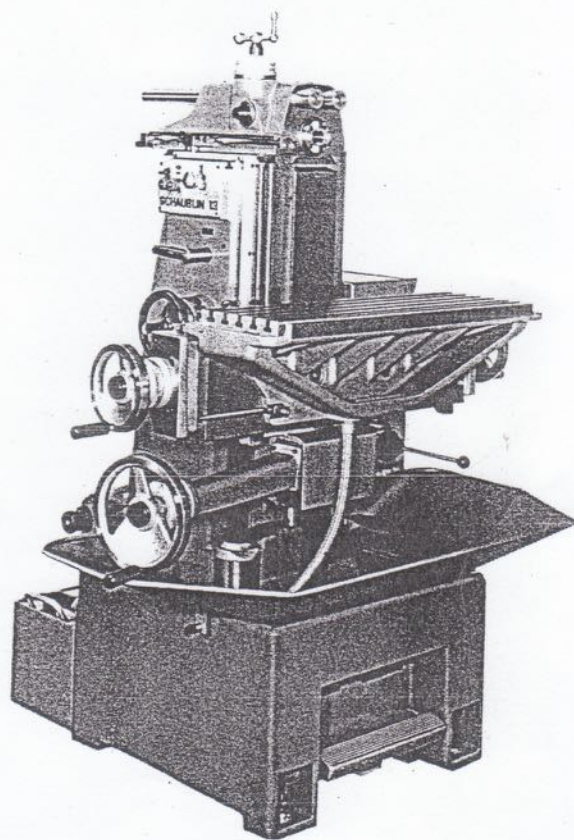


HIGH-PRECISION UNIVERSAL MILLING MACHINE

SCHAUBLIN 13



SERVICE INSTRUCTIONS

To be handed to the person responsible for operating the machine.

Reproduction of any of the text, drawings, or photographs is forbidden.
The dimensions, weights, and illustrations are given only as a guide, and
we reserve the right to modify the design at any time.

Edition du : 15.1.76
Annulée le : 11.8.78

Machine N° :

BL N° :

Voltage :

FABRIQUE DE MACHINES
SCHAUBLIN S.A.
2735 BEVILARD SUISSE

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1. SPECIFICATION

LONGITUDINAL SLIDE

Working surface	630 x 200 mm
Distance between T-slots	120 mm
Width of T-slots	12 mm(H7)
Longitudinal movement : with plain hand wheel	320 mm
with star wheel	265 mm
automatic	300 mm
Vertical movement : with plain hand wheel	375 mm
automatic	355 mm
10 rates of longitudinal and vertical movement	12, 18, 26, 38, 57, 85, 125, 185, 270, 400 mm/min.
Longitudinal and vertical rapid traverse	1,2 m/min.

BOX-SECTION TABLE

Working surface (type 13-5420)	700 x 210 mm
Distance between the four T-slots	40 mm
Width of T-slots	12 mm (H7)
Lateral movement possible	120 mm

HORIZONTAL SPINDLE HEAD

Axial movement	150 mm
Spindle-nose taper to standard	ISO 30 (NS 1 $\frac{1}{4}$ " VSM 33931 size 32 DIN 2079 size 30
Outside diameter of spindle nose	(2 $\frac{3}{4}$ ") 69.832 mm
Spindle bore	17 mm
Spindle speed	58 to 2000 rpm

MOTORS

Main motor	2 hp at 1500 rpm
Rapid-traverse motor	0.6 hp at 3000 rpm
Coolant pump motor	0.15 hp at 3000 rpm

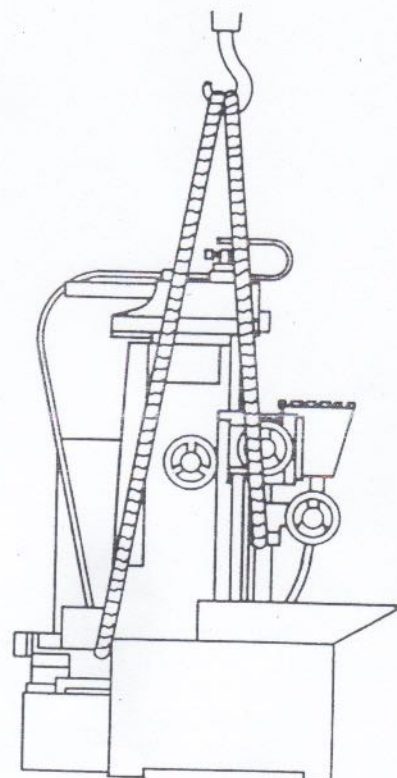
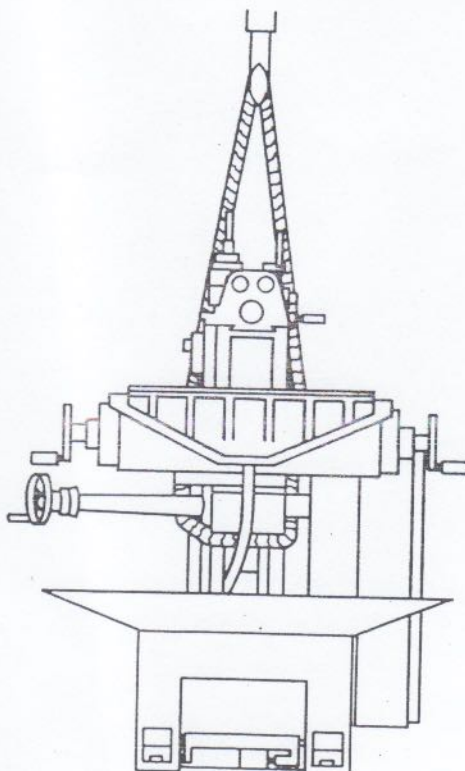
WEIGHT AND DIMENSIONS

Dimensions of machine, length x depth x height	150x110x160 cm
Dimensions of packing case, length x depth x height	160x120x174 cm
Net weight of machine with standard equipment approx.	690 kg

2. INSTALLATION

2.1 TRANSPORT

On receipt of the machine remove the lid and side walls of the packing case. Take all the accessories out of the case and remove the chip tray. To transport the machine by lift truck or on rollers, leave it fixed to the bottom of the case. For transport by hoist or overhead crane, separate the machine from the bottom of the case, lock the table in its lowest position, and place the ropes as shown in the sketch below.



2.2 SPACE REQUIRED

The machine must be freely accessible from all sides. For this purpose the minimum spacing between the machine and other machines or between the machine and the walls, as indicated on the foundation plan, must be maintained.

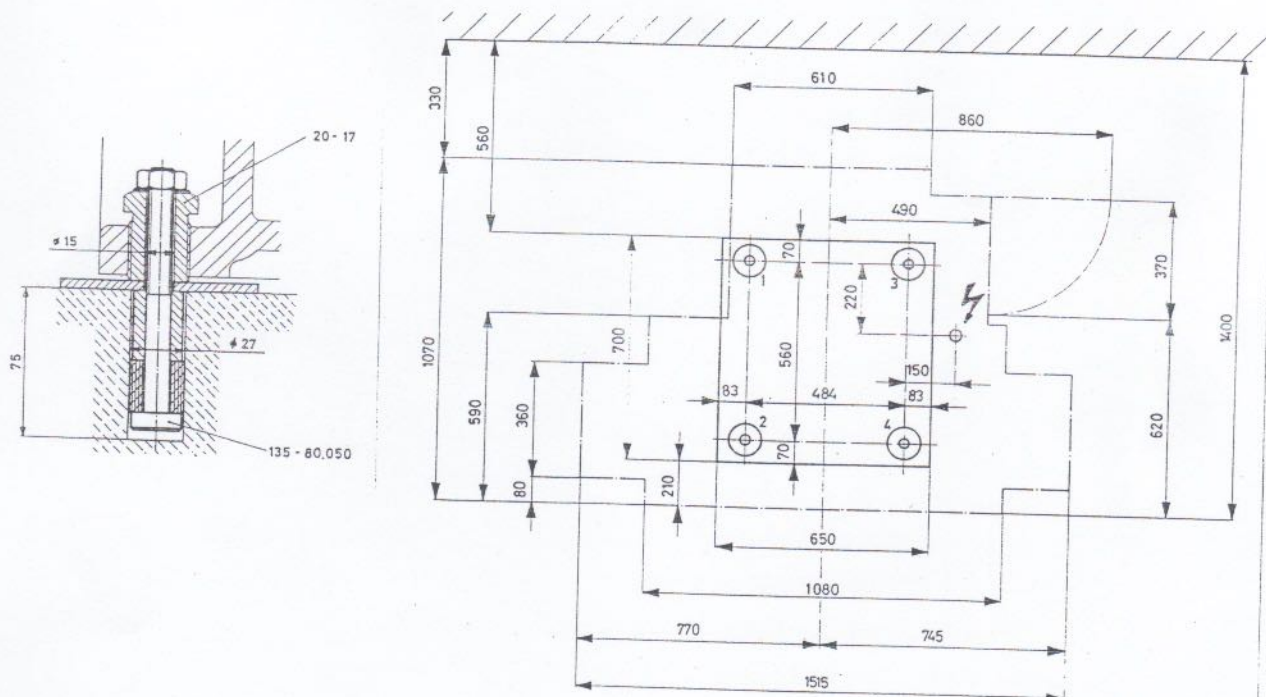
This minimum spacing is necessary for both maintenance of the machine and access to all control assemblies when dismantling.

2.3 FOUNDATION PLAN

To obtain the maximum benefit from the advantages offered by the machine, place it on a concrete foundation, as shown in the drawing below. The depth of the foundation depends on the nature of the ground. In any case the concreting must be done on solid ground.

A steel tube with an inside diameter of 26 mm, sunk into the concrete and standing about 30 cm above the level of the ground, is used for taking the electric wires carrying the current to the machine.

For fixing the machine to the foundation four Seetru bolts (135-80.050) and four plates of 100 mm diameter can be supplied on request. These items are numbered from 1 to 4 on the foundation plan. Mark off the holes for the bolts from the base of the machine (they must have a diameter of 27 mm and a depth of 90 mm).



2.4 CLEANING THE MACHINE

Before despatch all machines are coated with a rust-preventing grease. Since this has no lubricating properties, remove it very carefully before operating the machine in any way.

Any of this grease left on a slide or any such part of the machine could cause serious seizures, even after several weeks of operation.

To remove this grease, use only clean rags, preferably white and chemically neutral, previously soaked in paraffin.

2.5 LEVELLING

For checking it is best to use the surface of the table. To level the machine, use a precision spirit level (1 division = 0.03 mm/m).

Proceed as follows :

1. Tighten the foundation bolts 1 and 2 provisionally. Level the machine transversely with the aid of the two jacks (20-17) and then tighten the two bolts fully.
2. To level the machine longitudinally, tighten the foundation bolts 3 and 4 and adjust with the aid of the corresponding jacks.
3. Correct the transverse inclination with the jacks 3 and 4.
4. Check the transverse and longitudinal inclination over the entire surface of the table. Then tighten the bolts 3 and 4 fully.

2.6 LUBRICATION

The spindle gearbox and feed gearbox each have their own oil bath. That of the spindle gearbox serves at the same time as a tank for the central lubrication.

Before starting up the machine, check these two tanks and, if necessary, fill them (for the grades of oil recommended refer to the attached lubrication chart). All slideways, the longitudinal screw, the variator, and the feed drive freewheel arrangement are lubricated from the central system.

A mushroom-headed pushbutton on the righthand side of the machine is used for starting up the lubrication pump. Three or four shots of oil per day suffice to ensure proper lubrication of all parts.

IMPORTANT !

After a longer pause (weekends, etc.) 8 to 10 pumpshots are necessary in order to fill all oil grooves located in the slideways.

For maintenance consult the lubrication chart.

Before starting up, lightly oil all machined surfaces.

TABLEAU DE GRAISSAGE

pour Fraiseuse universelle

SCHMIERTABELLE

für Universal Fräsmaschine
















LUBRICATING CHART

for Universal milling machine

SCHAUBLIN
13

MODE DE LUBRIFICATION ART DER SCHMIERUNG TYPE OF LUBRICATION	ORGANE DE LA MACHINE MASCHINENTEILE MACHINE PARTS			LUBRIFIANT SCHMIERMITTEL LUBRICANT
<u>Lubrification centrale:</u> 3 à 4 coups de pompe par jour <u>Zentralschmierung</u> 3 bis 4 Pumpenstösse pro Tag <u>Central lubrication:</u> 3 to 4 shafts of gun daily	Guidage des coulisseaux	Schlittenführungen	Slide-guide ways	4
	Vis verticale	Vertikal-Gewinde Spindel	Vertical screw	4
	Variateur de vitesse	Stufenloses Getriebe	Stepless variable speed unite	4
	Roue libre de la boîte des avances	Freilauf des Vorschubgetriebes	Free wheel system of feed box	4
<u>Graissage:</u> tous les 6 mois <u>Fettschmierung:</u> halbjährlich <u>Grease lubrication:</u> halfyearly	Etau parallèle	Parallel Schraubstock	Parallel vice	10
	Tête verticale	Vertikalfräskopf	Vertical milling head	11
	Diviseur universel	Universal Teilapparat	Universal dividing att.	11
<u>Bains d'huile:</u> Changer d'huile tous les ans <u>Oelbad:</u> Oelwechsel jährlich <u>Oil bath:</u> Change oil yearly	Boîte à vitesse de la broche	Spindelgetriebe	Spindle gearbox	4
	Boîte à vitesse des avances	Vorschubgetriebe	Feed gearbox	4
<u>Garnissage pour roulements de:</u> tous les cinq ans <u>Fettpackung für Kugellager von:</u> fünfjährlich <u>Grease packed for ballbearings of:</u> every five years	Broche horizontale	Horizontalspindel	Horizontal spindle	11
	Moteurs électriques	Elektromotoren	Electric motors	7

**TABLEAU DE CONVERSION
VERGLEICHSTABELLE**
**COMPARISON CHART
TAVOLA DI EQUIVALENZA**

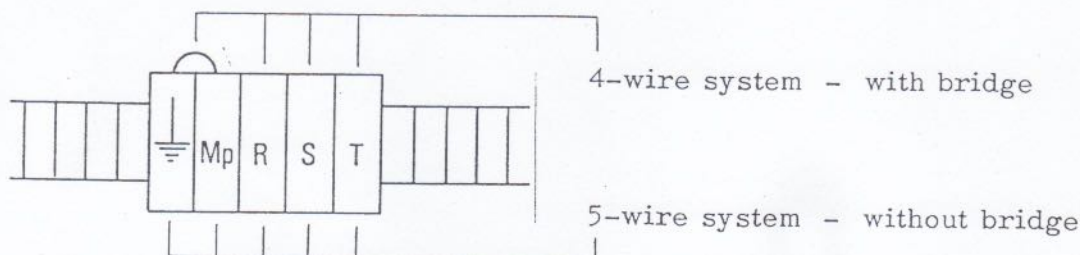
Huile - Oil - Oel N°	1	2	3	4	5	6	7	8	9	10	11
	Velocite N° 6	DTE-Oil light DTE 24	DTE Oil heavy medium DTE 26	Vactra N° 2		DTE-Oil 11	Mobilux GRN° 2	Mobiplex 47	Compound FF		
	Energol HP 3	Energol HP 10	Energol HP 20C	Energol HP 20 C		Energol HLP 50	LS 2 - EP		GR 550 XP		RBB 2
	Slap 200	Hydraulic 150	Hydraulic 275	Slap 310			Cosmolube N° 2	Cosmolube T27	Slap EP Gear Oil 140		
	Oel CMO	Oel CMS	Oel HTX	Oel CMU			Fett HL 2	Fett HTR	Oel DG		
	16-105	16-110	16-120	16-22		16-708	6-077	6-077	11-533		
	Magna AB	Hyspin 70	Magna BO				Spherol AP 2	Spherol AP 2	Alpha LS 4		
	Spindle Oil 3X	OC Turbine Oil 9	OC Turbine Oil 15	Vistac Oil 14X			Grease BRB-2	Dura-Lith Grease EP 2	Gear Compound 140		
	Spinesso 34	Nuto H 44	Nuto II 54	Febis K-51			Deacon 2	Deacon 2	Pol EP 5		
	KR 2008	DK 30 N	TU 518	K			LW 2	HTR	BMB 35		
	Gulfspin 35	Harmony 44	Gulfway 52	Gulfway 52			Gulfdown Grease 2 Pen 290	Gulfdown Grease EP 2 Pen 285	Supraco MPL 32		
MOTUL	Safco speed A	Safdrive A	Safdrive C	Safco slid VX3			Supraco G 43 SL	Supraco G 53 XP			
NON-FLUID OIL	Spindle-Oil 20		A-90	A-90	A-89 / NR		G-60	G-60	D-18		
	Tellus Oil 15	Tellus Oil 27	Tellus Oil 33	Tonna oil 33			Alvania Grease R 2	Alvania Grease R 2	Macoma Oil R 77		Aeroshell Grease 7
	Sunvis 907	Sunvis 916	Sunvis 931	Way lubricant 80			Sunaplex 992 EP	Sunaplex 992 EP	Sunep 1110		
	R-60 TOS	EP Compound HT N° 0	EP Compound HT N° 1	EP Compound HT N° 1			LB Grease N° 2	LB Grease N° 2	EP Compound HT N° 5		
	Special Continu 3A	Misala AH	Misala BH	Moglia B			Pebron RT 3 S	Pebron RT 3 S	Pebron HPN 35		
KLÜBER	Lamora 5	Airpress HLP 16	Lamora 34	Lamora Super Poladd 30	Airpress com- pound SAE 10		Centoplex 2	Centoplex 2	Lamora Gearoil 300	Altemp Q NB 50	Isoflex LDS 18 Spéciale A
	OSO 15	OSO 35	OSO 55	OSO 55			GR MU 2	GR PP	REP 307		

2.7 CONNECTION TO THE ELECTRIC POWER SUPPLY

The power cable is on the righthand side of the machine and is connected directly to the electric cabinet. For connection to the power supply follow the wiring diagram enclosed with the instructions.

To protect the operator, earth the machine.

Connection must be made as follows :



IMPORTANT ! The rapid-traverse motor is provided with a freewheel arrangement. Should the motor be wrongly connected, it could block the table feed. To remedy this, reverse two of the three poles of the system.

