

# PLANOPOL

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1. DESCRIPTION

PLANOPOL is a machine for the production of plane specimen surfaces by means of mechanical lapping, grinding, and polishing. A turntable accommodates horizontally rotating, exchangeable polishing discs. A powerful two-speed motor drives the turntable (V-belt drive) which together with motor is mounted on a steel frame, forming the base of the machine. The table model is placed on the bench top on vibration-dampening rubber knobs attached to the steel frame. The machine cabinet is made of glass-fibre reinforced polyester, cast into one unit with built-in spill pan for catching water and polishing suspension from the disc. A built-in pipe connects the spill pan to a tube branch on the back of the machine. On the cabinet is mounted a valve (fig. 1.1) for regulating the admission of water, and an adjustable sprinkler pipe (fig. 1.2) is placed over the disc. The admission pipe (fig. 2.1) is carried through the back of the machine.

A loose protection ring (fig. 1.3) placed in the spill pan catches splashes and any 'stray' specimens from the rotating disc. A dust cover for the protection ring is supplied as accessory (CODE: PLAID). The narrower protection rings for DP-U2 (CODES: DEPRI and ROTIN) also fit PLANOPOL.

A perforated bottom guard (fig. 3.1) is mounted under the machine as a protection against unintentional contact with transmission and electrical parts.

As standard model PLANOPOL is supplied for single-phase or three-phase operation and with rotational speeds of the disc of 150 and 300 rpm. A conversion kit is available, enabling alteration of the rotational speeds to 75/150, 300/600, or 600/1200 rpm. PLANOPOL may be used with lapping, grinding, and polishing discs of diameters 200, 230, 250, and 300 mm.

Apart from the table model, PLANOPOL is available as a special built-in model (see fig. 4). The interior of this model is identical with that of the table model, but it differs from it externally in that it is provided with a special plastics spill pan (fig. 4.1), allowing the machine to be built into a laboratory bench with the top of the machine flush with the bench top. Also it has a special bottom guard (fig. 4.2).

PdM-FORCE specimen holder may be mounted on both single-phase and three-phase PLANOPOL, PEDEMAX specimen holder only on the three-phase model. Clamping devices for specimen holders are located under the caps (fig. 1.4) on the cabinet top. The clamping screws of these devices are operated through the holes (fig. 1.5) in the sides of the cabinet, and the screws for adjusting the height of the machine (fig. 3.2) are operated through holes in the bottom guard.

The operation of PEDEMAX is equally convenient whether this specimen holder is mounted on the table model or on the built-in model, but PdM-FORCE is operated more conveniently on the table model, as this provides easier access for exchange and cleaning of the specimen holder discs.

### 1.1 Technical Data

Power Supply, 3-phase model:	3 x 220 V - 50 Hz
	3 x 220 V - 60 Hz
	3 x 380 V - 50 Hz
	3 x 310 V - 60 Hz
	3 x 415 V - 50 Hz
	3 x 500 V - 50 Hz
Power Supply, 1-phase model:	1 x 110 V - 50 Hz
	1 x 115 V - 60 Hz
	1 x 220 V - 50 Hz
	1 x 220 V - 60 Hz
Motor Output, 3-phase model 50 Hz:	0.75/0.40 HP
Motor Output, 3-phase model 60 Hz:	0.90/0.50 HP
Motor Output, 1-phase model :	0.35/0.20 HP
Dimensions, Table Model :	Width 450 mm
	Depth 690 mm
	Height 335 mm
	Weight 43 kg
Dimensions, Built-in Model :	Width 453 mm
	Depth 644 mm
	Height 350 mm
	Weight 43 kg

## 2. INSTALLATION

### 2.1 Packing Case Contents

#### 2.1.1 Table Model

- 1 PLANOPOL, Table Model
- 1 Protection Ring (fig. 1.3)
- 1 Sprinkler Pipe (fig. 1.2)
- 1 PVC Outlet Pipe 3/4" x 3 mm x 2000 mm
- 1 Unbrako Key (NV4) for specimen holder
- 1 Unbrako Key (NV6) for turntable
- 1 Key (NV13) for dismounting the machine from packing case bottom and for adjustment of screw on clamping device for specimen holder

### 2.1.2 Built-in Model

- 1 PLANOPOL, built-in model with mountings
- 1 Spill Pan (fig. 4.1)
- 1 Tube of Contact Glue
- 1 Protection Ring (fig. 4.3)
- 1 Sprinkler Pipe (fig. 4.4)
- 1 Front Plate with Washer and Sealing Ring
- 1 PVC Outlet Pipe 3/4" x 3 mm x 2000 mm
- 1 Unbrako Key (NV4) for specimen holder
- 1 Unbrako Key (NV6) for turntable
- 1 Key (NV13) for dismantling the machine from packing case bottom and for adjustment of screw on base for specimen holder.

## 2.2 Assembly

### 2.2.1 Table Model

First of all, make sure that the local mains voltage corresponds to the voltage indicated on the type plate (fig. 2.3) at the back of the machine.

Detach the machine from the case bottom by unscrewing the 4 fastening bolts in the corners, and place it on the table. If the machine is to work with water, it should not be placed farther away than 1.5 m from water supply and drain.

### 2.2.2 Built-in Model

The built-in model may be mounted in a laboratory bench of suitable height for working (about 850 mm), min. width under the bench 678 mm (see fig. 5), and a solid table top of thickness 20 - 30 mm.

Several PLANOPOLs may be mounted in a row with the spill pans joining. For operational reasons, however, it is recommended to place the machines somewhat farther apart.

Make a cutout in the table top, and drill 4 holes, according to fig. 5, observing the minimum distance to front and bottom edges of the table. Fit the base frame of the machine with motor, ect., by means of the four mountings (fig. 12.51) and fasten it with 4 screws through the holes in the table top. Adjust the frame in the mountings in such a way that a polishing disc placed on the turntable will be parallel with and 2 mm above the table top. Dismount the turntable (fig.12.52) by removing the 3 screws. Mount the switch according to fig. 6. Mount the tap. Glue the spill pan to the table top with contact glue, making sure that its holes centre with the components of the machine. Finally, fix turntable and bottom guard.

### 2.3 Mains Connection

Mount a plug on the electric cable in the following way:

3-phase model : yellow/green core to earth  
brown core to phase  
~~blue~~ *black* core to phase  
black core to phase

The correct direction of rotation is anti-clockwise. If, after connection, the turntable runs clockwise, reverse the direction by interchanging two of the phase cores in the plug.

1-phase model : yellow/green core to earth  
brown core to phase  
~~blue~~ *blue* core to neutral

### 2.4 Water Supply

For water supply PLANOPOL may be connected either to the mains or to a recirculating unit. For connection to the tap water the admission hose (fig. 2.1) may be screwed directly onto a tap or nozzle provided with a  $\frac{1}{2}$ " pipe thread (BS 2779: G  $\frac{1}{2}$ ). The hose is dimensioned for permanent water pressure, but it is recommended to turn off the water at the water mains when the PLANOPOL is not running. For connection to recirculating unit, remove the pipe union from the free end of the admission hose, and connect the hose to the pump by means of a hose coupling. Finally, insert the sprinkler pipe (fig. 1.2) in the nozzle on top of the tap on the machine (fig. 1.1)

### 2.5 Water Outlet

#### 2.5.1 Table Model

The tube branch on the outlet pipe (fig. 2.2) may be turned in the direction wanted. Before changing the position of the branch, place the machine on one side and remove the bottom guard (fig. 3.1) (4 screws). With a screwdriver reach behind the motor bridge (fig. 3.3) and loosen one of the hose clips (fig. 3.4) holding the outlet pipe, turn the pipe in the desired direction, and fasten it again with the hose clip. The whole length of the outlet hose must have a slope, in order to prevent water from spilling over from the spill pan of the machine.

#### 2.5.2 Built-in Model

Carry the outlet hose through the bottom guard in such a way that there is a slope throughout its length and into the laboratory drain.

## 2.6 Conversion to Different Speeds

As mentioned above, the standard design of the machine is supplied with the rotational speeds 150 and 300 rpm, but may be converted to have the speeds 75/150, 300/600, and 600/1200 rpm. Modifications are carried out by mounting of a conversion kit (CODE: PLATT), enabling alteration of the speeds of the machine to any of the speeds mentioned.

### 2.6.1 Contents of Packing Case, Conversion Kit

- 1 V-belt pulley with 2 grooves, self-lubricating bronze bearing, tight-fitting bolt, washer, and adjusting plate.
- 1 V-belt S (Z) 19, 10 x 494 mm
- 1 V-belt S (Z) 46, 10 x 1180 mm
- 1 Unbrako key (NV8) for tight-fitting bolt
- 1 Unbrako key (NV2.5) for V-belt pulley
- 3 Plates for front plate, marked 0/75/150, 0/300/600, and 0/600/1200

### 2.6.2 Mounting of Conversion Kit

The rotational speed is changed by changing the gear ratio between motor and turntable. The motor V-belt pulley (fig. 3.5) has two tracks of different diameter. In the standard model (150/300) the belt runs directly between the track of smaller diameter and the pulley of the turntable. But if the V-belt pulley is reversed, so that the motor is driven from the track of larger diameter, the turntable will rotate at double speed. Like the motor V-belt pulley, the V-belt pulley of the conversion kit (fig. 3.6) has two tracks of different diameters. By inserting this V-belt pulley as an intermediate wheel it is possible to obtain a speed which is either double or half that of the original speeds, dependent on which of the diameters of the intermediate wheel and the motor V-belt pulley is used.

