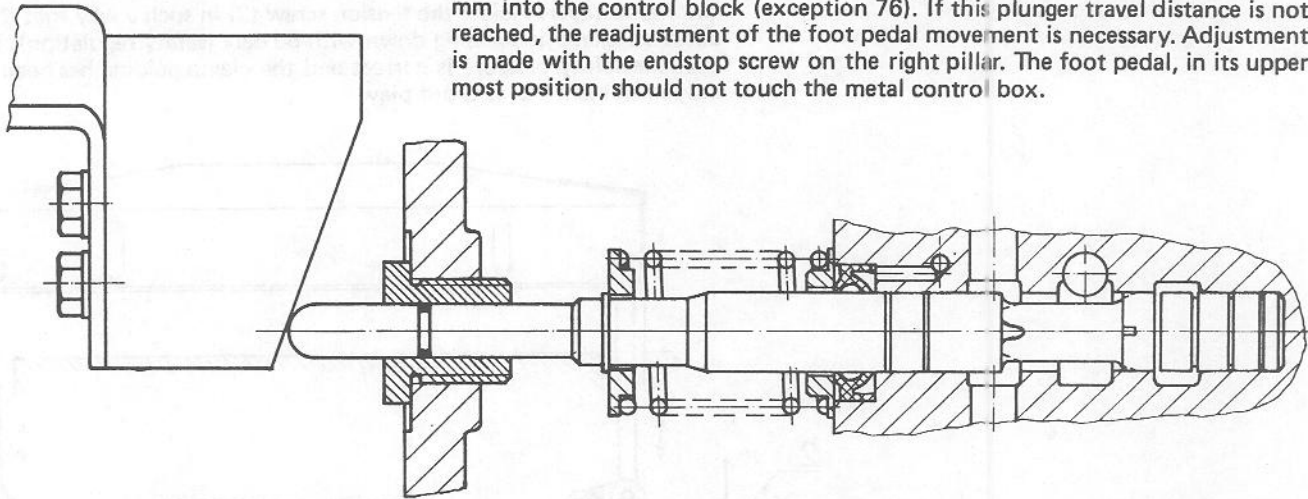
POLAR 92 = 16 bar  
POLAR 115 = 18 bar  
POLAR 137 = 18 bar  
POLAR 155 = 18 bar

then the return spring tension has to be set in such a way that the clamp will press down with 50 daN when the foot pedal is engaged.

**Meaning:****Remedy:**

e) Cam on foot pedal device is out of position

e) With the foot pedal in its normal position, i. e. in the upper position, an air gap of 0.0 – 0.1 mm should exist between plunger of the control block and the adjusting cam. If this is not the case, then the adjusting cam has to be repositioned. Pushing the foot pedal to its lowest position should move the plunger 12 mm into the control block (exception 76). If this plunger travel distance is not reached, the readjustment of the foot pedal movement is necessary. Adjustment is made with the endstop screw on the right pillar. The foot pedal, in its upper most position, should not touch the metal control box.

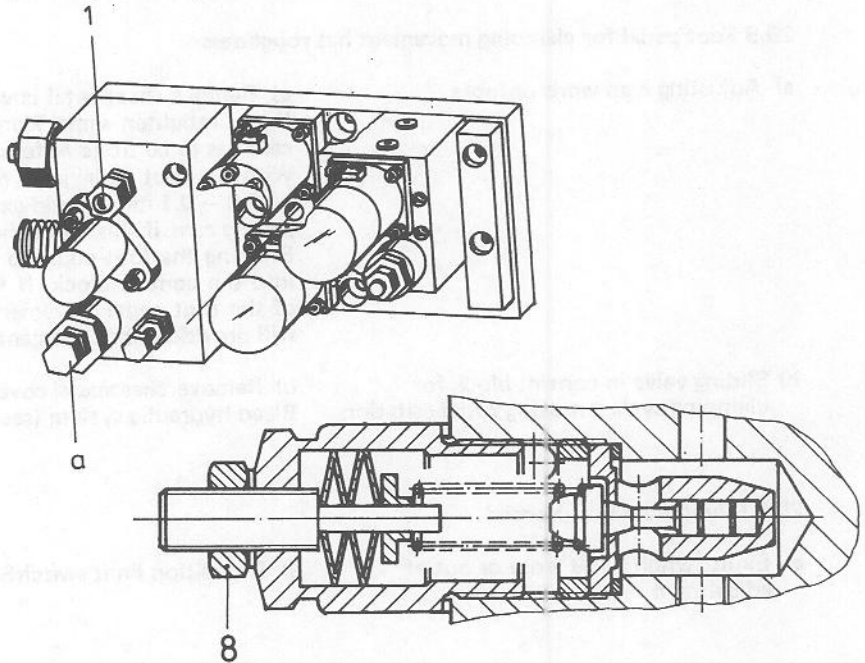


f) Safety pressure set too low

f) Remove clutch guard, covers and lid. Safety pressure should be checked on check point (1) with the foot pedal pressed down completely. The correct safety pressure on

POLAR 92 = 16 bar  
 POLAR 115 = 18 bar  
 POLAR 137 = 18 bar  
 POLAR 155 = 18 bar

If necessary readjust safety pressure on the safety valve (a). Take off cap nut, loosen up lock nut (8) and adjust the pressure, using an allen wrench SW 6 (clockwise turn will increase the pressure). After adjustment secure lock nut and cap nut again. Observe proper seating of copper washers. Bleed hydraulic system (see chapter 21.2)



### 20.3 Clamp is moving down too slow during cutting cycle

a) Pipes or connections are leaking. Air in the hydraulic system. Distribution device dirty or out of adjustment

a) Check all pipes and retighten connections. Bleed hydraulic system. Distribution device to be cleaned and readjust.

b) Pump delivery is insufficient despite pressure to be okay

b) Remove clutch guard, lid and cover plates as well as V-belts, take out hydraulic oil and remove pump to be exchanged. Bleed hydraulic system (see chapter 21.2)

c) Clamping pressure build up is retarded. Switch-over piston is delayed. Safety ball valve does not close

c) (see chapter 19.10)  
 Exchange cylinder  
 Valve M3 to be exchanged

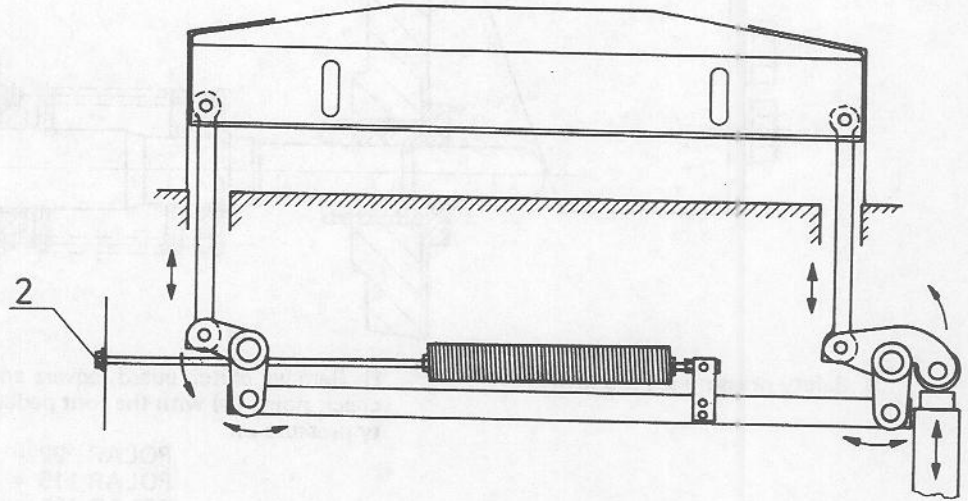
**Meaning:**

**Remedy:**

**20.4 Clamp is returning too slow**

- a) Return spring does not have sufficient tension

- a) Remove lid (3) (except 76) on the left side of the frame below the end of the frame cover. Adjust the tension screw (2) in such a way that the foot pedal actuated clamp is pressing down with 50 daN (safety regulation). It is essential that the safety pressure is correct and the clamp guiding has been adjusted for easy movement but without play.



- b) Slide valve moves with hesitation
- c) Valve S2/2 jammed or not energized
- d) Valve M3 has not dropped off

- b) Loosen up slide valve shaft.
- c) Exchange valve S2/2 or check supply voltage approx. 42 V D.C.
- d) Supply voltage should have been disconnected (see chapter 9.3.1)

**20.5 Foot pedal for clamping movement has roughness**

- a) Adjusting cam worn or loose

- a) Remove sheetmetal covers and check seating of the adjusting cam. If found loose, retighten same. Worm in adjusting cam has to be exchanged. Adjusting cam has to be fitted as follows:  
With the foot pedal in its normal position, i. e. in the upper position, an air gap of 0.0 – 0.1 mm should exist between plunger of the control block and the adjusting cam, if this is not the case, then the adjusting cam has to be repositioned. Bringing the foot pedal to the lowest position should move the plunger 12 mm into the control block. If this travel distance is not reached, the readjustment of the foot pedal movement is necessary. The end stop screw on the right pillar will provide this adjustment (exception 76).

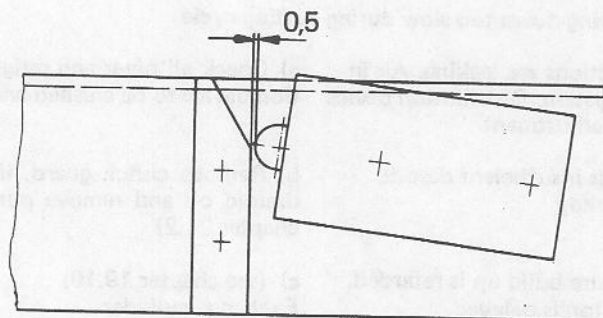
- b) Sliding valve in control block for clamping cycle is moving with hesitation

- b) Remove sheetmetal cover and access opening lid. Exchange control block. Bleed hydraulic system (see chapter 21.2).

**20.6 Clamp does not descend**

- a) Limit switch S309 loose or out of adjustment

- a) Reposition limit switch S309 and adjust.



## 21. Hydraulic

Work on hydraulic should only be performed by qualified personnel. It is essential to maintain the utmost cleanliness during work performance and that no dirt is allowed to enter the hydraulic system.

### 21.1 Hydraulic unit is loosing oil

#### Meaning:

a) Seal in the pump is leaking

#### Remedy:

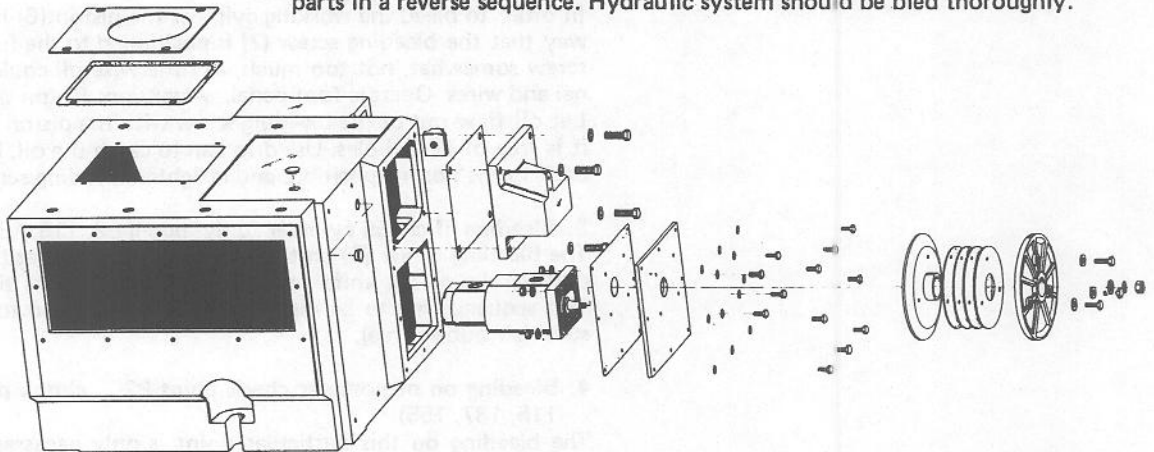
a) Dismantle pump and return to factory unopened. To do this job it will be necessary to remove clutch guard, V-belts and access hole cover. The oil can be saved if it is pumped into an absolutely clean container. Remove pump pulley with a gear puller. The filter has to be unscrewed. Loosen connection P1 and P2 on the pump. Remove all screws holding the pump against the flange. The pump can now be removed inside the pillar. One other possibility for removal of the pump is to dismantle the complete flange with the pump still attached to it. In this instance take out all screws by which the flange is attached to the frame pillar.

Assemble new pump to flange, insert same into pillar and tighten up all screws. Do not forget to put new gaskets between pump and flange and also between flange and pillar. Also use new copper washer underneath all screws.

Connect again the pipes to P1 and P2 as well as the filter to the pump. Fit pulley to pump shaft and V-belts to pulley. Fill in oil again and bleed hydraulic system. Mount access cover and clutch guard. Immediately after machine is turned on, apply load to hydr. pump to assure the immediate lubrication to all parts of the pump. To accomplish this, move foot pedal for clamp a few times or make a few knife cycles with clamp pressure set at half. Bleed hydraulic system.