2.8 STARTING UP

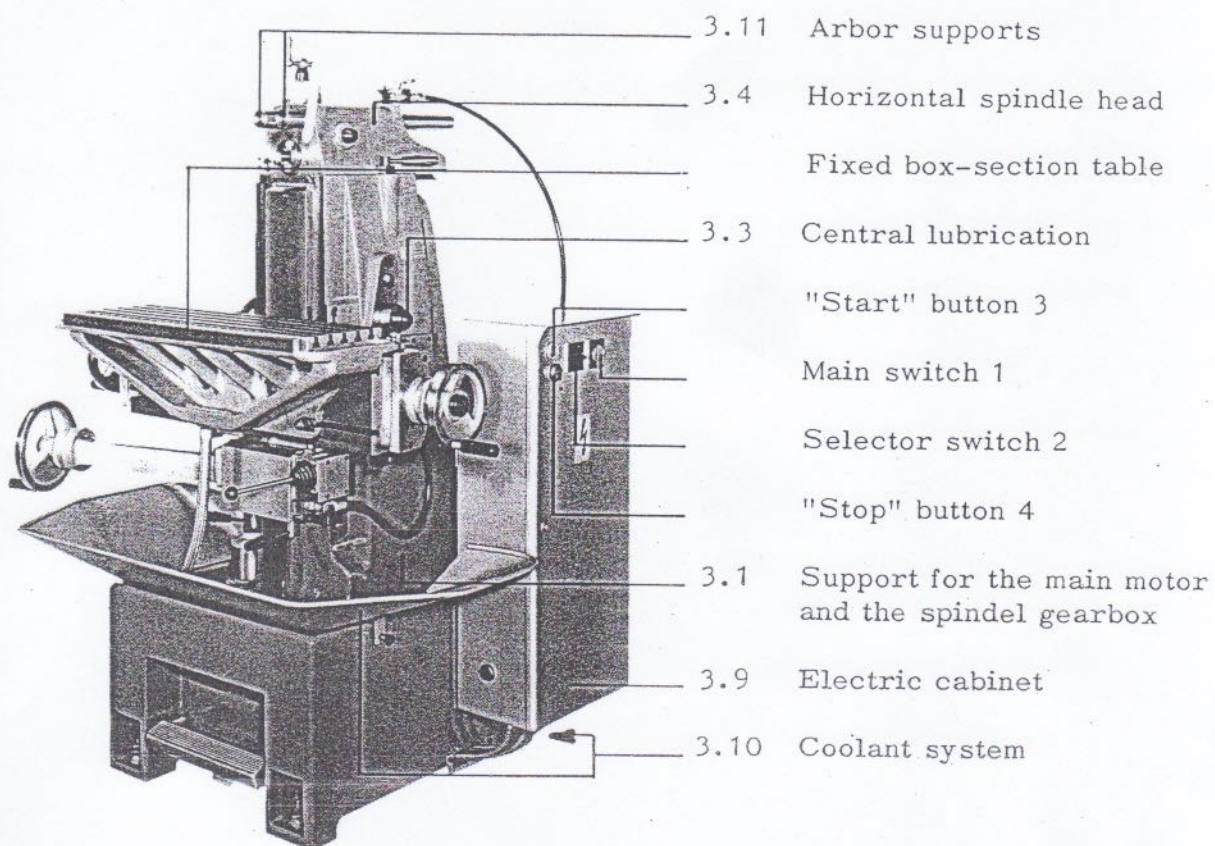
For the reference numbers see page 10.

1. Close the main switch 1 on the electric cabinet (a pilot lamp inside the pushbutton 3 comes on).
2. The choice of the direction of rotation of the horizontal spindle with or without the coolant pump is made with the switch 2 on the electric cabinet.
3. The machine is started with the pushbutton 3 on the electric cabinet or with the pushbutton 3a on the electric panel.
4. The machine is stopped with the mushroom-headed pushbutton 4 on the electric cabinet or with the mushroom-headed pushbutton 4a on the electric panel.

Selection of the rotational speeds of the spindle is made with the hand wheel 5 when the machine is running. The changeover from one range of speeds to the other is made with the lever 6, but only when the machine is stationary. The feeds are selected with the knob 7 on the feed gearbox. In the lower range of speeds it is possible to engage the feed when the machine is running.

3. DESCRIPTION AND MAINTENANCE OF THE MACHINE

Construction of the machine



"Start" button 3a

"Stop" button 4a

Level 6

3.2 Variator

Hand wheel 5

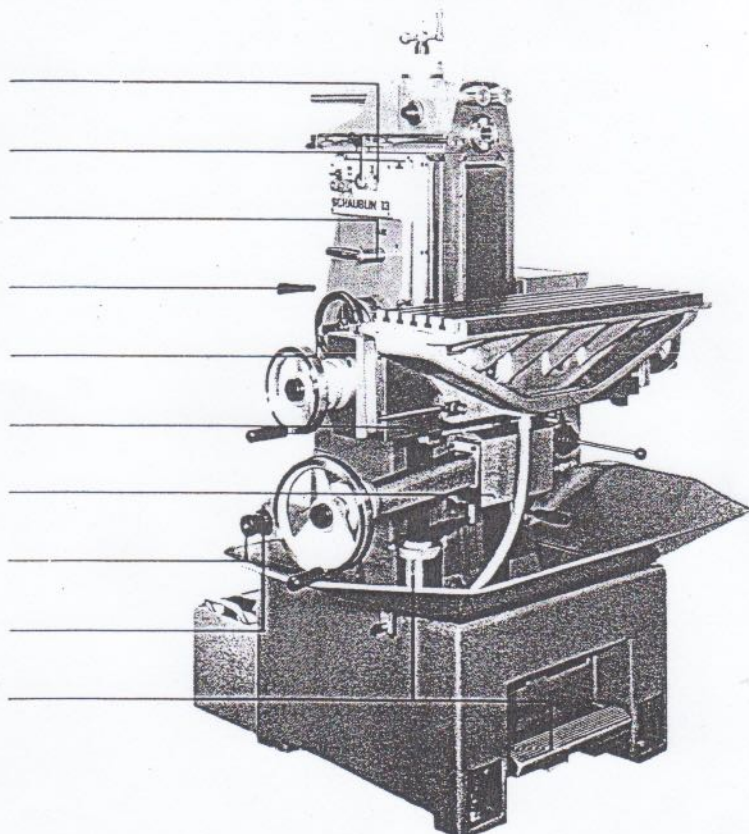
3.6 Transverse slide

3.5 Vertical slide

Knurled knob 7

3.7 Feed gearbox

3.8 Rapid-traverse arrangement



3.1 FRAME WITH MOTOR AND SPINDLE GEARBOX 13-300/13-400

The frame is a single-piece casting containing the main motor and the rapid-traverse motor in the lower part and the spindle gearbox and the variator in the upper part. The oil bath not only ensures lubrication of the spindle gearbox, but also serves as a tank for the central lubrication. Vertical and transverse scales fixed to the frame form part of the standard equipment.

On the righthand side there is a T-slot that takes the stops for the vertical slide.

Electric wires for a work lamp (78714.0000) are already installed in the frame. To fit the lamp, remove the cover (13-303) and connect the cable to the terminal under the cover.

The four screws (CCM M6x40/17) are used for fixing the foot of the lamp.

Maintenance

Lubrication

On account of its double function the oil bath is continually filled with fresh oil (see section headed "Central lubrication").

Nevertheless the tank must be drained every year and cleaned with paraffin.

Fill with fresh oil.

The capacity of the tank up to the "maximum" mark is 2,5 litres. See lubrication chart on pages 7 and 8.

Note : Never mix oils of different grade or origin; mixed oils may react chemically and lose their lubricating properties.

3.2 VARIATOR 13-500

Description

The speeds of 58 to 2000 rpm are spread over two ranges, distinguished on the dial by the colours red and green.

The rotational speed of the spindle is infinitely variable and can be selected from the two ranges with the hand wheel (13-74); selection has to be made while the machine is running.

The variator can be locked by means of the lever (13-508).

The changeover from one range of speeds to the other must be made only when the machine is stationary. For this purpose use the lever (13-415). A coloured point corresponding to the colour of the range chosen and marked on the frame indicates the range engaged.

Maintenance

Lubrication

The variator-pulley shaft and the adjusting mechanism are lubricated from the central system.

The mushroom-headed pushbutton has to be pressed only three or four times a day to lubricate the various parts.

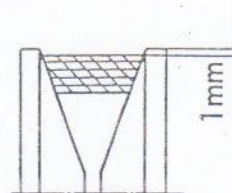
See lubrication chart on pages 7 and 8.

Adjusting the tension of the belts

To get to the drive belts, remove the cover (13-302) from the rear of the frame by undoing the two screws (CCM M10x70/25).

Setting the top vee belts :

1. Set the hand wheel (13-74) to the highest speed (2000 rpm).
2. Loosen the two locking screws (CCM M8x45/20) of the variator pulley support and position the support so that the top of the belt is 1 mm below the top edge of the pulley.
3. Retighten the two locking screws.



Adjusting the bottom vee belt

1. Undo the screws (CCM M12x42/30 and DCMC M12x35) of the feed gearbox to slacken the drive belt.
2. With the aid of the two nuts (0,5d M14) adjust the motor platform so that the spindle reaches its maximum speed.
3. Retighten the two nuts (0,5d M14).
4. Set the variator to the lowest speed (58 rpm) and make sure that the vee belt likewise is 1 mm below the outside diameter of the pulley (see fig. 6).

Retighten the drive belt (see section headed "Feed gearbox").

Changing belts

To change the two (Variflex Z vee belts 26,5x9x1305/30°), undo the two nuts (0,5d M14) and then raise the platform.

It will thus be possible to remove the bottom belt from the motor pulley and the top belt from the gearbox pulley.

For the method of fitting the new belts see the previous section.

3.3 CENTRAL LUBRICATION 13-8500

Description

As mentioned in section 3.1, the oil bath of the spindle gearbox serves also as a tank for the central lubrication.

The righthand side of the frame accommodates a submerged-type lubrication pump operated by a mushroom-headed pushbutton and is provided with a sightglass with maximum and minimum markings and a filler opening (closed by the screw 20-20.097).

The lubricant, under the thrust of the piston (mushroom-headed pushbutton), flows into two metering devices that distribute the necessary quantity of oil to the various parts of the machine. When the pushbutton is released, the piston, under the action of a pressure spring, resumes its position and the cylinder is again filled with oil. A non-return valve prevents the pipes from emptying.

The central lubrication system supplies lubricant to the following parts :

- the vertical, transverse, and longitudinal slides,
- the longitudinal screw,
- the variator, and
- the freewheel arrangement of the rapid traverse.

The lubricant is metered in such a way that the mushroom-headed pushbutton has to be pressed only three or four times a day to ensure perfect lubrication.

After a longer pause (weekends, etc.) 8 to 10 pumpshots are necessary in order to fill all oil grooves located in the slideways.

Maintenance

The pump used in the central lubrication system requires no maintenance.

The oil level must be checked every week and, if necessary, topped up to the maximum mark. The capacity of the tank up to this mark is about 2,5 litres.

Note : Never mix oils of different grade or origin; mixed oils may react chemically and lose their lubricating properties.

3.4 HORIZONTAL SPINDLE HEAD 13-2200

Description

The spindle head can be equipped with a spindle having an ISO 30 or No 4 Morse taper, but the design of these two variants is the same. The front bearing of the spindle consists of two preloaded, matched angular-contact bearings. The preloading makes it unnecessary to take up play and under normal conditions should last as long as the period of lubrication.

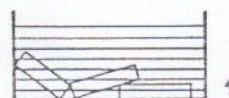
The transverse screw used for adjusting the spindle head can be operated by the main vertical shaft (13-2224) or by the secondary horizontal shaft (13-2239) that goes right through the spindle head. The crank handle (13-16.524) can be fitted to the ends of these shafts and to the ends of the main shaft. The dial mounted on the main shaft always turns with it. Caps (13-2227) cover the unused ends of the shafts; they are interchangeable.

For fixing and locating accessories such as the vertical spindle head or the arbor supports the horizontal spindle head is provided with two support arms (13-2005). These can be pulled out as required when the two clamps (13-2004) on the spindle head have been released.

Maintenance

The bearings of the horizontal spindle head are lubricated for a period of about 5 years with Klüber Isoflex LDS 18 Special A grease. When relubrication becomes necessary, use a place that is clean and dustproof. Lubrication by immersion is entirely satisfactory. To lubricate by this method, proceed as follows :

1. Place the bearings in oil of turpentine and leave them in it for 1 to 2 hours to dissolve the old film of grease.
2. Shake the bearings in a second recipient filled with oil of turpentine without rotating the races one against the other.
3. Having thus cleaned the bearings, dip them in a solution of 70% oil of turpentine and 30% Isoflex LDS 18 Special A grease. This solution penetrates the smallest of crevices and after evaporation of the solvent ensures a uniform and durable film of grease.



The gear (13-2215) is lubricated merely by contact with the spindle gearing. See lubrication chart on pages 7 and 8.

Note : Never mix oils of different grade or origin; mixed oils may react chemically and lose their lubricating properties.

Removing the horizontal spindle head

This is necessary for cleaning or changing the spindle bearings.

Proceed as follows :

1. Undo the screw (51-5075) and remove the gib (13-305).
2. Undo the screw (DCMB M8x6), remove the lever (13-322) and unscrew the stop screw (13-321).

3. Undo the three screws (CCM M5x10) under the horizontal spindle head and remove the stop (13-2235).
4. Move the spindle head forward until the transverse screw comes out of the nut (13-316).
5. Raise the spindle head as high as possible (so as not to damage the strippers 13-86/87) and pull it forward.

Removing the spindle

Only a conscientious, experienced person should be allowed to remove, fit, and adjust the spindle.

To remove the spindle, proceed as follows :

1. Remove the bottom plate (13-2216) by undoing the 10 screws (P M5x8).
2. Undo the 2 locking screws (CCM M5x10) and unscrew the nut (13-2209).
3. Undo the 3 screws (CCM M6x65/17).
4. Unlock the nut (13-2205) and the baffle (13-2211) by undoing the screws (DCMB M6x8).
5. Remove the nut (13-2205).
6. With the aid of a fibre hammer apply a few light blows to the rear of the spindle to enable it to be removed from the front.

Adjusting the bearings

To fit freshly lubricated or new bearings, proceed in the reverse order of dismantling the spindle. Having fitted the spindle, turn the nut (13-2209) until there is no longer any play between the bearings. From this position the bearings will be preloaded by an advance of 1/100 mm of the nut.

The rotation corresponding to this advance is calculated in the following manner :

$$\text{Pitch of nut} = 1 \text{ mm}$$

$$\text{Preload} = 1/100 \text{ mm}$$

$$\text{Rotation of nut : } \frac{1 \times 360}{100} = 3,6^{\circ}$$

Measured on the circumference of the nut, this gives a movement of

$$\frac{\phi 58 \times \pi \times 3,6}{360} = 1,82 \text{ mm}$$

Taking up play in the spindle-head slide

Any play caused by wear in the slideways can be taken up by adjusting the gib (13-305) with the aid of the screw (51-5075).

3.5 VERTICAL SLIDE 13-3200

Description

The vertical slide contains the transmission mechanism for the automatic feeds. The lever (13-3173) fitted at the bottom on the right provides a choice of direction in the horizontal or vertical plane and engages the corresponding coupling. Disengagement can be made by hand or automatically by the stops fitted on the righthand side for the vertical movement and under the longitudinal slide for the longitudinal movement. The lever (13-3173) is then returned to neutral.

To move the vertical slide, first engage the handwheel (13-3722) axially. A pressure spring disengages as soon as the handwheel is released.

The dial (13-3261) can be locked by means of the knob (13-3716) in the handwheel boss.

The locking lever (13-3237) on the lefthand side of the bottom of the slide locks the vertical slide, whilst the one on the righthand side locks the longitudinal slide; both locks act on the gibs. The position of the locking lever can be corrected by releasing the locking screws (DCMB M5x8) and turning the nut (22-513).

On the lefthand side of the vertical slide there is a bore of 22 mm diameter for taking the starwheel. To use this accessory, the longitudinal nut must be made inoperative. Push the longitudinal slide completely to the right and then unlock the fixing screw (CCM M12x35). The slide can then be pushed by hand to the left. When the starwheel is used, the longitudinal movement is reduced by about 55 mm. The screw (13-3737) on the right, under the transverse slide, must be fitted in the thread provided further to the left.

A hard-anodized telescopic tube protects the vertical screw from chips and coolant.

Maintenance

Lubrication

The slides, like the spindle and the gears, are lubricated from the central system. The mushroom-headed pushbutton has to be pressed only three or four times a day to lubricate the various parts.

See lubrication chart on pages 7 and 8.

3.6 LONGITUDINAL SLIDE

Description

The machined face of the longitudinal slide has two T-slots for fixing the component in the vertical plane and for accommodating the box-section table.

Two handwheels are provided for the longitudinal movements of the longitudinal slide, one at each end. As in the case of the movement of the vertical slide, engage both handwheels axially.

The dial (13-3715) can be locked by means of the knob (13-3716) in the hand-wheel boss.

The longitudinal screw is protected from chips and coolant by an Elasticone metal cover (13-3708).

Maintenance

Lubrication

The slides, like the longitudinal screw, are lubricated from the central system; the pipes leading to these points pass over the vertical slide. The mushroom-headed pushbutton has to be pressed only three or four times a day to lubricate the various parts.

See lubrication chart on pages 7 and 8.

Changing the lefthand cover over the screw

1. Push the longitudinal slide completely to the left.
2. Undo the locking screw (CCM M12x35) of the longitudinal nut (see general-arrangement drawing of the vertical slide).
3. Undo the 4 screws (CCM M8x60/17) of the lefthand bearing plate (13-3723) and remove the entire assembly.
4. Change the cover.
5. Put the nut back into the holder (13-3267) and secure it with the aid of the locking screw (CCM M12x35).
6. Centre the cover in the same nut holder.
7. Secure the bearing plate provisionally, without tightening the 4 screws fully.
8. Push the bearing plate, together with the longitudinal slide, completely to the right and centre it on the free part of the nut.
9. Lock the 4 screws (CCM M8x60/17).

Changing the righthand cover over the screw

1. Push the longitudinal screw completely to the right.
2. Undo the 4 screws (CCM M8x60/17) of the righthand bearing plate (13-3724) and remove it.
3. Change the cover.
4. Fix the bearing plate to the longitudinal slide provisionally, without tightening the 4 screws fully.
5. Push the slide completely to the left and centre it on the end of the screw and in the vertical slide.
6. Lock the 4 screws (CCM M8x60/17).

3.7 FEED GEARBOX 13-1200

Description

The feed gearbox is driven by a vee belt connected to the motor. The gears are mounted on three shafts and give a total of 10 work feeds ranging from 12 to 400 mm/min. To select one of these feeds, use the two co-axial knurled knobs. The figures that appear in the small window when the outside knob is turned correspond to the feed rates in mm/min. To choose the feeds on the first scale, turn the outside knurled knob; this has a movement of 180°. To choose the feeds on the second scale, proceed as follows : first turn the outside knob as far as the stop. Then turn the inside knob until the figures appear in the second window and choose the feeds required.

The feed gearbox has its own oil bath. The splash lubrication of the gears can be checked through the sightglass on the top.

The base houses a freewheel arrangement that ensures that the feeds always work in the same direction, regardless of the direction of rotation of the main motor.

Fitted in the vertical slide, at the end of the vertical drive shaft, is a ball-type safety device designed to prevent the mechanism from being damaged by overload. In the event of overload a rattling noise will be heard and all feed movement must then be stopped immediately.

Maintenance

Lubrication

The gearbox, having its own oil bath, requires no particular maintenance. All that is recommended is that the oil sightglass should be checked periodically when the machine is running. When the gears no longer splash in the oil, top up the bath. It has a capacity of 0,5 litre.

It is recommended that the gearbox should be cleaned once a year in paraffin and that at the same time the tank should be filled with fresh oil. The drain plug is under the two knurled knobs, the filler opening right next to the sight-glass.

Those parts of the feed gearbox in the base and in the vertical slide are lubricated from the central system.

The mushroom-headed pushbutton has to be pressed only three or four times a day to lubricate the various parts.

See lubrication chart on pages 7 and 8.

Note : Never mix oils of different grade or origin; mixed oils may react chemically and lose their lubricating properties.

Changing the vee belt and adjusting its tension

The feed gearbox is able to pivot round its drive shaft.

To change the vee belt, simply undo the screw (CCM M12x40/30) on the left-hand side of the gearbox and the screw (DCMC M12x35) in the frame. The gearbox is then able to pivot, and the belt can be changed.

By raising the gearbox, the belt is tightened.

Tighten the screw (CCM M12x40/30) and then lock the screw (DCMC M12x35).

3.8 ARRANGEMENT 13-1300

Description

The rate of in the vertical and longitudinal directions is 1200 mm/min. This speed is obtained through a motor controlled by the pedal on the front of the frame. The freewheel arrangement enables the rotation of the drive shaft to exceed the feed rates.

