OPERATING & MAINTENANCE MANUAL

EX-30 S and EX-50 S

438 9030-13/01
99.20

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 Selecta models washer/extractor has been developed to cover the heavy duty requirements of hotels, motels, nursing homes, hospitals, professional laundries, restaurants, airlines, steamships, schools, colleges and all on-premises laundries where flexibility and quick formula variation, coupled with high quality automatic washing, are required.

The machines are free-swinging, i.e., the drum is moveable and spring suspended in relation to the frame. This minimizes vibrations transferred to the frame thus simplifying installation, as no concrete base is required.

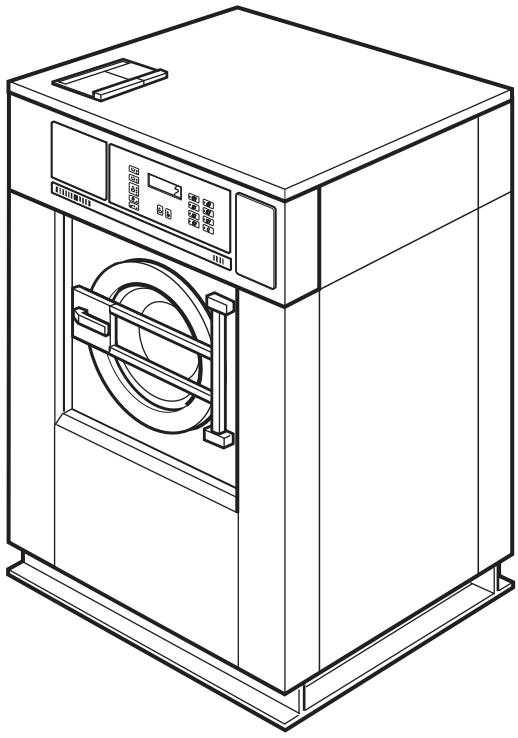
The high speed spin gives a G factor of approximately 300, providing very efficient water removal during the spin.

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

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

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

1



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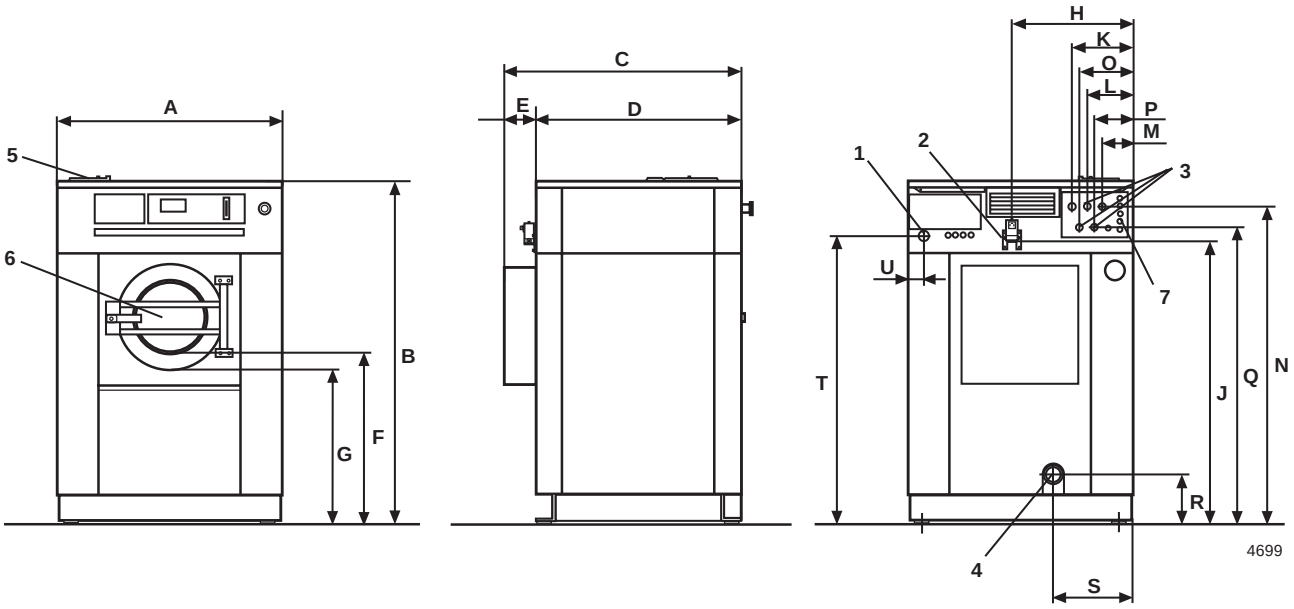
EX 30 S

Dry load capacity	up to		30 lbs
Overall dimensions	Width	870 mm	34 1/4''
	Depth	790 mm	
	Height	1325 mm	
	Net weight	290 kg	639 lbs
	Floor load	3.3 ± 1.1 kN	790 ± 264 lbs force
Crated dimensions	Volume	1.25 m^3	44 cu.ft
	Weight	315 kg	695 lbs
Inner drum	Diameter	620 mm	24 7/16''
	Depth	412 mm	16 5/16''
	Volume	120 litre	4.4 cu.ft
Speed of rotation	Wash		24-48 r.p.m.
	Distribution		78 r.p.m
	Extraction		up to 950 r.p.m.
G-factor	During wash		0.8
	During high extract		120-310
Voltage requirements			208-240 V 1-Phase 60 Hz
Rated power			
	Motor system		598 W
	Extraction		1900 W
Overcurrent protection	1-Phase		15 A
Water connections			
Water pressure, max	10 kp/cm^2		142 psi
Recommended water pressure	2-6 kp/cm^2		25-85 psi
Hose connection, water	20 mm		3/4''
Hose connection, drain	75 mm		3''

EX 50 S

Dry load capacity	up to		50 lbs
Overall dimensions	Width	1000 mm	39 3/8''
	Depth	900 mm	
	Height	1435 mm	
	Net weight	553 kg	1218 lbs
	Floor load	6.0 ± 2.0 kN	1440 ± 480 lbs force
Crated Dimensions	Volume	2.05 m^3	72.3 cu.ft
	Weight	588 kg	1295 lbs
Inner drum	Diameter	750 mm	29 1/2''
	Depth	500 mm	19 11/16''
	Volume	220 litre	7.8 cu.ft
Speed of rotation	Wash		44 r.p.m.
	Distribution		70 r.p.m.
	Extraction		up to 850 r.p.m.
G-factor	During wash		0.8
	During High Extract		120-300
Voltage requirements	Motor system		208-240 V 1-Phase 60 Hz
Rated power	Wash		756 W
	Motor, extraction		3000 W
Overcurrent protection	1-Phase		20 A
Water connections			
Water pressure, max	10 kp/cm^2		142 psi
Recommended water pressure	2-6 kp/cm^2		25-85 psi
Hose connection, water	20 mm		3/4''
Hose connection, drain	75 mm		3''

Outline and dimensions



1. Opening for electrical cable connection
2. Steam connection (optional)
3. Cold water
4. Hot water
5. Hot water (only EX 50)
6. Drain outlet
7. Soap box
8. Liquid supply connections

	EX 30 S	EX 50 S
	mm	mm
A	870	1000
B	1325	1435
C	915	1100
D	790	900
E	125	200
F	630	615
G	570	550
H	470	600
J	1075	1170
K	200	230
L	170	170
M	110	110
N	1215	1325
O	–	200
P	140	140
Q	1140	1235
R	175	175
S	305	370
T	1110	1220
U	60	60

Installation

The machine is delivered with expansion bolts and other items packed inside the drum.

Shipping securities

Fig. 2 The machine is shipped with four large metal brackets bolted to the four suspension legs as well as a support between the pulley and the back plate.

Prior to installation, follow these steps:

- Unpack the machine.
- Fig. 3 Remove the lower front panel and the two rear panels.
- Remove the support from the pulley at the back of the machine.
- Remove both front brackets.
- Remove both rear brackets.

Placement

The machine should be installed close to a floor drain or open drain to make installation, use and service easier.

The following clearances are recommended for ease of installation and service:

- Fig. 4 At least 20 inches between the machine and the wall behind it.
- At least 2 inches on each side.

The floor must be able to support a static load of 790 lbs for the EX-30 and 1440 lbs for the EX-50.

The maximum impact load at extraction is 260 lbs force for the EX-30 and 480 lbs for the EX-50.

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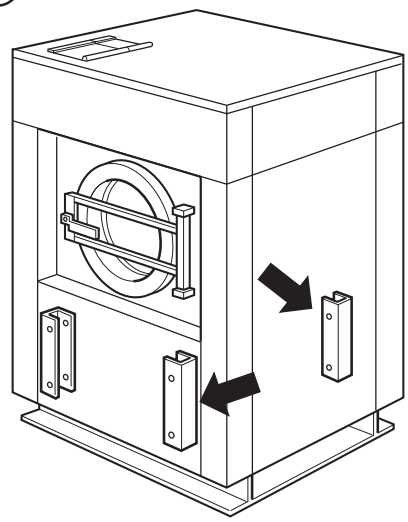

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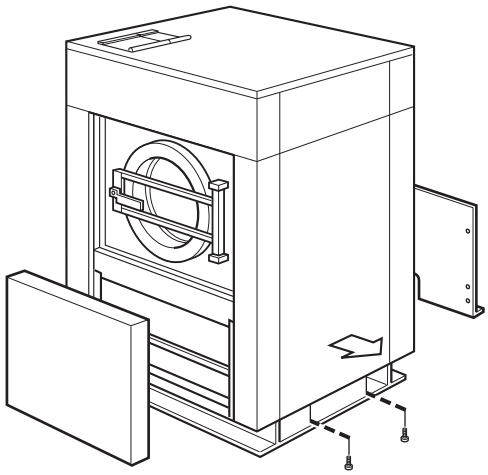

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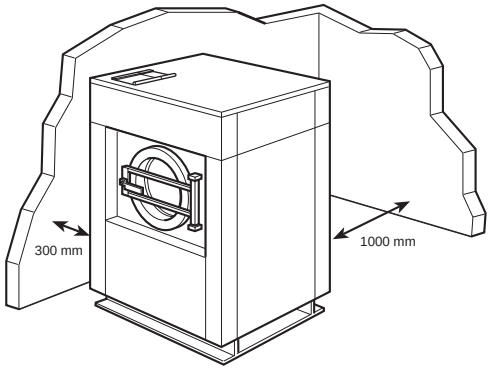

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Mechanical installation

Fig. 5

- Mark and drill two holes 3/8" in (8 mm) in diameter and approximately 3 1/2" in. (90 mm) deep according to the dimensions in figure 5.
- Place the machine in position. Never lift the machine by the door or handle.

Fig. 6

- Check that the machine is level and steady. Use stainless or galvanized washers between the machine and the floor.

Fig. 7

- Insert the expansion bolts supplied with the machine. Fit the washers and nuts.

It is of utmost importance that the machine is level, from side-to-side as well as front-to-rear. If the machine is not properly levelled, it may result in out-of-balance cutout without a real out-of-balance in the drum.

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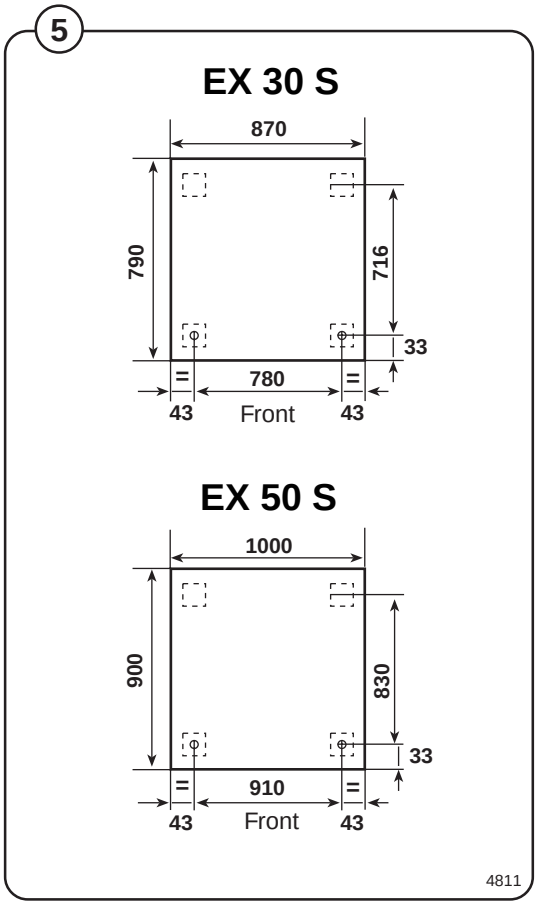

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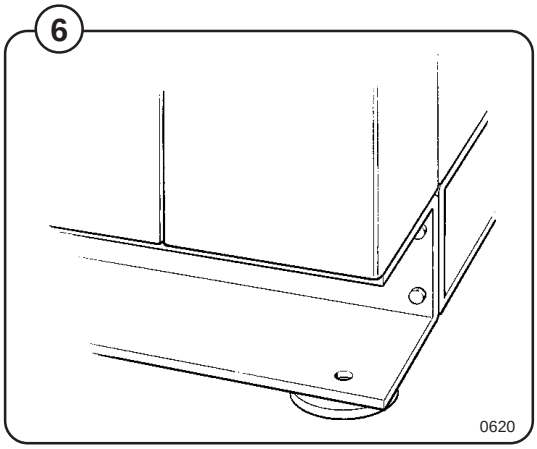

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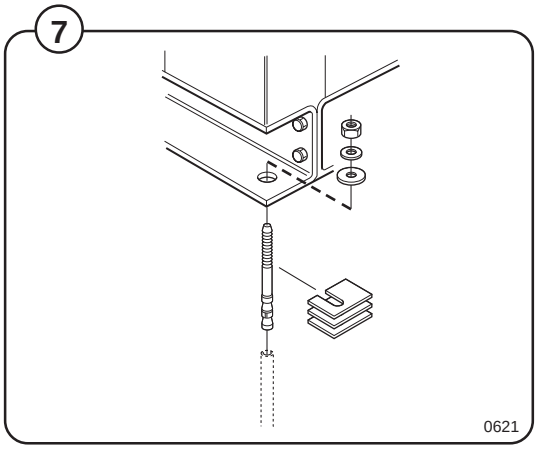


Connection for liquid supply (option)

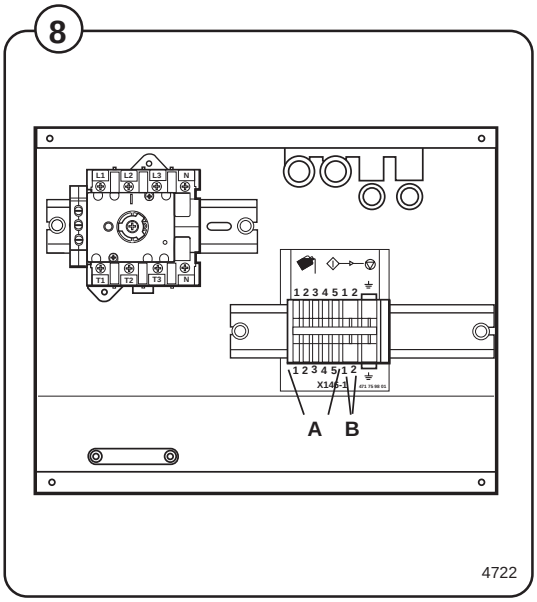
Electrical installation must be carried out by an authorized personnel!

Installed appliances must be EMC approved according to EN 50081-1 and EN 50082-2.

Fig. 8

The connections A (1-5) are signals for the liquid supply pumps.

The connections B are for Neutral (1) and Phase (2).



Water connections

All intake connections to the machine are to be fitted with manual shut-off valves and filters, to facilitate installation and servicing. In certain cases non-return valves will need to be fitted before the machine to comply with local plumbing regulations.

Water pipes and hoses should be flushed clean before installation. After installation hoses should hang in gentle arcs.

The machine may have between two and four DN 20 (R 3/4") water connectors. All connectors present on the machine must be connected up. The table shows the possible connection options, which will depend on the water types to be connected to the machine. Check the machine plates too.

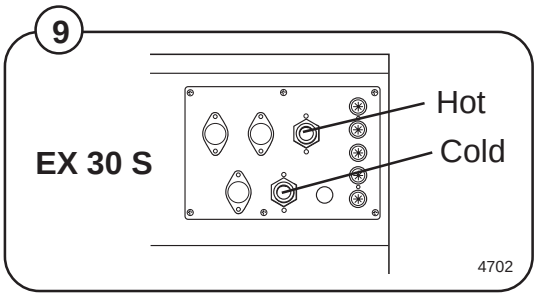
All water connectors must be connected up, otherwise the wash program will not function correctly.

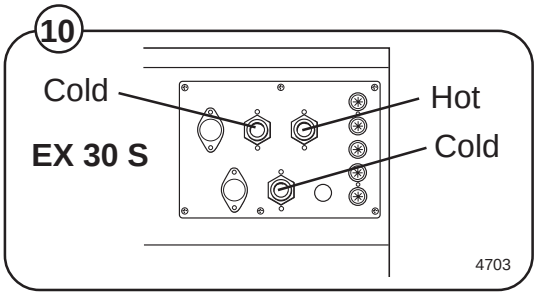
Hoses are to be of an approved type and grade, to comply with national regulations.

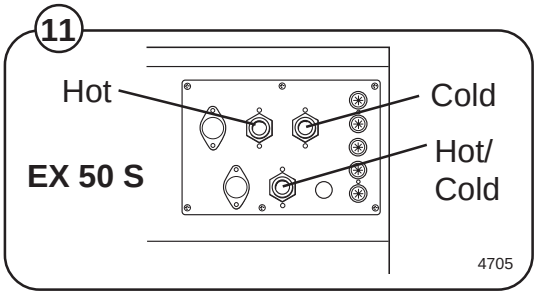
The water pressure data is as follows:

- min: 40 kPa (0,4 kp/cm^2)
- max: 1 MPa (10 kp/cm^2)
- recommended: 200-600 kPa (2-6 kp/cm^2)

	Water type	Water connection			
		1	2	3	4
Fig. 9	cold and hot	cold	hot		
Fig. 10	cold, hot and cold/hard	cold	hot	cold/hard	
Fig. 11	cold and hot	cold	hot		cold or hot





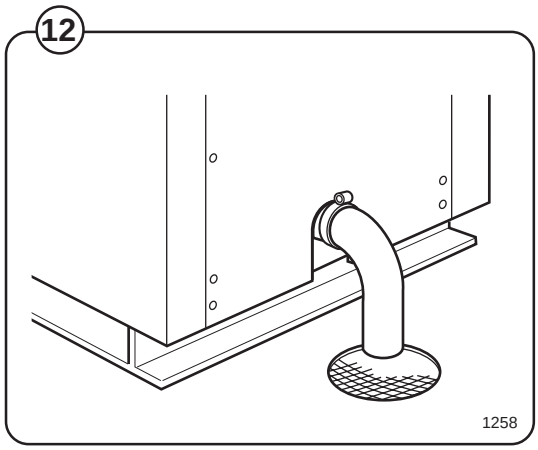


Drain connection

Fig. (12) Connect a 3'' (75 mm) flexible hose to the drain outlet of the machine.

The drain must not have any sharp bends and must slope downward from the machine to assure proper drainage. The outlet must open freely to the main drain.

Do not reduce the size of the drain connection from the machine to the waste line.



