

Abramatic

App. NO.:

Voltage:

*1990.12

Instruction Manual

Abramatic Instruction Manual

In technical enquiries and in orders for spare parts, please state app. No. and voltage (see cover).

All information and data in this Instruction Manual were valid when it was printed. The Struers policy being, however, to make current improvements of our products, we reserve ourselves the right to modify our products without notice. Besides, we ask you to note that this Instruction Manual concerns apparatus and all accessories. Consequently, it may happen that the Manual mentions equipment which is not of relevance for your purpose at the present time.

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1. DESCRIPTION

Abramatic is a microprocessor-controlled automatic machine for grinding and polishing of specimens clamped in specimen holder discs.

Grinding and polishing take place on a horizontally rotating disc against which the loaded specimen holder is pressed rotating eccentrically relative to the main disc. Pressure, disc speed, direction of rotation of specimen holder, dispensing of cooling, lubricating, diamond suspension and time are controlled by a microprocessor. This microprocessor has six standard programs and will accommodate ten additional programs (user's programs) which the user can modify according to his requirements. Each program contains all the process steps needed for grinding and polishing of any particular material.

The standard programs are based on the use of Struers High Quality consumables.

Technical data

Electric supply

Voltage/frequency version
Max Power supply

3 x 220 V/50 or 60 Hz

6.8 A

3 x 380 V/50 Hz

4.0 A

3 x 415 V/50 Hz

3.9 A

3 x 440 V/60 Hz

4.0 A

3 x 480 V/60 Hz

4.0 A

3 x 500 V/50 Hz

3.0 A

Compressed-air supply

Supply of compressed air: 6 bar (60 N/cm²)

Maximum consumption of compressed air: approx. 20 l/min

Adjustment of pressure control valve for lubricant bottles: 2 bar (max.)

Compressed air filter for lubricant and suspension: 1/4 µm

Outputs

Main motor effect: 550 W (0.75 HP) at 150 rpm (number of revolutions of the disc) and 1100 W (1.5 HP) at 300 rpm.

Gear motor effect: 150 W (0.2 HP)

Pressure control motor effect: 9.5 - 60 W

Number of revolutions of specimen holder: 150 rpm (reversible)

Vertical work pressure: 50 - 700 N

Pre-selective preparation time: 5 s - 600 s in steps of 5 s.

Physical data of the machine	<p>Width: 580 mm. Max width incl. operating console: 800 mm</p> <p>Depth: 850 mm</p> <p>Height: 1420 mm. Max. height incl. operating console: 1600 mm</p> <p>Weight: 238 kg (gross weight: 278 kg)</p> <p>Max. height of table to right-hand side of machine: 0.83 m</p> <p>Max. protrusion of specimens in specimen holder discs: 20 mm</p>
Standard	IEC 204 (VDE 0113)
Recirculating cooling unit	<p>3 x 220 V/60 Hz</p> <p>3 x 380 V/50 Hz</p> <p>Motor effect: 140 W</p> <p>Pump capacity: 57 l/min</p> <p>Dimensions:</p> <p>Width: 400 mm</p> <p>Depth: 500 mm</p> <p>Height: 410 mm</p> <p>Weight: Approx. 7.2 kg</p>
Standard	IP 44

2. **CONTENTS OF THE PACKAGE**
- 1 Abramatic operating console
 - 2 keys for operating console
 - 1 Abramatic basic unit
 - 1 top cover to be mounted after removal of transport fitting
 - 1 fitting for console
 - 1 column for console
 - 1 drain tube 1 1/4" x 1.5 m
 - 1 inlet tube 1/2" x 1.5 m
 - 2 hose clips, 17 mm
 - 1 reinforced supply tube for compressed air 1/4" x 3000 mm
 - 2 hose clips, 12 mm
 - 1 bottle tray, located in bottle chamber
 - 2 1-litre Pyrex bottles for lubricant (labelled)
 - 1 extra bottle, not labelled
 - 3 200 ml Pyrex bottles for suspension (labelled)
 - 1 extra bottle, not labelled
 - 1 DP-disc of aluminium (DEDAL)
 - 1 non-return valve for mounting on recirculating pump
 - 1 lid of ABS
 - 1 instructions for use
 - 3 summary instruction manuals
 - 2 sets of process cards (programs 1-6)
 - 10 process cards, blank
 - 1 extra lubricant jet
 - 1 key for replacement of lubricant jet (1.5 mm)

3. INSTALLATION

3.1 Placing

Abramatic can be placed directly on a plane and level floor and should be supported in all four corners. Adjust the left rear leg of the machine so that it stands firmly. Securing by bolts in the floor is not recommended, as this may cause damage to the machine shoe. The environment should be as clean as possible to avoid contamination of polishing cloths, etc. If possible, do not install Abramatic in the same room as cut-off and grinding machines.

After removal of the transport fitting secure the top cover with the screws in the plastic bag attached to one of the compressed air tubes. At the same time, fit the column of the operating console in the front right-hand corner. The up/down unit is during transport held by a wooden block, remove through the opening under the Abramatic front plate.

3.2 Connection of operating console

Mount the operating console on the column of the top cover, then lead the cable without sharp bends to the multiwire socket at the rear of the basic unit and secure the connection with the two screws. The operating console may alternatively be installed on a table beside the machine. If a table is placed up against the right-hand side of the machine, its height must not exceed 83 cm in order to allow opening of the door of the bottle chamber.

3.3 Power connection

Check the unit plate at the junction box at the side of the machine for the correct main voltage.

Connect the cable which leads out from the junction box to the mains as follows:

Yellow/green lead to earth

Brown lead to phase

Black lead to phase

Black lead to phase

Blue lead to neutral (important to connect if machine is marked 3N, e.g. 3N x 380 V/50 Hz).

Check that the turntable rotates counter-clockwise after connection. If this is not the case, reverse direction by changing over two phase leads.

3.4 Connection of recirculating cooling unit

Place recirculating cooling unit on the floor at the most convenient side of the machine. Fit the drain hose to the branch under the drain tray on the left side of the machine. Adapt the length of the drain hose to provide a gradual slope and press it into the branch mounted on the lid of the recirculating cooling unit.

Fit the inlet hose on to the pipe branch (fig. 6.1) on the back of the machine, and connect it to the recirculating cooling unit by mounting it on the outlet branch of the pump or on the non-return valve mounted in this position according to drawing 260-M-655. Tighten with hose clamp.

Pass the cable of the recirculation unit through the free cable inlet and connect it to the junction box as shown in fig. 8. If the rotational direction of the pump is not correct, change over two leads.

Fill tank with water (approx. 30 ltr.) and add "Additive for Cooling Fluid" in the concentration stated on the label.

3.5 Connection of compressed air supply

Connect special hose for the compressed air to the branch at the back of the machine (fig. 6.3). Use hose clamps. The compressed air supply may be in the form of a stationary compressed air unit, a small compressor with reservoir, or a compressed air bottle to be refilled at intervals. The feed pressure should be approx. 6 bar (approx. 6 kp/cm). A capacity of approx. 20 l/min at atmospheric pressure is sufficient.

3.6 Installation of lubricant and suspension bottles

Place the 5 bottles, numbered from 1-5, in the bottle chamber in the correspondingly marked positions with caps screwed down. Check that the lubricant bottles are intact, as a positive pressure of 2 bar will be applied to them.

If the standard programmes (1 - 6) are to be used the bottles must be filled as follows:

- Bottle 1: blue lubricant
- Bottle 2: red lubricant
- Bottle 3: 6 μm suspension
- Bottle 4: 3 μm suspension
- Bottle 5: 1 μm suspension

4. CONTROLS

Main switch (fig. 7.1)	Switches on and off the power supply of the machine. The switch is only used at installation and repair. Always put the key operated stand-by/on switch (fig. 2.1) on stand-by before turning on the main switch. The user's programs will not be erased when the main switch is turned off.
Emergency stop	Interrupts all functions. Specimen holder unit remains in lower position until emergency button is released by pulling. When emergency stop is activated, display indicates "Emergency Stop", and red light on the basic unit comes on (red light is also on in case of overload of any of the three motors).
Start buttons	To initiate a grinding or polishing step, press both buttons simultaneously until specimen holder motor starts. When display indicates "Clean samples and change disc" or "End of Program", press twice to continue or repeat program.
Operating console (fig. 2)	All keys on the keyboard beep when operated. Illuminated keys are self-locking and will only disengage when pressed a second time or by actuation of another selector key.
"Stand-by/on" (fig. 2.1)	Key-operated switch for selection of "stand-by" or "on". The on/off button for daily use. Set the button to On when the machine is to be programmed or has to work. The other functions of the operating panel can only be used when On is pressed. When the machine is not to be used for some time, set the button to Stand-by .
"Lubricant" (fig. 2.2)	Non-locking key. Dispenses type of lubricant indicated on display as long as key is depressed. When no types of lubricant are on display then the lubricant is automatically taken from bottle No. 1.
"Abrasive" (fig. 2.3)	Non-locking key. Dispenses diamond suspension of type indicated on display as long as key is depressed. Key blocked during operations not requiring suspension.
"Water" (fig. 2.4)	Self-locking key. Starts/stops cooling water pump. Function blocked during steps requiring lubricant or diamond. Amount variable with valve (fig. 1.4).
"Disc" (fig. 2.5)	Self-locking key. Starts/stops grinding or polishing disc at 150 rpm. The speed of the disc can be changed to 300 rpm by pressing "Disc R.P.M." (fig. 2.9).
"Program" (fig. 2.6)	Program is selected by pressing one of the buttons 1-10. 1-6 are fixed, ready-to-use standard programs with pre-determined steps and step data. 7-10 are user's own adjustable programs, made by transferring a standard program (1-6) to 7, 8, 9 or 10. Press "=" -key for transfer.
Example 1	Press "7", "=" and "1". Now program "1" has been transferred to "7", and desired modifications may be introduced by means of keys pos. 8 and 9.
Ten users' programs	The number of user's programs can be increased from 4 to 10. The required number of user's programs is selected in "stand-by" by pressing one of the buttons 4-10.

Example 2	Press "8" by means of which the display indicates "Fixed: 2 Open: 8". The four "new user's programs correspond to programs 3, 4, 5 and 6. The fixed programs 3, 4, 5 and 6 will not be deleted and can be retrieved by selecting the number of user's programs to 4.
Example 3	<p>If you want to delete a user's program, the hidden button between "10" and "=" ("Delete program") should be used.</p> <p>In order to delete program no. 9 press first "9", then "=" and at last press the hidden button between "10" and "=". After this the display indicates "Program deleted select new".</p>
Step (fig. 2.7)	<p>"Return" and "Forward"</p> <p>After selection of program, operator may use these keys for inspection of individual program steps, e.g. to check types of polishing media, discs, etc., used in any particular program. Between polishing steps using different grain sizes are intermediate steps for cleaning of specimens. Display indication: "Clean samples and change disc". These two keys can only be operated when the machine is not working.</p>
"Stop"	<p>This key interrupts a step in progress. The machine stops and the display shows the remaining process time. When pressing the start buttons the machine continues the process step from the stage it had advanced to. By pressing "Stop" or "Forward" you will change to the next step in the program, by pressing "return" you will change to the beginning of the interrupted step.</p>
"Pre", "Main", "Final" (fig. 2.8)	<p>The individual steps have three phases: "Pre", "Main" and "Final", following each other in automatic succession. With the pointer keys particular data of a user program can be changed (see below).</p>
Step Data (fig. 2.9)	<p>"Time" Activation of "Time" will display times of Pre, Main and Final phases of step in progress.</p> <p>"Rotation" Shows whether the step is performed with polishing disc and specimen holder rotating in identical or counter directions. Only the rotation of the specimen holder can be reversed.</p> <p>"Disc R.P.M." For selecting speed of rotation (150 or 300) used in Pre, Main and Final phases.</p> <p>"Force" For adjusting the force with which specimen is pressed against grinding or polishing disc (10N = 1 kg).</p> <p>"Abrasive Dosing" For selecting amount of suspension dispensed during individual phases. Possibilities: 0-10 (0 = off).</p> <p>"Lubricant Dosing" For adjusting amount of lubricant dispensed during individual phases. Possibilities: 0-10 (0 = off).</p>

"Select W/AB/LU"	For selecting of either cooling water, diamond suspension or lubricant and for the two latter the bottle number is displayed, suspension: 3, 4, 5; lubricant: 1, 2.
"Text On/Off"	Removes display text of a particular step, except indications of time. To be actuated when special consumables are used (only active in user's programs).
Display (fig. 2.10)	With 32 characters.
Lamps (fig. 2.11)	8 lights indicating step to be or being performed.
Process Card (fig. 2.12)	Exchangeable program survey card. All data are stated to allow quick checking. It is recommended to enter data of modified user's programs on blank cards.

5. PROGRAMMING

5.1 Program choice

Abramatic contains 6 standard programs, covering the preparation requirements of the majority of conventional materials. The programs are numbered from 1-6, corresponding to the numbering of the keys shown in fig. 2.6. The first step of most programs is planegrinding on SiC grinding paper 120 grit. This step may be omitted where an Abraplan planegrinding machine is used. Check the planeness after the first step and repeat, if necessary. The table below lists the programs recommended for a variety of materials.

Material	Program No.	
Ferrous metals	Hardened steel	3
	Cast iron	1*, 2
	C-steel	1*, 2, 3
	Low-alloyed steel	1*, 2
	Tool steel	(1*), 2, 3
	Heat resistant steel	1*, 3
	Stainless steel	2
	Superalloy	1*, 2

1*: Program 1 without process B

NB: For program modification refer to section 5.5

Non ferrous metals and plastics	Low-alloyed copper	4
	Low-alloyed aluminium	4
	Brass	(1*), 2, 4
	Bronze	(1*), 2, 4
	Al-Si casting alloy	(1*), 2, 4
	Al-Mg-Cu-alloy	4
	Al-Mg-Mn-alloy	4
	Titanium	2*
	Superalloy	1*, 2
	Plastic	2, 4

1*: Program 1 without process B

2*: Program 2 without processes E, F, and G and instead of OP-U use OP-S mixed: 96 ml OP-S, 2 ml H₂O₂, 2 ml Ammonia

NB: For program modification refer to section 5.5.

Composites	Printed circuit board	6
	Soft electronic component	2, 6
	Composites with large hardness difference	1, 5
	Plastic with fibres	2

Material		Program No.
Coatings	Plasma spray coating	1*
	Hard coatings on sintered carbides or ceramics	5
	Metal coatings on metal	1*, 2
	1*: Program 1 use process C instead of A and B.	
	NB: For program modification refer to section 5. 5.	
Sintered carbides	Sintered carbides	1*, 5
	1*: Program 1 use process C instead of A and B.	
	NB. For program modification refer to section 5. 5.	
Ceramics	Ceramics	1*, 5
	1*: Program 1 use process C instead of A and B	
	NB: For Program modification refer to section 5. 5.	
	All programs are based on average specimens 30 mm dia. prepared in a specimen holder disc, loaded with 6 specimens. Abramatic has provision for the reduction of process times which may be required when grinding smaller specimens, refer to section 5. 5.	
Step designations	A: Coarse grinding/planegrinding on 120 grit. To be used instead of Abraplan grinding machine.	
	B: Fine grinding step on SiC paper 220-4000 grit	
	C: Diamond grinding discs, grit 120, 600	
	D: Grinding 6 µm on Petrodisc-M	
	E: Polishing 6 µm on either DP-Plan, DP-Mat or DP-Dur	
	F: Polishing 3 µm on either Pan-W, DP-Plus, DP-Dur, DP-Mol or DP-Nap.	
	G: Polishing 1 µm on either DP-Dur, DP-Mol or DP-Nap	
	H: Final polishing OP-S or OP-U on OP-Chem	

5.2 Display indications

SiC Paper 120	SiC grinding paper grit 120
SiC Paper 320	SiC grinding paper grit 320
SiC Paper 500	SiC grinding paper grit 500
SiC Paper 1000	SiC grinding paper grit 1000
SiC Paper 1200	SiC grinding paper grit 1200
SiC Paper 4000	SiC grinding paper grit 4000
DIAMOND 120	Diamond grinding disc grit 120
DIAMOND 600	Diamond grinding disc grit 600
PETRODISC-M	Grinding disc Petrodisc-M
PLAN	DP-Plan polishing cloth
MAT	DP-Mat polishing cloth
PAN-W	Pellon polishing cloth type Pan-W
DUR	DP-Dur polishing cloth
MOL	DP-Mol polishing cloth
NAP	DP-Nap polishing cloth
PLUS	DP-Plus polishing cloth
CHEM	OP-Chem polishing cloth
6 Micron or 6 Mic.	6 μm diamond suspension
3 Micron	3 μm diamond suspension
1 Micron	1 μm diamond suspension
OP-S	Fine oxide polishing media
OP-U	Fine oxide polishing media
LUB: WATER	"Water" cooling
LUB: BLUE	"Blue Lubricant"
LUB: RED	"Red Lubricant"
LUB: NONE	No Lubricant
S	Seconds
N	Newton
LUBRICANT DOSING	Amount of lubricant dosed from 0-10
ABRASIVE DOSING	Amount of suspension dosed from 0-10
ROTATION \gg	Specimen holder and disc rotate in the same direction
ROTATION \ll	Specimen holder and disc rotate in the opposite direction
PROCESS TIME	Grinding or polishing time from 5s to 3 x 600s
DISC RPM	Rotation speed of the disc 150 RPM or 300 RPM
PRESSURE	Pressure used during process from 50N to 700N

WATER: O or ON	"Water" off or on (Activation of ON blocks lubricant and vice versa).
ABR: 3, 4 or 5	"Abrasive" suspension from bottle 3, 4 or 5
LUB: 1 or 2	"Lubricant" lubricant from bottle 1 or 2
DOOR OPEN	Bottle chamber door open
CLEAN SPECIMENS AND CHANGE DISC	Specimen holder should be cleaned before the next step and disc should be changed
SELECT PROGRAM	Select program number
SELECT BASE PROGRAM	Select base program (Nos 1-6)
EMERGENCY STOP	Emergency stop active or motor overloaded
END OF PROGRAM	Preparation completed
WAITING 1-5	Waiting for internal signal from various sensors (refer to section 7 (2))
BATTERY LOW	Battery worn out, time to change battery
FIXED: OPEN: 4-10	Number of fixed and open programs going to be used
	If machine is turned on with main switch, the following is displayed for 10 seconds:
ABRAMATIC VERSION 2.3	No errors in microprocessor memories
	or
PROGRAM ERROR	Error in PROM, call service
	or
MEMORY ERROR	Error in RAM, call service

5.3 Program run/inspection
































Example:

Function	Key	Display	LED for process card
1. Machine switched off		STAND-BY	
2. Machine switched on		SELECT PROGRAM	
3. Program selection		ABB BEFGH	
4. Display first step		SIC PAPER 120# LUB: WATER 90s	1
5. Start step 1		SIC PAPER 120# LUB: WATER 89s	1

Step performance stops when count-down has reached 0 s, or when STOP key is actuated. Further, on opening of bottle chamber and actuation of emergency stop.

6. Proceed to next step when count-down has reached 0 s		SIC PAPER 220# LUB: WATER 60s	2
7. Repeat step 1		SIC PAPER 120# LUB: WATER 90s	1
8. Display step 3		SIC PAPER 500# LUB: WATER 60s	3
9. Display step 4		SIC PAPER 1000# LUB: WATER 60s	4
10. Display next step		CLEAN SPECIMENS AND CHANGE DISC	4
		DUR 6 micron LUB: BLUE 180s	5
11. Display duration of pre-, main and final phases		PROCESS TIME 5 115 60 (Pre Main Final)	5

12.	Display direction of rotation		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ROTATION → → </div>	5 - 
		<p>→ → Identical rotation → ← Counter rotation</p>		
13.	Display disc speed in the three phases (two possibilities: 150 and 300)		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> DISC RPM 150 150 150 </div>	5 - 
14.	Display force applied between specimen holder and disc		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> PRESSURE 150 250 200 </div>	5 - 
15.	Display suspension dosing		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ABRASIVE DOSING 0 4 4 </div>	5 - 
16.	Display lubricant dosing		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> LUBRICANT DOSING 10 5 4 </div>	5 - 
17.	Display bottles dispensing liquid		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> WATER ABR. LUB. OFF 3 1 </div>	5 - 
18.	Step performance blocked during display of step data. Out of step data		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> DUR 6 micron LUB: BLUE 180s </div>	5 - 
19.	Display next step		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> CLEAN SPECIMENS AND CHANGE DISC </div>	5 - 
			<div style="border: 1px solid black; padding: 2px; display: inline-block;"> DUR 3 micron LUB: BLUE 180s </div>	6 - 
20.	Display next step		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> CLEAN SPECIMENS AND CHANGE DISC </div>	6 - 
			<div style="border: 1px solid black; padding: 2px; display: inline-block;"> NAP 1 micron LUB: BLUE 90s </div>	7 - 
21.	Display next step		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> CLEAN SPECIMENS AND CHANGE DISC </div>	7 - 
			<div style="border: 1px solid black; padding: 2px; display: inline-block;"> CHEM OP-U LUB: NONE 40s </div>	8 - 
22.	Display next step		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> END OF PROGRAM </div>	
23.	Display first step again		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> SiC PAPER 120# LUB: WATER 90s </div>	1 - 

5.4 Change to new program

Change of program is done by pressing one of the program keys. Programs can not be changed when a "Step Data" key is activated.

5.5 Program modification

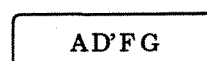
Example

Certain data in step 2 of the fixed program 3 have to be altered to suit a particular material. Since a fixed program cannot be modified, it must be copied into an open program, for instance program 7.

Function	Test	Display	LED for process card
1. Select program 7			
2. Transfer of program 3 to 7			
and			
3. Go to step 2			1 -
			2 -
4. Display phase times			2 -
5. Alteration of pre- and main phases — increments of 5 s. Hold up/down keys for quick shifts			
min. 0 s, max. 600 s			2 -
6. Display application of water or lubricant (the two are mutually exclusive)			2 -
7. Change of suspension, now to be taken from bottle No. 5, containing, for instance, 9 μm suspension			2 -
8. Back to display of step 2 Now 6 mic is no longer relevant, and to avoid misunderstanding the entire display text, except time indication, may be cancelled. Instead, enter alteration on process card for program 7			2 -
9. Cancellation of text (re-appears when key is pressed a second time)			2 -

P.S.: When program 7 has been produced it may be copied into the other open programs, if desired.

Modification of step data in relation to the original program is indicated adding a by dash to the type letter of the particular program step, e.g.