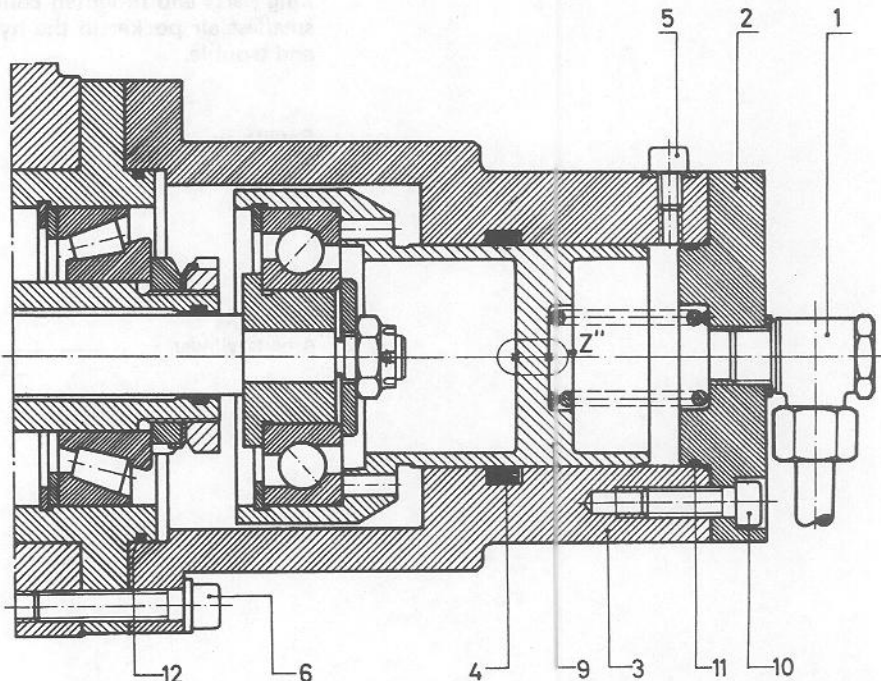
b) Seal between flange and pillar or

b) Remove clutch guard, V-belts and access hole cover. Pump oil into clean container. Pull off pulley. Unscrew the screws holding pump to flange as well as the screws holding the flange against the pillar. Replace the gaskets and assemble all parts in a reverse sequence. Hydraulic system should be bled thoroughly.



c) Copper washer under screws for pump or on the flange are leaking

c) Remove pulley and retighten flange screws if the result is negative, pump hydraulic oil into clean container and replace all copper washers A 8 x 14 x 1DIN 7603 (200928). Fill in oil again and bleed hydraulic system (see chapter 21.2).



**Meaning:**

d) O-ring in end plate of piston housing is leaking

**Remedy:**

d) Retighten holding screw (10) on end plate (2). If this does not solve the problem, then replace the O-ring (11). Dimension for:

POLAR 92 : R 40-2 (205064)  
POLAR 115,137,155 : R 55-2 (205057)

Check chamfered edge of cylinder housing (3) for burrs etc. Refinish if necessary. Fit the endplate again and secure with equal torque to the screws. Check tightness of screws again after the machine has been operated for a short time.

e) Pump is noisy

e) The noise produced by the pump is a high pitched whine. If the pressure is increased and the pump noise becomes higher and more intense during the cutting cycle, then the pump has to be exchanged.

**21.2 Air in hydraulic system**

Remove cover plates and lid. The bleeding is to be done with the machine running.

**1. Bleeding on manometer check point P1 – clamp pressure**

First, 3 cutting cycles should be made with full pressure setting. Now release cap nut on manometer check point P1 and press back the inside ball. Oil should flow out until it is not foamy any more. Retighten immediately cap nut. The normal oil pressure produced by the machine running idle is sufficient for this purpose.

**2. Bleeding of working cylinder**

In order to bleed the working cylinder the piston (6) has to be turned in such a way that the bleeding screw (7) is positioned to the front. Loosen the bleeding screw somewhat, not too much, as otherwise oil could get into the control panel and wires. Operate foot pedal. Attention: Piston will move out.

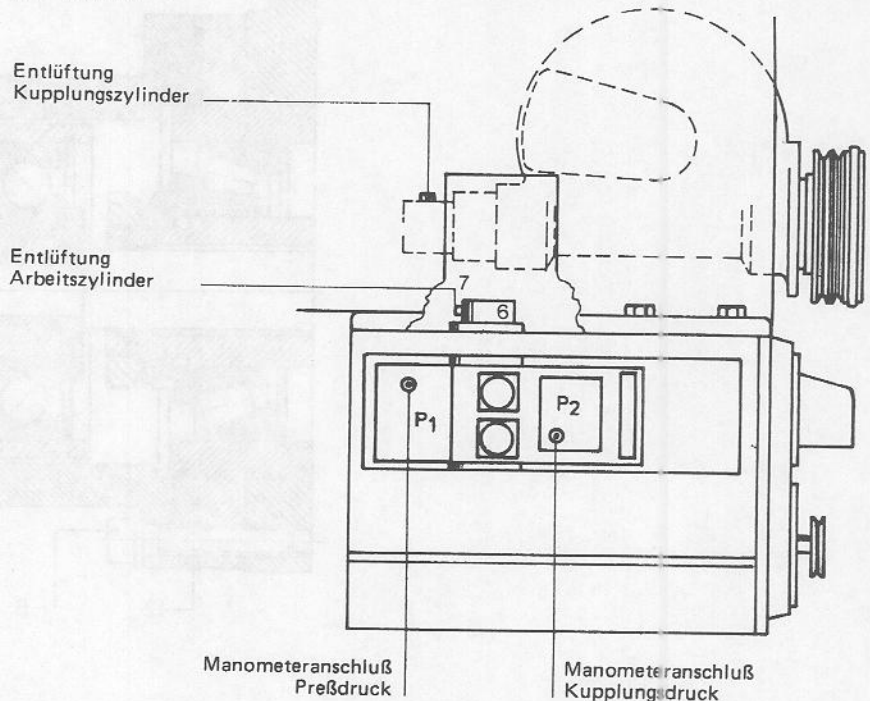
Let oil flow out of the bleeding screw with the piston in the out position, until it is free of air bubbles. Use drip pan to catch the oil, have the piston bar move back to the normal position. and retighten bleeding screw.

**3. Bleeding of clutch cylinder (only model 92, 115, 137, 155)**

The bleeding screw (5) on the clutch cylinder (3) has to be loosened during the downstroke of the knife and retightened as soon as the knife upstroke begins. This sequence has to be repeated as long as needed to get all air out of the system (air bubble free).

**4. Bleeding on manometer check point P2 – clutch pressure (only model 92, 115, 137, 155)**

The bleeding on this particular point is only necessary after removing of the manometer gauge or an oil change had been done. Loosen cap nut during cutting cycle and press ball inside away from seating, so that oil can flow out until it is free of air bubbles. After the bleeding is completed, check with a trouble light the hydraulic oil inside the tank, whether it is foaming or not. Foaming oil is an indication of leaking pipe lines and joints. Eventually search for these leaking parts and retighten connections as needed. Please remember that even the smallest air pocket in the hydraulic system could lead to operational problems and trouble.



**Meaning:**

**Remedy:**

**21.3 No inching mode of knife**

a) Valve open or out of adjustment

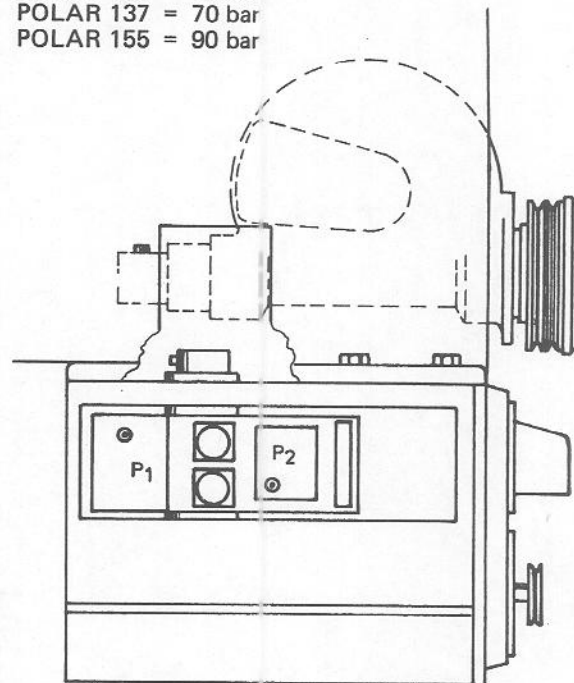
a) Inching valve has to be adjusted as follows:

Connect manometer gauge to check point P2. Bring clamp down to table using foot pedal and pull out hand wheel. After loosening the clamping device, shift same to a position where an inching pressure of 35 – 40 bar is reached. Secure clamping device again.

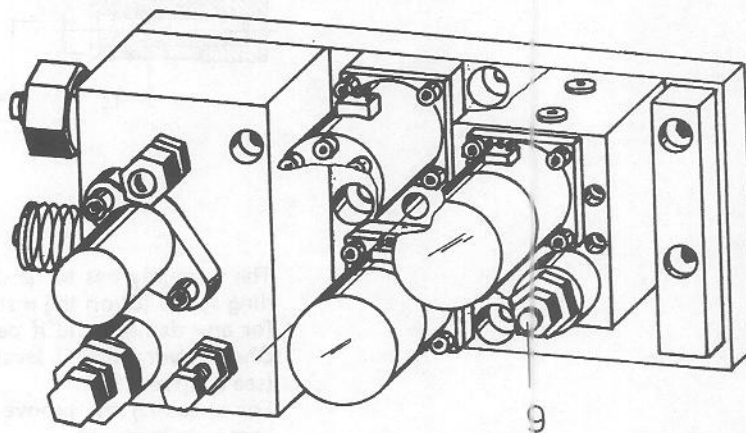
b) Clutch pressure too low

b) Connect manometer gauge to check point P2. The clutch pressure can only be checked during an actual cutting cycle. Temperature of the hydr. oil should be 40 – 50° C for best result. The clutch pressure specifications are on model

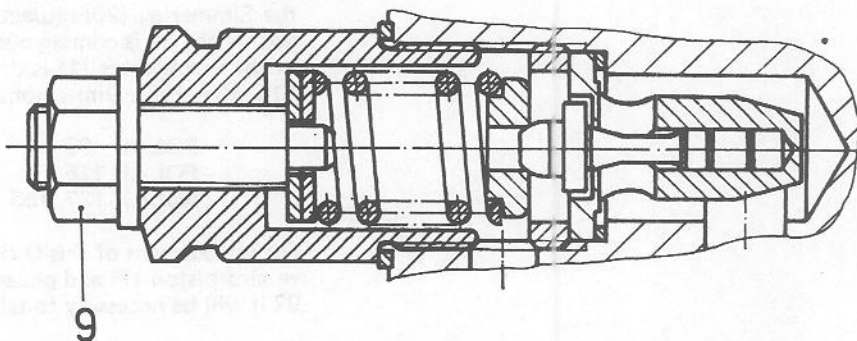
- POLAR 92 = 65 bar
- POLAR 115 = 70 bar
- POLAR 137 = 70 bar
- POLAR 155 = 90 bar



In case the clutch pressure is not as specified above, a readjustment of the clutch valve (9) on the hydr. block is necessary. Proceed as follows:



Loosen up lock nut (9). Use an allen Wrench SW 6 to adjust the clutch pressure as specified. Secure lock nut again.



## 22. Gear and clutch

### 22.1 Gear is loosing oil

#### Meaning:

- a) Oil level is rising

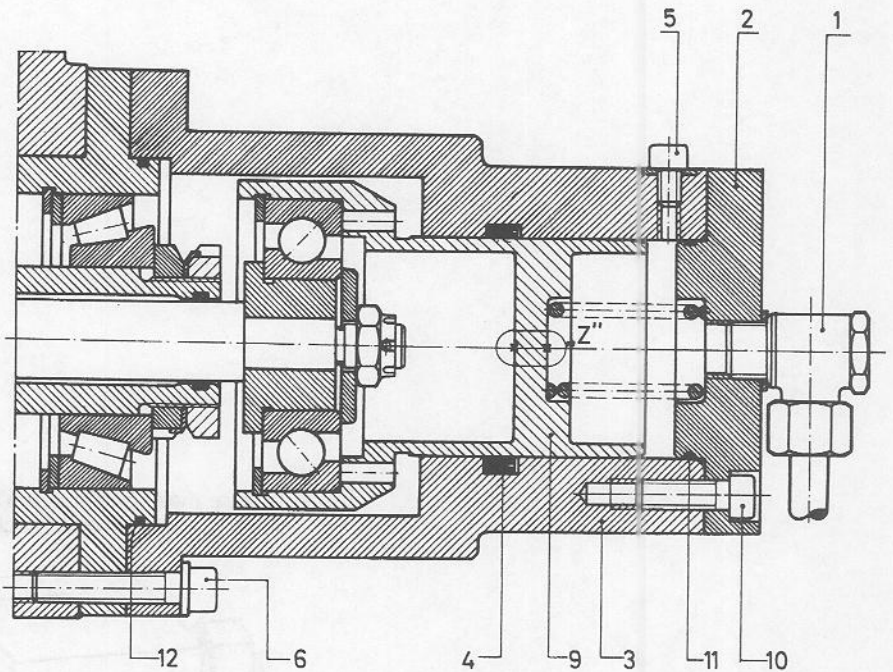
#### Remedy:

a) If the oil level in the gear is constantly rising, the groove ring (4) in the piston housing (3) is most likely damaged or has been fitted the wrong way. The hydr. oil can seep into the gear unit. Eventually it can rise to the point where the oil will flow out of the venting devise. Take out the gear oil first and then proceed with the groove ring exchange as follows:

Remove pipe connection (1) and take off end plate (2). Observe that the end plate is under a certain pressure. Catch any oil coming out this time. Loosen screws (6) on the piston housing and pull off same (3) from piston (9). It is important to hold the piston (9) in the present position to prevent the pressure bolt displacing itself from the fitting key. Check piston housing (3) for any damage and also piston for cracks at the center area „Z“. Replace groove ring (4). Dimensions of groove ring for model:

POLAR 92 = N 45-4 (205016)  
POLAR 115, 137, 155 = N 60-5 (205020)

Pay attention to the correct groove ring position. The lip of the groove ring has to face toward the oil inout line (see picture).



