OPERATING & MAINTENANCE MANUAL
EX-15 and EX-25
Emerald Series

438 9030-01/02
97.02

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, select a wash cycle, insert the proper coins and press the START button.

   For manually operated models, select a wash cycle 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 apaga da 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

Contents

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

Safety instructions

- **This machine is designed for water washing only.**
- **This 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.**
- **This machine must not be sprayed with water, otherwise short circuiting may occur.**
- **Fabric softeners with volatile or inflammable fluids are not to be used in the machine.**

Introduction

Fig. 1 The washer-extractors described in this manual are high-speed extract machines with built-in wash programs. They are designed for use in applications such as apartment-house laundries, hotels, commercial laundries, in industry, hospitals, small institutions, and by other users who require a machine with a high level of reliability, good performance and easy maintenance.

The drum assembly on these models is of the suspended type, in other words not rigidly mounted on the machine base. This means that a minimum of vibration is transferred to the frame, which in turn simplifies installation as no concrete foundation is required.

Vibration due to imbalance is further reduced because the drum begins the extraction cycle at distribution speed, to distribute the load before extraction at high speed.

The high extraction speed of the drum produces a G factor of approx. 300, which ensures a high degree of water extraction.

The machine has an electronic program control unit with built-in wash programs which can be modified through the use of option buttons. The program control unit also includes a built-in service program to assist in tracing faults quickly and efficiently.

The frequency-controlled motor is controlled by an advanced motor control unit. This means that the motor speed can be controlled with precision and flexibility at every stage in the program.

The machines are equipped according to customer requirements, with the option of electric or steam heating. The water intake can be adapted for various combinations of cold, hot and hard water supply.

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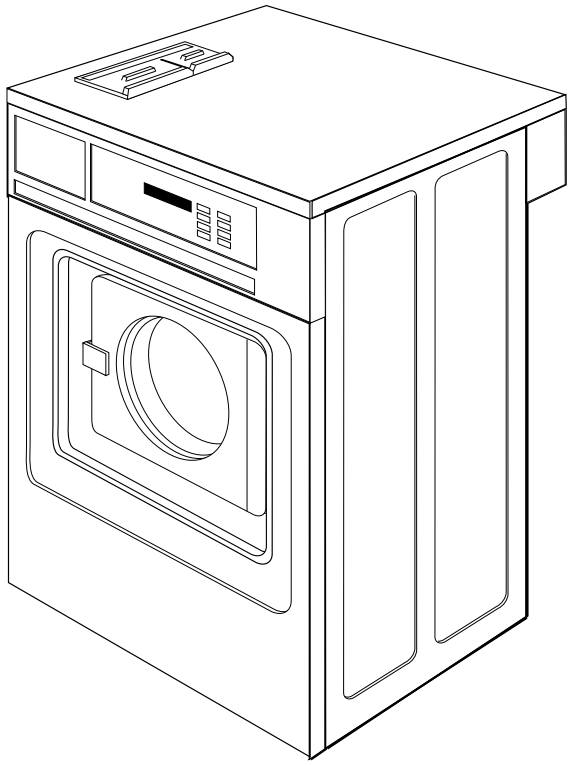

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Technical data EX-15 ES

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	169	kg	373	lbs
Maximum floor load		1.6 ± 0.7	kN	390 ± 170	lbs force
Crated dimensions	Volume	0.66	m^3	23.3	cu.ft
	Weight	181	kg	399	lbs
Inner drum dimensions	Diameter	520	mm	20 1/2	in
	Depth	310	mm	12 3/16	in
	Volume	65	litre	2.3	cu.ft
Drum speed	Wash	48	rpm		
	Distribution	90	rpm		
	Extraction	550/700/1020	rpm		
G-factor	During wash	0.8			
	During extraction	300			
Motor speed	During wash	415	rpm		
	During distribution	780	rpm		
	During extraction	4760/6060/8820	rpm		
Voltage requirements		120	V 1-Phase 60 Hz or 208-240 60-1		
Rated output power Max.	Frequency controlled motor	700	W	0.9	HP
		0-90	VAC	0-250	Hz
Overcurrent protection		15	A		
Water connections	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

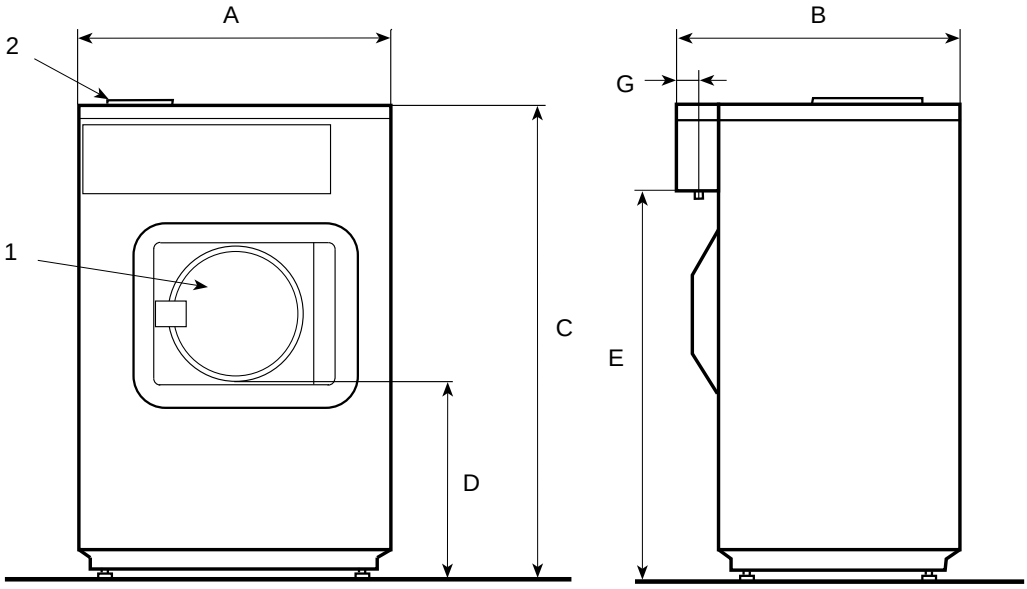
Technical data EX-25 ES

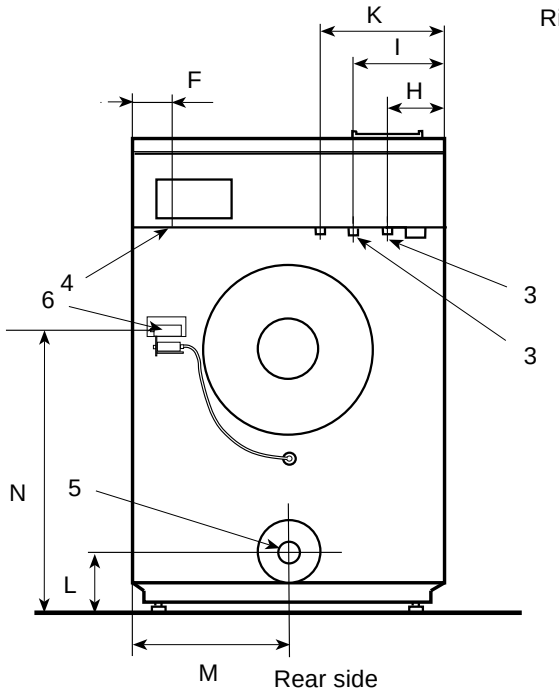
Dry load capacity	up to			25	lbs
Overall dimensions	Width	720	mm	28 11/32	in
	Depth	820	mm	32 9/32	in
	Height	1100	mm	43 5/16	in
	Net weight	255	kg	562	lbs
Maximum floor load		2.5 ± 0.95	kN	598 ± 232	lbs force
Crated dimensions	Volume	0.77	m^3	27.2	cu.ft
	Weight	270	kg	595	lbs
Inner drum dimensions	Diameter	520	mm	20 1/2	in
	Depth	470	mm	18 1/2	in
	Volume	100	litre	3.5	cu.ft
Drum speed	Wash	48	rpm		
	Distribution	90	rpm		
	Extraction	550/700/1020	rpm		
G-factor	During wash	0.8			
	During extraction	300			
Motor speed	During wash	415	rpm		
	During distribution	780	rpm		
	During extraction	4760/6060/8820	rpm		
Voltage requirements		120	V or 208-240 V 1- Phase 60 Hz		
Rated output power Max.	Frequency controlled motor	1500	W	2.0	HP
		0-90	VAC	0-250	Hz
Overcurrent protection		20	A at 120 V		
		15	A at 208-240 V		
Water connections	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

1	Door opening ø290 mm/11 7/16"
2	Soap box
3	Water connections (Hot and cold)
4	Electrical connection
5	Drain Ø 50 mm/2"
6	Steam connection 1/2" (optional)

		A	B	C	D	E	F	G	H	I	K	L	M	N
EX-15	mm	720	660	1100	440	905	60	60	130	235	290	150	360	630
	inch	28 11/32	26	43 5/16	17 5/16	35 5/8	2 3/8	2 3/8	5 1/8	9 1/4	11 7/16	5 29/32	14 5/32	24 13/16
EX-25	mm	720	820	1100	440	905	60	60	130	235	290	150	360	630
	inch	28 11/32	32 9/32	43 5/16	17 5/16	35 5/8	2 3/8	2 3/8	5 1/8	9 1/4	11 7/16	5 29/32	14 5/32	24 13/16





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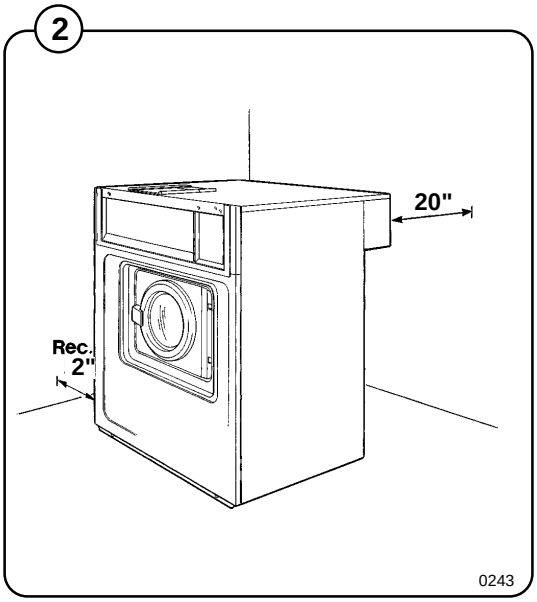
Installation



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 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 trough.

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:

	EX-15 ES	EX-25 ES
static	390 lbs	598 lbs
dynamic	170 lbs	220 lbs
frequency of dynamic force	17 Hz	17 Hz

Mechanical installation

Each machine is delivered with the drum locked in place by four security 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 security bolts holding the drum to the chassis.

NOTE!

These security bolts must be removed before operating the machine or it may be damaged.

- 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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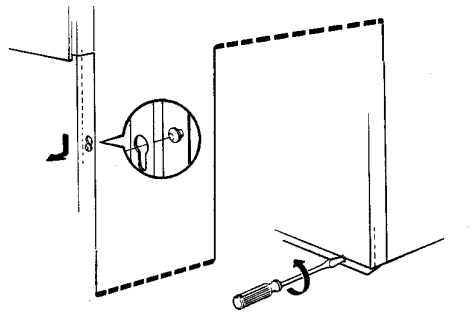

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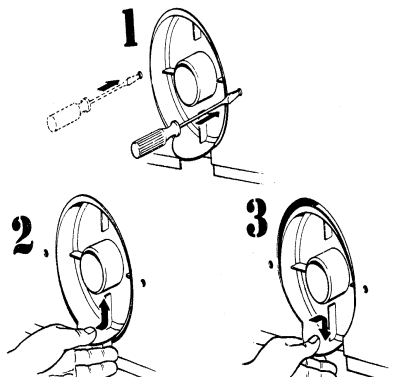

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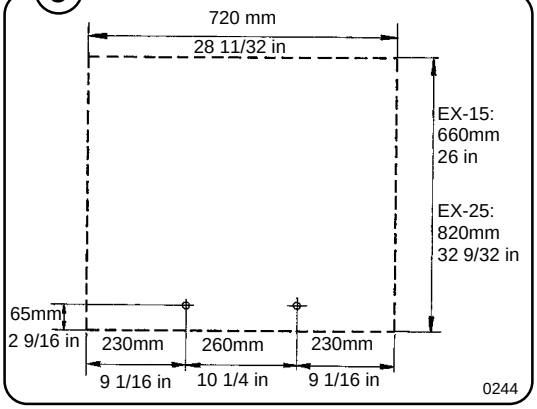

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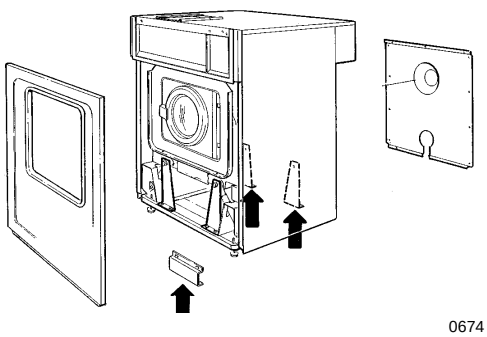

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Water supply

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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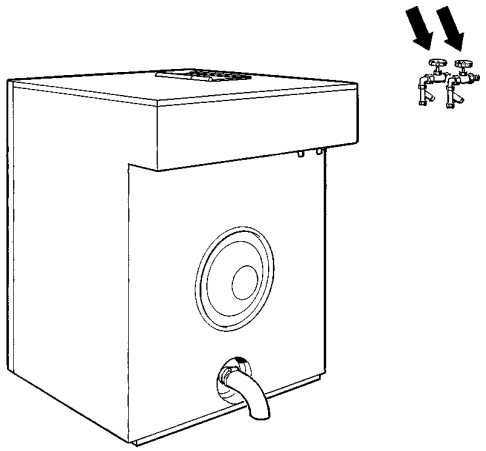

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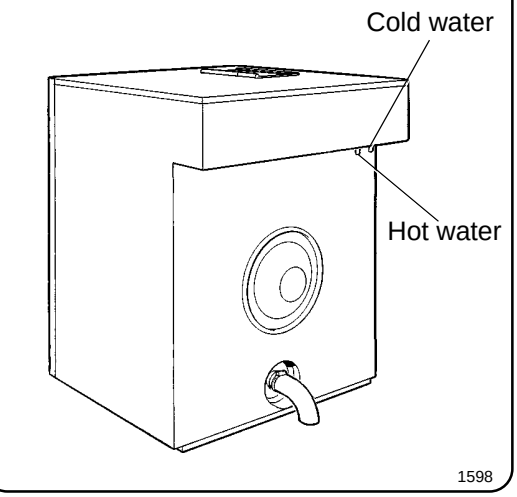

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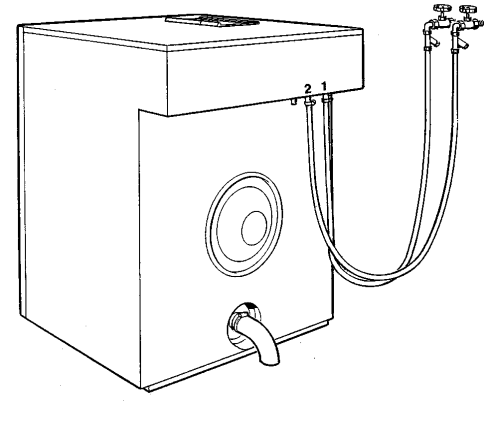

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Steam connections (optional steam heating)

The steam inlet pipe must be fitted with a manual cut-off valve in order to facilitate installation and service operations.

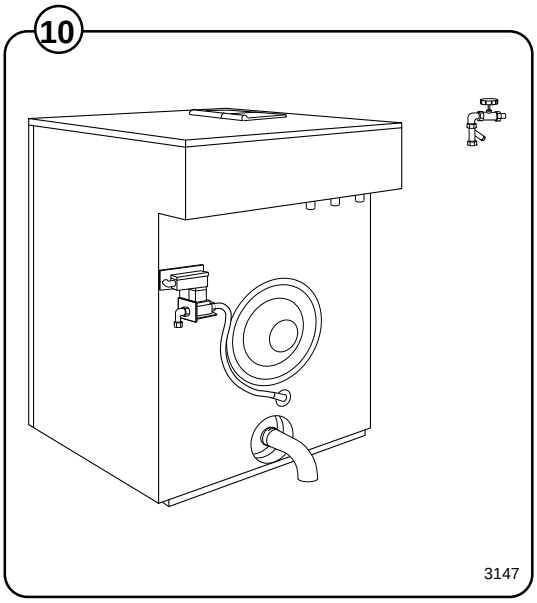
Fig. 10 Fit the filter supplied to the manual cut off valve.

The connection hose must be of an approved type. Connection size at filter: DN 15 (1/2").

Steam pressure required:

minimum:	7.1 psi (0.5 kp/cm²)
maximum:	114 psi (8 kp/cm²)
recommended:	57 psi (4 kp/cm²)

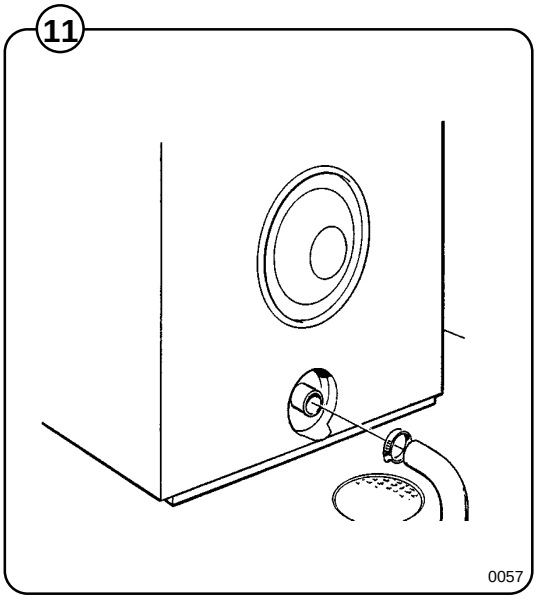
Check that there are no sharp angles or bends in the connection hose.



Drain connection

Fig. 11 Connect a 50 mm (2") pipe or rubber hose to the machine's drain pipe. 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

Electrical installation must be carried out by an authorized electrician, and must follow national and local regulations. Make sure that the ground wire is properly connected.

- Install a 1-phase circuit breaker for the machine's electrical supply.
- Connect the machine's cable between the circuit breaker and the machine.
- Check that the earth ground has been connected in the correct way.

For the rating of the supply cable, check the local regulations.

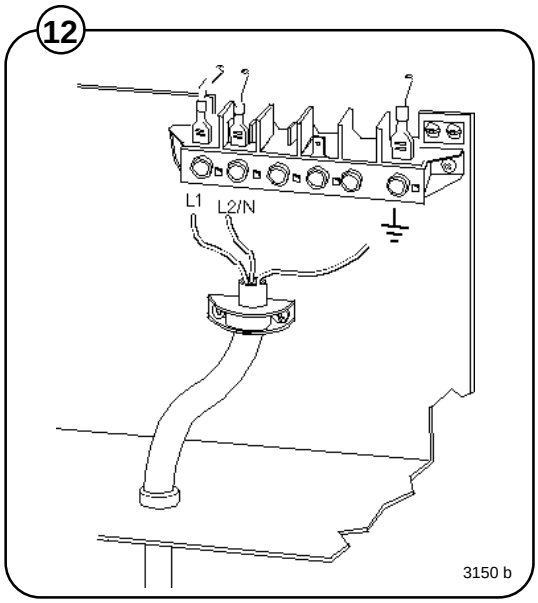


Fig. 12 Machines connected for 1-phase 120V or 240V AC.

Start-up and safety checklist

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

Fig. 13

- 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:

Fig. 14

- When washer loading door is open, the machine must not start. Verify this by attempting to start washer with door open.

Fig. 15

- 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.

IMPORTANT:

Door safety interlock must be checked daily in accordance with above procedure.

WARNING:

Before servicing Wascomat equipment, disconnect electrical power.

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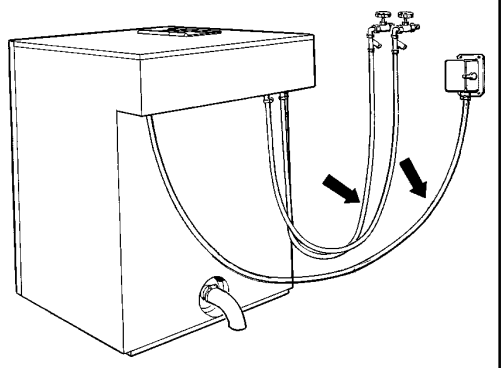

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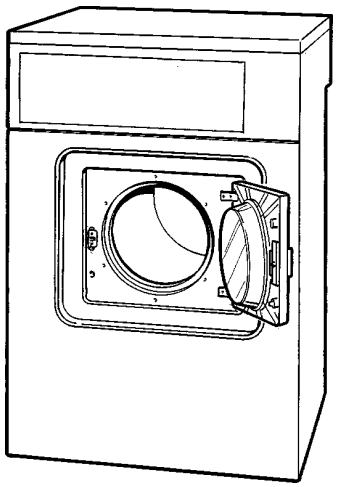

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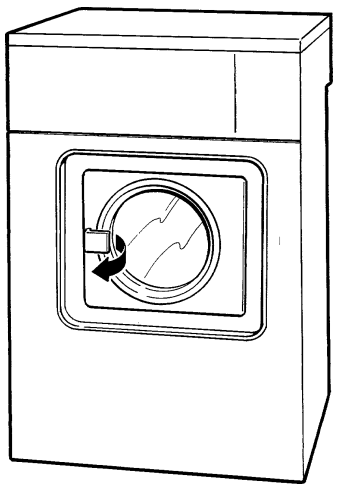

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Function control check-out list

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 10 of this manual.
5. Select the HOT program and start the machine.
6. Run through a complete cycle, checking for water temperature, drain operation and the extract function.
7. In the mainwash only hot water should enter. If cold water comes in, the hoses are improperly connected. Reverse hot and cold water hoses.