<p>5.6 Modification of user's programs (see also section 6.2)</p>	<p>The programs allow alteration of 7 different data (fig. 2.9) in the three phases Pre, Main and Final (fig. 2.8) There are thus many possibilities for modification, but the inexperienced operator should not begin to produce new programs by changing a large number of data.</p>
<p>Time</p>	<p>Generally, if a suitable program has been found for the preparation of a particular material, only the data in the main phase need to be changed, in most cases just the time. If the original program does not give satisfactory results, longer process times in grinding and polishing on hard polishing media (Petrodisc-M, DP-Dur, DP-Mat) will usually improve results. With softer polishing cloths the polishing time should be kept to a minimum in order to avoid relief and rounding of edges.</p>
<p>Rotation</p>	<p>In most cases, the best results are obtained if specimen holder and grinding/ polishing disc rotate in the same direction. In instances where a higher abrasion rate for hard materials is desirable, grinding with counter rotation may be tried. Grinding of soft and brittle materials with counter-rotation is not recommended because it can damage coatings and cause pullouts of brittle phases and severe deformation in soft materials.</p>
<p>Speed (grinding)</p>	<p>For grinding, the choice of disc speed depends on the desired rate of abrasion: the higher the rotational speed, the higher the abrasion. However, certain materials may be damaged at a speed of 300 rpm, especially when grinding with diamond as abrasive. In these cases, grinding with 150 rpm is recommended (use always 150 rpm with Petrodisc-M).</p>
<p>Speed (polishing)</p>	<p>The polishing is always done on 150 rpm. If, for any reason, 300 rpm is used for polishing, it is essential to apply enough lubricant to the polishing cloth for cooling purposes.</p>
<p>Force</p>	<p>Normally, the force is adjusted between 150 and 400 N for grinding and between 50 and 300 N for polishing. It is essential to keep the force at similar values from step to step, because large variations will make it difficult to grind and polish the entire area of the specimens. Programs 1-6 are designed for six 30 mm dia. specimens.</p>
<p>Constant pressure</p>	<p>To obtain the same pressure per unit of area when preparing various quantities and sizes of specimen the force must be changed. With six 40 mm dia. specimens the force should theoretically be increased by 75%. In actual practice an increase of 50% will be adequate.</p>
<p>Large specimens</p>	<p>Preparation of large specimens requires other changes besides an increase of the force: the grinding paper needs more frequent replacement, more polishing suspension has to be applied, and process times have to be increased.</p>

Varying the force	By changing the values of the force in each of the phases independently, it is possible to utilise both grinding paper and polishing suspension better. In paper grinding, for example, it is recommended to select a low value for the "Pre" phase then increase it in the "Main" phase, and increase it again in the "Final" phase. In polishing the "Pre"-phase has the function of wetting the polishing cloth, and for this operation (duration 5-10 sec) a low force is most appropriate. You may then use the actual process force in the "Main" phase, reducing it again in the "Final" phase, to avoid deep scratches.
Diamond and lubricant	Diamond suspension should be applied at a rate adapted to the lubricant rate. If the diamond suspension rate is increased, the lubricant rate should be reduced. For grinding on Petrodisc-M use a low abrasive dosing, and for the hard polishing cloths DP-Dur and Pan-W to use a dosing equal to or higher than level 5. The suspension should be agitated daily.
Lubricant rate	Generally, the lubricant rate should be adjusted to a minimum, though it should always be sufficiently high to prevent the grinding disc or polishing disc from running dry. This is particularly important with Petrodisc-M. The way diamond suspension and lubricant are distributed on the grinding disc and polishing cloth is also extremely important to achieve optimum results. For this reason it is possible to adjust the direction of the jet holder (fig. 13.3). The best distribution is obtained with a near-horizontal spray direction.
Lubricating Petrodisc-M	When using Petrodisc-M it is important to ensure that the suspension is applied close to the centre of the disc and the lubricant near the disc edge. In polishing both suspension and lubricant should preferably be applied near the centre area of the cloths.
5.7 Process cards and documentation	In order to assist the operator in following the progress of a program, each program has its own card ("Abramatic Process Card") stating all its steps and step data. A holder for this card is provided on the right side of the keyboard of the operating console. Light-emitting diodes (LEDs) located on the keyboard next to the card indicate the step being currently performed. It is recommended to enter modifications of user's programs in relation to the base program on a blank card.
5.8 Reprogramming of standard programs 1-6	Modification of the standard programs 1-6 requires programming of a new memory block (PROM) to replace the original PROM. At a reasonable cost Struers will program a new PROM based on a user-designed program. To do this the serial number of the operating console is needed and a process card containing all the step data which are to be incorporated in the 6 new programs. Removal of the original PROM, as well as plugging-in of the new one require special tools to avoid damage to the PROM. If at some future time a duplicate should be needed, Struers is capable of supplying a new PROM when informed of console number, because all data will be stored on floppy discs for 10 years.

6. OPERATION

6.1 Accessories and Consumables

Abramatic will perform grinding on SiC paper, Petrodisc-M, DP-NET cloth and diamond grinding disc; and polishing on a variety of polishing cloths and final polishing with OP-S and OP-U.

For the preparation of large samples and for high volume output, it is recommended to use an Abraplan for plane grinding, which is more efficient and economical.

Abramatic will work with both 160 and 200 mm specimen holder discs. For full utilisation of the consumables the choice of grinding and polishing discs should be determined by the diameter of the specimen holder disc.

Specimen Holder Disc/Preparation Disc The following combinations are recommended (Struers codewords in brackets):

160 mm specimen holder discs

Grinding with grinding paper

305 mm dia. grinding paper (ROTUS) on disc for non-adhesive grinding paper (ROTAL), according to the Knuth-Rotor principle

or

230 mm dia. grinding paper (ROTAR), with Spray Adhesive (PAPLI) on 230 mm dia. disc (DEDOT)

Grinding on Petrodisc-M

230 mm dia. (PETHA)

Polishing on Aluminium-discs

250 mm dia. (DEDIF)

200 mm specimen holder discs

Grinding with grinding paper

305 mm dia. grinding paper (ROTUS) on disc for non-adhesive grinding paper (ROTAL), according to the Knuth-Rotor principle

or

305 mm dia. grinding paper (ROTUS), with Spray Adhesive (PAPLI) on 300 mm dia. disc (DEDAL)

Grinding on Petrodisc-M

290 mm dia. (PETIL)

Polishing on Aluminium-disc

300 mm dia. (DEDAL)

Levelling apparatus (MAXVA)	With levelling disc for either 160 mm (MAXNY) or 200 mm (MAXYR) specimen holder discs. This apparatus ensures that the surfaces of specimens clamped in a specimen holder disc are on the same level, thus minimising the time required for plane grinding. The levelling disc ensures that the specimens protrude 2,5 or 6 mm from the specimen holder disc. In special cases the specimens might protrude max. 20 mm from the specimen holder disc (see section 10.5.3).		
Metason 200 (METWO)	Ultrasonic cleaner for cleaning of specimen holder disc with specimens.		
Drybox-2 (DESIC)	For drying of specimen holder disc with specimens.		
Diamond suspensions	High Quality, 15, 9, 6, 3, 1 and 1/4 μm .		
Oxide media	OP-S fine-polishing medium (oxide polishing medium, mainly for non-ferrous metals). (1 litre: OPSOT, 5 litres: OPSIF).		
	OP-U fine polishing medium (oxide polishing medium, for ferrous metals and multiphase non-ferrous metals). (1 litre: OPUNO, 5 litres: OPUFI).		
Lubricants	Blue Lubricant (1 litre: DEPTI, 5 litres: DEPIF). Red lubricant (1 litre: DEPP0).		
Diamond grinding discs	Bakelite bonded, 230 mm dia.:		
	Grit 120 (120 μm) GRAVA		
	Grit 220 (65 μm) GRATO		
	Grit 600 (20 μm) GRASI		
	Diamond Pads, self-adhesive	250 mm	300 mm
	250 μm	GRANT	GRAIB
	125 μm	GRARE	GRAEL
	40 μm	GRAFU	GRANO
	20 μm	GRATY	GRAKU
Petrodisc-M	Grinding disc for 15-6 μm diamond suspensions		
	230 mm dia. PETHA		
	290 mm dia. PETIL		
Polishing cloths, self-adhesive		Codeword	
		250 mm	300 mm
Prepolishing	DP-Net for 45-6 μm	NETMI	NETRE
	DP-Plan for 9-3 μm	DEPIM	DEPAN
	DP-Mat for 15-6 μm		PAXTE
Polishing	Pan-W for 15-1 μm		PANTE
	DP-Dur for 6-1 μm	DETRU	DEMUk
	DP-Mol for 9-1 μm	DETMO	DEMLO
One-Step Polishing	DP-Plus for 6-3 μm	DUPFI	DUPET
Final Polishing	DP-Nap for 3 μm or smaller	DETAP	DEMAN
	OP-Chem for OP-S and OP-U	APMON	APTIN
	OP-Nap for OP-S and OP-U	DETNA	APCOL

6.2 Program structure

6 additional user's programs	Abramatic has six standard programs, 1-6, and allows additional input of ten user's programs, 7-10 which are always available, and 1-6 are hidden behind the standard programs. When you switch on Abramatic, the six standard programs and the four open programs 1-10 will automatically be available. If you want to use other of the open programs, Abramatic is put in "Stand-by" and you press one of the keys, 5-10.
Example	<p>If eight open programs are required, press "8" and then the display will indicate "Fixed: 2 Open: 8". The four "new" user's programs correspond to program 3, 4, 5 and 6 so that 1-2 are standard programs and 3-10 are open programs.</p> <p>The standard programs 3-6 will not be deleted and can be retrieved again by selecting the number of open programs to four.</p> <p>The user's programs 1-6 are also stored, i.e. there will always be ten available programs and six hidden (see "Program Survey").</p>
Standard programs	With programs 1-6 it is possible to prepare with definite results most of the commonly occurring specimens. User's programs are intended for preparation of materials outside the scope of the standard programs.
Display	Each program contains up to 8 steps, of which 5 may be wet-grinding steps and the remaining 3 polishing steps. The display shows the relevant information, such as grit of grinding paper, type of polishing cloth and diamond suspension to be used, as well as the duration of individual steps. The operator does not have to remember the step data, as the display will keep him informed of the type of grinding paper, grinding disc or cloth to be mounted on the turntable. The display also indicates when it is time for the specimens to be cleaned.
Process card	The operation console has a holder for a process card on which all the data of any particular program are recorded.
Three Phases in each step	The process time of each step is divided into three phases, Pre, Main and Final, each sequence following automatically the next. However, the data of each of the phases may differ considerably in respect to dosing of lubricant and suspension, force applied or rotational speed.
Pre-Phase	The Pre-phase is used in the standard programs either for starting off preparation with a low-force grinding or for wetting the cloth with lubricant in the beginning of a polishing operation. In these cases dispensing of polishing medium will usually be suspended in order to prevent the diamonds being "flushed" away by the lubricant.
Main Phase	The Main phase is the actual processing phase.
Final Phase	In the Final phase it is possible to reduce the polishing force or increase the rate of lubricant supply to achieve the high quality known from manual polishing.

Disc Speed	Disc speeds are selected in such a way that an optimal quality is achieved at a minimum of time.
Grinding	300 rpm are used for grinding to obtain a high rate of abrasion and to ensure optimal adhesion of the grinding paper if grinding disc ROTAL is used. If 300 rpm is too high for grinding of soft materials, use 300 rpm in the Pre-phase to ensure paper adhesion, and then continue the preparation at 150 rpm.
Polishing	Generally, the appropriate speed for polishing is 150 rpm, which is also the rate at which the specimen holder disc rotates.
Identical Rotation	When polishing with identical rotation and a turntable speed of 150 rpm the special condition arises where the relative speed between specimen and polishing base is unchanging as to magnitude, and is constantly changing direction. This provides uniform polishing over the entire specimen surface without directional preferences, which will prevent such polishing defects as comet tails or inclusions to be pulled out.
One-step Polishing	Certain specimens, such as very hard steels, can be polished in a one step-polish using 300 rpm.
Axial Displacement	Grinding and polishing speeds further depend on the excentricity (non-alignment) between the axes of specimen holder and turntable. Large axial displacement causes high relative speed with consequent high rate of abrasion. Thus it applies for identical rotation that relative speed is directly proportional to excentricity.

6.3 Performance of programs

- Always keep main switches turned on, turn off only for service purposes. Shift change-over key from "Stand-by" position to "On". Select program and display the first process step by touching the two-hand start or one of the buttons "Forward/Return".
- Preparation Disc** Place the indicated polishing or grinding disc on the turntable, fitting the three pins of the disc into the matching holes of the turntable. Make sure that the supporting surfaces between the turntable and the disc are clean.
- Mounting of Specimen Holder Disc** You may now mount the specimen holder disc containing the levelled specimens (use a levelling apparatus, see section 6.1) in the quick-coupling on the specimen holder motor. Insert the specimen holder stud in the quick-coupling and, while pushing the specimen holder upwards, press the plastic flange of the quick coupling down with your thumbs, thus pushing the specimen holder a small distance further into the coupling. Continue pushing the specimen holder upwards and let go of the plastic flange, which returns to its original position. The quick-coupling has caught hold of the specimen holder stud. By turning the specimen holder disc, the driving pins of the quick-coupling will engage with the specimen holder disc to ensure that they will rotate together.
- Removal of Specimen Holder Disc** To remove the specimen holder, depress the plastic flange of the quick-coupling with your thumbs, holding the other fingers under the specimen holder disc to catch it when it is released.
- Horizontal Adjustment of Specimen Holder Motor** Adjust the specimen holder motor horizontally in relation to the disc. For grinding purposes adjust it in such a way that the largest possible area of the grinding paper is utilised. With Petrodisc-M the specimens should cross the centre as well as the edge to preserve disc planeness. This also applies when diamond grinding disc are used. When polishing, use the polishing cloth as extensively as possible, but do not allow specimens to move beyond the edge. By using matching diameters of the various types of discs (refer to section 6.1) it is possible to find a permanent position for the specimen holder motor, which avoids adjustment between steps.
- Non-adhesive Grinding Paper** If non-adhesive paper is used (Knuth-Rotor principle), pour a small amount of cooling water onto the disc by pressing key "Water" (fig. 2.4). Then place paper and retainer ring and start grinding. In the case of large and soft specimens, which tend to tear the paper, it is recommended to start the rotation of the turntable by pressing the key "Disc" before initiating the step. A favourable effect on the final result may be obtained by "trimming" the grains projecting from the surface of the grinding paper by passing a single specimen across the paper before starting the step. Alternatively, a disc of grinding paper 500 grit may be placed, grit facing downwards, under the actual grinding paper, to increase the friction between aluminium disc and grinding paper.

Start The process step is started by simultaneously operating the two push-buttons marked "Start" (fig.1.3) on the front panel of Abramatic until the specimen holder begins to turn.

Stop In normal preparation the step ends when the time shown on the display has counted down to 0 seconds, but it may also be interrupted by pressing "Stop" or pushing the emergency stop. All normal operations, except program selection, can be effected by the two-hand start buttons, including acknowledgement of specimen cleaning if "Clean samples and change disc" is displayed. When the display text says "End of Program", repeated actuation of the two-hand start buttons will display the first step of the same program again, and it can be repeated.

By using the two-hand start buttons you avoid leaving wet and dirty fingermarks on the operating console.

Adhesive Grinding Paper Paper adhesion with spray adhesive is recommended when the preparation requires grinding beyond the edge of the grinding paper to avoid relief and rounding-off of the outer edge of the specimens. However, this may cause problems with specimens mounted in soft resins, because the resin causes less wear of the grinding paper than the specimens do. Also in such cases may projecting grains advantageously be "trimmed" by passing a single specimen across the rotating grinding paper. Adhesive fixation of the paper is further recommended for planegrinding, since inadequately levelled specimens are liable to tear paper fitted according to the Knuth-Rotor principle. "Spray adhesive" can be used for fixation of the grinding paper on a plane aluminium disc.

6.4 Manual preparation Manual preparation is possible on a grinding and polishing disc rotating at 300 rpm after pressing the key "Disc". Water for grinding is supplied when pressing the key "Water". When polishing manually, press "Lubricant" or "Abrasive" to obtain, respectively, lubricant and diamond from Abramatic's dispensing device. Select type by entering into a program using the desired combination.

6.5 Lubricant and suspension refill

The special fittings make it easy to detach the screw caps of the two 1-litre lubricant bottles from the tubes. Push the red ring of the fitting down and pull out the tube. Then remove bottle with cap and refill with lubricant. Reinsert the bottle and connect the two tubes by pressing the tube right to the bottom of the fitting and pushing the red ring back up into place. This will lock the tube firmly into position (tube should be intact). Make sure not to interchange the tubes.

Air in the tubes

After the refill operation air will be present in the tubes. This causes inaccurate dosing, and lubricant continues to flow from the jet for some time after the valve has closed. To remove the air, flush the system by operating the "Manual Lubricant" button.

Warning!

The pressure in the lubricant bottles is 2 bar. When the door of the bottle chamber is opened, the bottles are automatically de-pressurised, but with almost empty bottles the pressure is not neutralised immediately. So allow a little time before removing tubes or screw caps. Make sure that the two lubricant bottles are undamaged when refilling.

Suspension

Remove the 250 ml OP-S and OP-U suspension bottles from the chamber and clean them before refilling in order to avoid clogging of the system due to sedimentation. Do not fill more than 200 ml into the bottles, otherwise the suspension will spill over when the automatic stirring effected by blowing air through the suspension is started. Do not block the hole in the cap.

If the standard programmes (1-6) are to be used the bottles must be filled as follows:

Bottle 1: blue lubricant
Bottle 2: red lubricant
Bottle 3: 6 μm suspension
Bottle 4: 3 μm suspension
Bottle 5: 1 μm suspension

Cleaning of jets

Whenever Abramatic is not operated for more than 4-6 hours, the jets should be cleaned of suspension.

Use the following cleaning procedure:

Select program 1.

Find 1st polishing step (6 μm) by repeated actuation of "Forward".

Remove plastic suspension supply tube from jet on right. Manually actuate "Abrasive" for 5 seconds.

Refit tube.

Then proceed to next polishing step 3 μm pressing "Forward" and repeat procedure for centre jet. Finally, repeat procedure for left 1 μm jet. Also clean if any of the 3 jets have supplied suspension, but not will be operated for the next 4-6 hours.

Direction of application

The direction of the lubricant and suspension sprays can be adjusted by turning the jet holder. The lubricant jets can also be turned in their holders so as to change the distribution of the supplied lubricant on the cloths. The best positioning will vary according to the diameters of the discs and specimen holder discs used.

7. TROUBLE SHOOTING

Red light on (Emergency stop or overloaded)	Emergency stop depressed. Release Emergency stop by pulling the button. One of the motors overloaded. Wait till red light turns off. Reduce grinding or polishing pressure. If light turns on soon after, 1-2 seconds, one phase is missing or a motor is defective.
No suspension comes out of the suspension nozzles	The nozzles are choked by the dried up suspension. Dismount and clean the nozzles (see section 10.5.8)
The suspension cannot reach the nozzle during dosage	The nozzles are not properly adjusted. Dismount and adjust the nozzles (see section 10.5.8) or The suspensions do not have the right viscosity because a) they are not Struers' suspensions. Change for Struers' or adjust nozzles. b) they are too old. Change suspension. c) they have remained too long since the last bubbling-through. Set the machine on "stand-by" and then on "on" to start the bubbling-through of the suspensions.
Central area of specimens in specimen holder not polished after grinding on Petrodisc-M or diamond grinding wheel	Specimens travel too far beyond extreme edge of grinding disc. Adjust position of specimen holder disc relative to grinding disc (shift specimen holder motor). or Excessive grinding force used in preceding step (Petrodisc-M, grinding paper, Abraplan). Reduce pressure in grinding process, maintaining almost the same in each step. or Uneven distribution of diamonds on Petrodisc-M. Adjust suspension jet, aiming it in more central direction.
Polishing suddenly requires very long time	Suspension deteriorated, causing diamonds to sink to the bottom. Agitate bottle frequently or change suspension.
Deficient amount of cooling water	Cooling pump rotates in wrong direction. Change over two phases supplying the pump. or Lack of water in container. Add water and additive. (See section 3.4).

Grinding paper torn on contact with specimen	Excessive grinding pressure or Specimens inadequately levelled. or Soft and ductile specimens. Fix paper by adhesion or press against grinding wheel with dummy specimen (See section 6.3).
Grinding paper torn on contact with specimen (especially when specimens are protruding more than 6 mm)	Excessive down-speed. Adjust speed with throttle valve on back of machine (turn right to reduce down-speed) Fig. 6.4 (See section 10.5.3). Incorrect adjustment of shock dampening in compressed air cylinder. Remove bottle tray and adjust the screw of the cylinder. See section 10.5.4. Normal adjustment 1/8 turn from home position.
Difficulties in removing specimen holder disc from quick-coupling	Burrs on specimen holder stud produced by displacement of quick-coupling on shaft. Remove burrs and adjust position of quick coupling on shaft with a distance of 27-28 mm to the shaft end.
Polishing disc continues rotation after completion of step	Contactor damaged by overheating and fails to switch off motor. Repair or replace contactor. or Fuse (F 4) on control current transformer (T 2, 24 V) is defective and should be replaced.
Display showing "Waiting 1-5"	Waiting 1 indicates that the <u>safety switch S6</u> has turned off the motor of the pressure control unit in order to protect it as the computer has lost control. This happens when the machine is exposed to short disturbances in the operating voltage during process. 1. The machine must be set on Power on= ready to start. 2. Check the pressure on the manometer of the pressure control unit. 3. If the pressure on the manometer of the pressure control unit shows a figure higher than <u>5.3 bar</u> , the two conducting wires of the microswitch <u>S6</u> shall have to be short circuited on terminal <u>x 1008</u> and <u>x 1010</u> . The machine will then reset automatically and again be ready for use.

4. If on the manometer of the pressure control unit the pressure is down to 1,4 bar the machine must be turned off. The two screws on the motor box shall be loosened and the reducing valve is turned round manually (with a 2mm Allen key in the hole of the reducing valve) and clockwise until the manometer indicates about 2-4 bar. The two screws on the motor box are fastened, and the machine can be started again.

Waiting 2-5 may indicate defect in slotted optical switches (B1-B6), defective interface circuit board or loose wires.

Call service engineer.

Display defective

Defect in display circuit board.
Replace.

Defect in CPU circuit board.
Replace.

8. CLEANING

Abramatic and the recirculating cooling unit should be cleaned regularly to avoid poor preparation results due to contamination by abrasive grains and metal particles.