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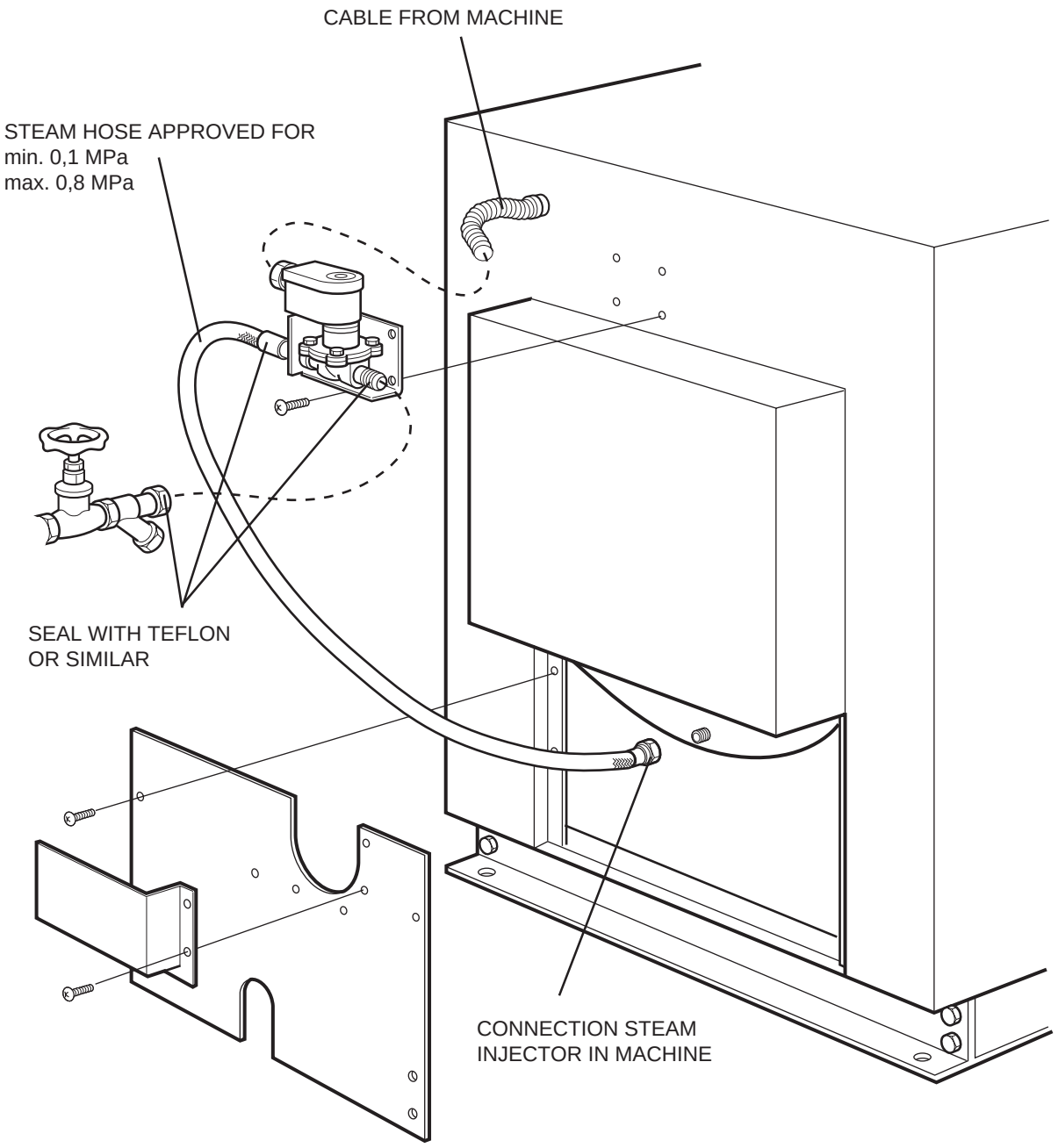

For rebuilding look at the wiring diagram of the machine.

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Steam connections (optional steam heating)

Steam pressure required:

- minimum 7 PSI
- maximum: 110 PSI
- recommended: 40-85 PSI

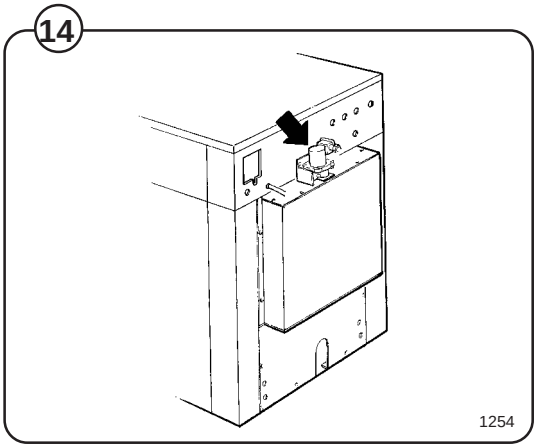
A steam valve for this machine type is fitted separately in a bracket on the upper rear cover plate. The steam valve, hose and filter are supplied with the machine.

Steam-flush all pipes and hoses before connection.

Installation instructions:

- Install rear cover plates.
- Install steam valve bracket and valve. The steam valve must be mounted in upright position.
- Connect the steam hose between the steam valve and the steam intake on the machine.
- The steam inlet pipe must be fitted with a manual cut-off valve. Fit the filter supplied with the machine to the manual cut-off valve.
- Connect an approved 1/2" steam hose between the steam valve and the filter. The connection must be vertical or be fitted with a pipe connector in order to avoid sharp angles in the hose.
- Connection size at filter: DN15 (R 1/2'"). Check that there are no sharp angles or bends in the connection hose.

Fig. 14



Electrical installation

Electrical installation must be carried out by an authorized personnel!

Mount a multi-pole switch prior to the machine to facilitate installation and service operations.

The connecting cable should hang in a gentle curve.

Fuse size can be found on next page.

Single-phase connection:

Fig. 15 Connect the earth and other two wires as shown in example "1AC" in the figure.

Three-phase connection:

Fig. 16 Connect the earth, neutral and phase wires as shown in example "3AC" in the figure.

When the installation is completed, check:

- that the drum is empty,
- that the machine operates by turning on the mains switch, starting the machine and using RAPID ADVANCE to reach the spin cycle (see operations manual).

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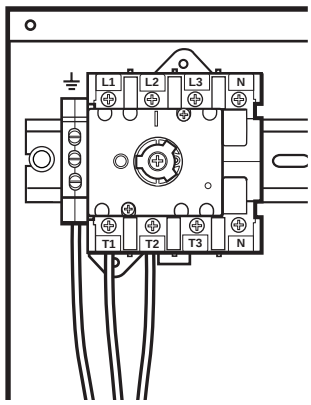
1AC



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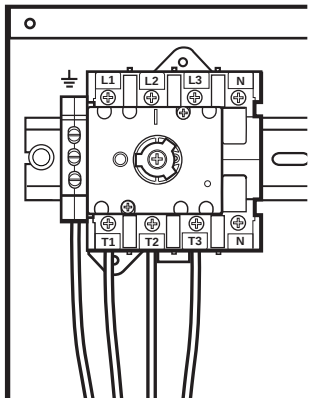
3AC



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Setting the timing on the electro-lube oil dispenser

This machine is equipped with an electronic oiler which lubricate the seals on a timed bases. With the rear panel removed locate the oiler, which is attached to the base frame at the lower rear.

Fig. 17 Pry off the switch panel cap with a screwdriver.

- Under the cap are the switches for time setting.

Fig. 18

- The light will start flashing after a few minutes and will continue to flash every 15th to 20th seconds as long as the dispencer is in operation.

Fig. 19

- The decal shown below should be affixed at the front of the machine and updated as required.

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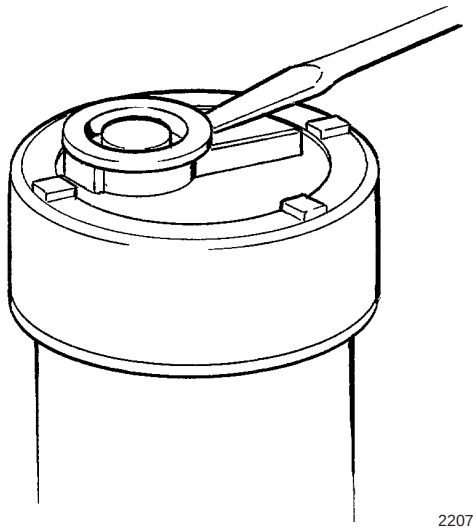

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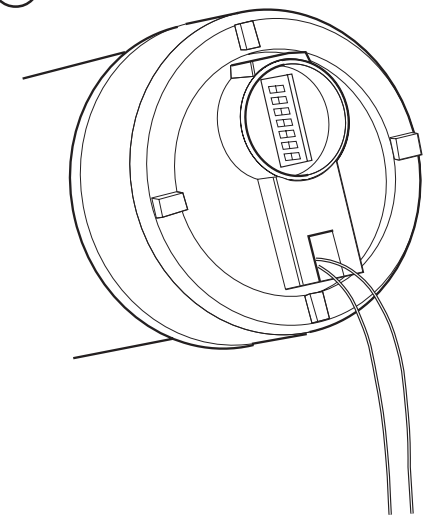

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IMPORTANT

NOTICE

This machine is equipped with an automatic oiler, located at the right rear of the machine, which keeps it lubricated for long bearing and seal life.
The amount of oil in the container is sufficient for approximately one year's lubrication. It is of utmost importance that the oiler does not become empty. Therefore we recommend that the rear panel be removed and a visual inspection made on a bimonthly basis. When the oil reaches a low level, the cannister must be replaced with a new one available from Wascomat as Part No. 827601.

Date Last Replaced	Date Last Replaced

Start-up and safety checklist

Before initial start-up of an EX 30 S/EX 50 S washer, the following safety checks must be performed:

- 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. 20
- When washer loading door is open, the machine must not start. Verify this by attempting to start washer with door open.

Fig. 21
- 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 safety interlock or call a qualified serviceman.

If the machine starts with the door open or the door can be opened after machine is running, the machine must immediately be placed OUT OF ORDER and the door interlock system must be repaired or replaced. Disconnect electrical power from the machine until the necessay repairs are made.
Door safety interlock must be checked daily in accordance with above procedure.

Before servicing Wascomat equipment, disconnect electrical power.

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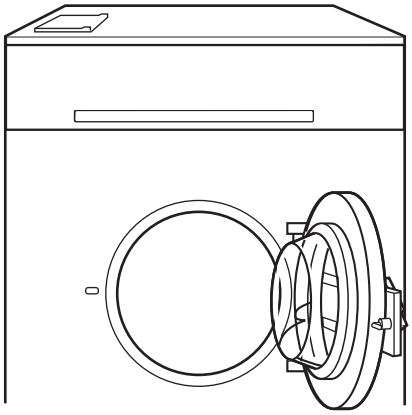

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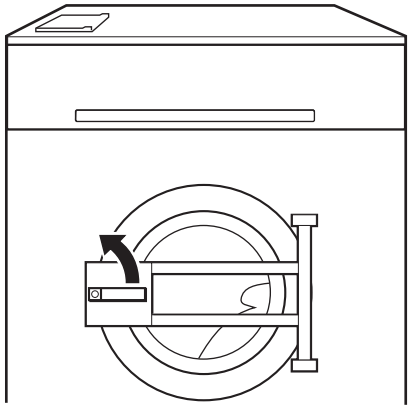

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Safety rules

- **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.**

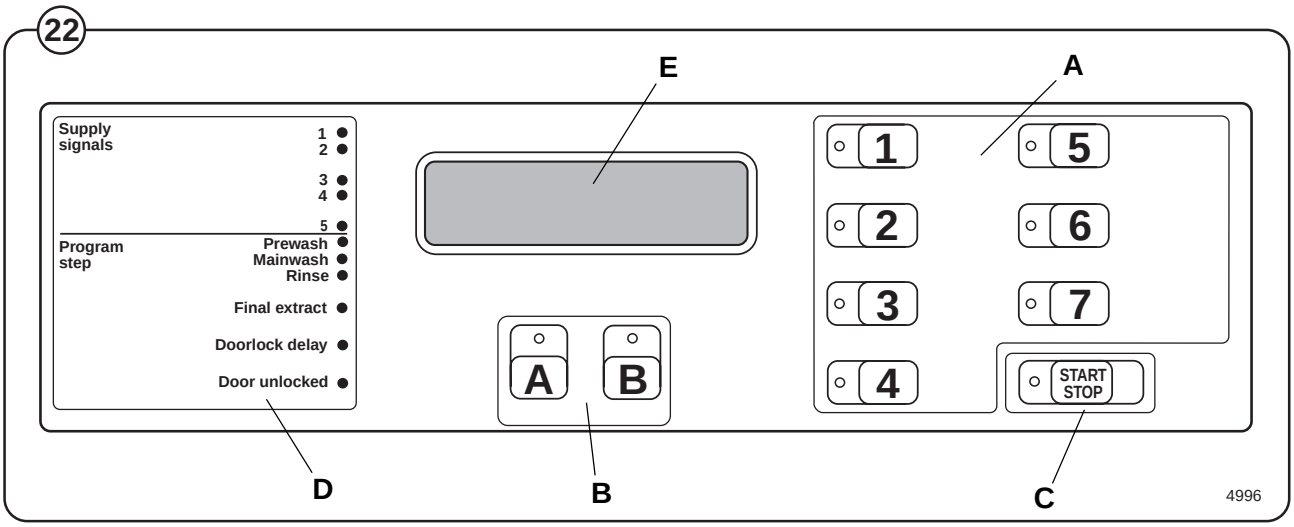
Operating instructions

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. 22 The control panel consists of program selection buttons (A) and (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. 23
- Press the button for the desired program.

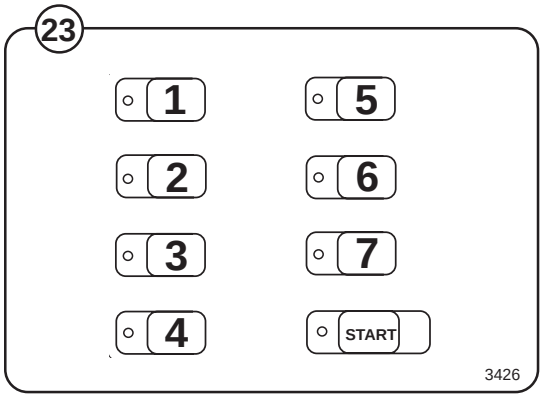
Fig. 24
- Now the LEDs alongside the program symbols will show what the selected program consists of.

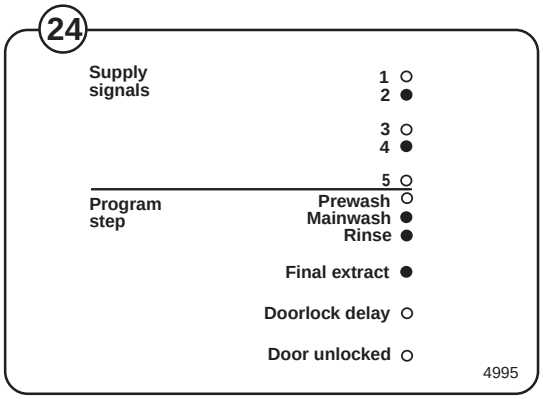
Fig. 25
- Press the button(s) for any options required.

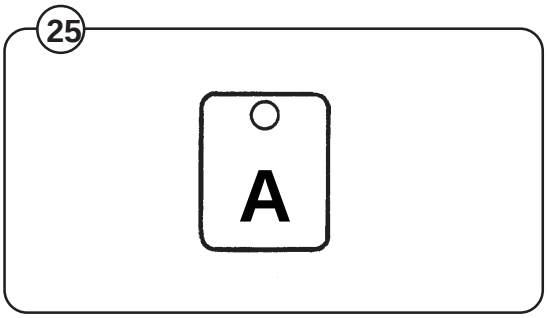
Fig. 26

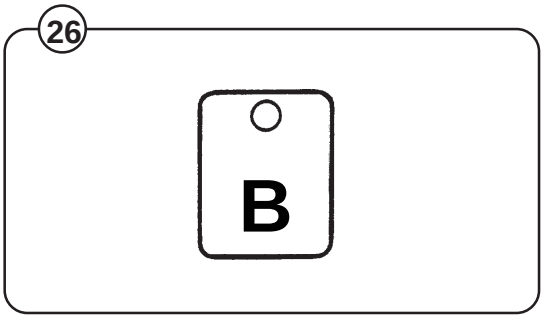
Gentle actions consists of 6 seconds rotation, as opposed to 18 seconds pause and 6 seconds pause and 14 seconds rotation for Normal action.

Fig. 27
- Press the **START** button.









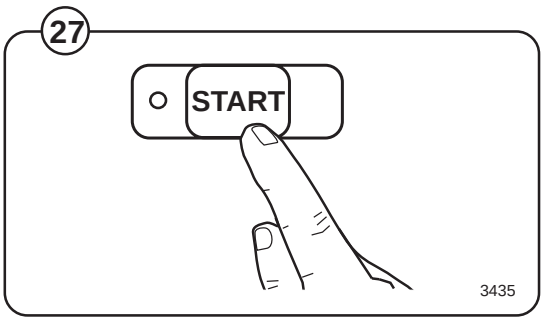
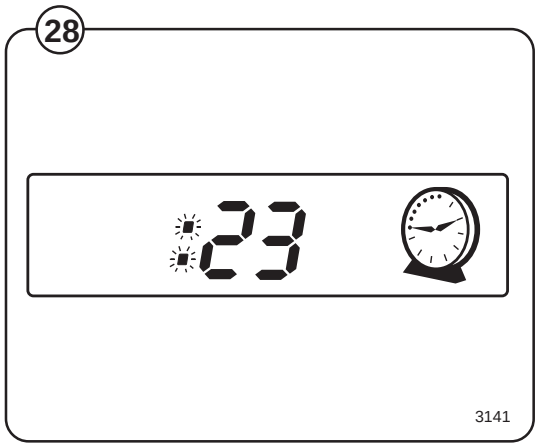


Fig. 28

- 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. 29

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

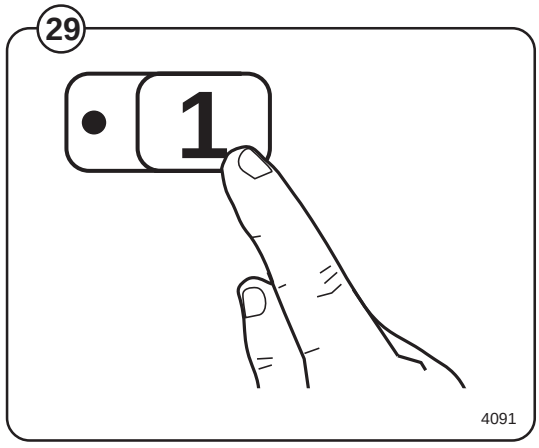
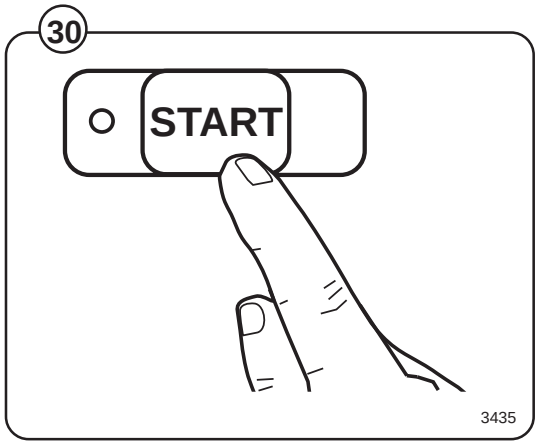


Fig. 30

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.

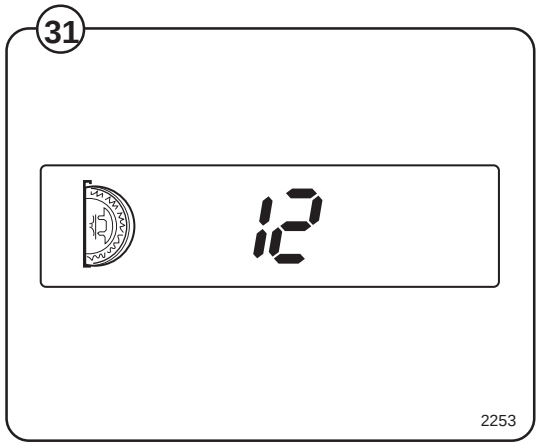


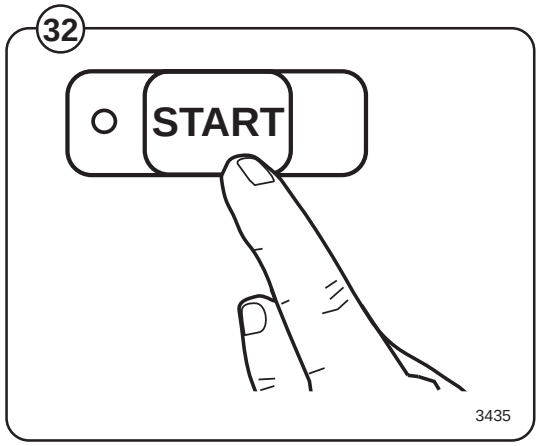
For coin-operated machines

Fig. 31 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.

