Abrapol-2

Instruction Manual

Struers

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Table of Contents **Page**

Always state *Serial No* and *Voltage/frequency* if you have technical questions or when ordering spare parts. You will find the Serial No. and Voltage on the type plate of the machine itself. We may also need the *Date* and *Article No* of the manual. This information is found on the front cover.

The following restrictions should be observed, as violation of the restrictions may cause cancellation of Struers legal obligations:
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Abrapol-2
Safety Precaution Sheet

To be read carefully before use

1. The operator should be fully aware of the use of the machine according to the instruction manual.

2. The machine must be placed in an adequate working position.

3. Be sure that the actual voltage corresponds to the voltage stated on the side of the machine. The machine must be earthed.

4. Be sure that the water connections are without leaks. The main water supply should be turned off if you leave the machine unattended.

5. Make sure that the specimens in the specimen holder are securely fixed.

6. Keep clear of the preparation disc when operating.

7. If you observe malfunctions or hear unusual noises - stop the machine and call technical service.

The equipment is designed for use with consumables supplied by Struers. If subjected to misuse, improper installation, alteration, neglect, accident or improper repair, Struers will accept no responsibility for damage(s) to the user or the equipment.

Dismantling of any part of the equipment, during service or repair, should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).

User's Guide

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1. Installation

2. Operation

1. Installation

Checking the Contents of Packing

In the packing box you should find the following parts:

Abrapol-2

1 Abrapol-2 complete with inlet hose and cable
1 Splash ring
1 Lid
1 Non-return valve for recirculating Cooling Unit
1 Outlet hose
1 Fitting for outlet hose
2 Hose clamps for outlet hose
1 Hose for compressed air
1 Hose connection for compressed air
2 Hose clamps for compressed air
1 Hexagon key, 2.5 mm
20 Program Cards
1 Instruction Manual

Checking the Contents of Packing of Accessories

Recirculation Cooling Unit

1 Recirculation Cooling Unit
1 Drain angle
1 Funnel
20 Plastic bags

Dosing Unit (DOTWO)

1 Bottle holder plate
1 Nylon Strap
4 Screws M5x10
1 Screw M4x8
4 Washers M5
1 Washer M4
2 Lubricants
3 Suspensions

Solenoid Valve

1 Solenoid valve with mounting plate
1 Clamp for inlet hose
2 Washers
2 Screws (M5x10)

Drip Lubricator

1 Lubricant bottle
1 Mounting plate with valves and bottle holder
2 Screws (M5x10)
2 Washers (M5)

Microstop

1 Microswitch with mounting box
2 Screw (M5x10)
3 Screws (M5x16)
3 Washers (M5)
1 Cable clamp
1 Washer (M4)
1 Screw (M4x8)
1 Hexagon key (4 mm)
1 Micrometer screw
1 Instruction Manual

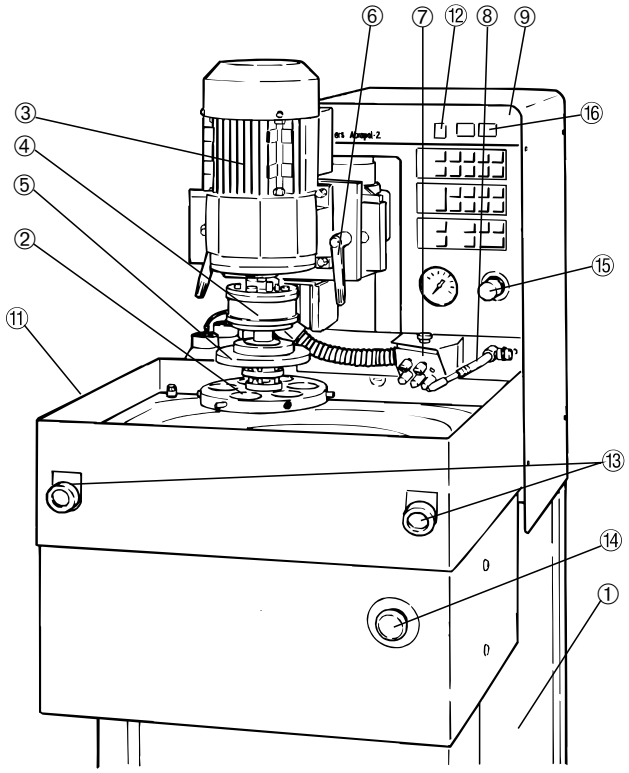
Placing Abrapol-2

Abrapol-2 should be placed on a plane and horizontal floor. The machine must be placed close to the power supply, water mains and water outlet facilities.

Getting Acquainted with Abrapol-2

Front of Abrapol-2

Take a moment to familiarise yourself with the location and names of the Abrapol-2 components.



① Base unit
② Specimen holder
ℜ Specimen holder motor
℘ Quick-clamping device
⊗ Quick coupling flange
⊕ Handle for adjusting specimen holder position
∅ Nozzle block
⑧ Cooling water
⑨ Front panel
⑪ Main Switch (left-hand side of cabinet)
⑫ Standby
⑬ Double start buttons
⑭ Emergency stop
⑮ Force selector
⑯ Display

Supplying Power

IMPORTANT
Check that the mains voltage corresponds to the voltage stated on the type plate on the side of the machine.

- Mount a plug on the electric cable and connect it as follows:

Yellow/green: earth
Black/brown: phase

Direction of Rotation

Check that the preparation disc rotates counter-clockwise. If not change the two phases.

Supplying Compressed Air

- Connect the compressed air supply with the inlet on the rear side of the machine by means of the air hose and the hose connection delivered with the machine.
- Fasten the air hose with a hose clamp.

The pressure supply should be 6 bar and should be supplied either from a central compressor, portable compressor with compressed air reservoir or compressed-air bottle. A capacity of 20 l/min at atmospheric pressure is sufficient.

Mounting a Recirculation Cooling Unit (Accessory)

- Place the recirculation cooling unit on either side of the machine where you find it the most convenient.
- Mount the non-return valve on the pump of the recirculation cooling unit.
- Mount the inlet hose from the machine on the non-return valve.
- Connect the electric cable from the pump to the machine.
- Mount the outlet hose on the underside of the tank.
- Mount the drain angle on the other end of the outlet hose by means of the hose fitting and lead it down into the hole of the recirculation cooling unit.
- Check that there is a steady fall on the whole course of the outlet hose.
- Place a plastic bag in the tank and fill with water and additive.

Mounting a Solenoid Valve (Accessory)

If no recirculation cooling unit is mounted on Abrapol-2 a solenoid valve must be mounted instead:

- Fasten the solenoid valve on the rear side of the machine by means of two screws with washers.
- Connect the electric cable to the machine.
- Cut the inlet hose at a distance of 100 mm from the machine and connect the part still fixed on the machine to the inlet of the valve and connect one end of the cut off part to the outlet of the valve and the other end to the water tap.

Mounting a Dosing Unit (Accessory)

- Mount the dosing box on the left side of Abrapol-2 by means of screws.
- Loosen the nozzle plate and screw the nozzle holder firmly on the front plate of the machine. Fasten the nozzle plate again.
- Connect the compressed air hose on the rear side of the machine.
- Connect the plug on the rear side of the machine and fasten the cable with the nylon strap, screw and washer.
- Place the bottle support under the bottle box.
- Place the bottles, fill them, and connect them with the tubing.

Lubricant 1:	blue lubricant
Lubricant 2:	red lubricant
Suspension 1:	DP-Suspension, highest grain size
Suspension 2:	DP-Suspension, medium grain size
Suspension 3:	DP-Suspension, lowest grain size

IMPORTANT
Only use Struers suspension in the dosing unit.

Mounting a Drip Lubricator (Accessory)

- Fasten the mounting plate on the arm for the specimen holder motor by means of the two screws with washers.
- Connect the plug to the machine.
- Fill the bottle with lubricant and place it in the lubricator.

Mounting Microstop (Accessory)

- Fasten the microswitch to the left side of the machine by means of screws.
- Connect the plug to the rear side of the machine and fasten the cable with the cable clamp, the screw and washer.
- Clamp the micrometer screw in the holder and mount the holder to the arm for the specimen holder motor by means of screws and washers.

2. Operation

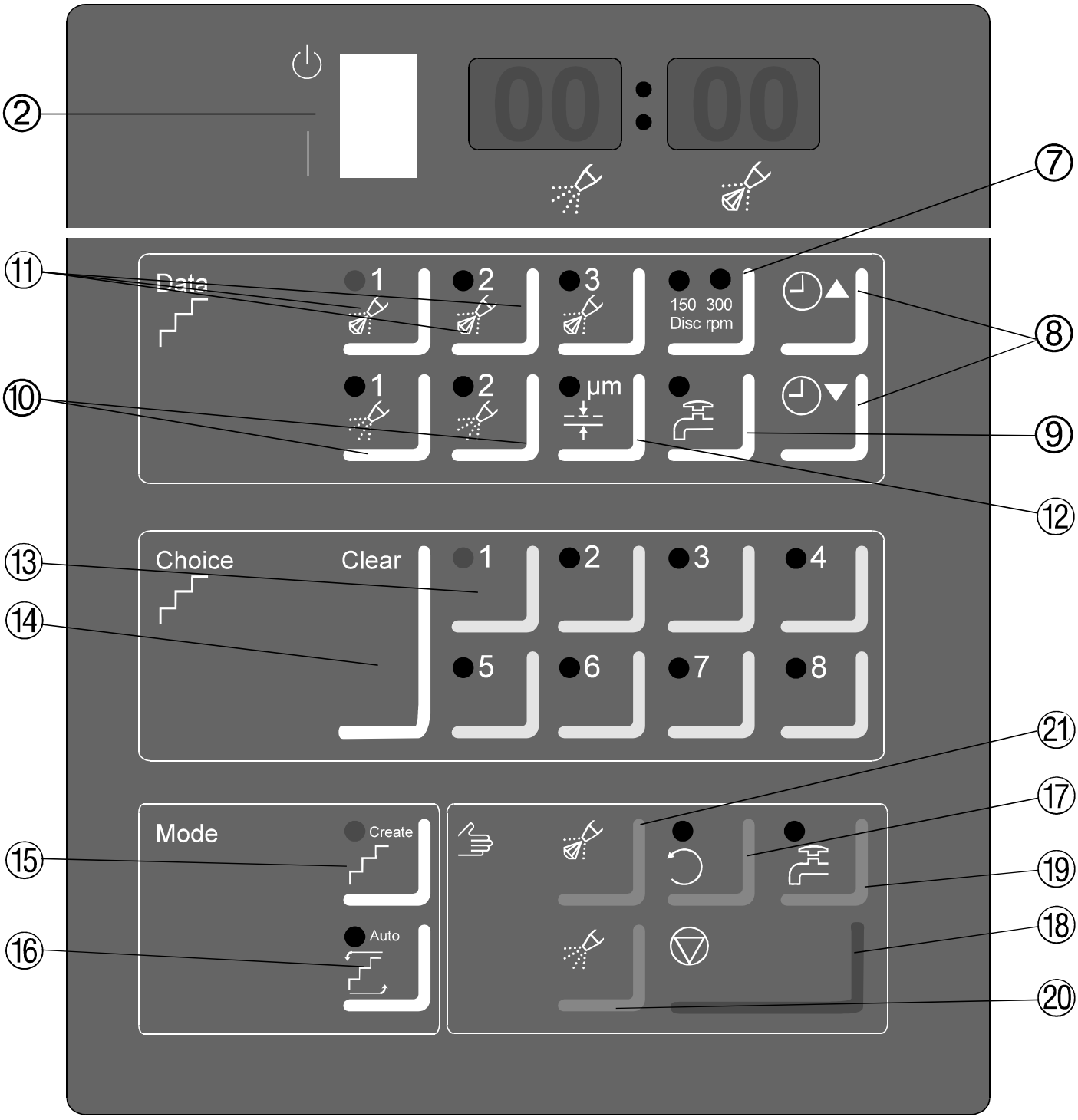
Using the Controls

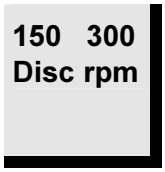
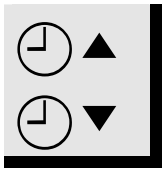
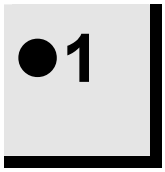
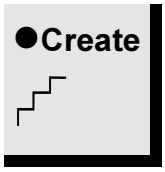
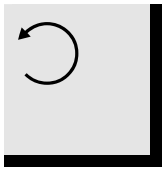
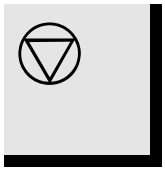
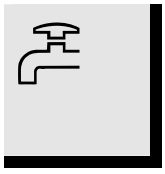
Buttons/Adjusting Knobs

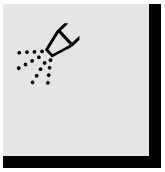
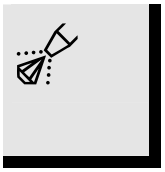
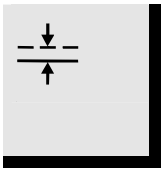
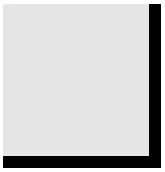
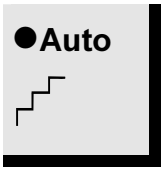
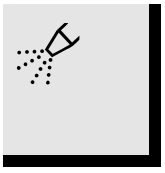
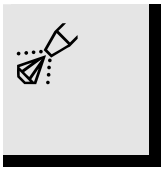
See section Getting aquainted with Abrapol-2 for location of buttons.

Name	Key	Function	Name	Key	Function
Buttons/Adjusting Knobs (See Drawing of Abrapol-2)					
MAIN SWITCH	⑪	Turns on/off the main power of the machine. The main switch is located on the left-hand side of the machine.	EMER GENCY STOP	⑭	Interrupts all functions. The specimen holder remains in lower position until the emergency button is released by pulling the button.
STAND-BY	⑫	On/Off switch for daily use.	FORCE SELECTOR	⑮	For setting the required force. The pre-set force can be read on the manometer.
DOUBLE START	⑬	Starts the preparation process. Press the double start button simultaneously until the specimen holder starts rotating.	DISPLAY	⑯	For reading the pre-set time of grinding/polishing.

Front Panel Keys



Name	Key	Function
Data		
⑦ SPEED		Sets the speed of disc. Choose between 150 rpm and 300 rpm.
⑧ TIME UP/ DOWN		Increases (🕘▲) or decreases (🕘▼) the preparation time.
⑨ WATER		Activates the water flow. Remember to adjust the flow on the water tap.
CHOICE		
⑬ STEP KEYS		8 keys for programming the individual preparation steps. With these keys a complete preparation method can be transfered to the machine memory.
MODE		
⑮ CREATE		To program a preparation step CREATE mode should be activated.
MANUAL FUNCTIONS		
⑰ DISC		The disc starts rotating independently of the specimen holder.
⑱ STOP		The machine is stopped at any time during the preparation process. By restart the machine will start from the point where the preparation was interrupted.
⑲ WATER		Activates the water supply. Remember to adjust the flow on the water tap.

Name	Key	Function
⑩ LUBRI-CANT		Activates the dosing of lubricant. Choose between bottle 1-2.
⑪ SUSPEN-SION		Activates the dosing of suspension. Choose between bottle 1-3.
⑫ MICRO-STOP		Activates Microstop.
⑭ CLEAR		The present preparation sequence is deleted when AUTO is activated.
⑯ AUTO		When transferring a preparation method or if you want to clear a sequence AUTO mode should be activated.
⑳ LUBRI-CANT		Activates the dosing of the selected lubricant.
21 SUSPEN-SION		Activates the dosing of the selected suspension.

Program Cards

The program cards supplied with the machine are used for filling in data about the preparation method of a given material. Data about the single preparation step should be stated on the back of the card and data about the material to be prepared as well as information about the preparation disc and force should be stated on the front of the card. The card should be placed on the front panel so that it covers the Choice functions.

Programming a Preparation Step

8 different preparation steps can be programmed individually in regard of time, speed of disc, water, type and dosing of lubricant and suspension. These 8 steps can be combined in a number of different ways so that different materials can be prepared without having to repeat the programming.

- Set the machine to CREATE mode.
- Press the PREPARATION STEP KEY, 1 to 8.
- Set the time by pressing the key TIME UP ▲ or TIME DOWN ▼. The pre-set time can be read on the display.
- Set the speed of disc to either 150 rpm or 300 rpm by pressing the key SPEED respectively on the left side of the key to select 150 rpm and on the right side to select 300 rpm.
  NB! The speed of disc will automatically be pre-set to 150 rpm when an unprogrammed preparation step key is pressed.

When Grinding with Water

- Select water supply by pressing the key WATER.

When Grinding/Polishing with Lubricant

- Select the type of lubricant needed for the step by pressing one of the two LUBRICANT keys Lub.1 or Lub.2.
- When one of the lubricant keys has been activated the display (left) shows level 0. Set the dosing level (0-10) by pressing the selected lubricant key again. Each time you press, the dosing level increases (see table below for Recommended Dosing Levels).
- Select the suspension needed for the step by pressing one of the three SUSPENSION keys Susp.1 , Susp.2, or Susp.3.
- When one of the suspension keys has been activated the display (right) shows level 0. Set the dosing level (0-10) by pressing the selected suspension key. Each time you press, the dosing level increases (see table below for Recommended Dosing Levels).

Recommended Dosing Levels

The table gives examples of recommended dosing levels for 7 different polishing cloths with different resilience. Remember that these examples are Struers recommendations and therefore adjustments may be needed according to the requirements of the specimens to be prepared.

Name of Cloth	Recommended Dosing Levels	
	Lubricant	Suspensions
DP-Plan	3	5
DP-Pan	3	5
DP-Dur	6	5
DP-Dac	6	5
DP-Plus	8	5
DP-Mol	8	5
DP-Nap	8	5

Editing a Preparation Step

- Set the machine to CREATE mode.
- Press the key for the preparation step which should be edited.
- Enter the required changes by means of the Data Keys.

Transferring a Preparation Method

- Place the program card for the material to be prepared on the two pins on the front plate so that is covers the Choice Program. The keys can be activated through the card and a light diode shows when a key is selected.
- Press AUTO mode.
- Press CLEAR to cancel existing step sequence.
- Select a preparation method by pressing the relevant PREPARATION STEP KEYS in the correct sequence. The light diode for the first selected step turns green and the following steps turn red indicating that the step to be activated when the machine is started is the step with the green light. The programmed data for this step can now be read on the data keys.