The assembly has to be done in the reverse sequence. Make sure that the bleeding screw (5) on the piston housing remains on the top. Check the O-rings (12) for any damage and if necessary replace same. Fill in gear oil to proper level. Check hydraulic oil level, replenish if need to be and bleed hydraulic system (see chapter 21.2).

For checking the groove ring on model 92 it will be necessary to remove the complete gear unit.

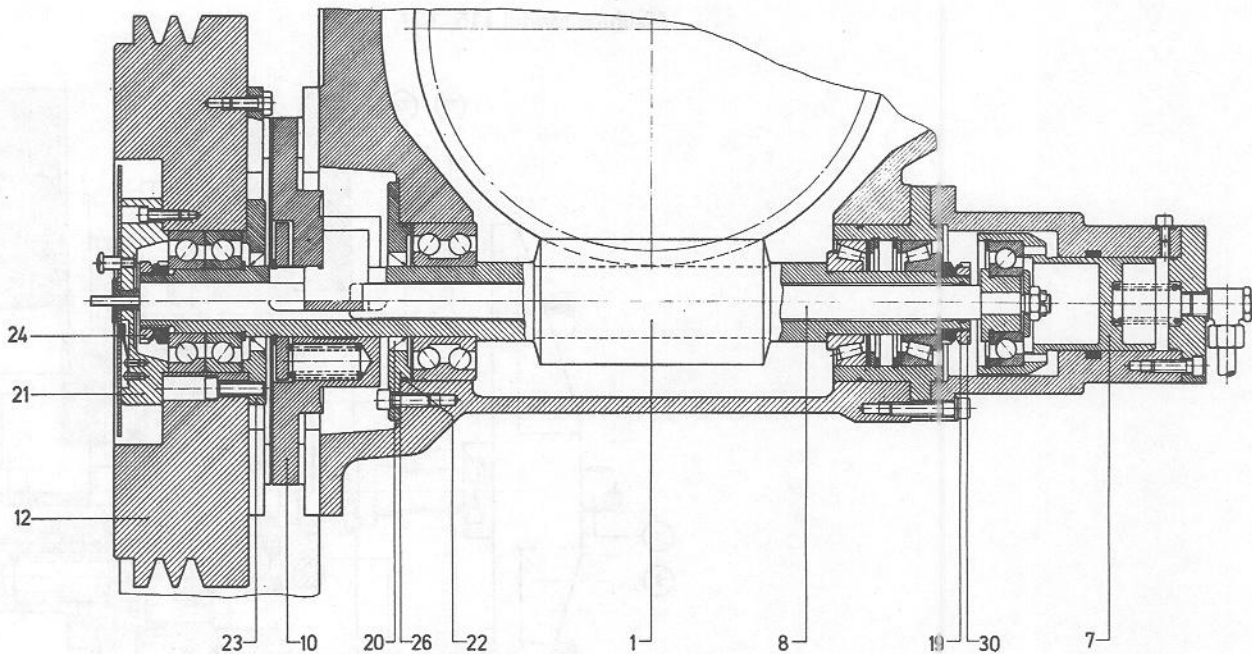
- b) Oil is coming out on the brake

b) Support knife carrier. Bring brake disk tightly to the drive wheel by means of the two clutch handles, and check whether O-ring (19) on the worm shaft or the Simmering (20) respectively the gaskets (22) on the center gear lid is damaged. If the oil is coming out on the slot of the worm shaft, then the O-ring (19) in the worm shaft (1) is damaged and has to be replaced (only on models 92, 115, 137, 155). Dimensions of the O-ring on model:

POLAR 92 = R 18-3 (205043)  
POLAR 115 = R 22-3 (205045)  
POLAR 137, 155 = R 25-3 (205047)

For replacement of this O-ring remove the piston housing and in addition remove also piston (7) and pressure bolt (8). The O-ring is now accessible. On model 92 it will be necessary to take off the complete gear.

**Remedy:**



If the oil is coming out on the center bearing cover (26) it is most likely to have a damaged Simmering (20) or the gasket (22) is defective. Replacement is necessary. In order to start this repair job it will be necessary to take off drive wheel (12) and brake disk (10). The dismantling requires special tools and dismantling is done as follows:

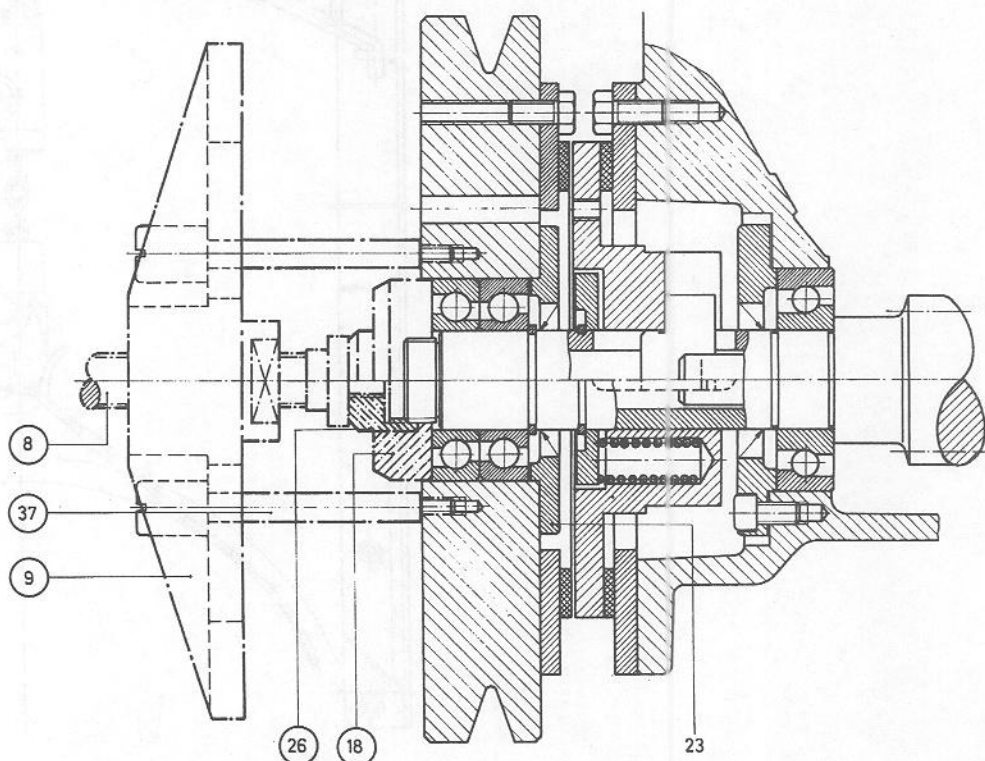
**Model 92, 115, 137, 155**

Take out gear oil. Remove front bearing cover (21). Unscrew slot type nut (24) with safety plate. Take out all allenhead screws of the rear bearing cover (23) on the drive wheel. Dismantling tools for model:

POLAR 92	8	9	18	26	37	
POLAR 115	4	8	9	10	20	27
POLAR 137	4	8	9	10	20	27
POLAR 155	4	8	9	10	20	27

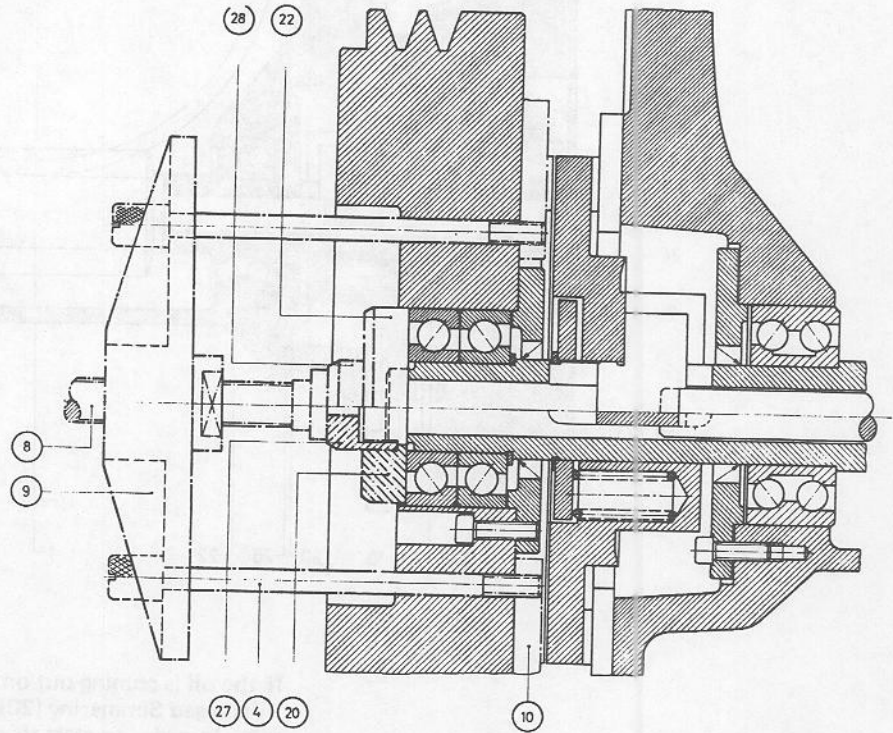
Prepare respectively tools and pull off drive wheel.

**Machine Model 92**

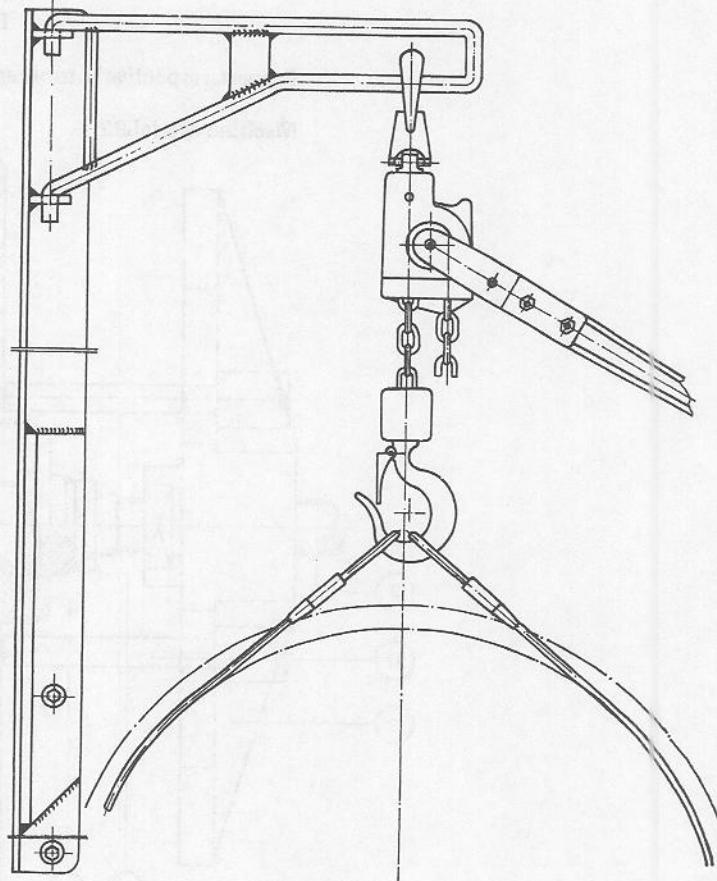


**Remedy:**

**Machine Model 115, 137, 155**



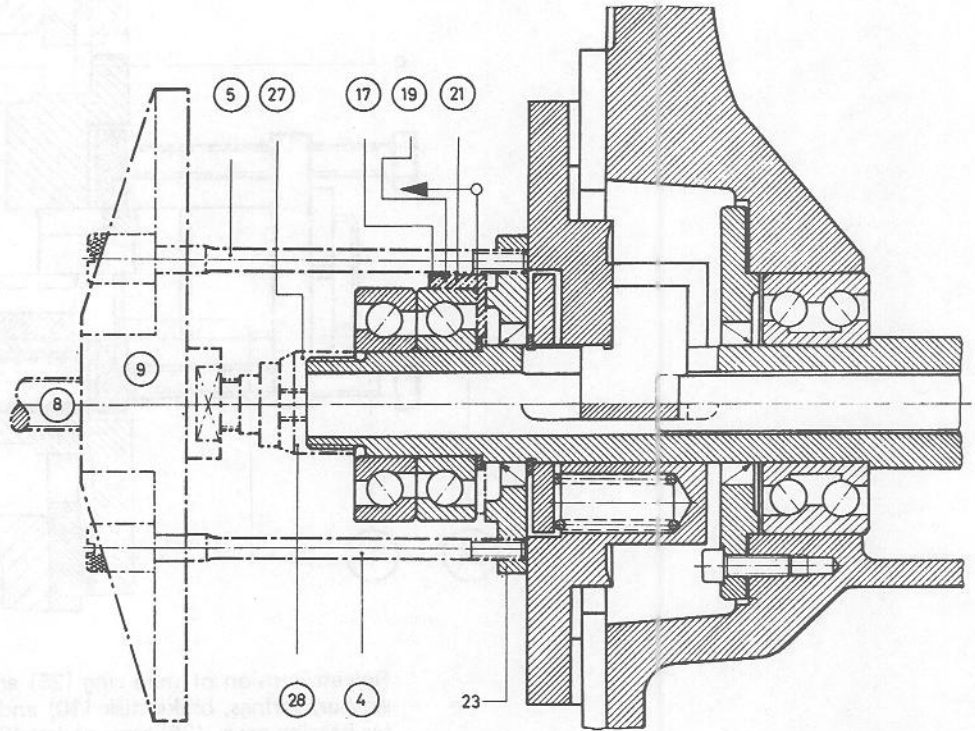
For dismantling or assembling of the drive wheel on model 115, 137, 155 it will be necessary to use the special lift kit SKV 683. The lifting device is mounted to the right side of the frame, using the predrilled holes for the hydr. lifts. If the machine is equipped with the hydr. lift, then the lifting device SKV 683 can be mounted to the hydr. lift flange. In this case 2 cylindric screws M 16 x 20 DIN 912 should be used. On machines without the hydr. lift unit, attach the lifting device to the frame by using this time 2 cylindric screws M 16 x 35 DIN 912.