Fig. 16

Fig. 17

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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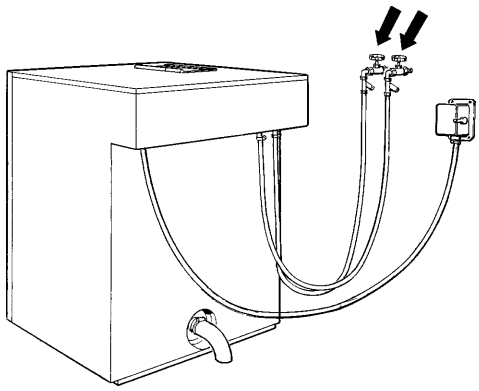

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	HOT	
	Time (Min.)	Temp.
Prewash	3	Warm
Detergent 1		
Drain	1	
Mainwash	6	Hot
Detergent 2		
Drain	0.7	
Extraction	0.5	
Rinse 1	1	Warm
Drain	0.7	
Extraction	0.5	
Rinse 2	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 3	2	Cold
Detergent 3		
Drain	0.7	
Extraction	4	
Shake-out	0.5	
Total time (water fill time not included)	22	

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Safety rules

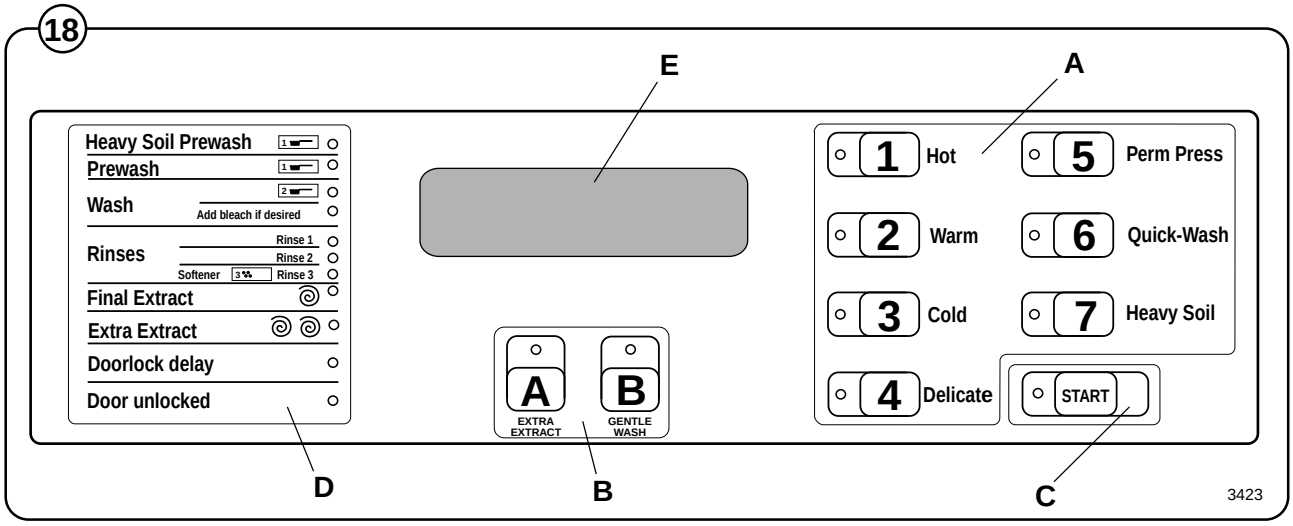
- **This machine is designed for water washing only.**
- **Machines must not be used by children.**
- **All installation operations are to be carried out by qualified personnel. Licensed personnel are necessary for all electric power wiring.**
- **The interlock of the door must be checked daily for proper 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.**
- **This machine must not be sprayed with water, otherwise short circuiting may occur.**
- **Fabric softeners with volatile or inflammable fluids are not to be used in this machine.**

The Emerald Series program unit controls the various functions of the machine in a certain time sequence with the aid of seven built-in standard programs. The standard programs can also be modified by selecting various options. By selecting options, the user has access to programs for all types of wash loads and degrees of soiling.

Fig. 18 The control panel consists of program selection buttons (A), option buttons (B), a combined start, pause and rapid advance button (C), symbols with LEDs (D) which show the program selected and the program sequence, plus an alphanumeric display (E).

The alphanumeric display shows illuminated green characters.

In the event of faults, error codes will be displayed on this window. See Fault codes.



Explanation of control panel

A Program selection buttons

B Option buttons

C Start/pause and rapid advance button

D Symbols with LEDs to indicate program sequence

E Information display

Washing

Fig. 19
- Press the button for the desired program.

Fig. 20
- Now the LEDs alongside the program symbols will show what the selected program consists of.

Fig. 21
- Press the button(s) for any options required.
- This option button gives a longer extraction time on "Hot", "Warm", "Cold", "Delicate" and "Perm Press" programs.

Fig. 22
- This option button gives "Gentle action" in all programs except "Delicate" which has gentle action as standard.

> **NOTE!**
>
> **Gentle actions consists of 6 seconds pause, as opposed to 18 seconds rotation and 6 seconds pause for Normal action.**

Fig. 23
- Add the correct amount of detergent and fabric softener.

Fig. 24
- Press the **START** button.

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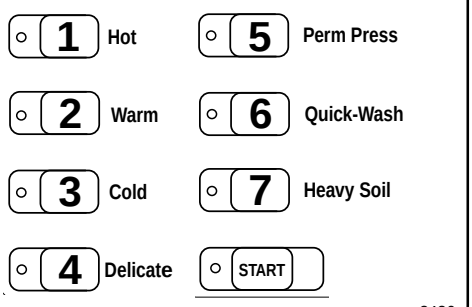

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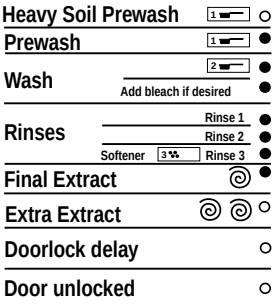

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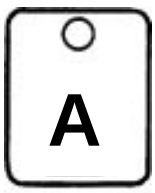

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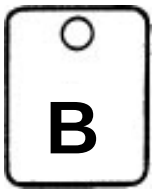

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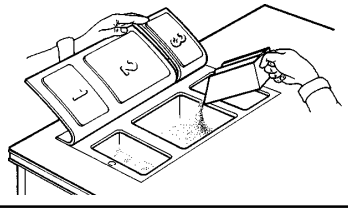

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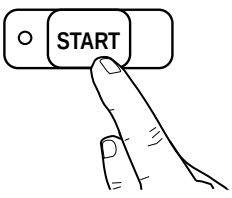


Fig. 25

- Now the display will show the clock symbol and two digits. The two digits are the time left before the wash will be finished.

The two digits indicating time left will not appear when the machine is first installed. Each program needs to have been used at least once before the time left will be displayed.

- For 5 minutes immediately after START is pressed the colon character (:) will flash on the display. As long as this character is still flashing a new program can be selected (without the drain opening). This means you still have the chance to change the setting if the wrong program has been selected. Do as follows:

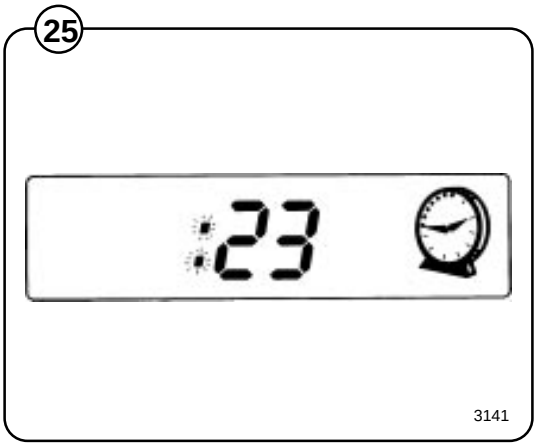
Fig. 26

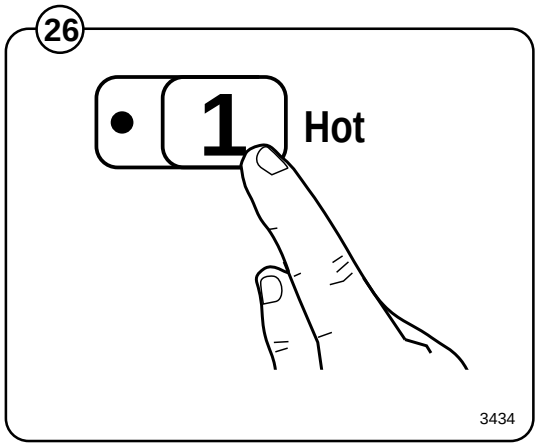
- Press **START**.
- Select a new program.
- Press **START** again after making any change in the program selected.

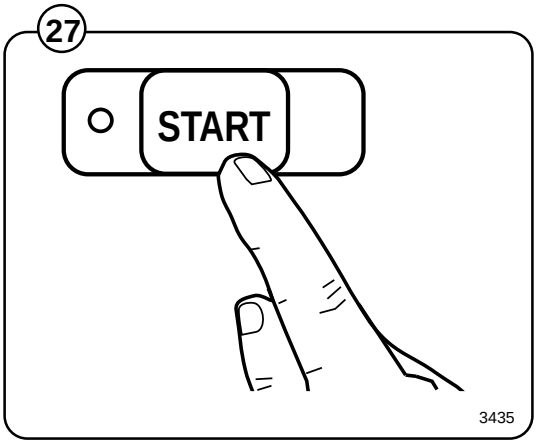
Fig. 27

If for any reason you wish to halt the wash cycle for a time, press the **START** button for a moment or two. The program will be suspended and the drain will remain closed.

To restart the program, press the **START** button again briefly.





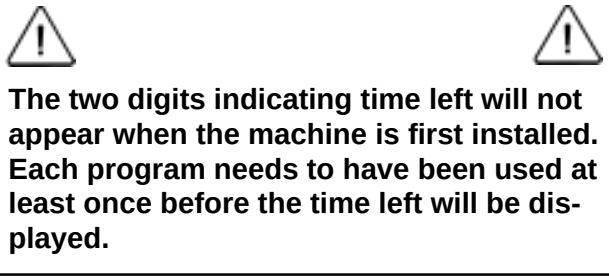


For coin-operated machines

Fig. 28 Select a wash program, then insert the number of coins corresponding to the figure shown on the display.

As each coin is added the machine counts backwards towards 00 on the display. The machine will not start until the display shows 00.

Fig. 29
- Press the START button.
- Now the display will show the clock symbol and two digits. The two digits are the time left before the wash will be finished.



The two digits indicating time left will not appear when the machine is first installed. Each program needs to have been used at least once before the time left will be displayed.

Fig. 30
- For a time immediately after START is pressed the colon character (:) will flash on the display. As long as this character is still flashing a new program can be selected (without losing anything). This means you still have the chance to change the setting if the wrong program has been selected.
- Press **PAUSE/START**.
- Select a new program.
- If the new program costs more to run than the amount already paid, the difference will be shown on the display. Insert enough coins to make the display show 00 again.
- Press **START** again after making any change in the program selected.

28

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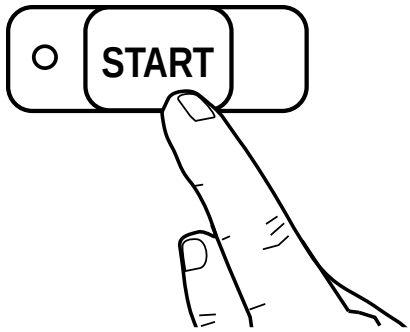

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3141

Rapid advance

Whole steps in programs can be skipped using rapid advance.

Fig. 31

- Press and hold the **START** button until the program indicator LEDs have moved past the program steps you wish to skip.

Program end

Fig. 32

After final extraction, the LED by the "doorlock delay" comes on. This shows that the door lock will shortly be unlocked.

Fig. 33

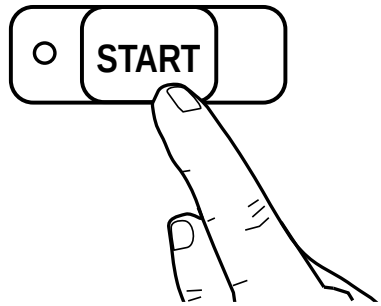
The door will not actually be unlocked until the green LED by the "door unlocked" comes on, accompanied by an audible signal. This takes about 1 minute.

Troubleshooting

If the machine won't start, check that:

- the circuit breaker is on.
- the manual shut-off valves for water are open.
- a program has been selected.
- the door is properly locked.

31



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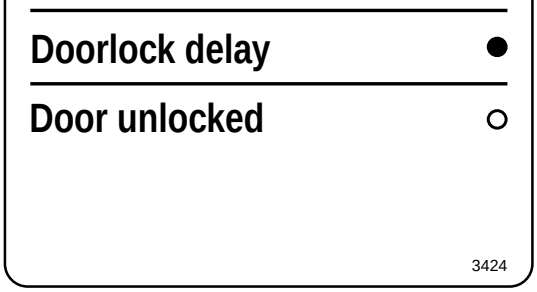

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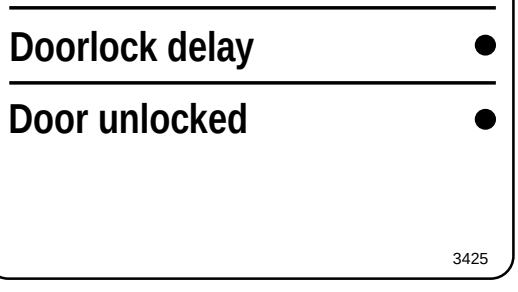


3425

Maintenance

This machine has been carefully designed to minimize preventive maintenance. However, the following routine operations should be performed at regular intervals (depending on how much the machine is used).

Daily

- Clean detergent residue from the door seal and 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.
- Start the machine and check that the door is locked while the machine is operating.

Every three months

- Check for leaks in valves, hoses and connections.
- Remove any lint from the machine’s drainage system.
- Check water inlet screens for clogging.

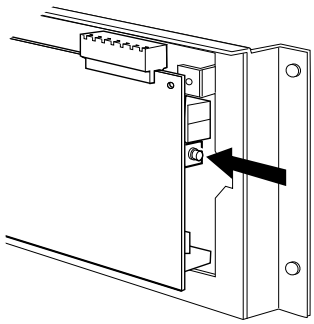
Coin-operated machines

In coin-operated machines the prices for the various programs have to be programmed in.

Values from the coin mechanism (the accumulated value) can be read out with the aid of the service program.

If a machine is fitted with a coin mechanism after its original installation the relevant electronic circuitry will have to be activated before the prices can be programmed in.

34



3400

⚠ ⚠

Only trained service personnel may use the service program and program in prices for coin operation.

Activation of electronic circuitry in machines fitted with coin operation after original installation.

Fig. 34
Fig. 35

- Press the service button.

  Now certain of the buttons switch to being number keys (1 to 9), with the START button being 0.

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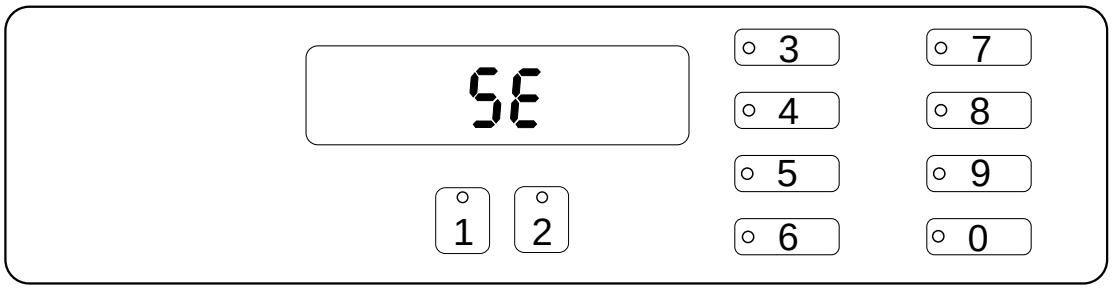


3429

Codes 91 and 92 are used to store the values for coin slots 1 and 2. For mechanisms with only one slot, only code 91 is used.

The values to be stored are the ratio of one coin to the other.

For example: if the coin slots are for a 10 cent coin and a 50 cent coin. The value 10 should be stored under code 91, and the value 50 should be stored under code 92.

Fig. 36
- Enter code 91 using the buttons which have become number keys 9 and 1.

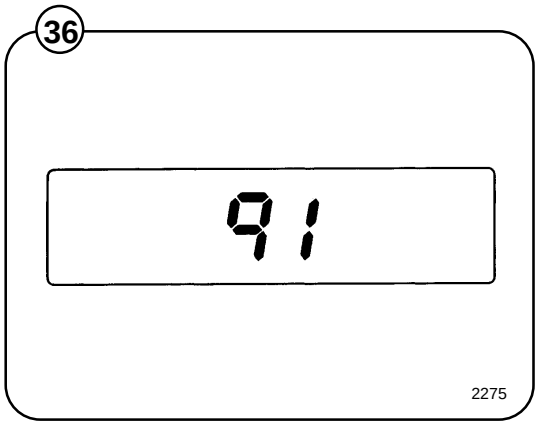
  The display will now show 91.

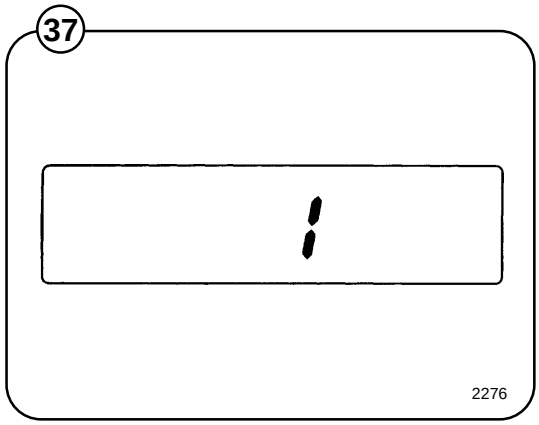
Fig. 37
- When entering the actual value: keep the price-programming button activated (the switch is located under the top cover at the right front edge). Enter the value 1 and then release the button.

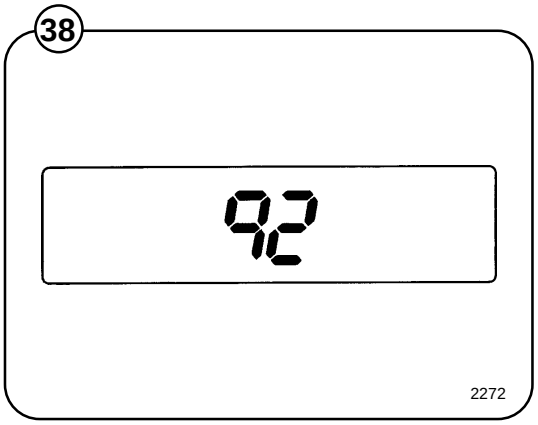
Fig. 38
- Enter code 92. The display will now show 92.

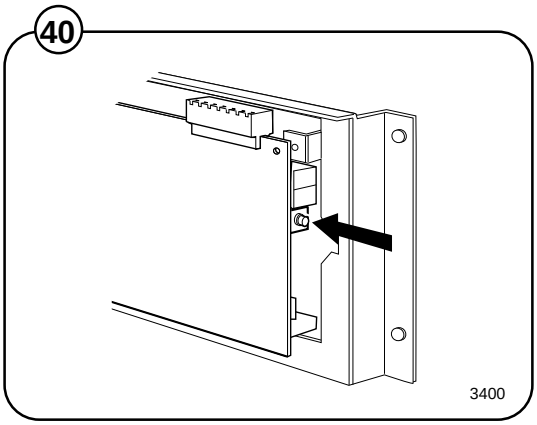
Fig. 39
- Enter the value 5.

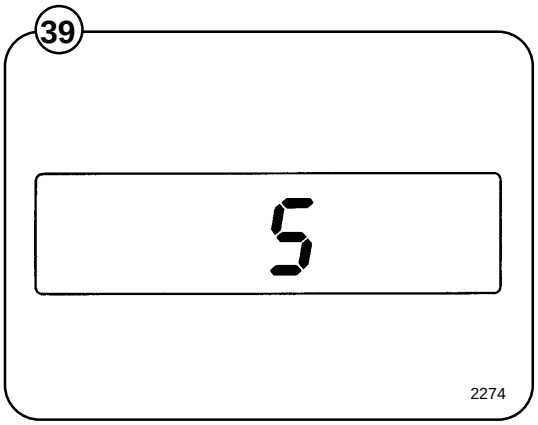
Fig. 40
- Exit the service program by pressing the service button again.











Price programming:

- Press the relevant wash program selector button.

When programming the price of a wash program plus options, press both the relevant program selector button and the option button.