Editing a Preparation Method

- Set the machine to AUTO mode.
- Press CLEAR to delete any existing sequence.
- Select a new sequence with the PREPARATION STEP KEYS.

Mounting a Preparation Disc

- Place the disc on the turntable and move it until the three pins engage with the holes in the turntable.

Inserting the Specimen Holder

- Place the specimen holder under the quick coupling.
- Press and hold the black flange of the column down with your thumbs while guiding the pressure tap of the specimen holder into the coupling.
- Release the black flange.
- Turn the specimen holder until the three pins engage with the corresponding holes.

Adjusting the Specimen Holder Position

The position of the specimen holder has to be adjusted correctly in relation to the preparation disc to get the best possible preparation results.

- Loosen the two handles placed on each side of the specimen holder motor.
- The specimen holder motor can now be moved manually to the sides. The eccentricity can be read on the scale placed on the specimen holder motor.
- When the correct position is found fasten the handles again.

Adjusting the Force

- Turn the adjusting knob Ⓕ to set the required force.

Starting the Preparation Process

- Start the preparation step by pressing the two start buttons simultaneously until specimen holder starts rotating.

When grinding with Water

- Regulate the water flow on the tap.

When Grinding/Polishing with Lubricant

- Adjust the dosing valve of the drip lubricator.
- The remaining time of preparation can be read on the display.

Stopping the Preparation Process

When the time has elapsed the preparation disc will automatically stop and the specimen holder will return to its initial position. The light diode for the next preparation step in the sequence turns green. The machine is now ready for the next step.

- A preparation step can be stopped at any time during the process by pressing the key STOP ▽ in Manual Functions.

Setting Microstop

- Press the key MICROSTOP in the Data field.
- Press both start buttons. The specimen holder is activated independently of the disc and moves downwards without being rotated.
- Turn the micrometer screw clockwise until STOP is read on the display.
- Press the key STOP. The specimen holder moves upwards to its initial position.
- Turn the micrometer screw counter-clockwise corresponding to the required removal.

IMPORTANT
When Microstop is activated the machine does not automatically proceed to the next step. Press the key STOP and the next step will switch from red to green.

Manual Functions

Manual operations are possible as the disc can run independently of the specimen holder. The manual functions are found on the lower right corner of the front panel indicated with.

- Start the disc separately by pressing the key DISC .The disc will operate according to the pre-set speed 150 rpm or 300 rpm as indicated with a light diode.

When Grinding with Water

- Start the flow of water independently of a preparation step by pressing the key WATER in Manual Functions. If lubricant and suspension are selected in the Data Program water cannot be selected.

When Grinding/Polishing with Lubricant

- To be able to give manual dosing of lubricant and suspension you should first choose the type of lubricant and suspension you want to use in the data field and also set the dosing level.
- You can now press the key LUBRICANT and the key SUSPENSION in Manual Functions. The dosing will be at maximum for as long as the key is pressed.
- Stop the disc and water by pressing the key STOP or by pressing the key DISC and the key WATER.

Reference Guide

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1. Accessories and Consumables

Specification	Code
Cooling unit Recirculating cooling unit, complete, 3-phased	TRECI
Additive Bottle with 1 litre additive for cooling fluid	ADDUN
Dosing unit Dosing unit for 2 lubricants and 3 suspensions, complete	DOTWO
Water valve Magnet valve for control of tap water supply, complete	ABVEN
Connection Kit for Multidoser Serial no. > 260 1383	MULAT
Drip lubricator Holder for one lubricant bottle, with valve for ON/OFF and mechanical regulation of quantity	ABPYR
Microstop For stopping the process after removal of the required material	ABKRO
Grinding/polishing disc Wet grinding disc, aluminium, for ø305 mm SiC-paper	ROTAL
DP-polishing disc, aluminium ø230 mm (9") ø250 mm (10") ø300 mm (12")	 DETOT DEDIF DEDAL
MD-polishing disc, aluminium ø200 mm (8") ø250 mm (10") ø300 mm (12")	 DEMLA DEMIF DEMAL
Petrodisc-M ø290 mm (8") for 200 mm specimen holder ø230 mm (9") for 160 mm specimen holder	 PETIL PETHA
Specimen holders For many sizes and shapes of specimens. Ask for separate list.	
Table unit for Abraplan or Abrapol-2 With cabinet and trolley for recirculating cooling unit and 1 set of tubes for cooling unit	LABAB
Storage unit For accessories and consumables. The unit consists of 2 chapters, one with 8 drawers, including a drawer with inserts for specimen holders, and another one with 8 shelves.	LABCO
Insert for specimen holders Fits into the specimen holder drawer of the LABCO storage unit	LABOA

Remember...
Struers offers a comprehensive range of consumables for grinding and polishing. Please ask for separate leaflets.

2. Struers Metalog Guide™

Metalog Guide

In Struers Metalog Guide™ you will find a detailed description of grinding/polishing methods for automated mechanical specimen preparation.

Struers Metalog Guide™ offers preparation methods for the most common materials, based on a simple analysis of two key properties: hardness and ductility. Finding the right method is easy, including choice of consumables. Always consult Struers Metalog Guide™ for the correct preparation method for the actual specimens.

Struers Metalog Guide™ contains 6 useful chapters:
Metalogram: a quick and safe guide to the right preparation method.
Metalog Methods: a complete catalogue of preparation methods, based on Struers' vast store of materialographic experience, and employing Struers' range of consumables.
Preparation Philosophy: the basics of modern specimen preparation, seen from a professional point of view.
Metalog Process: the materialographic preparation process from start to finish, logically explained.
Metalog Master: a combined trouble-shooting guide and supply of in-depth information on the processes of mechanical preparation, including an expert system for the solving of preparation problems.
Consumables Specification: quick access to the relevant consumables for the chosen preparation methods.

A complete guide to materialographic specimen preparation. Contact your local dealer for a free copy of Metalog Guide™.

3. Maintenance

Daily

Suspension nozzles

Shake the DP-suspensions lightly every morning. Blow the nozzles free from suspension every night.

Cleaning of nozzles alone

Should be carried out whenever the machine is not operated for more than 4-6 hours:

- Take a bottle of lukewarm water.
- Replace the 1µm suspension bottle with the water bottle. If 1µm suspension is not used, choose the finest diamond suspension used. This should correspond to SUSP. 3.

1. Press Create in MODE.
2. Remove the plastic suspension supply tube from suspension nozzle 3.
3. Manually activate ABRASIVE for 5 seconds with a beaker under the nozzle.
4. Refill tube.
5. Repeat procedure for SUSP. 2 and SUSP. 1.

Weekly

Coolant

Check if the supply of coolant in the tank is sufficient and not too contaminated.

Extended Cleaning of Nozzles and Tubes

Must be performed every week or before breaks longer than 24 hours. The cleaning should be carried out in the following order:

1. Take a bottle of lukewarm water.
2. Replace the 1µm suspension bottle with the water bottle. If 1µm suspension is not used, choose the finest diamond suspension used. This should correspond to SUSP. 3.
3. Press Create in the MODE.
4. Press key for step no. 1 in CHOICE.
5. Press SUSP. 3 in DATA.
6. Press SUSP. in Manual Control and hold a beaker under the nozzle to avoid water splashing on the cloth. Press for 5-10 seconds.
7. Move the bottle with water from 1µm suspension to 3µm suspension. Press SUSP. 2 corresponding to 3µm suspension. Repeat point 6.
8. Repeat point 7 for 6µm, suspension, SUSP. 1.

Yearly

V-belts

Check regularly and at least once a year that the V-belts are tight. Adjust if necessary.

General Cleaning

The machine and the recirculating cooling system should be kept as clean as possible in order to avoid contamination of the specimens.

Cooling Tank

Every time water is changed, the cooling tank should be cleaned carefully to remove all grinding waste. Cleaning will be easier if Struers plastic inserts are used. Remember to add Additive for Cooling Fluid.

IMPORTANT
Do not use benzine or petroleum for cleaning when the additive is used.

Painted Surfaces

Painted surfaces and keyboard should be cleaned with a moist cloth and common household detergents.

IMPORTANT
Never use alcohol, acetone or similar solvents.

Air Filter

The air filter should be cleaned regularly and water in the glass vessel around the filter let out. This is carried out by pressing the button at the bottom of the vessel. Access through hole in the rear plate (fig. 10.3).

Lubricant Nozzles

The lubricant nozzles can be blocked by impurities in the lubricant:

- Remove the nozzle and try to blow it clean with compressed air (blow from the point and inward).
- If this does not help, the nozzle has to be cleaned with a very fine needle under microscope.

Manual Lubrication

Before the nozzle is remounted, the whole system should be washed out by activating the Manual lubricant key.

Lubrication Chart

Point of Lubrication	Lubricant	Interval
Quick coupling	Oil	200 h
Surfaces of columns of up-and-down unit	Oil	200 h
Grinding disc bearing	Grease	2,000 h
Gear of gear motor	Grease	10,000 h or 2 years

Grease: eg. Shell Albida Grease LX

4. Machine Adjustments

The Adjustments listed below are only required after repairs or service.

Adjustment of Counter-pressure

Counter-pressure is the pressure on the primary side of the compressed air cylinder, which counterbalances the weight of the up/down unit. The counter-pressure returns the unit to its initial top position. It is adjusted by a reduction valve (fig. 20b.8). The correct pressure is 2.7 bar (when using air to eliminate hysteresis). Measure with a precision manometer.

Adjustment of Down-speed

The Down-speed is adjusted by an adjustable throttle valve (fig. 10.4), normal position of the valve being approx. 1 3/4 turn from home position. To obtain faster travel, turn the valve approx. 1/4 turn. Screwing the valve beyond the latter 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. When specimens are 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. 10.4) is closed 1/2 to 1 turn to reduce the down-speed.

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 two holes at the left side plate. 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 disc when working at a low process pressure. This may cause problems, particularly with thin specimens, therefore specimens should always protrude approx. 2.5 mm from the specimen holder.

Adjustment of quick-coupling

After loosening the two screws (fig. 19.10) 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 or by the fact that the lock slots of the specimen holder studs have become smooth from wear.

5. Trouble shooting

Error	Cause	Action
Display shows "ES"	The emergency stop button has been activated (Emergency Stop)	Release the emergency stop button by pulling the button.
	One of the motors has been overloaded.	Wait till "ES" disappears from the display. Reduce the grinding and polishing pressure. If "ES" immediately appears again, a phase is missing or the motor is defective.
No suspension escapes the nozzles	The nozzles are blocked.	Clean the nozzles.
	The suspensions do not have the right viscosity	You are using suspensions not manufactured by Struers: Change to the original Struers suspensions. The suspensions are too old: Change the suspensions. The suspension bottles have not been shaken for a long time: Shake the bottles.
Centre of specimen not polished (after previous grinding on Petrodisc-M or diamond grinding disc)	The specimens go too far beyond the outer edge of the grinding disc.	Adjust the position of the specimen holder disc in proportion to the grinding disc.
The polishing suddenly takes more time	The polishing cloth is filled up with removed material.	Change polishing cloth.
	The suspension ability has deteriorated and the diamonds sink to the bottom.	Shake the suspension bottle.
The supply of coolant is inadequate	The cooling pump rotates the wrong way.	Change two phases in the electric connection of the pump.
	There is no water in the tank.	Fill up with water and additive.

Error	Cause	Action
The grinding paper is torn up by contact with the specimens	Excessive grinding pressure.	Reduce the pressure with the reduction valve (fig. 1.7).
	The specimens are not at the same level.	Use Struers levelling apparatus.
	Soft and brittle specimens.	Use adhesive grinding paper or run a dummy specimen over the whole surface of the grinding paper.
	Specimen holder lowered too fast (especially if the specimens project more than 6 mm over the edge).	The speed of the downward movement is controlled by a throttle valve (fig. 20.8). Adjust the speed by turning the screw at the top of the valve, clockwise for decreasing and counter-clockwise for increasing the speed.
	Incorrect adjustment of the shock reduction device in the compressed-air cylinder.	Adjust the screw on the cylinder. Access through the lower hole in the side plate (behind the bottles if doser unit is mounted). Normal setting 1/8 rotation from the starting point.
Display shows NO AIR	Missing or incomplete air supply.	Check that air hoses are tight and properly clamped.
Display defective	Defect in the circuit of the display or defect in the CPU circuit.	Replace the display.

6. Technical Data

Abrapol-2

Voltage/frequency	3 x 200V, 50/60Hz, max. 6.8A 3 x 220V, 50/60Hz, max. 2 A 3 x 380V, 50Hz, max. 3.8 A 3 x 415V, 50Hz, max. 3.6 A 3 x 440V, 60Hz, max. 3.5 A 3 x 480V, 60Hz, max. 3.6 A
Internal fuse	1.6 AT
Entry pressure	6 bar ±0.2 Maximum consumption: approx. 20 l/min.
Main motor	550W (0.75 hp) at disc rotation 150 rpm 1100W (1.5 hp) at disc rotation 300 rpm
Specimen holder motor	150 W (0.2 hp)
Rotational speed	Disc: 150 rpm or 300 rpm Specimen holder: 150 rpm
Vertical working pressure	50-700 N
Timer intervals	From 0:05 to 99:55 min at 0:05 min intervals
Dimensions and Weight	Height: 1420 mm Length: 850 mm Depth: 510 mm Weight: 250 kg
Noise Level	The noise level of the machine is 55 dB (A) measured at idle running at a distance of 1 m/39.4” from the machine.
Safety standard	IEC 204 / EN 60204-1 (VDE 0113)

Recirculating Cooling Unit

Motor	110 W
Pump	64 l/min (1 m water column pressure at 0.1 atm)
Dimensions and Weight	Height: 410 mm Length: 400 mm Depth: 500 mm Weight: about 7.2 kg
Standard	IP 44

Abrapol-2

Spare Parts and Diagrams

Manual No.: 14227001

Date of Release: 18.02.1999

Revised: 09.06.2000

Abrapol-2
Spare Parts and Diagrams

Always state *Serial No* and *Voltage/frequency*
if you have technical questions or when ordering spare parts.

The following restrictions should be observed, as violation of the restrictions may cause cancellation of Struers legal obligations:
Instruction Manuals: Struers Instruction Manual may only be used in connection with Struers equipment covered by the Instruction Manual.
Service Manuals: Struers Service Manual may only be used by a trained technician authorised by Struers. The Service Manual may only be used in connection with Struers equipment covered by the Service Manual.

Struers assumes no responsibility for errors in the manual text/illustrations. The information in this manual is subject to changes without notice. The manual may mention accessories or parts not included in the present version of the equipment.

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1. Spare parts and Diagrams

Table of contents **Drawing**

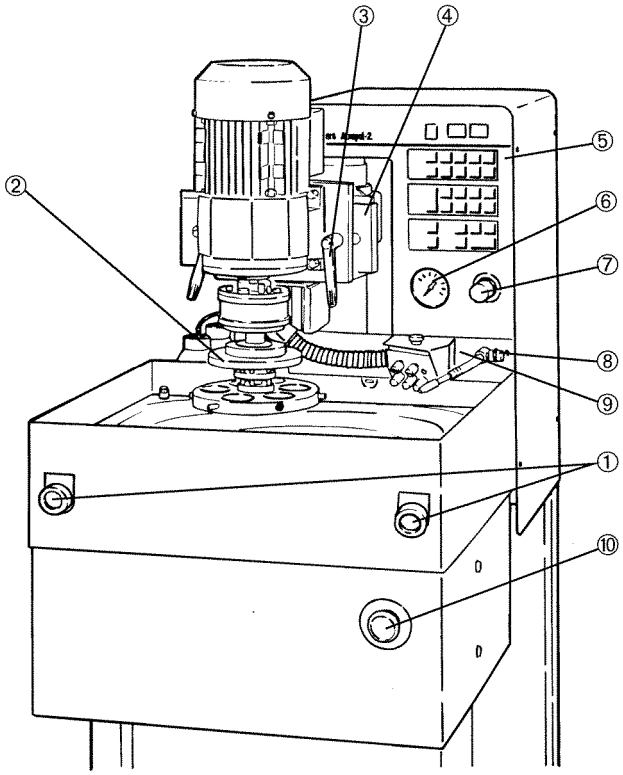
Photos and drawings

Diagrams

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

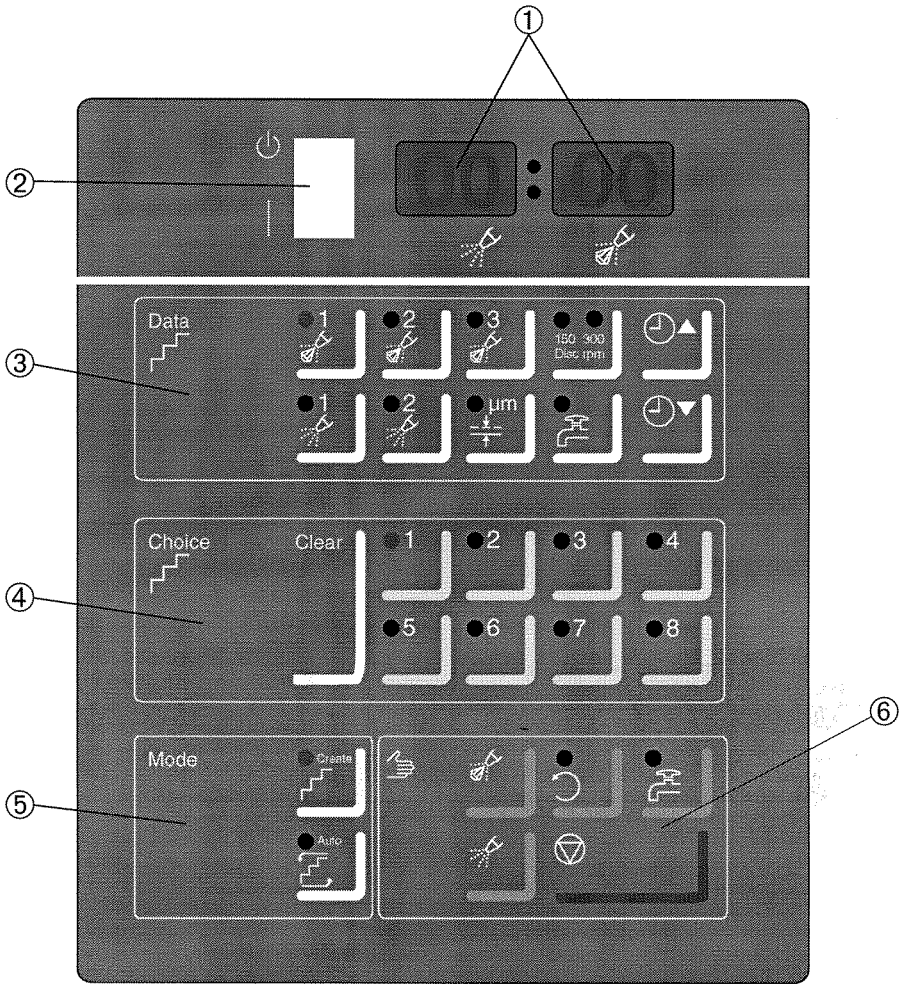
1. Front **Pos. and Description** **Spare Part No.**