Use water and ordinary detergent for cleaning the drain tray and the cover. Painted surfaces should be cleaned with a damp cloth, and the same applies to the keyboard (do not clean with alcohol). Clean the cooling tank and make sure that all abrasive sludge is removed before fresh water is filled into the tank (approx. 30 l) and add "Additive for Cooling Fluid" in the concentration stated on the label. This ensures better cooling and prevents corrosion of machine and specimen.

For cleaning of suspension jets, refer to section 10.5.8. If the jet is blocked by dried suspension, dismount it and place it in very hot water, alternatively in an ultrasonic cleaner, for approx. 10 min.

Make sure that the jets are correctly adjusted when remounted; refer to section 10.5.8.

9. MAINTENANCE

9.1 Belt tension Once a year check the tension of the V-belts running between the principal motor and the turntable to ascertain adequate tension. Access to V-belts and tension adjuster is gained by removing the lower back plate. With correct belt tension a force of 15N applied half-way between the V-belt pulleys will depress the belt approx. 8 mm. To tighten the belts, adjust the nuts on the spindle (fig. 6.5). Secure both nuts after adjustment.

9.2 Air filters and water separator The compressed air filter (fig. 4.4) should be cleaned once every year, depending on the quality of the compressed air. The water separator containing the filter should be drained whenever necessary to prevent the water level from reaching the filter. Drain by shifting the plastic tube in the bottom of the tank.
The microfilter (fig. 5.1) cleaning the compressed air for the lubricant and suspension system should be replaced every second year.

9.3 Lubrication chart

Lubrication Point	Lubricant	Interval
Quick-coupling	Oil	200 hours
Column surfaces	Oil	200 hours
Spindle of pressure control valve (fig. 4.3)	Grease 1)	500 hours
Axial bearing (fig. 9.2)	Grease 1)	1000 hours
Gear motor gear	Grease 1)	2000 hours or 2 years

1) BP: Energrease HT-O
Esso: Fibrax 370
Mobil: Mobil grease 480
Shell: Simnia grease 0

9.4 Test of safety valve The safety valve must be tested at least twice a year. This is done by pulling the finger screw a little out - air must get out if the valve is in order.

10. SERVICE AND REPAIR
(for service engineers)

10.1 Mechanical design
(fig. 11)

Frame	The machine rests on a stationary base frame built of steel sections and steel plate. On this frame guards, drain tray etc. are mounted. The frame is surmounted by a unit comprising the moving parts and the pneumatic and electric systems, all of which suspended in a vibration-dampened rubber engine mounting.
Moving Parts	The moving parts rest on a sturdy horizontal beam, on its front end the bearing structure for the grinding wheel is mounted and its other end supports the principal motor (fig. 11.22) mounted in a slidable carriage under the beam. On top of the beam two hardened precision-ground columns are mounted on which the up/down unit travels.
Up/down Unit	The up/down unit consists of a sturdy horizontal traverse to which two cylindrical guides are welded, provided with smooth-running ball bushes. The front end of the traverse accommodates the gear motor (fig. 11.1) driving the specimen holder. Pointing vertically downwards, the shaft of the specimen holder motor is fitted with the quick-coupling for the specimen holder disc.
Bearing Block	<p>The bearing block (fig. 9) consists of a heavy-duty axial bearing and two ball bearings. The lower part is mounted with a V-belt pulley, and the upper part with a turntable on which the grinding or polishing disc is placed. The plastic drain tray extends into the housing of the bearing block, which prevents water from spilling over by a high edge.</p> <p>The principal motor is a 1/1.5 HP, three-phase asynchronous motor with two speeds. The power is transmitted to the turntable via two V-belts.</p>
Quick-Coupling	The quick-coupling (see fig. 10) consists of a stationary part, mounted on the shaft of the specimen holder motor, and a vertically movable part. When the movable part travels down, two steel balls recede to allow insertion and removal of the specimen holder stud. When the operator releases the movable part, the action of a spring causes it to move upwards, and at the same time the two balls engage with a slot in the specimen holder stud, locking it into position. Rotation is transferred to the specimen holder by three spring-loaded driving pins caused to engage with the stud of the specimen holder disc by turning the latter.

10.2 Pneumatic system

Refer to diagram at the end of manual.

The up-and-down movement of the specimen holder disc motor with specimen holder disc is effected by means of a compressed air cylinder. The cylinder has an adjustable shock-dampening in both ends to soften the impact of the piston.

Compressed air is admitted to the primary side of the cylinder through a reduction valve (fig. 4.1) adjusted to 3.0 bar to counterbalance the own-weight of the up/down unit and return it to its initial position after the process. The downward movement is caused by removal of the counterpressure from the primary side by deaeration through a throttle valve. In this way the down-speed can be controlled with the throttle valve (fig. 6.4), which is adjustable in special cases (see section 10.5.3), and to which easy access is provided at the back of the machine. Just before contact between specimen holder and grinding or polishing disc the magnet valves (fig. 4.2) for counterpressure and process pressure, respectively, are opened. This operation is controlled by two slotted optical switches mounted at the up/down unit. The process pressure is adjusted with a motor-operated pressure control valve (fig. 4.3) controlled by the microprocessor via the interface circuit board. When the main switch is turned on, the pressure reference of the microprocessor is reset in relation to the motor adjustment. The compressed air is cleaned by passing through a manually operated water separator (fig. 4.4) containing a filter.

10.3 Spray system

The dispensing of lubricant and diamond/suspension is done with compressed air. Before contact with the liquids the pre-cleaned compressed air is passed through a microfilter (1/4 μm) (fig. 5.1) and its pressure reduced to approx. 2 bar with a pressure control valve (fig. 5.2).

Dosing of the diamond suspension is effected by the mixing jets (fig. 13.1) drawing the liquids from the bottles with compressed air. The compressed air admitted to the individual mixing jets is controlled by magnetic valves (fig. 5.3) which are in turn controlled by the microprocessor. Manual operation of the air valves is possible by pressing a button mounted on the valves.

The compressed air for the lubricant is passed through a closing and bleeder valve to the two 1-litre bottles, which are put under pressure. Whenever the door of the compartment is opened, the bottle is depressurised by the bleeder valve. The lubricant is passed through tubes from the bottles through magnet valves (fig. 5.5) to the jets (fig. 13.2).

A sealed safety valve adjusted at 2,5 bar ensures that the bottles are not exposed to too high a pressure. See section 6.5.

10.4 Electric system

The electric system comprises three parts: 1. Microprocessor (CPU), 5 V. 2. Interface circuit board, 24 V, for actuation of control motor, valve, contactors and relays on signal from the microprocessor. 3. High-voltage unit, 115–500 V, for starting and stopping principal motor, specimen holder motor and pump with contactors provided with thermal cut-out switches to prevent motor damage from overload.

The microprocessor is located in an operating console with membrane keys, 32-character display with control circuit, and a 5 V power supply. The operating console is connected to the machine with multiwire socket in the back of the machine.

10.5 Adjustments and testing

Adjustments listed below are only required after repairs.

10.5.1 Adjustment of counterpressure

The counterpressure, i.e. the pressure on the primary side of the compressed air cylinder, which counterbalances the own-weight of the up/down unit and returns the unit to its initial top position, is adjusted by the reduction valve (fig. 4.1). The correct pressure is 3 bar (when using air to eliminate hysteresis). Measure with a precision manometer.

10.5.2 Adjustment of process pressure

Turn off Abramatic with stand-by key and allow approx. 15 sec. before turning it on again. This will cause the control motor (fig. 4.5) to adjust to a pressure of 200N, which should correspond to 2.3 bar on the reduction valve (fig. 4.3). If the manometer reading is not 2.3 bar (when using air to eliminate hysteresis), adjust the valve spindle in relation to the motor shaft extension. This is done by slackening two pointed screws with a 2 mm Allen key and then turning the spindle until correct pressure is obtained. Secure the two pointed screws after adjustment.

50 N corresponds to 1.4 bar
700 N corresponds to 5.4 bar.
(Version V1: 1.7 bar,
Version V2: 2.3 bar)

10.5.3 Adjustment of down-speed

The down-speed is regulated by an adjustable throttle valve (fig. 6.4), normal position of the valve being approx. 1 3/4 turns from the home position. To obtain faster travel give valve another approx. 1/4 turn. Screwing the valve beyond that position may cause problems in the form of excessive initial grinding pressure (for approx. 1/4 - 1 sec), involving a risk of the specimen tearing the grinding paper or polishing cloth. At specimens protruding more than 6 mm from the sample holder disc, the brake (see below) does not work, and in this case the throttle valve (fig. 6.4) is closed 1/2 to 1 turn to reduce the down-speed.

10.5.4 Adjustment of brake action in bottom position of vertical movement

The brake incorporated in the compressed air cylinder comes into operation 5-10 mm above the polishing disc, depending on how far specimens protrude from the specimen holder. Access to the adjusting screw is gained through the bottle chamber after removal of the bottle tray. Two adjusting screws (fig. 10) are located here. The upper screw adjusts the braking action of the up/down unit when it returns to its initial top position. Normal adjustment of the down-speed brake action is approx. 1/8 turn from the home position. Adjustment is very delicate, because the braking action should not prevent the specimen holder from contact with the grinding wheel when working at a low process pressure (50 N). This may cause problems, particularly with thin specimens, therefore specimens should always protrude approx. 2.5 mm from specimen holder disc.

10.5.5 Adjustment of quick-coupling

After slackening of the two screws (fig. 10.5) the position of the quick-coupling on the shaft can be vertically adjusted. Mounting the quick-coupling too close to the shaft end may transmit the grinding pressure to the specimen holder through the two lock-balls. This would damage the specimen holder stud and make removal of the specimen holder difficult. Incorrect mounting can be noticed either by measuring (see section 7) or by the fact that the lock slots of the specimen holder studs have become smooth from wear.

10.5.6 Cleaning of pneumatic system (diagram 376-M-100)

In spite of the filter with water separator built into the apparatus, compressed air with a high content of water, oil and/or dirt, may be detrimental to the operation of the apparatus. This because dirt and oil settle on the membranes of the valve, thus hampering their function.

If a service check reveals oil and water in the water separator (V7) and liquid in the compressed air tubes, valves and tubings must be cleaned. A complete cleaning requires separation valves and tubings, however, in most cases it is sufficient to rinse tubes and valves which are particularly exposed, in alcohol, especially the reduction valves (V3) and (V4) as well as the throttle valve (V6). NB: the compressed air cylinder must not be exposed to alcohol, because the grease required in the cylinder would thereby be washed out too.

1. Cleaning of the compressed air side:

- a) vent the apparatus
- b) dismount the tube for the top of the compressed air cylinder
- c) dismount the tube for the inlet side of the reduction valve (V3) and fill it up with alcohol and mount it again
- d) put the reduction valve on maximum
- e) the magnetic valve (V9) is opened by means of a manual button
- f) the compressed air is connected again whereby the valves are rinsed - repeat the whole processus 2-3 times
- g) mount the tube for the compressed air cylinder again

2. Cleaning of the counter-pressure side

- a) vent the apparatus
- b) dismount the tube for the bottom of the compressed air cylinder
- c) dismount the tube for the outlet side of the reduction valve (V4) and fill it with alcohol and mount it again
- d) NB: do not increase/decrease the function of this reduction valve, as it is adjusted precisely for 3.0 bar
- e) connect the compressed air again whereby the valve is rinsed - repeat the entire processus 2-3 times

NB:

If there is alcohol in the tube for the manometre, dismount the tube near the manometer and blow it clean.

10.5.7 Disassembly of main bearing

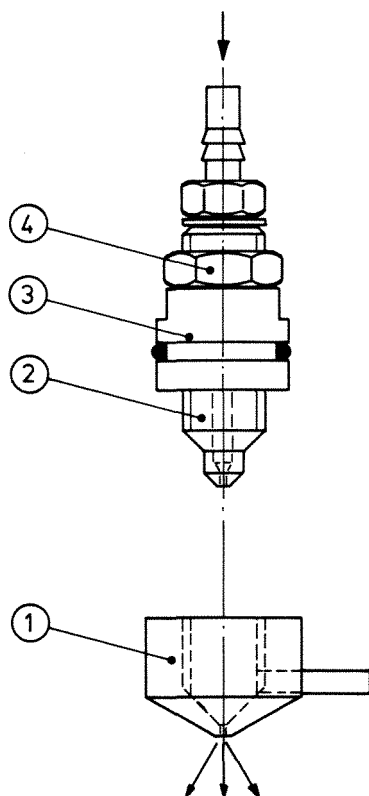
Access for exchange of drain tray (fig. 11.7) and to axial bearing (fig. 9.2) is gained in the following way:

Remove the turntable (fig. 9.1) by taking out the three screws. Then take out the two screws in the bearing cover (fig. 9.3) and remove cover.

Disassembly and dismantling of the bearing block can be performed after removal of the V-belt pulley at the lower end of the shaft. To remove V-belt pulley at the lower end of shaft, take out the 2 screws in the bush. Take one of the screws and put it in the third unused hole. Now remove the pulley. When refitting the pulley, insert the screws in their original holes, and after re-mounting the pulley in its position 2 mm from the end of the shaft, tighten the screws again.

10.5.8 Cleaning and adjustment of jets

If the lubricant and suspension bottles with tubes are kept free from dirt, removal and cleaning of the jets will not be necessary.



The design of the suspension jets causes the suspension to return to the bottle whenever the jet is inactive for any considerable time. This generally prevents blocking of the jets with dried-up suspension. If, however, a jet has become blocked, the dried suspension can be removed either by blowing through the jet or by cleaning it with a needle, (do not use a needle for the lubricant jets).

The suspension rate of the suspension jet can be varied by adjusting the distance between the inner and outer parts of the jet. The jets are factory-adjusted to approx. 1 turn from home.

Adjusting by use of Struers suspensions

- A. Dismount the tubes and press the jet out from the jet holder.
- B. Screw part 1 and part 2 from each other and clean them, if necessary.
- C. Loosen part 4 and screw both part 3 and part 4 backwards towards the connecting branch for compressed air.
- D. Screw part 1 and part 2 (smeard with vacuum grease) right together.
- E. Screw part 1 $3/4$ -1 turn forward again.
- F. Turn part 3 until it lies true against part 1.
- G. Turn part 4 until it locks part 3.
- H. Press the jet back in the jet holder and connect the tubes.

NB:

Depending on the viscosity of the suspensions you can try with a larger or smaller distance between part 1 and part 2 (see point E.).

Impurities in the lubricant may block the lubricant jets. Remove the jet and try to blow the impurities out with compressed air (blowing it in from the outside of the jet). If this does not help, the jet may be cleaned with a very fine needle under a microscope. Before remounting the tube on the jet, flush the system by actuating the "Manual lubricant" key.

10.5.9 Testing operating console, buttons and sensors

The operating console has a built-in auto-test and test of buttons and sensors. Actuation of the main switch always starts testing of the two memories PROM and RAM, and in the case of errors, display shows for 10 seconds, either "PROGRAM ERROR" if there is an error in the PROM, or "MEMORY ERROR" if the RAM is defective. An auto test procedure starts if the operator depresses one of the two-hand start buttons and at the same time actuates the main switch. The display now shows "DIAGNOSTIC" and after that display indicates for 10 seconds PROM = OK, RAM = OK, if the two memories are in working order, and PROM = XX, RAM = XXXX, if both PROM and RAM are defective. After this memory test all keyboard lamps (LEDs) are automatically tested by lighting up successively at one second intervals, the display indicating "LED-TEST". Finally, the display shows T = XX-XX I = XX, XX, "X" changing with actuation of different keys, buttons or sensors. T stands for test code and I for input code for push buttons and sensors (slotted optical switches).

T = XX-XX I = XX, XX

1 2 3

- 1 Test code for key board, (also for extra keys), hold keys for a couple of seconds. See table at the back of instruction manual (376-M-220R).
- 2 Test code for sensors (slotted optical switches) in connection with pressure adjustment and position of up/down unit.

Slotted optical switch no. 1 on pressure control unit	01
Slotted optical switch no. 2 on pressure control unit	02
Stop for bottom reference pressure on pressure control unit	08
Signal for up/down unit (top)	10
Signal for up/down unit (bottom)	20

In the case of simultaneous actuation of several signals the display shows the added result.

Example 1:

Signal for up/down unit (top)	10
Signal for up/down unit (bottom)	20
Slotted optical switch 2	<u>02</u>
	32

In this case the display will not show 32 but 2 G, since G = 16. Other alphabetic codes include A = 10, B = 11, C = 12, D = 13, E = 14, F = 15, G = 16, etc.

Example 2:	Stop for bottom reference pressure on pressure control unit	08
	Slotted optical switch 1	<u>01</u>
		09

Display indication: 09

3 Test code for pushbuttons and
door sensor

Signal for "Stand-by" switch "On"	01
-----------------------------------	----

Example:

Signal for emergency stop	02
---------------------------	----

Signal for door open	03
----------------------	----

Two-hand start button (right)	40
-------------------------------	----

Two-hand start button (left)	80
------------------------------	----

Emergency stop + "On"	03
-----------------------	----

Door sensor signal + "On"	05
---------------------------	----

Door sensor signal + Emergency stop	07
-------------------------------------	----

Both two-hand start buttons + "On"	CI
------------------------------------	----

In addition, the display will show whether Abramatic is waiting for signals. Normally, such indications are only displayed for a few seconds, but if they do not disappear the cause may be a defect in the system (call service engineer).

Abramatic has the following waiting signals:

WAITING: 1 Waiting for pressure control unit to reset after actuation of main switch.

WAITING: 2 Waiting for signal for up/down unit (bottom) to disappear.

WAITING: 3 Waiting for signal for up/down unit to disappear or for completion of pressure adjustment after step.

WAITING: 4 Waiting for signal for up/down unit (top) to disappear after completion of step.

WAITING: 5 Waiting for completion of pressure adjustment after step.

Survey of program data
(standard programs 1-6)

Fixed Programs	
Prog. No.	Materials
1	Basic program for modification
2	Low and high alloy steels
3	Routine method for steels
4	Non ferrous metals Plastics
5	Ceramics Sintered carbides
6	PCB Soft electronic components

Open Programs		
Prog. No.	Base Prog.	Materials
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Program
No: 1

Materials: Basic program for modification :
- General steels, plasma spray coatings: without process B.
- Ceramics, sintered carbides: use process C*instead of A and B.

Process	Disc / Cloth	SiC-paper	Total Time: 90 s	Pre	Main	Final
Type: A	Grain Size:	120 No:	Time	5 s	65s	20 s
	Lubricant:	Water No:	Force	100 N	250 N	300 N
	Rotation:	↔ / →	Lubr. Dosing	-	-	-
	Step: 1	Comments: Until plane	Abras. Dosing	-	-	-
			Disc R.P.M.	300	300	300
Process Type: B	Disc / Cloth:	SiC-paper	Total Time: 60 s	Pre	Main	Final
	Grain Size:	320 No:	Time	5 s	35 s	20 s
	Lubricant:	Water No:	Force	150 N	250 N	200 N
	Rotation:	↔ / →	Lubr. Dosing	-	-	-
	Step: 2	Comments:	Abras. Dosing	-	-	-
Disc R.P.M.			300	300	300	
Process Type: B	Disc / Cloth:	SiC-paper	Total Time: 60 s	Pre	Main	Final
	Grain Size:	1000 No:	Time	5 s	35 s	20 s
	Lubricant:	Water No:	Force	150 N	250 N	200 N
	Rotation:	↔ / →	Lubr. Dosing	-	-	-
	Step: 3	Comments:	Abras. Dosing	-	-	-
Disc R.P.M.			300	300	300	
Process Type: D	Disc / Cloth:	Petrodisc-M	Total Time: 300 s	Pre	Main	Final
	Grain Size:	6 µm No: 3	Time	5 s	235 s	60 s
	Lubricant:	Blue No: 1	Force	150 N	250 N	200 N
	Rotation:	↔ / →	Lubr. Dosing	7	2	2
	Step: 4	Comments:	Abras. Dosing	0	4	4
Disc R.P.M.			150	150	150	
Process Type: E	Disc / Cloth:	DP-Mat	Total Time: 300 s	Pre	Main	Final
	Grain Size:	6 µm No: 3	Time	5 s	235 s	60 s
	Lubricant:	Blue No: 1	Force	150 N	250 N	200 N
	Rotation:	↔ / →	Lubr. Dosing	10	3	2
	Step: 5	Comments:	Abras. Dosing	0	4	4
Disc R.P.M.			150	150	150	
Process Type: F	Disc / Cloth:	Pan-W	Total Time: 300 s	Pre	Main	Final
	Grain Size:	3 µm No: 4	Time	5 s	235 s	60 s
	Lubricant:	Blue No: 1	Force	150 N	250 N	200 N
	Rotation:	↔ / →	Lubr. Dosing	10	3	3
	Step: 6	Comments:	Abras. Dosing	0	4	4
Disc R.P.M.			150	150	150	
Process Type: G	Disc / Cloth:	DP-Nap	Total Time: 90 s	Pre	Main	Final
	Grain Size:	1 µm No: 5	Time	5 s	55 s	30 s
	Lubricant:	Blue No: 1	Force	150 N	200 N	100 N
	Rotation:	↔ / →	Lubr. Dosing	10	7	7
	Step: 7	Comments:	Abras. Dosing	0	4	3
Disc R.P.M.			150	150	150	
Process Type: H	Disc / Cloth:	OP-Chem	Total Time: 60 s	Pre	Main	Final
	Grain Size:	OP-U No:	Time	5 s	35 s	20 s
	Lubricant:	No:	Force	100 N	150 N	100 N
	Rotation:	→ ← / ↔	Lubr. Dosing	-	-	-
	Step: 8	Comments: Optional. Add OP-U manually and water only to final.	Abras. Dosing	-	-	-
Disc R.P.M.			150	150	150	



