Operating Jnstructions

for

—KOEPFER—

Rack Cutting Machine

205/210

Machine-No.:

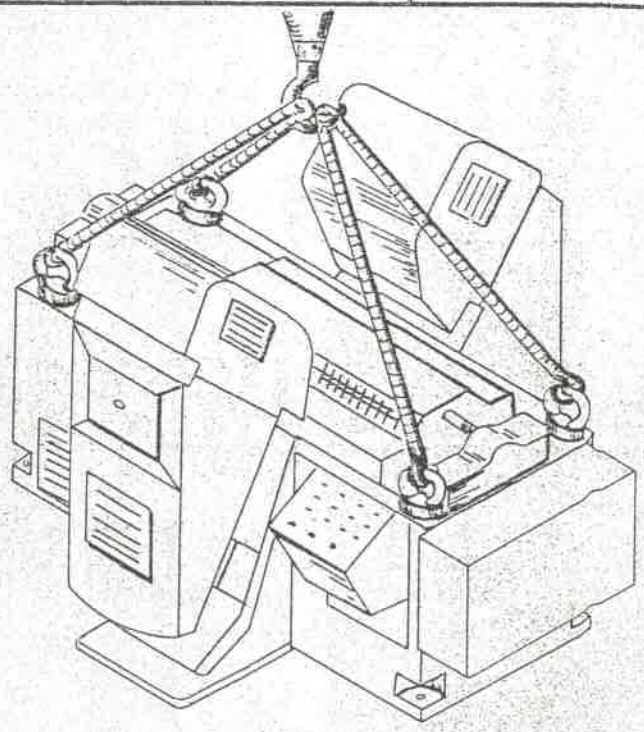
Order-No.:

Date:

Before the machine is put into operation, these instructions should be studied carefully.
When a request for information or a complaint is made, please refer to the above mentioned data.

Printed in Germany

205/210	Contents	



Transport:

When the machine is lifted by means of a crane, the ropes are to be attached to the 4 bolts as shown on the sketch.

Cleaning:

Remove protective grease from all unpainted parts with petrol. For further cleaning, see page 3.

Installing the machine:

The machine must be levelled using a highly sensitive spirit level.

After opening the cover of the switch cabinet (31) the junction box is accessible. The wires should be inserted through the junction box (42) into the switch cabinet and fixed to the terminals.

Attention must be paid to see that the cutter spindles run in the direction as indicated by screws (page 15).
For this purpose, turn selection switch (15) page 18 at the operating panel and main switch (42) page 15 into position I.
Press push button (2) page 18 for "Cutters".

Standard accessories:

When the machine arrives, check the accessories mentioned in the delivery note.

The following standard accessories are furnished:

1 set = 8 pulleys for V-belts for each cutter head
for the cutter speeds

1 set = 12 change gears (module 1) for plunge feed for each cutter head

1 set = 12 change gears (module 2) for longitudinal feed for each machine

4 change gears for indexing

8 allen keys 2 - 2.5 - 3 - 4 - 5 - 6 - 8 - 10

8 spanners 6 x 7; 8 x 10; 9 x 11; 9 x 12; 14 x 17; 19 x 22; 24 x 27 and 32

1 socket wrench 14 x 17 SW DIN 896

1 socket wrench 17 SW 250 mm length

1 socket wrench 41 with handle 20 mm dia., 300 mm length

2 wrenches 34 - 36

2 wrenches 40 - 42

1 wrench 52 - 55

1 wrench 68 - 75

2 special levers

1 grease gun

1 cranked handle with socket wrench extension 12 mm, length 70 mm

1 wrench for the V-belt-pulleys of the cutter head (No. 205-2241)

The machine has a circuit lubrication system. There are only a few lubrication points which have to be supplied by hand.

The machine is supplied without any oil in the containers.

Before putting the machine into operation, it must be lubricated according to the lubrication chart. The following should be noted:

The main oil container 36 (page 14) in the base of the machine must be filled with oil up to the centre of the oil level sight glass 22 (page 14).
Then the machine should run idle for about 5 minutes so that the intermediate oil containers fill themselves automatically. After that stop the machine for approximately 20 minutes. During this time, the oil in the intermediate oil containers will reach the normal level and the oil in the lubrication system will run back into the main container. The level in the container will have sunk and must be raised again until it reaches the centre of the sight glass.

This procedure must be repeated each time the oil is changed.