The motor drives the shaft through a flexible coupling.

Maintenance

The arrangement requires no maintenance.

3.9 ELECTRIC CABINET 13-14.010/14.020

Description

The switchgear is concentrated in a cabinet fixed on the righthand side of the machine. The main switch, the switch for selecting the direction of rotation and for the coolant pump, and the pushbuttons for starting and stopping are mounted on the door of the cabinet. Both switches are equipped with a safety device that prevents the door from being opened when a circuit is closed. The door cannot be opened unless the switches are set to zero.

The small pocket on the inside of the door is provided for taking the wiring diagrams.

Space is reserved in the cabinet for the addition of a motor brake.

Another two pushbuttons for starting and stopping the machine are provided in an electric box on the lefthand side of the frame. This permits easier operation of the machine from both sides.

The electric box accommodates also two Amphenol 6-volts sockets for providing the lighting current for accessories such as the centring microscope and the optical readers. One switch closes the circuit for both sockets.

The circuit breakers in the cabinet protect the following elements :

- a2 : the main motor m1
- a4 : the main circuit
- e2 : the pump motor
- e3 : the rapid-traverse motor.

In the event of breakdown of any of the elements listed above determine the cause of the breakdown and carry out any repairs that may be necessary before connecting the corresponding circuit breaker.

In the event of breakdown of the 6-volts circuit (Amphenol plug) replace the 2-amp (5x20) fuse e1.

3.10 COOLANT SYSTEM 13-7100

Description

The oil tank (capacity 28 litres), together with the submerged-type pump, is on the outside of the base and is therefore easily accessible. It is suspended by two screws (CCM M8x18) on the rear of the machine.

The pump is connected electrically by means of a plug on the righthand side of the cabinet. The circulation of the coolant, together with the direction of rotation, can be controlled with the preselection switch (see section relating to the electric cabinet). The coolant pump is started up at the same time as the main motor by pressing the "Start" button.

A pipe carries the coolant to the horizontal spindle head, and from here a flexible metal pipe directs it to the tool. An (EMHO 3/8") tap is provided for some time, stop the pump. This will prevent unnecessary wear.

The tank is very easily drained or cleaned, as it is simple matter to detach it and move it away. Do not forget to disconnect the electric plug and the coolant supply pipe. To detach the pipe, all that is necessary is to press on the knurled ring fitted at the end of the pipe. To refit the pipes, press them together.

The coolant is collected in the chip tray and is returned to the tank through a rubber tube. A filter (22-7004) prevents the chips from passing through.

Maintenance

The frequency of cleaning depends on the degree of contamination of the coolant. The tank, the pump, and the pipes must however be drained and washed out in cleaning petrol at least twice a year.

For maintenance of the submerged-type pump see the manufacturer's instructions in section 4.

3.11 ARBOR SUPPORTS 13-6160

Description

To use the arbor support (13-6161), pull the two support arms (13-2005) out from the horizontal spindle head and fix them in the position required.

The arbor supports are centred on the support arms and cutter arbor and locked with the aid of the screw (CCM M12x45/30).

The bearings are interchangeable, equipped with self-lubricating bushes, and locked in the arbor support by means of the nut (13-10.002) and the bolt (22-3019).

Maintenance

Lubrication

Since the bushes are self-lubricating, the arbor supports need no additional maintenance.

4. ACCESSORIES

4.1 VERTICAL HEAD 13-10.200

The vertical head can be equipped with an ISO 30 or No. 4 Morse taper.

The front spindle bearing consists of two matched angular-contact bearings, preloaded, so that it is not necessary to take up any play. Under normal conditions the adjustment should last as long as the period of lubrication of the bearings.

The vertical head is driven by the horizontal spindle through the gear (13-10.222 in the case of ISO 30 and the gear 13-10.223 in the case of No. 4 Morse taper). These gears are fixed with the aid of the spanners (13-2522 and 13-2108) respectively.

The number of revolutions of the vertical spindle is the same as that of the horizontal spindle.

To fit the vertical head, bring the two support arms (13-2005) forward 40 mm and lock them. The vertical head can then be centred on the two arms and is locked in turn by means of the nut (13-10.020). Tighten the three fixing screws (1x CCM M8x20, 2x CCM M8x55/20).

In its vertical plane the head can be rotated through 360°. The four nuts (13-10.020) on its face enable it to be fixed in the position required.

Maintenance

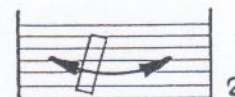
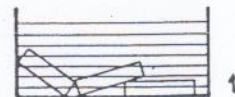
Lubrication

The bearings of the vertical head are lubricated for a period of about 5 years with Klüber Isoflex LDS 18 Special A grease.

For subsequent lubrication use a clean, dust-free locality. Lubrication by immersion gives complete satisfaction provided the following points are observed :

1. Immerse the bearings in oil of turpentine and allow the old layer of grease to dissolve for 1 to 2 hours.
2. Shake the bearings in another vessel filled with oil of turpentine, but do not rotate the races against each other !
3. Having cleaned the bearings in this manner, dip them in a solution of 70% oil of turpentine and 30% Isoflex LDS 18 Special A grease.

The solution penetrates the smallest spaces and following evaporation of the solvent ensures a uniform, lasting layer of grease.



The gears also are lubricated with Klüber Isoflex LDS 18 Special A.

If the vertical head is used permanently, the gears must be lubricated every six months.

See lubrication chart on pages 7 and 8.

Removing the spindle

First separate the vertical head from the flange (13-10.202) by unscrewing the four nuts (13-10.020).

To remove the spindle, proceed as follows :

1. Undo the four screws (CCM M6x15) and remove the cover (13-10.209).
2. Unscrew the nut (13-10.208) and remove the baffle (13-10.205).
3. Gently tap the rear end of the spindle, using a fibre hammer, and remove the spindle from the front.
4. Remove the spindle bearings.

Adjusting the spindle bearings

The bearings of the vertical spindle must be preloaded.

First assemble the spindle and eliminate the play in the bearings by adjusting the ring (13-10.215). Then machine the ring down by 1/100 mm to obtain the necessary bearing preload.

Now fit the spindle into the housing of the vertical head and check the backlash in the gears.

The remachining done to the ring (13-10.215) may necessitate correction of the backlash in the gears. In this case adjust the ring (13-10.214).

Removing the drive shaft

Withdraw the shaft (12-10.211) with the bevel gear (13-10.212) from the flange (13-10.202). Then drive out the needle cage (BK 1622).

4.2 FIXED BOX-TYPE TABLE 13-5420

Description

The fixed box-type table is secured to the longitudinal slide by four T-bolts (13-3513). Two keys (13-4002) are used for centring the table in the top slot of the longitudinal slide.

The working surface of the table measures 700 x 210 mm and has four T-slots spaced 40 mm apart.

The coolant drains into the table and is discharged through a central pipe. Three screens (13-5412 and 13-5415) are provided to prevent blockage of the pipe.

The fixed box-type table requires no particular maintenance.

4.3 UNIVERSAL TABLE 13-5300

Description

The universal table is secured to the longitudinal slide by three T-bolts (13-5307, 13-5395 and 13-3513).

It is centred in the bottom slot by two keys (13-4002).

The working surface of the table measures 600 x 260 mm and has four parallel T-slots spaced 40 mm apart.

The table can be moved in three different planes, as indicated below :

Longitudinal inclination	max $\pm 45^{\circ}$
Transverse inclination	max $\pm 30^{\circ}$
Horizontal rotation	max $\pm 30^{\circ}$

The table has a scale marked off in degrees for each movement.

To incline the table, withdraw the plungers (13-5394).

When the table is returned to zero, the plungers resume their initial position and lock the table.

To lock the table in the longitudinal and transverse planes, use the T-bolts (13-5311). To lock it in the horizontal plane, use the T-bolts (13-5316).

Pipes on both sides of the table return the coolant to the tray.

The table requires no particular maintenance.

4.4 PARALLEL VICE 51-13.000

Description

The base plate of the vice is guided in the table T-slots by two keys and can be secured by two T-bolts (M12x38/28).

The swivel vice is fixed on the base plate and can be locked in any position by three T-bolts (51-13.018 and M12x70/40).

A scale on the base plate permits accurate setting of the required angle.

For simple jobs the vice can easily be removed from the base plate and mounted directly on the table. To do this, remove the two keys (52-811) from the base plate and fit them directly to the vice according to the angular setting required. To secure the vice, use the two T-bolts (M12x38/28) of the base plate.

Maintenance

Lubrication

The screw and slideway must be lubricated, and the grease used for this purpose must be renewed every six months. The screw is easily reached by opening the jaws as far as possible.

4.5 SLOTTING HEAD 13-12.100

Description

The slotting head is fixed on the horizontal spindle head and can be inclined 90° either way.

To make fitting easier, proceed as follows :

1. Release the two support arms (13-2.005) in the horizontal spindle head.
2. Fit the arbor (51-12.029) for ISO 30 or (13-12.028) for No. 4 Morse with the gear (13-12.024).
3. Engage the slotting head with this gear and press it against the horizontal spindle head.
4. Push one of the two support arms forward and lock it with the nut (13-10.020).
5. Push the second arm forward and lock it.
6. Screw-in the three screws (1 x CCM M8x20 and 2 x CCM M8x70/20).
7. Lock the two support arms in the horizontal spindle head.

Owing to the reduction of the driving gears the ratio between the number of revolutions of the spindle and the number of strokes per minute is 2 : 1. The number of strokes per minute however must be limited to approximately 430, which corresponds to a maximum spindle speed of approximately 860 rpm.

The stroke of the slide is variable between 0 and 60 mm.

Use tools of 12 x 12 mm section.

Lubrication

The slotting head is lubricated with Klüber Isoflex LDS 18 special A grease.

This treatment is sufficient for a period of about 5 years.

Although the slotting head does not call for any special maintenance, it is recommended that a few drops of oil be applied to the slides from time to time, particularly after a prolonged period of idleness.

Prevent coolant from coming into contact with the slides.

Adjusting the inclination of the tool

1. To adjust the inclination of the tool, first undo the two screws (CCM M8x15).
2. Select the required position with the aid of the two screws (DCMB M8x22).
3. Lock the two screws (CCM M8x15).

Adjusting the stroke of the slide

1. Move the slide (13-12.113) into its rearmost position to gain access to the adjusting screw (13-12.124).
2. Undo the nut (13-12.117) half a turn.
3. Adjust the stroke by means of the screw (13-12.124). On the scale (51-12.023) the index (52-1.226) always indicates the total stroke of the slide.
4. Retighten the nut (13-12.117).

Taking up play in the slide

Following wear in the slide the play can be taken up by adjusting the gib (13-12.004) with the aid of the screw (51-5.075).

4.6 VERTICAL HEAD WITH QUILL 13-10.400

The vertical head with quill can be equipped with a spindle having a No. 30 ISO or No. 4 Morse taper.

The spindle bearings are matched, preloaded angular-contact bearings. Owing to the preload no adjustment of play will be necessary. In normal conditions the adjustment should last as long as the period of lubrication of the bearings.

The vertical head with quill is driven by the horizontal spindle through the gear (13-10.222 in the case of No 30 ISO or 13-10.223 in the case of No. 4 Morse) mounted on the arbor and fixed in the spindle with the aid of the draw-bar (13-2.522 or 13-2.108).

The speed of the vertical spindle corresponds to that of the horizontal spindle.

In its vertical plane the head can be inclined at 90° either way. The three nuts (13-10.440) on the front face enable it to be fixed in the position required.

The total stroke of the quill is 60 mm. When there is direct drive between the two gears (13-10.430 and 13-10.429), that is to say, when the shaft 13-10.-444) is pushed, this stroke can be made in $3/4$ of a revolution of the arm (13-10.410). When the shaft (13-10.444) is pulled, a reduction gear permits a feed of 2,5 mm per revolution of the arm (13-10.410).

The quill can be locked with the aid of the lever (Ad S No 3).

The scale (13-11.206) and the index mounted on the face of the vertical head permit accurate control of the quill feed.

To mount the vertical head, proceed as follows :

1. Fix the three sleeves (13-10.438) on the horizontal head. The milled-out portion of the top sleeve must point to the left, that of the two bottom sleeves downwards.
2. Pull the two arms about 40 mm out of the horizontal head and lock them.
3. Mount the vertical head and fix it with the aid of the three eccentrics (13-10.434).
4. Then lock the two nuts (13-10.440) acting on the two arms.

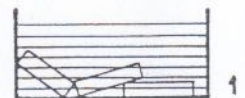
Lubrication

The bearings of the vertical head are lubricated for a period of about 5 years with Klüber Isoflex LDS 18 Speciale A grease.

Carry out any subsequent lubrication in a room that is clean and free from dust. The best method of lubrication is by immersion. For this purpose proceed as follows :

1. Immerse the bearings in oil of turpentine and allow the old coating of grease to dissolve for 1 to 2 hours.
2. Shake the bearings in a second recipient filled with oil of turpentine, but do not rotate the races against each other !
3. Immerse the clean bearings in a solution of 70% oil of turpentine and 30% Isoflex LDS 18 Speciale A grease.

After evaporation of the solvent the solution, by penetrating the smallest of spaces, ensures a uniform and lasting coat of grease.



The gears also are lubricated with Klüber Isoflex LDS 18 Speciale A grease. When the vertical head is in constant use, the gears must be lubricated every six months.

See lubrication chart (pages 7 and 8).

Compensation of tool weight

On assembly at our works the tension of the spring (T 440-13) is set to balance the weight of the quill.

To compensate the extra weight of the tool, the spring can be tensioned as follows :

1. Unscrew the nut (13-10.407) at the rear of the spindle.
2. Remove the index (13-11.223) and unscrew the two nuts (13-11.143).
3. Pull the quill forward until the rack comes out of mesh with the pinion (13-10.429).
4. Continue rotating the pinion to increase the tension of the spring. Two revolutions of the arm (13-10.410) give a feed of one tooth on the pinion or an increase of about 400 g in the tension of the spring.
5. Push back the quill and bring the rack into mesh with the pinion in the position required.
6. Refit the nut (13-10.407).
7. Refit the two nuts (13-11.143) and the index.

Dismantling the quill

1. Unscrew the nut (13-10.407).
2. Remove the index (13-11.223) and unscrew the two nuts (13-11.143).
3. Pull the quill forward until the rack comes out of mesh with the pinion and withdraw it from the frame.
4. Undo the six screws (CCM M5x15) and remove the flange (13-10.446) with the rack.
5. Remove the quill (13-10.427).
6. Loosen the two screws (DCMB M4x8) and unscrew the nut (13-10.419).
7. Remove the bearings and spacer rings.

Note : The bearings cannot be replaced individually. Since they are matched bearings, it is necessary to change the complete set. The two spacer rings (13-10.403 and 54/45x16) can be re-used in the new bearing. For the pre-load however it is very important that the two rings should be of exactly the same width.

Fit the quill in the reverse order of dismantling.

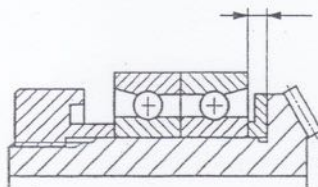
Removing the rear spindle bearing

Once the quill has been removed, the rear bearing is dismantled as follows :

1. Unscrew the two knurled nuts (R3 - M6).
2. Remove the protective sleeve (22-3.262).
3. Undo the four screws (CCM M5x15) to free the flange (13-10.445).
4. Loosen the two screws (P M5x12) and unscrew the nut (13-10.418).
5. Withdraw the gear (13-10.442) with the bearings.

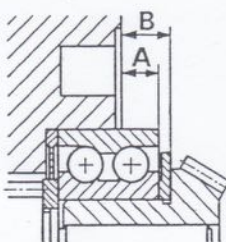
Note : As the two bearings are matched, they must both be replaced. The position of the outer race of the front bearing in relation to the gear must be checked with both the old and new set of bearings.

To simulate the preload during the check, the two bearings must be tightened by the nut (13-10.418). Any difference between the two dimensions measured must be compensated on the spacer ring (13-10.404) to ensure proper meshing of the bevel gear.



Removing the drive shaft

1. Unscrew the three nuts (13-10.440).
2. Detach the frame (13-10.447) from the support (13-10.448).
3. Carefully check the dimensions A and B shown in the sketch below.



4. Withdraw the gear (13-10.421) with the bearing of the support (13-10.448).
5. Loosen the screw (DCMA M6x15) and remove the screw (13-11.229).
6. Remove the spacer rings and the bearing.

IMPORTANT : Fitting can be carried out in the reverse order of dismantling. To ensure perfect meshing of the gear (13-10.421) when fitting a new bearing, observe the following points :

1. Once the drive shaft has been assembled and fitted in the support (13-10.448), the dimension A must be measured in accordance with the sketch on the previous page.
2. Any difference between this dimension and that of the old bearing must be compensated on the ring (13-10.218).
3. After this correction measure the dimension B.
4. Compensate the difference between the old the new bearing on the ring (13-10.437).

4.7 UNIVERSAL DIVIDING HEAD 13-16.700

The universal dividing head is fixed in the table T-slots by means of the two T-bolts (M12x45/35).

The top of the dividing head can be swivelled through 360° and can be locked by means of three eccentrics (13-16.578). The spindle has roller bearings and is designed to take W20 collets.

The spindle nose is threaded and will take a 3-jaw chuck. The centre height is 105 mm.

With the aid of the screw (CCM M10x22) and the key (13-16.597) the slot in the helical gear enables the spindle to be locked in any position.

The index plate (13-16.705) fixed on the spindle has 24 holes for direct indexing. If the indexing is done manually, the worm can be disengaged by undoing the screw (CCM M10x35/25) and turning the drum (13-16.703). The knurled knob (13-16.728) is used for moving the plunger (13-16.534).

For indirect indexing a set of three index plates (52-837) is available.

To change the plate on the worm, proceed as follows :

1. Unscrew the nut (M12 0,5d).
2. Remove the handle (52-1032) with the sleeve (52-972) and the two pointers (52-838 and 52-839).
3. Undo the three screws (F M5x25) and change the plate.

Fitting is done in the reverse order of removal.

For indirect indexing turn the handle (52-1032).

By raising and turning the knurled sleeve (52-969), the plunger is locked and indexing is made possible. To index, unlock the plunger.

By moving the plunger on the handle, it is then possible to select the indexing required.

The reduction between the handle and the dividing head is 40 : 1.

The locking shoe is actuated by the arm (8x70) and enables the index plate to be locked in the position required.

The universal dividing head can be used in conjunction with the automatic drive (13-16.650) for milling helices etc.

The drive is transmitted through the shaft (13-16.715).

The direction of rotation of the universal dividing head can be selected by turning the stud (13-16.717), which controls the coupling (13-16.715).

The stud itself is held by notches in each of its positions.

Maintenance

Lubrication

The gears and bearings of the universal dividing head are lubricated with grease, and the amount of grease provided is sufficient for a period of 5 years. The helical gear on the other hand must be greased once every 6 months.

By undoing the screw (20-20.097), the helical gear is readily accessible. See lubrication chart on pages 7 and 8.

Taking up play in the spindle bearings

Before removing the spindle, disengage the worm by turning the drum (13-16.703).

To remove the spindle, proceed as follows :

1. Check the end play with a dial indicator reading to within 1/1000 mm.
2. Loosen the screw (CCM M10x22) and, by turning the spindle, look for the removal position of the key (13-16.597).
3. Remove the key.
4. Unscrew the nut (13-16.727).
5. Remove the index plate (13-16.705).
6. Drive the spindle forward by applying a few light blows to the rear end with a fibre hammer.
7. Remove the helical gear and the spacer (13-16.712).