Abramatic Process Card

Program
No: 2

Materials:
Low and high alloy steels

Process Type: A Step: 1	Disc / Cloth:	SiC - paper	Total Time:	90 s	Pre	Main	Final
	Grain Size:	120 No:	Time		5 s	65 s	20 s
	Lubricant:	No:	Force		100 N	250 N	300 N
	Rotation:	*** / → →	Lubr. Dosing		-	-	-
	Comments:	Until plane	Abras. Dosing		-	-	-
			Disc R.P.M.		300	300	300
Process Type: B Step: 2	Disc / Cloth:	SiC - paper	Total Time:	90 s	Pre	Main	Final
	Grain Size:	220 No:	Time		5 s	65 s	20 s
	Lubricant:	No:	Force		150 N	250 N	200 N
	Rotation:	*** / → →	Lubr. Dosing		-	-	-
	Comments:		Abras. Dosing		-	-	-
			Disc R.P.M.		300	300	300
Process Type: B Step: 3	Disc / Cloth:	SiC - paper	Total Time:	60 s	Pre	Main	Final
	Grain Size:	500 No:	Time		5 s	35 s	20 s
	Lubricant:	No:	Force		150 N	250 N	200 N
	Rotation:	*** / → →	Lubr. Dosing		-	-	-
	Comments:		Abras. Dosing		-	-	-
			Disc R.P.M.		300	300	300
Process Type: B Step: 4	Disc / Cloth:	SiC - paper	Total Time:	60 s	Pre	Main	Final
	Grain Size:	1000 No:	Time		5 s	35 s	20 s
	Lubricant:	No:	Force		150 N	250 N	200 N
	Rotation:	*** / → →	Lubr. Dosing		-	-	-
	Comments:		Abras. Dosing		-	-	-
			Disc R.P.M.		300	300	300
Process Type: E Step: 5	Disc / Cloth:	DP-Dur	Total Time:	180 s	Pre	Main	Final
	Grain Size:	6 µm No:3	Time		5 s	115 s	60 s
	Lubricant:	blue No:1	Force		150 N	250 N	200 N
	Rotation:	*** / → →	Lubr. Dosing		10	5	4
	Comments:		Abras. Dosing		0	4	4
			Disc R.P.M.		150	150	150
Process Type: F Step: 6	Disc / Cloth:	DP-Dur	Total Time:	180 s	Pre	Main	Final
	Grain Size:	3 µm No:4	Time		5 s	115 s	60 s
	Lubricant:	blue No:1	Force		150 N	250 N	200 N
	Rotation:	*** / → →	Lubr. Dosing		10	5	4
	Comments:		Abras. Dosing		0	4	4
			Disc R.P.M.		150	150	150
Process Type: G Step: 7	Disc / Cloth:	DP-Nap	Total Time:	90 s	Pre	Main	Final
	Grain Size:	1 µm No: 5	Time		5 s	55 s	30 s
	Lubricant:	blue No: 1	Force		150 N	200 N	100 N
	Rotation:	*** / → →	Lubr. Dosing		10	7	7
	Comments:		Abras. Dosing		0	4	3
			Disc R.P.M.		150	150	150
Process Type: H Step: 8	Disc / Cloth:	OP-Chem	Total Time:	40 s	Pre	Main	Final
	Grain Size:	OP-U No:	Time		5 s	25 s	10 s
	Lubricant:	- No:	Force		100 N	150 N	100 N
	Rotation:	→ ← / ***	Lubr. Dosing		-	-	-
	Comments:	Optional. Add OP-U manually and water only to final.	Abras. Dosing		-	-	-
			Disc R.P.M.		150	150	150



Abramatic Process Card

Program
No: 3

Materials:
Routine method for Steels

Process Type: A Step: 1	Disc / Cloth: SiC	Total Time: 90 s	Pre	Main	Final
	Grain Size: 120 No:	Time	5 s	55 s	30 s
	Lubricant: No:	Force	100 N	250 N	300 N
	Rotation: → x ← / → →	Lubr. Dosing	-	-	-
	Comments: Until plane	Abras. Dosing	-	-	-
		Disc R.P.M.	300	300	300
Process Type: D Step: 2	Disc / Cloth: Petrodisc-M	Total Time: 300 s	Pre	Main	Final
	Grain Size: 6 µm No:3	Time	5 s	235 s	60 s
	Lubricant: blue No:1	Force	150 N	250 N	200 N
	Rotation: → x ← / → →	Lubr. Dosing	7	2	2
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: F Step: 3	Disc / Cloth: DP-Plus	Total Time: 240 s	Pre	Main	Final
	Grain Size: 3 µm No: 4	Time	5 s	175 s	60 s
	Lubricant: blue No: 1	Force	150 N	250 N	200 N
	Rotation: → x ← / → →	Lubr. Dosing	10	7	7
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: G Step: 4	Disc / Cloth: DP-Nap	Total Time: 90 s	Pre	Main	Final
	Grain Size: 1 µm No: 5	Time	5 s	55 s	30 s
	Lubricant: blue No: 1	Force	150 N	200 N	100 N
	Rotation: → x ← / → →	Lubr. Dosing	10	7	7
	Comments: Optional.	Abras. Dosing	0	4	3
		Disc R.P.M.	150	150	150
Process Type: Step: 5	Disc / Cloth:	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			
Process Type: Step: 6	Disc / Cloth:	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			
Process Type: Step: 7	Disc / Cloth:	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			
Process Type: Step: 8	Disc / Cloth:	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			



Abramatic Process Card

Program
No: 4

Materials:
Non-ferrous metals and alloys - Plastics

Process	Disc/ Cloth : SiC-paper	Total Time: 60s	Pre	Main	Final
Type:	Grain Size: 320 No:	Time	10 s	30 s	20 s
B	Lubricant: Water No:	Force	50 N	150N	150 N
	Rotation: xx ← / → →	Lubr. Dosing	-	-	-
Step:	Comments: until plane	Abras. Dosing	-	-	-
1		Disc R.P.M.	300	300	300
Process	Disc/ Cloth : SiC-paper	Total Time: 30s	Pre	Main	Final
Type:	Grain Size: 500 No:	Time	10 s	10 s	10s
B	Lubricant: Water No:	Force	50 N	150N	100 N
	Rotation: xx ← / → →	Lubr. Dosing	-	-	-
Step:	Comments:	Abras. Dosing	-	-	-
2		Disc R.P.M.	300	300	300
Process	Disc/ Cloth : SiC-paper	Total Time: 30 s	Pre	Main	Final
Type:	Grain Size: 1000 No:	Time	10 s	10 s	10 s
B	Lubricant: Water No:	Force	50 N	150N	100 N
	Rotation: → xx / → →	Lubr. Dosing	-	-	-
Step:	Comments:	Abras. Dosing	-	-	-
3		Disc R.P.M.	300	300	300
Process	Disc/ Cloth : SiC-paper	Total Time: 60 s	Pre	Main	Final
Type:	Grain Size: 4000 No:	Time	10 s	30 s	20 s
B	Lubricant: Water No:	Force	50 N	150N	100 N
	Rotation: → xx / → →	Lubr. Dosing	-	-	-
Step:	Comments:	Abras. Dosing	-	-	-
4		Disc R.P.M.	300	300	300
Process	Disc/ Cloth : DP-Mol	Total Time: 240s	Pre	Main	Final
Type:	Grain Size: 3 µm No: 4	Time	5 s	175 s	60 s
F	Lubricant: Blue No: 1	Force	50 N	200N	150 N
	Rotation: → xx / → →	Lubr. Dosing	10	6	6
Step:	Comments:	Abras. Dosing	0	4	4
5		Disc R.P.M.	150	150	150
Process	Disc/ Cloth : DP-Mol	Total Time: 180s	Pre	Main	Final
Type:	Grain Size: 1 µm No: 5	Time	5 s	115 s	60 s
G	Lubricant: Red No: 2	Force	50 N	150N	100 N
	Rotation: xx ← / → →	Lubr. Dosing	10	6	6
Step:	Comments:	Abras. Dosing	0	4	4
6		Disc R.P.M.	150	150	150
Process	Disc/ Cloth : OP-Chem	Total Time: 60 s	Pre	Main	Final
Type:	Grain Size: OP-S No:	Time	5 s	35 s	20 s
H	Lubricant: - No:	Force	50 N	150N	50 N
	Rotation: → ← / xx →	Lubr. Dosing	-	-	-
Step:	Comments:	Abras. Dosing	-	-	-
7		Disc R.P.M.	150	150	150
Process	Disc/ Cloth :	Total Time: s	Pre	Main	Final
Type:	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
Step:	Comments:	Abras. Dosing			
8		Disc R.P.M.			



Abramatic Process Card

Program
No: 5

Materials: Ceramics, sintered carbides
Hard coatings on hard materials

Process Type: C Step: 1	Disc/ Cloth : Diamond	Total Time: 60 s	Pre	Main	Final
	Grain Size: 120 No:	Time	5 s	35 s	20 s
	Lubricant: Water No:	Force	200 N	300 N	200 N
	Rotation: xxx / -> ->	Lubr. Dosing	-	-	-
	Comments: Until plane	Abras. Dosing	-	-	-
		Disc R.P.M.	300	300	300
Process Type: C Step: 2	Disc/ Cloth : Diamond	Total Time: 120 s	Pre	Main	Final
	Grain Size: 600 No:	Time	5 s	85 s	30 s
	Lubricant: Water No:	Force	200 N	300 N	200 N
	Rotation: xxx / -> ->	Lubr. Dosing	-	-	-
	Comments:	Abras. Dosing	-	-	-
		Disc R.P.M.	300	300	300
Process Type: D Step: 3	Disc/ Cloth : Petrodisc-M	Total Time: 300 s	Pre	Main	Final
	Grain Size: 6 µm No: 3	Time	5 s	235 s	60 s
	Lubricant: Blue No: 1	Force	200 N	250 N	200 N
	Rotation: xxx / -> ->	Lubr. Dosing	7	2	2
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: E Step: 4	Disc/ Cloth : DP-Plan	Total Time: 300 s	Pre	Main	Final
	Grain Size: 6 µm No: 3	Time	5 s	235 s	60 s
	Lubricant: Blue No: 1	Force	200 N	250 N	200 N
	Rotation: xxx / -> ->	Lubr. Dosing	7	3	3
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: F Step: 5	Disc/ Cloth : Pan-W	Total Time: 300 s	Pre	Main	Final
	Grain Size: 3 µm No: 4	Time	5 s	235 s	60 s
	Lubricant: Blue No: 1	Force	200 N	250 N	150 N
	Rotation: xxx / -> ->	Lubr. Dosing	10	3	3
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: G Step: 6	Disc/ Cloth : DP-Dur	Total Time: 120 s	Pre	Main	Final
	Grain Size: 1 µm No: 5	Time	5 s	55 s	60 s
	Lubricant: Blue No: 1	Force	150 N	200 N	100 N
	Rotation: xxx / -> ->	Lubr. Dosing	10	5	4
	Comments:	Abras. Dosing	0	4	3
		Disc R.P.M.	150	150	150
Process Type: H Step: 7	Disc/ Cloth : OP-Chem	Total Time: 60 s	Pre	Main	Final
	Grain Size: OP-U No:	Time	5 s	35 s	20 s
	Lubricant: No:	Force	100 N	150 N	100 N
	Rotation: -> -< / xxx	Lubr. Dosing	-	-	-
	Comments: Optional. Add OP-U manually and water only to final.	Abras. Dosing	-	-	-
		Disc R.P.M.	150	150	150
Process Type: Step: 8	Disc/ Cloth :	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: -> -< / -> ->	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			



Abramatic Process Card

Program
No: 6

Materials: Printed circuit boards
soft electronic components

Process Type: A Step: 1	Disc/ Cloth : SiC-paper	Total Time: 120 s	Pre	Main	Final
	Grain Size: 120 No:	Time	5 s	95 s	20 s
	Lubricant: Water No:	Force	100N	200 N	150 N
	Rotation: xxx / → →	Lubr. Dosing	-	-	-
	Comments: Until plane	Abras. Dosing	-	-	-
		Disc R.P.M.	300	300	300
Process Type: B Step: 2	Disc/ Cloth : SiC-paper	Total Time: 60 s	Pre	Main	Final
	Grain Size: 1200 No:	Time	5 s	35 s	20 s
	Lubricant: Water No:	Force	100N	200 N	100 N
	Rotation: xxx / → →	Lubr. Dosing	-	-	-
	Comments:	Abras. Dosing	-	-	-
		Disc R.P.M.	300	300	300
Process Type: E Step: 3	Disc/Cloth: DP-Mat	Total Time: 120 s	Pre	Main	Final
	Grain Size: 6 µm No: 3	Time	5 s	75 s	40 s
	Lubricant: Blue No: 1	Force	150N	200 N	150 N
	Rotation: xxx / → →	Lubr. Dosing	7	3	2
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: F Step: 4	Disc/Cloth: DP-Mol	Total Time: 120 s	Pre	Main	Final
	Grain Size: 3 µm No: 4	Time	5 s	75 s	40 s
	Lubricant: Red No: 2	Force	150N	200 N	100 N
	Rotation: xxx / → →	Lubr. Dosing	10	6	6
	Comments:	Abras. Dosing	0	4	4
		Disc R.P.M.	150	150	150
Process Type: G Step: 5	Disc/Cloth: DP-Nap	Total Time: 60 s	Pre	Main	Final
	Grain Size: 1 µm No: 5	Time	5 s	35 s	20 s
	Lubricant: Red No: 2	Force	100N	150 N	100 N
	Rotation: xxx / → →	Lubr. Dosing	10	7	7
	Comments:	Abras. Dosing	0	4	3
		Disc R.P.M.	150	150	150
Process Type: H Step: 6	Disc/Cloth: OP-Chem	Total Time: 60 s	Pre	Main	Final
	Grain Size: OP-U No:	Time	5 s	35 s	20 s
	Lubricant: No:	Force	50 N	150 N	50 N
	Rotation: → ← / xxx	Lubr. Dosing	-	-	-
	Comments: Optional. Add OP-U manually and water only to final.	Abras. Dosing	-	-	-
		Disc R.P.M.	150	150	150
Process Type: Step: 7	Disc/Cloth:	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			
Process Type: Step: 8	Disc/Cloth:	Total Time: s	Pre	Main	Final
	Grain Size: No:	Time	s	s	s
	Lubricant: No:	Force	N	N	N
	Rotation: → ← / → →	Lubr. Dosing			
	Comments:	Abras. Dosing			
		Disc R.P.M.			



Abramatic Process Card

Program
No:

Materials:

Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 1	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 2	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 3	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 4	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 5	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 6	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 7	Comments:	Abras. Dosing				
		Disc R.P.M.				
Process	Disc / Cloth:	Total Time:	s	Pre	Main	Final
Type:	Grain Size:	No:	Time	s	s	s
	Lubricant:	No:	Force	N	N	N
	Rotation:	→ ← / → →	Lubr. Dosing			
Step: 8	Comments:	Abras. Dosing				
		Disc R.P.M.				



Abramatic Process Card

Spare Parts/Ersatzteile/Pieces de Rechange

Some of the drawings may contain position numbers not used in connection with this manual.

Figure/pos.	Description	Spare Part No.
	<i>Electric parts</i>	
11.22	Main motor (state voltage and frequency)	376MP001
11.1	Specimen holder motor (state voltage and frequency)	376MP002
	Reconditioned specimen holder motor (state voltage and frequency)	376MP160
4.5	Force regulating motor	376MP003
	Thermo relay, F 1 (state voltage)	376MP164
	Thermo relay, F 2 (state voltage)	376MP165
	Thermo relay, F 3 (state voltage)	376MP166
	Contactor K1, K2, K3, K4, K5	376MP110
	Auxiliary switch block for K5	376MP163
	Fuse, F 4, 0,2 A	376MP009
	Fuse, F 5 (state voltage)	376MP010
	Fuse, F 6, 1,25 A	376MP011
	Transformer, T 1	376MP012
	Transformer, T 2	376MP013
4.6	Interface circuit board, complete	376MP014
	Lamp, white	376MP015
	Lamp, red	376MP016
	Lamp, yellow	376MP017
7.1	Main switch	376MP018
11.6	Push button, start	376MP019
11.5	Cap for push button, start	376MP020
11.8	Emergency stop push button	381MP439
11.8	Switch element for emergency stop	381MP440
5.8, 6.8	Slotted optical switch (B1-6)	376MP023
4.12	Microswitch (force regulator (S6))	376MP024
	Noise filter	376MP109
	Excess voltage protection print	375MP267

(Spare parts)

Figure/pos.	Description	Spare Part No.
	<i>Operating console</i>	
	Operating console, complete,	376MP180
	Membrane (switch board) for new operating console	R4480050
	Display circuit board, complete	376MP181
	Back up battery	376MP190
	CPU circuit board, without prom	376MP182
	Connection cable for operating console/interface board	376MP183
	<i>Abramatic Master</i>	
	Prom 0-1 V2.11 (2 pcs.)	14330010
	Key for operating console	376MP031
11.24	Column for operating console	376MP032
11.25	Mounting angle for operating console	376MP033
11.26	Clamp between column and mounting angle	376MP034
11.27	Grip for clamp (376MP034)	376MP035
	<i>Pneumatics for dosing</i>	
5.1	Filter unit (V 1)	376MP039
5.2	Reduction valve (V 1)	376MP040
5.1	Filter insert 1/4 µm (V 1)	376MP041
	Reduction valve, V 2 (= V 4)	368MP330
5.3, 5.6, 5.7	Solenoid valve, Y 1-5	376MP043
5.5	Solenoid valve, Y 6-7	376MP044
5.9	Quick-release hose fitting	376MP045
	Hose nipple	376MP046
	<i>Pneumatics for up/down movement</i>	
4.4	Filter unit - SMC, V7	381MP189
	Filter glass for 381MP189	381MP435
4.1	Reduction valve, V 4 (= V 2)	368MP330
4.8	Cap and stem (376MP103) for V 3	376MP049
4.3	Reduction valve, V 3, motor-driven	376MP050
	Double-acting compressed air cylinder	376MP060
	Ball joint for air cylinder	376MP061
4.13	One way restrictor valve (V 5)	376MP062
6.4	Throttle/one way restrictor valve	
4.2	Solenoid valve Y 8	376MP064
4.2	Solenoid valve Y 9	376MP065
	Quick release valve	376MP112
	Air hose, Ø 8 mm, 2 m	376MP067
	Air hose, Ø 5 mm, 1 m	376MP068
	Safety valve, V9	376MP113
	Fittings for safety valve	376MP114

(Spare parts)

Figure/pos.	Description	Spare Part No.
	<i>Force regulating unit</i>	
	Force regulating unit complete	376MP108
4.9	Coupling for reduction valve	376MP102
4.7	Stem for reduction valve	376MP103
	Gear wheel axle	376MP104
4.10	Coupling for motor	376MP105
	Index disc	376MP107
	<i>Nozzles</i>	
13.3	Nozzle holder	376MP048
13.1	Suspension nozzle, complete	376MP072
	O-ring	376MP073
	Inner nozzle screw (section 10.5.8 pos. 2)	376MP074
	Outer nozzle (section 10.5.8 pos. 1)	376MP075
	Nozzle body (section 10.5.8 pos. 3)	376MP076
	Hose nipple	376MP077
13.2	Lubricant nozzle	376MP078
	Lubricant nozzle fastener	376MP111
	Lubricant hose nipple	376MP079
	Suspension hose (1 m)	376MP080
	Lubricant hose (1 m)	376MP081
13.4	Thumb-screw	376MP082
	<i>Lubricant & suspension bottles</i>	
3.1	Bottle tray	376MP083
3.2	1 l Lubricant bottle with hole cap	376MP084
3.3	Suspension bottle, 300 ml	375MP027
3.4	Cap plate with fittings for 1 l bottle	376MP088
3.5	Cap plate with fittings for 250/300 ml bottles	376MP090
	Gasket for 1 l bottles	376MP091
12.1	Nylon T-fitting	376MP161
12.2	Nylon angle-fitting	376MP162
	Throttle bushing for suspension bottle air tube, 4 pcs.	394MP060
	<i>Body sheets</i>	
	Bottle room door	R3769034
	Top sheet	R3769039
	Rear lower sheet	R3769054
	Rear upper sheet	R3769038
13.6	Drip rail, left	376MP098
13.7	Drip rail, right	376MP099
13.5	Nozzle cover plate	376MP100
11.23	Support of black plastic	376MP101

(Spare parts)

Figure/pos.	Description	Spare Part No.
<i>Water supply</i>		
6.1	Tube	260MP116
11.14	Sprinkler pipe	R4220034
	Union nut	RNF40044
11.16	Cock	260MP075
11.17	Connection piece	260MP117
11.7	Drain tray	260MP185
11.29	Branch for drain tray, complete	260MP168
11.28	Locking handle	260MP155
11.4	Splash guard	260MP077
	Lid	PLAID
<i>Bearing Unit</i>		
9	Bearing unit complete, but without turntable and V-belt pulley	260MP065
9.2	Axial bearing, 51120/P6	260MP017
9.3	Bearing flange	260MP197
9.4	Roller bearing, upper, 6007	260MP018
9.6	Roller bearing, lower, 6007RS	260MP066
9.8	Seegerring I 62 x 2	260MP019
9.9	Seegerring U 35 x 1.5	260MP067
9.5	V-belt pulley (please state frequency)	260MP068
9.7	Bush for V-belt pulley	260MP069
9.1	Turntable	R4590223
9.10	Bearing protection ring	260MP183
9.11	V-ring VA 130	260MP184
9.12	Thrust collar, set of 4	260MP190
<i>Miscellaneous</i>		
11.20	V-belt pulley for main motor	260MP071
11.21	Bush for V-belt pulley	260MP072
11.9, 11.10	Driving belt, 2 pcs. SPZ/3V, 1320 mm at 50 Hz.	260MP073
11.9, 11.10	Driving belt, 2 pcs. SPZ/3V, 1500 mm at 60 Hz.	260MP083
11.19, 11.11	Lock-bracket 260MP020	
11.13	Ball bush, KH 4060	260MP022
11.12	Sealing ring, G 40 x 52 x 5	260MP024
11.15	Seeger ring for stay for piston rod U 12 x 1.0	260MP025
	Non-return valve with fittings for Recirculation Cooling Unit (drawing No. 260-M-655)	260MP082

(Spare parts)

Figure/pos.	Description	Spare Part No.
	<i>Quick-release coupling</i>	
10.	Quick-release coupling, complete	260MP027
10.4	Driving pin with spring	260MP028
10.7	Bush with balls	260MP145
10.3	Seeger ring U 48 x 1.75	260MP032
10.1	Seeger ring U 25 x 1.20	260MP033
11.2	Damper coupling, complete	260MP080
11.3	Damper coupling with lower flange	260MP081
	Lower flange for Damper coupling	R4229024