**Remdy:**

Tools needed for:	POLAR 92	5	8	9	17	
	POLAR 115	5	8	9	19	27
	POLAR 137	4	8	9	21	28
	POLAR 155	4	8	9	21	28

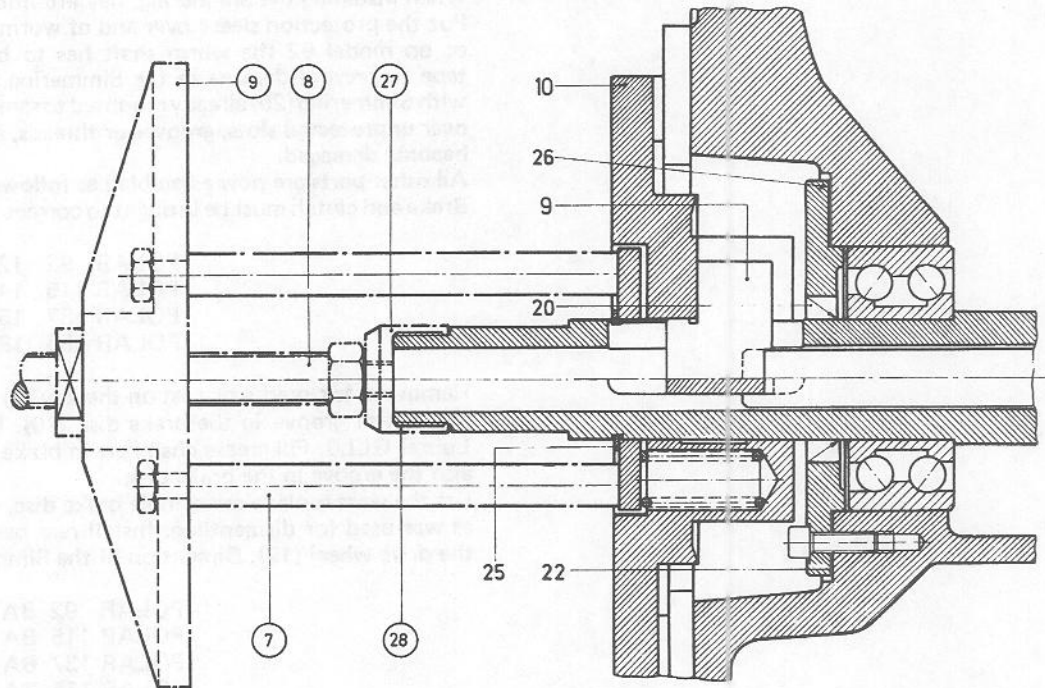
**Prepare the respective tools for bearing removal.**



**Tools needed for brake disk removal for model:**

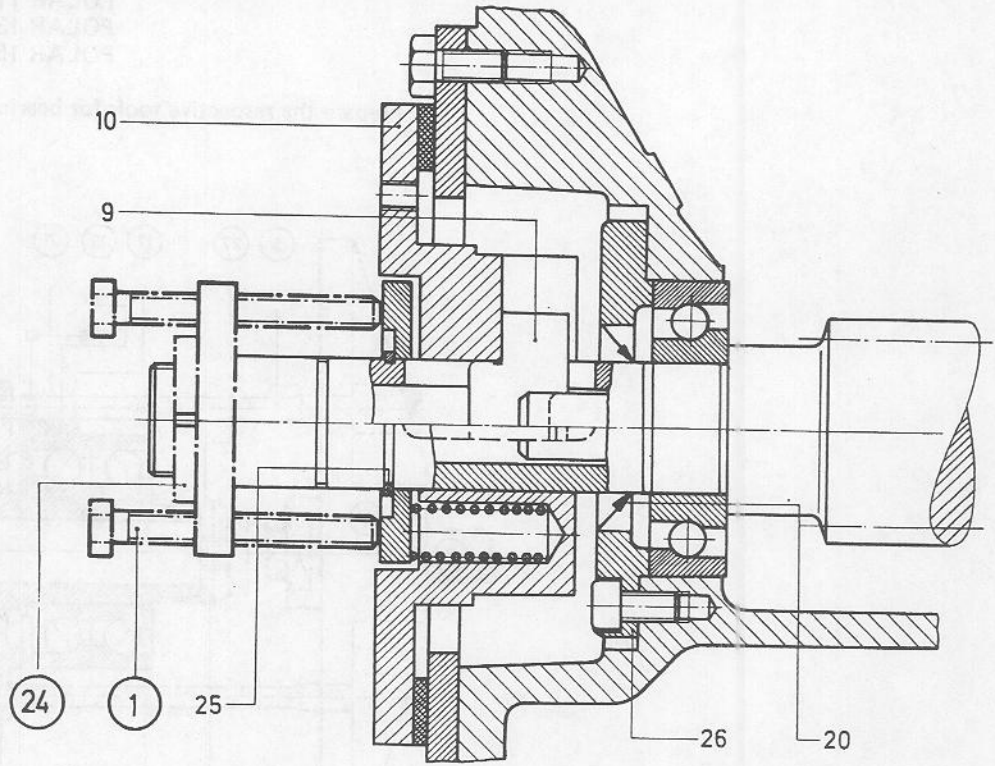
POLAR 115	7	8	9	27
POLAR 137	7	8	9	28
POLAR 155	7	8	9	28

**Prepare the respective tools for brake disc removal.**



**Place tool (1) onto worm shaft (model 92) and screw slotted nut (24) as far as possible.**

**Remedy:**



Release tension of snap ring (25) and take same off. Dismantle spring counter washer, springs, brake disk (10) and key (9). Exchange Simmering (20) in center bearing cover (26) resp. gasket (22).

**Dimension. of the Simmerings**

POLAR 92 BAFg	35 x 55 x 10	(223830)
POLAR 115 BA	45 x 62 x 12	(205095)
POLAR 137 BA	55 x 75 x 10	(224830)
POLAR 155 BA	60 x 85 x 13	(207274)

**Dimension of the O-rings**

R 76 x 2	(219278)
R 100 x 3	(205077)
OR 115 x 2,5	(232360)
R 230 x 4	(205083)

When installing the Simmering, pay attention to the correct position of lip. Put the protection sleeve over end of worm shaft. 35 model 115, 36 model 155 or on model 92 the worm shaft has to be wrapped with scotch or adhesive tape to prevent damage to the Simmering. Slide over center bearing cover (26) with Simmering (20) already mounted to same. Simmerings should never be pushed over unprotected slots, grooves or threads, as otherwise the lip of the ring could become damaged.

**All other parts are now assembled as follows:**

Brake and clutch must be brought to correct thickness and shims added as needed:

POLAR 92	12 mm + 0.05
POLAR 115	14 mm + 0.05
POLAR 137	15 mm + 0.05
POLAR 155	18.5 mm + 0.05

Remove track marks or rust on the key (9) or on the brake disc, smoothen out and polish groove in the brake disc (10). Lubricate worm shaft and key with Lubral GLL9. Fill grease chambers in brake disc with same grease and lubricate also the groove in the brake disc.

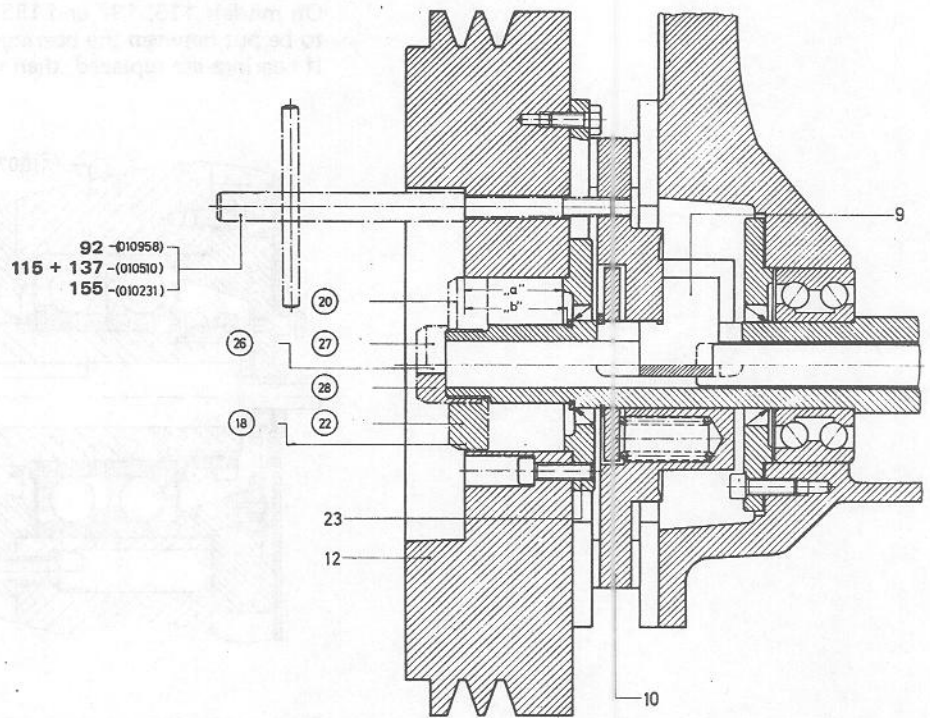
Use the same tools to reassemble brake disc, snapping and spring counter washer as was used for dismantling. Install rear bearing cover (23) with Simmering to the drive wheel (12). Dimension of the Simmerings for model:

POLAR 92 BA	35 x 52 x 7	(205092)
POLAR 115 BA	45 x 65 x 10	(205096)
POLAR 137 BA	55 x 75 x 10	(224830)
POLAR 155 BA	60 x 85 x 13	(107274)

Attach protection sleeve (35 model 115, 36 model 155) to end of shaft for prevention of damage to Simmering. Use adhesive tape on model 92.

Push the drive wheel carefully onto the shaft end and secure same to the brake disc (10) by slightly turning in the clutch handles. Remove protection cover resp. adhesive tape and center the drive wheel now with tools 18 26 on model 92, 20 27 on model 115, 137, 22 28 on model 155. Now tighten the clutch handles to the full extend and remove the centering tools.

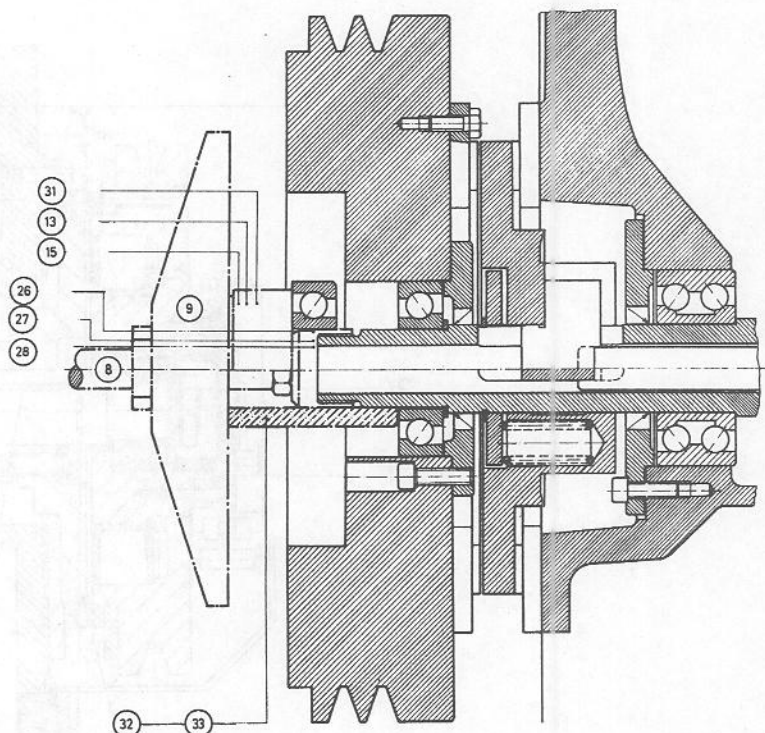
**Remedy:**



Fit snapping (on model 92) resp. support ring (on model 115, 137 and 155) to the worm shaft. Measure distance „a“ and „b“ (see picture) with depth gauge. Distance at „b“ should be larger by 0.4 mm than the distance at „a“. If necessary for adjustment add shims (see spare parts catalog 30.00).  
 Prepare tools for bearing assembly for model:

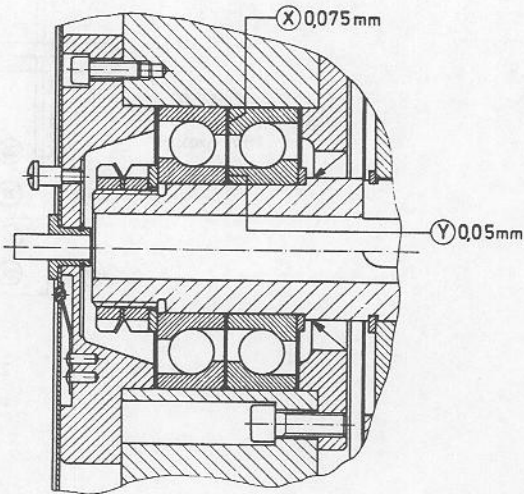
POLAR 92	8	9	26	31		
POLAR 115	8	9	13	27	32	
POALR 137	8	9	42	43	44	45
POLAR 155	8	9	15	28	33	

Before bearings are fitted fill same with roller bearing grease.



**Remedy:**

On models 115, 137 and 155 steel shims (X) 0.075 mm and (Y) 0.05 mm have to be put between the bearings.  
If bearings are replaced, then new steel shims have to be used also.