The various combinations possible are shown in fig. 7, which also indicates the V-belts to be used. Notice that the V-belt pulleys are mounted in such a way that the two tracks between which the belt runs are on a level.

Change of gear ratio is performed in the following way:

Dismount the bottom guard (fig. 3.1) (4 screws), disengage the motor bridge (fig. 3.3) (4 screws), and remove the belt from the pulley. Exchange of the long belt (300/600 and 600/1200 models) involves removal of the turntable from the bearing. This is done after removing 3 screws (NV6) from the top of the turntable.

The V-belt pulley on the motor shaft is fastened by two pointed screws located in the track <sup>but</sup> ~~surface~~ of the V-belt tracks. These pointed screws bear against the key in the motor shaft. Before reversing the V-belt pulley (75/150 and 300/600 models), these screws are unscrewed and the pulley drawn off.

The intermediate pulley may be installed without disassembling the machine any further. The mounting procedure appears from fig. 8. Insert the adjusting plate (fig. 8.1) behind the motor bridge, the plane side facing the motor flange. Pass the tight-fitting bolt (fig. 8.2) through the V-belt pulley (fig. 8.3) and the base plate (fig. 8.4), and then through the hole in the motor bridge. Screw it loosely into the nut of the adjusting plate. Lay the belts around the pulleys, and adjust the short belt first by turning the adjustment plate in such a way that, by pressing against the motor, it lodges the bearing for adequate belt tension. Then tighten the tight-fitting bolt with the key (NV6). Next, tighten the long belt by forcing the motor plate backwards and tightening the 4 screws securing the motor bridge. It is important that the belt tension should be adequate, as a too low belt tension will cause the belt to skid on the pulley, thus decreasing the tractive power of the motor, and a too high tension will set the machine droning. The belt tension is correct when application of a force of 0.5 kp to the middle of the long belt causes a deflection of 6 mm, and application of the same force to the middle of the short belt causes a deflection of 2.5 mm.

After removing the switch knob and 2 screws, the plate indicating the appropriate rotational speed is mounted. Finally, mount the bottom guard.

### 3. DIRECTIONS FOR USE

The different PLANOPOL models have the following applications:

PLANOPOL 75/150 is at 75 rpm used for lapping on cast iron disc and polishing on PETRODISC or PELLON cloths. At 150 rpm it is used for diamond polishing or alumina polishing of mineralogical specimens.

This model is particularly well suited for mineralogical specimen preparation. A particularly useful accessory for lapping and polishing is the specimen holder PdM-FORCE, which may be used with both single- and three-phase models. The single-phase model will be found sufficiently powerful for all normal purposes. In hand polishing use discs of diameters 200 and 300 mm, and in automatic preparation use 300 mm dia. discs.

PLANOPOL 150/300 the standard model, is used for metallographic wet grinding and diamond polishing, 150 rpm being used most advantageously for diamond polishing, 300 rpm for wet grinding.



Of the two specimen holders supplied as accessories for automatic preparation PdM-FORCE is used for polishing and PEDEMAX for both grinding and polishing. For hand polishing as well as for automatic polishing with PdM-FORCE the single-phase model has sufficient power, but use of PEDEMAX demands use of the three-phase model, because of the risk of overloading the single-phase motor.

For hand grinding it is possible to use either pregrinding discs for paper fixation according to the KNUTH-ROTOR principle (see below), or discs for self-adhesive grinding paper of diameters 230 or 300 mm. For hand polishing, use polishing discs of diameters 200, 250, or 300 mm. Automatic polishing with PdM-FORCE is performed on 300 mm disc. Automatic grinding with PEDEMAX allows the use of a grinding wheel (CODE: <sup>PWARI</sup>PLABU), which is kept plane and sharp by means of the diamond trueing-up unit (CODE: PLACC). For pregrinding on grinding paper of specimens clamped in 160 mm specimen holder discs, 300 mm dia. disc with paper fixation according to the KNUTH-ROTOR-principle or plane discs for 230 mm dia. self-adhesive grinding paper may be used. For polishing with this specimen holder disc are used 250 mm dia. or 300 mm dia. plane discs for self-adhesive polishing cloths. For grinding and polishing with 200 mm dia. specimen holder discs a 300 mm dia. plane disc is normally preferred. For automatic grinding and polishing with PEDEMAX we recommend aluminium polishing discs because of their ability to retain planeness. For hand grinding and hand polishing, as well as for automatic polishing with PdM-FORCE, either PVC or aluminium discs may be used.

Fixing of grinding paper according to the KNUTH-ROTOR principle is performed as follows:

Before starting the KNUTH-ROTOR disc, pour water onto the disc, then place grinding paper on the disc, and finally put the loose ring on the disc. Now let the discs rotate for a moment, at the same time gently pressing the entire surface of the grinding paper against the disc, for instance with a specimen.

PLANOPOL 300/600 is a special model, intended for wet grinding and alumina polishing. PdM-FORCE cannot be used at these high speeds, but PEDEMAX may be used with the three-phase version of PLANOPOL 300/600. There is the same choice of discs sizes as mentioned under PLANOPOL 150/300. For hand grinding and hand polishing we recommend use of the protection ring (CODE: DEPRI) for 300 mm dia. and 250 mm dia. discs, and the protection ring (CODE: ROTIN) for 200 mm dia. discs.

PLANOPOL 600/1200 is a special model for hand polishing with alumina at extra high speed. Disc sizes as mentioned under PLANOPOL 150/300 and protection rings as mentioned under PLANOPOL 300/600.

For details about modification from one of the models to another, see chapt. 2.6.

#### 4. MAINTENANCE, PRECAUTIONS

##### 4.1 Maintenance

The spill pan should be cleaned at regular intervals, thus ensuring free discharge of water.

The V-belt (V-belts) should be tightened once a year. See instructions, chapt. 2.6.2

The turntable runs on greased ball bearings, which need no further lubrication.

##### 4.2 Precautions

With normal use and operation according to the directions no risk is involved in the use of PLANOPOL.

Always make sure before use that all parts are firmly mounted as laid down in the instructions. It is particularly important at high speeds that the polishing disc should be in firm mesh with the turntable. Furthermore, when hand polishing at high speeds, keep a firm grip on the specimen, otherwise it may be hurled off the disc.

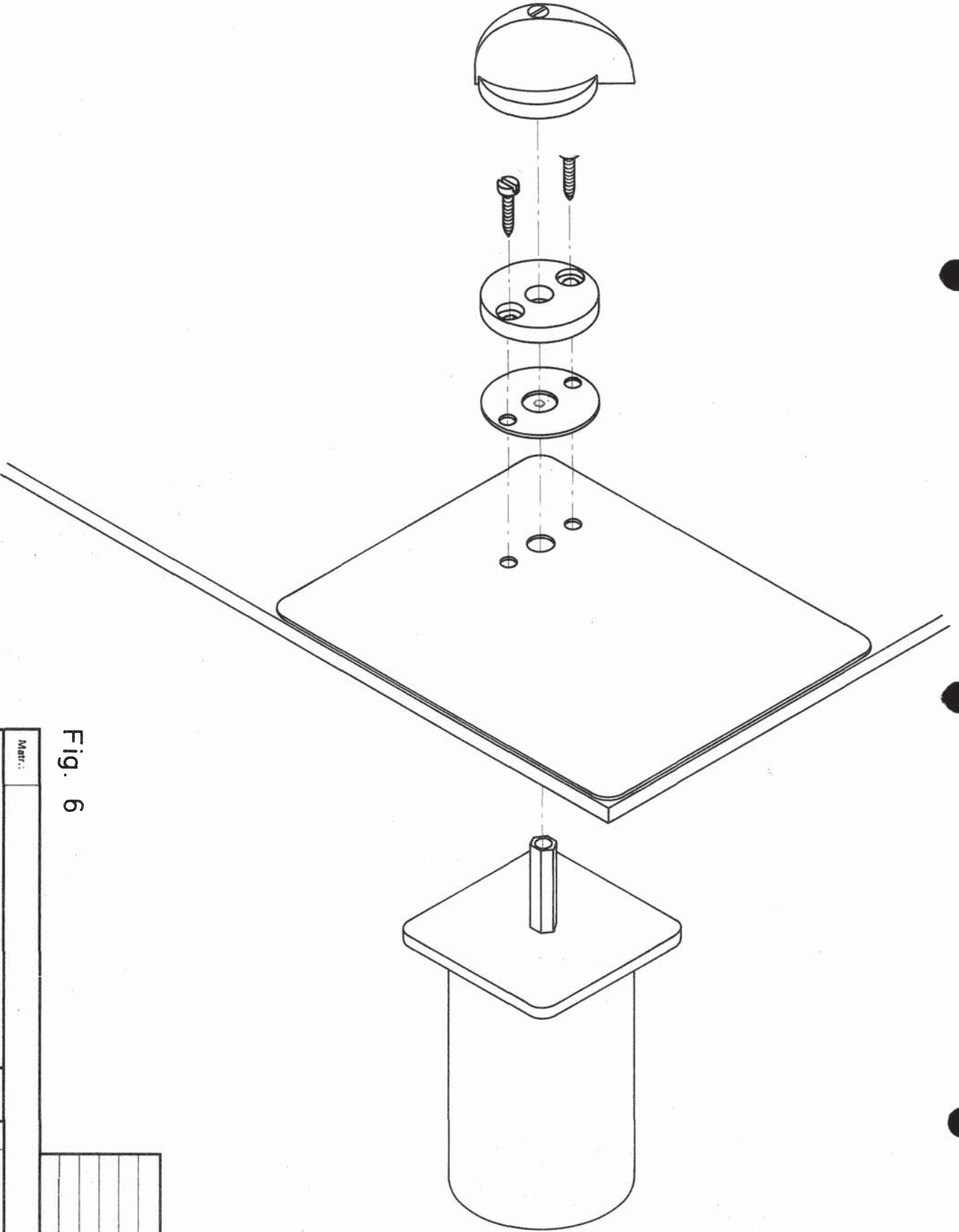


Fig. 6

Mater.:		Målestok	
<b>STRUERS</b>		1 : 1	Topn. PE/FL
KØBENHAVN		Date 18/3 - 75	
ÅARRHUS			
ODENSE			
MOUNTING OF SWITCH		266 - M - 122	