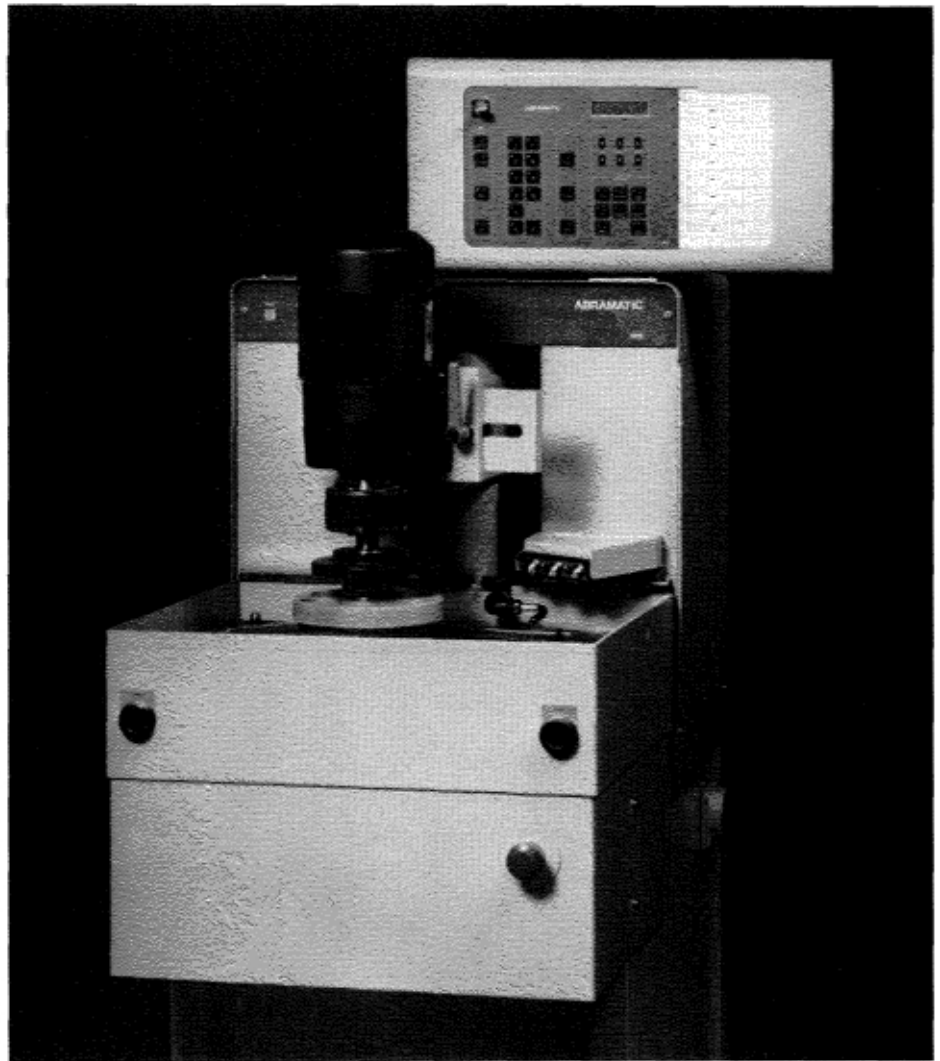


Fig. 1

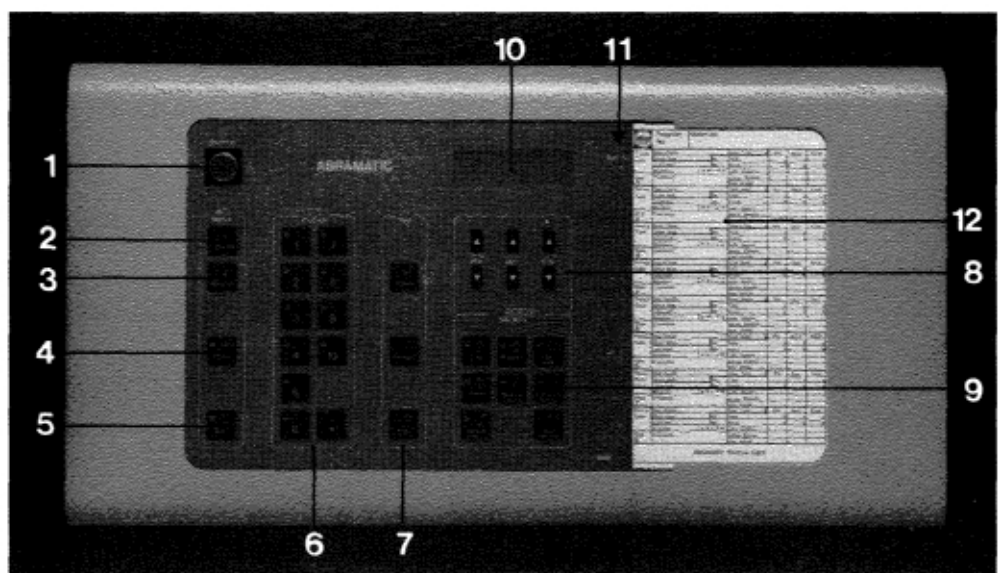


Fig. 2

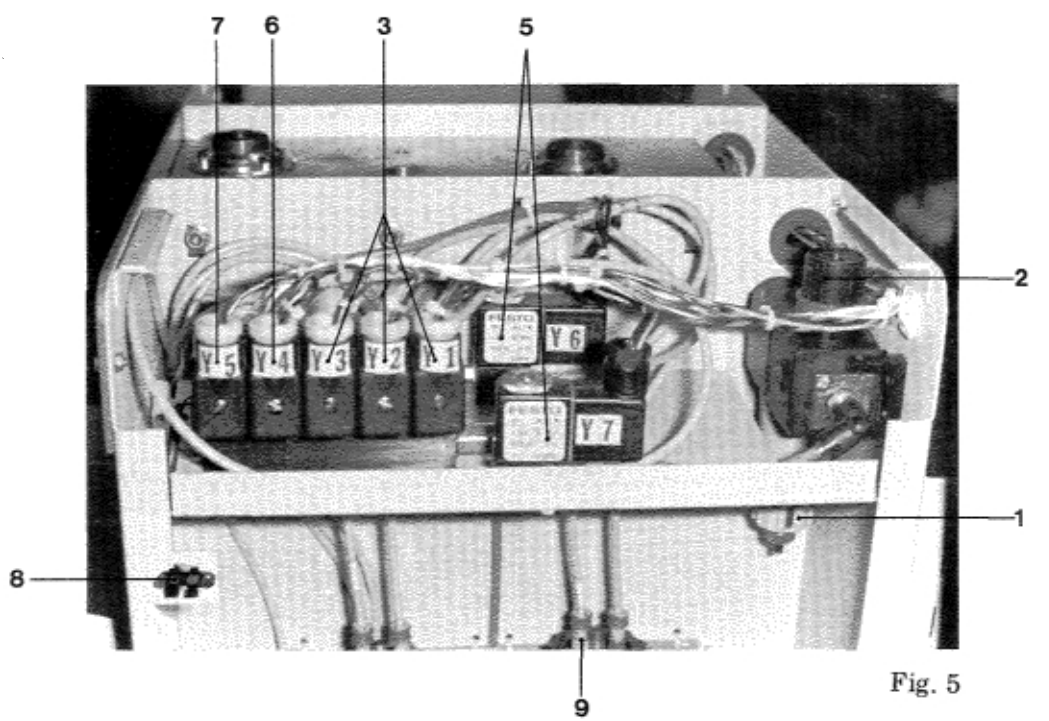
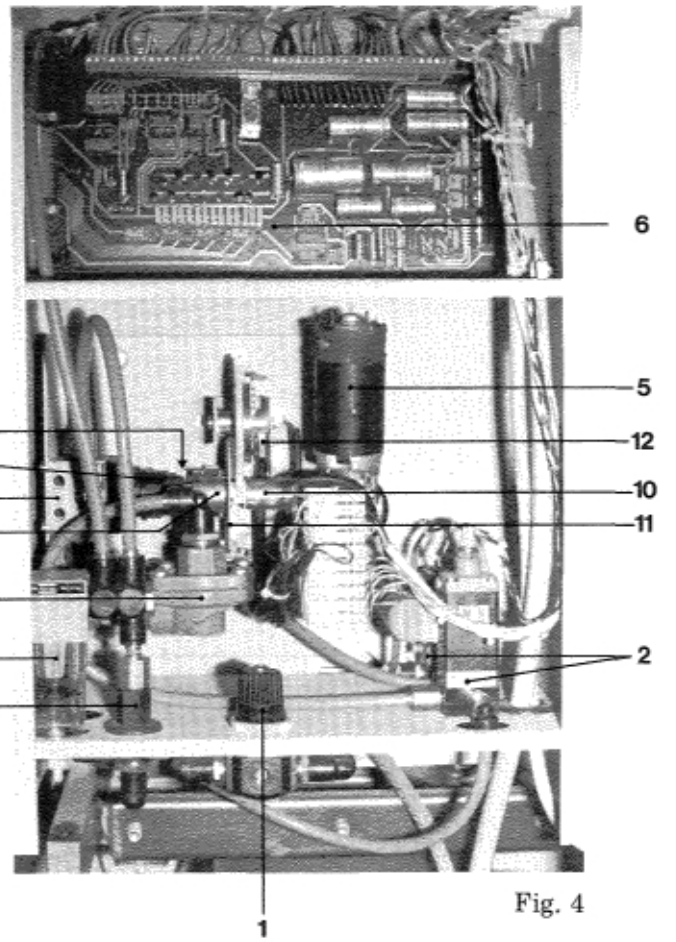
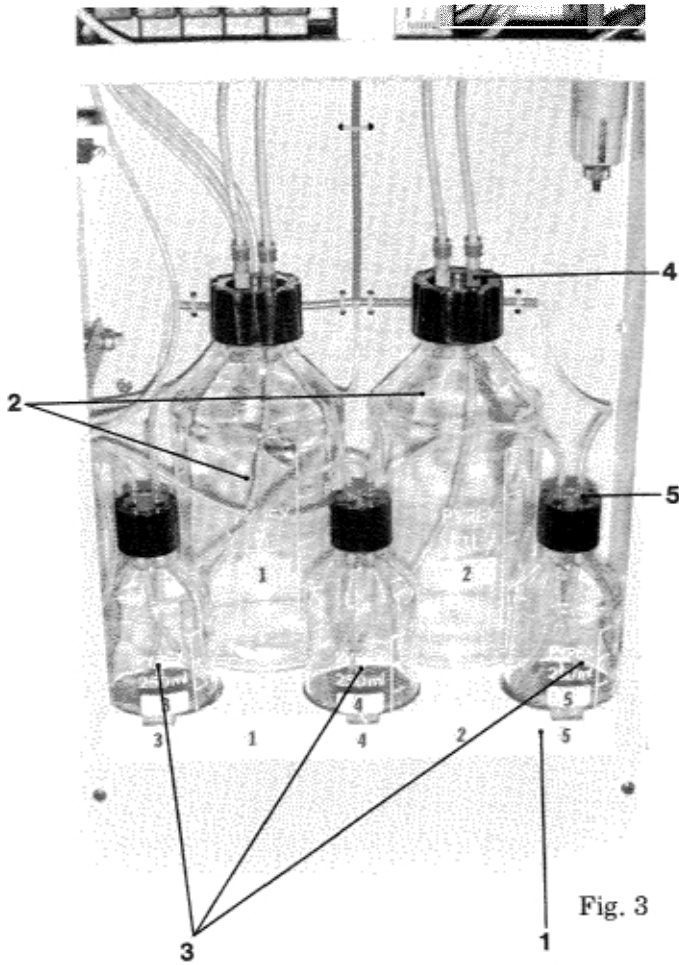


Fig. 6

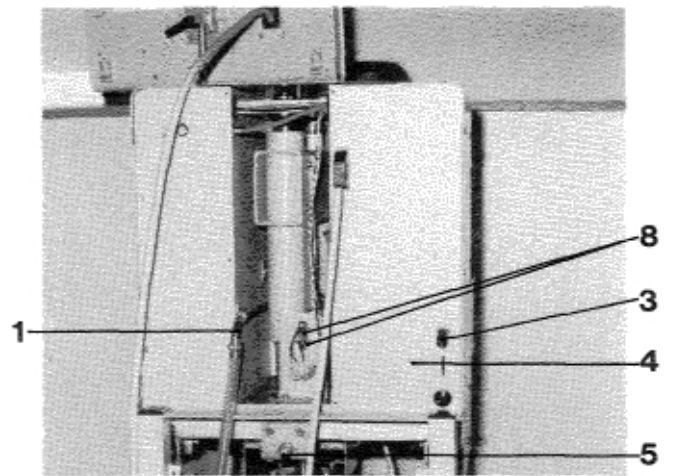


Fig. 7

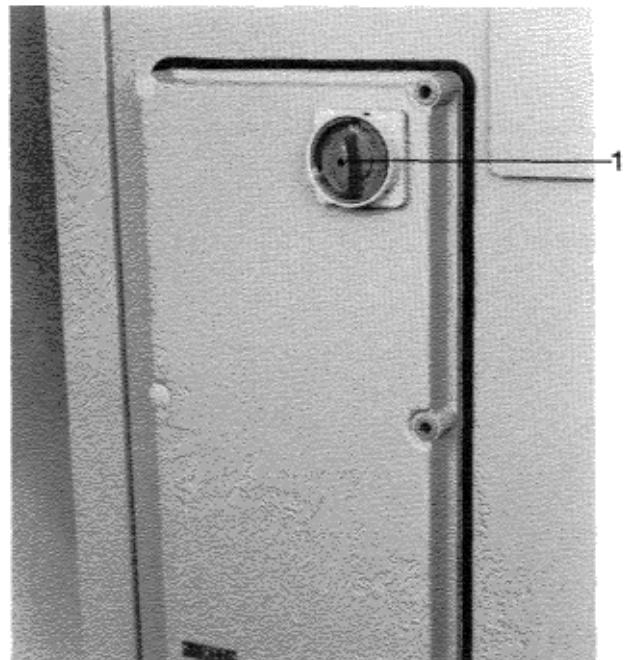
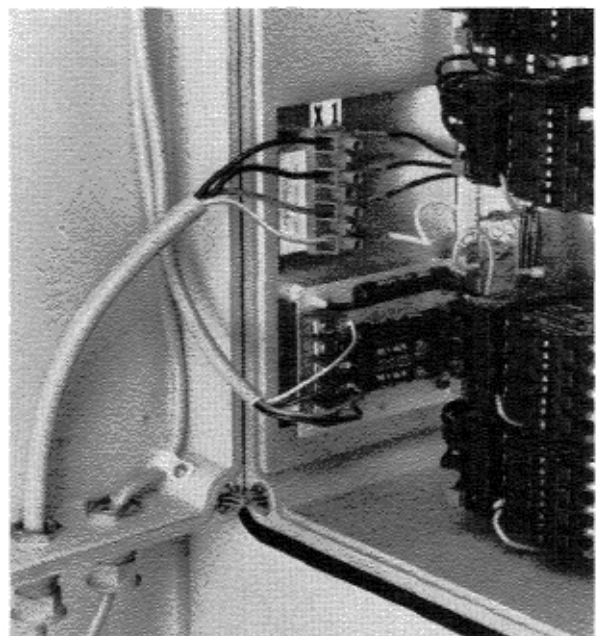


