OPERATING & MAINTENANCE MANUAL
EX 7 – EX 10

471 1562-89/95.01
From machine No. 93/38450–

WARNING: ALL OPERATING AND MAINTENANCE PROCEDURES SHOWN ON THE NEXT PAGE OF THIS MANUAL MUST BE FOLLOWED DAILY FOR PROPER OPERATION OF YOUR WASCOMAT MACHINE.

PLEASE ENTER THE FOLLOWING INFORMATION AS IT APPEARS ON THE MACHINE(S) DATA PLATE(S).

MACHINE TYPE OR MODEL	
MACHINE SERIAL NUMBER(S)	
ELECTRICAL CHARACTERISTICS: _____ VOLTS, _____ PHASE, _____ HZ.	

MAKE CERTAIN TO KEEP THIS MANUAL IN A SECURE PLACE FOR FUTURE REFERENCE.

NOTICE TO: OWNERS, OPERATORS AND DEALERS OF WASCOMAT MACHINES

IMPROPER INSTALLATION AND INADEQUATE MAINTENANCE, POOR HOUSEKEEPING AND WILLFUL NEGLECT OR BYPASSING OF SAFETY DEVICES MAY RESULT IN SERIOUS ACCIDENTS OR INJURY. TO ASSURE THE SAFETY OF CUSTOMERS AND/OR OPERATORS OF YOUR MACHINE, THE FOLLOWING MAINTENANCE CHECKS MUST BE PERFORMED ON A DAILY BASIS.

1. Prior to operation of the machine, check to make certain that all operating instructions and warning signs are affixed to the machine and legible. (See the following page of this manual for description and location of the signs.) Missing or illegible ones must be replaced immediately. Be sure you have spare signs and labels available at all times. These can be obtained from your dealer or Wascomat.

2. Check the door safety interlock, as follows:

   (a) OPEN THE DOOR of the machine and attempt to start in the normal manner:

   For coin-operated models, insert the proper coins to start the machine.

   For manually operated models, place the ON-OFF switch in the ON position and press the Start switch.

   For FL and EX models, insert a program card, turn the starter knob to the Start position and place the ON-OFF switch in the ON position.

   For HI-TEK microprocessor models, turn the key switch to the RUN position, choose a program and press the START button.

   For SELECTA 28 models, select a wash program and press the Start button.

   THE MACHINE(S) SHOULD NOT START !

   (b) CLOSE THE DOOR to start machine operation and, while it is operating, attempt to open the door without exerting extreme force on the door handle. The door should remain locked!

   If the machine can start with the door open, or can continue to operate with the door unlocked, the door interlock is no longer operating properly. The machine must be placed out of order and the interlock immediately repaired or replaced. (See the door interlock section of the manual.)

3. DO NOT UNDER ANY CIRCUMSTANCES ATTEMPT TO BYPASS OR REWIRE ANY OF THE MACHINE SAFETY DEVICES AS THIS CAN RESULT IN SERIOUS ACCIDENTS.

4. **Be sure to keep the machine(s) in proper working order**: Follow **all** maintenance and safety procedures. Further information regarding machine safety, service and parts can be obtained from your dealer or from Wascomat through its Teletech Service Telephone - 516/ 371-0700.

All requests for assistance must include the model, serial number and electrical characteristics as they appear on the machine identification plate. Insert this information in the space provided on the previous page of this manual.

5. **WARNING**: DO NOT OPERATE MACHINE(S) WITH SAFETY DEVICES BYPASSED, REWIRED OR INOPERATIVE! DO NOT OPEN MACHINE DOOR UNTIL DRUM HAS STOPPED ROTATING!

SAFETY AND WARNINGS SIGNS

Replace If Missing Or Illegible

One or more of these signs must be affixed on each machine as indicated, when not included as part of the front instruction panel.

LOCATED ON THE OPERATING INSTRUCTION SIGN OF THE MACHINE:

CAUTION

1. Do not open washer door until cycle is completed, operating light is off, and wash cylinder has stopped rotating.
2. Do not tamper with the door safety switch or door lock.
3. Do not attempt to open door or place hands into washer to remove or add clothes during operation. This can cause serious injury.

MACHINE SHOULD NOT BE USED BY CHILDREN

PRECAUCION

1. No abra la puerta de la máquina lavadora sino hasta que la máquina haya terminado su ciclo, la luz operativa esté apagada y el cilindro de lavado haya completamento terminado de girar.
2. No interferia o manipule el switch o la cerradura de la puerta.
3. No trate de abrir la puerta o meta las manos dentro de la máquina para meter o sacar ropa mientras la máquina está en operación, pues puede resultar seriamento herido.

LAS MÁQUINAS NO DEBEN SER USADAS POR NIÑOS

LOCATED AT THE REAR OF THE MACHINE:

INSTALLATION AND MAINTENANCE WARNINGS

1. **When installed on a floor of combustible material, the floor area below this machine must be covered by a metal sheet extending to the outer edges of the machine.**
2. **This washing machine MUST be securely bolted to an uncovered concrete floor according to the installation instructions to reduce the risk of fire and to prevent serious injury, or damage to the machine.**
3. **This machine MUST be serviced and operated in compliance with manufacturer's instructions. CHECK DOOR LOCKS EVERY DAY FOR PROPER OPERATION TO PREVENT INJURY OR DAMAGE.**
4. **Disconnect power prior to servicing of machine.**
5. **This washing machine MUST be connected to a dedicated electrical circuit to which no other lighting unit or general purpose receptacle is connected.**
6. **TO REMOVE TOP PANEL FOR SERVICE, remove two screws under soap supply box cover, holding panel to the supply box, before unlocking. Be certain to reinstall screws when remounting the top panel to prevent leaks from the supply box.**

MANUFACTURED BY ELECTROLUX-WASCATOR, LJUNGBY, SWEDEN
DISTRIBUTED BY WASCOMAT OF AMERICA, INWOOD, NEW YORK, USA
SOLD AND SERVICED BY INDEPENDENT WASCOMAT DEALERS
471 7446-00

LOCATED ON THE DOOR:

If you need to order more safety or warning signs, call Wascomat's parts department at 516-371-2000, or call your local dealer.

WARNING !

TO CLOSE
PUSH THE DOOR IN GENTLY.
TO OPEN
WAIT A SHORT TIME AFTER THE LAMP HAS GONE OUT AND DRUM HAS STOPPED ROTATING THEN PRESS IN AND PULL HANDLE.

471 7651-32

Contents

The manufacturer reservs the right to make changes to design and material specifications.

Safety instructions

- **The machine is designed for water washing only.**
- **The machine must not be used by children.**
- **All installation operations are to be carried out by qualified personnel. Licensed personnel are necessary for all electric power wiring.**
- **The interlock of the door must be checked daily for proper operation and must not be bypased.**
- **All seepage in the system, due to faulty gaskets etc., must be repaired immediately.**
- **All service personnel must be fully familiar with the operating manual before attempting any repair or maintenance of the machine.**
- **The machine must not be sprayed with water, otherwise short circuiting may occur.**
- **Fabrics softener with volatile or inflammable fluids are not to be used in the machine.**

Introduction

Fig. 1 The Ex 7 and Ex 10 models washer/extractor with high spin speeds, have been developed to cover the requirements of apartment house laundry rooms, laundromats, insitutions, hospitals etc., where high quality automatic washing and quick formula variation are required.

The machines are free-standing, i.e. the drum is free to move relative to the frame of the machine, being suspended from it by springs. This results in a considerable reduction in vibration transferred to the frame of the machine, which in turn simplifies installation: no special foundation is required.

The machines offer four pre-set wash programs Hot, Warm, Cold and Permanent Press. These programs are designed to suit a variety of fabrics and offer different water temperature. The machine is designed for connection to hot and cold water supplies.

All parts of the machine which come into contact with the items being washed are made of heavy gauge surgical stainless steel, ensuring long life and lasting beauty, as well as full protection for no-iron fabrics. The wash/extract motor, electrical components and water valves are made accessible for servicing by simply removing the top panel.

This manual contains a technical description of the Wascomat Ex7 and Ex10 model machines with instructions for their installation, operation and maintenance. Together with the wiring diagram which accompanies each individual machine it should be kept in a safe place for easy reference.

When ordering spare parts always give the machine serial number, model, voltage and other electrical characteristics appearing on the nameplate at the rear of the machine.

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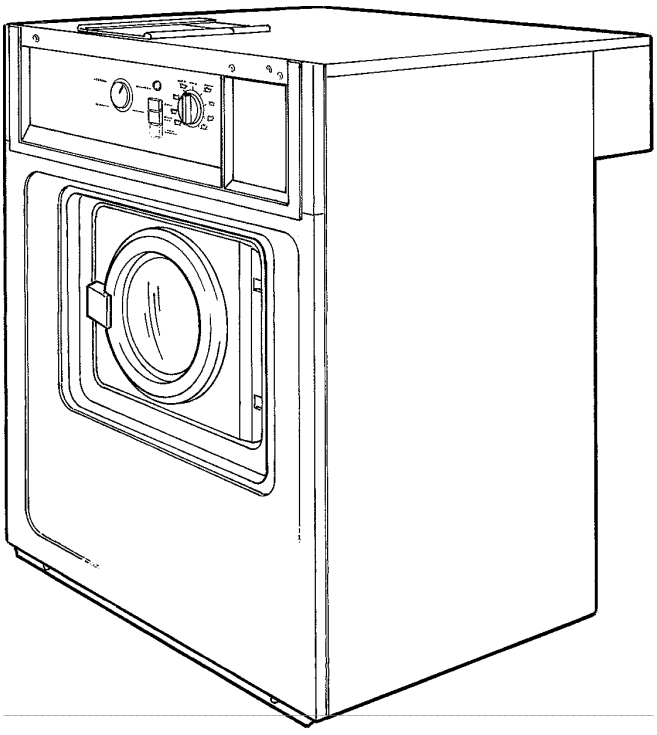

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Technical data Ex 7

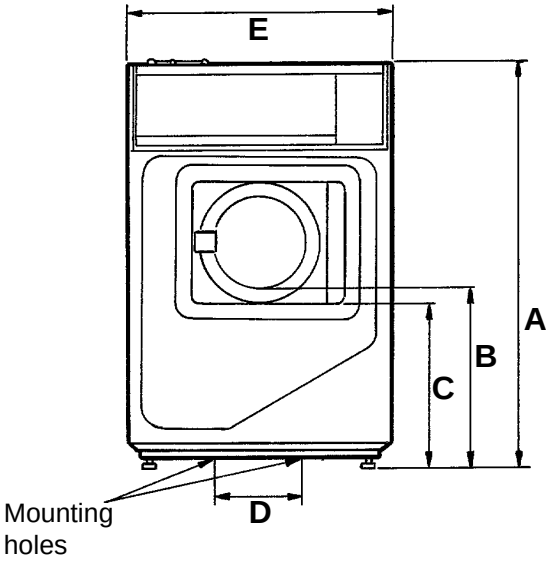
Dry load capacity	up to			15	lbs
Overall dimensions	Width	720	mm	28 11/32	in
	Depth	660	mm	26	in
	Height	1100	mm	43 5/16	in
	Net weight	164	kg	361	lbs
Maximum floor load		1.64 ± 0.7	kN	390 ± 170	lbs force
Crated dimensions	Volume	0.66	m^3	23.3	cu.ft
	Weight	176	kg	387	lbs
Inner drum dimensions	Diameter	520	mm	20 15/32	in
	Depth	310	mm	12 3/16	in
	Volume	60	litre	2.1	cu.ft
Drum speed	Wash	52	r.p.m.		
	Distribution	80	r.p.m.		
	Extraction	1020	r.p.m.		
G-factor	During wash	0.8			
	During extraction	300			
Motor speed	During wash	1140	r.p.m.		
	During distribution	1740	r.p.m.		
	During extraction	3430	r.p.m.		
Voltage requirements		120	V 1-Phase 60 Hz		
Rated output power	Motor, wash	140	W	0.19	HP
	Motor, distribution	100	W	0.13	HP
	Motor extraction	350	W	0.5	HP
Overcurrent protection		20	A		
Water connections	Max. pressure	10	kp/cm^2	142	psi
	Rec. pressure	2-6	kp/cm^2	25-85	psi
	Hose connection, water	DN 20		3/4	in
Drain connection	Hose	50	mm	2	in

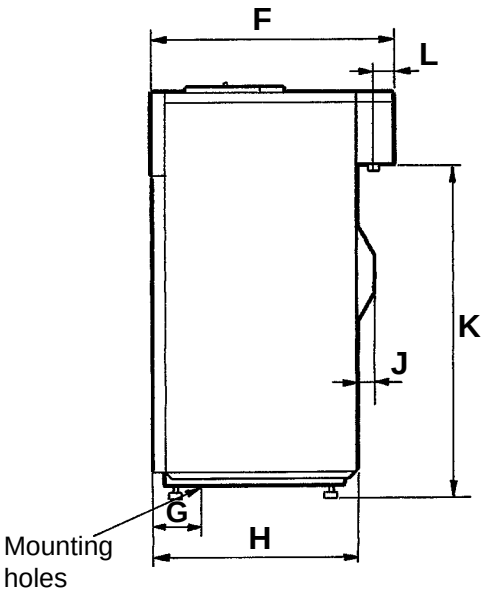
Technical data Ex 10

Dry load capacity	up to			25	lbs
Overall dimensions	Width	720	mm	28 11/32	in
	Depth	820	mm	32 9/32	in
	Height	1100	mm	43 5/16	in
	Net weight	225	kg	495	lbs
Maximum floor load		2.3 ± 0.9	kN	550 ± 220	lbs force
Crated dimensions	Volume	0.77	m^3	27.2	cu.ft
	Weight	240	kg	528	lbs
Inner drum dimensions	Diameter	520	mm	20 15/32	in
	Depth	470	mm	18 1/2	in
	Volume	100	litre	3.5	cu.ft
Drum speed	Wash	52	r.p.m.		
	Distribution	80	r.p.m.		
	Extraction	1020	r.p.m.		
G-factor	During wash	0.8			
	During extraction	300			
Motor speed	During wash	1130	r.p.m.		
	During distribution	1730	r.p.m.		
	During extraction	3400	r.p.m.		
Voltage requirements	120 V or 208-240 V 1- Phase 60 Hz				
Rated output power	Motor, wash	200	W	0.27	HP
	Motor, distribution	180	W	0.24	HP
	Motor extraction	550	W	0.74	HP
Overcurrent protection		20	A at 120 V		
		15	A at 208-240 V		
Water connections	Max. pressure	10	kp/cm^2	142	psi
	Rec. pressure	2-6	kp/cm^2	25-85	psi
	Hose connection, water	DN 20		3/4	in
Drain connection	Hose	50	mm	2	in

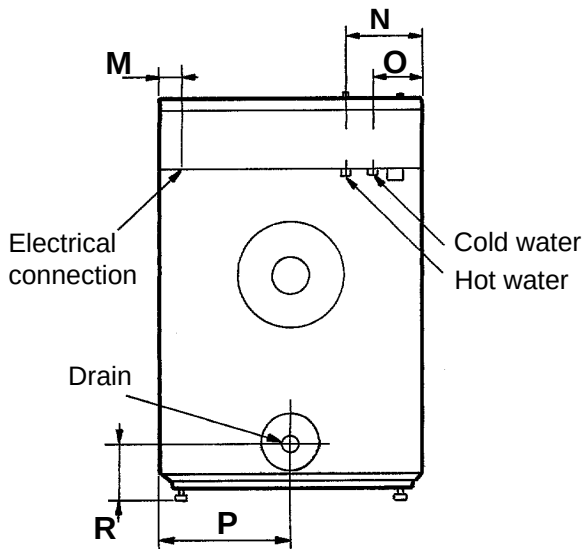
Technical data

Outline and dimension

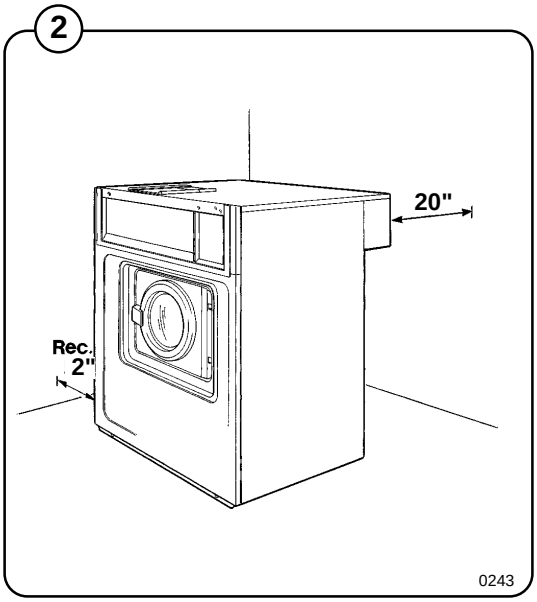




	Ex 7		Ex 10	
	mm	inches	mm	inches
A	1100	43 5/16	1100	43 5/16
B	485	19 3/32	485	19 3/32
C	440	17 5/16	440	17 5/16
D	260	10 1/4	260	10 1/4
E	720	28 11/32	720	28 11/32
F	660	26	820	32 9/32
G	65	2 9/16	65	2 9/16
H	555	21 27/32	715	28 5/32
J	50	1 31/32	50	1 31/32
K	905	35 5/8	905	35 5/8
L	40	1 9/16	40	1 9/16
M	60	2 3/8	60	2 3/8
N	210	8 9/32	210	8 9/32
O	130	5 1/8	130	5 1/8
P	360	14 5/32	360	14 5/32
R	150	5 29/32	150	5 29/32



Installation



The machines are free-standing, i.e. the drum can move relative to the frame of the machine. This results in a considerable reduction in vibration transferred to the frame which in turn simplifies installation: no special foundation is required.

The machine is delivered complete with expansion bolts, template etc. packed inside the drum. Move the machine on its pallet to where it is to be installed before removing the pallet retaining bolts.

Location

Fig. (2) Install the machine close to a floor drain or open drain.

In order to make installation and servicing the machine easier the following clearances are recommended:

- At least 20" between the machine and the wall behind
- and a minimum of 2" on both sides of the machine whether installed next to the wall or other machines.

Where space is limited it is possible to reduce this distance to a minimum of 1" at the rear and sides, since most service operations are carried out from the front or top of the machine.

Floor

The floor must be able to withstand the following loads:

	EX7	EX10
static	390 lbs	550 lbs
dynamic	170 lbs	220 lbs
frequency of dynamic force	17 kHz	17kHz

Mechanical installation

The machine is delivered with the drum locked in place by four transport bolts fitted between the frame and the drum. In order to remove these and install the machine, proceed as follows:

- Unpack the machine.

Fig. 3
- Slacken off the screws in the lower edge of the front cover plate and remove the plate by pulling downward and outward to unhook it from the chassis.