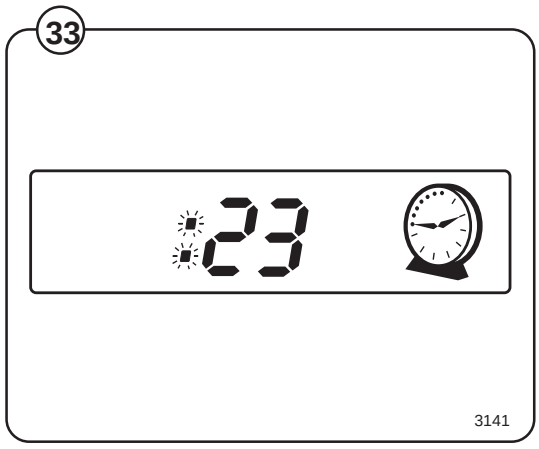
Fig. 32
- Press the START button.
- Now the display will show the clock symbol and two digits. The two digits are the time left before the wash will be finished.





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. 33
- 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.



Rapid advance

Whole steps in programs can be skipped using rapid advance.

Fig. 34

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

Program end

Fig. 35

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

Fig. 36

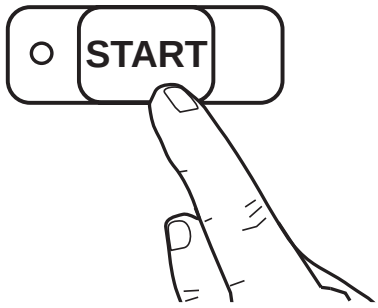
The door will not actually be unlocked until the green LED by the "door unlocked" comes on, accompanied by an audible signal. This takes about 1 minute.

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.

34



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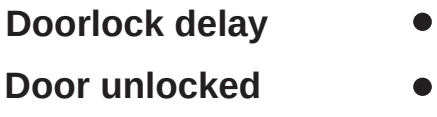


3425

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.

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. 37

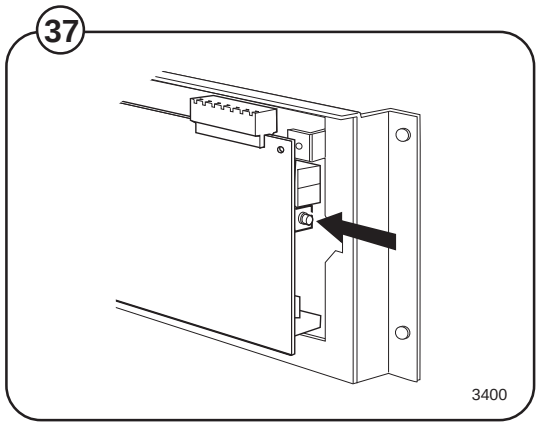
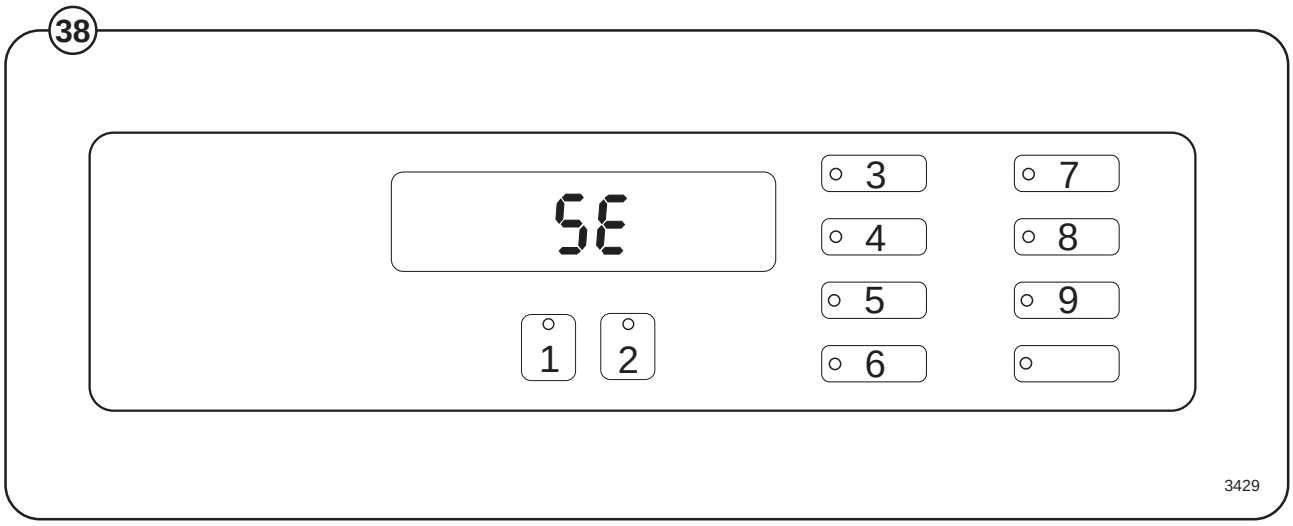


Fig. 38

- Press the service button.

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



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. 39

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

  The display will now show 91.

Fig. 40

- 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. 41

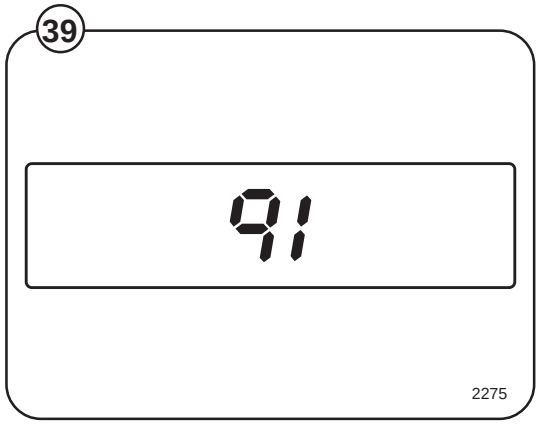
- Enter code 92. The display will now show 92.

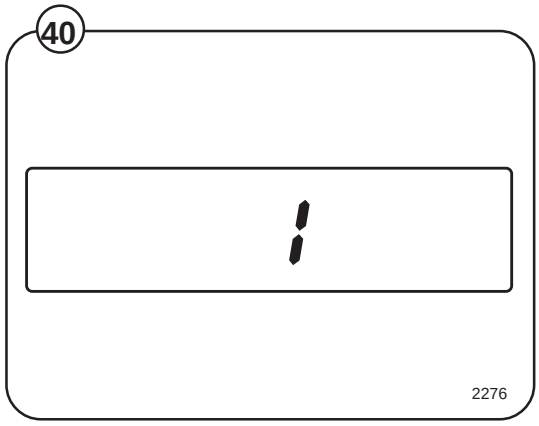
Fig. 42

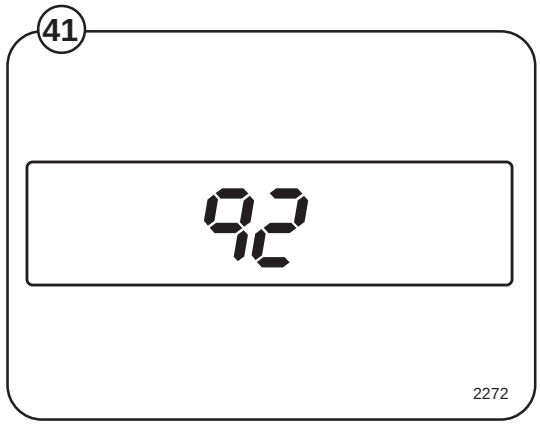
- Enter the value 5.

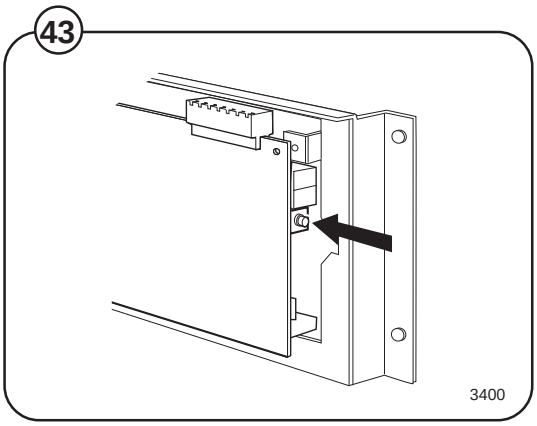
Fig. 43

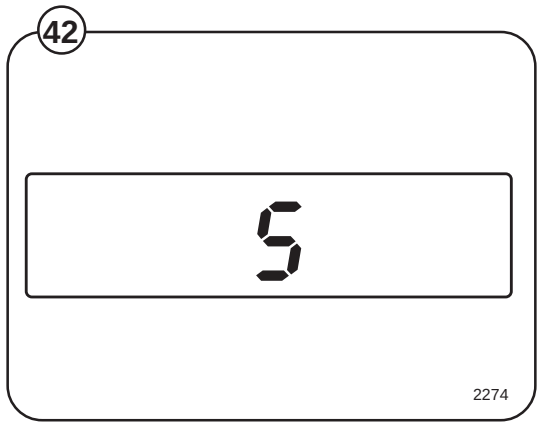
- Exit the service program by pressing the service button again.











Price programming:

- Press the relevant wash program selector button.

Fig. 44

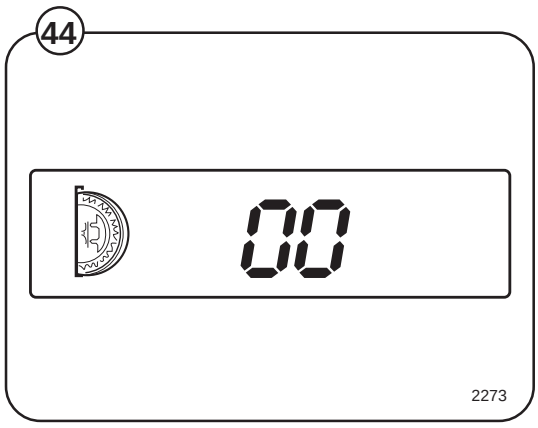
When programming the price of a wash program plus options, press both the relevant program selector button and the option button.

- 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.



Hospitality wash formulas

For hotels/motels, restaurants, retirement communities, schools and universities, commercial and institutional laundries.

1	White uniforms sheets & pillow-cases (light soil)	1A	White towels (medium soil short program)	1B	White table linen (bleach, no starch)	1AB	White table linen (bleach and starch)
2	White uniforms sheets & pillow-cases (light/ medium soil)	2A	Colored towels	2B	Colored table linen (bleach, no starch)	2AB	Colored table linen (bleach and starch)
3	White uniforms, sheets, pillow-cases (medium soil)	3A	White towels (heavy soil)	3B	White or colored table linen (no bleach, no starch)	3AB	White or colored table linen (starch, no bleach)
4	Colored uni-forms, sheets, pillowcases (light soil)	4A	Bedspreads/ delicates (cold water)	4B	White 100% polyester (VISA) table linen	4AB	Bedspreads/ delicates (warm water)
5	Color uniforms, sheets, pillow-cases (medium soil)	5A	Kitchen & housekeeping rags	5B	Colored 100% polyester (VISA) table linen	5AB	Light soil general wash formula
6	White towels (light soil)	6A	Mops	6B	Chef coats	6AB	Extra rinsing with extract
7	White towels (medium soil)	7A	Stain treat-ment (short formula)	7B	Stain treat-ment (long formula)	7AB	Test program

Healthcare wash formulas

For nursing homes, hospitales and medical center.

1	White uniforms sheets & pillow-cases (very light soil)	1A	Diapers/pads medium soil	1B	Colored uni-forms, sheets & pillowcases (light soil)	1AB	White cotton or blend table linen
2	White uniforms sheets & pillow-cases (medium/ heavy soil)	2A	Diapers/pads heavy soil	2B	Colored towels	2AB	Colored cotton or blend table linen
3	White uniforms, sheets, pillow-cases (medium/ heavy soil)	3A	Diapers/pads extra heavy soil	3B	Dietary and kitchen rags	3AB	100% polyester (VISA) table linen
4	White uniforms sheets, pillow-cases (heavy soil)	4A	100% polyester pads	4B	Housekeeping rags	4AB	AIDS/ infectious disease iso-lation in water soluble bags
5	Color uniforms sheets, pillow-cases (medium soil)	5A	Delicates/ bedspreads	5B	Mops	5AB	Rinse and extract (cotton/terry)
6	White towels (light/medium soil)	6A	Sheepskins/ cubicle curtains	6B	Stain treatment (short formula)	6AB	Rinse and extract (polyester)
7	White towels (heavy soil)	7A	Personals/ general ldry.	7B	Stain treatment (long formula)	7AB	Test program

Shirt laundry formulas

1	Shirts (starch, cold rinses)	1A	Short formula shirts (no starch) (may use with 5 or 6)	1B	Delicates	1AB	White or colored blend table linen (with bleach, no starch)
2	Shirts (starch, warm rinses)	2A	Heavy soil shirts (one starch injection)	2B	Mops	2AB	White or colored blend table linen (with bleach and starch)
3	Shirts (no starch) (may use with formula 5 or 6)	3A	Shirts (pause for starch)	3B	Extra heavy soil – no – iron fabrics	3AB	White or colored 100% polyester (VISA) table linen (white bleach, no starch)
4	Shirts (no starch, no bleach) (may use with formula 5 or 6)	4A	Light soil general wash no-iron fabrics	4B	Extra heavy soil – cotton fabrics	4AB	White or colored 100% polyester (VISA) table linen (with bleach and starch)
5	One starch injection with extract	5A	Light soil general wash (cotton)	5B	Wool blankets	5AB	White cotton blankets
6	Two starch injections with extract	6A	Shirts (no starch, short extract) (may use with formula 5 or 6)	6B	Stain treat-ment	6AB	Uniforms
7	Short rinse and extract	7A	Shirts (starch, short extract)	7B	Stain soak (supplies added manually)	7AB	Test program

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

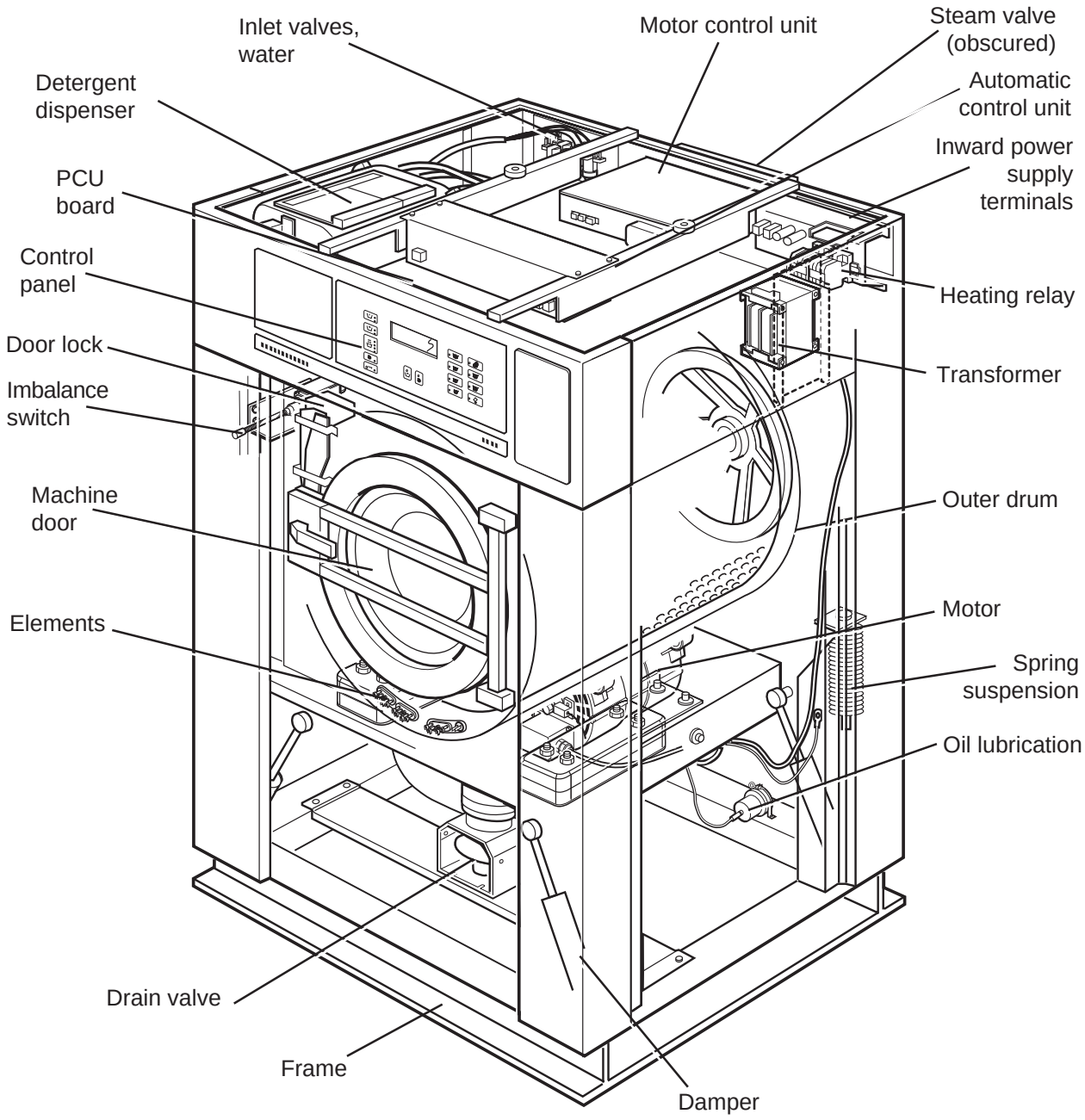
- Clean detergent residue from the door seal and check that the door does not leak.
- Clean the detergent compartments and wipe down the machine with a damp cloth.
- Check that the drain valve does not leak.
- Start the machine and check that the door is locked while the machine is operating.

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.

45

Machines with permanent programs



The washing machines are controlled by a microprocessor program unit. This provides several major advantages:

- The control of times, levels and temperatures takes place with considerable precision and flexibility
- The large character display provides detailed information in clear text about the different wash programs, the machine's different activities, relevant wash times and temperatures.
- The user is able to program new wash programs and adapt the programs exactly on the basis of previous experience, different kinds of materials, the degree of soiling etc. Depending on the length of the program, up to 90 different programs can be programmed. Refer to the separate appendix for programming.
- When supplied, the machine is provided with a number of standard programs.
- Machine safety can be maintained at a very high level through continuous monitoring and integral safety checks.
- The machine has an integral service program for testing machine functions.

To avoid high mechanical stresses during the spin cycle, the machine is fitted with an automatic imbalance sensor. The spin cycle is discontinued if imbalance occurs, the machine is filled with water and the machine operates with a reversing action to redistribute the wash goods. The drain valve then opens, the machine operates at distribution speed and a new spin cycle starts.

The machine can also be operated manually.

The electronic controls together with carefully considered machine design based on long experience also provide:

- simple installation and a long service life.
- a low noise level.
- maximum water removed as a result of the high speed spin cycle and the large drum diameter.
- low water and power consumption in relation to capacity.
- extreme ease of servicing.

The C-machines are equipped with a frequency control and a multi-speed motor. This gives advantages such as:

- very smooth drum rotation through a slow acceleration of the drum.
- wash with reduced speed.
- quiet operation.
- improved distribution of the load.

Frame

Description

Fig. 46 The frame is constructed on the free-swinging principle, i.e. the washing drum is freely and resiliently suspended in the fixed frame.

The entire frame is constructed of U-shaped iron beams forming a stable and torsionally rigid structure.

The suspension device for the drum unit and motors consists of four posts, one in each corner, each with a robust spring to which the washing drum supports are attached. In order to prevent excessively great vibrations which can be caused by imbalance in the drum, a shock absorber is fitted between the drum and frame by each spring. (The EX 30 model has twin shock absorbers at the front.)