Fig. 8



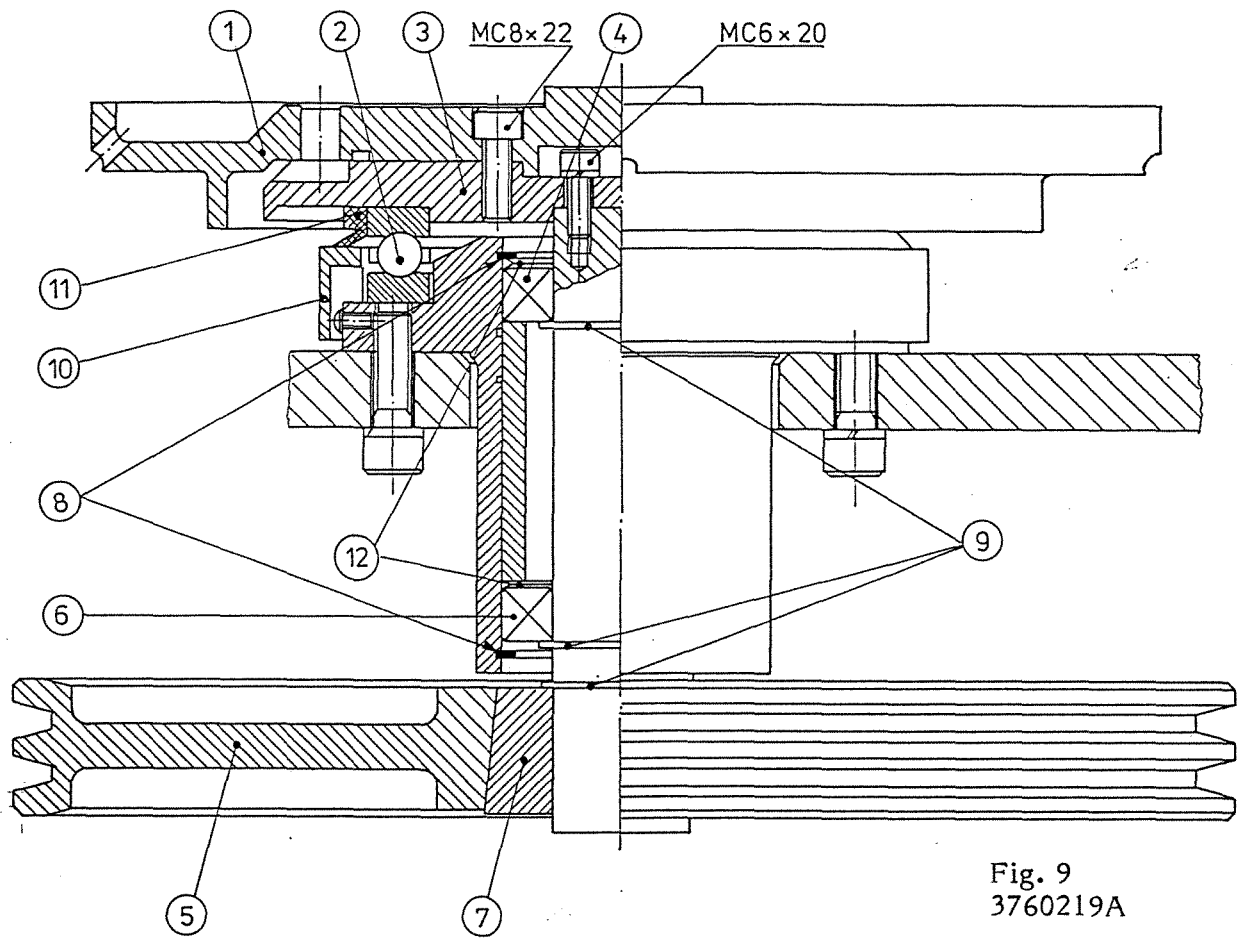


Fig. 9
3760219A

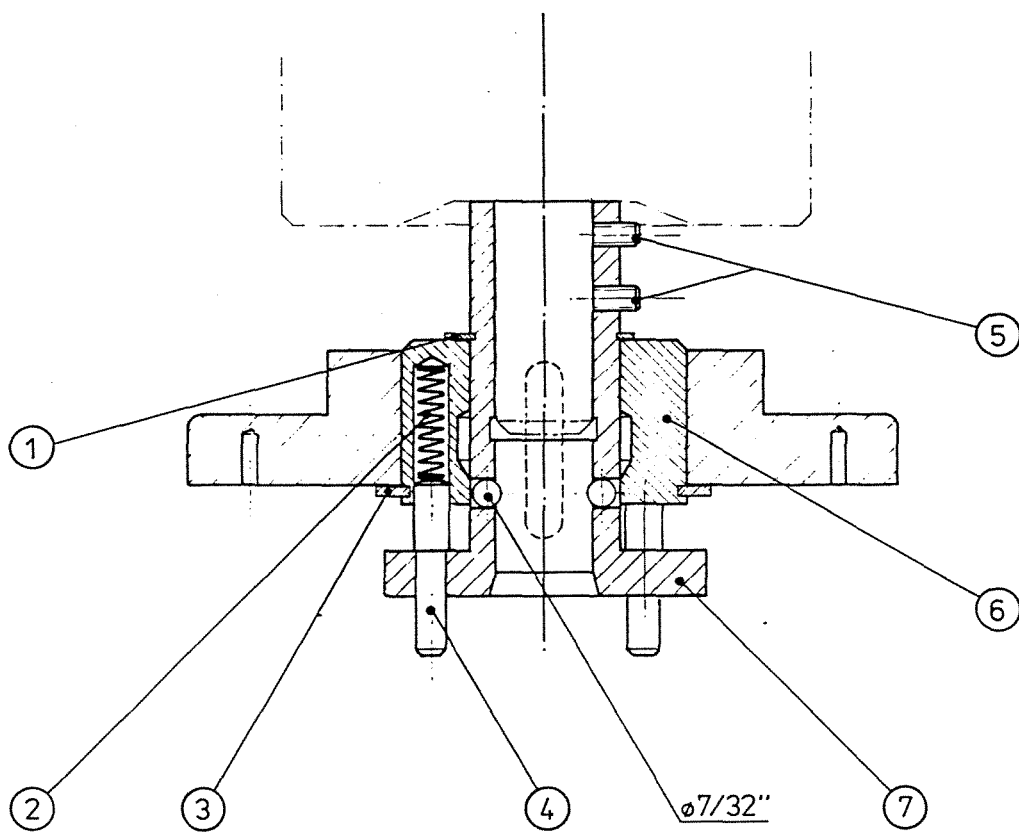


Fig. 10
376-M-222R

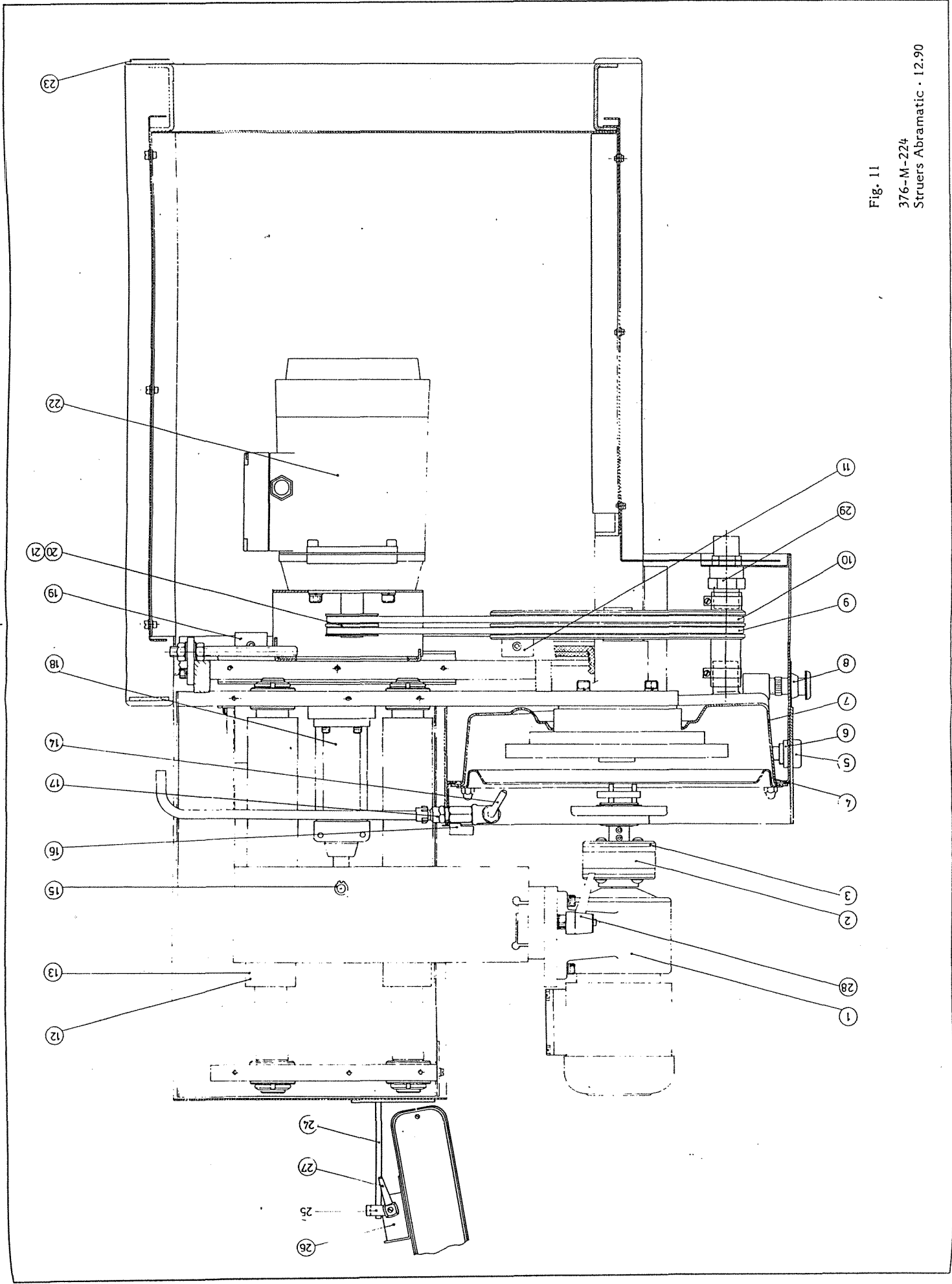


Fig. 11

376-M-224
Struers Abramatic • 12.90

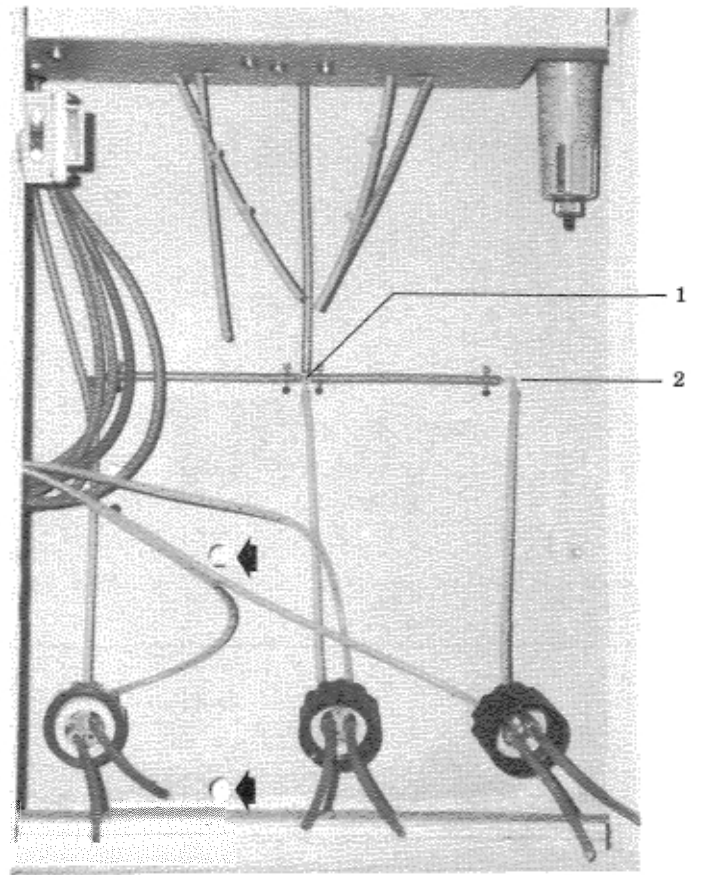


Fig. 12

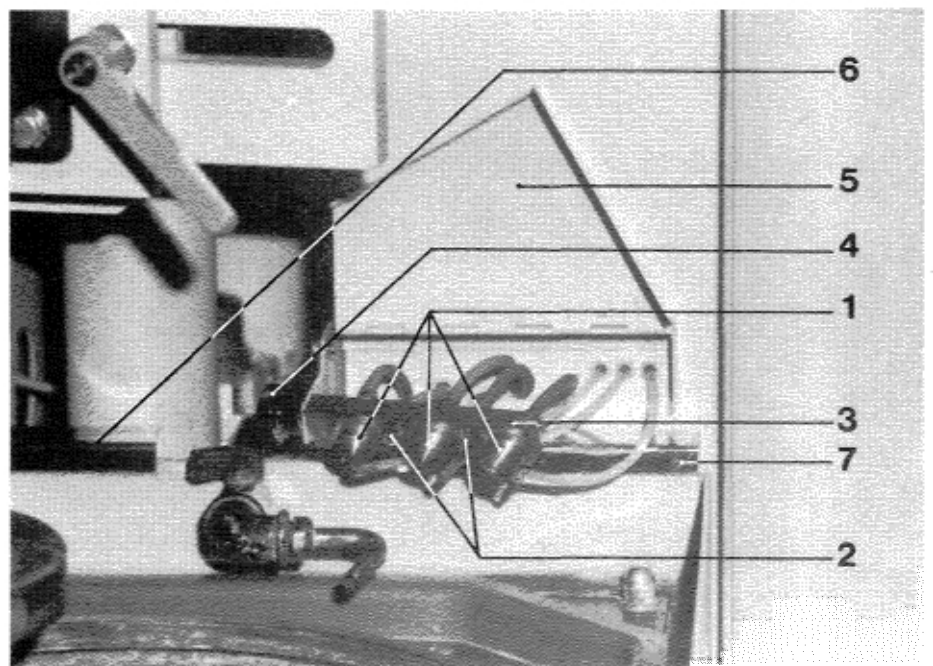
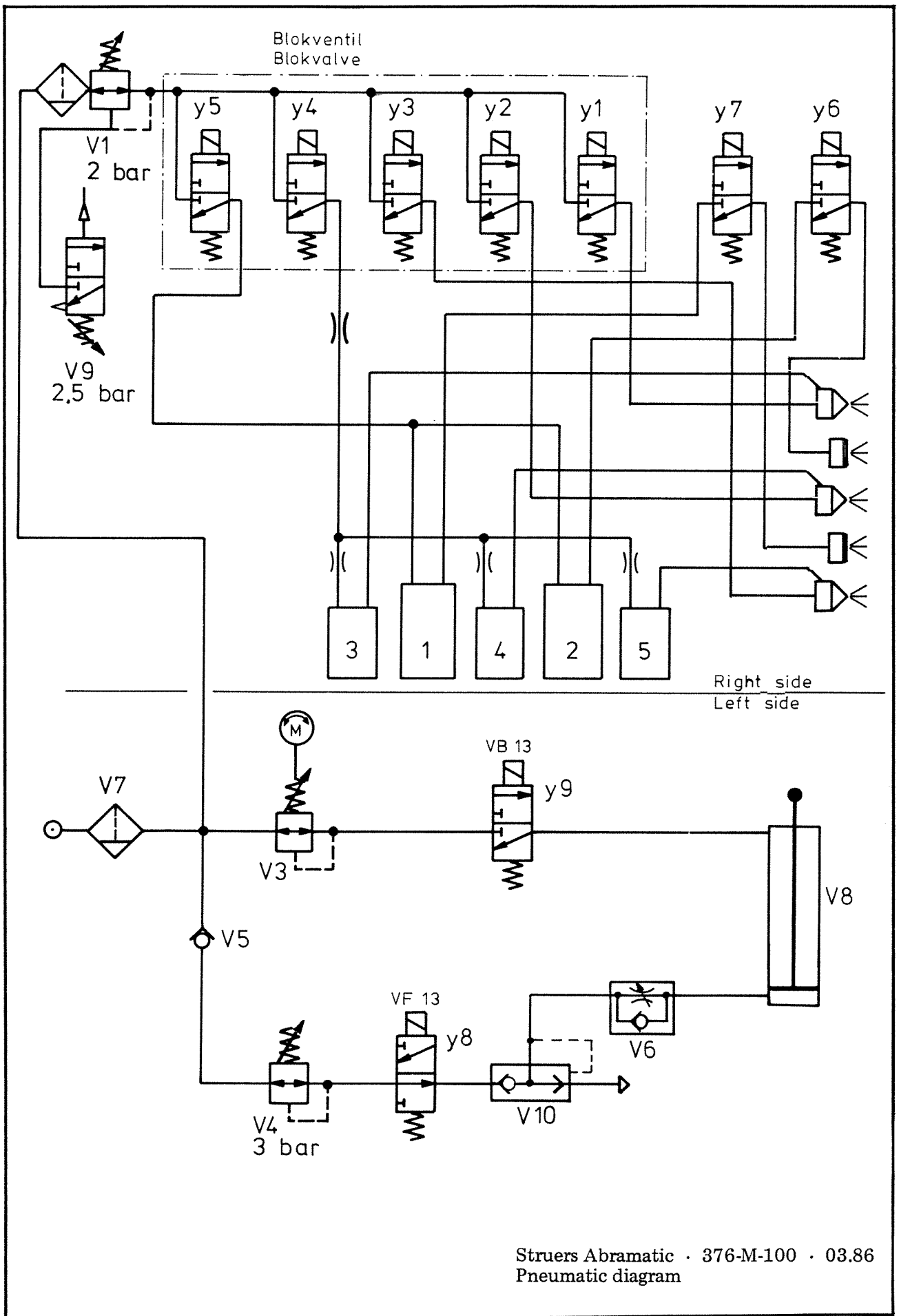
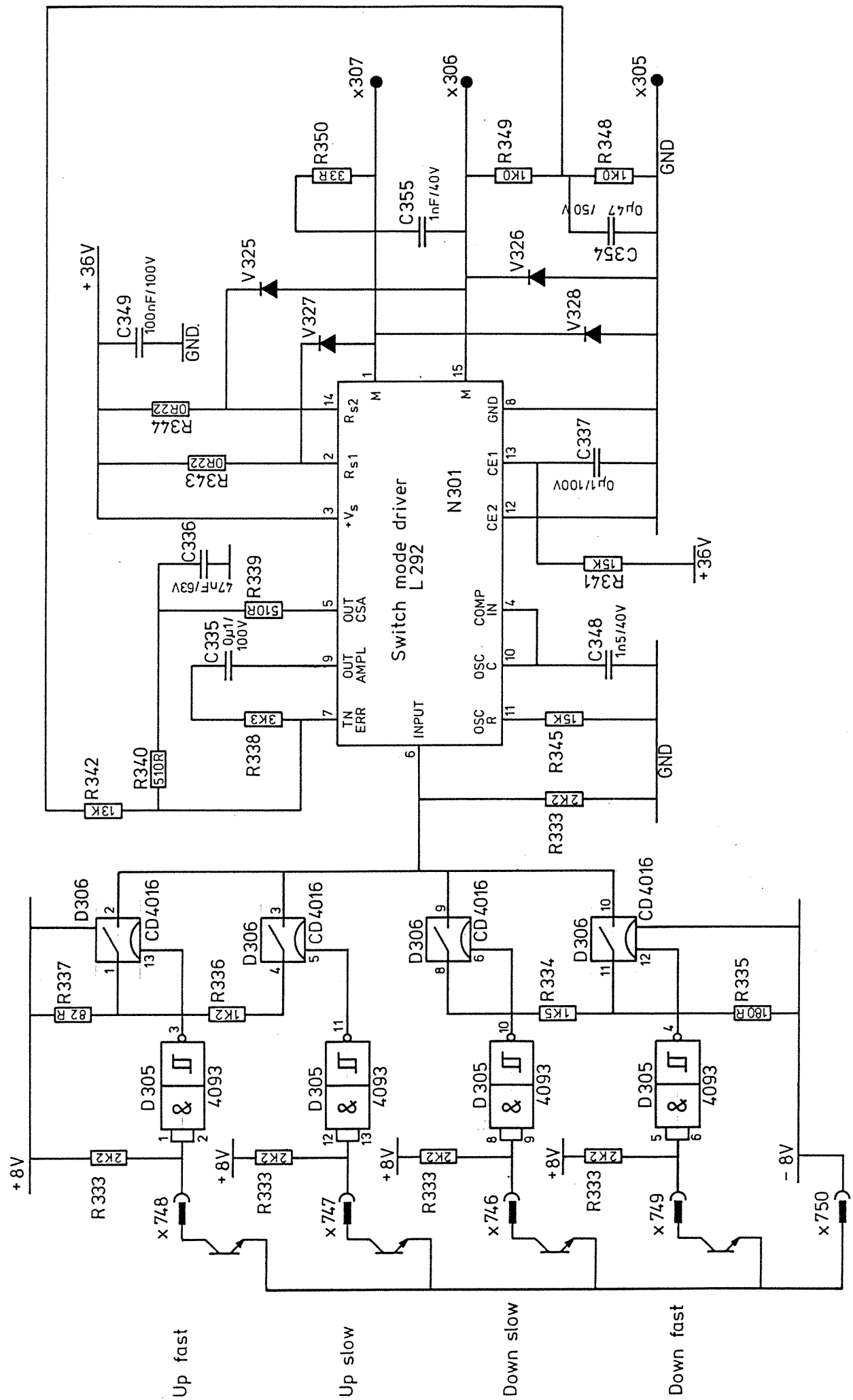
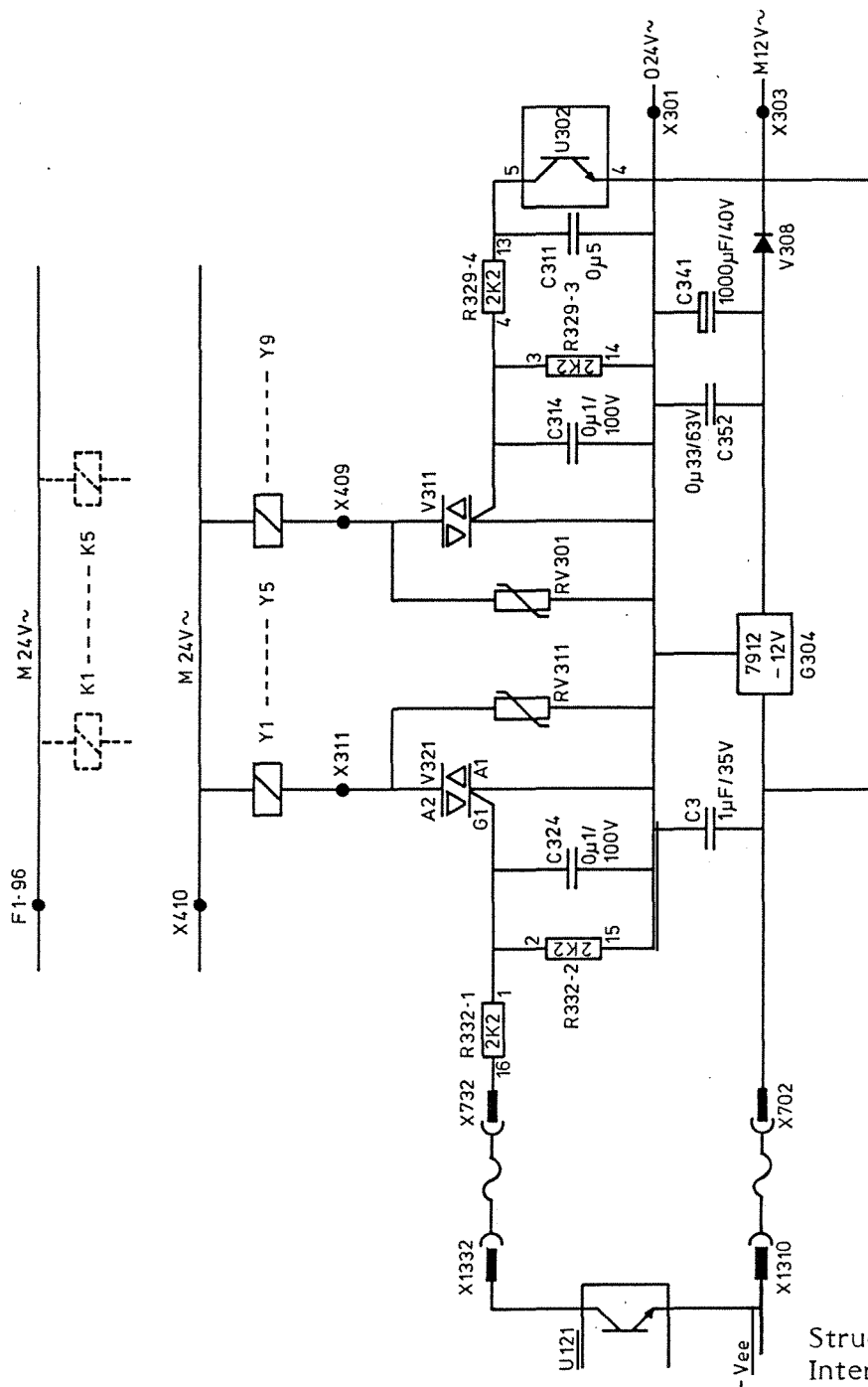


Fig. 13





Struers Abramatic • 3760182A • 05.90
Interface output

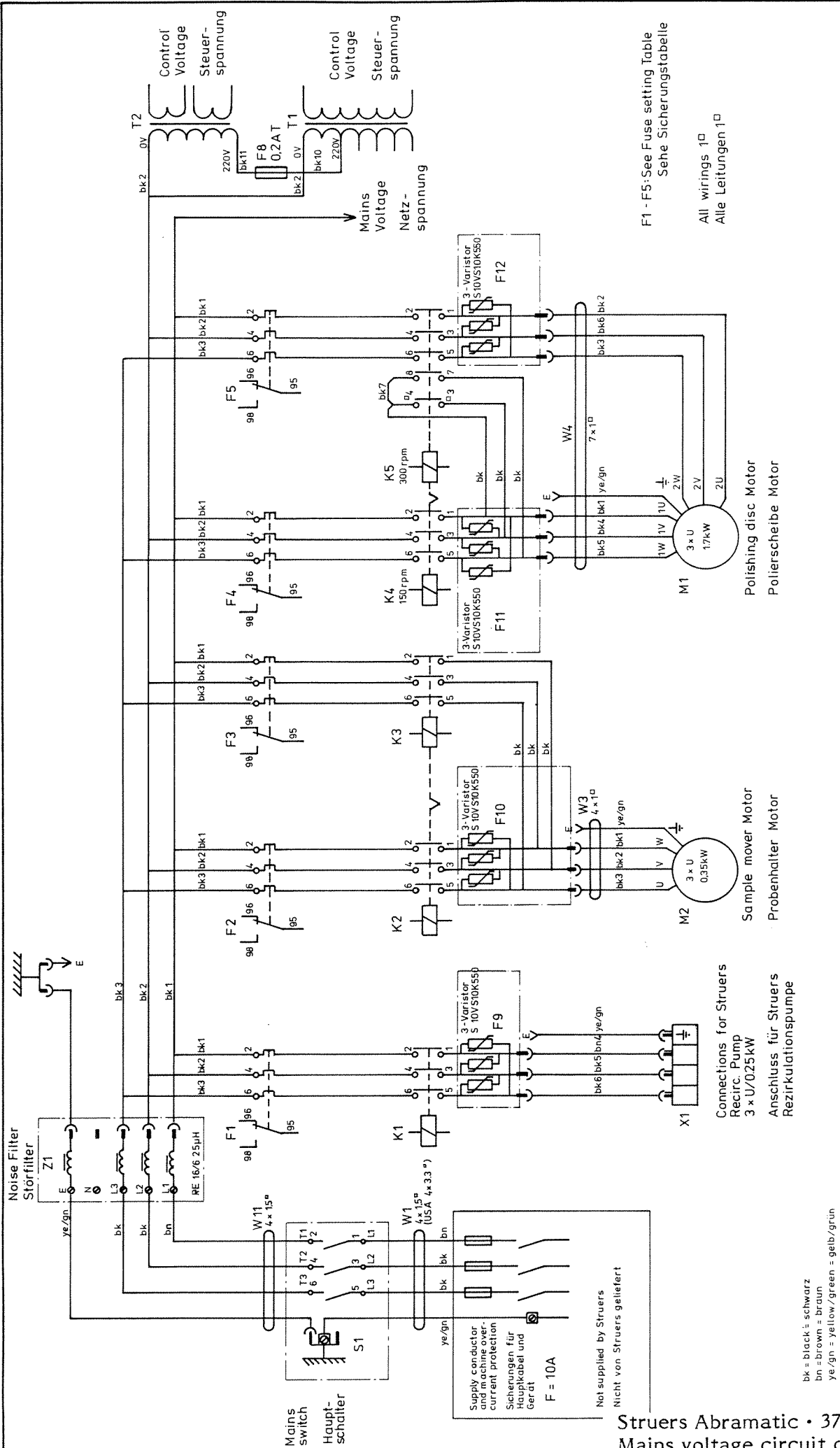


X 13--	X 7--	GATE R -1, -2	GATE C	RV --	TRIA X V	X3--T0 X4--T0	K Y
X1313	X 715	R 331-7/8	C 323	RV 310	V 320	X 312	Y 2
-- 31	-- 731	-- 5/6	-- 322	-- 309	-- 319	-- 401	-- 3
-- 12	-- 714	-- 3/4	-- 321	-- 308	-- 318	-- 402	-- 4
-- 14	-- 716	-- 332-3/4	-- 325	-- 312	-- 322	-- 310	-- 6
-- 33	-- 733	-- 5/6	-- 326	-- 313	-- 323	-- 309	-- 7
-- 16	-- 728	-- 330 3/4	-- 316	-- 303	-- 313	-- 407	-- 9
-- 34	-- 711	-- 329 7/8	-- 315	-- 302	-- 312	-- 408	Y 8
-- 15	-- 717	-- 332 7/8	-- 327	-- 314	-- 324	-- 308	K 1
-- 29	-- 729	-- 330 5/6	-- 318	-- 305	-- 315	-- 405	-- 2
-- 35	-- 712	-- 3/4	-- 317	-- 304	-- 314	-- 406	-- 3
-- 11	-- 713	-- 7/8	-- 319	-- 306	-- 316	-- 404	-- 5
X1330	X 730	R 331 1/2	C 320	RV 307	V 317	X 403	K 4