Shorten the spacer by the amount of play to be taken up. See that the two faces of the spacer remain perfectly parallel.

Refit the universal dividing head in the reverse order of removal.

Taking up play in the worm

To take up play between the worm and the helical gear, use the adjusting screw (13-16.718).

1. Undo the screw (DCMB M6x6).

2. Undo the screw (CCM M10x35/25) of the drum (13-16.703).
3. Press the worm against the helical gear by turning the drum (13-16.703) and undo the screw (13-16.718) until the play is taken up.
4. Retighten the screws (CCM M10x35/25 and DCMB M6x6).

4.8 AUTOMATIC DRIVE TO THE UNIVERSAL DIVIDING HEAD 13-16.650

Description

The automatic drive to the universal dividing head is fixed in place of the bearing plate (13-3724) on the righthand side of the longitudinal slide. It is operated by the longitudinal screw and through a set of gears controls the spindle.

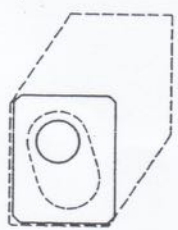
To fit the automatic drive, proceed as follows :

1. Move the longitudinal slide completely to the right.
2. Undo the four screws (CCM M8x60/17) securing the righthand bearing plate (13-3724) and remove this.
3. Secure the casing (13-16.671) provisionally to the longitudinal slide without fully tightening the fixing screws.
4. Move the casing, together with the longitudinal slide, completely to the left and centre it in the vertical slide and on the end of the screw.
5. Lock the four fixing screws (two CCM M8x60/20 and two CCM M8x35/20).

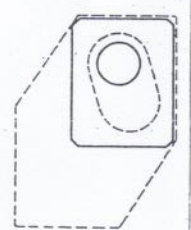
The drive-shaft bearing has to take up various positions according to how the dividing head is used. This is made possible by the two base plates (13-16.655 and 13-16.665), which are fitted in different ways, depending on whether the fixed box-section table or the universal table is used and whether the indexing is direct or indirect.

The following examples show how the base plates are used :

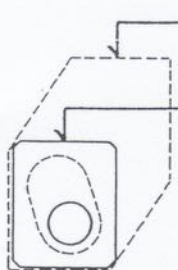
Indirect indexing
on universal table



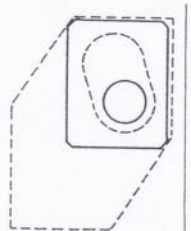
Direct indexing
on universal table



Indirect indexing on
fixed box-section
table



Direct indexing on
fixed box-section
table



On the magnetically locked cover (13-16.652) the plate (13-16.666) must be positioned according to the drive shaft.

The crank handle (13-16.524) can be fitted to the drive shaft.

The intermediate gears can be mounted on their studs (13-16.528) and then inserted into and fixed in the quadrant.

The drive shaft is available in three versions :

For direct indexing : 13-16.680

For indirect indexing : 13-16.518 (long version)

or : 13-16.569 (short version)

Lubrication

The needle bearings are greased and need no further maintenance for 5 years.

The drive shaft turns in self-lubricating bushes that require no maintenance.

When fitting change gears, lightly grease the studs and gears.

4.9 TAILSTOCK 13-16.750

Description

The centre height of the tailstock is 105 mm and is the same as that of the universal dividing head.

To use the tailstock parallel to the table, centre it with the two keys (13-16-237).

If the universal dividing head has to be inclined, remove the two keys to enable the tailstock to be aligned in the same axis. The tailstock T-bolts (M12x45/25) are guided in slots and may be left in them.

With the hand wheel (70-23.005) it is possible to move the centre (13-16.752) axially.

To lock the centre, use the eccentric (13-16.756).

4.10 UNIVERSAL VICE 13-13.050

PRINCIPAL TECHNICAL DATA

Width of cheeks	85 mm
Maximum opening	60 mm
Height of cheeks	37 mm
Swivels through	360°
Inclination	360°
Stop on every	15°

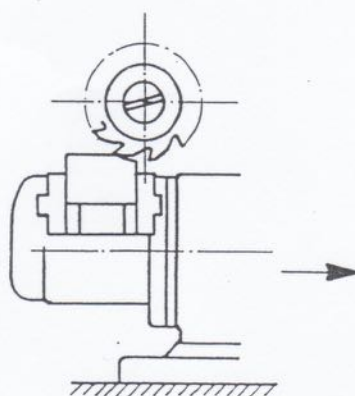
Cleaning, lubrication and maintenance

On receipt and during use of the universal vice, the same instructions are applicable as to the machine itself, and must be scrupulously observed.

The vice has one lubricating nipple for use in conjunction with the oil gun delivered with the machine as a standard accessory. By placing the closed jaws in a horizontal position (0°), the sliding jaws and the screwed spindle can be easily lubricated; by turning the jaws to the vertical position (90°) in the direction of the lubricating nipple the guide key can be lubricated.

Use

The baseplate is fixed in one of the T-slots of the table by means of two tiebolts. 2 stones are provided for alignment purposes. The vice is locked in all positions in the horizontal plane by two bolts. The jaws can also be inclined to any position, in addition to which the jaws can be accurately set every 15° by a hardened peg. Locking in position is effected by means of a grooved nut and a hooked spanner delivered with the vice. Excellent milling results are obtained by proceeding as shown in the sketch below :

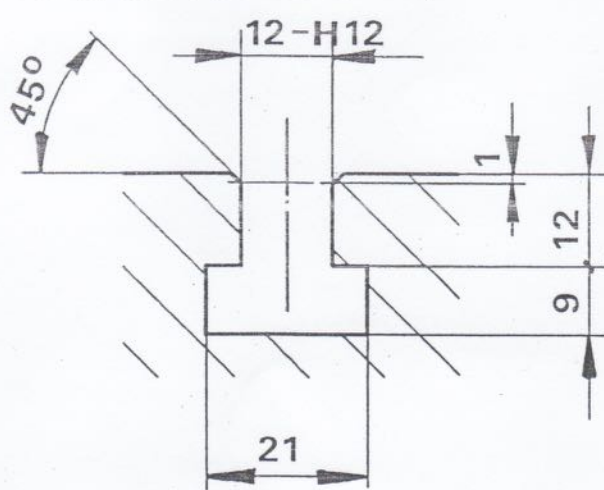


4.11 ROTARY TABLE 51-10.003

PRINCIPAL TECHNICAL DATA

Diameter of table	250 mm
Overall height	90 mm
Interior taper of table	Morse 2
Graduation of table, every degree to	360°
1 turn of handwheel corresponds to	3°
1 division of vernier to	0° 01'
Number of T-slots	8

Dimensions of T-slots in accordance
with VSM 33811 standard



Accessories

13-10.850 : Dividing head (indexing) attachment with 3 index plate mounted on rotating circular table.

Division : 2 to 360° attached hereto.

Index table IN 53-27

The circular table is attached to 2 T-slots in the table by means of 4 10-mm.-diameter drawback bolts which are included among the standard accessories. 2 guide stones ensure correct alignment on the table. The circular table is immobilized by means of two eccentric blocking attachments.

The rotary table can be disengaged from the worm by slackening the screw (CCM M10x40/25) and turning the eccentric sleeve (51-10.003) (see page 37).

Cleaning, lubrication and maintenance

Both on receipt and during operation, the general instructions supplied for the machine must be strictly observed. Never lift the rotary table by its top, but always take hold it at its base.

Oil bath

The worm is lubricated by an oil bath. The following is the procedure for filling the oil bath (viscosity of oil : 2,5°E at 50°C) :

Screw out plug (CM M8x10). Fill oil bath to mark on inspection window (24).

Once a year the oil bath should be drained, swilled out with paraffin, and refilled with oil.

The table is also provided with 2 lubricating nipples for lubrication with the oil gun supplied with the machine.

Removing the vernier

1. Slacken screw (51-10.015).
2. Withdraw crank (51-10.016) and sleeve (51-10.013) carrying the vernier (51-10.014), together with its spring (13-2.020).

Removing the index plates

1. Unscrew nut (M12x6,5) and remove washer (13/28).
2. Remove hand crank (52-1032) with index peg (52-969) and sleeve (52-972).
3. Take off pointers (52-838) and (52-839).
4. Remove the three screws (F M5x12) and take off index plate (52-837).

Taking up axial play in worm

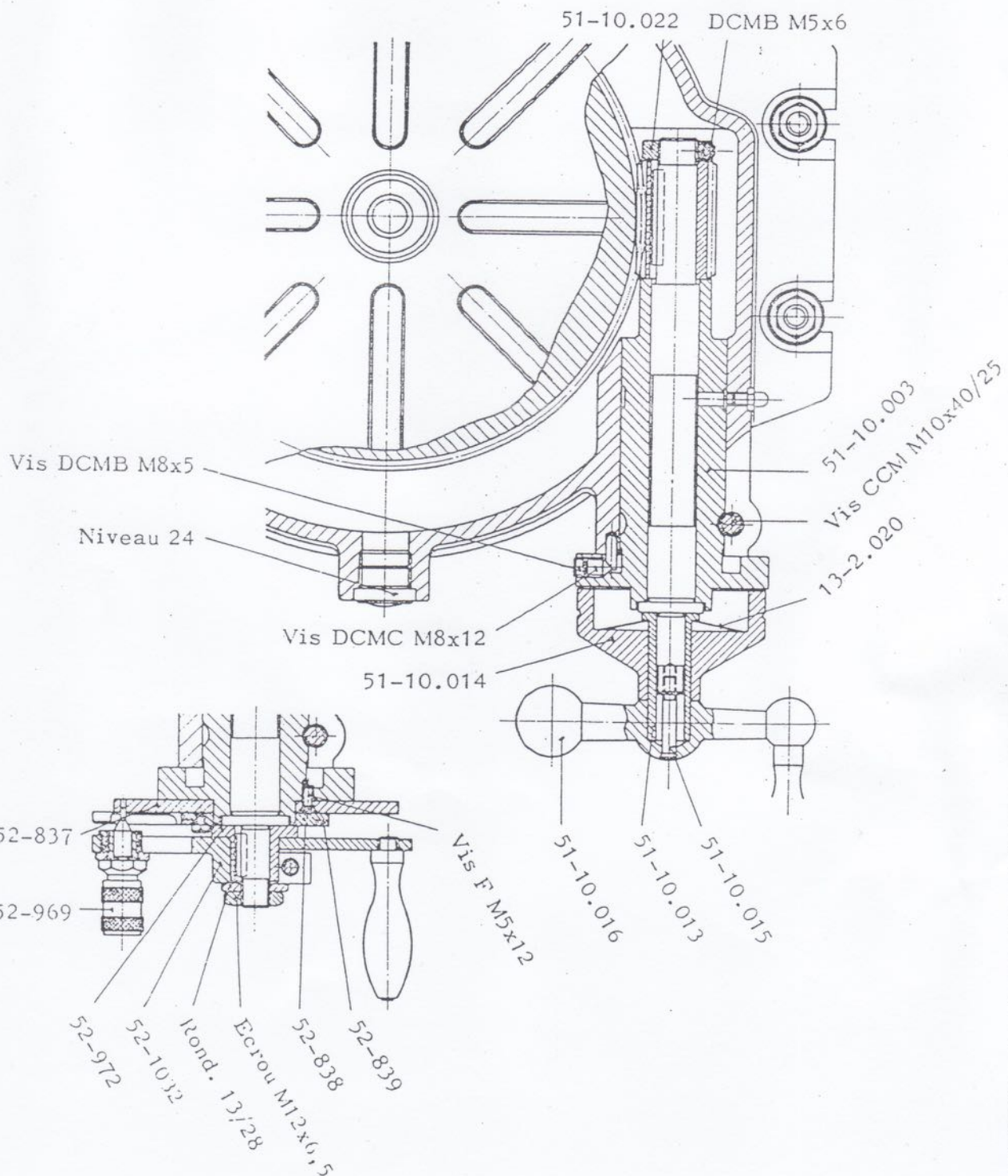
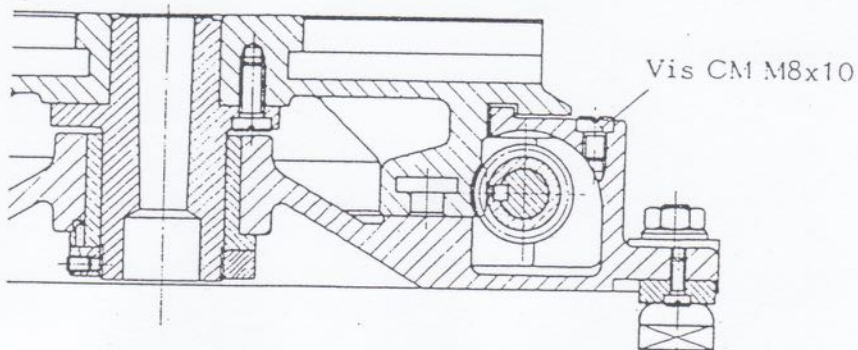
Where the axial play proceeds from the toothing :

1. Completely unscrew screw (DCMB M8x5).
2. Unscrew screw (DCMC M8x12) according to the amount of play to be taken up.
3. Replace screw (DCMB M8x5) and tighten firmly.

Where the axial play proceeds from the worm axle :

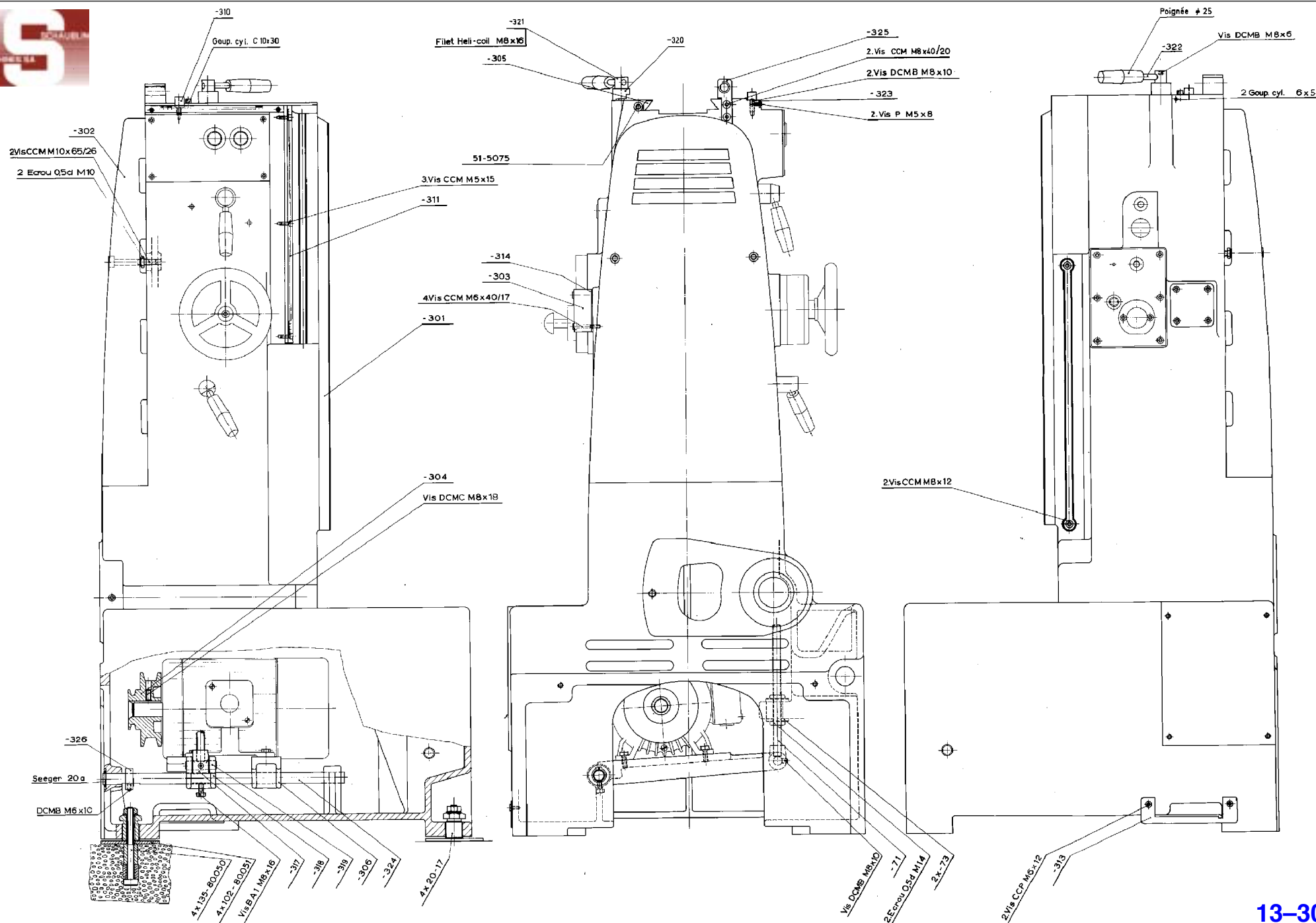
1. Unscrew (CCM M10x40/25) and remove eccentric sleeve (51-10.003).
2. Slacken screw (DCMB M5x6) and tighten nut (51-10.022) according to amount of play to be taken up.
3. Firmly tighten screw (DCMB M5x6).