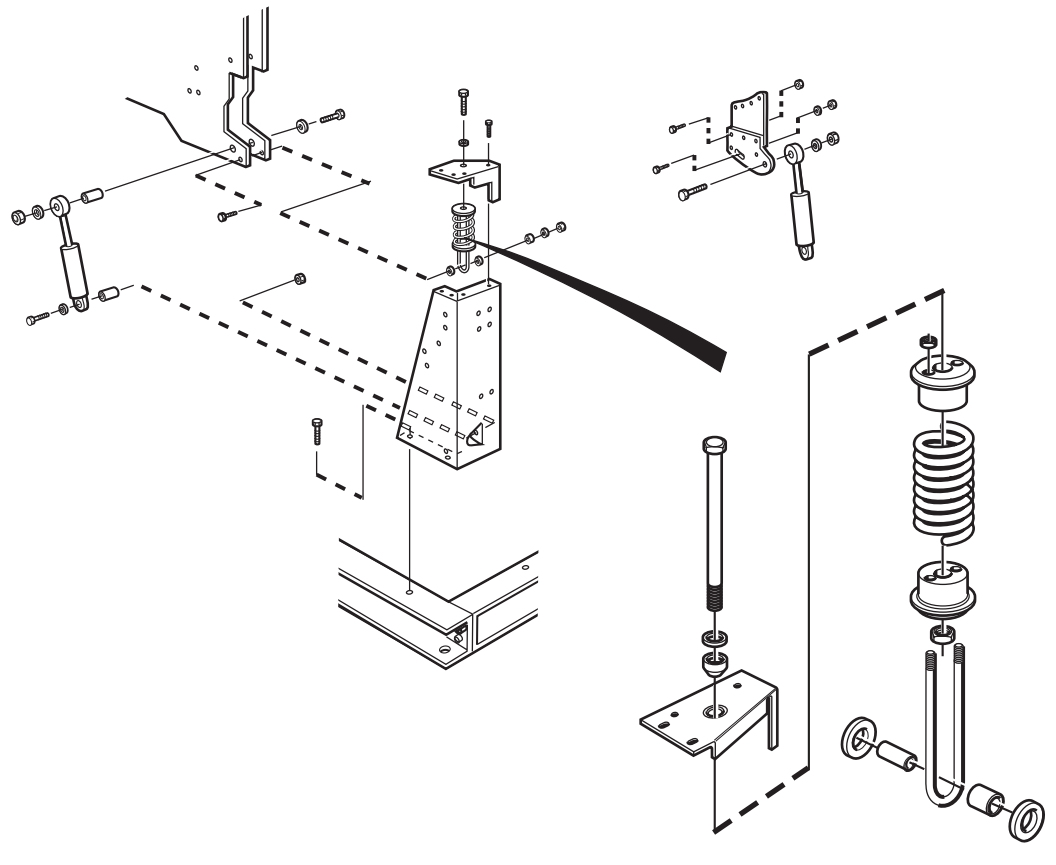
Repair instructions

If the out-of-balance cutout is repeatedly triggered

- Check the shock absorbers, replace them if required. Note that the shock absorbers should be fitted with the plunger rod upwards.
- Check the attachment of the springs:
  - the spring is attached by a bolt from above: Check that it has been properly tightened down.

The entire spring unit should be replaced in spring replacement.

46



4709

Drum with bearings

Description

Fig. 47 The inner drum is journalled to the outer drum by two robust bearings in a bearing housing which is bolted to the rear plate. The bearing unit supports the drum without any support being needed at the front. Shaft seals of the V-type, as well as O-rings, seal against leakage.

The space between the bearings is packed with grease during assembly. No additional grease is required.

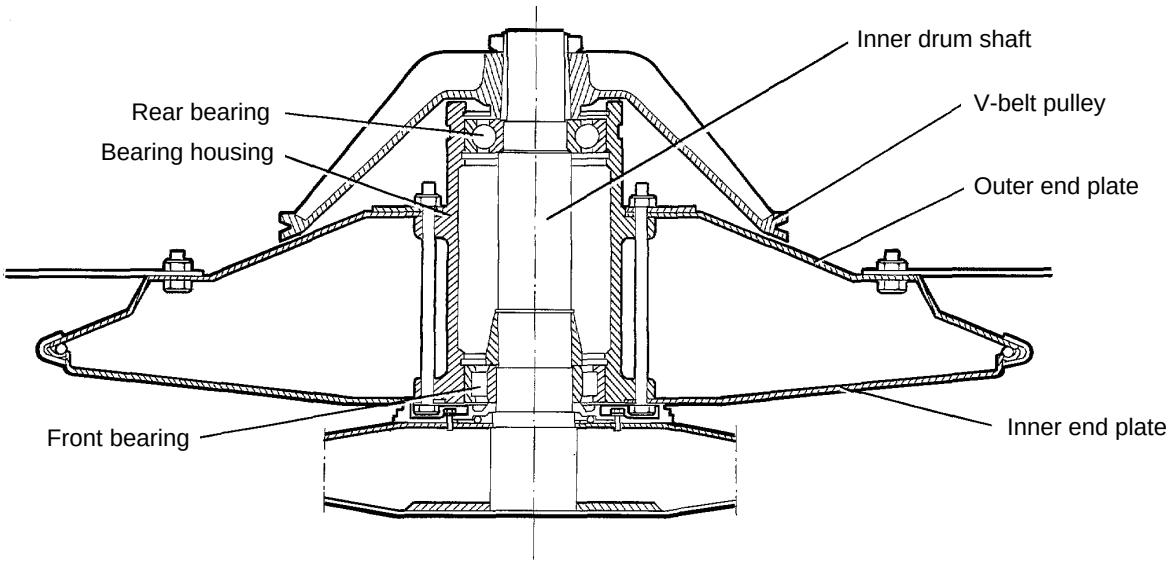
The inner drum shaft is continuous, and the V-belt pulley is attached to the protruding journal by an adapter sleeve.

The outer drum end plate consists of two parts, the inner and outer end plates which are bolted to the bearing housing with through bolts. NOTE: The inner and outer end plates must not be taken apart when the bearings are replaced.

The outer drum and rear plate are held together by 3 straps.

The outer drum is connected to its resilient suspension by four supports, bolted to the end plates. It is important that these supports are not loosened from the rear plate during repairs.

47



EX 30 S

0635

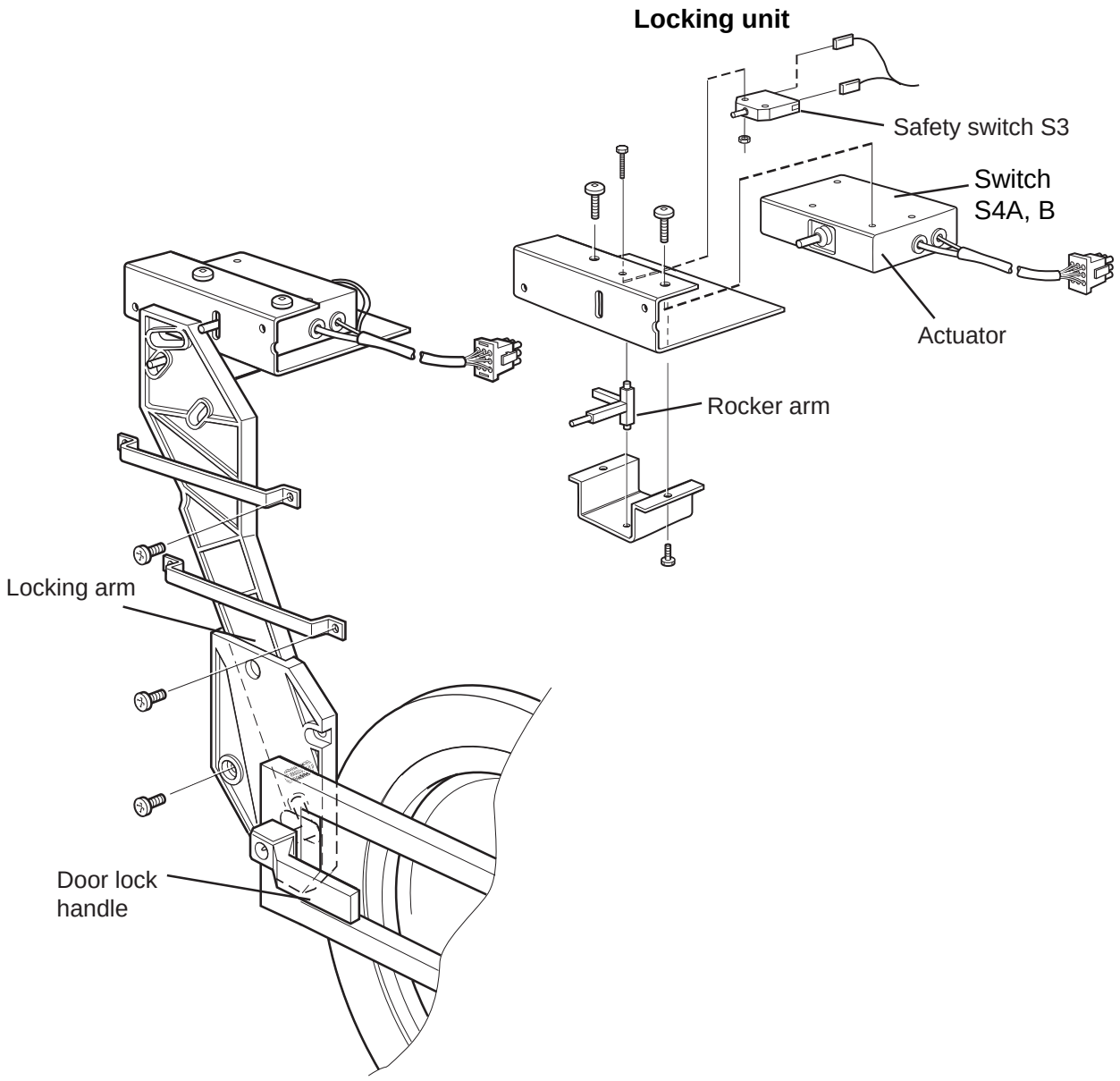
Description

Fig. 48

The machine door lock consists of the following:

- The locking unit, located behind the front panel below the detergent dispenser. The unit consists of a solenoid which locks the door, and two microswitches. Switch S4A indicates that the door is locked and switch S3 indicates that the door is closed.
- The door lock control unit, located in the automatic control unit. This unit consists of a circuit board for monitoring door lock functioning.
- The locking arm, located between the door lock handle and the locking unit. This arm provides the mechanical link between door lock handle and locking unit.

48



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101637

Door lock control unit

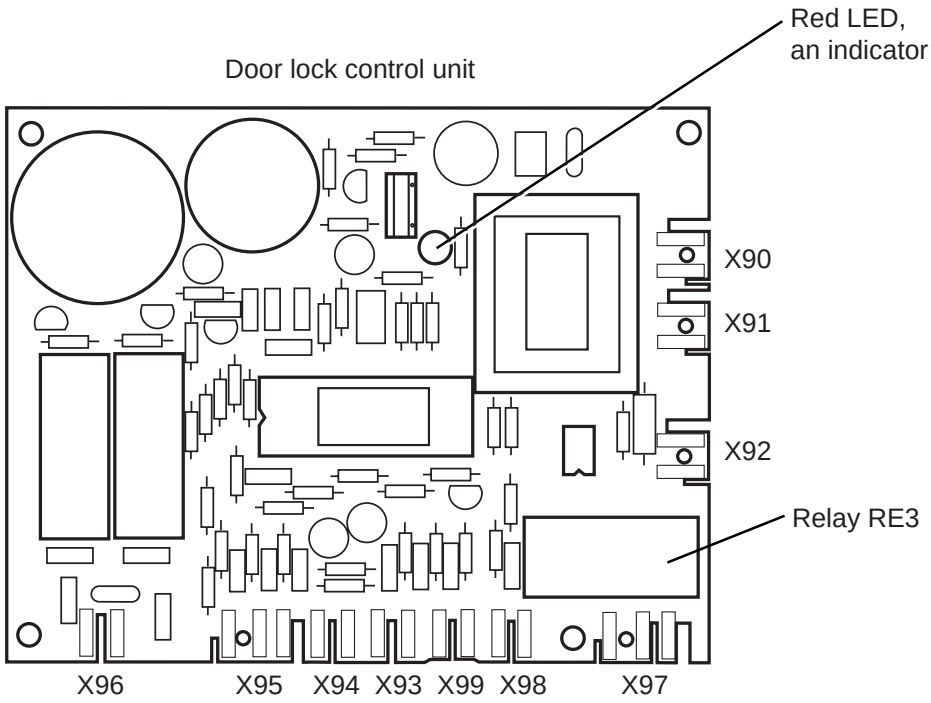
Fig. 49

The sole function of this control unit is to oversee the correct functioning of the door lock. The CPU board receives information from the motor control unit about motor rotation, and has its own level-monitoring device. The control unit also detects water level and motor speed through separate level measurement devices and the rotation guard (speed-monitoring device). Through this double monitoring, a very high level of safety can be achieved.

When the CPU board commands door locking, the control unit checks that there is no water in the drum and that the drum is not rotating. Only after that is a signal sent to the door lock. Level and rotation are checked in the same way before the door is allowed to open.

For even greater safety, the voltage feed to the I/O boards' outputs goes via both the emergency stop and the door lock switch. This means that no functions can proceed unless the emergency stop is in its normal position (not actuated) and the door is locked.

49



Error indication patterns

Fig. 50 If the door lock is working correctly, this is indicated by the red LED, by a pattern of flashes which indicates “OK”. The error indication patterns revealed by the LED flash at various frequencies for the various errors or faults. All error indication patterns have a frequency cycle of 50%, i.e. the LED will be on half the time, off half the time.

50

LED pattern of flashes during normal functioning

1 second

Pattern of flashes indicating “OK”, drum at standstill

Pattern of flashes indicating “OK”, drum rotating, 5 Hz

Error indication pattern	Meaning/cause
	Level-sensing device indicates water in drum when door lock is open. 2.19 Hz
	Auxiliary relay for motor indicates that the motor contactor is activated when the door lock is open (this error indication pattern does not occur when the excess-speed-monitoring device is selected). 1.88 Hz
	Signals from rotation sensor and auxiliary relay do not correspond. 1.56 Hz
	The control unit sensor circuits indicate fault/ error in drive circuits for door lock including its wiring. 0.85 Hz
	Armament circuits for RE1/RE2 activated (capacitor C8 charged when it should be discharged). 0.37 Hz

4686

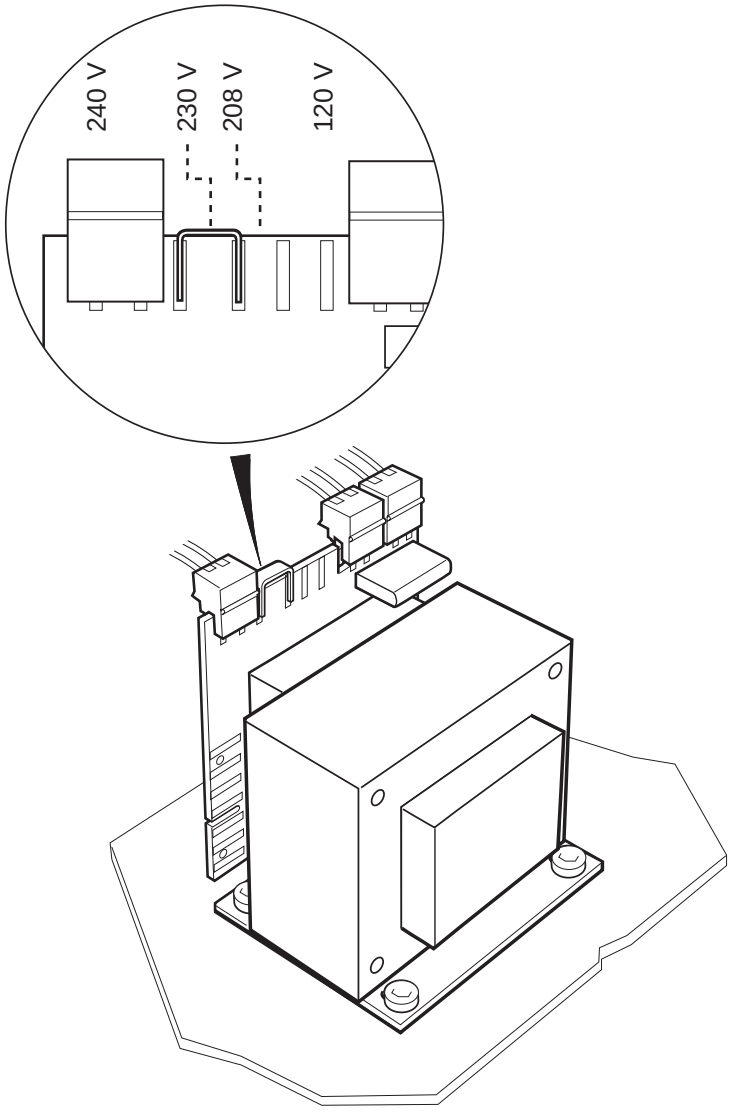
Program control unit

Control system transformer T10

Fig. 51 The control system transformer is used to provide the voltage feed for the circuit boards. The transformer supplies 12 V on its secondary side, and can be adapted to suit any of four different primary voltages by moving a strap.

The transformer should normally be connected for a primary voltage of 230 V. Switching for different power supply voltages takes place at transformer T1.

51



4746

Imbalance switch

Description

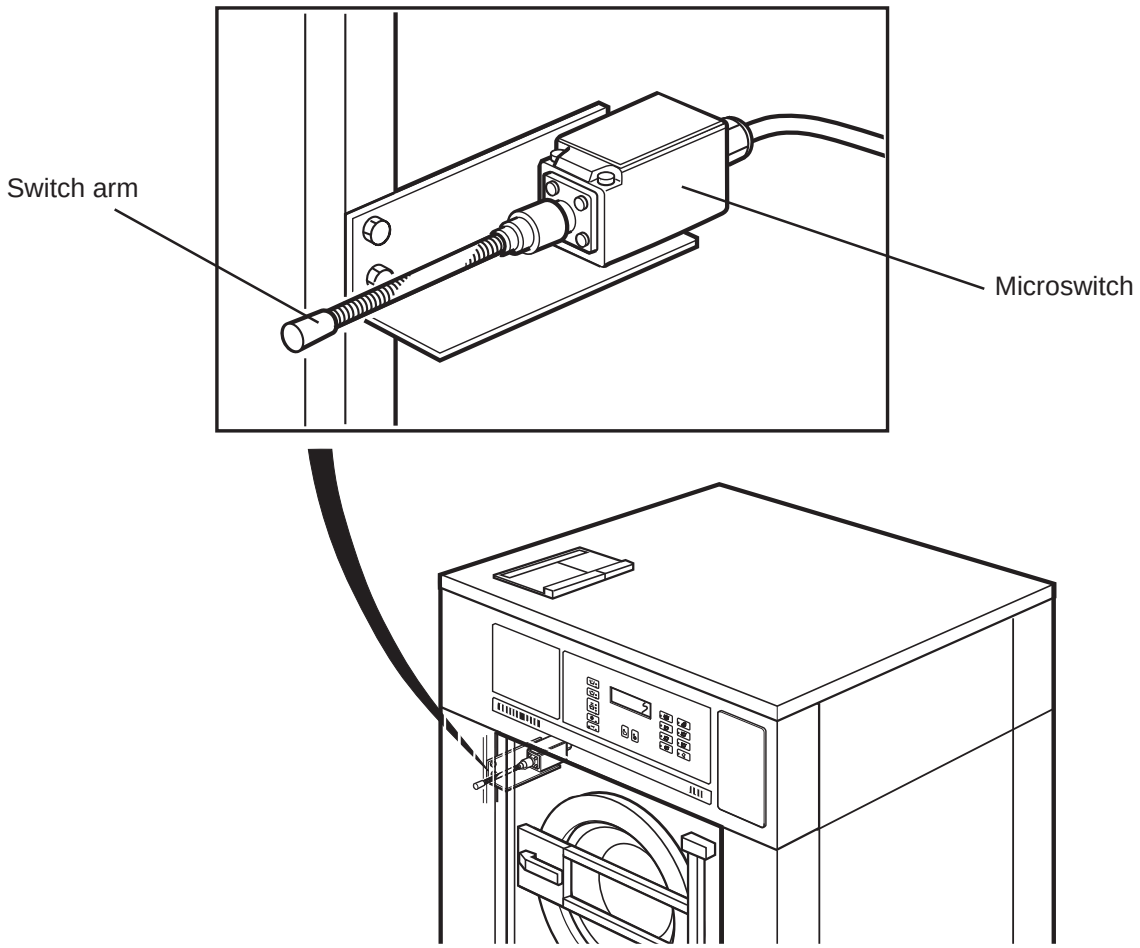
Fig. 52 The imbalance switch is a safety feature which protects the machine from damage during extraction caused by uneven distribution of the wash load.

