Built-in Dishwashers
Series 634
with automatic programme system

For models see inside

Küppersbusch

THE HEART OF A GOOD KITCHEN

GB

Service Manual: H7-71-05

Models

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Contents

1. Safety

Danger!

Repairs may only be carried out by a qualified electrician!
Improper repairs can be extremely dangerous for the user.

It is essential that you observe the following instructions in order to prevent electric shocks:

- The casing and the frame may be live in the event of faults!
- Touching live components inside the appliance may cause dangerous currents to flow through your body!
- Disconnect the appliance from the mains prior to carrying out any repair work!
- When inspecting live parts, a residual current circuit breaker must always be used!
- The earthed conductor resistance must not exceed the resistance specified in the standard! It is vital for ensuring the safety of persons and the functioning of the appliance.
- On completion of repairs, an inspection must be carried out in accordance with VDE 0701 [Association of German Electrical Engineers] or in accordance with the corresponding regulations for your country!
- On completion of repairs, a function and impermeability inspection must be carried out.

Attention!

It is essential that you observe the following instructions:

- Due to the all-pole disconnection (relay, press switch), when carrying out measurements via the connector plug in accordance with VDE 0701, a direct measurement must be used to check the heating (flow heater) for insulation faults or the appliance's differential current must be measured!
- When replacing the dispenser and the pump cavity, beware of sharp edges around the stainless steel components.
- The appliances must be disconnected from the mains prior to all repairs. If inspections must be carried out on live appliances, make sure you use a residual current circuit breaker.

Sharp edges: use protective gloves.

Components may be electrostatic!
Observe handling regulations!

2. Technical description

2.1 General

This service manual serves the purpose of providing customer service technicians who already have the know-how required to repair dishwashers with specific information on the operating mode of the appliances indicated on the title page.

Descriptions and operating modes of components that are not new have therefore not been included in this edition.

Please refer to the service manual H7-71-01 (H7-410-02-01) in this case.

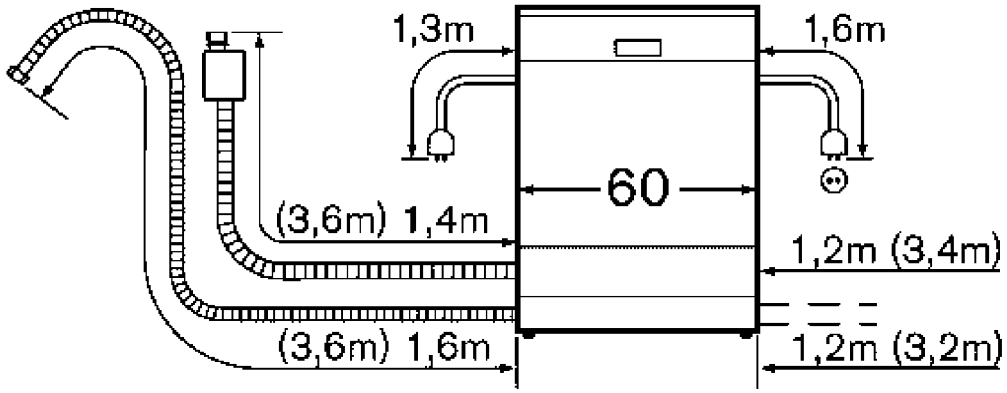
3. Installation and connection

3.1 Installation

In order to ensure that the lock functions perfectly and to prevent any leakages in the area of the door, the appliance must be perfectly aligned with the adjustable feet. In the case of integrated appliances, it is possible to adjust the middle adjustable foot at the back from the front. Note: for built-under and integrable appliances screw the appliance in an upward direction by means of the adjustable feet until the outer casing is at the same level as the worktop.

3.2 Water connection

If the appliance is installed onto the drain with the standard length of hose, the max. permissible height above the floor is 90 cm. If the discharge hose is extended, a max. height of 80 cm is not to be exceeded.



Connection dimensions
for all dishwashers 60 cm
( ) Dimensions with extensions

3.3 Electric connection

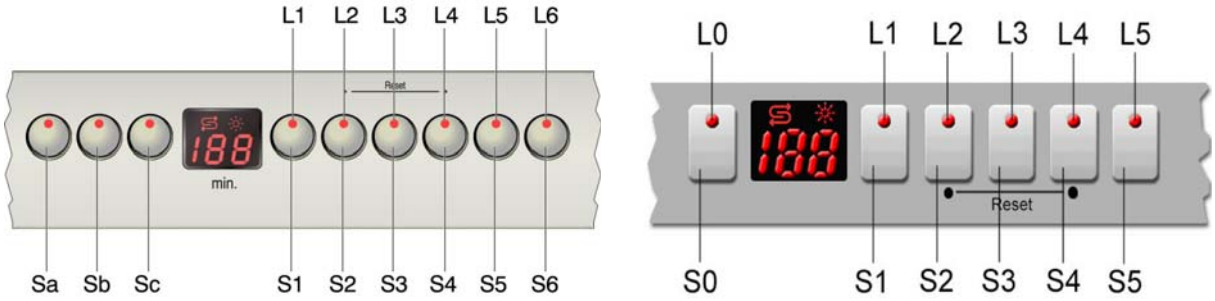
Connect the appliance to a wall socket with earthing in accordance with regulations only. Please observe details on the identification plate (see technical data).

4. Functional description

4.1 General

The appliances are equipped with an alternating rinse system and a glass protection system. The alternating rinse system is explained under the water diverter sub-title. The glass protection system comprises the prewashing programme, the incoming water valve and the heat exchanger.

4.2 Control panel design, depending on the model



LEDs = L0 to L6

Buttons Sa - Sc and S0 to S6

Main switch

Double-pole On/Off switch with a mechanical link to the door lock.

Pre-set time

The time-setting button enables the starting time to be postponed by up to 24 hours.

4.2.1 Display (2½-digit or 3-digit 7-segment display)

The display comprises a 2½-digit or 3-digit 7-segment display, which also enables programme times of more than 99 minutes to be shown. The remaining duration is recalculated at the end of the heating positions. Should deviations result due to aqua sensor decisions, the water intake temperature, the quantity of dishes, etc., the remaining time for these phases will be adjusted. Time differences of up to 60 minutes may hence result at the end of the washing and clear-rinse cycles. When a programme is started the remaining time which the programme required the last time it was used is indicated.

Remaining time display (2½-digit 7-segment display)

While the programme is operating, the indicator shows in minutes how much time is still likely to be required. Should the required time exceed 99 min., 2H is indicated on the display. If the time-setting has been set, the number will appear on the display with a small “h”. The programme duration will automatically be adjusted in accordance with the type of dishes being washed, the quantity of dishes, the water temperature and the water pressure. On completion of the programme, the display will indicate “0”.

4.2.2 Termination of a programme (reset) (see quick user guide for key configuration)

Press the respective buttons for 3 seconds (for button allocation see the marking on the panel) with the appliance switched on. The display will indicate a “0” and the appliance will pump off water for approx. one minute. The detergent box should then be closed so that the dispenser is also reset.

Pre-set time

The time-setting button enables the starting time to be postponed by up to 24 hours.

Soaking  **(optional)**

The button for soaking can be pressed as a supplement to any programme. When the button is pressed, an additional pre-rinse programme with heating up to 55 °C will take place in the lower basket, resulting in an extension of the programme time of approx. 20 min. Recommended for washing various types of dishes: top basket for sensitive dishes / bottom basket for extremely dirty robust dishes.

Top basket (optional)

The button for the top basket must be pressed if only the top basket is to be rinsed. The water diverter will be positioned in the top basket rinsing position throughout the rinsing process. The programme sequence will however be maintained as for alternating rinses.

Time reduction  **(optional)**

The time reduction button can be pressed as a supplement to any programme. When the button is pressed, the circulating time and the drying time, and therefore the washing and drying performance, are reduced (see circuit diagrams and consumption data).

Half load (optional)

The “Half Load” function reduces the water consumption and the operation time. Basically this is achieved by overrunning the prerinse and the second intermediate rinse cycle.

Vario speed (optional)

The Vario Speed function reduces the programme running time with a higher water and energy consumption. This is achieved by using more water in the rinse cycle and with a dual-basket water diverter.

4.3 Programmes

Intensive 70°

The programme comprises a pre-rinse at 50°, a washing cycle at 70°, two or three intermediate rinses, a clear rinse at 70 °C and a drying cycle. Please ensure that rinsing is only carried out in the bottom basket until the required temperature has been reached.

Normal 65°

This programme comprises a washing cycle at 65°, two intermediate rinses, a clear rinse at 69° and a drying cycle. The aqua sensor is not activated in this programme. Please ensure that rinsing is only carried out in the bottom basket until the required temperature has been reached.

ECO 50°

This programme comprises a washing cycle at 50°, one intermediate rinse, a clear rinse at 66° and a drying cycle. The aqua sensor is not activated in this programme. Please ensure that rinsing is only carried out in the bottom basket until the required temperature has been reached.

Gentle 40°

This programme comprises a washing cycle at 40°, one intermediate rinse, a clear rinse at 55° and a drying cycle.

Rapid 35°

This programme comprises a washing cycle at 35°, one intermediate rinse, a clear rinse at 55°, and no drying. The aqua sensor is not activated in this programme.

Pre-wash

The programme only comprises a pre-wash cycle. The aqua sensor is not activated in this programme.

Auto 55° / 65° (depending on the model)

In the automatic programme the aqua sensor not only decides on a change of water after the pre-wash cycle; it also determines the washing temperature and the number of intermediate rinses. Depending on the aqua sensor decision, the programme comprises:

- Cleaning at 50°, one intermediate rinse, a clear rinse at 65° and a drying cycle.
- Cleaning at 65°, two intermediate rinses, a clear rinse at 65° and a drying cycle.
- Pre-wash, cleaning at 55°, one intermediate rinse, a clear rinse at 65° and a drying cycle.

4.4 Special functions

4.4.1 Adjustment of the water softener (see the quick user guide for key configuration)

Keep the button (for configuration refer to the contro panel) pressed and switch on the appliance. The setting will be indicated in the number indicator. The setting rises once every time the button is pressed. Once the setting has reached 7, the indicator returns to 0 (factory setting = 2).

If the appliance is switched off, the setting is stored. See too 9.7 and the following.

Recommendation

At each initial visit the setting of the water hardness level should be checked and, if necessary, adjusted. Do not apply the maxim “the lower the water hardness setting, the better”.

4.4.2 Setting intensive drying, according to the model (see quick user guide for key configuration)

Keep the normal button pressed and switch on the appliance. The number indicator will show “0”. By pressing the normal-button once again, 1 will appear on the display, meaning that the intensive drying programme is switched on. If the appliance is switched off, the setting is stored. Activating intensive drying raises the temperature by 3K in the clear rinse programme.

4.4.3 Deactivating the refill rinse aid display, depending on the model (see quick user guide for key configuration)

Keep the button pressed and switch on the appliance. I:01 will appear in the numeric display. When the button is pressed again the display will indicate I:00 and the rinse aid refill display will have been deactivated.

I:00 = switched off

I:01 = on

If the appliance is switched off, the setting is stored. Deactivating the refill rinse aid display will raise the temperature for the clear rinse by 3K in order to achieve better drying results (see too 3 in 1 detergent recognition).

4.4.4 Combined detergents (3 in 1), according to the model (see quick user guide for key configuration)

Detection

Drying results will not be as good when a combined detergent (e.g. 3 in 1 detergent) is used. In order to improve the drying results, a special programme sequence which uses less water in the intermediate rinse cycles is activated. The clear rinse temperature is also raised by 3K (the same temperature as for intensive drying). With the water which is saved the heat exchanger is filled up a second time in the drying cycle to enhance the drying results.

The special programme cycle is activated if:

- the electronic system detects that the level of rinse aid is too low;
- the rinse aid fill-up display is deactivated.

The additional “Intensive drying” function can still be activated if wished; it will however have no effect on the clear rinse temperature.

The maximum temperature rise is 3K.

Application area

3 in 1 detergents have an application range up to a water hardness of 21°dH (37°fH, 26°Clarke, 3.7mmol/l). The water softening system does not need to be activated up to 21°dH.

If water hardness is above 21°dH, the water softening system must be activated and the hardness range set at 6.

Button lock (optional)

The button lock prevents a programme from being unintentionally selected.

- Activation:
  Switch on appliance and select a programme.
  Hold down S5 button for at least 4 sec.
  CL is displayed.

CL is displayed when a button is pressed while the programme is running. The programme cannot be reset.

- Deactivation:
  Hold down S5 button for at least 4 sec. until CL goes out.

= **When the programme ends, the button lock is deactivated. The button lock remains activated in the event of a power failure.**

Whenever a programme is started, the button lock must be re-activated.

4.4.5 Setting the rinse aid dispenser at the standard dose (see quick user guide for key configuration)

Keep the Sc-button pressed and switch on the appliance. The number indicator will show “1”. After pressing the Sc-button once again “0” will appear on the display and the rinse aid fill-up display will switch off. During the setting procedure the Lc LED will blink. The setting is stored when the appliance is switched off.

4.4.6 Setting the buzzer (see quick user guide for key configuration)

Keep the S4-button pressed and switch on the appliance. The setting will be shown in the display. The setting rises once every time the S4-button is pressed. The volume can be set and adjusted from 0 = buzzer off and 3 = buzzer loud. During the setting procedure the S4 LED will blink. The setting is stored when the appliance is switched off.

4.5 General instructions on the controls

4.5.1 Tap closed

If the level is not reached within 6 minutes after commencement of filling up (fl is not activated), the programme will be terminated (1 minute). Pumping water out -> re-start) This process can be carried out three times in all. If the filling level has then not been reached, the filling valve will still be selected until the level switch is activated.
The indication in the display will remain visible for 6 minutes after the programme has started, until the level has been reached.

4.5.2 Level switch is not activated

If during filling the level switch (fl) is not activated, the filling valve will be selected until the safety level has been reached. The safety switch switches the detergent water pump on and the filling valve off. The filling valve is selected again when the safety switch has been reset. This results in alternating pumping and filling.
If the level switch (f1) does not switch within 6 minutes, the programme will be terminated. (1 minute pumping off). The filling step will then be re-started. This process can be carried out three times in all. This hence attempts to get the level switch going again. If the filling level has then still not been reached, the filling valve will still be selected until the safety level has been reached again (filling/ pumping/ filling/ pumping …).
The indication in the display will remain visible for 6 minutes after the programme has started, until the level has been reached.

4.5.3 Regeneration electronics system

On comparing the degree of water hardness set in the appliance, the electronics system determines what quantity of water is possible before the water softener is exhausted. The quantity of water used is calculated. Once the subsequent maximum number of rinses has been reached, recovery is carried out. The discharge behaviour of the regeneration electronics system can be seen in the description under initial operation / replacing the electronics unit.

4.5.4 Warm water recognition

If the water running in for a clear rinse has a temperature exceeding 45 °C , the heat exchanger is not filled for the drying stage. In order to guarantee the difference in temperature essential for condensation, the temperature for the rinse with a rinsing agent is raised to 72 °C , thus increasing the dishes own heat.

4.5.5 Memory electronics system

The electronics system has a memory store which registers the last programme selected. Should no other programme be selected on programme start-up, the programme selected last will operate.

4.5.6 Power cut

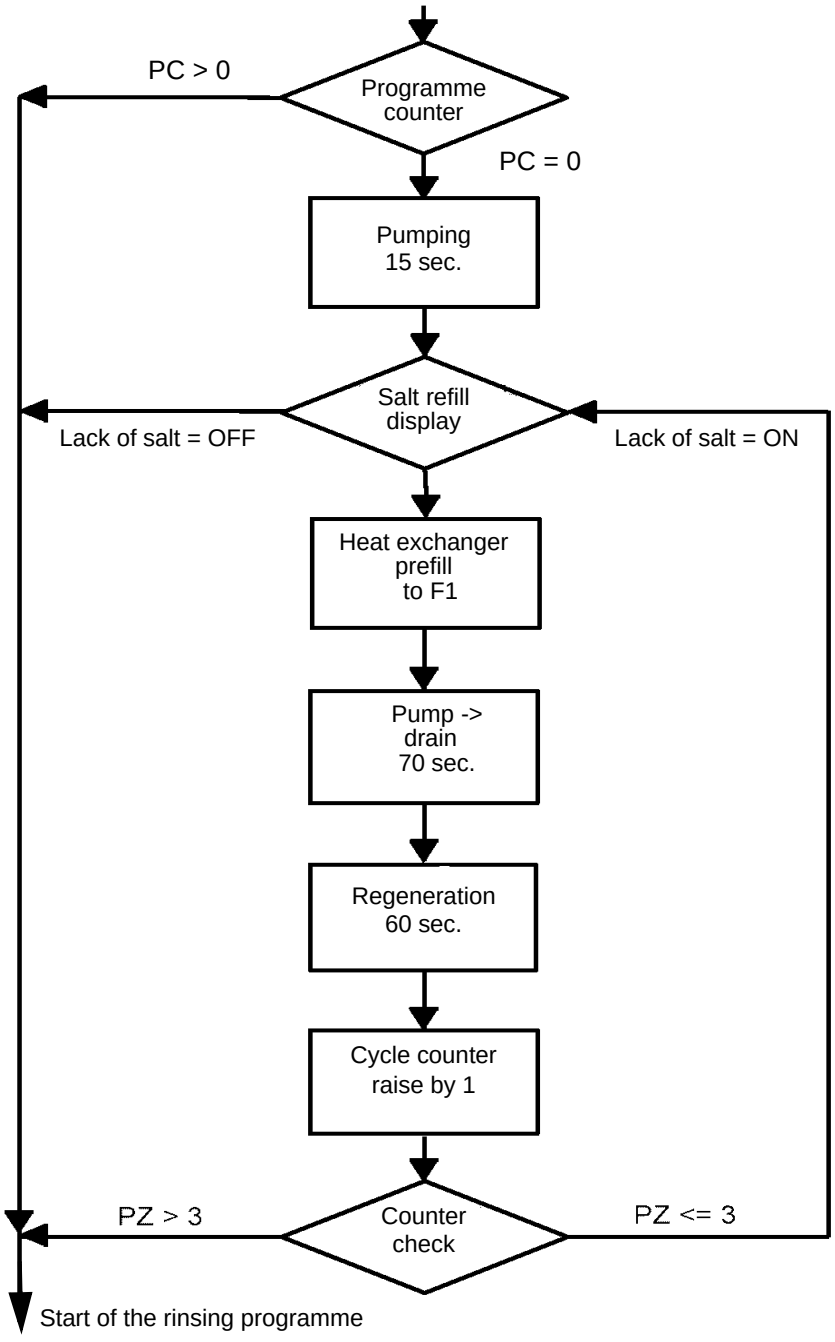
The electronics system has a mains cut-off store which ensures that a rinsing programme that has been commenced when a power failure occurs will be continued.