Struers Abramatic • 3760189A • 05.90
Interface output

T00.00 I00.00

LUB. 02 - 20	1 04 - 20	7 08 - 20	80 - 20	▲ 40 - 20	▲ 20 - 20	▲ 10 - 20
ABR. 02 - 10	2 04 - 10	8 08 - 10	RET. 80 - 10	▼ 40 - 10	▼ 20 - 10	▼ 10 - 10
02 - 08	3 04 - 08	9 08 - 08	80 - 08	40 - 08	20 - 08	10 - 08
WATER 02 - 04	4 04 - 04	10 08 - 04	FRW 80 - 04	TIME 40 - 04	ROT. 20 - 04	R.P.M. 10 - 04
02 - 02	5 04 - 02	08 - 02	80 - 02	FORCE 40 - 02	ABR. 20 - 02	LUB. 10 - 02
DISC. 02 - 01	6 04 - 01	08 - 01	STOP 80 - 01	BOTTLE 40 - 01	20 - 01	TEXT 10 - 01



F1 - F5: See Fuse setting Table
 Siehe Sicherungstabelle

All wirings 1^o
 Alle Leitungen 1^o

Connections for Struers
 Recirc. Pump
 3 x U/025kW
 Anschluss für Struers
 Rezirkulationspumpe

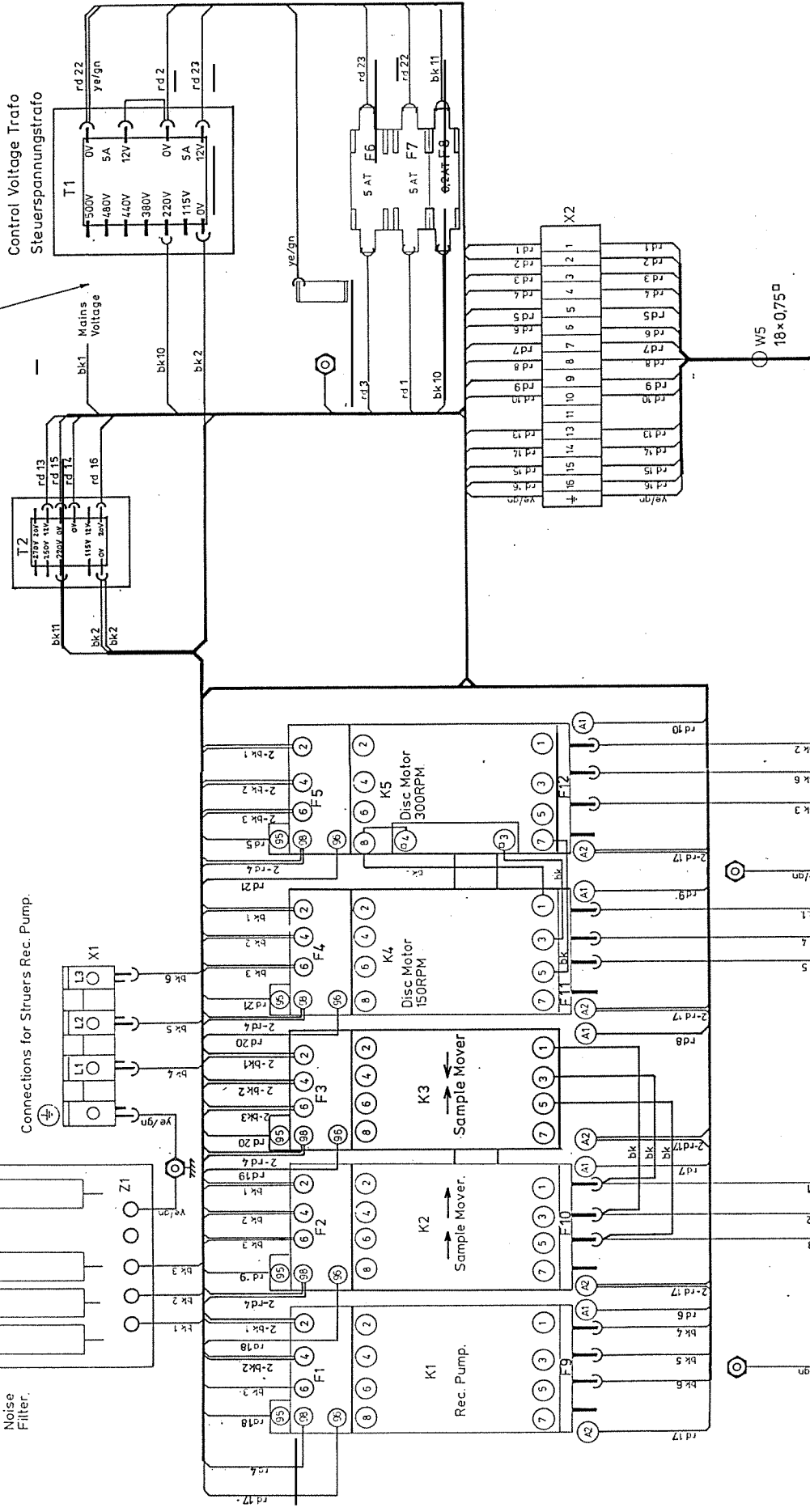
Sample mover Motor
 Probenhalter Motor

Polishing disc Motor
 Polierscheibe Motor

bk = black = schwarz
 bn = brown = braun
 ye/gn = yellow/green = gelb/grün

Struers Abramatic • 3760290 • 09.89
 Mains voltage circuit diagram
 Netzspannung-Schaltplan
 3 x 220-500 V/50-60 Hz

Ved 220V, samles sort 1 & 10 med Espa 05563

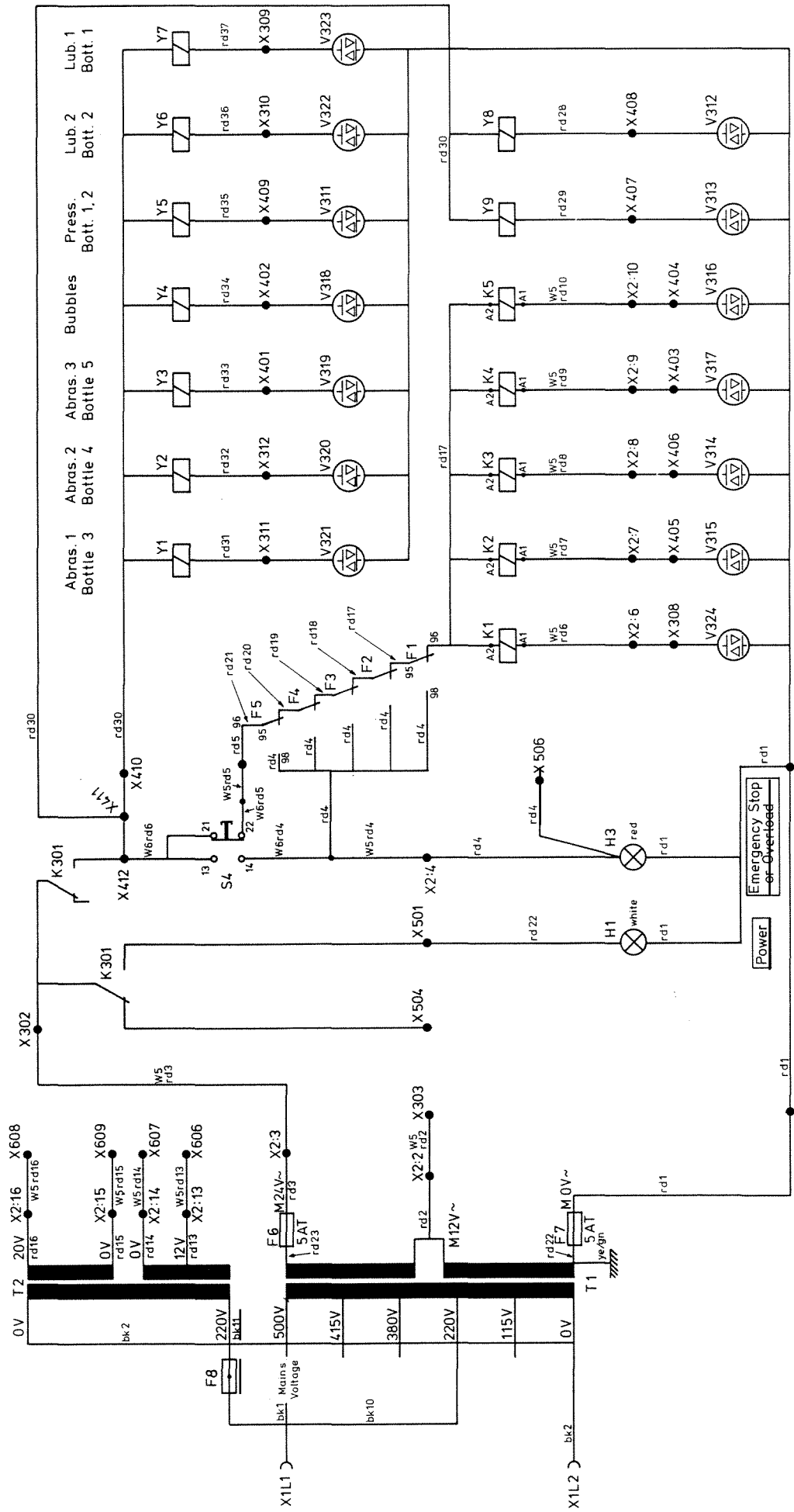


Connections for Struers Rec. Pump.

Noise Filter.

bk = black-schwarz
rd = red-rot
ye/gn = yellow/green = gebl/grun

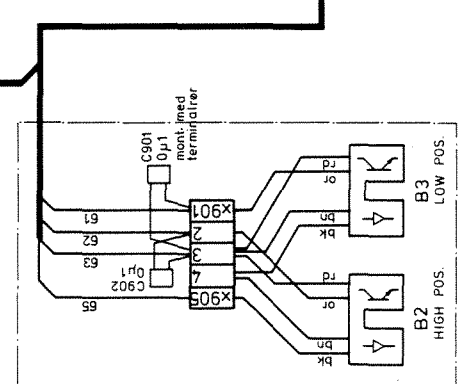
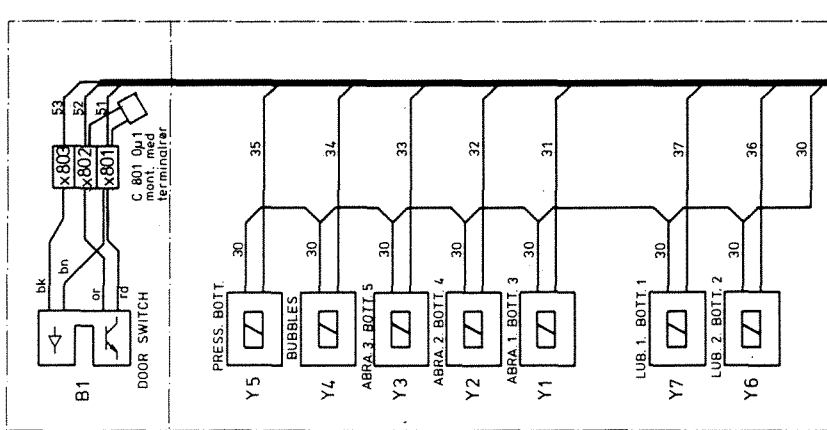
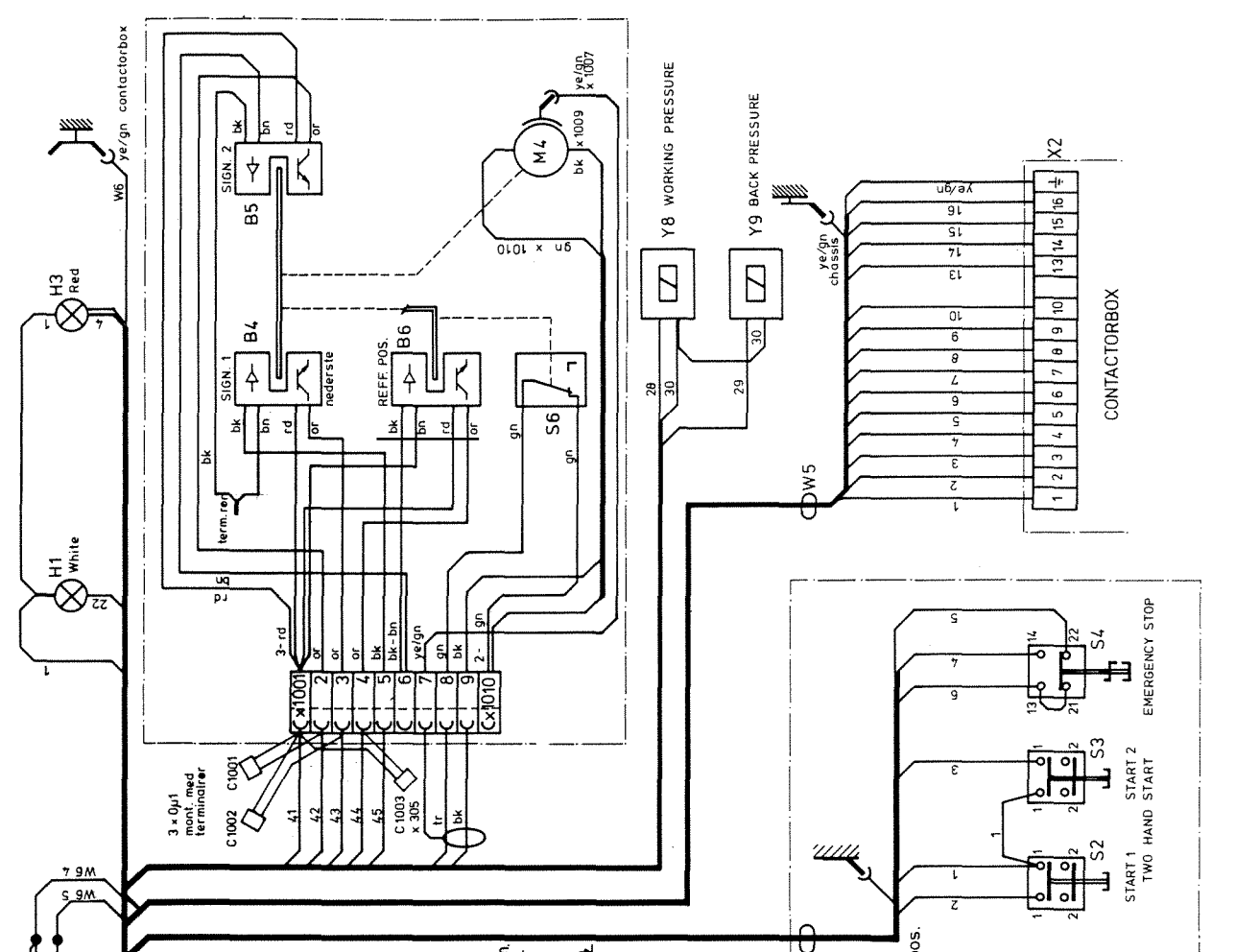
Ikke ang. nummer.	✓
Ikke ang. betegnelse.	±
Målestik	Overmålestik
STRUERS A/s	
Abramatic	
Name B./J. K.	
Date 20.7.89	
Emit. A76-0117 1/2 F1	
Kode	Ans. type
	Færdiggørelse
	Wiring Diagram
	Contactor Box
	3760291 B



All wirings 1^o

Emergency Stop or Overload

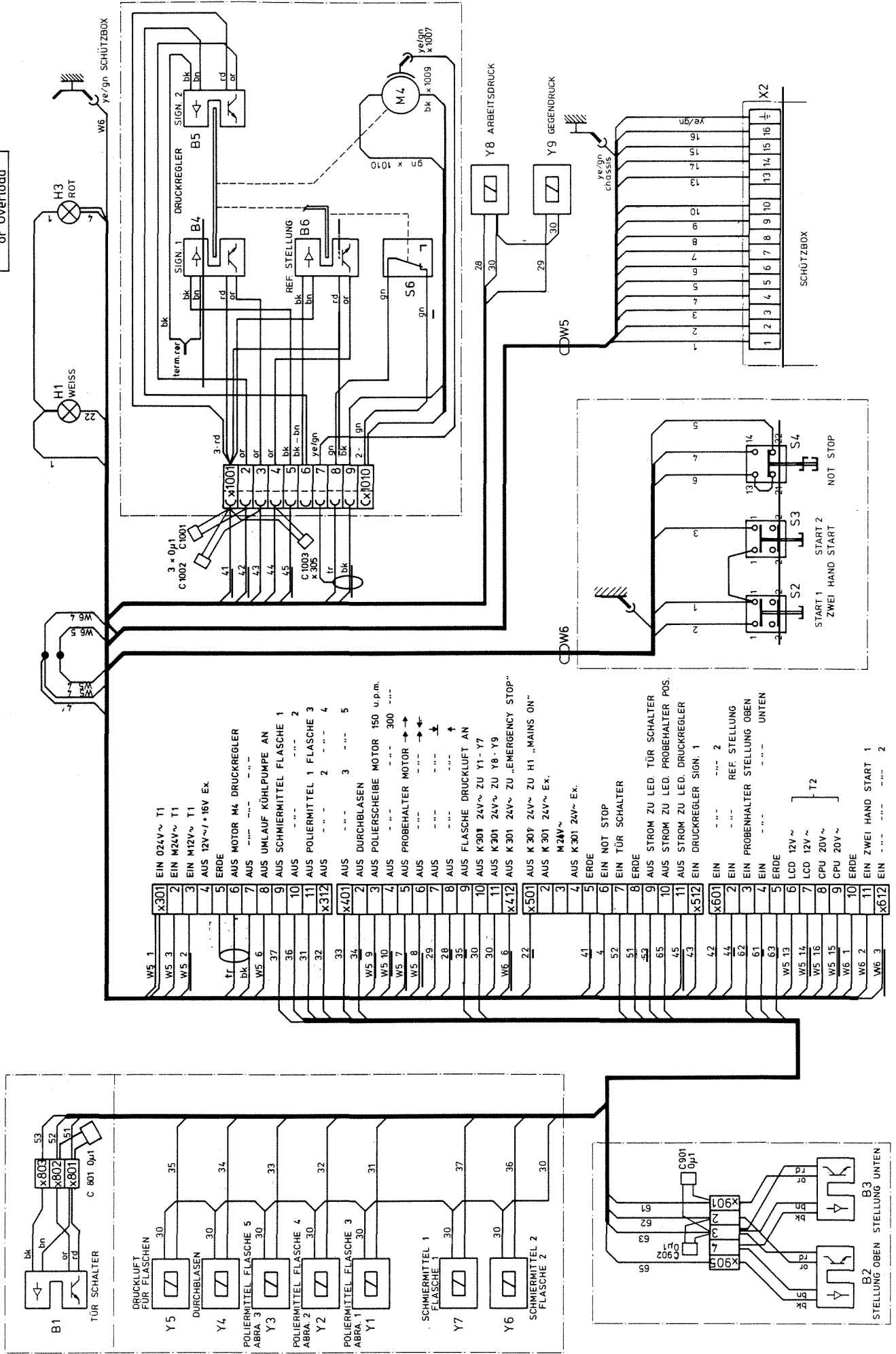
Power



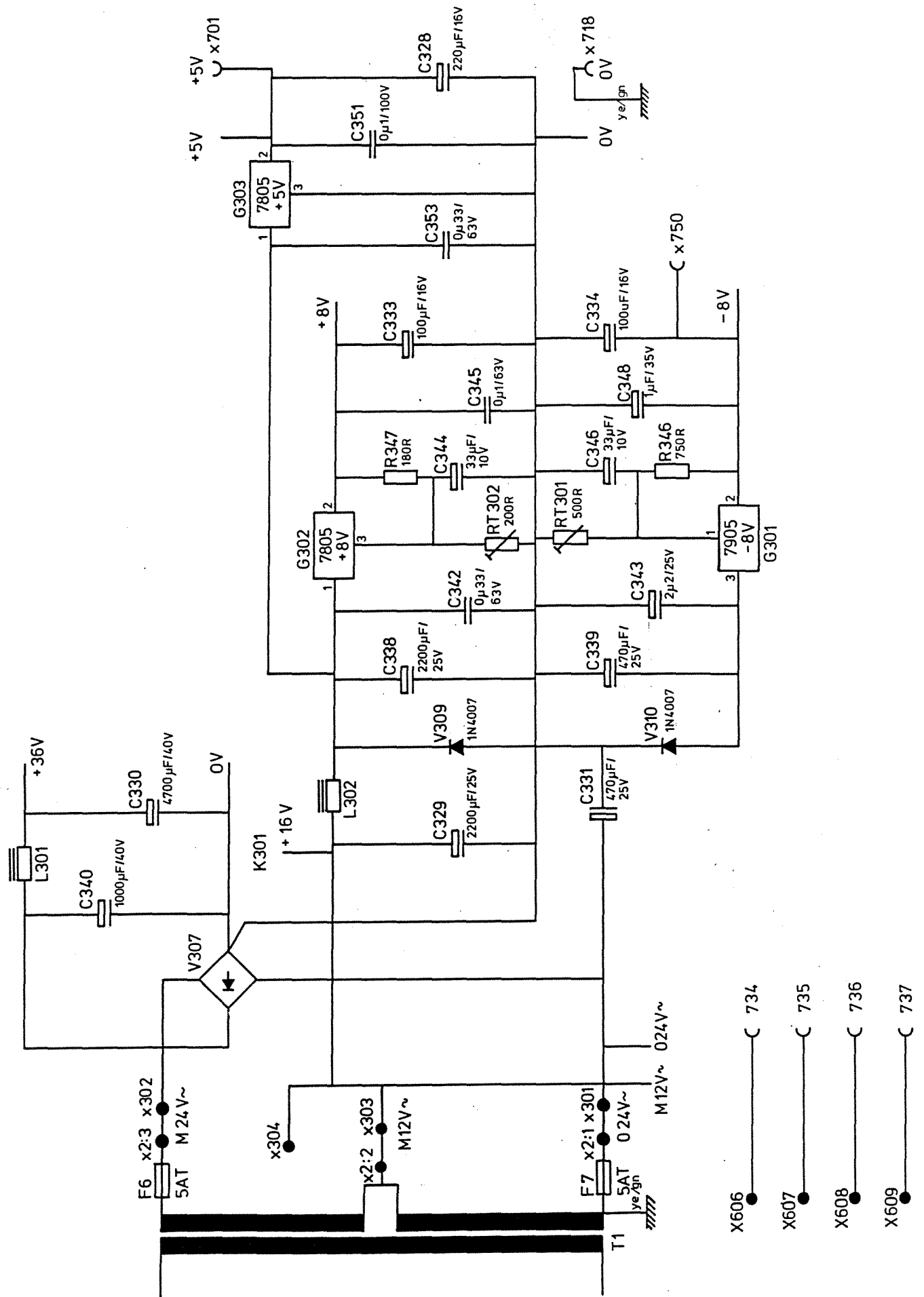
W5 1	X301	IN 024V~ T1
W5 3	2	IN M24V~ T1
W5 2	3	IN M12V~ T1
tr	4	OUT 12V~/+16V Ex
bk	5	GND
W5 6	6	OUT Motor M4 press reg.
36	7	OUT Recirc. pump on
37	8	OUT Lubricant bott. 1
31	9	OUT Lubricant bott. 2
32	10	OUT Abrasive 1 bott. 3
X312	11	OUT Abrasive 2 bott. 4
33	X401	OUT Abrasive 3 bott. 5
34	2	OUT Bubbles
W5 9	3	OUT Polishing disc. motor 150 rpm.
W5 10	4	OUT Polishing disc. motor 300 rpm.
W5 7	5	OUT Sample mover motor
W5 8	6	OUT working press.
29	7	OUT back press.
28	8	OUT Bottle pressure on
35	9	OUT K301 24V~ to Y1-Y7
30	10	OUT K301 24V~ to Y8-Y9
30	11	OUT K301 24V~ to emerg. stop
W6 6	X412	OUT K301 24V~ to M24V~ ex.
22	X501	OUT K301 24V~ ex.
41	2	OUT K301 24V~ ex.
4	3	GND
52	4	IN Emergency stop
51	5	IN Door switch
53	6	GND
65	7	OUT Power to LED door switch
45	8	OUT Power to LED samp. mover pos.
43	9	OUT Power to LED press reg.
X512	10	IN Press reg. sign. 1
42	X601	IN Press reg. sign. 2
44	2	IN Press reg. ref. pos.
61	3	IN Sample mover pos. high
62	4	IN Sample mover pos. low
63	5	GND
W5 13	6	LCD 12V~ T2
W5 14	7	LCD 12V~ T2
W5 16	8	CPU 20V~
W5 15	9	CPU 20V~
W6 1	10	GND
W6 2	11	IN Two hand start 1
W6 3	X612	IN Two hand start 2