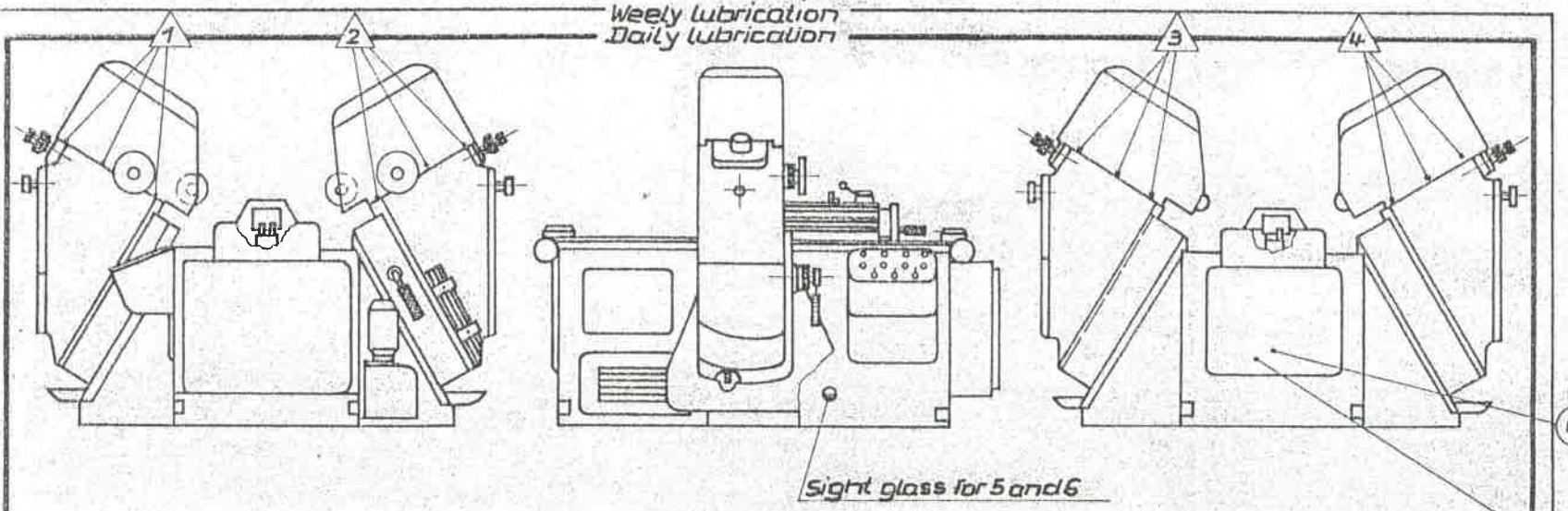
It is recommended to change the oil after 500 working hours. The suction filter should be cleaned weekly. Only quality oils as recommended should be used.

J.K.S.

Lubrication according to instructions

Weely lubrication

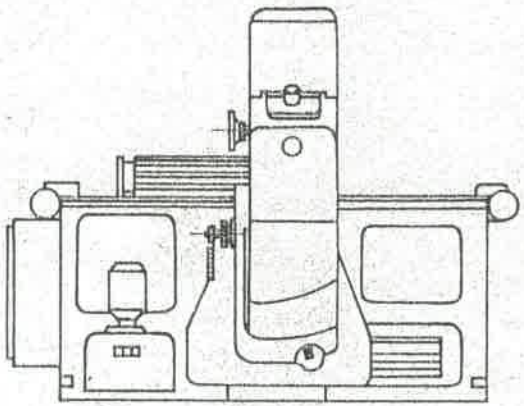
Daily lubrication



recommended oils	
lubricant according	Viscosity

See oil chart page 5

1.) For 8 hour - shift



Lubrication Instructions		
lubrication	lubrication points	Quantity
daily	1 - 4	4 - 5 strokes of grease gun
weekly	5	up to centre of oil sight glass
every 6 months	6	approx. 65 litres = 14 gallons

Oil sight glasses to be inspected constantly

Correct lubrication of the machine is essential. Only when the very best lubricants are used, the machine can give its best performance.

The following lubricants have prooved satisfactory:

Lubrication points	Lubrication	Suppliers		
		Esso	Gasoline	Vacuum
1 - 4	Lubrication by hand		Deganol Spezialfett I	Cargoyle Fett 1200
5 - 6	Circuit lubrication system	Coray 40 Spindle Oil	Spindle Oil Raffinat 2160	

	Suppliers		
		Mobil Oil	
Cutting oil only cutting oils for low viscosity should be used		"Sultran D"	

If recommended lubricants are not available, use the nearest possible equivalent to the analyses given below:

Lubricant	Specific weight at 50° C	Viscosity at 50° C
Voltol Gleitöl O	approx. 0,895	approx. 2,5° E
Coray 40 Spindle Oil	" 0,895	" 3,4° E
Spindle Oil Raffinat 2160	" 0,895	" 2,5° E

J. K. S.

Control of automatic circuit lubrication:

Before the machine is put into operation it is necessary to adjust the automatic circuit lubrication system to the viscosity of the lubricant used, i.e. the oil volume reaching the control and lubrication spots must be checked.

To regulate the flow of the lubricant one main distribution unit and one intermediate distribution unit for each cutter head is provided. The distribution units, equipped with setting screws, allow to supply each individual lubrication spot with its proper adequate dose of lubricant.

Left resp. right turn of setting screws means decrease resp. increase of lubricant flow.

Control and setting up of the lubrication and distribution system takes place as follows:

A) Installation of the machine in its proper place (see instruction book page 1).

B) Filling in of lubricant and greasing all hand operated lubrication spots. (page 3 - 5 instruction book)

C) Control of automatic lubrication on the various lubrication spots and, if necessary, readjustment of the distribution units-

1. Remove cover 34 on the machine bed and cover 8 and 23 on the cutter heads. This gives acces to the distribution units and to the lubrication spots to be checked. (see page 14).
   To check the lubricant in the main table guide ways their protections (tin strap) are to be loosened on the main table front sides and rolled back into their housings.
   This must be done as follows, i.e. the given sequence must be maintained:

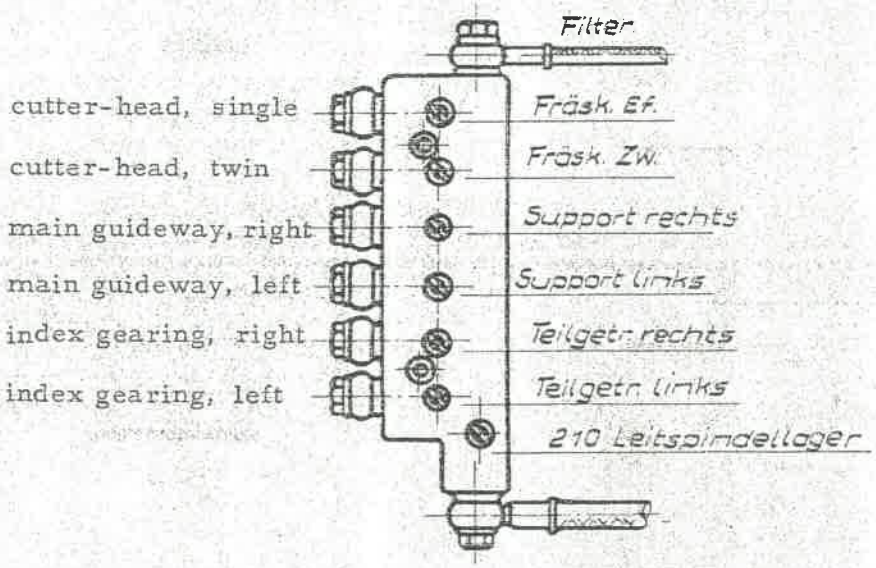
   Main switch 42 (page 14) on

   Main selection switch 15 in position 1 = setting up - and positioning of main table in its left end-position by working push button 12.

   Remove the three locking screws of the front protection on the left hand side of the main table.

Protection and clamping strap to be retightened, separate from the main table, with the screws and nuts.
After this, two of the three screws of the rear protection can be loosened entirely whereas the third screw is to be untightened only so far as to allow protection and clamping strap to be retightened, separate from the main table, with the two screws and nuts removed at the beginning. This done, by retaining both (front and rear) spring-loaded protections the remaining screw can be taken out entirely. The protections will now, by applying appropriate counter force, be pulled back smoothly into their housing by springload.

Attention: Non-observance of above instructions will entail tedious and awkward resetting of the protection mechanism.



a) Adjustment of the main distribution unit:

The following information given with regard to the location of various lubrication spots or groups thereof on the machine is related to a person standing in front of and facing the inscribed front plate of the main distribution unit 15 (page 14).

1. Setting screw "210 Leitspindellager" (210 index screw bearing) (This is only used on a machine type 210!)

The lubrication spot is situated above the distribution unit 15 on the top of the machine bed, near the guideway protection housing. The oil level in this particular oil basin must reach the overflow.

2. Setting screw "Teilgetriebe links" (index gearing, left)

Oil basin on top, lefthand side, of the index gear box. All oil tubes, supplying the change gears and studs on the front side of the index gear box must drip constantly.

3. Setting screw "Teilgetriebe rechts" (index gearing, right)

Oil basin on top, righthand side, of index gear box. All oil tubes, supplying the feed gears and studs on the front side of the index gear box must drip constantly.

4. Setting screw "Support links" (Main guideway, left)

Lubrication spot: main guideway, left.
Operate the main table by pressing push buttons for accelerated movement *11* and *12*. The oil wave, created by the table movement must remain 0, 1 - 0, 2 inch below the guideway edge.

5. Setting screw "Support rechts" (main guideway, right)

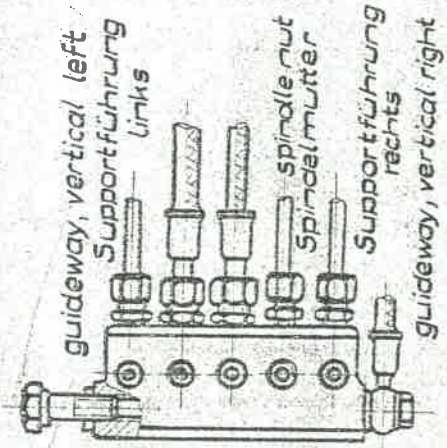
Lubrication spot: main guideway, right
Control of oil flow as under (4).

6. Setting screw "Fräskopf, Zwilling" (cutter head, twin)

Supply tube for intermediate distribution unit *41* (page *14*) on the righthand cutter head.
The oil flow must be sufficient for the righthand cutter head in its entity.

7. Setting screw "Fräskopf, Einfach" (cutter head, single)

Supply tube for intermediate distribution unit *41* (page *14*) on the lefthand cutter head.
The oil flow must be sufficient for the lefthand cutter head in its entity.



b) Adjustment of the intermediate distribution unit for the cutter heads

(This unit will be found on the single head machine in the cutter head unit which is mounted opposite the general operation side. In the twin head machine, the distribution unit is contained in the cutter head on the general operation side).

The following lubrication instructions apply to both cutter heads.

Information given with regard to the location of various lubrication spots or groups thereof on the cutter heads is related to a person standing in front of and facing the inscribed front plate of the intermediate distribution unit 41 (page 74).

1. Setting screw "Fr" (cutter head control eye)

A continous flow of oil must be visible in the control eye 5 (page 74).

2. Setting screw "Ta" (plunge feed unit)

   Remove plunge change gears and bushing. The lubricant must emerge from the now visible oil outlets in the axles.

3. Setting screw "Spindelmutter" (Vertical feed screw nut)

   Lubrication spot: vertical feed screw and nut, situated behind the distribution unit.

   The feed screw must be covered with an adequate oil film.

4. Setting screw "Supportführung rechts" (guideway, vertical, right)

   Lubrication spot: right hand vertical guideway of cutter head unit.
   On the upper, visible part of the vertical cutter head guideways a thin oil film must develop, without excess oil being pressed sideways from underneath the cover strips and downwards at the guideway ends into the oil container. Excess lubricant makes eventually the container overflow.

   To adjust for the correct amount of oil, make the cutter heads move up- and downward by operating push buttons 9 or 10.

5. Setting screw "Supportführung links" (guideway, vertical, left)

   Lubrication spot: Lefthand vertical guideway of cutter head unit.

   Procedure of adjustment as given under (4).