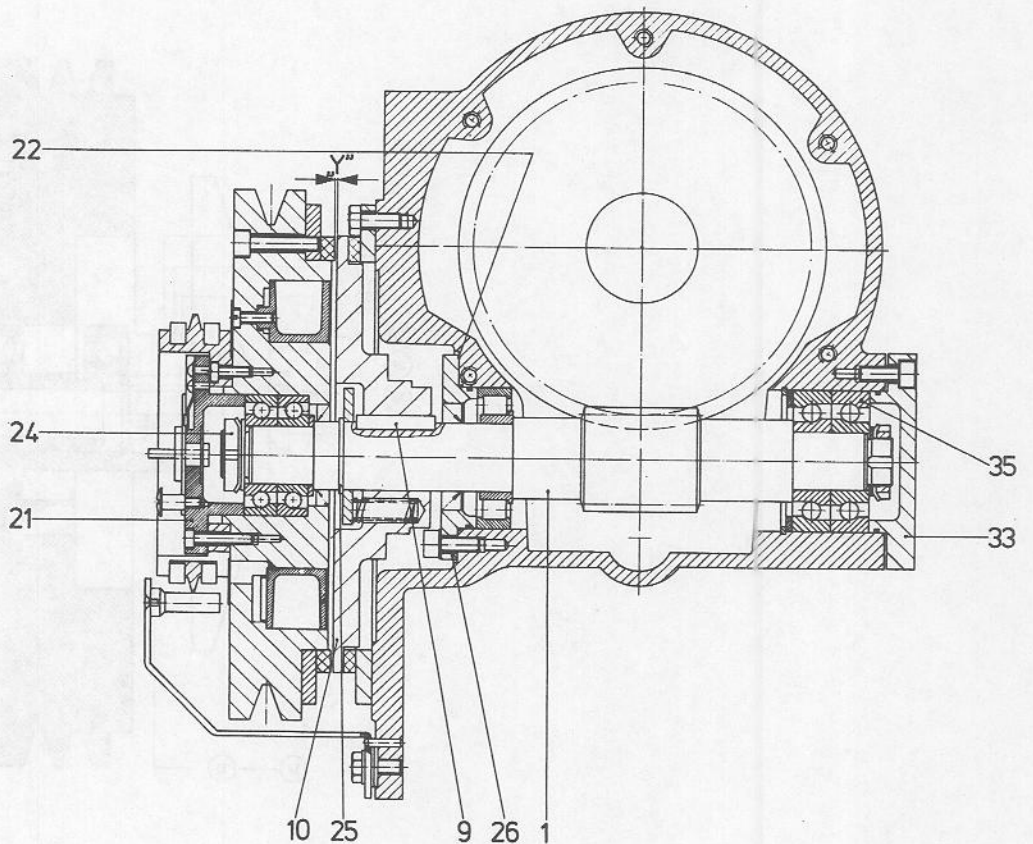


Reassemble support ring, safety plate and slotted nuts to worm shaft. Drive wheel is still pressed against the brake disc. Now measure with a depth gauge the shoulder of the front bearing cover (21). This measurement has to be larger by 0.6 mm than the measurement between the outer face of the drive wheel and the outer ring of the bearing. If necessary this measurement has to be adjusted by adding shims.

After this has been completed, fit front bearing cover. Fill with gear oil and if needed add hydraulic oil. Bleed hydraulic system (see chapter 21.2).

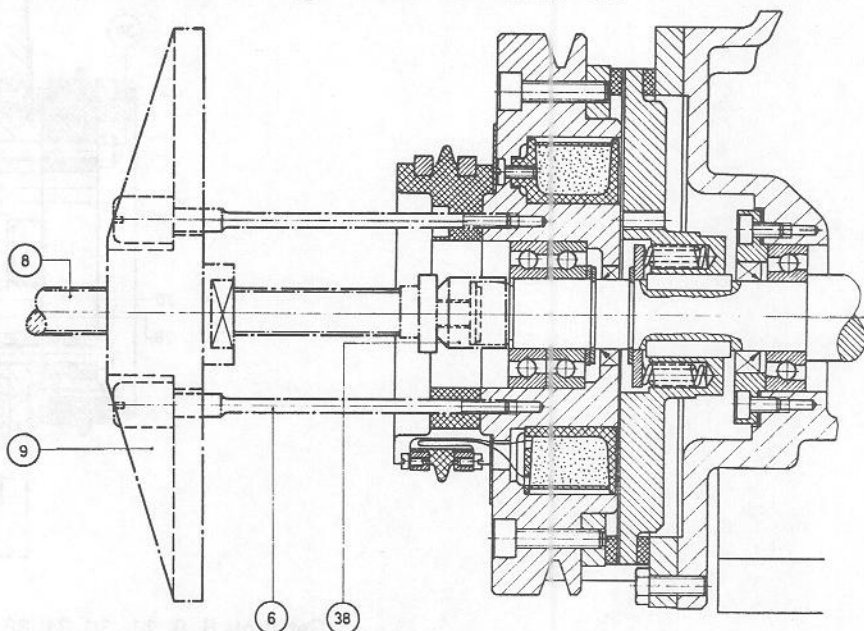
**Machine Model 76**

Remove gear oil and take off carbon brush holder. Take off front bearing cover (21). Remove now visible slotted nut (24) with safety plate. Take out support washer and steel shims.



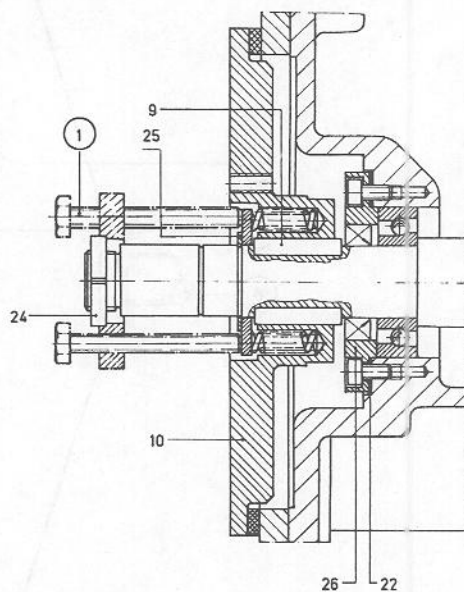
### Remedy:

Get tools 6, 8, 9, 38 ready for dismantling of drive wheel with bearings. Since the Simmering BA 35 x 52 x 7 (205092) always becomes damaged during the above dismantling, it is necessary to replace the same. Please pay attention to location and amount of support washers and spacer foils.



### Remove brake disc as follows:

Prepare tool 1 and screw grooved nut (24) onto the worm shaft. Release tension of snap ring (25) and take off. Dismantle now spring counter disc, springs, brake disc (10) and key from shaft.

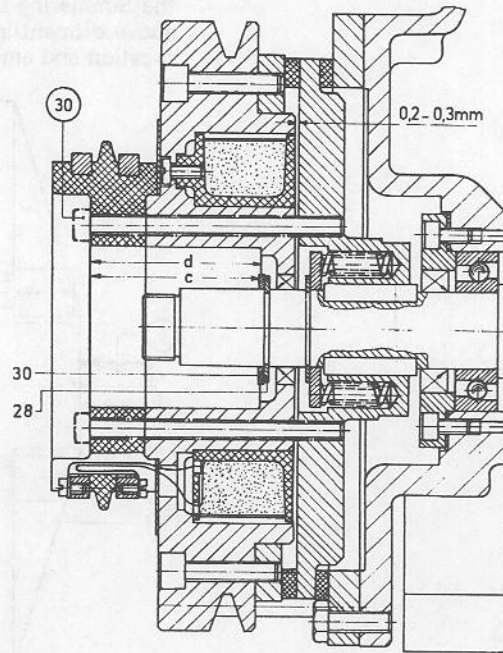


Dismantle center bearing cover (26) and replace Simmering BAFg 35 x 55 x 10 (205098) as well as gasket (22). As mentioned before at the instruction for 92, 115, 137, 155 the Simmering has to be fitted very carefully.

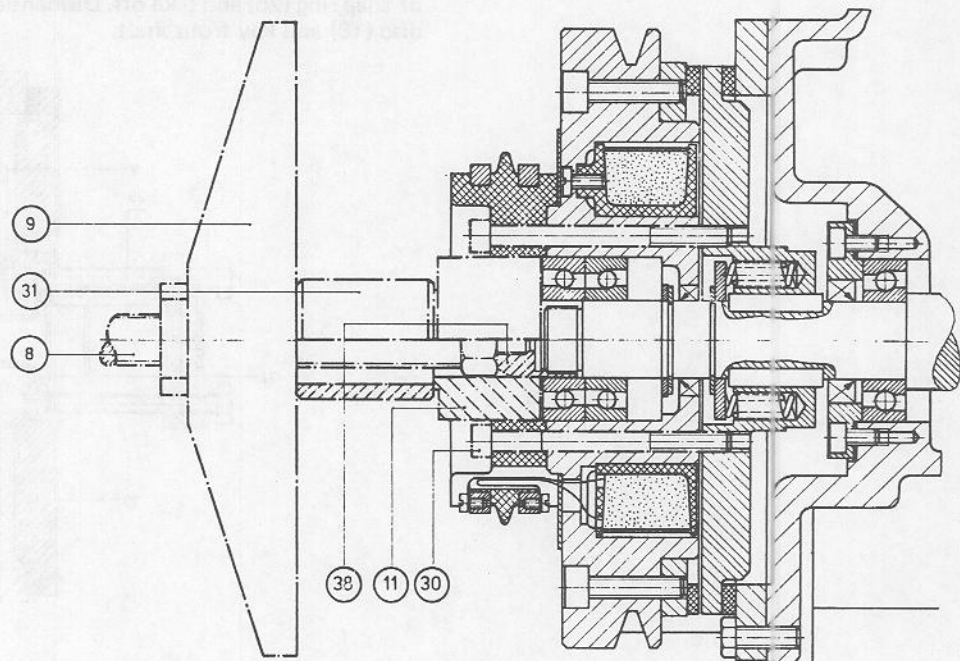
Brake ring shoes ( $13 + 0.05$  mm thickness) and clutch ring shoes ( $13.2 + 0.05$  mm thickness) should be brought to proper dimensions by adding foils accordingly. Bring brake disc against the already mounted clutch segments of the drive wheel and check air gap between brake disc and magnet coil body with a feeler gauge. The air gap should be  $0.2 - 0.3$  mm. If necessary adjust with foils. Drive shaft (disc seating area) and key should be lubricated with Lubral GLL9. The grease chambers in the brake disc should also be filled with this type grease. Brake disc, snap ring and spring retaining washer should be mounted with the same special tools as had been used for dismantling. Mount Simmering into the drive wheel. Get tool 11 and 30 ready. Center drive wheel and screw tightly against brake disc. Remove centering tool 11. Mount snap ring (28) and support washer (30) onto the shaft and press snap ring against the rear side of the groove, using the sleeve 34 for this purpose. Measurement „c” and „d” (see picture) has to be established with a depth gauge. Measurement on „d” has to be  $0.3$  mm larger than the one at „c”. If necessary compensate with shims (see spare part catalog . . .-30.00. . .).

Meaning:

Remedy:



Get tools 8, 9, 11, 30, 31, 38 ready and fit bearings. Before mounting bearings grease same with roller bearing grease.



Reassemble support washer, safety catch and nuts to worm shaft. Drive wheel is still pressed against the brake disc. Now measure with a depth gauge the shoulder of the front bearing cover (21). Write down this measurement „e“. This measurement „e“ has to be 1.2 mm larger than the measurement „f“ which is the distance from where the front bearing cover is resting against to the outer ring of the bearing. If this measurement is not as required, then it has to be made up with steel ring spacers. Remove screws 30 and mount bearing cover. Refill gear oil.

c) Oil is seeping from sight glass or around holding ring or oil drain plug

c) Retighten glass respectively holding ring. If this will not solve the problem, drain oil into clean container, remove oil level sight glass incl. holding ring. Check seals and gaskets as well as the seal seating area. If necessary replace seals — gaskets. Seal for oil level sight glass: 25 Ø x 20.5 Ø x 1.5 (205622). Seal for drain plug: A 16 x 22 x 1.5 DIN 7603 (200966).

For oil quantity and brand see operation manual.

**Meaning:**

d) Oil is leaking between gear housing and piston housing

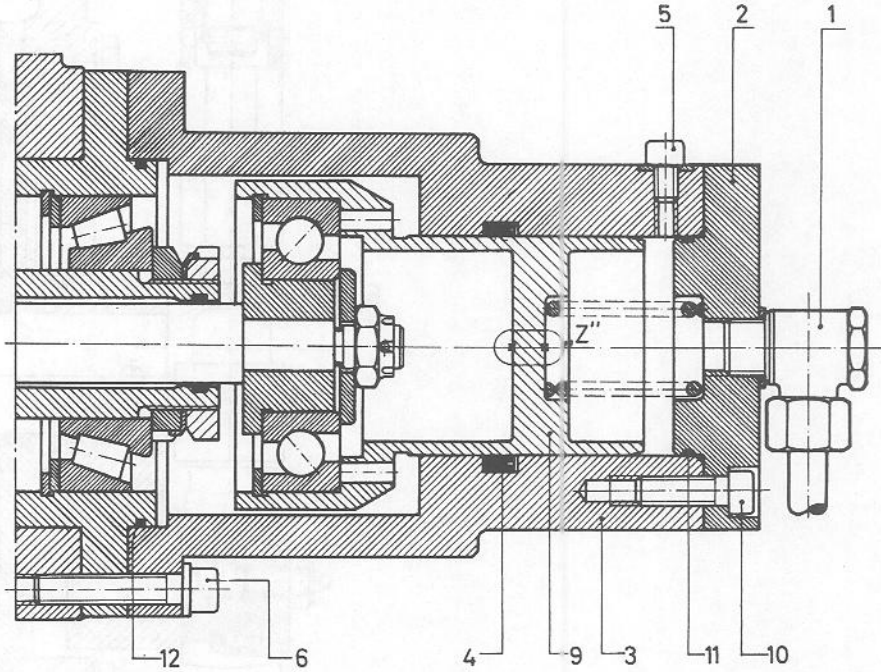
**Remedy:**

d) Drain gear oil, remove pipe (1) and also end plate (2). Attention: The end plate (2) is under pressure by the inside spring. Catch any oil coming out. Loosen up the screws (6) on the piston housing. Pull off the piston housing (3) from the piston. Replace O-ring (12). Dimension of O-rings on model:

POLAR 92	R 80-3	(205072)
POLAR 115	R 100-3	(205077)
POLAR 137	OR 115-2.5	(232360)
POLAR 155	R 130-4	(205083)

Reassemble all parts in reverse procedure. Pay attention to the bleeding screw Reasse

Reassemble all parts in reverse procedure. Pay attention to the bleeding screw (5) position, which always has to be on the top of the housing.