4.5.7 Sensors

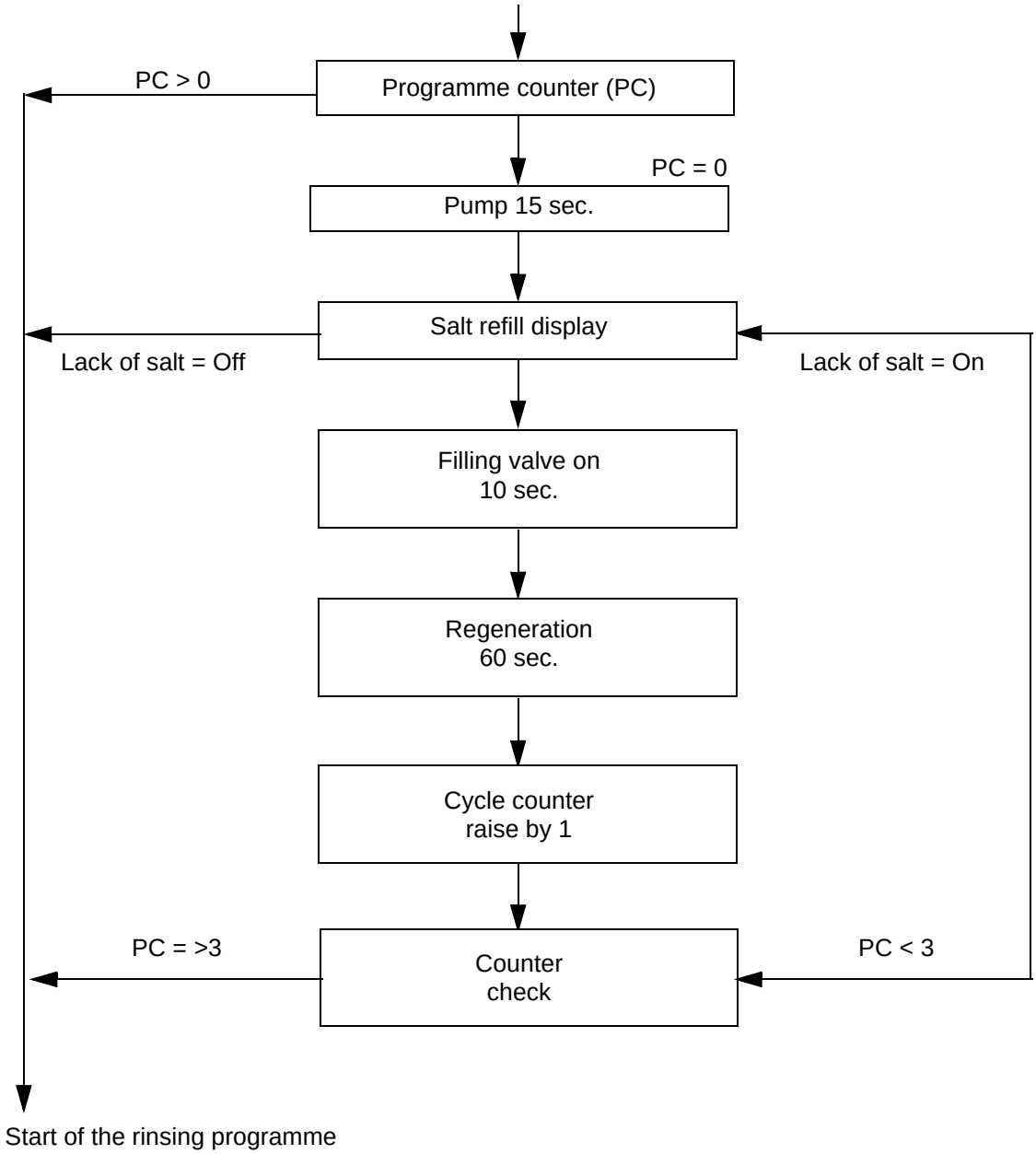
All of the signals leaving the door switch, the level switch, the NTC sensor and the refill switches are recorded and evaluated by the microprocessor at the respective point in time.

4.5.8 Procedure for initial start-up - appliances with a heat exchanger

When putting the electronics unit into operation or replacing the unit, following programme procedure is to be observed. (Programme counter = 0!)



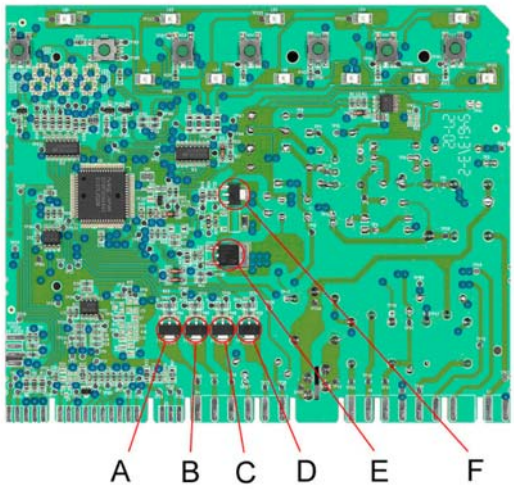
4.5.9 Procedure for initial start-up - appliances without a heat exchanger



4.6 Triac list (consumers and relays)

When a module is replaced due to a defective triac it is essential to check the activated component too.

Observe ESD instructions!

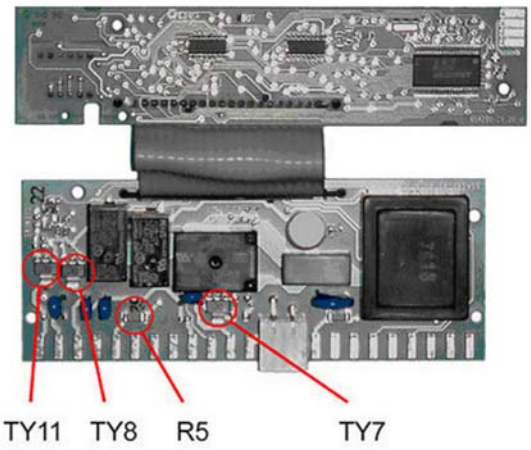


IG 644. to 5
IG 657.2E
IGS 644.0

A	Heat exchanger drain valve
B	Regeneration valve
C	Filling valve
D	Water diverter
E	Circulation pump
F	Dispenser actuator

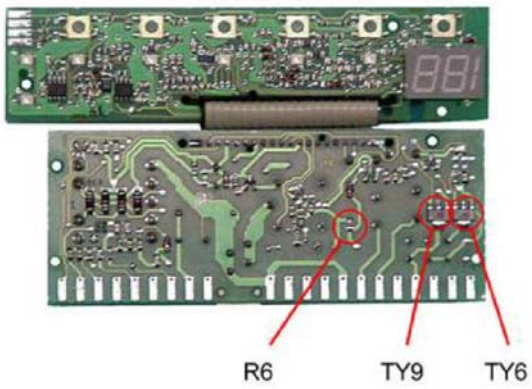
Consumers

Consumers such as valves, detergent and clear rinse dispensers (actuators) are activated by means of triacs (see photo). The circulation and the vacuation pump and the continuous flow heater are activated with relays.



IG 647.1

R5	Filling level
R6	Filling level
TY6	Drain valve heat exchanger
TY7	Dispenser actuator
TY8	Regeneration valve
TY9	Filling valve
TY11	Top basket valve / water diverter actuator



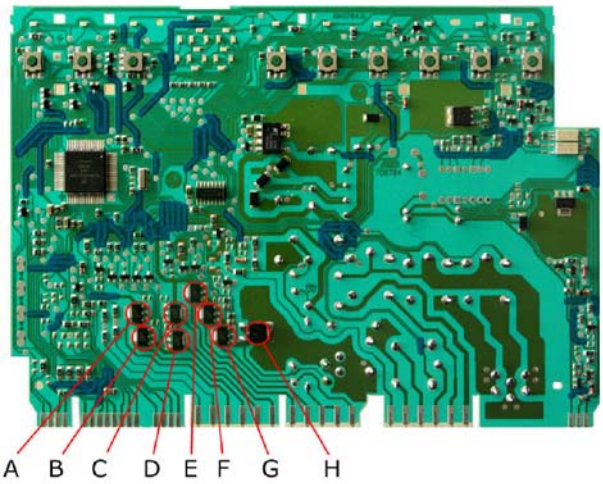
Triacs

When a module is replaced due to a defective triac it is essential to check the activated component too.

Observe ESD instructions!

IG 6508.0E / IGVS 659.4

A = Water diverter
B = Filling valve
C = Incoming water valve
D = Regeneration valve
E = -----
F = Drain-off valve
G = Dispenser
H = Circulation pump



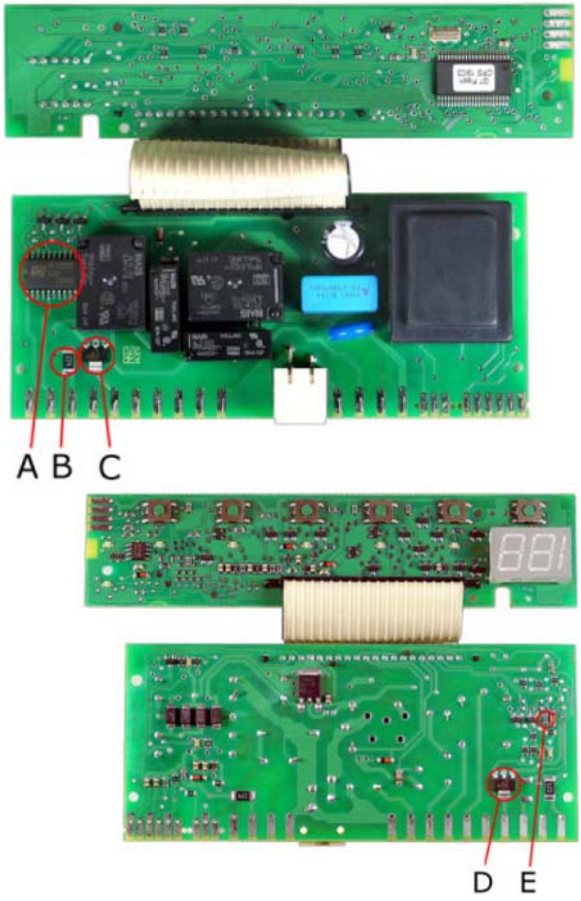
Consumers

Consumers such as valves, detergent and clear rinse dispensers (actuators) are activated by means of triacs (see photo). The circulation and the vacuation pump and the continuous flow heater are activated with relays.

IG 647.2E
IG 634.4

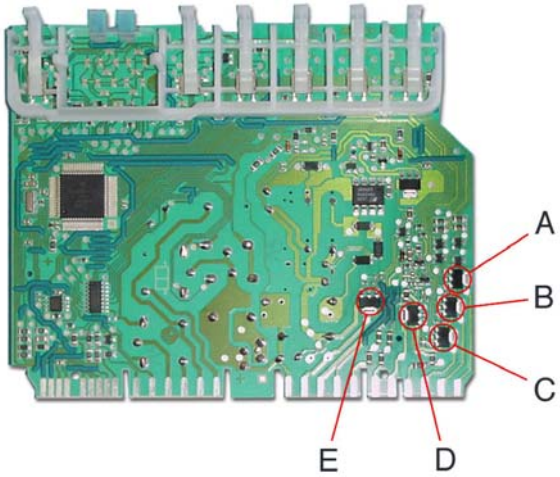
H = Circulation pump
A* = Filling level
A = Dispenser
A* = Water diverter
B = Filling level
C = Heat exchanger drain valve
D = Regeneration valve
E = Filling valve

* = Triple triac



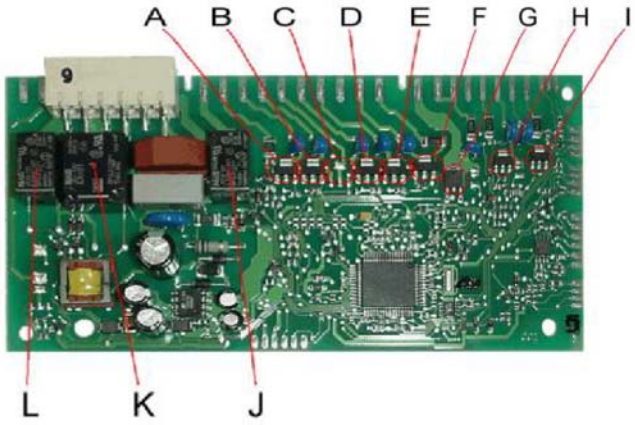
IGV 649.0
IGVS 649. ...

A	Drain valve
B	Regeneration valve
C	Filling valve
D	Water diverter actuator
E	Dispenser actuator



Triacs

A	Filling valve
B	Heat exchanger drain valve
C	SICSYM activation
D	Incoming water valve
E	Regeneration valve
F	Water diverter
G	Circulation pump
H	Dispenser actuator
I	Motor lock

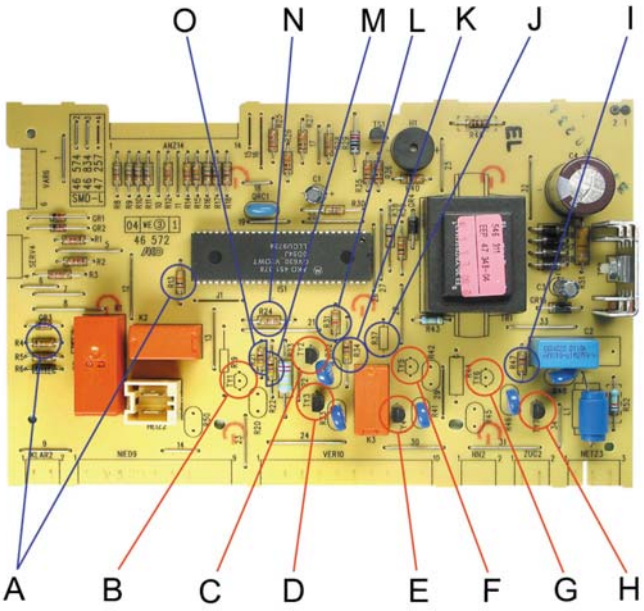


Relay

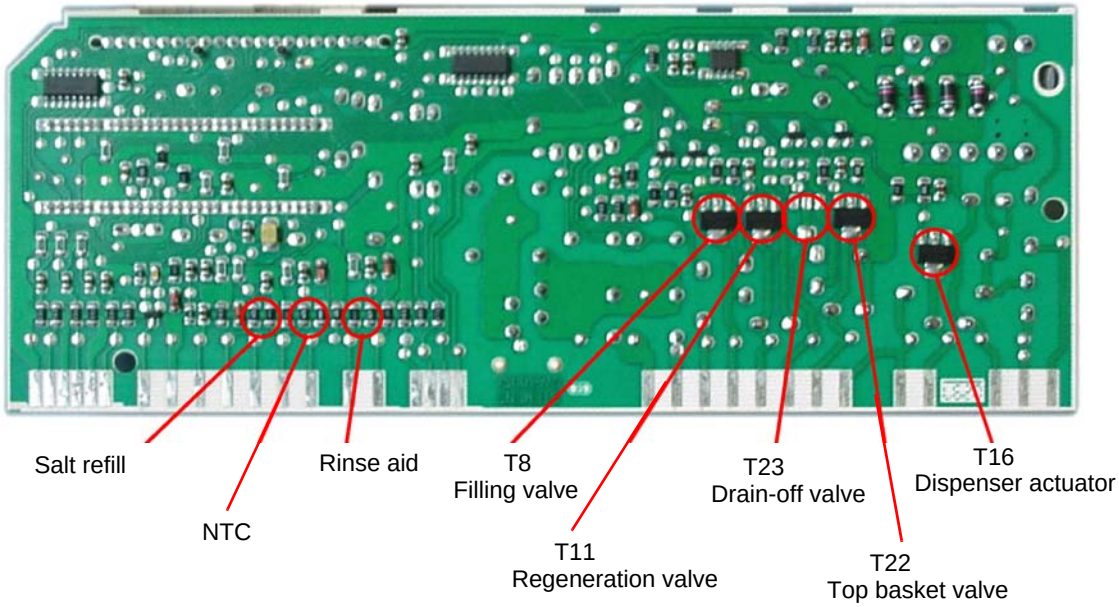
J	Detergent water pump
K	Heater
L	PTC optosensor

When a module is replaced due to a defective triac it is essential to check the activated component too.