Fig. 4
- Unscrew the retaining screws on the rear plate and remove the plate. Remove the drainage connection by unscrewing the two screws. Lift the drainage connection upwards until comes loose from the rear plate.

Fig. 5
- Mark and drill two holes (diameter =5/16") about 4" deep in the positions shown.
- Remove the machine from the transport pallet. Fit the adjustable feet provided.
- Place the machine above the bolt holes you just drilled. Always lift the machine by the chassis, never by the door or door handle.

Fig. 6
- Remove the four transport bolts securing the drum to the chassis.
- Check that the machine is level and steady. Adjust the level by using the four adjustable feet (check first that they are screwed in as far as possible). Lock the feet using the lock nuts when the machine is satisfactorily positioned.

NOTE!

It is of utmost importance that the machine be level, from side- to- side as well as front- to- rear. If the machine is not properly leveled, it may result in a false out-of-balance cutout.

- Insert the expansion bolts supplied in the holes drilled in the floor.

Fit the washers and nuts, and tighten well.

After the machine has been in use for a while check and retighten the nuts if necessary.

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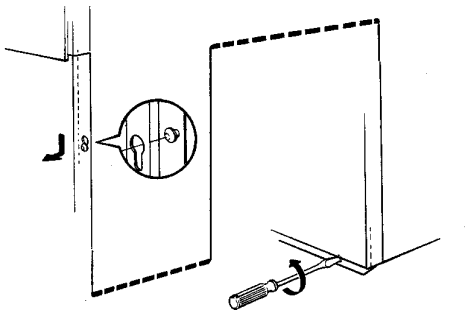

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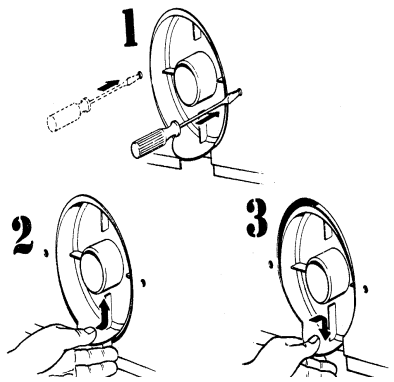

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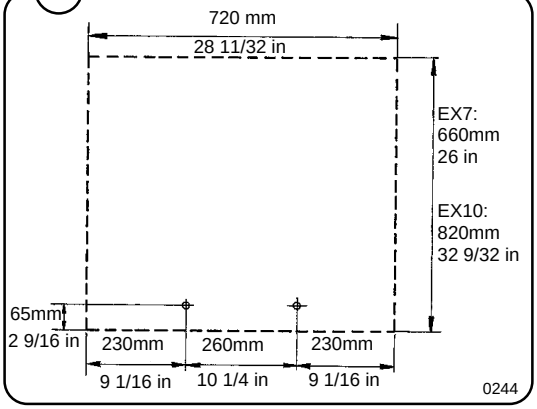

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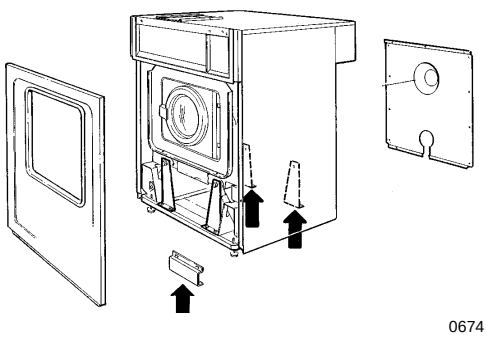

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Water supply

NOTE

All plumbing must conform to national and local plumbing codes.

Fig. (7) The water supply to the machine should be fitted with manual shut-off valves to facilitate installation and servicing.

Fig. (8) Water inlets are labelled for hot and cold water connections. Hoses should be flushed through before being connected to the machine.

Fig. (9) Connection hoses should be 3/4" reinforced rubber hosing not to exeed 6 ft in length. Make sure the hoses have no sharp bends or angles.

Water pressure should be:

maximum:	142 psi (10 kp/cm^2)
recommended:	25-85 psi (2-6 kp/cm^2)

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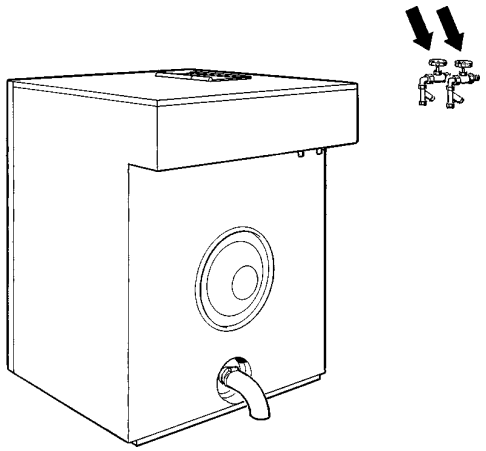

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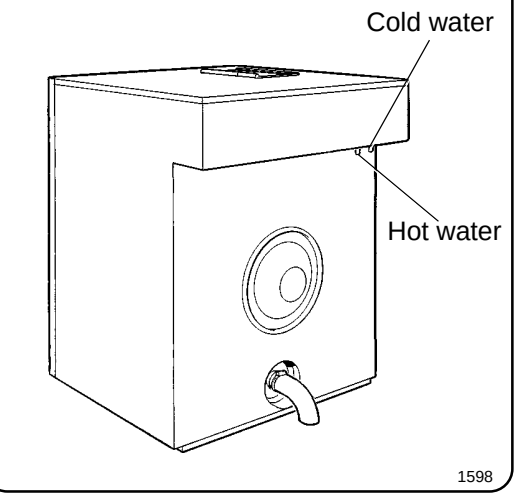

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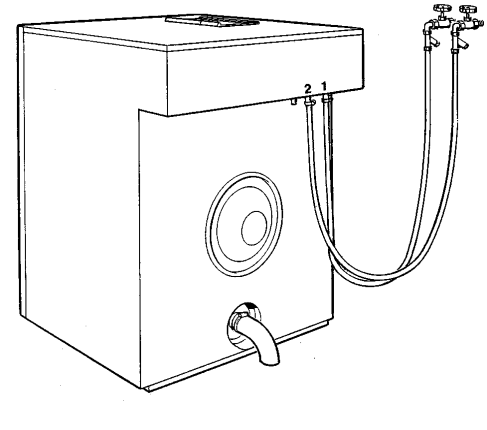

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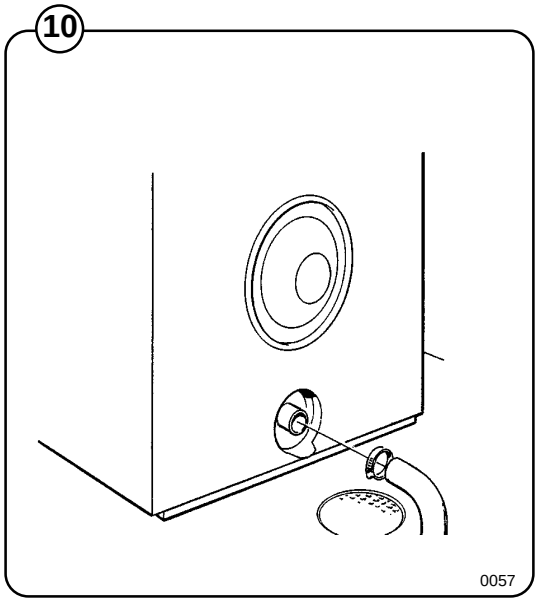
Drain connection

Fig. (10) Connect a 50 mm (2") flexible hose to the machine's drain outlet. Avoid sharp bends which may prevent proper draining.

The drainage pipe should be located over a floor drain, drainage channel or similar so that the distance between the outlet and the drain is at least 25 mm (1"). Refer to local regulations on water supply and drainage.



Electrical installation

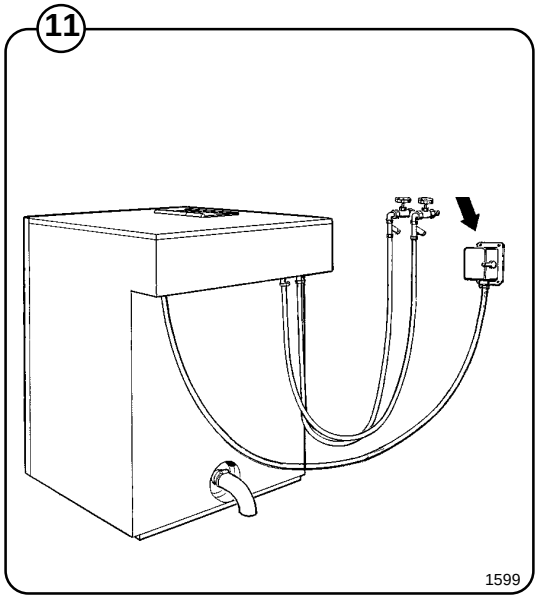
IMPORTANT!

Electrical installation must be carried out by an authorized electrician, and must follow national and local regulations.

Make sure that the ground wire is correctly connected.

Fig. (11) Each machine must be connected through its own circuit breaker.

The cable must hang in a gentle arc.



Depending on the electrical supply type available, the machine is to be connected as follows:

Fig. 12 Machines connected for 3N AC.

Fig. 13 Machines connected for 3 AC

Fig. 14 Machines connected for 1 AC

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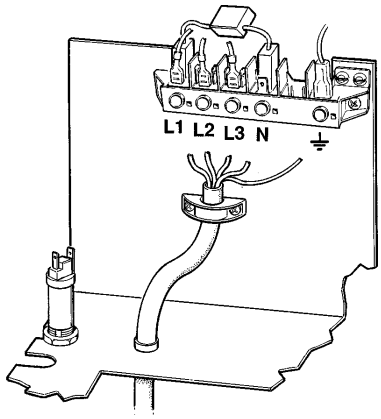

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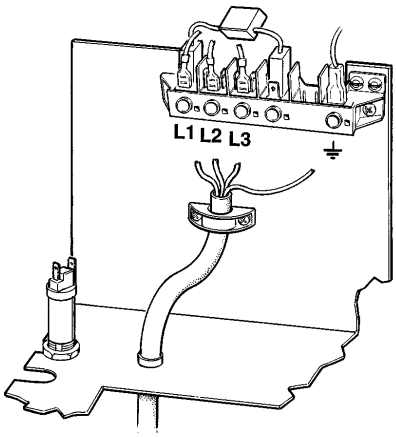

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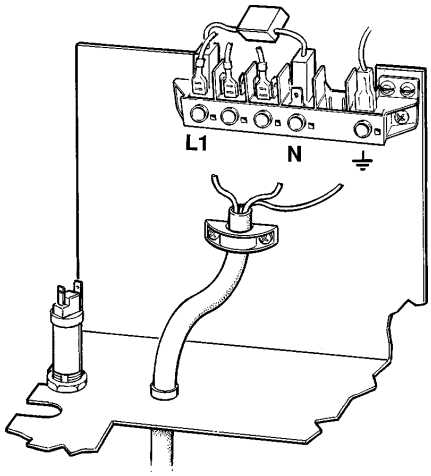

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Start-up and safety checklist

IMPORTANT:

Door safety interlock must be checked <u>daily</u> in accordance with the procedure described below.

WARNING:

Before servicing Wascomat equipment, disconnect electrical power.

Before initial start-up of the washer-extractor, the following safety checks must be performed:

- Make sure the machine is properly bolted to the floor.
- Make sure that all electrical and plumbing connections have been made in accordance with applicable local codes.
- Use only flexible water fill and drain hoses of the proper length to avoid sags and kinks.
- Make sure the machine is properly grounded electrically.

Before the machine is operated, the door safety interlock must be checked for proper operation as follows:

- When washer loading door is open, the machine must not start. Verify this by attempting to start washer with door open (see section ”Procedure”).
- When washer is in operation, the loading door is locked and cannot be opened. Verify this by attempting to open the loading door when the machine is operating. If necessary, consult this manual for proper operation of the door lock and door safety interlock or call a qualified serviceman.

Fig. 15

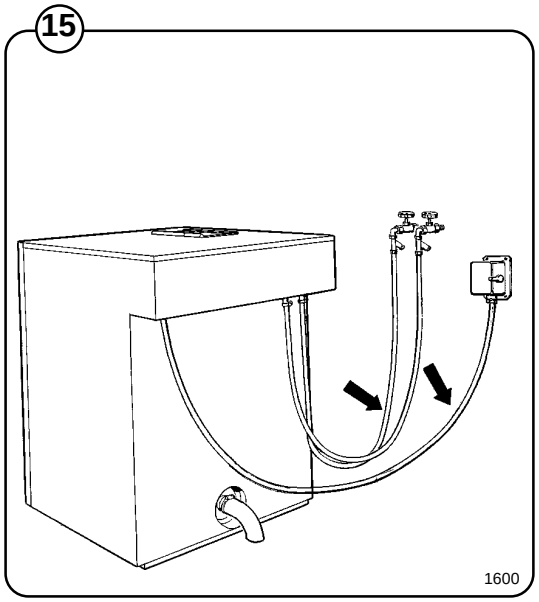


Fig. 16

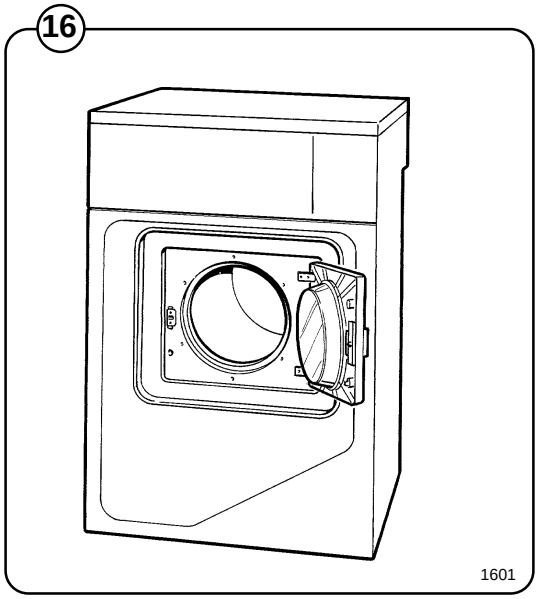
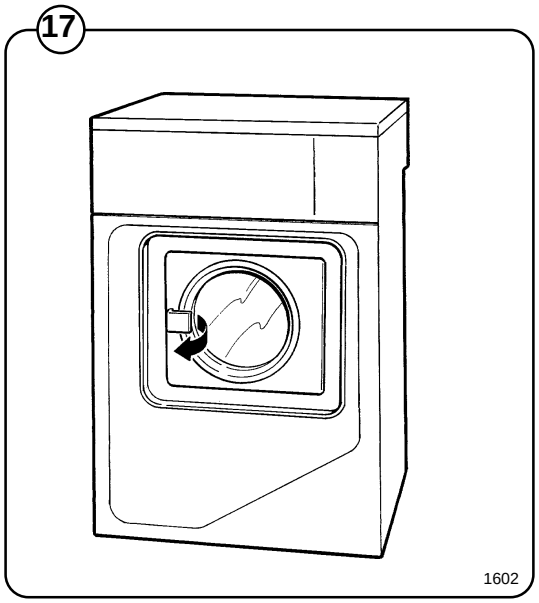


Fig. 17



Function control check-out list

In the machine cylinder, you will find the warranty registration card, a copy of the warranty policy and other pertinent material. The warranty card should be completed and sent to Wascomat. All other items should be placed in a safe place for future reference.

The machine should be cleaned when the installation is completed, and checked out as detailed below without loading the machine with fabrics:

1. Check the incoming power for proper voltage, phase and cycles.
2. Open manual shut-off valves to the machine.
3. Turn on electric power.
4. Check the door safety interlock as detailed on page 9 of this manual.
5. Select the HOT program and start the machine.

Fig. 18

6. Run through a complete cycle, checking for water temperature, wash, rinse and exctract operation, function of the soap supply box and drain valve.

Fig. 19

7. In the Wash cycle only hot water should enter. If cold water comes in, the hoses are improperly connected. Reverse hot and cold water hoses.

> **NOTE**
>
> **All machines are factory tested prior to shipment. Occasionally, some residual water may be found when the machine is installed.**

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	HOT		
	Time (min)	Temp	Water level
Prewash	3	Warm	Medium
Detergent 1			
Drain	1		
Mainwash	6	Hot	Medium
Detergent 2			
Drain	1		
Rinse 1	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 2	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 3	2	Cold	Medium
Detergent 3			
Drain	1		
Extract	5		
Shake-out	1		
Total time (water fill time not included)	25		

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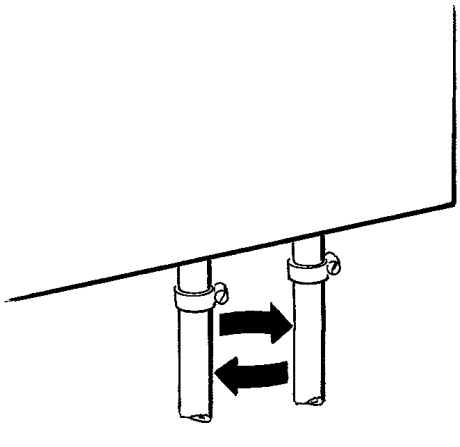

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Safety rules

- **The machine is designed for water washing only.**
- **Machines must not be used by children.**
- **All installation operations are to be carried out by qualified personnel. Licensed personnel are necessary for all electric power wiring.**
- **The interlock of the door must be checked daily for proper operation and must not be bypassed.**
- **All seepage in the system, due to faulty gaskets etc., must be repaired immediately.**
- **All service personnel must be fully familiar with the operating manual before attempting any repair or maintenance of the machine.**
- **The machine must not be sprayed with water, otherwise short circuiting may occur.**
- **Fabrics softener with volatile or inflammable fluids are not to be used in the machine.**

General

The door, cycle indicator, coin meter or manual start switches, control light and program-selection knob are located at the front of the machine.

The motor and all control and indicating components, i.e. relays, level control, etc are assembled under the top cover, easily accessible from the top of the machine for simplified servicing.

Main units

Fig. 20

1 Program selector - rotary switch for choice of different wash programs.

2 Door - with automatic locking device which remains locked throughout the different wash processes.

3 Detergent supply box - three compartments for automatic injection of powdered detergents and fabric softener.

4 Inner cylinder - of stainless steel supported at the rear by two ballraces.

5 Outer drum - of stainless steel (18/8) suported by a four spring suspension system. There are also four shock-absorbers to control the movement of the drum.