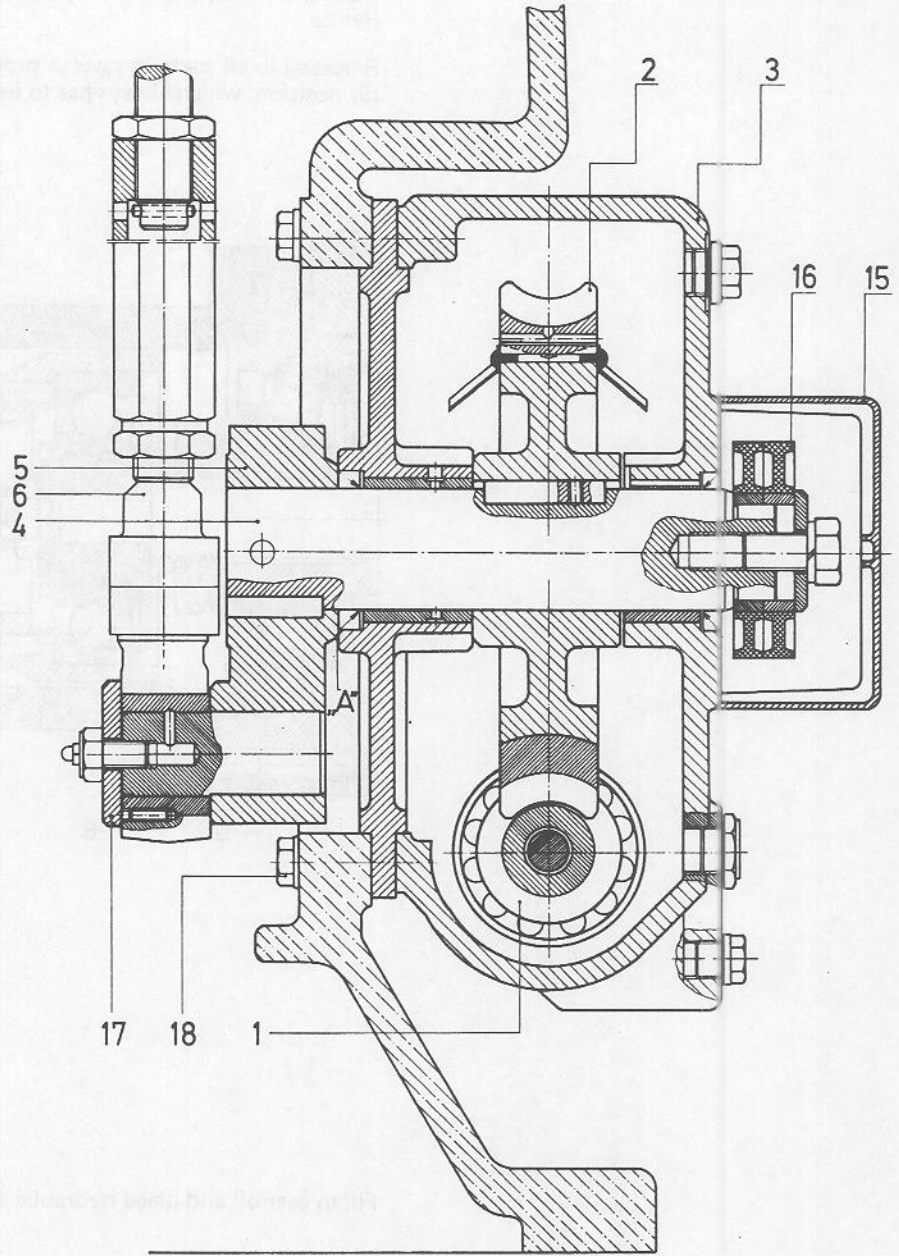


Fill in gear oil and bleed hydraulic system (see chapter 21.2).

On **POLAR model 92** the gear has to be removed from the frame. **Attention!** Every time a gear is to be removed from the machine, the knife carrier has to be supported by wooden blocks or cardboard piles up to the clamp opening on which the knife is than rested.

**Remedy:**

Furthermore remove clutch guard and oil tank access cover. Remove oil. Take off V-belts. Take off cover (15) and remove limit switches from cams (16). Take off end washer (17) from pulling arm and all pipes attached to gear. Carefully remove gear holding screws (18) since the gear has a weight of 90 kg.



**Meaning:**

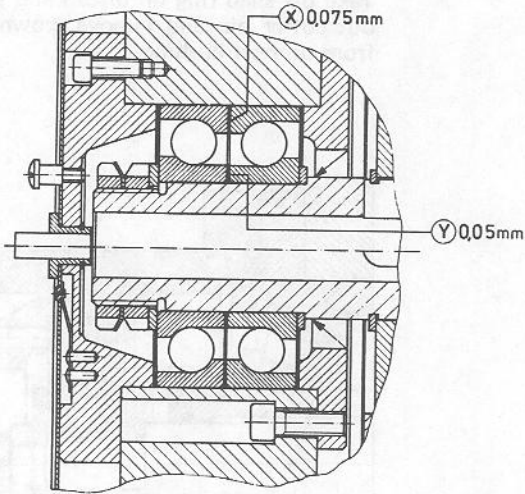
**Remedy:**

**22.2 Noise on gear (and clutch)**

a) Bearings in drive wheel are defective

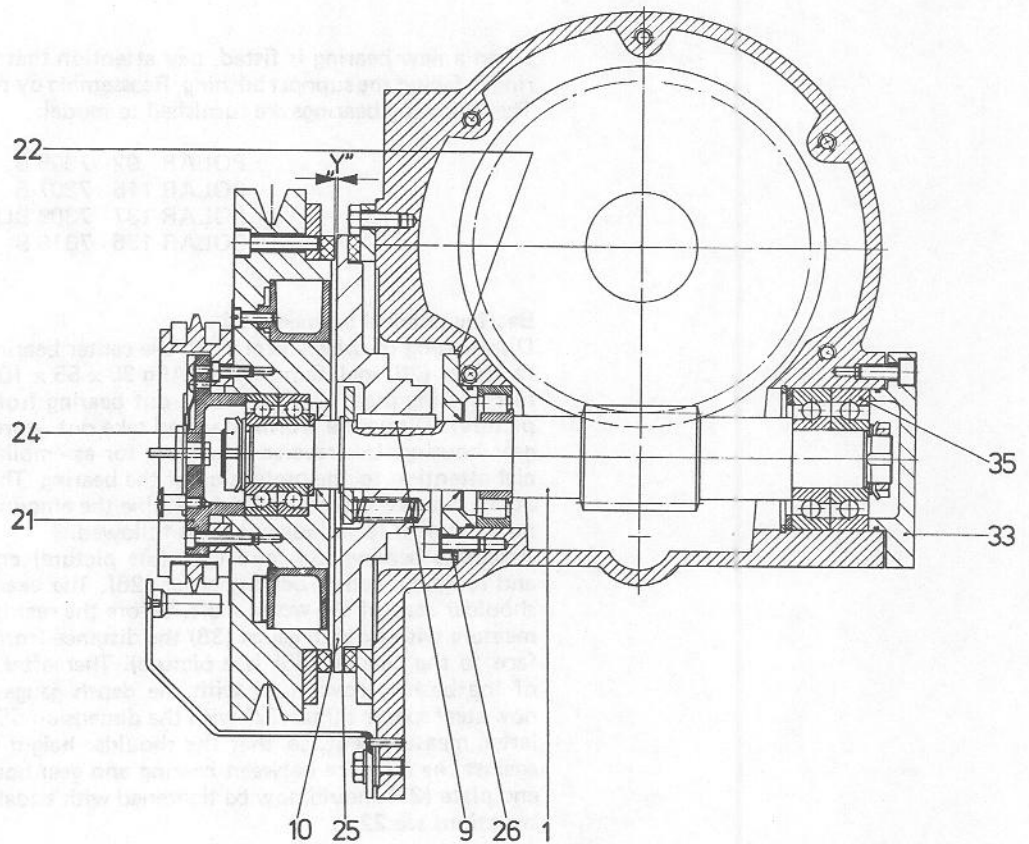
a) If there is a noise in the drive wheel during idle speed, which will disappear as soon as the clutch is engaged, it has to be assumed that the drive wheel bearings are defective and an exchange is inevitable.

It has to be emphasized again that only bearings supplied by our Parts Dept. should be used for replacement since they have special tolerances not found on the regular bearings. Furthermore it is of utmost importance to pay attention to the required pretension (see picture) applied to the bearings on model 115, 137 and 155. On model POLAR 76 this pretension for the bearings has been incorporated without foils during assembly at the factory.



When exchanging bearings, new shims have to be used. On modell:

POLAR 115 (Y) =	40 x 50 x 0.05	(215079)
(X) =	80 x 90 x 0.075	(215080)
POLAR 137 (Y) =		(224842)
(X) =		(224843)
POLAR 155 (Y) =	55 x 65 x 0.05	(219525)
(X) =	110 x 120 x 0.075	(219526)



**Meaning:**

b) Worm shaft bearing defective

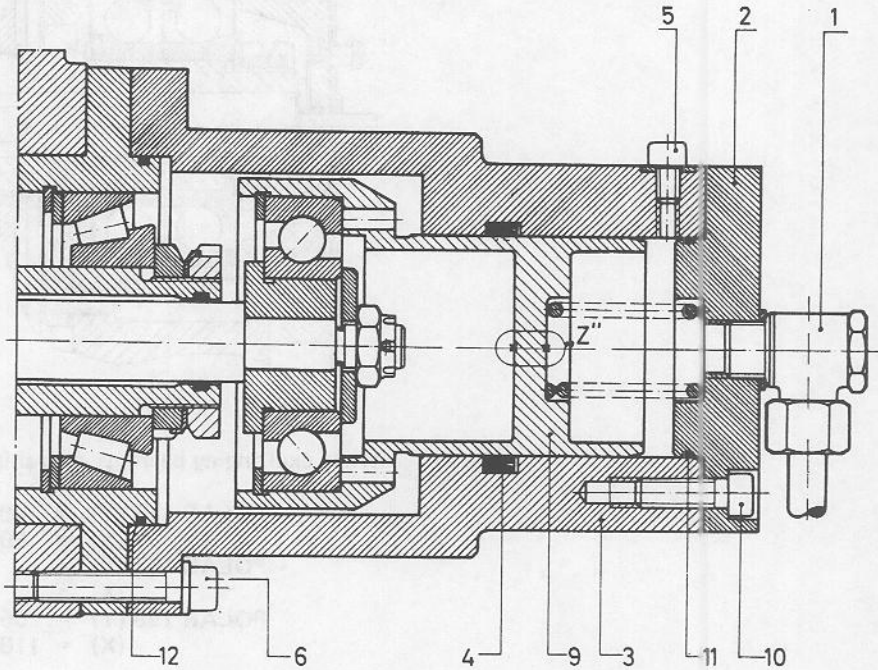
**Remedy:**

b) If only during cutting cycles bearing noise will be present, it has to be assumed that the worm shaft bearings or the trust bearing are defective. In every case work is performed on the gear it is essential to block the knife carrier. During gear assembling it is equally important to observe the correct amount and location of spacer washers.

c) Trust bearing defective

**c) Removal of trust bearing:**

Dismantling of piston housing as under chapter 22.1. Thereafter turn drive wheel with the clutch handles to such a position that the key in the brake disc is positioned horizontal. This can be observed by looking through the gap between brake ring and brake disc. Now remove piston (9) including pressure rod. Take off snap ring on piston and press back bearing by means of screws. Take out cotter pin and remove crown nut. Take off washer and pull off bearing from support bushing.