The imbalance switch consists of a microswitch and a switch arm, mounted on the left-hand front pillar of the frame. If the inner frame moves outside a certain range, it will actuate the microswitch via the switch arm. As a result, extraction will be halted and the PCU will switch to wash speed. After that the PCU switches to distribution speed, before another attempt at extraction.

If the imbalance switch is being triggered repeatedly, possible causes are:

- Unsuitable wash loads.
- The dampers are in poor condition, see Chapter 43. Frame.
- High water level not programmed for extraction.

52



4752

Motor

Description

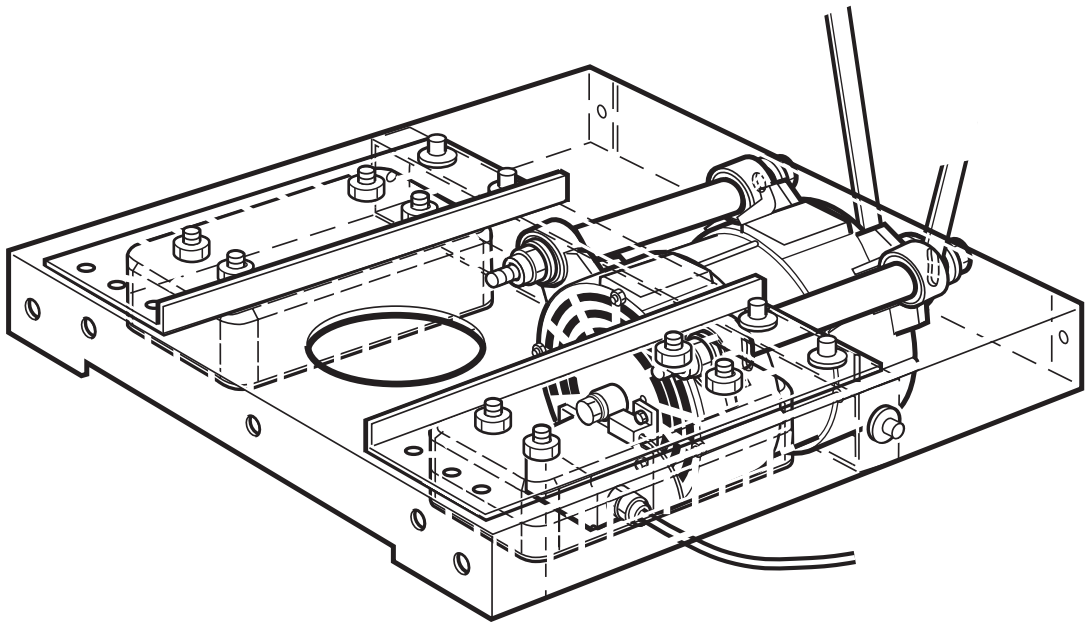
Fig. 53 The motor is mounted inside a motor mounting unit beneath the outer drum. It drives the inner drum via a drive belt. The drive belt tension is adjusted with the aid of two retaining screws on the side of the motor mounting unit. See the section “Belt tension” in this chapter.

Electrical connection for the motor is by quick-connector.

This is a frequency-controlled motor, and its speeds for normal action, distribution and extraction are controlled by E10, which is a microprocessor-based motor control unit in the automatic control unit.

The motor windings have overload protection in the form of a thermal protection device which resets automatically.

53



4740

Motor control unit E10

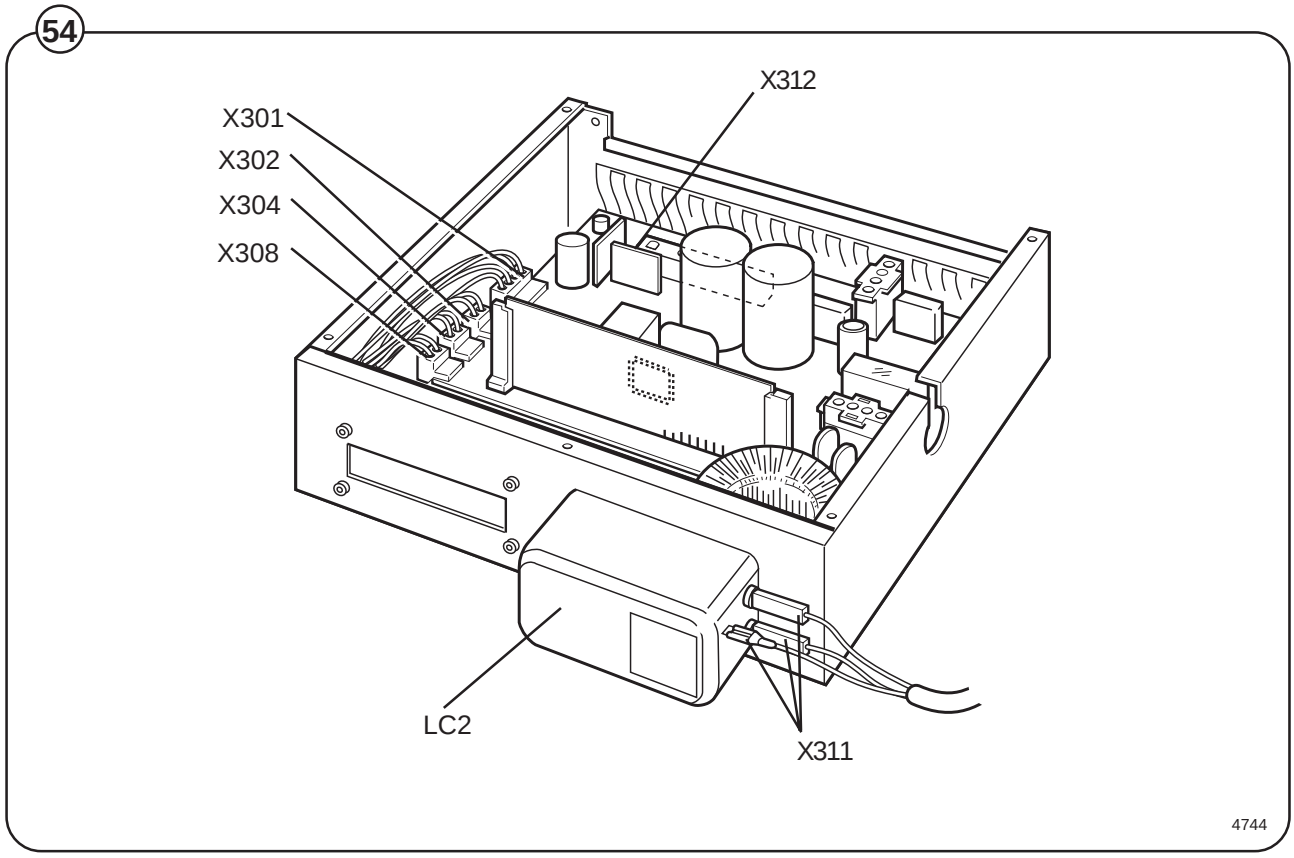


Fig. 54

LC2	Suppression filter
Connectors	
X301	Serial communication with PCU
X302	Input, lock sequence
X304	Relay output
X308	Imbalance input
X311	Main input
X312	Connection, motor and thermal protection device (Klixon)

Motor control unit

Fig. 55

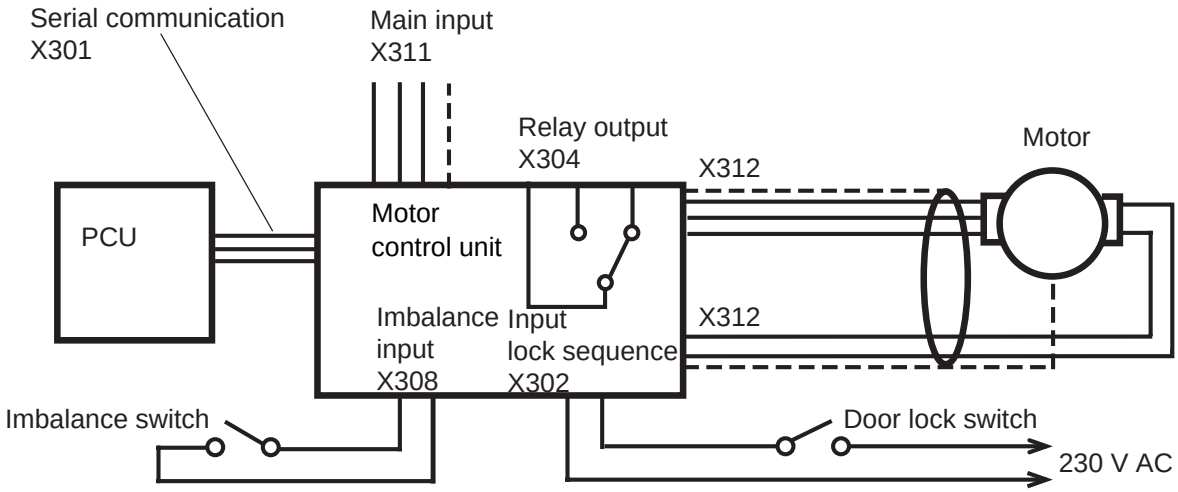
Fig. 57

The motor control unit communicates with the PCU board via a serial duplex interface. With the aid of the MCU, the PCU board can not only control the speed the motor is to have at any given moment, but also control the acceleration and deceleration rates the motor will use to reach the speed commanded. The MCU constantly relays information back to the PCU board on current operating status, e.g. whether everything is proceeding without problems or if a fault or error has arisen.

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

WARNING
Take great care when using measuring instruments on the MCU, since all components have a potential difference of approx. 300 V in relation to earth and neutral.
The MCU will not be de-energised until 10-30 seconds after the machine is isolated from the power supply and the motor has stopped.
The green LED on the MCU board will remain lit for as long as there are hazardous voltages present in components.

55



4711

For the 220 l machine there is a cooling fan on the MCU, on account of its higher wattage. The fan starts up automatically when the heat sink reaches a temperature of approx. 65°C, which can arise during extraction if the load is unfavourable or if the ambient temperature is high. When the machine power supply is first switched on the fan operates for a short time.

The MCU has an interlock signal input connected to a switch in the door, which supplies the input with main voltage when the door is locked.

PCB connector/Function

X301: Serial communication

Communications between MCU and PCU. With an interface it is possible to connect a PC for testing machine operation/functions.

X 301:2 Gnd
X 301:3 Txd
X 301:4 Rxd

X302: Input lock sequence

An input voltage of 96-276 VAC is required to start the motor.
The function of this input is to stop/not start the motor when the door lock is open.

Input voltage: 120 V-20 % (=96 V) - 240 V+15 % (=276 V), 50/60 Hz
Current: Max. 0.01 A

X304: Relay output

The relay is controlled via commands from the PCU (X301). The relay is not to be activated if communication with the PCU is lost.

Isolation voltage: 3750 V
Voltage: 250 VAC
Current: max. 2 A
Relay connections: 1-pole, 2-way (three connections)

Connector:	X304:1	Normally open
	X304:2	Normally closed
	X304:3	Common

X307: Internal

For 220 l machines, this contact is used for connection of a fan for cooling the MCU.

X308: Imbalance input

The function of the imbalance input is to stop the motor if the drum's movement is too great. (The imbalance switch is normally open.) When the imbalance switch is activated (closes) a voltage of 96 - 276 V AC is supplied to the MCU. The MCU detects that imbalance has arisen and stops the motor.

Input voltage: 120 V-20 % (=96 V) - 240 V+15 % (=276 V), 50/60 Hz
The imbalance input receives its supply from Input lock sequence (X302).

Current: Max. 0.01 A

X311: Main input

Input voltage: Single-phase or DC three-phase: 200 V-15%(=170 V) - 240 V+10% (264 V)

X312: Output to motor and input thermal protection device (Klixon)

The output is connected to a thermal protection device, located on the motor windings, with a connection back to the input. If the motor becomes overheated, the thermal protection device switch opens. The yellow LED reveals an error code through its pattern of flashes, see the section "Error indication patterns".

Current, max. 0.01 A

Error indication patterns

Fig. 56 If a fault or error occurs in the motor or motor control unit, the MCU sends an error signal to the PCU board. In addition to an error code showing on the display, errors/faults are revealed by the flashing of a yellow LED on the MCU board. The table below shows how to identify the error/fault on the basis of the flashing pattern of this LED.

Fig. 57

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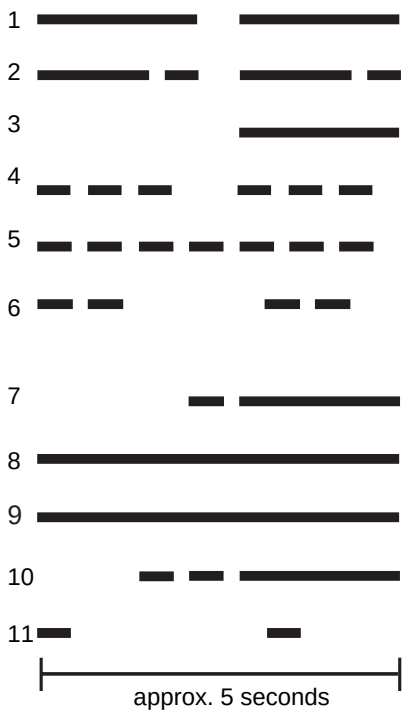


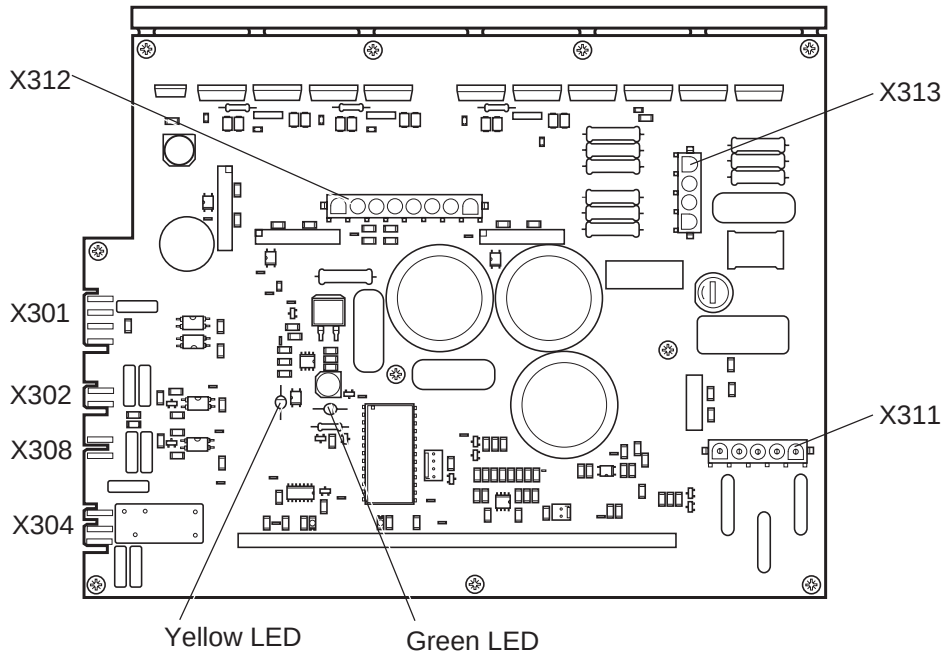
LED pattern of flashes	Error code/message on display	Cause
1		
2	31E	Heat sink on MCU too hot.
3	32E	Motor thermal protection device activated
4	33E	MCU has received start command, but not received interlock signal.
5	13E	Communication error MCU – PCU
6	-	Short in motor windings, wiring or internally in MCU. MCU will restart automatically.
7	35E	Once again short in motor windings, wiring or internally in MCU.
8	36E	Fault in interlock circuits in MCU.
9	37E	MCU DC voltage too low.
10	38E	MCU DC voltage too high
11	39E	Ripple DC-bus (EWD 4000 only).
	41E	Fault/error in MCU overheating circuits.

4710

Fault-finding

There are fault-finding charts for all error codes.

57



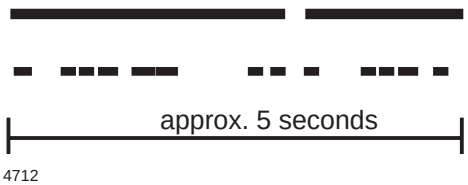
Error indication patterns, green LED

Fig. 58 The green LED on the MCU board is normally lit except for a brief pause approx. once every five seconds (pattern which indicates “OK”).

When the microprocessor for the PCU is removed from the machine or has reset status, the LED will be lit without flashing.

When the MCU current-limiting function is activated, the LED will instead flicker, and the flashing pattern which indicates “OK” will be suspended for as long as the current-limiting function is activated. When the MCU current-limiting function ceases, the pattern of flashes indicating “OK” will return after 10 seconds.

58



Pattern indicating “OK”

Flickering when MCU current-limiting function is activated.

Extraction

Fig. 59

During extraction, the motor speeds follow an extraction sequence which is always the same. This extraction sequence is used for all WE/MP machines and for standard programs 991-999 for CLARUS machines.

The table shows the extraction speeds during the various phases of the sequence, for various drum volumes.

The extraction sequence is as follows:

Phase 1. Distribution period of 40 seconds, with imbalance sensing. Imbalance sensing takes place during the last 5 seconds.

Phase 2. Extraction for 30 seconds.

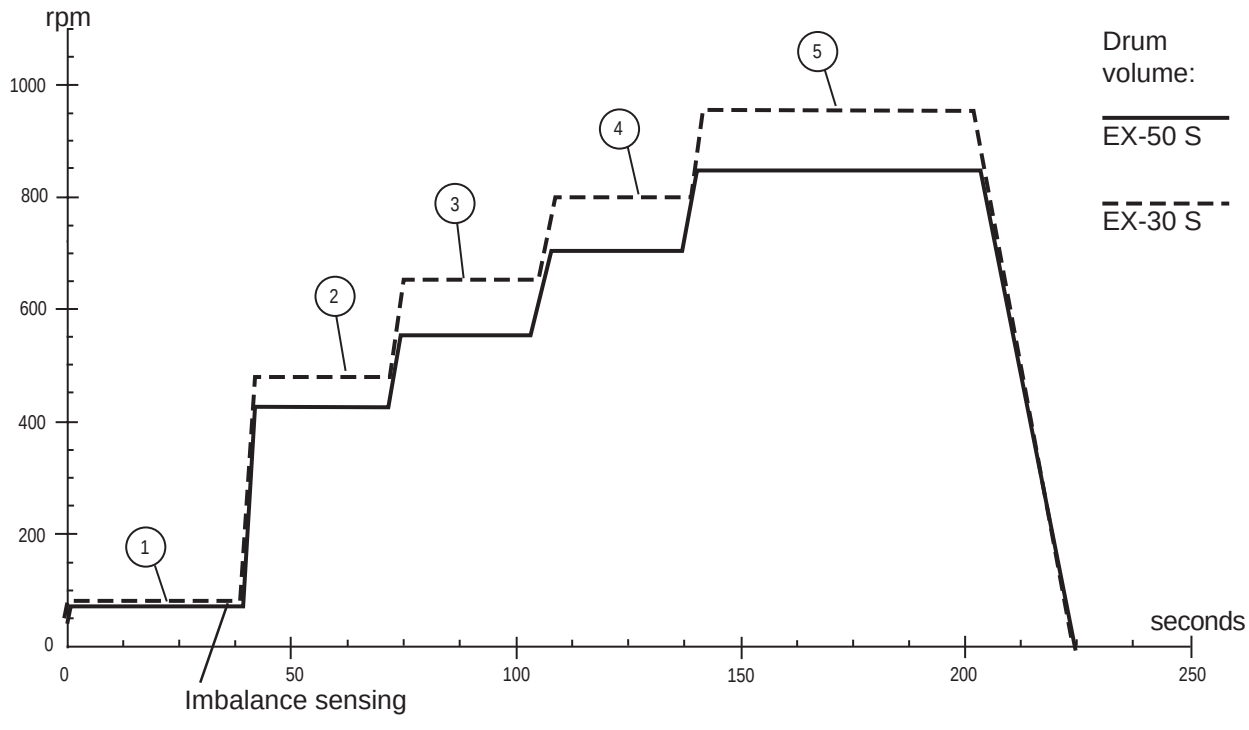
Phase 3. Extraction for 30 seconds.