Fig. 1



2. Controls **Pos. and Description** **Spare Part No.**

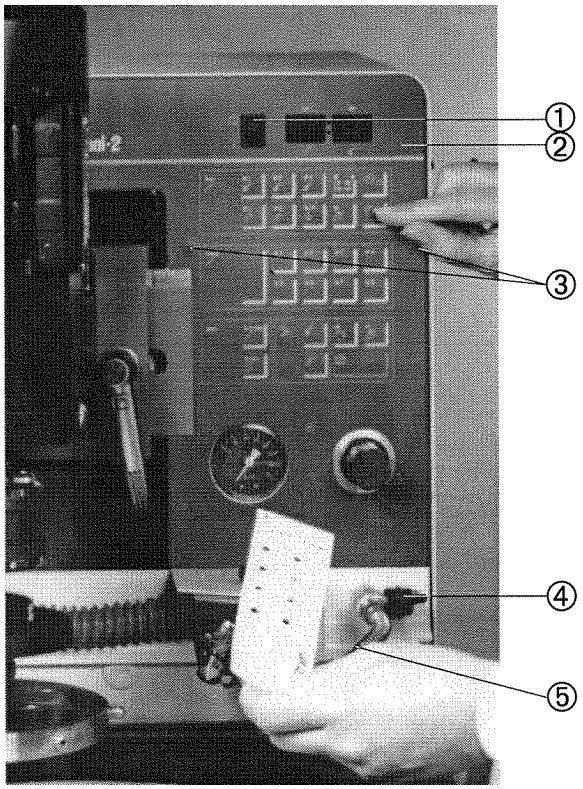
Fig. 2



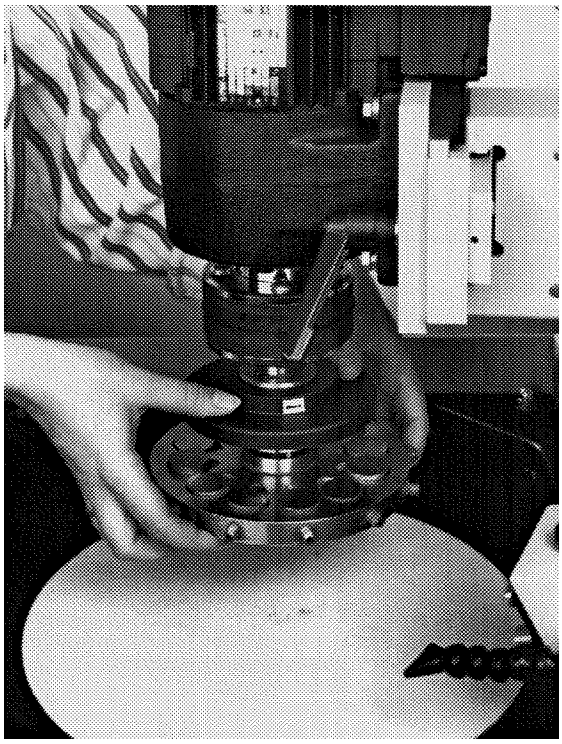
3. Placing the Program Card

Fig. 3

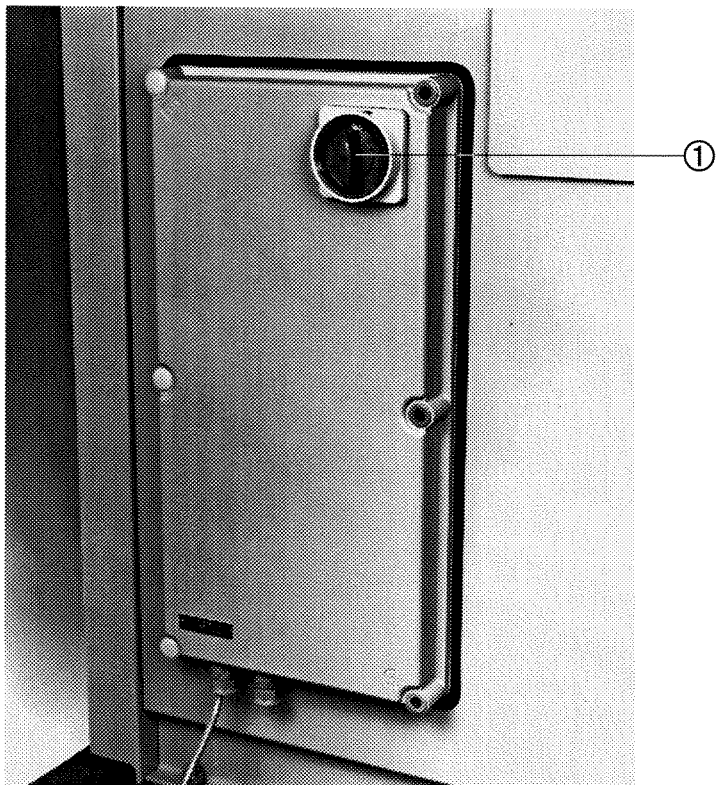
Pos.	Description	Spare Part No.
1	Switch	394MP040
2	Front plate with touch pad keyboard	14220087
	Program set V02, 2 pcs.	422MP040
3	Pin for program card	422MP041
4	Ball cock	383MP020
5	Flex tube, complete	422MP003



4. Inserting the Specimen Holder
Fig. 4

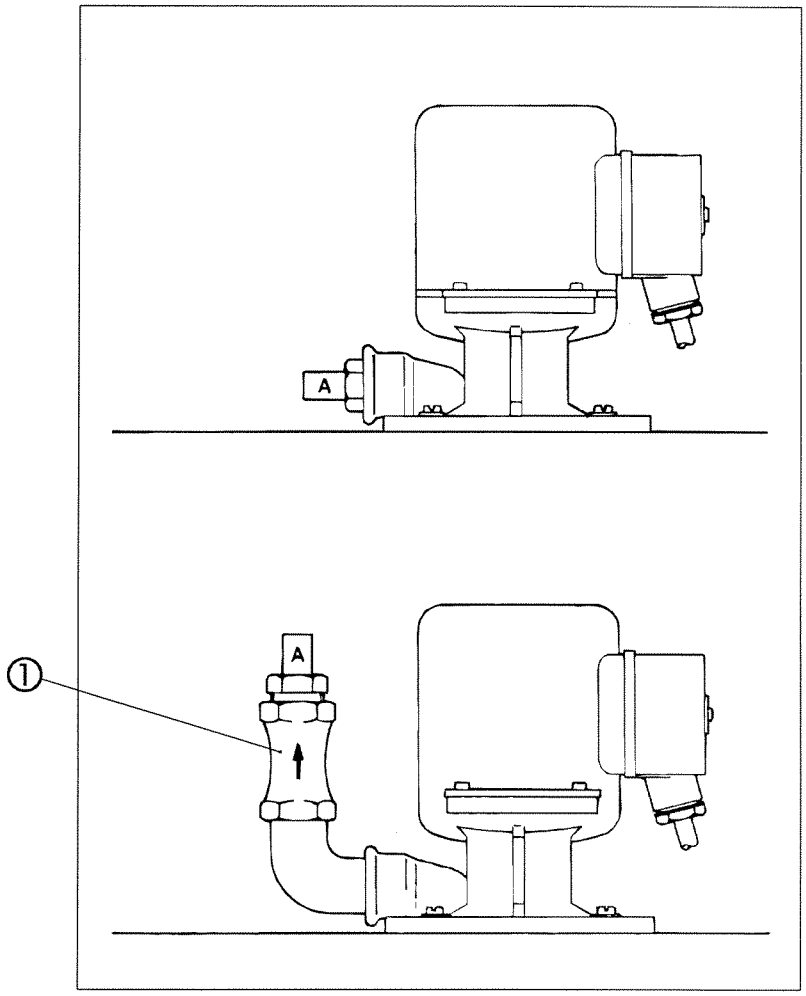


5. Main Switch
Fig. 5

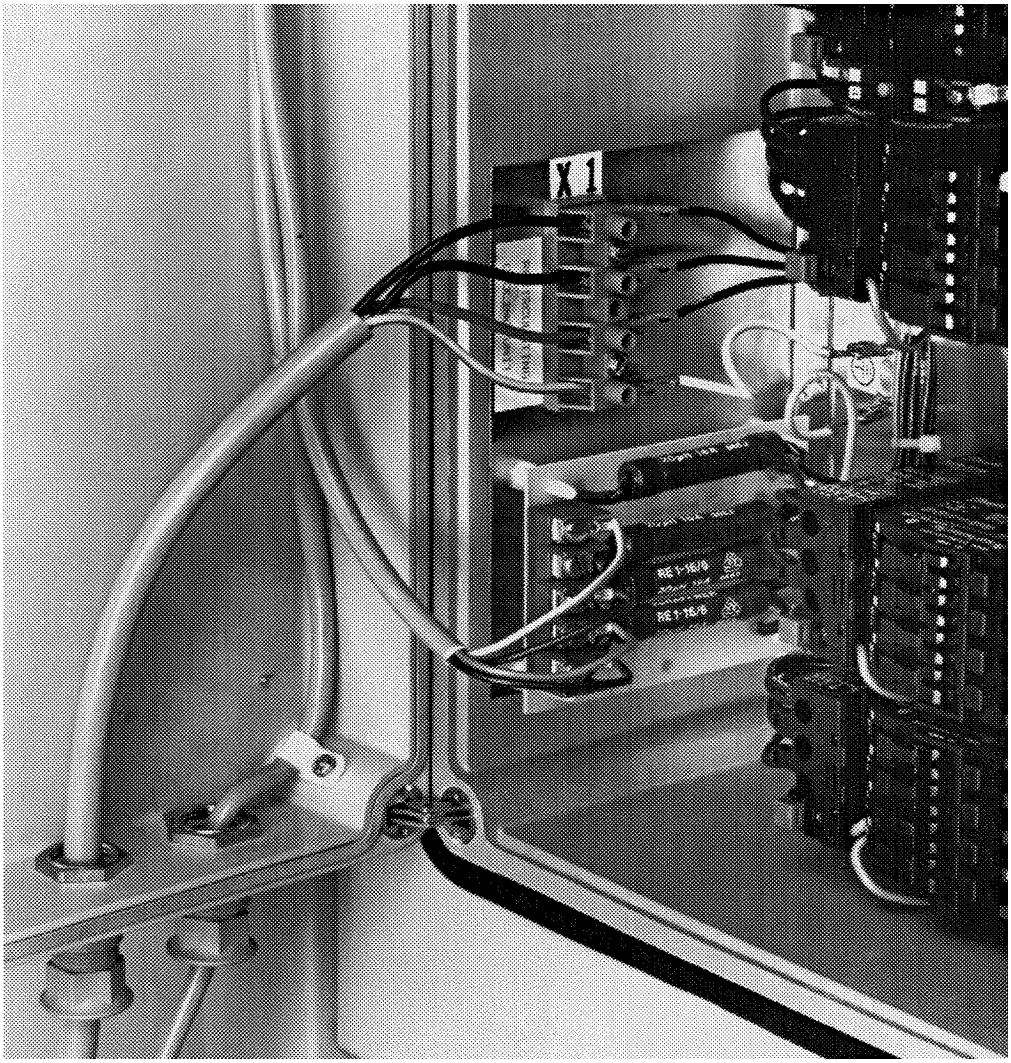


6. Non-return valve
Fig. 6

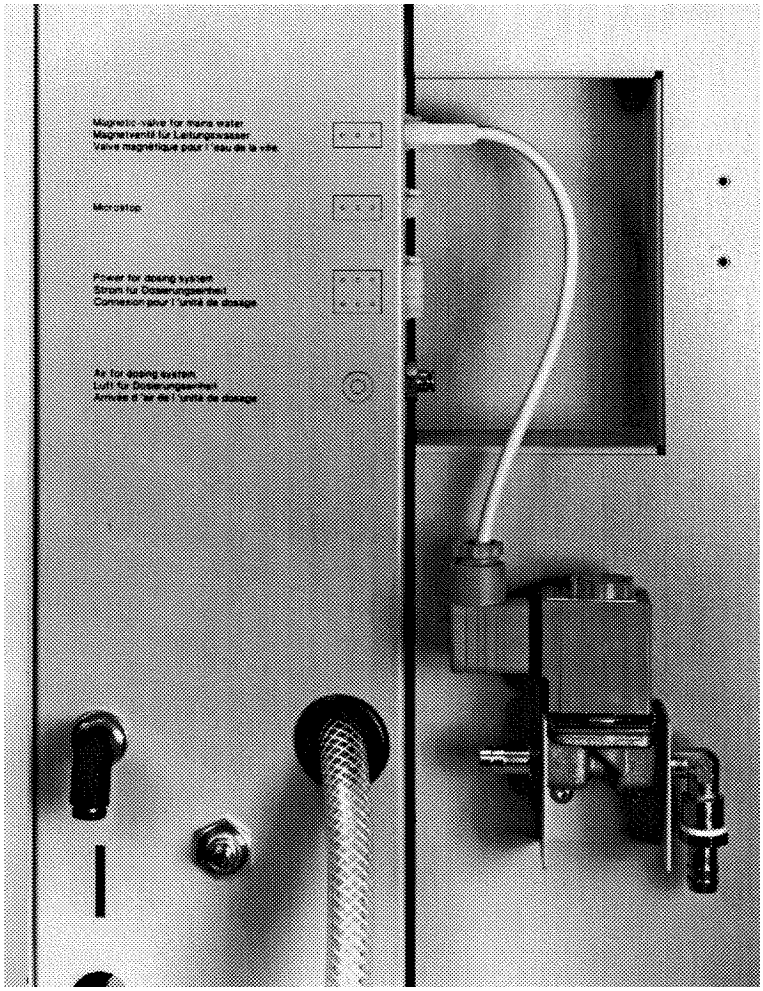
Pos. and Description	Spare Part No.
1 Non-return valve, 3/4" for TRECI	260MP082



