SERVICE MANUAL

FLE 804 – FLE 810

471 1555-01

Electrolux

Wascator

NOTICE TO SERVICE PERSONNEL

INSTALLATION

Improper installation of Wascomat laundry and wet cleaning equipment can result in personal injury and severe damage to the machine.

REFER INSTALLATION TO QUALIFIED PERSONNEL!

RISK OF ELECTRIC SHOCK

The equipment utilizes high Voltages. Disconnect electric power before servicing.
The use of proper service tools and techniques, and the use of proper repair procedures, is essential to the safety of service personnel and equipment users.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL!

RISK OF PERSONAL INJURY

This equipment contains moving parts, and some components that may have sharp edges. Improper or careless service procedures may result in serious injury to service personnel.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL!

ABOUT THIS MANUAL

This manual is intended to provide service guidance to qualified service personnel. Wascomat and its authorized dealers make no determination regarding the qualification of individuals requesting this service manual. The service provider assumes all risks inherent to the servicing of this equipment and any risks that arise as result of the lack of knowledge or ability of any person servicing this equipment.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL!

NOTE:

Improper installation or servicing of Wascomat equipment will void the manufacturer's warranty!

The 800-litre washing machines FLE 804 and FLE 810 described in this manual are high-extraction machines with flexible programs, intended for installation in hotels, laundries, factories, hospitals, larger institutions, etc.

The machines differ primarily with respect to their automation capabilities. The FLE 810 has a larger door and its operating panel is mounted at the side, which means that much of the automation equipment can be built on to provide an automatic washing line.

The machines are equipped with a freely rotating washing drum which is suspended by springs in the frame. Minimal vibration is thus transmitted to the frame, simplifying installation by obviating the need for a concrete foundation.

A further vibration reduction caused by unbalance is achieved via a special distribution cycle designed to spread the washing evenly in the drum prior to extraction.

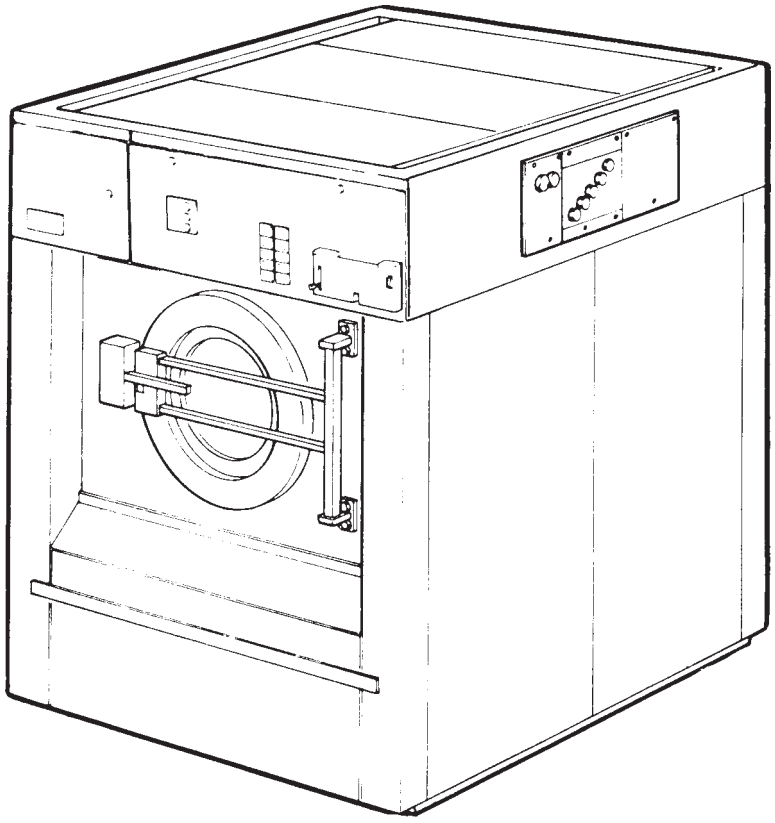
The distribution speed in combination with drainage ensures good extraction.

The high spin speed provides a G-factor of around 500, thus ensuring excellent extraction during spin.

The washing programs are programmed according to the equipment alternative, by means of either an automatic card unit or a microprocessor.

The machines are supplied equipped in accordance with customer specifications, i.e., for heating by electricity or steam, or without heating.

The machine is also available in various connection alternatives for cold, hot and/or cold hard water.



Safety provisions

- The machine is designed for water washing only.
- The machine must not be used by children.
- Installation and servicing may only be carried out by qualified personnel.
- The machine’s door lock should be in working order and must not be by-passed under any circumstances.
- All leakage in the system, such as worn door seal, must be rectified immediately.
- The personnel concerned must study the relevant manuals before undertaking repairs or service.
- The exterior of the machine may not be sprayed with water.

		FLE 804	FLE 810
Dry weight capacity			
for filling factor 1:13	kg	62	62
for filling factor 1:10	kg	80	80
Drum volume	litre	800	800
diameter	mm	1120	1120
depth	mm	856	856
Drum speed			
wash	r/m	36	36
distribution	r/m	57	57
extraction, low	r/m	440	440
extraction, high	r/m	880	880
G-factor			
wash		0.8	0.8
distribution		2.0	2.0
extraction, low		121	121
extraction, high		485	485
Dimensions			
width	mm	1395	1460
depth	mm	1760	1740
height	mm	2095	2080
Recommended service space			
side	mm	300	500
rear	mm	1000	1000
Min. space for moving machine during service			
side	mm	300	300
rear	mm	500	500
Weight			
net	kg	2500	2500
gross, crate packed	kg	2600	2600
gross, box packed	kg	2700	2700
Transport volume			
crate packed	m^3	7.15	7.15
box packed	m^3	7.15	7.15
Max. floor load during spin	kN	27.5±2.5	27±2.5
Frequency (dynamic load)	Hz	7.5/15	7.5/15
Motors 3AC 50/60 Hz (power rating)			
input power, wash speed	kW	3.0/3.1	3.0/3.1
input power, distribution speed	kW	4.9/5.2	4.9/5.2
input power, extraction speed	kW	13.9/14.4	13.9/14.4
Water valves, connection		DN 50 2"	DN 50 2"
Rec. water pressure	kPa	200-600	200-600
Pressure limits	kPa	40-1000	40-1000
Capacity at 300 kPa	l/min	800	800
Drain valve			
conn. outside diameter	mm	160	160
capacity	l/min	600	600
Steam valve, connection		DN 32 1 1/4"	DN 32 1 1/4"
Rec. steam pressure	kPa	300-600	300-600
Pressure limits	kPa	50-800	50-800

Air valve, connection		DN 8 1/4"	DN 6 1/8"
Rec. air pressure	kPa	400-600	400-600
Air consumption, without tilting	l/h	20	20
Air consumption, with tilting	l/h	100	100

Voltage	**Element output**	**Total output**	**Fuse**	**Connection cable type min HO5 VV-F as per CEE (13) 53 07027**
	kW	**kW**	**A**	**Area mm²**
Steam- and non-heated				
220 V 3AC 50 Hz	-	13.9	100	4 x 25
380-415 V 3NAC 50 Hz	-	13.9	63	5 x 10
208-240 V 3AC 60 Hz	-	14.4	100	45 x 25

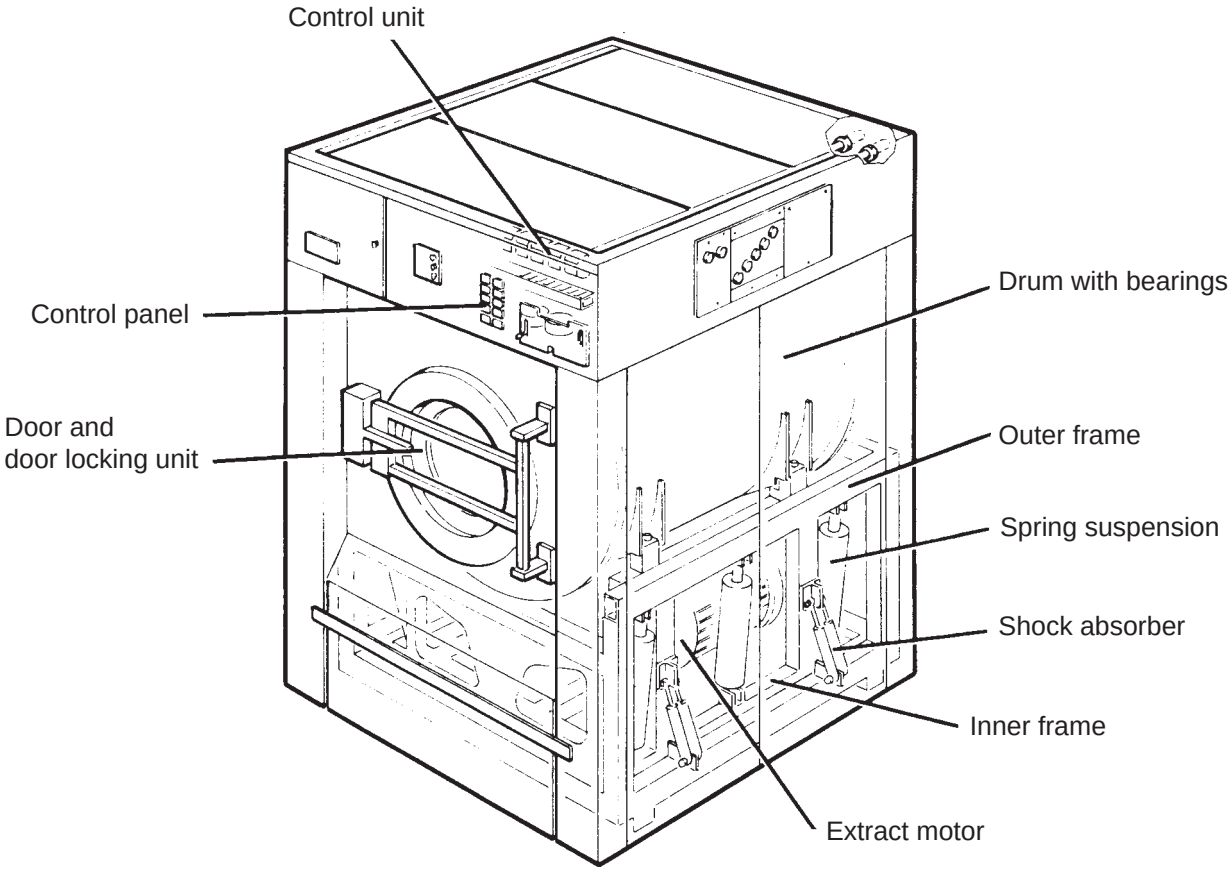
The machine is equipped with a freely rotating washing drum which means that the outer drum and motor are suspended in the frame via three robust springs on each of the long sides of the machine. Shock absorbers to dampen any unbalance in the machine are located at the front and central springs.

The inner drum is driven via V-belts by two motors, one for wash and distribution and the other for extractions. The inner drum is journalled on the outer drum by means of two strong bearings at the rear gable and is sealed with three V-rings.

The motors are suspended in the inner frame on supports. The washing motor is mechanically connected to the drum via V-belts over a belt gear with an electromechanical clutch. The extraction motor is mechanically connected to the drum via a hydrostatic clutch, a through shaft on the aforementioned belt gear and V-belts. Two belt-tensioning devices are located on the rear gable of the outer drum, one acting on the belt connection between the belt gear and the drum pulley and the other action on the belt connection between the washing motor and the belt gear.

The water supply line extends from the detergent compartment to the underside of the outer drum at the drain valve, an arrangement which provides for a favourable flow during filling, and also prevents lye fumes from entering the detergent compartment.

The door is a robust, round type with a handle that is locked by a safety locking device during operation.



The operating panel contains a number of buttons for manual control of certain functions, indicator lamps, thermostat and automatic card unit or microprocessor for control of the washing programme cycles.

Level control, relays, etc. are located in the control unit. The automatic unit is placed behind the operating panel and is easily accessible from the front since the panel can be folded down like a hatch.

The machine is equipped with a freely rotating washing drum which means that the outer drum and motor are suspended in the frame via three robust springs on each of the long sides of the machine. Shock absorbers to dampen any unbalance in the machine are located at the front and central springs.

The inner drum is driven via V-belts by two motors, one for wash and distribution speed, and the other for extraction speed. The inner drum is journalled on the outer drum by means of two strong bearings at the rear gable and is sealed with three V-rings.

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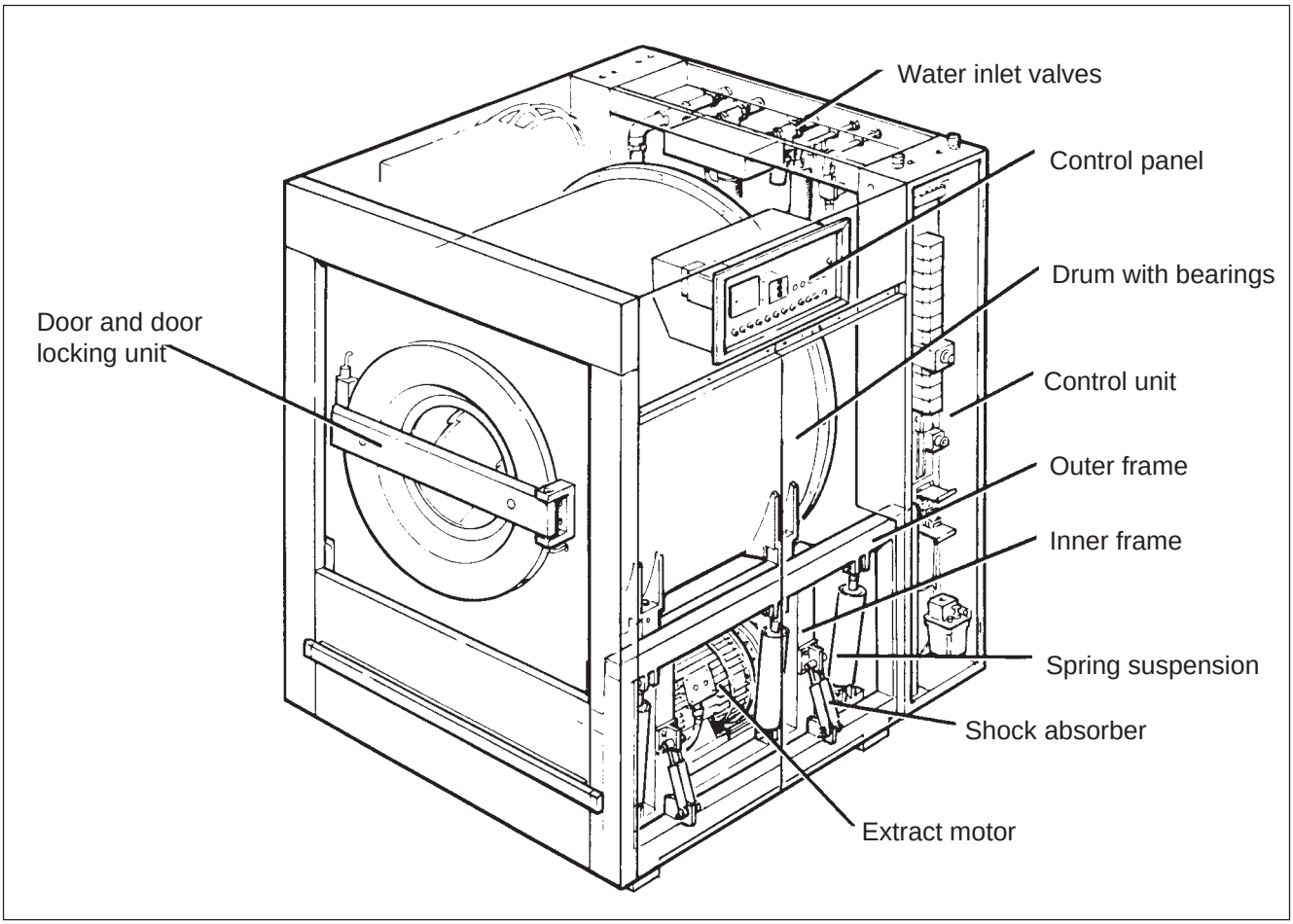
The water supply line extends from the detergent compartment to the underside of the outer drum at the drain valve, an arrangement which provides for a favourable flow during filling, and also prevents lye fumes from entering the detergent compartment.

The door is a robust, round type without a handle. It is locked and tightly sealed by a pneumatic unit. Door closure may also be pneumatic depending on equipment alternatives.



3. Description of principal components

The operating panel on the side of the machine contains a number of buttons for manual control of certain functions, indicator lamps and thermostat, as well as a microprocessor for control of the washing programme cycles.

Level control, relays, etc. are located in the control unit/electric control enclosure. The automatic unit comprises two spaces at the far rear on the long side and is easily accessible from the side in that the doors are opened.

The following steps should be taken to obtain optimum safety and machine performance and to avoid breakdowns.

The frequency should be adapted to the degree of machine usage.

Daily

- Check the door latch for normal functions and for tight door closure. The door gasket must be cleaned and any residual detergent removed.
- If the machine is equipped with dispensers for solid detergent, any residual detergent must be removed (also from scoops).
- Check the drain valve for leaks, and for normal opening and closure.
- Check external connections, hoses, etc. for leakage.
- Check the machine's enclosure plates and doors for tightness.

Every three months

1. Set main power switch to OFF position.
2. Remove the rear and side plates of the machine.
3. Check hoses and connections for leakage.
4. Check belts for damage and proper tension. If necessary, adjust the belts with the two belt tighteners, see figure 1 and section "30. Motor."
5. Check the imbalance breaker control arm for straightness or damage and the imbalance breaker for proper adjustment. The control arm, figure 2, should be located 10 mm from the two adjustment screws. When the machine is empty, the arm should touch the screws' anchor plate (for more information, please refer to section "28. Imbalance Breakers").
6. Clean the steam and water connection filters. Drain the water separator at the compressed air connection.
7. Check the steam valve oil container for leakage and proper setting. The adjustment screw on the oil container, figure 3, should be set to allow the steam valve to open in 5 to 10 seconds.
8. If the machine is equipped with a device for lubrication of shaft seals: check the oil level in the container, figure 4. If the level is too low, the machine will stop. If necessary, add more oil (Shell Tellus Oil 46 or equivalent).
9. If the machine is equipped with a tilting device: check the bellow for damage.
10. Check the hydraulic coupling for tightness and leakage.
11. Check the shock absorbers for leakage.
12. Check the door for leakage.

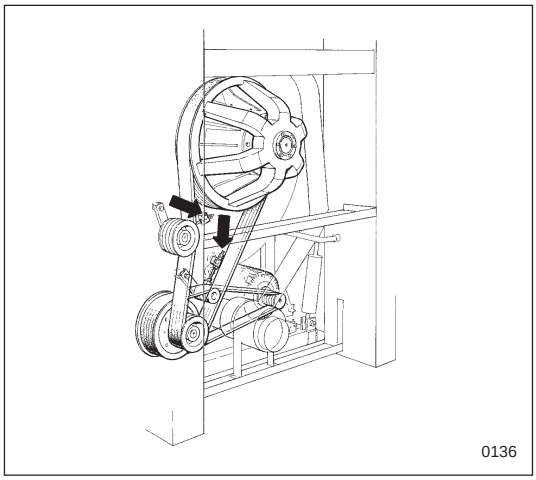


Figure 1.

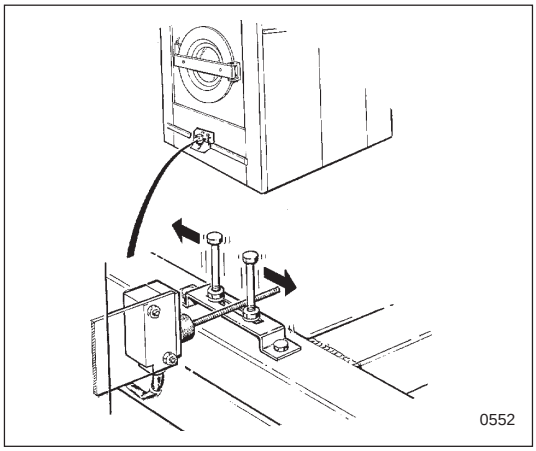
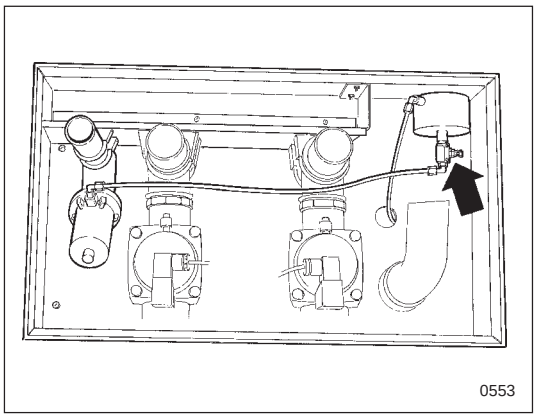


Figure 2.



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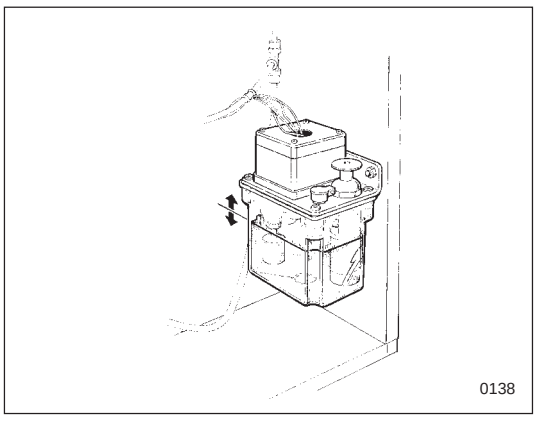


Figure 4.

13. After the check-off list is completed: reassemble enclosure plates and set main power supply switch to ON.

Every six months

1. Set main power switch to OFF position.
2. Then remove rear cover plate.
3. Lubricate the drum shaft with a force-feed grease gun (two grease fittings, figure 5), 10-15 pump strokes for each.
4. Check that the steam valve opening time is 5-10 seconds. The timing can be adjusted by turning the adjustment screw of the oil container.
5. Check the hose and the couplings for leakage. If necessary, oil can be added to the container through the air hose connection.
6. Check that no cables are rubbing against moving parts or are kinked.
7. If the water is hard: clean the water valve nozzles, especially the hot water valves since lime starts to deposit at 70°C.
8. Check that the microswitch for the hydraulic coupling works properly:
   - turn the release arm, figure 5, to the disengaged position
   - close the washing drum door
   - check that the machine cannot be started
   - check that the warning light for the clutch goes on (located on the control panel, but in certain models on the automatic unit).
9. Check all drain valve connections and the drain outlet box itself for leaks.
10. Fill the machine with water, close the drain valve and check to make sure there is no leakage into the drain.

Every year

1. Set main power switch to OFF position.
2. Remove rear and side enclosure plates from the machine.
3. Lubricate the motor shaft bearings with a force-feed grease gun (two lubrication fittings on each motor, figure 7), one pump stroke at each lubrication point.
4. Check the hydraulic clutch oil level:
   - turn the hydraulic clutch so that the refill plug, figure 8, is in an upright position
   - remove the refill plug of the clutch
   - turn the clutch 30° to 60° until oil runs out
5. After completion of all steps, reassemble the enclosure plates and set the main power supply to ON.

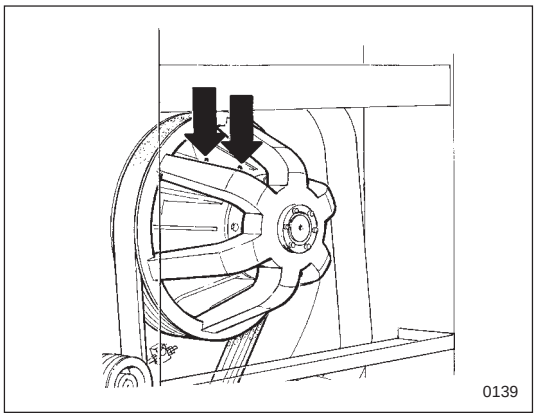


Figure 5.

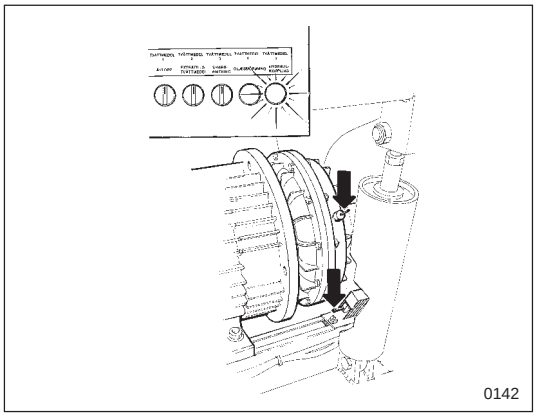


Figure 6.

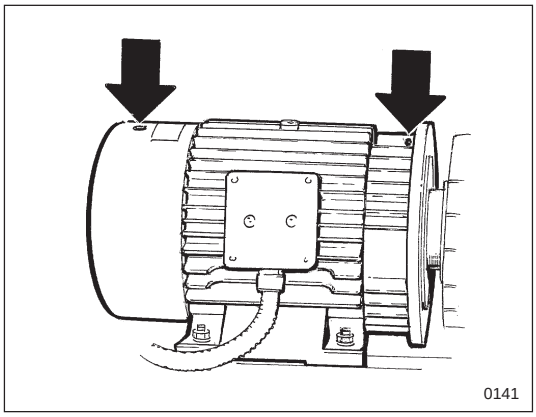


Figure 7.

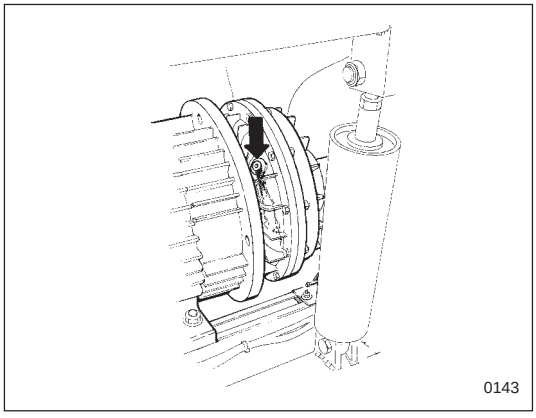


Figure 8.

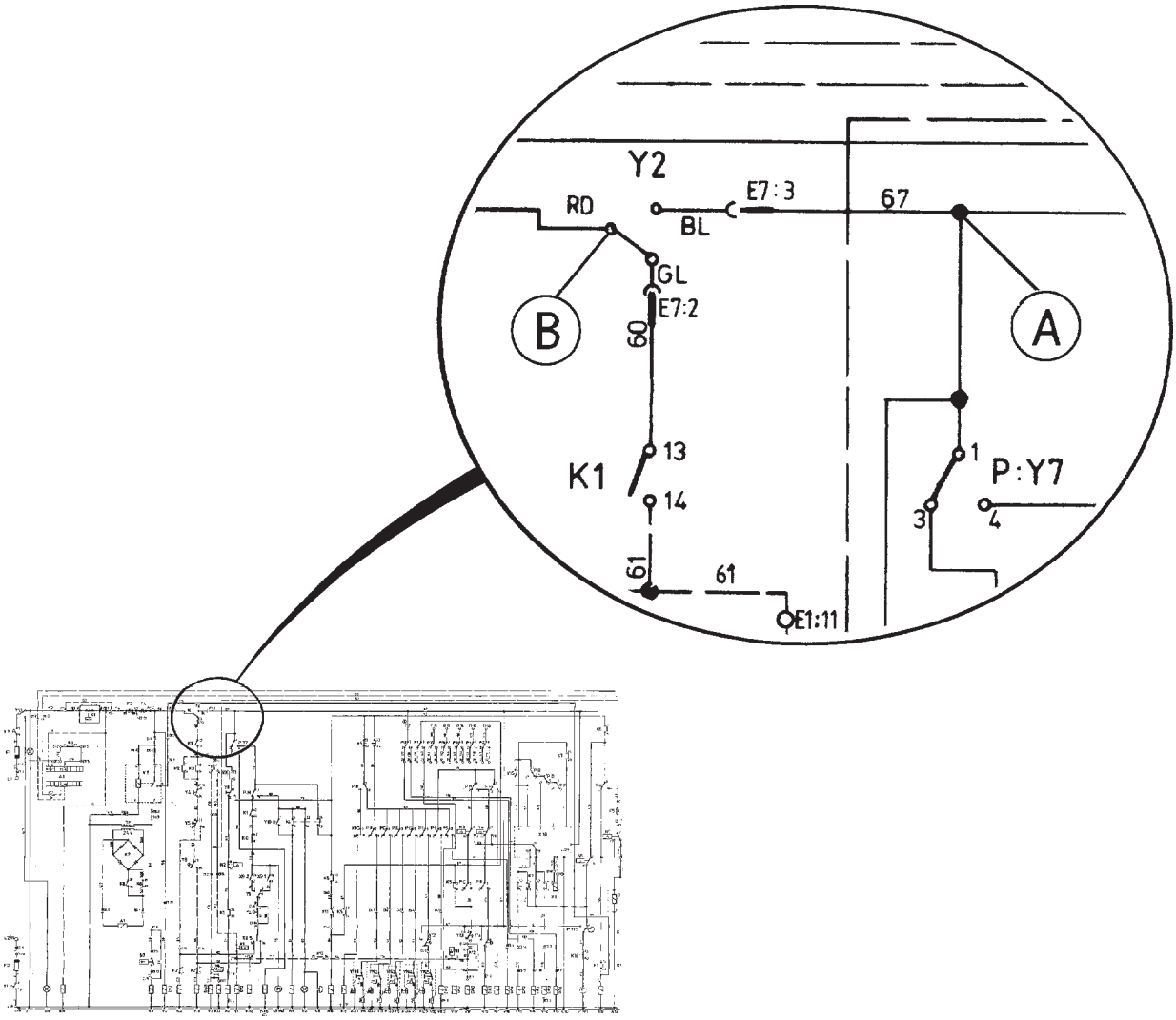
General

To assist with fault diagnosis in the electrical system of the machine, the circuit diagrams are broken down into function sequences. The following sequences are described:

Fig. 1 All sequences, apart from door lock, require voltage (220/380 V) up to program knob switch P:Y7 **(A**).

The door lock sequence requires voltage (220/380 V) up to door switch Y2 **(B)**.

1



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Wash speed

Fig. 2

Contactors K2 and K3 control the switching of the winding to set the wash speed of the wash motor. With K2 switched on the motor turns in one direction, and with K3 switched on it turns in the other direction. For the relay coil (12) of K2 or K3 to be energised, the following conditions must be met:

- **The knob on the programmer (1) may be in one of two positions:**

  a When the knob is set to 0:

  The motor can be operated with the switch ( ) (4) on the control panel of the machine, provided that the ”stop programmer” relay (K16) (2) is energised and that the conditions below are met.

  b When the knob is set to I:

  Row M, stop (3) must not be programmed on the program card.

- **The motor speed must not exceed 310 rpm (50 Hz).**

The speed switch X6 of the machine energises relay K1 (5) as long as the motor speed is below 310 rpm. If the speed goes above this value, relay K1 (5) cuts off the voltage to K2 or K3.

- **The drain must be closed**

When the drain valve is open, either distribution speed or spin speed is used. K6:62-61 (6) therefore opens when drain is programmed.

- **The reverser motor must start**

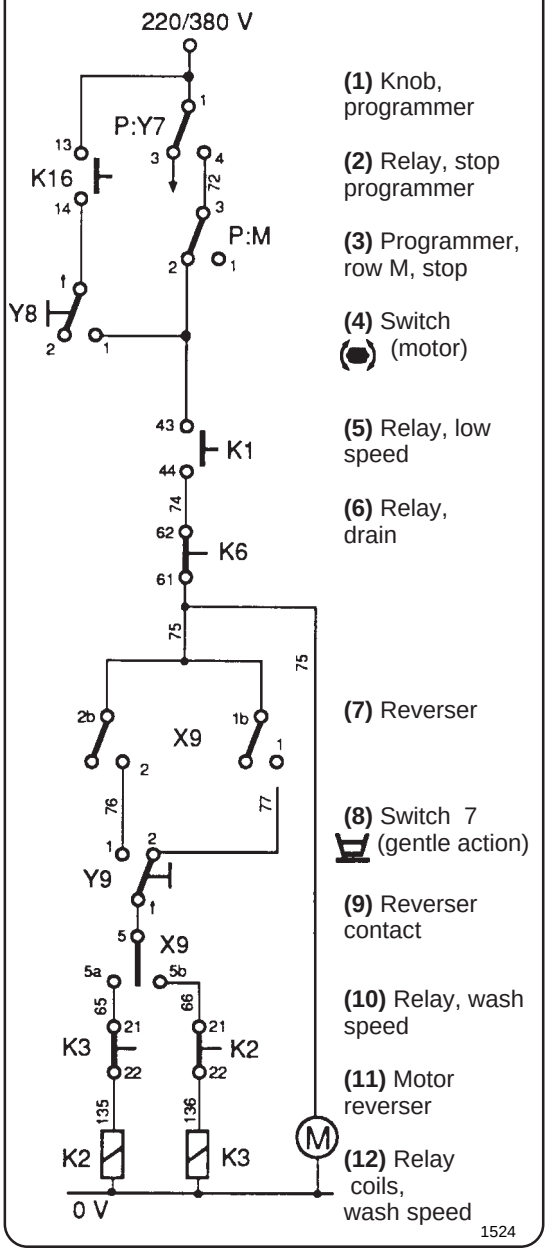
Fig. 3

If the conditions above are met, the reverser motor (11) is energised and the reverser starts. The reverser contacts (6) close and open according to a programmed pattern (see diagram below). The switch (8) on the control panel of the machine is used to select which of the two reverser contacts is to control the motor.

Reverser contact 5 (9) alternately switches on contacts K2 and K3.

To prevent both contacts being energised simultaneously, the coil of K2 is in series with a closed contact on K3, so that when K3 is energised, contact K3:21-22 (10) opens and blocks the coil of K2. In the same way, the coil of K3 is in series with a contact on K2.

2



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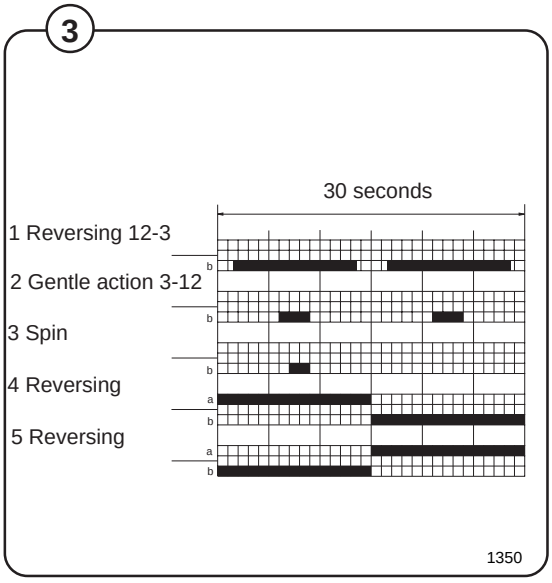


Spin

Fig. (4) Relay K9 controls the switching of low speed for the spin motor, and relay K10 and K11 control the switching of high speed. The following conditions must be met for any of these relays to be energised:

- **The programmer knob (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**
- **The drain must be open.**

  The drain is open when relay K6 is energised. K6:13-14 (3) is then closed.
- **Row H, spin (4) must be programmed on the program card.**
- **The thermal cut-out (5) of the spin motor must not have tripped.**
- **The spin level switch (6) must not be activated.**

  The level switch operates if the water level in the drum goes above 70 mm.

If the conditions above are met, the relay coil (19) of time relay X12 is energised. After 70 seconds X12:12-13 (7) closes, switching the spin motor from the low speed to high speed, provided that the switch (9) on the control panel of the machine has not been pressed.

For the low speed relay K9 (18) to pick up:

- **The high speed relays K10 and K11 must be de-energised.**

This is a safety measure to prevent damage to the motor, and is checked by K10:31-32 (10) and K11:31-32 (11).

For the high speed relays K10 (16) and K11 (17) to pick up after 70 seconds:

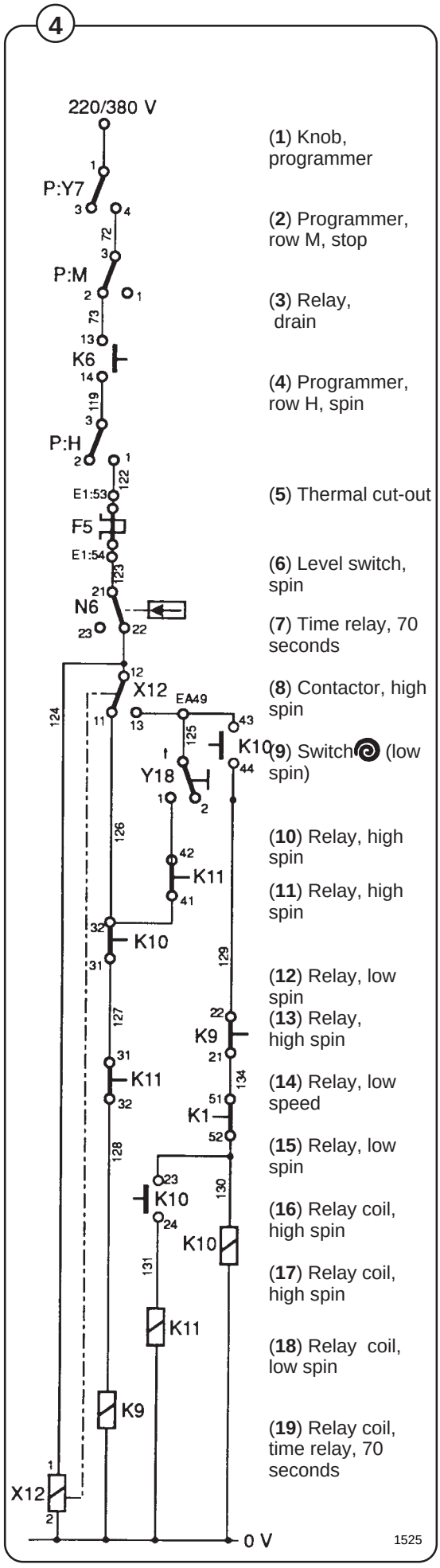
- **The switch (8) must not be pressed**
- **The low speed relay K9 must be de-energised**

This is a safety measure to prevent damage to the motor, and is checked by K9:21-22 (12).

- **Low-speed relay K1 must not be energised**

Relay K1 is controlled by the speed switch of the machine. When the drum rotates at a speed above 310 rpm the speed switch cuts off the voltage to relay K1. To avoid overloading the spin motor, high spin can only be switched on above this speed. This is checked by K1:51-52 (14).

When high speed is switched (K10 energised), switch is shorted by K10:43-44.



Drain

Fig. (5) Relay K6 controls the air valve of the drain valve. The drain valve is open when the motor power supply is off. When the power supply comes on, the valve is closed, but is opened again by spring force when the motor power supply goes off again.

When the washing machine is switched on, the air valve of the drain valve is powered via the switch (7) and K6:51-52 (8). The valve can be opened and closed manually with the switch on the control panel of the machine.

For relay K6 to pick up and open the valve, the following conditions must be met:

- **The knob on the programmer (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**
- **The out-of-balance cut-off must not have cut in.**

  The out-of-balance cut-off cuts in during spin if the washing is not properly distributed in the drum. A sequence of actions to redistribute the washing then takes place. The first is the closing of the drain valves which is done by K5:51-52(3). The out-of-balance functions are described in detail in the section headed Out-of-balance.

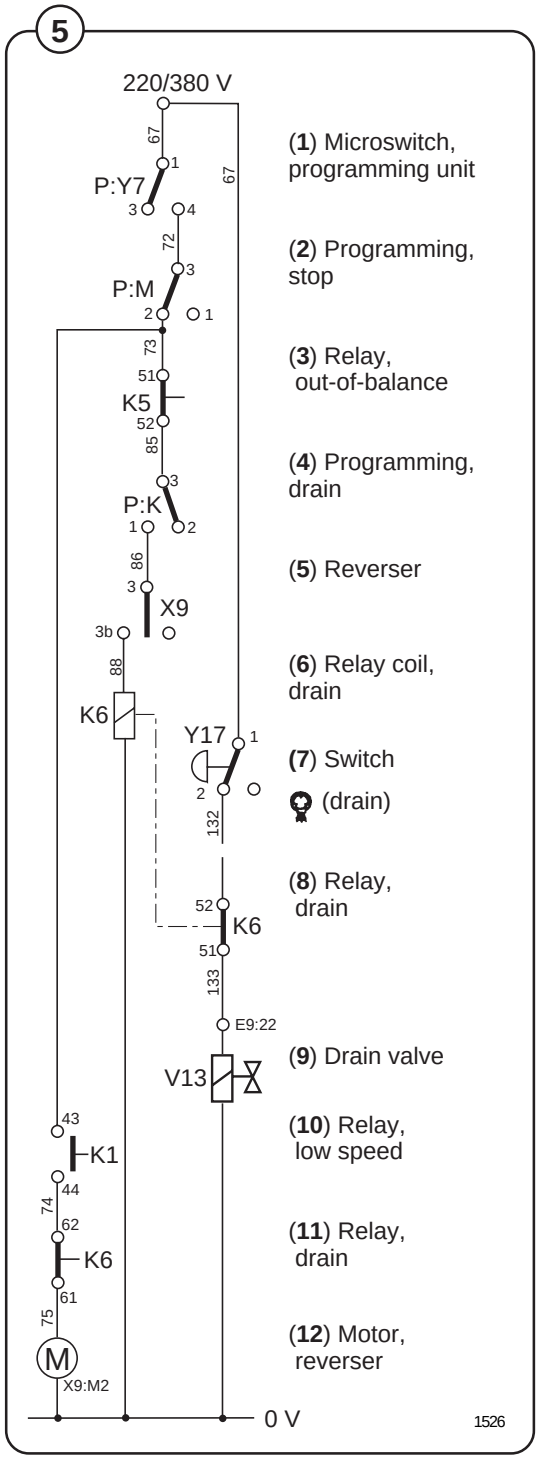
- **Row K, drain (4) must be programmed on the program card.**
- **The reverser contact 3:b must be closed.**

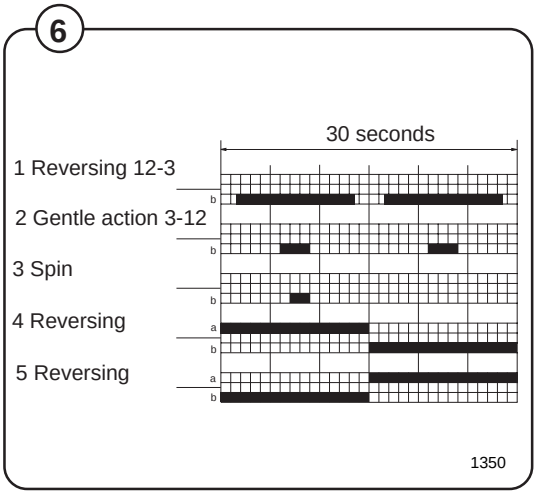
  When relay K6 picks up, the motor switches from wash speed to distribution speed (see section headed Distribution speed). To minimise stress on the motors, belts and drum bearing, the motor must be running at washing speed and rotating in a particular direction when distribution speed is switched on. When reverser contact 3:b closes, contacts 4 and 5 are in the right position (the motor is running in the right direction) and the motor runs regardless of whether the machine is operating with normal action (reverser contact 1) or gentle action (reverser contact 2).