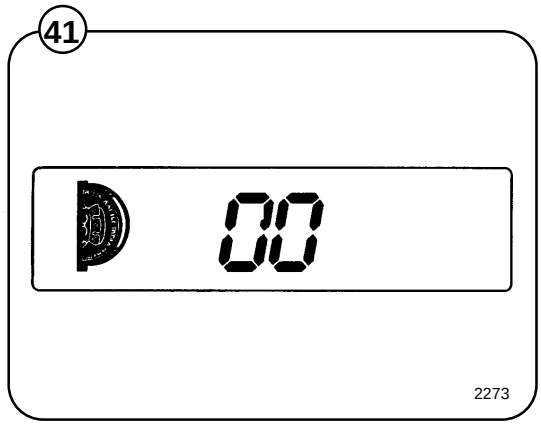
Fig. 41

- Keep the price-programming button activated.

  Now the display shows 00 plus the coin symbol.

- Enter the price via the numerical key functions. The START button can be used to enter 0.
- Release the price-programming button.

This procedure should be repeated for all wash programs.



Wash Cycles

Fig. 42 In the figure below and on the following page is an overview of the seven wash cycles.

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

42

	HOT		WARM		COLD		PERM PRESS	
	Time (Min.)	Temp.	Time (Min.)	Temp.	Time (Min.)	Temp.	Time (Min.)	Temp.
Prewash	3	Warm	3	Warm	3	Cold	3	Warm
Detergent 1								
Drain	1		1		1		1	
Mainwash	6	Hot	6	Warm	6	Cold	6	Warm
Detergent 2								
Drain	0.7		0.7		0.7		0.7	
Extraction	0.5		0.5		0.5		0.5	
Rinse 1	1	Warm	1	Cold	1	Cold	1	Cold
Drain	0.7		0.7		0.7		0.7	
Extraction	0.5		0.5		0.5		0.5	
Rinse 2	1	Cold	1	Cold	1	Cold	1	Cold
Drain	0.7		0.7		0.7		0.7	
Extraction	0.5		0.5		0.5		0.5	
Rinse 3	2	Cold	2	Cold	2	Cold	2	Cold
Detergent 3								
Drain	0.7		0.7		0.7		0.7	
Extraction	4		4		4		2	
Total time (water fill time not included)	22		22		22		20	

43

	DELICATE		QUICK-WASH		HEAVY SOIL	
	Time (Min.)	Temp.	Time (Min.)	Temp.	Time (Min.)	Temp.
Prewash					2	Warm
Drain					1	
Prewash					3	Warm
Detergent 1						
Drain					1	
Mainwash	4	Warm	5	Warm	8	Hot
Detergent 2						
Drain	0.7		0.7		0.7	
Extraction	0.5		0.5		0.5	
Rinse 1	1	Cold	1	Cold	1	Warm
Drain	1		1		0.7	
Extraction					0.5	
Rinse 2	1	Cold	1	Cold	1	Cold
Drain	1		1		0.7	
Extraction					0.5	
Rinse 3	2	Cold	2	Cold	2	Cold
Detergent 3						
Drain	0.8		0.8		0.8	
Extraction	1		4		4	
Total time (water fill time not included)	13		17		27.4	

Hot

Prewash

Fig. 44 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. At the same time detergent from compartment 1 is mixed with the incoming water.

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 prewash, the drain valve will open.

Mainwash

After draining the drain valve will close again and hot water will fill to the level determined by the level control. At the same time detergent from compartment 2 is mixed with the incoming hot water.

The water level controlled machine will now wash the fabrics for 6 minutes. The machine is then emptied, followed by a 30 second extraction.

Rinses

Hot and cold water are filled to the medium level for the first rinse which lasts one minute, followed by spin 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 four minutes duration.

44

	HOT	
	Time (Min.)	Temp.
Prewash	3	Warm
Detergent 1		
Drain	1	
Mainwash	6	Hot
Detergent 2		
Drain	0.7	
Extraction	0.5	
Rinse 1	1	Warm
Drain	0.7	
Extraction	0.5	
Rinse 2	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 3	2	Cold
Detergent 3		
Drain	0.7	
Extraction	4	
Total time (water fill time not included)	22	

Warm

Fig. 45

On starting the machine, the door will automatically be locked, 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 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 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 a extraction of four minutes duration.

45

	WARM	
	Time (Min.)	Temp.
Prewash	3	Warm
Detergent 1		
Drain	1	
Mainwash	6	Warm
Detergent 2		
Drain	0.7	
Extraction	0.5	
Rinse 1	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 2	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 3	2	Cold
Detergent 3		
Drain	0.7	
Extraction	4	
Total time (water fill time not included)	22	

Cold

Fig. 46 On starting the machine, the door will automatically be 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 concluded 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 a extraction of four minutes duration.

46

	COLD	
	Time (Min.)	Temp.
Prewash	3	Cold
Detergent 1		
Drain	1	
Mainwash	6	Cold
Detergent 2		
Drain	0.7	
Extraction	0.5	
Rinse 1	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 2	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 3	2	Cold
Detergent 3		
Drain	0.7	
Extraction	4	
Total time (water fill time not included)	22	

Permanent Press

Fig. 47

On starting the machine, the door will automatically be locked, the drain valve closed, the hot and cold water valves opened 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.

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

47

	PERM PRESS	
	Time (Min.)	Temp.
Prewash	3	Warm
Detergent 1		
Drain	1	
Mainwash	6	Warm
Detergent 2		
Drain	0.7	
Extraction	0.5	
Rinse 1	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 2	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 3	2	Cold
Detergent 3		
Drain	0.7	
Extraction	2	
Total time (water fill time not included)	20	

Delicate

Fig. 48

On starting the machine, the door will automatically be locked.

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 four minutes. The machine is then emptied.

Cold water is filled for the first rinse which lasts one minute.

Than comes the second rinse in cold water 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 one minute duration.

During washing and rinsing gentle action is used, which is 6 seconds drum rotation and 18 seconds pause, then reverse direction and repeat. The GENTLE WASH option button does not affect the Delicate cycle.

48

	DELICATE	
	Time (Min.)	Temp.
Prewash Drain		
Prewash Detergent 1 Drain		
Mainwash Detergent 2 Drain Extraction	4 0.7 0.5	Warm
Rinse 1 Drain Extraction	1 1	Cold
Rinse 2 Drain Extraction	1 1	Cold
Rinse 3 Detergent 3 Drain Extraction	2 0.8 1	Cold
Total time (water fill time not included)	13	

Quick-Wash

Fig. 49

On starting the machine, the door will automatically be locked, the drain valve closed.

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

On reaching this level, hot water is closed.

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

Cold water is filled for the first rinse which lasts one minute.

Then comes the second rinse in cold water, 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 three minutes duration.

49

	QUICK-WASH	
	Time (Min.)	Temp.
Prewash Drain		
Prewash Detergent 1 Drain		
Mainwash Detergent 2 Drain Extraction	5 0.7 0.5	Warm
Rinse 1 Drain Extraction	1 1	Cold
Rinse 2 Drain Extraction	1 1 0.5	Cold
Rinse 3 Detergent 3 Drain Extraction	2 0.8 4	Cold
Total time (water fill time not included)	17	

Heavy Soil

Fig. 50

On starting the machine, the door will automatically be locked, the drain valve closed, the hot and cold water valves opened and the two pre-washes 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 hot is filled to the level determined by the level control.

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

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

Hot and cold water are filled for the first rinse which lasts one minute, followed by extraction for 30 seconds.

Fabric softener is automatically admitted during the third rinse. The fabrics are rinsed with cold water for two minutes followed by a extraction of four minutes duration.

50

	HEAVY SOIL	
	Time (Min.)	Temp.
Prewash	2	Warm
Drain	1	
Prewash	3	Warm
Detergent 1		
Drain	1	
Mainwash	8	Hot
Detergent 2		
Drain	1	
Extraction	0.5	
Rinse 1	1	Warm
Drain	0.7	
Extraction	0.5	
Rinse 2	1	Cold
Drain	0.7	
Extraction	0.5	
Rinse 3	2	Cold
Detergent 3		
Drain	0.8	
Extraction	4	
Total time (water fill time not included)	27.4	

OPTION BUTTONS:

EXTRA EXTRACT -- Selecting this option adds 1.5 minutes to the final extraction Hot, Warm and Cold and 1 min on Delicate and Perm Press program. For example, the HOT cycle plus EXTRA EXTRACT gives the customer a total of 5.5 minutes extraction. You can easily program the washer to charge more money (usually one more quarter) if this option is selected! The effect of extra extraction depends on the type of laundry washed, load size, etc.

GENTLE WASH -- The normal wash action of a Wascomat washer is 18 seconds rotation, 6 seconds pause, reverse direction and repeat. Selecting the GENTLE WASH option converts the selected wash cycle to gentle action, which is 6 seconds drum rotation and 18 seconds pause, reverse direction and repeat. The DELICATE cycle always uses gentle action so it is not affected by this option. There is no extra charge to the customer for this option, so it is simply up to them to choose their preference. You may want to advertise and promote this option since market research indicates there are people who believe certain clothing items are too delicate to wash in a commercial washer. Now you have the answer!

General

This machine has a suspended drum, which means that the outer drum and motor rest on a ”cradle” with four counterweights and a broad retaining strap. The cradle rests on four coil springs and has four (EX 15) or five EX 25 shock absorbers which, together with the counterweights, are highly effective in counteracting any imbalance which may arise from the load.

The inner drum is driven by a belt drive from the motor. This motor is located above the outer drum, and has a device for belt tensioning. The motor is frequency-controlled, which allows precise and reliable control of its speed during wash, distribution and extraction stages of the program.

The union between the inner drum and the outer drum is at the rear and uses two sealed bearings.

The drain valve is a membrane-type valve which is controlled by water pressure. The machine can also be equipped with a drain pump.

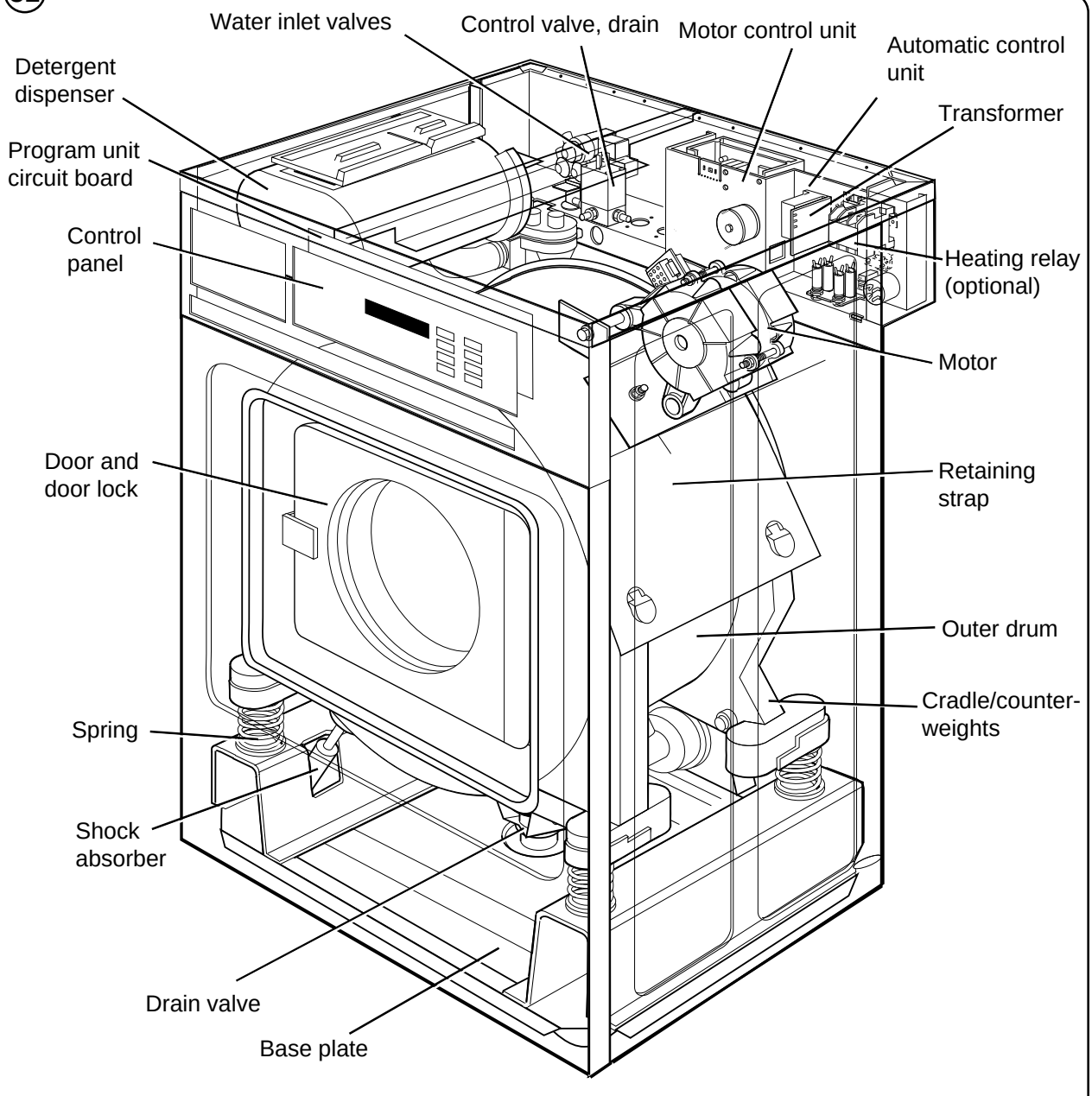
The machine door is of the heavy duty rectangular type, which is locked shut while the machine is operating.

The control panel has seven program-selection buttons, two option buttons, and a combined start/pause and rapid-advance button. Each button has an LED to show the current program selected. There are a further eleven LEDs on the panel which are used to indicate the current status of the program. The control panel display is used to show temperature, time left for the program to run and error codes.

The program control unit is directly behind the control panel. Components such as the motor control unit, relays, water valves are on a component shelf at the rear of the machine, with easy access from above.

The side and front exterior panels may be of either stainless steel or of cold-rolled, galvanised and enamelled sheet steel. The machine top is of stainless steel.

51


Water inlet valves
Control valve, drain
Motor control unit
Automatic control unit
Detergent dispenser
Transformer
Program unit circuit board
Control panel
Heating relay (optional)
Motor
Door and door lock
Retaining strap
Outer drum
Cradle/counter-weights
Spring
Shock absorber
Drain valve
Base plate
3318

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. 52 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.

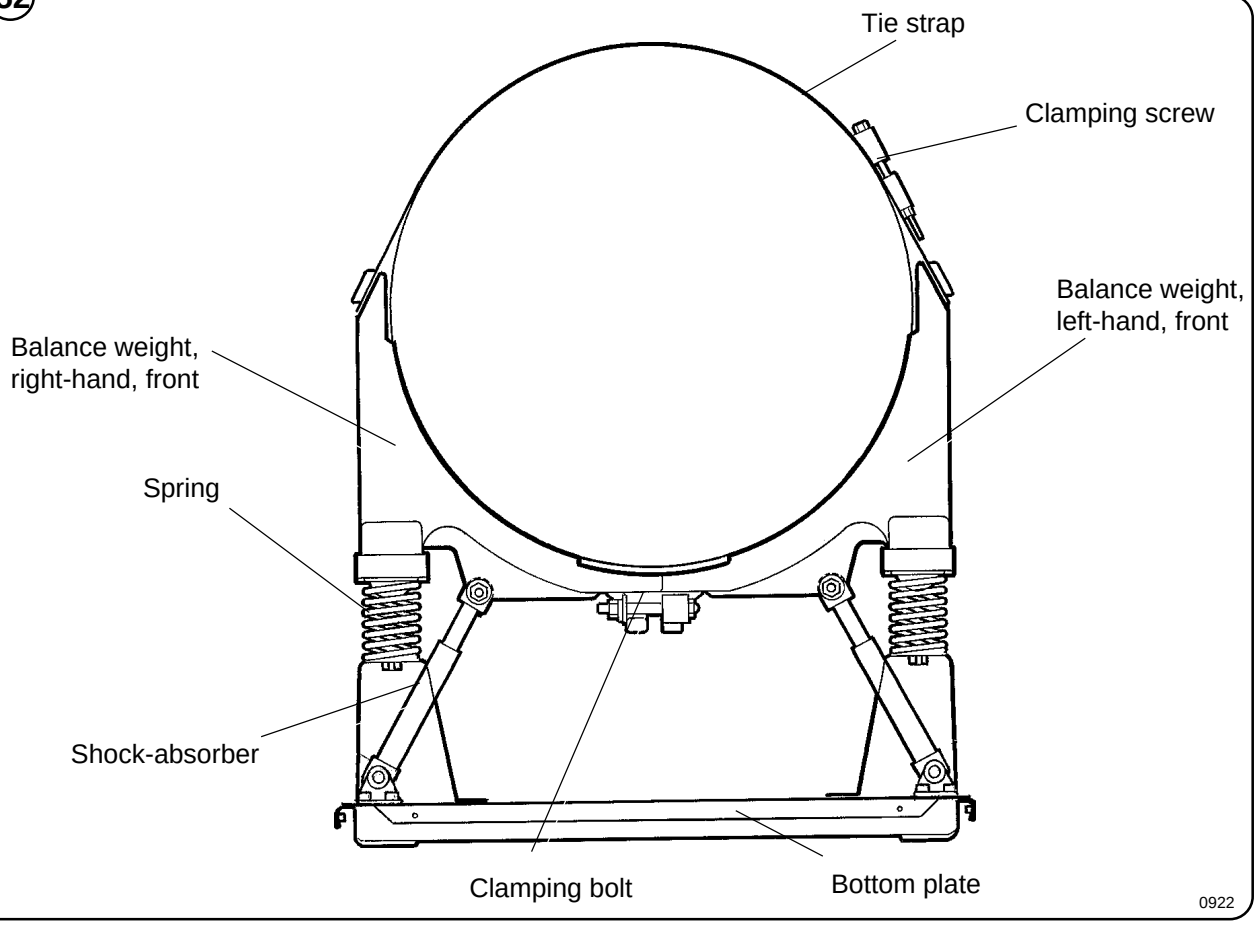
Inner cylinder

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.

52



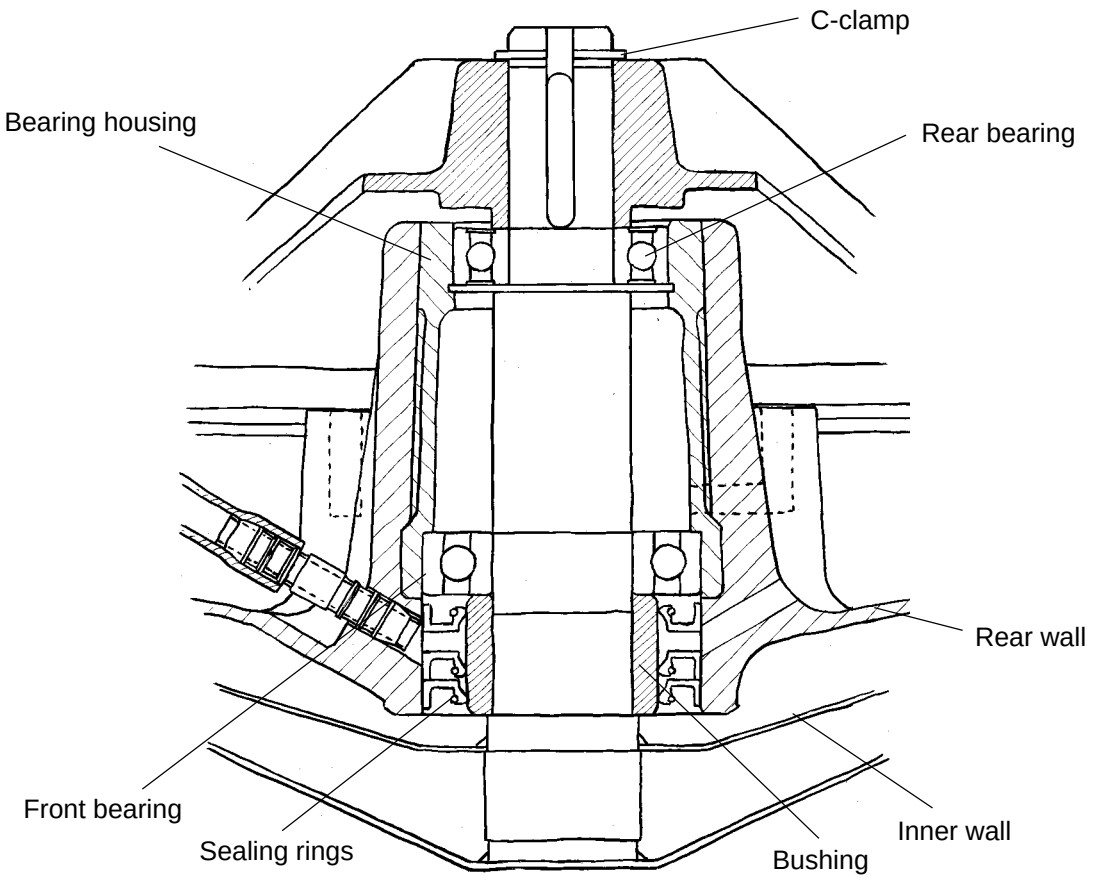
Back gable and bearing

Fig. 53 The back gable and the bearing trunnion housing are constructed of a webbed heavy casting for extra rigidity. There are three neopreene 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.

53



Door

Description

Fig. 54 The door is mounted on the outer drum of the machine. The door glass is held inside the door by three retainers and is easy to replace. The door seal is retained by a flange on the outer drum and creates a seal directly against the door glass. This seal is not bonded in place, so is easy to replace.