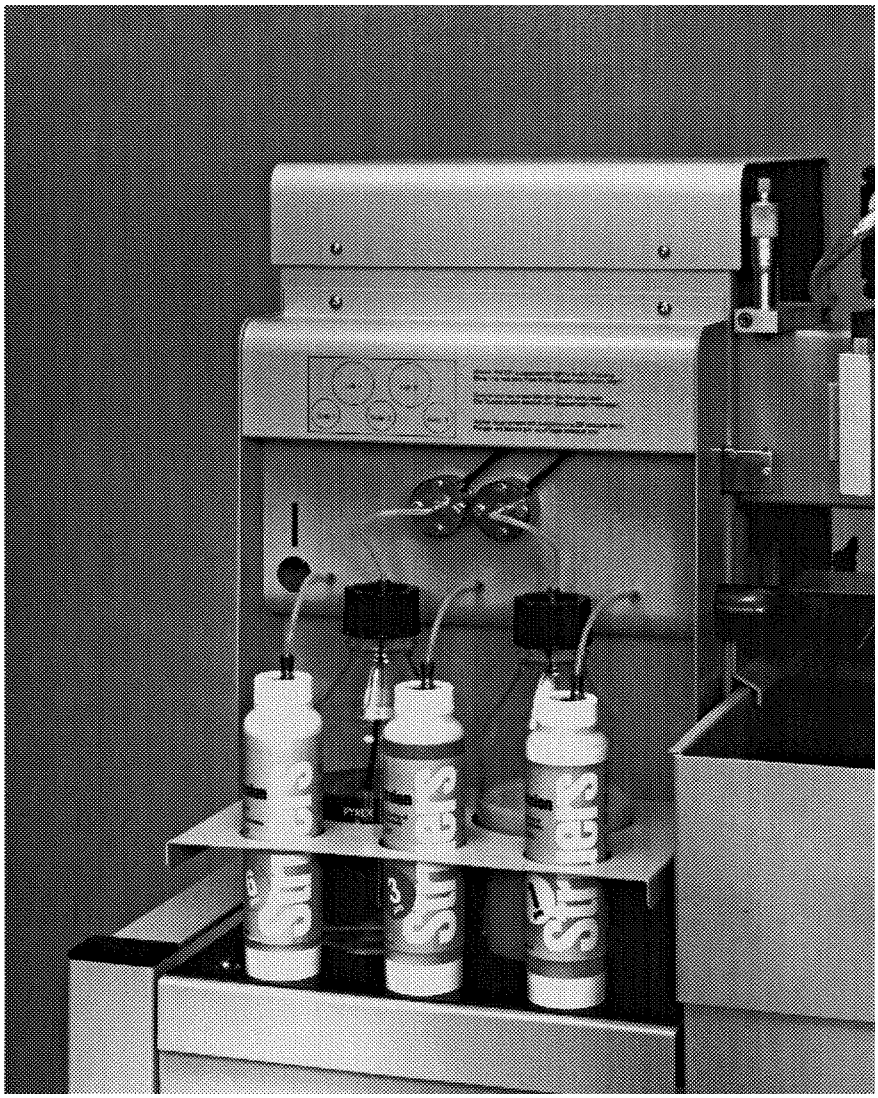
7. Connection of Recirculating Pump



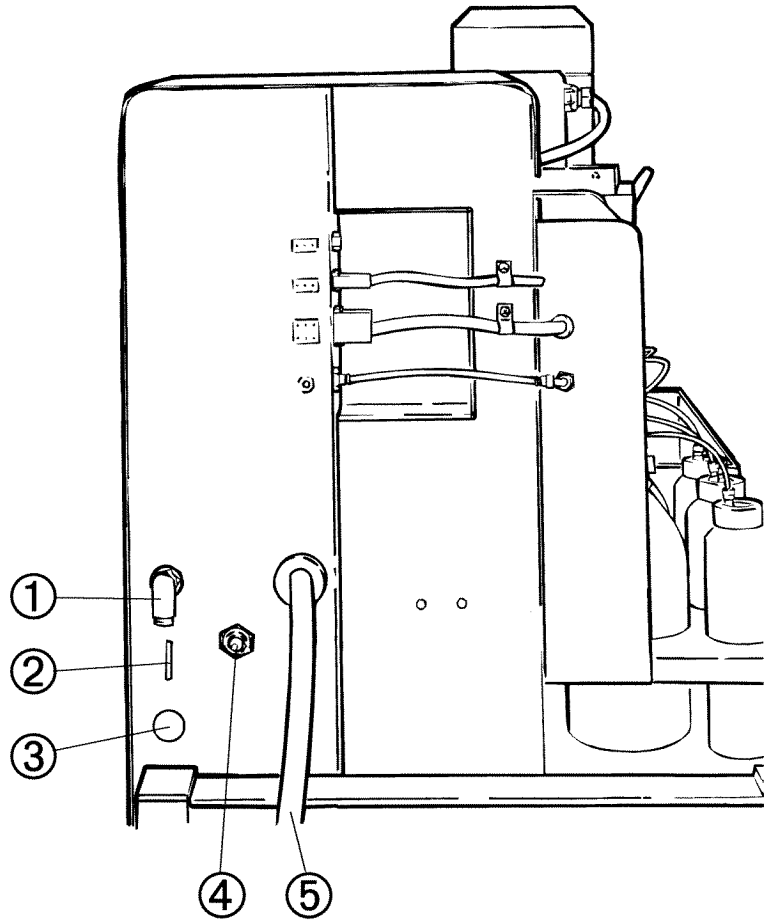
8. Valve for mains water
Fig. 8



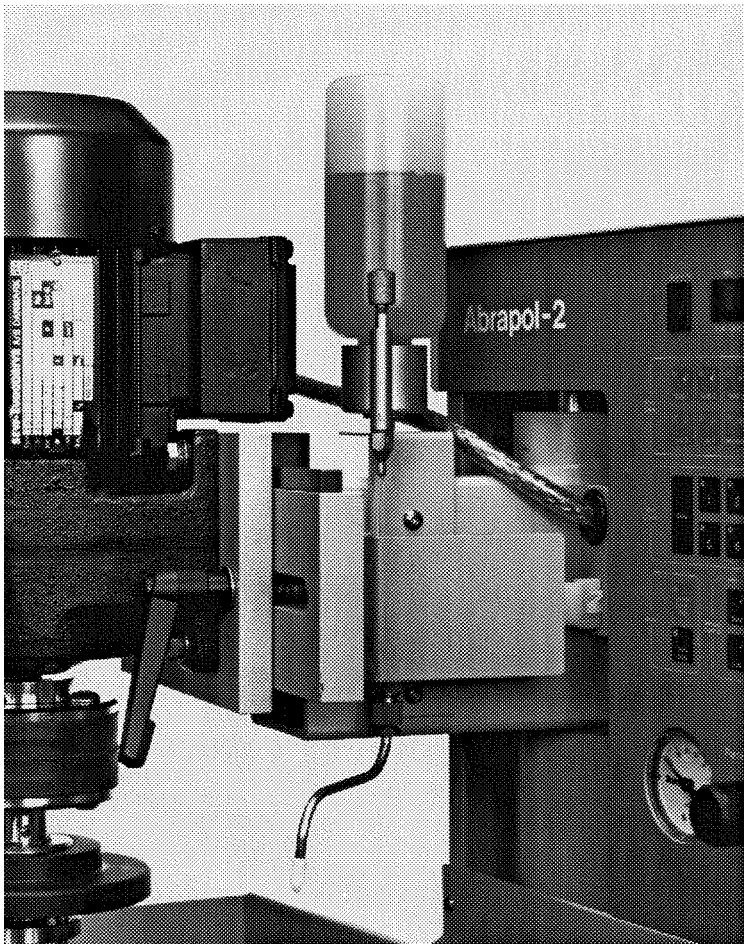
9. Dosing Unit
Fig. 9



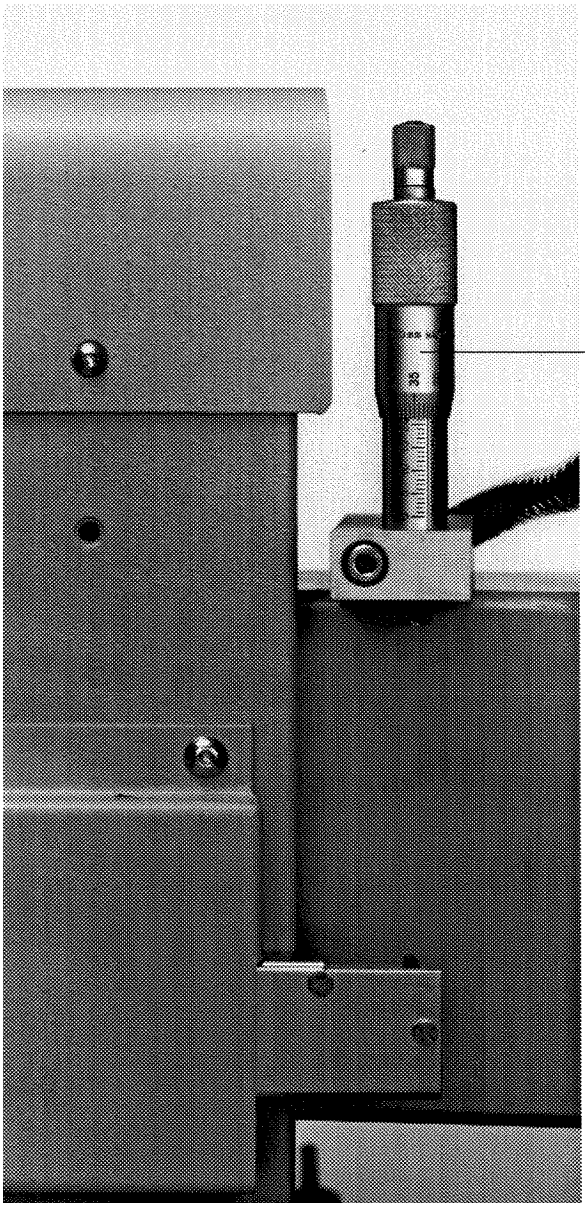
10. Dosing Unit, Connection
Fig. 10



11. Drip lubricator
Fig. 11

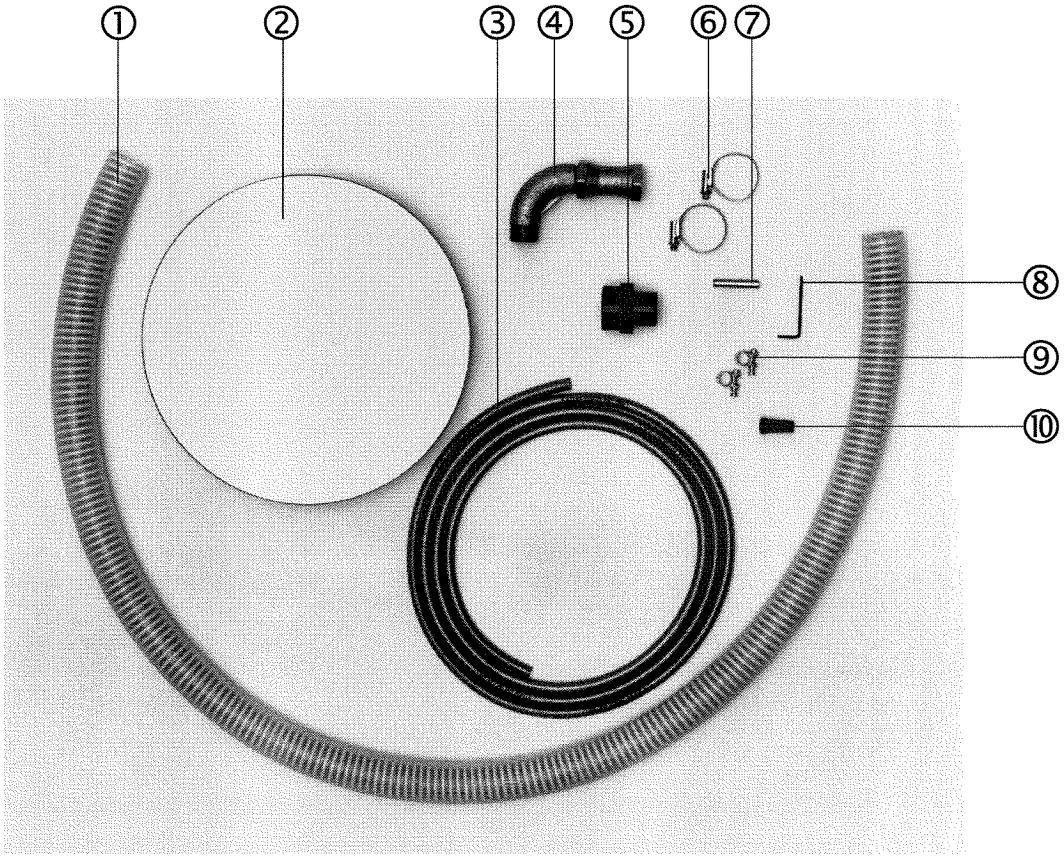


12. Microstop
Fig. 12



13. Contents of Packing Case **Pos. and Description** **Spare Part No.**
Fig. 13

3 Water hose 1/2 " (10m).....RNU29316



② DP-disc or MD- disc to be ordered separately

14. Recirculating Cooling Unit
Fig. 14

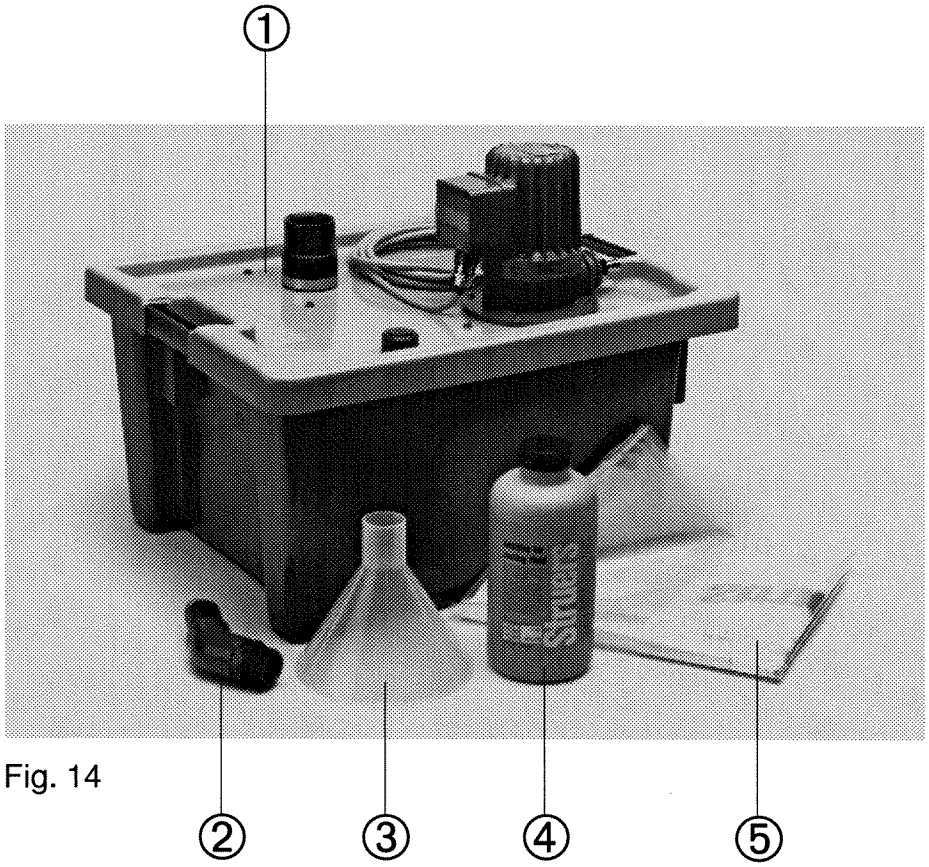


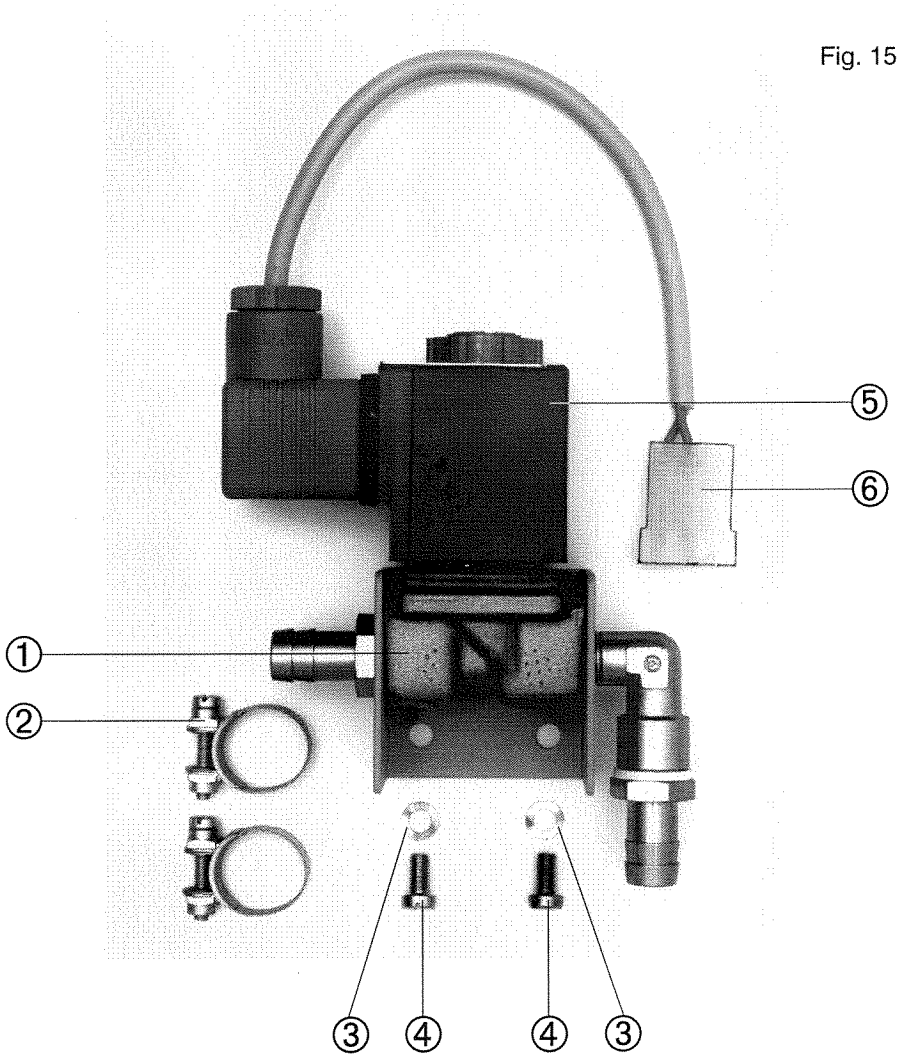
Fig. 14

15. Valve for Mains Water

Fig. 15

Pos.	and Description	Spare Part No.
1	ABVEN Solenoid valve, complete 50Hz	04226902
1	ABVEN Solenoid valve, complete 60Hz	04226903
5a	Solenoid 50Hz	375MP192
5a	Solenoid 60Hz	375MP193
5b	Solenoid valve for water, 50Hz	422MP004A
5b	Solenoid valve for water, 60Hz	422MP004B
6	3-pole box, contact plug incl.	422MP005

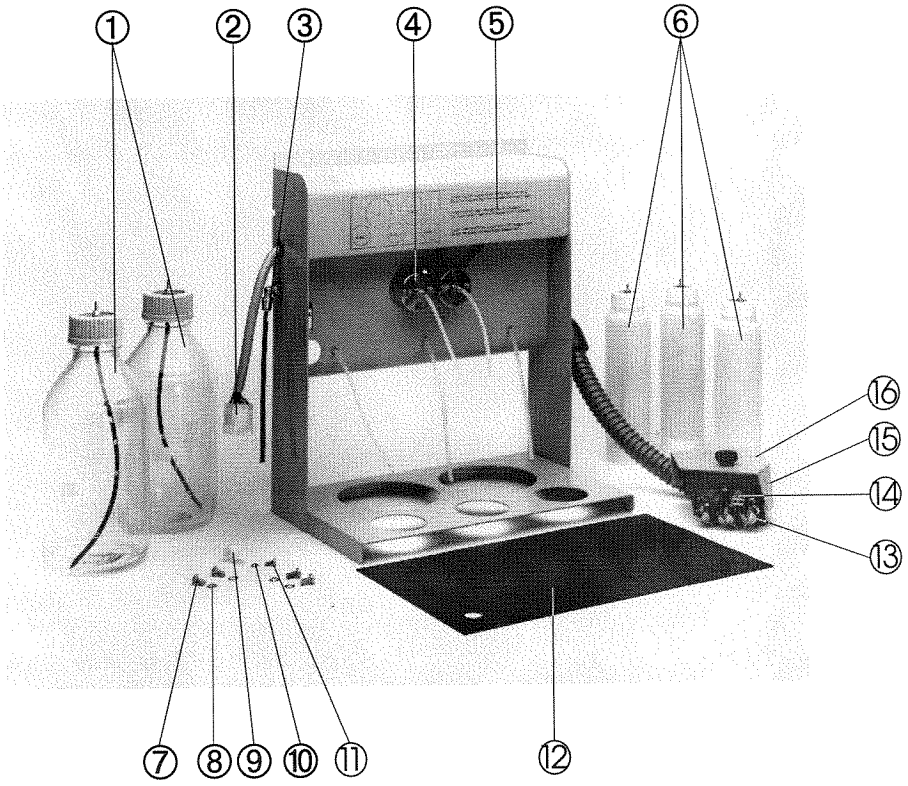
Fig. 15



16. Dosing Unit

Fig. 16

Pos.	Description	Spare Part No.
1	Bottle, 1L, cap with hole	376MP084
	Cap plate for lubricant bottle (1000 ml)	375MP028
2	9-pole box incl. contact plug	422MP008
3	Water trap	435MP017
4	Lubricant pump, complete	375MP025
5	Box without valves and pumps	422MP006
	Solenoid valve	375MP187
	O-ring ø10.82-1.78 (10 pcs)	130MP057
	Air tube ø5/ø3.2 (2m), Blue	375MP178
6	Suspension bottle, 250 ml	375MP027
	Non-return valve for cap plate	422MP018
	Cap plate for suspension bottle (250 ml)	422MP017
13	DP-Suspension nozzle, complete	375MP031
14	Lubricant nozzle, complete	375MP032
15	Nozzle holder plate	422MP013
	Nozzle elbow	422MP014
	Lubricant pump, complete	375MP025
	Throttle gauge for air tubing, suspension nozzle	422MP016
16	Nozzle holder cover	422MP009