A	Salt/rinse aid fill-up
B	Option
C	Filling valve/Aqua-Stop
D	Regeneration valve
E	Top basket actuator
F	Heat exchanger drain-off valve
G	Option
H	Dispenser actuator
I	Dispenser
J	Heat exchanger drain-off valve
K	Actuator



Controls F

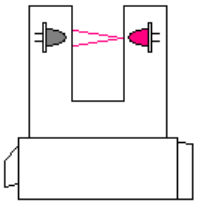


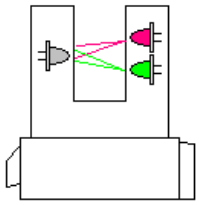
5. Aqua sensor I + II

In addition to an infra-red LED, the aqua sensor II is also equipped with a green LED, which means that undissolved substances such as tea or spinach can also be recognised. In the automatic programme, for example, the Aqua sensor II has the following functions:

1. Aqua sensor infra-red LED check in the pre-wash cycle
   Depending on the result of this check, water is either exchanged (extremely dirty) or still used (hardly dirty).
2. Aqua sensor green LED check in the washing cycle
   Depending on the result of this check, a final temperature of 45 °C (little soiling) or 50 °C or 55 °C (heavy soiling) is reached during the washing cycle. Should the aqua-sensor decide on a change of water during the pre-rinse cycle, the temperature for the washing cycle will be raised from 50 °C to 55 °C. Should the washing cycle be carried out at 50 °C or 55 °C, the filter will be rinsed through afterwards.
3. Aqua sensor green LED check in the first intermediate rinse
   Depending on the result of this check, an additional intermediate rinse will be carried out after the first intermediate rinse (heavy soiling) or only the filter will be rinsed through.

Aqua sensor 1





Aqua sensor 2

Calibrating aqua-sensor II

48 programme structures are possible in the automatic programme.

In each programme sequence in which the Aqua sensor is active the sensor is also calibrated. This uses 400 ml of water.

If the calibration is defective, a fault is written to the fault memory of the module, the setting is adjusted to turbid and a maximum programme sequence is run.

6. Fill system

6.1 Water intake with a heat exchanger

After the filling valve is opened, the water flows to the integrated inlet over the free flow line into the softener and then as softened water into the heat exchanger. After the regeneration chamber is filled the water flows through the overflow channel into the throttle cup of the level sensor. The pressure build-up in the pressure sensor causes the level switch to open the heat exchanger drain valve. The electronic system determines the time between the open command of the filling valve and the closing of the level switch (f1). From this time the additional fill time of the filling valve is calculated.

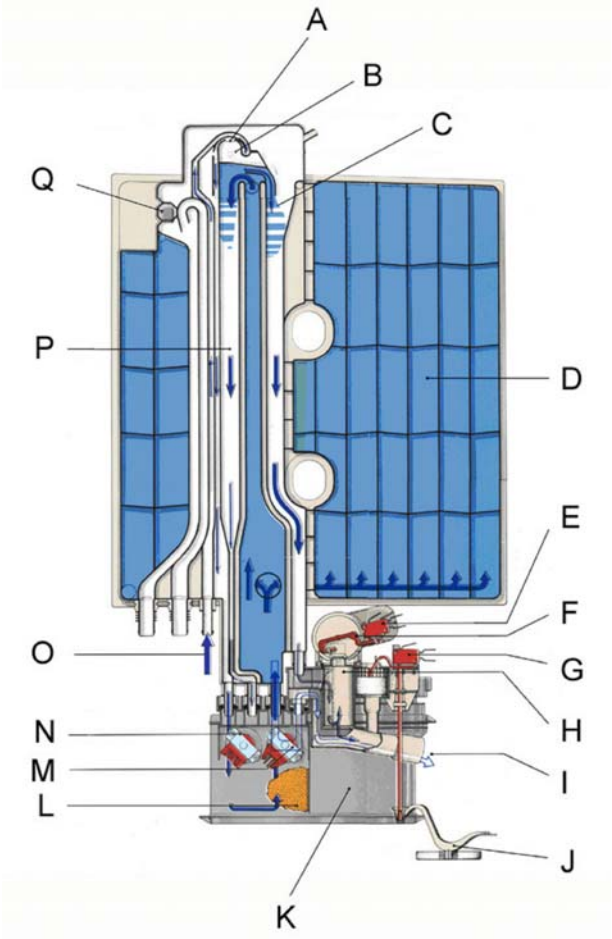
The recirculation pump is switched on with a time delay and the drain valve stays open until the heat exchanger has been completely emptied.

The water quantities of the wash cycles which have already run are registered by the electronic system and determine the timing for regenerating the softener.

Before each regeneration step the electronic system checks whether the capacity of the softener is still sufficient for a complete normal programme sequence. If not, regeneration is carried out.

The water softener is regenerated and flushed in the washing cycle. During regeneration the regenerating valve on the softener is opened. The reservoired quantity of water flows across the valve into the salt container, is enriched with salt, and flows as brine through the softener into the heat exchanger. This is done in three cycles, each with a calculated quantity of water.

A	Free flow line
B	Leaking water
C	Overflow channel
D	Heat exchanger
E	Level pressure switch f1
F	Switch lever
G	Safety circuit breaker
H	Air chamber level
I	To pump cavity
J	Float in the base pan
K	Salt box
L	Ion exchanger
M	Heat exchanger drain valve
N	Regeneration valve
O	Water intake
P	Regeneration chamber
Q	Discharge hose ventilation valve



6.2 Intake of water without a heat exchanger

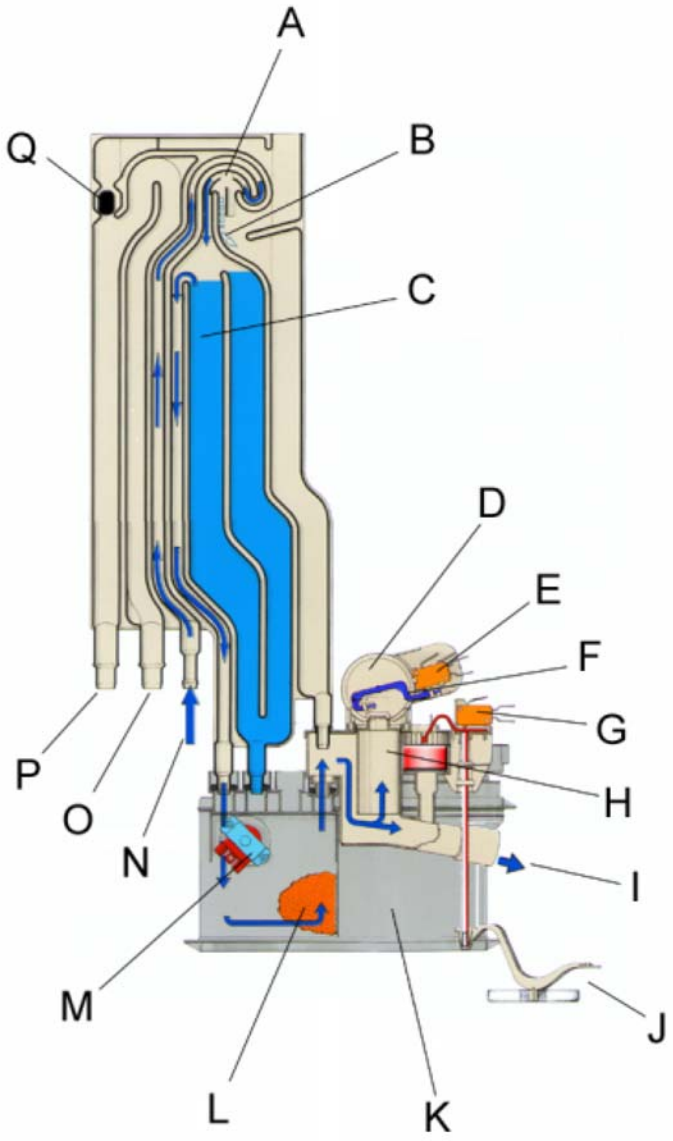
After the filling valve has been opened, the water flows over the free flow line into the regeneration chamber for integrated intake. When the regeneration chamber has been filled the water will flow through the overflow channel to the softener and as soft water into the level sensor and the pump cavity.

Once the statistic level has been reached the signal transmitted by the level pressure switch is picked up by the electronics system and the circulation pump is switched on. The level pressure switch is reset when the circulation pump commences operation. Dynamic filling continues until the level switch is reactivated; the rinsing level will then have been reached.

The water quantities of the wash cycles which have already run are registered by the electronic system and determine the timing for regenerating the softener. Before each regeneration step the electronic system checks whether the capacity of the softener is still sufficient for a complete normal programme sequence.

If not, regeneration is carried out. The water softener is regenerated and flushed in the washing cycle. During regeneration the regenerating valve on the softener is opened. The reservoired quantity of water flows across the valve into the salt container, is enriched with salt, and flows as brine through the softener into the pump cavity. This is done in three cycles, each with a determined quantity of water.

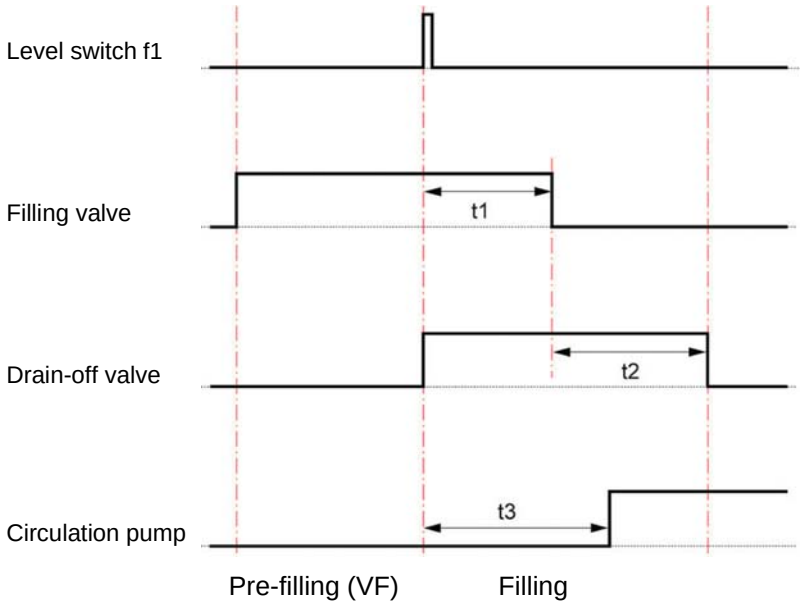
A	Free flow line
B	Leaking water
C	Regeneration chamber
D	Pressure sensor
E	Level pressure switch f1
F	Switch lever
G	Safety circuit breaker
H	Air chamber level
I	To pump cavity
J	Float in the base pan
K	Salt box
L	Ion exchanger
M	Regeneration valve
N	Water intake
O	from discharge pump
P	to discharge hose
Q	Discharge hose ventilation valve



Filling procedure for appliances with a heat exchanger

The electronic system determines the time between the open command of the filling valve and the closing of the level switch (f1). From this time the additional fill time of the filling valve is calculated. For every initial fill-up in a rinsing programme, 200 ml more water than the standard water volume will be filled in.

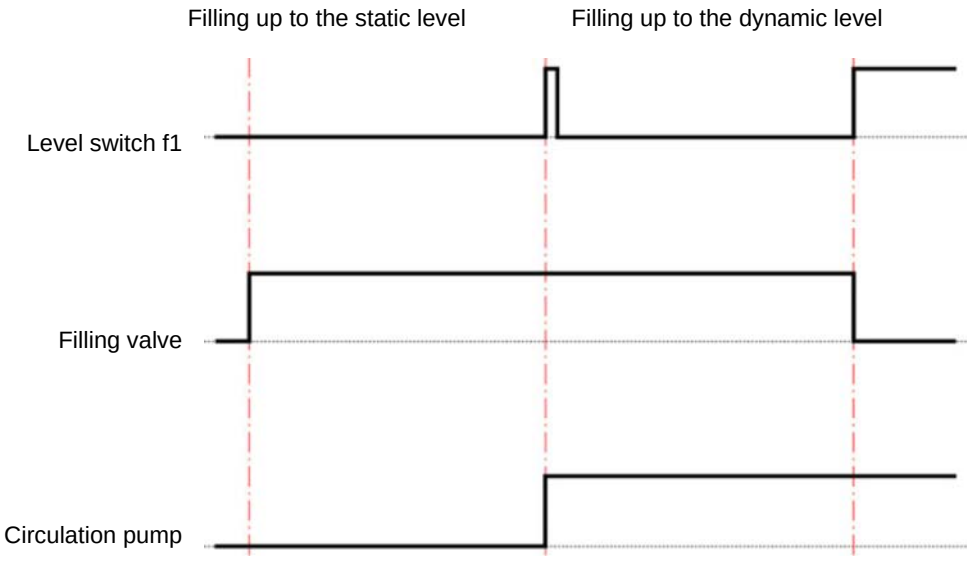
On initial intake of water for the washing programme, this volume of water is used to balance the water which is lost when the dry dishes are wet. This ensures that the circulation pump runs concentrically and water is saved when the dishwasher is filled up again. The recirculation pump is switched on with a time delay and the drain valve stays open until the heat exchanger has been completely emptied.



t1=refill time calculated, t2=drain-off valve lag time, t3=circulation pump switch-on delay

Filling procedure for appliances without a heat exchanger

After the statical level has been reached the module will be selected by the level switch, will move into the next position and the circulation pump will be switched on. The level pressure switch is reset when the circulation pump commences operation. Dynamic filling continues until the level switch is re-activated. The rinsing level will then have been reached.



7. Functions and components

7.1 Safety function

Should functional defects in the dishwasher control system or in the structural elements occur, resulting in an over-filling of the machine, the valve combination will be closed by means of the safety system, thus blocking off the water supply. The discharge pump is switched on by means of the safety level switch. Pumping will continue until the filling level has once again been reached. Any leaks occurring within the machine are collected in the base pan. Leaks in the supply hose are guided to the base pan by means of the leakage water hose.

Once a set level in the base pan has been reached, the float activates the safety level switch by means of a switch lever, which then switches off the filling and safety valve electrically. At the same time the discharge pump is switched on, the rinse water is removed from the rinsing basin, and the discharge pump switches onto continuous operation.

7.1.1 Visual rinse aid fill-up sensor

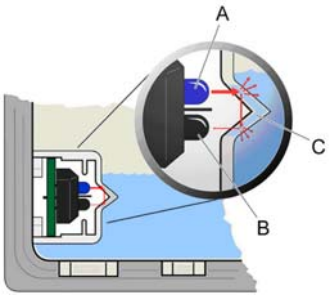
The visual rinse aid fill-up sensor comprises a transmission and a receiving diode.

The transmission diode sends a light beam to the receiving diode via a prism. If the reservoir is filled up, the light beam will be dispersed in the prism. The signal received is weaker than the signal transmitted.

A Transmission diode

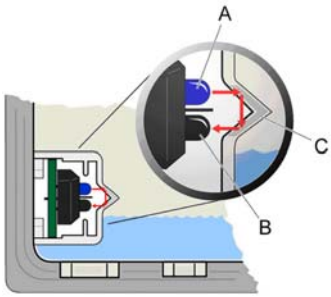
B Receiver diode

C Prism



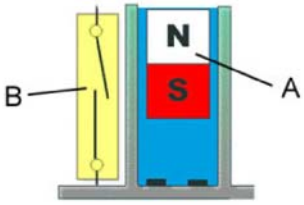
If the reservoir is empty the light beam will be reflected in the prism. The signal received is the same as the signal transmitted.

The module will evaluate the signal received and will activate the fill-up LED.



7.1.2 Salt and clear rinse agent display

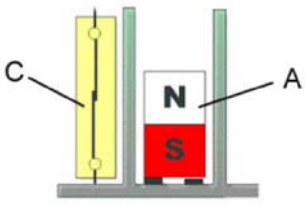
The reservoir is equipped with a float which has an integrated permanent magnet. This uses the magnetic field to activate a reed switch which is attached to the outside of the reservoir. This switch in turn activates the lamps of the fill-up displays in the control panel.