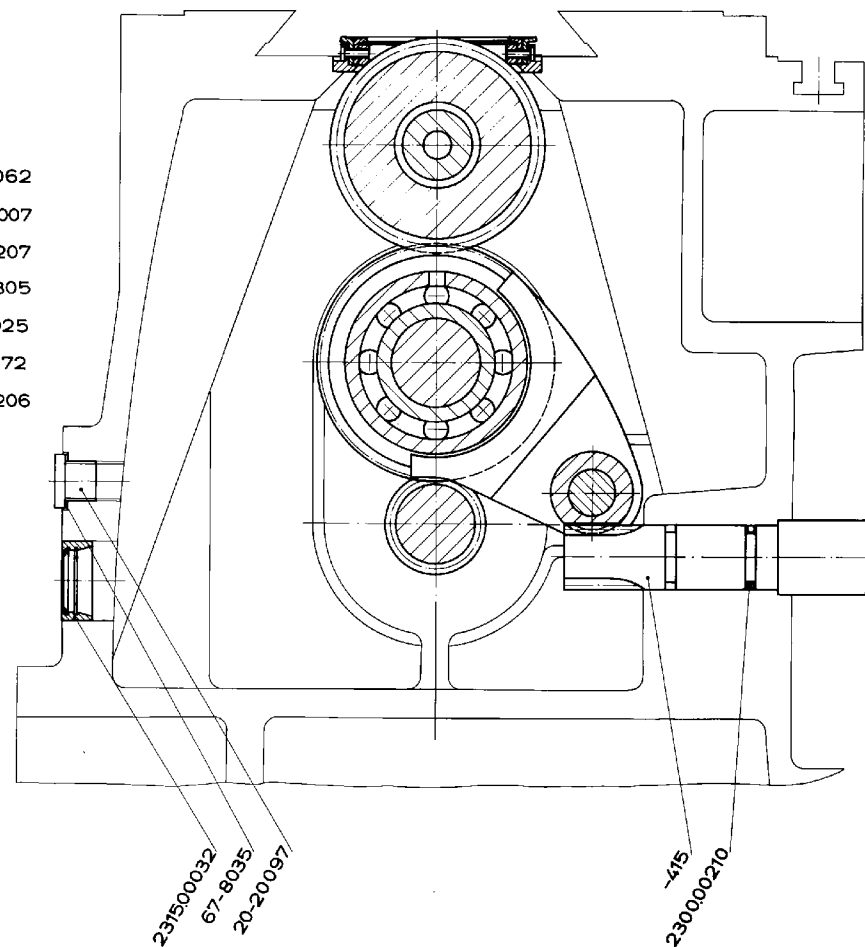
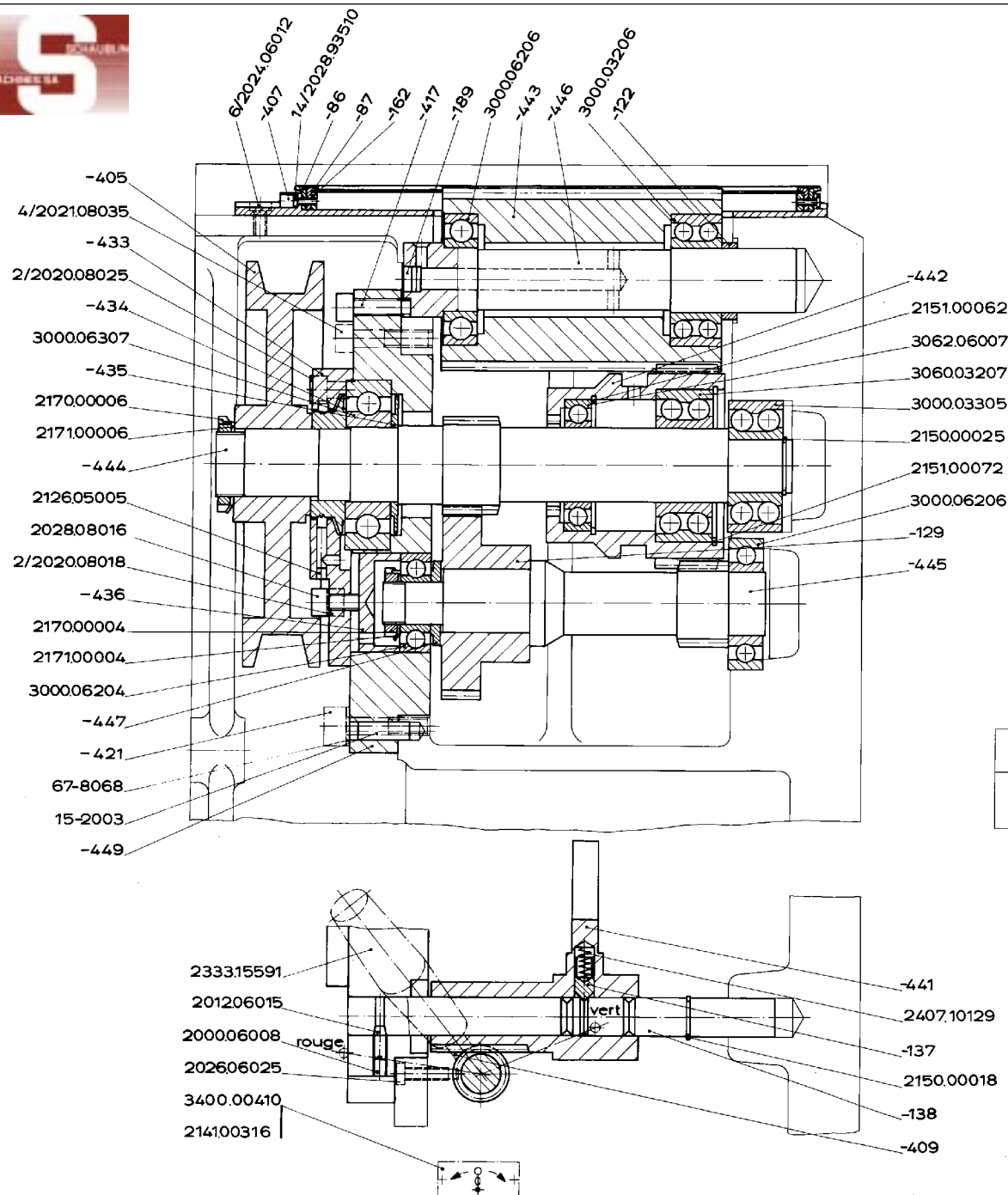
Only experienced personnel should be entrusted with these adjustments, as they call for the exercise of extreme care.

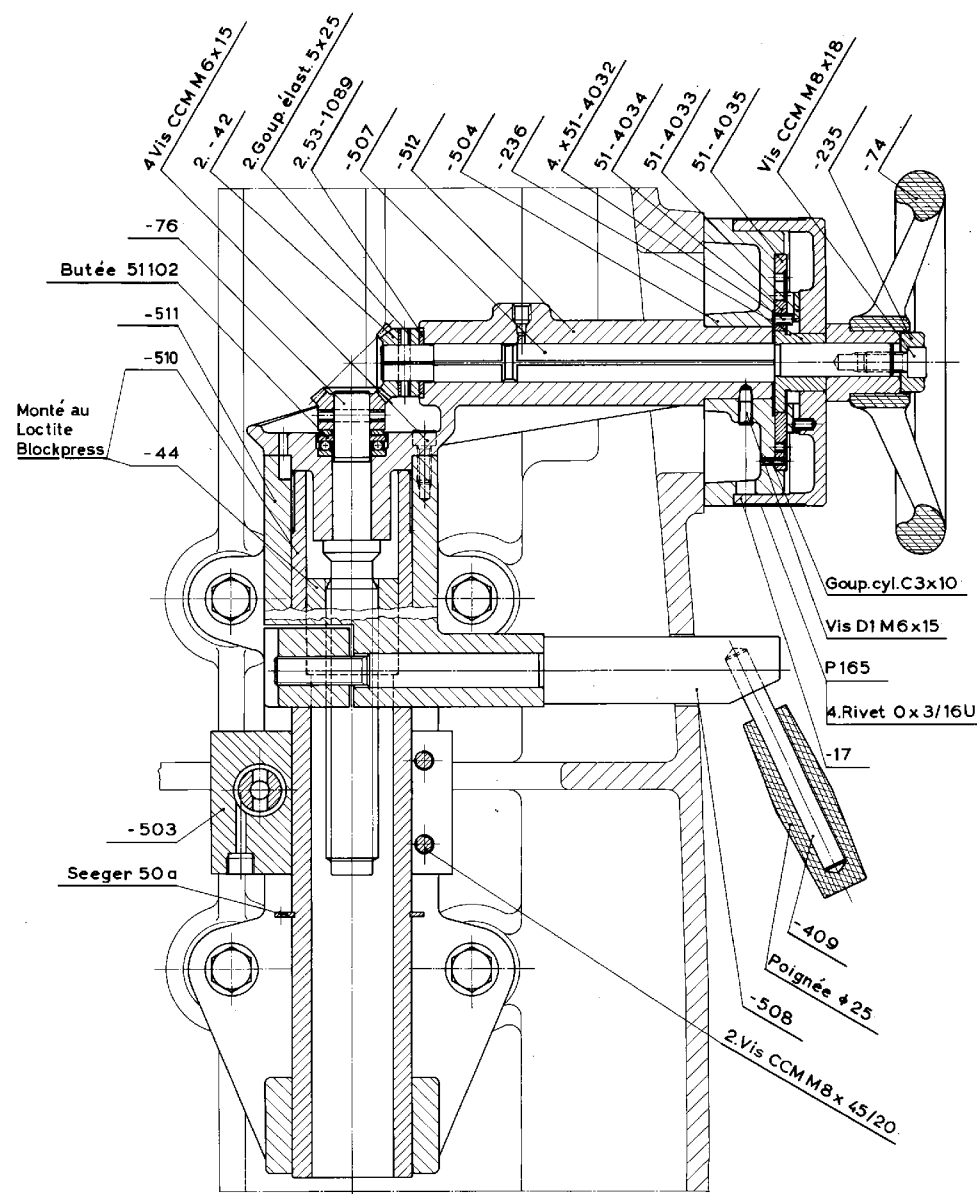
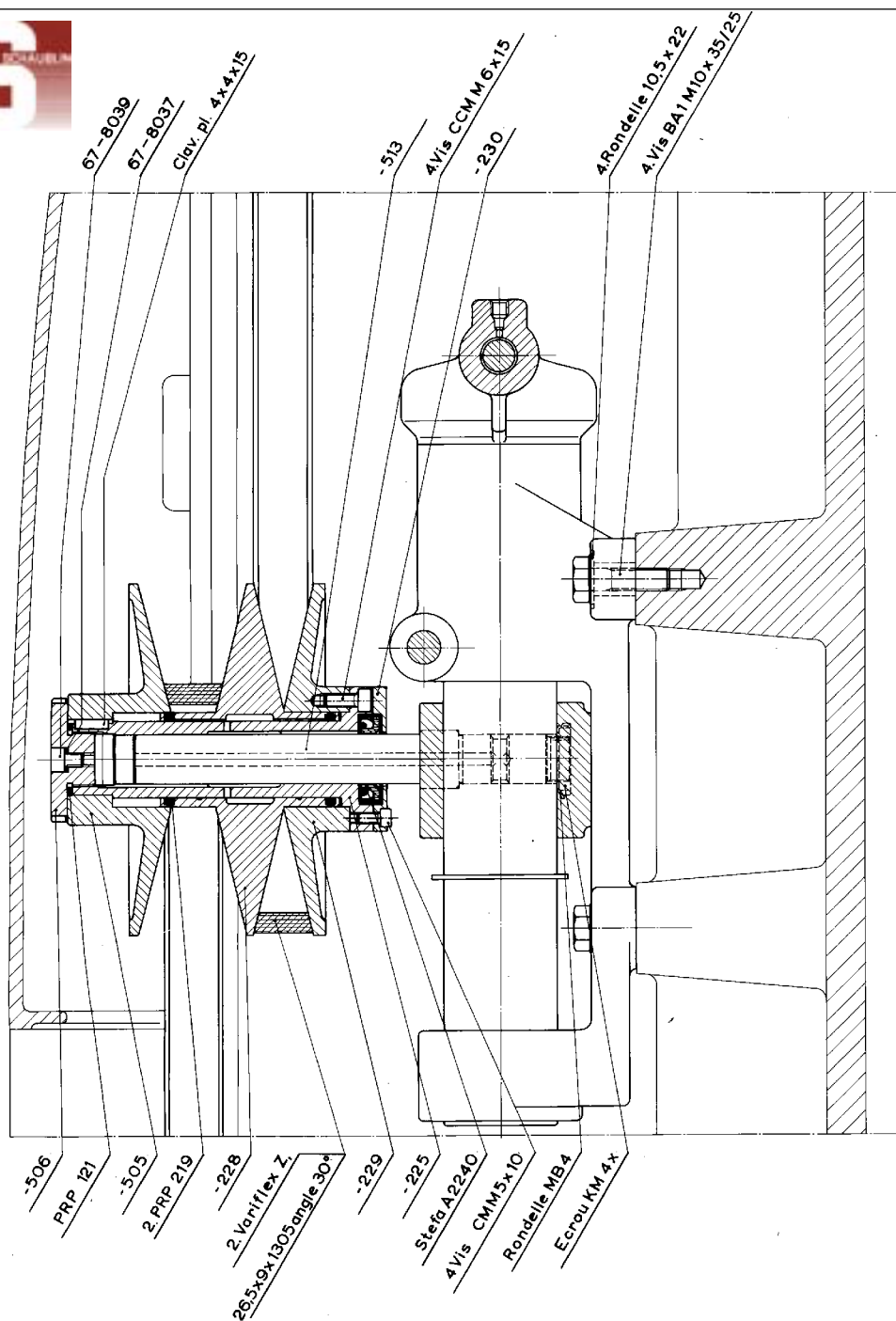


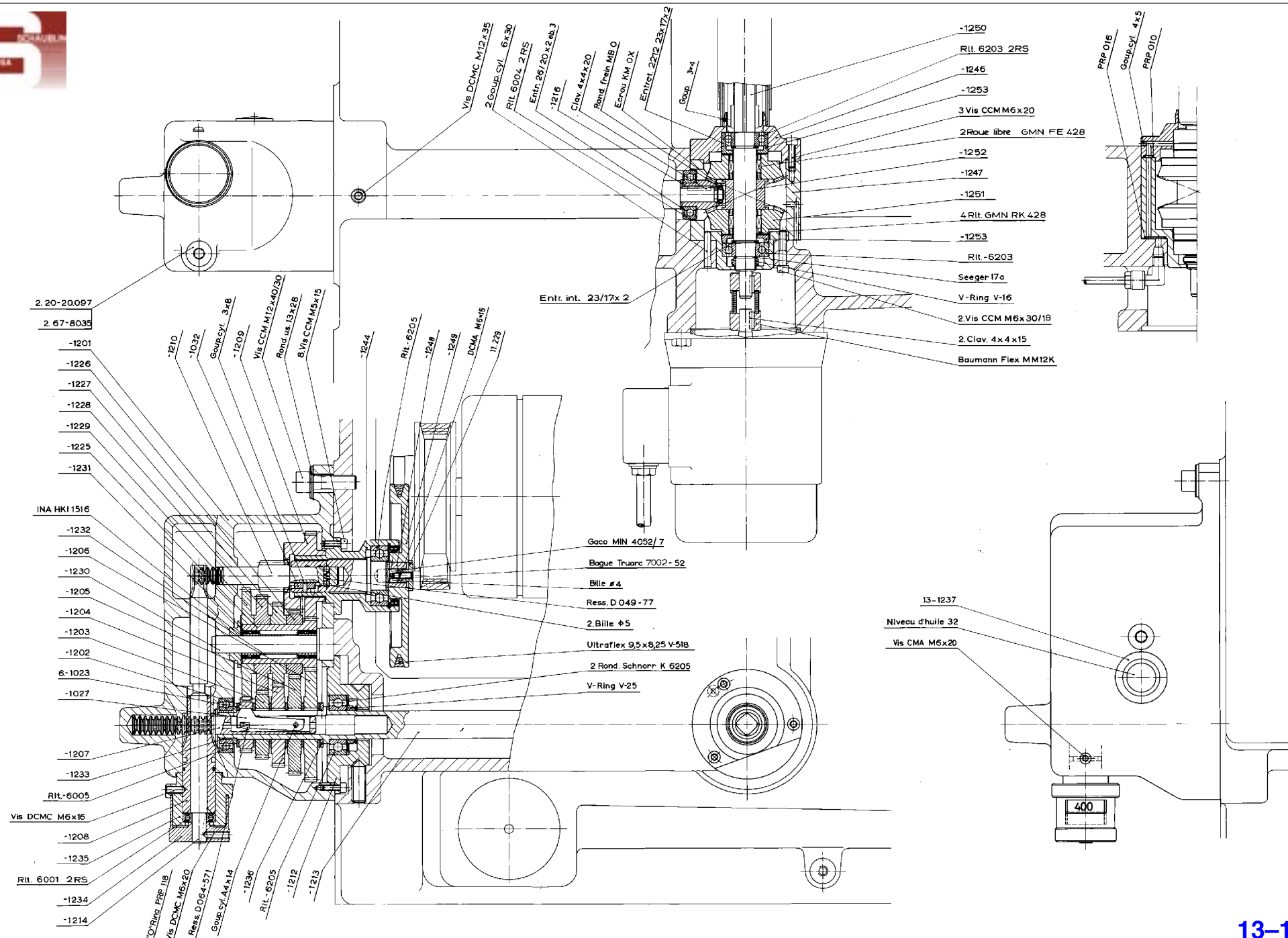
5. DRAWINGS

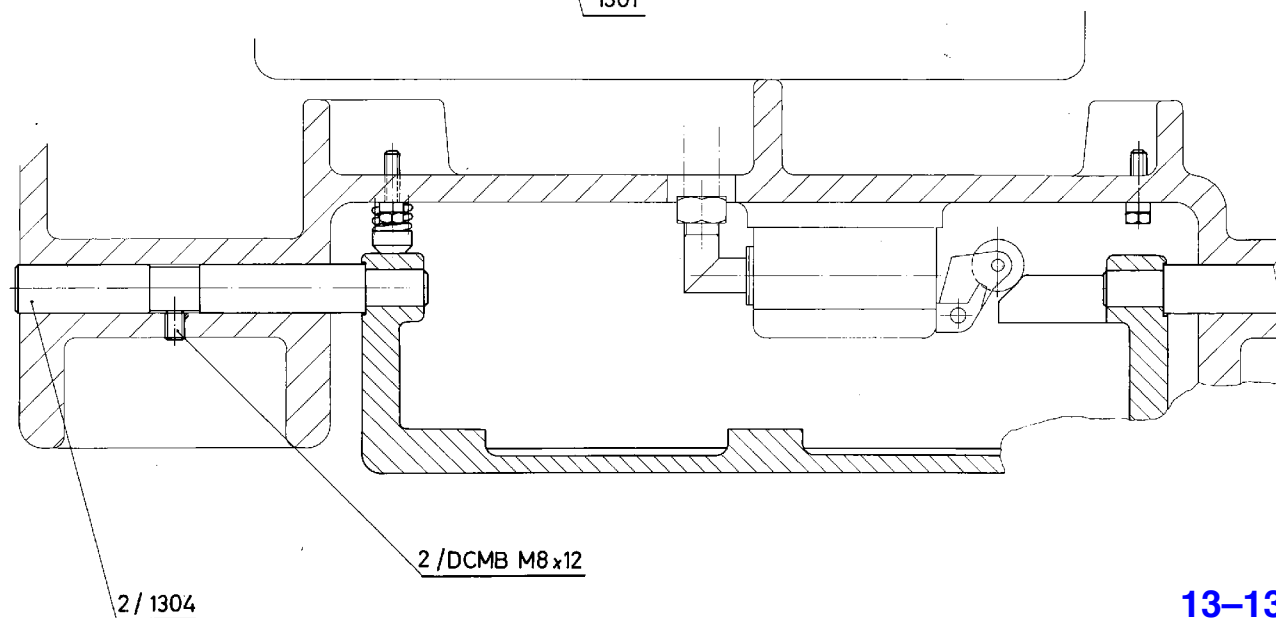
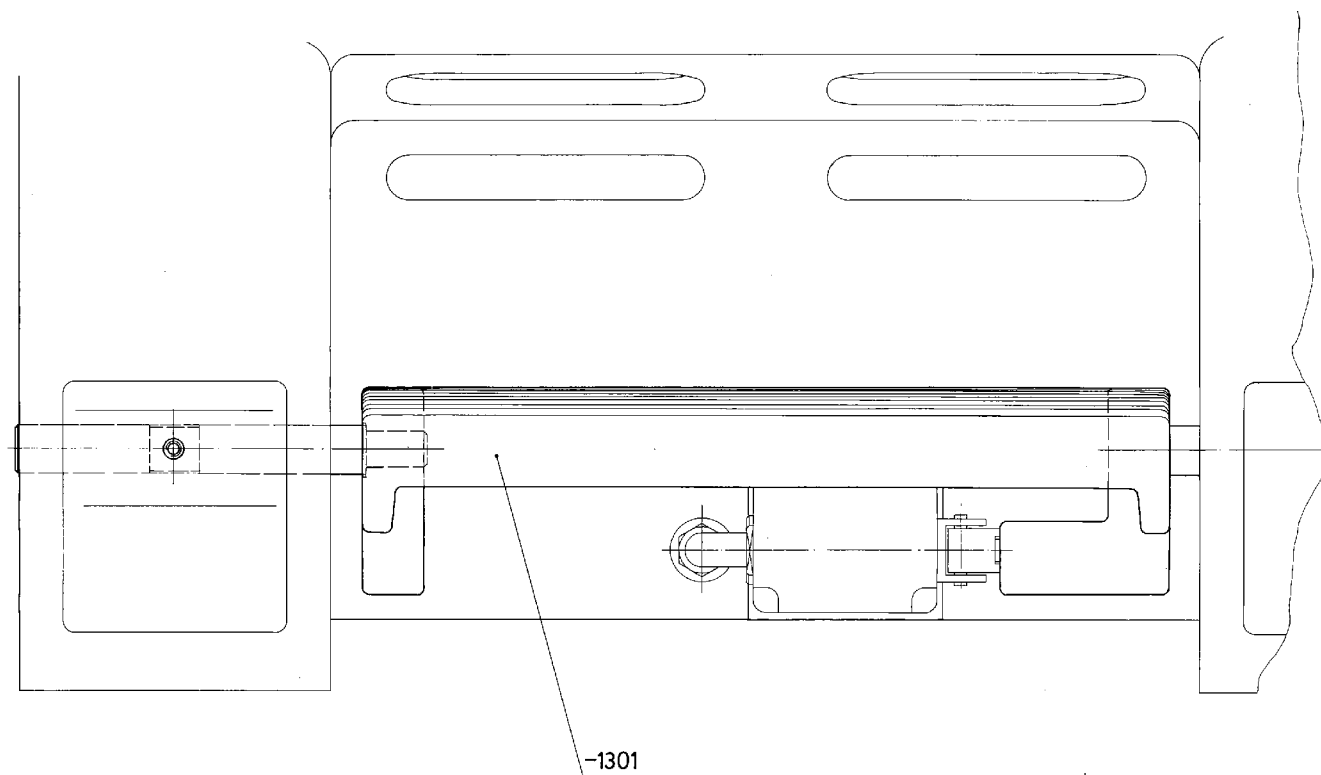
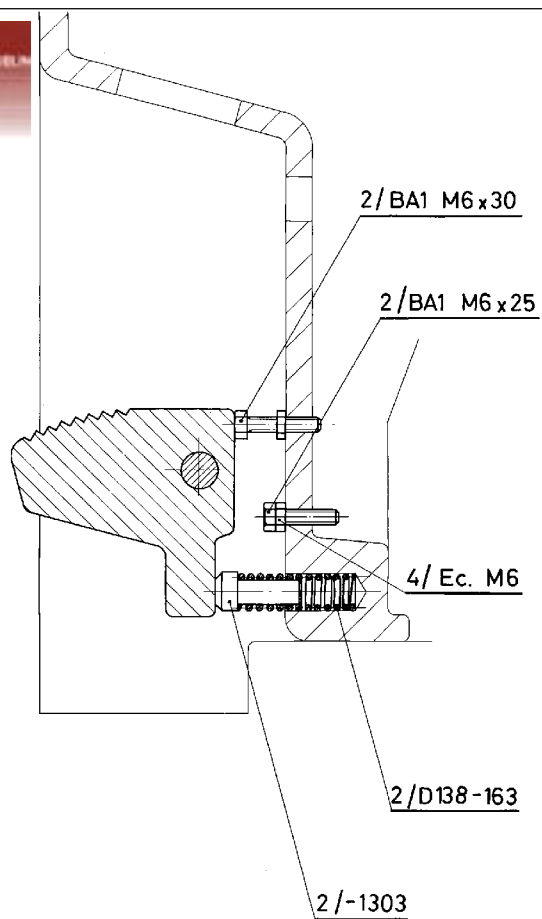
The following drawings not only facilitate the assembly and disassembly of the various sectors of the machine, but equally permit a quick identification of a part to be replaced.