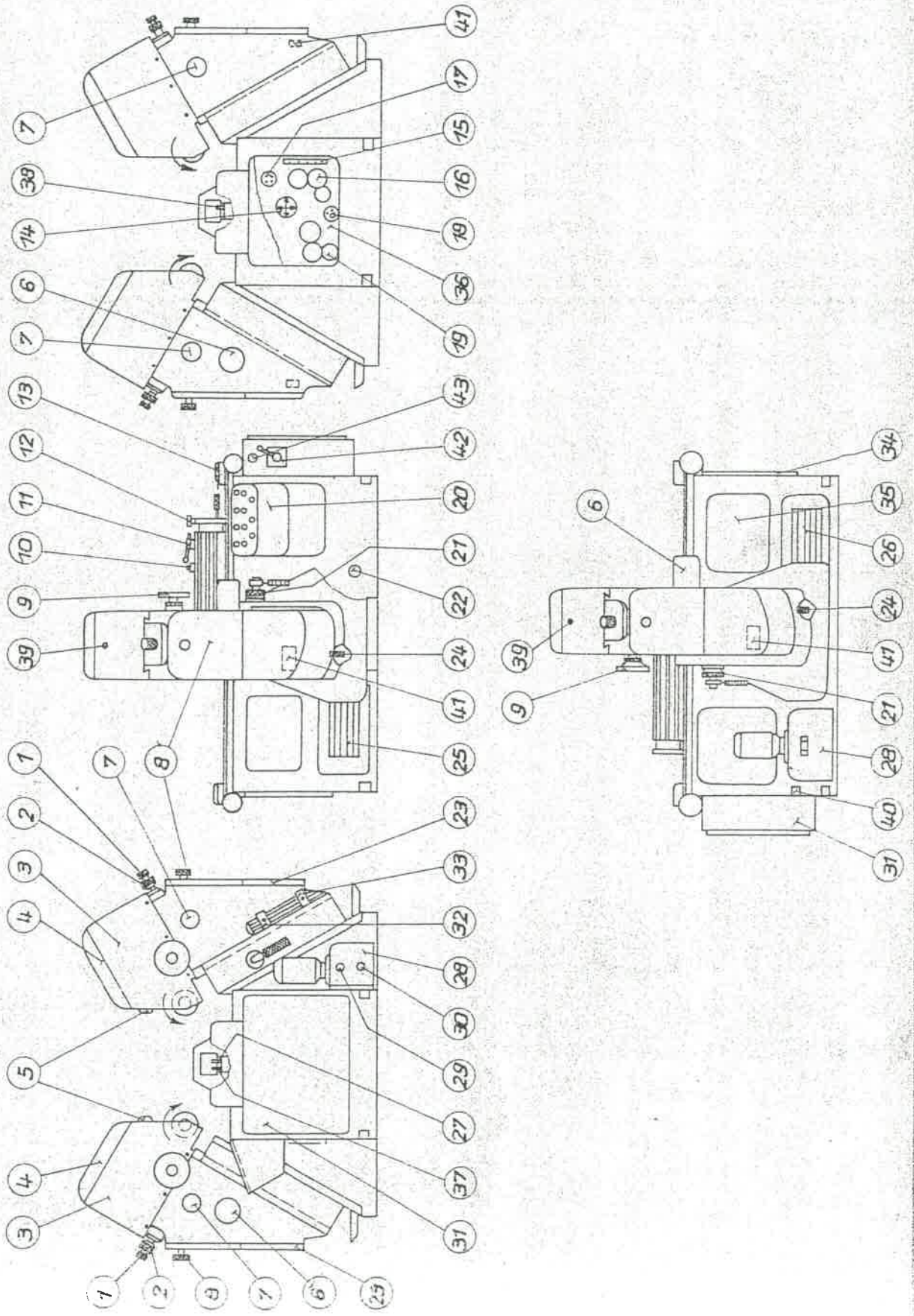
Tooth data:	Maximum pitch		
	in steel of 60 tons per sq. in.		DP 6
	in cast iron		DP 5
	Maximum cutting length - type 205 -		20"
	- type 210 -		40"
	Maximum cutting width		4"
Worktable:	Length of clamping surface - type 205 -		27 1/2"
	- type 210 -		47"
	Width of clamping surface		5 1/4"
	Number of T-slots		3
	Width of T-slots		12 mm
Speeds of quick return movements:			
	Plunge cut return	approx. in/sec.	25/64
	Longitudinal cutter return	" in/sec.	25/64
	Worktable return	" in/sec.	1
Cutter head:	can be swivelled to either reight or left hand side		20°
Number of feeds with standard change gears:			
	Plunge feeds		9
	Longitudinal feeds		9
Range of feeds:	Plunge feed	in/min.	5/8 - 10
	Longitudinal feed	in/min.	1 - 20
Machine power:	Single head machine	h.p.	7
	Double head machine	h.p.	10
Weights:	Single head machine type 205	approx.	4660 lbs
	Double head machine type 205	"	5750 lbs
	Single head machine type 210	approx.	6000 lbs
	Double head machine type 210	"	7100 lbs

A) Single head machine:

1.	1 Main drive motor (squirrel cage)	1.5 kW 1500 rev/min
2.	1 Motor for plunge motion of the cutter head (squirrel cage)	0,55 kW 2800 rev/min
3.	1 Motor for the rapid return of the feed (squirrel cage)	1,1 kW 3000 rev/min
4.	1 Motor for feed (squirrel cage)	0,55 kW 1500 rev/min
5.	1 Motor for the indexing mechanism (squirrel cage)	0,55 kW 1500 rev/min
6.	1 coolant pump motor	0,33 kW 2800 rev/min

B) Double head machine:

1.	2 Main drive motors	1,5 kW 1500 rev/min.
2.	2 Motors for plunge motion of the cutter head	0,55 kW 1500 rev/min
3.	1 Motor for the rapid return of the feed	1,1 kW 3000 rev/min
4.	1 Motor for feed	0,55 kW 1500 rev/min
5.	1 Motor for the indexing mechanism	0,55 kW 1500 rev/min.
	1 coolant pump motor	0,33 kW 2800 rev/min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J. K. S.