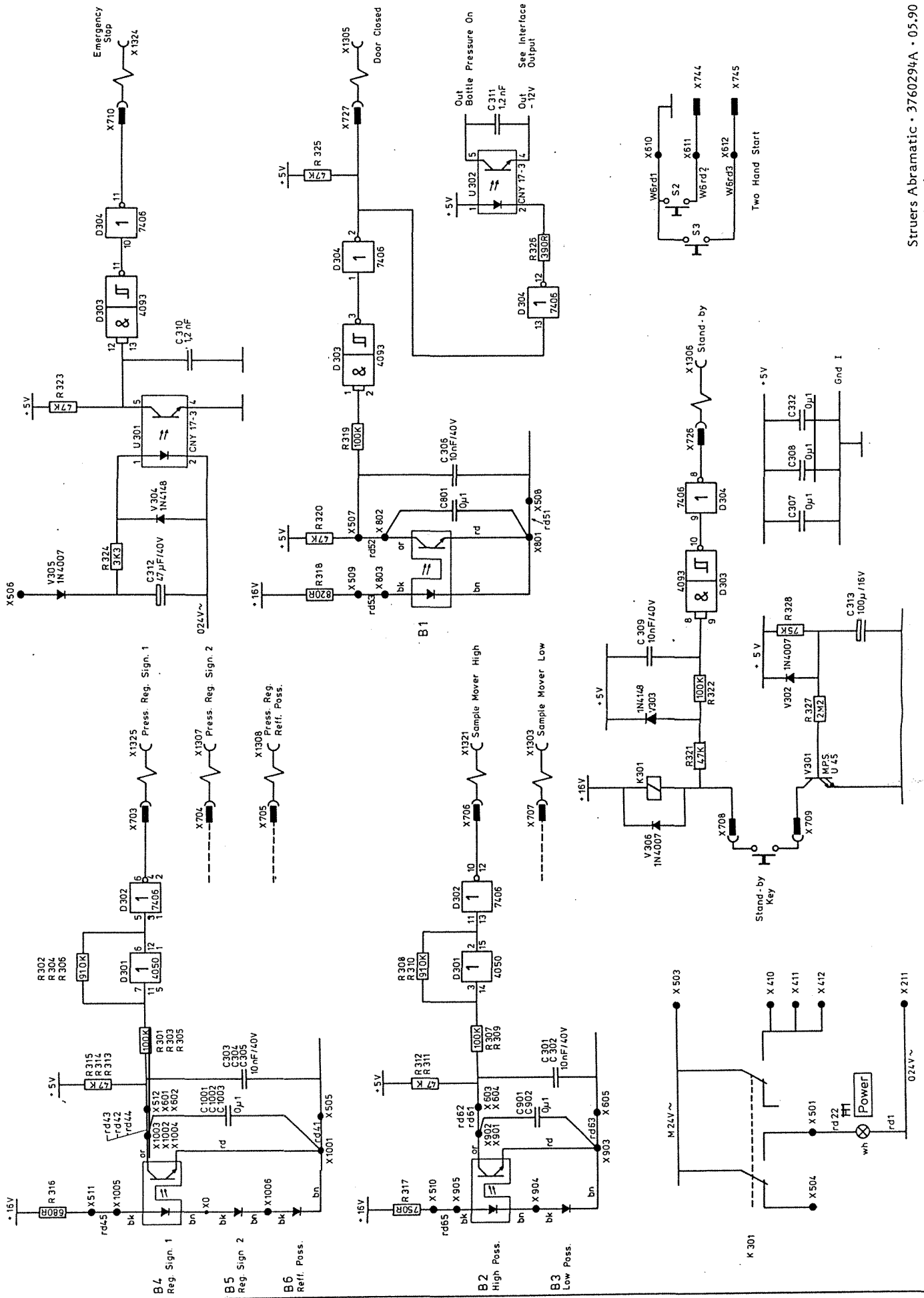
Emergency Stop or Overload

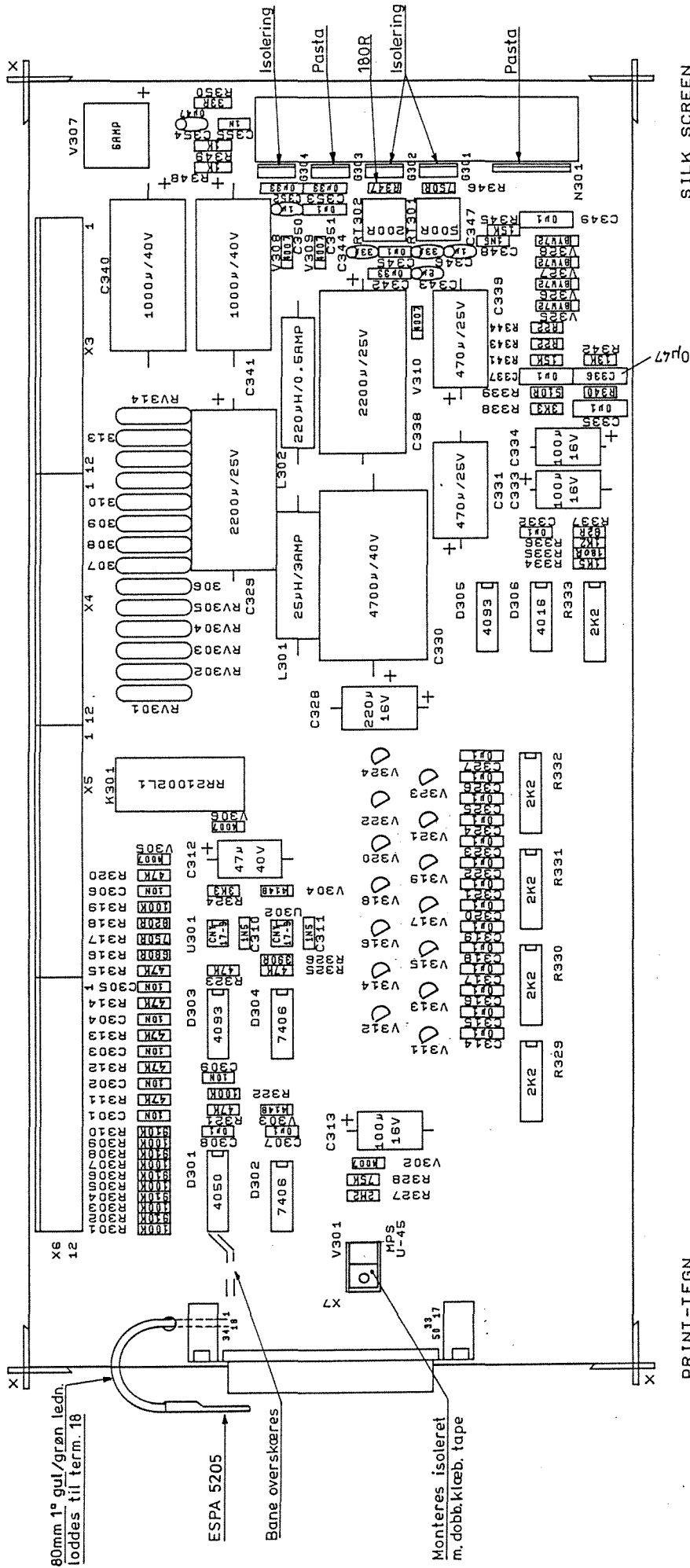
Power



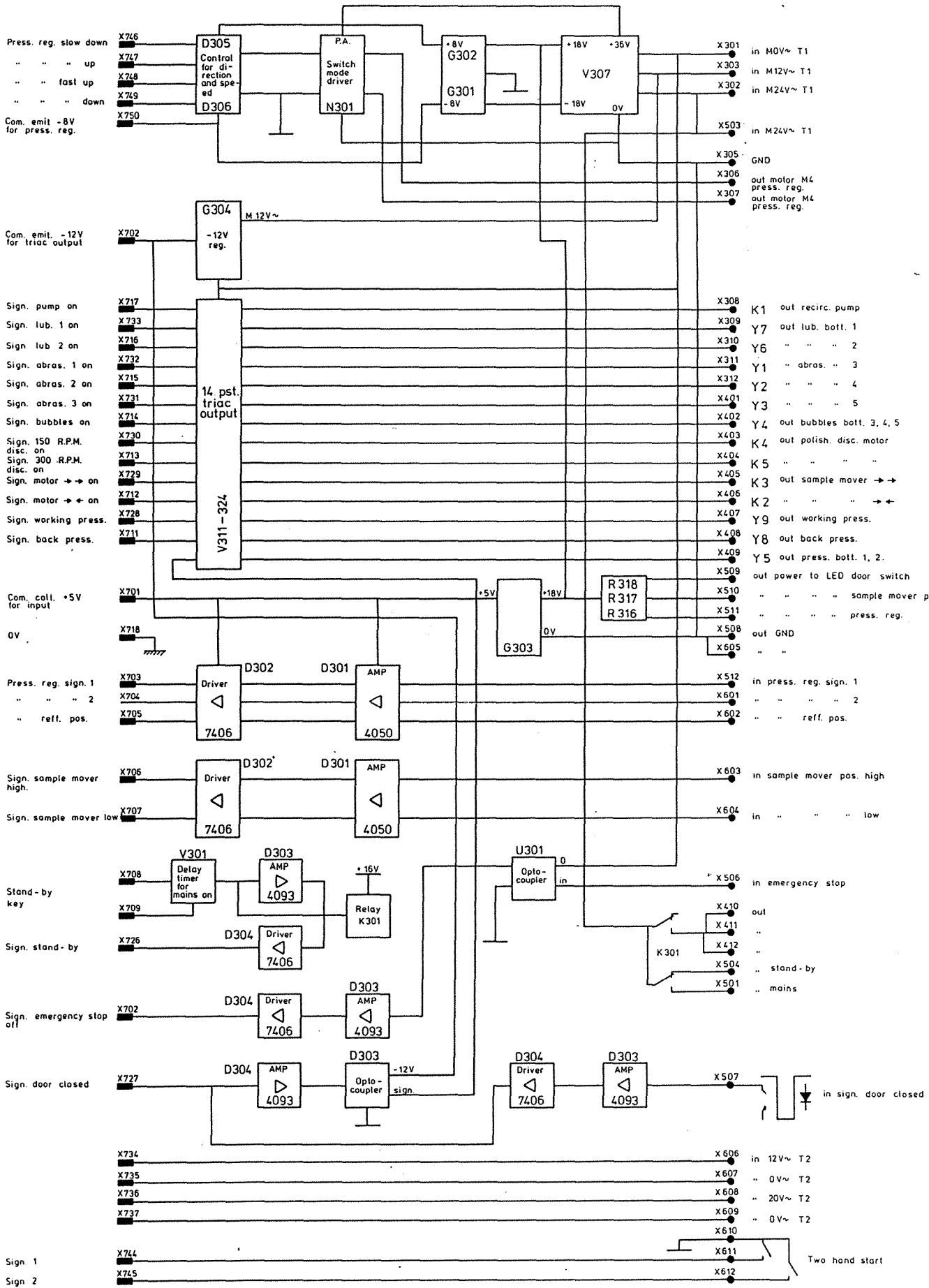
- | | |
|-------|------------------------------------|
| X301 | EIN 024V~ T1 |
| W5 3 | EIN M24V~ T1 |
| W5 2 | EIN M12V~ T1 |
| 4 | AUS 12V~/+16V Ex. |
| 5 | ERDE |
| 6 | AUS MOTOR M4 DRUCKREGLER |
| 7 | AUS |
| 8 | AUS UMLAUF KÜHLPUMPE AN |
| 9 | AUS SCHMIERMITTEL FLASCHE 1 |
| 10 | AUS |
| 11 | AUS POLIERMITTEL 1 FLASCHE 3 |
| 32 | AUS |
| X312 | AUS |
| 33 | AUS |
| X401 | AUS |
| 2 | AUS DURCHBLASEN |
| 3 | AUS POLIERSCHIBE MOTOR 150 u.p.m. |
| W5 10 | AUS |
| W5 7 | AUS |
| 5 | AUS PROBEHALTER MOTOR → |
| W5 8 | AUS |
| 29 | AUS |
| 28 | AUS |
| 35 | AUS |
| 30 | AUS FLASCHE DRUCKLUFT AN |
| 10 | AUS K301 24V~ ZU Y1 - Y7 |
| 11 | AUS K301 24V~ ZU Y8 - Y9 |
| X412 | AUS |
| W6 6 | AUS |
| X501 | AUS K 301 24V~ ZU H1 „MAINS ON“ |
| 2 | AUS K 301 24V~ Ex. |
| 3 | M24V~ |
| 4 | AUS K 301 24V~ Ex. |
| 5 | ERDE |
| 4 | EIN NOT STOP |
| 52 | EIN TÜR SCHALTER |
| 51 | ERDE |
| 53 | ERDE |
| 65 | AUS STROM ZU LED. TÜR SCHALTER |
| 10 | AUS STROM ZU LED. PROBEHALTER POS. |
| 45 | AUS STROM ZU LED. DRUCKREGLER |
| 43 | EIN DRUCKREGLER SIGN. 1 |
| X512 | EIN |
| 42 | EIN |
| 44 | EIN |
| 62 | EIN |
| 61 | EIN |
| 63 | EIN |
| W5 13 | ERDE |
| 6 | LCD 12V~ |
| W5 14 | LCD 12V~ |
| W5 16 | LCD 12V~ |
| 8 | CPU 20V~ |
| W5 15 | CPU 20V~ |
| W6 1 | ERDE |
| W6 2 | EIN |
| W6 3 | EIN |
| X612 | EIN |



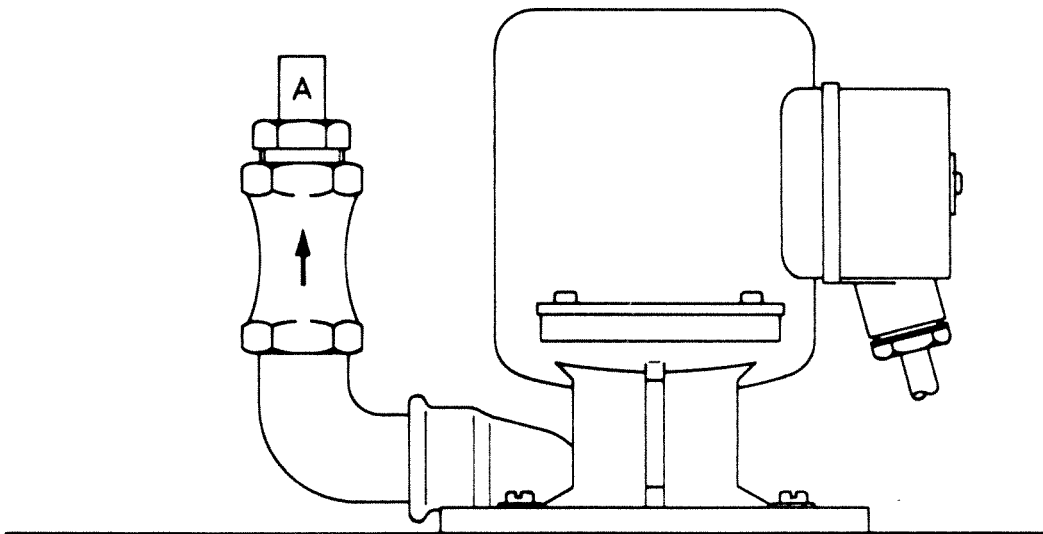
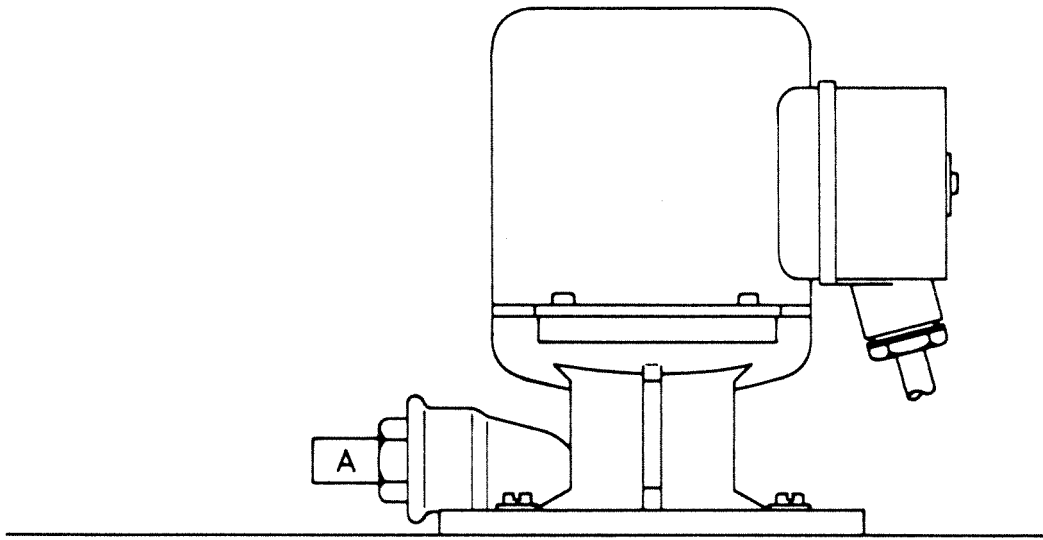




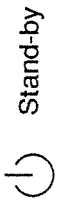
PRINT-TEGN
 JSTRU02
 831005



Struers Abramatic • 3760303 • 05.90
Block diagram interface



Struers Abramatic • 260-M-655 • 09.89
Mounting of non-return valve
Recirculating of cooling unit



Stand-by

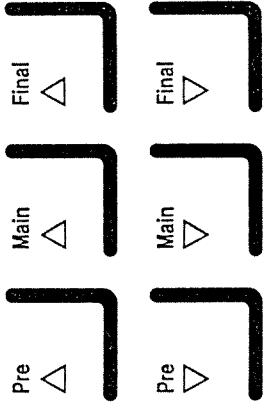
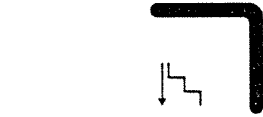
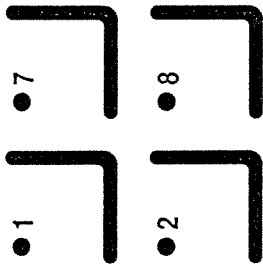
No.

1 ●



Struers Abramatic

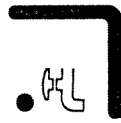
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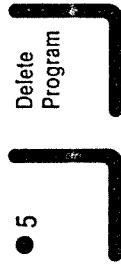
3 ●



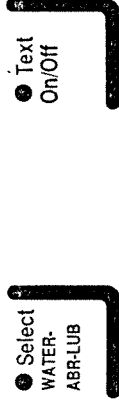
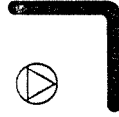
Data



4 ●



5 ●



1. Manual/
Manuelle/
Manuel


2. Program/
Programm/
Programme


3. Step/
Stufe/
Etape


4. Step data/
Stufendaten/
Programmation


5. Step No./
Stufe Nr./
No. d'étape

Pictograms/ Piktogramme/ Pictogrammes

 Lubricant/
Lubrikant/
Lubrifiant

 Abrasive/
Suspension/
Suspension

 Water/
Wasser/
Eau


 Disc 150 rpm/
Scheibe 150 U/m/
Disque 150 t/m


•1 to •10 Program/
Programm/
Programme

= Transfer of program/
Programm kopieren/
Transfer de programme

Delete program/
Programm löschen/
Effacement de programme

 Stop/
Stopp/
Arrêt


 Step back/
Stufe wiederholen/
Répétition d'étape

 Step forward/
Stufe auslassen/
Omission d'étape

 Time/
Zeit/
Temps

 Force/
Kraft/
Pression

•Select water/
Wasser wählen/
Selection d'eau

 Counter rotation/
Entgegengesetzte Richtung/
Contre-rotation

• Text/
Text/
Texte