16 A/B Dosing Unit
Fig. 16 A/B

Pos. and Description	Spare Part No.
A	
1 Lubricant nozzle head	375MP035
2 O-ring ø3 x 1 for lubricant nozzle head	375MP036
3 Lubricant nozzle screw	375MP038
A/B	
4 O-ring ø4,48 x 1,78 for nozzle screw	375MP037
5 Guide ball for nozzle	375MP270
6 O-ring ø16 x 2 for nozzle ball	422MP015
B	
1 DP-Suspension nozzle head	375MP034
3 DP-Suspension nozzle screw	375MP039

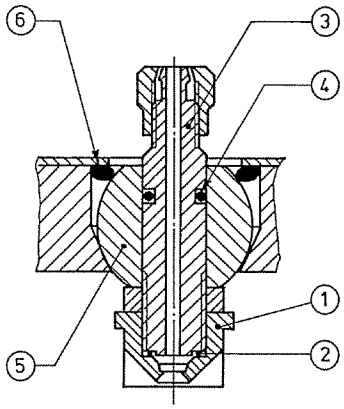


Fig. 16a
Lubricant Nozzle

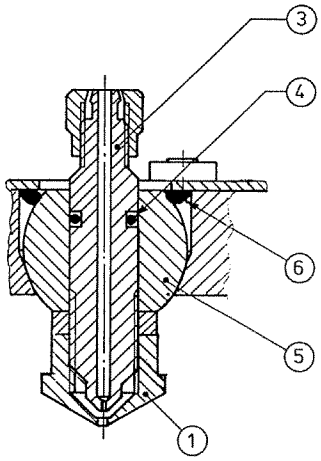
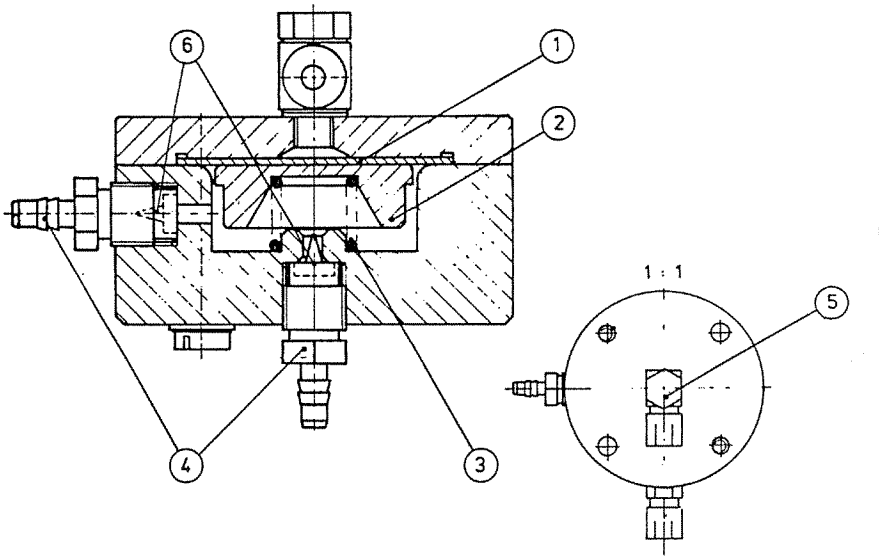


Fig. 16b
DP-Suspension Nozzle

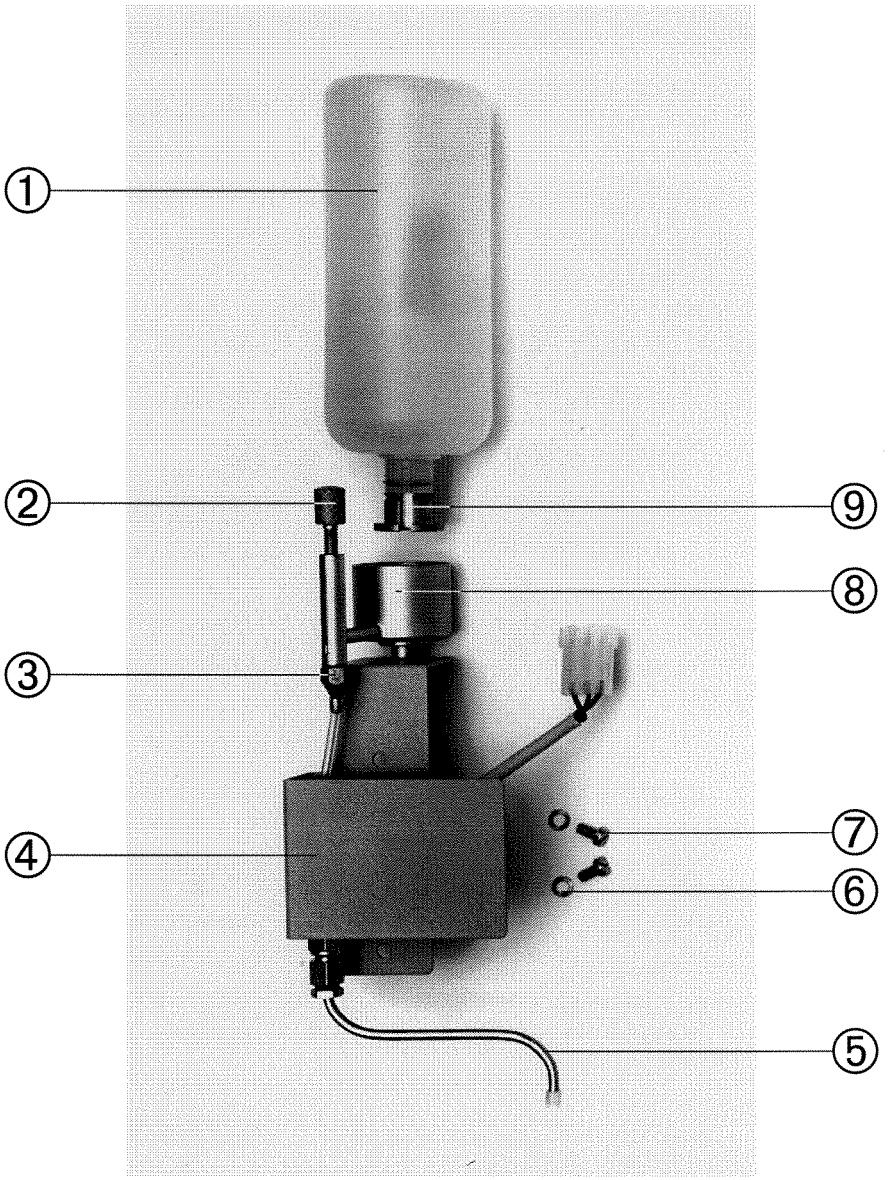
16C Dosing Unit
16C (16.4)

Pos. and Description		Spare Part No.
	Lubricant pump, complete	375MP025
1	Diaphragm	375MP052
2	Piston	375MP053
3	Spring	375MP020
4	Nipple	375MP022
5	Banjo connection	375MP023
6	Check valve (non-return valve)	375MP024
	Solenoid valve	375MP187
	Filter	422MP007
	Throttle gauge for air tubing, suspension nozzle	422MP016
	Cap plate for suspension bottle	422MP017



17. Drip Lubricator
Fig. 17

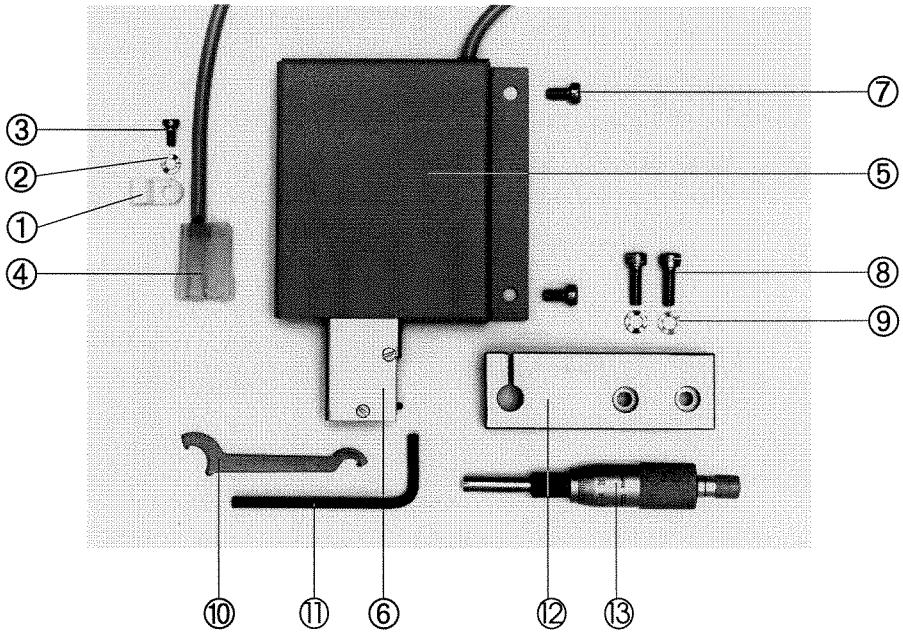
Pos. and Description		Spare Part No.
1	Bottle, 2 l	158MP016
2	Valve needle	158MP010
3	Valve outlet	158MP005
4	Solenoid valve	376MP044
5	Nozzle with fittings	422MP019
8	Lubricator cup	158MP014
9	Bottle fixture	158MP015
	O-ring, ø11.91x2.62	249MP032
10	3-pole box incl. contact plug	422MP005
11	Solenoid Housing	14229048



18. Microstop

Fig. 18

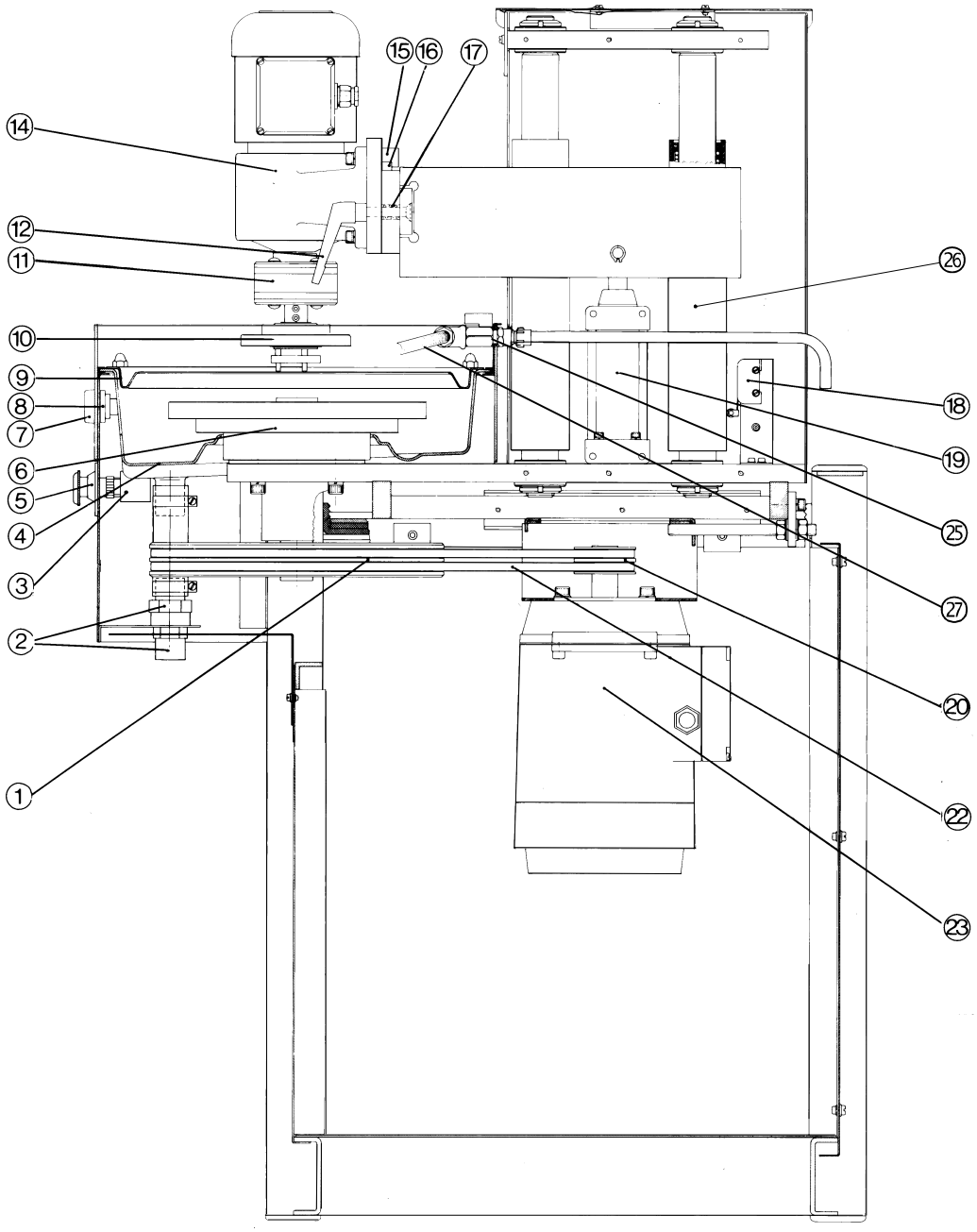
Pos. and Description	Spare Part No.
4 3-pole box incl. contact plug	422MP005
6 Microswitch	260MP202
13 Micrometer screw	260MP206



19. Abrapol-2
Fig. 19

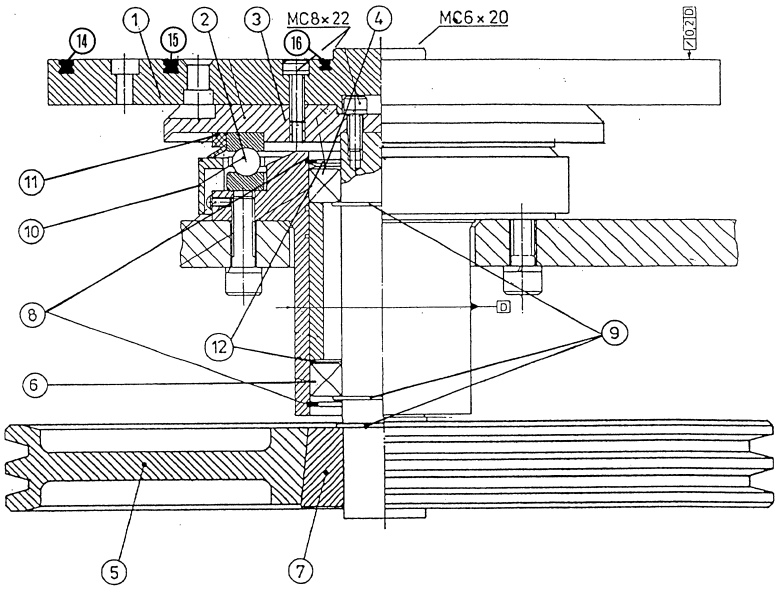
Pos.	Description	Spare Part No.
1	V-belt pulley (state frequency)	260MP068
	Bushing for V-Belt pulley (260MP68)	260MP069
2	Nipple and connecting piece	260MP168
3	Emergency stop switch element	381MP440
4	Drain tray	260MP185
5	Emergency stop push-button, without switch element	381MP439
7	Cap for 260MP004	260MP005
8	Push button, start	260MP004
9	Splash guard	260MP143
	Lid for 260MP143	260MP144
10	Quick-release coupling, complete	260MP027
11	Damper coupling, complete	260MP080
	Damper coupling with lower flanger	12600330
12	Handle	260MP155
14	Specimen holder motor (state voltage and frequency)	260MP085
15	Sliding piece	422MP021
16	Dial rail	422MP022
17	Pressure spring	422MP023
18	Microswitch	260MP009
19	Double-acting compressed-air cylinder	260MP102
20	V-belt pulley for main motor	260MP071
21	Bushing for 260MP071	260MP072
22	Driving belt, 50 Hz, 2 pcs.	260MP073
22	Driving belt, 60 Hz, 2 pcs.	260MP083
23	Main motor (state voltage and frequency)	260MP070
24	Hose, complete	422MP003
25	Water Cock 1/4”	383MP020
26	Column for Abra arm	12600312
27	Flexible water nozzle, complete	42MP003