6 Motor with an epicyclic gearbox - for reversing wash action, distribution and high speed spin action.

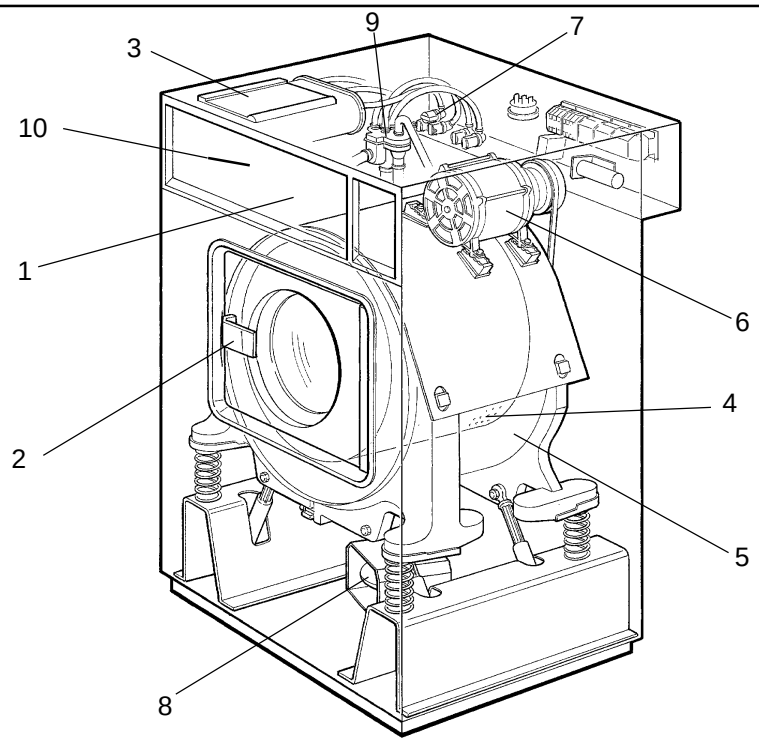
7 Hot and cold water valves - program and level controlled solenoid valves for filling with water, and for flushdown of automatic detergent dispenser.

8 Drain valve - timer controlled for draining the machine of water.

9 Siphon breaker - to prevent water in the machine from re-entering the water supply system.

10 Control unit - of plug in type.

20



0918

Machine construction

Panels

The machines are equipped with a top panel made of stainless steel. The front panel is available in different colors or in stainless steel. The colored panels are made of phosphatized steel plate. For servicing purposes, the panels can easily be removed.

Frame

Fig. 21 The frame consist of a bottom plate and two balance weights. The balance weights form a cradle for the outer drum and are suported by four springs. There are four shock absorbers to control the movements of the drum.

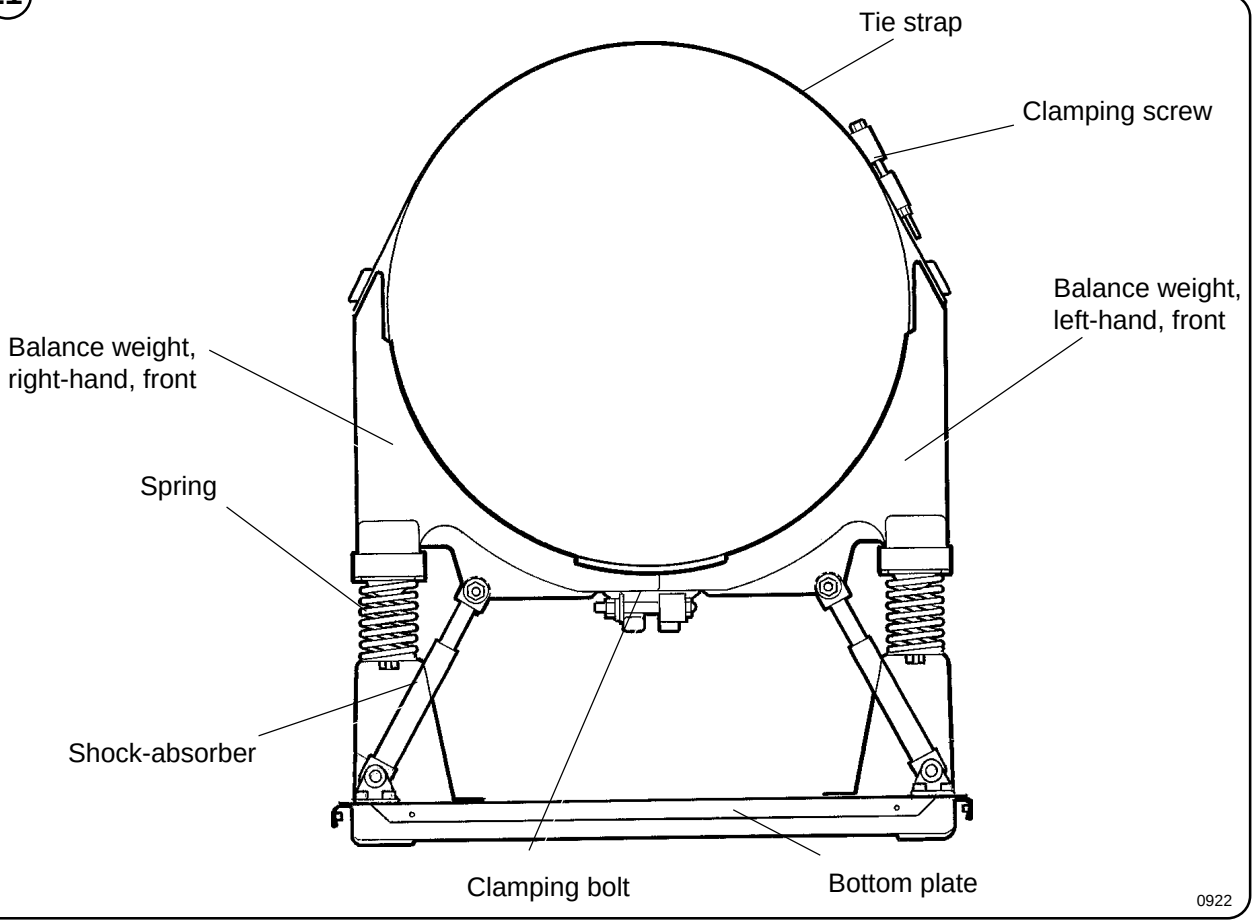
Inner cylinder

The inner cylinder is made of perforated surgical stainless steel. It is equipped with three lifting ribs and has highly-polished side sheets and back with maximum embossed perforated area to assure high flow of water and supplies through fabrics.

Scientifically correct ratio of cylinder diameter and depth assures maximum washing action.

The shaft is electrically welded to the reinforced back of the cylinder. A specially designed chrome-plated sleeve bushing protects the seals from wear.

21



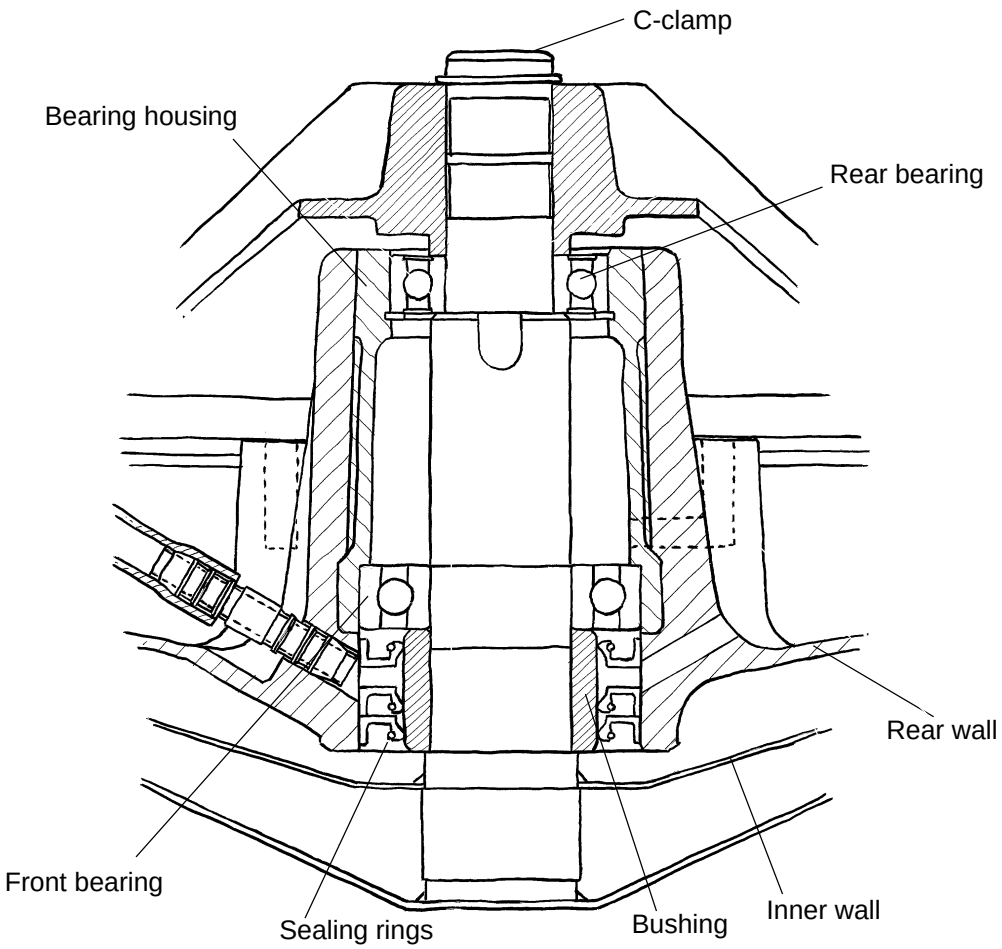
Back gable and bearing

Fig. 22 The back gable and the bearing trunnion housing are constructed of a webbed heavy casting for extra rigidity. There are two neoprene seals to protect from filtration of water. The sleeve bearings are water protected. An intermediate safety outlet provides an escapement for any possible condensation.

The seals are mounted on a chrome-plated, non-corresive, specially hardened sleeve bushing that is mounted on the drive shaft to prevent wear of the seals and shaft. The main bearing is fitted machine-tight into the bearing trunnion housing. A C-clamp is placed on the shaft to prevent the cylinder from moving in and out.

The extension of the bearing trunnion housing supports the rear bearing holding the shaft. The bearings are permanently lubricated and need no maintenance.

22



EX7

2412

Description

The door locking mechanism is a safety system that prevents injury by:

- Preventing the machine from starting before the door has been closed and the handle secured.
- Locking the door automatically when the machine starts.
- Preventing the door from being opened before the program has been concluded and the drum is stationary. This ensures that the drum is stationary when the door is opened and that there is no water in the machine.

Brief description of the locking action

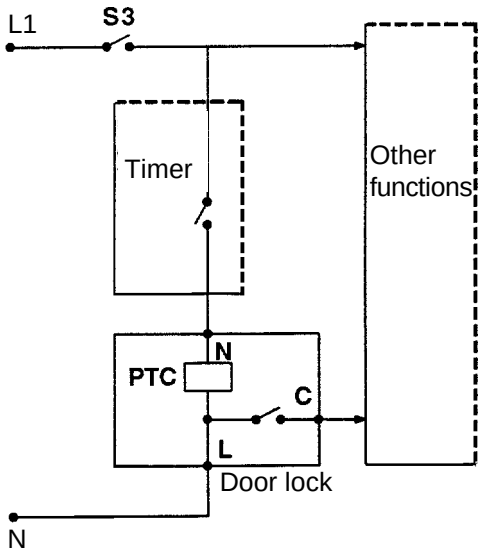
Fig. 23

1.	Door is closed	Microswitch S3 is operated by the door and closes.
2.	Coins are inserted or START button is pressed	The timer energises the PTC resistor in the locking mechanism. This causes the bimetal strip in the mechanism to heat up and toggle over to lock the catch. It also operates an electrical contact, connecting the N line to the connectors and valves in the machine.
3.	Program runs	
4.	Program is finished	The supply to the PTC resistor is disconnected, allowing the bimetal to cool. When it has cooled, it toggles back and releases the catch, while the electrical contact interrupts the common (N) connection to the connectors and valves.

NOTE

Do <u>not</u> repair a faulty door lock. Allways replace the old unit with a new one, to assure proper operation of the door safety interlock.

23



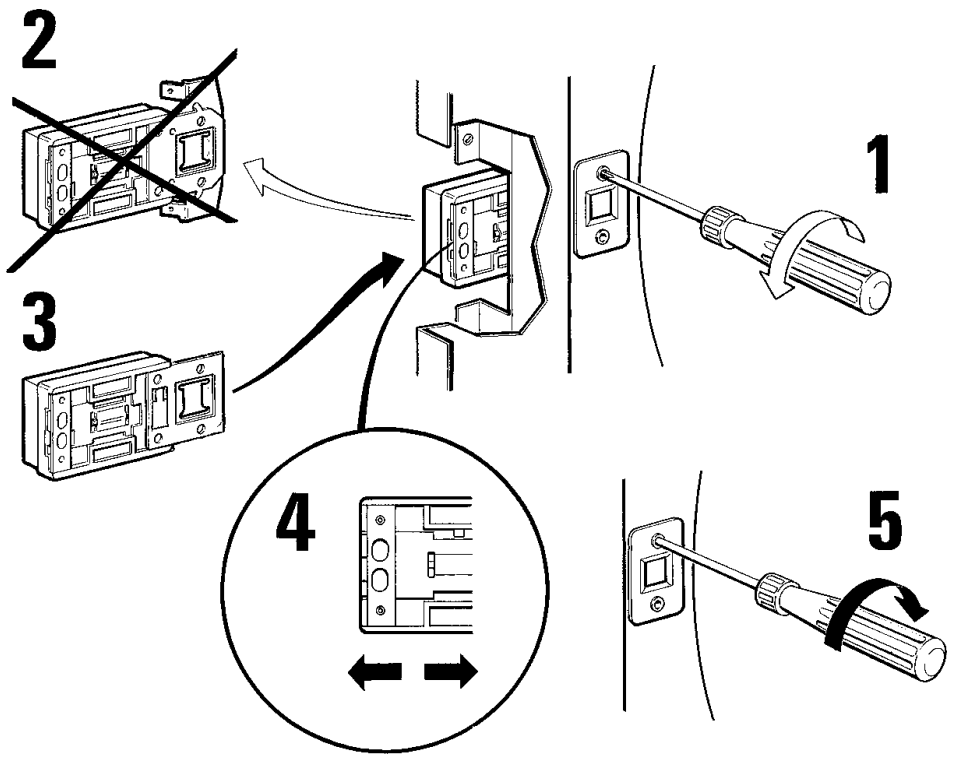
Replacement of door lock

1. Remove the retaining screws securing the front panel and slide the panel downwards until it disengages. Lift it away.
2. Open the door of the machine.

Fig. 24

3. Remove the door lock by undoing the two retaining screws and remove the locking plate (**1**).
4. Pull the lock outwards at the side of the front trim (**2**).
5. Transfer the electrical connections from the old locking mechanism to the new locking mechanism, one at a time.
6. Position the new locking mechanism behind the front trim (**3**).Position the striker plate and secure it using the two retaining screws (**4**).
7. Close the door of the machine and check that the door lock is working.
8. Engage the front panel, and slide it upwards until it can be retained by the two screws in the bottom. Fit the two screws (**5**).
9. Check that the door switch is operating properly by starting the machine and checking that the door cannot be opened while the program is running.

24



0925

Control unit

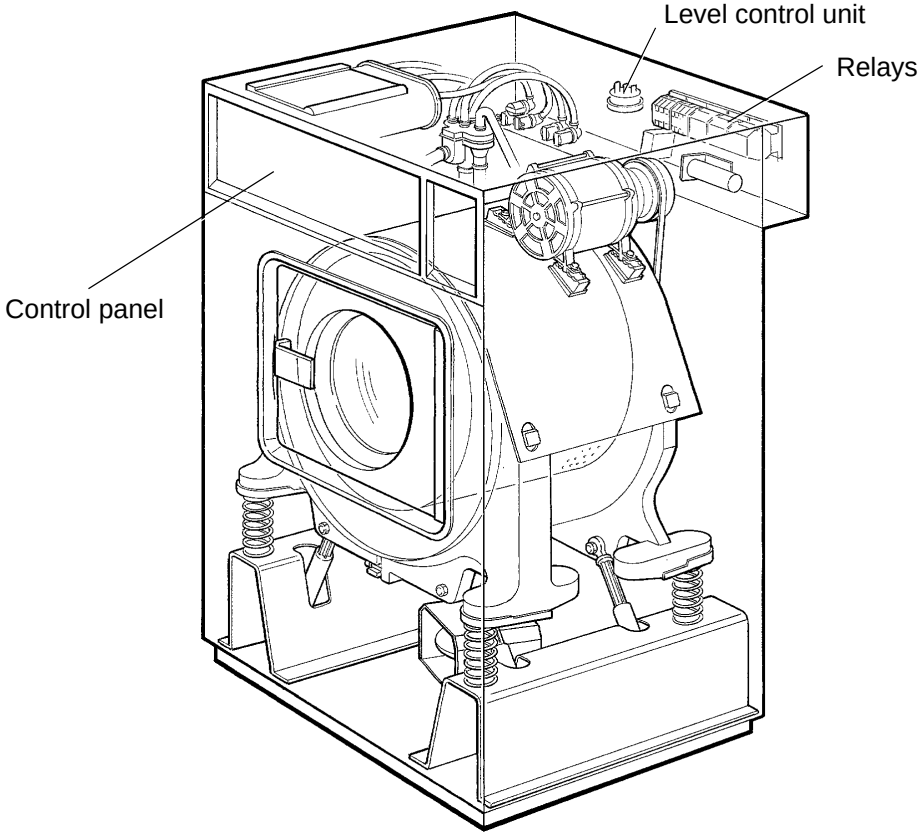
Fig. (25) The timer and program selector are mounted just behind the control panel.

Relays and level controls are located at the top of the machine, easily accessible for service.

Electrical connections to the machine are made by quick-disconnect plugs.

The timer scheme and circuit diagram are sent with each machine.

(25)



0918

Relays

Fig. 26 The Ex7 and Ex10 models employ four relays. The relays control:

- wash speed forward
- wash speed reverse
- distribution speed
- extraction speed

Construction

Fig. 27 The body of the relay holding the stationary contacts is made of current-resistant plastic. A solenoid and a contact bank hold the moving contacts. The contacts are spring-loaded to assure the correct contact pressure.

The relay is constructed for continous operation, whether mounted horizontally or vertically.

Screw-type terminals provide perfect connections even when one or two wires have different diameters.

Operation

When the solenoid is energized, the two halves of the magnet core are drawn together, pulling down the moving contacts, thus making or breaking the circuit. When the current cuts out, springs force the contact bank into its original position, thus closing or opening the circuits.