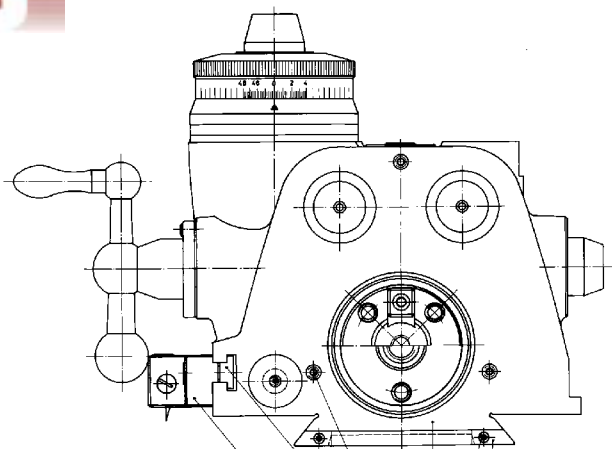




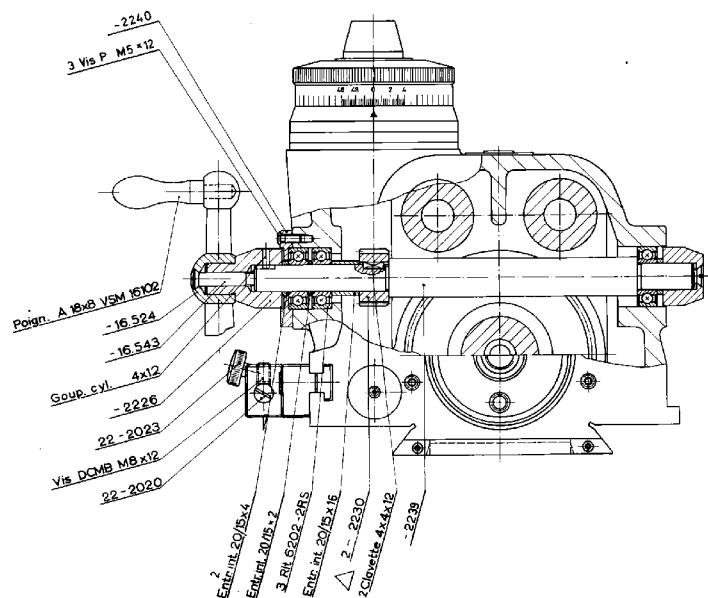




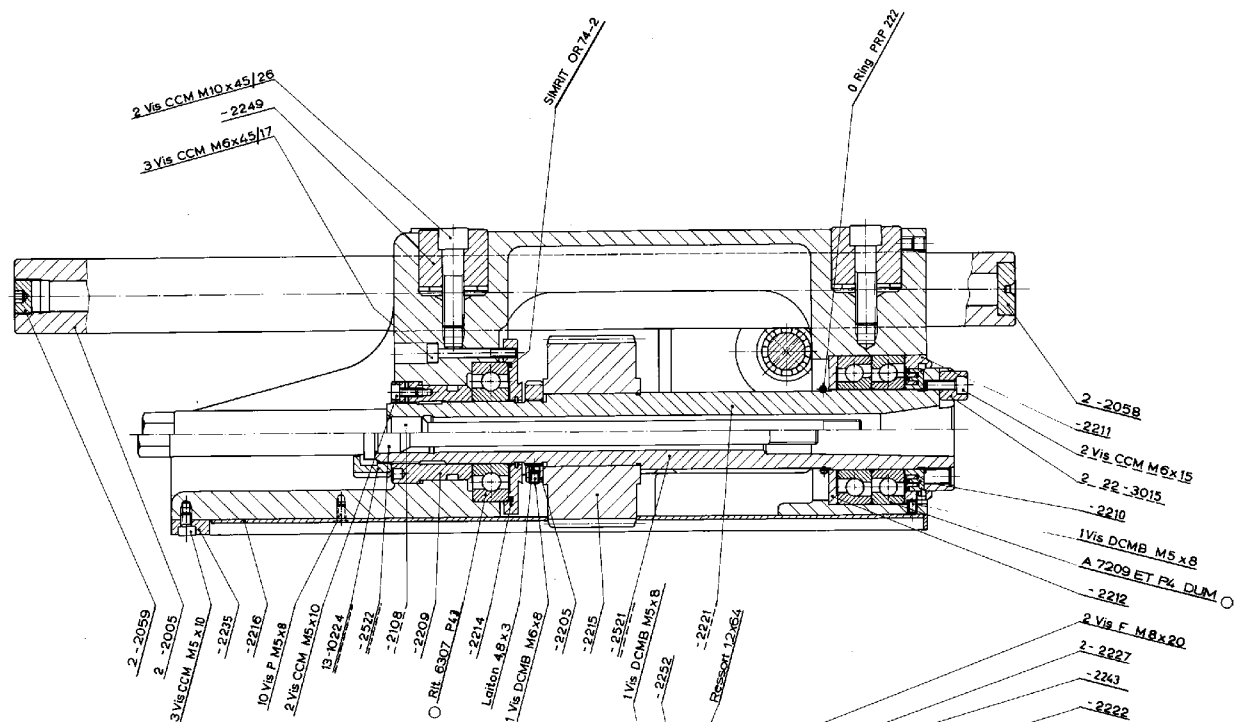




-2204
2 - 102 - 47506
3 Vis DCMB M8x8
3 Filet Hw-Coil M8
-2201
2 Vis P M5x8
-2206



-2240
3 Vis P M5x12
-16524
-16543
Goup. cyl. 4x12
-2226
22-2023
Vis DCMB M8x12
22-2020
Ente. int. 20/15x14
Ente. int. 20/15x12
3 RIL 6202-2RS
Ente. int. 20/15x16
2 - 2230
2 Clefette 4x4x12
-2238



2 Vis CCM M10x45/26
-2249
3 Vis CCM M6x45/17

SWAIT OR 74-2

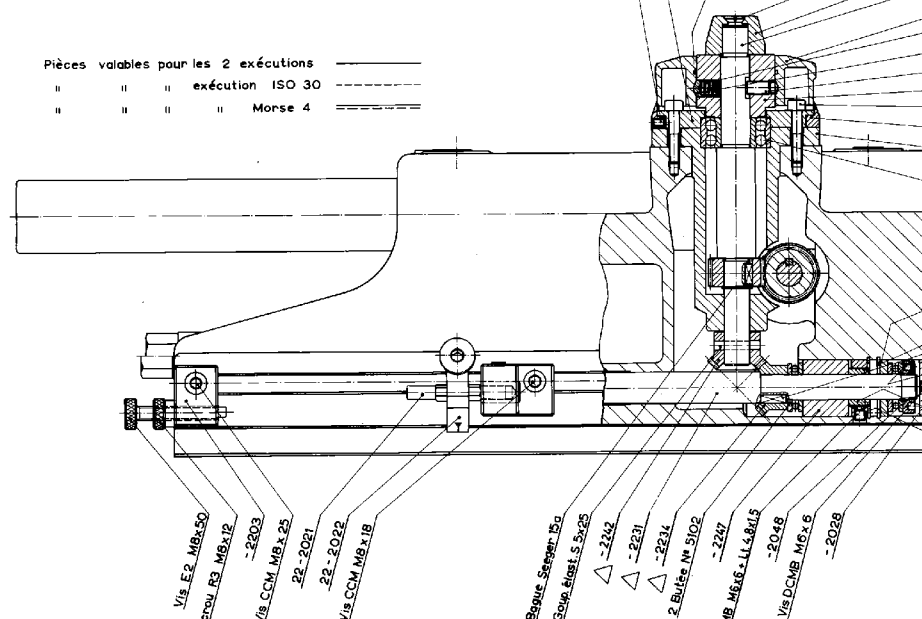
0 Ring PRF 222

2 - 2059
2 - 2005
3 Vis CCM M5x10
-2225
-2216
10 Vis P M5x8
2 Vis CCM M5x10
13 10224
-2532
-2108
-2209
RIL 6307 P43
-2214
Laiton 4.8x3
1 Vis DCMB M6x8
-2205
-2215
-2501
1 Vis DCMB M5x8
-2252
Ressort 12x44
-2221

2 - 2058
-2211
2 Vis CCM M6x15
2 - 22-3015
-2210
1 Vis DCMB M5x8
A 7209 ET P4 DUM
-2212

2 Vis F M8x20
2 - 2227
-2243
-2222
Ressort D 075-602
-2237
Vis DCMB M8x15
-2244
4 Vis CCM M6x30/18
-2251
-2223

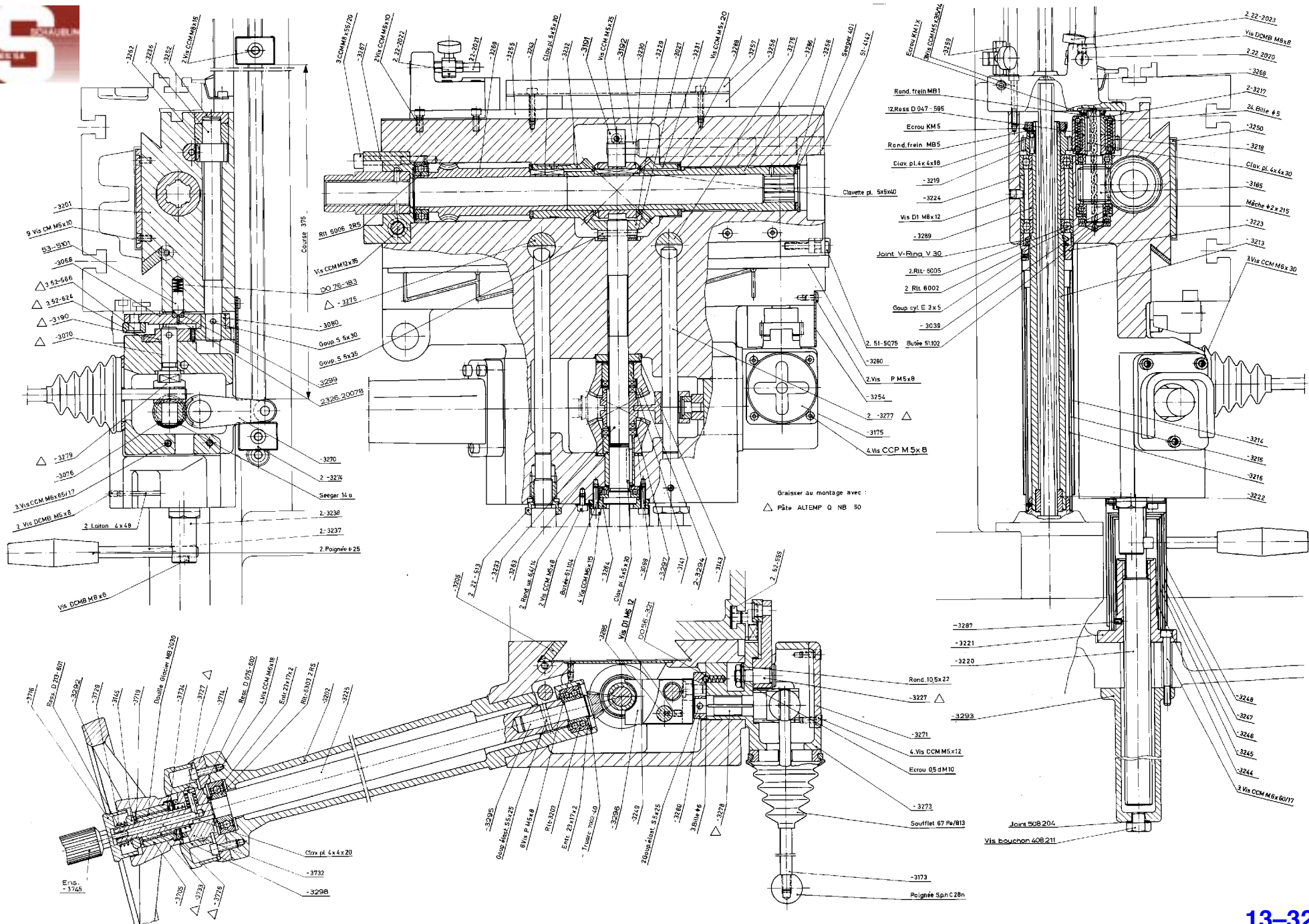
Pièces variables pour les 2 exécutions
" " " exécution ISO 30
" " " " Morse 4

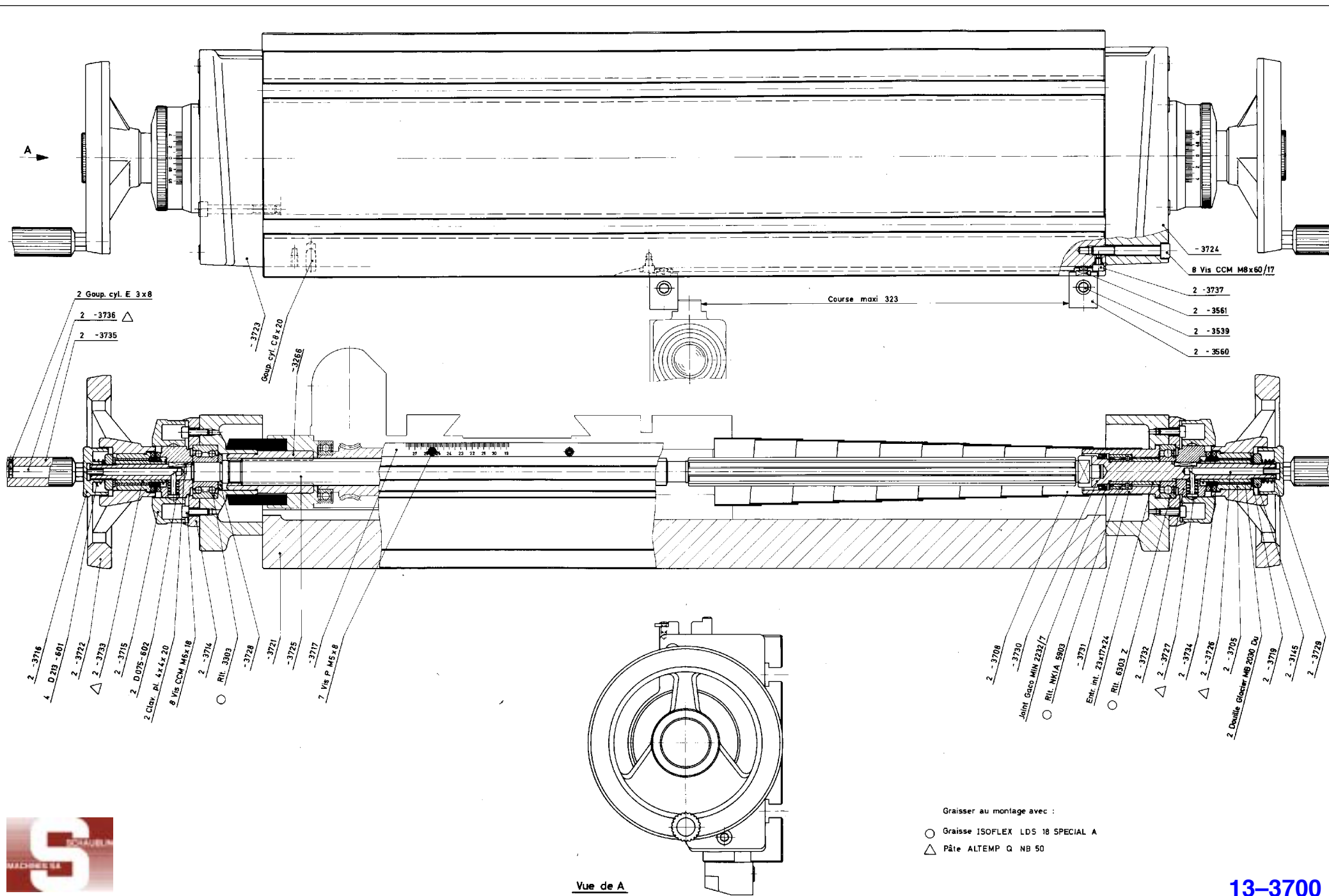


Vis E2 M8x50
Ecrou R3 M8x12
-2203
Vis CCM M8x25
22-2021
22-2022
Vis CCM M8x18

Bague Serrin 50
Goup. stat. 5x25
-2242
-2241
-2211
2 Butée N° 5102
-2247
DCMB M8x16-L14x15
-2048
Vis DCMB M6x6
-2028

Graisser au montage avec:
○ Graisse ISO FLEX LDS 18 SPECIAL A
△ Pâte ALTEMP Q NB 50
-2245
-2246