Phase 4. Extraction for 30 seconds.

Phase 5. Extraction for remainder of the program's total extraction time.

Speed rpm \ Drum volume l	EX-30 S	EX-50 S
Phase 1	85	78
Phase 2	475	425
Phase 3	650	550
Phase 4	800	700
Phase 5	950	850

59



Imbalance measurement

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 extraction having taken place.
- If the imbalance is “small”, extraction will take place, but at a reduced speed.

Belt tension

Fig. 60

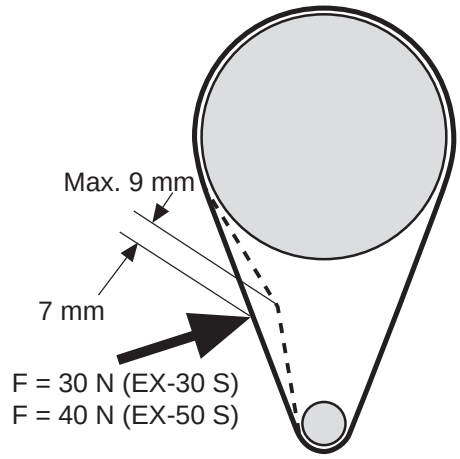
The tension of the drive belt is preset at the factory.

Fig. 61

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

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

60



X = 7 mm when belt is new.
Max. 9 mm on subsequent checks of same belt. If X = more than shown here, increase belt tension.

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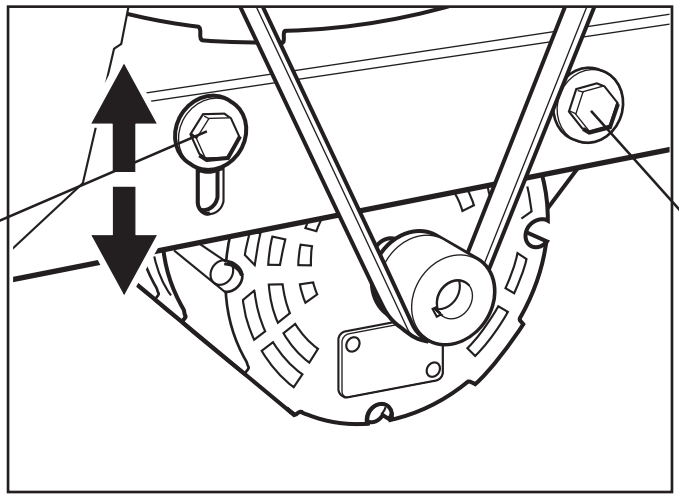


4832

Drain valve

Description

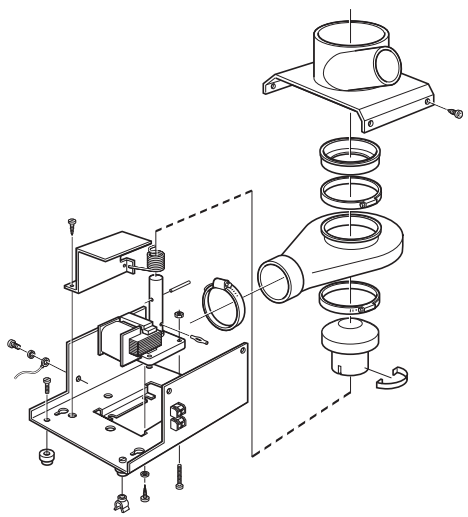
Fig. 62 The drain valve is a motor-operated diaphragm valve which allows rapid emptying thanks to its large cross-section. This is a self-clearing design, Fig. 63 so there is no need for a lint filter.

Main parts of the valve:

- motor plus gear
- piston rod with trapezoidal thread, plus piston and return spring
- rubber diaphragm
- connections for water filling, overfilling, drain

In its open state, the valve is not energised. In this state the piston rod is screwed down to its lowest position by the return spring. The diaphragm is pressed downwards with the piston and the valve is open.

62



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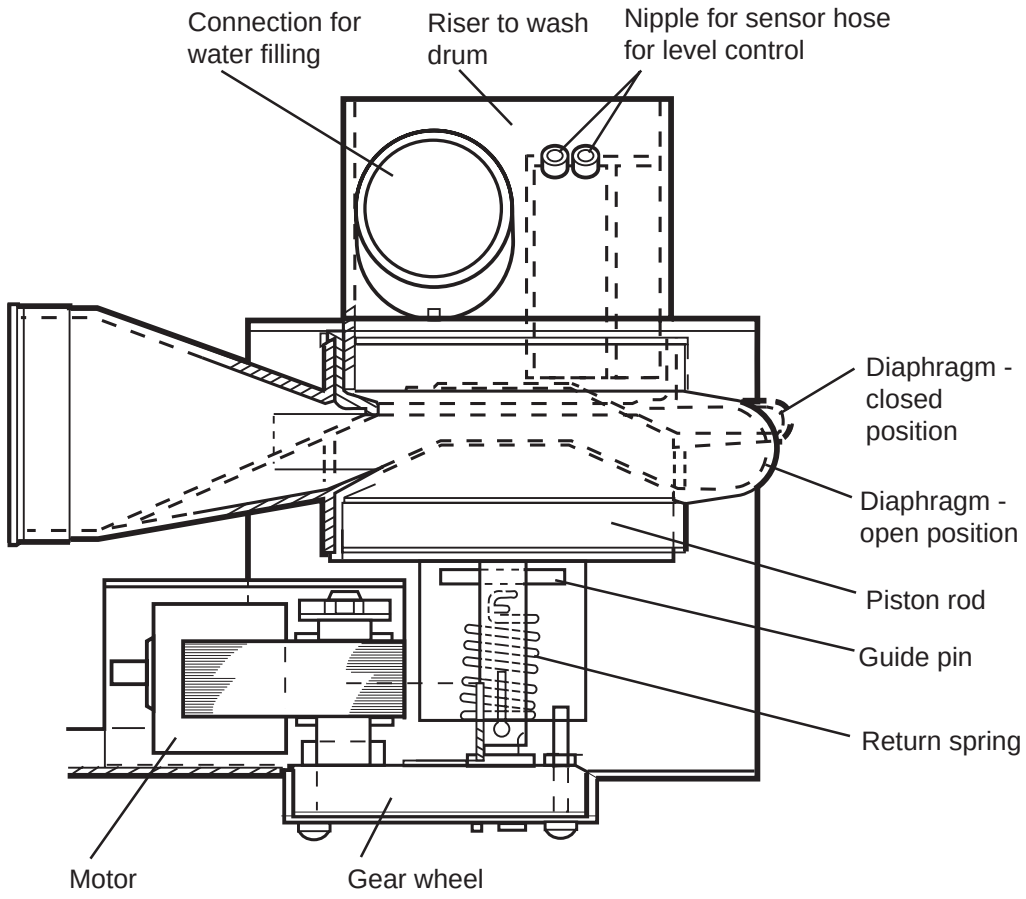

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When the motor is activated and begins to rotate, the piston rod is turned upwards via the gear, the diaphragm is pressed upwards with the piston and presses against the valve seat: the valve closes.

The connection for overfilling is connected to the upper part of the wash drum, water and foam are diverted straight to the drain if the intake valves or level control should malfunction.

On the riser for the wash drum are the connection for water filling and a nipple for connecting the sensor line for the level control.

Instructions for repair

Deposits on the diaphragm can prevent the valve from opening or closing properly. The valve should therefore be cleaned at certain intervals, depending on operating conditions and water quality.

If the valve is not opening or closing properly:

Fig. 64

- Check that the motor has the right input voltage.
- Check that the piston rod can move freely.
- Check whether the diaphragm is clogged with deposits.

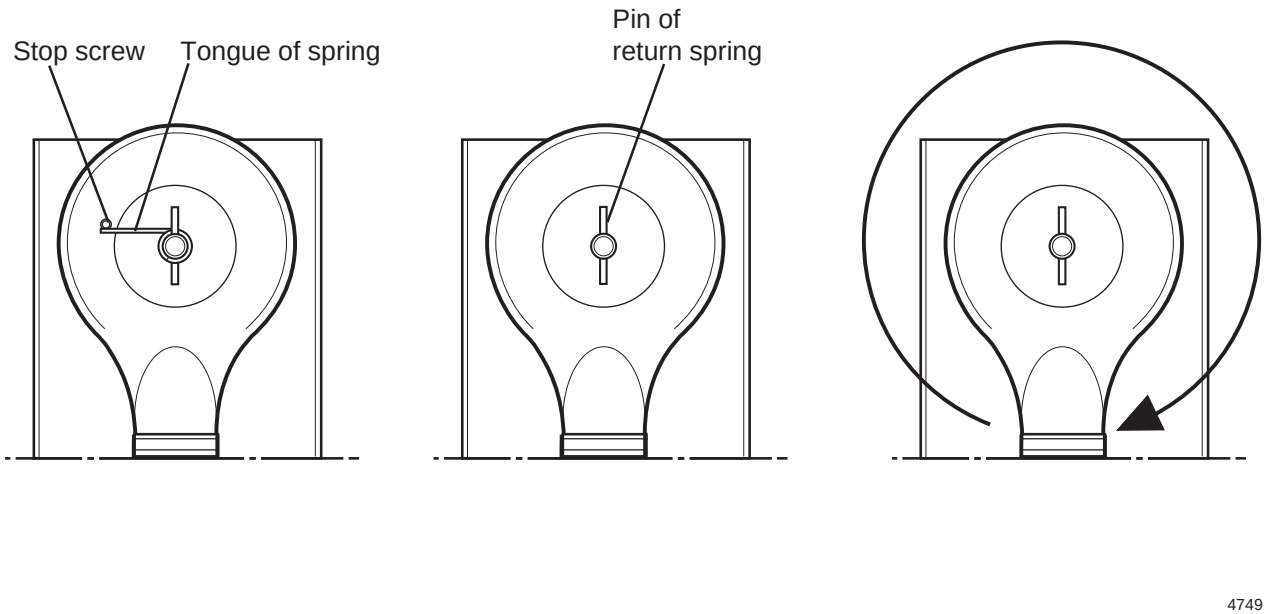
To note if replacing the motor:
Brown cable: 60 Hz
Blue cable: common
Black cable: 50 Hz

Tensioning of return spring

With the valve housing removed:

- Turn the return spring so that the “tongue” of the spring is resting against the stop screw.
- Position the valve housing over the return spring so that the pin on the spring will fit into the recess on the piston rod. (Note: the piston rod should be installed so its recess is aligned along the housing.)
- Then turn the housing one turn clockwise. (This will screw the pin of the spring into the piston rod. The spring will be now tensioned approx. 1/4 of a turn on account of the lead in the piston rod.)

64



Heating

Description

Fig. 65 The machine elements are in the lower part of the outer drum, accessible from the machine front. They are switched in by heating relays, controlled by the program control unit. For input voltage 400-440 V one heating relay is used (K21), and for 208-240 V, two are used (K21 and K22).

Fig. 66

The program control unit prevents the elements from being switched in when there is no water in the drum. If some fault should arise which causes the elements to heat with no water in the drum, their own fuses will blow.

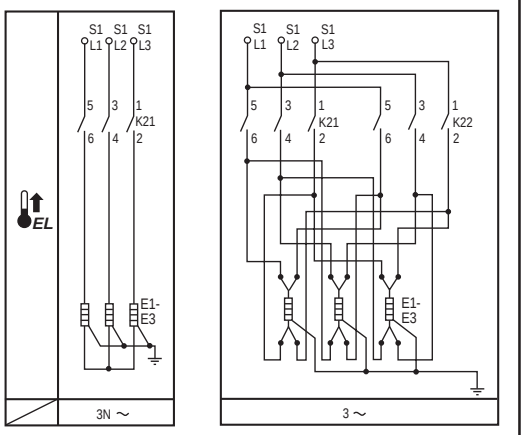
Fault-finding

To be carried out by authorised personnel only.

If heating time is abnormally long:

- Check with a multimeter to see if one of the elements is burnt out. For access to the elements, remove the machine's front panel.
- Build-up of limescale can reduce the efficiency of the elements. If necessary descale them with a suitable descaling product. Follow the manufacturer's instructions concerning quantity of descaler.

65



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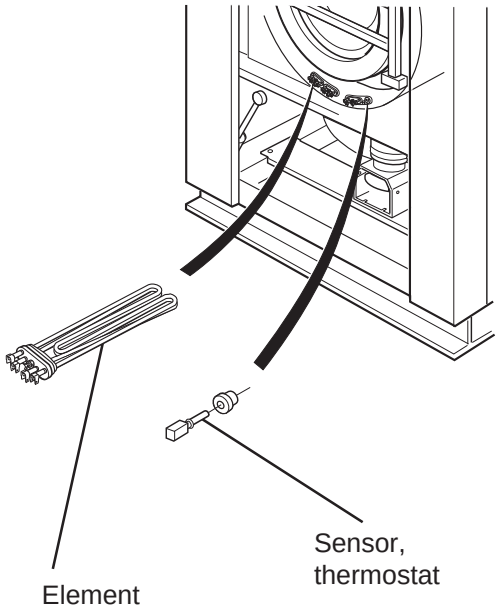

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To replace an element

- Switch off the power supply to the machine at the main switch/wall switch and check that the machine is isolated from the power supply. Remove the front panel.
- Note exactly how the elements electrical connections are arranged, then disconnect them.
- Undo the nut between the element’s connections and turn the screw a half turn.
- Remove the inspection cover in the inner drum. Turn the drum so the opening is at the bottom. This will give access to the nut for the element holder through the opening. Release the nut for the element holder enough to allow the element to be pulled out.
- Guide the new element into the element holder at the rear of the drum, turn the screw one half turn and tighten the nut.
- Connect the element’s electrical connections.
- Tighten the nut on the element holder.
  Refit the inspection cover.
- Fill the machine and check that there are no leaks from the element seal.

Weighing equipment

Description

Fig. 67

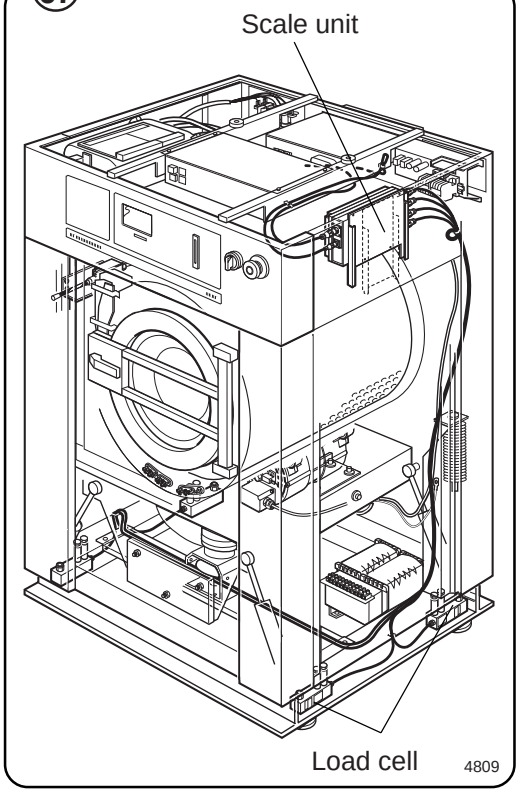
The weighing equipment comprises the following units:

- A scale unit located inside the machine's right side panel
- Four load cells, one in each corner of the frame
- Wiring

The weight of the wash load is registered by the four load cells, which send analogue signals to the scale unit. In the scale unit the signals are processed and converted to a weight value in an analogue-digital converter. The weight value is transmitted via a serial interface to the CPU board. The weight is then shown on the display.

Weighing the load allows the water level to be adjusted automatically according to the actual weight of the load, i.e. the water level is reduced during washing if the machine does not have a full load. The consumption of water and energy can thus be reduced.

67



Safety rules

The weighing equipment is a precision measuring device and must be treated as such.

- Never spray water directly onto the load cells and scale unit.
- The load cells are vulnerable to impact.
- The load cells are potentially vulnerable if welding is carried out. If welding has to be done on the washer extractor, attach the earth cable clamp as close as possible to the welding site.

After a power-cut

When the power is restored after a power-cut, the weight displayed will always be 0, no matter whether there is a load in the drum or not. If this happens, it is important that you use the "Reset weighing equipment" function via the Clarus software. Follow the instructions under "Reset weighing equipment" in the "Machine operation" section of the manual.

After a power-cut, the weighing equipment will always display 0, no matter what the actual load in the drum. In this event you will have to use the "Reset weighing equipment" function.

Inlet valve, detergent

Construction

Fig. 68 The valve has a single-inlet with either one, two or three outlets, each with its own solenoid coil. The body is made of heat-resistant polyamid plastic and the solenoids encased in water-tight plastic.

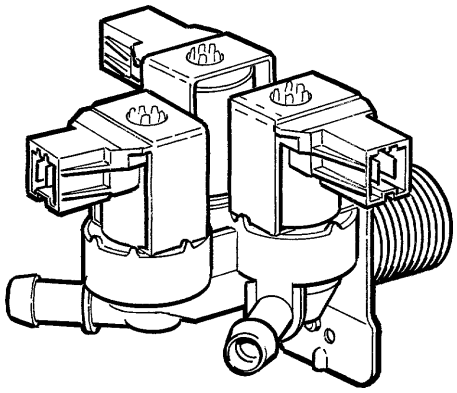
A filter screen on the inlet side prevents dirt from entering the valve. Flow restrictors can be placed at either the inlet or any of the outlets.

Operation

Fig. 69 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.

68



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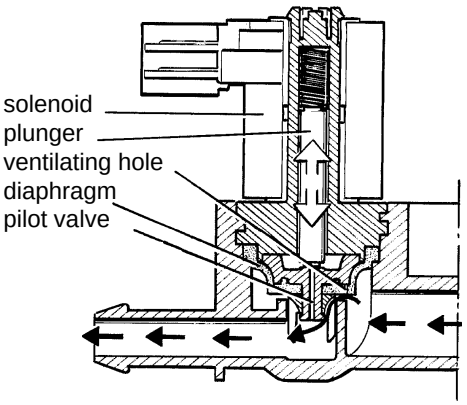

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Maintenance instructions

Lime scale can block the hole in the valve diaphragm and interfere with the function of the valve.

Fig. 70 It is therefore advisable to disassemble and clean the valve at certain regular intervals. The frequency depends on operating conditions and the level of contamination in the water.

Trouble shooting

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.
- Disassemble the valve (see below) and check the openings in the valve diaphragm.
- Check the inlet strainer and clean as required.
- Undo the coil and clean the surfaces of the magnetic core.

If the valve does not close

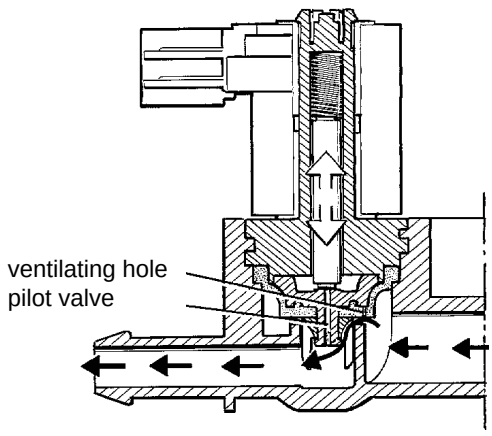
- Check that the coil is not live. The valve is normally closed when the magnet is not energised.
- Check the return spring.
- Check the diaphragm (pilot pressure opening).

Disassembling the valve

Fig. 71
- Pull the coil straight upwards. Use a screwdriver if necessary to carefully undo the coil.

Fig. 72
- Use the tool supplied with the machine (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 wrench or a pair of pliers and unscrew the upper part of the valve housing.