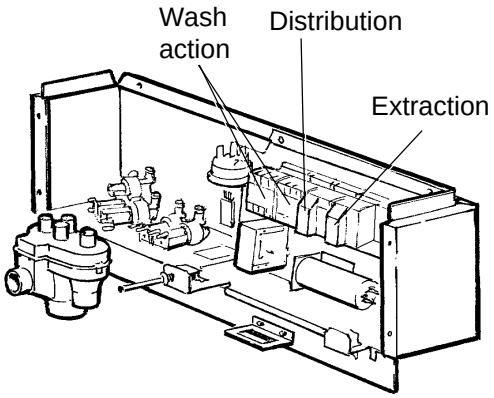
Trouble shooting

If the relay fails to operate despite power to the coil, turn off the power and check the solenoid by measuring the resistance across the terminals (1).

If the relay hums when power is applied, this indicates either a break in the insulator holding the moving contacts at the axle where it holds the top half of core (3) or a rusty core (4), which can be cleaned.

Make sure that the moving contact assembly moves freely. Always replace burnt or pitted contacts (2) ... do not reuse contacts.

26



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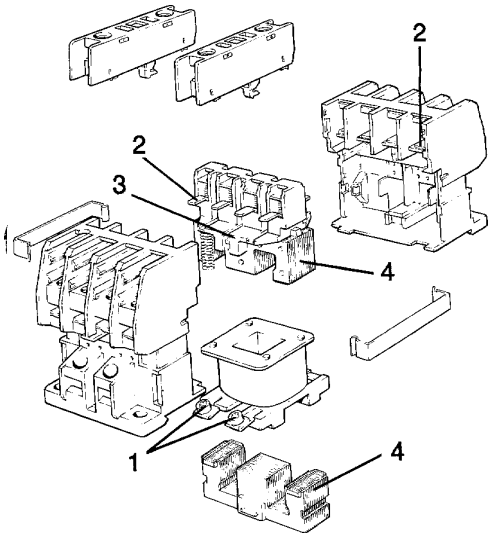


0301

Drive motor

Description

Fig. 28

The motor is mounted on top of the outer drum, on stepped feet to provide a means of adjusting the belt tension. The motor drives the drum through a gearbox and centrifugal clutch via a V-belt.

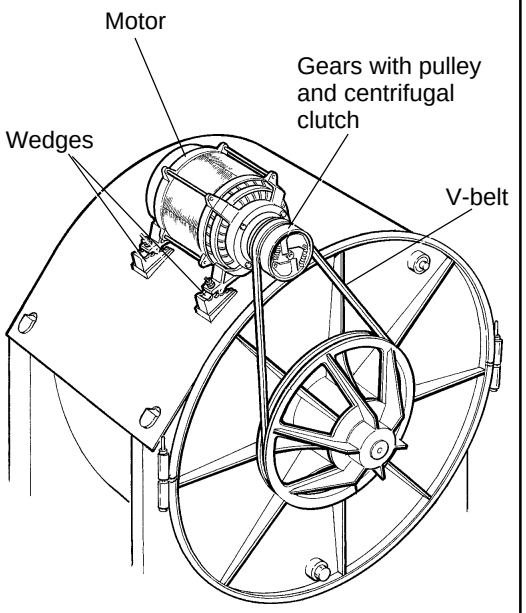
The motor consists of stator, rotor and end-shields with ball-bearings. The stator and the rotor consists of plates, insulated from each other and welded together. The stator is provided with slots in which three windings are wound (one 6-pole for washing action, one 4-pole for distribution speed and one 2-pole for extraction. The windings are impregnated with a temperature-resistant sound-insulating resin varnish according to class B. The end-shields are die-cast. The ball bearings are permanently lubricated.

The gearbox and centrifugal clutch are mounted in one housing on the motor shaft, with the outer casing serving as the belt drive pulley. At washing action speed, the clutch is disengaged, with the result that the motor drives the pulley through a gear reduction. At spin speed, the centrifugal clutch engages and gradually locks the planet carrier to the pulley casing. The pulley is thus accelerated up, by conventional clutch action, to full spin speed, at which speed it is rotating at the same speed as the motor shaft. This arrangement provides a change from washing action speed to spin speed, that requires only one drive motor.

Stepped motor mounts on the outer drum provide a means of adjusting the belt tension. Four bolts secure the motor to the outer drum. Wedge-shaped mounts with a number of steps between the motor feet and the mounting points allow the motor position to be adjusted to give the required belt tension.

The motor incorporates a thermal overload protector, embedded in the motor windings. If the temperature of the windings exceeds about 150° C, the contact interrupts the circuit to the motor contactors.

28



Tensioning the drive belt

1. Slacken the motor securing bolts.
2. Adjust the position of the step wedges until the correct belt tension is obtained. Always adjust the wedges in pairs so that the motor shaft remains parallel to the drum shaft.
3. Retighten the nuts securing the motor.

Replacement of clutch shoes.

Fig. 29

1. Slacken the nuts securing the motor and pull the step wedges outwards to slacken the drive belt. Remove the belt.
2. Disconnect the motor cable connector and remove the motor.
3. Using a puller, pull off the clutch shoe carrier from the motor shaft.
4. Gently tap the replacement clutch shoe carrier onto the motor shaft.
5. Reposition the motor and replace the nuts loosely. Fit the drive belt and connect the motor plug.
6. Tension the drive belt as described above under Tensioning the Drive Belt.

Replacing the gears

1. Slacken the nuts securing the motor and pull the step wedges outwards to slacken the drive belt. Remove the belt.
2. Disconnect the motor cable connector and remove the motor.
3. Using a puller, pull off the clutch shoe carrier from the motor shaft.
4. Remove the circlip from the motor shaft and remove the four screws that secure the gearbox to the motor casing.
5. Using an extractor, pull the gearbox off the motor shaft.
6. Pass a new gearbox over the motor shaft and secure it to the motor frame by means of the four retaining screws.
7. Refit the circlip to the motor shaft and gently tap a replacement clutch shoe carrier onto the motor shaft.
8. Reposition the motor and replace the nuts loosely. Fit the drive belt and connect the motor plug.
9. Tension the drive belt as described above under Tensioning the Drive Belt.

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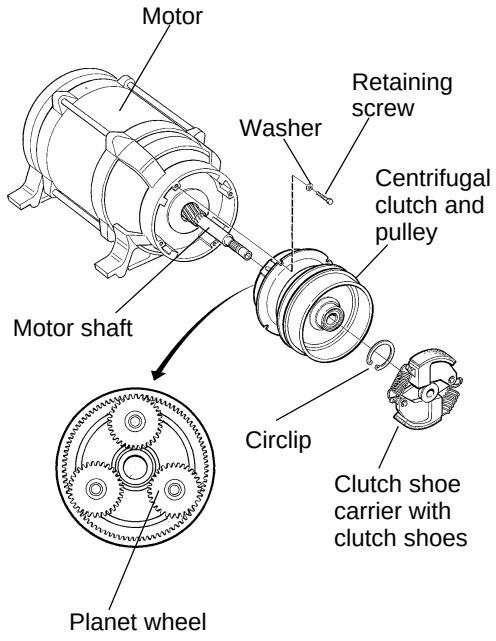
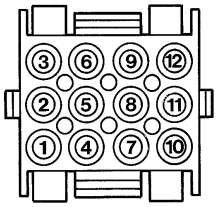


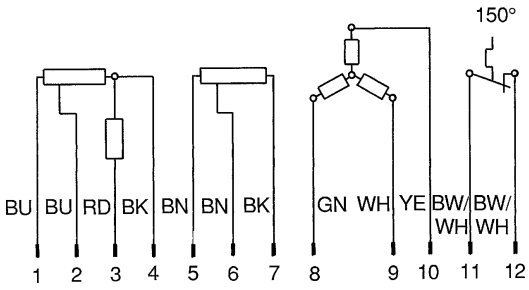
Checking the motor windings

Fig. (30) At room temperature, the motor windings should have the approximate resistances as shown below, when measured between the appropriate connectors in the plug:

(30)



Motor cable connector



Machine model	Resistance (ohms) between terminals: 1-4	2-4	3-4	5-7	6-7	8-9	8-10	9-10
Ex 7	2.6	1.6	3.5	2.6	1.6	4.7	4.7	4.7
EX 10 120V	1.3	0.8	1.7	1.3	0.8	3.4	3.4	3.4
Ex 10 208-240V	4.0	2.7	7.7	4.0	2.7	11.4	11.4	11.4

As a further check, the No-load current with V-belt removed is as follows:

Machine model	No-load current (amps) at terminals: Wash			Dist.					
	8	9	10	2	7	1	3	4	7
Ex 7	3.6	3.6	1.9	6.2	6.2	6.6	5.6	6.6	3.9
EX 10 120V	4.7	5.5	2.4	8.9	8.9	11.0	6.4	11.0	6.8
Ex 10 208-240V	3.0	2.6	1.45	5.4	5.4	6.8	3.6	6.8	4.5

Water level controls

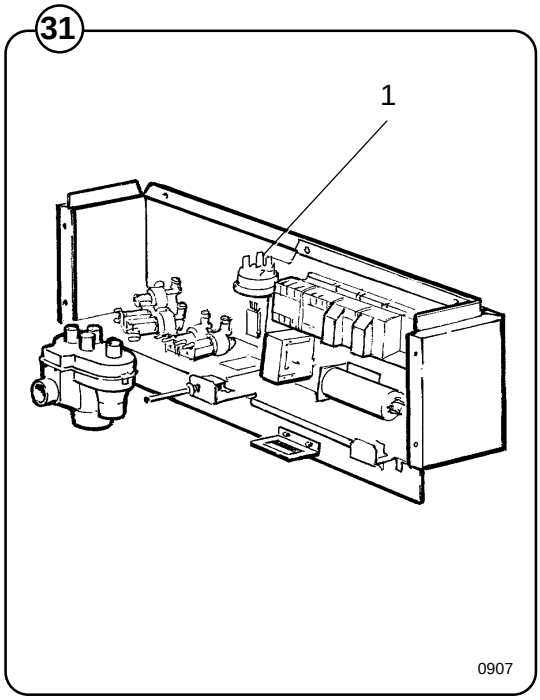
Fig. 31 One pressure switch (1) is used to control the correct water levels during various cycles of the washing program.

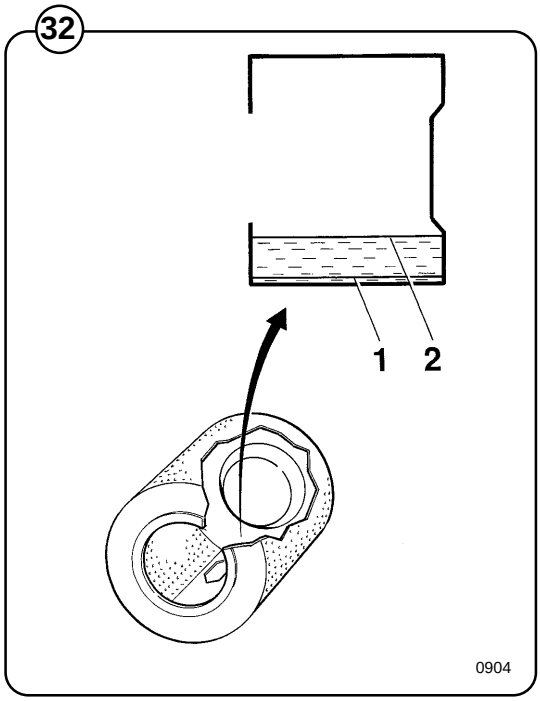
Adjustment

All pressure switches are factory-calibrated to meet specific requirements. The trip level for any one pressure switch can be changed only within narrow limits because each trip range requires a different set of springs.

Water level

Fig. 32 As a guide for checking the level control for proper functioning, the low level should be when the water just reach to the top of the paddle (1), and the high level when the water just reach the outer edge of the tapered section in the rear of the of the drum (2).





Inlet valves

Construction

Fig. (33) The valve has a single-inlet with either one, two or three outlets, each with its own solenoid coil. The body is made of heat-resistant polyamid plastic and the solenoids encased in water-tight plastic.

A filter screen on the inlet side prevents dirt from entering the valve. Flow restrictors can be placed at either the inlet or any of the outlets.

Operation

Fig. (34) When the solenoid is energized, the spring-loaded plunger is drawn up and the pilot valve in the center of the diaphragm open. Because of the difference in diameter between the pilot valve opening and the ventilating hole in the diaphragm, the pressure above the diaphragm drops to a point where the admission pressure below the diaphragm can lift the diaphragm, thus opening the valve.

When the current to the solenoid is cut off, the plunger spring will press the plunger against the pilot opening of the diaphragm. The pressure above the diaphragm then rises to correspond to the water inlet pressure and the pressure of the spring will close the valve.

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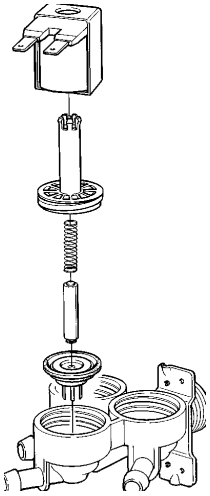

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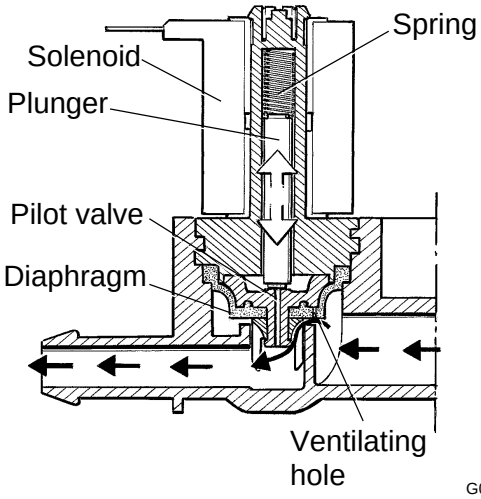

G030

Repair instructions

Limescale can block the holes in the valve diaphragm and interfere with the function of the valve.

Fig. 35 It is therefore advisable to dismantle and clean the valve at certain regular intervals. The frequency depends on operating conditions and the level of contamination in the water.

If the valve does not open

- Check that power is supplied to the coil.
- Check the coil with an instrument to determine whether there is a break or a short circuit.
- Dismantle the valve (see below) and check the openings in the valve diaphragm.
- Check the inlet strainer and clean as required.
- Undo the coil and clean the surfaces of the magnetic core.

If the valve does not close

- Check that the coil is not live. The valve is normally closed when the magnet is not energised.
- Check the return spring.
- Check the diaphragm (pilot pressure opening).

Dismantling the valve

Fig. 36
- Pull the coil straight upwards. Use a screwdriver if necessary to carefully undo the coil.

Fig. 37
- Use the tool supplied (attached to one of the hoses when the machine is delivered) to open the valve housing. Slide the tool over the protruding plastic sleeve to that the pegs on the tool engage the corresponding sockets in the valve housing.
- Use a spanner or a pair of pliers and unscrew the upper part of the valve housing.

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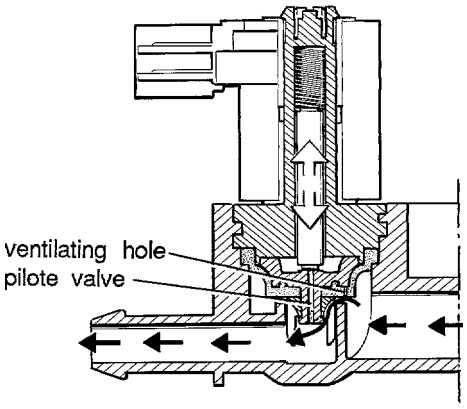

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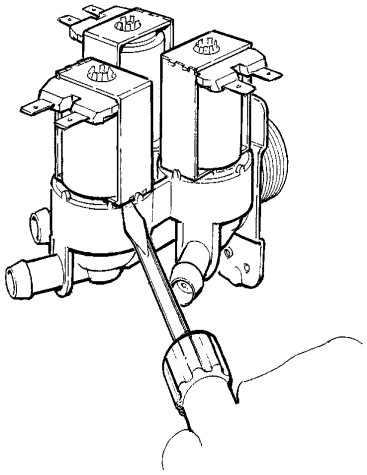

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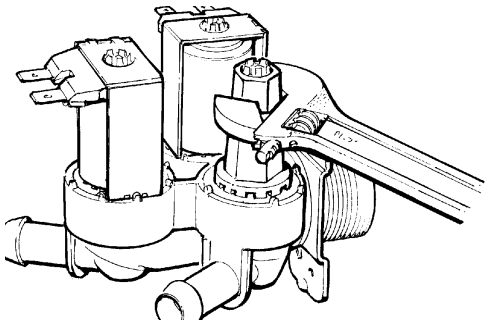

0310

Soap supply box

Fig. (38) The three-compartment soap supply box is located at the top of the machine. Viewed from the front, the compartments marked with figures 1, 2 and 3 are used as follows:

Compartment 1

This compartment is used for adding detergent to the wash at the start of the Soak cycle.

Compartment 2

This compartment is used for adding supplies to the wash at the beginning of the Wash cycle.

Compartment 3

The small compartment is used for adding fabric softener, which is flushed down by a siphon action at the start of the third rinse.

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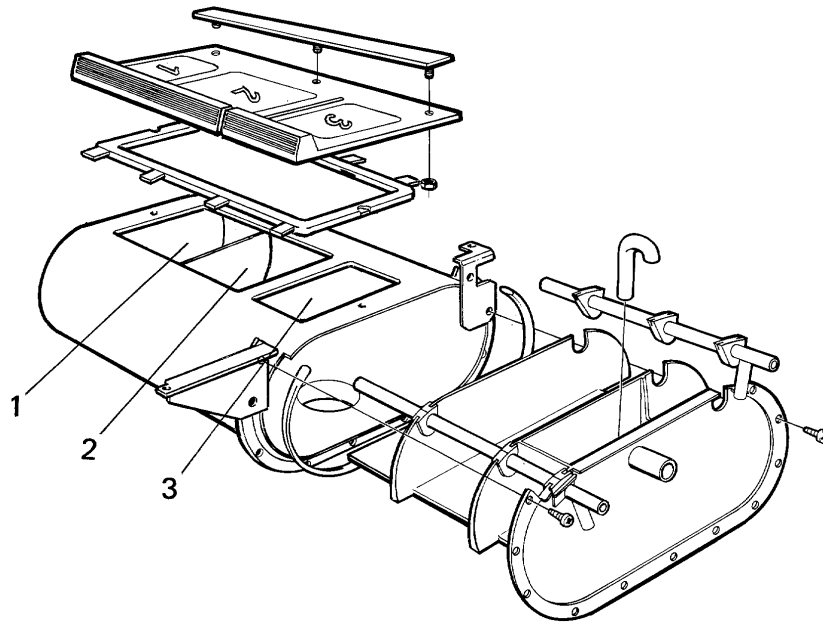


1182

Drain valve

Description

Fig. 39 The drain valve is a motor-operated membrane valve having a large opening cross-section to produce rapid emptying of the machine. The rapid flow action produces a self-cleaning effect, eliminating the necessity for a fluff filter.