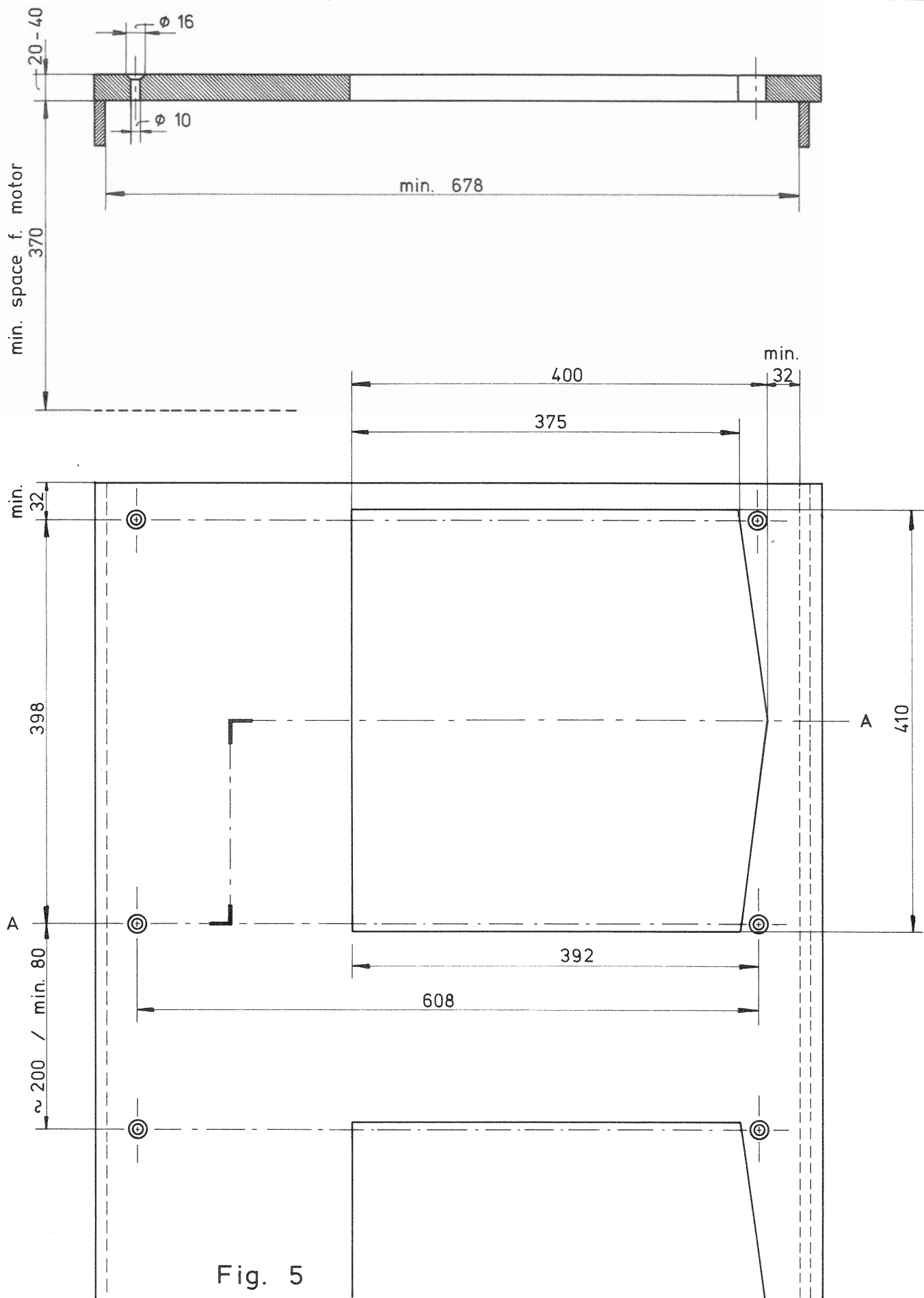


Fig. 5

Matr.:

**STRUERS**

KØBENHAVN  
AARHUS ODENSE

Målestok

Tegn.