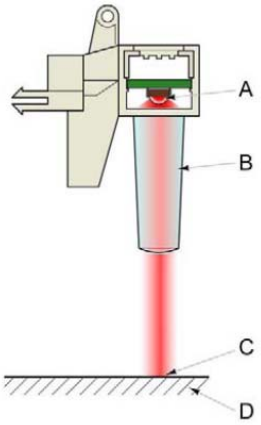
A = Permanent magnet

B = Reed switch open

C = Reed switch closed



7.2 Info light (optional)



The fully-integratable models are fitted with a program status display (info light) which is visible from the outside and provides users with additional information.

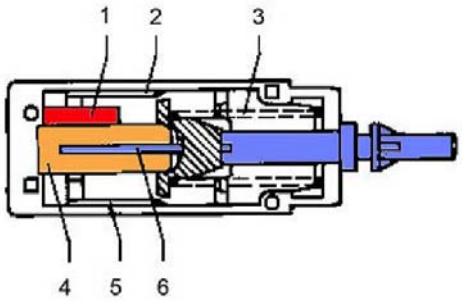
The info light comprises an LED (A) and a fibre optic cable (B). The fibre optic cable focuses the light which is projected as a spot of red light (C) on the background (D) in front of the dishwasher while the programme is in operation.

The info light is fastened on the hinge plate between the inner door and the outer door and is regulated by the module.

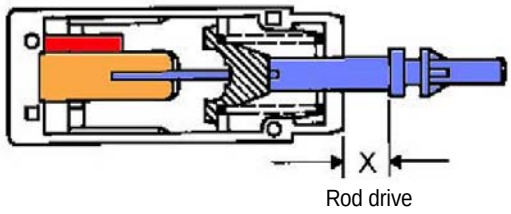
7.3 Thermohydraulic system (actuator)

The thermohydraulic system comprises a metal cylinder with a push rod. The cylinder is filled with a substance which expands considerably when heated. A PTC serves as a source of heat (Positive Temperature Coefficient), and this makes direct contact with the metal cylinder. Subsequent to switch-off of the heat source, a strong compression spring returns the push rod back to its original position.

Construction



Actuator activated



1 PTC
2 Contact
3 Compression spring
4 Alternating cylinder
5 Contact
6 Push rod

After voltage has been applied to the PTC, it heats up and transmits the heat to the metal cylinder which is filled with wax. The wax expands and presses the push rod out of the cylinder to the outside. The push rod transmits the mechanical movement to the release mechanism of the detergent and clear rinse agent dispensers. If the source of heat is switched off the volume of wax will be reduced on cooling down. The compression spring returns the push rod back to its original position.

The release period is approx. 2 min.; the resetting time is approx. 3 min.

Technical data

Nominal voltage	110 - 240 V
Frequency	50 / 60 Hz
Resistance	0.5 - 1.5 kΩ

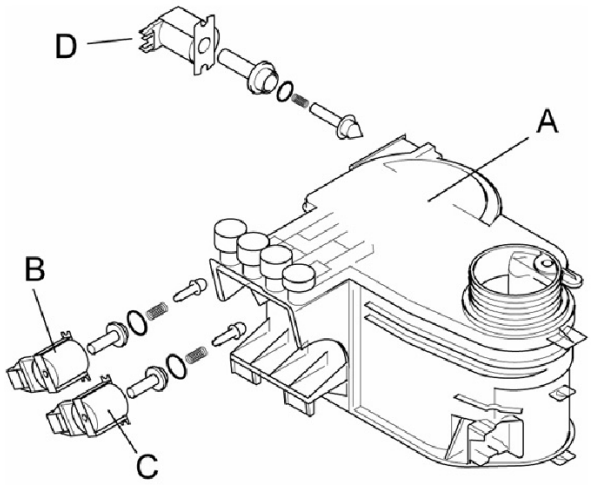
7.4 Regeneration, drain-off and incoming water valves

The regeneration valve and the drain-off valve are located on the softening equipment. When the regeneration valve is activated the volume of water stored in the regeneration chamber is lead through the softening equipment. When the drain-off valve is activated the volume of water stored in the heat exchanger is lead through the softening equipment to the rinsing cavity.

The incoming water valve is located on the rear on the softening unit and is used for adding hard water.

The incoming water and the soft water valves are activated by the electronic unit which calculates how frequently and for how long the valve needs to be activated. This ensures a constant degree of water hardness of approx. 5°dH. For this reason it is vital to set the range of hardness precisely.

When the valve is activated (open) the incoming water is lead through the softening equipment and is softened. If the valve is not activated (closed), the entry to the softening equipment is closed and the incoming water flows direct from the water inlet to the heat exchanger.



A = Softening unit

B = Regeneration valve

C = Heat exchanger drain valve

D = Incoming water valve

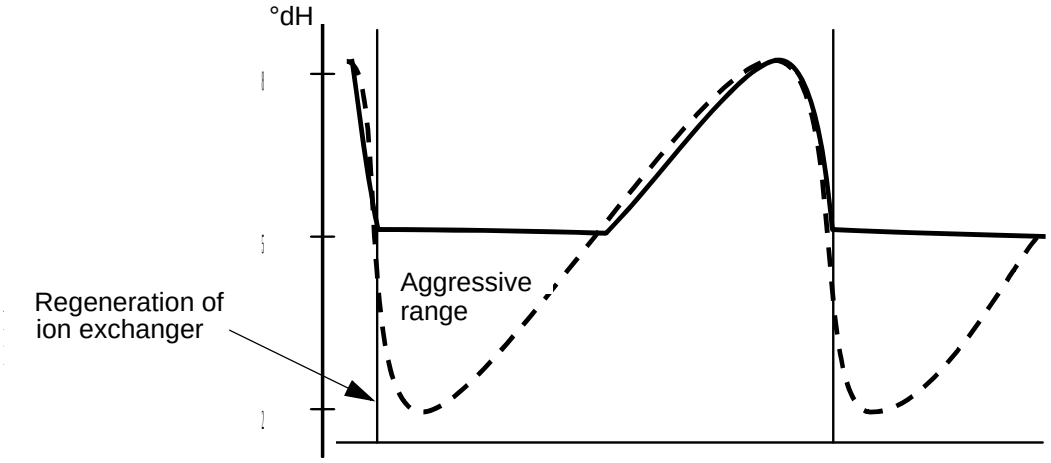
Technical data

Nominal voltage	230-240 V
Frequency	50 Hz
Resistance	2.45 Ω

7.4.1 Glass protection (Aqua-Mix)

Targeted control of the degree of water hardness prevents aggressive soft water from affecting the dishes. Depending on the degree of hardness set (8 settings, from 0 to 7, setting on the front panel) and by means of a “bypass”, fresh tap water is mixed with the softened rinse water, so that the degree of water hardness in the appliance is always at least 5°dH. The aqua-mix valve is activated by the electronics system and is located on the water softening device. In the case of naturally soft water, which has no negative effects on glass, the softening level can be set onto “0” and the glass protection technology will then not be activated.

Change in degree of hardness of the water in the appliance during several rinses



7.4.2 Alternating pumping procedure

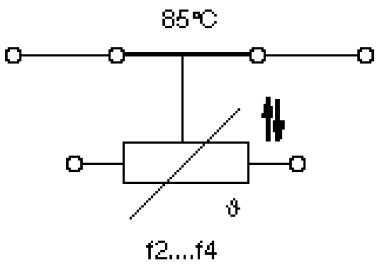
In order to achieve a better cleaning of the fine sieve, the water is circulated and pumped out alternately 3 times for 5 seconds. This means that water flows through the sieve in both directions.
(Attention: noises.)

7.5 Temperature safety system (NTC)

The temperature cut-out switch installed (>85°C) is combined with the NTC sensor. In the event of a fault the heater will be switched off when the water temperature reaches 85°C (clocked).

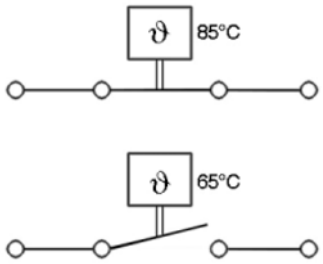
Temperature °C	Resistance in kΩ	Tolerance +/- °C
25	48,4	7,9
30	38,5	7,1
50	16,5	6,2
60	11,0	5,6
65	9,1	5,5

Dual Klixon



Temperature cut-out switch IG 634.4

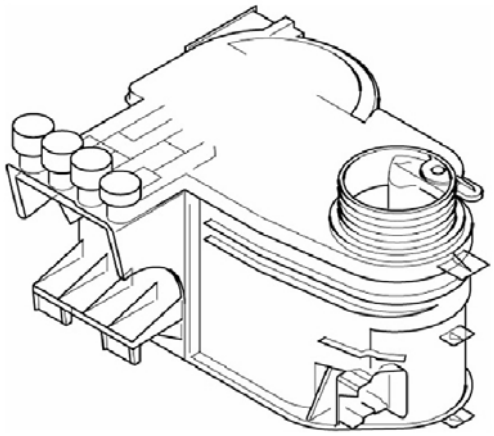
The temperature cut-out switch installed (>85 °C) is combined with the thermostat (65 °C). In the event of a fault the heater will be switched off when the water temperature reaches 85 °C (clocked).



7.6 Water softener

The inlet water with its hardness constituents is conveyed via the synthetic resin. Calcium and magnesium are bonded to the surface of the exchange compound while sodium ions are released into the water. When all sodium ions have been replaced with ions of the hardness constituents, the capacity of the water softening system is exhausted and it must be regenerated.

7.6.1 Disassembly



1. Screw off the outer door, the base cover, the L-strap and the side panels.
2. Detach the traction rope from the hinge lever and unscrew the screws between the base pan and the hinge plates.
3. Unscrew the rinse cavity on the back wall of the base pan.
4. Disconnect the door wiring harness at the plug connection in the base pan. Remove the electrical connections from the regeneration and drain valves.
5. Screw off the fastening nut between the salt box and the rinsing vessel.
6. Suction the brine out of the reservoir with a suction syringe.
7. Lay the device on its back and carefully pull out the base pan. Release the lock from the level sensor case and the water softening unit.
8. Separate the circulation pump with the rubber bearing from the base pan and pull the base pan off further until the softening unit can be removed from the plug connections on the water supply and the level sensor casing.
9. Pull out the Reed switch and the softening unit.

The following must be carried out before the softening unit is installed:

1. Put the seal onto the filler neck of the salt box.
2. Insert the sealing rings into the plug connections.
3. Put the rubber cap onto the bearing connection in the base pan for the pump cavity.
4. Insert the switch rod for activating the safety level switch.
5. Put the rubber mounting onto the circulation pump.

Salt box filling capacity

Fine-grained salt	approx. 2.0 kg
Coarse-grained salt	approx. 1.5 kg
Salt tablets	approx. 0.7 kg

7.6.2 Assembly

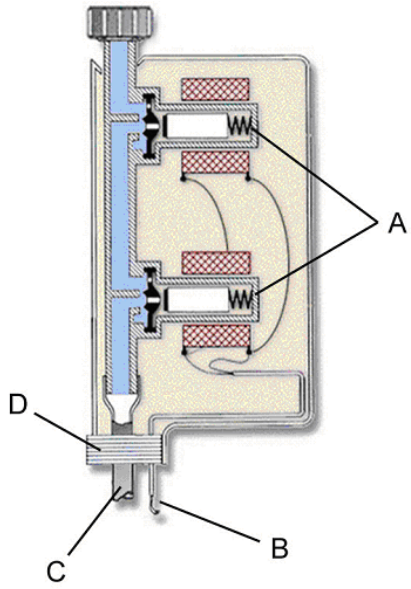
1. Insert water softening system.
2. Engage reed switch.
3. Push base pan onto the tank.
4. Put the rubber mounting onto the circulation pump.
5. Screw the fastening nut on the salt box to the rinsing vessel.
6. Connect the electrical connections from the regeneration and drain valves.
7. Connect plug-and-socket connection from the door cable harness.
8. Screw the rinsing tank onto the rear panel of the base pan.
9. Screw the base pan to the hinge plates.
10. Attach the tension cords to the hinge levers.
11. Screw on angle strip, side panels, base panel and outside door.

7.7 Aqua Stop system

The valve system comprises two series-connected, parallel-activated electrical solenoid valves, the filling valve and the safety valve. The safety function can be released with the safety level chamber or electrically by means of the float in the base pan. The flow of water is then automatically stopped. An electric solenoid valve which is enclosed in a casing is attached to the water tap. From the valve the water supply hose is lead to the integrated water intake device and the electric trip line for the solenoid valve is lead to the base pan through a leak water hose attached to the valve casing in the power room.

Technical data

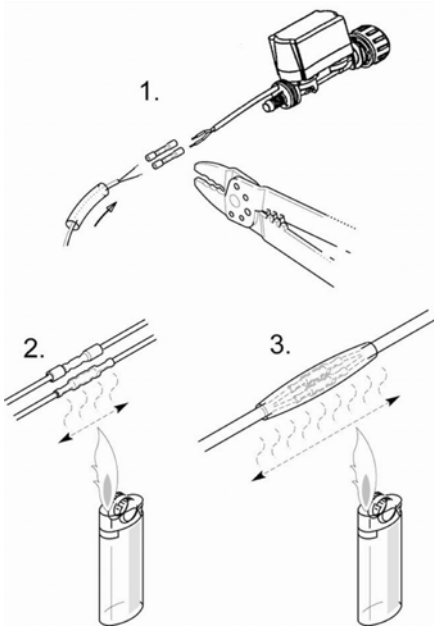
Nominal voltage	230-240 V
Frequency	50 Hz
Resistance	2 kΩ
Flow rate	2.75 l/min
Water pressure	0.5 - 10 bar



A = Solenoid valves
B = Trip line
C = Supply hose
D = Leaking water hose

7.7.1 Dismounting

1. Open the casing and remove the supply hose.
2. Cut through the electric connection cables.
3. Strip the ends of the wires; push shrinkdown plastic tubing over the cable and connect the electric cables with the insulating bushing (1).
4. After mounting heat up the connectors until the shrinking process has commenced and the hot-melt adhesive squeezes out of the ends of the connectors (2).
5. Push the shrinkdown plastic tubing over the connectors and warm it up too until the shrinking procedure has been completed (3).



7.8 Flow sensor

The flow sensor is integrated in the water intake device. It registers the volume of water flowing in.

It comprises a casing, an impeller wheel with a permanent magnet and a circuit board with a Reed switch.

The water sets the impeller wheel in motion. The magnet attached to the impeller wheel switches a reed switch twice for every revolution (north/ south-south/north).

The impulses generated are counted by the electronic system. They cannot be measured.

Technical Data:

Hydraulic data:

Minimum flow rate:	0.8 l/m
Maximum flow rate:	4.0 l/m
Nominal flow rate:	2.5 l/m

Electrical data:

Output signal:	Square signal
Switching current:	max. 5 mA
Nominal output signal:	at 2.5 l/min
Flow rate:	208 impulses / litre

A = Water intake

B = Water discharge

C = Connector plug

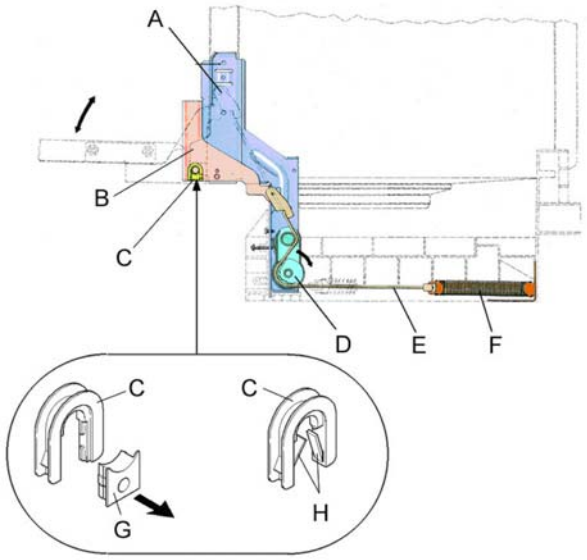
It is vital to ensure that the direction of flow is correct on installation. An arrow on the flow sensor indicates the direction of flow.

8. Accessing the individual components

8.1 Hinge

8.1.1 Dismounting

1. Unscrew the outer door, the base, the angle plate, and the side walls.
2. Detach the traction rope from the hinge lever.
3. Unscrew the hinge lever from the inner door.
4. Unscrew the hinge plate from the cavity frame.
5. Unscrew the fixing screw from between the hinge and the base pan.
6. Lift the hinge plate clear of the frame; and pull the hinge upwards.
7. Remove the spring compressor.



A Hinge plate
B Hinge lever
C Bearing brush
D Spring compressor
E Traction rope
F Traction spring
G Retaining piece
H Catches

Two-piece hinge bearing bush:
Open the bearing bush, disengage the retaining piece using a screwdriver (see sketch).