Fig. (6)

When K6 has picked up, K6:61-62 (11) cuts off the supply to the reverser motor (12). This means that reverser contact 3:b is closed as long as the drain valve is open.

Contact K1:43-44 (10) is only closed when the machine is running at low speed. This is a safety feature which prevents the reverser changing the direction of rotation of the motor at high speed.





Detergent dispensing (TMPF)

Fig. (7)

The machine has five different detergent compartments. The flushing of detergent and conditioner is controlled by five external water valves V4-V8. The following conditions must be met for any of the valves to be controlled:

- **The knob on the programmer (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**
- **The out-of-balance cut-off must not have cut in.**

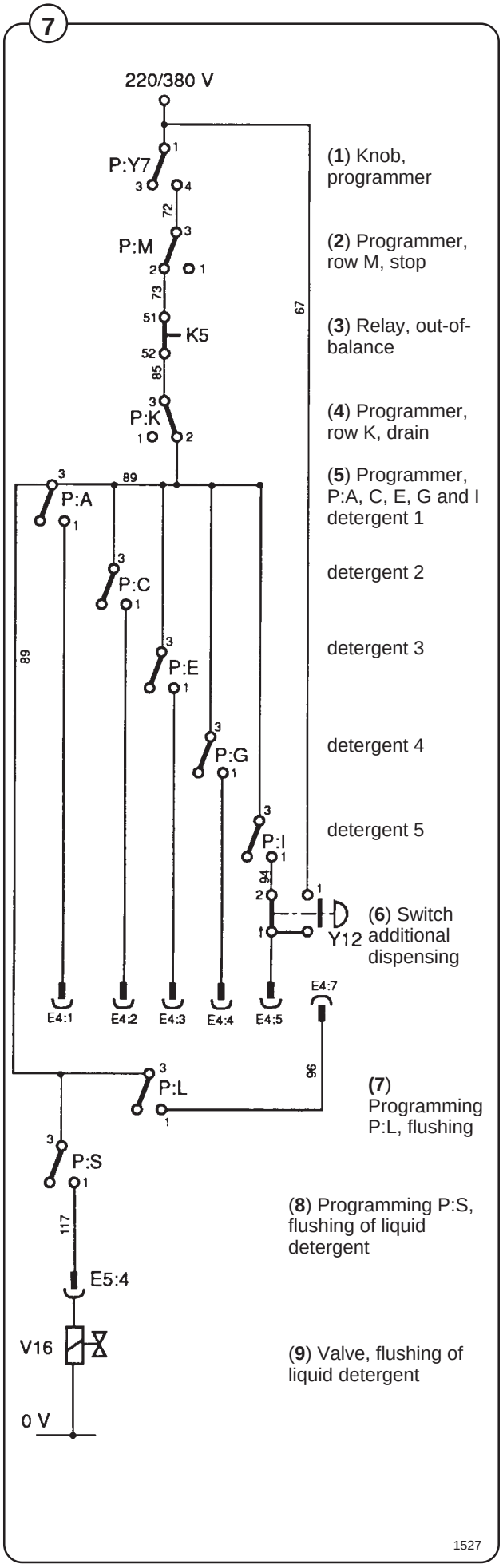
The function of K5:51-52 (3) is explained under the headings Out-of-balance and Drain. The relay contact opens only during spin when the washing is not properly distributed. Since detergent dispensing is never programmed during a spin, relay contact K5:51-52 (3) is always closed during detergent dispensing.

- **Row K, drain (4) must not be programmed on the program card.**

If the conditions above are met, valves V4-V8 can now be controlled individually by programming rows A, C, E, G and I on the program card.

Detergent flushing is obtained by programming row L (7). Flushing of liquid detergent is obtained by programming row S (8), which in turn activates valve V16 (9).

Additional detergent is dispensed by pressing switch Y12 (6).



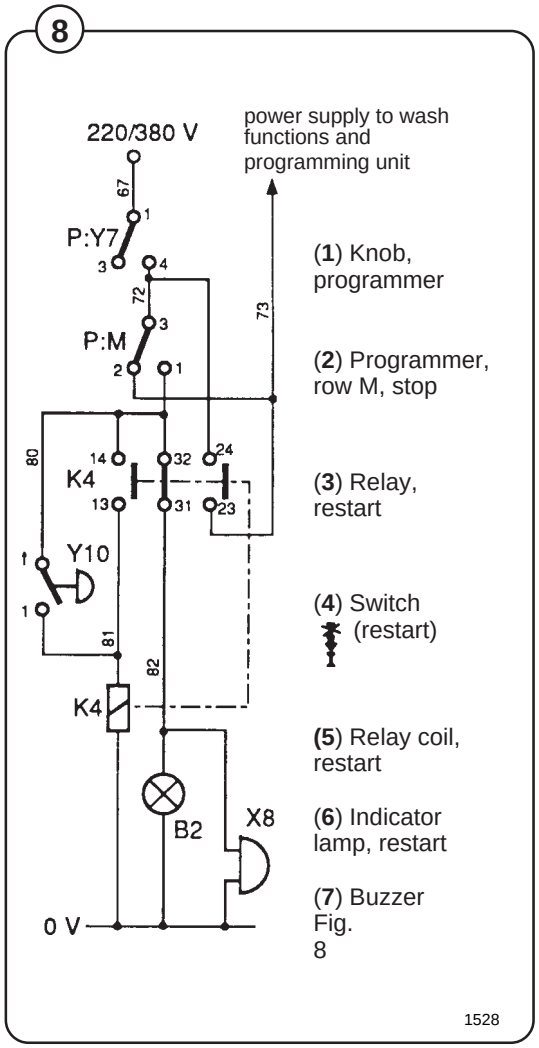
Restart

Fig. (8) Row M, stop, on the program card is programmed when a stop is required in a program run, for example to dispense detergent or when the wash is done.

- When row M (2) has been programmed, the programmer switch changes and power is fed to the indicator lamp (6) and the buzzer (7). At the same time, the power is cut off from all washing functions (the drain remains closed) and the programmer motor stops.

- Relay K4 (5) is activated by pressing the switch (4) on the control panel of the machine. The relay holds itself in via relay contact K4:13-14 (3).

- When relay contact K4:13-14 (3) closes, power is restored to the program functions and programmer motor, and the program run continues. When row M is no longer programmed (P:M (2 changes over), relay K4 (5) drops out.



Out-of-balance

Fig. (9)

The purpose of the out-of-balance function is to protect the washing machine from undue stress during the spin cycle. If the washing is not properly distributed in the drum, the spin cycle stops, the washing is redistributed and the spin cycle starts again. This takes place automatically as follows:

- **Out-of-balance cut-off (7) is activated.**

  The cut-off is activated when the drum oscillates more than about 17 mm from its rest position.

  Relay K6 is energised during the spin cycle (the drain is open). As a result, K6:33-34 (6) is closed.

When the cut-off operates, the following events happen immediately:

- **Relay K5 (18) picks up and is held in by K5:33-34 (8) and K5:23-24 (11) closing.**
- **Relay K6 drops out (K5:21-22 (8) opens) and the drain closes (K6:51-52 (2) closes).**
- **The spin cycle and the programmer motor stop (K6:13-14 (13) opens).**
- **The machine starts filling with cold water (K5:43-44 (12) closes).**

When the drum speed has fallen below 310 rpm (50 Hz), speed switch X1 energises relay K1 and the following event happens:

- **The machine starts running at wash speed (K1:43-44 (5) closes).**

When the water in the drum has reached a level that causes level switch N2 (10) to operate, the following events happen:

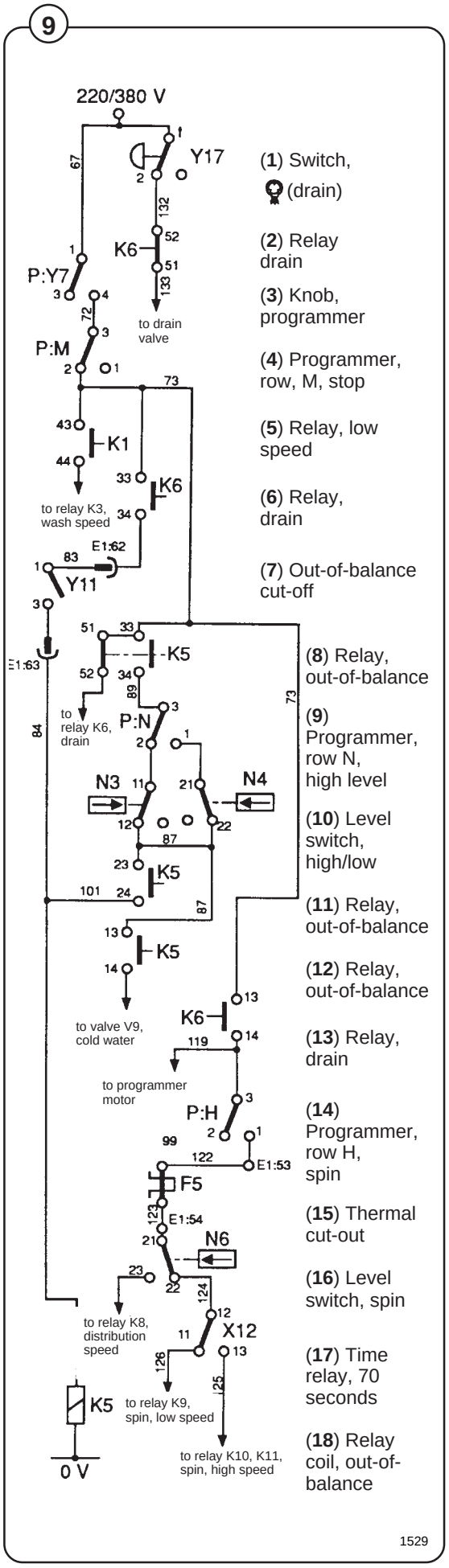
- **Relay K5 closes its self-holding (N3:11-12 or N4:21-22 (10) opens).**

  Which of these contacts opens depends on whether row P:2, high level (9) is programmed.

- **Relay K6 picks up (K5:21-22 (8) closes) and the drain opens (K6:51-52 (2) closes).**
- **The programmer motor starts and the drum starts running at distribution speed (K6:13-14 (13) closes).**

When the water level in the drum has fallen below 115 mm, level switch N6 (16) operates and the following event happens:

- **Spin relay K9 (low spin) picks up. After 70 seconds, time relay X12 (17) operates and high spin relays K10 and K11 pick up (see also the section headed Spin).**



Water

Fig. (10) The standard version of the machine is fitted with two water valves, V9 for cold water and V10 for hot water. The machine is also designed to be fitted with a third water valve.

The following conditions must be met for either of water valves V9 and V10 to be energised:

- **The knob on the programmer (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**

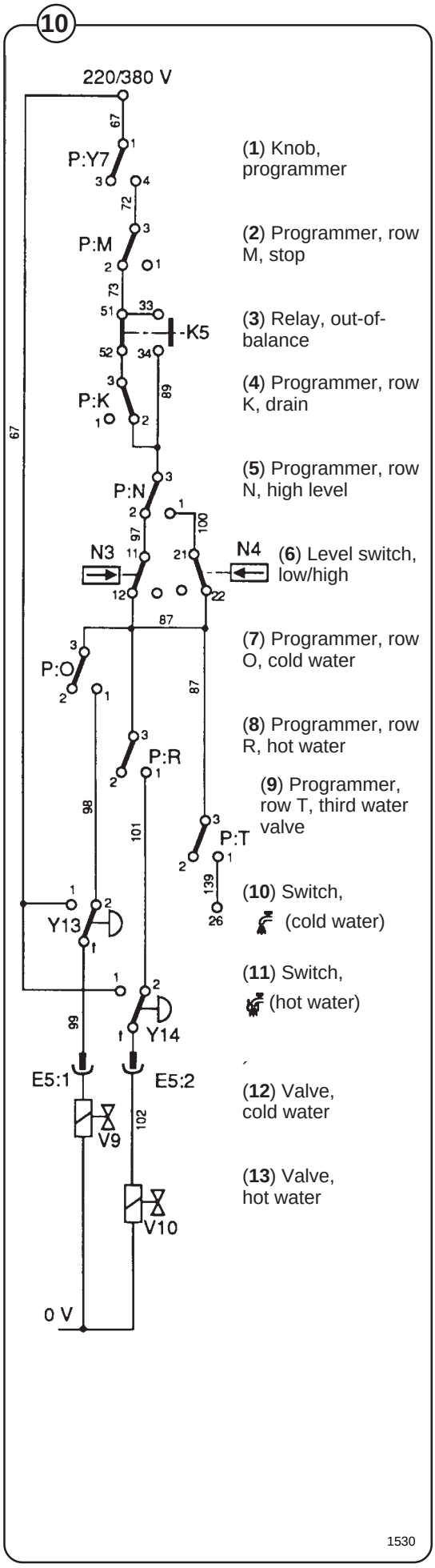
The function of K5:51-52 (3) is explained in the sections headed Out-of-balance and Drain. The relay contact opens only during spin when the washing is not properly distributed. Since water filling never takes place during a spin, relay contact K5:51-52 (3) is always closed at this stage.

- **Row K, drain (4) must not be programmed on the program card.**
- **The water level must not exceed low or high level.**

  The level switches N3 and N4 (6) have two break (NC) contacts, N3:11-13 which opens at low water level and N4:21-22 which opens at high water level. Which of these contacts activates the water valves depends on whether row N, high level (5) is programmed on the program card.

If the above conditions are met, water valves V9 (12) and V10 (13) are controlled by programming row O for cold water (7) and row R for hot water (8) on the program card. A third water valve can be controlled by row T (9).

V9 and V10 can also be controlled manually with switches (10) and (11) on the control panel of the machine.



Heating

Fig. (11) On machines heated with steam, heating is controlled by a steam valve (V11).

The following conditions must be met for valve V11 (15) to be energised:

- **The knob on the programmer (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**

The function of K5:51-52 (3) is explained in the sections headed Out-of-balance and Drain. The relay contact opens only during spin when the washing is not properly distributed. Since heating never takes place during spin, relay contact K5:51-52 is always closed during heating.

- **Row K, drain (4) must not be programmed on the program card.**
- **The drum must be filled with water to the correct level.**

  The level switches N3 and N4 (6) have two make (NO) contacts, N3:11-13 which closes at low water level and N4: 21-23 which closes at high water level. Which of these activates the heating relay depends on whether row N, high level (5) is programmed on the program card.

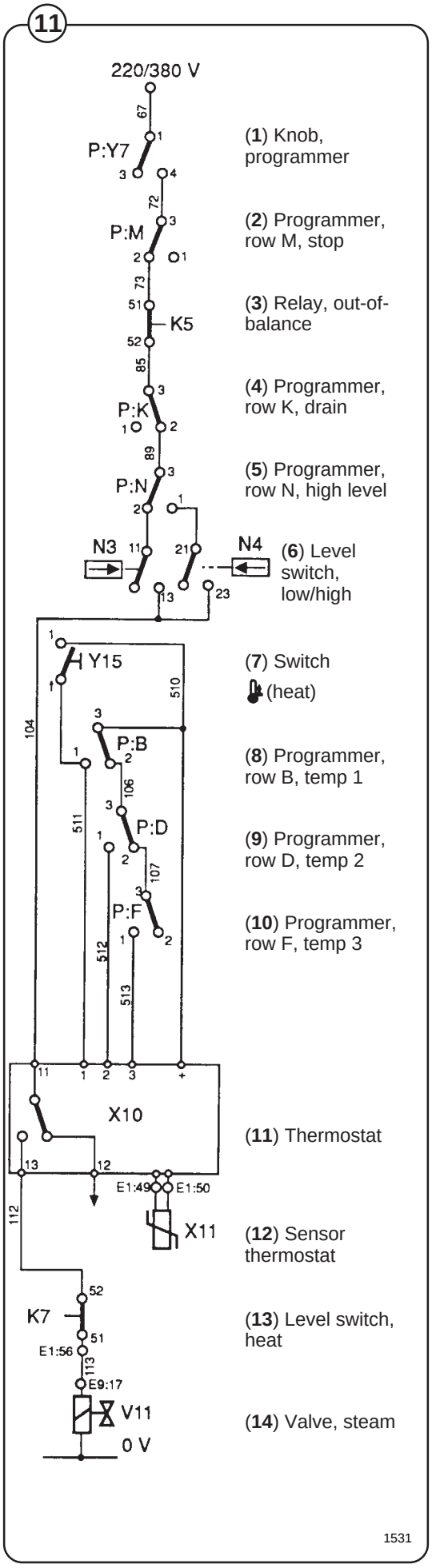
If the above conditions are met, the changeover contact 11-12-13 in the thermostat (11) receives voltage.

Three different final temperatures can be set on the thermostat with the three knobs marked B, D and F. Which of these settings the thermostat is to follow depends on whether row B (8), D (9) or F (10) has been programmed on the program card.

The heating can also be operated manually with switch (7) on the control panel of the machine. The final temperature can be regulated by knob B on the thermostat.

If any of the three rows has been programmed or the switch has been pressed and the temperature of the water is lower than the set temperature, the thermostat contact switches to position 11-13. For valve V11 to be energised:

- **the water level must not fall below the safety level.**
- **Row P, cool-down must not be programmed on the program card.**



Cool-down

Fig. (12) Cool-down is obtained by valve V12 (12) letting cold water into the drum.

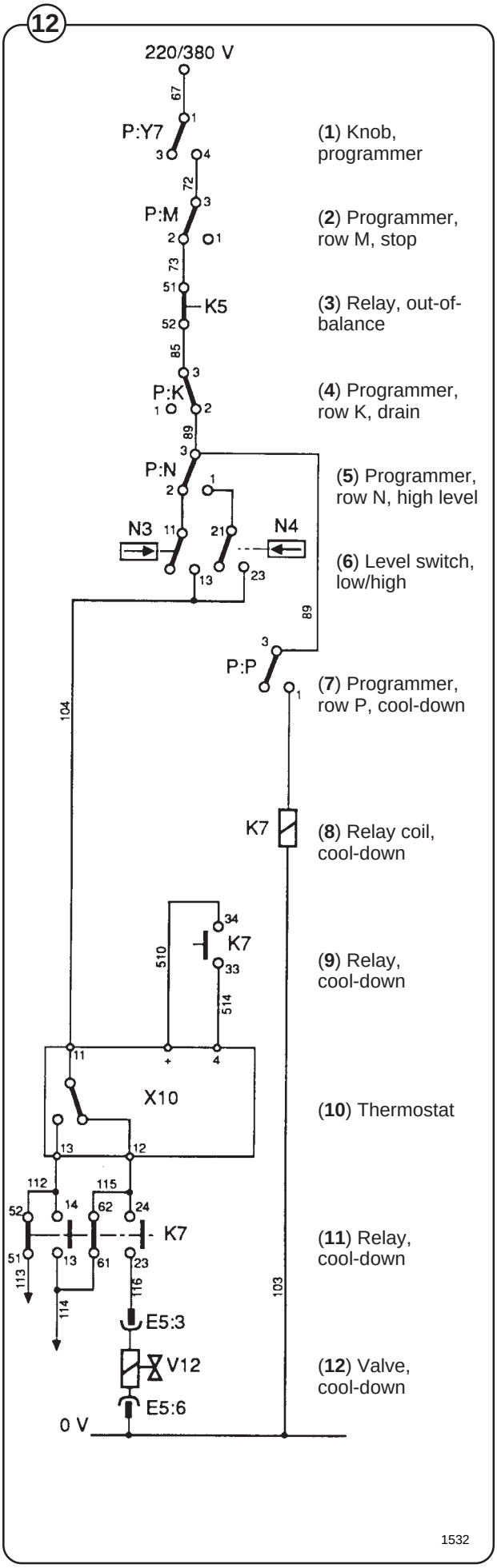
The following conditions must be met for valve V12 (12) to be energised:

- **The knob on the programmer (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**

The function of K5:51-52 (3) is explained in the sections headed Out-of-balance and Drain. The relay contact opens only on spin when the washing is not properly distributed. Since cool-down is never operative during spin, K5:51-52 (3) is always closed during cool-down.

- **Row K, drain (4) must not be programmed on the program card.**
- **The level switch (6) which is switched on by programming row N, must be active.**
- **Row P, cool-down (7) must be programmed on the program card.**

If the above conditions are met, relay K7 (8) picks up and closes the contacts K7:23-24. If the temperature is high in the wash drum (thermostat closed between X10:11-13), valve V12 (12) is energised and the drum starts to fill with cold water.



Distribution speed = Drain

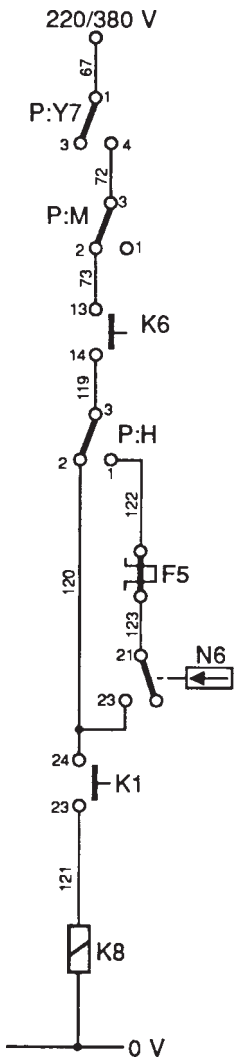
Fig. (13) The following conditions must be met for relay K8 (8) to be energised:

- **The knob on the programmer (1) must be set to I.**
- **Row M, stop (2) must not be programmed on the program card.**
- **Row K, drain must be programmed on the program card so than K6:13-14 (3) is closed.**
- **Row H, spin (4) must not be programmed on the program card.**
- **Relay K1 (low speed) must be energised (K1:23-24 (7) closed).**

  K1 is controlled by speed switch X6 and is energised when the motor is running at a speed of less than 310 rpm (50 Hz). The motor is protected from switching on when the rpm is too high by K1:23-24 (7).

If the above conditions are met, relay K8 picks up and the motor runs at distribution speed.

13



(**1**) Knob, programmer

(**2**) Programmer, row M, stop

(**3**) Relay, drain

(**4**) Programmer, row H, spin

(**5**) Thermal cut-out

(**6**) Level switch, spin

(**7**) Relay, low speed

(**8**) Relay coil, distribution

1533

Programmer power supply

Fig. (14)

The programmer is stationary during three stages of the wash process: during water filling, during water heating and during the drain phase.

Two conditions must be met for the program motor to start:

- **The knob on the programmer (1) must be at position I.**
- **Row M, stop (2) must not be programmed on the program card.**

The following events occur during a typical wash cycle with water fill, heating, washing, cool-down, drain and spin:

- **Water fill**

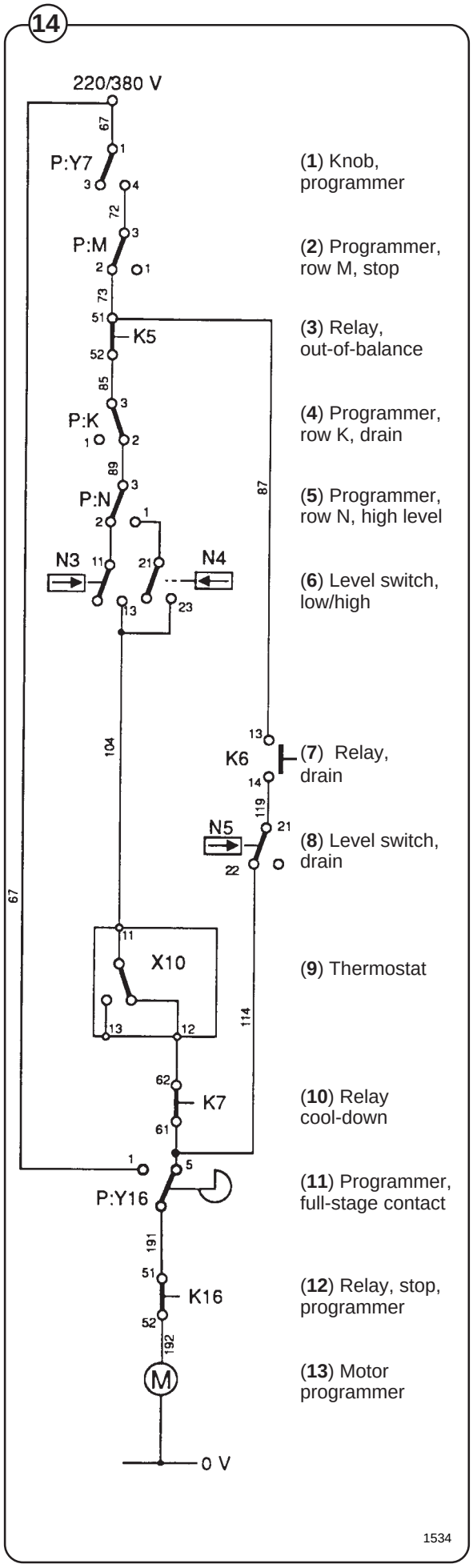
  The programmer motor (13) is stationary because the two changeover contacts of the level switches (6), N3:11-12 for low level and N4:21-22 for high level are in the left-hand position. When the correct water level has been reached (the relevant level depends on whether row N (5) has been programmed or not), the contacts of the level switch operate and the programmer motor (13) is energised.

- **Heating**

  During heating, the changeover contact of thermostat X10 is in position 11-13. This cuts off the supply to the programmer motor. When the desired temperature is reached, the contact switches over to position 11-12 and the motor is energised again.

- **Drain and spin**

  The drain valve is controlled by relay K6. When K6 picks up, K6:13-14 (7) picks up and the programmer motor is energised even though row K (4) has changed over, and either level switch N3 or N4 (6) changes over when the water is drained. Relay K6 is energised during both drain and spin.



Door lock

Fig. (15) The door is interlocked during washing by means of an electro-mechanical locking device (see section 29, Door and door lock). For the closed door to be opened, door coil A2 (6) must be energised. The following conditions must then be met:

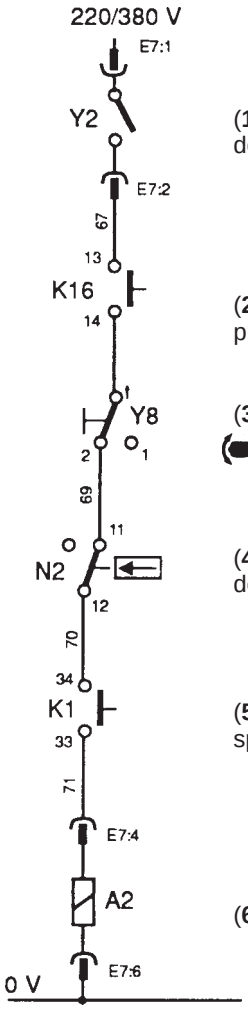
- **The door lock microswitch (1) must be closed (lock knob in position).**
- **The knob on the programmer must be set to 0, so that relay K16 (2) is energised.**
- **Switch (3) must not be pressed.**
- **Level switch N2 (4) must not have changed over.**

  This means that the water level in the drum must not exceed 70 mm.

- **Low speed relay K1 (5) must be energised.**

  The relay is controlled by speed switch X1 and is energised when the motor speed is below 310 rpm.

15

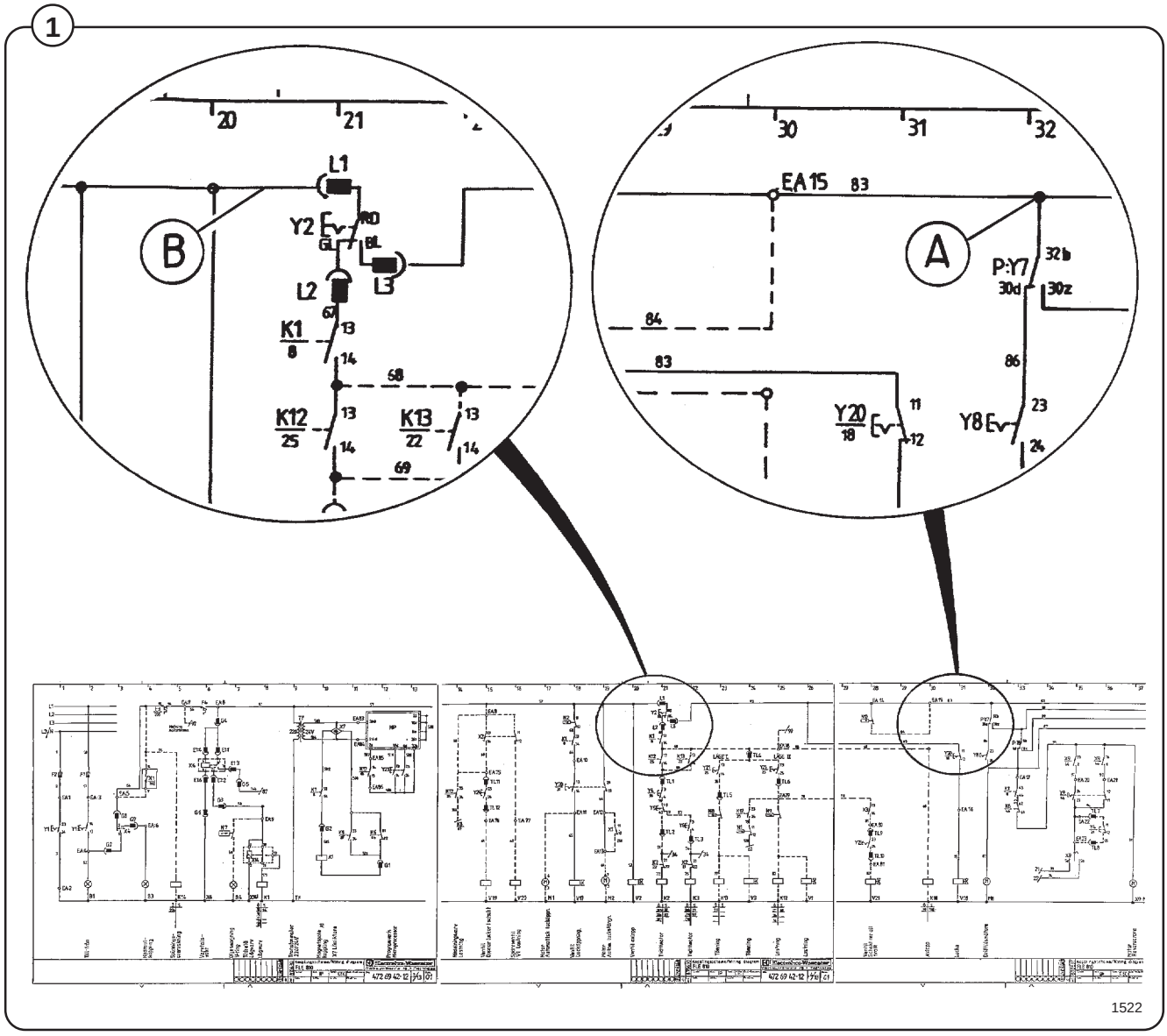


General

To assist with fault diagnosis in the electrical system of the machine, the circuit diagrams are broken down into function sequences. The following sequences are described:

Fig. 1 All sequences, apart from door lock, require voltage (220/380 V) up to program knob switch P:Y7 **(A)**.

The door lock sequence requires voltage (220/380 V) up to door switch Y2 **(B)**.



Wash speed

Fig. 2

Relays K2 and K3 control the switching of the winding to set the wash speed of the wash motor. With K2 switched on the motor turns in one direction, and with K3 switched on it turns in the other direction. For the relay coil (12) of K2 or K3 to be energised, the following conditions must be met:

- **The microswitch on the programmer (1) may be in one of two positions:**

  a When contact 30d is closed:

  The motor can be operated with the switch (4) on the control panel of the machine, provided that the conditions below are met.

  b When contact 30z is closed:

  P:18, stop (2) must not be programmed on the program card.

- **The motor speed must not exceed 310 rpm (50 Hz).**

  The speed switch X6 of the machine energises relay K1 (4) as long as the motor speed is below 310 rpm. If the speed goes above this value, relay K1 (4) cuts off the voltage to K2 or K3.

- **The drain must be closed**

  When the drain valve is open, either distribution speed or spin speed is used. K6:62-61 (6) therefore opens when drain is programmed.

- **The reverser motor must start**

  If the conditions above are met, the reverser motor (10) is energised and the reverser starts. The reverser contacts (6) close and open according to a programmed pattern (see diagram below). The switch (7) on the control panel of the machine is used to select which of the two reverser contacts is to control the motor.

  Reverser contact 5 (8) alternately switches on contacts K2 and K3.

  To prevent both contacts being energised simultaneously, the coil of K2 is in series with a closed contact on K3, so that when K3 is energised, contact K3:21-22 (9) opens and blocks the coil of K2. In the same way, the coil of K3 is in series with a contact on K2.

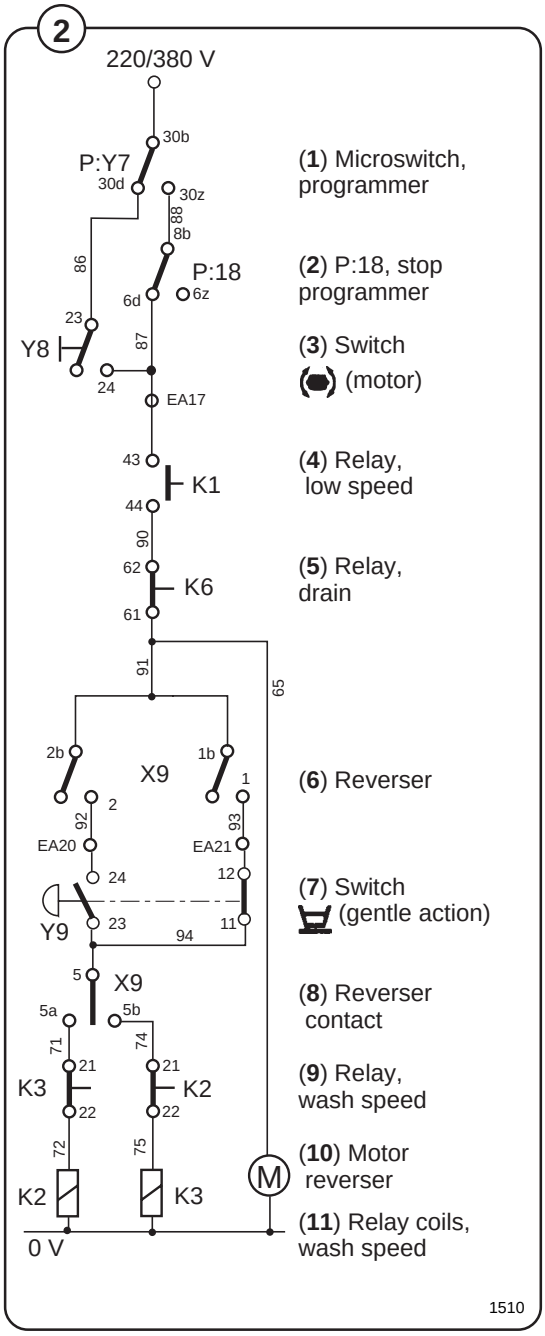
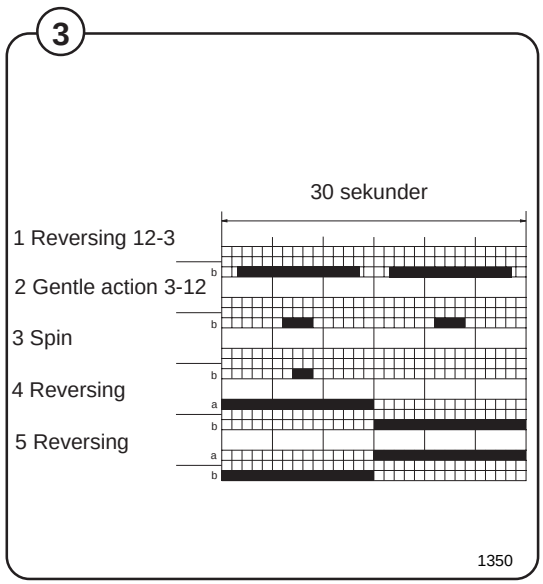


Fig. 3



Spin

Fig. (4)

Relay K9 controls the switching of low speed for the spin motor, and relays K10 and K11 control the switching of high speed. The following conditions must be met for any of these relays to be energised:

- **The microswitch (1) must closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**
- **The drain must be open.**

  The drain is open when relay K6 is energised. K6:13-14 (3) is then closed.
- **P:16, spin (4) must be programmed on the program card.**
- **The thermal cut-out (5) of the spin motor must not have tripped.**
- **The spin level switch (6) must not be activated.**

  The level switch operates if the water level in the drum goes above 70 mm.

If the conditions above are met, the relay coil (18) of time relay X12 is energised. After 70 seconds X12:12-13 (7) closes, switching the spin motor from the low speed to high speed, provided that the switch (9) on the control panel of the machine is in high speed position.

For the low speed relay K9 (17) to pick up:

- **The high speed relays K10 and K11 must be de-energised.**

  This is a safety measure to prevent damage to the motor, and is checked by K10:31-32 (11) and K11:31-32 (10).

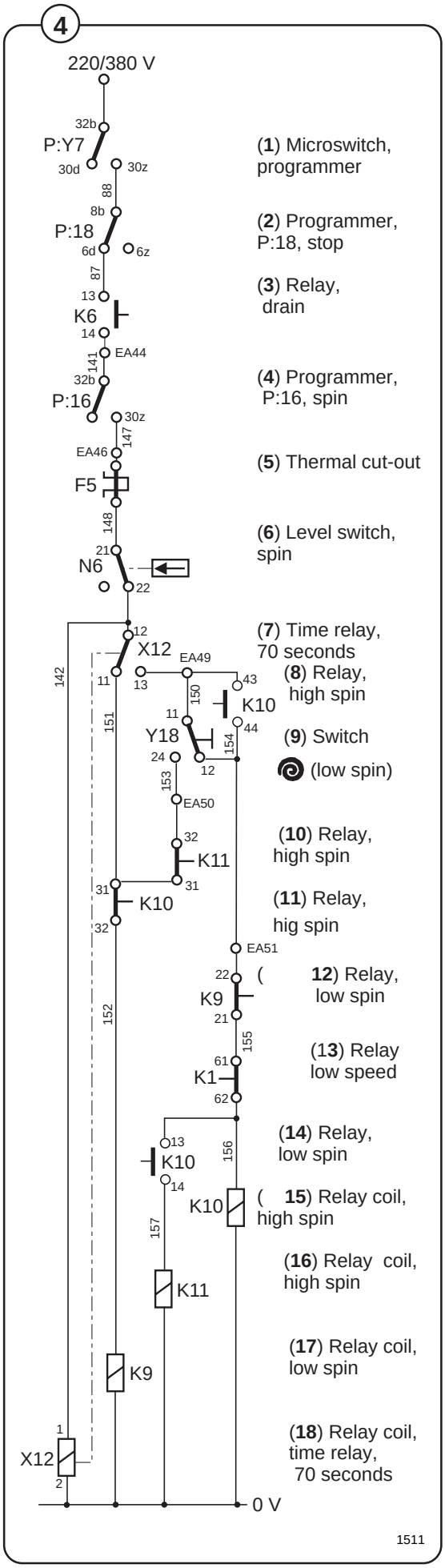
For the high speed relays K10 (15) and K11 (16) to pick up after 70 seconds:

- **The switch (8) must be in high speed position**
- **The low speed relay K9 must be de-energised**

  This is a safety measure to prevent damage to the motor, and is checked by K9:21-22 (12).
- **Low-speed relay K1 must not be energised**

  Relay K1 is controlled by the speed switch of the machine. When the drum rotates at a speed above 310 rpm the speed switch cuts off the voltage to relay K1. To avoid overloading the spin motor, high spin can only be switched on above this speed. This is checked by K1:51-52 (14).

When high speed is switched (K10 energised), switch is shorted by K10:43-44.



Drain

Fig. 5

Relay K6 controls the air valve of the drain valve. The drain valve is open when the motor power supply is off. When the power supply comes on, the valve is closed, but is opened again by spring force when the motor power supply goes off again.

When the washing machine is switched on, the air valve of the drain valve is powered via the switch (7) and K6:51-52 (8). The valve can be opened and closed manually with the switch on the control panel of the machine.

For relay K6 to pick up and open the valve, the following conditions must be met:

- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**
- **The out-of-balance cut-off must not have cut in.**

  The out-of-balance cut-off operates during spin if the washing is not properly distributed in the drum. A sequence of actions to redistribute the washing then takes place. The first is the closing of the drain valves which is done by K5:51-52 (3). The out-of-balance functions are described in detail in the section headed Out-of-balance.
- **P:8, drain (4) must be programmed on the program card.**
- **The reverser contact 3:b must be closed.**

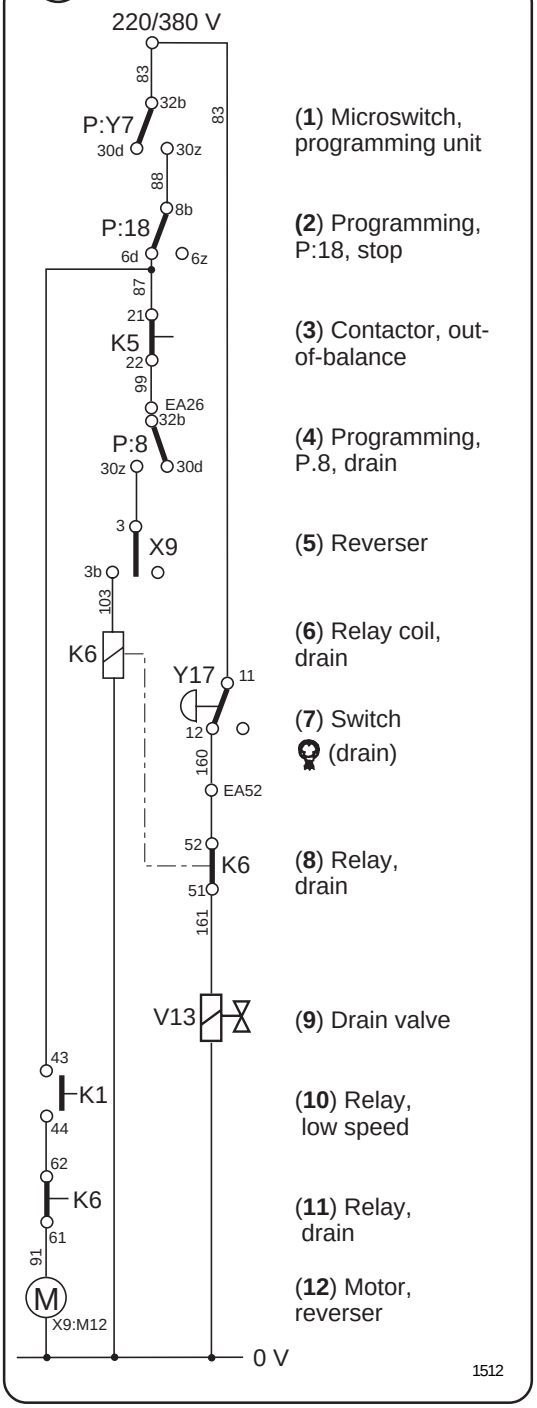
Fig. 6

When relay K6 picks up, the motor switches from wash speed to distribution speed (see section headed Distribution speed). To minimise stress on the motors, belts and drum bearing, the motor must be running at washing speed and rotating in a particular direction when distribution speed is switched on. When reverser contact 3:b closes, contacts 4 and 5 are in the right position (the motor is running in the right direction) and the motor runs regardless of whether the machine is operating with normal action (reverser contact 1) or gentle action (reverser contact 2).