The main parts of the valve are:

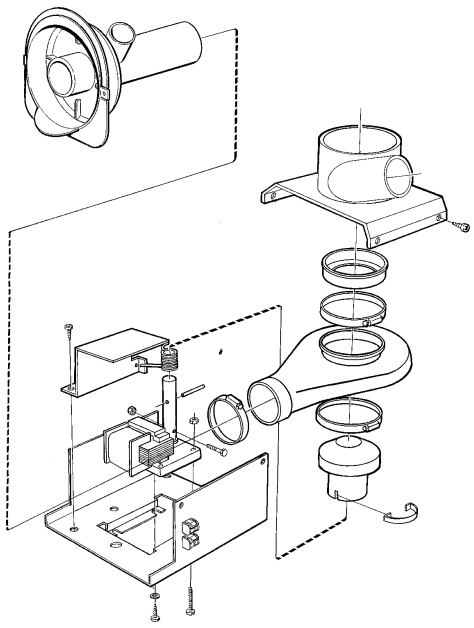
- Motor and gear
- Trapezoidal-threaded piston rod with piston and return spring
- Rubber membrane
- Connections for water filling, overflow, drain and level switch

When de-energised, the valve is open. In this state, the piston, under the action of the return spring, is at the bottom of its travel. The membrane follows the piston downwards and the valve is open.

Energizing the motor drives the piston upwards through the action of the gear and the trapezoidal thread, pressing the membrane against the valve seat and closing the valve.

The overflow connection is connected to the siphon breaker, so that water and foam are discharged directly to drain if the inlet valve or level switch should fail.

39



0919

Repair instructions

Lime deposits or dirt on the membrane can result in the valve not opening or closing correctly. The valve should therefore be cleaned at regular intervals, depending on operating conditions and water quality.

Valve does not open or close correctly

- Check that the motor is correctly energised
- Check that the piston rod can move freely
- Check that the membrane is not clogged with deposits

When changing the motor and gear assembly, note the following cable connections:

Brown cable: 60 Hz

Blue cable: Common

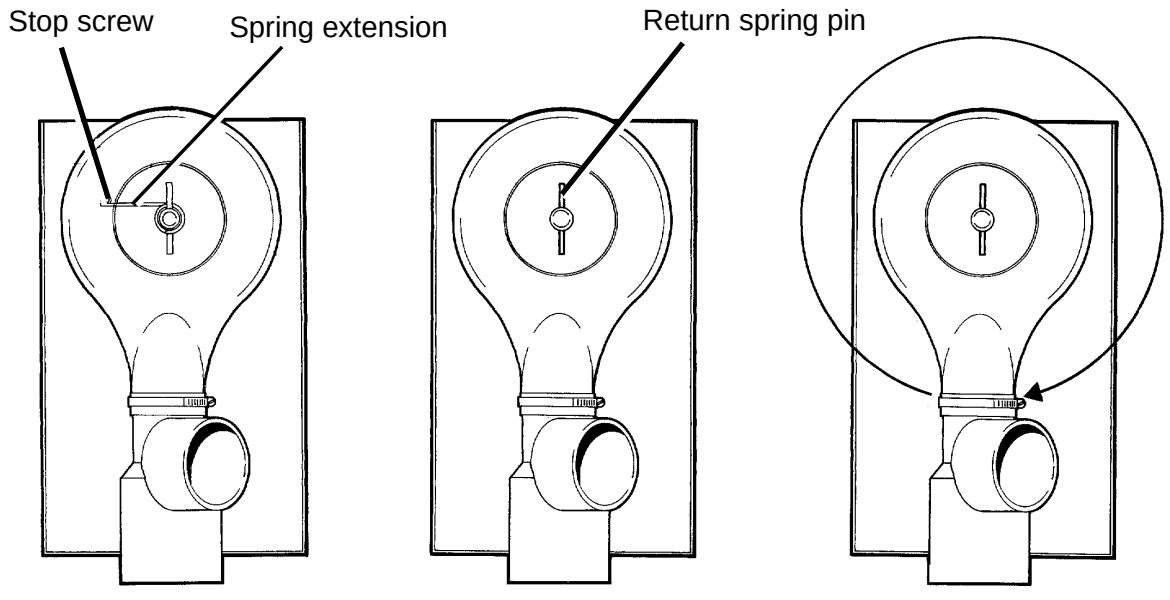
Black cable: 50 Hz

Pre-tensioning the return spring

Fig. (40) Remove the valve casing.

1. Turn the return spring so that the arm of the spring bears against the stop screw.
2. Fit the piston rod so that the slot in which the spring is to engage is aligned with the casing. Place the valve casing over the return spring so that the pin on the spring fits into the slot in the piston rod.
3. Turn the casing through one turn clockwise. This will engage the pin on the spring in the piston rod, tensioning the spring by about 1/4 of a turn due to the rise of the piston rod.

(40)



Out of balance switch

Description

Fig. 41 The purpose of the out-of-balance protection switch is to prevent the machine from being damaged by vibration that could be caused if the washing load was too unevenly distributed in the drum during spinning.

The switch consists of a microswitch with an extended operating lever, fitted to the electrical component platform, and a rectangular plate with a cut-out fitted to the outer drum.

Excessive movement of the outer drum caused by vibration will cause the plate to operate the microswitch, resulting in the programmer stepping forward to the next stage of the program and interrupting the current to the spin connector.

See also Function Sequences.

Repair instructions

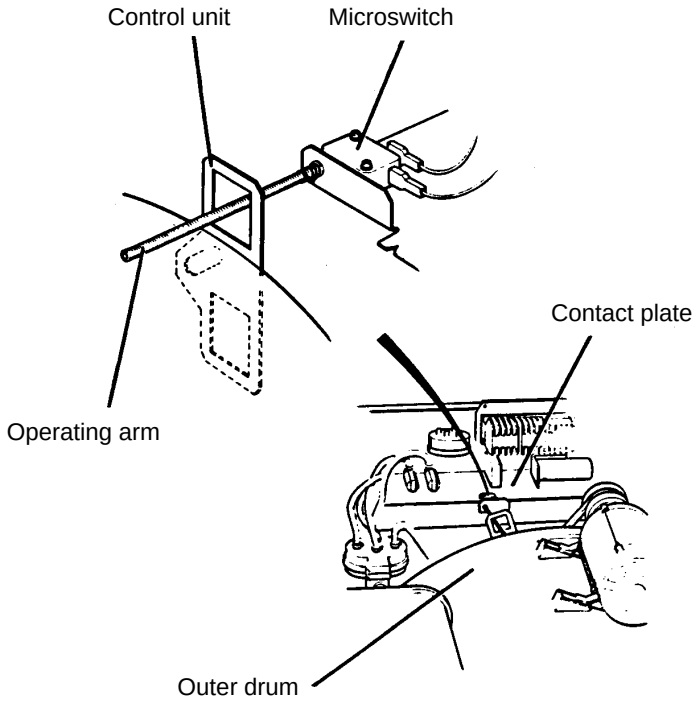
Checking the setting of the out-of balance protection switch.

When the machine is spinning, with a load in the drum, check that the operating arm of the microswitch is about 5 mm below the centre of the rectangular cut-out. Adjust if necessary by moving the metal plate with the cut-out.

The out-of-balance protection switch operates repeatedly

- Unsuitable load in the drum
- The switch is incorrectly adjusted. Adjust as described above.
- The shock-absorbers are worn.

41



0933

Speed guard

Description

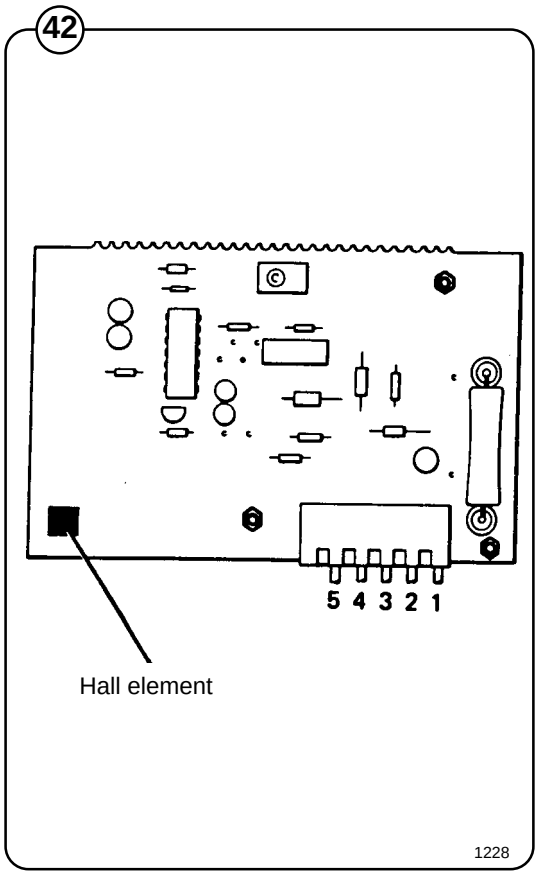
The speed guard protects the main drive motor so that:

- Reverse direction of rotation cannot be engaged until the motor is stationary.
- Washing action speed cannot be engaged directly after spinning until the motor is stationary.

Fig. 42 The speed guard consists of a circuit board with at Hall effect sensor, positioned so that two magnets, fitted diametrically opposite each other on the drum drive pulley, sweep across it and generate pulses.

The pulses from the Hall effect sensor are processed on the board, the output of which is in the form of a triac which connects terminals 2 and 5 when the following conditions are all fulfilled simultaneously:

- Terminals 3 and/or 4 of the circuit board are energised.
- The time between pulses from the Hall element exceeds 2 s, i.e. the drum is stationary.
- A power supply is connected to terminal 1.

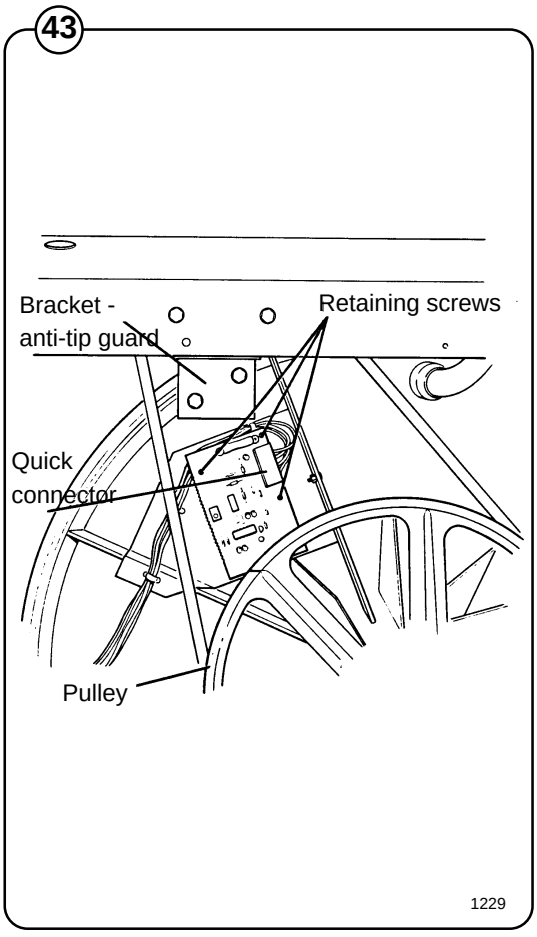


Repair instructions

Fig. 43 We do not recommend that any attempt be made to repair the speed guard: a faulty switch should be replace.

Replacement of speed guard.

1. Remove the rear panel of the machine and undo the speed guard cable connector.
2. Remove the four retaining screws that secure the speed guard board.
3. Fit a new speed guard, reconnect the cable connector and test-run the machine. Refit the rear panel.



Procedure for use

Preparations

Sort the laundry according to the wash program categories listed on the control panel. Check washing instructions on garment tags.

Empty pockets and close zippers.

Open door, put laundry in the machine and close door.

Washing

Fig. (44) Turn control knob to desired wash program.

Add detergent and fabric softener in the compartments on top of the machine:

- pre-wash detergent in compartment 1
- regular detergent in compartment 2
- liquid fabric softener in compartment 3

Fig. (45)

Follow dosage instructions on detergent package.

Liquid detergent can only be added at the beginning of the specific cycle.

Insert coins or tokens. When the right amount has been added the machine starts automatically.

Finishing

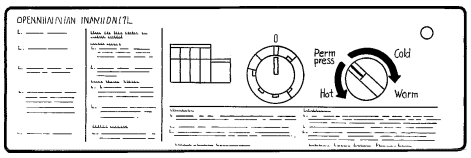
When the wash program is finished and the drum has stopped rotating, open the door and take out the laundry.

Fig. (46) When necessary, clean the door gasket and detergent compartments. Wipe off the machine with a damp cloth.

Leave the door open when the machine is not in use.

Leave the machine in the condition you would expect to find it in.

44



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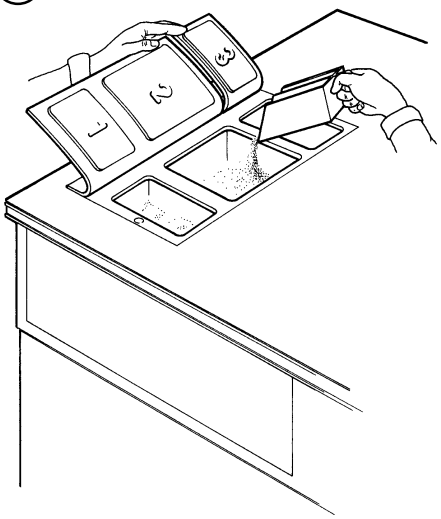
45



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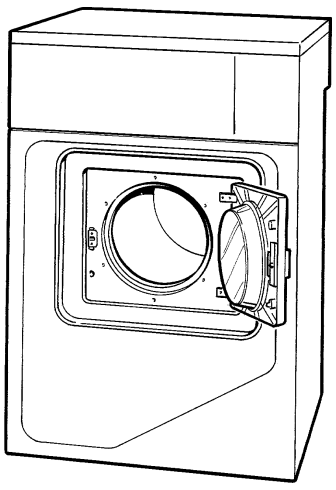
46



1606

Wash Programs

Fig. 47 In the figure below is an overview of the four wash programs.

On the following pages you will find a more detailed description of the programs.

47

	HOT			WARM			COLD			PERM PRESS		
	Time (min)	Temp	Water level	Time (min)	Temp	Water level	Time (min)	Temp	Water level	Time (min)	Temp	Water level
Prewash	3	Warm	Medium	3	Warm	Medium	3	Cold	Medium	3	Warm	Medium
Detergent 1												
Drain	1			1			1			1		
Mainwash	6	Hot	Medium	6	Warm	Medium	6	Cold	Medium	6	Warm	Medium
Detergent 2												
Drain	1			1			1			1		
Rinse 1	1	Cold	Medium	1	Cold	Medium	1	Cold	Medium	1	Cold	Medium
Drain	1			1			1			1		
Extract	0.5			0.5			0.5			0.5		
Rinse 2	1	Cold	Medium	1	Cold	Medium	1	Cold	Medium	1	Cold	Medium
Drain	1			1			1			1		
Extract	0.5			0.5			0.5			0.5		
Rinse 3	2	Cold	Medium	2	Cold	Medium	2	Cold	Medium	2	Cold	Medium
Detergent 3												
Drain	1			1			1			1		
Extract	5			5			5			1		
Shake-out	1			1			1			1		
Total time (water fill time not included)	25			25			25			21		

1603

Wash program, Hot

Fig. 48

After the machine has started and the door automatically locked, the drain valve will close and the hot and cold water valves will open to fill the machine with mixed hot and cold water to the level determined by the level control.

When this level is reached, both water valves will close. During filling and then through the wash program the drum has a reversing rotation.

At the end of the soak, the drain valve will open, whereafter hot water will fill to the level determined by the level control. At the same time detergent from compartment 2 is flushed down with hot water.

The water level controlled machine will now wash the fabrics for 6 minutes. The machine is then emptied.

Cold water is now filled to the high level for the first rinse which lasts one minute, followed by drain and short extraction for 30 seconds. After the extraction comes the second rinse in cold water, ending with extraction, whereafter the third rinse is started. Fabric softener is automatically admitted during the third rinse. The fabrics are rinsed in cold water for two minutes followed by an extraction of five minutes duration. Finally there is a shake out for one minute.

48

	HOT		
	Time (min)	Temp	Water level
Prewash	3	Warm	Medium
Detergent 1			
Drain	1		
Mainwash	6	Hot	Medium
Detergent 2			
Drain	1		
Rinse 1	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 2	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 3	2	Cold	Medium
Detergent 3			
Drain	1		
Extract	5		
Shake-out	1		
Total time (water fill time not included)	25		

1603

Wash Program, Warm

Fig. (49) On starting the machine, the door will be automatically locked, and the pre-wash will be carried out as previously described, whereafter the main wash is started.

As the main wash is started, the drain valve closes, detergent is admitted and mixed hot and cold water is filled to the level determined by the level control.

On reaching this level, the water valves are closed.

The water level controlled machine will now wash the fabrics for six minutes. The machine is then emptied.

Cold water is filled for the first rinse which lasts one minute, followed by extraction for 30 seconds.

After this extraction comes the second rinse in cold water ending spin extraction, whereafter the third rinse is started. Fabric softener is automatically admitted during the third rinse. The fabrics are rinsed with cold water for two minutes followed by a extraction of five minutes duration. Finally there is a shake out for one minute.

49

	WARM		
	Time (min)	Temp	Water level
Prewash	3	Warm	Medium
Detergent 1			
Drain	1		
Mainwash	6	Warm	Medium
Detergent 2			
Drain	1		
Rinse 1	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 2	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 3	2	Cold	Medium
Detergent 3			
Drain	1		
Extract	5		
Shake-out	1		
Total time (water fill time not included)	25		

1603

Wash Program, Cold

Fig. 50

On starting the machine, the door will be automatically locked, the drain valve closed, the cold water valve opened and the pre-wash carried out as previously described, whereafter the main wash is started.

As the main wash is started, the drain valve closes, detergent is admitted and cold water is filled to the level determined by the level control.

On reaching this level, cold water is closed.

The water level controlled machine will now wash the fabrics for six minutes. The machine is then emptied.

Cold water is filled for the first rinse which lasts one minute, followed by extraction for 30 seconds.

After this extraction comes the second rinse in cold water ending with extraction, whereafter the third rinse is started.

Fabric softener is automatically admitted during the third rinse. The fabrics are rinsed with cold water for two minutes followed by an extraction of five minutes duration. Finally there is a shake out for one minute.

50

	COLD		
	Time (min)	Temp	Water level
Prewash	3	Cold	Medium
Detergent 1			
Drain	1		
Mainwash	6	Cold	Medium
Detergent 2			
Drain	1		
Rinse 1	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 2	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 3	2	Cold	Medium
Detergent 3			
Drain	1		
Extract	5		
Shake-out	1		
Total time (water fill time not included)	25		

1603

Wash Program, Permanent Press

Fig. (51) On starting the machine, the door will automatically lock, the drain valve close, the hot and cold water valves open and the pre-wash will be carried out as previously described, whereafter the main wash is started.