One-piece hinge bearing bush:
Open the bearing bush, bending out the catches with a screwdriver. The bearing bush also needs to be renewed after it has been removed.

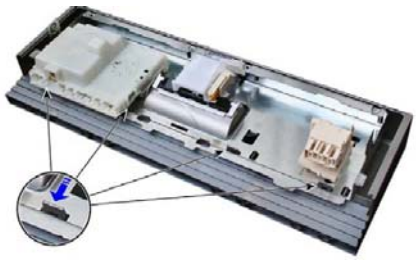
8.1.2 Assembly

1. Insert spring clamp (D) into the hinge plate (A).
2. Insert hinge plate (A) into the base pan.
3. Screw hinge plate (A) to the frame and base pan.
4. Insert hinge lever (B) with the bearing bush (C) into the hinge plate (A).
5. Screw inner door to hinge lever (B).
6. Attach tension cord (E) to the hinge lever (B).
7. Screw on side panels, angle strip, base panel and outside door.

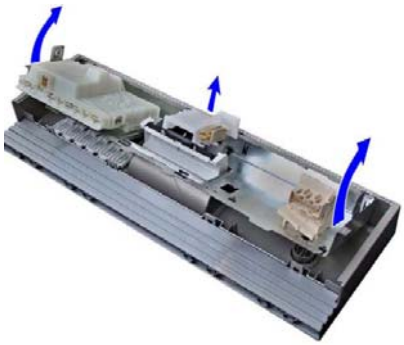
8.2 Module

8.2.1 Dismounting

1. Remove the furniture front (if fitted).
2. Remove outer door
3. Disconnect support plate with the fascia from the inner door.
4. Disengage four catches on the fascia from the support plate.

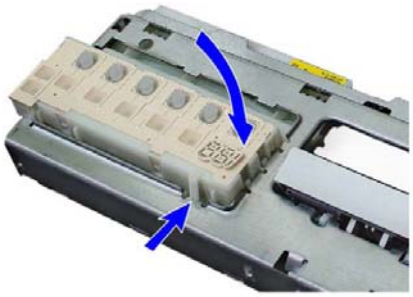


5. Tilt support plate away from the fascia.
6. Disengage catches on the module housing from the support plate.
7. Pull module down out of the support plate.
8. Remove plugs from the module; the plugs are coded.



8.2.2 Assembly

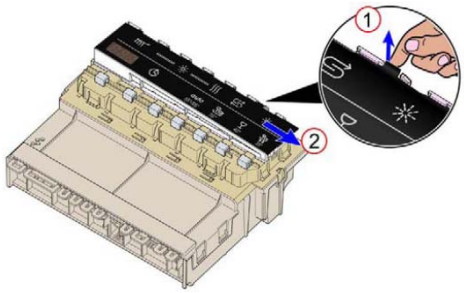
1. Connect plugs from the cable harness to the module.
2. Push module into the control panel frame until the module is held firmly in place by the catches.
3. Attach support plate to the inner door.
4. Attach fascia from above into the support plate and tilt down until the four catches lock.
5. Attach outer door.
6. Attach furniture front (if fitted).



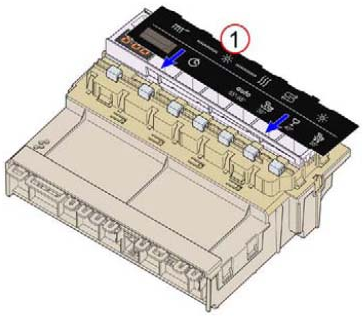
8.3 Display film

8.3.1 Removing

1. Slightly raise the catch for the display film.



2. Push display film to the right and remove.

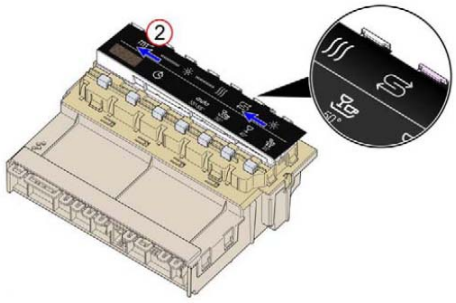


8.3.2 Mounting

1. Insert display film into the lower guide.

= When pushing in the display film, ensure that it is inserted at the top in all guides.

2. Push display film to the left into the holder until it locks.



8.4 Dispenser

The triggering mechanism is activated with an actuator. When first triggered, the cover of the detergent dispenser is opened, and at the same time the trigger catch snaps into the socket on the rinse aid lever, enabling a dosing plunger for the rinse aid to be raised next time the actuator is triggered.

Please note!
To remove the dispenser, leave the top basket in the appliance, close the door, then press the unlatched dispenser inwards.
Use protective gloves. Risk of cuts.

Before installing the dispenser, align the holding flaps to the middle to ensure that all supporting cams snap in securely. Before installing, lubricate the seal using cleaning agent.

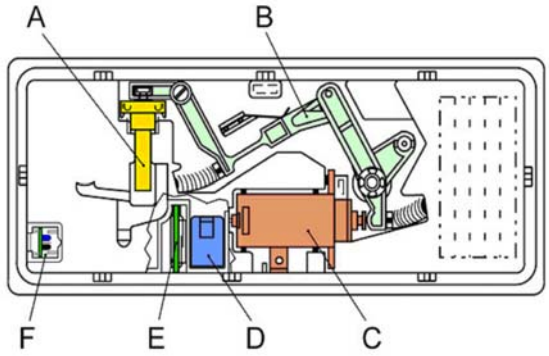
Technical data

Rinse aid filling quantity	120 ml
Setting 1-6	each 1 ml
Cleaning agent capacity max.	45 g

For further technical data, see the actuator.

Dismounting

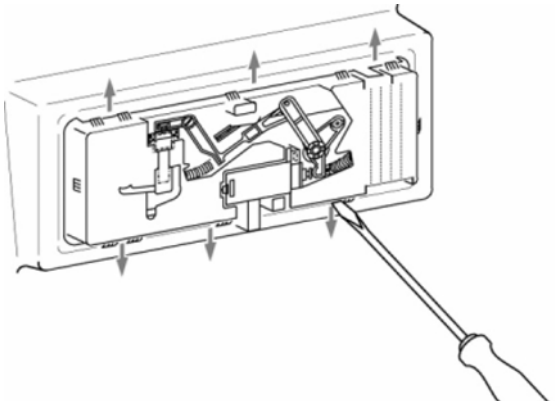
1. Screw off the outer door.
2. Disconnect the electrical connections.
3. Use a screwdriver to lift the holding flaps that are stamped out of the inner door clear of the supporting cams.



A Dosing plunger
B Socket
C Actuator
D Float magnet
E Reed contact (optional)
F optical sensor (optional)

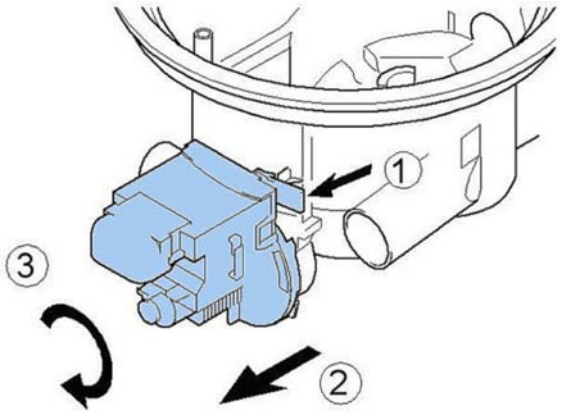
Please note! To remove the dispenser, leave the top basket in the appliance, close the door, then press the unlatched dispenser inwards.
Use protective gloves. Risk of cuts!

4. Before installing the dispenser, align the holding flaps to the middle to ensure that all supporting cams snap in securely.
5. Before installing, lubricate the seal using cleaning agent.



8.5 Detergent water pump

Remove the base cover and the base sheet. The detergent water pump is engaged in the pump cavity on the front left-hand side. In order to remove the pump the lever (1) must be disengaged. The pump must then be turned towards the front (2). After approximately a quarter of a turn it will be possible to pull the pump off (3).



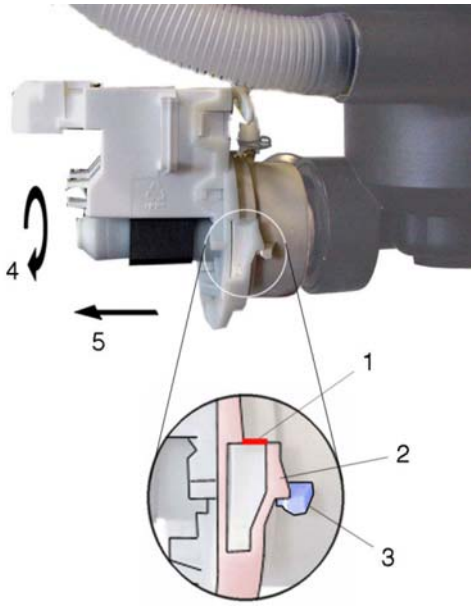
Technical Data:

Nominal voltage	230-240 V
Frequency	50 Hz
Resistance	110 - 260 Ω
Delivery height	0.9 m
Discharge	10 l/min

In order to reduce running noises, the pump has soft bearings between the pump cavity and the discharge hose.

In order to achieve a better cleaning of the fine sieve, the water is circulated and pumped out alternately 3 times for 5 sec. (except when a programme is started). This means that water flows through the sieve in both directions (alternating pumps).

After the drying phase the pump will be activated alternately 3 times for 5 seconds and there will be a break of 5 sec. (sputter pumping). This step is required to deaerate the pump.



Dismounting

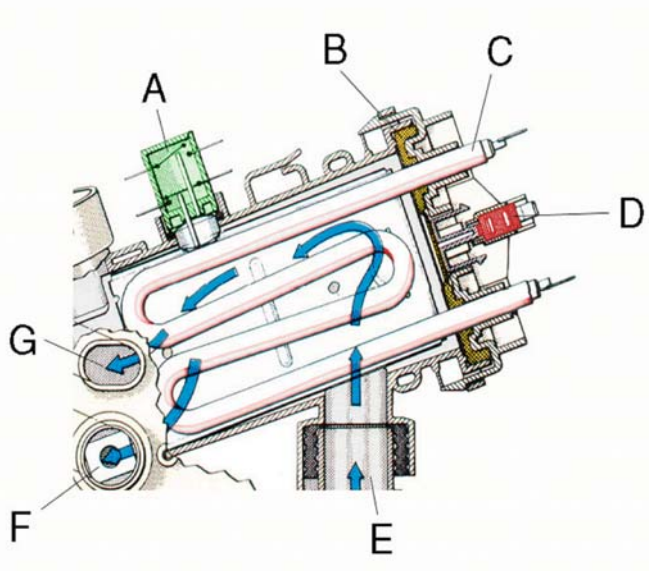
1. Remove the base cover and the base sheet. The detergent water pump is engaged in the pump cavity on the front.
2. Cut through the link (1) on the catch (2).
3. Press the catch (2) over the locking device (3) and turn the pump downwards at the same time.
4. After approximately a quarter of a turn (4) it will be possible to pull the pump off (5).

8.6 Continuous flow heater

The continuous flow heater is installed in the spray arms water circuit. When rinse water flows through, a rubber membrane located on a flange is activated and switches the heater's safety pressure switch. If the pressure falls, the heating is turned off. The heating position is overridden, thus avoiding the dry appliance being heated.

Dismounting

1. Unscrew the outer door, the base plate, the angle plate, and the side walls.
2. Detach the traction rope from the hinge levers.
3. Unscrew the screws between the base pan and the hinges.
4. Unscrew the rinse cavity on the back wall of the base pan.
5. Disconnect the door wiring harness at the plug connection in the base pan.
6. Lay the device on its back and carefully pull out the base pan. Release the lock from the level sensor case and the water softening unit.
7. Separate the circulation pump with the rubber bearing from the base pan.
8. Open the base pan enough for the continuous flow heater to be unscrewed from the pump cavity. Unscrew the continuous flow heater.
9. Release the lock on the pump cavity and lift the continuous flow heater away from the pump cavity/ circulation pump plug connections.



A Klixon / NTC ; 85 °C cut-out switch
B Membrane
C Heater
D Safetey pressure switch
E From the circulation pump
F To the bottom spray arm
G To the top spray arm

Technical Data:

Nominal voltage	230-240 V
Frequency	50 Hz
Output	2150 W
Resistance	approx. 22 Ω

8.7 Level sensor with a safety function

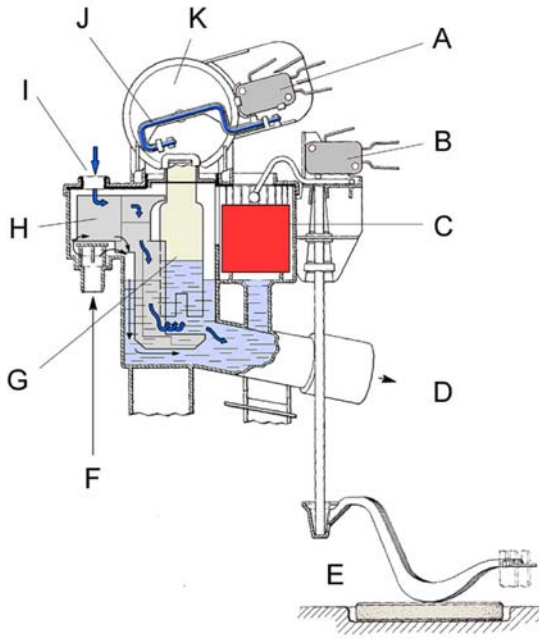
Should functional defects in the dishwasher control system or in the structural elements occur, resulting in an over-filling of the machine, the valve combination will be closed by means of the safety system, thus blocking off the water supply.

The discharge pump is switched on by means of the safety level switch. Pumping will continue until the safety level switch is switched back

Any leaks occurring within the machine are collected in the base pan. Leaks in the supply hose are guided to the base pan by means of the leakage water hose.

Once a set level in the base pan has been reached, the float activates the safety level switch by means of a switch lever, which then switches off the filling and safety valve electrically.

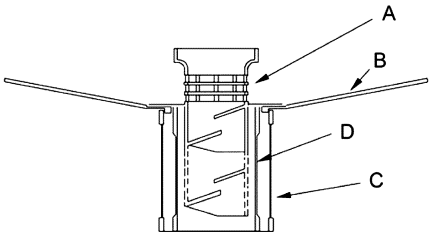
At the same time the discharge pump is switched on, the rinse water is removed from the rinsing cavity and the discharge pump switches onto continuous operation.



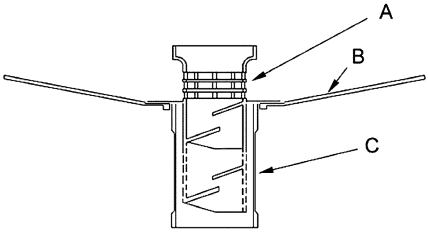
A Level switch
B Safety level switch
C Float for safety level
D To pump cavity
E Float in the base pan
F From the drain valve for appliances with a heat exchanger; from the softener for appliances without a heat exchanger
G Air chamber
H Throttle cup for appliances with heat exchanger
I From overflow channel
J Switch lever
K Pressure sensor

8.8 Sieve system

To prevent dirt particles from getting into the rinsing circuit, the coarse sieve cylinder must be engaged tightly with the pump cavity (observe marking).



Four-stage sieve system



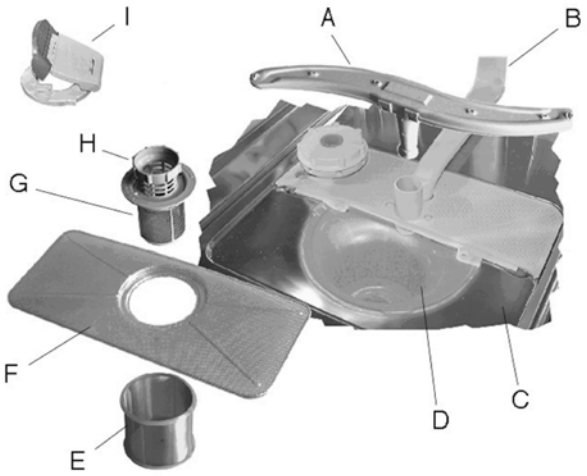
Three-stage sieve system

A Coarse sieve
B Horizontal sieve
C Micro-fine sieve cylinder
D Fine sieve cylinder

The sieve system comprises a fourfold filter system (a course filter, fine sieve cylinder, a horizontal fine sieve and a micro-fine sieve). The pump cavity, where the micro-fine sieve is located, is covered by the horizontal fine sieve. The horizontal fine sieve and the combined coarse and fine sieve cylinder are attached to the bottom of the pump cavity by means of a bayonet catch.