1 = Locking screw.

2 = Scale for setting the return lift of the cutter head.

After having loosened locking screw 1 the scale can be turned and adjusted to the position desired.

Return lift = cutting depth + 1/64" as security.

3 = Cutter head.

The cutter head is a self-contained unit.

4 = Guard can be lifted when cutter speed has to be changed.

5 = Oil sight glass for the lubrication circuit.

6 = Motor for plunge motion of the cutter head.

7 = Cover for the line can be removed for checking or exchange of the brushes of the electro-magnetic clutches.

Instructions for maintenance: see page 20.

8 = guard of the change gears for plunge feed.

9 = Handwheel with graduated scale for setting the cutting depth.

10 = Fine longitudinal adjustment of the worktable.

11 = Locking lever for fine longitudinal adjustment.

12 = Locking know for stop dog.

13 = Dial indicator for fine adjustment of the initial position of the worktable (special accessory).

14 = Shaft for setting 4 different pitches.

15 = Main oil distributor.

16 = Change gears for feed.

17 = Oil filter "MANN" (for cleaning instructions see page 21).

18 = Oil pump for circuit lubrication system.

19 = Change gears for pitches.

20 = Operating panel for selection switches.

For operation instructions see page 17.

Wähde & Co., Rastatt 2234

21 = Device for setting the angles.

22 = Oil sight glass for main oil container

23 = Cover of intermediate oil distributor at cutter head

24 = Locking bolt for setting the angle at zero.

25 = Air inlet for feed motor.

26 = Air inlet for the indexing mechanism driving motor.

27 = Skip device (special accessory).

28 = Coolant tank with pump.

29 = Sight glass for coolant tank (maximum level).

30 = Sight glass for coolant tank (minimum level).

31 = Switch cabinet for electrical switch gear.

32 = Stop dog for downward movement of the cutter head.

33 = Stop dog for upward movement of the cutter head.

34 = Guard of indexing mechanism (front side).

35 = Guard of the electric installation leading to the electro-magnetic clutches of the indexing mechanism.

36 = Cover of the main oil container and the suction filter.

37 = Stop dogs for setting the worktable travel to its final position governing also the start of the quick table return.

38 = Stop dog for setting the worktable to its initial position.

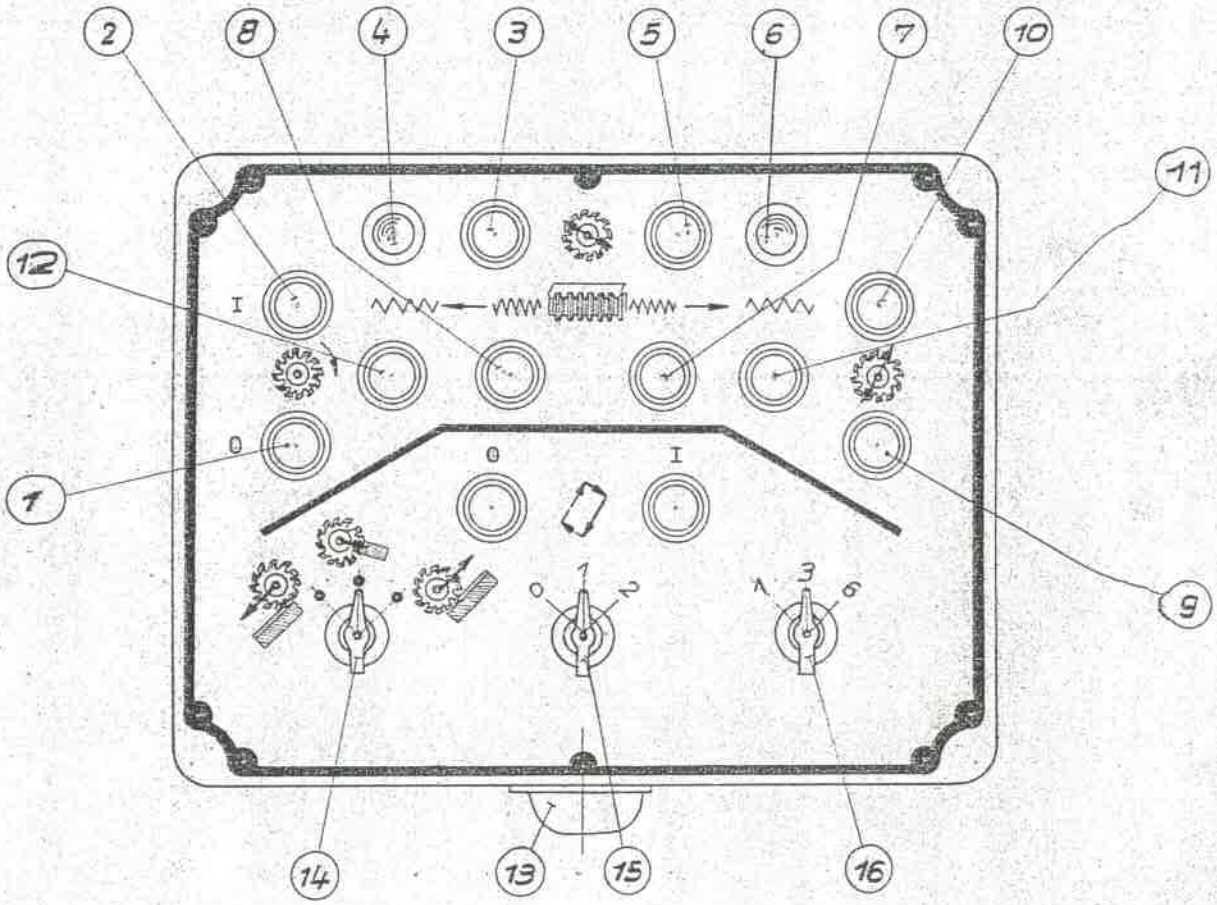
39 = Screw to adjust the tension of the V-belts for the cutter drive.