As the main wash is started, the drain valve closes, detergent is admitted and mixed hot and cold water is filled to the level determined by the level control.

On reaching this level, the water valves are closed and the wash motor starts its reversing rotation.

The water level controlled machine will now wash the fabrics for six minutes. The machine is then emptied.

Cold water is filled for the first rinse which lasts one minute, followed by extraction for 30 seconds.

After this extraction comes the second rinse in cold water ending with extraction, whereafter the third rinse is started.

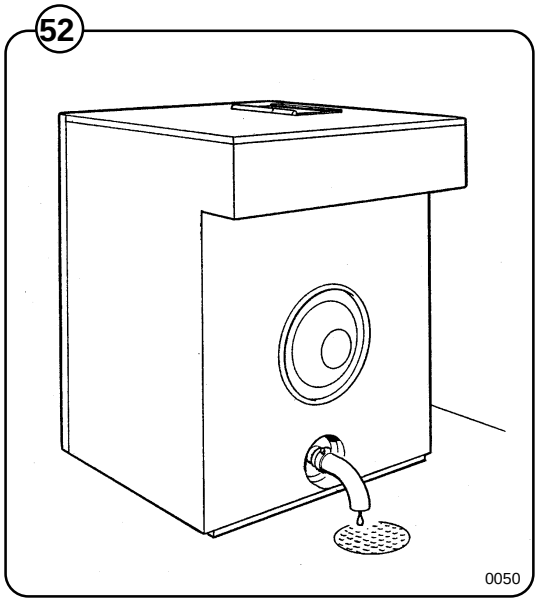
Fabric softener is automatically admitted during the third rinse. The fabrics are rinsed with cold water for two minutes followed by an extraction of one minutes duration. Finally there is a shake out for one minute.

51

	PERM PRESS		
	Time (min)	Temp	Water level
Prewash	3	Warm	Medium
Detergent 1			
Drain	1		
Mainwash	6	Warm	Medium
Detergent 2			
Drain	1		
Rinse 1	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 2	1	Cold	Medium
Drain	1		
Extract	0.5		
Rinse 3	2	Cold	Medium
Detergent 3			
Drain	1		
Extract	1		
Shake-out	1		
Total time (water fill time not included)	21		

1603

Maintenance



Preventive maintenance has been reduced to a minimum by the careful design of reliable components and material.

However, the following measures should be taken at regular intervals and in proportion to the hours of service.

Daily

- Check the door lock and interlock before starting operations.
- Start the machine and check that the door remains locked while the machine is operating. Use the Rapid Advance function to step the program to the Stop position and check that the door stays locked until 30 seconds after the program is completed.
- Clean the door seal and remove powder residue. Check that the door does not leak.
- Clean the detergent compartments and wipe down the machine with a damp cloth.
- Check that the drain valve does not leak, and that it opens properly.

Fig. 52

Weekly

- Remove lint or fluff remnants from the drain opening, joints in drain pipes, etc.

Every third month

- Check for leaks in valves, hoses and connections.
- Check that the V-belts between the motor and pulley is undamaged and correctly tensioned.

IMPORTANT!

Make certain that all electrical power to the machine is shut off before removing top or rear panels.

Trouble shooting

If machine does not start

Check to ensure that:

- it is turned on at the mains.
- the manual shut-off valves are open.
- a program has been selected.
- the drum door is locked
- if it is a coin-operated machine, that the correct amount of coins or tokens have been inserted.
- the glass cartridge fuse is not blown.

If water does not drain

Fig. 53

A Check drain valve for proper operation.

B Disconnect drain hose connected to drain line. If full flow of water comes out, the problem is in the main waste line. If water flow is slow, the problem is the accumulation of foreign materials between the drain valve and shell outlet of machine. Clean valve body of any foreign objects found.

If machine does not extract

Fig. 54

A Check extract relay and relay coil for proper operation.

B Check level control tube for clogging

If motor does not operate at wash speed

Fig. 55

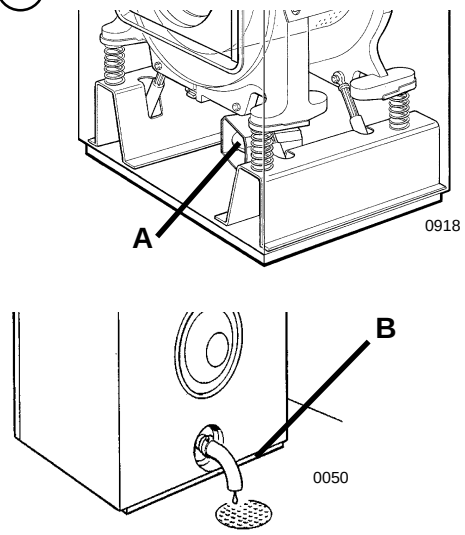
A Check wash relays.

B Check motor and V-belt.

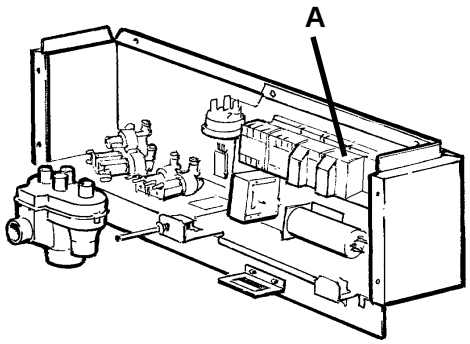
C Check normally-closed contact of extract relay.

D Review procedures outlined under section ”If machine does not start” above.

53



54



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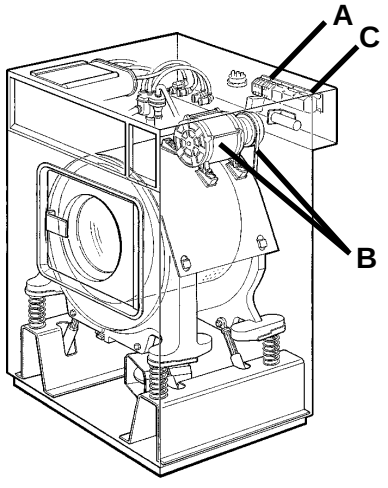
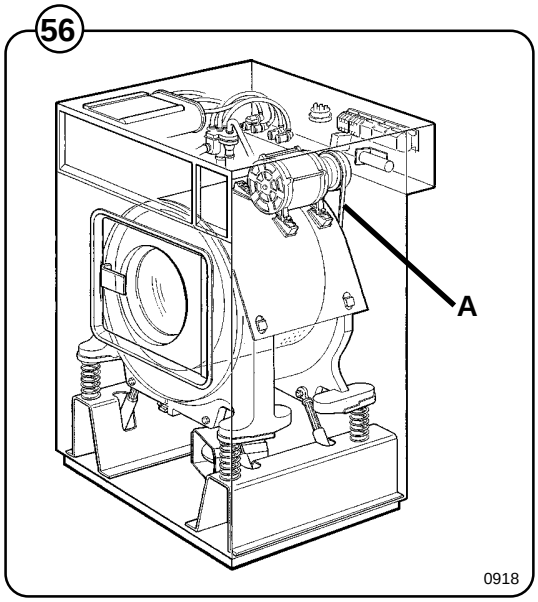


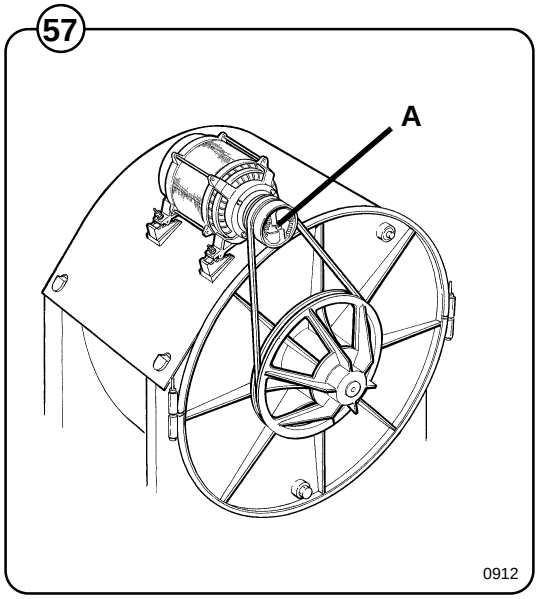
If machine runs slowly on wash speed or there is a slapping or thumping noise.

Fig. 56 **A** Replace V-belts

If a metallic noise can be heard at rear of machine

Fig. 57 **A** Tighten pulley on motor shaft





If there is a leaking around the glass

Fig. 58

A Replace door gasket if worn.

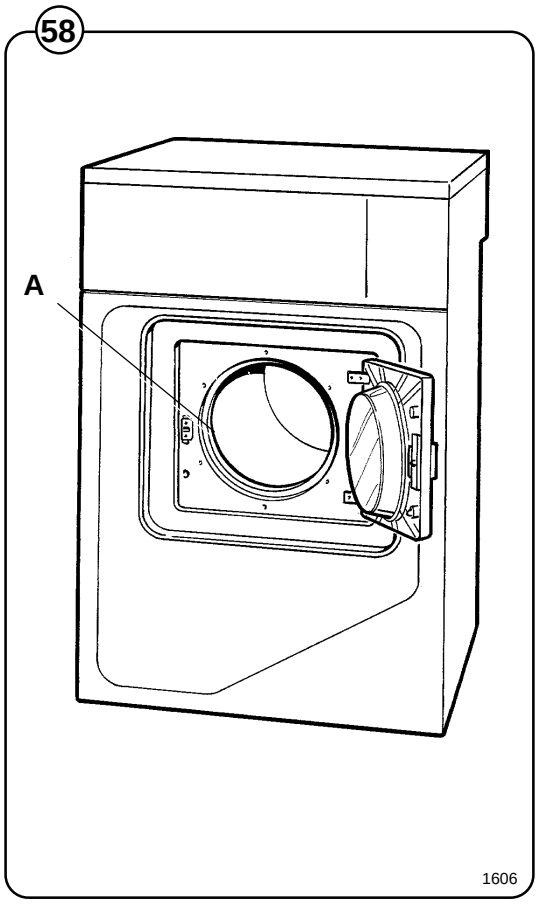
If water does not enter the machine.

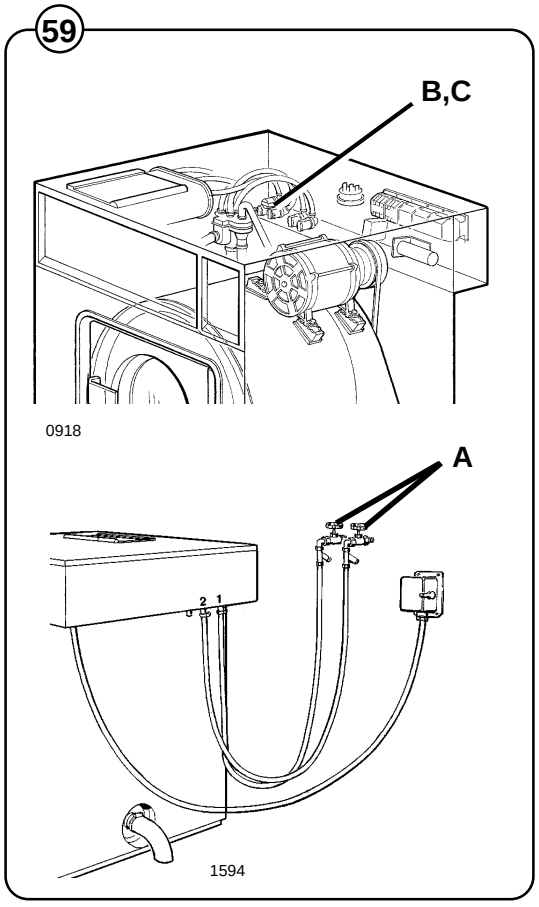
Fig. 59

A Be sure manual shut-off valves are in open position.

B Check the coils on inlet valves.

C Check wires leading to valve coils.





If water continues to fill without stopping.

Fig. 60

A Check hose attached to level control unit.

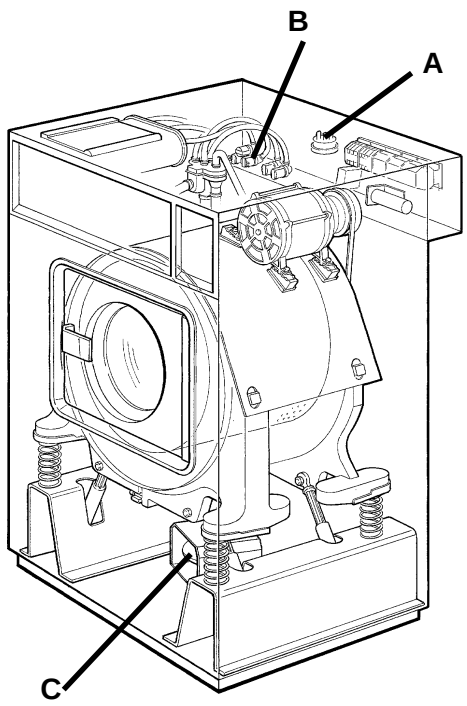
B Check inlet valves for dirt underneath the valve diaphragm. To localize, shut off power. If water continues to flow, inlet valves have foreign material in them and should be thoroughly cleaned.

If water continues to flow without filling machine.

Fig. 60

C Check seating of drain valve.

60



0918

General

This chapter describes the electrical operation of models EX7 and EX10 with the washing program P03CH. These machines are equipped with an electromechanical timer, are connected to cold and hot water and do not have steam or electrical heating.

To facilitate fault tracing in the electrical system of the machine, the circuit diagram in divided into function sequences. The following sequences are described.

Notes:

(a) Numbers in parentheses (x) refer to portions of the wiring diagram which are numbered from the top down on each page with a diagram on it.

(b) Numbers in circles ⓧ refer to specific points on the wiring diagram.

(c) Numbers refered to as "position" x refer to numbered steps on the timer scheme at the bottom of each descriptive page.

Power supply and start, machine without coin meter

Most parts of the control circuit do not receive voltage until the door is shut and the door switch S3 (4) is closed (point Ⓑ in the diagram). Other portions of the circuit receive voltage even if the door is open (point A in the diagram). These feed points reoccur in other function sequences.

The same conditions apply for points Ⓒ and Ⓓ. Point Ⓒ does not receive voltage until switch S21 (15) in the door lock is closed, i.e. the door is locked. Point Ⓓ receives voltage even if the door is unlocked.

Start

When a program is completed the machine stops in program timer position 54 and the door can be opened.

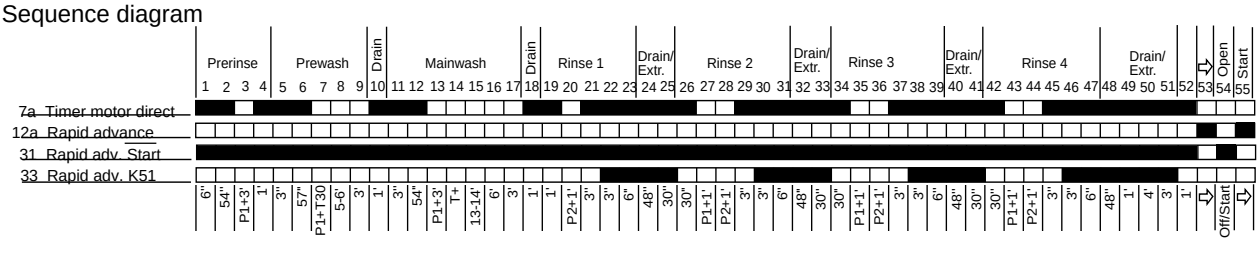
To be able to start the machine the door must be closed and locked so that the contacts of S3 (4) and S21 (15) are closed. Then switch S6 (11) receives voltage. When S6 is pressed to start a new program, the coil for rapid advance (14) receive voltage as timer contact 31 (13) is closed in position 54. In position 55 the timer stops (row 3) until S6 is released. Then the timer is rapid advanced to position 1 (contact 12a (5) is closed in position 55) and the wash program starts. This design prevents accidental excess rapid advance of the timer when starting.

Rapid advance

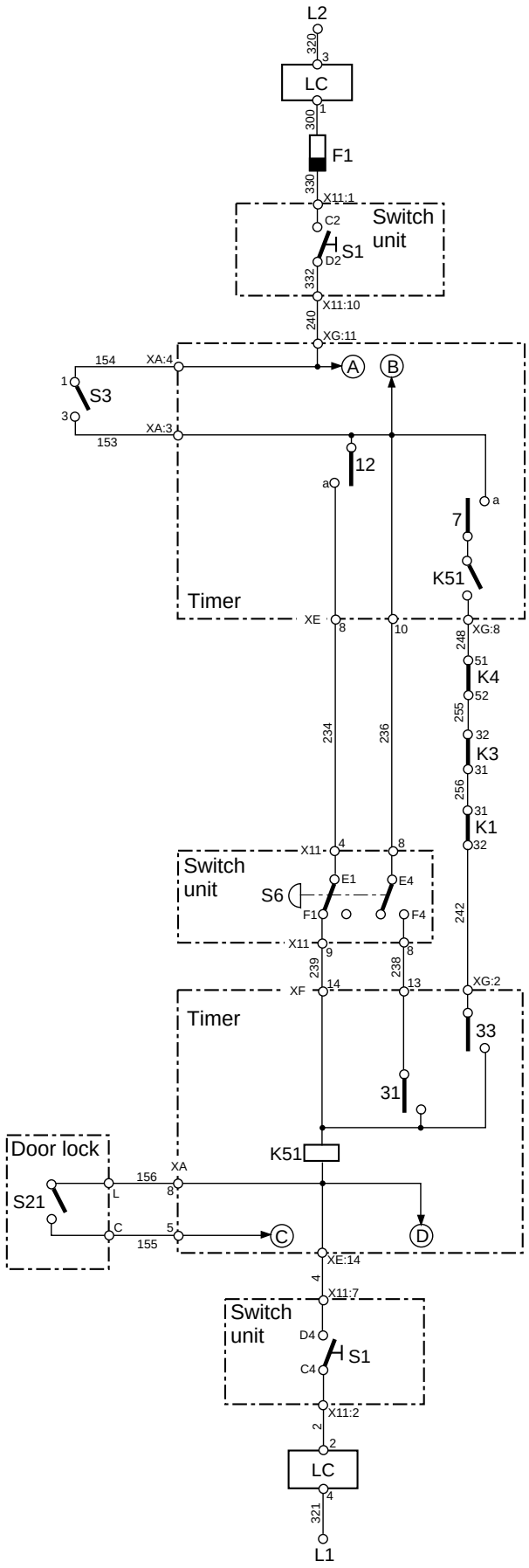
By pressing S6 (11) one can rapid advance past different parts of the wash cycle (contact 31 (13) is closed in position 1-52). If S6 is released during extraction the rapid advance will continue and pass this phase due to:

- Contact 7a (6) and 33 (12) are closed during extraction.
- Relay contact K51 (7) is closed when rapid advancing.
- The feeding to all motor relays is interrupted at rapid advance, which means that relay contacts K4 (8), K3 (9) and K1 (10) are closed.
- The coil for rapid advance (14) receives voltage during extraction even if S6 is not pressed.