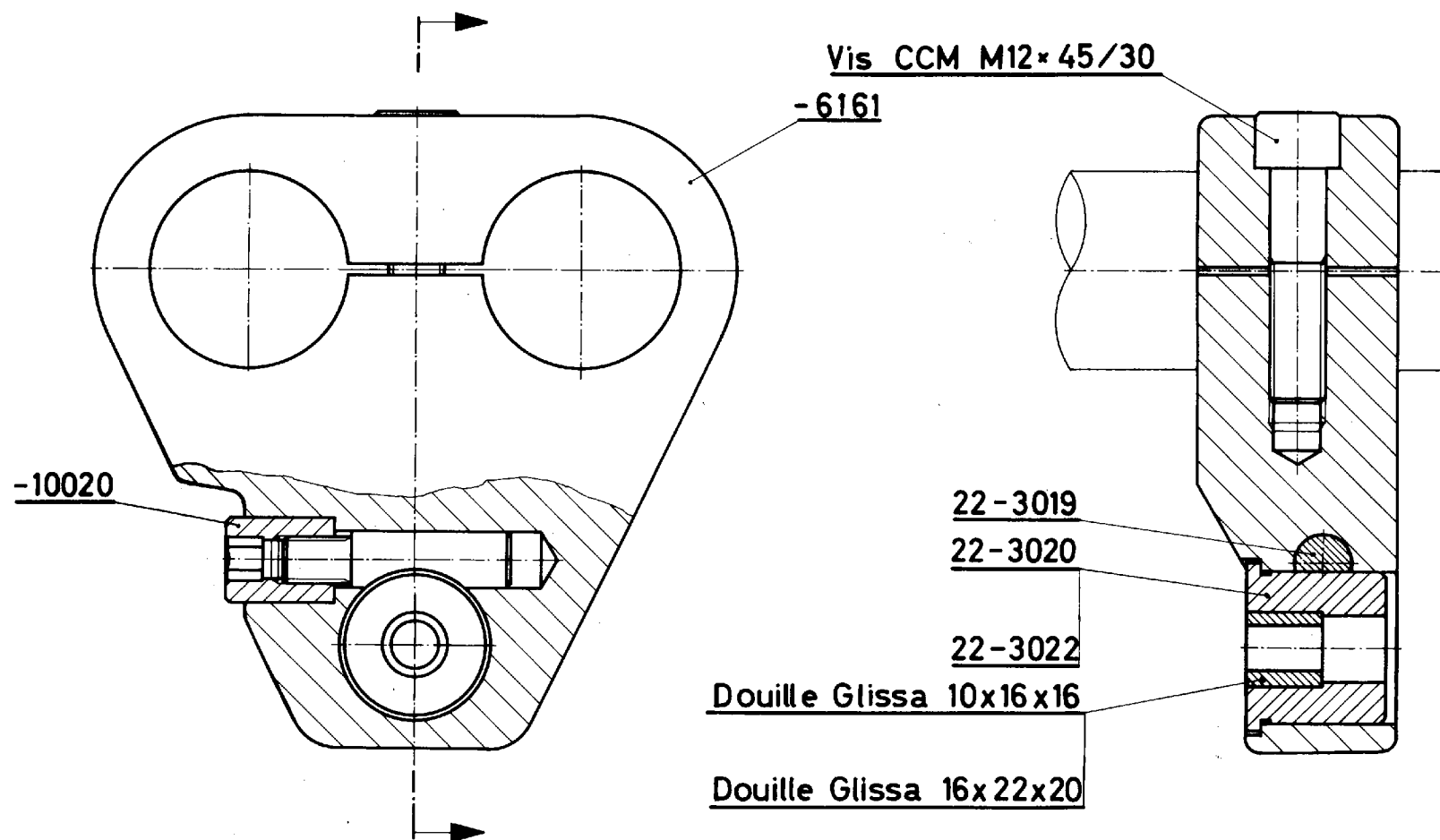


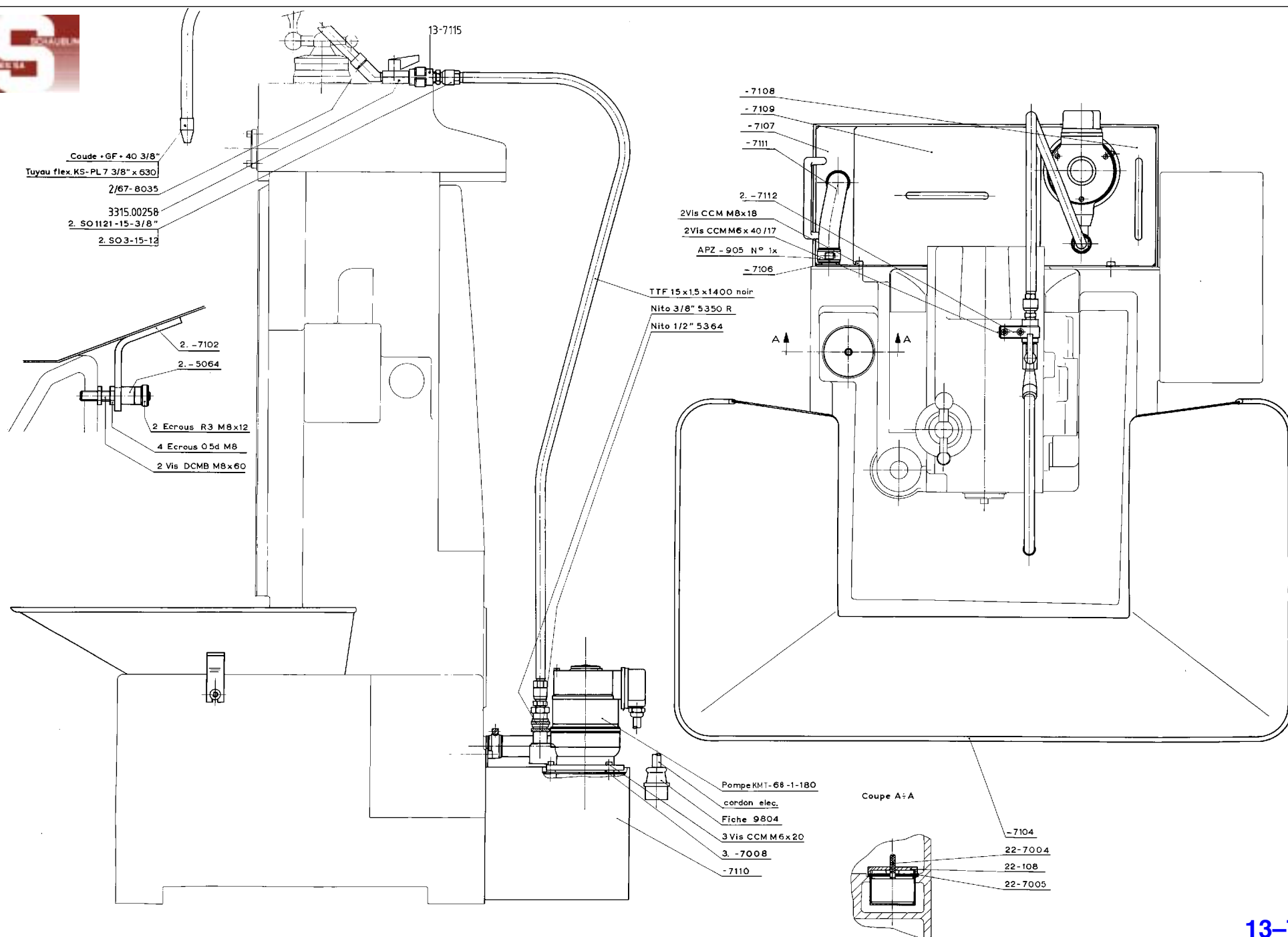


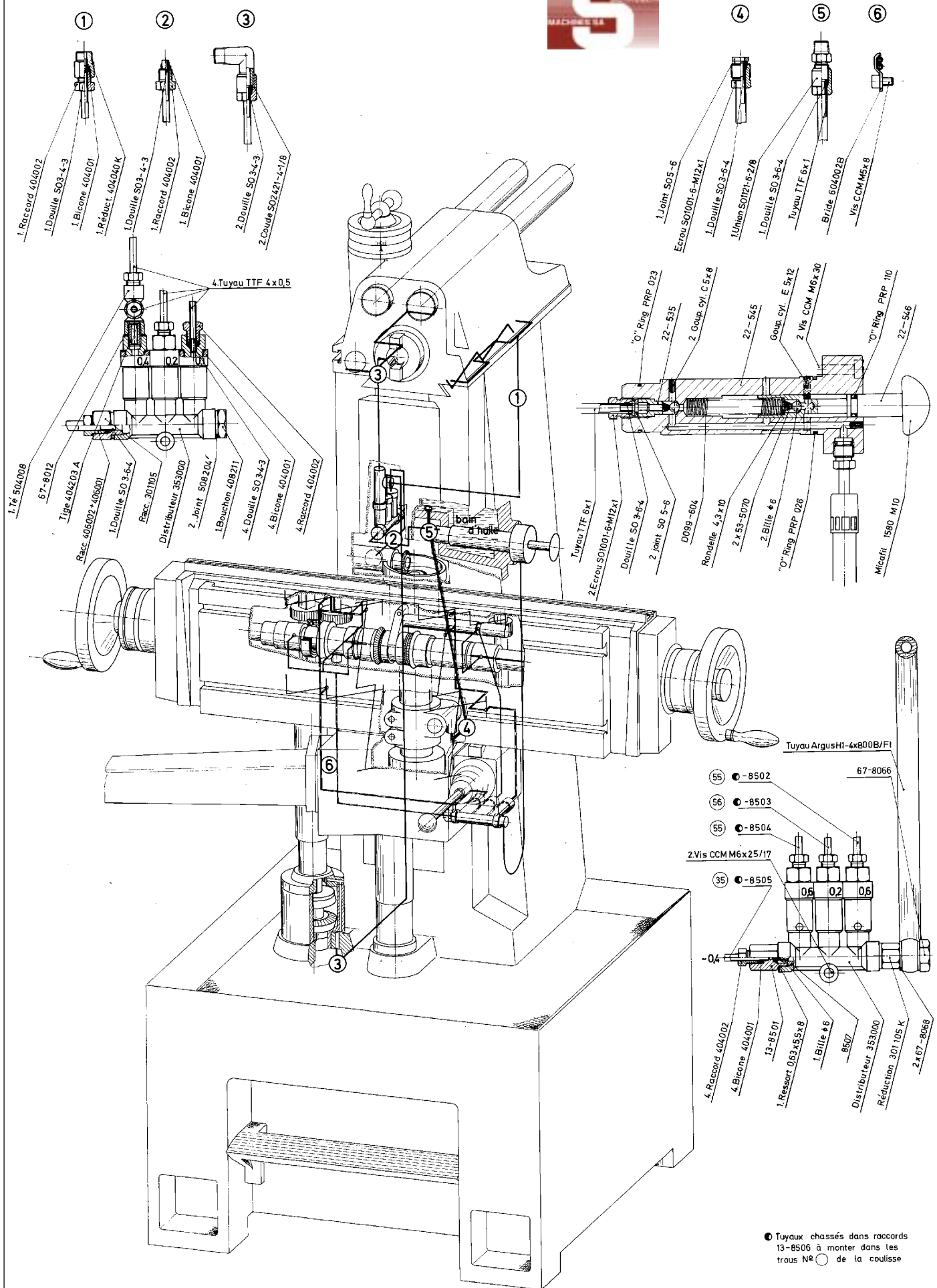
Graisser au montage avec :

- Graisse ISOFLEX LDS 18 SPECIAL A
- △ Pâte ALTEMP Q NB 50

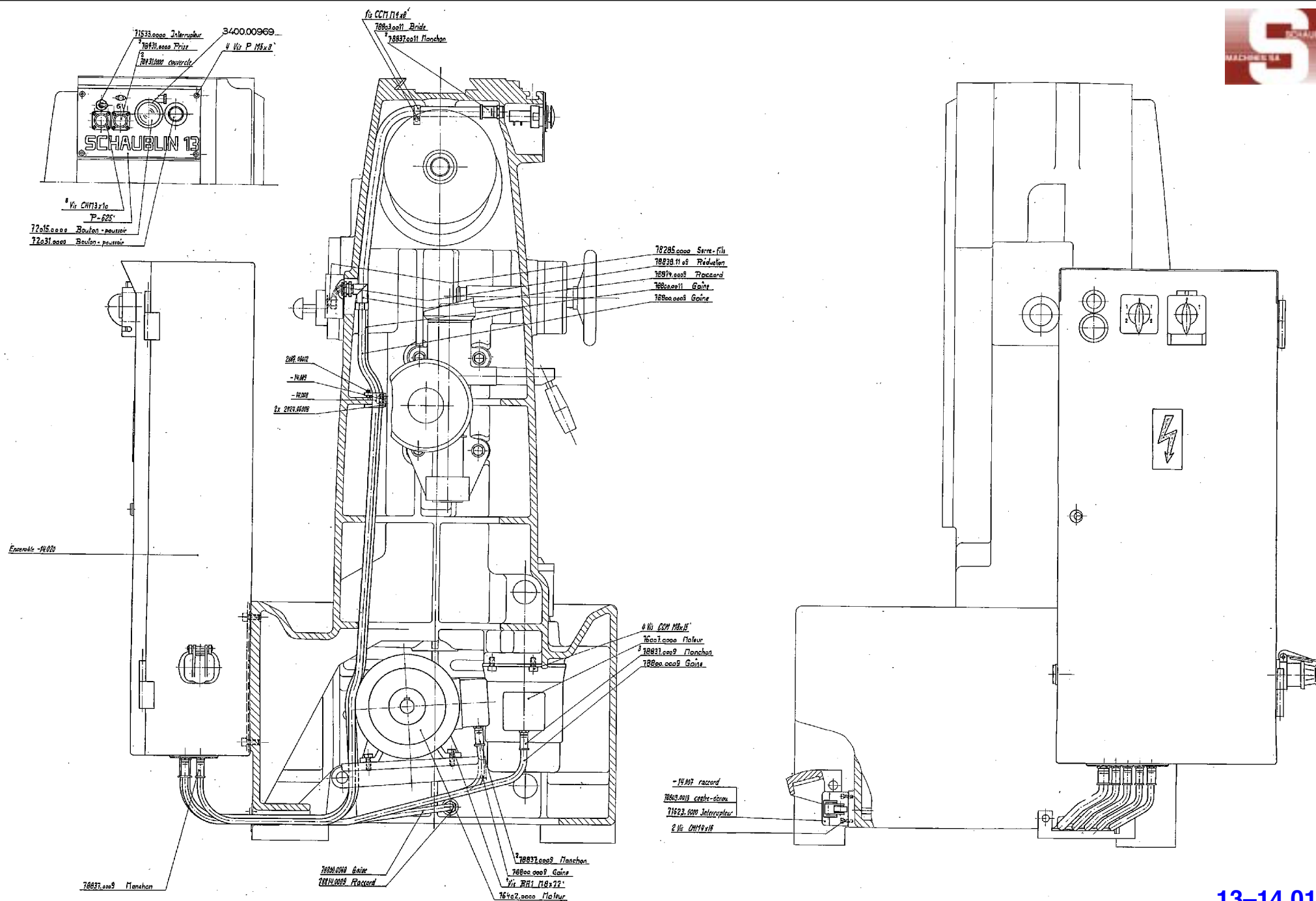
13-3700

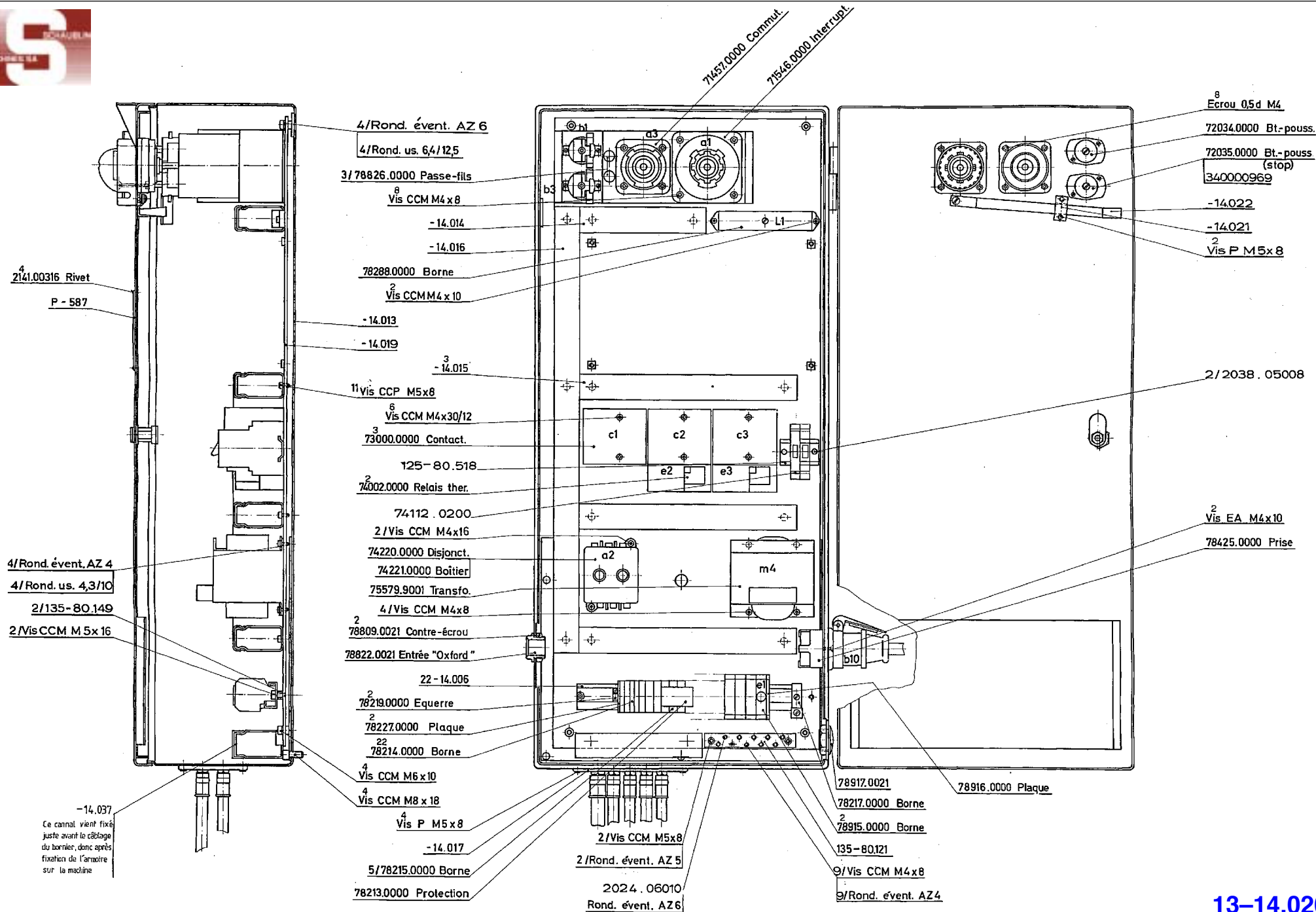






● Tuyaux chassés dans raccords
13-8506 à monter dans les
trous NR ○ de la coulisse







Prescriptions de service pour moteurs à courant alternatif

1. Emplacement

1.1 Généralités

Le moteur doit être placé sur un bâti solide, exempt de vibrations et facilement accessible. Le local doit être autant que possible protégé des poussières et de l'humidité. La température du local ne doit pas dépasser 35°. L'aération du moteur doit s'effectuer librement sur tous les côtés. Les tôles de protection qui accompagnent éventuellement le moteur, doivent être montées dans leur position initiale. Les accouplements ou poulies livrés avec le moteur doivent être mis à la presse sur le bout d'arbre libre. Tout coup peut endommager le palier.