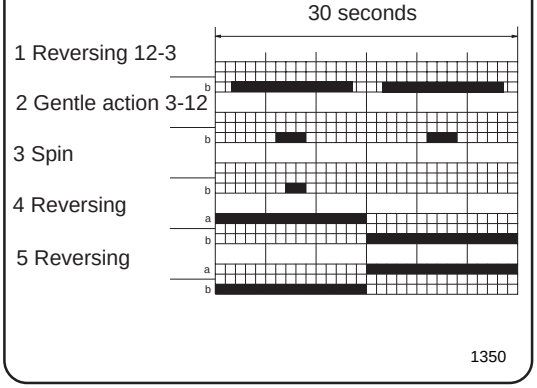
When K6 has picked up, K6:61-62 (11) cuts off the supply to the reverser motor (12). This means that reverser contact 3:b is closed as long as the drain valve is open.

Contact K1:43-44 (10) is only closed when the machine is running at low speed. This is a safety feature which prevents the reverser changing the direction of rotation of the motor at high speed.

5



6



Detergent dispensing (TMPF)

Fig. (7)

The machine has five different detergent compartments. The flushing of detergent and conditioner is controlled by five external water valves V4-V8. The following conditions must be met for any of the valves to be controlled:

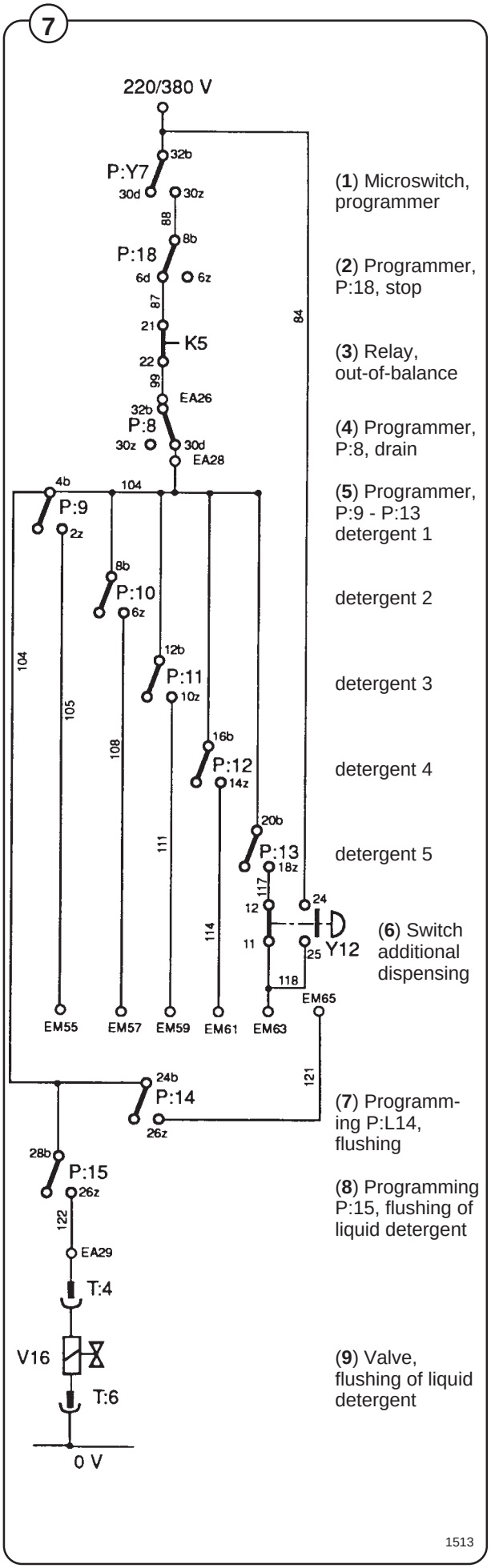
- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**
- **The out-of-balance cut-off must not have cut in.**

  The function of K5:51-52 (3) is explained under the headings Out-of-balance and Drain. The relay contact opens only during spin when the washing is not properly distributed. Since detergent dispensing is never programmed during a spin, relay contact K5:51-52 (3) is always closed during detergent dispensing.
- **P:8, drain (4) must not be programmed on the program card.**

If the conditions above are met, valves V4-V8 can now be controlled individually by programming P:9 - P:13.

Detergent flushing is obtained by programming P:14 (7). Flushing of liquid detergent is obtained by programming P:15 (8), which in turn activates valve V16 (9).

Additional detergent is dispensed by pressing switch Y12 (6).



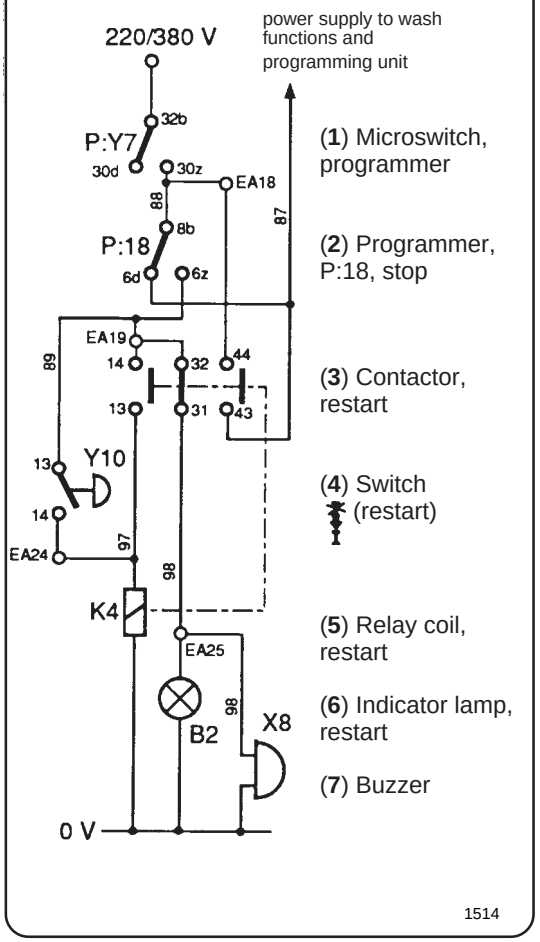
Restart

Fig. 8

P:18, stop, on the program card is programmed when a stop is required in a program run, for example to dispense detergent or when the wash is done.

- When P:18 (2) has been programmed, the programmer switch changes and power is fed to the indicator lamp (6) and the buzzer (7). At the same time, the power is cut off from all washing functions (the drain remains closed) and the programmer motor stops.
- Relay K4 (5) is activated by pressing the switch (4) on the control panel of the machine. The relay holds itself in via relay contact K4:13-14 (3).
- When relay contact K4:13-14 (3) closes, power is restored to the program functions and programmer motor, and the program run continues. When P:18 is no longer programmed (P:18 (2 changes over), relay K4 (5) drops out.

8



Out-of-balance

Fig. (9)

The purpose of the out-of balance function is to protect the washing machine from undue stress during the spin cycle. If the washing is not properly distributed in the drum, the spin cycle stops, the washing is redistributed and the spin cycle starts again. This takes place automatically as follows:

- **Out-of-balance cut-off (7) is activated.**

  The cut-off is activated when the drum oscillates more than about 17 mm from its rest position.

  Relay K6 is energised during the spin cycle (the drain is open). As a result, K6:33-34 (6) is closed.

When the cut-off operates, the following events happen immediately:

- **Relay K5 (18) picks up and is held in by K5:33-34 (8) and K5:23-24 (11) closing.**
- **Relay K6 drops out (K5:21-22 (8) opens) and the drain closes (K6:51-52 (2) closes).**
- **The spin cycle and the programmer motor stop (K6:13-14 (13) opens).**
- **The machine starts filling with cold water (K5:43-44 (12) closes).**

When the drum speed has fallen below 310 rpm (50 Hz), speed switch X1 energises relay K1 and the following event happens:

- **The machine starts running at wash speed (K1:43-44 (5) closes).**

When the water in the drum has reached a level that causes level switch N2 (10) to operate, the following events happen:

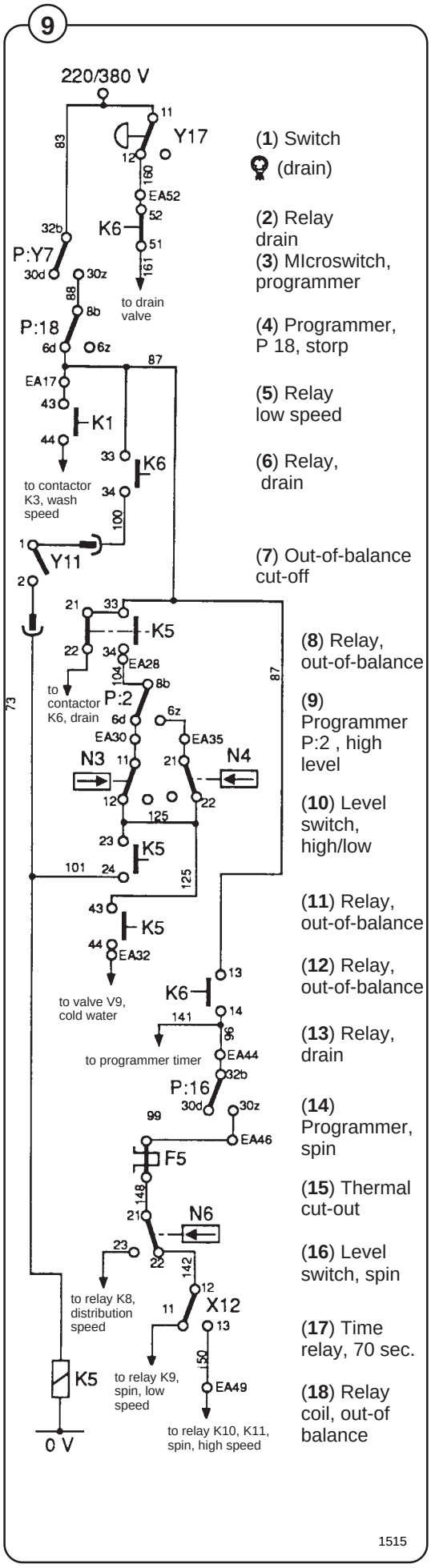
- **Relay K5 loses its self-holding (N3:11-12 or N4:21-22 (10) opens).**

  Which of these contacts opens depends on whether row P:2, high level (9) is programmed.

- **Relay K6 picks up (K5:21-22 (8) closes) and the drain opens (K6:51-52 (2) closes).**
- **The programmer timer starts and the drum starts running at distribution speed (K6:13-14 (13) closes).**

When the water level in the drum has fallen below 115 mm, level switch N6 (16) operates and the following event happens:

- **Spin relay K9 (low spin) picks up. After 70 seconds, time relay X12 (17) operates and high spin relays K10 and K11 pick up (see also the section headed Spin).**



Water

Fig. (10)

The standard version of the machine is fitted with two water valves, V9 for cold water and V10 for hot water. The machine is also designed to be fitted with a third water valve, V15.

The following conditions must be met for either of water valves V9 and V10 to be energised:

- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**

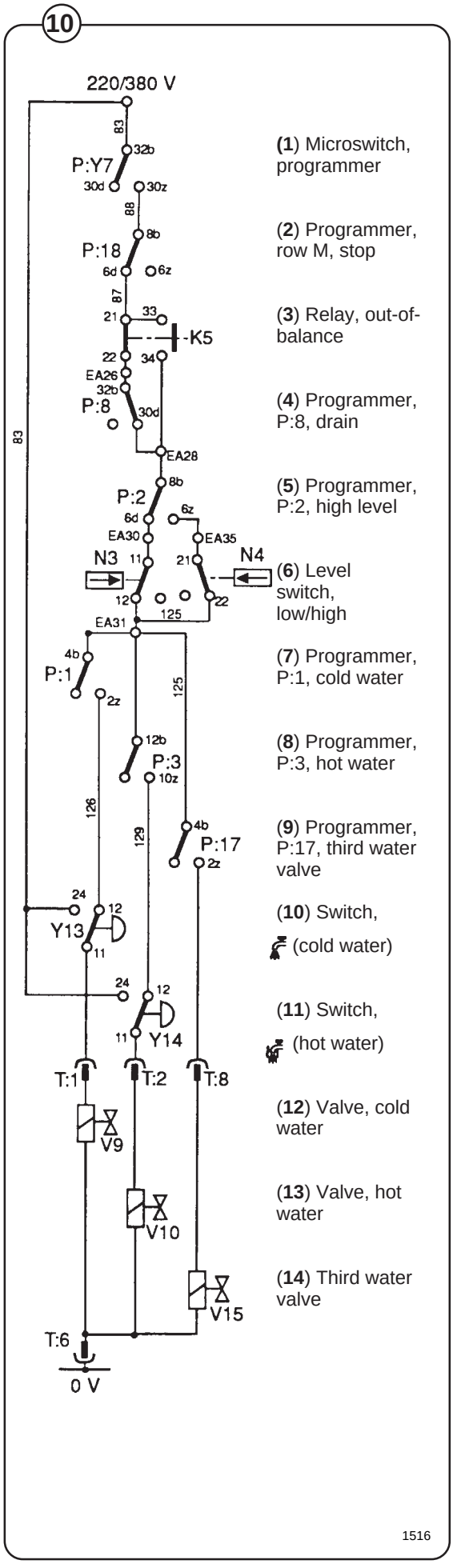
The function of K5:51-52 (3) is explained in the sections headed Out-of-balance and Drain. The relay contact opens only during spin when the washing is not properly distributed. Since water filling never takes place during a spin, relay contact K5:51-52 (3) is always closed at this stage.

- **P:8, drain (4) must not be programmed on the program card.**
- **The water level must not exceed low or high level.**

  The level switches N3 and N4 (6) have two break (NC) contacts, N3:11-13 which opens at low water level and N4:21-22 which opens at high water level. Which of these contacts activates the water valves depends on whether P:2, high level (5) is programmed on the program card.

If the above conditions are met, water valves V9 (12) and V10 (13) are controlled by programming P:1 for cold water (7) and P:3 for hot water (8) on the program card. A third water valve can be controlled by P:17 (9).

V9 and V10 can also be controlled manually with switches (10) and (11) on the control panel of the machine.



Heating

Fig. (11) On machines heated with steam, heating is controlled by a steam valve (V11).

The following conditions must be met for valve V11 (15) to be energised:

- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**

The function of K5:51-52 (3) is explained in the sections headed Out-of-balance and Drain. The relay contact opens only during spin when the washing is not properly distributed. Since heating never takes place during spin, relay contact K5:51-52 is always closed during heating.

- **P:8, drain (4) must not be programmed on the program card.**
- **The drum must be filled with water to the correct level.**

  The level switches N3 and N4 (6) have two make (NO) contacts, N3:11-13 which closes at low water level and N4:21-23 which closes at high water level. Which of these activates the heating relay depends on whether P:2, high level (5) is programmed on the program card.

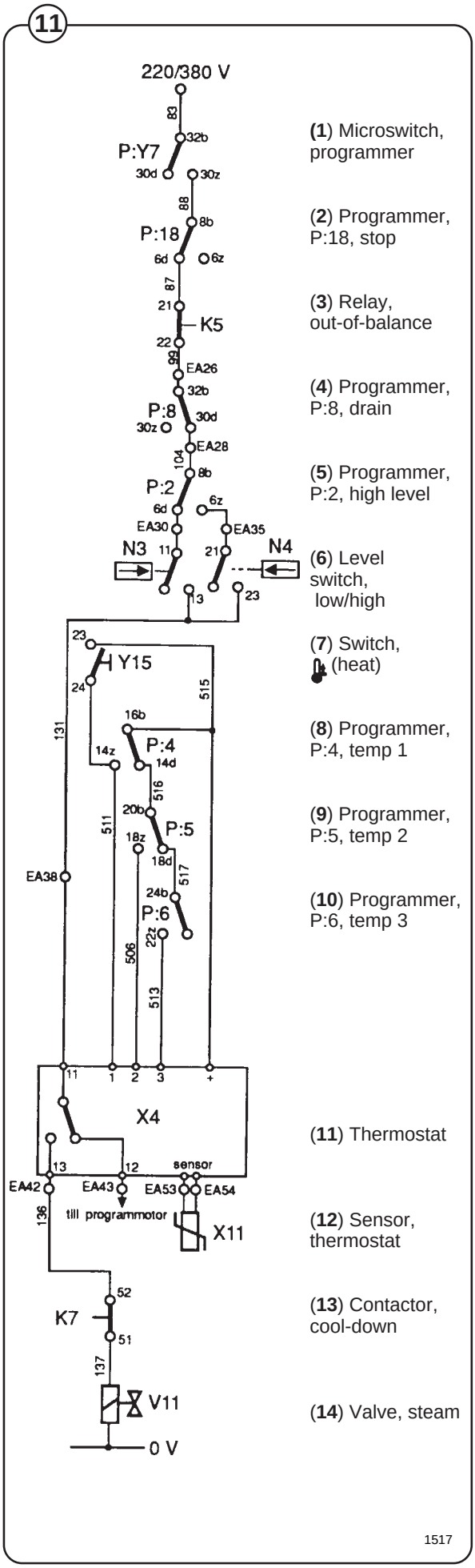
If the above conditions are met, the changeover contact 11-12-13 in the thermostat (11) receives voltage.

Three different final temperatures can be set on the thermostat with the three knobs marked B, D and F. Which of these settings the thermostat is to follow depends on whether row B (8), D (9) or F (10) has been programmed on the program card.

The heating can also be operated manually with switch (7) on the control panel of the machine. The final temperature can be regulated by knob B on the thermostat.

If any of the three rows has been programmed or the switch has been pressed and the temperature of the water is lower than the set temperature, the thermostat contact switches to position 11-13. For valve V11 to be energised:

- **the water level must not fall below the safety level.**
- **P:7, cool-down must not be programmed on the program card.**



(**1**) Microswitch, programmer

(**2**) Programmer, P:18, stop

(**3**) Relay, out-of-balance

(**4**) Programmer, P:8, drain

(**5**) Programmer, P:2, high level

(**6**) Level switch, low/high

(**7**) Switch, (heat)

(**8**) Programmer, P:4, temp 1

(**9**) Programmer, P:5, temp 2

(**10**) Programmer, P:6, temp 3

(**11**) Thermostat

(**12**) Sensor, thermostat

(**13**) Contactor, cool-down

(**14**) Valve, steam

Cool-down

Fig. (12) Cool-down is obtained by valve V12 (12) letting cold water into the drum.

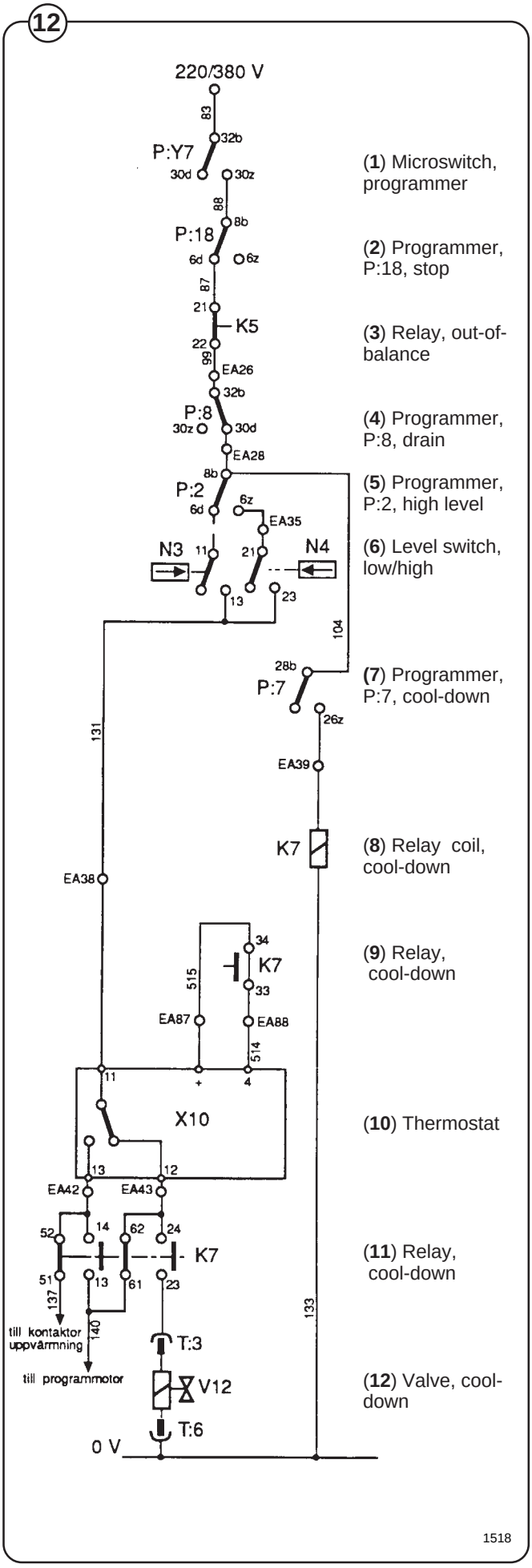
The following conditions must be met for valve V12 (12) to be energised:

- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**

The function of K5:51-52 (3) is explained in the sections headed Out-of-balance and Drain. The relay contact opens only on spin when the washing is not properly distributed. Since cool-down is never operative during spin, K5:51-52 (3) is always closed during cool-down.

- **P:8, drain (4) must not be programmed on the program card.**
- **The level switch (6) which is switched on by programming P:2 (5), must be active.**
- **P:7, cool-down (7) must be programmed on the program card.**

If the above conditions are met, relay K7 (8) picks up and closes the contacts K7:23-24. If the temperature is high in the wash drum (thermostat closed between X10:11 - 13), valve V12 (12) is energised and the drum starts to fill with cold water.



Distribution speed = Drain

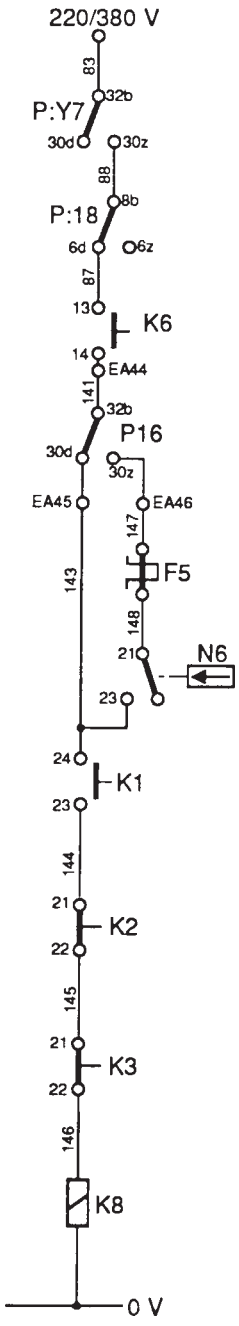
Fig. (13) The following conditions must be met for contactor K8 (10) to be energised:

- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**
- **P:8, drain must be programmed on the program card so that K6:13-14 (3) is closed.**
- **P:16, spin (4) must not be programmed on the program card.**
- **Relay K1 (low speed) must be energised (K1:23-24 (7) closed).**

  K1 is controlled by speed switch X6 and is energised when the motor is running at a speed of less than 310 rpm (50 Hz). The motor is protected from switching on when the rpm is too high by K1:23-24 (7).

If the above conditions are met, Relay K8 picks up and the motor runs at distribution speed. In order to prevent the motor wash speed winding from being activated simultaneously with the distribution speed, both wash speed relays K2 and K3 are in series with relay coil K8. If either K2 or K3 is activated, the circuit is broken and K8 closes.

13



Programmer timer

Fig. (14) The programmer is stationary during three stages of the wash process: during water filling, during water heating and during the drain phase.

Two conditions must be met for the program timer to start:

- **The microswitch on the programmer (1) must be closed to 30z.**
- **P:18, stop (2) must not be programmed on the program card.**

The following events occur during a typical wash cycle with water fill, heating, washing, cool-down, drain and spin:

- **Water fill**

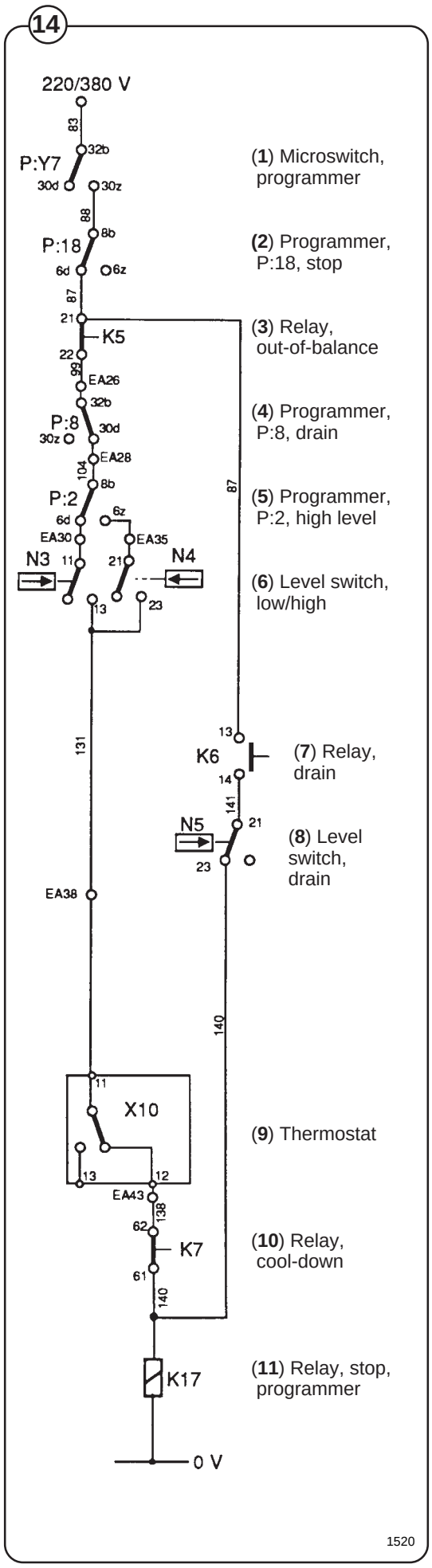
  The program is stationary (no power at K17 coil (11)) because the two changeover contacts of the level switches (6), N3:11-12 for low level and N4:21-22 for high level are in the left-hand position. When the correct water level has been reached (the relevant level depends on whether P:2 (5) has been programmed or not), the contacts of the level switches operate and energise the K17 coil. K17 is activated and the programmer timer is energised.

- **Heating**

  During heating, the changeover contact of thermostat X10 is in position 11-13. This cuts off the supply to the K17 coil and the program stops. When the desired temperature is reached, the contact switches over to position 11-12, K17 activates and the timer is energised again.

- **Drain and spin**

  The drain valve is controlled by relay K6. When K6 picks up, K6:13-14 (7) picks up and K17 is energised even though P:8 (4) has changed over, and either level switch N3 or N4 (6) changes over when the water is drained. Relay K6 is energised during both drain and spin.



Door lock

Fig. (15)

The door is interlocked during washing by means of an electro-mechanical locking device (see section 29, Door and door lock). The door is opened and closed using the air valves V17 (open) and V18 (close), as follows:

- **Closing the door**

  When switch Y2 (2) is pressed, the coil for V18 (5) receives supply and the door closes with help from valve V18 (5).

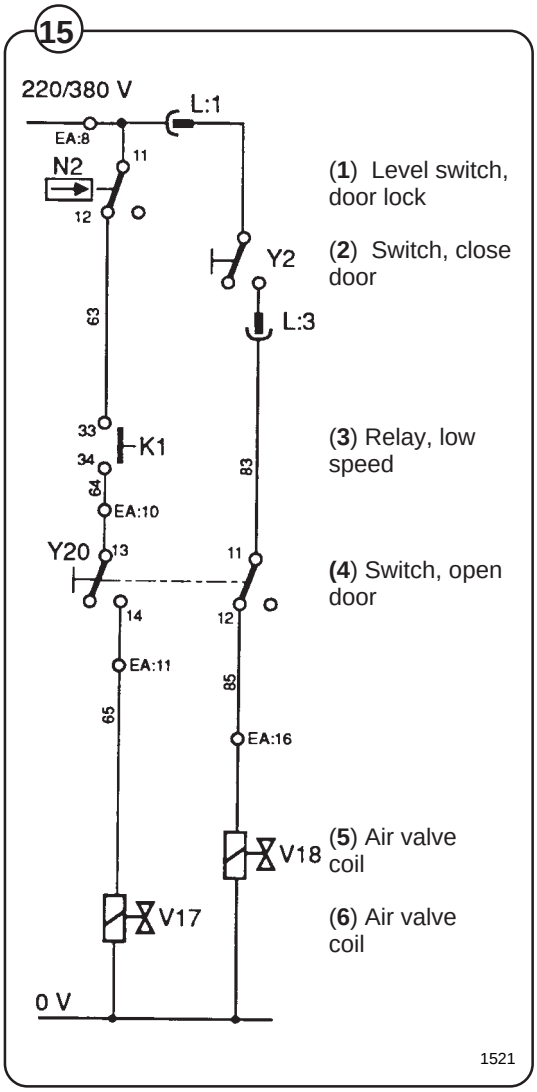
- **Opening the door**

  The following conditions must be met in order to open the door:

  - Level switch N2 (1) must not have changed over.
  - The low speed relay must be energised.

  The relay is controlled by speed switch X6 and is energised when the motor speed is below 310 rpm.

When switch Y20 (4) is pressed, the coil for V17 (6) receives supply and the door opens with help from valve V17 (5).



Components

F1 Control fuse, 1,6 A

F2 Control fuse, 1,6 A

F3 Overcurrent protection

K1 Relay for electro/mechanical clutch, low speed from extract motor.

K2 Relay for wash motor - wash speed

K3 Relay for wash motor - wash speed

K4 Relay for restart

K5 Relay for unbalance cutout

K6 Relay for drain valve

K7 Relay for cool down valve

K8 Relay for wash motor - distribution speed

K9 Relay for extract motor - low speed

K10 Relay for extract motor - star connection

K11 Relay for extract motor - high speed

K12 Relay for tilting

N1 Level control, loading

N2 Level control, door lock

N3 Level control, low level

N4 Level control, high level

N5 Level control, drain

N6 Level control, extraction

P Timer

TF Transformer

X7 Rectifier

X8 Buzzer

X9 Motor - reverser

X10 Thermostat - controls wash temperature and cool down.

Y1 Switch - ON/OFF

Y8 Switch - Motor

Y9 Switch - Gentle action

Y10 Switch - Restart

Y12 Switch - Flushing detergent (comp. 5/external conn. 5)

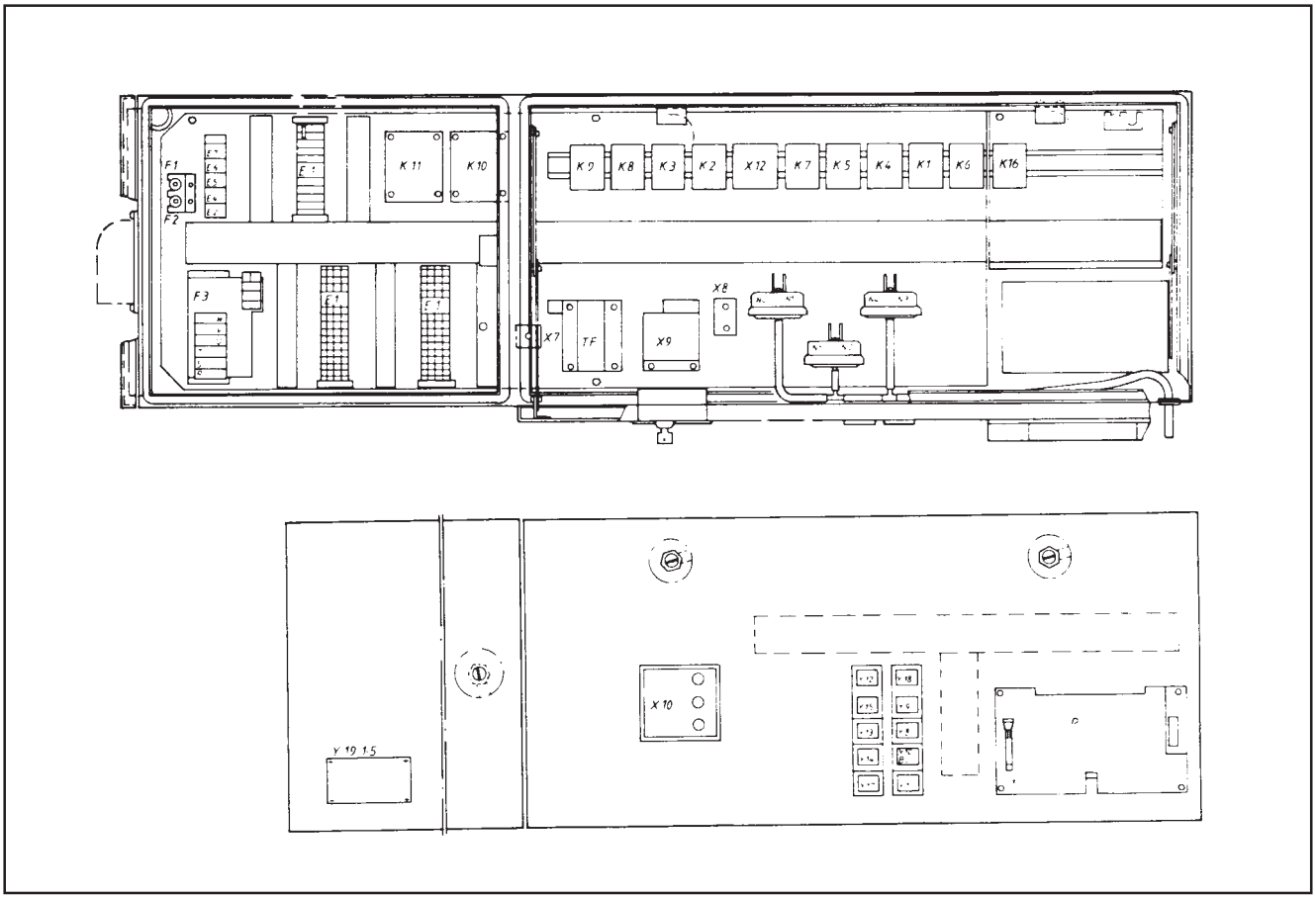
Y13 Switch - Cold water

Y14 Switch - Hot water

Y15 Switch - Heating

Y17 Switch - Drain

Y18 Switch - Low extraction



Components

E1 Terminal connection

F1 Control fuse, 1,6 A

F2 Control fuse, 1,6 A

F3 Overcurrent protection

K1 Relay for electro/mechanical clutch, low speed from extract motor.

K2 Relay for wash motor - wash speed

K3 Relay for wash motor - wash speed

K4 Relay, restart

K5 Relay for unbalance cutout

K6 Relay for drain valve

K7 Relay for cool down valve

K8 Relay for wash motor - distribution speed

K9 Relay for extract motor - low speed

K10 Relay for extract motor - star connection

K11 Relay for extract motor - high speed

K17 Relay for stopping timer

N1 Level control, loading

N2 Level control, door lock

N3 Level control, low level

N4 Level control, high level

N5 Level control, drain

N6 Level control, extraction

N7 Level control, oil lubrication

N8 Pressure switch, unloading/loading

N9 Pressure switch, unloading/loading

N10 Pressure switch, loading/return

P Timer

TF Transformer

V Pneumatic valves for different functions, such as drain valve.

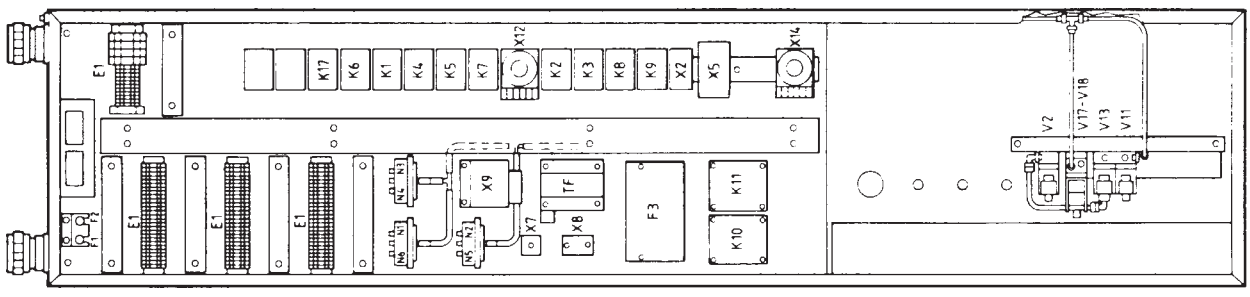
X7 Rectifier

X8 Buzzer

X9 Motor - reverser

X10 Thermostat - controls wash temperature and cool down.

X12 Time relay



Description

Voltage monitoring is done by a cutout connected in parallel with the machine's three-phase connector and a contactor in series with that three-phase connection, connected after the control unit.

The cutout is a combined phase-sequence and voltage monitoring relay for 3-phase networks. The cutout has a restart function. The voltage is measured between the phases and the current is measured by means of measuring transformers in two phases, the current in the third phase being calculated by the cutout. The cutout can, as in this application, be used purely as a voltage-measuring relay.

There are a number of connections on the cutout, as well as three LEDs and a potentiometer. Connections 1, 3 and 5 are a combined input for voltage measurement and cutout feed, (see Fig. 1). Connections 11, 12, 13 and 14 are current inputs for connecting two measuring transformers. Connection 15 is for connection to a zero conductor (Note: not an earth connection). Connections 7, 8 and 9 are relay outputs for the internal network error relay in the cutout. Connections 9 and 10 are relay outputs for the internal phase sequence relay in the cutout.

The left-hand green LED is an operations indicator that is lit when the cutout is energised. The red (central) LED is lit in the event of a phase sequence error, and the green right-hand LED is extinguished in the event of a network error (when relay output 8-9 trips).

The function of the potentiometer is to adjust the restart time, 0 to 5 minutes. This is the lead time given to the cutout before it restarts the machine after the net has stabilished.

If the value for permitted mains voltage variation is exceeded or not reached, the internal relay in the cutout is activated, and thus its relay output. Relay ouput 8-9 thus trips and the contactor connected in series with the machine connection triggers. When the net has re-stabilised and the restart time set on the cutout has expired, relay output 8-9 closes again. This energises the external relay and allows current to the machine.

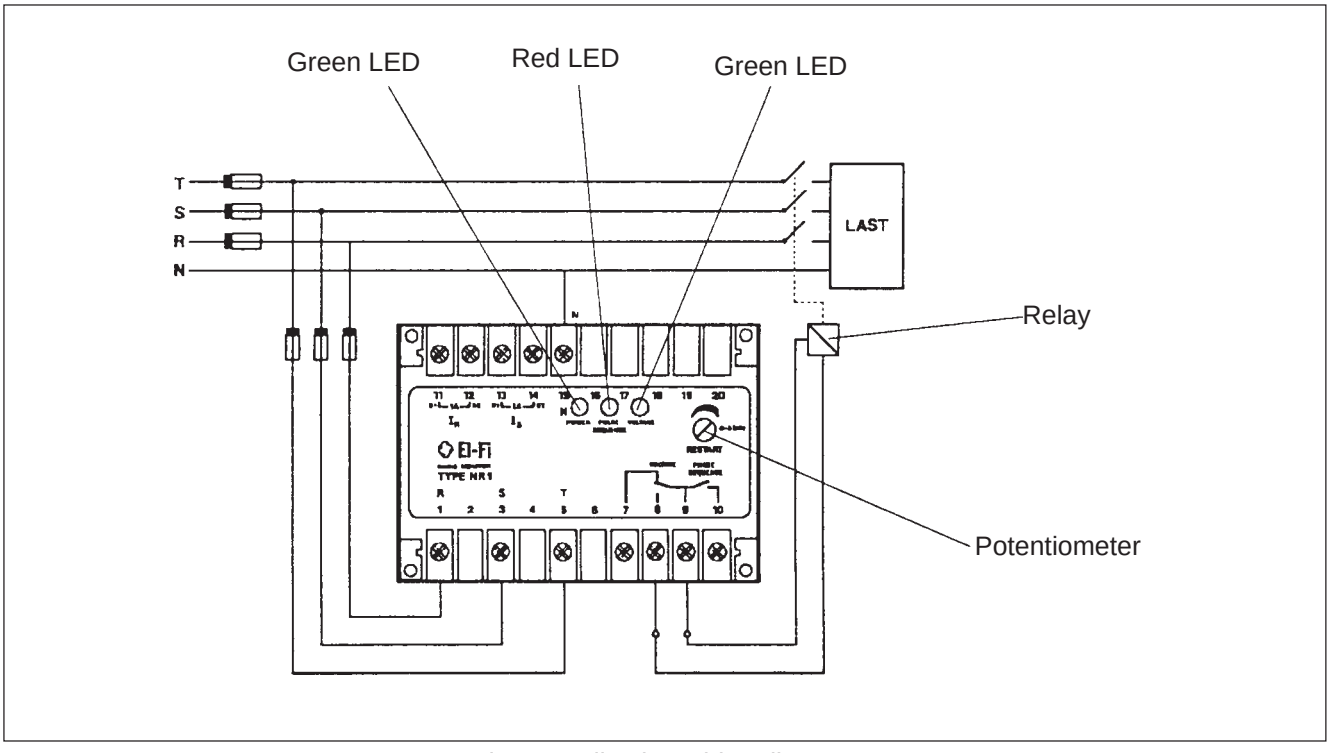


Fig. 1 Application wiring diagram

Repair instructions

The cutout should be replaced, not repaired.

Troubleshooting

The cutout does not function

- Check that the cutout connection voltage agrees with the mains and the cutout has been connected correctly.
- Check that the left-hand green LED in the cutout is lit when the cutout is energised.

The cutout gives a continuous warning

- Check that current/voltage is within the cutout warning limits (otherwise it will give a continuous alarm).
- Check that the cutout is connected as in fig. 1.

The cutout gives an occasional warning without any network error being found

- Use a printer to check whether any short-duration mains variations down to 2 sec. are present. The cutout trigger delay is 2 sec.

The cutout never gives warning

- Check that the cutout is connected correctly.
- Use a printer to check whether the mains variation are very short in duration (under 2 sec.). The cutout trigger delay is 2 sec.