Sequence diagram



1649



(1) LC-unit

(2) Fuse F1

(3) Switch S1 On-Off

Ⓐ Ⓑ : Power supply to other function sequences

(4) Switch S3 Door

(5) Timer contact 12a
Rapid advance

(6) Timer contact 7a
Timer motor direct

(7) Relay K51 rapid advance

(8) Relay K4
Extraction M1

(9) Relay K3
Distribution M1

(10) Relay K1
Wash M1

(11) Switch S6
Start + K51

(12) Timer cam 33
Rapid advance K51

(13) Timer cam 31
Rapid advance Start + Continuous

(14) Coil for rapid advance
of timer

(15) Switch S21
Door lock

Ⓒ Ⓓ : Power supply to other function sequences

(16) Switch S1 On-Off

(17) LC-unit

1648

Power supply and start, machine with coin meter

Some control circuits do not receive voltage until the door is shut and the door switch S3 (4) is closed (point Ⓑ in the diagram). Other circuits receive voltage even if the door is open (point Ⓐ in the diagram). These feed points reoccur in other function sequences.

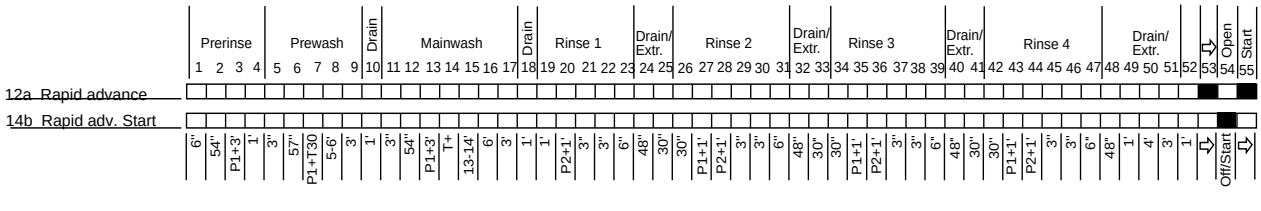
The same conditions apply for points Ⓒ and Ⓓ. Point Ⓒ does not receive voltage until switch S21 (15) in the door lock is closed, i.e. the door is locked. Point Ⓓ receives voltage even if the door is unlocked.

Start

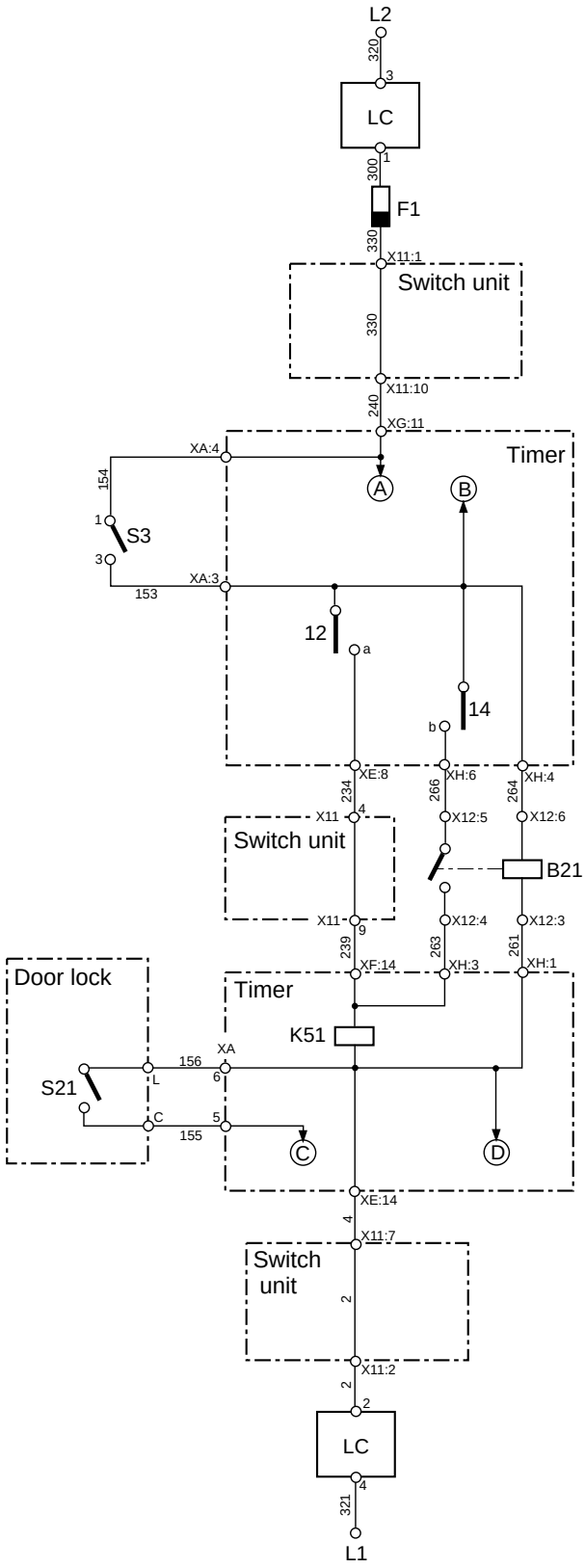
When a program is completed the machine stops in program stage 54 and the door can be opened.

To be able to start the machine the door must be closed and locked so that the contacts of (S3 (3) and S21 (8) are closed. Then the coin meter B21 (6) receives voltage. When correct amount of coins have been inserted, the contact (6) are closing. As contact 14 (5) is closed in position 54, the coil for rapid advance receive voltage from timer (7) and advances the timer. In program position 55, contact 14b opens but the timer continues to feed to position 1 as contact 12a (4) is closed in position 55. With this design the timer is advanced to stage 1 independently of how long time the contact of the coin meter is closed.

Sequence diagram



1651



(1) LC-unit

(2) Fuse F1

Ⓐ Ⓑ : Power supply to other sequences

(3) Switch S3 Door

(4) Timer contact 12a
Rapid advance

(5) Timer contact 14b
Rapid advance Start

(6) Coin meter B21

(7) Coil for rapid advance of timer

(8) Switch S21 Door lock

Ⓒ and Ⓓ = Power supply to other sequences

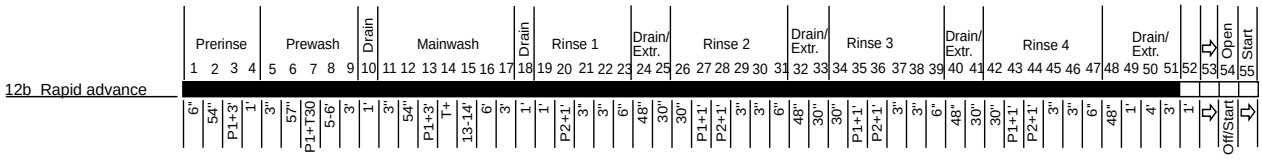
(9) LC-unit

1650

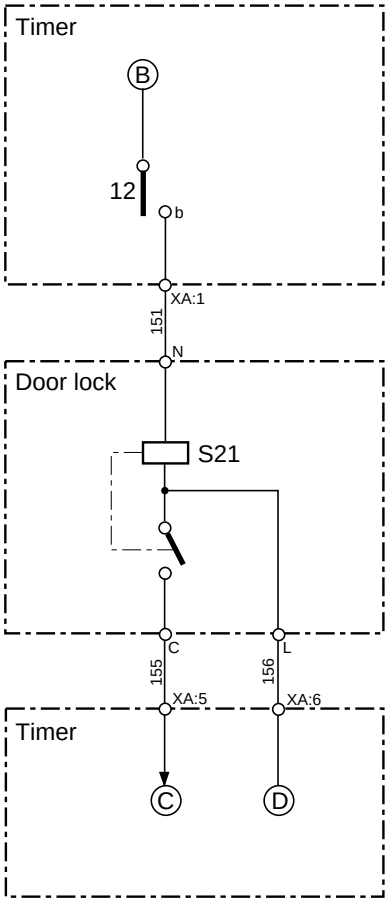
Door lock

When the door is closed there is voltage to point Ⓑ in the diagram. (see sequence ''Power supply and start''). When the machine has been started and the timer advanced to stage 1, contact 12b (1) closes. The door coil (2) receive voltage and locks the door lock. When the door is locked the door lock switch (3) is closed and point Ⓒ in the diagram is connected with point Ⓓ . From point Ⓒ the motor relays and inlet valves receive voltage.

Sequence diagram



1653



Ⓑ = Power supply, see function sequence "Power supply and start"

(1) Timer contact 12b
Rapid advance

(2) Door solenoid S21

(3) Switch door lock

Ⓒ Ⓓ = Power supply, see function sequence "Power supply and start"

Rapid advance, program selection

The timer is built to be used in many different types of machines and is equipped with functions which are not used in EX7 and EX10. Because of this the timer is passing some stages by rapid advance.

Rapid advance, all programs:

Row	Stage	Part
34	1-4	Program stage Pre-rinse omitted
37	8	Pre-wash shortened by 6 minutes
38	15	Main-wash shortened by 14 minutes
40	26-33	Rinse 2 is passed.

EX7 and EX10 have no heating. Because of this position 7 and 14 are rapid advanced. Normally the timer stops for heating.

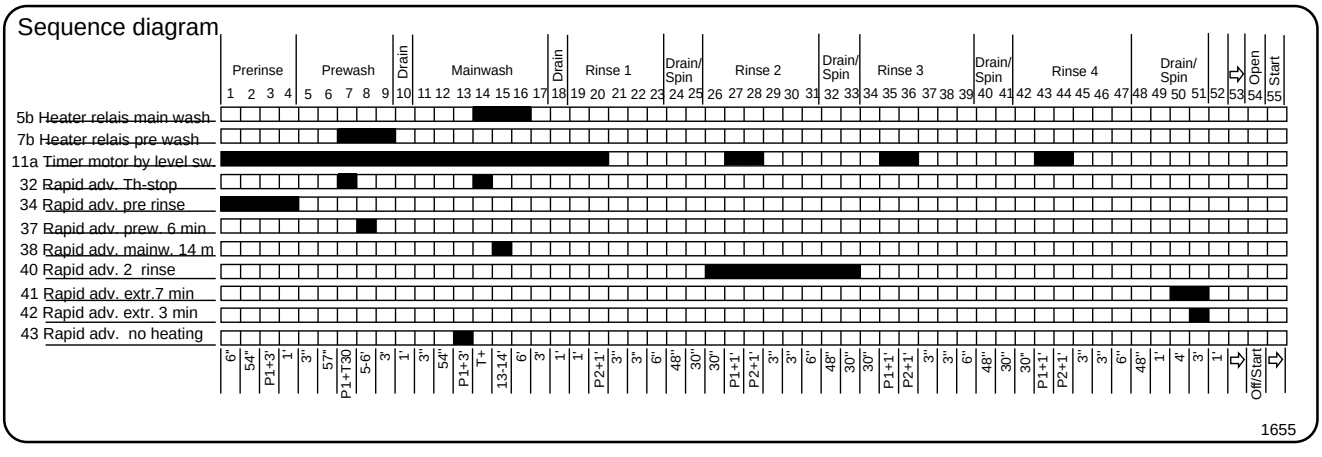
In position 7 the contacts 11a (1) 7b (3) and 32 (7) are closed. When water has been filled to correct level, point Ⓔ receives voltage (see sequence "Water filling'). Then the coil receives voltage and the timer rapid advances to position 8.

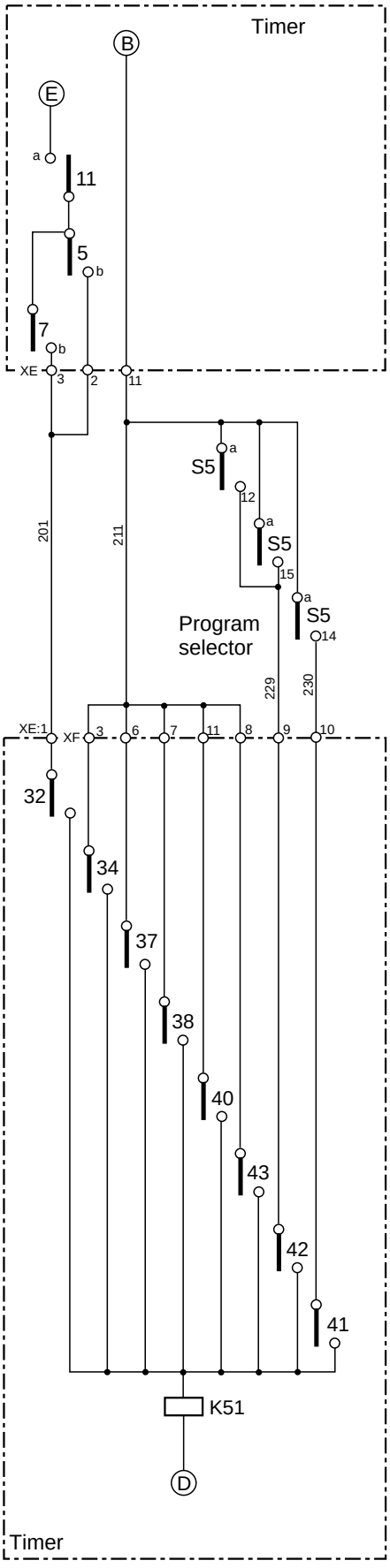
In position 14 the contacts 11a (1), 5b (2) and 32 (7) are closed. When water has been filled to correct level, point Ⓔ receives voltage (see sequence "Water filling"). Then the coil receives voltage and the timer rapid advances to stage 15.

Rapid advance at program selection

In the programs Cold, Worm and Hot contacts 12 (4) or 15 (5) in the program selector closed. This means that the timer rapid advances position 51, when contact 42 (13) closes ad shortens the extract time by 3 minutes.

In the program Permanent Press, contact 14 (6) in the program selector is closed. This means the timer rapid advances position 52, when contact 41 (14) closes and shortens the extract time by 7 minutes.





Program selector

	12	14	15
1 Cold			■
2 Warm	■		
3 Hot	■		
4 Perm. press		■	

1656

Ⓑ Ⓔ = Power supply. B, see sequence "Power supply and start". E, see sequence "Water filling".

(1) Timer contact 11 a
Timer motor by level switch

(2) Timer contact 5 b
Heater relais main wash

(3) Timer contact 7 b
Heater relais pre wash

(4) Program selector contact 12

(5) Program selector contact 15

(6) Program selector contact 14

(7) Timer contact 32
Rapid advance Th-stop

(8) Timer contact 34
Rapid advance pre rinse

(9) Timer contact 37
Rapid advance pre wash 6 min

(10) Timer contact 38
Rapid advance main wash 14 min

(11) Timer contact 40
Rapid advance 2 rinse

(12) Timer contact 43
Rapid advance no heating

(13) Timer contact 42
Rapid advance extraction 3 min

(14) Timer contact 41
Rapid advance extraction 7 min

(15) K51 Coil for rapid advance of timer

Ⓓ = Power supply, see function sequence "Power supply and start".

1654

Motor control

Wash speed

Contact 7 a (1) is closed during the whole wash cycle except when the drum is filled with water (stage 7-9 in pre-wash, stage 13-17 in main-wash, stage 27-28, 36-36 and 43-4 in the different rinses). During these stages contact 11a (3) is activated and receives voltage from he level control, point (E) in the diagram which receives voltage when water level is correct (see function sequence "Water filling").

Contact 13b (4) is activated during those stages when the motor is running on wash speed. Contact 24b (5) is changing on gentle action: 3 seconds rotation, stops 12 seconds, 3 seconds rotation, etc. If jumper XE: 4-5 is open, the motor will run with gentle action. If the jumper is closed the motor will run on normal action, rotation 12 seconds, stops 3 seconds etc.

Distribution speed

The motor windings for distribution speed are connected by relay K3 (10) with help from contact 13a (4). Before connecting the motor to distribution speed, it must be rotation in the correct direction. To control this contact 11a (3) is opening and 11b (3) is closing in the program stage before distribution. In this way relay K1 (12) is always connected 3 seconds before distribution speed.

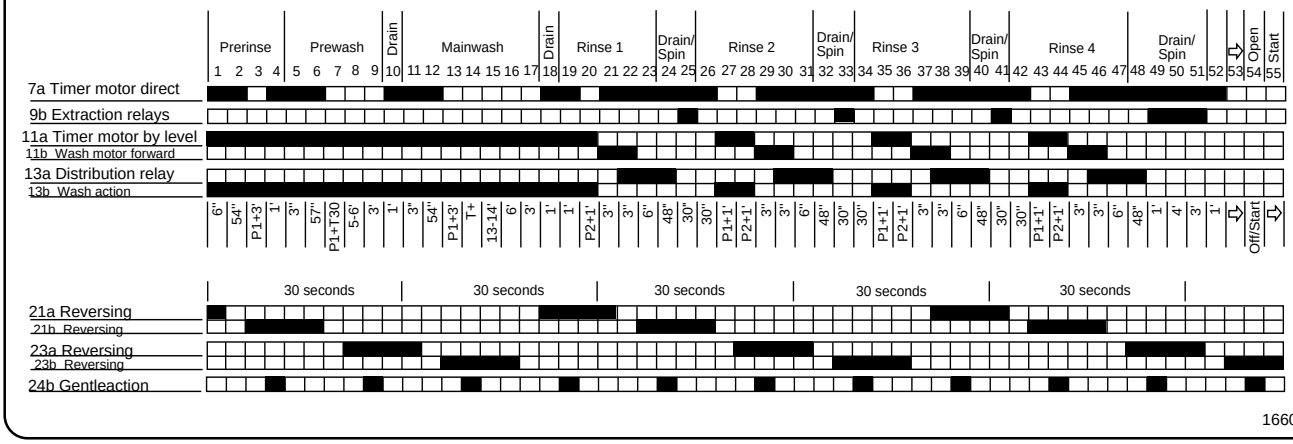
Extraction speed

The motor is connected by relay K4 (9) which is controlled by contact 9b (2).