40 = Main power cable.

41 = Intermediate oil distributor at cutter head (accessible after removal of cover (23) page 15)

42 = Main switch (see also page 20)

43 = Control lamp for main switch (see also page 20)



All electrical switches are concentrated at the operating panel.

Easily comprehensible symbols indicate the operation to be engaged by using the corresponding switch.

In its upper part, the operating panel contains all switches required for setting up the machine rapidly (Setting up field).

In its lower part, the switches, necessary for preselection, starting and stopping of the machine cycle are grouped (Operating field).

Setting-up field: switch 15 in position 1

1 Push button "stop" for the cutters.

2 Push button "start" for the cutters.

3 Push button for quick return travel of the plunge feed.

4 Control lamp lights when the plunge feed has stopped.

5 Push button for plunge feed (can only be actuated when the cutter turns).

6 Control lamp lights when the quick return travel of the plunge feed has stopped.

7 Push button governing the indexing mechanism of the worktable travel to the right (x)

8 Push button governing the indexing mechanism of the worktable travel to the left (x)

9 Push button for quick downward motion of the cutter head (x)

10 Push button for quick upward motion of the cutter head (x)

11 Push button for quick traverse of worktable to the right (x)

12 Push button for quick traverse of worktable to the left (x)

Push buttons 7 - 12 (x) will work only when the cutter head is not at cutting depth, i.e. lamp number 6 must be alight.

Operating field: switch 15 in position 2

14 Switch for the selection of the cutting method:

Switch in left hand position = Conventional cutting, combined plunge-longitudinal feed

Switch in intermediate position = Plunge cutting

Switch in right hand position = Climb cutting, combined plunge-longitudinal feed.

15 Main selection switch

Switch position 0 = Machine stopped

Switch position 1 = Preselction "Setting up"

Switch position 2 = Preselection "Operation"
(Automatic working cycle)

16 Selection switch for the indexing range

Switch position 1 = indexing range 1 - 8 mm

Switch position 3 = indexing range 3 x 1 - 8 mm

Switch position 6 = indexing range 6 x 1 - 8 mm

Selection switches 14, 15 and 16 are mecanically interlocked. Switches 14 and 16 cannot be used if switch 15 is not in position O.

13 Switch for coolant pump.

Main switch:

Main switch (42) page 14 is mounted at the switch cabinet on the right hand side of the operating panel.
According to its position, the main switch connects with or disconnects the machine from the line. Only when the main switch is put into operating position, the machine can be started.

Important: The machine should be disconnected from the line by turning off the main switch whenever it is not used.

Control lamp for main switch (42) page 14

When the control lamp (43) page 14 lights up, the machine is under power.

When the covers 7 and 35 (page 14) have been removed, the electric installations leading to the electro-magnetic clutches are accessible.

These should be checked approx. every two months.

First the rubber cap should be removed. Then the leads can be disconnected and part b unscrewed.

The brushes should be replaced when they have lost about 4 mm (29/64") through wear. The maximum wear is approx. 6 mm (17/32"). The brushes can be supplied without part b.

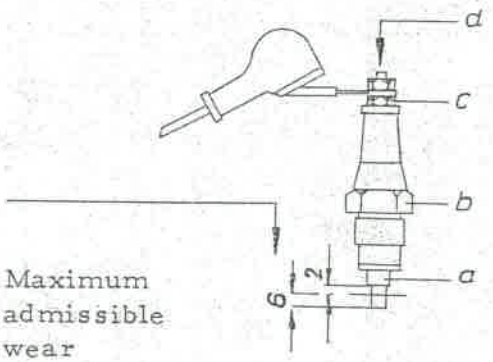
The exchange of a new brush against the worn one is mad as follows:

Nut c must be released, then the brush a can be removed by knocking lightly in direction d. Then the spare brush can be fitted.

In order not to mix up the various lead, it is recommended to exchange one after the other.

Important: Before the brushes are exchanged, the machine has to be switched off, i.e. the main selection switch 42 page 14 must be in position "stop".

Even during an electrical check of the clutches the current must never be interrupted by lifting up the brushes from the rotor. This causes tiny burnt spots on the rotor, and increases the wear of the brushes considerably.



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Lubricant Filter:

a) Cleaning:

The lubricant filter should be cleaned after 400 - 500 working hours.

b) After releasing the screws the insert can be removed from the container by pulling it carefully.

The packet of sieves fixed on the insert must never be removed.

The sieves should be cleaned by brushing them from the outside with petrol. The brush used should have long bristles so that even the smallest holes in the sieves are cleaned.

Before the filter is refitted, its housing should be carefully cleaned from dirt and swarf.

c) When the insert has been rinsed again with clean petrol it may be re-fitted. The packing ring between filter head and casing must not be forgotten.