70



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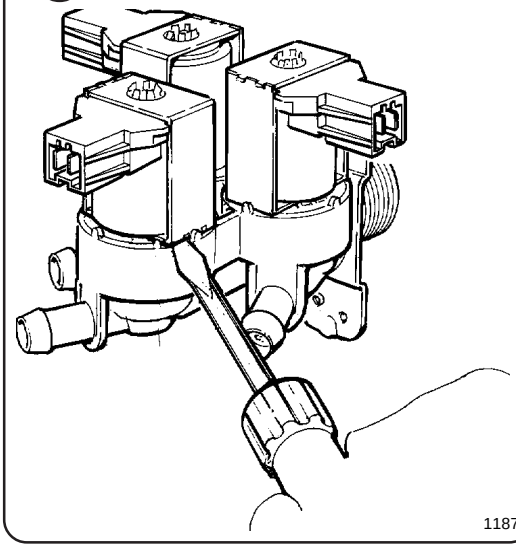

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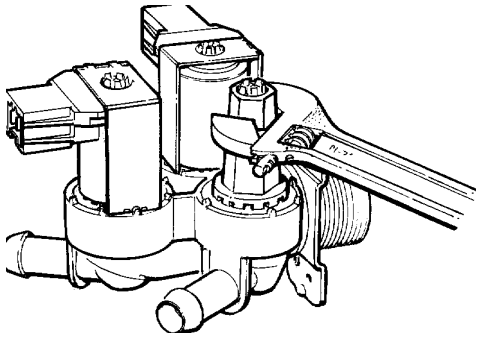

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Inlet valve

Fig. 73 The water inlets have brass bodies with larger cross section of the outlet in order to achieve a shorter filling time for the machine.

Construction

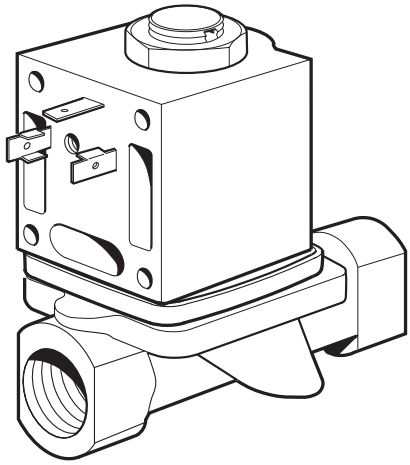
Fig. 74 The valve housing is made of pressed brass. The spring-loaded plunger is made of stainless steel and located at its lower end.

Operation

The valve is automatically operated by means of a rubber diaphragm and a pilot valve in exactly the same way as the supply injector valve.

To strip, clean, re-assemble and troubleshoot the inlet valve, follow the instructions outlined for the supply injector valve.

73



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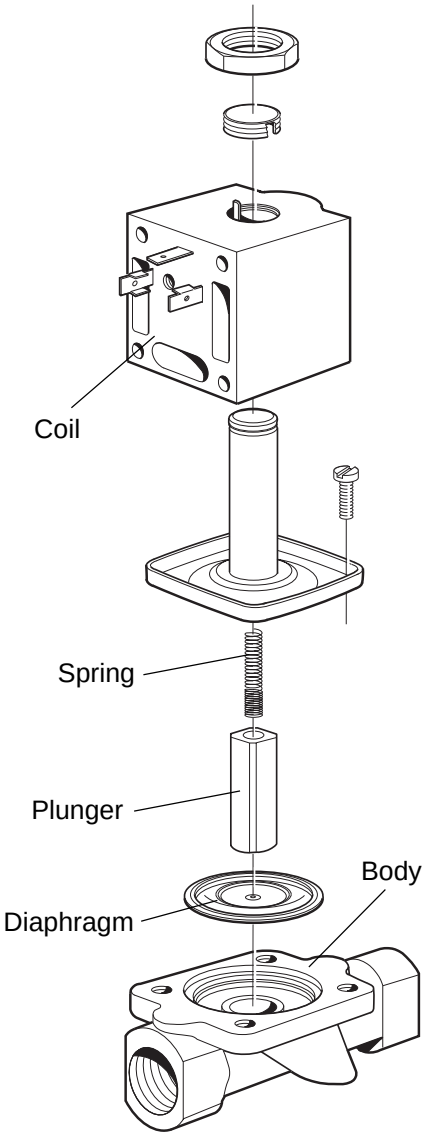

3961

Soap supply box

Fig. 75 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 at the beginning of the Prewash cycle. Powders may be loaded immediately; for liquids, wait until the display shows an arrow and the compartment flushes with water.

Compartment 2

This compartment is used for adding detergent at the beginning of the Wash cycle. If bleach is used, it is added to this compartment when the display arrow appears.

The insert is used to help prevent oversudsing.

Compartment 3

This compartment is used for liquid fabric softener, which is siphoned into the drum at the start of the third rinse. Liquid softener may be added at the beginning of the cycle or during the final rinse when the arrow appears.

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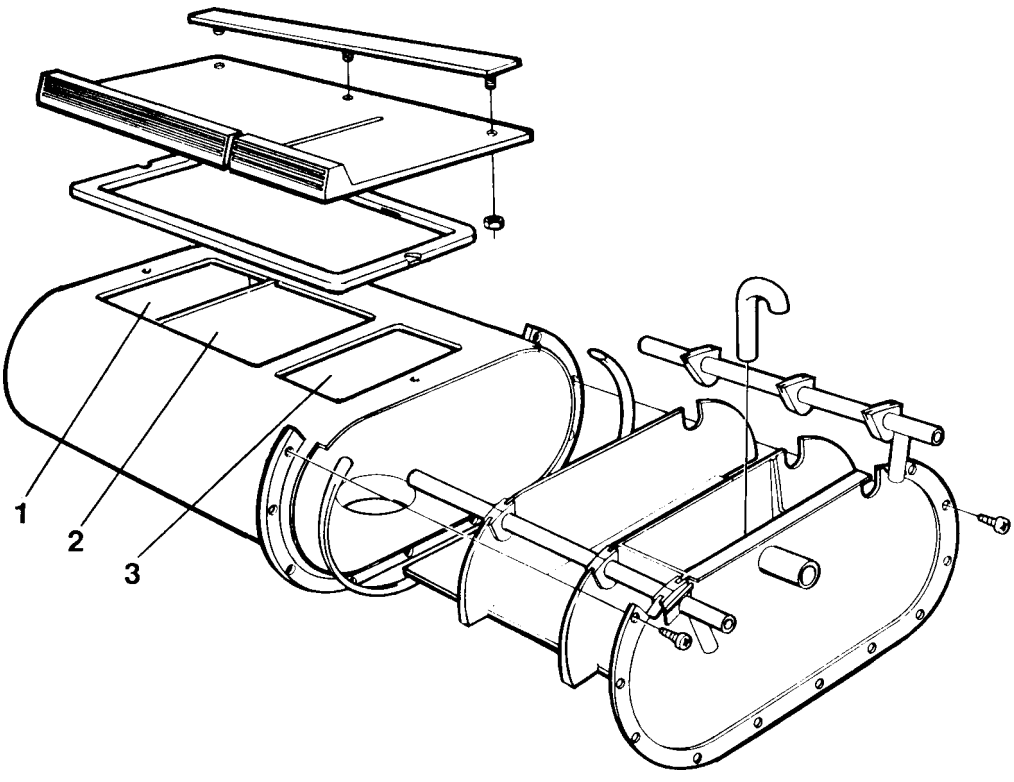

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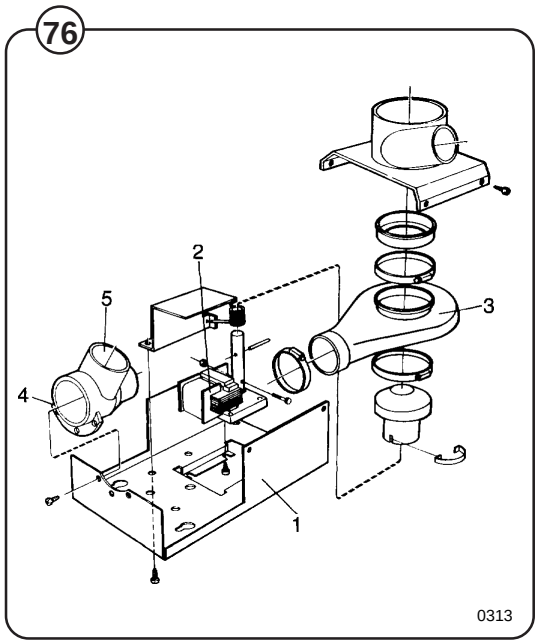
Drain valve



Description

Fig. 76 The drain valve consists of a bracket (1), on which are mounted the motor and gear (2) and diaphragm (3). The rubber diaphragm is resistant to a water temperature up to 100°C (212°F). The installation of a lint trap is not necessary. The machine is equipped with an overflow, which bypasses the drain valve. The drain can be cleaned by removing the drain connection (4) outside of the machine or by removing the rubber diaphragm (3). The motor and gear assembly is covered by a plate and provided with quick-disconnect electrical connections. The stator coil is constructed for continuous operation.

Operation

The drain valve is normally open, i.e. the motor does not close the valve until it receives current via a contact of the timer. As soon as the current is cut, the shaft turns and opens the diaphragm of the valve. This also permits the machine to drain, in the event of power failure. The overflow hose (5) leads excess water or suds directly to the waste line, in the event of failure in the inlet valves or level control.

Trouble-shooting

If the valve does not open or close properly:

1. Check that the shaft is moving freely.
2. Check that the diaphragm is not obstructed.
3. Check the coil for continuity.

Clean out

Periodic cleaning of the valve is recommended, depending upon how often the machines are used, as well as the type of wash handled most frequently.

Electronic program control unit

Description

Fig. 77

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.

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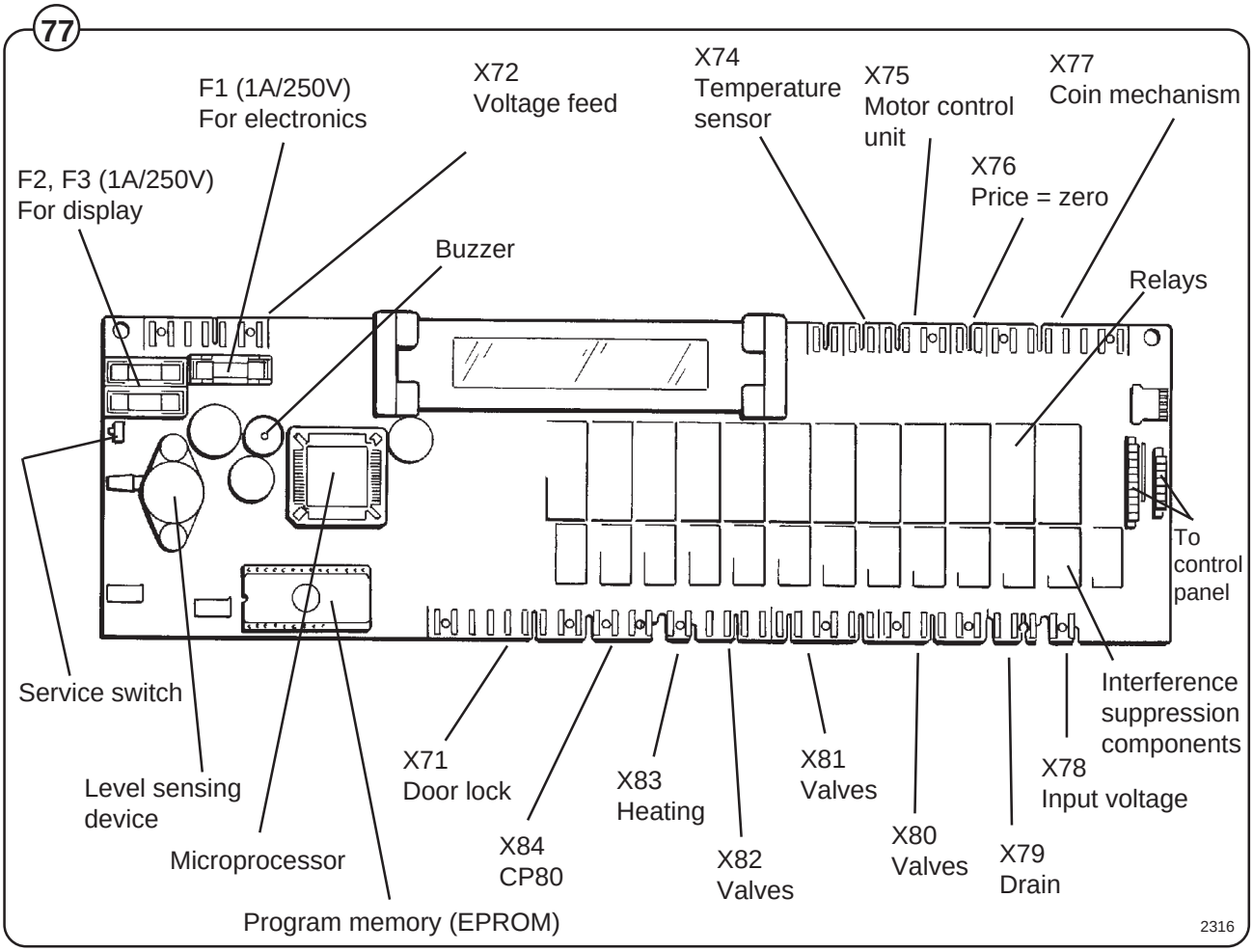


Operating time, accumulated coin value, EPROM no.

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. 78 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.

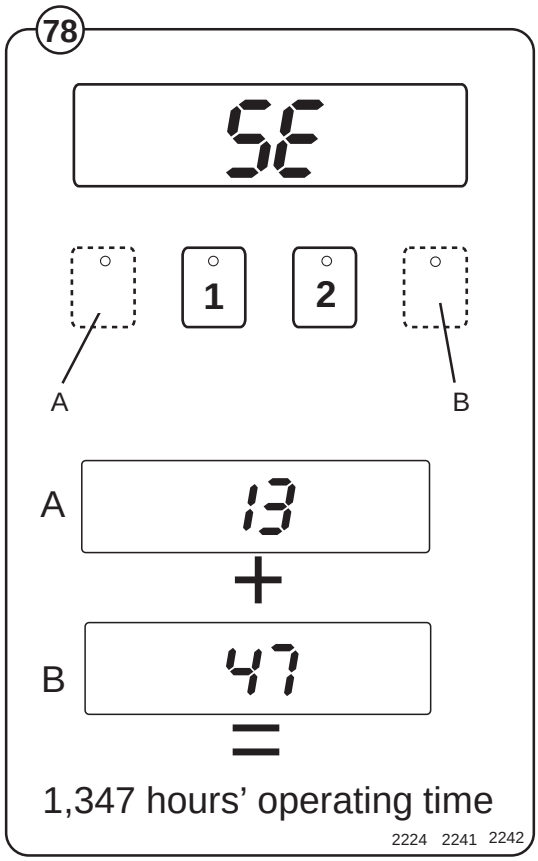
To switch on service mode

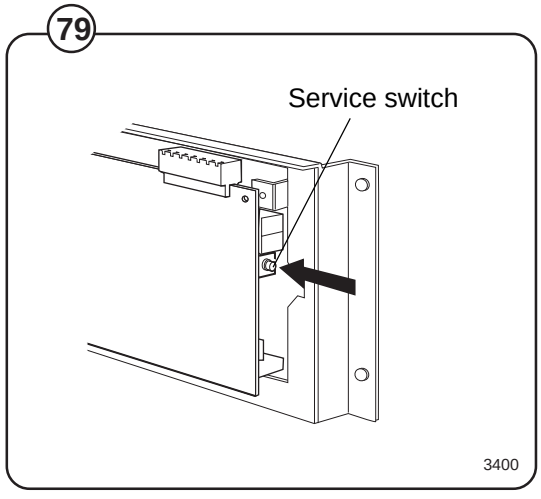
- Remove the machine top and the cover for the program unit circuit board.
- Fig. 79 Press the service switch. This switch is on the left-hand edge of the circuit board when viewed from the machine front. The display will now show SE, which means that the service program is activated.

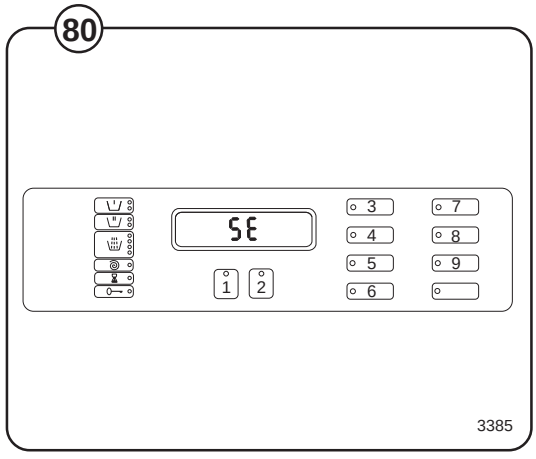
Fig. 80 Now some of the buttons switch to being number keys (1 to 9). The start button becomes an **ON/OFF** key.

To switch off service mode

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





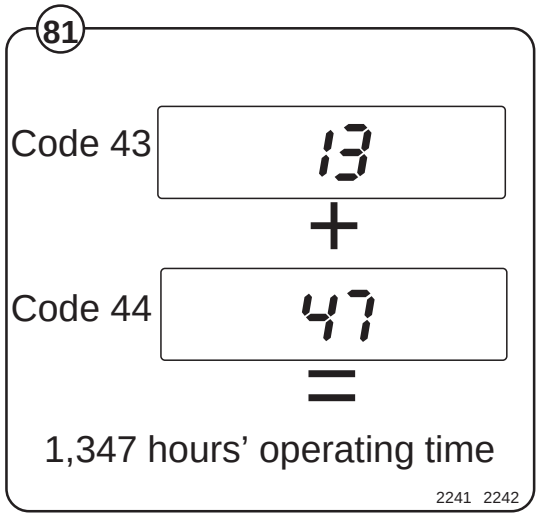


To check in service mode

Fig. 81 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.



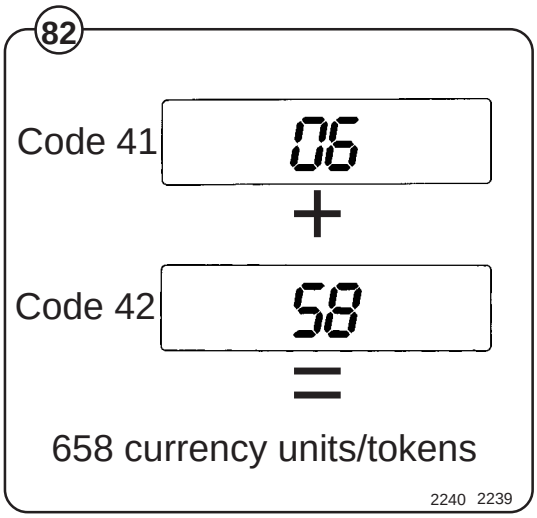
To check in service mode

Fig. 82

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. 83

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

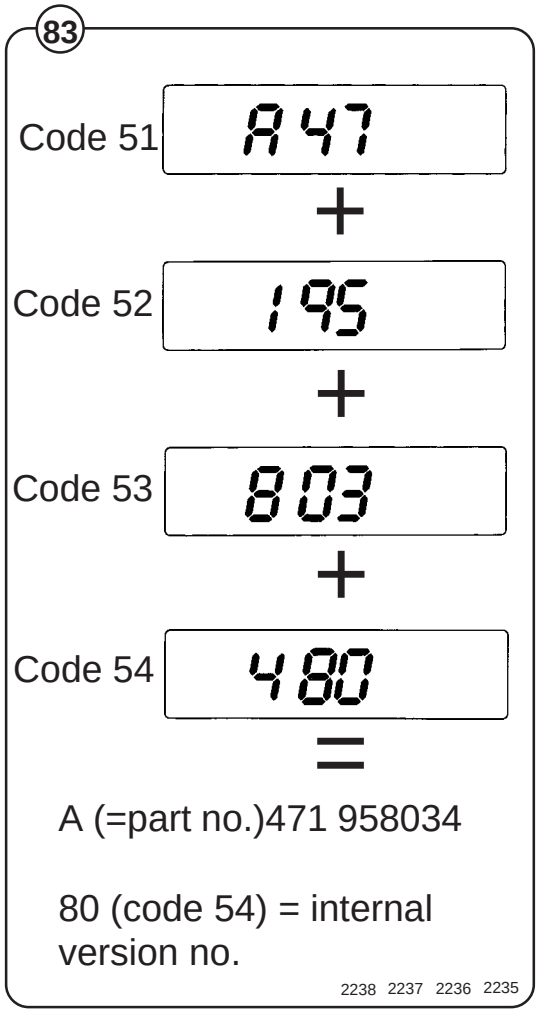
Enter code 52. The display will show (e.g.) 195.

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.