Leaking door seal

If the seal shows no signs of scratches or other damage, a loss of elasticity in the seal may be the cause of a leak. Replace the seal.

Leaks from the door seal may also be caused by dirt and build-up of lint. Clean the seal.

Door lock

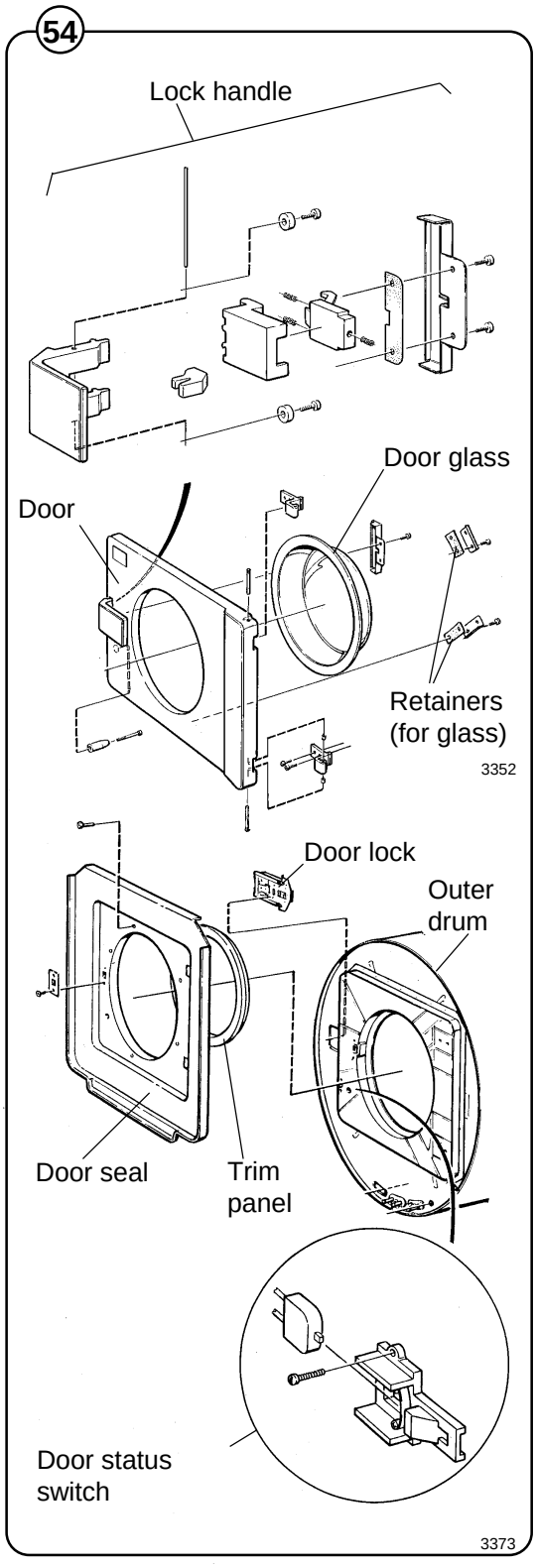
Description

The machine door lock forms part of a safety system which prevents injury by ensuring that:

- The machine cannot be started until the door is closed.
- The door cannot be opened until the wash program is ended and the drum is at a standstill.

The lock consists of:

- The lock handle (door handle) which closes the door and presses it against the door seal.
- The door lock, which locks the door when the machine is operating. The lock contains a delay mechanism in the form of a bimetallic component which heats up when the lock is activated. The door lock also has a closing contact which sends a signal to the program control unit when the lock is activated.
- The door status switch which closes a circuit and sends a signal to the program control unit when the door is closed.



Function

When the door is closed, the door status switch closes a circuit and sends a signal to the program control unit to indicate that the machine is ready to start.

When a program has been selected and the start button has been pressed, the door lock will be activated and will lock the door, at the same as the switch in the door status switch closes. Only now will the program control unit allow the program to start.

When the door lock is activated a bimetallic component in the lock heats up. If the power supply is interrupted, it takes about 1.5 minutes before the bimetal cools enough to release the door lock. This gives enough time for the drum to stop rotating and any water in the drum to be discharged (the discharge valve will open automatically if the power supply is cut).

If a fault or error relating to the door locking system should arise, the machine will stop and an error code will appear on the display (a flashing two-digit code followed by E). These are the error codes which involve the door lock:

Error code	Cause
02E	Door status switch open during program operation.
03E	The lock has not locked the door within the set time.
17E	Door status switch open, even though the door lock is locked.

To trace the cause of faults which initiate any of these codes, refer to Trouble-shooting.

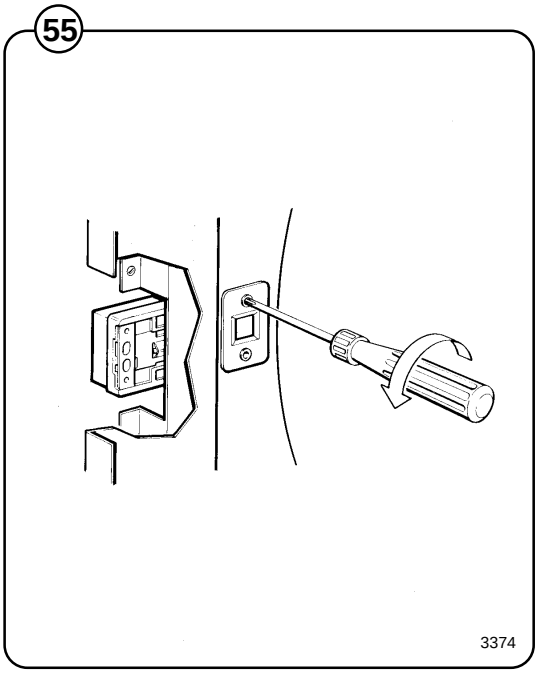
Instructions for repair

To replace the door lock

To be carried out by authorised personnel only.

Fig. 55

- Remove the front panel.
- Release the door lock by unscrewing the two screws.
- Pull out the lock mechanism. Transfer the electrical connections one by one from the old lock to the new.
- Insert the new unit and secure it with the screws. Close the door and check carefully that the lock will hold the door shut properly.
- Run a program, check that the door lock is really locking the door and that it is not possible to open the door for a period of 1.5 minutes after the program has ended.

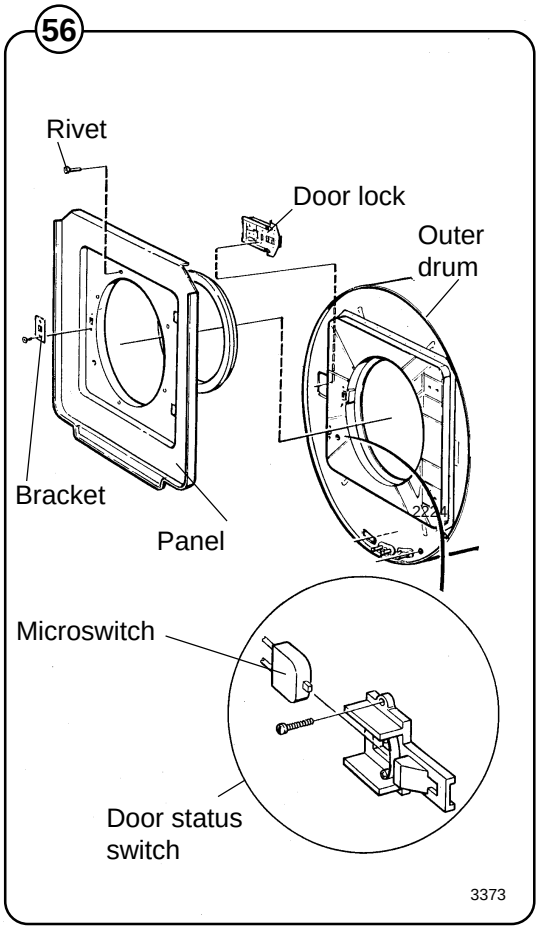


To replace the door status switch

To be carried out by authorised personnel only.

Fig. 56

- Remove the front panel.
- Undo the four screws for the hinges and remove the door.
- Unscrew the two screws holding the door lock and take off the mounting plate.
- Remove the trim panel as follows:
  - The trim panel is fixed to the outer drum by six plastic rivets. Each of these rivets was originally fixed by a wedge tapped into place at its centre, causing it to expand.
  - Use a suitable tool to tap these wedges, to release each one from its rivet. This will allow you to remove the trim panel.
- Unscrew the door status switch and replace the microswitch, or possibly the entire switch unit.
- Install the switch unit and fix the trim panel back in place. New wedges for the rivets are supplied in the spare parts kit for the door status switch.
- Refit the door lock and door.
- Check the door status switch functions with the aid of the service program (see Chapter 12, Fault-finding).



Electrical components

57

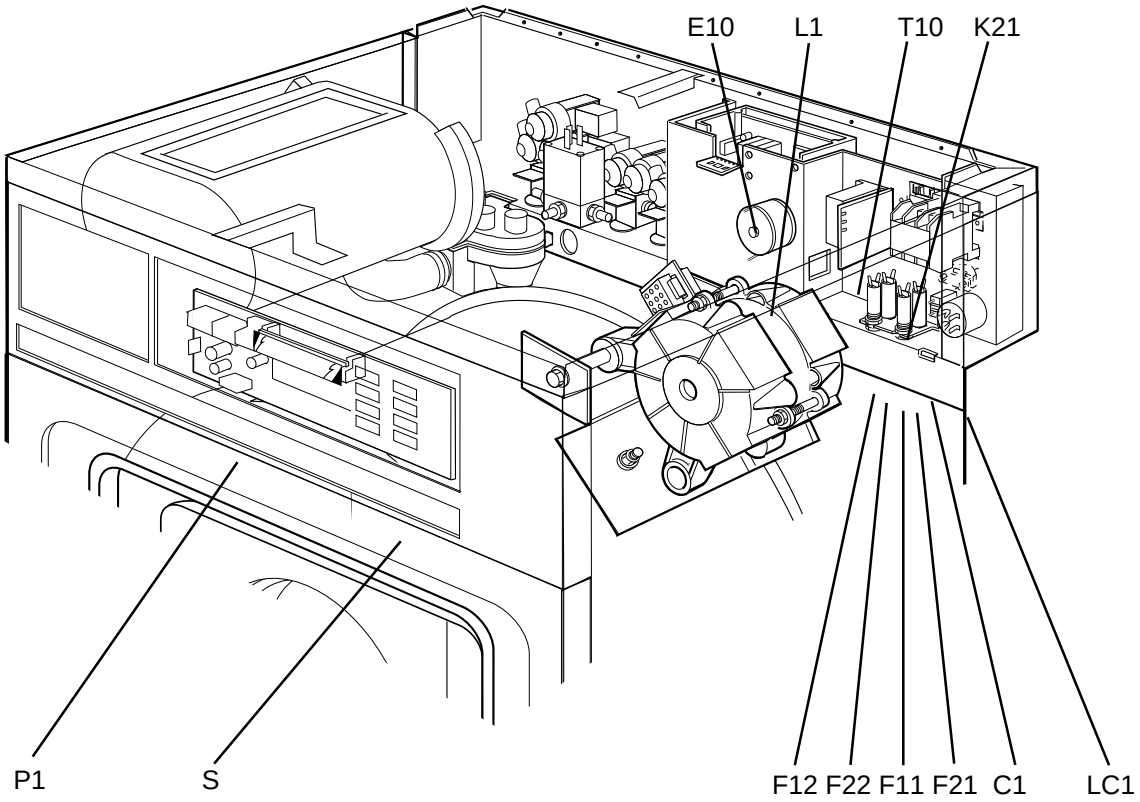


Fig. 57		
	P1	Electronic, microprocessor-controlled program control unit. Controls the sequences of the various programs as set out in program tables.
	E10	Motor control unit, microprocessor-controlled. Controls the direction of rotation and speed. The motor control unit is also used for imbalance monitoring and for calculating the weight of the wash load.
	K21	Relay for heating elements (option).
	LC1	Surge protection filter
	C1	Surge protection (capacitance)
	T10	Low-voltage transformer, which supplies the program control unit with a number of voltages.
	F11 - F22	Fuses
	S	Control panel plate with integral push-buttons
	L1	Surge protection (inductance)

Electronic program control unit

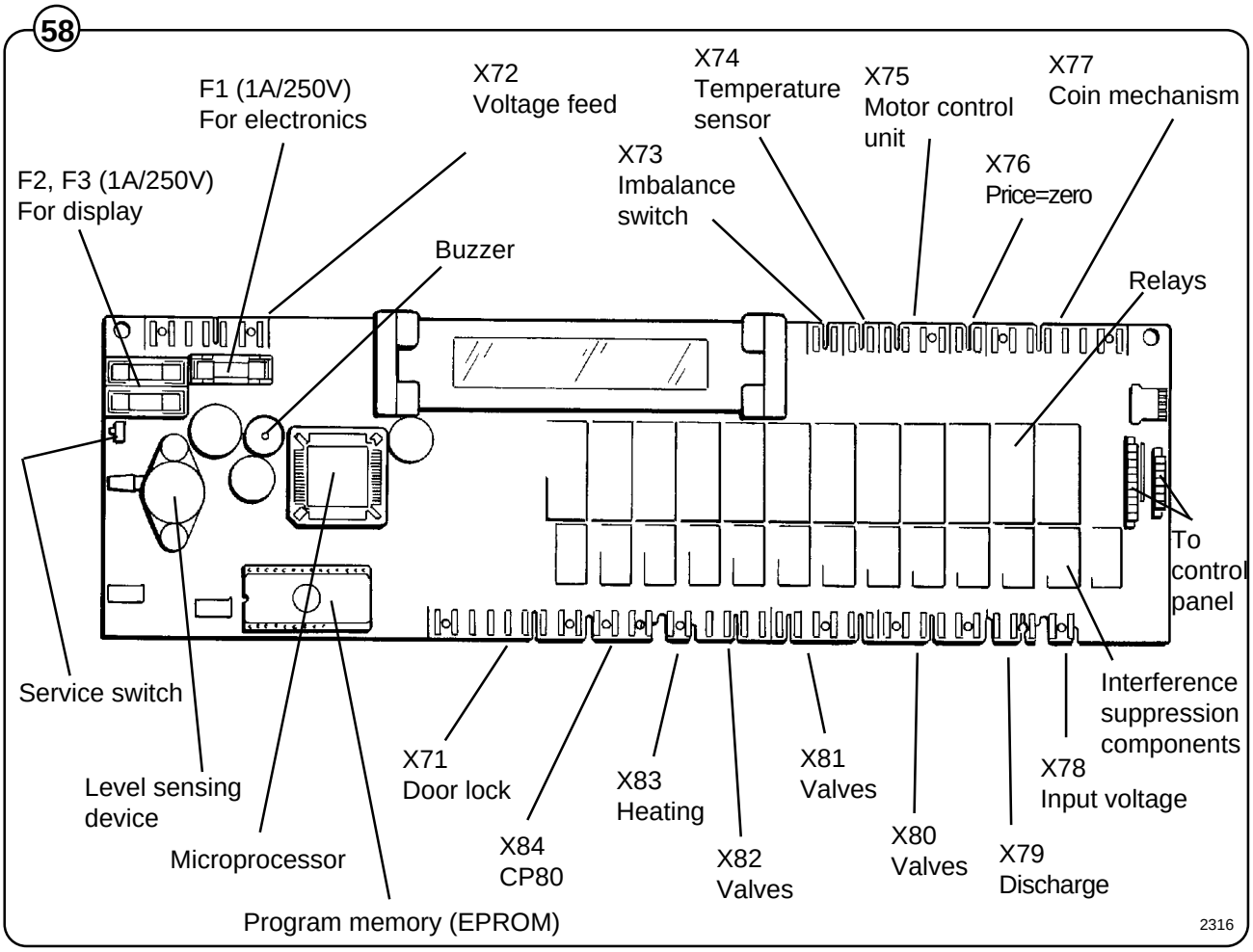
Description

Fig. 58 The program control unit is electronic and consists of a circuit board with components. On one half are the microprocessor, program memory (EPROM), power supply circuits, temperature and level control devices and so on. On the other half are the relays and interference suppression components. The program control unit has the following inputs and outputs:

- Inputs reacting to push-buttons on the control panel.
- Inputs which provide information on the machine's door lock status, level control, temperature sensors and coin mechanism if installed.
- Outputs which via relays directly control the various functions of the machine, e.g. motor control, water valves and door lock.
- Outputs to the display.
- Serial communication with the motor control unit.

The program control unit is controlled by the microprocessor, which fetches its instructions from the program memory (EPROM). The EPROM contains instructions for operation, the service program, control of relays, sensing of inputs etc. The EPROM also contains the standard programs supplied with the machine.

58



Operating time, accumulated coin value, EPROM no.

The machine's built-in service program can be used to check the machine's accumulated operating time, the accumulated coin value (for coin-operated machines), and the program EPROM part number.

Accumulated operating time

To check during normal operation

Fig. 59 The machine needs to be actually operating (program selected and started).

The buttons identified as A and B in the illustration may be "concealed" on some machines, in other words, have no symbols or other markings. They will still be usable for this function, however.

Press button A. The first two digits of a four-digit number will now be displayed, e.g. 13.

Press button B. The last two digits of a four-digit number will now be displayed, e.g. 47.

This means that the machine's accumulated operating time is 1,347 hours.

To switch on service mode

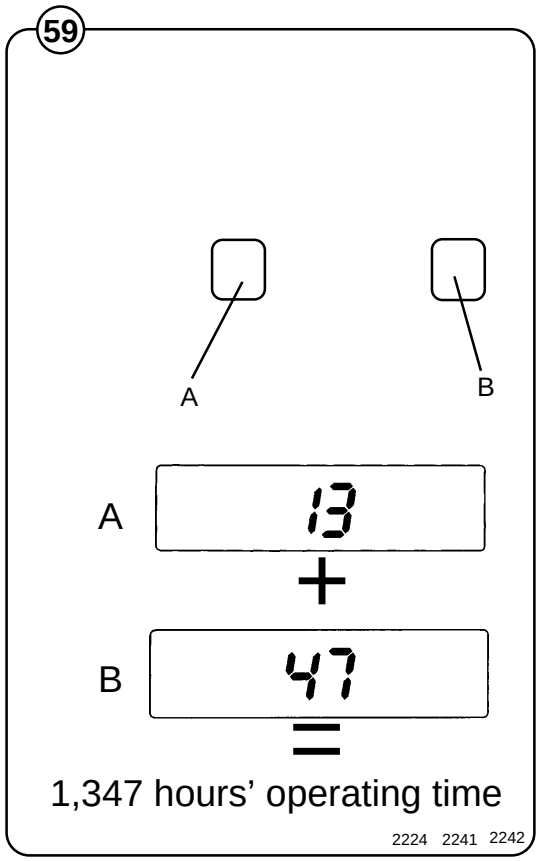
Fig. 60
- Remove the machine top and the cover for the program unit circuit board.

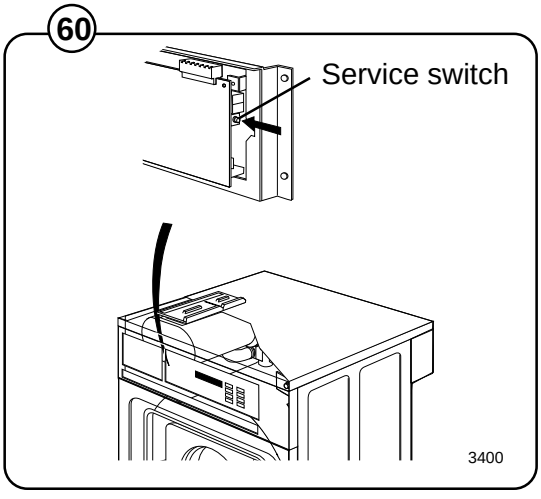
Fig. 61
- Press the service switch. This switch is on the left-hand edge of the circuit board when viewed from the machine front. The display will now show SE, which means that the service program is activated.

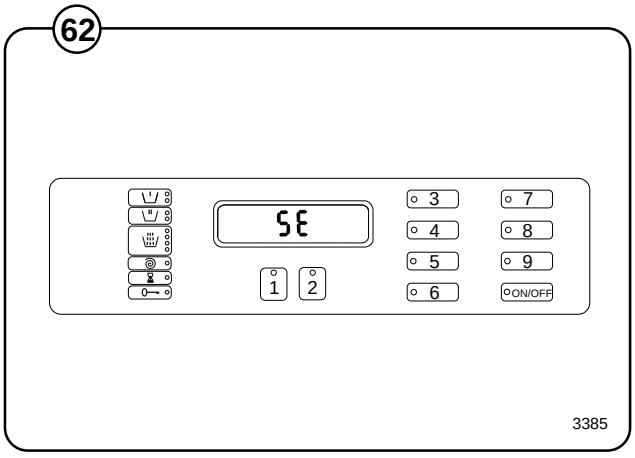
Fig. 62 Now some of the buttons switch to being number keys (1 to 9). The start button becomes an **ON/OFF** key.