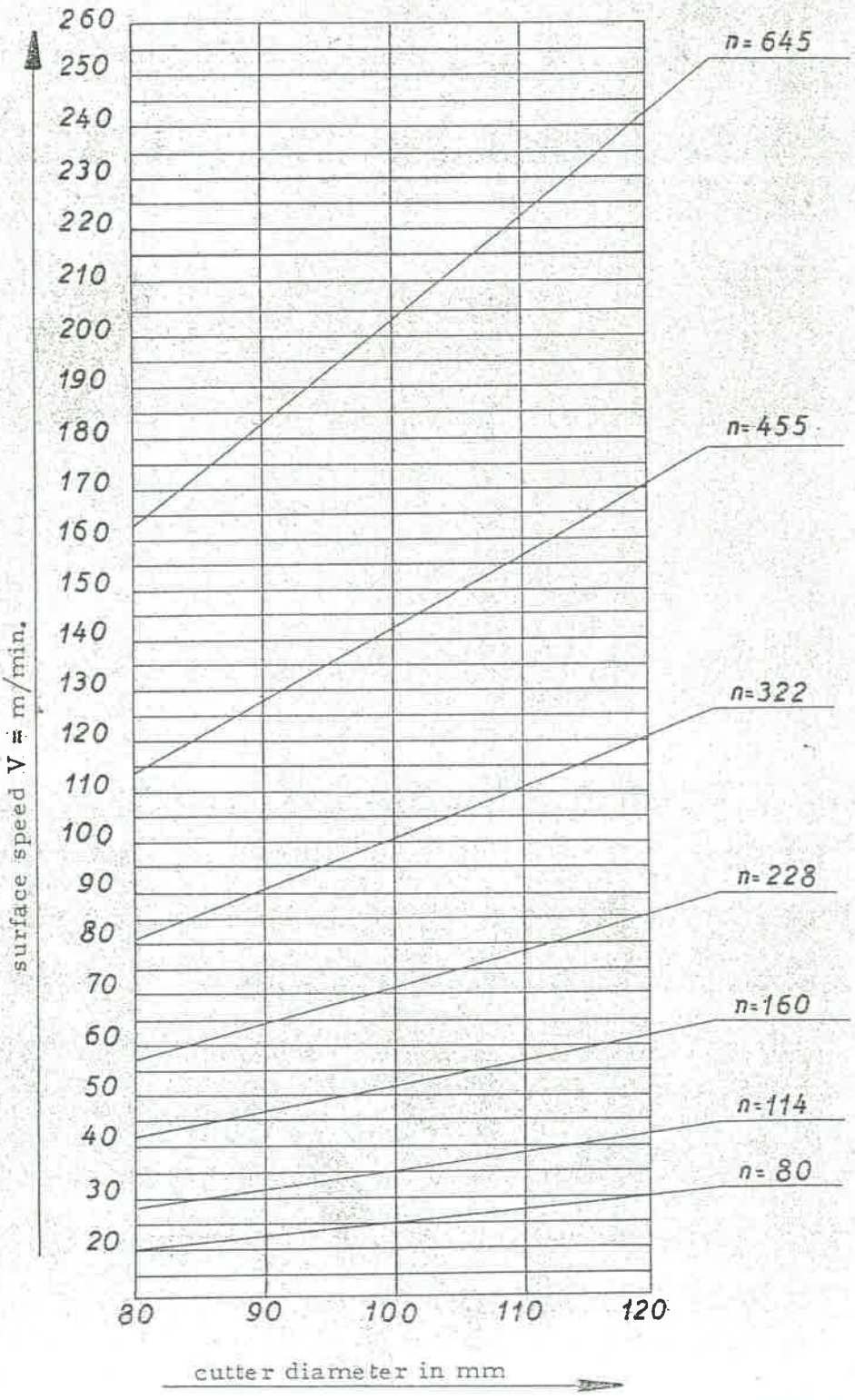
Cleaning of the lubricant container:

The lubricant must be replaced from time to time and the coolant tank 28, see page 14, has to be cleaned.

When the nut union is released, the piping can be separated from the coolant pump. Container and pump can then be taken from the machine. Unscrew the two knurled screws, take away the pump from the container and clean the latter.

Removal of chips and swarf

On the left hand side of the operating panel, on each side of the machine, a swarf container is provided. It has to be cleaned regularily in order to avoid that the swarf gets into the coolant tank.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100
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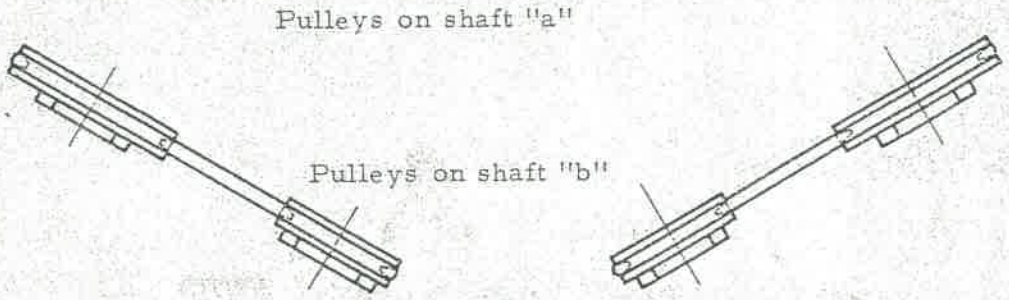
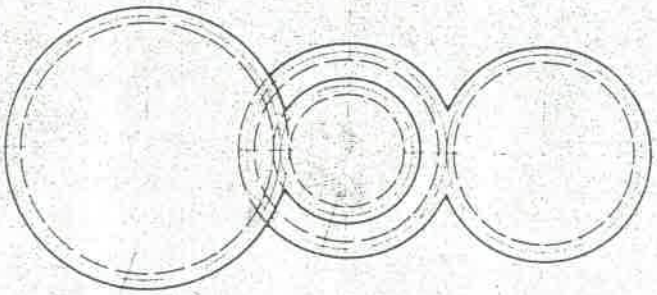
60
50
40
30
20
surface speed V = m/min.
n= 645
n= 455
n= 322
n= 228
n= 160
n= 114
n= 80
Hob revolutions/min.
80
90
100
110
120
cutter diameter in mm



For gightening or releasing the V-belts turn screw (39) page 15 either to the right or to the left.