Fig. 19, Drawing



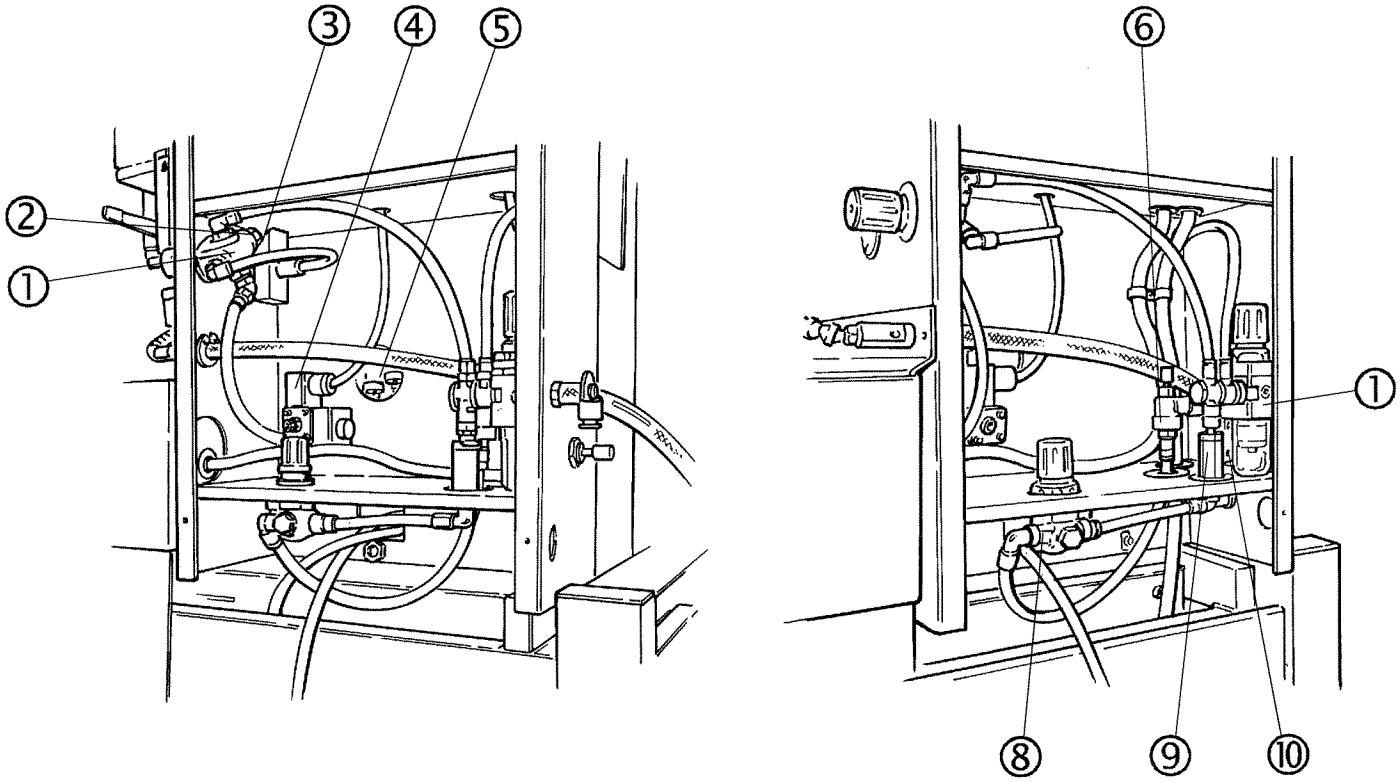
19A. Abrapol-2
Fig. 19A

Pos.	Description	Spare Part No.
	Bearing unit complete, but without turntable, V-belt pulley and bearing flange	260MP065
1	Turntable w. quad ring and 4xM8 screw holes (300mm)	14590010
2	Axial bearing ø100/ø135 x 25	260MP017
	Shell ALBIDA LX Grease	381MP415
3	Bearing flange	260MP197
4	Roller bearing, upper, 6007	260MP018
5	V-belt pulley (please state frequency)	260MP068
6	Roller bearing, lower, 6007RS	260MP018
7	Bush for V-belt pulley	260MP069
8	Seeger ring I 62 x 2	260MP019
9	Seeger ring U 35 x 1.5	260MP067
10	Bearing protection ring	260MP183
11	V-ring VA 130	260MP184
12	Thrust collar, set of 4	315MP059
14	Quad-ring	2IQ04450
15	Quad-ring	2IQ04441
16	Quad-ring	2IQ04326



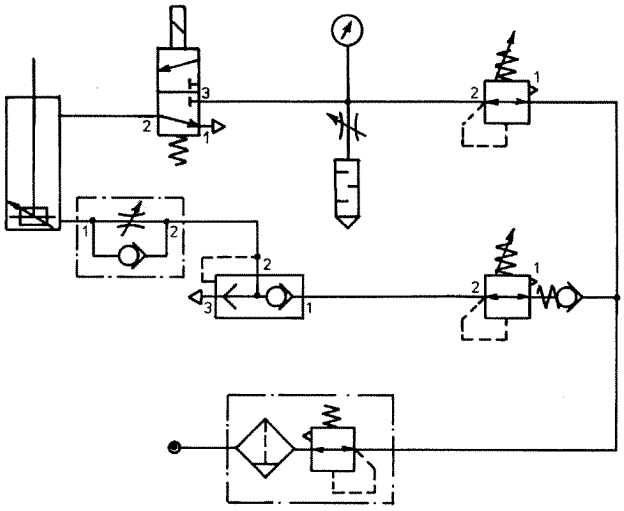
20. Pneumatic Parts
Fig. 20

Pos. and Description	Spare Part No.
1 Reducing valve	368MP330
2 Throttle sound absorber	422MP024
3 Manometer	14229027
4 Solenoid valve	260MP012
6 Quick exhaust valve	14222900
Filter/reduction valve unit - SMC	375MP199
Filter glass for 375MP199	381MP435
8 Reduction valve	2YR00003
9 Non-return valve	260MP127
10 Non-return throttle valve	260MP128



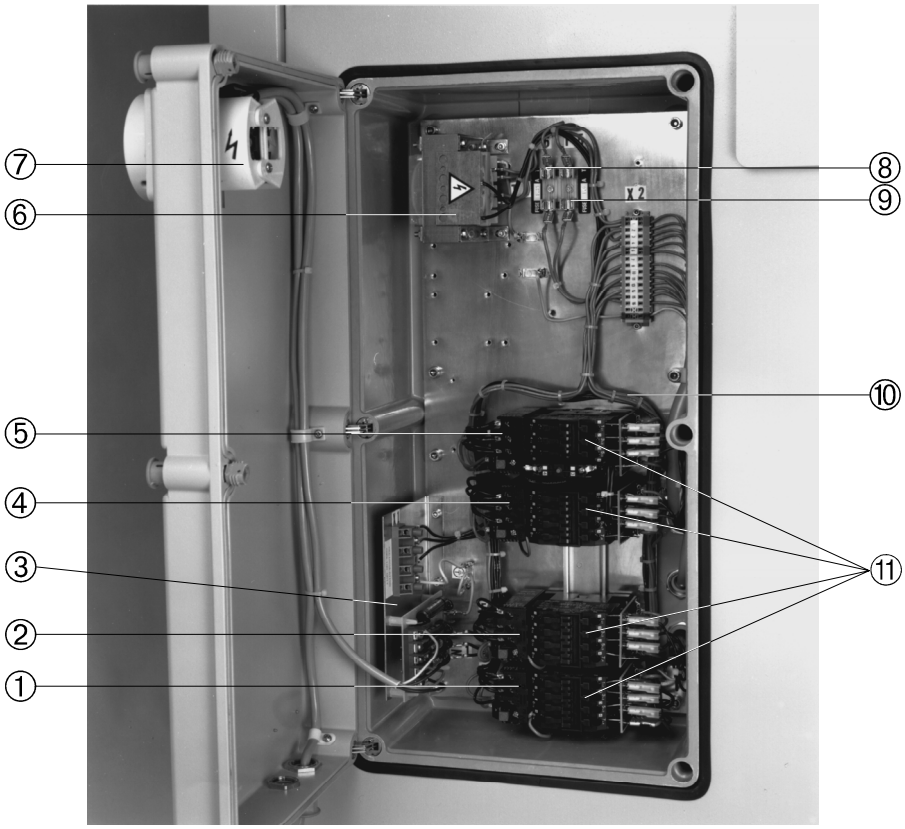
21. Pneumatic Diagram **Pos. and Description** **Spare Part No.**

Fig. 21 (Drawing 14220236)



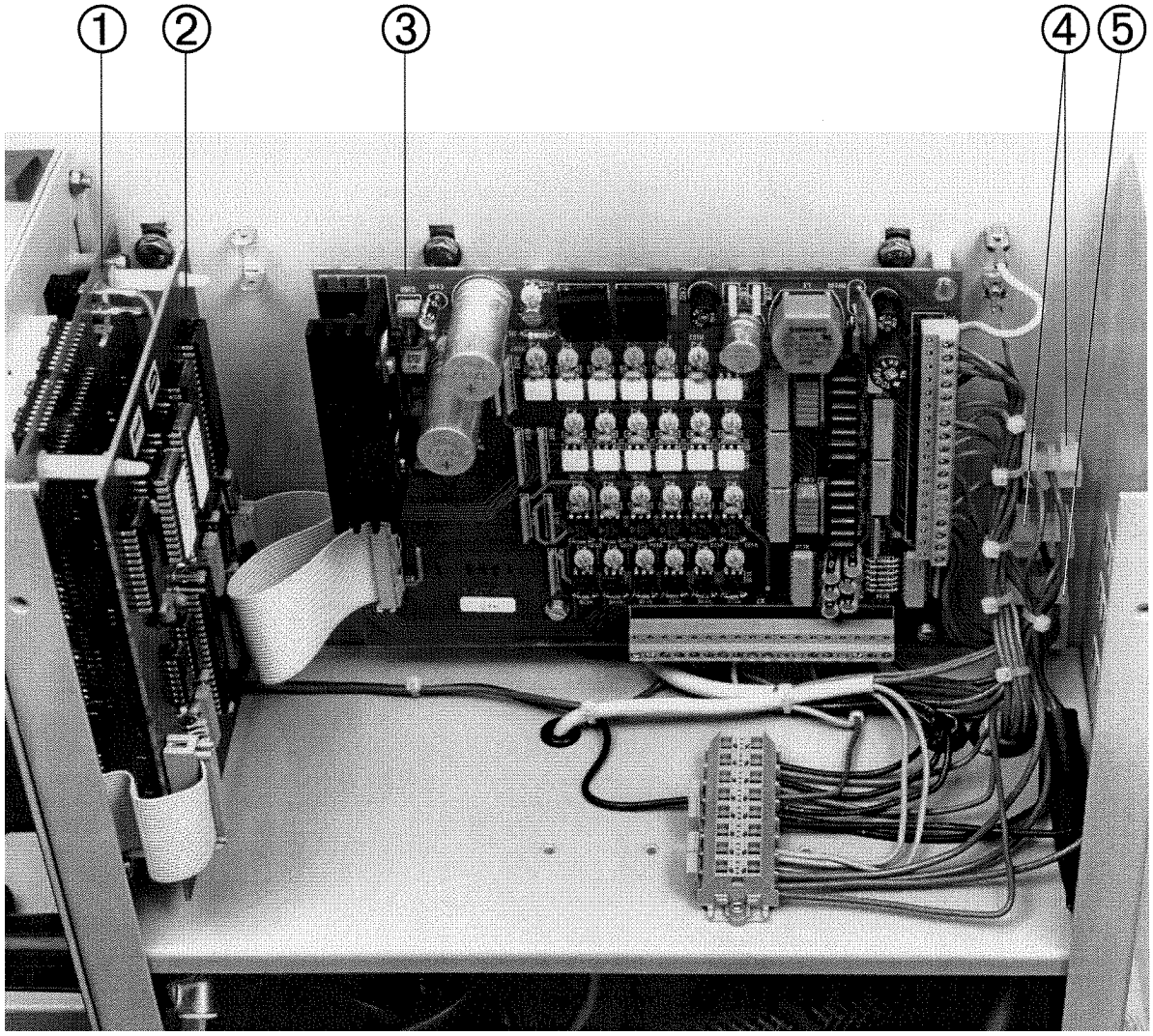
22. Contactor Box
Fig. 22

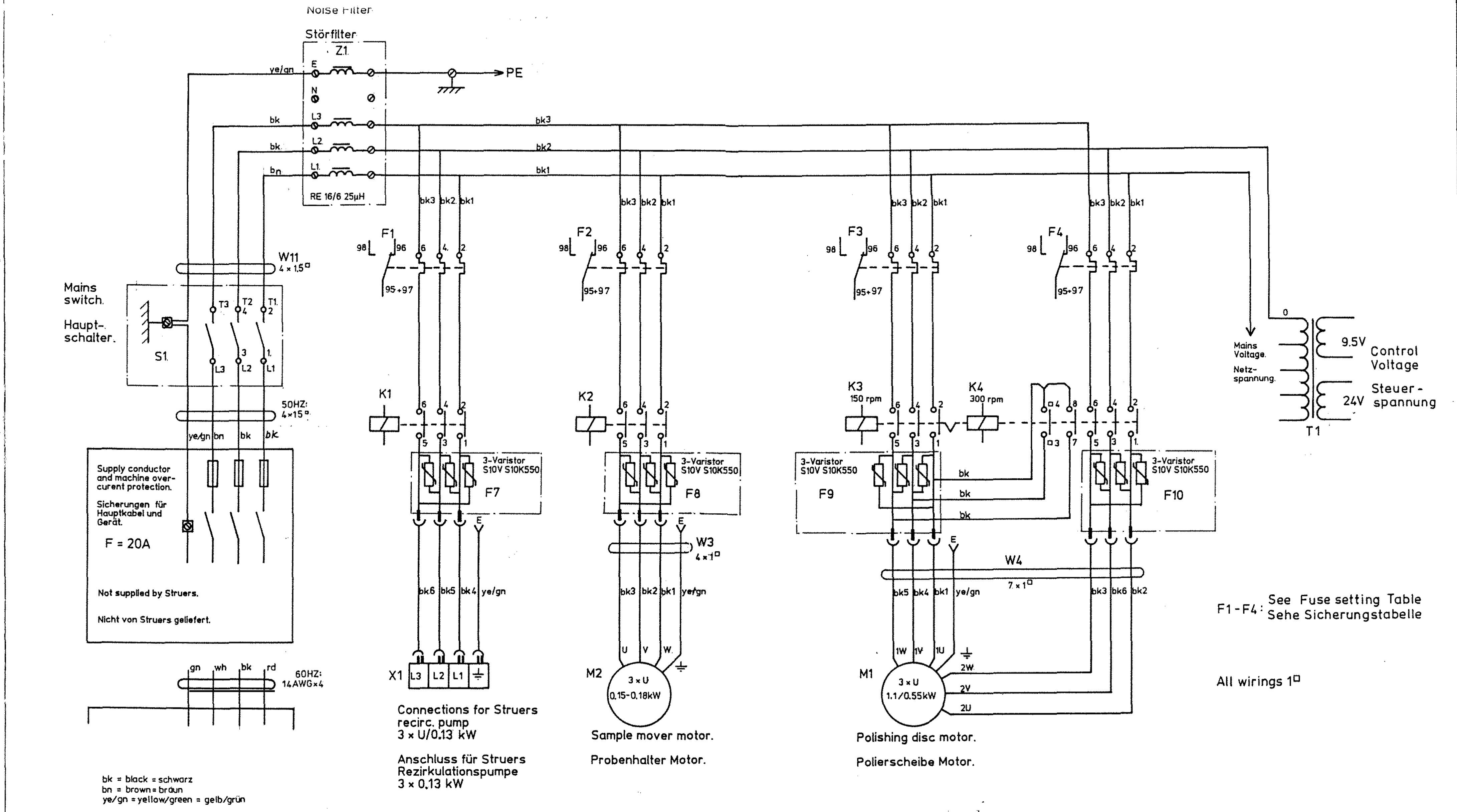
Pos. and Description	Spare Part No.
1 Thermo relay F1 (200-240V)	381MP234
Thermo relay F1 (380-480V)	394MP050B
2 Thermo relay F2 (200-240V)	394MP049C
Thermo relay F2 (380-480V)	381MP234
3 Mains noise filter	394MP045
4/5 Thermo relay F3/F4 (200-240V)	381MP233
Thermo relay F3/F4 (380-480V)	375MP263B
6 Transformer T1 (state voltage)	394MP043
7 Main switch	2SE00149
8 Fuse F12, 2.5 AT (10 pcs.)	RFU14000
9 Fuse F11, 1.6 AT (10 pcs.)	422MP027
10 Auxiliary switch for K4	381MP237
11 Contactor (K1, K2, K3, K4)	376MP110



23. Circuit Boards
Fig. 23

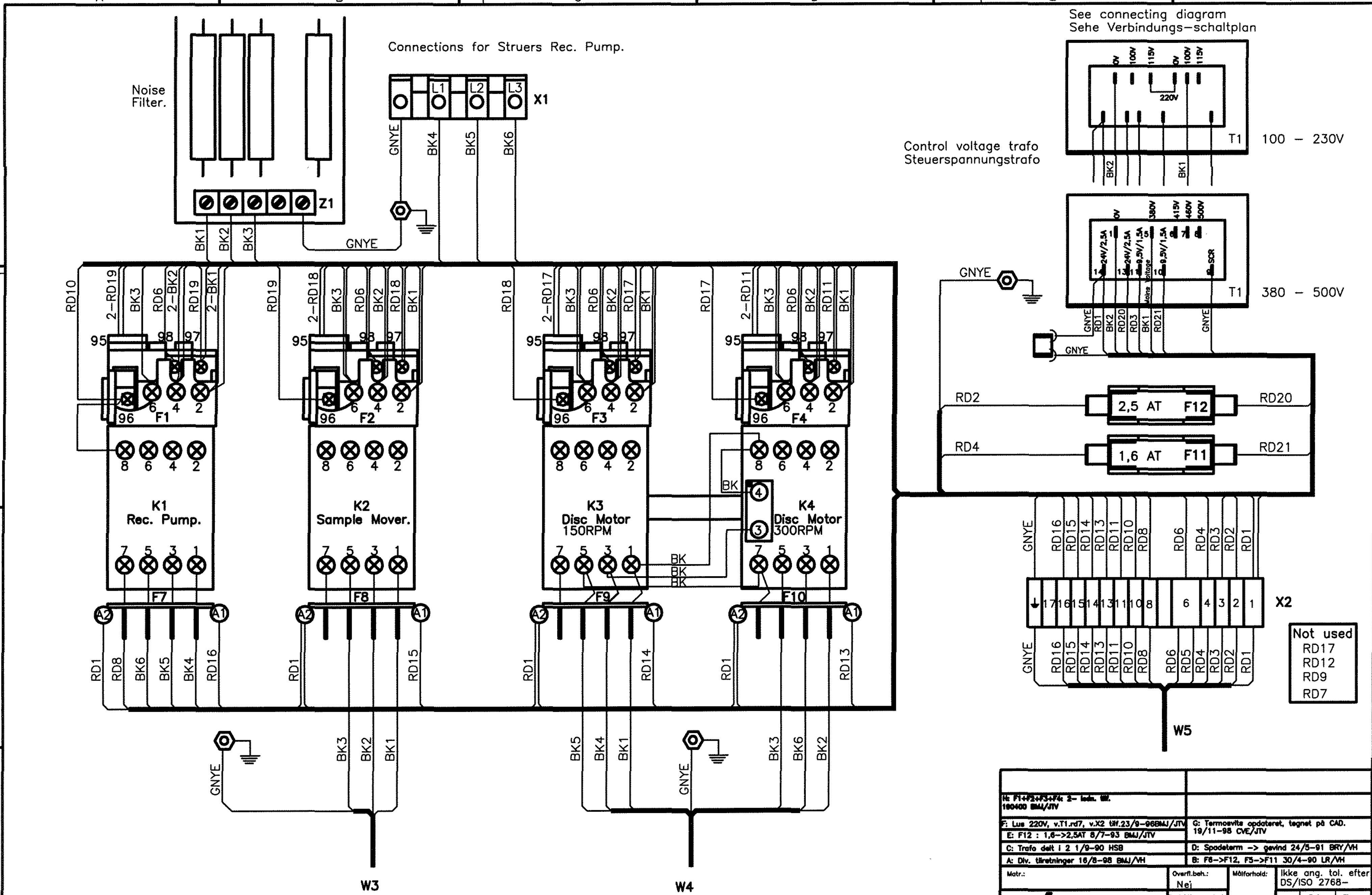
Pos. and Description		Spare Part No.
1	Display Board	422MP010
2	CPU Board	422MP011
	PROMP, latest version	422MP040
3	Interface/Power Supply Board	422MP012
4	3-pole cabled plug for solenoid valve	422MP029
5	9-pole cabled plug for solenoid valve	422MP030
	Fuse on PCB F5 (2.5 AT)	422MP031
	Fuse on PCB F6 (1.6 AT)	422MP032