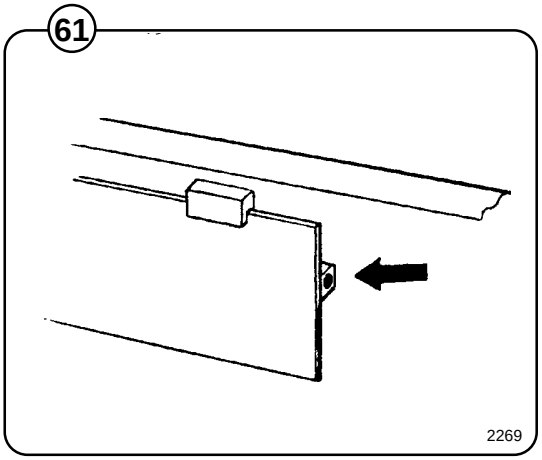
To switch off service mode

Press the service switch again, or switch off the machine power supply.







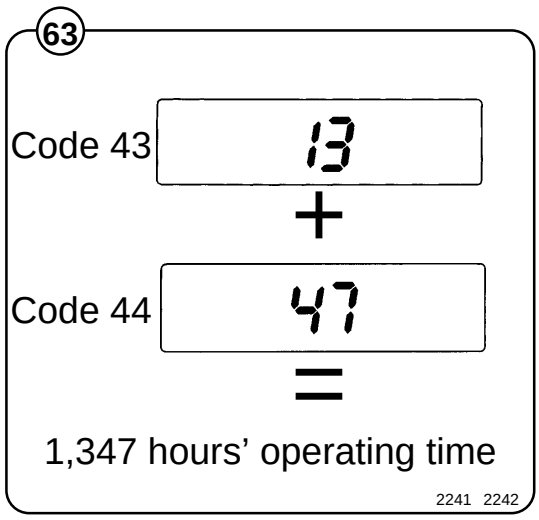


To check in service mode

Fig. 63 Enter code 43. The first two digits of a four-digit number will now be displayed, e.g. 13.

Enter code 44. The last two digits of a four-digit number will now be displayed, e.g. 47.

This means that the machine's accumulated operating time is 1,347 hours.



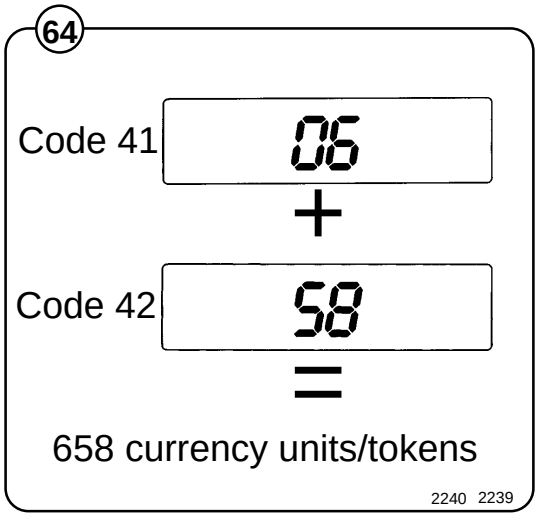
To check in service mode

Fig. 64

Enter code 41. The first two digits of a four-digit number will now be displayed, e.g. 06.

Enter code 42. The last two digits of a four-digit number will now be displayed, e.g. 58.

This means an accumulated coin value of 658 currency units or 658 tokens. In other words, it shows that 658 currency units or tokens have been inserted into the coin mechanism up until the time of the check.



Program EPROM part no. (check in service mode)

Fig. 65 Enter code 51. The letter A and two digits will be displayed, e.g. A47. ”A” denotes part no. (article no.).

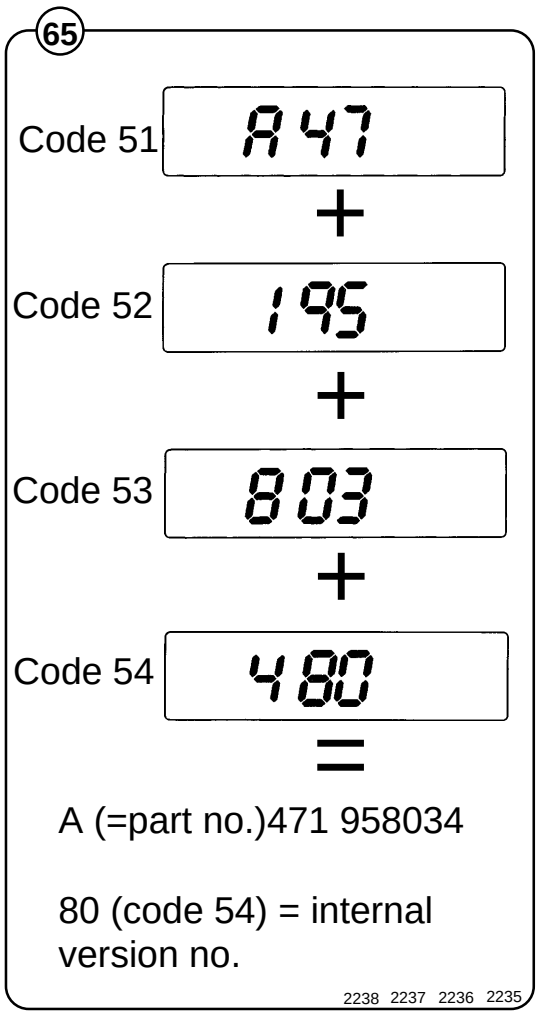
Enter code 52. The display will show (e.g.) 195.

Enter code 53. The display will show (e.g.) 803.

Enter code 54. The display will show (e.g.) 480.

When these digits are put together they make up the full part number:

A471 958034. The two digits at the end are an internal version number.

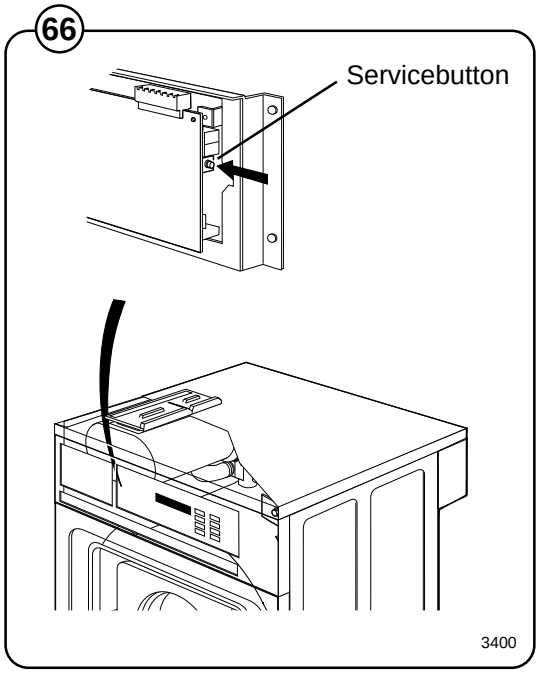


Level control

Description

The "level control", which is located on the circuit board, is a pressure switch which monitors the different water levels in the drum by sensing the air pressure in a tube which is connected to the bottom of the drum. As the water rises in the drum, the air inside the tube is compressed and at a set pressure ("cut-out-level") the microprocessor cuts out water filing.

When the water is emptied from the drum the microprocessor switches back to the starting position again, but now at lower water levels than were needed to switch when the drum was filling. These levels are called "on-levels". If during a wash the water should sink below on-level, the machine will be filled with water again, to cut-out-level.



Checking functioning and fault location

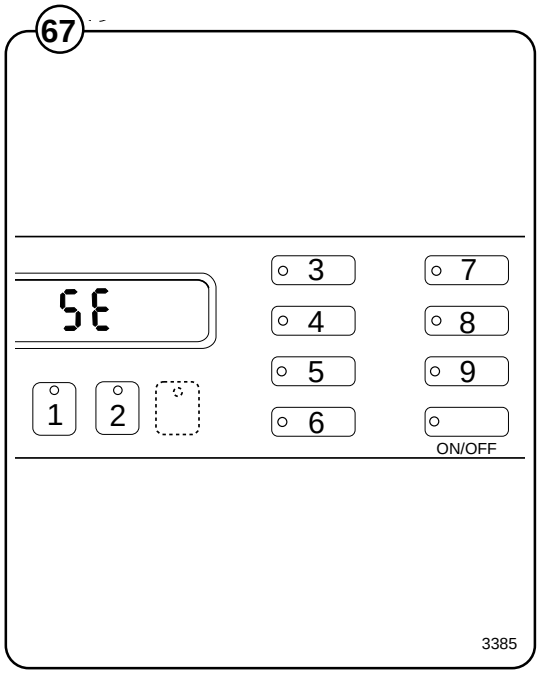
To be carried out by authorized personnel only.

A faulty level control cannot be repaired. Instead the whole circuit board must be replaced.

To check functioning of the level control

Fig. 66
- Start the service program by pressing the service button. Now certain of the buttons switch to being number keys (1 to 9).

Fig. 67
- Enter code 24. Now the display will show the current level in the machine on a scale of 1 to 200. An empty machine should show a value between 0 and 4.
- Press the START button. The machine will start to fill.
- Check that the figure shown on the display is counting upwards as the water level rises.
- After completing your check, stop filling by pressing the START button.
- Enter code 21 and open the drain valve to empty the machine.
- Quit the service program by pressing the service button.



If machine is filling to a level which is too high:

- Check that the tube between the level control and drum is not blocked. If necessary clean it by disconnecting it at the level control end with no water in the machine and blowing it clean.
- Check that the tube is undamaged.
- Test the machine by running a program.

Motor

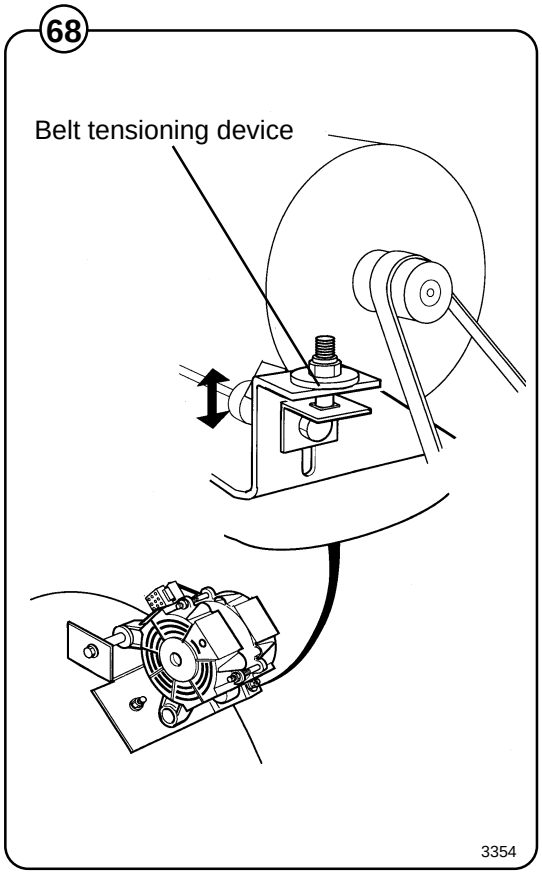
General notes

Fig. 68 The motor is mounted on a motor mounting plate above the outer drum. It drives the inner drum via a drive belt. There is a belt-tensioning device on the motor mounting plate.

The motor is connected to the electrical system via a quick-connector.

This is a frequency-controlled motor. Its various operating speeds (normal, distribution, extraction) are controlled by a microprocessor-based motor control unit, E10, in the automatic control unit.

The motor windings are protected by a thermal cutout device.



Motor control unit

Fig. 69 Fig. 70

The motor control unit communicates with the program control unit board via a serial (input/output) interface. With the aid of the motor control unit the program control unit can control not only the speed of the motor at any given point, but also the acceleration or deceleration rate at which the motor is to achieve the speed required. The motor control unit constantly feeds information on current status (both normal status and on any abnormalities arising) back to the program control unit board.

The motor control unti can also supply data on the torque of the motor at constant speed and when accelerating and decelerating. This data is used both tor calculating the weight of the wash load and for detecting any imbalance present.

WARNING
The voltage at test points 1-4 (TP1-4) has a potential difference of approx. -100 V in relation to incoming neutral and ground. Because of this, be careful when measuring. Use ungrounded oscilloscopes. If the motor control unit has a green LED, this will remain lit for as long as there are hazardous voltages present in components.

The motor control unit on the 100-litre machine has a cooling fan. The fan starts automatically when the temperature reaches about 65°C which can happen during extraction or if the surrounding temperature is high. When the machine starts the fan is rotating for a short while.

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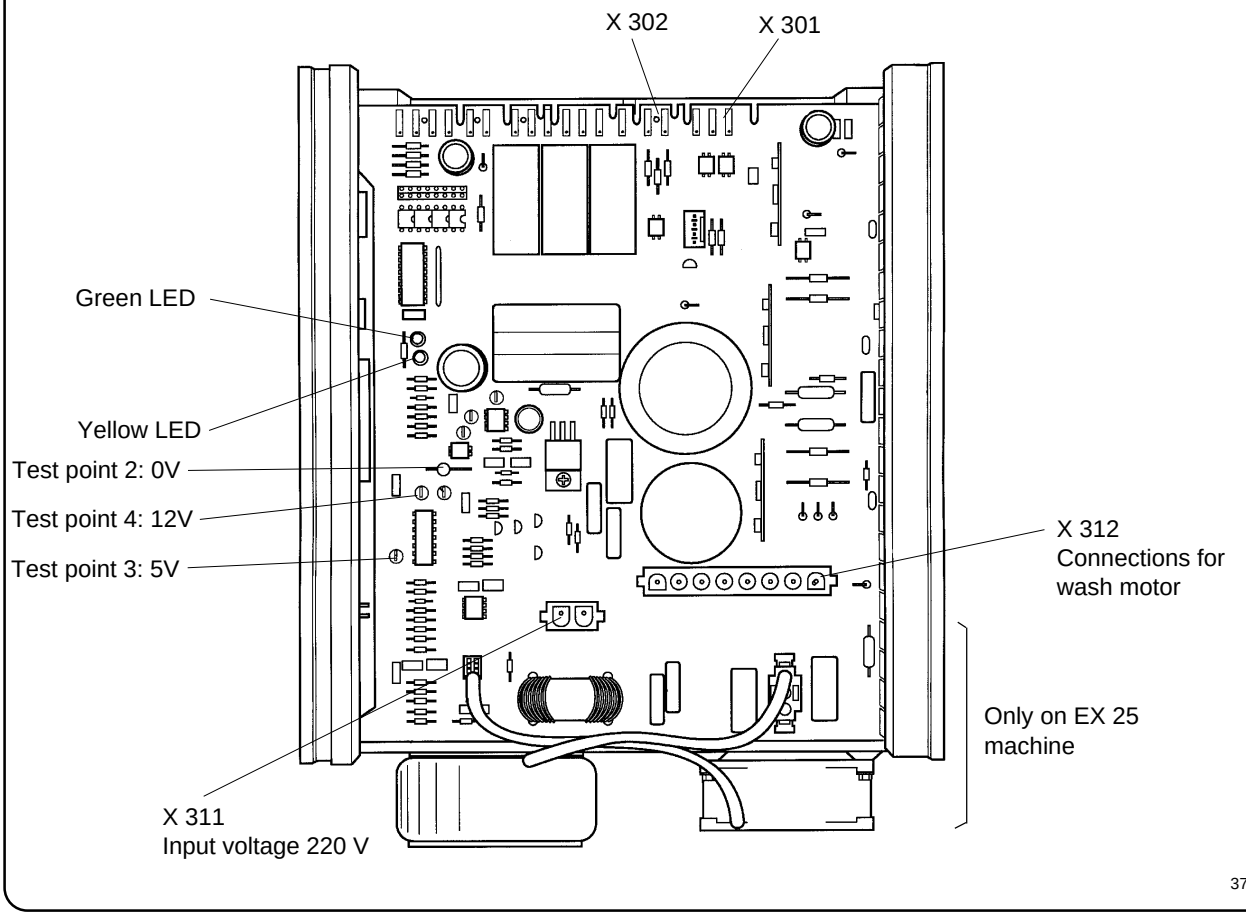

Fault/error indication

Fig. 70 Fig. 69

If a fault or error occurs in the motor or motor control unit, the latter will indicate this to the program control unit board. Information on these errors, besides appearing as an error code on the display, is also provided by a yellow LED on the motor control unit board. To understand this additional inform-ation, the pattern of flashes from the LED has to be observed and compared with this chart:

	LED pattern of flashes	Error code	Cause
1		31E	Heat sink temperature too high.
2		32E	Thermal protection for motor has cut out.
3		33E	The motor control gets start signal but lacks lock acknowledgement.
4			Communications fault motor control-program control unit.
5		35E	Short-circuit in motor windings, wire harness or internely in motor control.
6		36E	Fault in receiving circuitry for lock acknowledgement signal.
7		37E	Too low DC level in the motor control.
8		38E	Too high DC level in the motor control.
9			Motor control unit current-limiting function activated. Does not give an error code.

Fault-finding

The fault-finding charts for all error codes are in Chapter 12, Fault-finding.

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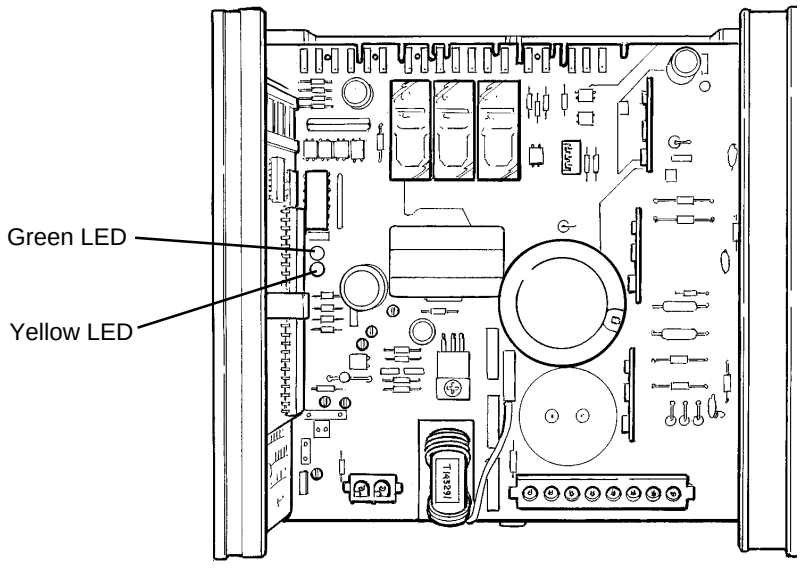

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Extraction

Fig. 71 For extraction the motor operates in an extraction pattern which is always the same with regard to motor speed. The pattern is as follows:

1. A brief, fast extraction, which removes most of the water from the wash load.
2. A brief reversed drum action, to allow optimum distribution of the load.
3. A distribution period with imbalance sensing – 20 seconds.
4. Extraction at 550 rpm – 30 seconds.
5. Extraction at 700 rpm – 2 minutes.
6. Extraction at 1020 rpm – remaining time out of the program's total extraction time.

The different extraction cycles in the different programs are achieved by varying the time that the motor will follow this extraction pattern.

Imbalance sensing

At the start of every extraction sequence, the system monitors variations in the motor torque while the drum is operating at distribution speed. If these variations are too great, it indicates that the load is unevenly distributed in the drum. At this point extraction is halted, the motor speed is reduced to wash speed and a fresh attempt to begin extraction starts. This procedure will be repeated up to three times per extraction. After the third time the system will decide whether the imbalance is "great" or "small".

- If the imbalance is "great", the extraction stage of the program will end without extraciton having taken place.
- If the imbalance is "small", extraction will take place, but at a reduced speed.

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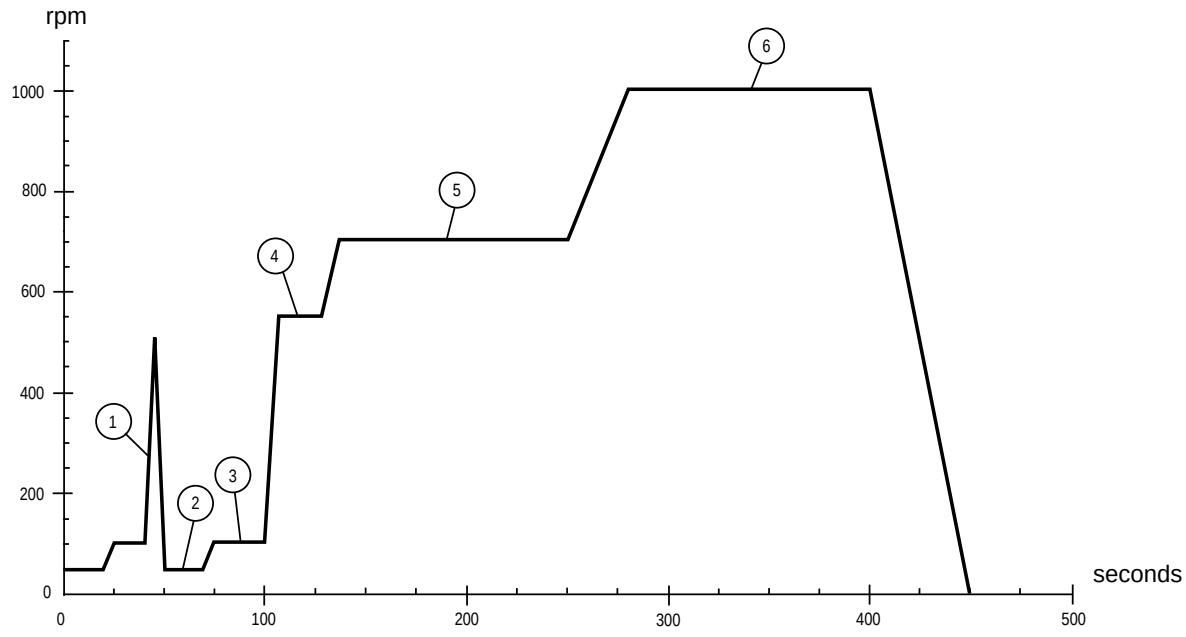


Belt tension

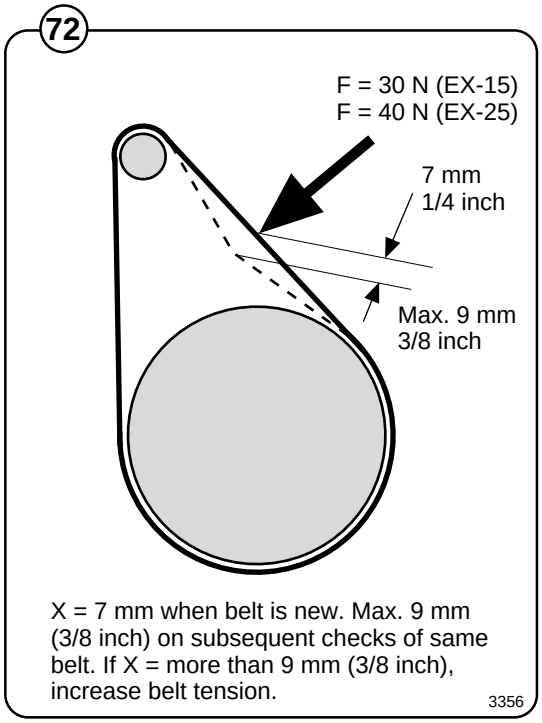
Fig. 72

The tension of the drive belt is preset at the factory.