PE / MG

Dato

20/5 - 74

PLANOPOL Building-in Model  
Cutout of tabletop

266 - M - 120

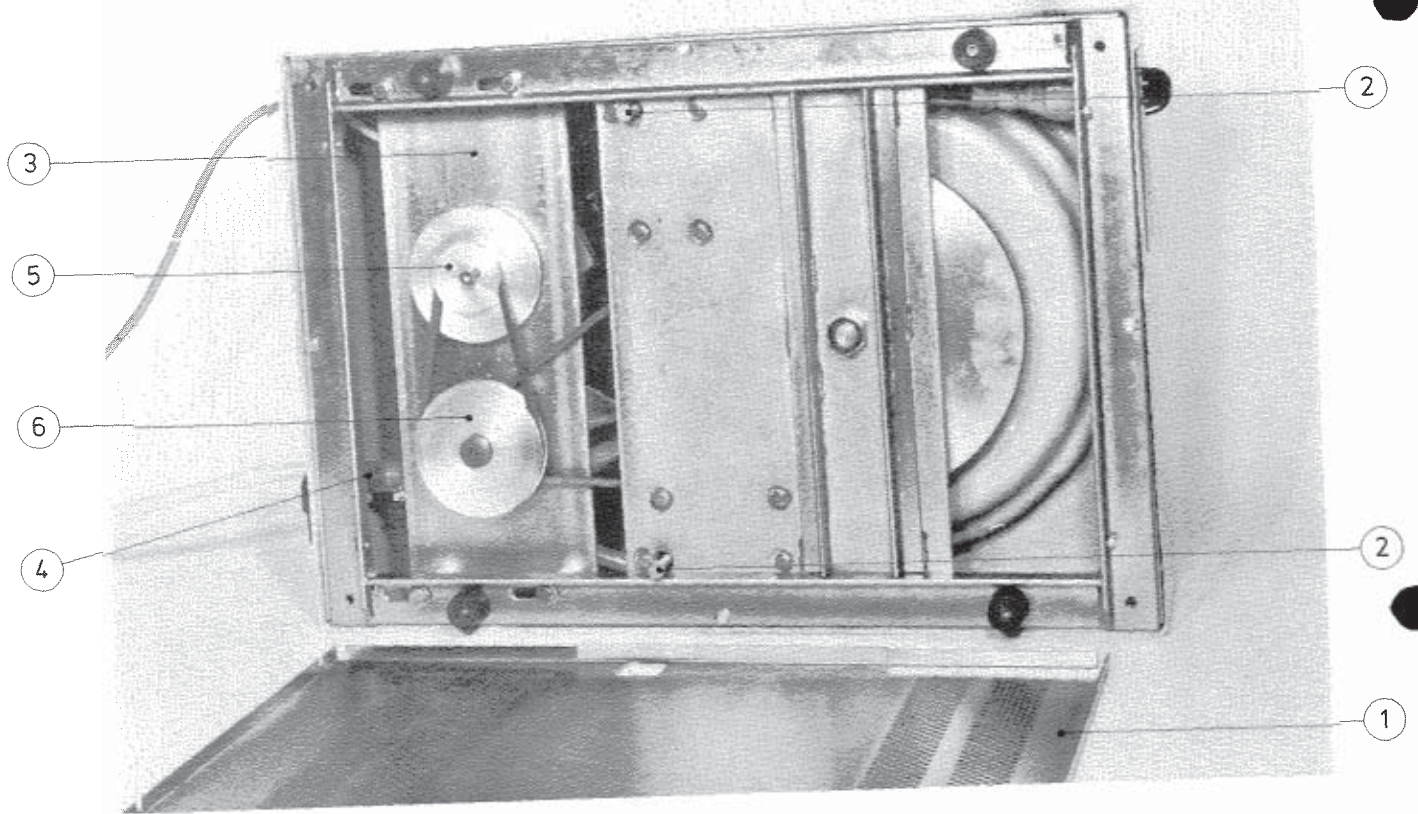


Fig. 3

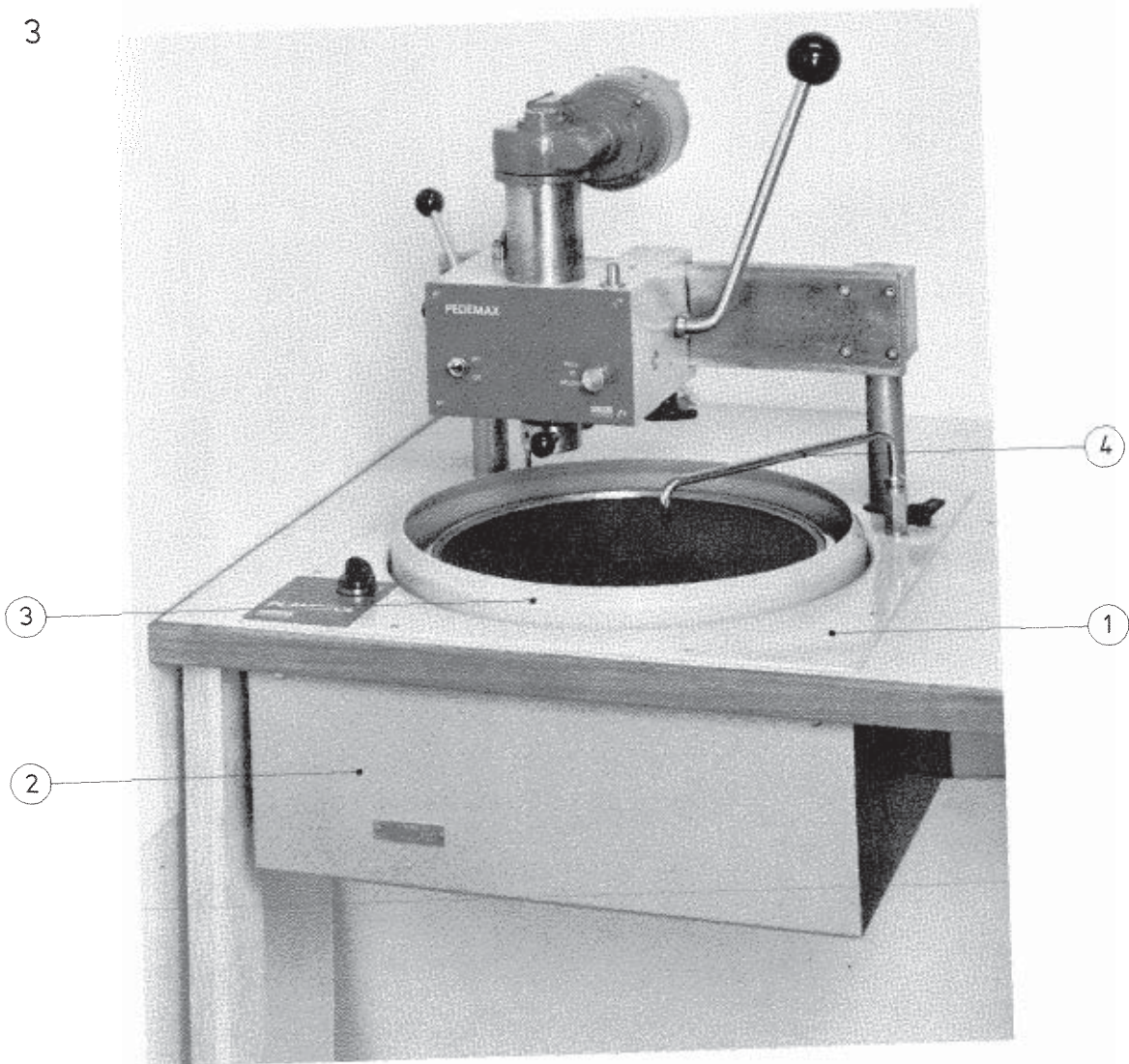


Fig. 4

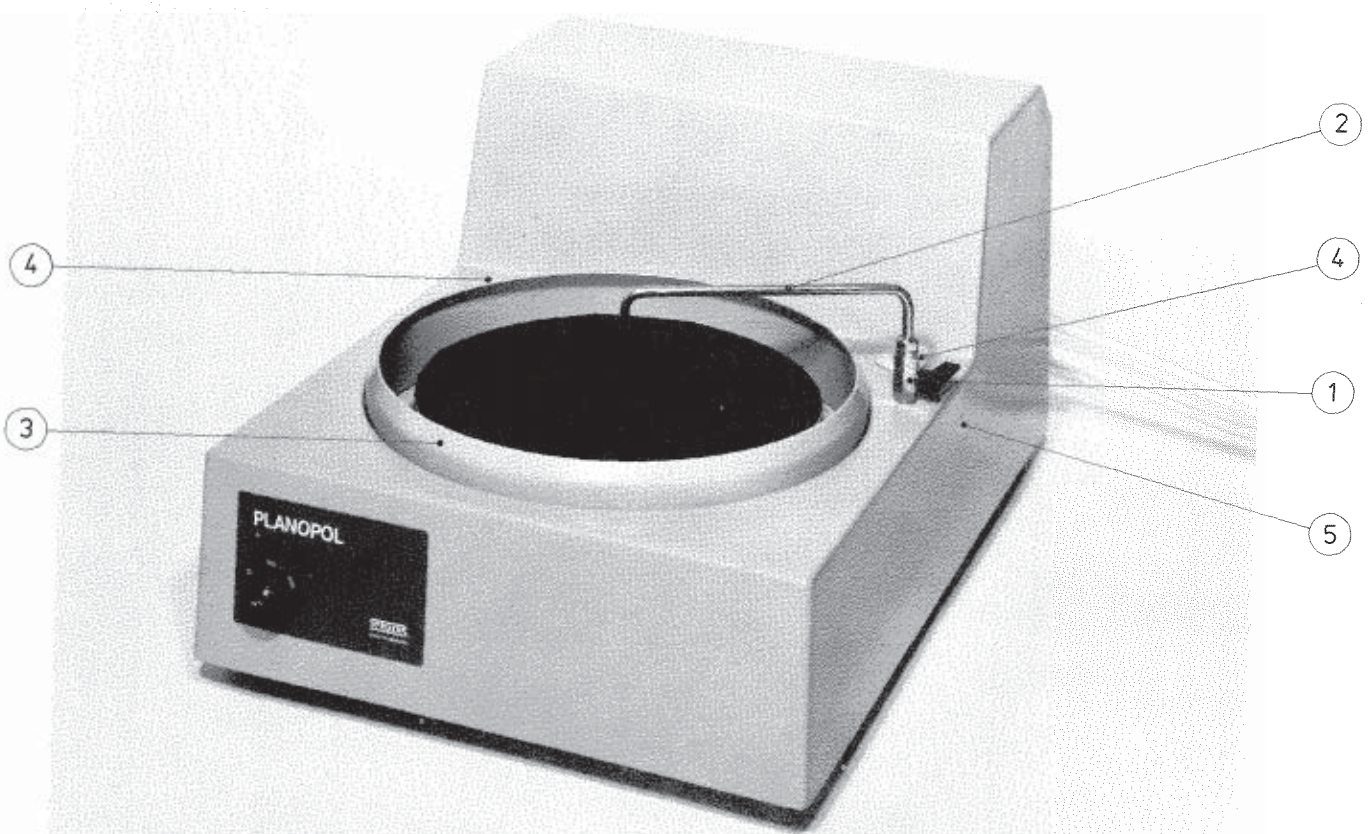


Fig. 1

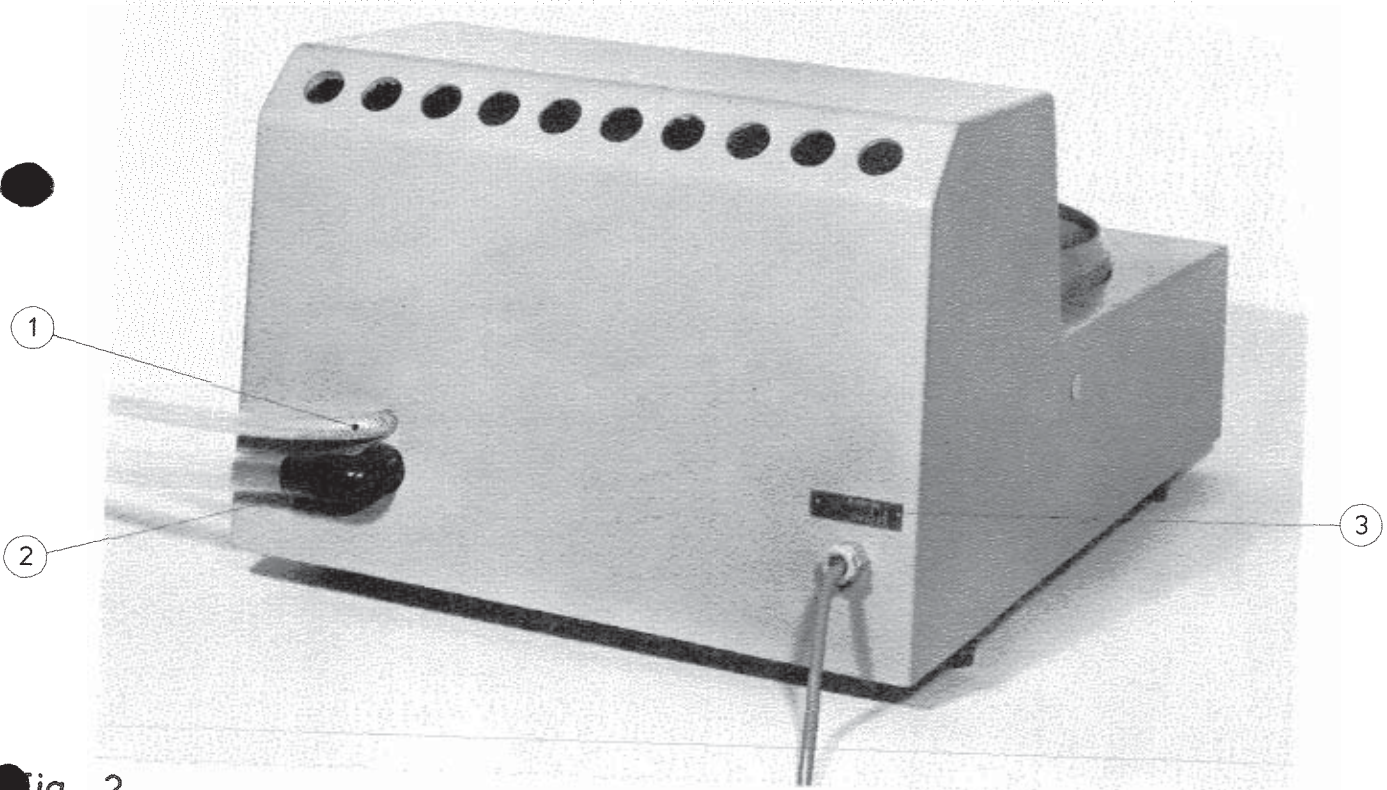


Fig. 2

5.3 Parts for Table Model

<u>Fig. and Pos. No.</u>	<u>Description</u>	<u>Spare Part No.</u>
11.38	Cabinet with Front Plate and Outlet Pipe	266 MP 38
11.39	Rubber Knob with Screw	266 MP 39
11.40	Outlet Branch with Hose Clip	266 MP 40
11.41	Cover Plug	266 MP 41