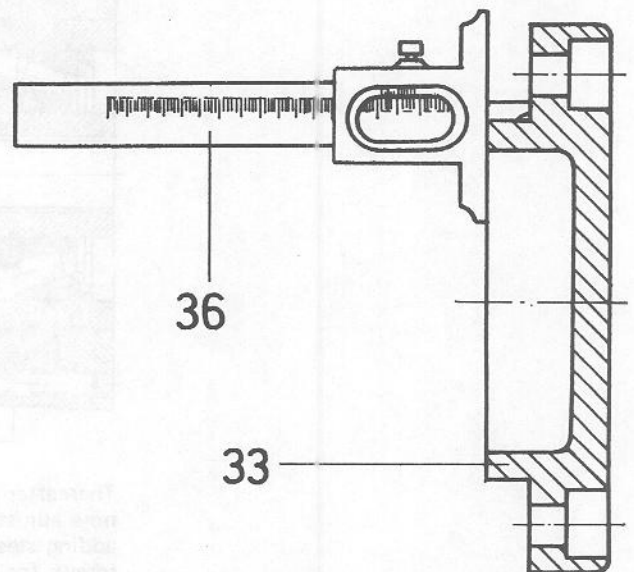
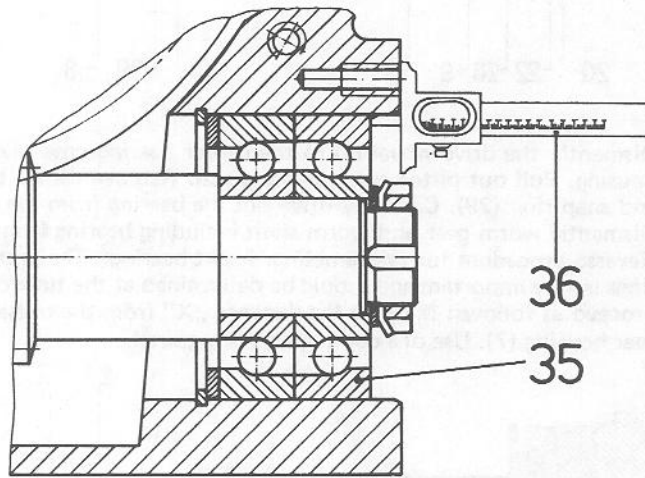
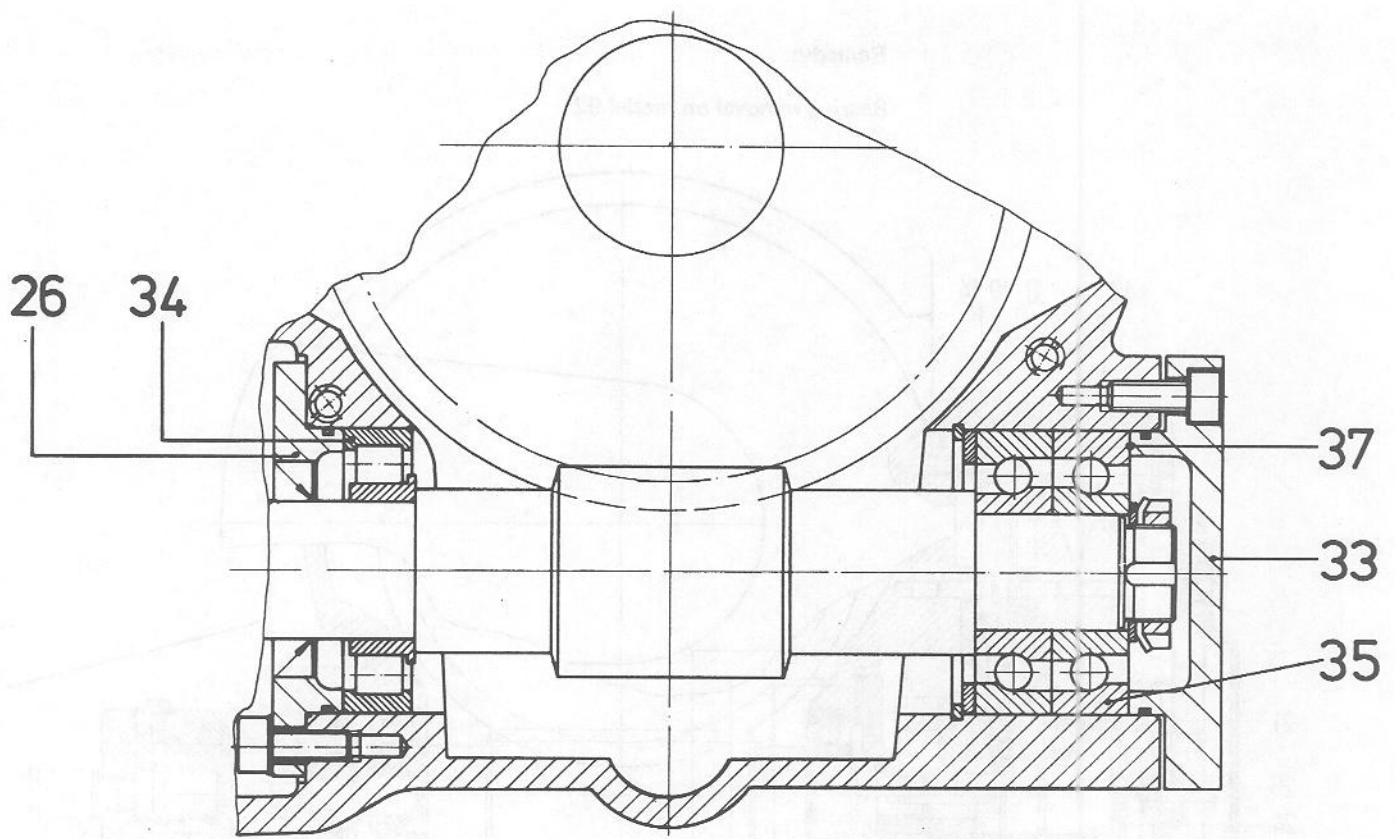
When a new bearing is fitted, pay attention that the inner shoulder of the bearing is facing the support bushing. Reassemble by reversing the above procedure. The following bearings are furnished to model:

POLAR 92	7305 B	(205157)
POLAR 115	7307 B	(205160)
POLAR 137	7308 BUO	(205162)
POLAR 155	7310 B	(207284)

**Bearing removal on model 76**

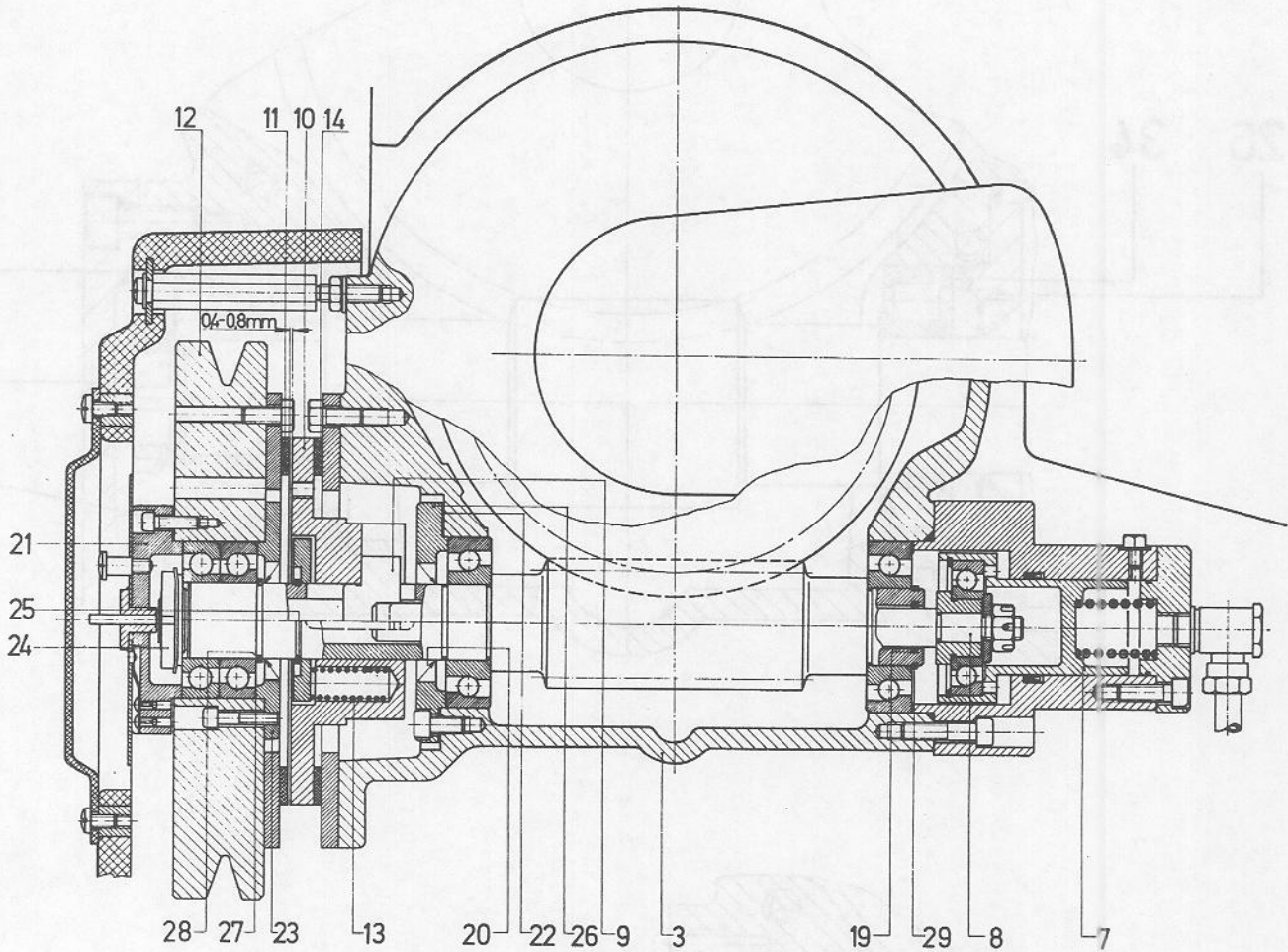
Dismantling of drive wheel up to the center bearing cover. Remove bearing center cover (26) incl. Simmering BAFg 35 x 55 x 10 (205093) carefully. Unscrew rear bearing plate (33) and drive out bearing from the drive side (see arrow in picture). Dismantle worm gear and take out worm shaft incl. bearing from the gear housing. Use reverse procedure for assembling. Insert bearing and pay special attention to the pretension of the bearing. The latter should be determined at the time of assembly. To determine the amount of pretension, the following measurement technique has to be followed.

Assemble bearing (34) and (35) (see picture) complete onto the worm shaft and retighten center bearing cover (26). The bearing (35) is resting against the shoulder step of the worm shaft. Before the rear bearing cover (33) is attached, measure with a depth gauge (36) the distance from the gear housing outside surface to the bearing (35) (see picture). Thereafter measure the shoulder height of the bearing cover (33) with the depth gauge. For pretension purpose add now steel spacer shims (37) with the dimension 55 x 72 x 0.05 (222677) to the latter measurement, so that the shoulder height will be increased by 0.2 mm against the distance between bearing and gear housing outside surface. Bearing end plate (33) should now be tightened with equal torque. Further assembly instructions see 22.1.

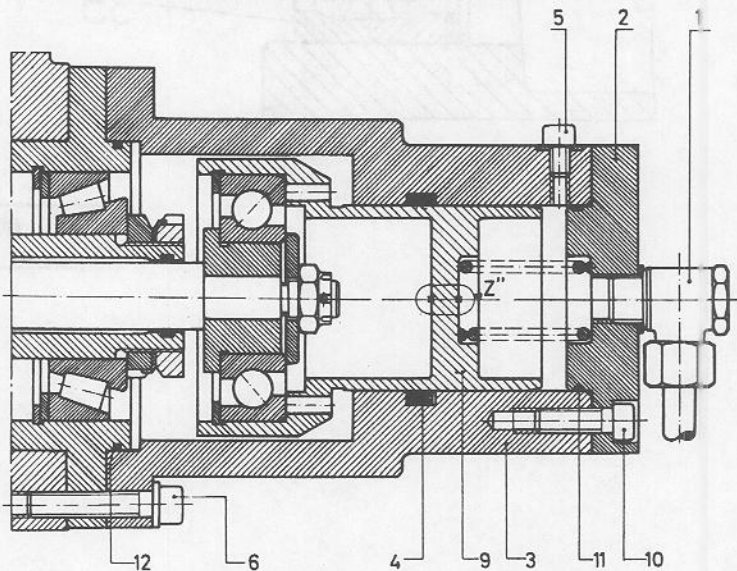


**Remedy:**

**Bearing removal on model 92**



Dismantle the drive wheel up to the center bearing cover (26) and the piston housing. Pull out piston with pressure rod. Remove center bearing cover (26) and snap ring (29). Carefully drive out the bearing from the side of the piston. Dismantle worm gear and worm shaft including bearing from the gear housing. Reverse procedure for reassembling. Insert bearings. The pretension of the bearings is very important and should be determined at the time of assembly. Please proceed as follows: Measure the distance „X” from the outside shoulder of the gear housing (7). Use of a depth gauge is required.



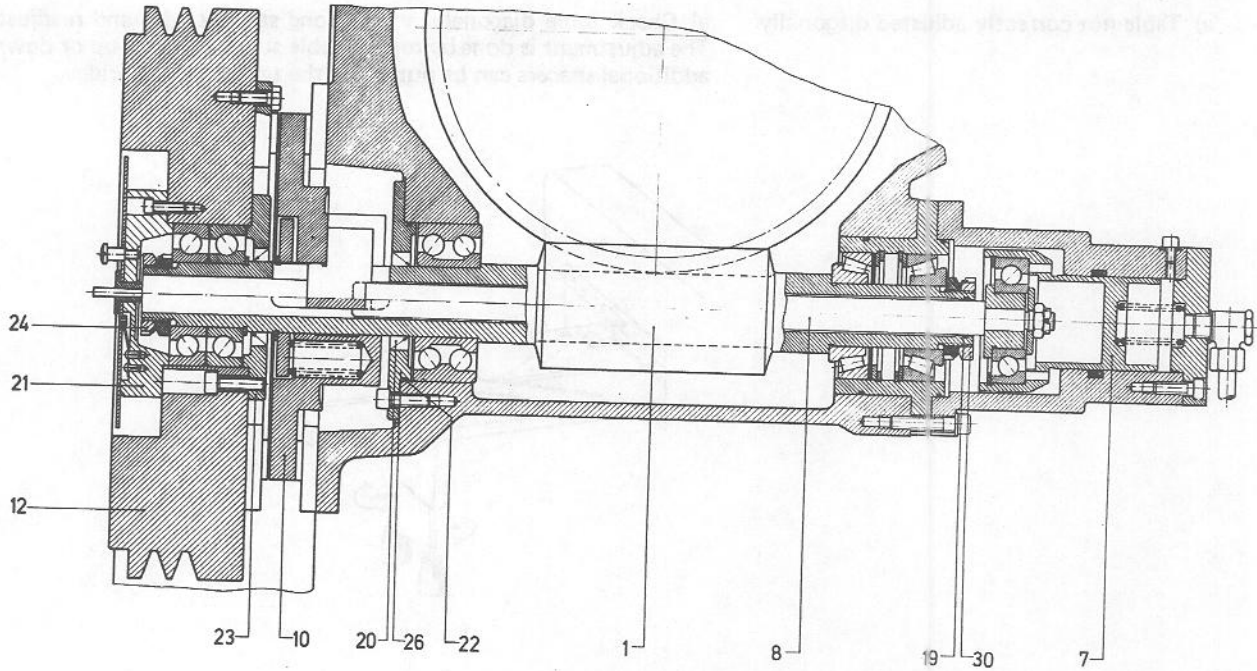
Thereafter establish the shoulderheight of the piston housing. This distance is now adjusted to be 0.5 mm larger as the previously measured distance „X” by adding steel shims (8) with the dimensions of 63 x 80 x 0.2 (224332). Tighten screws for piston housing with equal torque. Further assembly instructions see chapter 22.1.