When checking belt tension, or after replacing components which affect belt tension, follow the instructions contained in the figure.

Note!

Correct belt tension is important. The tension should always be checked as part of service and maintenance.



Inlet valves

Construction

Fig. (73) Each 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.

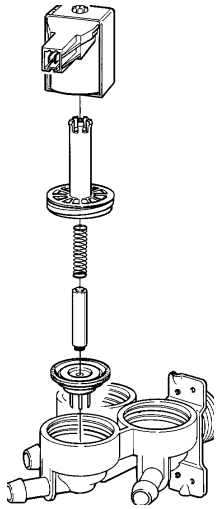
A filter screen on the inlet side prevents dirt from entering the valve. Flow restrictors can be placed at either the inlet or any of the outlets.

Operation

Fig. (74) 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.

73



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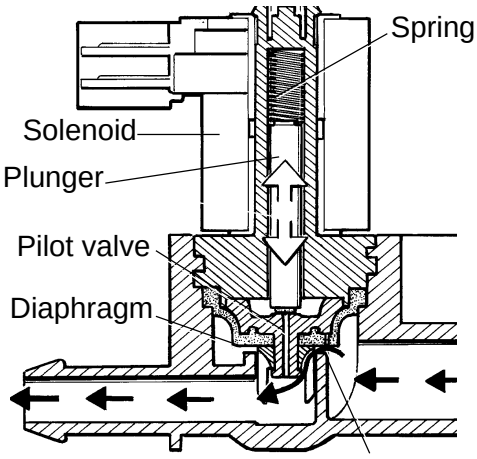

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Repair instructions

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

Fig. (75) 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 energized.
- Check the return spring.
- Check the diaphragm (pilot pressure opening).

Dismantling the valve

Fig. (76)
- Pull the coil straight upwards. Use a screwdriver if necessary to carefully undo the coil.

Fig. (77)
- 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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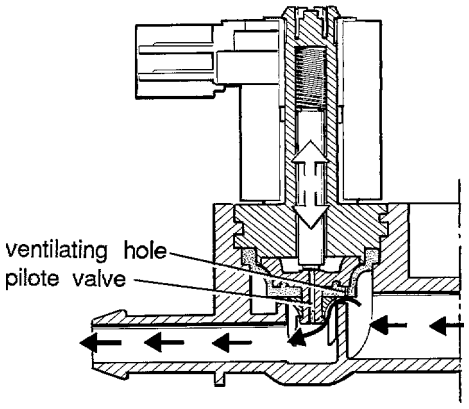

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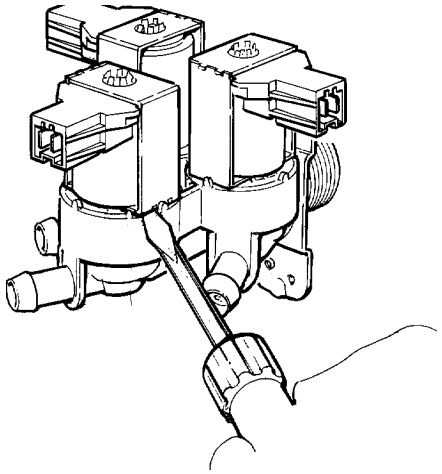

1187

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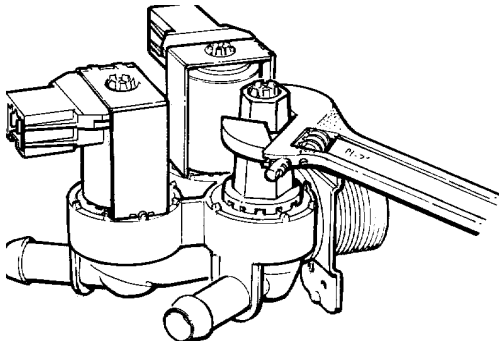


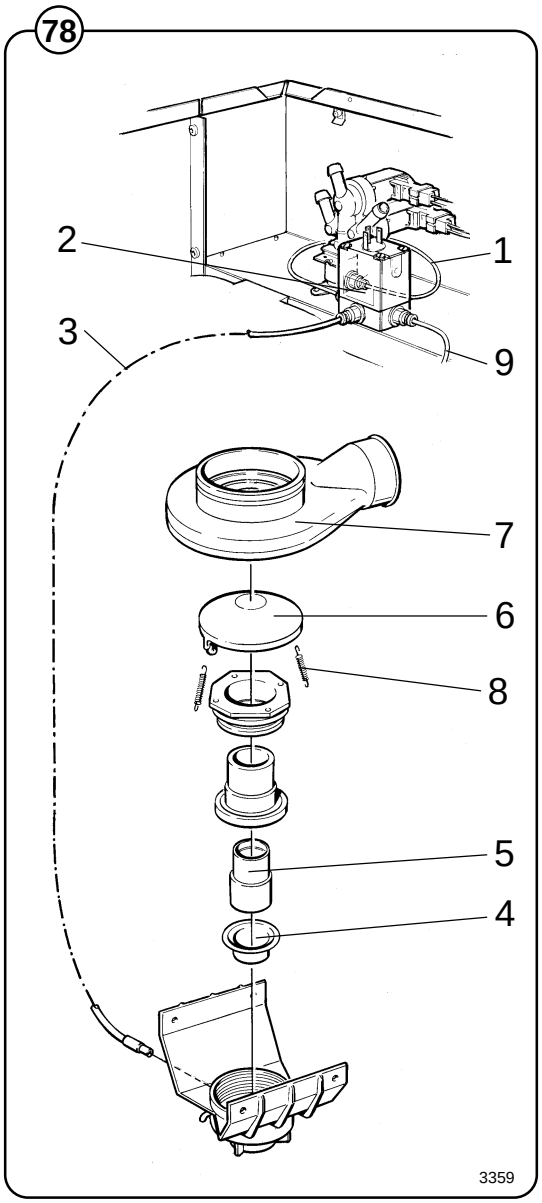
1181

Drain valve

Description

Fig. (78) The water pressure of the cold water intake is used for closing the drain valve. There is a hose (1) connected between the water intake and the control valve (2). When the control valve is activated it opens and lets water into the supply line (3) which is connected to the drain valve. The water presses up a rubber membrane (4) and a plunger (5) with a pressure plate (6) which closes the valve's rubber membrane (7).

When the control valve shuts off water pressure to the drain valve the springs (8) pull back the plunger. The return water passes the control valve and is discharged into the waste pipe via the return hose (9).



Fault-finding

To be carried out by authorized personnel only.

Drain valve will not close

Check that:

- Control valve (2) is energized.
- Hoses and control valve are not blocked, by disconnecting the supply line (3) from the drain valve and then activating the control valve.
- The rubber membrane (4) is sound.
- The plunger (5) is not binding.

Drain valve will not open

Check that:

- The return hose (9) is not blocked.
- The plunger (5) is not binding.

Drain pump (optional)

Description

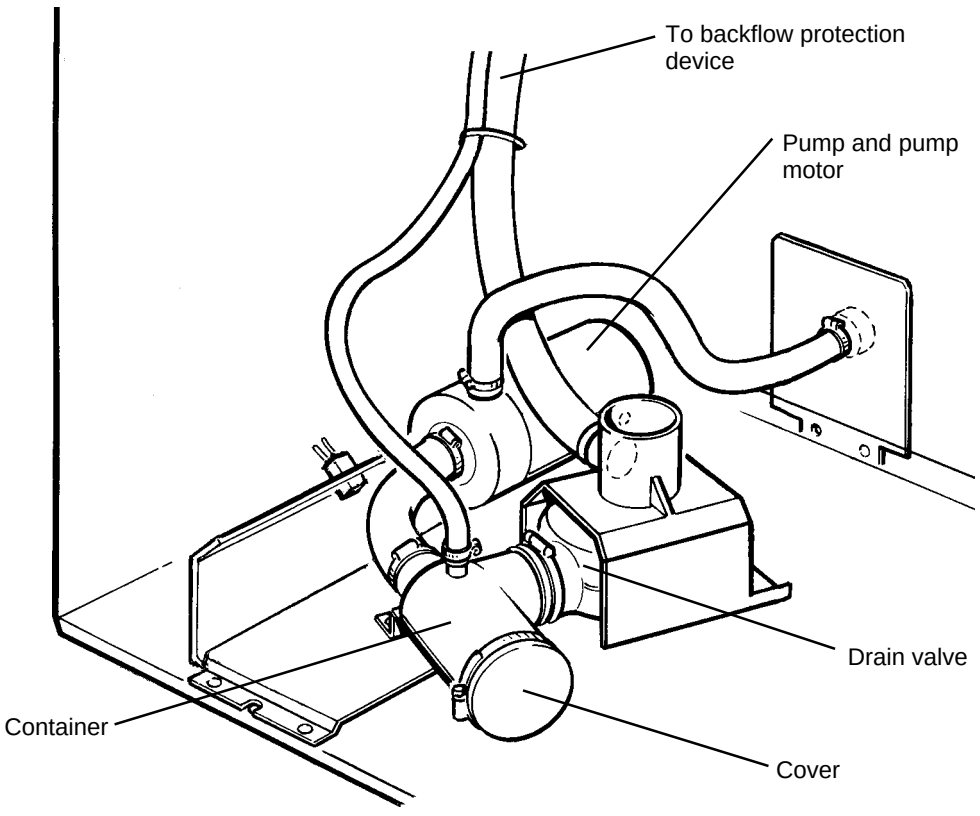
Fig. 79 The pump is located under the drum and consists of a pump and pump motor, plus a container with cover between the drain valve and the pump. Because the hose diameter at the pump is less than the outlet of the drain valve there is the risk that solid matter and lint will lodge between valve and pump. Any obstructions to the water flow can easily be removed by taking off the cover on the container. There is also a hose connecting the container with the backflow protection device.

Fault-finding

Machine will not empty

- Clean any foreign matter out of the pump.
- Check pump functioning:
  - Is the motor energised?
  - Has the impeller come loose from the motor shaft?

79



Soap supply box

Fig. (80) 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 Prewash cycle.

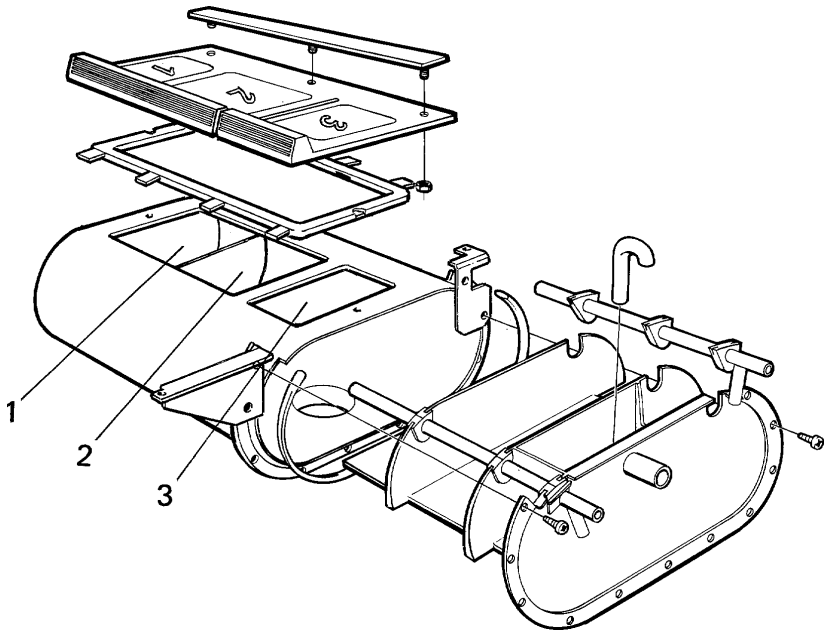
Compartment 2

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

(80)



1182

Built-in service program

The machine has a built-in service program to facilitate function checking and fault-finding.

> ⚠ **This program may only be used by trained and authorized service personnel.** ⚠

To switch on service mode

- Remove the machine top and the cover for the program unit circuit board.
- Press the service switch. This switch is on the left-hand edge of the circuit board when viewed from the machine front. The display will now show SE, which means that the service program is activated.

Fig 81

Controls in service mode

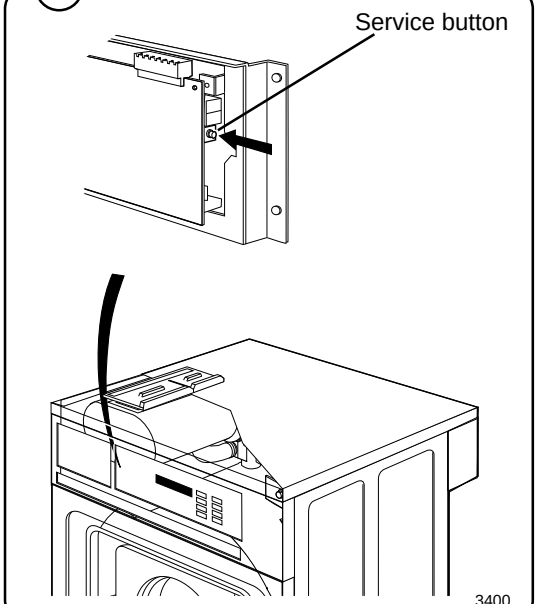
Fig 82 Now some of the buttons switch to being number keys (1 to 9). The start button becomes an **ON/OFF** key. The various machine functions can be tested using numerical codes (see table on next page).

Fig 83 The LEDs to the left of the display show which input signals to the program control unit are active.

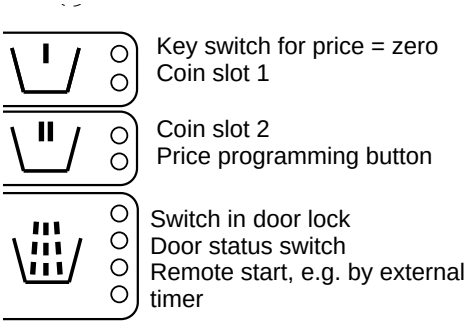
To switch off service mode

Fig 81 Press the service switch again, or switch off the machine power supply.

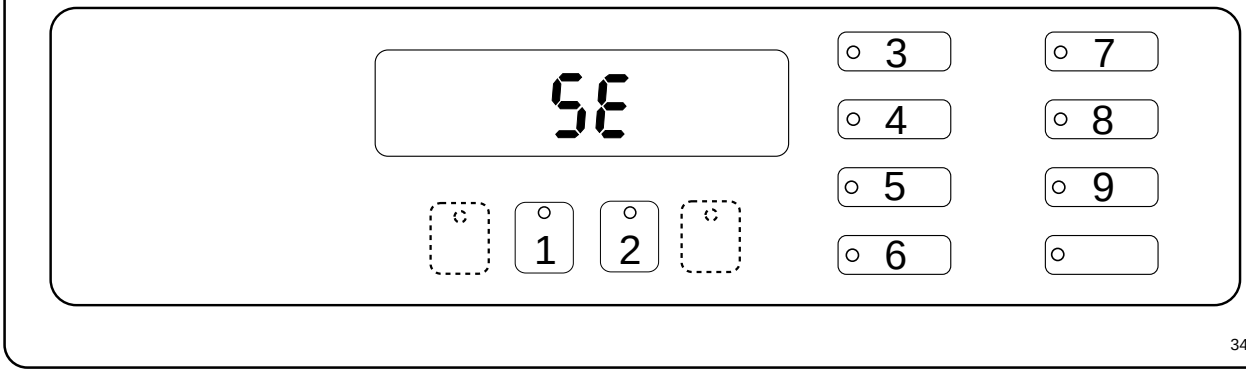
81



82



83



Simulation of functions

Some machine functions can be simulated by entering a numerical code via the keys. This function can then be switched on and off with the **ON/ OFF** key.

Number Code	Function
11	Detergent signal 1, liquid detergent.
12	Detergent compartment 2, cold water /Detergent signal 2, liquid detergent.
13	Detergent compartment 3, cold water /Detergent signal 3, liquid detergent.
14	Detergent compartment 2, hot water /Detergent signal 4, liquid detergent.
15	Detergent signal 5, liquid detergent.
16	Hot water in drum.
17	Detergent compartment 1, cold water.
18	Hard water in drum.
19	Heat: display shows actual temperature in drum, not code 19. When ”START” is pressed, the heating relay reacts if the water level is above 64 scale units. (Safety level).
21	Drain valve/pump
23	Activate door lock. When it is deactivated, the water drain valve will also open.
24	Level check. The parameter corresponding to the actual level will be shown on the display, not code 24. When ”START” is pressed, filling with cold water commences via detergent compartment 1.
25	Motor, wash speed low (30 rpm), counterclockwise.
26	Motor, wash speed low (30 rpm), clockwise.
27	Motor, wash speed high (48 rpm), counterclockwise.
28	Motor, wash speed high (48 rpm), clockwise.
29	Distribution speed (90 rpm), clockwise.
31	Extraction, low (550 rpm), clockwise.
32	Extraction, medium (700 rpm), clockwise.
33	Extraction, high (1000 rpm), clockwise.
34	Extraction, high (1000 rpm), clockwise.
35	Display, test of segments, LED test, and buzzer.
36	Buzzer

Number Code	Function
37	LED test
41-42	Coin mechanism (see Page 39, Program control unit).
43-44	Counter (hours) for accumulated operating time (see Page 39, Program control unit).
45	Last error code flagged.
51-54	Program EPROM part number (see Page 39, Program control unit).
91	Coin value, coin slot 1. This is set using the price-programming switch (see Page 39, Program control unit).
92	Coin value, coin slot 2. This is set using the price-programming switch (see Page 39, Program control unit).
93	Availability of pause function in coin-operated machines. Can be 1 = Yes or 0 = No. This is set using the priceprogramming switch (see Page 39, Program control unit).
94	Availability of rapid advance function in coin-operated machines. Can be 1 = Yes or 0 = No. This is set using the price-programming switch (see Page 39, Program control unit).
95	Activate coin-op input. Can be 1 = Active or 0 = Off. This is set using the price-programming switch (see Page 39, Program control unit).
97	To program a price reduction on a coin-operated machine, use the price-programming button. You set a price reduction as a percentage between 0 and 99. Rounding-up will take place to the next coin value upwards. A price reduction of 99% means a free wash program.

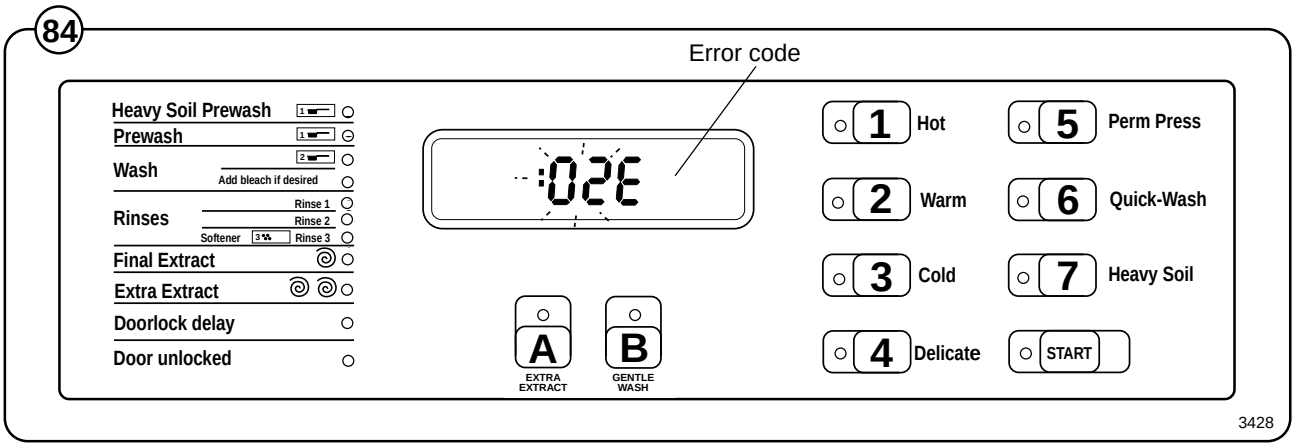
Trouble shooting

If the power supply to the machine should be cut while it is operating, the program unit has a memory which stores the program selected for about 3 to 5 minutes.