5.4 Parts for Built-in Model

<u>Fig. and Pos. No.</u>	<u>Description</u>	<u>Spare Part No.</u>
12.42	Spill Pan	266 MP 42
12.43	Front Plate with gasket and sealing ring for switch	266 MP 43

5. LIST OF SPARE PARTS

5.1 Parts Identical for Table Model and Built-in Model

Fig. and Pos. No.	Description	Spare Part No.
11.1 12.1	Sprinkler Pipe	266 MP 1
11.2 12.2	Tap with Coupling	266 MP 2
	O-ring for Tap $\emptyset$ 7.6 x 2.4 mm	266 MP 3
11.4	Admission Hose $\emptyset$ 8 x 3 x 2000 mm with unions	266 MP 4
	Tap complete with Hose and Sprinkler Pipe	266 MP 5
	Outlet Hose 3/4" x 3 x 2000 mm	266 MP 6
11.7 12.7	Protection Ring	266 MP 7
11.8	Clamping Device for Specimen Holder, complete	266 MP 8
11.9 12.9	Cover Plug, big	266 MP 9
11.10	Cable lead-throug	266 MP 10
11.19 12.19	Ball Bearing for Turntable, 6205-2Z	311 MP 19
11.21 12.21	Spring Clip f.axle U 25 x 1.2 mm	266 MP 21
11.22 12.22	Pressure Ring 41.6 x 25.2 mm	266 MP 22
11.23 12.23	Switch	266 MP 23
11.24 12.24	Motor (please state voltage, frequency, and number of phases)	266 MP 24
	Capacitor (please state voltage, frequency, and number of phases)	266 MP 25
11.26 12.26	V-belt Pulley for Motor, complete	266 MP 26
11.27 12.27	Key for Motor V-belt Pulley	266 MP 27
11.29 12.29	V-belt S (Z)44, 10 x 1129 (effective)	266 MP 29

5.2 Parts for Conversion Kit

Fig. and Pos. No.	Description	Spare Part No.
	Intermediate Pulley, complete with bronze bearing, tight-fitting bolt, washer, and adjusting plate	266 MP 30
	Intermediate Pulley	266 MP 31
	Bronze Bearing and Tight-fitting Bolt for Intermediate pulley	266 MP 32
	V-belt S (Z)M <sub>1</sub> 10 x 494 (effective)	266 MP 33
	V-belt S (Z) 46, 10 x 1180 (effective)	266 MP 34
	Plate for Front Plate 0/75/150	266 MP 35
	Plate for Front Plate 0/300/600	266 MP 36
	Plate for Front Plate 0/600/1200	266 MP 37



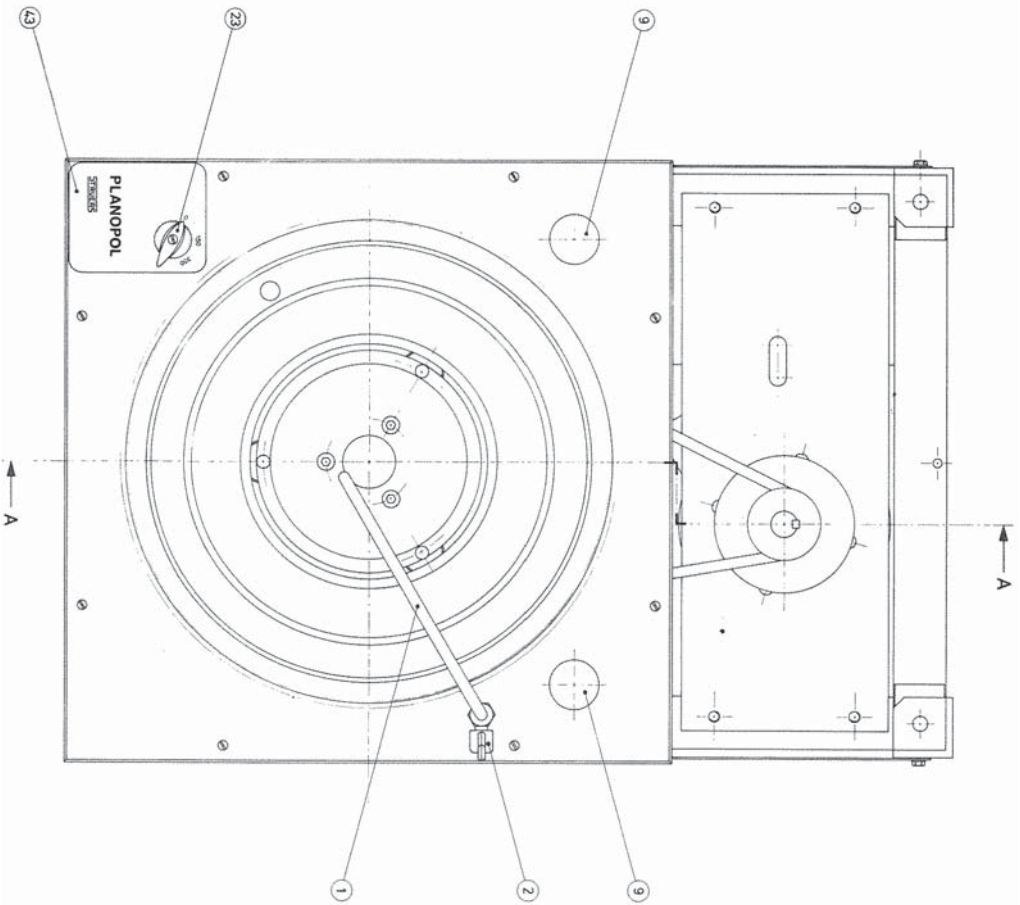
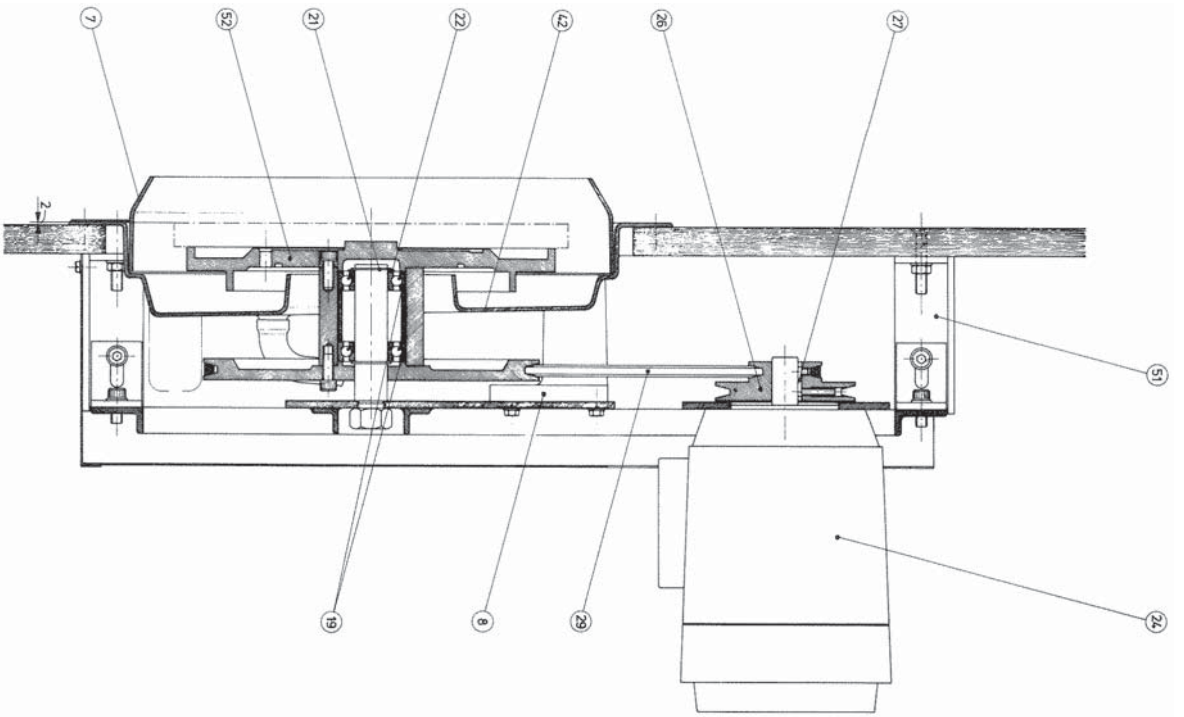