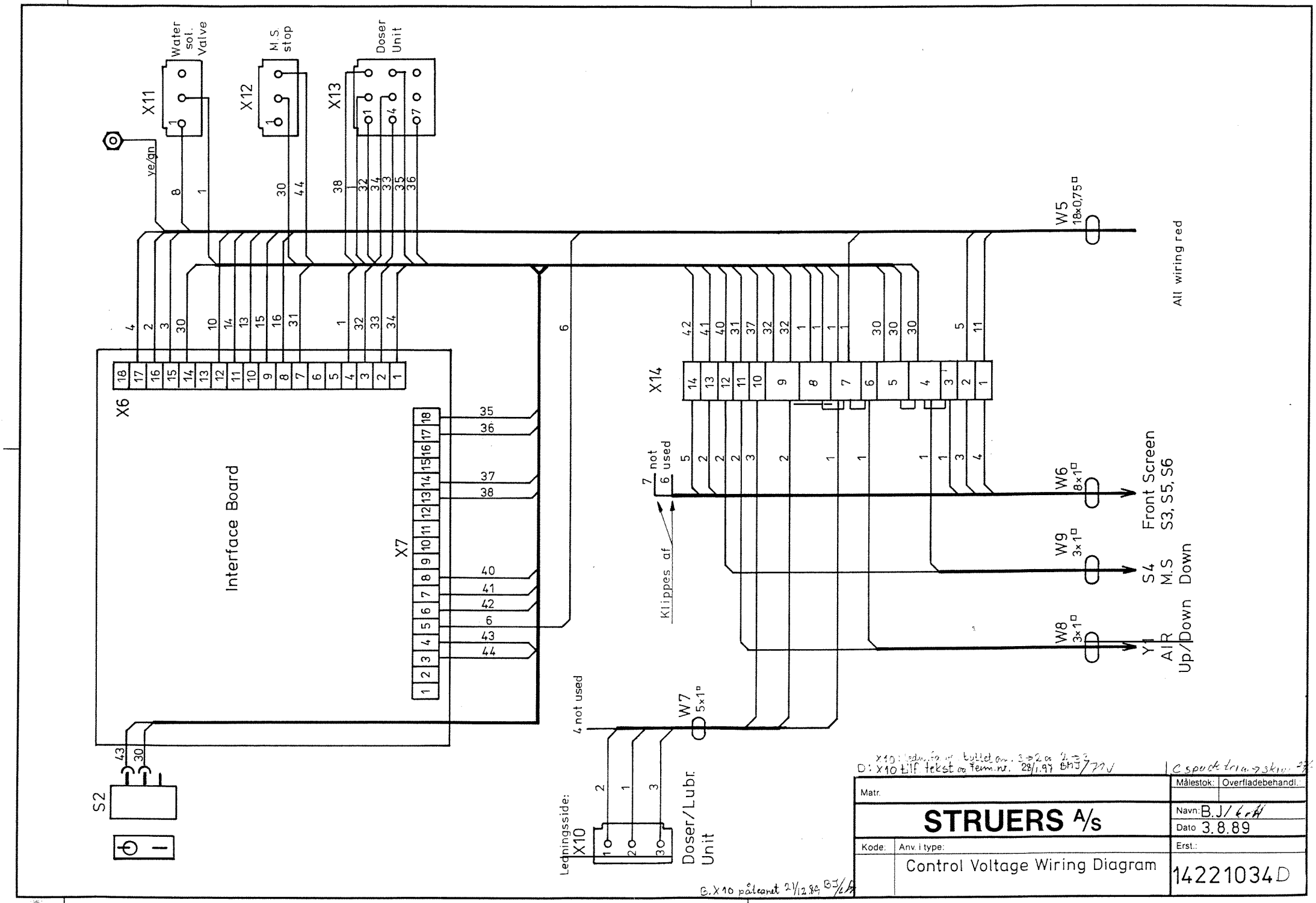
G: ledning fra S1 rd > bk 15/4.99
F: 95 → 95+97 18/11-98
E: F=10A → F=20A 5.12.97

D: 0.25 kW → 0.13kW M2: 0.55kW → 0.15-0.18kW; M1: 1.7kW → 1.1/0.55kW 29.11.96	Ikke ang. ruheder: √
C: ... → ... tilf. Bn → rd; bk → bn v. 4x1,5□ 23/9.96	
B: Spadeterm. → gevindstag 24/5.94	
A See Fuse .... tilf. Control Voltage tilf 18/7 89	Ikke ang. tolerancer: ±
Matr. Abrapol - 2	Målestok: / Overfladebehandl.
STRUERS A/S	Navn: BR
	Dato 24.2.89
Kode: / Anv. i type:	Erst.: 1006
Kredsskema: Circuit Diagram for Mains Voltage. Schaltplan für Netzspannung. 3×220-500V/ 50-60Hz	14221007G

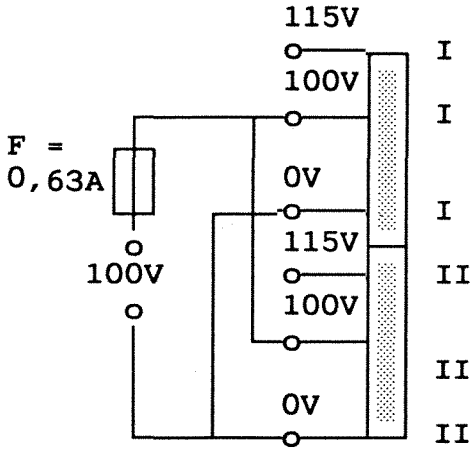


H: F1+F2+F3+F4: 2- ledn. tilf. 190400 BMJ/JTV	
F: Lus 220V, v.T1.rd7, v.X2 tilf.23/9-96BMJ/JTV	G: Termosvits opdateret, tegnet på CAD. 19/11-98 CVE/JTV
E: F12 : 1,6->2,5AT 8/7-93 BMJ/JTV	
C: Trafo delt i 2 1/9-90 HSB	D: Spadeterm -> gevind 24/5-91 BRY/VH
A: Div. tilretninger 16/8-98 BMJ/VH	B: F6->F12, F5->F11 30/4-90 LR/VH

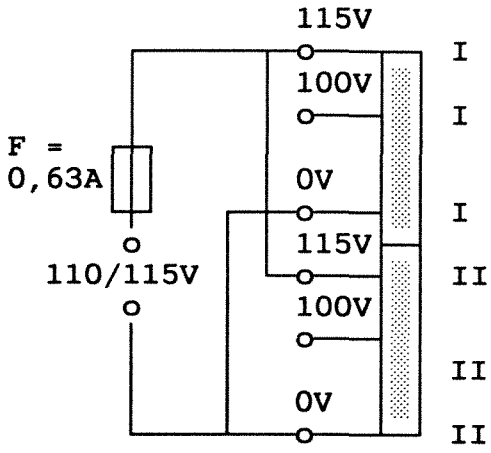
Matr.:	Overfl.beh.: Nej	Målforhold: 1:1	Ikke ang. tol. efter DS/ISO 2768-
Struers	Projektionsmetode		Dato: Tegn: 110498 Sign.: BRY; Kontr.
Wiring Diagram, Contactor Box		Erst.:	**14221012H**


Water sol. Valve
M.S stop
Doser Unit
X11
X12
X13
ve/gn
Interface Board
X6
X7
X14
W5 18x0,75□
W6 8x1□
W9 3x1□
W8 3x1□
W7 5x1□
All wiring red
Front Screen S3, S5, S6
S4 M.S Down
Y1 AIR Up/Down
7 not used
6 used
Klippes af
4 not used
S2
Ledningsside: X10
Doser/Lubr. Unit
Matr.
STRUERS A/S
Kode:
Anv. i type:
Control Voltage Wiring Diagram
Målestok:
Overfladebehandl.
Navn: B.J/ErH
Dato 3.8.89
Erst.:
14221034D

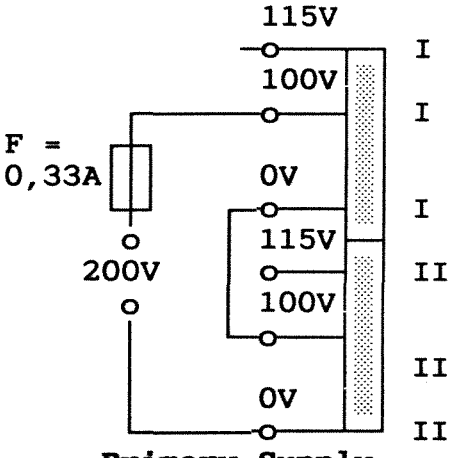
Primary Supply
Primär Versorgung
100V AC



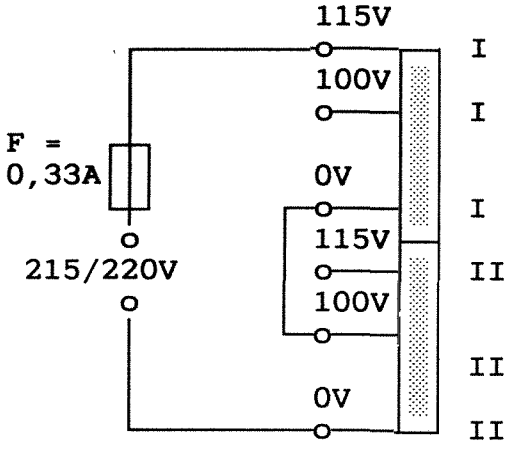
Primary Supply
Primär Versorgung
110/115V AC



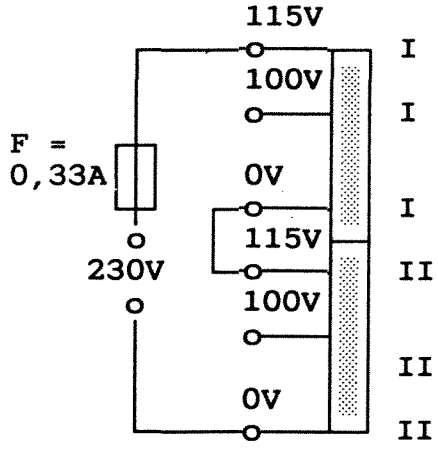
Primary Supply
Primär Versorgung
200V AC

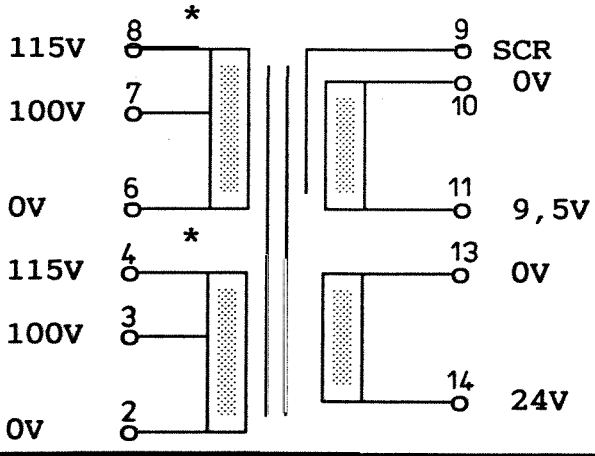


Primary Supply
Primär Versorgung
215/220V AC



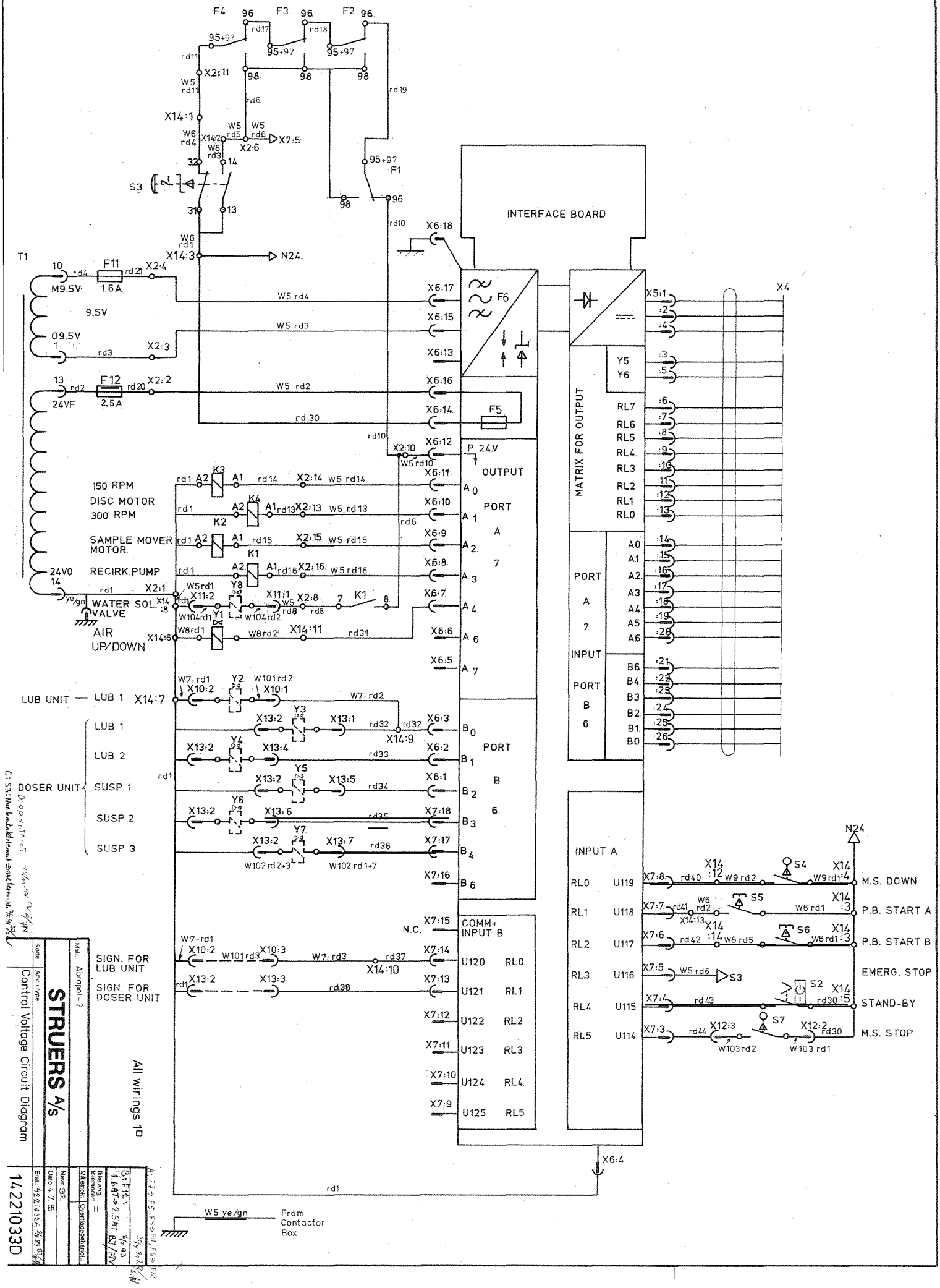
Primary Supply
Primär Versorgung
230V AC





	Matr.				Målestok:
	Struers	Ikke ang. tolerancer: ±	Overfl.-behandl. Ja ☐ Nej ☐		Dato / Sign.
		Ikke ang. ruheder:		Tegn. 129.90 TSB	
				Kontr. 8/10-90 DM/TTV	
	Kode	Anv. i type: 394 - 419		Erst.:	
A	Terminalnr. tilf. 150399 BMI/TTV	Connecting Diagram Supp. Volt. 100-230V Verbind.-schaltpl. Versorg. sp. 100-230V			14221013A

Ko-01-24-12/89


INTERFACE BOARD
MATRIX FOR OUTPUT
OUTPUT PORT A 7
INPUT PORT B 6
INPUT A
COMM+ INPUT B
150 RPM DISC MOTOR
300 RPM SAMPLE MOVER MOTOR
RECIRK.PUMP
WATER SOL. VALVE
AIR UP/DOWN
LUB UNIT
LUB 1
LUB 2
DOSER UNIT
SUSP 1
SUSP 2
SUSP 3
SIGN. FOR LUB UNIT
SIGN. FOR DOSER UNIT
M.S. DOWN
P.B. START A
P.B. START B
EMERG. STOP
STAND-BY
M.S. STOP
From Contactor Box
All wirings 1Ø
STRUERS A/s
Control Voltage Circuit Diagram
14221033D