1.2 Accouplement direct

L'arbre du moteur doit être soigneusement aligné avec l'axe entraîné. Ce dernier ne doit pas exercer la moindre pression sur l'arbre du moteur.

1.3 Accouplement à courroie

La tension de la courroie doit pouvoir être réglée à volonté. A cet effet on adaptera un rail tendeur à la base du moteur ou tout autre dispositif adéquat. On veillera à ce que les courroies soient strictement en ligne et que l'arbre du moteur soit également bien parallèle avec l'axe entraîné. Les courroies ne doivent pas être tendues trop fortement, car ceci causerait très vite des dégâts aux paliers, surtout lorsqu'il s'agit de paliers à glissement. En particulier, les courroies trapézoïdales ne doivent en aucun cas toucher le fond de la gorge. On veillera à ce qu'elles puissent encore être pressées librement à la main entre les poulies. Pour les

moteurs pourvus de paliers à graissage à bague, on veillera à ce que la traction de la courroie s'effectue si possible vers le bas. Les courroies doivent être collées sans fin afin d'éviter des à-coups sur les paliers.

2. Branchement

2.1 Généralités

Le branchement au réseau doit être effectué par un homme du métier. Tout d'abord, d'après la plaquette indicatrice, il faut s'assurer que la connexion, telle qu'elle est faite sur la plaque à bornes du moteur, concorde bien en tous points avec la tension du réseau (p. ex. connexion en étoile ou triangle). Les éventuels agrégats de démarrages, tels que relais, condensateurs, etc., doivent être raccordés selon le schéma de connexion.

2.2 Protection du moteur

Comme organe de connexion, nous recommandons des coffrets de protection de moteurs. Les fusibles protègent uniquement l'amenée du courant (protection contre les court-circuits) et non pas le moteur lui-même. Seuls les coffrets de protection bien réglés protègent le moteur contre toute surcharge et marche sur une ou deux phases seulement. La plaque indicatrice du moteur fournit les données permettant de régler exactement le coffret de protection. S'il y a des dispositifs de protection complémentaires, tels que des éléments thermiques incorporés au bobinage, ils doivent être connectés en concordance avec les indications figurant sur le schéma du moteur.

3. Mise en service de fonctionnement

3.1 Graissage

La fabrique livre les moteurs à paliers à roulement, ou ceux à paliers lisses sans bague de graissage, prêts à fonctionner, c'est-à-dire correctement pourvus de graisse ou d'huile dans les paliers. Avant la mise en marche, les paliers de graissage à bague doivent être tout d'abord vidés, puis bien rincés au pétrole ou à la benzine et séchés (la vis de vidange est située sous le palier). On versera alors lentement et prudemment de l'huile pour moteur dans ce palier (voir chiffre 4.2) jusqu'au milieu de l'indicateur de niveau ou jusqu'au trou de trop-plein sur le côté. Si l'indicateur de niveau manque, on aura soin d'éliminer l'une des deux vis de trop-plein. Un excédent d'huile est tout aussi nuisible au moteur qu'un manque de graissage. Un excédent d'huile coule le long de l'arbre lorsque le moteur tourne et attire toujours plus d'huile vers l'extérieur. On ne fera jamais tourner un moteur avec paliers à bague, avant de l'avoir pourvu d'huile. Avant la mise en marche du moteur, on aura soin de s'assurer en faisant tourner l'arbre à la main que les bagues tournent et entraînent bien l'huile. (Voir aussi chiffre 4.1 et 4.2.)

3.2 Résistance de l'isolation

Un séjour prolongé dans les locaux humides est nuisible au bobinage des moteurs. On contrôlera la résistance au moyen d'un indicateur à manivelle, entre les bornes du moteur et le fer, en ayant soin de déconnecter la conduite d'amenée. Ce contrôle devra montrer les valeurs minimales suivantes:

Moteurs pour 220 V: 0,2 mégohm,
380 V: 0,4 mégohm,
500 V: 0,5 mégohm.

Au cas où ces valeurs ne seraient pas atteintes, il faudrait alors procéder au séchage du moteur.

3.3 Connexion

En utilisant des interrupteurs en étoile-triangle il faut attendre que le moteur ait atteint un nombre de tours constant, voisin du nombre de tours nominal et ceci en restant sur la connexion en étoile. On passera ensuite à la connexion en triangle.

3.4 Sens de marche

Pour autant qu'une flèche de sens de marche ne figure pas sur le moteur,

il est alors possible de le faire tourner dans les deux sens. Pour renverser le sens de marche, il suffira d'interchanger deux phases des moteurs à courant triphasé. Pour ce qui est des moteurs à courant mono- et bi-phasé, il faut procéder selon les indications du schéma de connexion.

3.5 Fonctionnement

Indépendamment des différentes charges possibles, le moteur doit fonctionner sans vibration et sans bruit excessif. Dans les cas douteux, on le déconnectera de la machine et on le laissera tourner à vide, afin de comparer la marche. Les moteurs modernes supportent une température supérieure à celle que peut supporter une pression constante de la main sur la carcasse. Les moteurs fermés peuvent même atteindre une température de 100° C en surface. Par contre la température des paliers ne doit pas dépasser 80° C.

Il est possible de constater quelle est la température admissible d'un moteur, en procédant comme suit:

La résistance ohmique d'une phase (p. ex. U—X) doit être mesurée en déconnectant le moteur, une fois à froid et l'autre dans l'espace de 30 secondes, immédiatement après une marche continue. L'échauffement est dans les limites admissibles, si le rapport «résistance à froid» et «résistance à chaud» ne dépasse pas 1,3.

4. Entretien

4.1 Graissage des paliers à billes

Les moteurs n'ayant pas de dispositif de graissage extérieur (graisseur, boîte Stauffer) sont pourvus d'une lubrification dite permanente, qui suffit pour une marche normale de 8 heures pendant 5 ans soit environ 12 000 heures de marche. Passé ce délai, il faudra alors procéder au démontage des plateaux à paliers et nettoyer soigneusement tant les paliers que les chambres à graisse avec de la benzine ou du benzol, puis les sécher et les graisser à nouveau, sans toutefois faire tourner les axes à sec. Les paliers doivent être remplis complètement, tandis que les chambres à graisse le seront au ¾ seulement.

Les moteurs équipés d'un dispositif de graissage extérieur sont livrés avec une prescription, selon laquelle le graissage doit être effectué sur le moteur en marche. Avant le graissage, il faut nettoyer les graisseurs. Les paliers, chambres à graisse et conduites doivent être nettoyés dès

Les roulements de nos moteurs sont normalement graissés avec Aseol-Litea 6-076. A défaut, le Shell-Alvania 3 ou une graisse équivalente à base de savon au lithium peuvent être utilisés. Tout mélange de graisse de qualité différente doit être évité. La qualité de la graisse d'origine est indiquée sur la prescription attachée à tous les moteurs avec dispositif de graissage extérieur.

Pour un service normal journalier de 8 heures on changera l'huile pour la première fois après deux mois, puis ensuite tous les six mois. Après avoir procédé à la vidange, il faut alors nettoyer les paliers, comme indiqué sous chiffre 3.1, ci-dessus; il en sera de même pour le remplissage. Il faut contrôler le niveau d'huile tous les six mois et, si nécessaire, procéder au remplissage, le moteur arrêté. Toutes les vis devront être bien serrées. On utilisera uniquement de l'huile minérale exempte d'acide, avec une viscosité de 65° E à une température de 50° C. Nous vous conseillons TERESSO 56 (ESSO) ou VITREA 37 (SHELL).

La lubrification de tels paliers, utilisés spécialement pour les petits moteurs, a lieu au moyen de feutres ou mèches imbibés d'huile ou de

Selon les besoins du service, on nettoiera le moteur, soit mensuellement, soit annuellement, ceci naturellement à moteur arrêté. On veillera spécialement à ce que la circulation d'air soit parfaite, et pour les moteurs fermés, on nettoiera soigneusement la carcasce. En exécutant ce travail, éviter toute pénétration de saleté dans les paliers.

En cas de commande de pièces de rechange, il est indispensable d'indiquer très précisément la pièce (si possible envoyer la pièce à échanger), en signalant le type et le numéro de fabrication se trouvant sur la plaque du moteur.

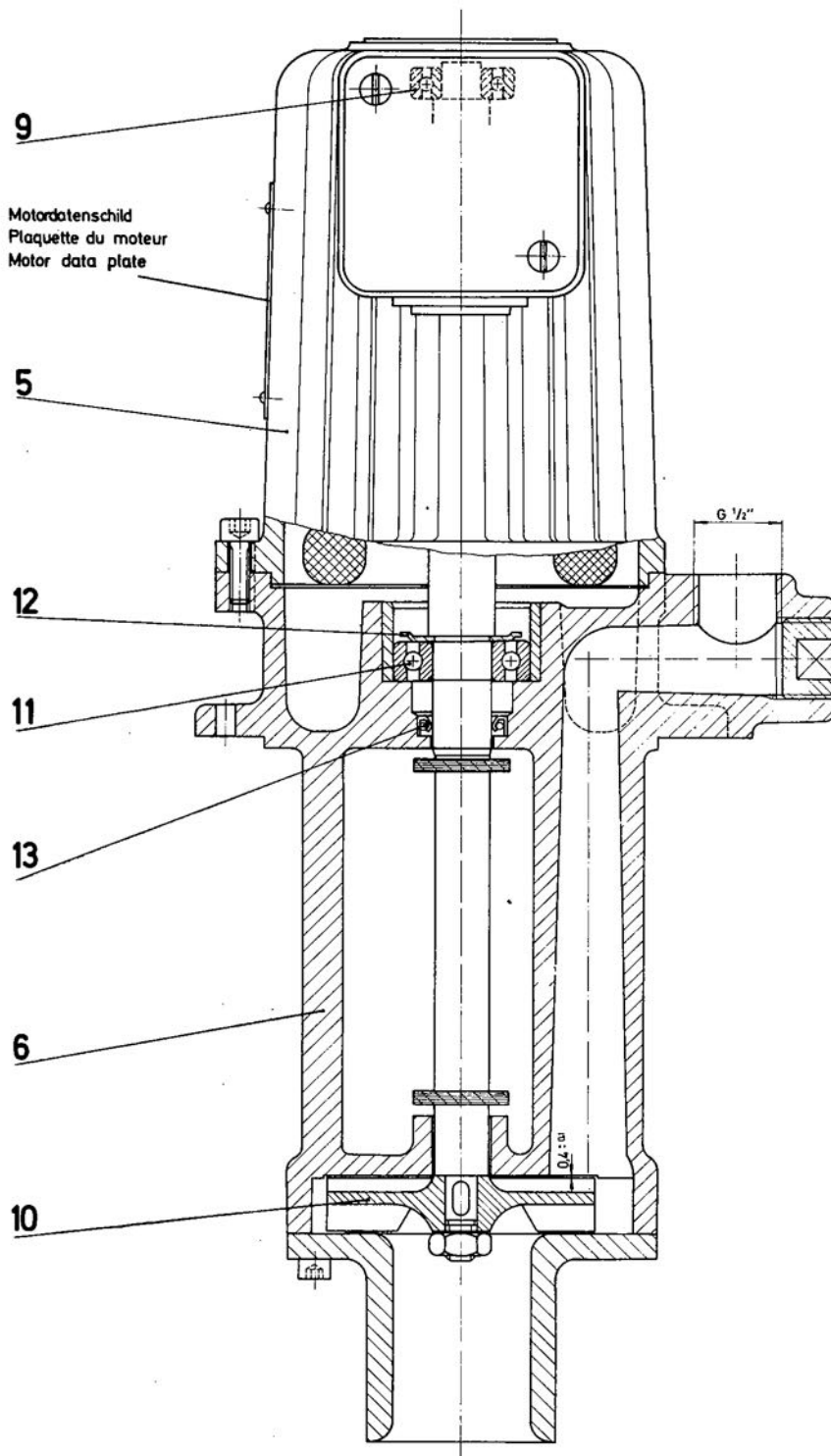
Le schéma ci-après permet sans autre de localiser les pannes pouvant se produire dans des moteurs à courant triphasé et les éliminer par le spécialiste sur la place même. Dans les cas douteux, on est prié de s'adresser à notre fabrique ou à notre représentation.

[illegible]



BETRIEBS- UND WARTUNGSVORSCHRIFT
INSTRUCTION DE SERVICE ET D'ENTRETIEN
OPERATING AND SERVICING INSTRUCTION

KMT 68-1-180



- 5 Motor
- 6 Pumpengehäuse
- 9 Kugellager $\varnothing 10/26 \times 8$
- 10 Laufrad
- 11 Kugellager $\varnothing 15/35 \times 11$
- 12 Deckscheibe
- 13 Wellendichtung $\varnothing 24/15 \times 7$

- 5 Moteur
- 6 Corps de pompe
- 9 Roulement à billes $\varnothing 10/26 \times 8$
- 10 Turbine (Roue)
- 11 Roulement à billes $\varnothing 15/35 \times 11$
- 12 Disque de protection
- 13 Joint de l'arbre $\varnothing 24/15 \times 7$

- 5 Motor
- 6 Pump casing
- 9 Ball bearing $\varnothing 10/26 \times 8$
- 10 Impeller
- 11 Ball bearing $\varnothing 15/35 \times 11$
- 12 Cover plate
- 13 Shaft seal $\varnothing 24/15 \times 7$

Drehrichtung rechts.

Sens de rotation à droite.

Direction of rotation: right

Wartung:

Der Unterhalt der Pumpe beschränkt sich bei normalen Betriebsbedingungen auf die periodische Wartung der Kugellager. Diese ist nach ca. 4500 Betriebsstunden notwendig. In der Regel werden nach dieser Zeit die Kugellager und einfachheitshalber auch die Wellendichtung ausgewechselt. Die Kugellager sind mit gutem Kugellagerfett zu schmieren. Dem Motor ist ein auf Nennstrom eingestellter Motorschutzschalter vorzuschalten.

Entretien:

Avec des conditions d'utilisation normales, l'entretien de cette pompe se limite à un contrôle périodique du palier lisse, soit après 4500 heures de fonctionnement environ. A cette occasion, on en profitera pour remplacer les paliers ainsi que le joint sur l'arbre. Les paliers lisses doivent être graissés avec une bonne graisse pour roulements à billes non acide. Un coffret de protection réglé pour intensité nominale doit être intercalé au moteur.

Attendance:

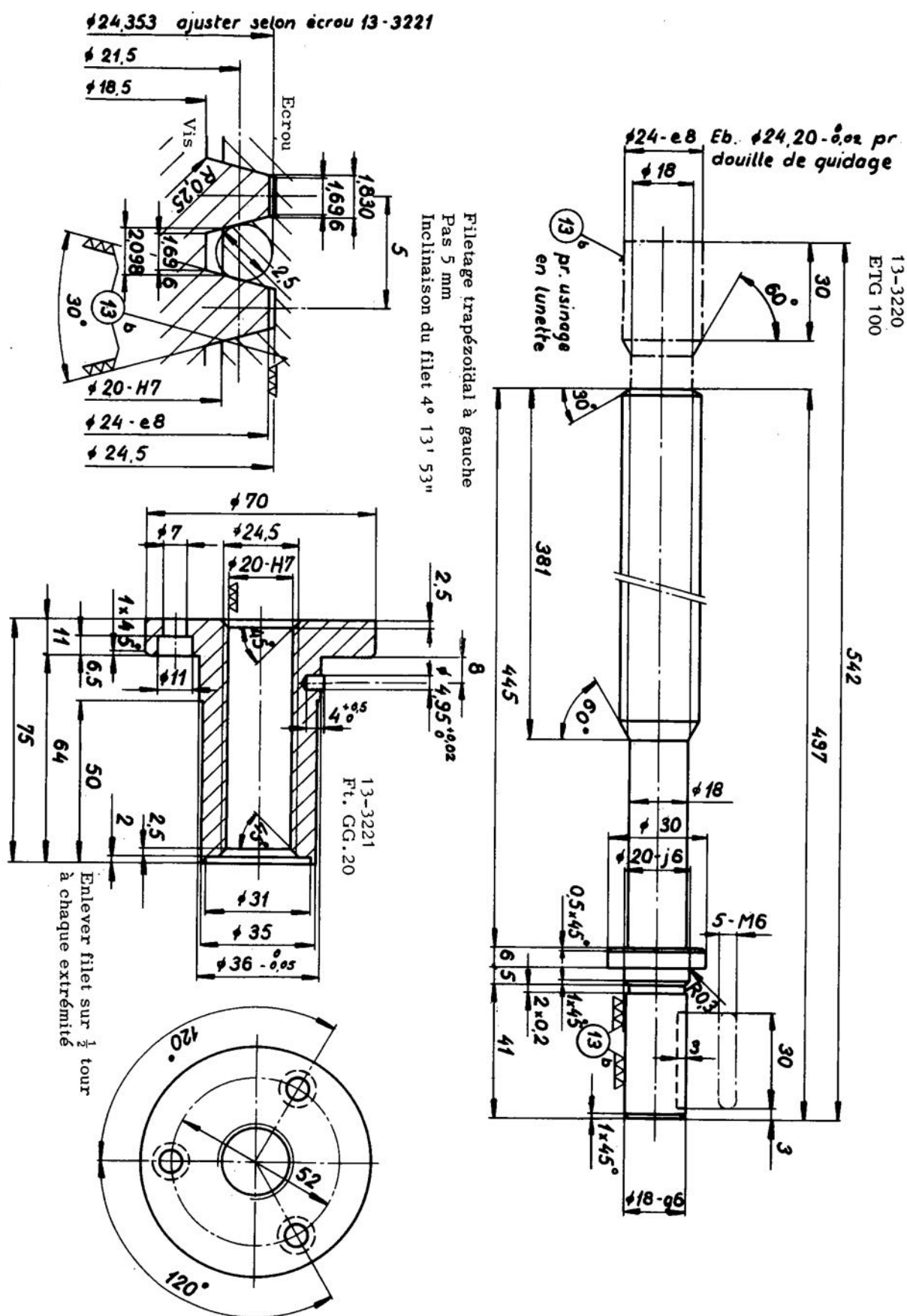
Under normal conditions, the maintenance required by the pump is confined to periodic attendance of the rolling bearings. This is necessary after about 4500 working hours. As a rule, after that time the rolling bearings are changed for new ones and, for simplicity, the shaft seal is also renewed. The rolling bearings have to be lubricated with good ball-bearing grease, free from acid. A motor safety switch, adjusted to the nominal current, has to be connected in series with the motor.

7. ACCESSOIRES

DESIGNATION	NUMERO D'ARTICLE	INSTRUCTIONS
Table universelle	13-5.300	
Table d'équerre fixe	13-5.421	
Tête verticale avec cone ISO 30 ou Morse 4	13-10.200	
Tête verticale avec cône ISO 40	13-10.270	
Tête verticale avec quill et cône ISO 30 ou Morse 4	13-10.400	
Tête verticale avec quill et cône ISO 40	13-10.470	
Plateau circulaire	13-10.800	
Tête rapide universelle	13-11.200	
Tête à mortaiser	13-12.100	
Etau parallèle	13-13.000	
Etau universel	13-13.050	
Poupée diviseur	13-16.230	
Commande automatique de la poupée diviseur universelle	13-16.650	
Diviseur universel	13-16.700	
Contre-poupée	13-16.750	
Microscope de centrage	13-1369/70	

A la suite figurent les instructions de tous les éléments de la liste ci-dessus marqués d'une *

VIS VERTICALE



VIS LONGITUDINALE

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