Fig. 12

Scale	1:2	Date	28/7/75
Author	STRUIERS		
Checker	KORNBANK		
Project	PLANOPOL, BUILT-IN MODEL		
Part No.	266 - M - 101		

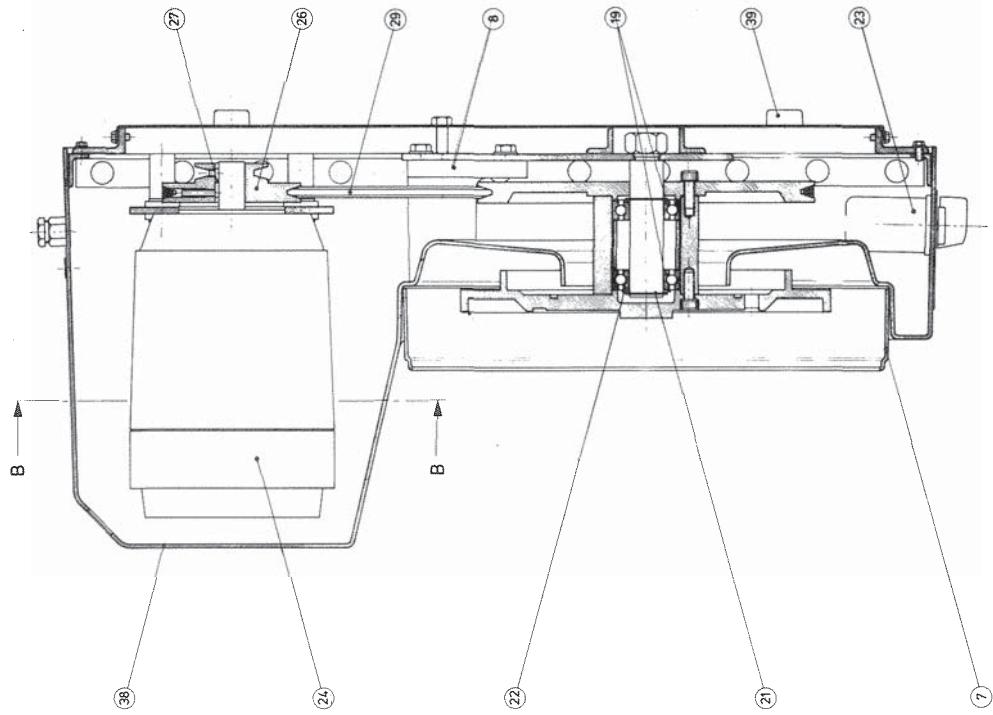
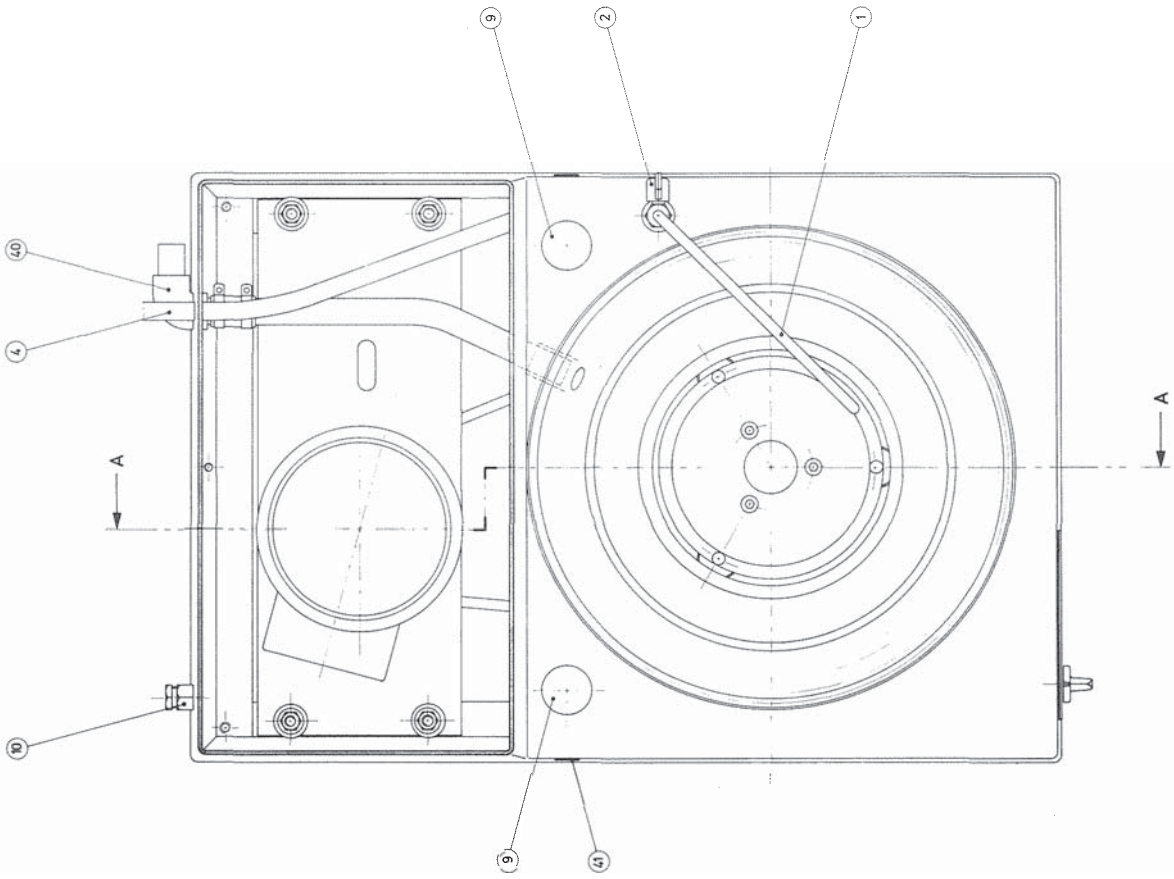


Fig. 11

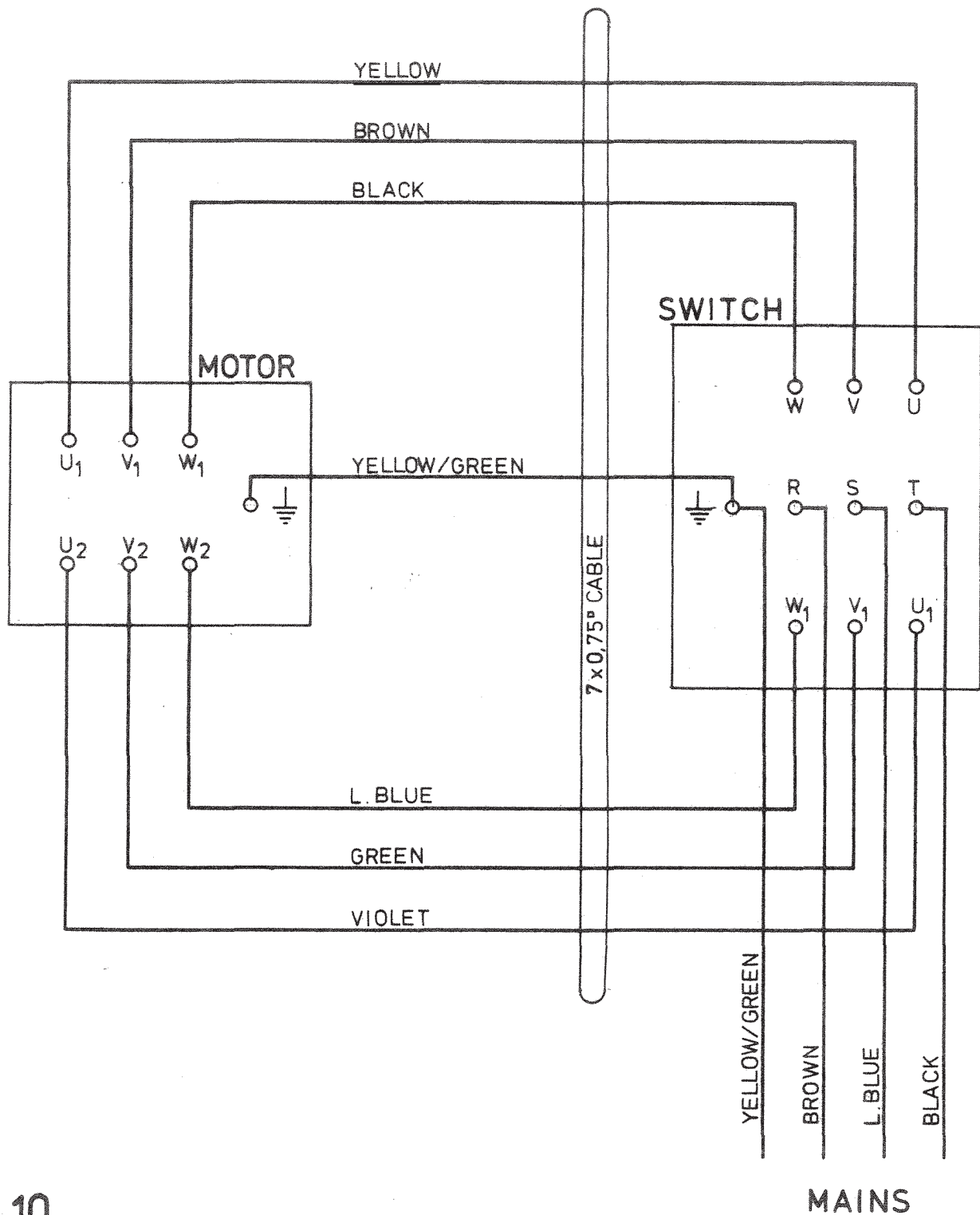


Fig. 10

MAINS

	Matr.:		Målestok:	Tegn. J.K./F.
				Dato 15. 1. 76
	<b>STRUERS K/S</b>		Erstatter:	
	CIRCUIT DIAGRAM THREE-PHASE T-T MOTOR.		<b>266-M-81</b>	