Sieve system

A Bottom spray arm
B Feed pipe to top spray arm
C Rinse cavity
D Pump cavity
E Micro-fine sieve
G Fine sieve
H Coarse sieve
D Pump cavity
F Horizontal sieve
I Hinged lid (optional)

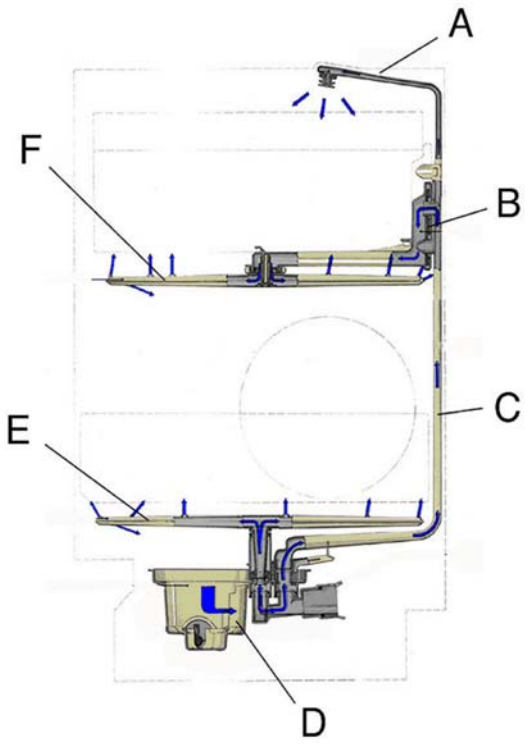


8.9 Rotary spray system

The rotary spray system consists of three spray levels, the bottom and top spray arm and a ceiling spray.
The water supply to the top spray arm and the ceiling spray is brought through the inlet pipe attached to the inside of the container rear wall. This pipe is connected by a direct connection with the flow heater under the pump cavity at one of its two outlets.

The top spray arm is directly fastened with its inlet pipe to the top basket. The inlet pipe is connected with a variable coupling. For dishwashers with a height-adjustable top basket this variable coupling adapts water entry to the spray arm.

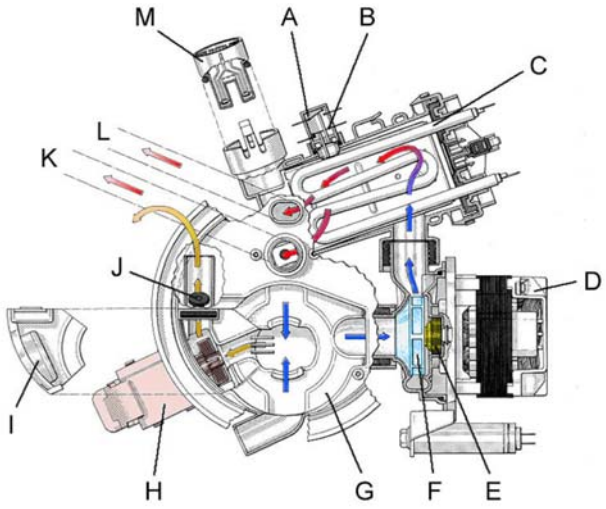
The bottom spray arm with its bearing is connected directly through the pump cavity at the second outlet of the flow heater and is fitted with a nozzle underneath in order to clean the horizontal sieve.



A	Ceiling spray	D	Pump cavity
B	Coupling	E	Bottom spray arm
C	Inlet pipe	F	Top spray arm

8.10 Rinsing and pump system

The circulating pump and the discharge pump as well as the continuous flow heater are connected to the pump cavity by means of plug connections. The continuous flow heater is also screwed to the pump cavity in such a manner that no pressure can occur. The sieve system comprises a fourfold filter system (a course filter, fine sieve cylinder, a horizontal fine sieve and a micro-fine sieve). The pump cavity, where the micro-fine sieve is located, is covered by the horizontal fine sieve. The horizontal fine sieve and the combined coarse and fine sieve cylinder are attached to the bottom of the pump cavity by means of a bayonet catch. The rinse water which flows into the pump cavity is sucked up by the circulation pump and forced into the continuous flow heater.



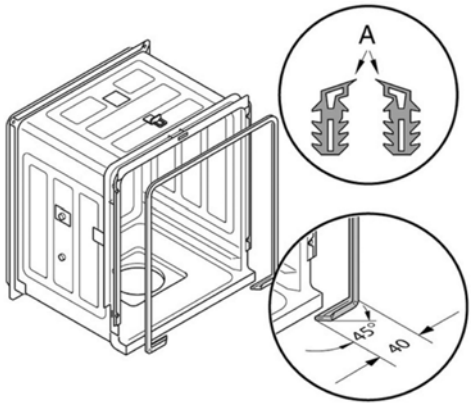
A	NTC / thermostat	H	Detergent water pump
B	Safety temperature control	I	Cover of the impeller *
C	Continuous flow heater	J	Non-return flap
D	Circulation pump	K	To bottom spray arm
E	Sealing kit	L	To top spray arm
F	Impeller	M	Aqua sensor *
G	Pump cavity		

If the pressure is sufficient, the push button for the heater is actuated by means of the flange membrane. A series-connected thermostat with a cut-off temperature of 85 °C prevents overheating. For appliances with automatic controls, this temperature switch is combined with a 65 °C thermostat and for appliances with electronic control it is combined with an NTC sensor (negative temperature coefficient), into one component part in each case. The surface of the sensor makes direct contact with the rinse water. The aqua sensor is positioned at the exit of the continuous flow heater and has its sensor in the flow of the rinse water in order to determine how dirty this water is. The direct fitting of the discharge pump onto the pump cavity means that the impeller and the non-return flap are accessible when the cover in the rinse cavity is removed.

8.11 Door seal

The new seal must be fitted before it is installed:

- The length of the seal must fit around the circumference of the cavity.
- Cut the ends of the seal at a 45° angle.
- Allow the seal to rest 40 mm on the base of the cavity (splashproof stop for the bottom corners).
- Press the seal in evenly without any kinks.



Prior to installation make sure that the sealing lip is in the correct position; it must point towards the centre of the dishwasher cavity otherwise there will be leaks around the door.

8.12 Door spring

The weight of the front of the unit is balanced with the door springs.

The door springs are located on the right and on the left side below the base pan. The traction force is transmitted to the door hinge with a cable drawn over a deflection pulley. With the adjusting screw supplied (for built-in appliances only) the traction force of the spring can be increased with the deflection pulley.

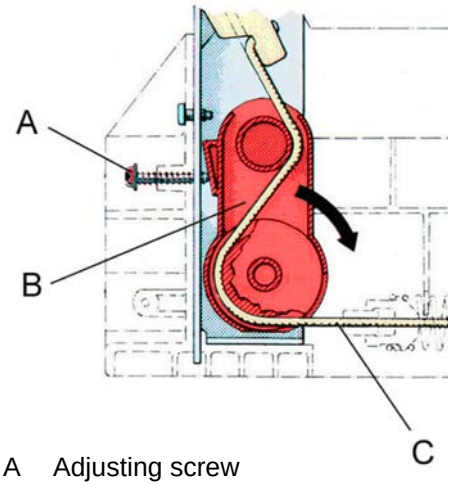
For very heavy unit doors (e.g. marble) the traction force of the springs which are installed as a standard and the maximum initial load of the spring clamp will not be sufficient.

In this case stronger door springs (see chart) can be used.

If the unit doors are extremely lightweight, the door springs may also be replaced with lighter ones.

Only pairs of door springs may be replaced!

The maximum unit door weight is about 10.5 kg



A Adjusting screw
B Spring clamp (deflection pulley)
C Traction rope

Spring power	Colour dot	Spare-part no.	Max. weight of the door
max.  min.	grey	426 895	10.5 kg approx.  1 kg
	green	426 490	
	black	427 073	
	brown		
	red		
	yellow		

8.13 Circulation pump (SICASYM)

The circulation pump is operated by means of a single-phase alternating current motor.
Switching the two motor windings with the motor capacitor is either activated by an electronic unit or a relay on the motor connection or by the module. During the start-up phase the two windings (in series with the capacitor) are parallel to one another direct on the power supply and generate an extremely powerful starting force.

After switch-over the two windings will be in series (behind one another), i.e. the two windings are each supplied with half of the power supply. The motor will then be optimally adjusted to the pump (in operation) and, besides requiring very little power - for label AAA – it will also make very little noise, since the windings are supplied with half of the power supply in operation.

Technical data

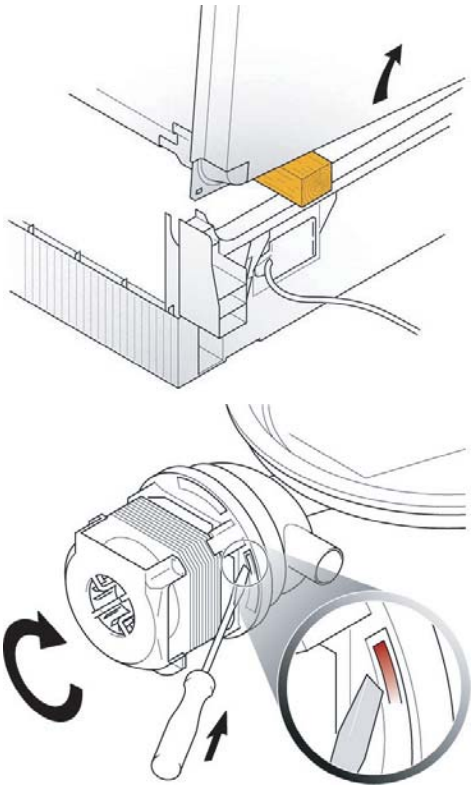
Designation	Value	Unit
Nominal voltage	230 - 240	V
Frequency	50	Hz
Resistance	Ha approx. 40-54 Hi approx. 45-70	Ω Ω
Delivery height	3.0 - 4.0	m
Discharge	17 - 63	l/min
Starting current	1.3 - 2.2	A
Operating current	0.3 - 0.4	A

8.13.1 Dismounting

1. Remove the side panels and the base sheet.
2. Remove the 2 screws (at the front and the rear) connecting the stainless steel shell and the plastic base pan on the right-hand side.
3. Raise container on the right side and tilt to the left and secure the container with an approx. 4 cm thick object.
4. Use a screwdriver to press the catch on the right-hand side of the circulation pump to the inside and turn the pump clockwise. You will then be able to remove the pump.

NOTE! ***The gasket must be lubricated with detergent prior to installation.***

NOTE! ***When a motor is replaced the spacer ring which is placed on the motor shaft must be used again for the new motor as the impeller wheel will otherwise become sluggish or blocked!***



8.13.2 Assembly

PLEASE NOTE! ***Leaks***
Ensure that all 4 locking hooks in the pump housing are attached.

Sluggish or blocked fan impeller
When the pump is changed, the spacer ring attached to the motor shaft must be transferred to the new pump.

1. Rotate pump to the left into the pump housing until the catch engages.
2. Tilt container back into base pan.
3. Screw stainless steel container to the base pan.
4. Screw on base plate and side panels.

8.13.3 Removing the rotary seal

1. Remove circulation pump.
2. Loosen fan impeller, locking the rotor with a pen or screwdriver.
3. Remove pump housing and the rotary seal.

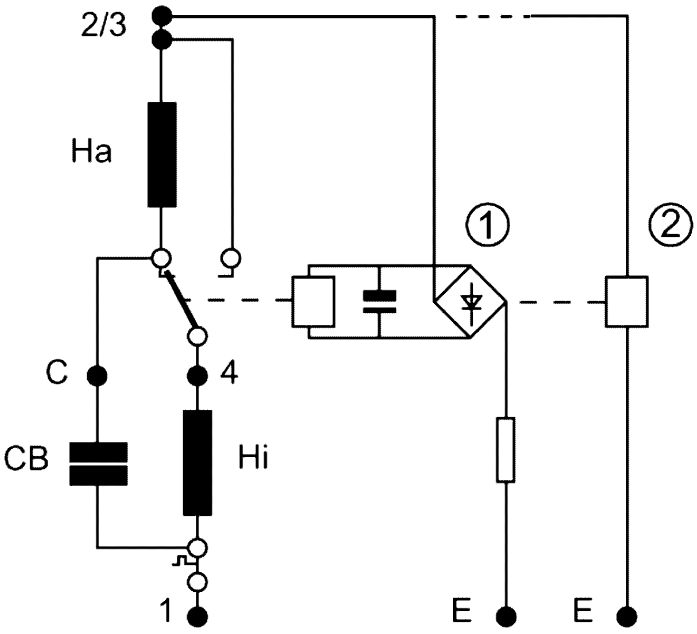
8.13.4 Installing the slide ring seal

NOTE! ***Sluggish or blocked fan impeller***
Ensure that the spacer ring is re-attached to the motor shaft.

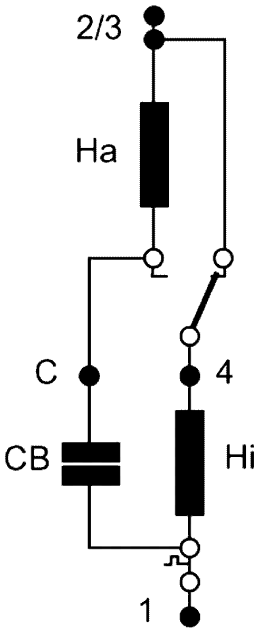
1. Press rotary seal into the pump housing.
2. Manually rotate fan impeller firmly onto the motor shaft.
3. Attach sealing ring.
4. Install circulation pump.

Circuit diagram

Operation:



Start:



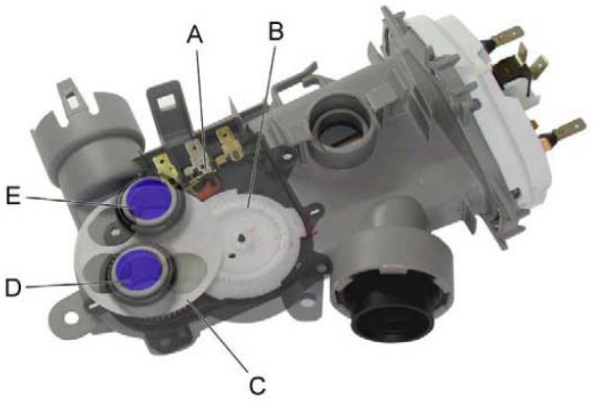
8.14 Water diverter

The water diverter is responsible for alternate rinsing and for different rinsing pressures.

It consists of a synchronous motor with gears, cam disc (B), microswitch (A) and a sealing washer (C).

The synchronous motor is activated with a triac. The controller receives information on the position of the sealing washer (C) from the microswitch (A) which is actuated by the cam disc (B).

The synchronous motor drives the transmission and hence also the cam disk and the sealing washer.



The sealing washer has three openings and locks the relevant water channel to the spray arms. Water pressures vary depending on the position of the sealing washer.

Alternate rinsing | Two-in-one | Change between two-in-one or top basket throttled

NOTE! ***The water diverter is integrated in the continuous flow heater and can only be replaced as a full unit with the continuous flow heater.***

.

Type of rinse		**Water pressure**
Alternating rinse	Top basket or bottom basket	high
Two-in-one	Top basket and bottom basket	medium
Change	Between two-in-one or top basket throttled	low

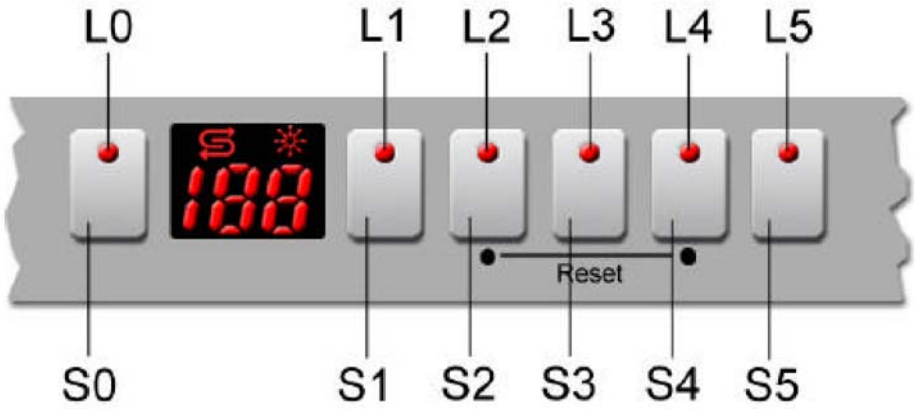
Technical data

Designation	**Value**	**Unit**
Nominal voltage for the synchronous motor	230 - 240	V
Frequency	50 / 60	Hz
Resistance	approx. 9.3	kΩ

9. Operation and function

9.1 IGV 659.2 and IGV 659.3 operation

The electronics system comprises two modules installed in a cabinet. The control/power module is connected to the operating/display module by means of a flat cable.



9.1.1 Function

LEDs

- Programme selection
- 2 1/2 digit display
- Rinse aid fill-up display
- Salt refill indicator

9.1.2 Buttons / programme selection

Pre-set time

The time-setting button enables the starting time to be postponed by up to 19 hours (setting between 0h – 19h). The button must be pressed for at least one second.

Intensive 70°

The programme comprises a pre-rinse at 50°, a washing cycle at 70°, two intermediate rinses, a clear rinse at 70°C and a drying cycle.