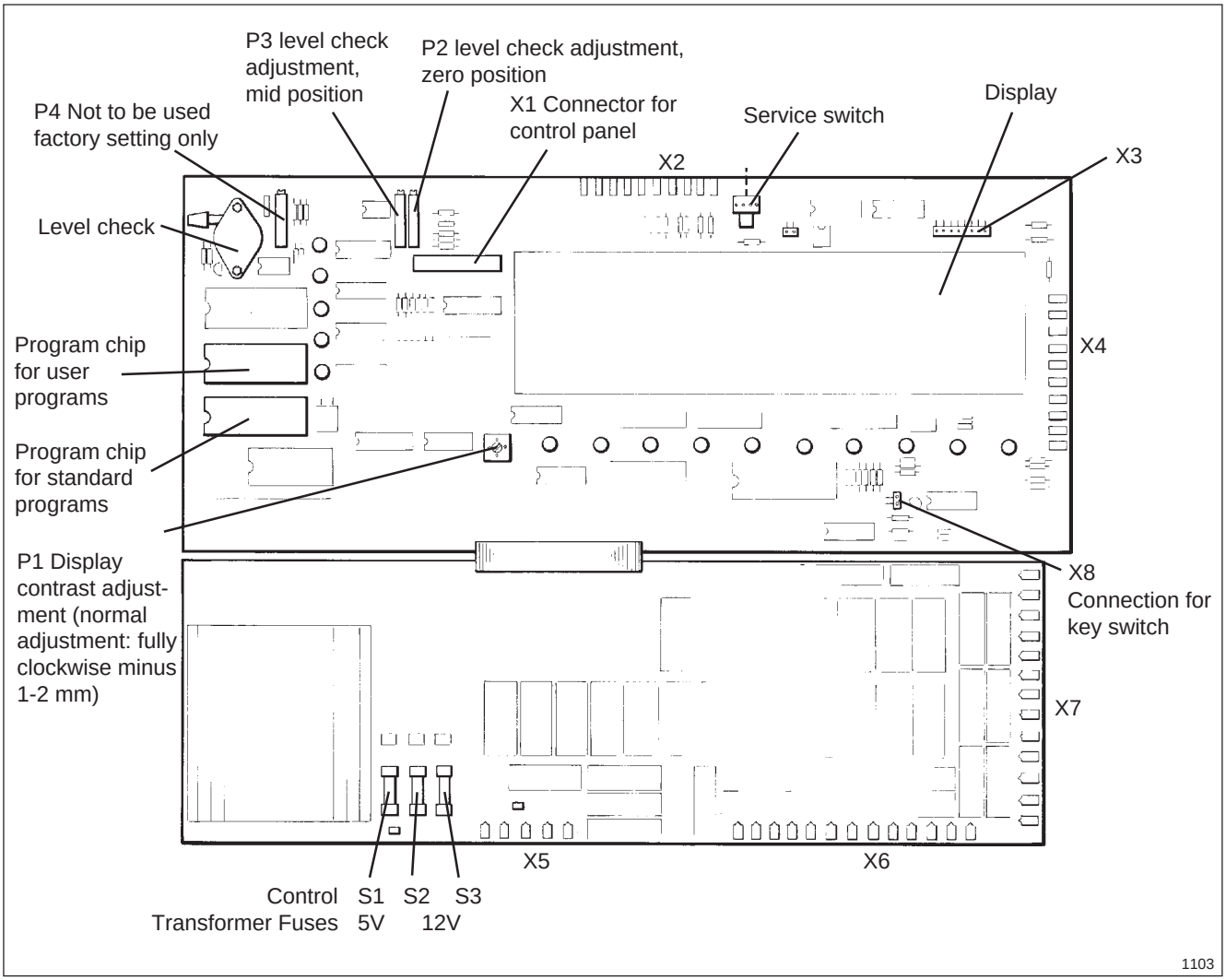
Description

The programmer is electronic and is made up of two circuit boards, the control board with microprocessors and program memory, and the relay board with relays and interference suppression circuits. The programmer has the following outputs and inputs:

- Outputs which, via relays, control the various functions of the machine such as water fill, drain, spin etc.
- Outputs which control the information that is to appear on the display.
- Inputs that detect keystrokes from the keyboard.
- Inputs that give information about the status of the washing machine from, for example, thermostat sensors, level detectors, out-of-balance detectors, door lock and speed switch.

The programmer is controlled by the instructions stored in the program memory. The memory is in the form of two memory chips (see diagram below):

- The lower chip, which contains memory information that cannot be changed, contains instructions about operation, service program, relay control, sensing of inputs etc. It also contains the standard programs supplied with the machine on delivery.
- The upper memory chip stores programs created by the customer. The content of this memory can easily be changed by erasing unwanted programs and creating new ones.



Repair Instructions

A faulty electronic unit must be replaced, not repaired.

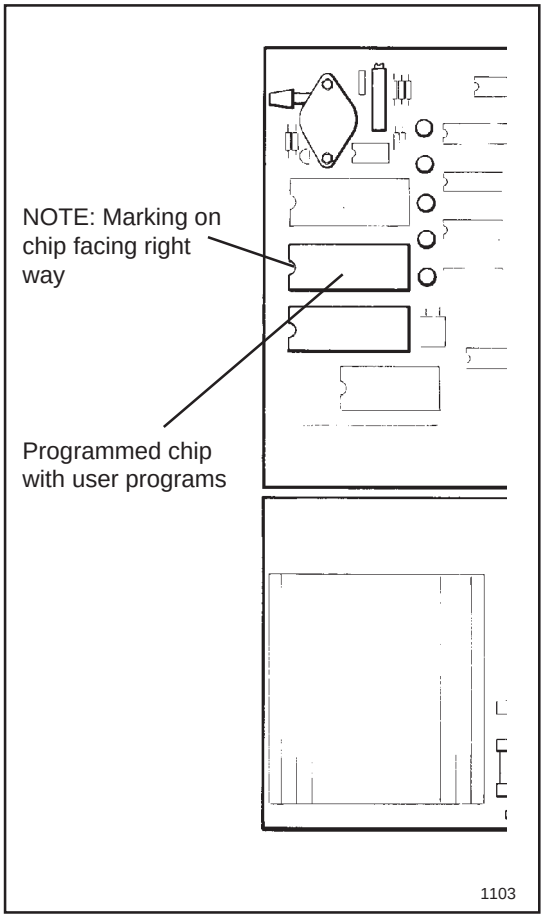
Removing the circuit board

- Unplug the board connectors and the tube to the level detector (see diagram below).
- Unscrew the 6 screws that secure the board.
- Unplug the connector from the keyswitch and the ribbon cable from the control panel.

Changing the memory chip for user programs

If the control board has to be replaced, the program chip containing programs created by the user may be moved to the new board, provided the chip is not faulty.

Carefully remove the chip from its socket and transfer it to the new board.



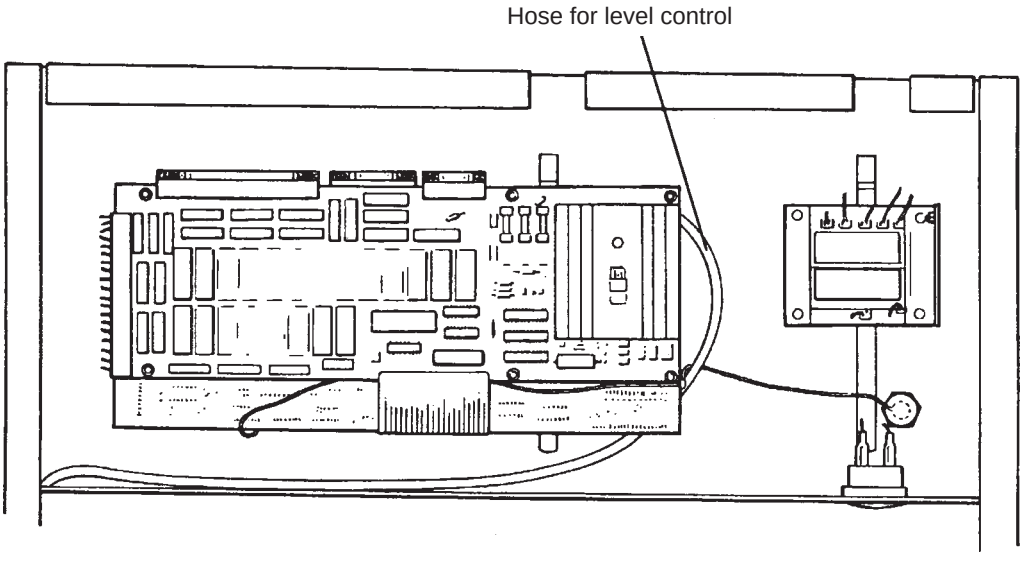
Important

The memory chip must be installed the right way round in accordance with the markings on the chip and the socket.

Check that the programs in the transferred memory chip can now be selected with the new circuit board.

Check that the programs statistics are correct (by selecting program number 00 and pressing PROG INFO). The statistics display must not show the characters ?\>, only numbers.

If any of the above does not work, the original memory supplied with the new board must be installed and the wash programs will have to be reprogrammed.



Example FLE 360

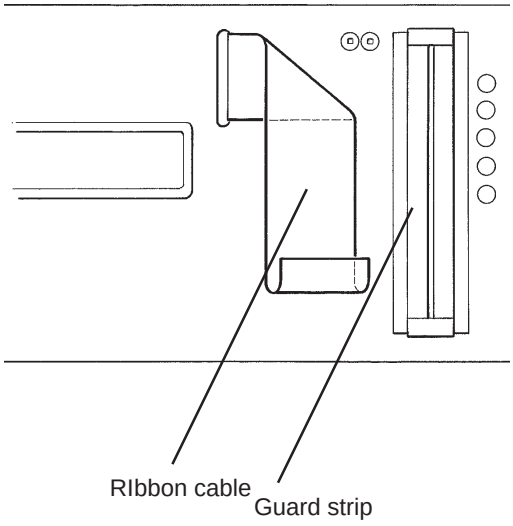
Installing the circuit board

- Plug in the connectors from the keyswitch and the ribbon cable. Note that the ribbon cable must be folded as shown in order to be plugged in the right way round.
- Check that the guard strip between the board and the control panel (see sketch) is in position.
- Secure the board with the 6 screws and put back the board connectors and the tube to the level detector.

Removing the control panel and circuit board

- Unplug the board connectors and the tube to the level detector.
- Remove the two metal clips by pulling them straight upwards.
- Pull the unit forward and outward so that the two metal tongues unlatch from the fixing eyelets.

Installing the ribbon cable



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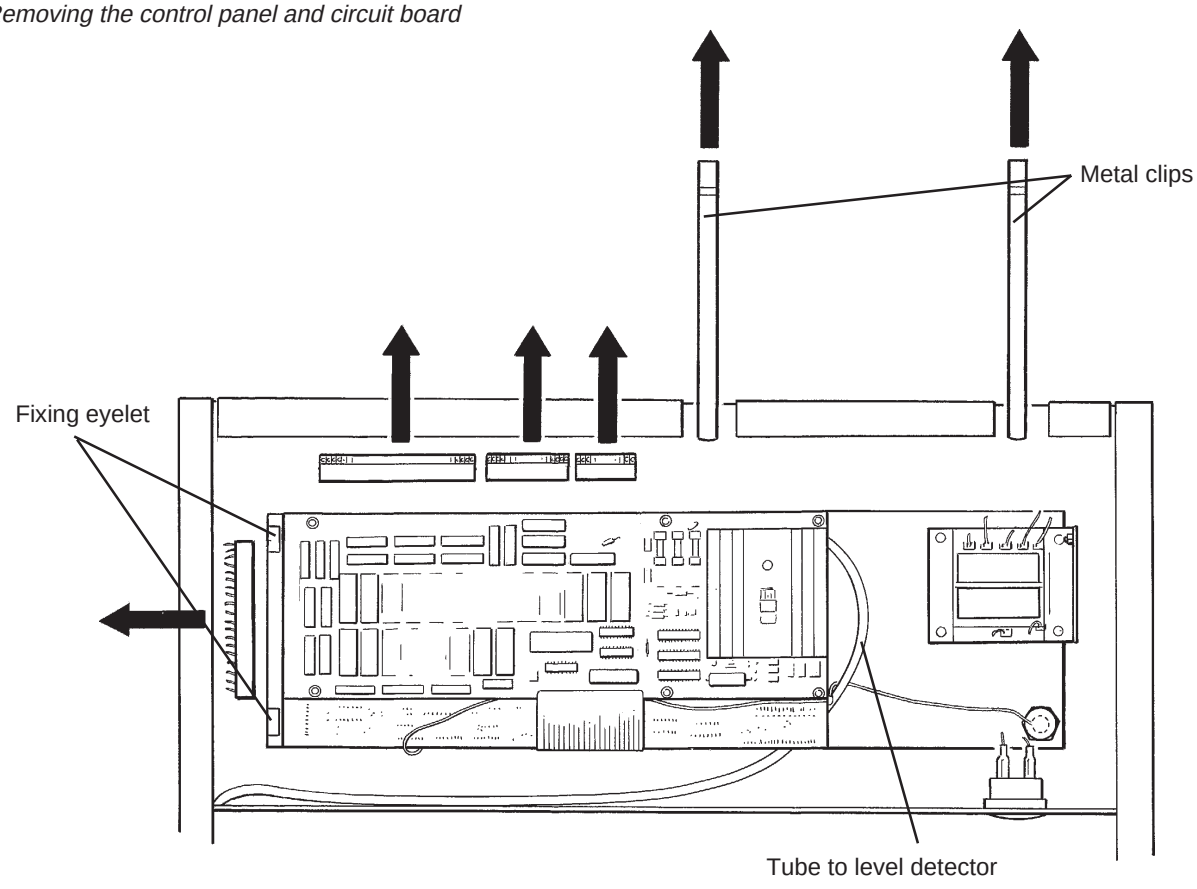
Removing the control panel and circuit board



Example FLE 360

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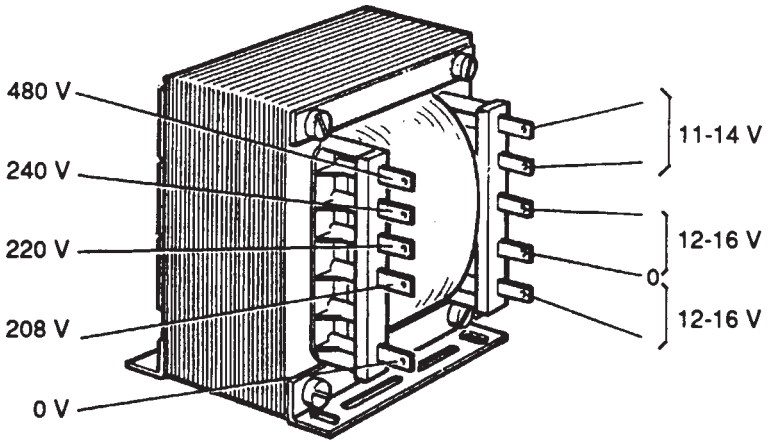
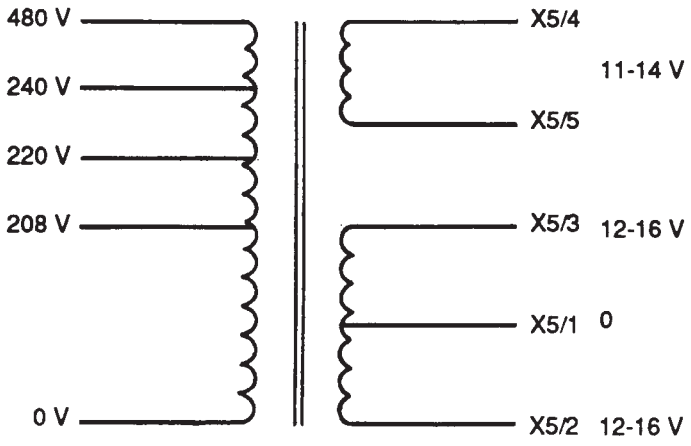
Control transformer

On the primary side of the control transformer there are four terminals for 208, 220, 240 and 480 volt, and a neutral terminal. There are two secondary windings, one of which has a centre tap. The secondary voltages are 11-14 volt and 2 x 12-16 volt. The diagram of the transformer is given below. On the secondary side there are references to the second board terminal numbers for the control voltages.





1105

Description

The reversing and gentle action of the machine are controlled by the reverser. This contains a reversing cylinder with permanent cams which actuate the making and breaking contacts. The reversing cylinder is driven by a synchronised motor which rotates once in 3 minutes.

Repair instructions

Checking the reverser motor

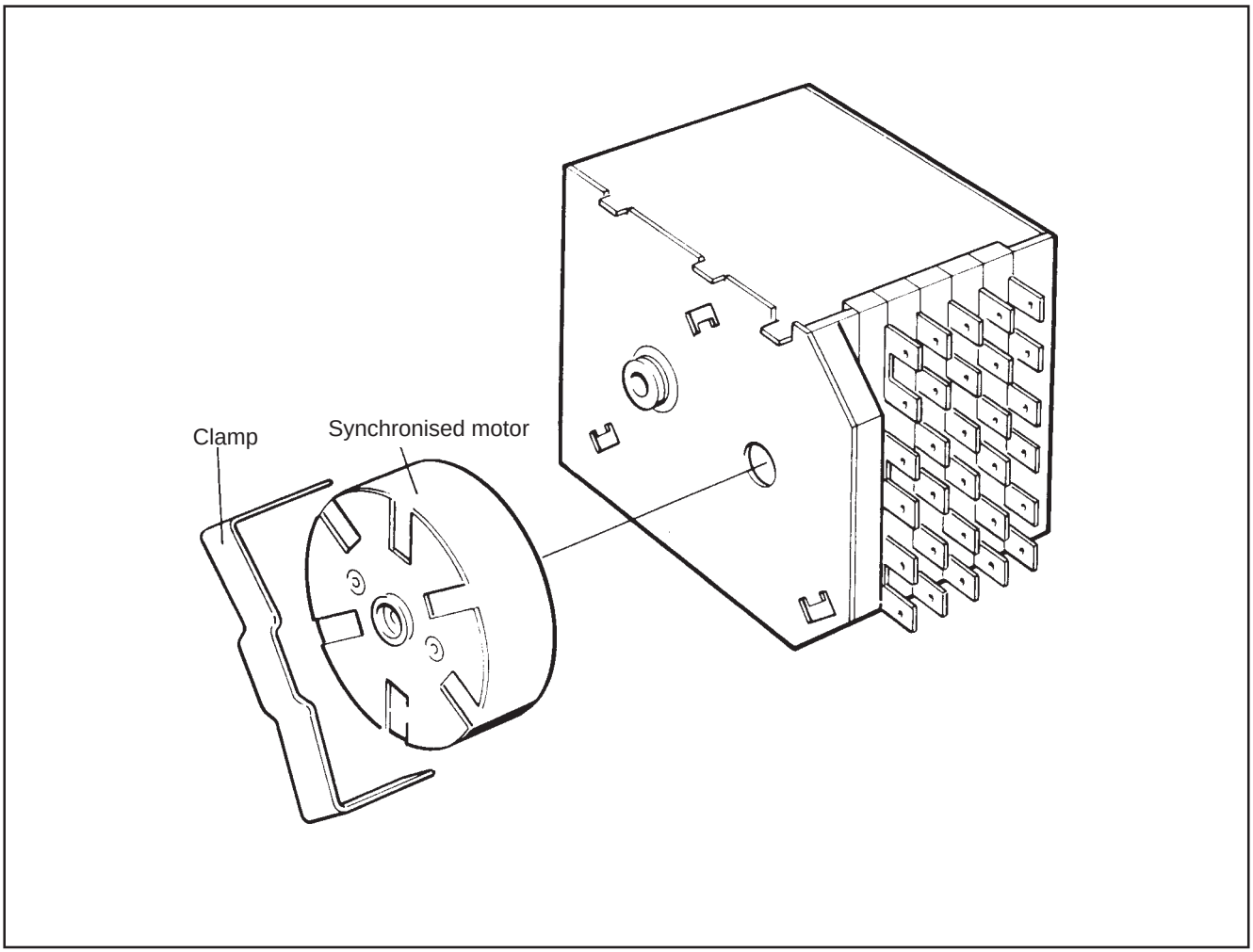
- A complete motor can only rotate in one direction.

If the reverser motor is live but the motor is not running, replace the motor.

- Remove the clamp which holds the motor.
- Mark up the push ons of the motor connections and remove them.
- Replace the motor with a new one. Check that the cogs enter the reverser correctly.
- Connect the cables and put back the clamp.

If the motor runs but the reverser cylinder does not advance, change the entire reverser as this has an internal fault.

No other measures are recommended for the reverser.



Data

The contactor can handle a nominal voltage of + 10%-15%.

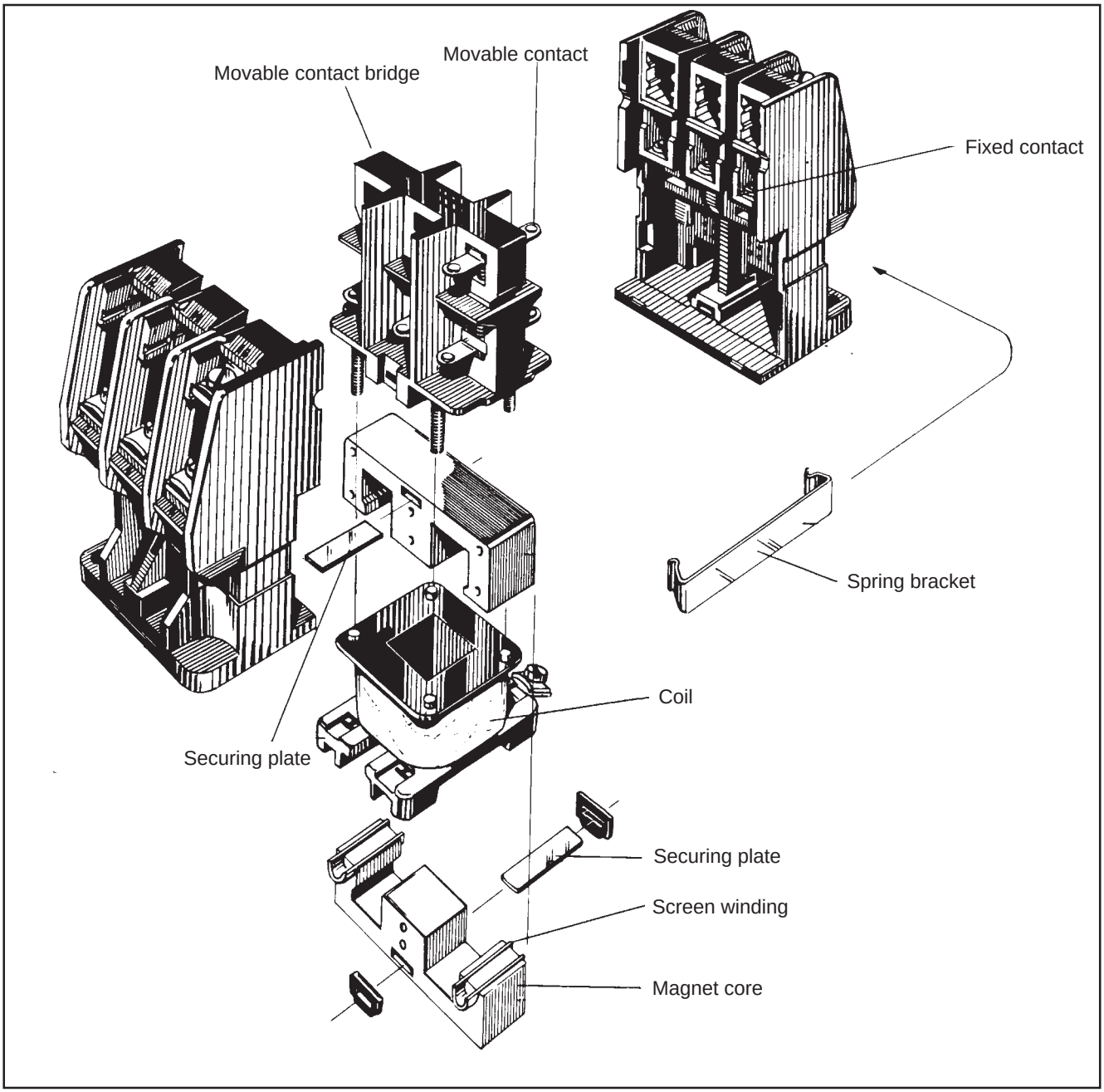
Description

The contactor consists of:

- Housing in two halves with fixed, make and break, contacts. The halves are secured by spring brackets.
- Movable contact bridge with movable contacts.
- Solenoid with coil and core.

  The upper half of the core is suspended by springs and attached to the moving contact bridge.

  The fixed, lower half of the core is fitted with screened windings which divide the flow through the core. The flow must never falls to zero and mains hum is prevented.



Repair instructions

The contactor fails to make or break.

- Check that the operating coil is energised. If this is the case, take measurements at the coil to check for a break. If a break has occurred, replace the coil as follows:
- Undo the contactor and lift it out.
  NOTE! The connection cables to the contacts do not need to be removed.
- Price apart the spring brackets and carefully take the contactor halves apart; be carefully so that the movable contacts do not jump out.
- Loosen the connections to the coil.
- Replace the coil.
- Prior to reassembly, check that the contact surfaces to the magnet core are clean and undamaged.
- Reassamble and replace the contactor.

The contactor hums considerably

- Loosen and take the contactor apart as described above.
- Check whether or not the screen windings are intact. A damaged screen winding causes a loud hum. If this is the case, replace the contactor.
- Check for foreign particles on the contact surfaces of the magnet core. Clean carefully with a fine emery cloth if necessary.

The contactor sticks

- Undo and take the contactor apart as described above.
- Check that there are no burrs on the coil bobbin which brake the motion of the movable contactor half. Where necessary, deburr.
- Check that the movable contact bridge can move freely in the contactor housing and that the movable contacts are correctly seated in their holders.

Other contactor faults

- Replace the contactor.

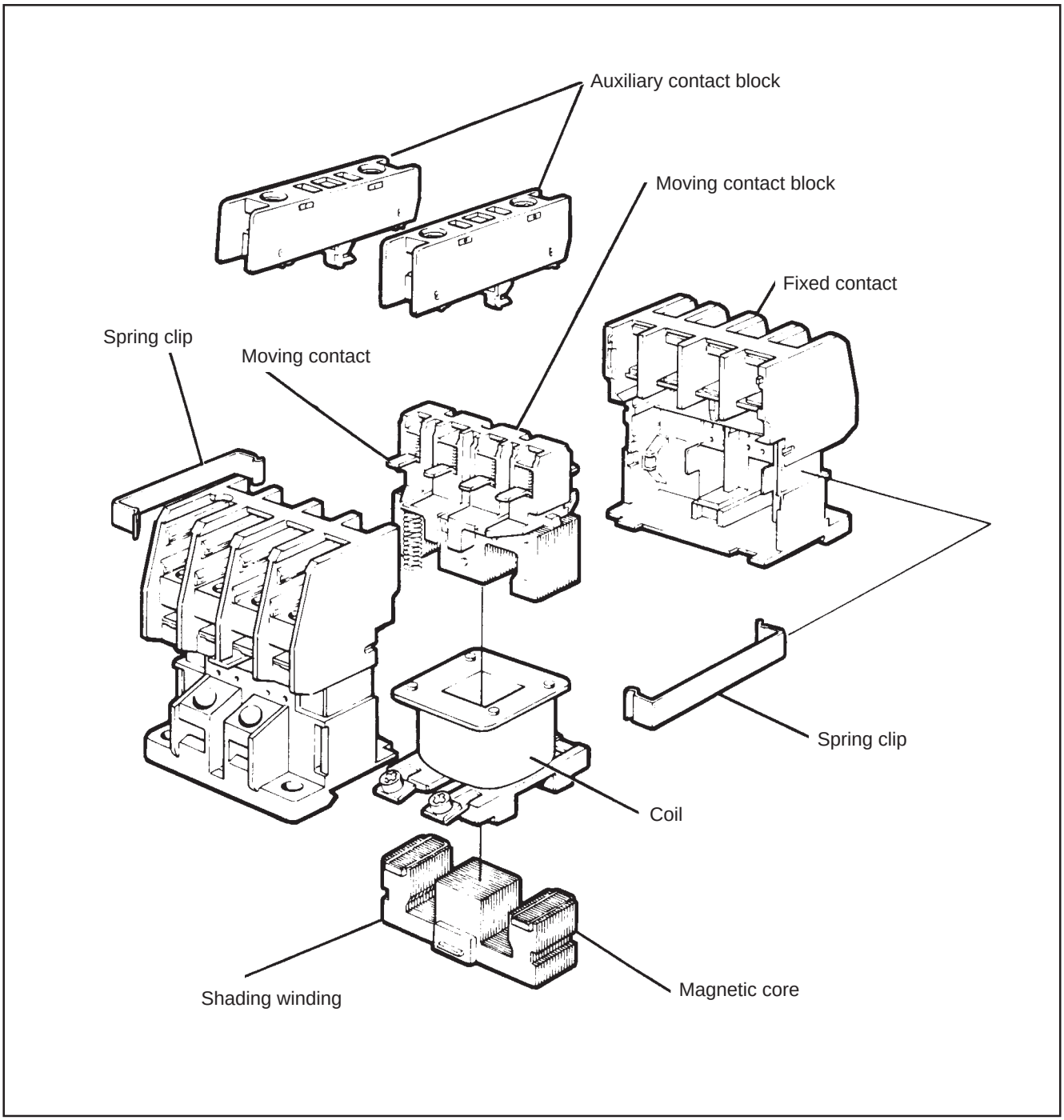
Description

Each relay consists of:

- A casing in two halves, containing six normally-open and/or normally-closed contacts. The two halves are helt together by spring clips.
- A moving contact carrier containing moving contacts.
- A solenoid, with coil and core.
- (Optionally) an auxiliary contact block, for increasing the number of contacts.

  The magnetic core is split, with the upper part, which carries the moving contact block, being spring-secured.

  The fixed, lower portion of the core carries shading windings which modify the phase of the flux through the core, so that it never reduces to zero, eliminating 50/60 Hz hum.



Relay repairs

The relay does not open or close

- Check that the coil is energised. If so, check its continuity. If the coil is open-circuited, replace it as follows:
- Remove the auxiliary top contact block as described below under Replacement of Auxiliary Contact Block.
- Undo the connector and remove it.

  NB: The wires to the contacts do not need to be removed.
- Prise off the spring clips and carefully separate the two halves of the main relay block. Be careful not to allow the moving contacts to spring out.
- Remove the connections to the coil and replace the coil.
- Before re-assembly, check that the surfaces of the magnetic core are clean and undamaged. Re-assemble and reposition the connector.

Loud hum from the relay

- Unscrew and disassemble the relay as described above.
- Check that the shading windings are undamaged – damaged shading windings will result in considerable hum. If the windings are damaged, replace the entire relay.
- Check that there are no foreign particles adhering to the contact surfaces of the core. If necessary, carefully clean the surfaces with fine emery cloth.

Relay is sticking

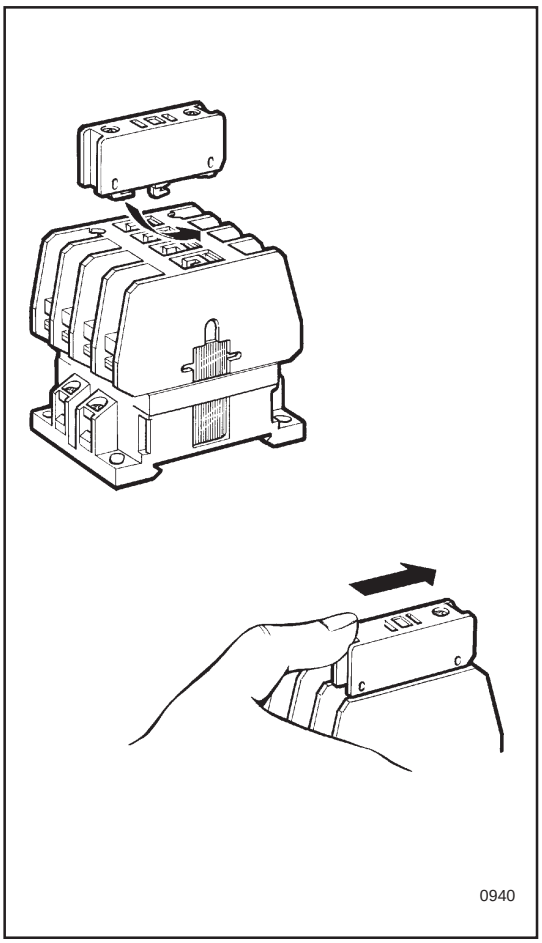
- Remove and dissemble the relay as described above.
- Check that the coil does not have any sharp edges or flash that are/is preventing free movement of the moving part of the core. Rub off any sharp edges or flash if necessary.
- Check that the moving contact carrier can move freely in the relay casing, and that the moving contacts are correctly located in their housings.

Relay is sticking

- Replace the relay.

Replacement of the auxiliary contact block

- Remove the auxiliary contact block as follows:
  - Using one finger, press the rear edge of the auxiliary contact block forwards and upwards until the block disengages. (The rear edge is that which is marked HN01/HN10: see diagram).
- Fit the auxiliary contact block as follows:
  - Position the auxiliary contact block on the body of the relay so that the black tab of the auxiliary contact block locates in the pole clips and the red tab locates in the recess in the moving contact block (see diagram).
  - Press the auxiliary contact block backwards until its rear edge drops down and clips into position.
- Check that the auxiliary contact block is operating properly, as follows:
  - Press and release the red/green pin in the middle of the auxiliary relay block, and check that the moving contact carrier moves freely without binding.



Calibrating the level detector

The level detector is at the left-hand end of the circuit board.
Both zero level and mid position must be calibrated.
Potentiometers P2 and P3 are used for these adjustments.

IMPORTANT

Do not adjust potentiometer P4. It is used for factory adjustments only.
Adjust the zero level before the mid level.

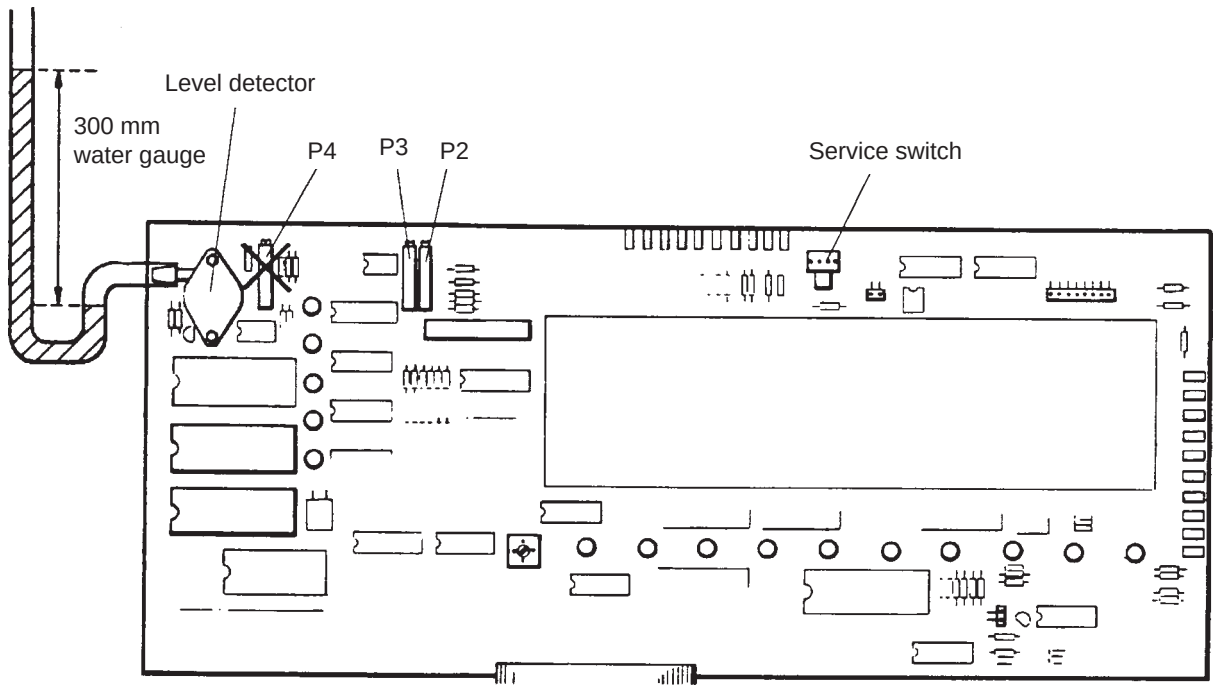
Zero level adjustment

- Make sure there is no water in the drum.
- Set the service switch to position 4, Service program.
- Disconnect the tube from the level detector.
- Read off the level on the display (bottom row, left).

  The reading must be between 0 and 4.
- If necessary, adjust with potentiometer P2.

Mid-level adjustment

- Connect a pressure of 300 mm water guage to the level detector. See example below.
- Read off the level on the display (bottom row). The reading must be between 126-128.
- If necessary, adjust with potentiometer P3.



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Setting the water level

This is the procedure for determining how many "units" are needed to reach a given water level in the drum (so that this value can be entered in the wash program):

- The key on the control panel of the machine must be int the **WASH** position. Set the service switch to position **4**, Service program.
- Press **O**, **1** and **START**. This activates the cold water valve and the level detector. (To activate the hot water valve, pess **0**, **2** and **START**). The following text appears on the display:

```
SERVICEPROGRAM     CHOOSE FUNCTION 001
COLD WATER
**ON**    LEVEL: 1>XXX   2>XXX     3>XXX
LEVEL     XXX    TEMP. XXX°C
```

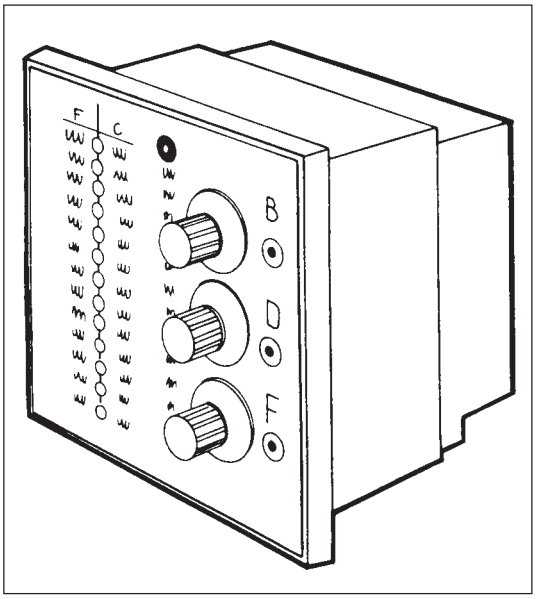
LEVEL 1, **2** and **3** show the manufacturer's recommended figures for level 1 (Empty), level 2 (Low) and Level 3 (High) for this model. **Level 1** (Empty) is used by the microprocessor as a limit value for opening the door, switching on heating elements (if any) and starting the spin. **LEVEL 1** cannot be reprogrammed and is shown as a reference only.

The reading at **LEVEL** on the bottom line of the display increases as the water level rises in the drum. When the desired level is reached, press **START** again to shut the water valve. The water level can now be read off on the bottom line.

The **TEMP.** indicator shows the inlet temperature of the water. On the basis of this figure the programmer can determine exactly the inlet temperature of the water when choosing **COLD WATER** or **HOT WATER**. If the model in question does not have built-in heating elements or steam heating, the highest possible water temperature is determined by the inlet temperature of the hot water (which may be very much lower than the outlet temperature from a water heater unit because of losses in pipes).

Specification

Area from – to	approx. 3 °C
Maximum temperature for bulb	150 °C



Description

The thermostat controls the temperature during the machine's program process. The heat supply is controlled by connecting and disconnecting contacts.

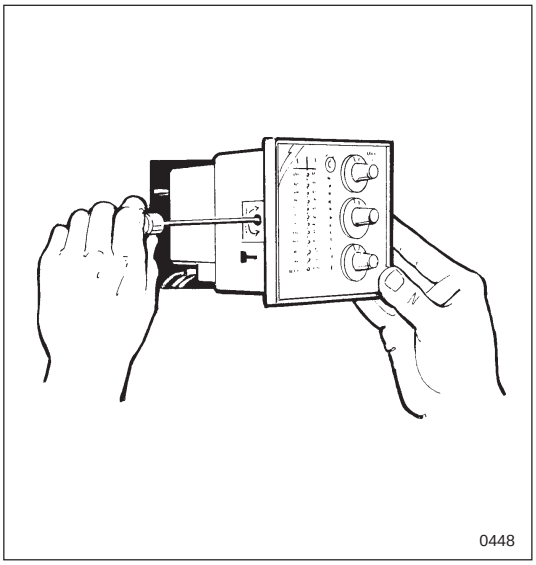
The thermostat sending unit (NTC resistor) is placed in such a way that it is in contact with the water in the drum. From the sending unit, cables lead to the thermostat placed on the control panel. The water temperature determines the sending unit's resistance, i.e. the "in signal" to the thermostat. When the "in signal" has reached the value for which the thermostat's different contacts have been set, the contacts in question, B, D or F are activated. Selection of the current contact is controlled by the program.

Repair instructions

General

No repairs of the thermostat are recommended. Instead, the unit should be replaced.

In measuring the transmitter (NTC resistance), it is necessary to use a digital type measuring device to prevent the transmitter from being heated. The resistance between the transmitter cables (connected to the thermostat pegs 6 and 7) should be 1kΩ.

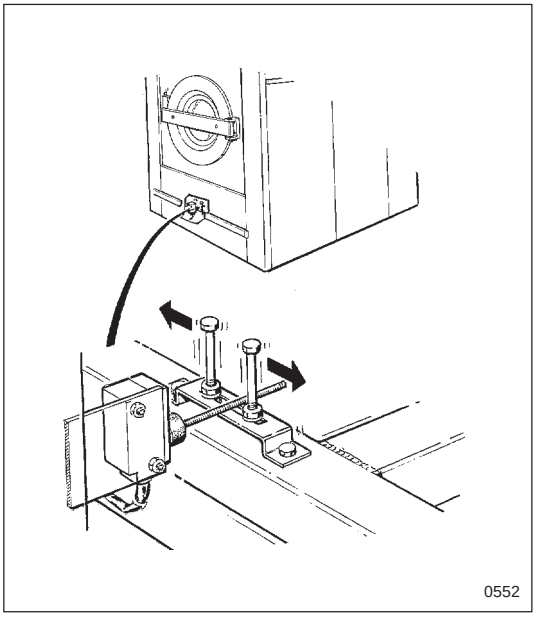


Adjustment of the final temperature during the cooling cycle (FLE 804, 810)

The final temperature during the cooling cycle can be set between approximately 40 and 60°C. At the factory, the temperature is set for 55°C. Adjustments are made by turning an adjustment screw located on the side of the thermostat.

- Remove the thermostat from the machine and turn the thermostat adjustment screw to the desired position. Turning clockwise reduces the cooling temperature for a lower temperature, turning counterclockwise increases the cooling temperature for a higher temperature.
- Check the setting by running a laundry program and measuring the temperature with the thermostat after a completed cooling cycle.

Description



The unbalance cutout is a safety device preventing machine damage during extraction due to uneven distribution of a wash load.

The unbalance cutout consists of a microswitch and a control arm, mounted on the outer frame, and a sensor mounted on the inner frame. The sensor consists of two adjustable screws on a sheet metal tab.

If the inner frame, and hence the sensor, moves beyond a certain point, the sensor will trip the microswitch via the control arm. The extraction contact will then be disconnected. The program unit switches to wash cycle speed and water will be filled to the high level (if the program card is so coded). Next, the program unit switches over to distribution cycle speed and a new extraction attempt will be made.

Repair instructions

Checking unbalance cutout adjustment

- With the machine empty, check that the unbalance cutout control arm is 10 mm away from the sensor adjustment screws and that the control arm touches the attachment clamp for the sensor.

  If necessary, adjustment can be done by:

  – moving the adjustment screws into the slots of the attachment tabs

  – Carefully bending the microswitch attachment tab

The unbalance cutout trips repeatedly

- Unsuitable wash load composition
- The unbalance cutout is incorrectly adjusted. Please refer to checking above.
- The shock absorbers are poor, see section ”43. Frame.”
- High water level has not been programmed for extraction.