**CAPACITOR:**

- 220V, 50Hz 25 $\mu$ F
- 220V, 60Hz 25 $\mu$ F
- 110V, 50Hz 100 $\mu$ F (4 x 25)
- 115V, 60Hz 100 $\mu$ F (4 x 25)

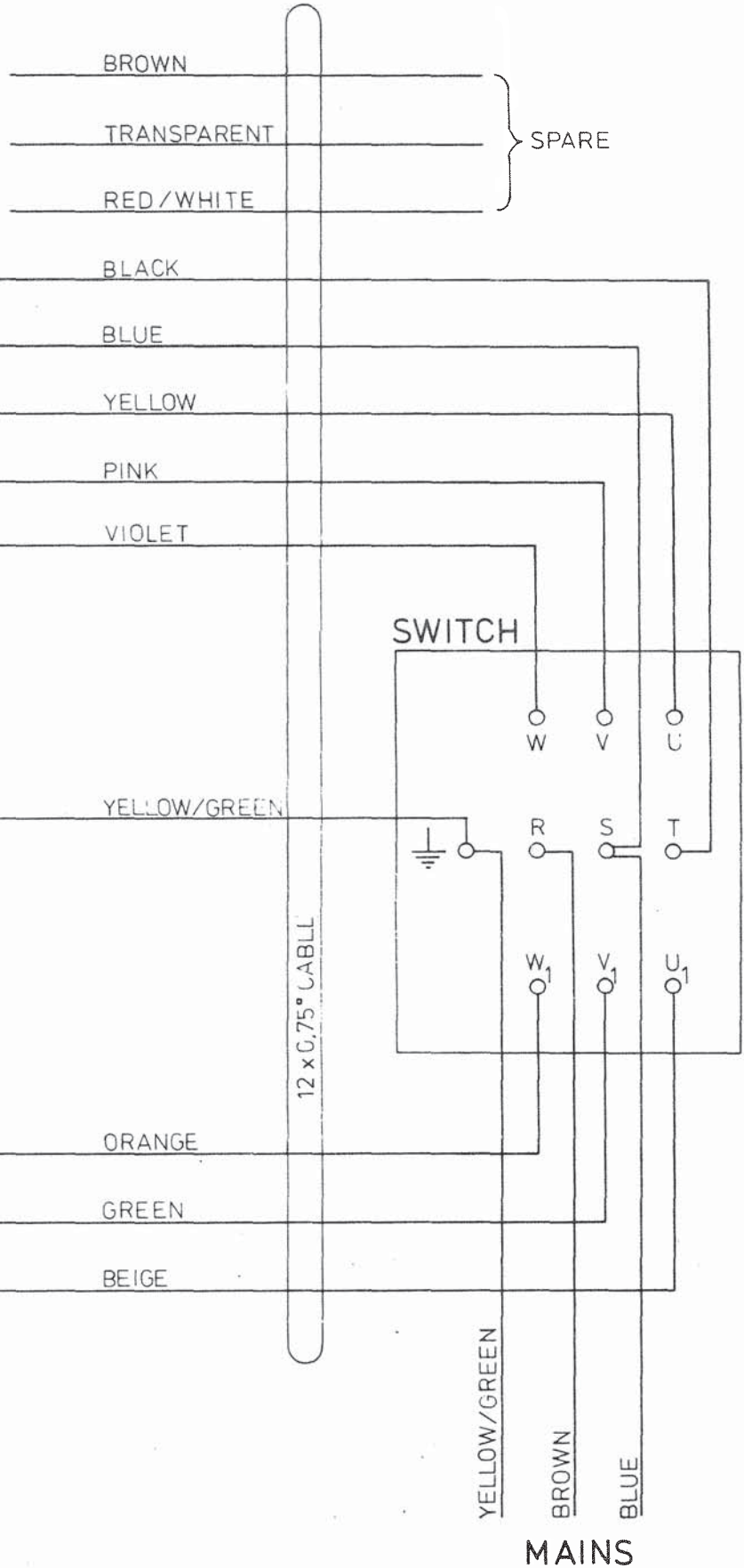


Fig. 9

Capacitor uardner oendret  
22. 1. 76 J. K.

Matr.

**STRUERS K/S**

Målestok: Tegn. J. K. / v. H.  
Dato 25. 9. 75

CIRCUIT DIAGRAM.  
SINGLE-PHASE T-T-MOTOR.

Erstatter:  
**266 - M - 69**

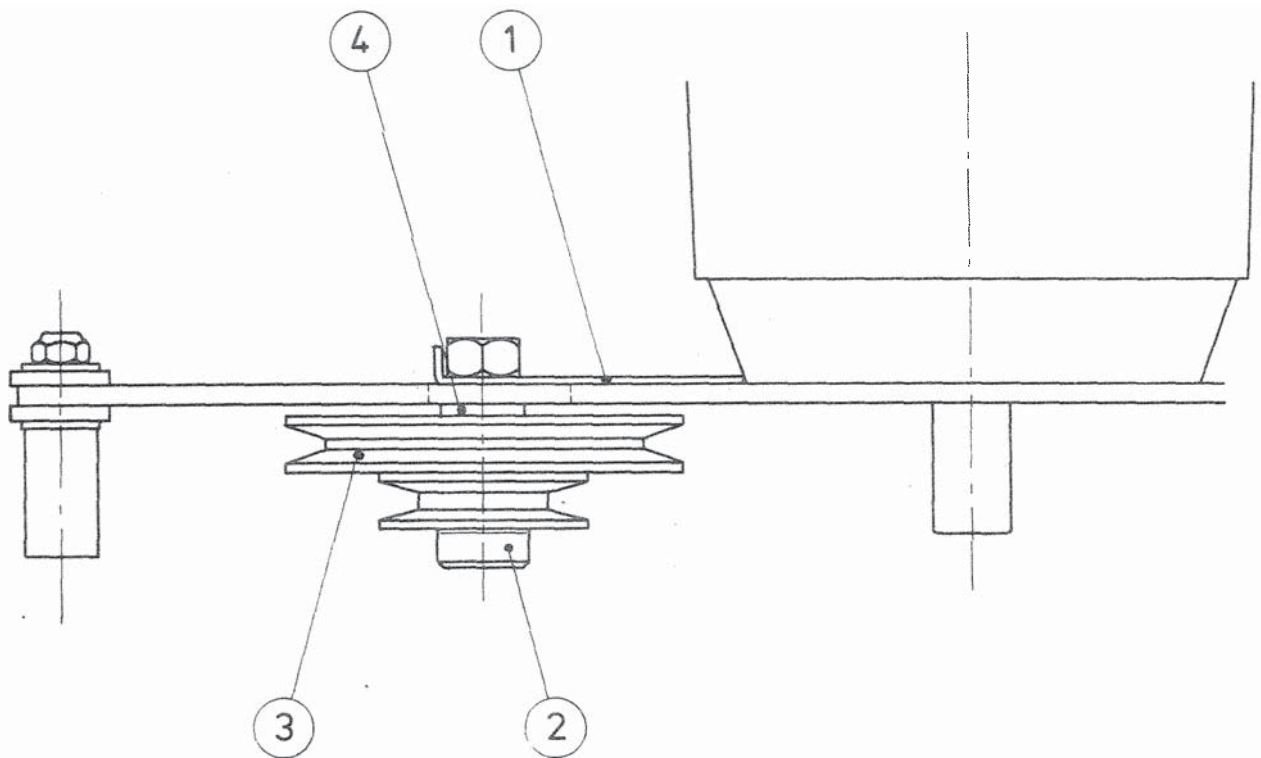
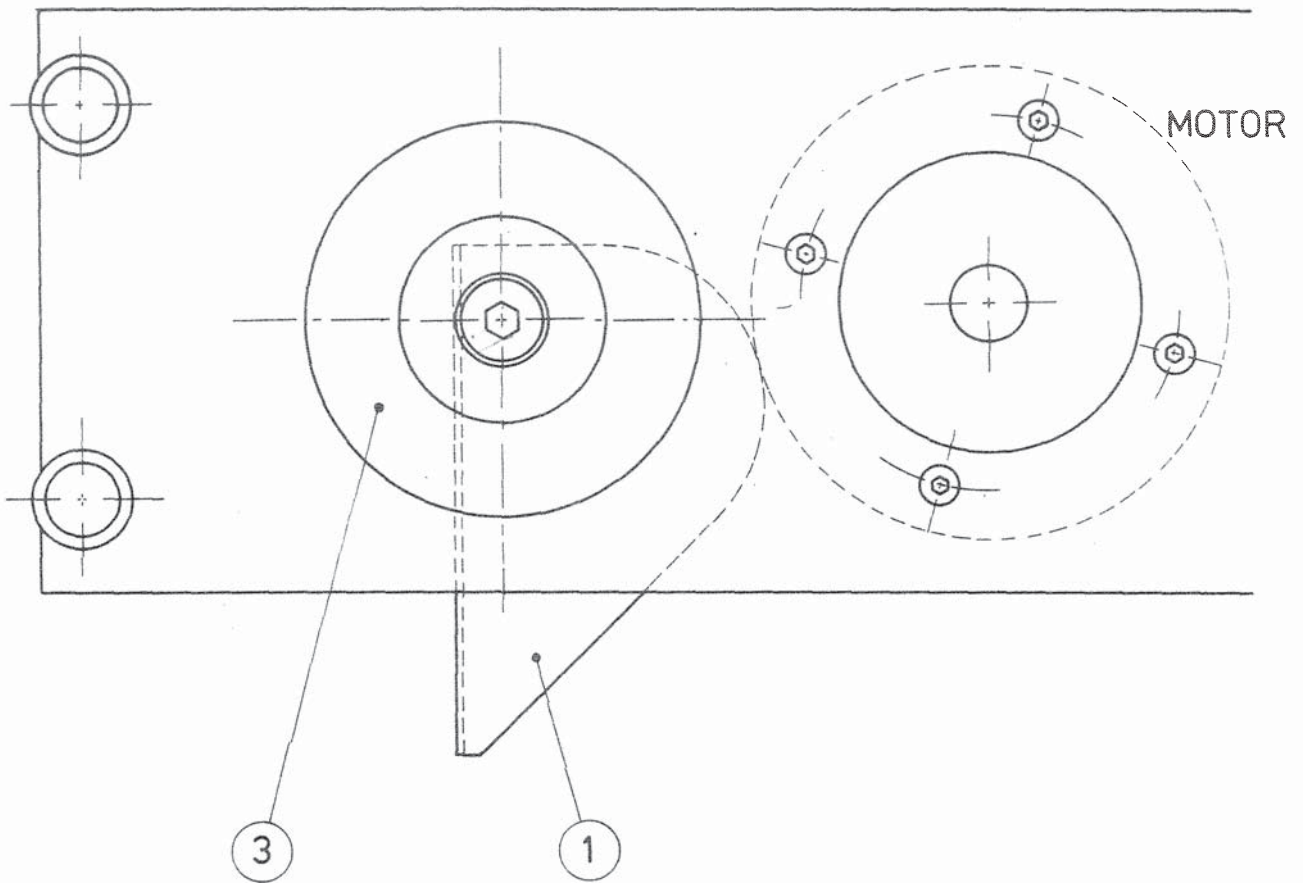