Auto 55 / 65

Depending on the aqua sensor decision, the programme comprises:

- cleaning at 50°, one intermediate rinse, a clear rinse at 65° and a drying cycle;
- cleaning at 65°, two intermediate rinses, a clear rinse at 65° and a drying cycle;
- pre-wash, cleaning at 55°, one intermediate rinse, a clear rinse at 65° and a drying cycle;

ECO 50

This programme comprises a washing cycle at 50°, one intermediate rinse, a clear rinse at 65° and a drying cycle.

Rapid 35

This programme comprises a washing cycle at 35°, one intermediate rinse, a clear rinse at 55°, and no drying.

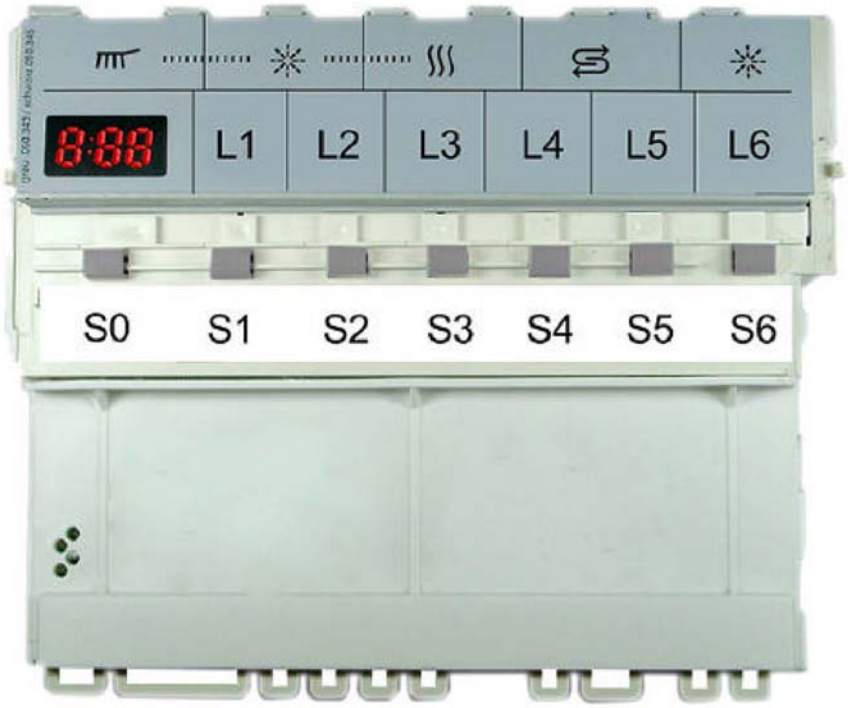
Pre-wash

The programme only comprises a cold rinse for the dishes.

9.1.3 Programme reset

With the appliance switched on, press the S2 button and the S4 button simultaneously for 3 seconds. The appliance will pump off water for approx. one minute. The cleaning agent compartment should then be closed, so that the dispenser is also reset.

9.2 IGV 657.1 and IG 644.4 operation



Pre-set time

The time-setting button enables the starting time to be postponed by up to 19 hours (setting between 0h and 19h). The button must be pressed for at least one second.

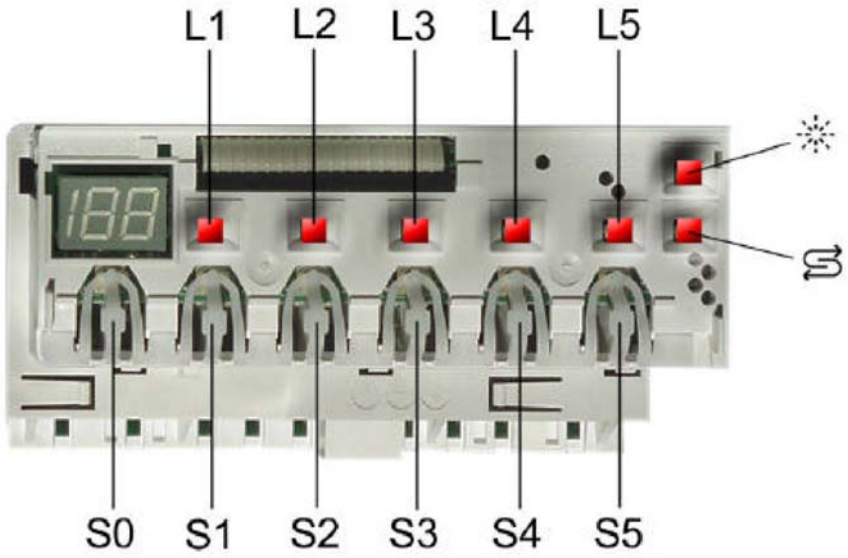
Display

The display consists of a 3 digit, 7 segment display. The display indicates the probable remaining time in hours and minutes.

The remaining duration is recalculated at the end of the heating positions. If deviations arise as a result of aqua sensor decisions, incoming water temperature, or volume of dishes etc., the remaining duration displayed is corrected for these items during these positions. Time differences of up to 50 minutes may occur. When a programme is started the remaining time which the programme required the last time it was used is indicated.

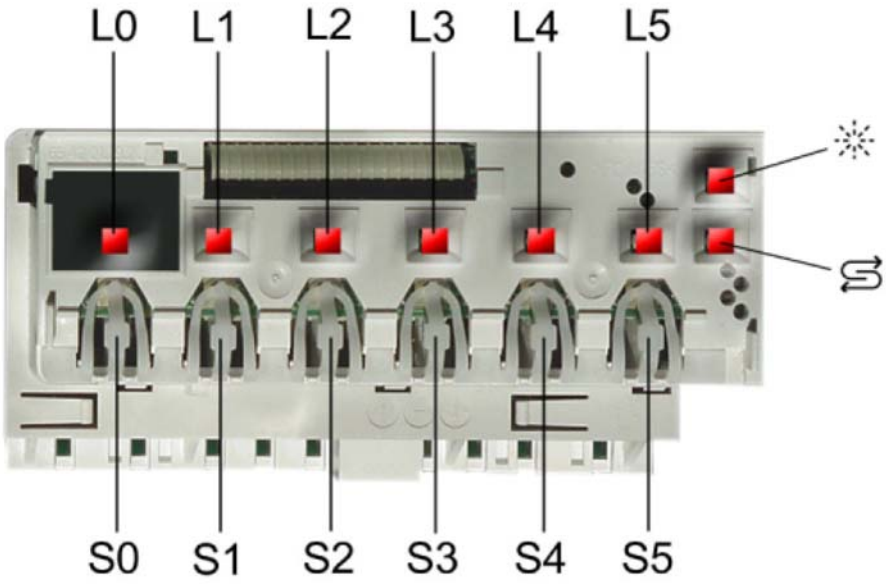
9.3 IGV 647.1 and IG 647.2 operation

The electronics system comprises two modules installed in a cabinet. The control/power module is connected to the operating/display module by means of a flat cable.

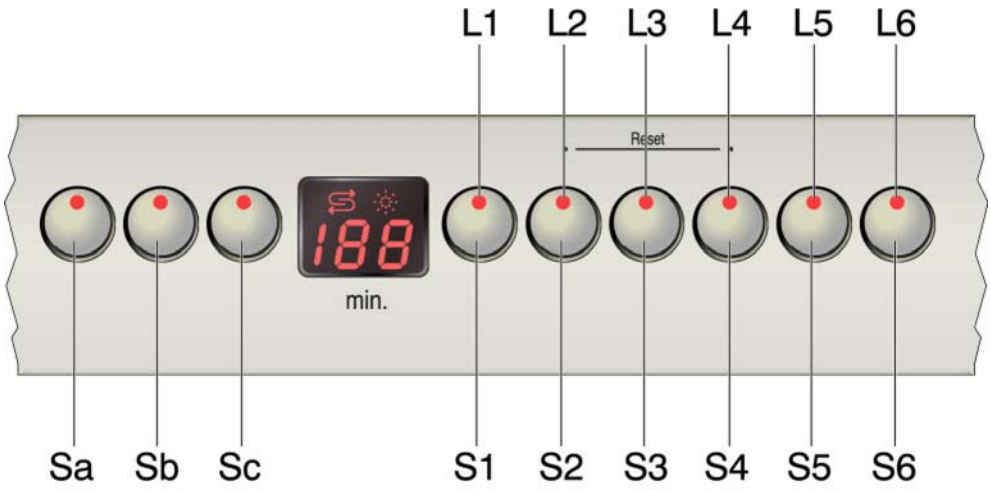


9.4 IGV 634.4 operation

The electronics system comprises two modules installed in a cabinet. The control/power module is connected to the operating/display module by means of a flat cable.



9.5 IGV 659.4 and IG 6508.0E operation



9.5.1 Push buttons / supplementary functions (Sa – Sc)

Main switch

Double-polar On/Off switch with wiping contact.

Soaking (optional)

The button for soaking can be pressed as a supplement to any programme. When the button is pressed, an additional pre-rinse programme with heating up to 55 °C will take place in the bottom basket, resulting in an extension of the programme time of approx. 20 min. Recommended for washing various types of dishes (top basket: sensitive dishes / bottom basket extremely dirty robust dishes).

Top basket (optional)

The button for the top basket must be pressed if only the top basket is to be rinsed. The water diverter will be positioned for rinsing the top basket during the entire rinsing process. The programme sequence will however be maintained as for alternating rinses.

Time reduction (optional)

The time reduction button can be pressed as a supplement to any programme. When the button is pressed, the circulating time and the drying time, and therefore the washing and drying performance, are reduced.

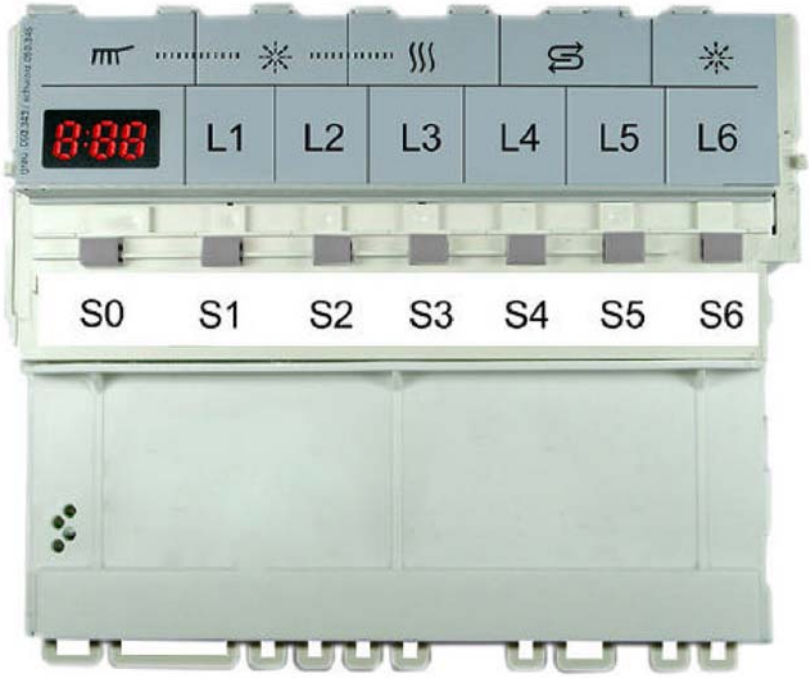
Bottom basket (optional)

The button for the bottom basket must be pressed if only the bottom basket is to be rinsed. The water diverter will be positioned for rinsing the bottom basket during the entire rinsing process. The programme sequence will however be maintained as for alternating rinses.

Pre-set time

The time-setting button enables the starting time to be postponed by up to 19 hours.

9.6 IGV 657.1 and IG 644.4 operation



Pre-set time

The time-setting button enables the starting time to be postponed by up to 19 hours (setting between 0h and 19h). The button must be pressed for at least one second.

Display

The display consists of a 3 digit, 7 segment display. The display indicates the probable remaining time in hours and minutes.

The remaining duration is recalculated at the end of the heating positions. Should deviations result due to aqua sensor decisions, the water intake temperature, the quantity of dishes, etc., the remaining time displayed for these phases will be adjusted. Time differences of up to 50 minutes may occur. When a programme is started the remaining time which the programme required the last time it was used is indicated.

9.7 IG 634.4 special functions

Setting the hardness range: Keep the S3-button pressed and switch on the appliance. The LED for fill-up salt will blink. The fault is indicated by means of the programme LEDs (see chart “Setting the hardness range”). The setting rises once every time the S3-button is pressed. If the appliance is switched off, the setting is stored.

9.8 IGV 659. from .4, IGVS 659. from .3 and IG 6508.0E special functions

Setting the hardness range: Keep the S3-button pressed and switch on the appliance. The setting will be indicated in the number indicator. The setting rises once every time the S3-button is pressed. Once the setting has reached “H7”, the indicator returns to “H0”. During the setting procedure the L3 LED will blink. The setting is stored when the appliance is switched off (see chart for setting the hardness range).

9.9 IG 644.4 special functions

Setting the hardness range: Keep the S5-button pressed and switch on the appliance. The setting will be indicated in the number indicator. The setting rises once every time the S5-button is pressed. Once the setting has reached “H:07”, the indicator returns to “H:00”. During the setting procedure the L5 LED will blink. The setting is stored when the appliance is switched off (see chart for setting the hardness range).

Hardness range chart

°dH	°fH	°Clarke	mmol/l	Setting (display)		
				IG 647. ...	IGV 659 from 4 IGVS 659 from 3 IG 6508.0E	IG 644.4 IG 644.5 IGS 644.0
0 - 3	0 - 6	0 -4	0 - 0,6	0	H0	H:00
4 - 6	7 - 11	5 - 8	0,7 - 1,1	1	H1	H:01
7 - 9	12 - 16	9 -11	1,2 - 1,6	2	H2	H:02
10 - 12	17 - 21	12 - 15	1,7 - 2,1	3	H3	H:03
13 - 16	22 - 29	16 - 20	2,2 - 2,9	4	H4	H:04
17 - 21	30 - 37	21 - 26	3,0 - 3,7	5	H5	H:05
22 - 30	38 - 54	27 - 38	3,8 - 5,4	6	H6	H:06
31 - 50	55 - 89	39 - 82	5,5 - 8,9	7	H7	H:07
Series setting				2	H4	H:04

10. Remedying faults for all of the series 630 – 634 appliances

Should your dishwasher develop a fault, please check up on the following before contacting our customer service (see, too, the relevant section in the instructions for use).

10.1 Controller / module

= Start up the customer service programme before replacing any modules.

Customer information	Cause	Remedy
Programme time too long	• Alternating rinse technology, energy saving.	• Advise customer, see Consumption rates or Alternate rinsing technology.
Component is not actuated	• Triac on the module does not switch properly; smoke traces may be visible on the module. • Regulator controller / power supply unit charred by humidity in the module.	• Before replacing the module, always measure the connected consumers (valves, actuators, etc.). • Sealing strip 298550 will also have to be renewed when the module is renewed.
Charred connections	• Connector plug. • Cable harness charred /cable torn.	• The plug repair set 491817 can be used for defective connections on electronic controllers. ***NOTE! Replace defect cable in the cable harness with universal cable 493906.*** ***Use extraction tool 340785 to remove the defect cable from the connector shell.***

10.2 Discharge

Customer information	Cause	Remedy
The pump can be heard but it transports no water or only a little water	• Sieve system blocked.	• Advise the customer; observe instructions on cleaning the sieves in the user manual. Clean the sieve.
	• Trap in the air intake device (pump cavity) clogged.	• Advise the customer. Clean the trap in the air intake device of the pump.
	• Non-return valve in the discharge has got caught.	• Remove the non-return valve. Check the valve and its position for dirt and clean if necessary.
	• Discharge hose blocked.	• Remove the obstruction (do not forget the dishwasher hoses) obstruction in the region of the hose connection to the water discharge; remove both discharge hoses and check.
Buzzing noise from the pump	• Pump mechanically blocked (foreign matter or pump damaged).	• Clean the pump; if necessary remove it. In order to enhance the capacity of the dishwasher to retain foreign matter, it is recommended that the additional sieve 428216 be installed in the coarse sieve.
Pump not working	• Refer also to buzzing noises from the pump or pump can be heard in operation.	
	• Water tap was closed during the drying cycle, heat exchanger was not yet filled, filling switch waiting for the level.	• Advise the customer, wait for the programme to be completed and only then close the tap. (Point out the presence of Aquastop if necessary.)
	• Pump is not activated.	• Activate the pump (test programme) and check according to flow diagram. Observe safety instructions!
Dishwasher pumps off briefly, circulates, pumps off…	• Alternating pumping (detergent water pump and circulation pump are activated alternately).	• Advise the customer.