Description

The machine door lock is a safety system which prevents personal injury since:

- the machine cannot be started until the door is closed and the handle is turned to closed position.
- the door is automatically locked when the machine is started.
- the door cannot be opened until the motor's low speed contactors are disengaged and the water level has dropped below the bottom of the inner drum.

The door lock consists of a guide plate with a microswitch and locking bolt controlled by a pulling magnet.

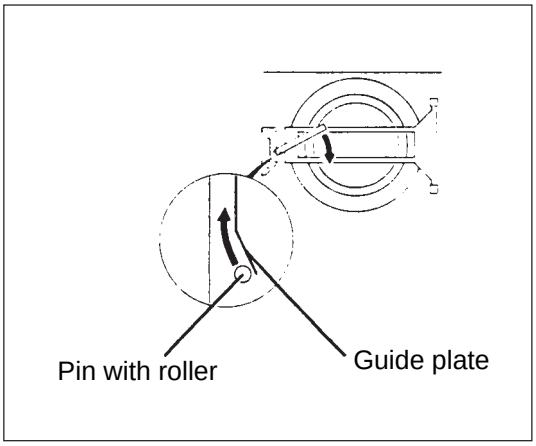


Figure 1.

Brief description of the door lock function

When the door is closed by turning the door handle to the closed position, the pin of the handle with its roller will slide against the door latch guide plate, see figure 1. The guide plate is shaped in such a way that the door is thereby pressed against the drum so that it seals.

During the last phase of turning, the door handle pin will go past the locking cam controlled by the pulling magnet, see figure 2. The locking cam pulling magnet is activated when the machine is switched on. At this point, the locking cam is located in an inactive position. When the turn is completed, the pin of the handle will affect the microswitch control arm and simultaneously open the way for the lock cam, see figure 3. The microswitch signals to the automatic unit that the door is closed so that the machine can be started. When the machine is started, the lock cam pulling magnet loses its voltage and the locking cam once again turns to a resting position, blocking the pin of the door handle and locking the door.

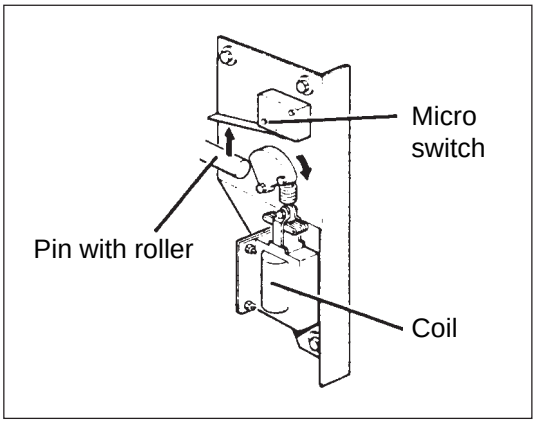


Figure 2.

When the program has ended, the door latch pulling magnet once again regains voltage and the pulling magnet moves the locking cam so that the door handle pin is not obstructed, see figure 4. The door is not locked and its handle can once again be turned to an open position.

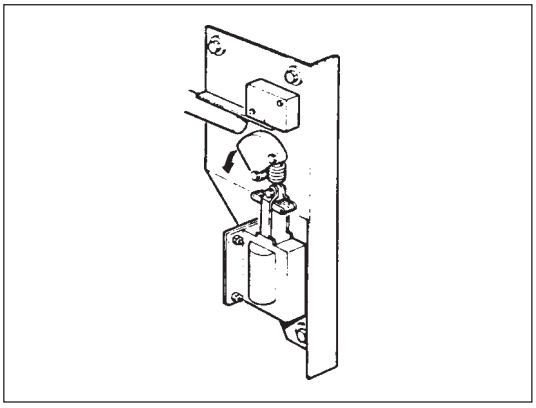


Figure 3.

Repair instructions

The pulling magnet does not open the door

- Check that the coil is fed 220 V AC.
- Check the coil to see if it is getting current.
- Check that the pulling magnet armature is not jammed.
- Replace the entire pulling magnet.

Replacing parts on the door lock

1. Unscrew the cover plate of the door lock.
2. Unscrew the guide plate of the door lock.
3. Replace damaged parts.
4. Reassemble the guide plate of the door lock.
5. Reassemble the cover plate of the door lock.

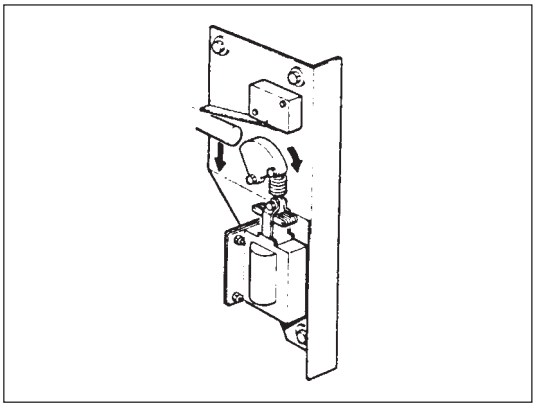


Figure 4.

Description

The machine door lock is the safety system which prevents personal injury since:

- the machine cannot be started until the door is closed and the handle has been turned to a closed position.
- the door is automatically locked when the machine is started.
- the door cannot be opened until the motor's low speed contactors have been released and the water level has dropped below the bottom of the inner drum.

Two pneumatic cylinders attach the door to a door arm, which in turn is pivotally attached to a clamp at one end. A locking ear located at the other end of the door arm, engages the door latch.

The door latch consists of a mechanism with a pneumatic piston, a pneumatic valve and a microswitch.

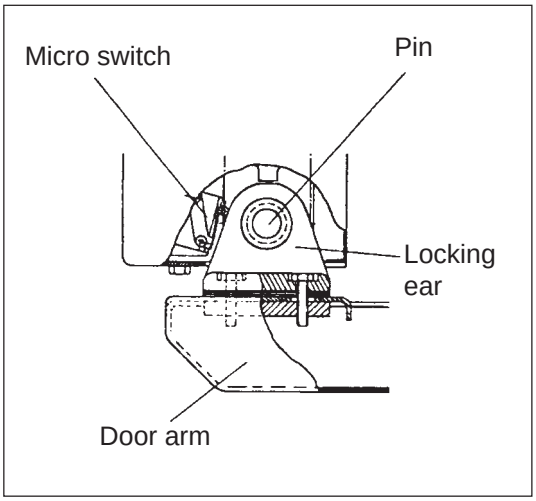


Figure 1.

Brief description of the door lock function

As the door is shut by the door arm being brought to a closed position, the door arm's locking ear activates the microswitch of the door latch, see figure 1. The program unit then receives a signal that the door is closed. At the same time, the microswitch provides voltage to a sliding gate valve which brings air pressure to the door latch piston, lowering a pin through the lock arm's clamp handle and locking the door.

When the pin is lowered it activates a pneumatic valve, see figure 2. Once activated, this valve opens the air supply to the door's two pneumatic cylinders which push the door toward the front valve of the drum, sealing it, see figure 3.

At the end of the program, feeding of the door latch microswitch is discontinued causing supply to the sliding gate valve to discontinue also. The air piston receives air pressure so that it disengages the piston from the locking ear. When the piston comes up, it stops activating the pneumatic valve causing the valve to change position. The door's two air cylinders are thereby connected with atmospheric pressure and revert to their original positions.

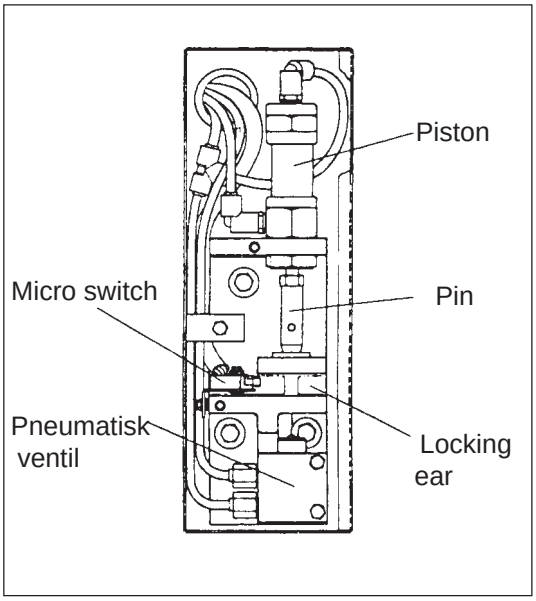


Figure 2.

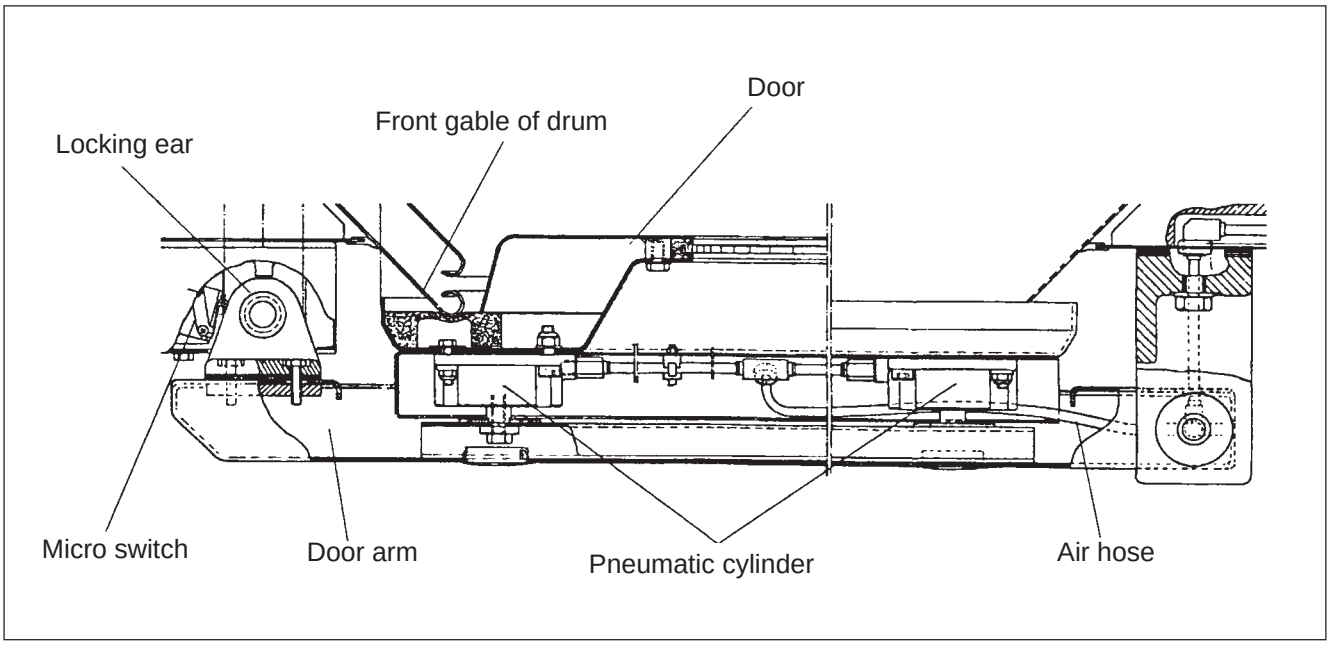


Figure 3.

The door lock piston does not lock the door

- Check that the microswitch receives voltage (220 V AC for flat-card automatic unit, 12 V DC at the microprocessor).
- Measure the microswitch to check for proper function.
- Check that the door arm's locking ear activates the microswitch.
- Check that the machine has an adequate supply of compressed air.
- Check that the sliding gate valve functions.

Replacement of the microswitch

1. Check that the machine is disconnected from the mains.
2. Remove the cover plate on the door latch.
3. Remove the microswitch.
4. Move the old microswitch connections over to a new microswitch.
5. Attach the microswitch without tightening.
6. Close the door so the microswitch is in the activated position.
7. Adjust the position of the microswitch so that the clearance between the breaker housing and the breaker arm is between 0.5 and 0.8 mm (Figure 4). Tighten the microswitch to torque 6.3 Nm.
8. Reattach the door latch cover plate.

Replacement of pneumatic valve

1. Check that the machine is disconnected from the mains and that the air pressure supply is disconnected as well.
2. Remove the cover plate of the door latch.
3. Disconnect the air tubes on the valve, and make note of the position of the tubes.
4. Remove the old valve and replace it with a new one.
5. Attach the air pressure tubes to the new valve.
6. Turn the machine on, check that the it has air pressure and close the machine door. The piston of the door latch lowers the pin and locks the door.
7. Adjust the pneumatic valve position so the clearance between the pins' end and the plane on the valve sensor is between 0.5 and 0.8 mm (Figure 5). Tighten the valve with torque 11 Nm.

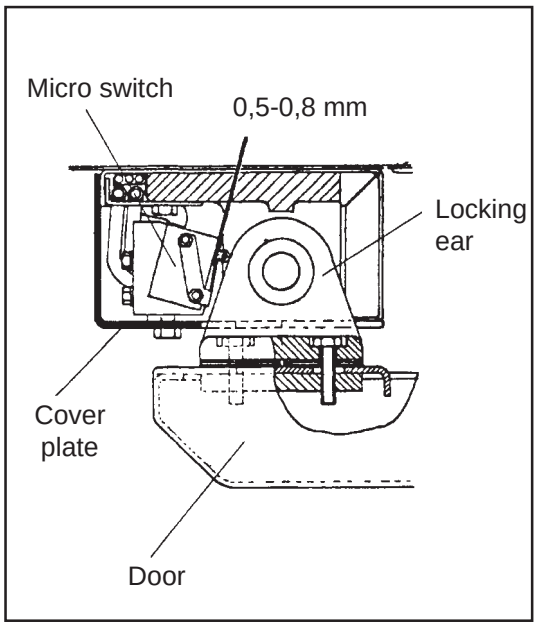


Figure 4.

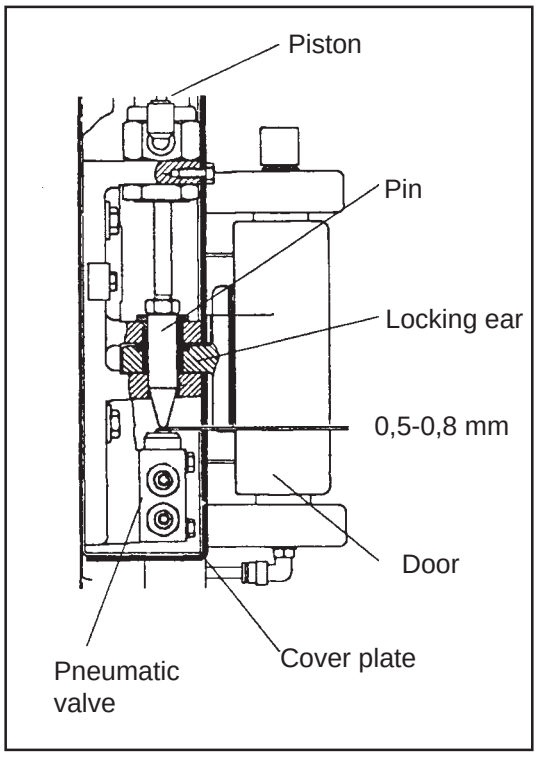


Figure 5.

Description

Both motors (Figure 1), one for washing and distribution, and one for extraction at high and low speeds, are mounted on the inner frame, each in a motor mount.

The washer motor is mechanically connected to the incoming pulley of a belt transmission. The incoming pulley of the transmission is connected with the outgoing pulley by an electro-mechanical clutch. The outgoing pulley of the belt transmission is connected to the drum via V-belts.

The extraction motor is mechanically connected to the previously mentioned belt transmission's outgoing wheel via a flexible rubber-lined coupling and a hydrostatic clutch.

On the inner frame there are two belt tensioners (Figure 2), one for the belt connecting the belt transmission's incoming pulley and the washer motor, and one for the belt connecting the belt transmission's outgoing pulley and the drum. The belt tensioner consists of a pulley attached to one end of a pivoting arm, the other end of which is hinged on the frame. The outer end of the arm is attached to the inner frame with a turnbuckle screw for adjusting the position of the belt tensioner.

The belt transmission (Figure 3) consists of a gear housing, an electro-mechanical clutch, and an incoming and an outgoing belt pulley. The gear housing is attached to the motor mount of the extraction motor. The transmission's outgoing belt pulley is fixed to a shaft that goes through the gear housing. The electromagnetic rotor is also fixed to the shaft. The incoming belt pulley runs on the shaft on a ball bearing, between the clutch rotor and the outgoing belt pulley. The pressure plate of the clutch is attached to the incoming belt pulley. An electromagnet is located on the gear housing flange. When the magnet is activated, the outgoing belt pulley pressure plate will be pressed by the magnetic force against the rotor attached to the shaft. Both belt pulleys are thereby connected to each other and the power from the washing motor is transferred to the drum.

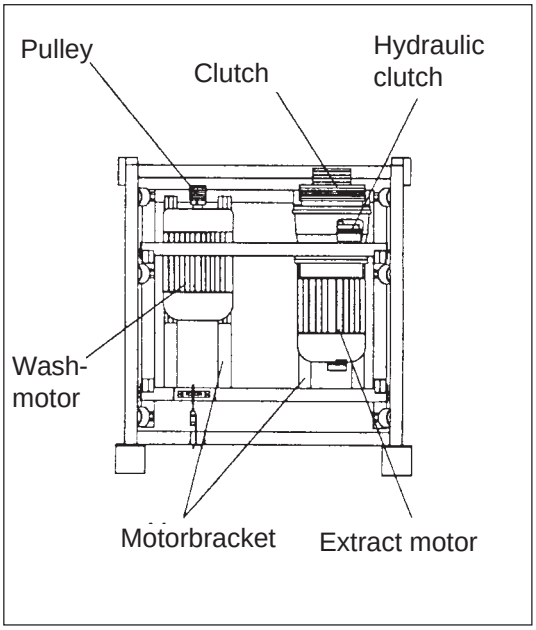


Figure 1. The motors

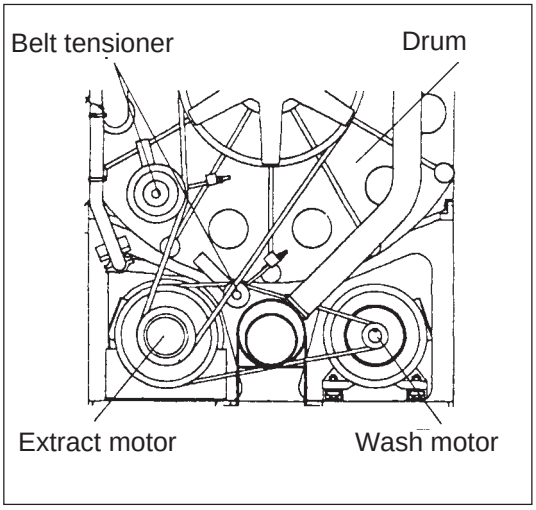


Figure 2. Belt tensioning mechanism

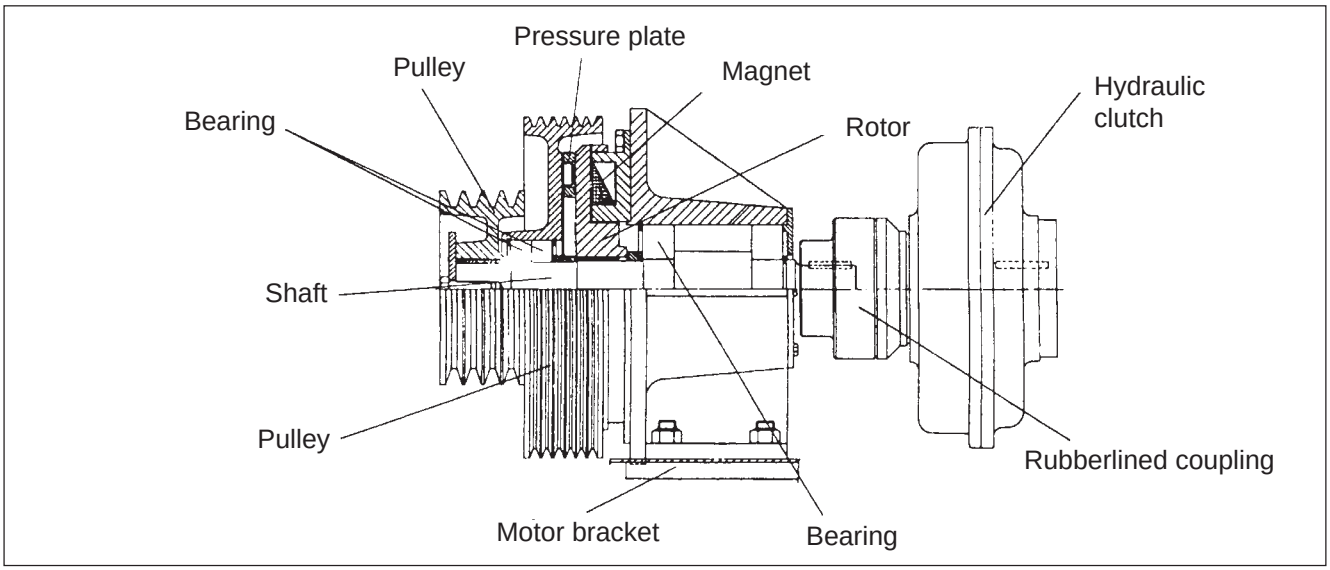


Figure 3. Belt transmission

The other end of the shaft that runs in the gear housing is connected to a hydrostatic clutch via a flexible rubberlined coupling for a smooth transfer of power between the hydrostatic clutch and the transmission shaft.

The hydrostatic clutch (Figure 4) has two blade wheels, a stator and a rotor. One blade wheel is the clutch housing and is connected to the clutch's outgoing shaft. The other blade wheel is connected with the incoming shaft of the clutch. The fluid in the clutch acts as the conduit of power transfer between the blade wheels. This arrangement is the reason why the clutche's outgoing shaft, and thereby the laundry drum, do not immediately rotate at the same speed as the centrifugation motor. Instead, they only gradually reach the same speed as the centrifugation motor. This difference in the speed between the motor and the drum means that the motor will start without a load, and the motor's starting power consumption is minimized.

The hydrostatic clutch is equipped against overheating with two safety plugs. One plug contains a pin that is held in place by a fuse. This fuse melts at 145°C and disengages the pin which by centrifugal force then activates a microswitch which in turn shuts down the power to the centrifugation contactor. The other plug, equipped with a fuse in its center, melts at 175° causing oil to drain from the clutch and power transmission to cease.

The centrifugation motor is equipped with a speed governor. On machines with a brake, the governor is located on the belt tensioner.

The motors are equipped with thermal protectors in the motor windings. The thermal protectors shut off power to the motor contacts in the event of motor overheating, that is, if the temperature exceeds 130°C.

The adjacent figures show the engagement of both motors.

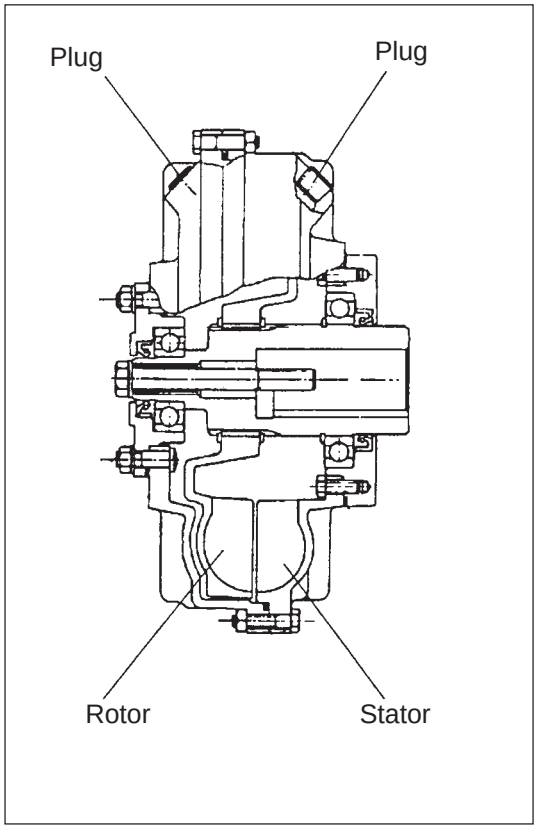


Figure 4. Hydrostatic clutch

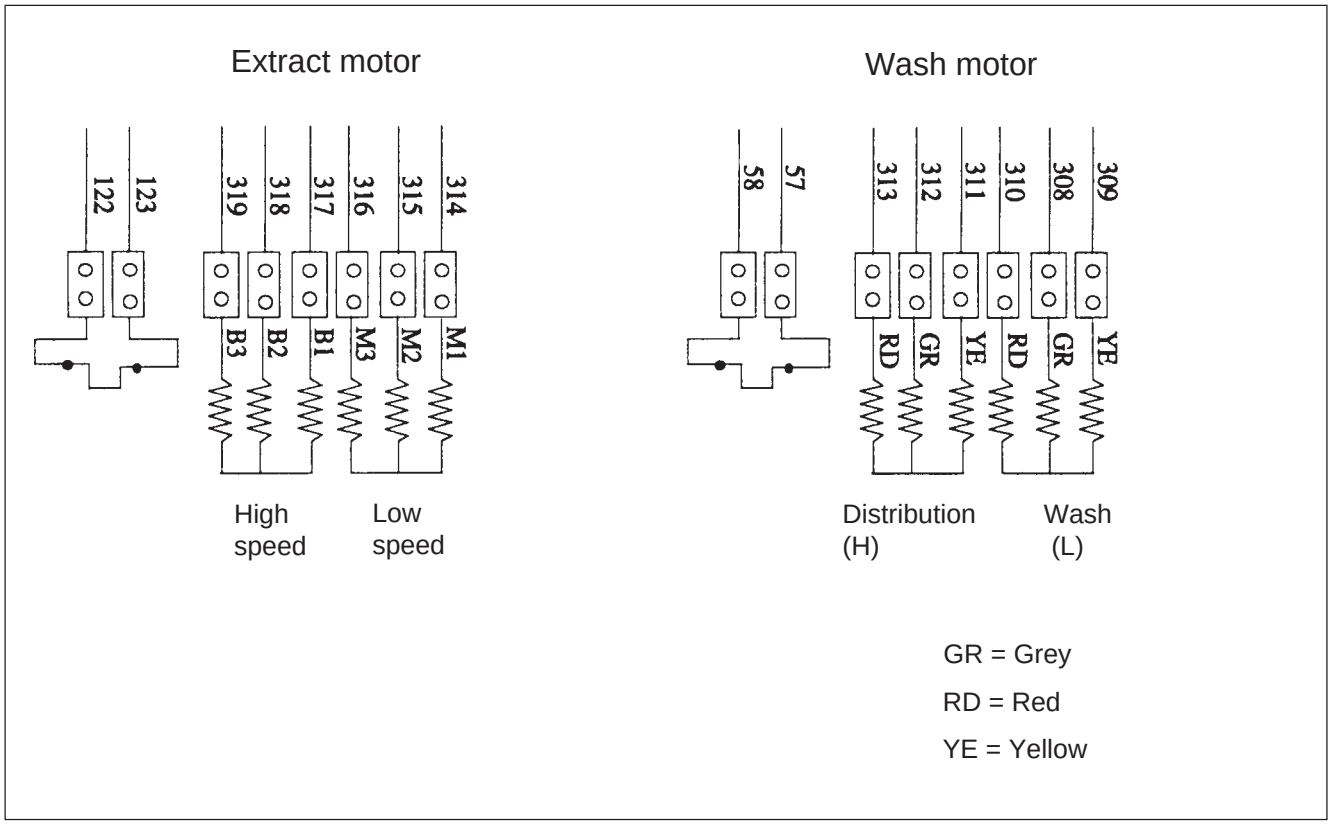


Figure 5. Engagement of the motors

Repair instructions

Possible faults

Overheated motor, the motor does not run

- Wait until the motor has cooled off. The motor protectors are reset automatically after approximately 30 minutes. Start the motor again.
- If the motor protector trips several times, this may be due to a short circuit. Faulty bearings in the motor or drum may also be the cause. Replace the motor.

The motor makes loud noises

- Bearing break down; replace the motor or bearings

The motor runs slowly

- The motor probably runs on two phases; measure the windings on the connection block.

The motor only runs at one of the speeds

- Check for proper connections
- Measure the connections, the error could be due to interruption in a winding.

The motor locks up

- Replace the motor or the bearings.

Tensioning of V-belts

- Loosen the turnbuckle screw of the tensioner and turn the turnbuckle screw until correct belt tension according to figure 6 has been obtained.

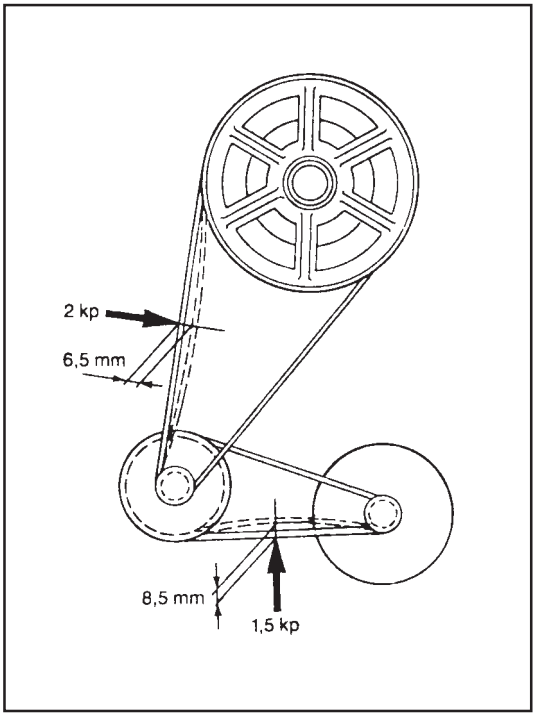


Figure 6. Tensioning the belts

Replacement of the washer motor

1. Loosen the turnbuckle screw for the belt tensioner on the belt connection between the laundry motor and the belt transmission (Figure 6).
2. Remove the belts.
3. Loosen the motor's electrical connections on the automatic unit and pull out the cables so they release and accompany the motor.
4. Remove the four motor mount bolts (Figure 7).
5. Pull the motor off the motor mount to the rear and away from the machine.
6. Attach the electrical components to the new motor. Be sure that the cables are attached correctly on the motor connector block, see schematic under "Description" in this section.
7. Push the new motor onto the motor mount.
8. Place the belts on the belt pulleys.

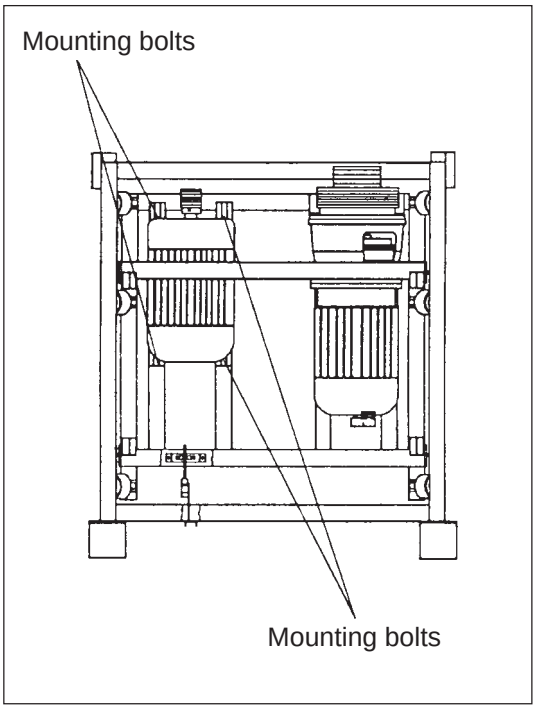


Figure 7. Wash motor – mounting

9. Line up the motor so that the belts pull straight:
   - place straightedge against the incoming pulley of the belt transmission
   - measure distance A (Figure 8) between the straight-edge and the belt at the incoming pulley of the belt transmission
   - adjust the position of the washer motor so that distance B (Figure 8) between the straightedge and the belt at the belt pulley of the wash motor is equal to distance A
   - tighten rear left bolt of the motor mount
   - measure distance C (Figure 8) between the inside edge of the motor belt pulley and the straightedge
   - adjust the motor bias position so that distance D (Figure 8) between the straightedge and the outside edge of the motor belt pulley is equal to distance C.
10. Tighten down the motor on the motor mount.
11. Check motor alignment and adjust if necessary.
12. Tighten the belts with the belt tensioner, according to ”Tightening of V-belts” in this section.
13. Pull and connect the motor cables to the control unit.

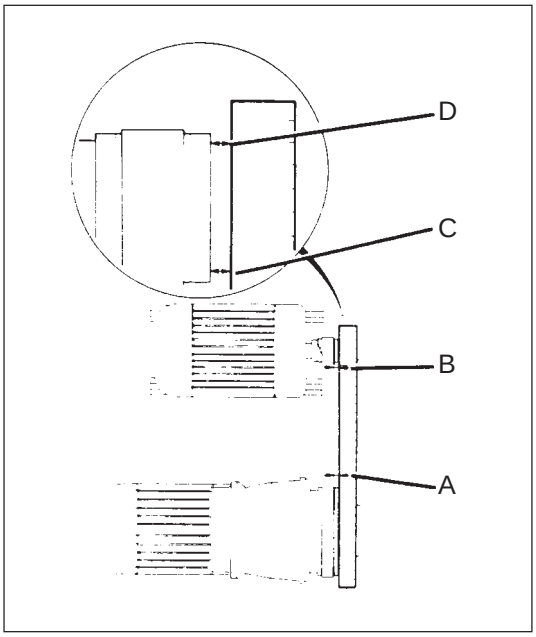


Figure 8. Alignment of washing motor

Replacement of extract motor

1. Loosen the turnbuckle screw of the belt tensioner for the belt connection between the wash motor and the belt transmission (Figure 6).
2. Remove the belts.
3. Loosen the turnbuckle screw of the belt tensioner on the belt connection between the belt transmission and the drum.
4. Remove the belts.
5. Loosen the motor’s electrical connections to the control unit and pull out the cables so they release and accompany the motor.
6. Loosen the electrical connection for the electromechanical clutch.
7. Unscrew the gear housing bolts from the motor mount (Figure 9).
8. Pull the gear housing out of the motor mount, to the rear and away from the machine.
9. For machines without motor brake: Remove the motor speed governor’s electrical connections.
10. Unscrew the motor bolts from the motor mount (Figure 10).
11. Pull the motor off the motor mount to the rear and away from the machine.

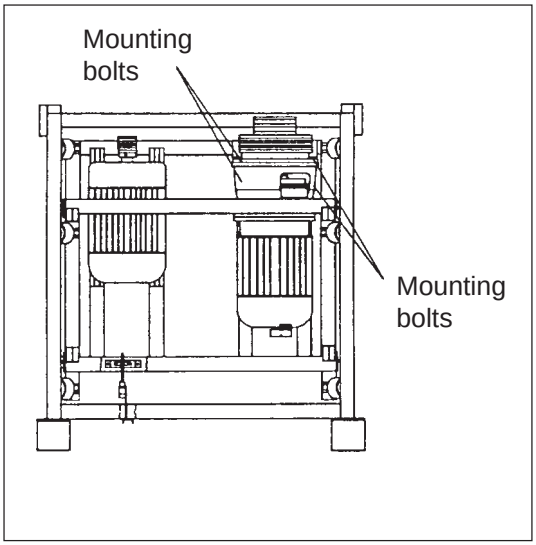


Figure 9. Attachment of gear housing

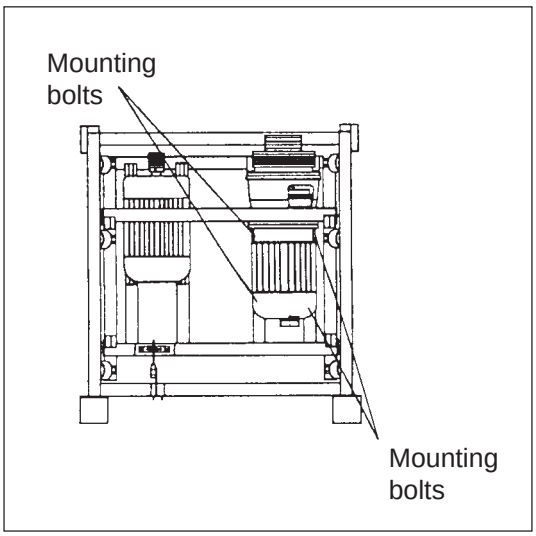


Figure 10. Attachment of extraction

12. Move the hydrostatic clutch over to the new motor; see ”Assembly and disassembly of hydrostatic clutch” in this section.
13. Move the electrical components over to the new motor. Be sure that the cables are correctly attached on the motor connector block, see schematic under ”Description” in this section.
14. For machines without motor brake: Move the motor speed governor’s guard polarized magnet over to the new motor’s shaft.
15. For machines without motor brake: Move the motor speed governor over to the new motor and adjust the motor speed governor’s position according to ”Repair instructions” under tab 31. Speed Governor.
16. Push the new motor into the motor mount.
17. Push the gear housing onto the motor mount.
18. Place the belts on the belt pulleys.
19. Line up the gear housing so that the belts pull straight:
    - place a straightedge against the belt pulley of the drum
    - measure distance A (Figure 11) between the straightedge and the belt at the drum’s belt pulley
    - adjust the gear housing location so that distance B (Figure 11) between the straightedge and the belt at the outgoing belt pulley of the gear housing is equal to distance A
    - tighten the gear housing’s right rear screw on the motor mount
    - measure distance C (Figure 11) between the upper edge of the gear housing outgoing belt pulley and the straightedge
    - adjust the position of the gear housing so that distance D (Figure 11) between the straightedge and the bottom edge of the gear housing outgoing belt pulley is equal to distance C.
20. Tighten down the gear housing on the motor mount.
21. Check the gear housing alignment and adjust if necessary.
22. Check the alignment of the wash motor according to item 9 of ”Replacement of wash motor” in this section, and adjust if necessary.
23. Push the wash motor forward against the gear housing so that the flexible rubber-lined coupling is engaged. Be certain not to damage the rubber liner.
24. Using a caliper, measure the distance between the flexible coupling’s male and female parts; the distance should be 2 mm. Adjust by moving the motor assembly.
25. Set up a measuring gage against the rubber-lined coupling (Figure 12).

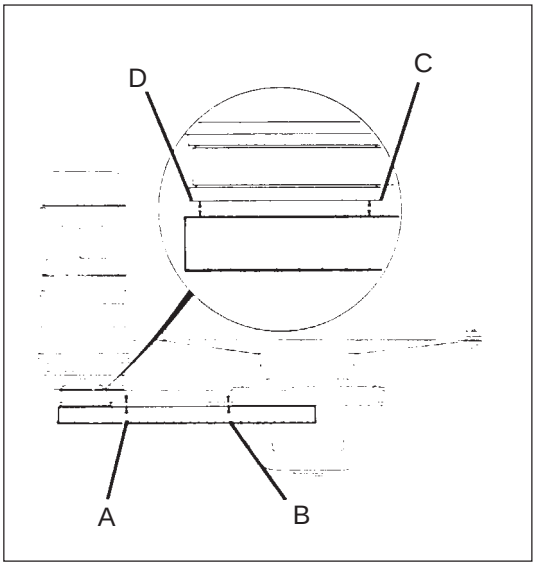


Figure 11. Alignment of gear housing

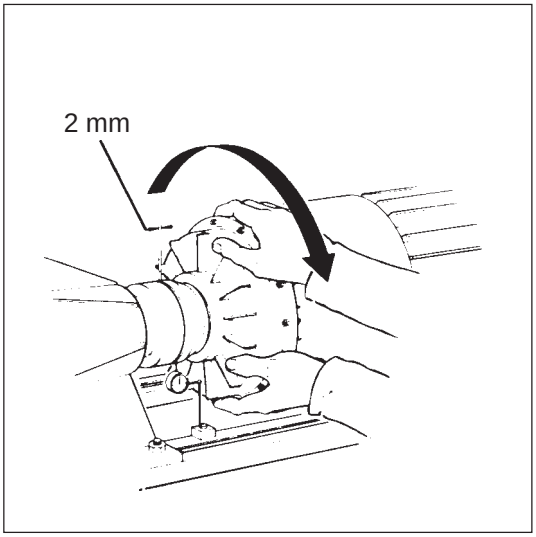


Figure 12. Alignment of extract motor

26. Set the gage to zero; rotate the coupling and read the axial pitch. Move the motor in the motor mount so that no axial pitch occurs. (You may have to insert shims for proper alignment.)
27. Tighten the motor on the motor mount.
28. Pull and attach the motor's connections to the automatic unit.
29. For machines without motor brake: Attach the motor speed governor.
30. Connect the electro-mechanical clutch.

Hydrostatic clutch

Disassembly of hydrostatic clutch

Necessary condition: loose motor

1. Remove the male part of the flexible coupling, located on the hydrostatic clutch outgoing shaft, by removing the locking screw at the shaft's center.
2. Pull the hydrostatic clutch off the motor shaft by threading a puller bolt into the hole for the clutch fastening nut.

Installation of hydrostatic clutch

Necessary Condition: loose motor

1. Place the hydrostatic clutch on the motor shaft and screw a long assembly bolt (with sleeve, bearing and nut) into the motor shaft, see figure 14.
2. Push the clutch in by turning the nut on the bolt.
3. Mount the flexible coupling's male part and lock the parts with the locking screw at the shaft's center.

Replacement of fuse in a hydrostatic clutch

- First find out what caused the overheating. (Oil level too low in the coupling? Insufficient cooling? Has the motor been started often? Long starting periods?) Make certain that the drum rotates freely and without resistance.
- The machine comes with a repair kit consisting of a ring of fuse material (tin alloy) and a mandrel. Replace the fuse as follows (see figure 15):

1. Remove the white cover screw above the fuse.
2. Remove the metal rod along with any residual tin.
3. Push the metal rod into the fuse socket as far as it will go.
4. Insert the new tin ring over the rod.
5. Push the ring down with the mandrel and tap lightly with a hammer so that the ring is pressed into the grooves of the socket side walls preventing the rod from protruding.
6. Tighten the white cover screw

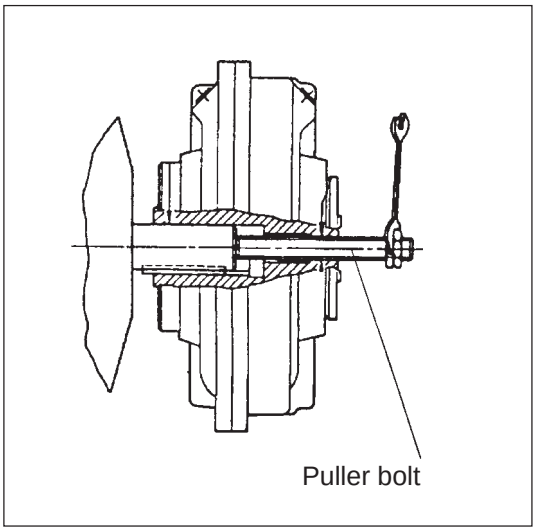


Figure 13. Hydrostatic clutch – removal

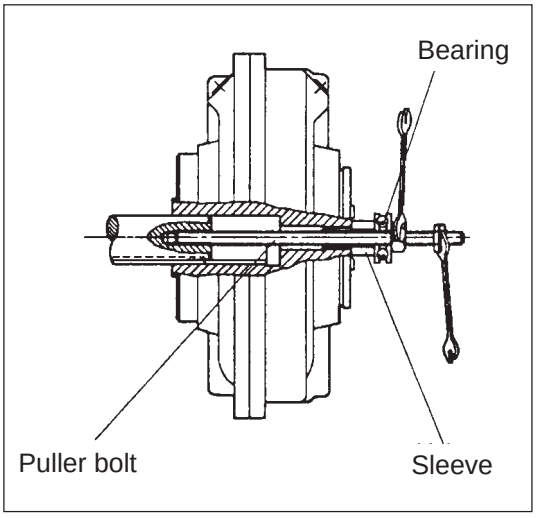


Figure 14. Installation of clutch

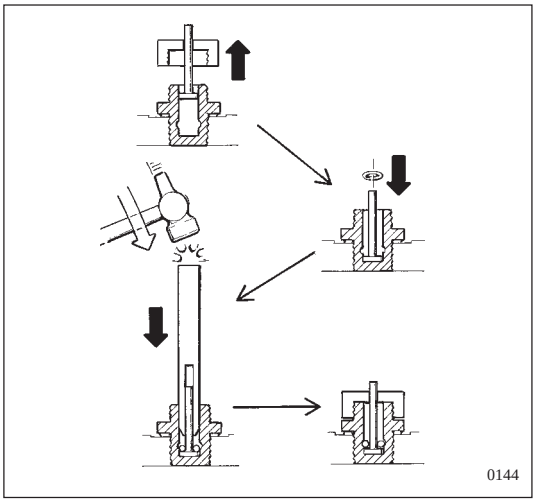


Figure 15. Replacement of fuse

Topping up the hydrostatic clutch with oil.