Within this period the machine will restart automatically once the power supply is restored.

Indication of faults/errors

Fig. 84 Faults/errors in the program or machine are indicated by a numerical error code followed by the letter E flashing on and off on the control panel display.



In the case of error codes 01E, 02E, 03E and 14E, an attempt to restart the machine may be made as soon as the fault/error has been remedied, without the power supply being switched off. For the other error codes, a service engineer must be called.

WARNING

<u>When working on the motor control unit</u>

The voltage at test points 1 - 4 (TP1 - 4) has a potential difference of up to 300 V in relation to incoming neutral and ground. Because of this, be careful when measuring. Use ungrounded oscilloscopes.

The motor functions as a generator when decelerating. If the motor has not stopped, high voltages may be present on the motor control circuit board even though the power supply to the machine has been disconnected.

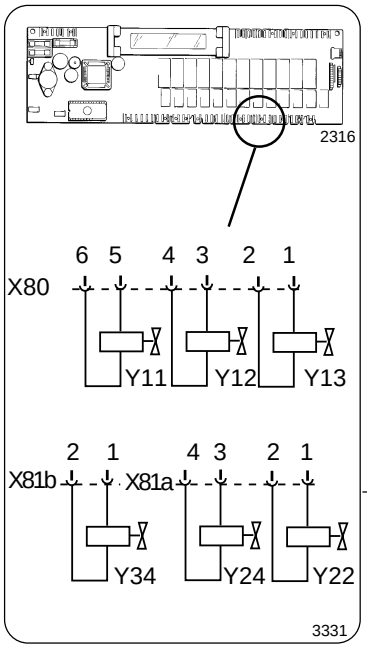
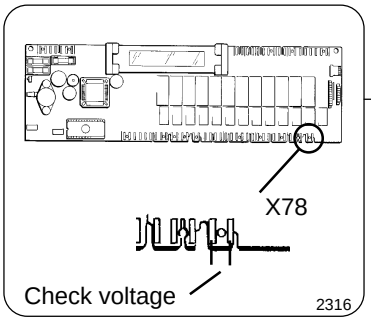
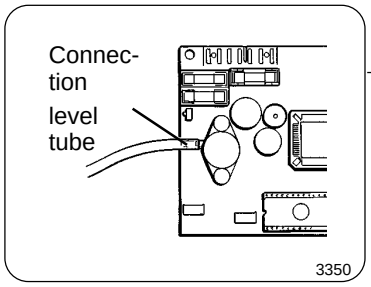
Error codes

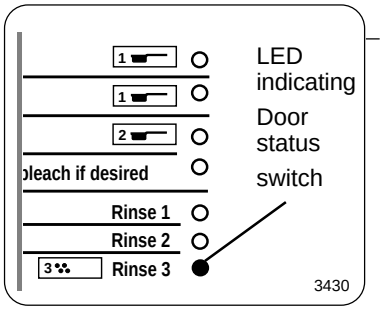
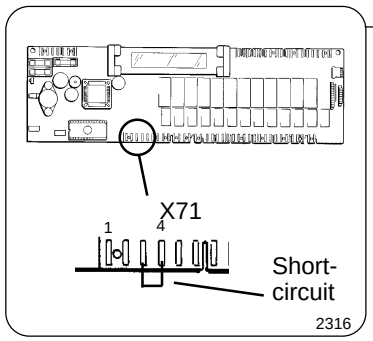
Given below is a brief summary of all the error codes and their causes. Starting on page 5 of this section there are fault-finding charts for all error codes.

At the end of the chapter there are also charts for faults which do not generate error codes.

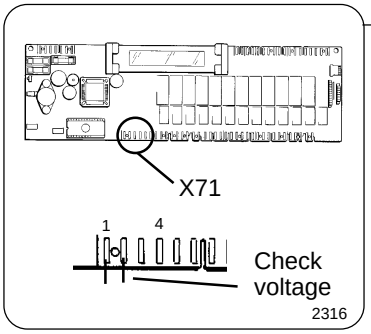
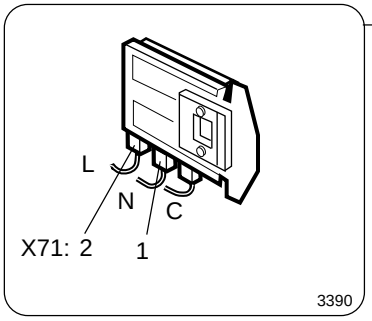
Error code	Cause
01E	Water level not reached within set time. Take necessary action. Press START again.
02E	Door status switch open during program operation. Take necessary action. Press START again.
03E	The lock has not locked the door within the set time. Take necessary action. Press START again.
04E	The temperature sensor indicates temperature below -5°C (open circuit).
05E	The temperature sensor indicates temperature above 98°C (short-circuit).
06E	The water level is above the safety level set for starting.
07E	The water level is above the safety level set for program operation.
08E	Temperature increase in water less than 5°C/10 min. (Heated machines).
10E	The water level is above the safety level set for after drain.
12E	The program control unit cannot read the program EPROM.
13E	Program control unit receiving no response from the motor control unit.
14E	Level system not temperature-calibrated. Press START to run the wash program. Program will run, but the water level will not be optimally adjusted.
17E	Door status switch open, even though the door lock is locked.
18E	Not used.
19E	Not used.
31E	Temperature of motor control unit heat sink too high.
32E	Thermal protection for motor has cut out.
33E	Motor control unit receiving start command from program control unit without first receiving lock acknowledgement signal. Motor control unit receiving circuitry for lock acknowledgement signal is not faulty.
35E	Motor control unit indicating short-circuit between outputs for motor windings.
36E	Motor control unit indicating fault in interlock hardware.
37E	Motor control unit indicating DC voltage level too low in motor control unit.
38E	Motor control unit indicating DC voltage level too high in motor control unit.

Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
01E Acknowledgement signal for water level not received within time allowed.	Check that the manual water valves (taps) are open.	
	Taps turned on.	Taps turned off. → Open taps. Press START again.
	Restart the program and use rapid advance to get to main wash. Check that the machine is filling with water.	
	Machine filling	Machine not filling
		Check input voltage on relevant water valve (See Program Tables, Chapter 4).
		Voltage not correct → Faulty valve. Check function as described in Chapter 34.
		Voltage correct
		Check water valve input voltage at PCB connector X80, X81a or X81b, according to valve.
		Voltage not correct → Faulty wiring between program control unit PCB and water valve. Check wiring and replace where necessary.
		Voltage correct
		Check input voltage (230 V) at PCB connector X78.
		Voltage not correct → Faulty control output from program control unit PCB. Replace PCB.
		Voltage correct → Faulty wiring program control unit PCB - transformer T10, or faulty/incorrect strapping on transformer T10.
	Check that the discharge valve is closed, i.e. water level rising in drum.	
	Discharge valve closed	Discharge valve open → Follow fault-finding procedure for error code 06E in this chapter.
	Check that level tube is sound, not kinked, not come loose from mother board.	
	Level tube OK	Level tube not OK → Fit tube properly or replace it.
		Level detection function on program control unit PCB faulty. Replace PCB.

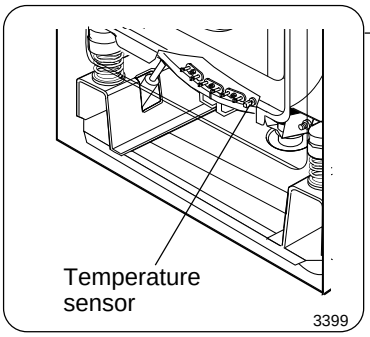
Error code/symptoms	Fault-finding	Cause/Action
02E Door status switch open during program operation.	Open door. Close door and try to restart the machine. Error code returns → No error code	Transient fault in door lock or program PCB.
	Set program control unit to service mode (see "To switch on service mode"). The door status switch will now be indicated by the LED (illustrated). Press in the door status switch manually and check if this is indicated by the LED. LED does not light. → LED lights.	Check whether the pin on the door or the plastic slide which the pin presses against are worn. Replace any worn parts.
	Disconnect the two wires from the switch. Short-circuit the two wires. LED does not light. → LED lights.	Door lock switch faulty. Replace switch.
	Remove connector X71 from the program control unit PCB. Short-circuit between inputs 3 and 4. LED does not light. → LED lights.	Continuity fault in wiring or connectors. Check wiring and replace if necessary.
		Fault in program control unit PCB. Replace PCB.

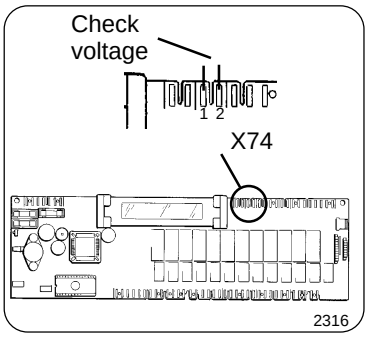
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
03E The lock has not locked the door within the set time.	Open door. Close door and try to restart the machine.	
	Error code returns ↓	No error code → Transient fault in door lock or program PCB.
	Start service program and activate door lock (code 23, press START). Check input voltage to door lock, PCB connector X71 between terminals 1 and 2.	
	Voltage correct. ↓	Voltage absent or wrong. → Faulty control output from program control unit PCB. Replace PCB.
	Unscrew the door lock. Door and door lock). Check voltage at door lock between terminals X71:1 and 2 as illustrated.	
	Voltage correct. ↓	Voltage absent or wrong. → Faulty wiring between program control unit PCB and door lock. Check wiring and change if necessary.
		Faulty door lock. Replace door lock.

Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
04E Temperature sensing device indicates temperature below -5°C (continuity fault).	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault.
	Short-circuit the temperature sensor by the sensor. Turn the machine's wall switch off and on again. Start a program. Check whether the error displayed is 04E or 05E.	
	04E	05E → Temperature sensor faulty. Replace sensor.
	Remove PCB connector X74 on program control unit PCB. Short-circuit inputs 1 and 2. Turn the machine's wall switch off and on again. Start a program. Check whether the error displayed is 04E or 05E.	
	04E	05E → Fault in wiring to temperature sensor. Check wiring and replace if necessary.
	04E →	Fault in temperature sensing device on program control unit PCB. Replace PCB.

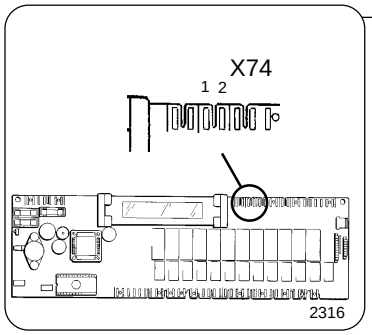
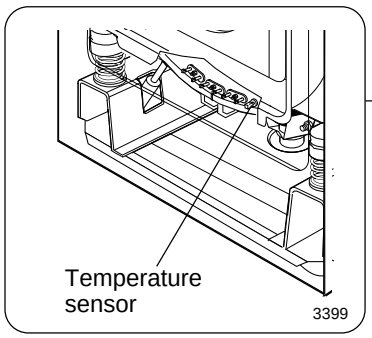




Rough values on the temp. sensor

T (°C)	R (ohm)
19	6100
20	5850
21	5600
22	5350
23	5100

Error codes which may arise on the control panel display

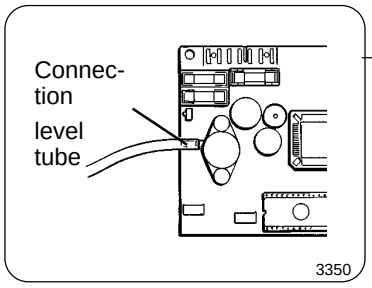
Error code/symptoms	Fault-finding	Cause/Action
05E Temperature sensing indicates temperature above 98°C (short-circuit).	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault.
	Remove PCB connector X74 on program control unit PCB. Turn the machine's wall switch off and on again. Start a program. Check whether the error displayed is 04E or 05E.	
	04E	05E → Fault in temperature sensing device on program control unit PCB. Replace PCB.
	Put back X74. Disconnect the link between wiring and sensor by the temperature sensor. Turn the machine's wall switch off and on again. Start a program. Check whether the error displayed is 04E or 05E.	
	05E	04E → Temperature sensor faulty. Replace sensor.
		Fault in wiring to temperature sensor. Check wiring and replace if necessary.

Rough values on the temp. sensor

T (°C)	R (ohm)
19	6100
20	5850
21	5600
22	5350
23	5100

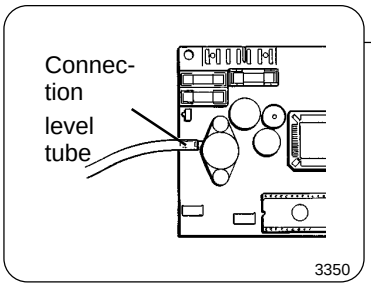
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
06E Water level signal above parameter set, on program start-up.	Are there water in the drum? Yes → No → Disconnect the level tube from the program PCB. Turn the machine's wall switch off and on again. Start a program. Error code 06E → No error code or error code 01E →	Level tube probably blocked, due to fluff of wrongly mounted. Clean or replace tube. Nipple blocked on drain valve. Level sensing device on program control unit PCB not working or incorrectly calibrated. Check zero level in the service program see chapter 12 page 4, code 24, zero level shall be between 0 and 4.
	Turn the machine's wall switch off. Does water run out of the drum? Yes → No →	Check the discharge valve (see Chapter 38). The service program can be used (code 21) to open and close the control valve for the discharge valve.
	Turn on wall switch. Start a program and let it run. Still an error code. → No error code. →	Transient fault. No action required.
	Check to see if the discharge valve is partially blocked or not opening fully. Discharge valve OK → Discharge valve not OK →	Check to see if the discharge valve is partially blocked or not opening fully (see Chapter 38). Faulty control signal to discharge valve from program control unit PCB. Replace PCB.

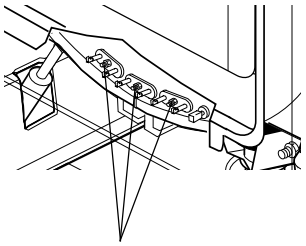
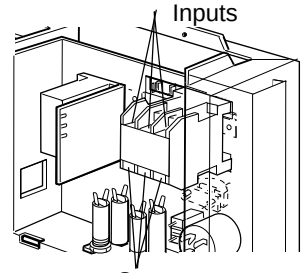
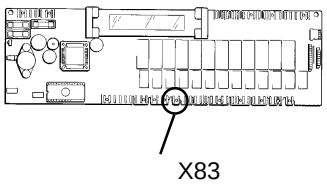


Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
07E Water level signal above parameter set for safety, during program.	Turn the machine's wall switch off and on. Start a program. Error code 06 → Is there a valve still drawing water? No error code →	Transient fault or water has been added manually.
	Yes → Remove connector for valve input voltage. Valve stops drawing water. →	Faulty water valve. Clean or replace valve (see Chap. 34).
	Valve still drawing water. →	Fault in control signal from program PCB. Replace PCB.
	No → Turn the wall switch off and on. Disconnect level tube from level sensing device on PCB. Start a program. Error 07 or 06 returns →	Level sensing device on program control unit PCB not working or incorrectly calibrated. Check zero level in the service program, see chapter 12 page 4, code 24, zero level shall be between 0 and 4.
	No error code →	Level tube probably blocked, due to fluff or wrongly mounted. Clean or replace tube. Nipple blocked on drain valve.

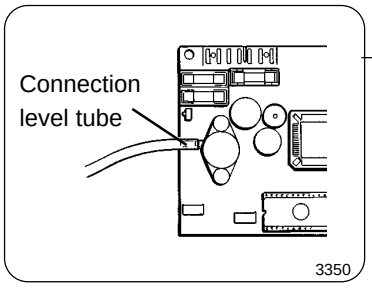


Error codes which may arise on the control panel display

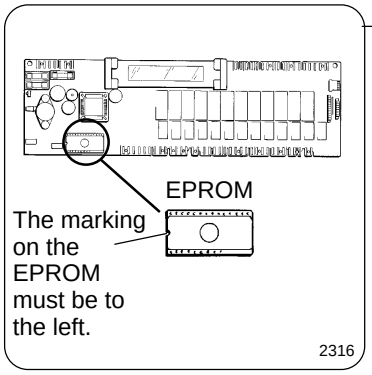
Error code/symptoms	Fault-finding	Cause/Action
08E Increase in water temperature is below parameter set. (Heated machines only).	Turn the machine's wall switch off and on again. Start a program. Error code returns — No error code	Transient fault. No action required.
	Check the input voltage to the machine. All fuses sound? Input voltage correct. — Input voltage wrong.	Replace fuse(s).
 Element connections 3399	Start the service program and fill with water (code 24) to at least level 80. Start heating (code 19). Measure voltage across each element at element connections, alt measure all phases with a clip-on ammeter (6-25A depending on the heating element effect). Voltage wrong — Voltage correct	
	Switch off power supply at wall switch. Measure resistance of elements: should be 20 - 25 Ω (2.5 kW) or 40 - 50 Ω (1 kW).	
 Relay 21 Inputs Outputs 3332	Correct — Wrong	Replace faulty element.
	Check voltage at outputs of relay 21. An incorrect voltage — Voltages correct	Check through hatch in drum whether the elements are coated with limescale. If necessary de-scale them.
	Check voltage at inputs of relay 21. Voltages correct — An incorrect voltage	Fault in wiring between relay and element. Check wiring and replace it if necessary.
 X83 2316	Check visually that the relay has reacted. Relay has not reacted — Relay has reacted	Fault in wiring between relay and connection block X1. Check wiring and replace if necessary.
	On program control unit PCB check the voltage at connector X83 between 1 and 2 (230 V). Voltage correct — Voltage wrong	Relay faulty. Replace relay.
	Check input voltage to relay coil (230 V) on relay 21 between connections A1 and A2. Voltage wrong — Voltage correct	Faulty control signal from program PCB. Replace PCB.
		Relay faulty. Replace relay.
		Fault in wiring between PCB and relay. Check wiring and replace if necessary.

Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
10E The water level is above the safety level set for after drain.	Is water visible in the drum? Yes → No → Remove the water drain valve from the drum. Is there water at the bottom of the drum? Yes → No → Disconnect the level tube from the program PCB. Turn the machine's wall switch off and on again. Start a program. Error code 06E or error code 10E → No error code or error code 01E	Level tube probably blocked. Clean or replace tube. Level sensing device on program control unit PCB not working or incorrectly calibrated.
	Turn the machine's wall switch off. Does water run out of the drum? Yes → No	Check the drain valve. The service program can be used (code 21) to open and close the control valve for the drain valve.
	Turn on wall switch. Start a program and let it run. Still an error code. → No error code.	Transient fault. No action required.
	Check to see if the drain valve is partially blocked or not opening fully. Drain valve OK → Drain valve not OK	Check to see if the drain valve is partially blocked or not opening fully. Faulty control signal to drain valve from program control unit PCB. Replace PCB.

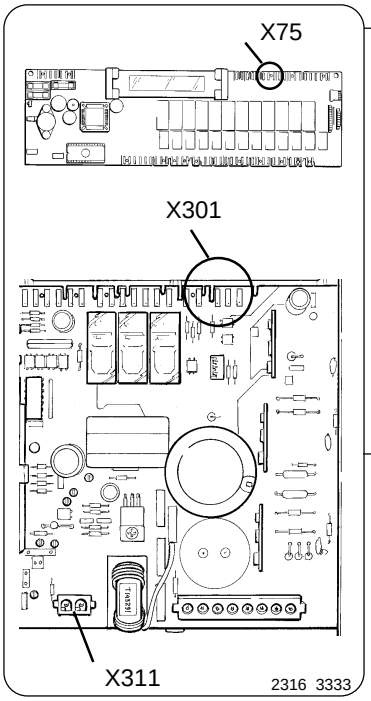


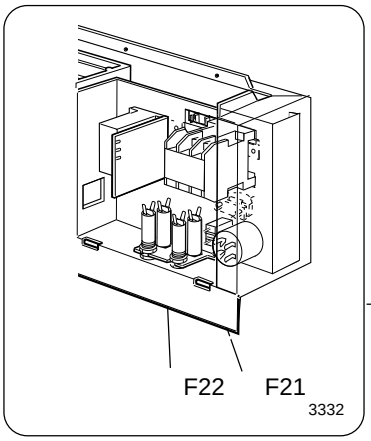
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
12E The program control unit cannot read the program EPROM.  	Turn the machine's wall switch off and on again. Start a program. Error code returns — No error code →	Transient fault. No action required.
	Unscrew the program control unit PCB. Remove the EPROM, then refit the same one. Check that the EPROM is turned the right way and that all its leg connectors enter the holder correctly. Restart the machine. Error code 12E returns — Machine normal →	Temporary loss of contact or EPROM fitted incorrectly.
	Replace the EPROM. Check that the new one has the correct program version. Restart machine. Error code 12E returns — Machine normal →	Old EPROM was faulty.
		Faulty program control unit PCB. Replace PCB. The old EPROM can probably be reused.

Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
13E Program control unit receiving no response from the motor control unit.	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault. No action required.
	Check wiring from X75 on program control unit PCB to X301 on motor control unit. Use an ohmmeter to check that the four conductors are sound as follows: X75: X301: 1 - 4 2 - 3 3 - 2 4 - 1 Measure also between the four connections in X75 to eliminate possibility of short-circuits between two conductors.	
	Wiring sound	Wiring faulty → Check wiring and replace if necessary.
	Check input voltage (120/230 V) to the motor control unit on contact X 311 (measure on rear of PCB).	
	Wrong voltage	Voltage correct → Replace motor control unit.
	Malfunction remains	Function normal → Fault in motor control unit communications circuits.
		Probable fault in program control unit PCB communications circuits. Refit the original motor control unit and replace the program control unit PCB.
	Check voltage (120/230 V) across fuses F21 - F22.	
	Wrong voltage	Voltage correct → Coil L1 faulty. Replace coil.
		Input voltage to machine incorrect.



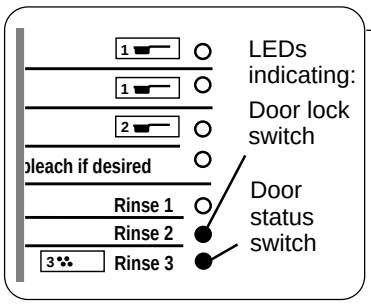


Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
14E Level system not temperature-calibrated	When START is pressed wash programs will run, but the water level will not be optimally adjusted. Turn the machine's wall switch off and on again. Start a program. Error code returns No error code →	Transient fault. No action required. Replace program control unit PCB.

Error codes which may arise on the control panel display

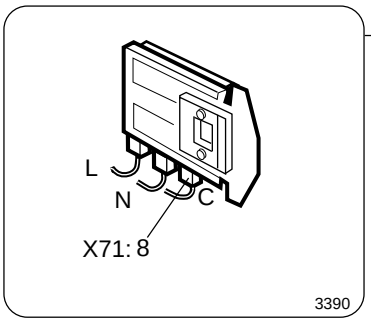
Error code/symptoms	Fault-finding	Cause/Action
17E Door status switch open, even though the door lock is locked.	Turn the machine's wall switch off and on again. Start a program. Error code returns → Set program control unit to service mode. The door status switch and door lock switch will now be indicated by the LEDs shown left. Follow this procedure (the door can be locked using code 23 and one press of the START button): No error code →	Transient fault. No action required.



Door	Status of LEDs should be for door lock switch:	for door status switch
open	OFF	OFF
closed, not locked	OFF	ON
closed and locked	ON	ON

Door lock switch LED ON when door not locked → Door status switch LED OFF when door closed →

Follow the chart for error code 02E to identify fault.



Unscrew the door lock. Remove connection to door lock switch "C" on door lock as illustrated.

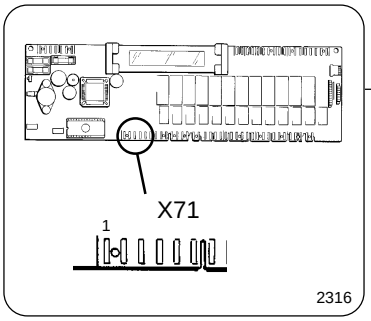
LED ON → LED goes out →

Door lock faulty. Replace lock.

Remove PCB connector X71 from program control unit PCB.

LED ON → LED goes out →

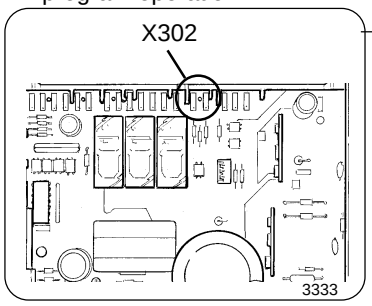
Fault in wiring between PCB and door lock. Check wiring and replace if necessary.

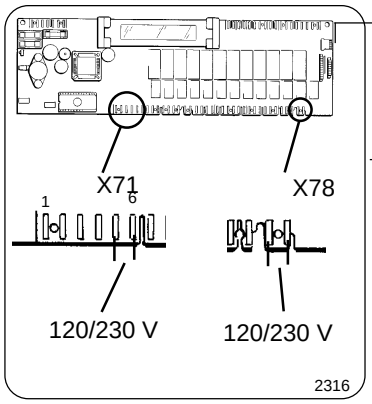


Fault in program control unit PCB. Replace PCB.

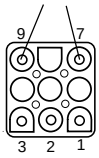
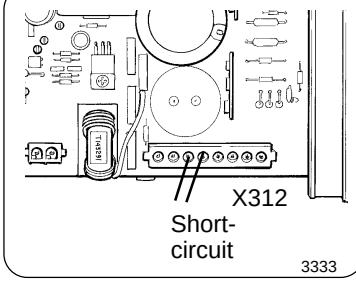
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
20E Interlock signal absent at motor control unit during program operation.	Turn the machine's wall switch off and on again. Start a program. Error code returns — No error code	Transient fault. No action required.
	Check the voltage between terminals 1 and 2 at PCB connector X302 on motor control unit. The voltage should be 120/230 V when the door is closed and locked. Voltage wrong — Voltage correct	Faulty signal detection on motor control unit. Replace motor control unit.
	Check the voltage between terminals 5 and 6 on PCB connector X71 on program control unit PCB. The voltage should be 120/230 V when the door is closed and locked. Voltage wrong — Voltage correct	Fault in wiring between program control unit PCB and motor control unit. Check wiring and replace if necessary.
	Check the input voltage to PCB connector X78 (120/230 V) Wrong voltage — Voltage correct	Faulty output signal on program control unit PCB. Replace PCB.
		Faulty wiring between transformer T10 and program control unit PCB. Check wiring and replace if necessary.

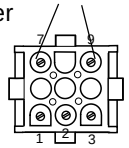
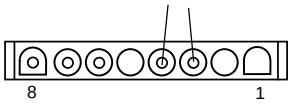
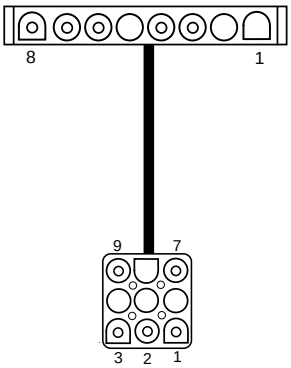




Error codes which may arise on the control panel display

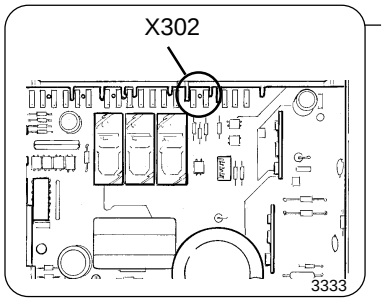
Error code/symptoms	Fault-finding	Cause/Action
31E Temperature of motor control unit heat sink too high.	This error code can occur if the ambient temperature has been extremely high. If so, lower the temperature, e.g. by opening a window. Turn off the machine's wall switch. Wait at least 10 minutes for the heat sink to cool, then switch on the machine power supply again. Check that the drum and motor rotate smoothly. Drum/motor OK / Drum/motor not rotating smoothly	Bearing failure in drum or motor or objects between inner and outer drum. Investigate and remedy.
	Start the service program. Run the motor on low wash speed, anticlockwise (code 25) and clockwise (code 26). Check for any abnormal noise from drum/motor. Drum/motor OK / Noise from drum/motor	
Connector X3, female, to motor control unit Short-circuit  3402	Run the motor at increasing speeds (high wash speed code 27-28, distribution speed code 29, extraction code 31-34). If no error code arises, finally run motor for at least 10 minutes on its highest extraction speed (code 33). Error code returns / No error code	Transient fault. No action required.
	Turn off the machine's wall switch and wait 10 minutes. Disconnect connector X3 by motor. Short-circuit X3:7 and 9 as illustrated (to simulate motor thermal cut-out). Switch on machine power supply, start service program and simulate extraction with code 33 for at least 10 minutes. Error code returns / No error code	Internal fault in motor causing excessively high currents in motor control unit. Replace motor.
 3333	Turn off the machine's wall switch and wait 10 minutes. Disconnect connector X312 on motor control unit. Short-circuit X312:3 and 4 as illustrated. Switch on machine power supply, start service program and simulate extraction with code 33. Error code returns / No error code	Fault in wiring between motor control unit and motor. Check wiring and replace it if necessary.
		Internal fault in motor control unit. Replace motor control unit.

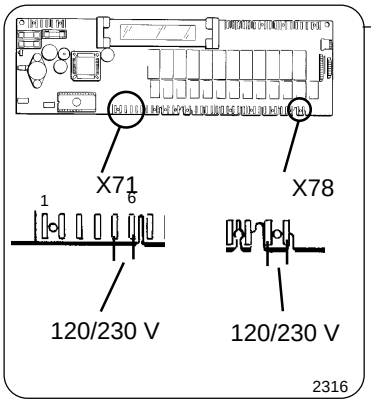
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
32E Thermal protection for motor has cut out.	Turn off the machine's wall switch. Check that the drum and motor rotate smoothly. Drum/motor OK / Drum/motor not rotating smoothly	Bearing failure in drum or motor or objects between inner and outer drum. Investigate and remedy.
	Wait at least 10 minutes to let motor cool, then switch on machine power supply. Start a program. Does the error code recur immediately? Not immediately / Error code immediately	
Connector X3, male, to motor control unit Check with ohmmeter  3402	Turn off the machine's wall switch. Disconnect connector X3 by motor. Use an ohmmeter to check between X3:7 - 9 on the fixed half of the connector (motor side). Circuit closed / Circuit open	Failure in motor thermal cutout. Replace motor.
Connector X312, wiring to motor Check with ohmmeter  3403	Reconnect X3. Disconnect connector X312 and use an ohmmeter on the part of the connector with wiring to the motor to check between X312:3 - 4. Circuit open / Circuit closed	Internal fault in motor control unit detection of thermal cutout protection. Replace motor control unit.
		Fault in wiring between motor control unit and motor. Check the wiring and replace it if necessary.
Connector X312, wiring to motor  Connector X3, wiring to motor control unit. 3401 3403	Start the service program. Run the motor on low wash speed, anticlockwise (code 25) and clockwise (code 26). Check for any abnormal noise from drum/motor. Drum/motor OK / Noise from drum/motor	Bearing failure in drum or motor. Investigate and remedy.
	Run the motor at increasing speeds (high wash speed code 27-28, distribution speed code 29, extraction code 31-34). If no error code arises, finally run motor for at least 10 minutes on its highest extraction speed (code 33). Error code returns / No error code	Transient fault. No action required.
	Check the wiring from X312 on motor control unit to X3 by motor. Use an ohmmeter to check five conductors as follows: X312: 3 4 6 7 8 X3: 7 9 1 2 3 Also check between the five conductors to eliminate possibility of shorts between any two. Wiring OK / Wiring faulty	Check the wiring and replace it if necessary.
		Internal fault in motor causing it to overheat. Replace motor.

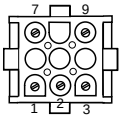
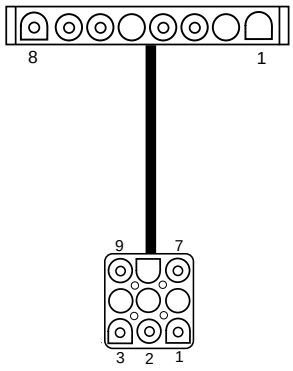
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
33E Motor control unit receiving start command from program control unit without first receiving lock acknowledgement signal. Motor control unit receiving circuitry for lock acknowledgement signal is not faulty.	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault. No action required.
	Check voltage between terminals 1 and 2 in PBC connector X302 on motor control unit. The voltage should be 120/230 V when door is closed and locked.	
	Voltage wrong	Voltage correct → Faulty signal detection on motor control unit. Replace motor control unit.
	Check voltage between terminals 5 and 6 on PCB connector X71 on program control unit PCB. The voltage should be 120/230 V when the door is closed and locked.	
	Voltage wrong	Voltage correct → Faulty wiring between program control unit PCB and motor control unit. Check wiring and replace if necessary.
		Faulty output signal on program control unit PCB. Replace PCB.

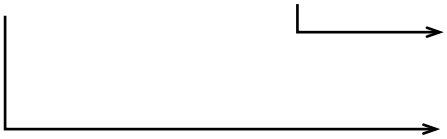




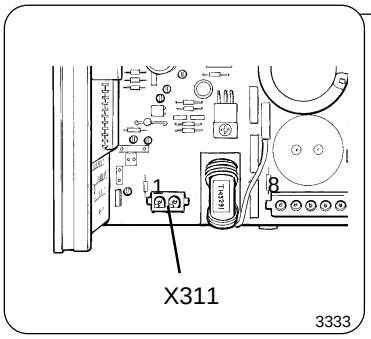
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
35E Motor control unit indicating short-circuit between outputs for motor windings.	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns ↓	No error code → Transient fault. No action required.
Connector X3, male, to motor control unit  3402	Disconnect connector X3 by motor and use an ohmmeter to check the motor windings. Check between 1 - 2, 2 - 3 and 1 - 3. Correct reading: 2.9 Ω.	
	Resistances correct ↓	Any resistance wrong → Replace motor.
Connector X312, wiring to motor  Connector X3, wiring to motor control unit. 3401 3403	Disconnect connectors X312 by motor control unit and X3 by motor. Check wiring by using ohmmeter to measure the three conductors as follows: X312: X3: 6 - 1 7 - 2 8 - 3 Also check between the three conductors to eliminate shorts between any two.	
	Wiring OK → Fault in motor control unit output stage. Replace motor control unit.	Wiring faulty → Check the wiring and replace if necessary.

Error codes which may arise on the control panel display

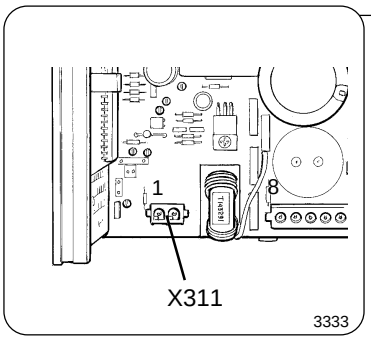
Error code/symptoms	Fault-finding	Cause/Action
36E Motor control unit indicates fault in receiving circuitry for lock acknowledgement signal.	Turn the machine's wall switch off and on again. Start a program. Error code returns 	No error code Transient fault. No action required. Fault in motor control unit. Replace unit.

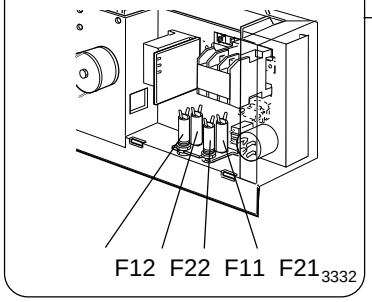
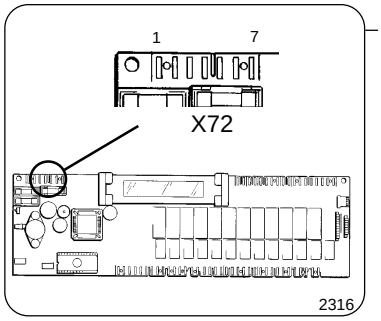
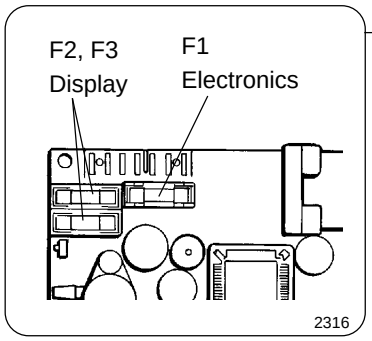
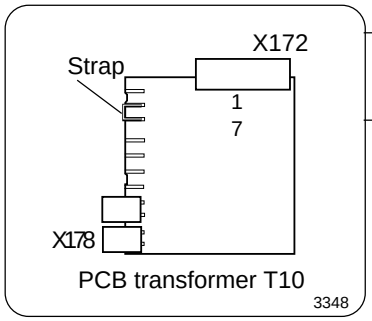
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
37E Motor control unit indicating DC voltage level too low.	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault. No action required.
	Check the motor control unit input voltage (120/230 V) at connector X311.	
	Voltage too low	Voltage correct → Fault in motor control unit. Replace unit.
	Check input voltage at machine connection terminal X1.	
	Voltage too low	Voltage correct → Fault in wiring, in interference suppression circuits LC1 or L1.
		Investigate cause of fault in power supply beyond the machine.

Error codes which may arise on the control panel display

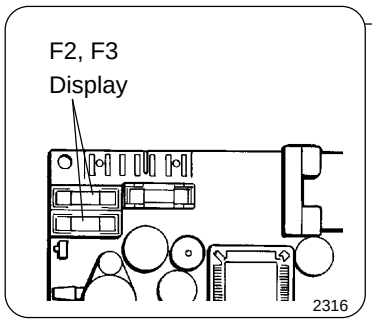
Error code/symptoms	Fault-finding	Cause/Action
38E Motor control unit indicating DC voltage level too high.	Turn the machine's wall switch off and on again. Start a program. Error code returns → Check the motor control unit input voltage (120/230 V) at connector X311. No error code →	Transient fault. No action required.
	Voltage too high. →	Fault in motor control unit. Replace unit.
	Voltage OK. →	Investigate cause of fault in power supply beyond the machine.

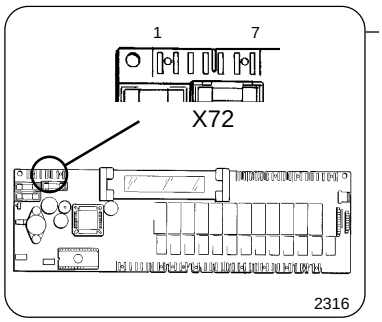


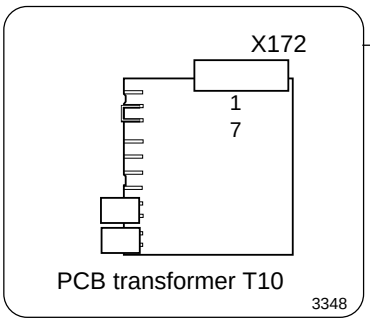
Error code/symptoms	Fault-finding	Cause/Action
Machine completely ”dead”. Display blank.	Turn the machine’s wall switch off and on again.	
	Fault persists.	Machine working → Transient fault. No action required.
	Check fuses F11, F12, F21 and F22.	
	Fuses sound	Fuse fault → Change fuse(s) and check functioning.
	Check that the input voltages to the PCB are correct. Measure on PCB connector X72 between the following inputs:	
	X72:1 - 2 ca 1,75 V ~	
	X72:2 - 3 ca 1,75 V ~	
	X72:4 - 5 ca 14,5 V ~	
	X72:6 - 7 ca 13,5 V ~	
	An incorrect voltage	Voltages correct
		Check the three glass-tube fuses on the PCB. Rating: 1 A/250 V.
		OK / Fuse fault → Change fuse(s) and check functioning.
		Replace program control unit PCB.
	Remove connector X172 on transformer T10. Measure the voltages between the following outputs on the transformer board.	
	5 - 6 ca 1,75 V ~	
	6 - 7 ca 1,75 V ~	
	3 - 4 ca 14,5 V ~	
	1 - 2 ca 13,5 V ~	
	Voltages correct	An incorrect voltage
		On T10 check the input voltage at connector X178 (120/230 V) and that the strap is correctly located and in contact with the circuit board.
		OK / A fault → Voltage fault: investigate cause in power supply beyond machine.
		Replace transformer T10.
		Fault in wiring between transformer and circuit board. Check wiring and replace if necessary.

Trouble shooting

Error code/symptoms	Fault-finding	Cause/Action
Display blank, but machine is working otherwise.	Turn the machine's wall switch off and on again.	
	Fault persists.	Machine working → Transient fault. No action required.
	Check glass-tube fuses F2 and F3 on program control unit PCB. Rating: 1 A/250 V.	
	Fuses sound	Fuse fault → Change fuse(s) and check functioning.
	Check that input voltages to PCB are correct. At connector X72, measure between the following inputs:	
	X72:1 - 2	ca 1,75 V ~
	X72:2 - 3	ca 1,75 V ~
	X72:6 - 7	ca 13,5 V ~
	An incorrect voltage	Voltages correct → Program control unit PCB faulty. Replace PCB.
	Remove connector X172 on transformer T10. Measure the voltages between the following outputs on the transformer board.	
	5 - 6	ca 1,75 V ~
	6 - 7	ca 1,75 V ~
	1 - 2	ca 13,5 V ~
	Voltages correct	An incorrect voltage → Replace transformer T10.
		Fault in wiring between transformer and circuit board. Check wiring and replace if necessary.







Maintenance

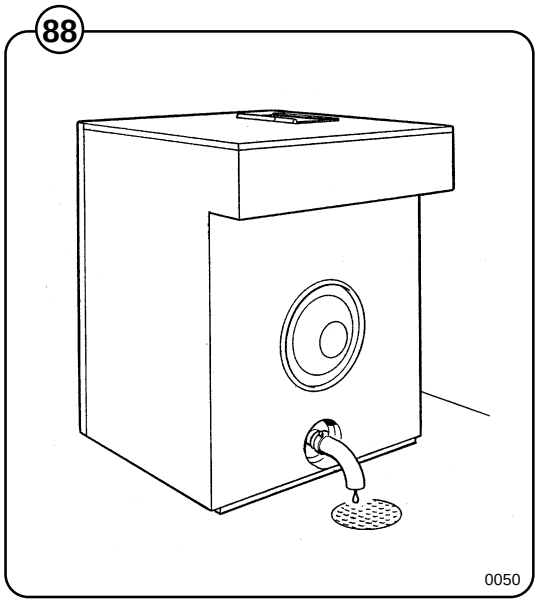
Preventive maintenance has been reduced to a minimum by the careful design of reliable components and material.

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. 88



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.

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