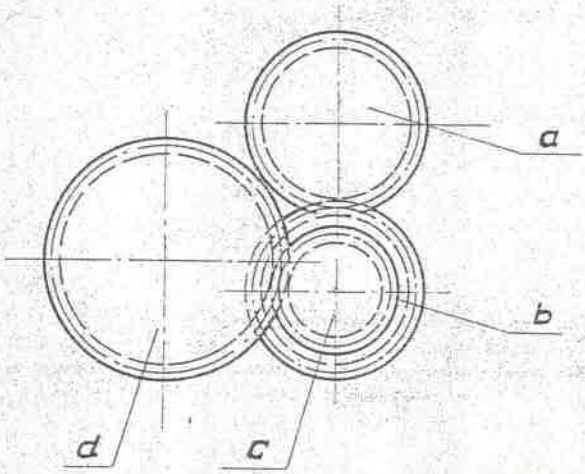
A special wrench is supplied as a standard accessory to be used for the removal of the pulleys when a worn V-belt has to be replaced.

Cutter revs/min.	Pulley number	
	shaft a	shaft b
80	1	7
114	2	6
160	3	5
228	4	4
322	5	3
455	6	2
645	7	1

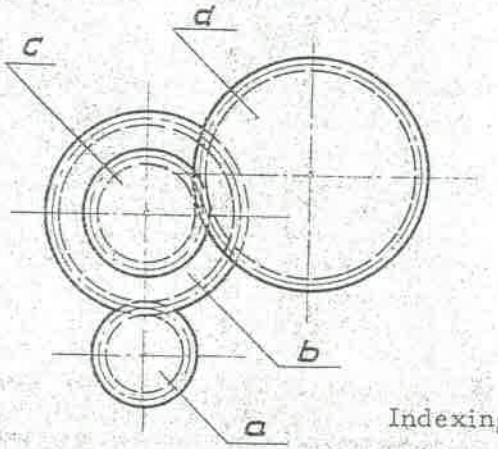


a b c d

Plunge feed mm per minute	Change gears module 1			
	a	b	c	d
16	32	90	32	90
22	32	90	40	82
32	32	90	50	72
46	32	90	61	61
63	40	82	61	61
90	50	72	61	61
129	61	61	61	61
186	72	50	61	61
264	82	40	61	61



Longitudinal feed mm per minute	change gears module 2			
	a	b	c	d
28	18	52	18	52
40	18	52	23	47
62	18	52	30	40
83	18	52	35	35
117	23	47	35	35
180	30	40	35	35
240	35	35	35	35
320	40	30	35	35
490	47	23	35	35



Indexing change gears

✳ with intermediate gear

	Formula of pitch range			Value adjusted on shaft 14, page 14
	1 - 8 mm	8 - 24 mm	24 - 48 mm	
pitch in mm = x	$\frac{a \cdot c}{b \cdot d} = \frac{x}{10}$	$\frac{a \cdot c}{b \cdot d} = \frac{x}{30}$	$\frac{a \cdot c}{b \cdot d} = \frac{x}{60}$	mm
pitch in module = m	$\frac{a \cdot c}{b \cdot d} = \frac{m \cdot 2}{10}$	$\frac{a \cdot c}{b \cdot d} = \frac{m \cdot 2}{30}$	$\frac{a \cdot c}{b \cdot d} = \frac{m \cdot 2}{60}$	module
pitch in inch. = y	$\frac{a \cdot c}{b \cdot d} = 2 \cdot y$	$\frac{a \cdot c}{b \cdot d} = \frac{2 \cdot y}{3}$	$\frac{a \cdot c}{b \cdot d} = \frac{2 \cdot y}{6}$	inch.
Number of teeth per inch. = V	$\frac{a \cdot c}{b \cdot d} = \frac{2}{V}$	$\frac{a \cdot c}{b \cdot d} = \frac{2}{3 \cdot V}$	$\frac{a \cdot c}{b \cdot d} = \frac{2}{6 \cdot V}$	inch.
Diametral Pitch = DP ✳	$\frac{a \cdot c}{b \cdot d} = \frac{10}{Dp}$	$\frac{a \cdot c}{b \cdot d} = \frac{10}{3 \cdot Dp}$	$\frac{a \cdot c}{b \cdot d} = \frac{10}{6 \cdot Dp}$	Diametral Pitch ✳
	1	3	6	
	Position of selection switch (16) page 17			

Number of pieces	Number of part	Description	produced by
6	205.264	Brush insert for electro magnetic clutch EM, type TSK 6/6552/ 102006	Siemens
6	205.264 A	Replacement brush for TSK 6/102006	Siemens
1	205.272	Brush insert for electro magnetic clutch EM, type TSN 6/16	Siemens
1	205.272 A	Replacement brush for TSN 6/16	Siemens
2	205.1049 (BN 3074)	Limit switch AT 11-2-i	Kloeckner-Moeller
2	205.24	V-belts, oil proof, 10 x 6 x 750 mm	Continental
2	205.25	V-belts, oil proof, 10 x 6 x 850 mm	Continental
2	205.1634	V-belts, oil proof 9,5 x 825 mm DIN 2215	Continental