1. Rotate the clutch so that the x-mark on its side points directly upwards (Fig. 16).
2. Unscrew the filler plug and clean it.
3. Top up with a few decilitres of oil through the oil filler hole.
4. Rock the clutch to and fro a few times to remove any trapped air.
5. Repeat points 3 and 4 until the oil overflows from the filler hole when the x-mark on the housing faces directly upwards.
6. Place sealing compound on the plug threads and screw the plug into the clutch.

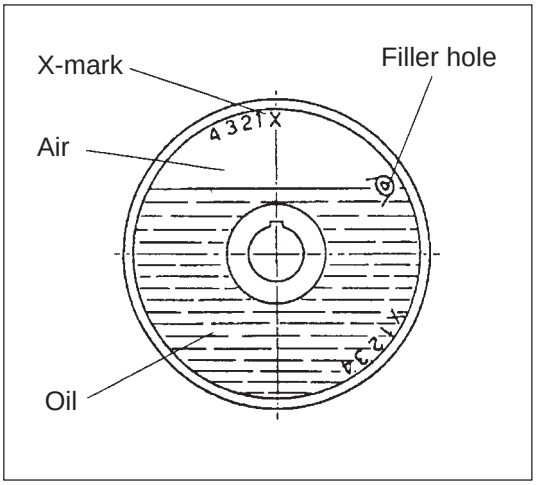


Figure 16. Topping up with oil

Magnetic clutch replacement .

1. Remove the locking screw and washer in the centre of the shaft (Fig. 17).
2. Pull the output pulley off the shaft with a puller. Save the spacer sleeve, spacer washer and wedge.
3. Pull the input pulley off the shaft with a puller. Save the spacer sleeve and spacer washer.
4. Thread the puller bolts into the rotor pulling holes and pull the rotor off the shaft. Save the wedge and spacer washer.
5. Remove the magnet by removing the mounting bolts.
6. Insert the new magnet so that it abuts the gear housing.
7. Coat the mounting bolts with Loctite and tighten the magnet.

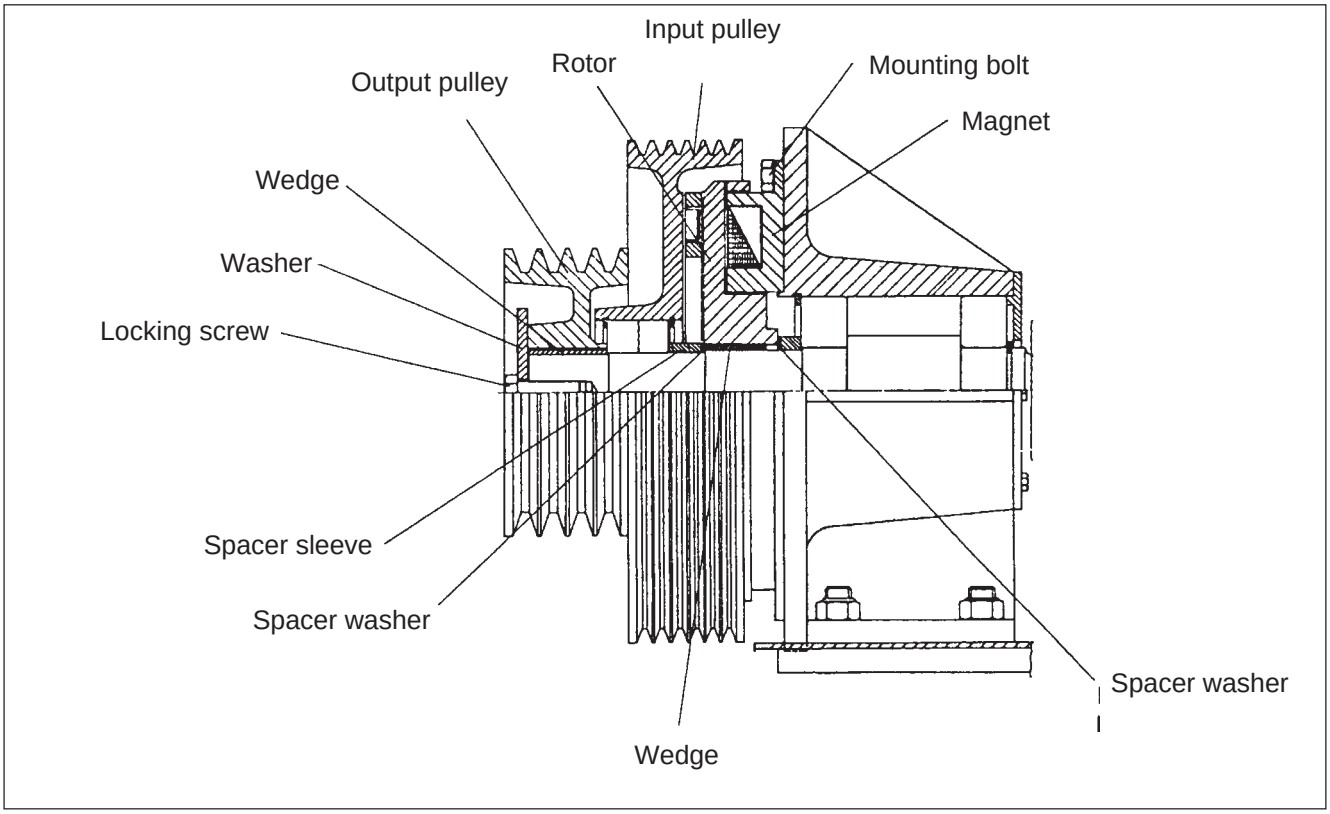


Figure 17. Gear housing and magnetic clutch

8. Measure and fit a spacer washer that gives a clearance of 2 ± 0.1 mm between magnet and rotor as follows:
   - measure and note the distance from the central rotor flange to the bottom of the rotor compartment for the magnet (A) (Fig. 18).
   - measure and note the distance from the surface of the magnet to the spacer ring at the front bearing (B) of the gear housing (Fig. 18).
   - Fit the required spacer washer to give the correct clearance.

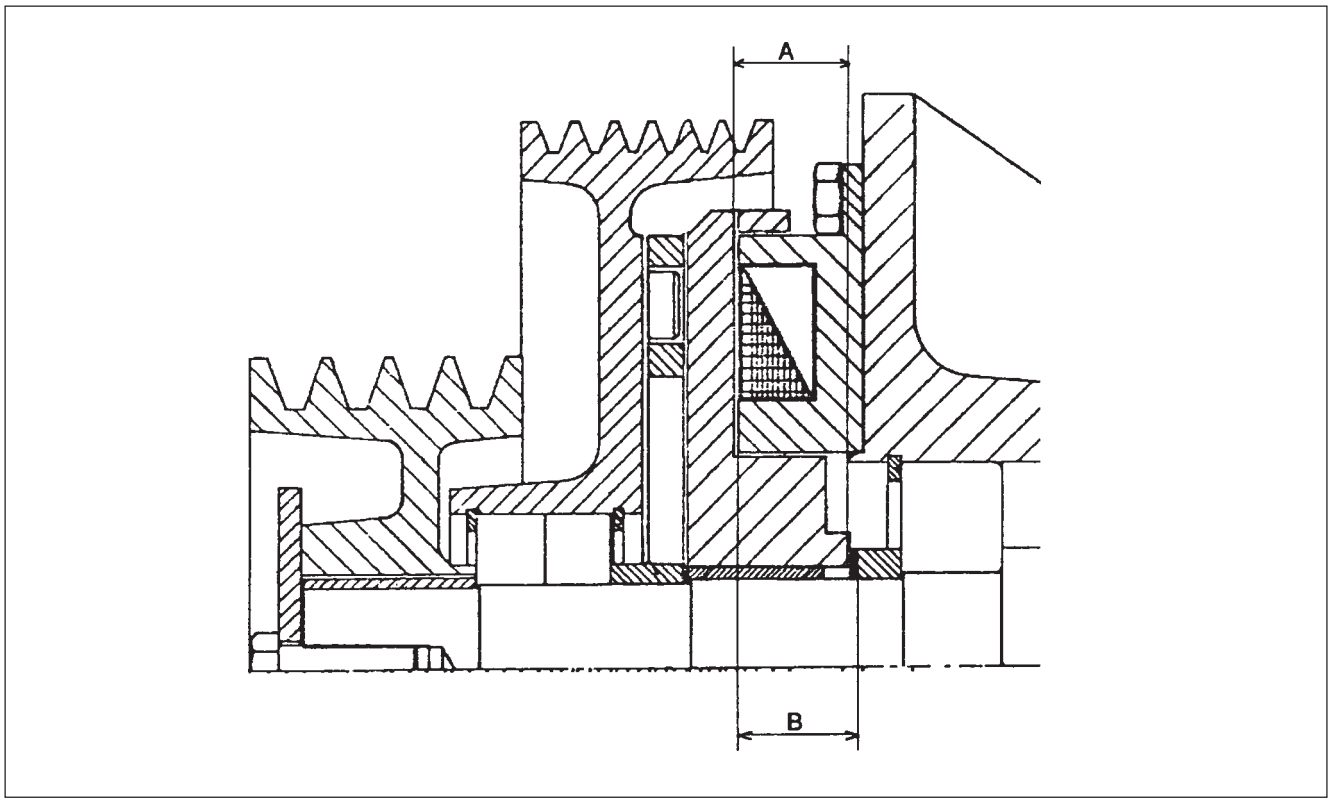


Figure 18. Measuring the spacer washer

9. Fit the wedge. Oil in the shaft and press on the rotor until it bottoms against the inner spacer ring.
10. Loosen the bolts that retain the pressure plate and remove the plate.
11. Fit the new pressure plate and mount it with the bolts.
12. Remove the inner locking ring in the input pulley.
13. Knock both ball bearings out of the pulley.
14. Lubricate the pulley cavities and knock in two new bearings with a sleeve drift that acts on the outer bearing race.

    NB. One bearing at a time so that both bearings bottom securely.
15. Place a shim between the rear bearing and the locking ring so that there is no axial play between the outer bearing ring and the locking ring.

16. Measure a spacer washer that gives a clearance of 0.4 mm with a tolerance of + 0.1/- 0 mm as follows:
    - measure and note the distance from the outer edge of the input pulley down to the surface for the pressure plate (A) (Fig. 19).
    - measure and note the distance from the outer edge of the output pulley down to the inner ring (B) of the rear ball bearing (Fig. 19).
    - measure the thickness of the spacer ring.
    - fit the required spacer washer to give the correct clearance.

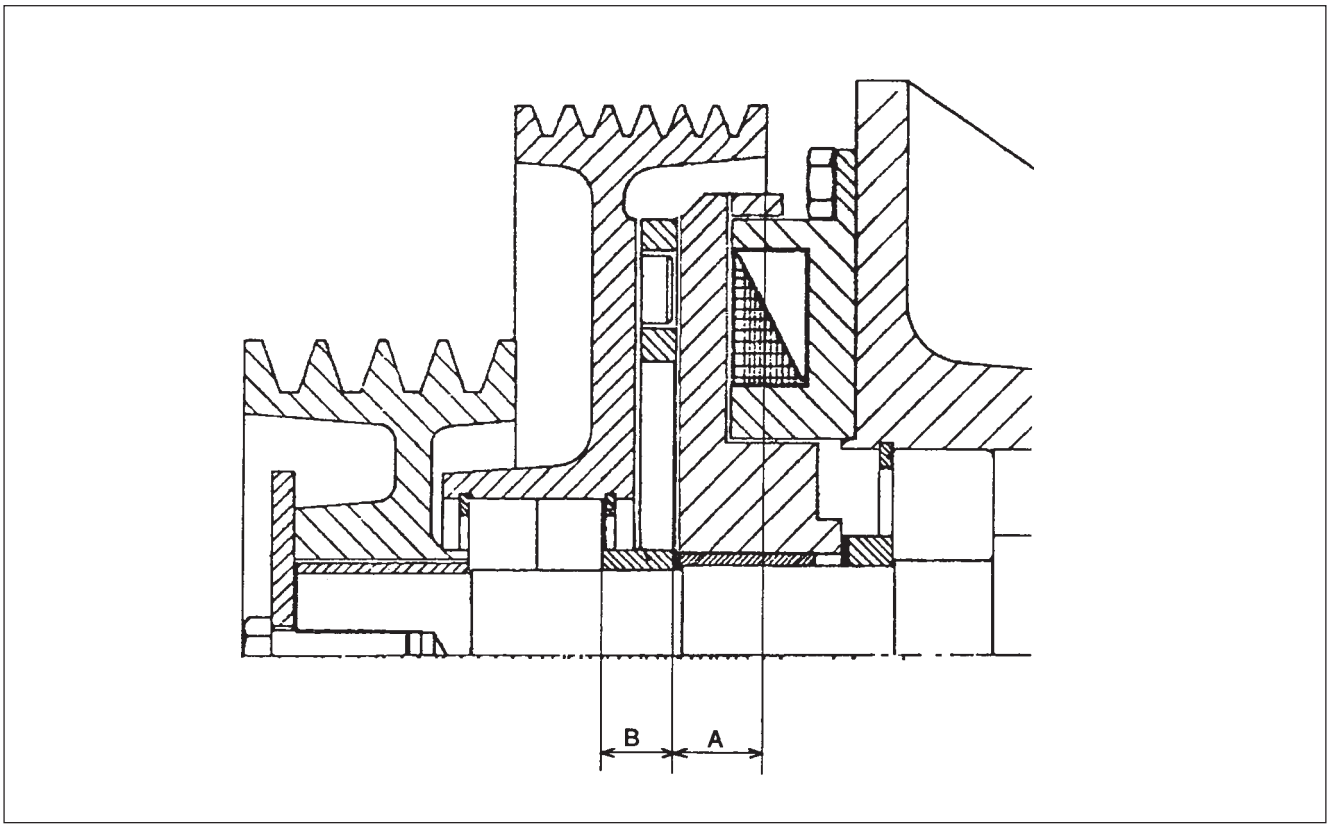


Figure 19. Measuring the spacer washer

17. Lubricate the shaft and fit the spacer washer to it.
18. Lubricate the shaft and knock on the input pulley with a sleeve drift that acts on the inner bearing race.
19. Fit the wedge. Oil in the shaft and knock in the output pulley until it bottoms.
20. Coat the central screw with Loctite, fit the washer, thread in the screw and tighten.

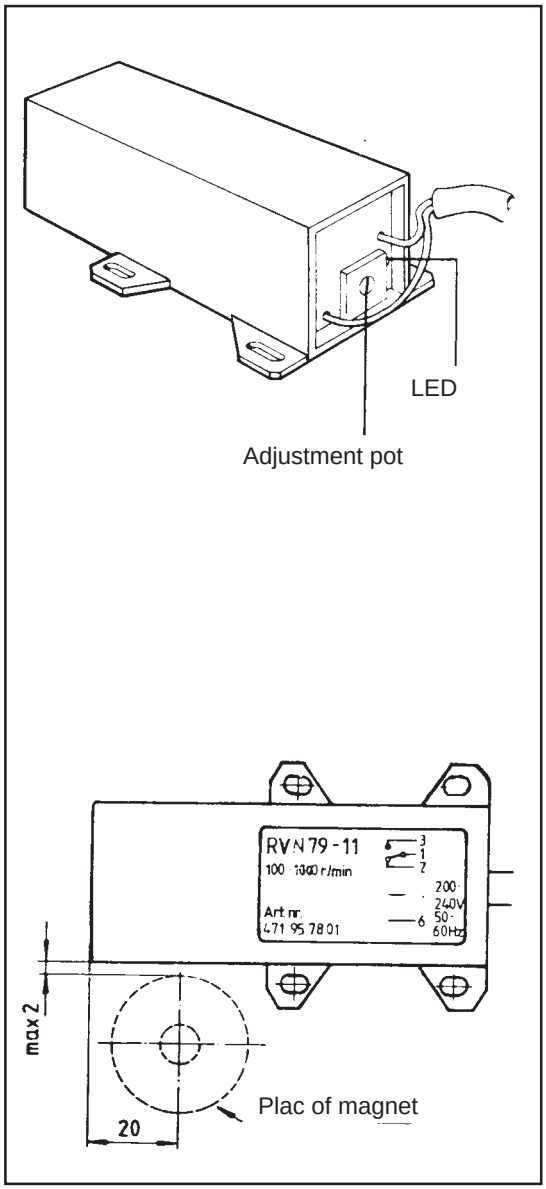
Description

The purpose of the speed guard is to protect the wash motor during spinning.

On the motor output shaft there is a polarised magnet element (wash motor on 120 litres; spin motor on 220 litres) which is sensed by the speed guard. When the spin motor has reached a certain speed the speed guard sends a signal to the automatic unit and the power is cut. The wash motor is reconnected when the spin motor speed has dropped and the wash motor cannot be damaged through connection.

On the 220 litres machine the two motors are disconnected. The speed guard cuts the power to the electromechanical connection on the output shaft and the spin motor can speed up without being followed by the wash motor. When the speed guard has disconnected the two motors a signal is sent to the wash motor to run at distribution speed. This is to protect the ball bearings of the wash motor against vibrations from the spin.

The speed guard has a potentiometer for the adjustment of the cutout point and an LED which indicates when the cutout point has been reached.



Repair instructions

Speed guards should be replaced, as repair is not recommended.

Replacement of speed guard.

1. Remove speed guard.
2. Install new speed guard and adjust position according to illustration.
3. Run machine at distribution speed. NOTE: the machine must be run at the correct frequency.
4. If the distribution relay does not chatter the guard may be too high. The speed guard should therefore be adjusted too low as a starting point to adjustment. Screw the potentiometer anticlockwise until the relay chatters. The speed guard can then be adjusted by turning the potentiometer clockwise until the distribution relay ceases to chatter.

Description to machine No -94/1770

Fig. 1

The motor brake consists of a control unit, a rectifier bridge with a fuse panel, connector block, and contactor, see figure 1.

The control unit has a number of terminals, three LED's and two potentiometer knobs. The time potentiometer, marked with numbers, is there to set the braking time. The other potentiometer (the power potentiometer) is there to set the brake power. Terminals A1-A2 are there to supply the control unit and are connected between zero and phase. Terminals 8-9 and 6-7 are sensor terminals.

The green LED indicates that the control unit is supplied with voltage. The lower red LED indicates that the motor brake functions.

On the safety panel there are two fuses, type and size (handwritten note), one for each braking phase. Connector block terminals L1 and L2 are for connection of the motor brake to two of the machine's phases (R and S). One side of the contactor, which is controlled by the control nit, is attached tot he braking unit. The other side is attached to two of the phases on the motor to be braked, see figure 2.

Fig. 2

When the control unit is supplied with voltage via terminals 8-9, a signal is sent to the unit where braking is to occur as soon as the terminal connection 6-7 is broken. When terminal 6-7 is broken, the control unit will pull the contactor which provides DC voltage to the two motor phases. The motor is then braked.

1

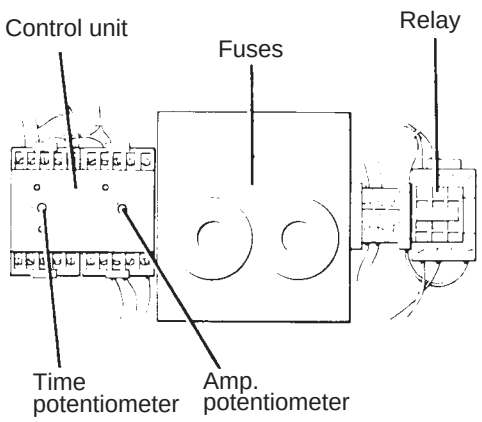


Figure 1. Motor brake

Repair instructions

Repairs of the motor brake are not recommended. Instead it should be replaced.

Adjusting the motor brake

1. Check that the machine is disconnected from the mains.

2

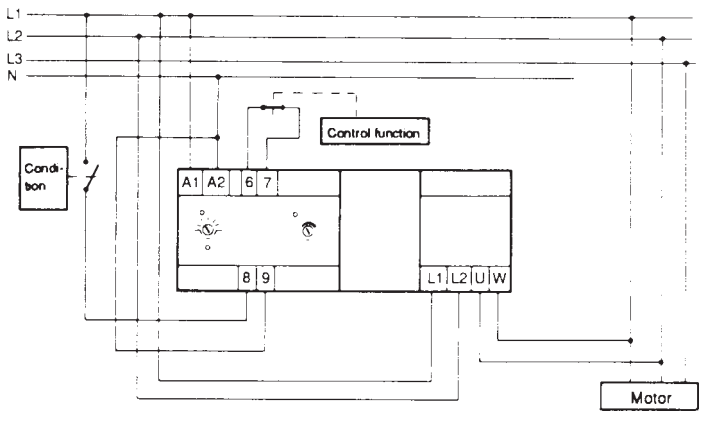


Figure 2. Engagement of the motor brake

2. Set the brake time at maximum braking time, 30 s.
3. Mark and loosen terminals 6-7 of motor brake, see figure 2. Then place a switch over the terminal. Check that the switch is set to OFF position.
4. Mark and loosen terminals 8-9 of the motor brake. Place a jumper across the terminal.
5. Mark and loosen terminals U and W on the contactor of the motor brake. Attach a volt meter across the contact terminals U and W.
6. Power up the motor brake. Watch the green LED lights up.
7. Break the connection between the motor brakes and terminals 6-7 with the power switch. (After a short while the red LED of the motor brake illuminates indicating that the motor brake is providing DC voltage to the contactor.)
8. When the red LED lights up, adjust the current to the contactor using the power potentiometer at 52 to 54 V.
9. Once again turn the power switch on when the red LED goes out. Then break the connection again and check the setting on the volt meter. Adjust the setting as required using the power potentiometer.
10. Turn the power to the machine off and reset it.

Replacement of the motor brake

1. Check that the machine is disconnected from the mains.
2. Mark all cable attachments to the motor brake.
3. Remove the motor brake package and replace with a new one.
4. Reconnect all the cables to their original positions as marked.
5. Adjust the motor brake according to ''Adjusting the motor brake'' in this section.
6. Reset the machine.

Description

Fig. 1

To protect the motors from overloading, current is supplied to them through a motor protector. On the motor protector's front side, there is a reset button with an adjustment arm on one side used for setting the power level at which the protector should trip.

The following setting values apply to the motor protector.

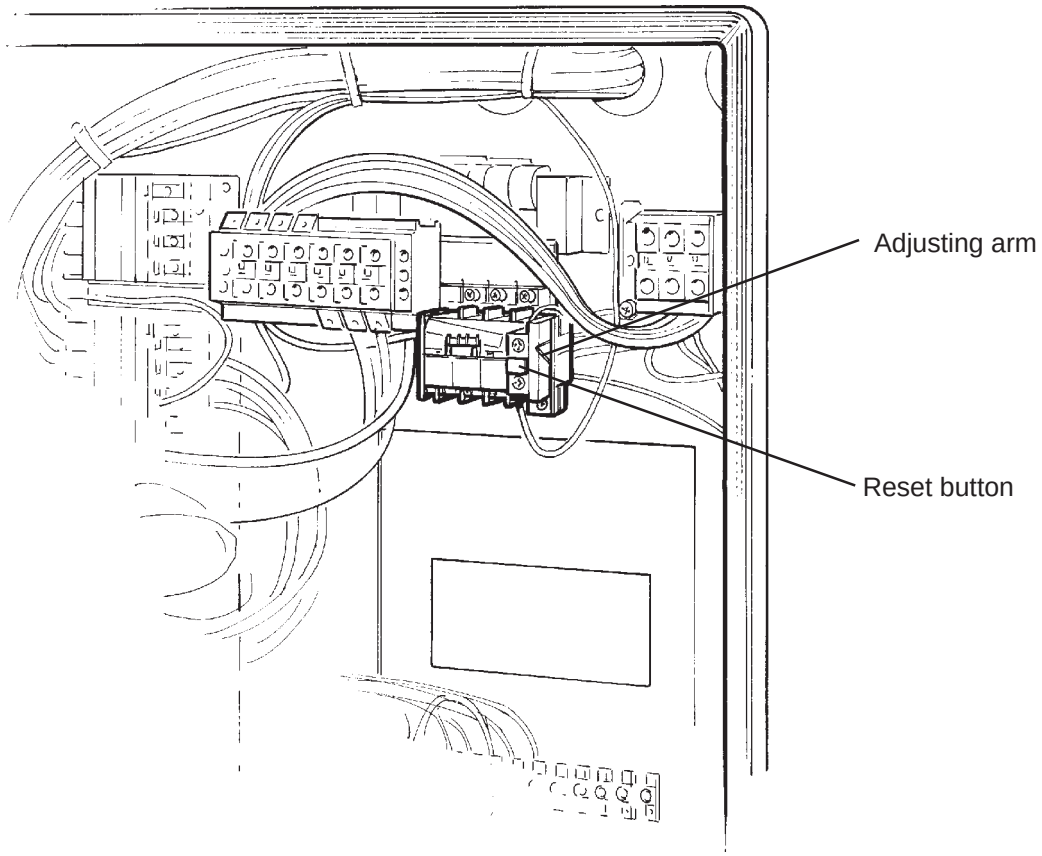
Setting values

Drum volume / Voltage	350 l	400 l	800 l
220 V	15 A	24 A	49 A
380 V	12 A	16 A	37 A

Repair instructions

Repairs are not recommended. The faulty motor protector should be replaced.

1



1491

Data

Max capacity, unrestrict., outlet	12 l/min
inlet	20 l/min
Working range, water pressure	0,3-10 bar
Number of sections	1, 2, 3 or 4

Description

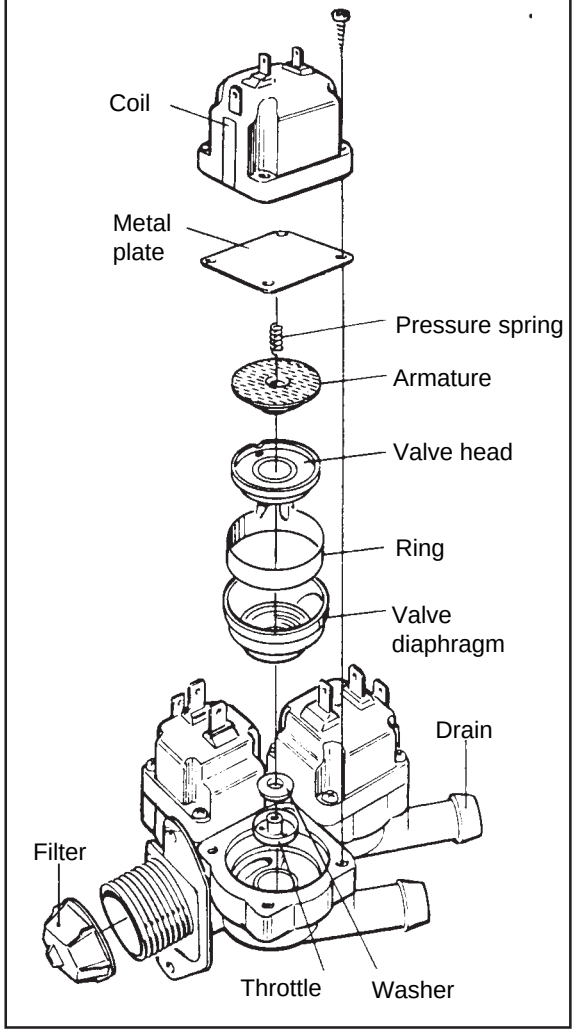
The valve is operated electromagnetically and has a rubber diaphragm as a closing and opening element. The valve utilises the water pressure in its opening and closing action.

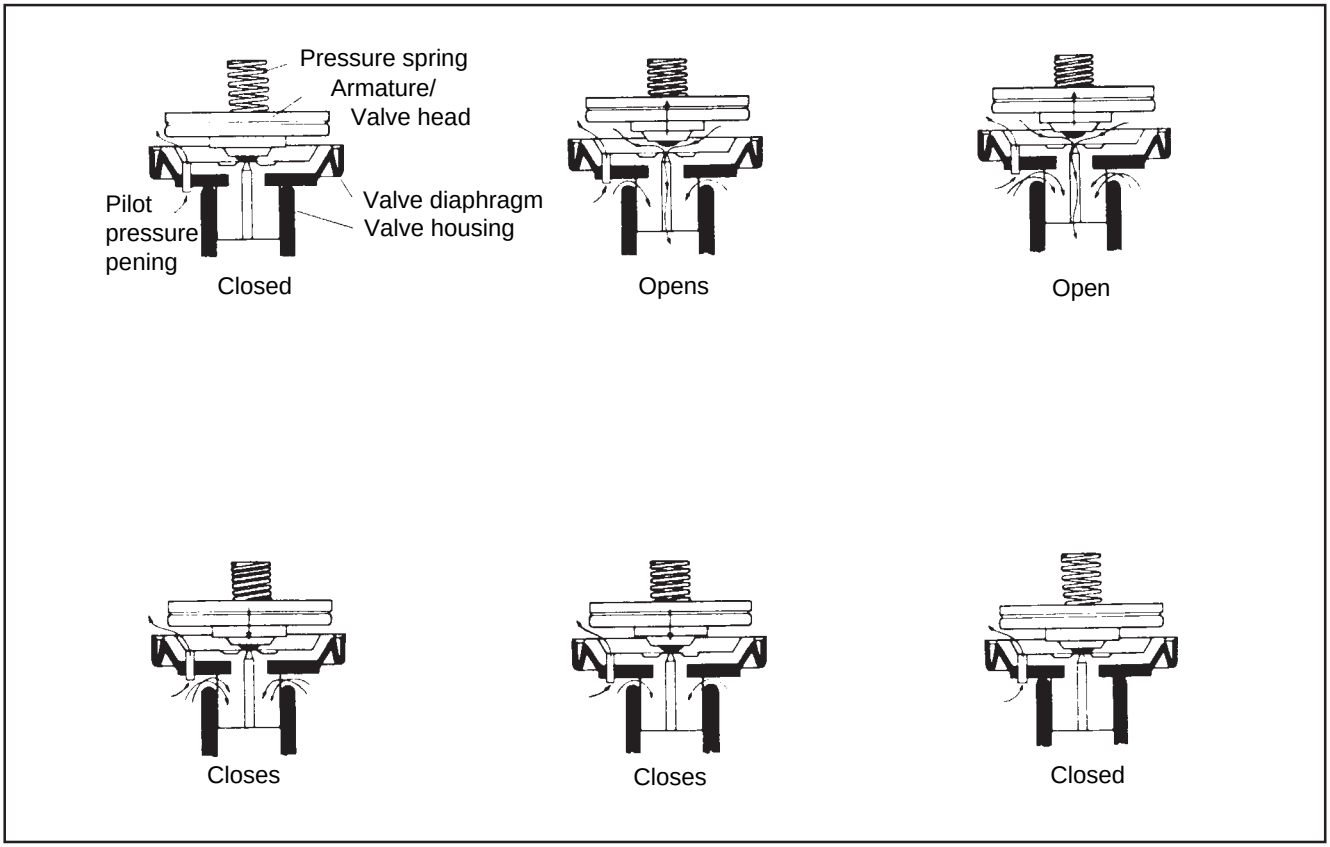
The valve is shut when the electromagnet is not energised. A pilot pressure opening in the diaphragm causes the water pressure to press the valve diphragm against the valve seat and keeps the valve closed. The hole in the centre of the valve diaphragm is then sealed by a rubber disc which is pressed against the valve diaphragm by the pressure spring of the electromagnet.

When the magnet is energised the armature lifts, opening the hole in the centre of the diaphragm so that the accumulated pressure can be relieved through the outlet. The water pressure in the supply line can lift the diaphragm off the valve seat, and the valve opens.

A fine mesh strainer is fitted inside the inlet line in order to trap particles of dirt etc. The strainer can be easily removed for cleaning.

A ristriction is mounted in the outlet which matches the water flow to the needs of the machine in question.





Repair instructions

Scale deposits can clog the hole in the diaphragm and disturb the operation of the valve.

It is thus advisable that the valve be taken apart and cleaned at regular intervals, depending on operating conditions and the degree of contamination of the water.

The valve refuses to open

- Check that the coil is being energised.
- Take measurements at the coil to look for a break or short circuit.
- Take the valve apart and check the openings in the valve diaphragm.
- Check the inlet strainer and clean if necessary.
- Loosen the coil and clean the surfaces of the magnet core.

The valve refuses to open

- Check that the coil is de-energised.
  The valve is normally closed when the magnet is unactivated.
- Check the return spring.
- Check the diaphragm.

Data

Maximum capacity, fully open,	outlet	60 l/min
	inlet	20 l/min
Working range, water pressure		0.5-10 bar
Number of outlets		1, 2, 3 or 4

Description

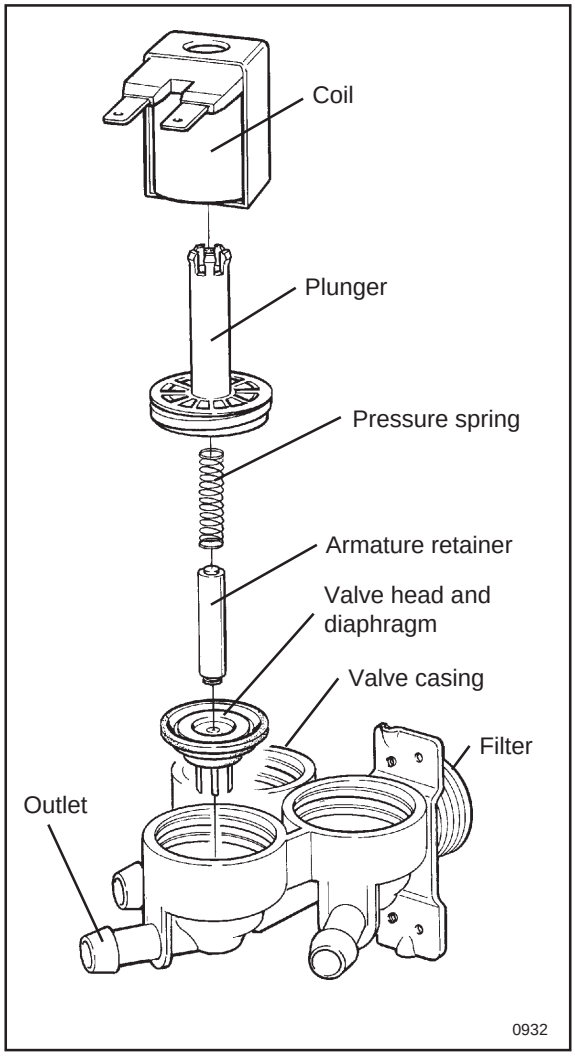
The valve is solenoid-operated, having a rubber membrane as the sealing element. Opening and closing actions are assisted by the water pressure.

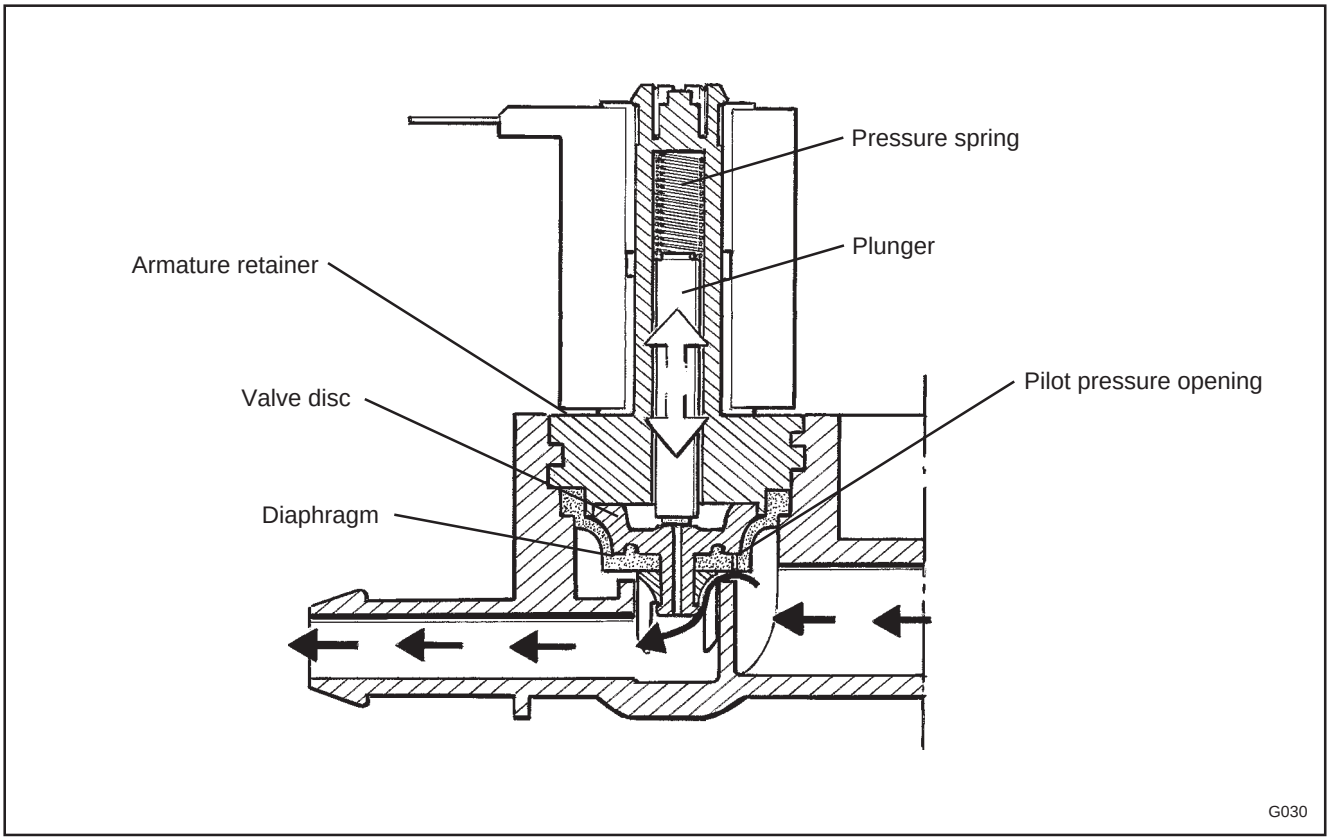
With the solenoid de-energised, the valve is closed. A pilot pressure opening in the membrane allows water pressure to act on the top of the membrane and press it down on the valve seat, closing the valve. In this state, the hole in the centre of the membrane is sealed by a rubber disc pressed down on to the membrane by the compression spring above the solenoid armature.

Energising the solenoid raises the armature against the spring, opening the hole in the middle of the membrane and releasing the water pressure above the membrane. The water pressure then raises the membrane from the valve seat and the valve opens.

The inlet pipe contains a fine-mesh strainer to trap solid particles. The strainer can be easily removed for cleaning.

The outlet from the valve contains a choke which adjust the water flow rate to suit the requirements of the machine.





Repair instructions

Lime deposits can block the holes in the valve membrane and interfere with correct operation.

It is therefore recommended that the valve be dismantled and cleaned at regular intervals, depending on operating conditions and the amount of dirt in the water.

The valve does not open

- Check that the coil is energised.
- Measure the coil resistance to check for a short circuit or open circuit.
- Dismantle the valve and check the holes in the membrane.
- Check the inlet strainer and clean if necessary.
- Remove the coil and clean the armature.

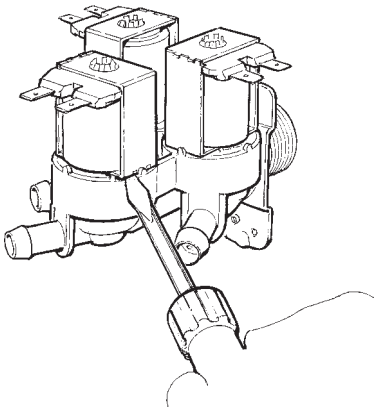
The valve does not close

- Check that the coil is de-energised. The valve is normally closed when the coil is de-energised.
- Check the return spring.
- Check the membrane (pilot pressure opening).

Dismantling the valve

1. Carefully prise off the coil using a screwdriver and pull the coil off the stem of the valve.
2. Place the special tool over the stem, so that its teeth engage with the corresponding teeth in the upper part of the valve casing. (The tool is supplied with the machine, secured to one of the water hoses).
3. Use an adjustable spanner to turn the tool anti-clockwise to unscrew the top of the valve.

Reassemble the valve in the reverse order.



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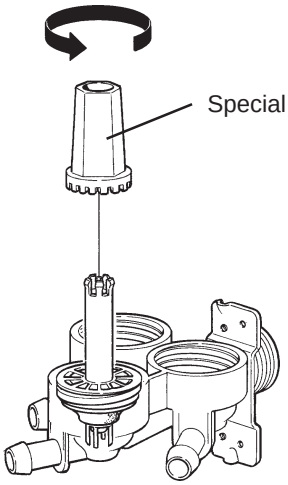

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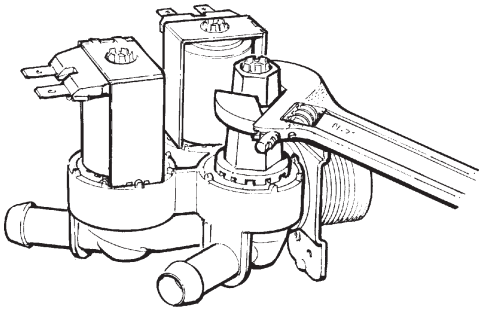

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Description

The steam valve, figure 1, is a liquid or air pressure controlled inclined seat valve which has a piston with a valve disk as the opening and closing device. The steam valve is controlled by air pressure, but oil is used as a transfer medium to avoid instantaneous opening characteristics when air pressure is utilized.

The control part of the valve consists of a bell containing a spring loaded disk fixed on the previously mentioned piston. On the air side of the disk is a closing spring and a vent which connects the area with atmospheric pressure. The fluid side, which is filled with oil, is attached via a pipe to an oil container and a variable throttling device. The oil container gets compressed air via a sliding plunger valve.

The throttle on the oil container makes it possible to set the opening time on the steam valve so an extended opening phase can be obtained. The opening time should be between 5 and 10 seconds.