28. Circuit Diagram, Keyboard/Display Board

Diagram 14221052

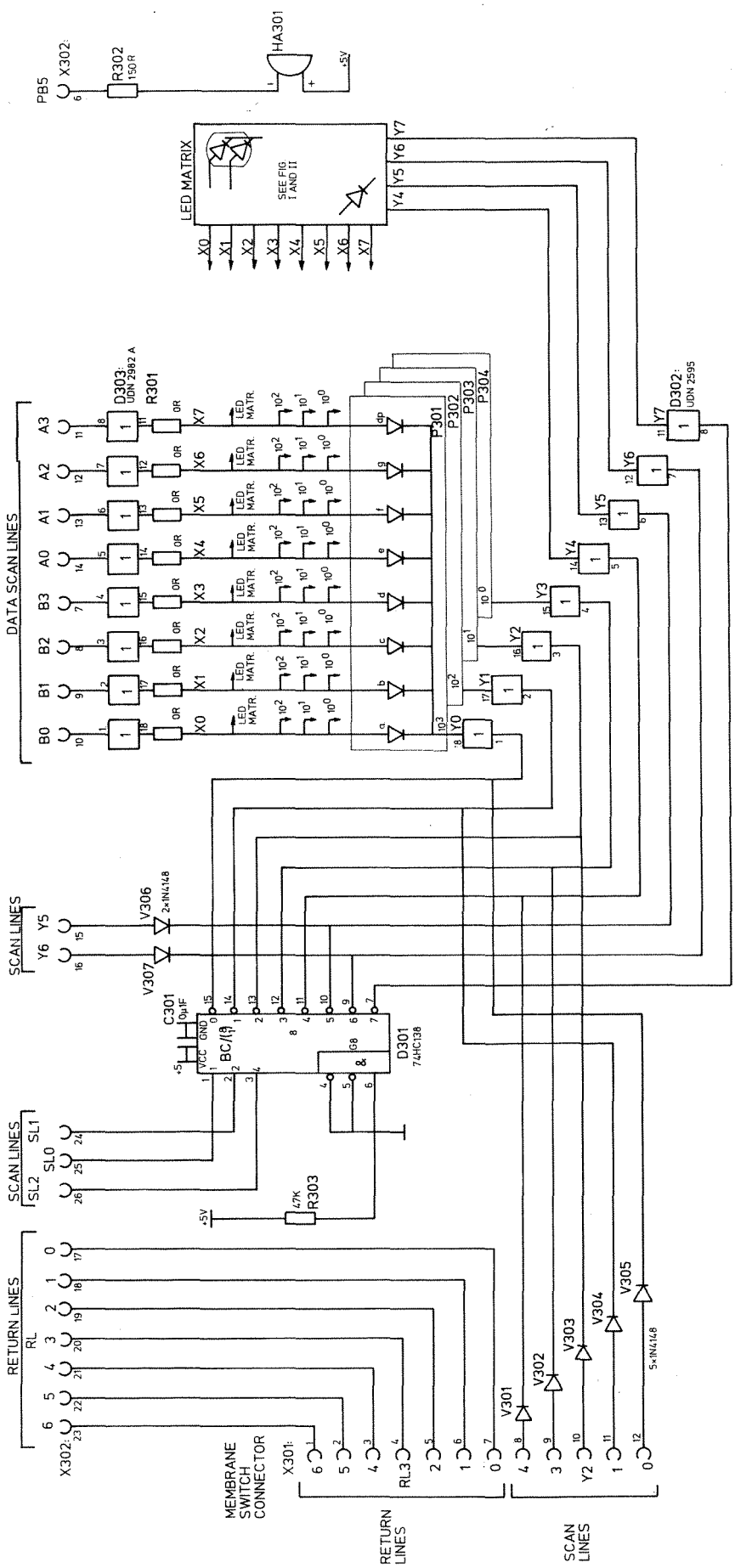
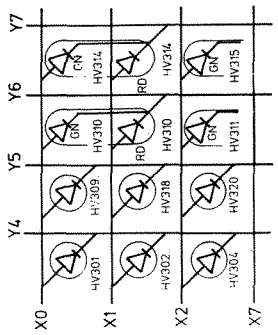
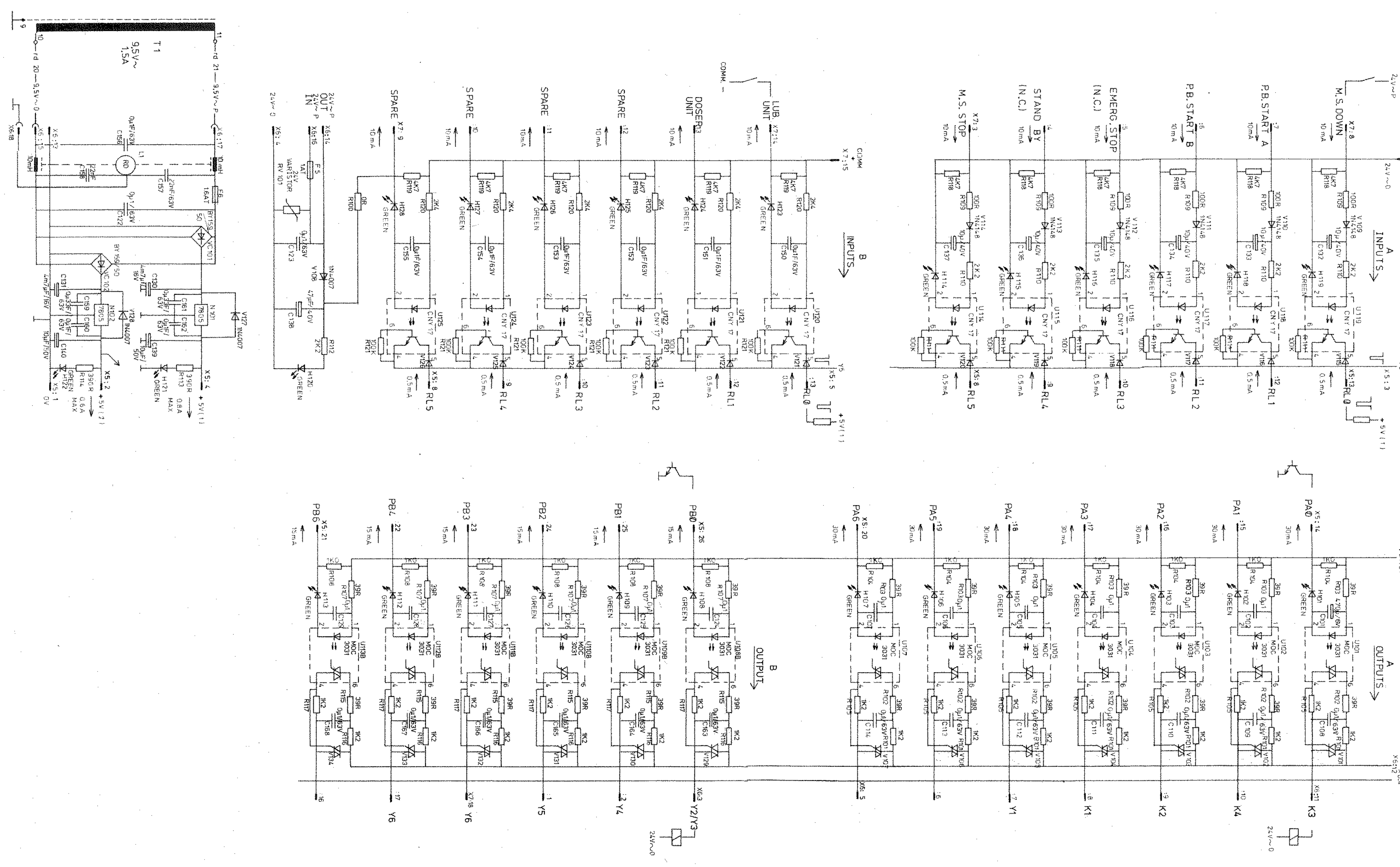


FIG. II

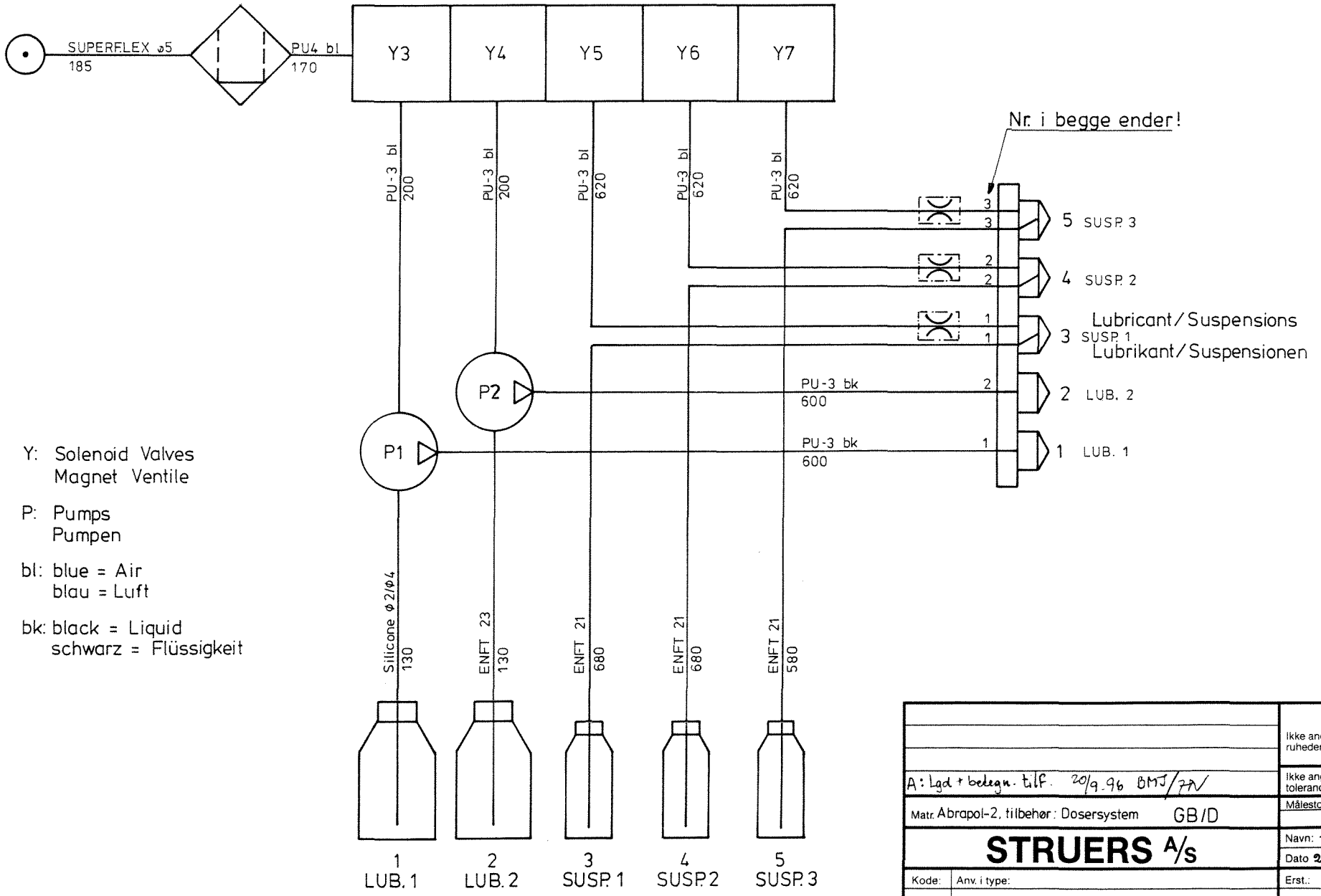
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X0	P301:a	P302:a	P303:a	P304:a	HV301 SUSP1	HV309 WATER	HV310, GN STEP 1	HV314, GN STEP 5
X1	b	b	b	b	HV302 SUSP2	HV318 SINGLE STEP	HV310, RD STEP 1	HV314, RD STEP 5
X2	c	c	c	c	HV303 SUSP3	HV319 AUTO STEP	HV311, GN STEP 2	HV315, GN STEP 6
X3	d	d	d	d	HV304 RPM150	HV320 DISC ON	HV311, RD STEP 2	HV315, RD STEP 6
X4	e	e	e	e	HV305 RPM300	HV321 WATER ON	HV312, GN STEP 3	HV316, GN STEP 7
X5	f	f	f	f	HV306 LUB 1	EX 1	HV312, RD STEP 3	HV316, RD STEP 7
X6	g	g	g	g	HV307 LUB 2	EX 2	HV313, GN STEP 4	HV317, GN STEP 8
X7	dp	dp	dp	dp	HV308 µ-●		HV313, RD STEP 4	HV317, RD STEP 4
					7-SEGM. DISPLAY		LED'S	

FIG. I LED MATRIX

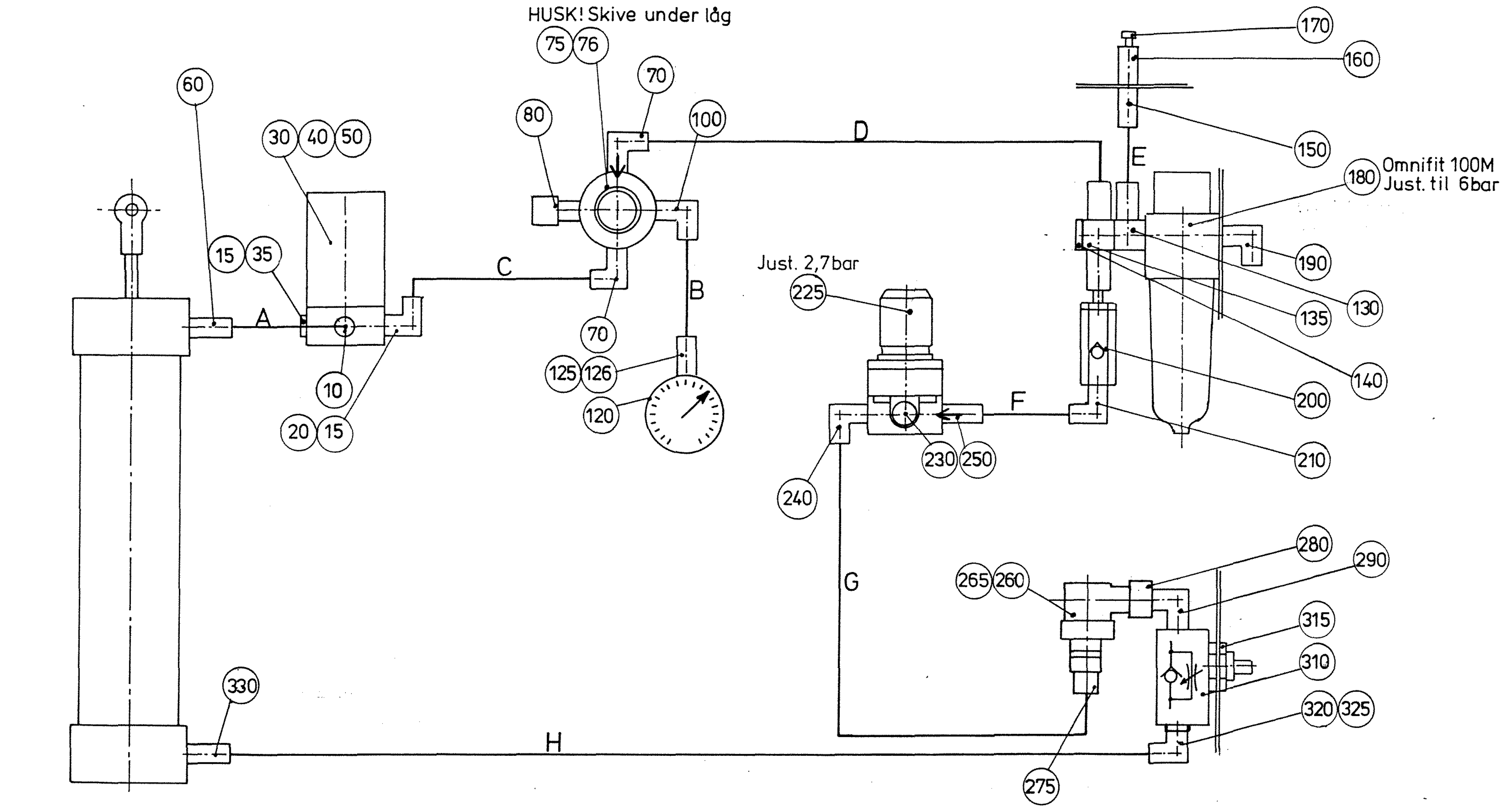




B: X3 og K4 byttet om	Ikke ang. radier
A: Fejl ved R103 rettet (2 x stod der R105)	Ikke ang. tolerancer ±
Abrapol-2 2050322/1	Målestok:
STRUERS K/S	Navn
	Dato: 13.10.95
Anvendes i type:	Erstatter



	Ikke ang. ruheder: ✓
A: Lgd + bedegn. tilf. 20/9.96 BMJ/JN	Ikke ang. tolerancer: ±
Matr. Abrapol-2, tilbehør: Dosersystem GB/D	Målestok: / Overfladebehandl.:
STRUERS A/S	Navn: BR
	Dato 21.06.96
Kode: / Anv. i type:	Erst.:
Pneumatic Diagram Pneumatik Diagramm	14220536 A



A: PA ϕ5 × 170
B: PA ϕ5 × 220
C: PA ϕ8 × 240
D: PA ϕ8 × 310
E: PA ϕ8 × 240
F: PA ϕ8 × 125
G: PA ϕ8 × 315
H: PA ϕ8 × 300.

K. Pos 15 rykket fra Pos. 10 til pos. 35. 15/3.99 BMJ/77	
J: Pos 270 FjerneT pos 265 Til F. 18/11-98 CVE/77	Ikke ang. ruheder: √
I: Pos 130+135 v. manometer → Pos 125+126 29/10.96 BMJ/77	
H: Tekst → Pos.nr. O-ringe pos 15 tilf. Nippel 1/4-1/4 pos 325 tilf. Slangelgd ϕ8 ænd. Passkiver pos 76 tilf. 250996 BMJ/77	Ikke ang. tolerancer: ±
	Målestok: / Overfladebehandl.:
Matr.	
STRUERS A/S	Navn: KK-BRH
	Dato 18.4.88
Kode: / Anv. i type:	Erst.: 14220231G
Pneumatik, monteringstegn.	14220 231 K

Motor protection fuse setting:

Motor schutz Einstellung:

Rèlage du fusible protégeant le moteur:

U / f	F1/A	F2/A	F3/A	F4/A
200/50	0.4	0.96	4.8	5.1
200/60	0.4	0.96	4.0	4.8
220/50	0.4	0.96	4.5	4.7
220/60	0.4	0.96	4.5	4.7
380/50	0.23	0.55	2.6	2.7
415/50	0.23	0.55	2.5	2.6
440/50				
440/60	0.23	0.55	2.6	2.7
480/60	0.23	0.55	2.5	2.6
500/50	0.18	0.5	2	2.1

C: F3 og F4 opdaterst for 200, 415 og 480 V 18/11-98 CVE/

B: F2/A alle værdier ændr. undt. 500/50 040196 BMJ/JTV

A: 200V/50+60tilf. 090392 BRH/JTV

Matr.:

Overfl.beh.:

Projektionsmetode

Målforhold:

Ikke ang. tol. efter DS/ISO 2768-

	Dato	Sign.
Tegn:	170889	BMJ
Kontr.	170889	v.H.

Struers

Indstilling af termosikring Abrapol-2

Erst.:

14221045C