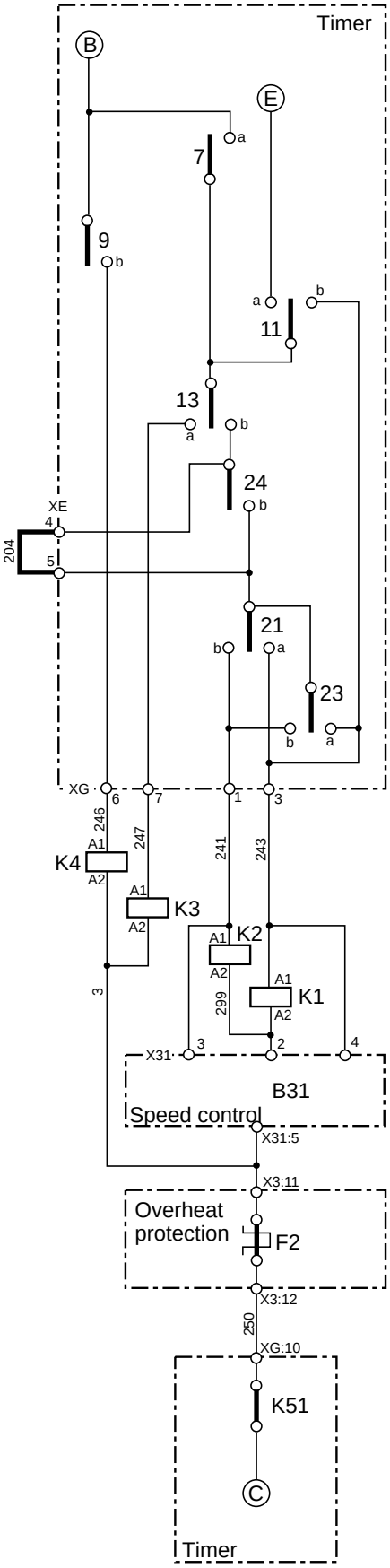
Speed control

When the motor is running on wash speed the speed control's B31 (13) connections 2 and 5 are connected to each other. If the power is interrupted to connection 3 and 4, either K1 (12) or K2 (11) is activated, the connection between 2 and 5 is interrupted. Now it shall be stopped (this is controlled by the speed control) in order to connect 2 and 5 again. This means that reverse rotation at wash speed or wash speed after an extraction can not be connected unless the drum has stopped.

Sequence diagram



1660



Ⓑ Ⓔ = Power supply. B, see sequence "Power supply and start". E, see sequence "Water filling".

(1) Timer contact 7a
Timer motor direct

(2) Timer contact 9b
Extract relays

(3) Timer contact 11
a: Timer motor by level switch
b: Wash motor forward

(4) Timer contact 13
a: Distribution relays
b: Wash action

(5) Timer contact 24b
Gentle action

(6) Clamp XE:4-5
clamp closed: normal action
clamp open: gentle action

(7) Timer contact 21
a: reversing
b: reversing

(8) Timer contact 23
a: reversing
b: reversing

(9) Relay K4 Extractioin

(10) Relay K3 Distribution

(11) Relay K2 Wash

(12) Relay K1 Wash

(13) Speed control B31

(14) Overheat protection F2

(15) Relay K51 rapid advance of timer

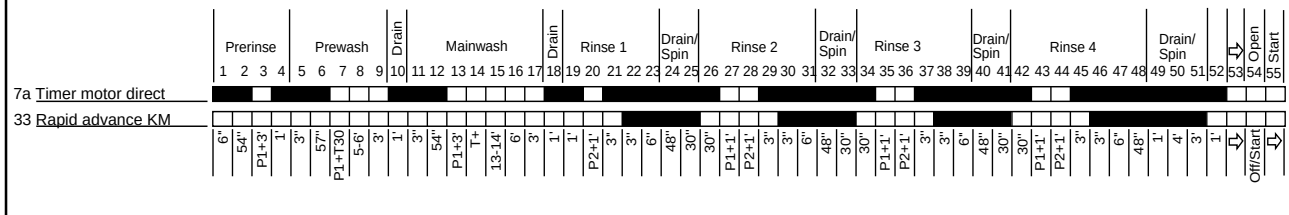
Ⓒ = Power supply, see sequence "Power supply and start".

Out-of-balance

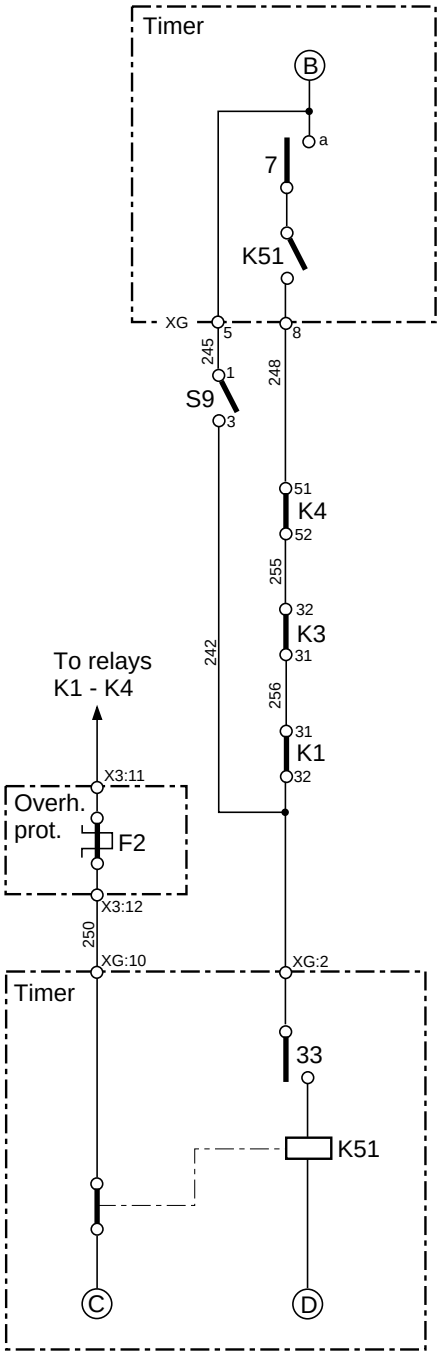
The purpose of the out-of-balance function is to protect the machine from undue stress during extraction. If the load is not properly distributed in the drum, the out-of-balance switch S9 (3) is activated and the following will take place:

- Contact 33 (8) is closed during all stages when the motor is running on distribution or extract speed.
- When S9 (3) closes the coil for rapid advance (9) receives voltage. Relay contact K51 (10) is interrupting the voltage to all motor relays.
- Contact 7a (1) is closed when the motor is running on distribution or extraction speed. Relay contact K51 (2) is on when coil (9) is activated. The relay contacts K4:51-52 (4), K3:31-32 (5) and K1:31-32 (6) are on. This means that the coil for rapid advance receives voltage and continues to advance the timer past the extraction phase, in spite that S9 (3) only closes for a short moment.

Sequence diagram



1662



Ⓑ = Power supply, see function sequence "Power supply and start".

(1) Timer contact 7a
Timer motor direct

(2) Relay K51 rapid advance of timer

(3) Switch S9 Out-of balance

(4) Relay K4 Extraction

(5) Relay K3 Distribution

(6) Relay K1 Wash

(7) Overheat protection F2

(8) Timer contact 33
Rapid advance K51

(9) Coil K51
Rapid advance of timer

(10) Relay K51
Rapid advance of timer

Ⓒ Ⓓ = Power supply, see function snequence "Power supply and start".

Water filling

Pre-wash

During the pre-wash contact 1b (2) is closed which means the machine is filling to high level (contact 21-22 in the level control is switching to 21-23 at high level). Contact 2b (8) is closed and cold water is flushing detergent in compartment 1 with valve Y11 (18).

During the pre-wash contact 8a (5) is also closed. Program selector contact 9 (10) is closed when program Warm, Hot or Permanent Press is selected. At these programs hot water is filled directly into the drum from valve Y24 (15).

Main wash

During the main-wash contact 3a (3) is closed. From jumper X0:4-7 (1) is selected if the water shall fill to low level (open jumper) or high level (closed jumper).

The contacts 2a (8) and 4b (6) are closed during the main wash.

The contacts 9 (10), 7 (13) and 10 (14), of the program selector control determine which of the water valves hall fill water:

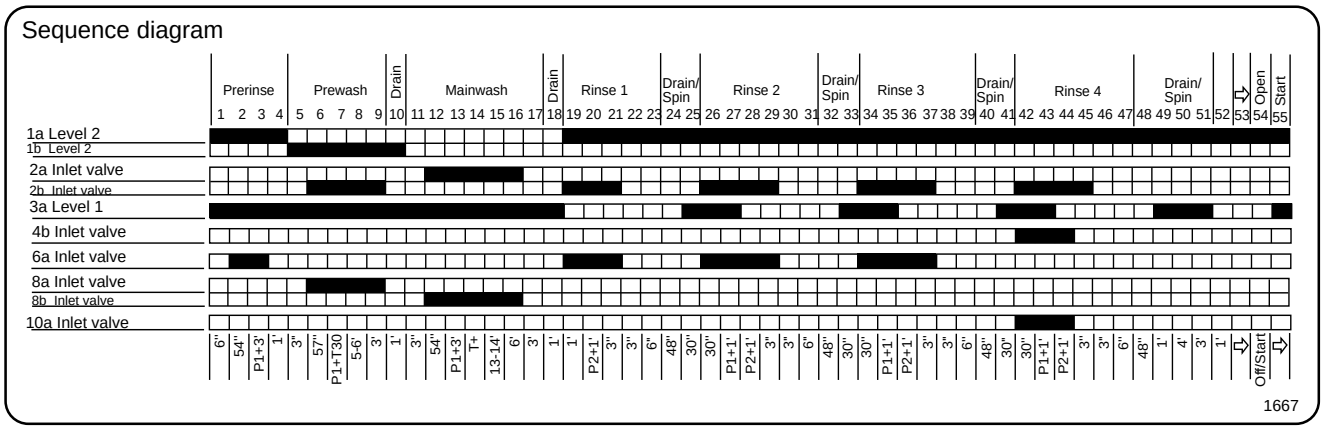
- In the Cold only cold water is flushing through compartment 2 from valve Y12 (17),
- In program Warm and Permanent Press cold water is flushed through compartment 2 from valve Y12 (7) and hot water directly into the drum from valve Y24 (15).
- In program Hot hot water is flushed through compartment 2 from valve Y22 (1b) and hot water directly into the drum from valve Y24 (15).

Rinse

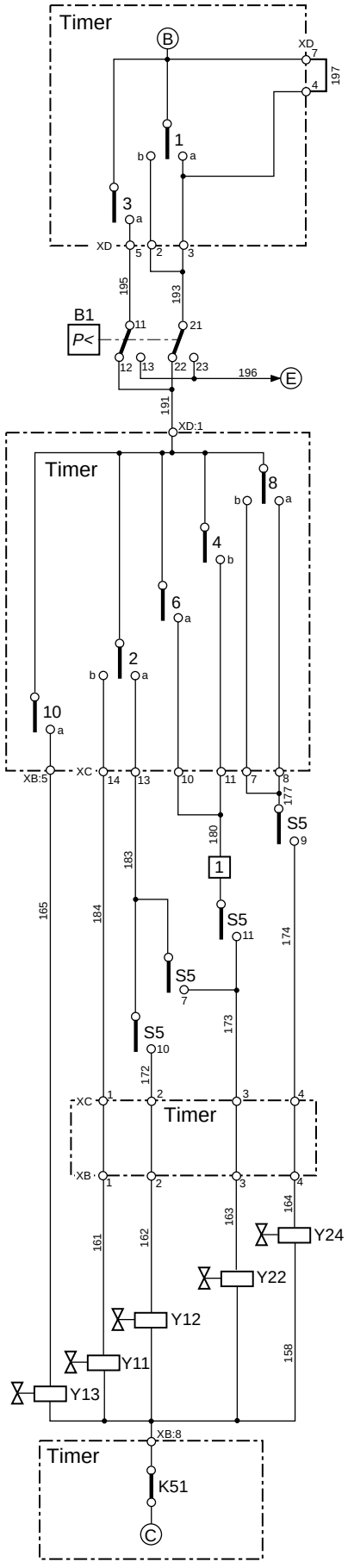
During all rinses contact 1a (2) is closed and water is filling to high level. Contacts 2b (8) and 6a (7) are closed during the first two rinses. Cold water is flushed through compartment 1 from valve Y11 (18). In program Hot, Warm and Permanent Press program selector contact 11 (12) closed. In these programs also hot water is flushed through compartment 2 from valve Y22 (16). The filling of hot water can be disconnected by opening the jumper at 1 (11).

In rinse 3 the contacts 4b (6) and 10a (9) are closed. Hot water is flushed through compartment 2 as in the fist rinses but cold water is flushed through compartment 3 from valve Y13 (19).

Sequence diagram



1667



Program selector

	7	9	10	11
1. Cold			■	
2. Warm			■	■
3. Hot	■	■		■
4. Perm. press		■	■	■

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Ⓑ = Power supply, see function sequence "Power supply and start".

(1) Jumper XD:4-7
clamp closed:high level in main wash
clamp open: low level in main wash

(2) Timer contact 1
a: Level 2 b: Level 2

(3) Timer contact 3a
Level 1

(4) Level control B1

Ⓔ = Power supply to other function sequences

(5) Timer contact 8
a: Inlet valve b: Inlet valve

(6) Timer contact 4b
Inlet valve

(7) Timer contact 6a
Inlet valve

(8) Timer contact 2
a: Inlet valve b: Inlet valve

(9) Timer contact 10a
a: Inlet valve

(10) Program selector contact 9

(11) Open at 1: cold water rinses
Closed at 1 : hot and cold water at rinses

(12) Program selector contact 11

(13) Program selector contact 7

(14) Program selector contact 10

(15) Valve Y24 hot water, drum

(16) Valve Y22 hot water, detergent 2

(17) Valve Y12 cold water, detergent 2

(18) Valve Y11 cold water, detergent 1

(19) Valve Y13 cold water, detergent 3

(20) Relay K51 rapid advance of timer

Ⓒ = Power supply, see function sequence "Power supply and start".

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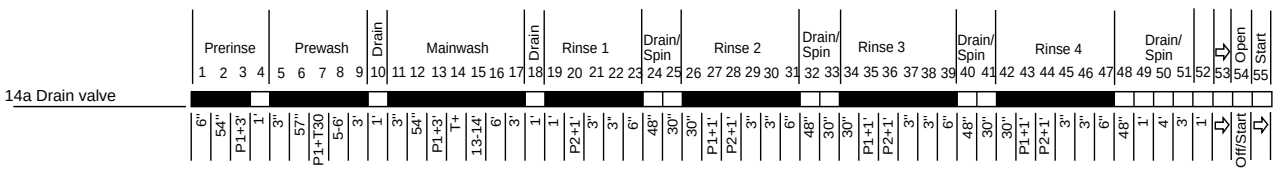
Drain

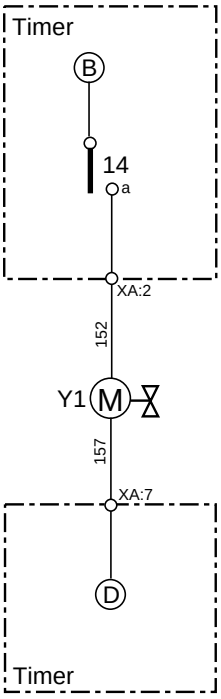
The valve Y1 (2) closes the drain valve when it receives voltage. The drain valve opens automatically when the voltage supply is interrupted.

Contact 14a (1) controls the drain valve and is closed during the stages when the valve shall be closed. The door must be closed and locked when the points (B) and (I) shall receive voltage (see sequence ''Power supply and start'').

Sequence diagram



1670



(B) = Power supply, see sequence "Power supply and start".

(1) Timer contact 14a
Drain valve

(2) Drain valve V1

(D) = Power supply, see sequence "Power supply and start".

Timer advance

The timer motor can be fed in the following ways:

From the timer

Contact 7a (2) is closed during all drain and extraction sequences. Apart from that contact 7a is closed during the first part of wash and rinse stages when water is filling.

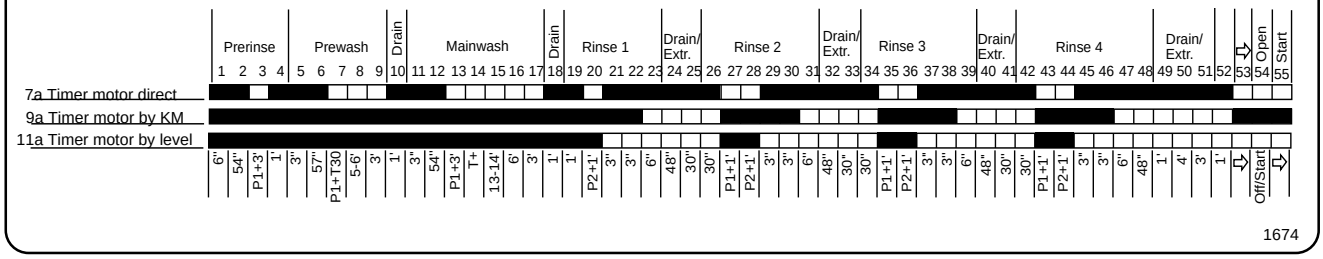
From the level control

When water has been filled to the correct level the contact of the level control is switching and point Ⓔ in the diagram receives voltage (see sequence ''Water filling''). Contact 11a (1) is closed during all the stages that contact 7a (2) is open and the timer motor then receives voltage from the level control. This means that if the machine does not fill water to correct level the timer stops.

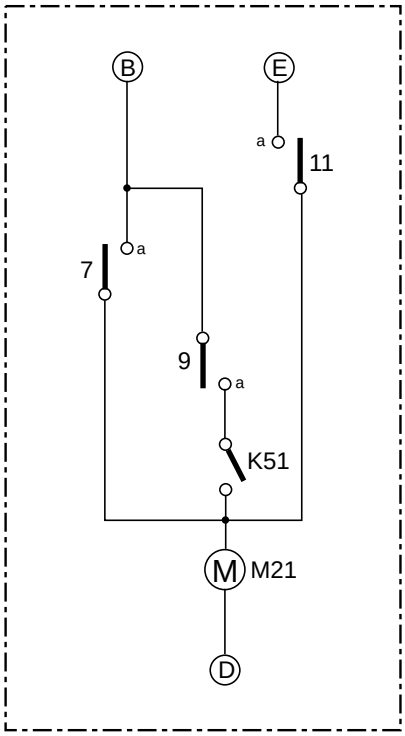
Rapid advance

Contact 9a (3) closes when contact 7a (2) is open. Rapid advancing relay contact K51 (4) closes so that the timer motor receives voltage either from contact 7a or 9a during rapid advance.

Sequence diagram



1674



Ⓑ Ⓔ = Power supply. Point B, see sequence "Power supply and start" Point E, see sequence "Water filling".

(1) Timer contact 11a
Timer motor by level switch

(2) Timer contact 7a
Timer motor direct

(3) Timer contact 9a
Timer motor by K51

(4) Relay K51
Rapid advance of timer

(5) Timer motor M21

Ⓓ = Power supply, see sequence "Power supply and start".