When the oil container receives compressed air, the air presses out the oil from the container via the throttle to the fluid side of the steam valve. Then the pressure from the oil will overcome the closing power of the spring. Since the oil flow has been restricted, the plate will be pressed backward at the same rate as the oil enters. When the plate is brought backwards it brings along the piston and the valve disk - the valve opens. As a result of this extended opening phase, the steam will no longer be let out immediately. Consequently, pressure jolts do not occur in the valve's partially water filled hose connection to the drum.

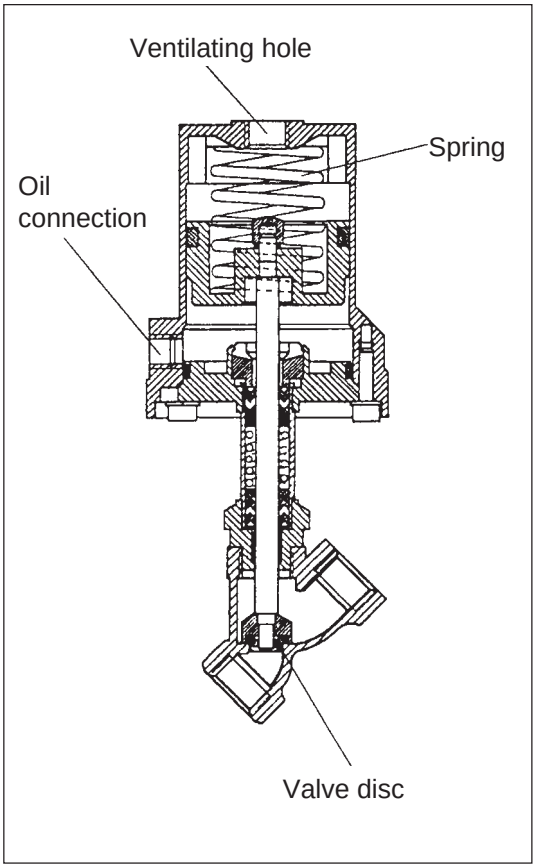


Figure 1. Cross section of the steam valve

Repair instructions

The valve opens too quickly

- Check that the oil container has correct amount of oil.
- Check for oil leakage through the venting of the steam valve–the disk seal may leak and need replacement.

Replacement of steam valve

1. Check that the machine is disconnected from the mains.
2. Check that the machine is not receiving steam.
3. Open the door to the automatic water unit.
4. Release the steam valve's oil filled control tube. Plug the pipe so that the oil does not run out of the oil container.
5. Loosen the steam valve's tube and the connection with the drum.
6. Open the new steam valve's control bell and remove all grease. Reassemble the control bell.

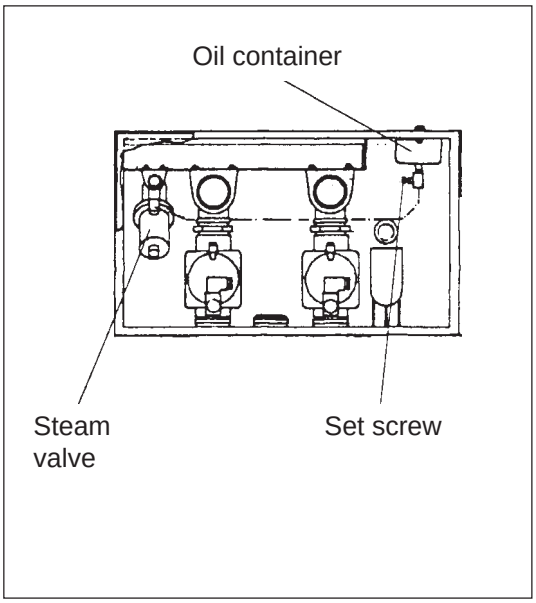


Figure 2. Steam valve

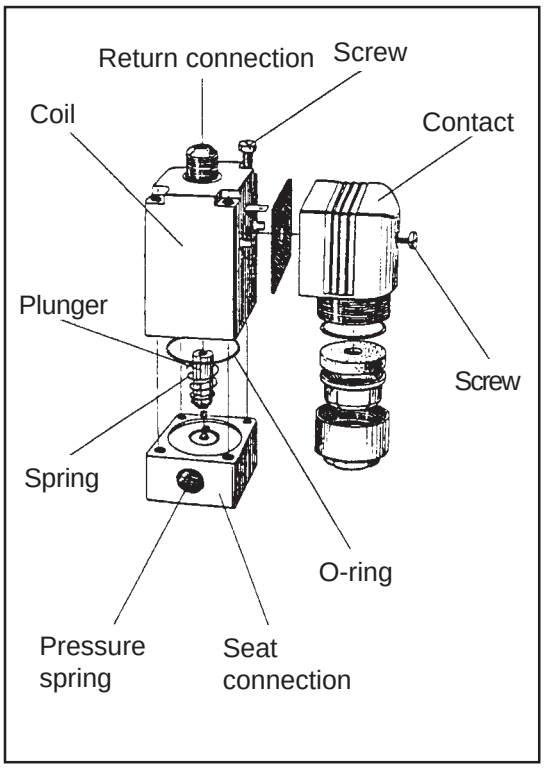
7. Remove the old steam valve and install a new one.
8. Attach the steam tube and connection to the drum.
9. Fill the steam valve's bell with oil through the connecting hole. Fill slowly and tap the bell lightly to remove all air.
10. Attach the oil filled control tube. Check that the right amount of oil is in the oil container.
11. Reset the machine and test.

Description

The air inlet valve is a directly actuated solenoid valve with three ports. The valve has three connections and two valve seats. One valve seat always remains open or closed, alternately. The connections are marked P, R and A (P = Pressure side, R = Return side and A = Operating side).

In a non-energised state, connection P (control pressure) is blocked. This is done in that the valve solenoid core is pressed by spring force against the valve seat of connection P. In this position, connections A and R remain connected to each other (the valve vents the actuated unit).

When the valve is energised, the magnetic force overcomes the spring force and presses the magnetic core against the valve seat of connection R. This blocks connection R and connections P and A are connected to each other (control pressure is released by the valve).



Repair instructions

Coil replacement

1. Make sure that the pressure side of the valve is un-pressurised and that the machine is not energised.
2. Remove the screw in the electric contact in the valve and pull off the pin connections.
3. Remove the valve return connection.
4. Unscrew the four mounting screws in the coil. Save the O-ring, armature and spring.
5. Fit the new coil to the seat section together with the O-ring, plunger and spring. Tighten the coil with the four screws.
6. Replace the valve return connection.
7. Replace the electric contact and secure it with the screw.
8. Test-operate the valve and reset the machine.

Replacement of O-ring, armature and spring.

1. Make sure that the pressure side of the valve is un-pressurised and that the machine is not energised.
2. Unscrew the four mounting screws in the coil. Remove the O-ring, plunger and spring.
3. Fit the coil to the seat section together with the new parts, O-ring, plunger and spring. Tighten the coil with the four screws.
4. Test-operate the valve and reset the machine.

Description

The drain valve, figure 1, is an air pressure controlled membrane valve which, by opening to a large crossection, provides quick emptying of the machine. The design is self-cleaning which means that there is no need for a lint filter.

The main components of the valve are as follows:

- an pneumatic cylinder with a pressure plate
- rubber membrane
- mounting yoke

The valve's pneumatic cylinder has no pressure in the open position and is brought back to its resting position by the cylinder's return spring. The membrane, which consists of a part of the membrane hose, springs downward with the pressure plate and opens the valve.

When the pneumatic cylinder is activated, the piston is pushed out of the cylinder. The membrane recoils with the piston head in an upward direction and is pressed against the valve seat, closing the valve.

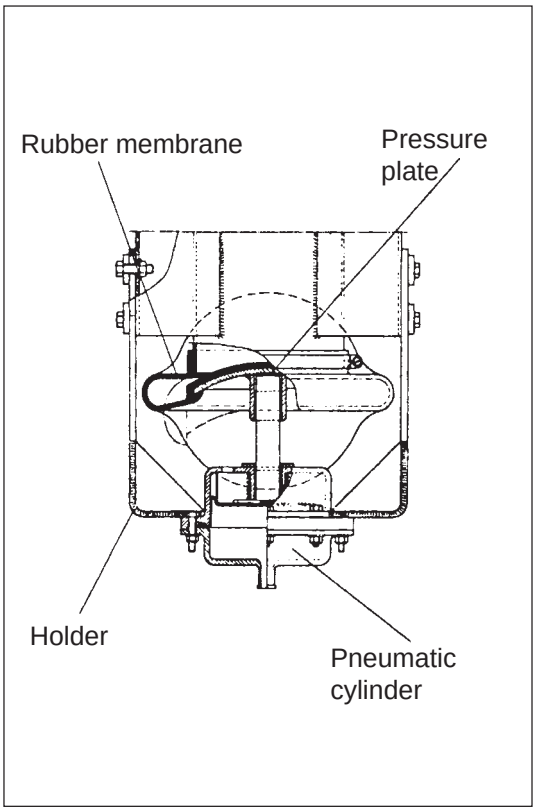


Figure 1. Drain valve

Repair instructions

Sedimentation in the membrane may result in the valve improperly opening or closing. The valve should therefore be cleaned now and then, the frequency depending on operating conditions and water quality.

The valve improperly opens and closes

- Check that the valve's air piston gets pressure.
- Check that the piston rod can move freely.
- Check that the membrane is not clogged by sedimentation.

Membrane replacement

1. Check that the machine is disconnected from the mains.
2. Remove the rear side plate.
3. Remove the membrane hose from the drain pipe.
4. Remove the drain valve's air pressure connection.
5. Loosen the four screws in the drain valve's holder a few turns and push the holder downward.
6. Release the membrane hose's upper part from the drain chamber.
7. Twist the membrane hose off the pressure plate.
8. Mount a new membrane hose on the pressure plate and then tighten the upper part of the hose to the drain chamber.
9. Bring up the attachment yoke so that the pressure plate with the membrane hose seals against the seat. Attach the holder for now, using the four screws.

NOTE! The holder should be attached loosely so it can move in a downward direction when the air pressure piston is placed under pressure or the membrane hose will be sheared off.

10. Close the drain valve carefully by applying pressure to the drain valve's air pressure piston. (The drain valve's holder will move a bit downward.)
11. Press the holder by hand in an upward direction and tighten the holder's four screws.
12. Attach the drain valve control tube.

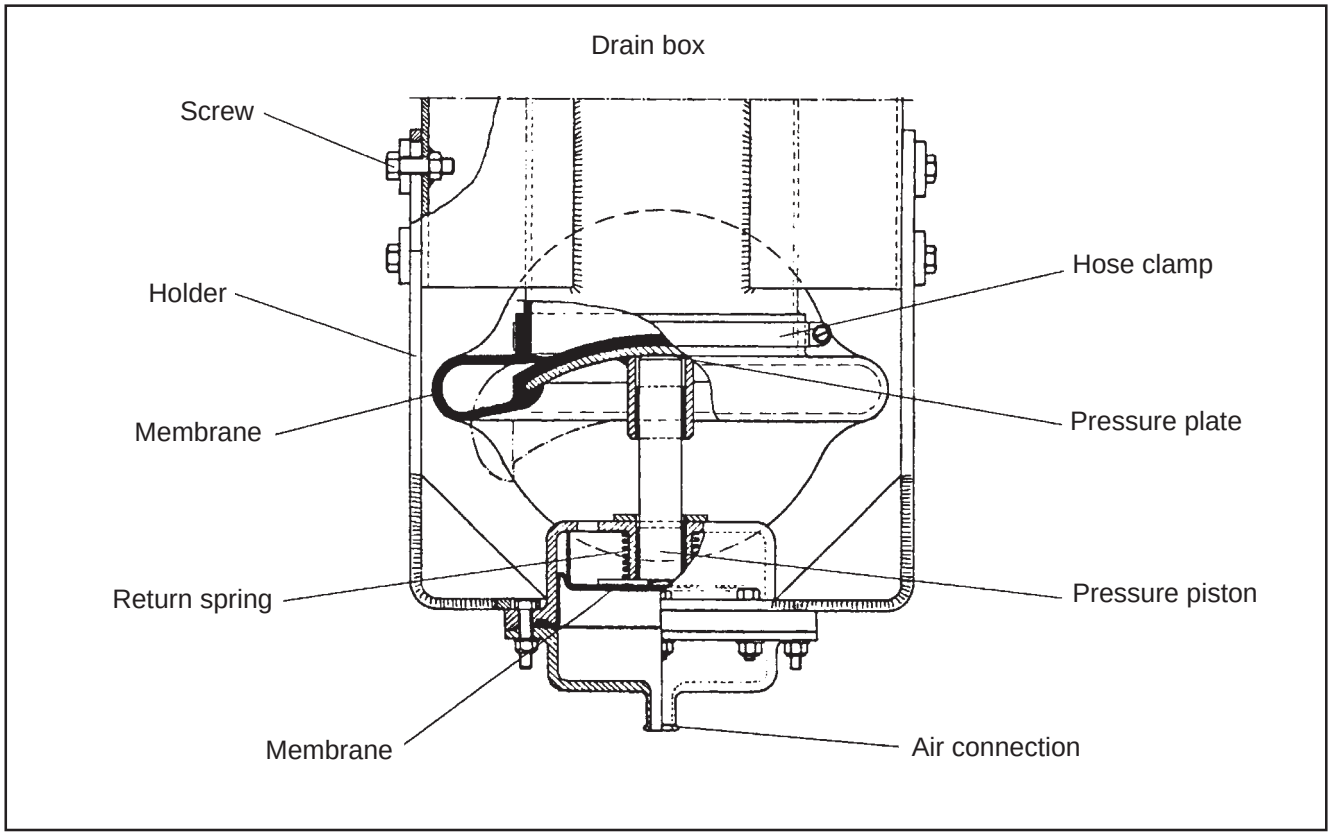


Figure 2. Drain valve

Description

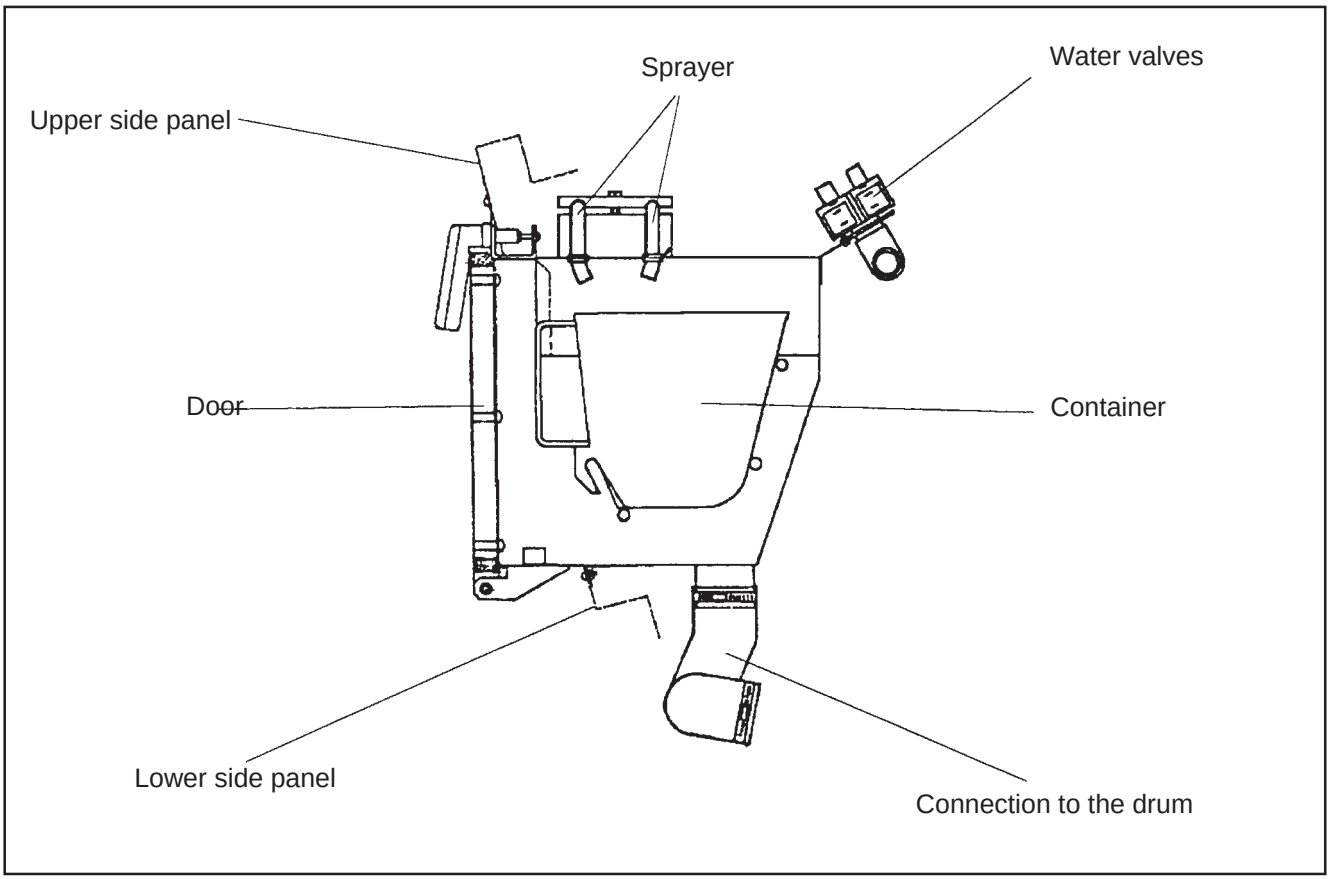
The detergent dispenser consists of a sheet metal container with five compartments and a common bottom for all compartments. In each compartment there is a detergent container. On the long side of the detergent container there is a door for easy access to the detergent containers. At the bottom of the container there is a tube connecting the dispenser with the side of the washer drum.

For each compartment there are two water valves, each with a sprayer, for flushing the detergent from the containers down into the machine via the bottom of the detergent container. In the right compartment container however, only one sprayer is used for this purpose, and the other sprayer is used to flush the bottom of the detergent container clean. This arrangement ensures that no residual detergent remains in the bottom of the detergent container.

Repair instructions

Replacement of detergent container

1. Check that the machine is disconnected from the mains.
2. Turn off the machine's water supply.
3. Remove the two bottom side plates as well as the three top plates.
4. Disconnect the water hoses from the detergent compartment sprayers.



5. Open the lid to the detergent compartment, checking that the dispenser containers are empty. Remove the containers from the compartments. Close the container lid.
6. Disconnect the detergent container hose connection to the drum.
7. Disconnect the detergent container from the upper side plate.
8. Push the detergent container inward and lift it out through the top of the machine.
9. Install a new detergent container through the top of the machine.
10. Attach the container to the upper side plate.
11. Connect the container to the drum and the water valves.
12. Open the container lid and insert the containers.
13. Replace the top plates and the lower side plates.
14. Reset and test-run the machine.

Description

Electrical heating of the laundry water takes place by pumping the water from the washer drum through a heating cartridge. The heating cartridge is located on one side of the machine together with a pump and a drain valve. To avoid lint from being pumped into the cartridge, there is a pre-filter on the side of the machine. The heating elements are activated via two heat contactors, which in turn are controlled by the program unit and a thermostat. Each heating contactor controls six heating elements. The contactors are turned on in a staggered fashion to reduce the initial power surge requirement.

The cartridge consists of a sheet metal container with 12 electrical heating elements, an inlet connection, and an outlet connection. There are six electrical heating elements in the upper part of the cartridge and six in its lower part.

To allow water drainage from the cartridge, there is a drain valve installed at its lowest point.

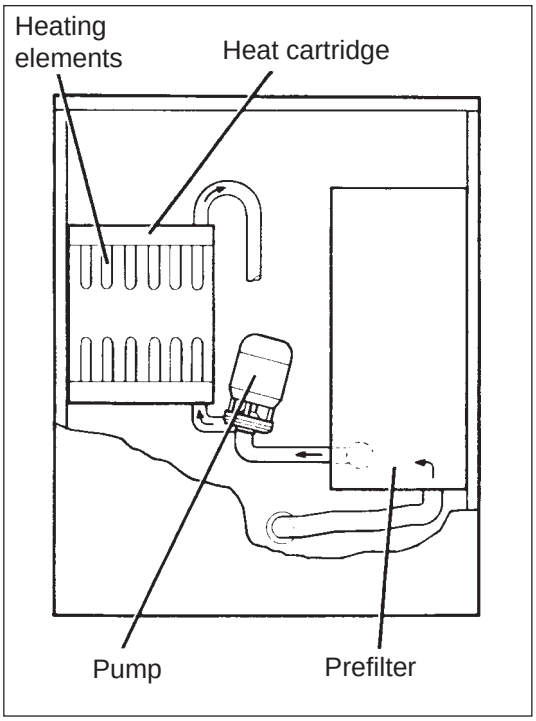


Figure 1. The electrical cartridge with peripheral equipment

Repair instructions

The heating time is abnormally long

- Check that both heating contactors turn on (with staggered time delays).
- With a universal instrument, check that no element is burned out.
- Lime deposits can result in reduced element performance. Check and remove the lime if necessary. Add descaling agents according to the manufacturer’s instructions.

Replacement of element

1. Check that the machine is disconnected from the mains and fully drained.
2. Remove the cartridge cover plate.
3. Disconnect the faulty element’s electrical connection and ground.
4. Loosen the nut on the middle screw of the element and turn the screw a quarter turn. The lock on the inside is now in a position allowing the element to be pulled out of the cartridge.
5. Insert a new element, turn the middle screw one quarter turn and tighten the bolt.
6. Connect the new element - NOTE grounding.
7. Replace the cover plate for the electrical cartridge and test-run the machine.

Description

The inner drum is mounted to the outer drum with two heavy-duty bearings at the rear of the drum. The bearings are pre-lubricated with grease and sealed from the inner drum using v-rings.

The inner drum shaft is through-going. The belt pulley has been attached to the projecting shaft stub using a clamp bushing.

The outer drum consists of a drum sweep, two front gables, a rear gable, and a cover plate. The two front gables and the machine's front plate are attached to the front edge of the drum sweep. The rear gable, together with the cover plate, is attached to the rear edge of the drum sweep.

The outer drum rests in a cradle consisting of the inner frame. The inner frame is flexibly attached with springs to the outer frame.

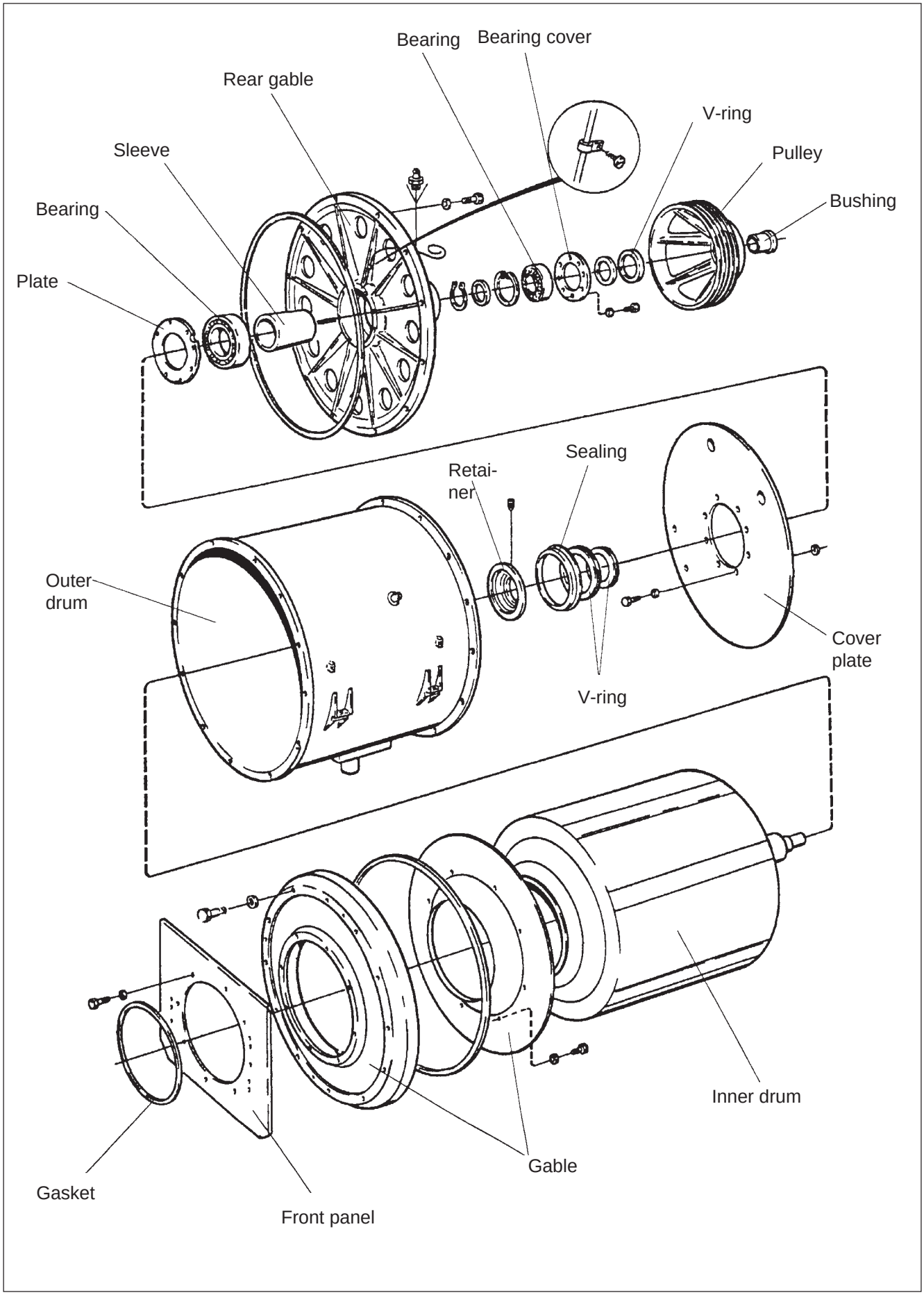
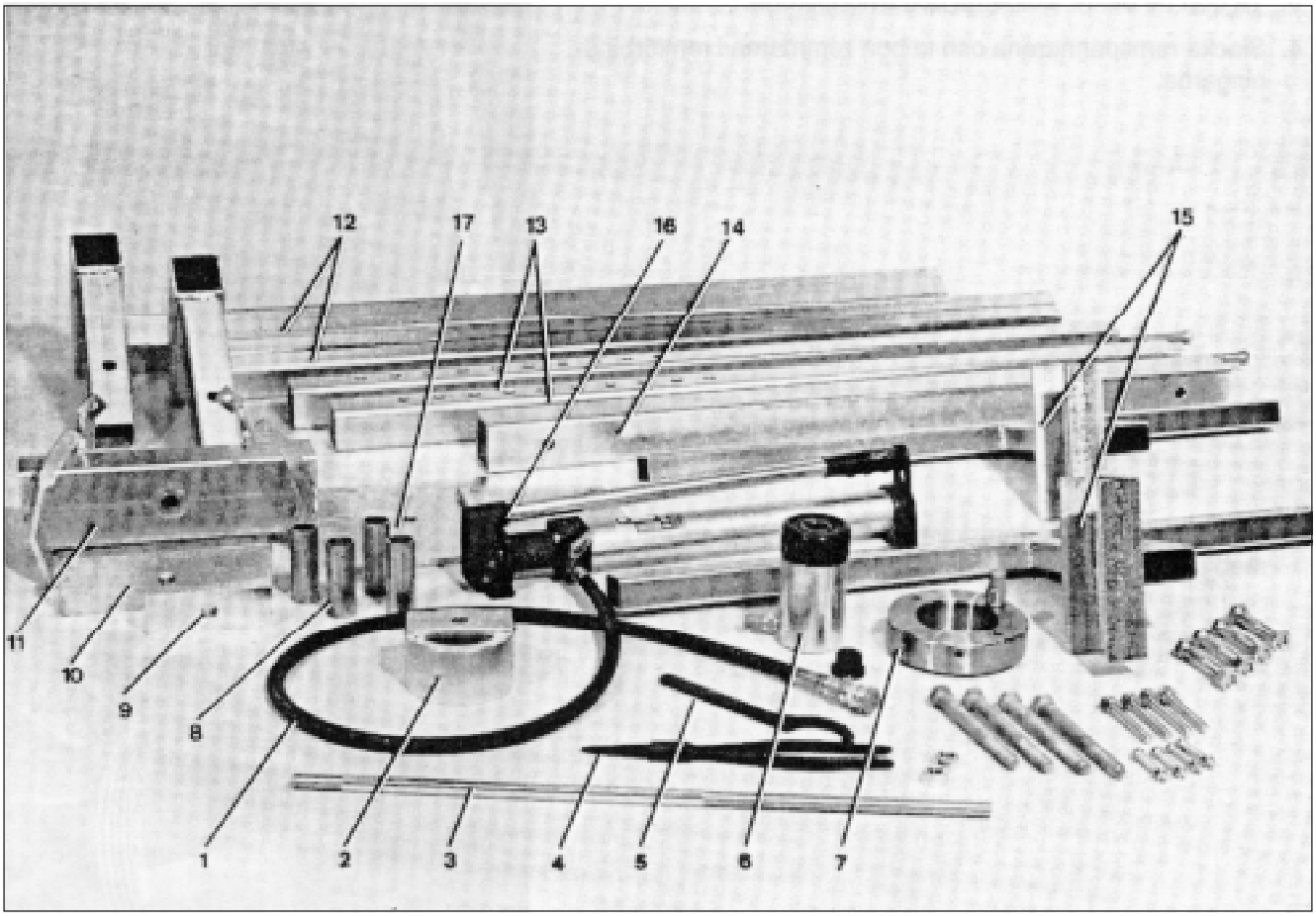


Figure 1. Spare parts – drum with bearings

Repair instructions

Bearing replacement

Special tools: Tool kit 472 6805-01



Pos	Part number	Designation
1	471 4008-86	Hydraulic pump
2	472 6996-01	Pressure mandrel
3	471 4172-01	Pulling rod
4	472 6807-01	Pliers 144-J4
5	472 6806-01	Hook wrench HN19
6	471 4008-85	Hole cylinder
7	471 8407-02	Hydraulic nut
8	472 6803-01	Tube
9	472 6993-01	Beam
10	472 6998-01	Beam
11	472 6991-01	Assembly yoke
12	471 4167-02	Extension arm
13	471 4164-01	Support legs
14	471 4155-02	Beam
15	472 6800-01	Tightening bracket
16	472 6989-01	Plate
17	472 6987-01	Plate
		Miscellaneous screws and nuts
	471 4171-01	Tool box (not shown)

1. Remove the rear top plate, side plates and cover plates.
2. Loosen the automatic unit and turn it up on top of the machine, see figure 2. Be careful with the cable harness.
3. Remove the rear posts and the drain tube.
4. Loosen the belt tensioners and remove the belts of the belt pulley.

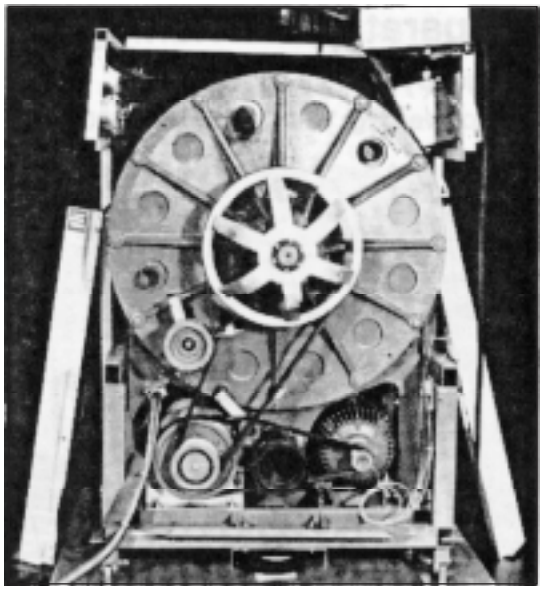


Figure 2. Machine prepared

5. Loosen the screws on the clamp bushing of the pulley, three turns with a 6 mm Allen wrench. Remove the pulley, see figure 3.

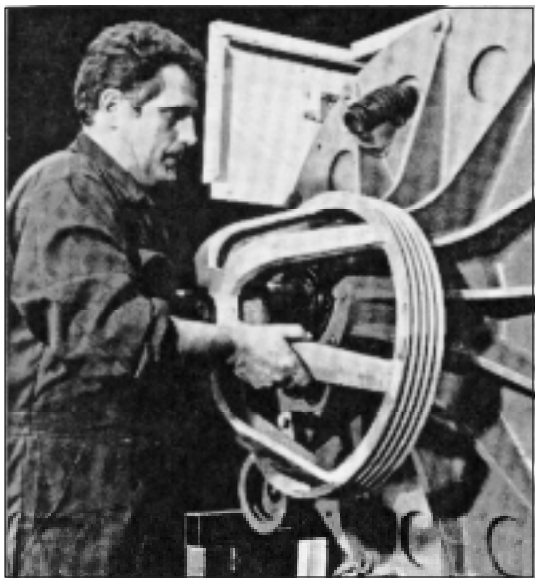


Figure 3. Removal of drum belt pulley

6. Drill four holes in the inner drum, two on the rear edge at the ridges and two on the front edge at the ridges. Thread in 4 pcs M10 support screws with locknuts. Tighten the locknuts, see figure 4.

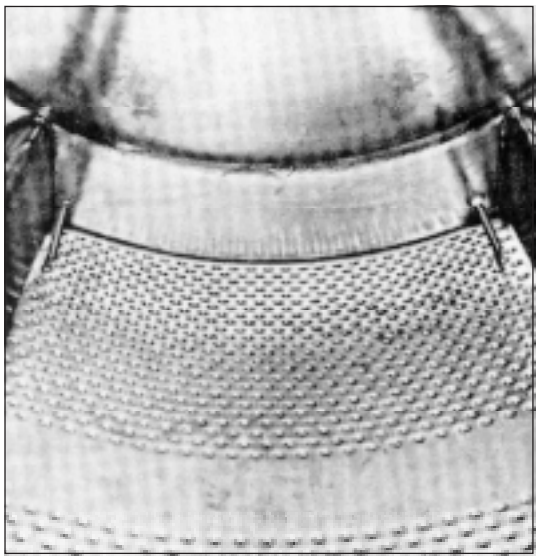


Figure 4. Installation of support screws

7. Loosen the clamp sleeve nut, A, approximately 2 turns and then tap the sleeve in, B (figure 5).

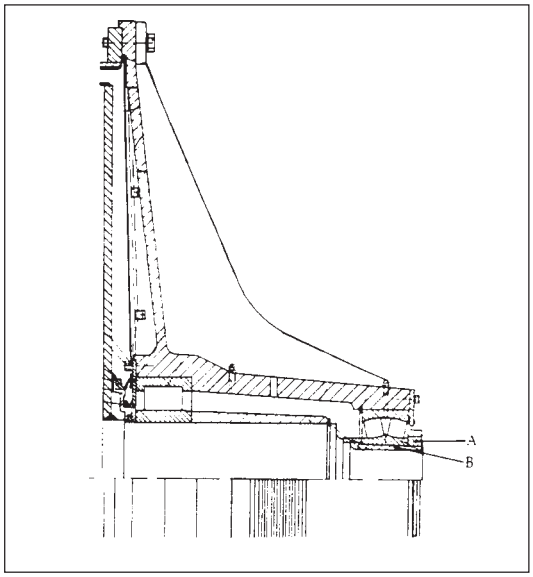


Figure 5. Clamp sleeve with nut

8. Loosen and remove all bolts on the rear gable's outer edge, figure 6.
9. Place four puller bolts in the special puller holes, position A in figure 6. Tighten the bolts alternately and press out the gable approximately 20 mm, until it is released from the outer drum. Remove the puller bolts.

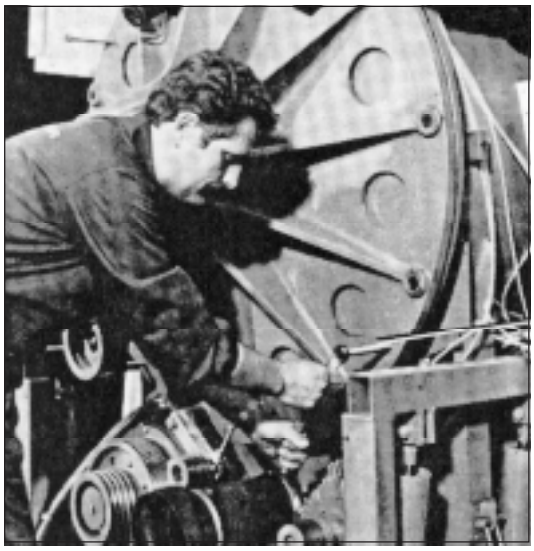


Figure 6. Removal of rear gable

10. Assemble the jig according to figure 7. Check that the jig is as horizontal as possible.
11. Attach the brackets to the rear gable, A in figure 7. Spacer sleeve, B in figure 7, should be positioned between the bracket and the gable.
12. Adjust the jig so that the brackets are butting against the jig, see position C 1, figure 7.
13. Pull the gable carefully towards the rear. Check to see that no tension exists between the gable and the shaft.
14. Remove the bearing cover.

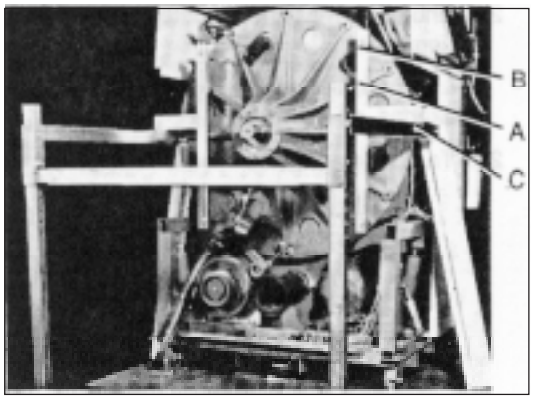


Figure 7. Jig and bracket installed

15. Install the yoke A with two screws, see figure 8.
16. Install the pulling rod and beam from the rear.
17. Install the hydraulic piston and lock it in place securely.
18. Carefully press the bearing out of the rear gable.

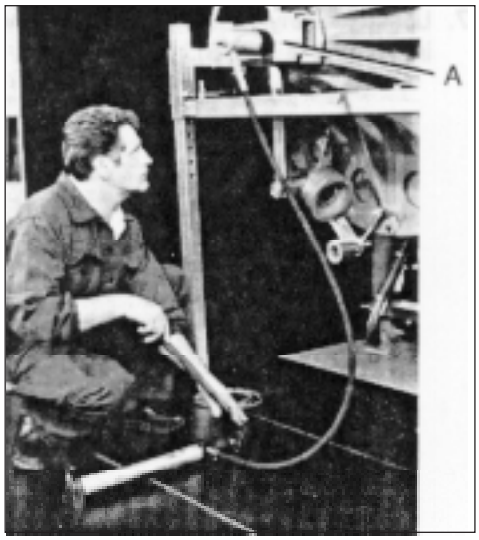


Figure 8. Pressing out the bearing

19. Remove all screws that hold the cover plate, see figure 9.
20. Remove the cover plate. NOTE! Be careful with the rubber gasket if it is to be used again.

Figure 9. Removal of cover plate

21. Only for machines equipped with lubrication of the V-rings:

    Lift the lubrication tube carefully to the side. Be certain not to damage the tube, see figure 10.
22. Remove the bearing cover.

Figure 10. Tube for bearing lubrication

23. Install the yoke with the wide opening against the bearing, see figure 11.
24. Install the beam, pulling rod and hydraulic piston. Lock the hydraulic piston securely in place, see figure 11.
25. Press out the bearing from the bearing housing with the hydraulic pump.

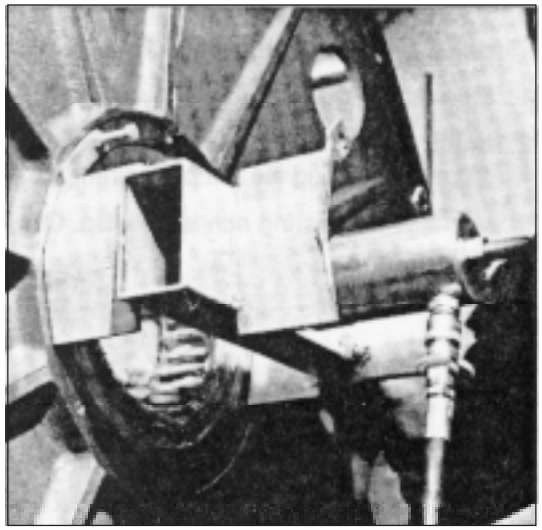


Figure 11. Pressing out the bearing

26. Remove the clamp sleeve and the spacer ring, position A in figure 12.
27. Remove the groove ring, position B, and the spacer sleeve, position C in figure 12. Remove the V-rings, position D.

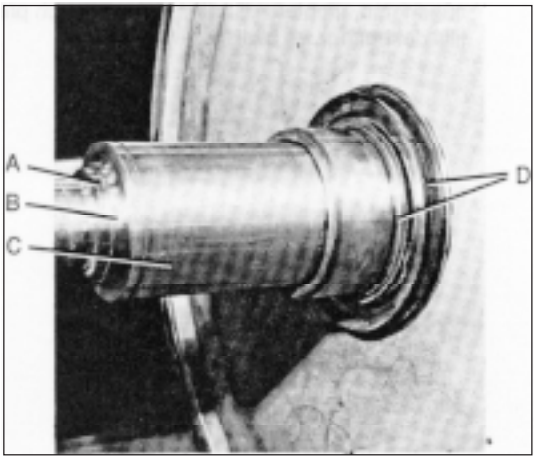


Figure 12. Disassembly of the clamp sleeve

28. Remove the inner bearing race by: grinding a 4 to 5 mm deep groove in the bearing race and then splitting the bearing race with a chisel, see figure 13.
29. Clean the shaft thoroughly. File down any burrs or nicks caused in disassembly. Remove any rust with emery cloth.

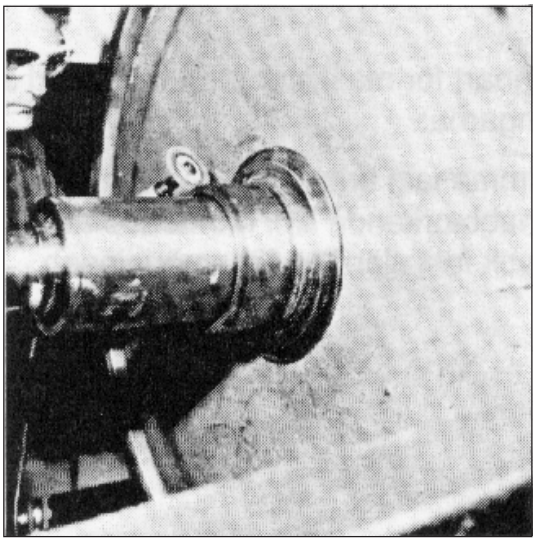


Figure 13. Removal of the bearing

30. Heat the new bearing race to approximately 150°C and then install, see figure 14.
31. Install new V-rings.
32. Lubricate the shaft and install the inner sleeve and lockring. Put a little grease on the V-rings.
33. Install the spacer ring and the clamp sleeve. NOTE! No lockwasher or nut.