Meaning:

Remedy:

Dismantling of bearing on the model 115, 137 and 155.

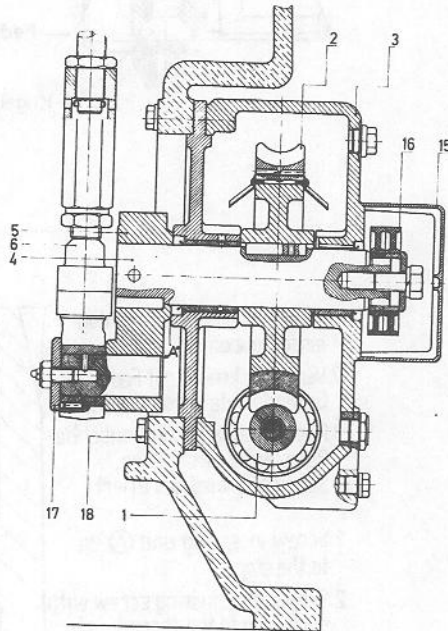
Dismantle the drive wheel (12), the brake disc (10) the center bearing cover (26) (see chapter 22.1) and the piston housing incl. piston (7) and pressure rod (8) (see chapter 22.1)



Remove worm shaft nuts (30) and drive out carefully the bearing from the side of the piston. The worm gear does not have to be removed. Reverse procedure to reassemble. Again it should be pointed out that only bearings supplied by the factory should be used as these bearings have special close tolerances.

c) Gear vibrates, cut vibrates

c) Either the bearings of the crankshaft (4) are worn out or the bushing (bearing) of pulling arm (6), which is riding on the crank arm, has too much play. Another possibility is the excessive play between worm shaft and worm gear teeth. The vibration is especially noticeable during cutting of thick or hard material.



The most permissible play within the teeth are model 76 = 65 mm, 92 = 70 mm, 115 = 100 mm, 137 = 120 mm, 155 = 140 mm. The play is measured on the outside diameter of the drive wheel.

Remedy in case of excessive play: Exchange gear.

## 23. Rakes, backgauge and sledge

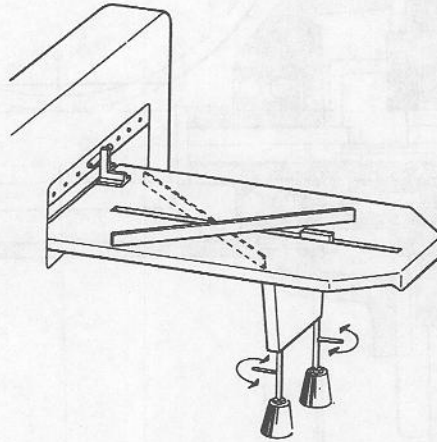
### 23.1 Bottom sheet slides under rakes

#### Meaning:

- a) Table not correctly adjusted diagonally

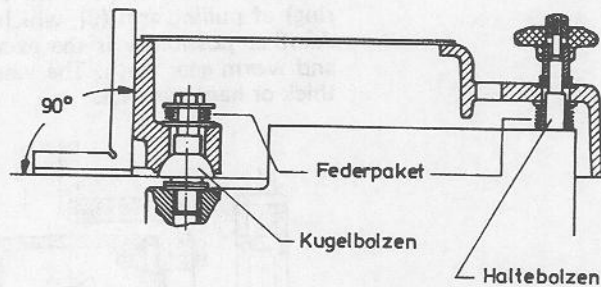
#### Remedy:

- a) Check table diagonally with a long straight edge and readjust if necessary. The adjustment is done by turning table support stands up or down, if necessary additional spacers can be put under the table support bridge.



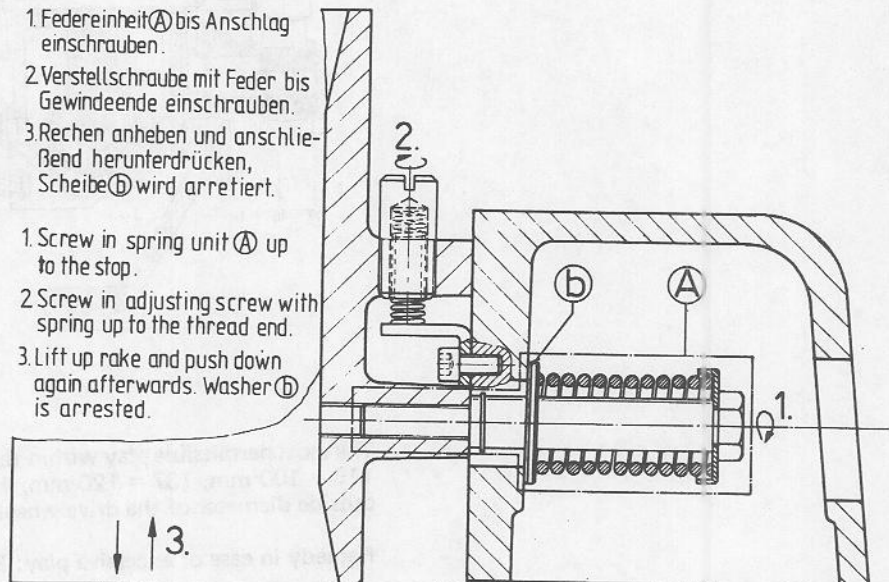
- b) Rakes or backgauge sections loose or dirt on mounting surface

- b) Remove rakes and section. Clean all mounting surfaces, remove burrs and check backgauge position with an accurate square to be sure all parts are adjusted 90° to the table. Secure rakes and backgauge section to center sledge as explained later on.



1. Federeinheit (A) bis Anschlag einschrauben.
2. Verstelle schraube mit Feder bis Gewindeende einschrauben.
3. Rechen anheben und anschließend herunterdrücken, Scheibe (B) wird arretiert.

1. Screw in spring unit (A) up to the stop.
2. Screw in adjusting screw with spring up to the thread end.
3. Lift up rake and push down again afterwards. Washer (B) is arrested.

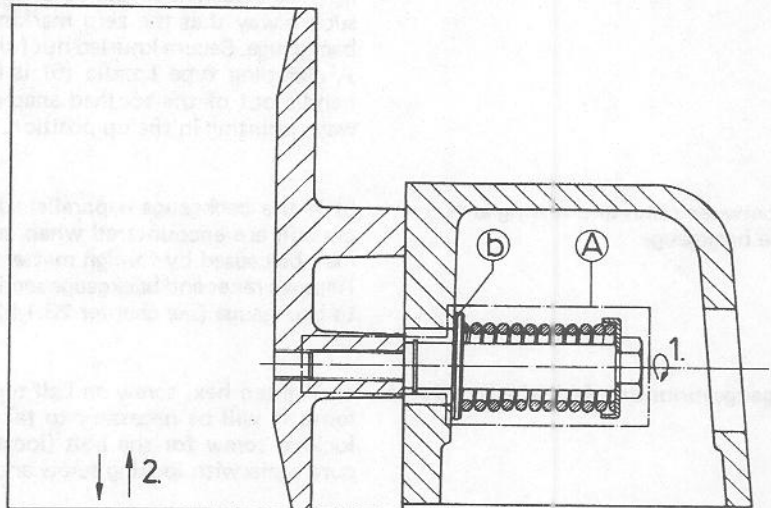


**Meaning:**

**Remedy:**

c) Adjustment of backgauge rakes model 92

1. Screw in spring assembly (A) until dead stop
2. Lift rake and push down again to have washer (b) repositioned.

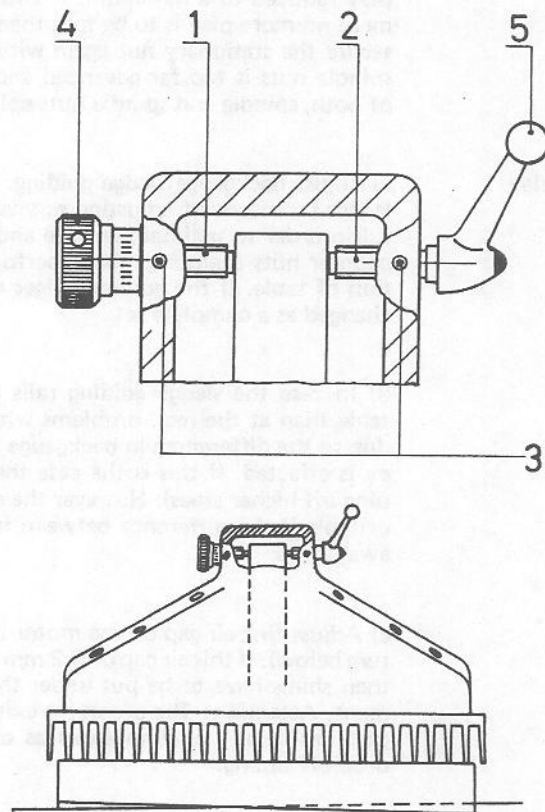


**23.2 The cutting material is not parallel**

a) The backgauge is not parallel to the knife

a) Adjustment of the backgauge is done as follows

Take a ream of paper, approx. 5 cm in height, 10 to 20 cm in width and preferable as long as the table length. Make a cleaning cut on each of the long side. Take a half of cut ream and turn it around 180°. Place this pile now on top of the remaining half in the machine. Make sure both piles are resting accurately against the backgauge. On this side on which the lower half of the ream is wider than the top half. The adjusting screw on this side has to be turned clockwise. However the opposite screw always has to be turned back beforehand the same amount. Make cut on both sides again and repeat the same adjusting procedure until both reams (upper and lower half) are of the same size. Only then the



**Meaning:****Remedy:**

backgauge is exactly parallel to the knife. Secure adjusting screws (1 + 2) from the top by inserting worm set screws (3). Knurled nut (4) with scale should now be attached to the adjusting screw (1) on the left side and positioned in such a way that the zero marking is in alignment with the mark „▽“ on the backgauge. Secure knurled nut (4) in this position with the two worm set screws. A clamping type handle (5) is fitted to the right adjusting screw. Pulling the handle out of the toothed snap device makes it possible to have the handle always pointing in the up position.

b) Dirt between rakes and resting area on the backgauge

b) If the backgauge is parallel adjusted as under chapter a and cutting differences still are encountered when cutting other paper sizes, it is possible that this may be caused by foreign matter between rakes and backgauge surface. Remove rakes and backgauge sections for thoroughly cleaning. Reassemble parts to backgauge (see chapter 23.1.b).

c) Backgauge mounting device became loose

c) Tighten hex. screw on ball type bolt. In case the ball type bolt itself became loose it will be necessary to take off the complete backgauge. Loosen up the locking screw for the bolt (located on the sledge) and retighten ball bolt. Secure again with locking screw and assemble backgauge parts.

### 23.3 Measurement backgauge position and measurement keyboard display is not in agreement

a) Backgauge guiding rails dirty or dry

a) Backgauge guiding rails have to be cleaned on a regular schedule, more often if cutter is exposed to excessive dust accumulation. After cleaning with mineral spirit lubricate entire rails by moving backgauge back and forward in order to get the oil distributed evenly over the full travel area on the guiding rails. Check also whether all oil lines are pumping out oil.

b) Table spindle resp. spindle nuts have too much play

b) Re-tension adjustable spindle nut. Beforehand remove the 2 lockscrews of the stationary spindle nut and retighten the stationary nut. This will reposition the backgauge and the adjustable spindle nut will receive some more tension from the spring. Retighten the stationary nut as far as needed to get the play reduced to a minimum. If with turning of the handwheel for fine adjustment no more play is to be felt, than the play has been taken all out. Thereafter secure the stationary nut again with the 2 lock screws. However if the wear on spindle nuts is too far advanced and any adjustment is fruitless, the exchange of both, spindle and spindle nuts cpl. , is inevitable.

c) Backgauge sledge guiding has play

c) Adjust backgauge sledge guiding. After loosening of counter nuts adjust the ledges by means of adjusting screws. The adjustment has to be made very careful in order to maintain an free and easy movement but without play. Secure counter nuts again and check performance of backgauge in front and rear section of table. If the guiding ledges are worn too far, they then have to be exchanged as a complete set.

d) Sledge guiding rails are worn

d) In case the sledge guiding rails are worn more at the front portion of the table than at the rear, problems with the automatic performance will come up due to the differences in backgauge movement. (Front-rear) The cutting accuracy is effected. If this is the case the guiding rails have to be worked on (Scraping off higher areas). However the complete exchange of the guiding rails is inevitable if the difference between front and rear is too large to be handscraped away.

e) Motor brake too much worn

e) Adjust first air gap on the motor brake. The gap should read 0.2 mm (see picture below). If this air gap of 0.2 mm is not possible through normal adjustment, then shims have to be put under the brake to reach the above air gap measurement. Attention: The presently existing brass shims have to be put to the same position in any circumstances as otherwise the brake will be retarded in the drop off timing.



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