Fig. 8

Metr.:

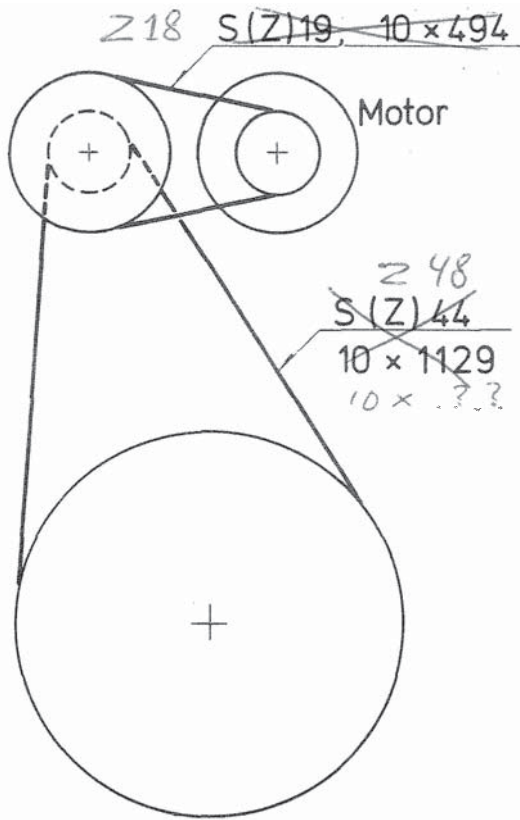
**STRUERS K/S**

Målestok:	Tegn.	PE/Lu
1:2	Dato	29/7-75

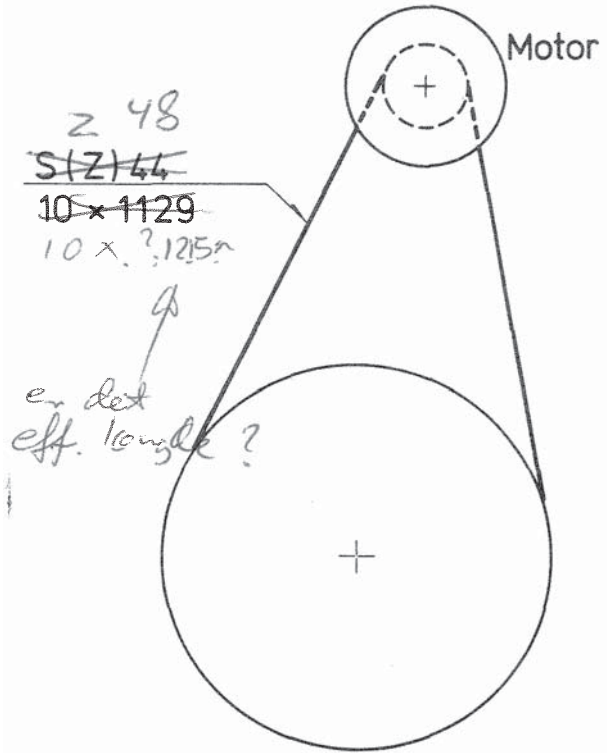
Erstatter:

MOUNTING OF CONE PULLEY

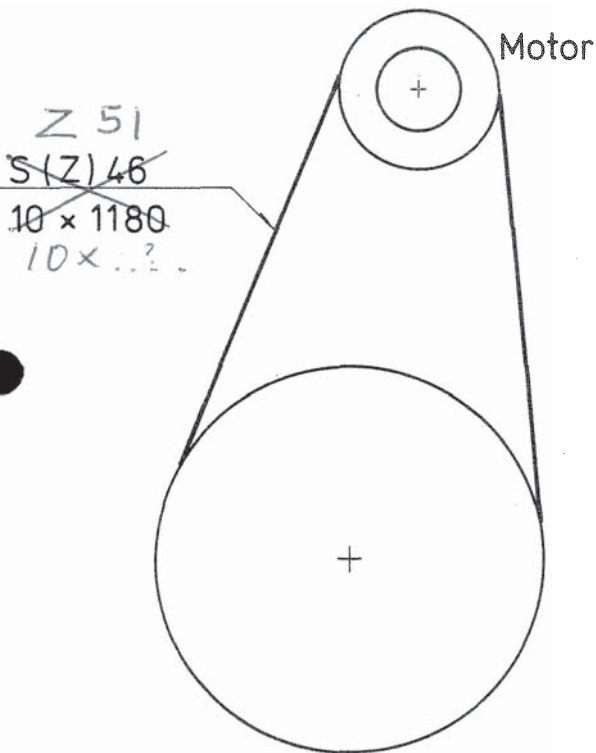
266 - M - 77



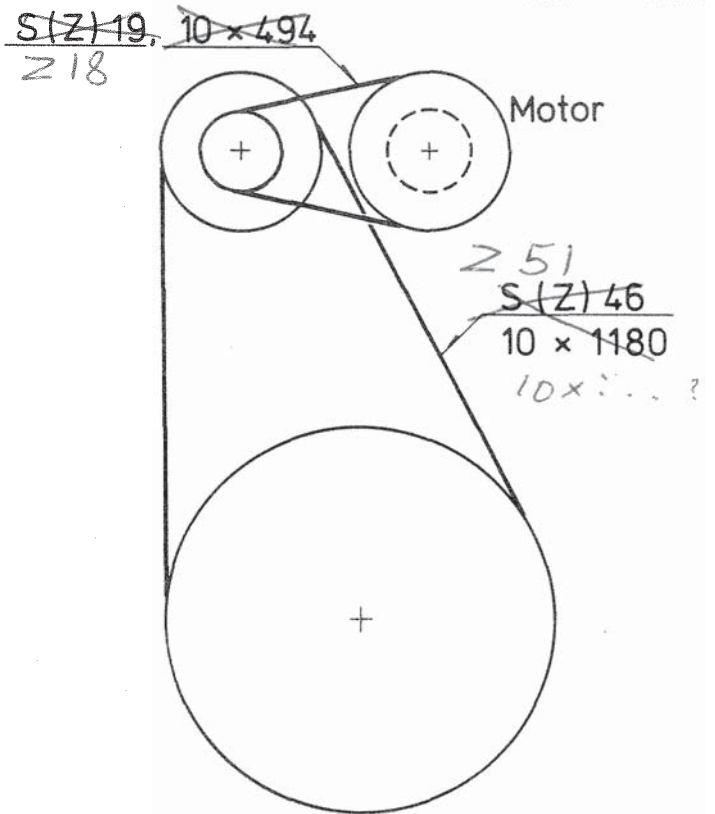
75 / 150



150 / 300



300 / 600



600 / 1200

Fig. 7

Note: Length of V-belts refers to pitch (eff.) length.

**STRUERS K/S**

PLANOPOL, SEEN FROM BELOW  
 CHANGE OF ROTATIONAL SPEED

Målestok: 1 : 5  
 Tegn. PE/LG  
 Dato 29/7-75-81

Erstatter:  
 363  
 266 - M - 74