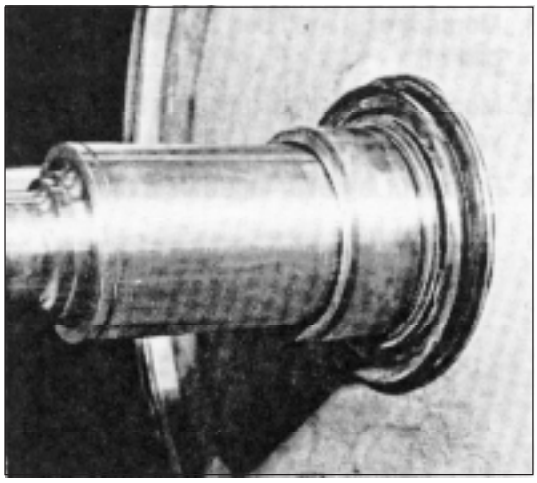


Figure 14. Installation of bearing race

34. Assemble the large bearing in the back gable. First tap in the bearing a few mm, then install tool and press the bearing in until it bottoms, see figure 15.

Figure 15. Installation of the large bearing

35. Only for machines equipped with lubrication for V-rings:

    Glue down the washers, position A in figure 16, on plate with quick drying glue. Install the plate with the groove up and secure the tube for lubrication.

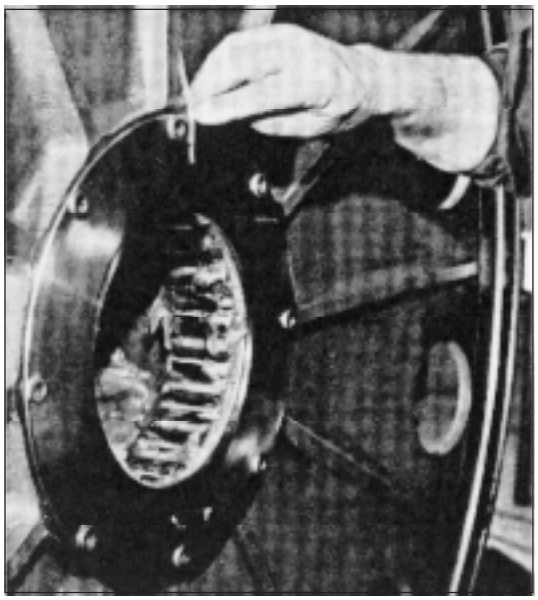


Figure 16. Fastening of the lubrication tube

36. Install the cover plate with the eight special screws, see figure 17. Use a ”Gurisil-ring” around the screw heads for sealing. Clean the surrounding surfaces.

    NOTE! The joint on the cover plate gasket should be up.

37. Lubricate the bearing liberally.

38. Lubricate the shaft with grease.

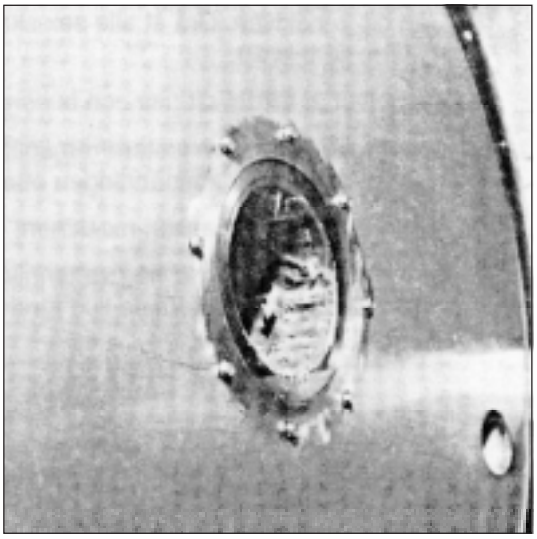


Figure 17. Installation of cover plate

39. Press on the small bearing, see figure 18.

    NOTE! Make sure that the cone-shaped inner ring is in the right direction. The small diameter side should be facing you.

40. Install the bearing cover, pressing the bearing in completely while screwing down the cover.

41. Clean the seating surfaces on the rear gable and the outside drum. Add a bead of ”Gurisil” where the gasket will seal between the gable and the outside drum.

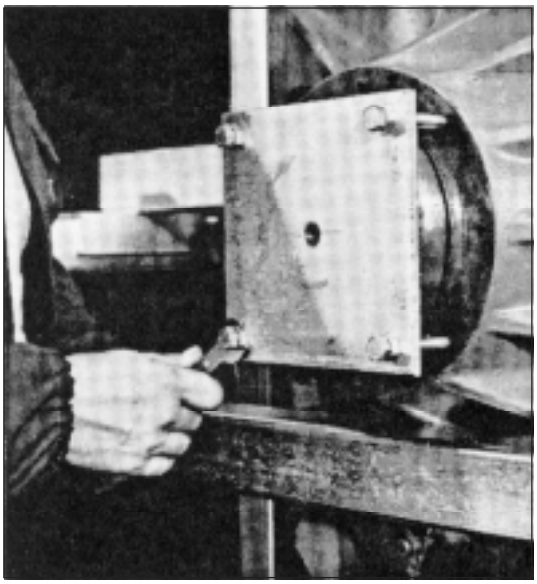


Figure 18. Pressing in the small bearing

42. Carefully push the rear gable forward, making sure that the bearings are not pushing against the shaft, see figure 19. If the bearings do push, the support legs must be adjusted.

    NOTE! It is important to push the gable as parallel to the machine as possible.

43. Insert all bolts around the back rear gable and tighten alternately.

44. Remove the jig.

45. Thread the hydraulic nut onto the clamp sleeve. Tighten the clamp sleeve with the hydraulic pump to 20 MPa (alternatively 0.8 - 0.9 mm tension after metallic contact).

46. Insert the lockwasher and the nut. Lock the nut.

47. Remove the support screws inside the drum. Grind off any burrs or nicks in the holes.

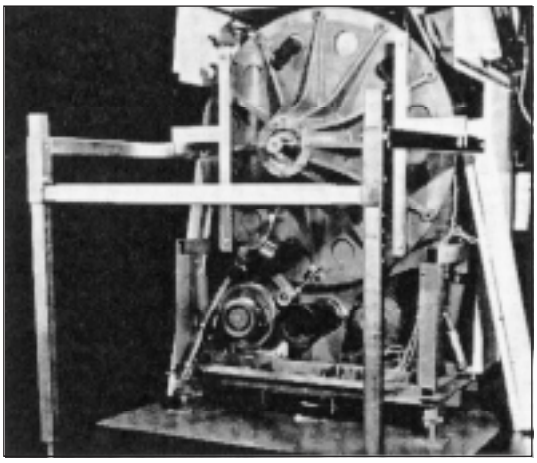


Figure 19. Installing the rear gable

48. Install the belt pulley. Tighten all six screws alternately to 13 Nm, see figure 20.

    NOTE! It is important that the hub and the bushing are absolutely clean.

49. Install the V-belts and adjust the belt tension. After a few laundry programs, the belt tension should be readjusted.

50. Re-install all plates and hook-up the machine.

51. Test-run the machine with high water level and check for leakage and abnormal sounds.

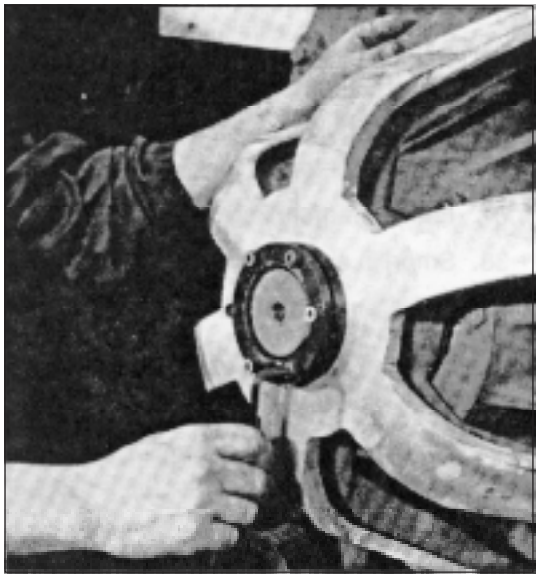


Figure 20. Installation of the belt pulley

Description

The frame comprises two parts, an outer and an inner frame. The inner frame is suspended in the outer frame by six spring struts, three on each side. In order to minimise the transmission of vibration between the frames, their lower sections are connected by eight shock absorbers, two at each corner.

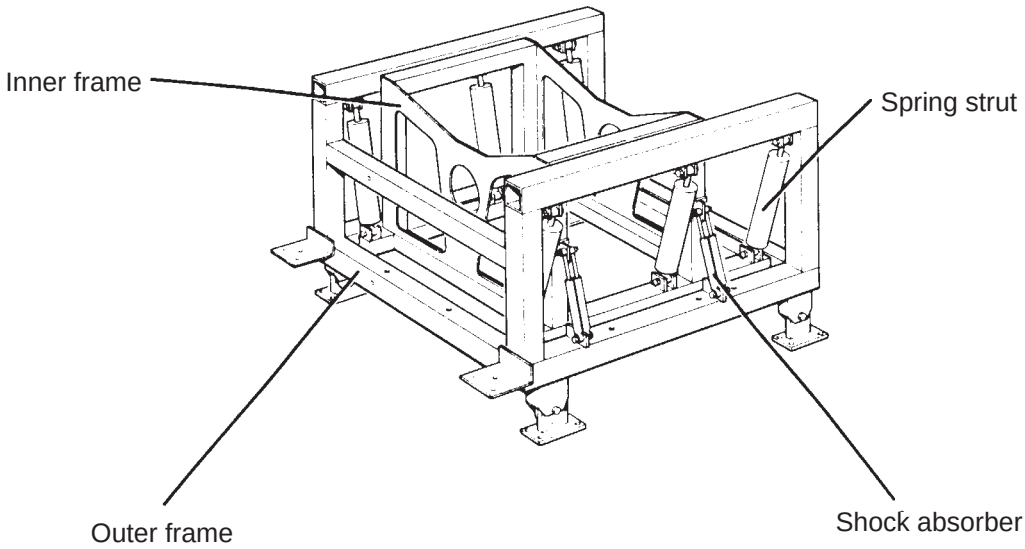
The outer frame is fitted with adjustable feet that can be anchored in the floor. The machine cladding panels are attached to the outer frame.

The inner frame supports the drum and the motor arrangement. The drum is bolted to the upper section of the inner frame by bolts. The motors are bolted to the lower section of the inner frame by screws.

Repair instructions

The out-of-balance cutout is repeatedly triggered

- Check the shock absorbers; replace them if required. Note that the shock absorbers should be fitted with the plunger rod upwards.
- Check the springs and their attachment.



Description

Fig. 1

The automatic lubrication consists of a oil container with pump, a level control with indication lamp and a small oil tube. The coil tube is connected at the sealing rings in the bearing house. The level control is placed in the oil container and connected to a indication lamp on the control panel.

Note!
FLE 804 up to machine No. -91/1661
When the oil level in the container becomes too low the control turns off the motor relays and the drum stops when the indication lamp lighten up.

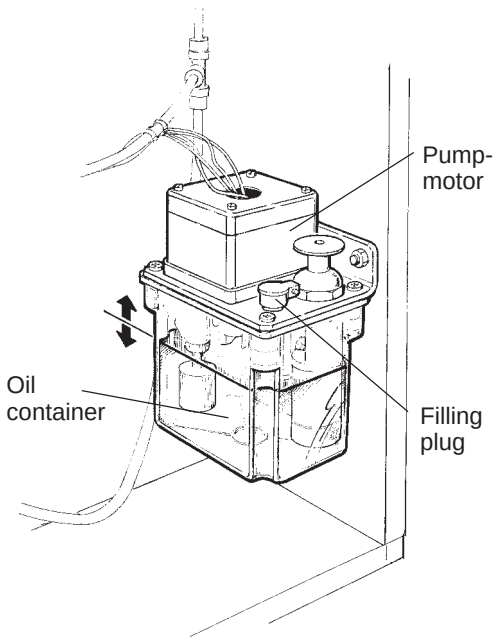
FLE 804 from machine No. 91/1662-
When the oil level in the container becomes too low the indication lamp on the panel lighten up. But the wash program continues.

The oil container can hold 0,5 l of oil (Shell Tellus 19 or similar).

The pump is lubrication only when the machine runs on high extraction speed.

The level switch can be changed if necessary.

1

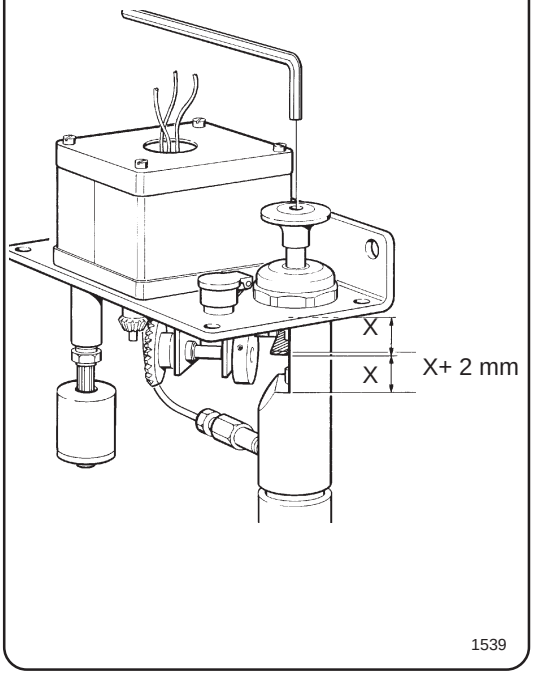


Adjusting the stroke length of the pump

Fig. 2

Remove the top screw in the handle on the pump, see picture. Under this screw is an adjusting screw for setting the stroke length for the pump. The length shall be set so that the plate is about 2 mm above the middle. Lock the setting by putting back the screw which have been removed earlier.

2



Data

Motor	220V 50/60Hz
Contacts, making capacity (breaking capacity)	6 (10)A 250V

Description

The automatic unit has a time relay for drain which prevents the spin from starting too early – the water must have drained. When the time relay for drain is live, the timer relay clock is set on a preselected time and the power to the spin is cut. (The timer relay engages peg 11 which is unconnected). The power chain for the spin is made live when the time on the clock has passed (peg 13 is engaged).

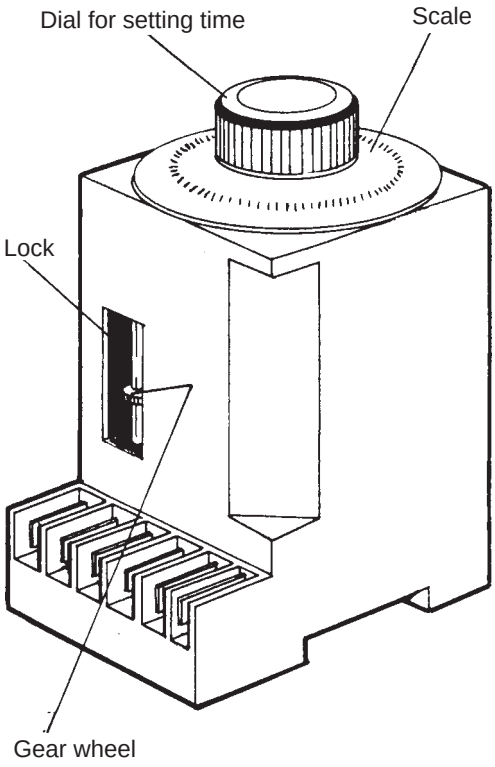
There is a further timer relay in the power chain of the spin. This timer relay ensures that the high spin speed is not connected until the low spin speed has lasted for a certain time. When the timer relay is live the circuit for low spin speed is connected and the timer relay clock is set on a pre-selected time. The circuit for high speed spin is made live when the selected time has passed.

Repair instructions

The timer relay should be replaced, as repair is not recommended.

Replacing the timer relay.

1. Remove and mark the time relay connections.
2. Remove the timer relay.
3. Have the new timer relay ready and open the door above connection terminal.
   Insert plastic gear wheel to the appropriate time interval (see table by door).
4. Turn the indicating hands to the time the relay should be set on.
5. Install relay and connect cables.



Timing relay

Description

The loading chute, figure 1, consists of a hydraulic motor, a rotating shaft with arms, a control module and a chute. The chute is adjustable and is mounted on the arms of the rotating shaft. The position of the chute is also adjustable in relation to the opening in the washer's drum. The rotating shaft is mounted in bearings in a console which, in turn, is attached to the upper part of the machine.

The hydraulic motor is also attached to the console. The motor's outgoing rotating shaft is connected to the rotating shaft with a rigid coupling and flat keys. At the other end of the motor shaft there are two cam wheels attached with screws, figure 2. Each of the cams activates a microswitch. The signals from the microswitches are used to remove the pressure supply to the hydraulic motor. In this way the positions of the cams determine the stopping position for the hydraulic motor. The loading chute is controlled by two pressure switches on a hand control device, please refer to "Relationship with other equipment" below.

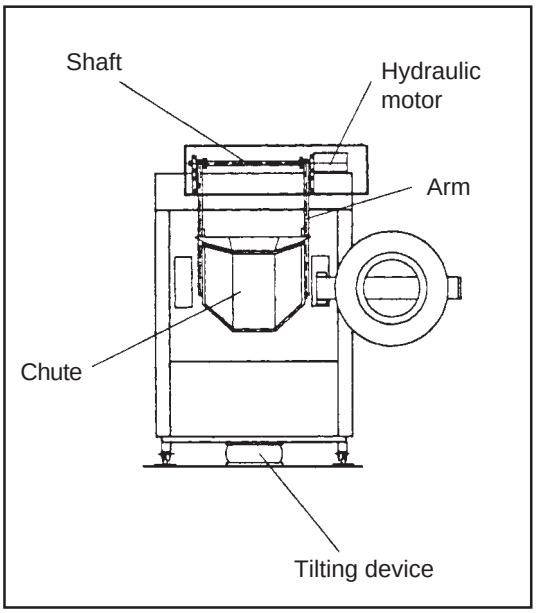


Figure 1.

Relationship with other equipment

Since the loading chute is always used together with "the tilting device" and "the turning device for the door," we will here briefly describe the interaction of these parts:

- The limit switches' signal on the turning device for the door is a necessary condition for the function of the loading chute. The chute cannot be tilted down if the washer drum door is not fully open.
- The limit switches' signed to the loading chute hydraulic motor is a necessary condition for the function of the turning device for the door. The door cannot be closed if the loading chute is not fully raised.
- The two control switches for the loading chute have been placed in the hand control device for the tipping device.

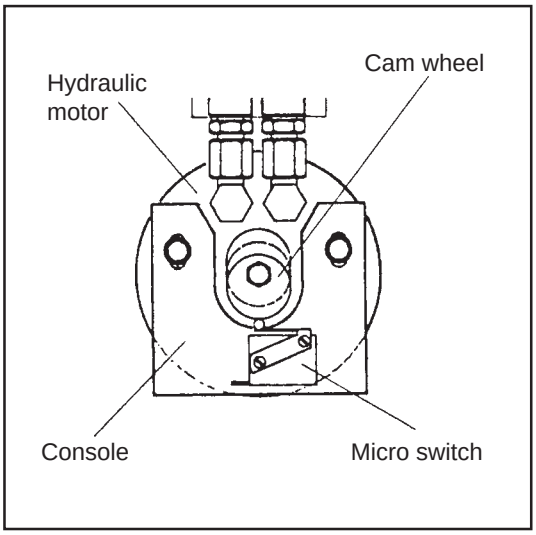


Figure 2.

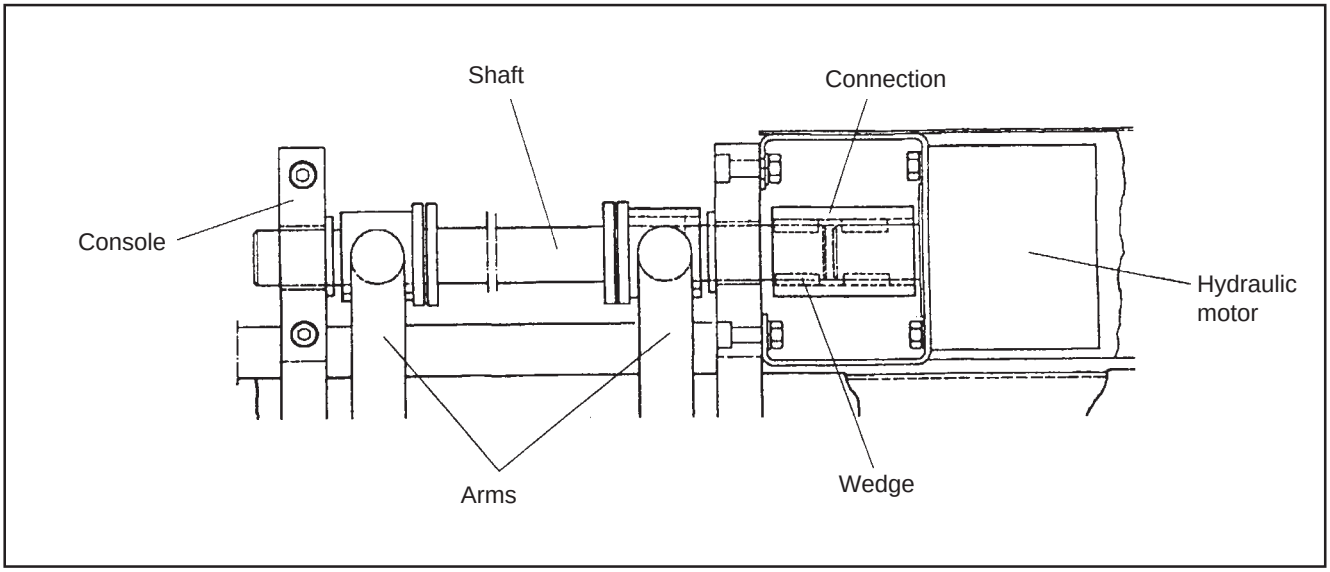


Figure 3.

Repair instructions

Changing of the loading chute's upper and lower stopping positions

1. Check that the machine is disconnected from the mains.
2. Remove the hydraulic motor's covering plate, see figure 3.
3. In order to change the loading chute's upper stop position:
   - loosen the control cam center screw, see figure 4
   - hold on to the inner cam
   - turn the outer cam until the top of the cam (the break position) is at the desired stopping position for the loading chute
   - tighten the locknut of the cam.
4. To change the loading chute lower stop position:
   - loosen the center screw of the control cams, see figure 4
   - hold on to the outer cam
   - turn the inner cam until the top of the cam (the break position) is at the desired stopping position for the loading chute
   - tighten the locknut of the cam.
5. Replace the hydraulic motor cover.
6. Test the function of the chute by using the hand control device. Repeat steps 3-6 until the correct door location is obtained.
7. Reset the machine.

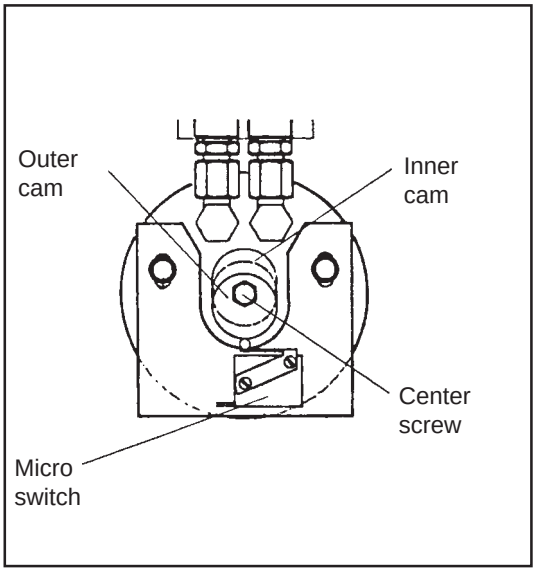


Figure 4.

Replacement of the hydraulic motor

1. Check that the machine is disconnected from the mains.
2. Remove the hydraulic motor's cover plate.
3. Secure the loading chute at the current position.
4. Mark and remove the hose connections to the hydraulic motor. Plug the hoses and the motor immediately in order to prevent clogging of the hydraulic system.
5. Remove the microswitch mounting tab from the motor, see figure 5.
6. Remove the mounting screws of the motor at the rigid coupling, see figure 6.
7. Pull the motor from the coupling. Save the flat keys.
8. Set the new motor into the coupling. Do not forget the flat keys.
9. Attach the motor to the plate at the coupling (using screws).
10. Tilt down the loading chute.
11. Install the mounting tabs for the microswitches.
12. Transfer the two control cams from the old hydraulic motor. Position the cams so that the outer cam points straight down while the inner cam points straight up (180° difference between the cam tops).
13. Connect the hydraulic motor hoses according as marked.
14. Test run the loading chute from the hand control device.
15. If necessary, adjust the control cam locations according to "Changing the loading chute's upper and lower stopping position."

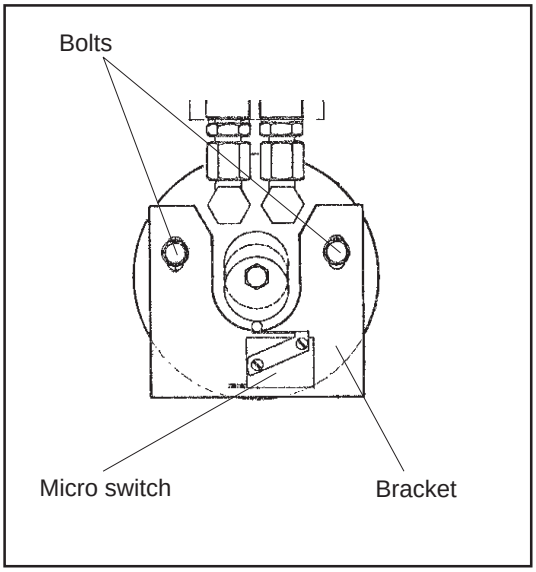


Figure 5.

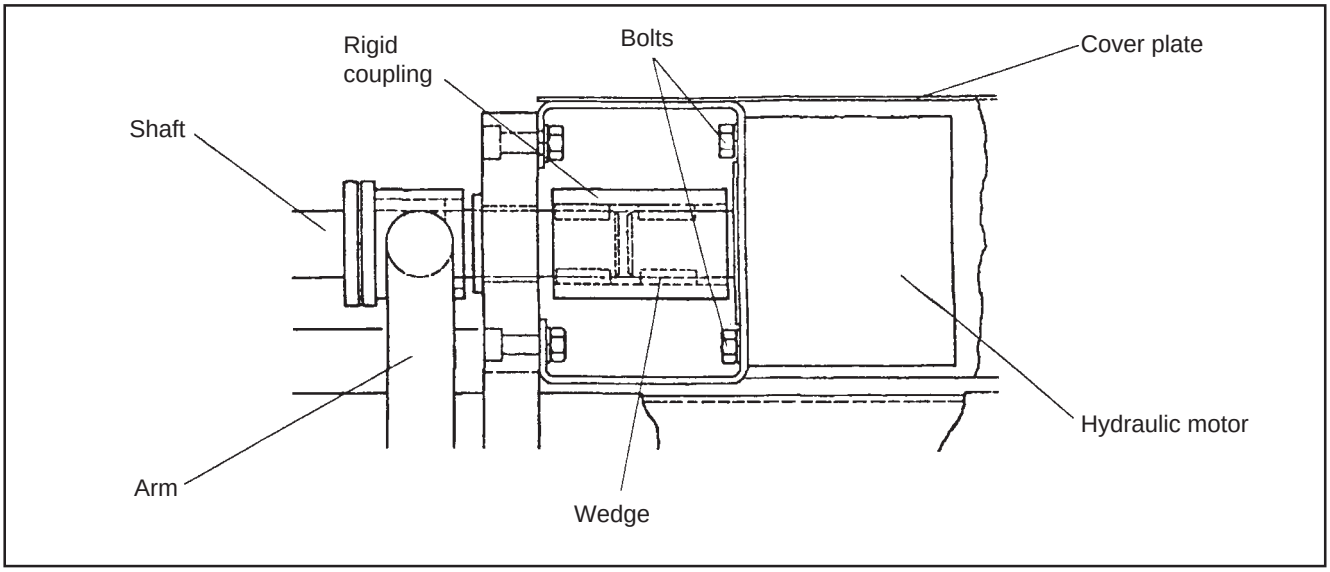


Figure 6.

Description

The turning device, figure 1, consists of a cam-controlled electric motor with a shaft and a safety clutch. The turning device is controlled from the control panel of the machine. The motor is attached to the door butt hinge shaft via a safety clutch. The safety clutch prevents the motor from being damaged if the door meets resistance when it is opened or closed.

By changing the position on the motor steering cams, it is possible to change the stopping position of the stepping motor - the door's opening and closing angle.

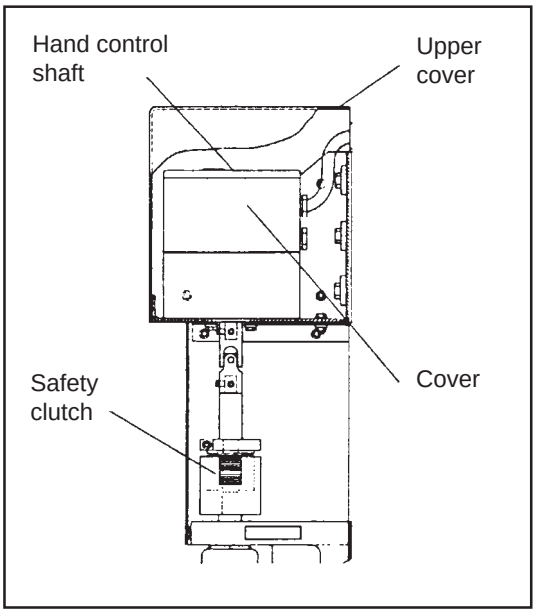


Figure 1.

Repair instructions

Changing of the door's opening and/or closing angle.

1. Check that the machine is disconnected from the mains.
2. Remove the upper cover plate of the turning device.
3. Remove the cover of the stepping motor.
4. To change the position of the door with the door closed:
   - turn the stepping motor hand control shaft, figure 2, until the door is at the desired stopping position (fully closed)
   - loosen the upper cam locknut, figure 3
   - turn the upper cam to the position where the microswitch is tripped
   - tighten the cam locknut.

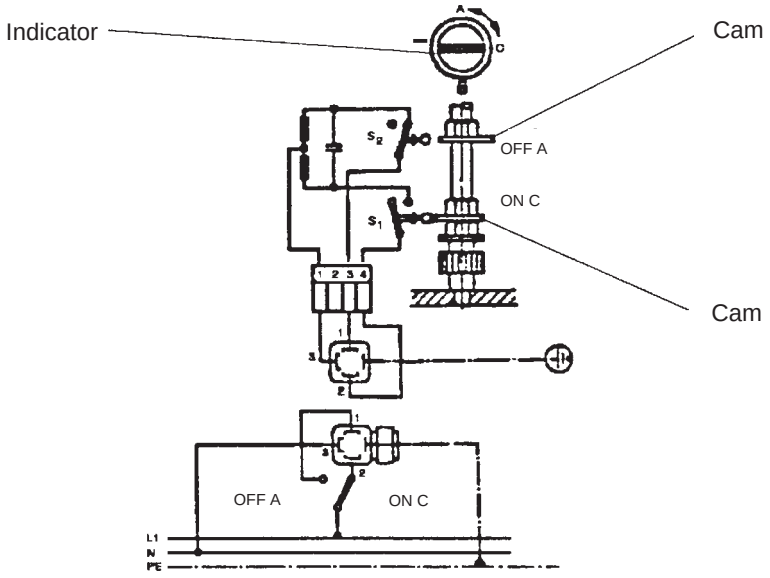


Figure 2.

5. To change the position of the door with the door open:
   - turn the stepping motor hand control device, figure 2, until the door is at the desired stopping position (fully open)
   - loosen the lower can locknut, figure 3
   - turn the lower cam to the position where the microswitch trips
   - tighten the cam locknut.
6. Replace the stepping motor cover.
7. Test run the door from the control panel. Repeat steps 3 through 7 until the proper door position has been obtained.
8. Replace the upper cover plate of the turning device.

Replacement of stepping motor.

1. Check that the machine is disconnected at the mains.
2. Remove the upper cover plate of the turning device.
3. Remove the stepping motor cover.
4. Mark and remove the connections to the stepping motor, figure 4.
5. Remove the lower cover plate of the turning device.
6. Using the stepping motor's hand control device, position the outgoing stub shaft of the stepping motor to allow access to the upper stop screw of the universal joint.
7. Loosen the universal joint upper stop screw using a 6 mm Allen wrench, figure 5.
8. Remove the stepping motor hold-down screws and lift the stepping motor upward, out of the console, figure 5.
9. Install a new stepping motor. Check that the groove in the motor's outgoing shaft is positioned in the middle, next to the locknut screw on the universal joint.
10. Tighten the universal joint upper Allen head screw to fix the V-joint to the motor shaft.
11. Secure the stepping motor to the console with screws.
12. Set the door's stopping positions according to "Changing of the door's opening and/or closing angle."
13. Attach the motor's electrical connections.
14. Re-install the upper and lower cover plates of the turning device.

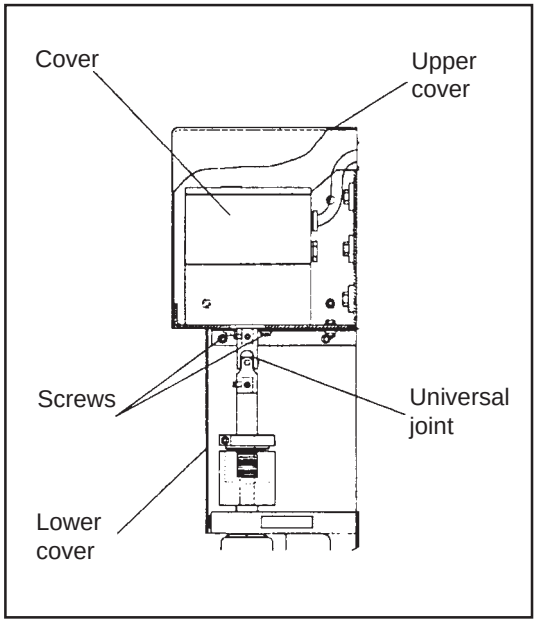


Figure 3.

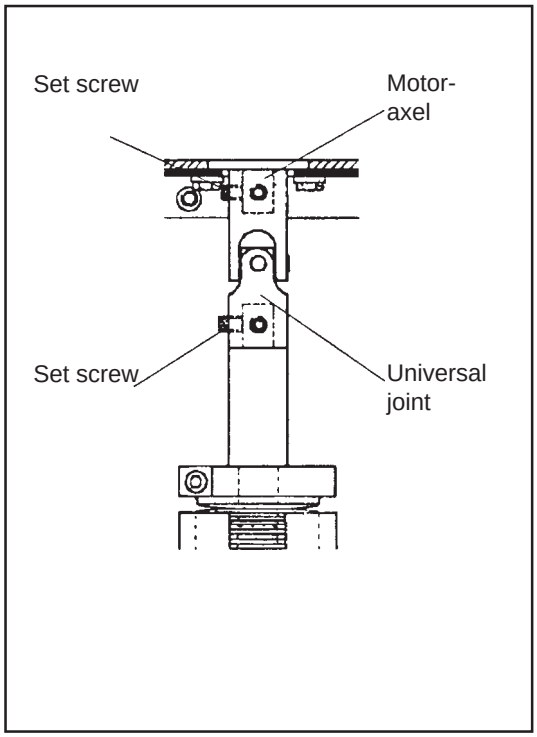


Figure 4.

Replacement of safety clutch

1. Check that the machine is disconnected at the mains.
2. Remove the upper and lower cover plate of the turning device.
3. Remove the stepping motor cover.
4. Remove the attachment screws on the stepping motor, figure 5, and lift out the stepping motor with the universal joint and shaft turned upward, and out of the console so that the shaft is released from the safety clutch. Save the flat key between the safety clutch and the shaft.
5. Loosen the lower stopscrew of the safety clutch, figure 6, using a 6 mm Allen wrench. Pull off the safety clutch from the hinge pin of the door. Save the flat key between the safety clutch and the pin.
6. Insert a new safety clutch on the hinge pin of the door. Do not forget the flat key. Lock the safety clutch on the pin with the clutch stopscrew.
7. Install the stepping motor, making sure that the shaft is correctly positioned in the safety clutch. Do not forget the flat key.
8. Secure the stepping motor in the console with screws.
9. Set the safety clutch turning torque according to ”Placement setting turning torque”.
10. Set the door stopping positions according to ”Changing of the door’s opening and/or closing angle.”
11. Re-install upper and lower cover plates of the turning device.

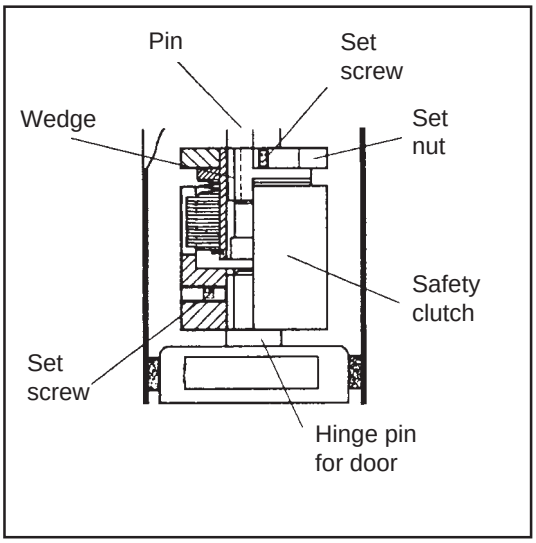


Figure 5.

Description

On machines equipped for water or heat recovery, a manifold with two drain valves are installed after the regular drain valve; figure 1. The two extra drain valves are identical to the regular drain valve. For further description of the drain valve, see tab ”38. Drain valve” variant 3.

To allow draining when this accessory is installed, two valves have to be opened, the regular drain valve and one of the valves on the manifold. The valves are controlled from the control unit and are installed in such a way that the regular drain valve and one of the manifold valves will always open when the program calls for draining. If normal draining is programmed, the regular drain valve plus the drain valve on one side on the manifold will open. If recovery is programmed, the regular drain valve and the drain valve on the other side of the manifold will open.

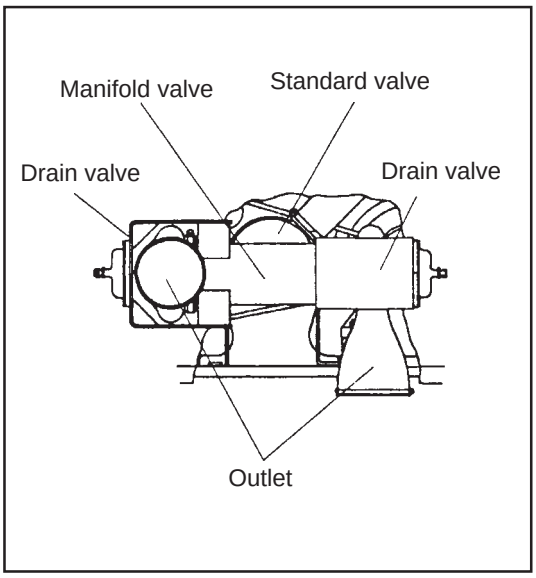


Figure 1

Description

The machine has a tilting device for tilting it forward, or both forward and backward. The tilting device consists of a beam with a rubber bellow, a tilting foot, a control valve and a control device. For tilting forward, there is a beam with a rubber bellow towards the rear under the outer frame of the machine, see figure 1. The machine also has a tilting foot in front, see figure 2.

For tilting both backward as well as forward, the machine is additionally equipped with a beam and bellow up front, and a tilting foot in the rear. In this way, both rubber bellows are connected to the sliding valve to prevent simultaneous tilting forward and backward.

On the front left side of the machine there is a control device located in a holder. The control device, figure 3, is connected to the machine via a soft cable to allow the device to be removed from the holder and held in the hand for maneuvering. The device consists of a three-position rotary switch and three recoiling pressure switches. The middle position of the rotary switch connects the rubber bellows with atmospheric pressure ensuring that both bellows cannot be used simultaneously. The switch is connected only when the machine door is open. The switches of this control device control tilting and drum rotation according to the following table:

Function	Switch combination					
	Y3			Y4	Y5	Y6
	I	0	II			
Tilting forward	x					
Tilting backward			x			
Drum rotation clockwise				x	x	
Drum rotation counter-clockwise				x		x

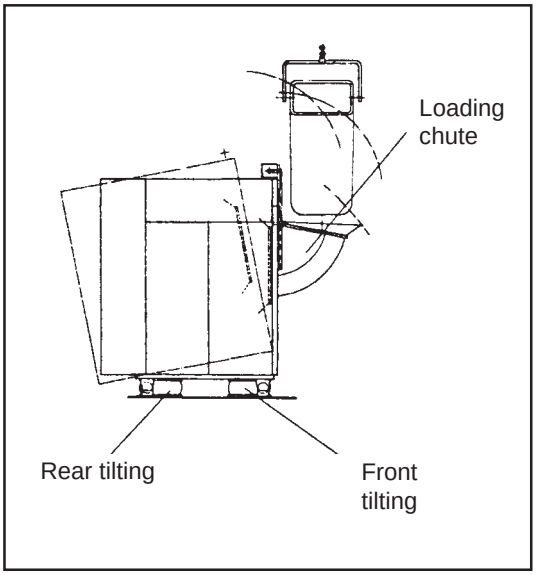


Figure 1

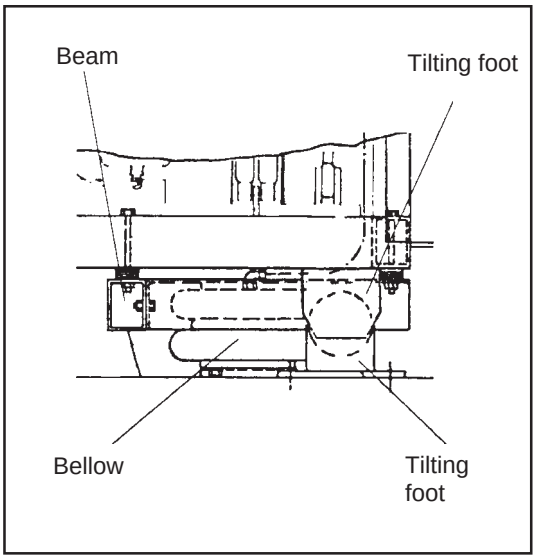


Figure 2

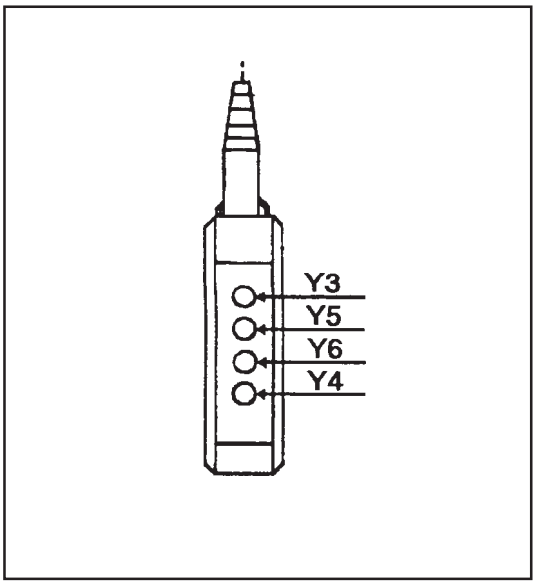


Figure 3