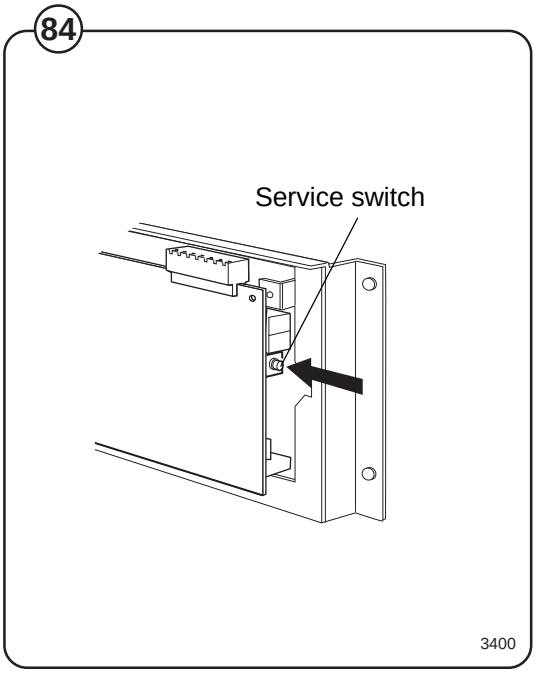


Level control

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 micro-processor 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

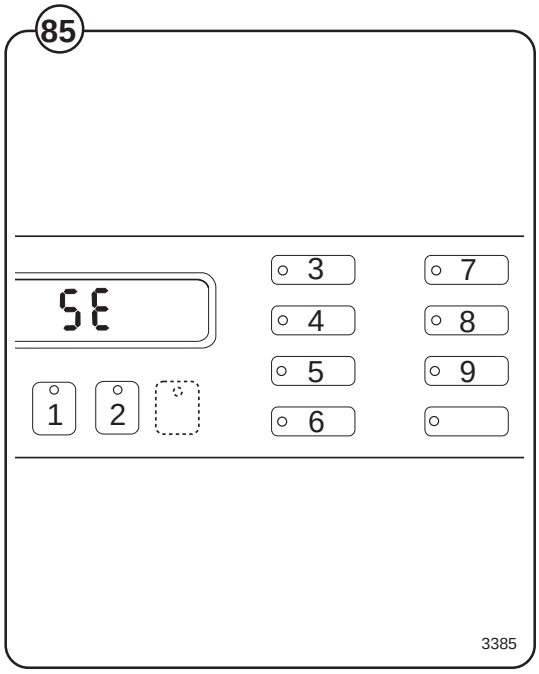
⚠ **To be carried out by authorized personnel only.** ⚠

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

To check functioning of the level control

Fig. 84
- Start the service program by pressing the service button. Now certain of the buttons switch to being number keys (1 to 9).

Fig. 85
- 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.

Built-in service program

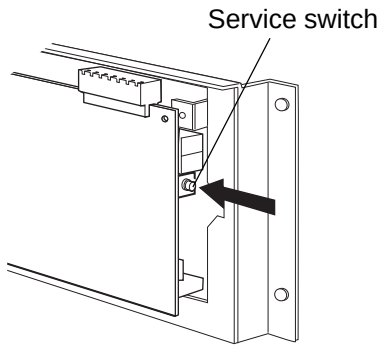
The machine has a built-in service program to facilitate function checking and fault-finding.

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 86



86 3400

Controls in service mode

Fig 87 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 88 The LEDs to the left of the display show which input signals to the program control unit are active.

87

Key switch for price = zero
Coin slot 1

Coin slot 2
Price programming button

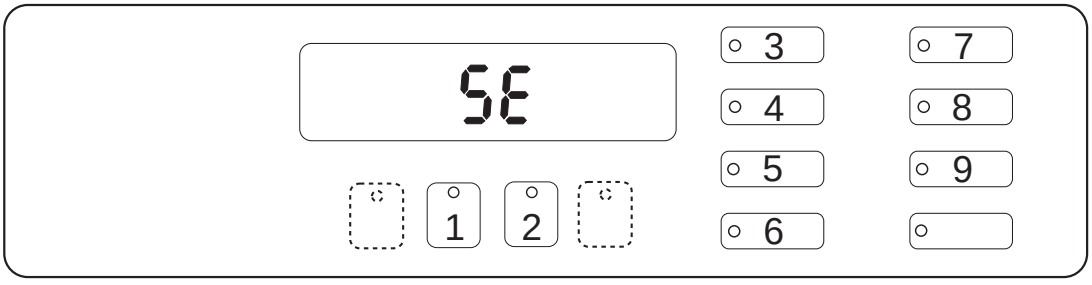
Switch in door lock
Door status switch
Remote start, e.g. by external timer

3385

To switch off service mode

Fig 86 Press the service switch again, or switch off the machine power supply.

88



3429

Error codes

Given below is a brief summary of all the error codes and their causes.

Error Code	Cause
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

Error Code	Cause
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.

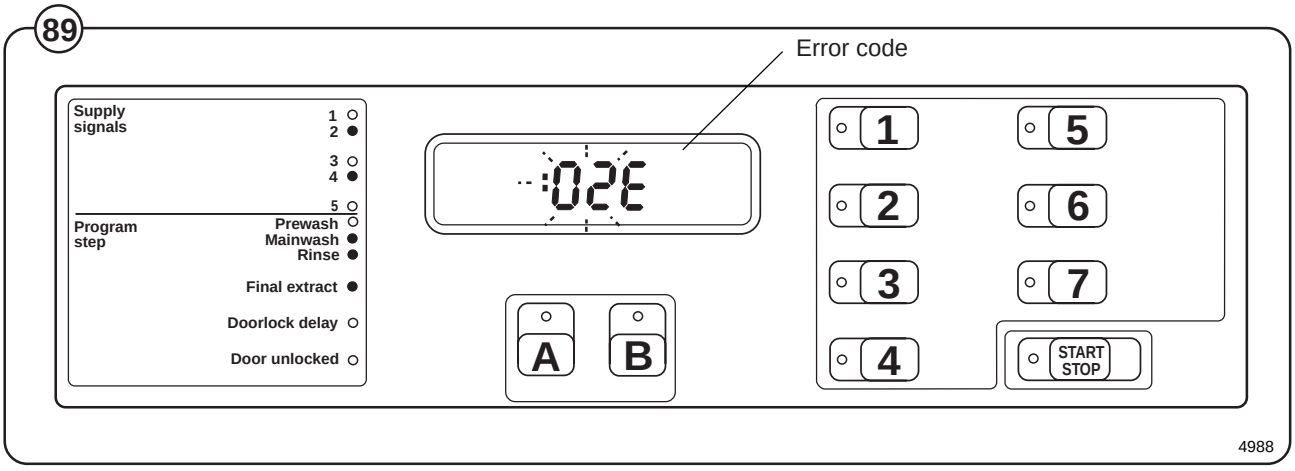
Trouble shooting

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. 89 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

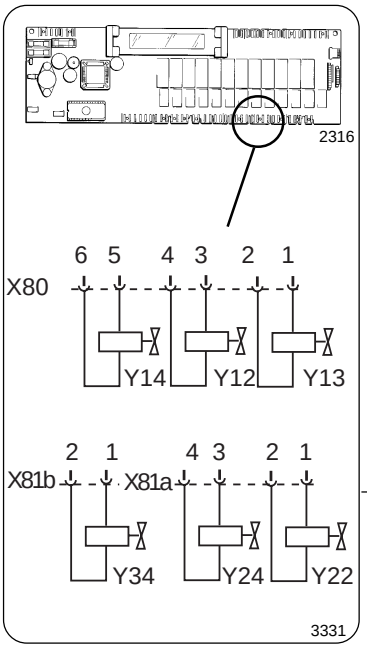
Given below is a brief summary of all the error codes and their causes. Starting on page 5 of this section there are fault-finding charts for all error codes.

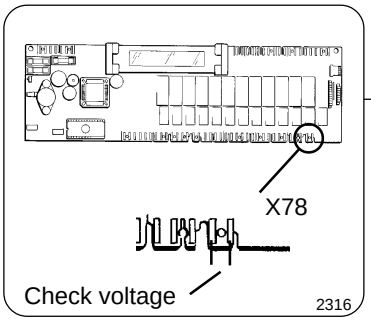
At the end of the chapter there are also charts for faults which do not generate error codes.

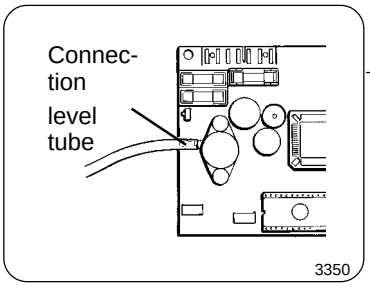
Error code	Cause
01E	Water level not reached within set time. Take necessary action. Press START again.
02E	Door status switch open during program operation. Take necessary action. Press START again.
03E	The lock has not locked the door within the set time. Take necessary action. Press START again.
04E	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.
43E	Unbalance switch on when motor not rotating.
45E	Tacho error

Error codes which may arise on the control panel display

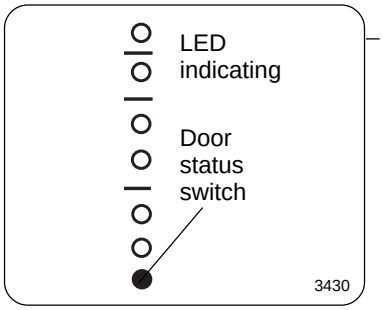
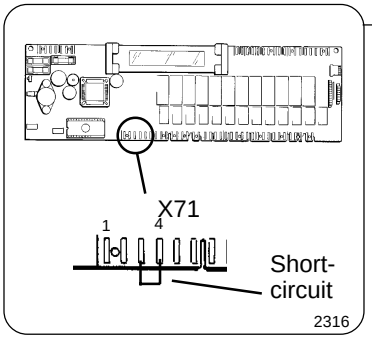
Error code/symptoms	Fault-finding	Cause/Action
01E Acknowledgement signal for water level not received within time allowed.	Check that the manual water valves (taps) are open.	
	Taps turned on. / Taps turned off.	Open taps. Press START again.
	Restart the program and use rapid advance to get to main 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 / Voltage correct	Faulty valve. Check function as described in Chapter 34.
	Check water valve input voltage at PCB connector X80, X81a or X81b, according to valve.	
	Voltage not correct / Voltage correct	Faulty wiring between program control unit PCB and water valve. Check wiring and replace where necessary.
	Check input voltage (230 V) at PCB connector X78.	
	Voltage not correct / Voltage correct	Faulty control output from program control unit PCB. Replace PCB.
		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.



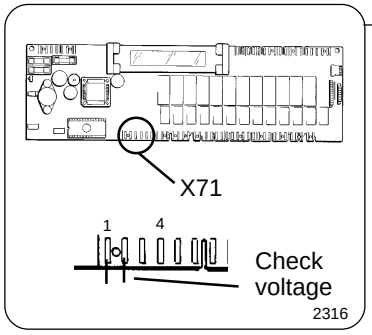
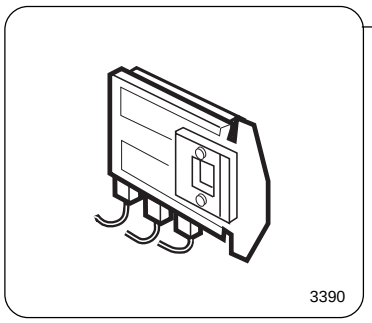




Trouble shooting

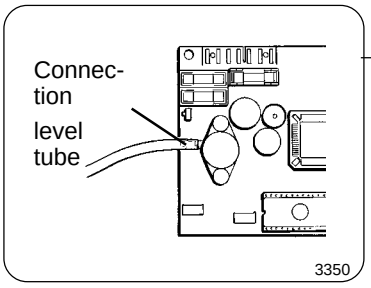
Error code/symptoms	Fault-finding	Cause/Action
02E Door status switch open during program operation.	Open door. Close door and try to restart the machine. Error code returns — No error code	Transient fault in door lock or program PCB.
	Set program control unit to service mode (see ”To switch on service 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.

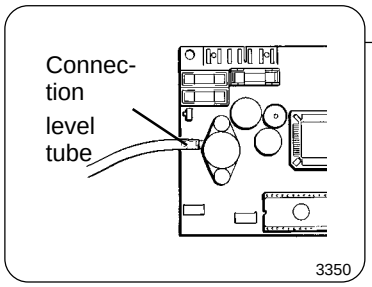
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
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.



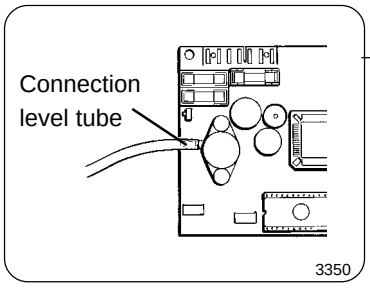
Error codes which may arise on the control panel display

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 → Turn the wall switch off and on. Disconnect level tube from level sensing device on PCB. Start a program. Error 07 or 06 returns → Remove connector for valve input voltage. No error code →	Level tube probably blocked, due to fluff or wrongly mounted. Clean or replace tube. Nipple blocked on drain valve.
	Valve stops drawing water. →	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.
	Valve still drawing water. →	Faulty water valve. Clean or replace valve (see Chap. 34).
		Fault in control signal from program PCB. Replace PCB.

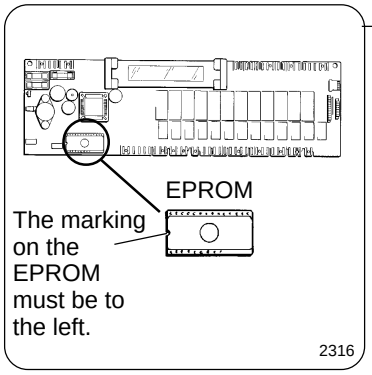


Error codes which may arise on the control panel display

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: Remove the water drain valve from the drum. Is there water at the bottom of the drum? Yes: 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: Level sensing device on program control unit PCB not working or incorrectly calibrated. No error code or error code 01E: Level tube probably blocked. Clean or replace tube. No: Turn the machine's wall switch off. Does water run out of the drum? Yes: Turn on wall switch. Start a program and let it run. Still an error code: Check to see if the drain valve is partially blocked or not opening fully. Drain valve OK: Faulty control signal to drain valve from program control unit PCB. Replace PCB. Drain valve not OK: Check to see if the drain valve is partially blocked or not opening fully. No error code: Transient fault. No action required. No: Check the drain valve. The service program can be used (code 21) to open and close the control valve for the drain valve.	



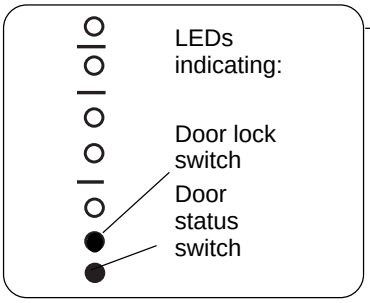
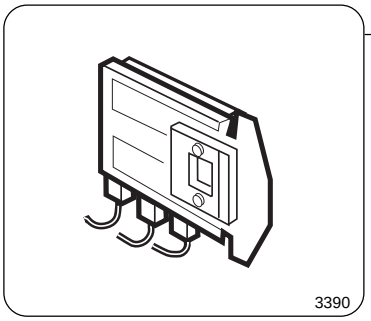
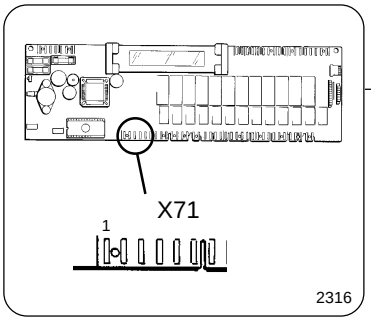
Error codes which may arise on the control panel display

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

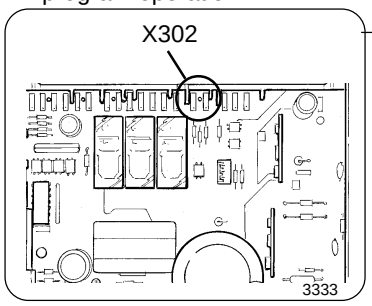
Error code/symptoms	Fault-finding	Cause/Action
14E Level system not temperature-calibrated	When START is pressed wash programs will run, but the water level will not be optimally adjusted. Turn the machine's wall switch off and on again. Start a program. Error code returns No error code →	Transient fault.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

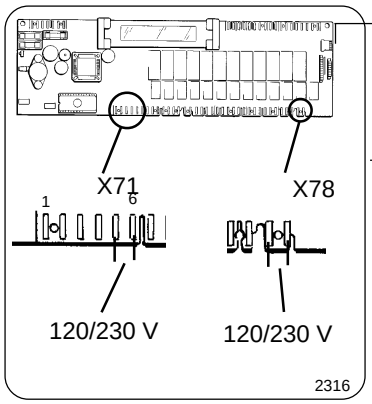
Error codes which may arise on the control panel display

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 → No error code	Transient fault. No action required.
	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):	
	Door: open — Status of LEDs for door lock switch: OFF — for door status switch: OFF Door: closed, not locked — Status of LEDs for door lock switch: OFF — for door status switch: ON Door: closed and locked — Status of LEDs for door lock switch: ON — for door status switch: 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.
	LED ON	Fault in program control unit PCB. Replace PCB.

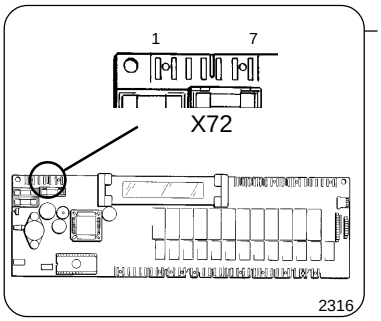
Error codes which may arise on the control panel display

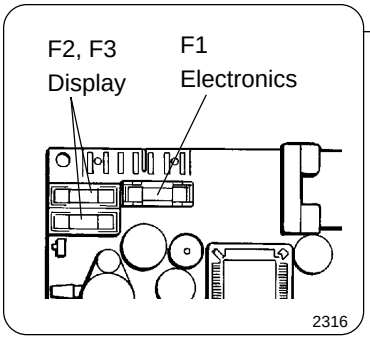
Error code/symptoms	Fault-finding	Cause/Action
20E Interlock signal absent at motor control unit during program operation.	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault. No action required.
	Check the voltage between terminals 1 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.

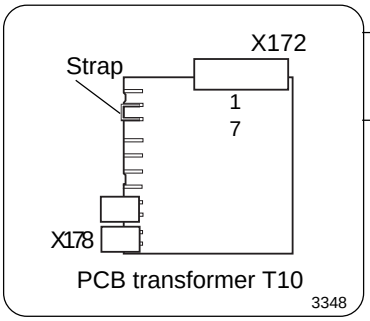




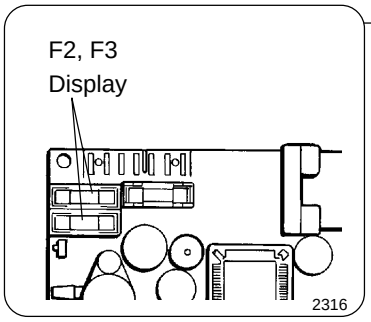
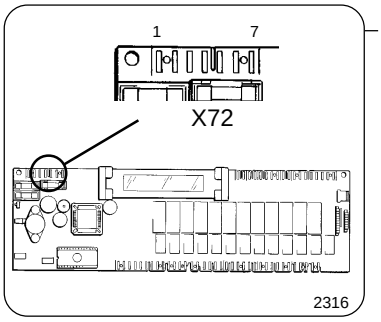
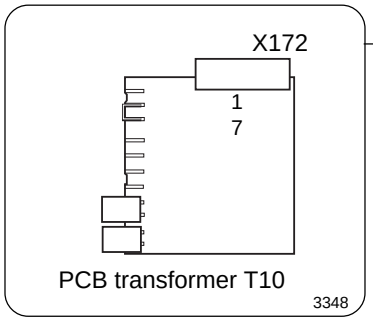
Error code/symptoms	Fault-finding	Cause/Action
Machine completely ”dead”. Display blank.	Turn the machine’s wall switch off and on again.	
	Fault persists.	Machine working → Transient fault. No action required.
	Check fuses F11, F12, F21 and F22.	
	Fuses sound	Fuse fault → Change fuse(s) and check functioning.
	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.
		OK → 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.
		OK → 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.