10.3 Smell

Customer information	Cause	Remedy
Burnt smell	• Connection cable improperly extended.	• Advise the customer; observe instructions in the user manual.
	• Socket burned (due to poor contact).	• Consult the customer; the socket and the connection cable must be replaced.
	• Winding damage or faulty insulation on the consumers.	• Check the consumers (test programme) and check according to flow diagram. Observe safety instructions.
	• Poor electric connection or leakage path on electrical components (inspect edge connectors).	• Rectify leakage paths and contact resistances; observe leaks, high-current cables may not be extended.
Smell of chemicals	• Detergent or rinse aid.	• Advise the customer. The customer specifies on chemicals; possibly replace the product (with lemon aroma) or recommend an air freshener.
	• Binding agent of the noise reduction devices (fleece, insulation mats).	• Explain about new odour to customer.
	• Steaming of electrical components or circuit boards.	• Advise the customer.
Smell of rotting	• Permanent insufficient dispensing of detergent.	• Advise the customer; observe dosing instructions.
	• Deposits under the cover of the sieve, in the pump cavity or in the area of the sealing. The smell comes from the sink drainpipe (the siphon may be extremely soiled or evacuated).	• Advise the customer to clean the machine or use a more powerful programme. Possibly refer customer to a plumber.
	• Dishwasher not properly connected to the siphon.	• Connect properly if possible or refer customer to a plumber if necessary.

10.4 Noises

Customer information	Cause	Remedy
Knocking noises in the pipes when water is being taken in	• Improper installation or cross section of the water pipes (usually only occurs with appliances fitted with an aqua-stop valve since the valve is connected direct onto the tap).	• Advise the customer and refer him to a plumber (have a pressure reducer installed).
Clattering noises during the rinsing cycle	• Spray arm knocking on the dishes.	• Advise the customer; dishes not loaded properly.
Alternating noises in the washing programme	• Alternating rinsing technology (55 sec. top basket rinsing, 5 sec. to change, 60 sec. for the bottom basket) of the water diverter. • Alternating pumping (detergent water pump and circulation pump are activated alternately).	• Advise the customer; load the dishwasher, possibly install a bottom spray arm with a larger jet stream (see “Water diverter” on page 44). • Advise the customer

The next few charts deal with food or sandy residues which may impair the rinsing results.
These are:

- Lime deposits (analyse with 10% hydrochloric acid in the diagnosis suitcase)
- Starch deposits (analyse with iodine solution in the diagnosis suitcase)
- Water-soluble or regenerating salt (analyse with distilled water in the diagnosis suitcase)
- Discolouration / colour deposits (e.g. tea, tomato juice, coffee, lipstick, etc.) (analyse with sodium hypochlorite bleach in the diagnosis suitcase)
- Residual detergent (analyse with distilled water in the diagnosis suitcase)
- Water-insoluble deposits / damage to dishes rinsed

10.5 Food or sandy deposits

Customer information	Cause	Remedy
Residual food or sandy deposits	• Coarse, micro or fine sieve clogged; sieve not engaged in the pump cavity.	• Advise the customer; insert sieve and care of the equipment
	• Spray arm jets, top spraying nozzle blocked.	• Clean parts if necessary, instruct customer on inserting the proper sieve
	• Spray arm bearing stiff (dirt in the region of the bearing).	• Cleaning
	• Foreign matter in the region of the discharge hose connections to the water inlet (discharge channel).	• Advise customer; cleaning
	• Trap in the pump cavity partially blocked.	• Cleaning
	• Discharge hose bent.	• Connect the discharge hose properly
	• No detergent dispensing or insufficient dispensing, wrong programme selected.	• Advise the customer; observe the dosing instructions of the detergent, use programme with a higher temperature; check the dispenser, see “Dispenser” on page 34.
	• Dishes not arranged properly (large dishes, e.g. pots, in the bottom basket), avoid contact points, rows of spikes bent.	• Advise customer, straighten the rows of spikes (see instruction manual)
	• Spray arm blocked by dishes or cutlery.	• Advise the customer

Customer information	Cause	Remedy
Residual food or sandy deposits	• Snorting noises; circulation pump does not run smoothly, too little water in the dishwasher (attention in the case of alternating rinse technology).	• Check the functioning of the level sensor (carry out a filling procedure)
	• Non-return valve leaking; dirty water flows back into the dishwasher.	• Remove the non-return valve, check the valve and its position for dirt and clean if necessary.
	• Dishwasher does not circulate.	• Check the circulation pump, see “Circulation pump (SICASYM)” on page 42.
	• Dishwasher does not heat up.	• Check the heating circuit in accordance with the circuit documents; observe the circuit breaker on the continuous flow heater (see “Continuous flow heater” on page 36) (the circulation pump can only build up sufficient pressure if there is enough water in the dishwasher).
in the top basket	• Dishwasher only rinses dishes in the bottom basket.	• Obstruction of the top basket rinsing cycle; it is essential to observe that in some steps in the programme, rinsing will only take place in the bottom basket. Check with the help of the customer service programme and diagnosis aids.
in the bottom basket	• Dishwasher only washes dishes in the top basket. For dishwashers with a top basket valve in the FD 7809 to FD 7811 production period, the float of the top basket valve may get caught between the continuous flow heater and the pump cavity.	• Replace the continuous flow heater.

10.6 Lime deposits

Customer information	Cause	Remedy
Lime deposits on the dishes	• Hardness level incorrectly set or incoming water hardness > 50°dH. Check the residual heat in the washing and clear rinse cycles	• Set the hardness level; advise the customer; use detergents containing phosphate.
	• Does not regenerate.	• Set the regenerating position and carry out a function check (observe the emptying of the regeneration chamber) Check the regeneration valve carefully (mechanical - valve stern; electrical – activation / coil).
	• Valve for incoming water does not open -> filling with incoming water only.	• Check the incoming water valve (mechanical - valve stern; electrical – activation / coil).

10.7 Starch deposits

Customer information	Cause	Remedy
Starch deposits on the dishes	• Insufficient detergent (unsuitable detergent).	• Advise the customer; use a detergent with enzymes.
	• Wrong programme selected (programme selected too weak).	• Advise the customer; select the right programme.
	• Dishwasher connected to a warm water supply; inlet water temperature too high.	• Check the warm water connection (target: less than 60°C), advise the customer, if necessary connect the dishwasher to a cold water supply.

10.8 Water-soluble or regeneration salt residue on the dishes

Customer information	Cause	Remedy
Water-soluble residue	• Regeneration salt on the dishes.	• Advise the customer.
	• Salt box top not watertight (check the screw fitting, regeneration chamber slowly emptied).	• Advise the customer, rectify leak.
	• Regeneration valve is leaking (regeneration chamber slowly emptied).	• Check the valve and its seating.
	• Regeneration valve permanently activated.	• Electrical check on the basis of circuit documents.
	• Commencing cloudiness of glass: can only apparently be wiped off.	• See damage to dishes, page 61.
	• Detergent water carried over.	• See residual food.
	• Combined product.	• Advise the customer.

10.9 Discolouration / residual colour

Customer information	Cause	Remedy
Residual colour	• Too little detergent used.	• Advise customer, increase the quantity of detergent.
	• Plastic becomes discoloured, for example by tomato deposits, tea, coffee, etc.	• Use a detergent with chlorine bleaching. If the dishwasher becomes discoloured recommend a cleaning agent for the machine.
	• Detergent very lumpy, cleaning effect and dissolving properties diminish.	• Advise the customer, store the detergent in a sealed container in a dry place.
	• Programme selected not powerful enough (if the programme is too short and the temperature too low there will not be sufficient contact with the oxidation bleach).	• Advise the customer; use a more powerful programme.
Rainbow-coloured smearing	• Silicate deposits on glasses only (cannot be removed).	• No remedy possible (glass damaged).
	• Rinse aid excessively dosed (can be rinsed off with water).	• Reduce the dispensing setting.
Silver cutlery becomes tarnished	• Discolouration occurs as a result of sulphur compounds contained in the air and in various food left-overs.	• Advise the customer; silver cutlery must be rinsed immediately after use.

10.10 Residual detergent

Customer information	Cause	Remedy
Residual detergent	• Detergent dispenser lid blocked by dishes (does not fully open up).	• Advise the customer, dishes not well loaded.
	• Detergent dispenser lid does not fully open up.	• Renew the spring of the dispenser.
	• Unsuitable programme selected.	• Advise the customer.
	• Tabs used in the quick or short programme.	• Tabs take too long to dissolve.
	• Tabs not used properly (make sure that they are used in the dispenser or in the cutlery basket).	• Advise the customer, observe instructions for use of tabs.
	• Spray arm jets blocked (sieves locked).	• Advise the customer.
	• Dispenser in the spray shadow (large pot or similar vessel loaded at the bottom left).	• Advise the customer.
	• Check the pumping out procedure, non-return valve.	• See residual food.
	• Detergent very lumpy, cleaning effect and dissolving properties diminish.	• Advise the customer.

10.11 Damage to rinsed dishes

Customer information	Cause	Remedy
Commencing or already present, irreversible (not rectifiable) cloudiness of glass	• Degree of hardness set too high, residual hardness in washing or clear rinse cycle <5 °dH.	• Optimise the setting after measuring.
	• Glasses not dishwasher-proof (glasses usually only suitable for use in a dishwasher).	• Advise the customer.
	• Programme selected too strong.	• Advise the customer, use the gentlest programme possible when rinsing glasses (low temperature < 50°C).
	• Reaction time of steam in drying process too long.	• Advise customer; do not switch on the appliance and only take out the dishes after a few hours, e.g. leave them in overnight.
Mechanical damage (scratches or break)	• Scratches due to contact points / areas with other dishes.	• Advise the customer, avoid contact points when loading the dishwasher.
Dishes faded	• Dishes not dishwasher-proof.	• Advise the customer; use dishwasher-proof dishes.
Rust on cutlery	• Cutlery not dishwasher-proof (knife/knife blade steel is usually not very resistant to corrosion).	• Use dishwasher-proof cutlery! (larger proportion of chrome/ nickel, at least 18/8 or 18/10).
	• Rust film: rust caused by corroding dishes or dishwasher baskets.	• Advise the customer, do not rinse any rusty items such as old pots in the dishwasher.

10.12 Drying results

Customer information	Cause	Remedy
Does not dry properly	• No rinse aid in the dispenser.	• Advise the customer
	• Appliance connected to a hot water supply; appliance is suitable for hot water, but it is not recommendable.	• Advise the customer; point out the function of the heat exchanger; if necessary connect the appliance to a cold water supply.
	• Dishwasher does not heat up.	• Check the heating circuit in accordance with the circuit documents; observe the circuit breaker on the continuous flow heater (the circulation pump can only build up sufficient pressure if there is enough water in the dishwasher).
	• Programme without drying selected.	• Advise the customer; the rapid programme is without a drying cycle, the degree of drying option is set too low.
	• The clear rinse has dissolved too quickly for tabs with an integrated rinse aid.	• Advise the customer, the tabs are not suitable for this programme.
	• Plastic dishes.	• Plastic materials hardly store heat and they have a hydrophobic surface which is difficult to wet. This results in the formation of drops during the drying cycle.
	• Combined detergents (2 in 1 / 3 in 1).	• Advise the customer; recommend separate detergent products (rinse aid and detergent separate).

10.13 Circulation pump

Customer information	Cause	Remedy
Circulation pump does not start up.	• After a long service life the set of seals may stick to the pump wheel.	• It is essential that the set of seals be renewed.

11. Technical data IG 6... and IGV 6...

The data indicated may deviate upwards or downwards. The figures are those resulting from laboratory tests in accordance with EN 50242 for the start of a series.

Dimensions	
Height	85.0 cm
Width	59.8 cm
Depth	57.0 cm
Voltage / Frequency	230 V / 50 Hz
Connected load	2.3 kW
Heating power	2.15 kW
Fuse protection	10 / 13 A

Dispenser	
Rinse aid fill quantity	120 ml
Setting 0-6	per 1 ml
Detergent filling quantity	45 g

Circulation pump	
Nominal voltage	230-240 V
Frequency	50 Hz
Resistance	Ha approx. 80 Ω Hi approx. 85 Ω Hi 2 approx.13 Ω
Delivery height	3.1 m
Discharge	25 - 30 l/min
Starting current	2.4 A
Operating current	0.31 A

Water diverter	
Frequency	50 / 60 Hz
Resistance	approx. 9.3 kΩ
Nominal voltage	230-240 V (synchronous motor)

Recovery / discharge / natural water valve	
Nominal voltage	230 - 240 V
Frequency	50 Hz
Resistance	2 kΩ
Flow rate	2.75 l/min.
Water pressure	0.5 - 10 bar

Actuator	
Nominal voltage	110 - 240 V
Frequency	50 / 60 Hz
Resistance	0.5 - 1.5 kΩ

Continuous flow heater	
Nominal voltage	230 - 240 V
Frequency	50 Hz
Output	2150 W
Resistance	approx. 22 Ω

Aqua Stop valve	
Nominal voltage	230 - 240 V
Frequency	50 Hz
Flow rate	2.75 l/min
Water pressure	0.5 - 10 bar

Energy label data	
Energy category	A
Washing performance	A
Drying performance	A

Volume (permanent rinse system)

Temperature	Resistance in kΩ	Tolerance
25	48.4	7.9
30	38.5	7.1
50	16.5	6.2
60	11.0	5.6
65	9.1	5.6

Klixon / NTC

85 °C safety switch

Salt container - capacity	
Fine-grained salt	approx. 2 kg
Coarse-grained salt	approx. 1.5 kg
Salt tablets	approx. 0.7 kg

Detergent water pump	
Nominal voltage	230 - 240 V
Frequency	50 Hz
Resistance	110 - 260 Ω
Delivery height	0.9 m
Discharge	10 l/min

11.1 Consumption data IGV 647. ...

11.1.1 Appliance with water diverter and heat exchanger

	Intensive 70°	Auto 55-65°	Normal 65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	112	100-145	108	140	72	30	19
Power consumption in kWh	1.8	1.15 - 1.46	1.85	1.05	0.8	0.6	0.1
Water consumption in litres	21	14 - 19	18	14	15	10	4

11.1.2 Appliance with water diverter without a heat exchanger

	Intensive 70°	Auto 55-65°	Normal 65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	115	110 - 135	106	140	75	30	19
Power consumption in kWh	1.7	1.25-1.55	1.45	1.05	0.9	0.7	0.1
Water consumption in litres	21	14 -19	18	14	15	10	4

11.2 Consumption data IG 644 to .4.

11.2.1 Appliance with water diverter and heat exchanger

	Intensive 70°	Auto 55-65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	112	95 - 145	140	72	30	19
Power consumption in kWh	1.6	1.15 - 1.60	1.06	0.8	0.6	0.1
Water consumption in litres	21	11 - 19	14	15	10	4
Water consumption in litres with Aquasensor	18			12		

11.2.2 Appliance with water diverter without a heat exchanger

	Intensive 70°	Auto 55-65°	Normal 65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	115	95 - 140	140	140	75	30	19
Power consumption in kWh	1.7	1.25 - 1.60	1.46	1.05	0.9	0.6	0.1
Water consumption in litres	21	11 - 19	18	15	15	10	4
Water consumption in litres with Aquasensor	18				12		

11.3 Consumption data IG 634 to .3

11.3.1 Appliance with water diverter and heat exchanger

	Intensive 70°	Auto 55-65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	112	95 - 145	140	72	30	19
Power consumption in kWh	1.6	1.15 - 1.50	1.05	0.8	0.6	0.1
Water consumption in litres	21	11 - 19	14	15	10	4
Water consumption in litres with Aquasensor	18			12		

11.3.2 Appliance with water diverter without a heat exchanger

	Intensive 70°	Auto 55-65°	Normal 65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	115	95 - 140	140	140	75	30	19
Power consumption in kWh	1.7	1.25 - 1.60	1.45	1.05	0.9	0.7	0.1
Water consumption in litres	21	11 - 19	18	15	15	10	4
Water consumption in litres with Aquasensor	18				12		

11.4 Consumption data IG 647.2E

11.4.1 Appliance without heat eschanger

	Intensive 70°	Normal 65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash
Time in min.	94	92	88	68	30	13
Power consumption in kWh	2.0	1.75	1.44	1.0	0.8	0.1
Water consumption in litres	23	23	16	19	12	5

11.5 Consumption data IG / IGS 6407.0 - IG 6507.0E

11.5.1 Appliance with water diverter and heat exchanger

	Intensive 70° Power 75	Auto 55- 65°	Normal 65°	ECO 50°	Gentle 40°	Rapid 35°	Pre-wash	Warming plates
Time in min.	125 - 135	85 - 140	140	140	68 - 72	30	9	25
- Half-loaded	120	85 - 130		120	62			
- with Vario Speed	85 - 90	71 - 75		65 - 70	52 - 56			
Power consumption in kWh	1.55 - 1.60	1.05 - 1.60	1.60	1.05	0.75 - 0.80	0.7	0.05	0.60
- Half-loaded	1.50	1.00 - 1.40		1.05	0.75			
- with Vario Speed	2.00 - 2.10	1.40 - 1.50		1.40 - 1.44	0.85 - 0.95			
Water consumption in litres	13 - 16	10 - 17	16	12	11 - 14	10	4	4
- Half-loaded	12	10 - 14	16	12	11 - 14	10	4	4
- with Vario Speed	16 - 20	15 - 20		12 - 14	12 - 16			

The data indicated may deviate upwards or downwards. The figures are those resulting from laboratory tests in accordance with EN 50242 for the start of a series.