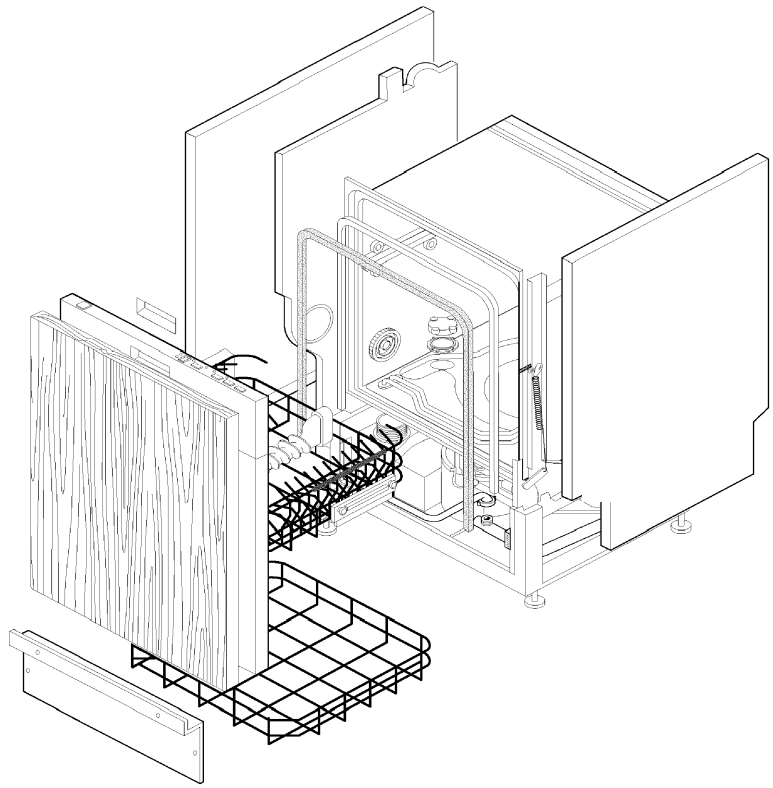

Fully Integrated Dishwasher

New Structure

ITRONIC «HL» 60 cm

IGV 689.1

Küppersbusch

THE HEART OF A GOOD KITCHEN

GB

Service Manual: H7-410-03-02-C

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Contents

1. General

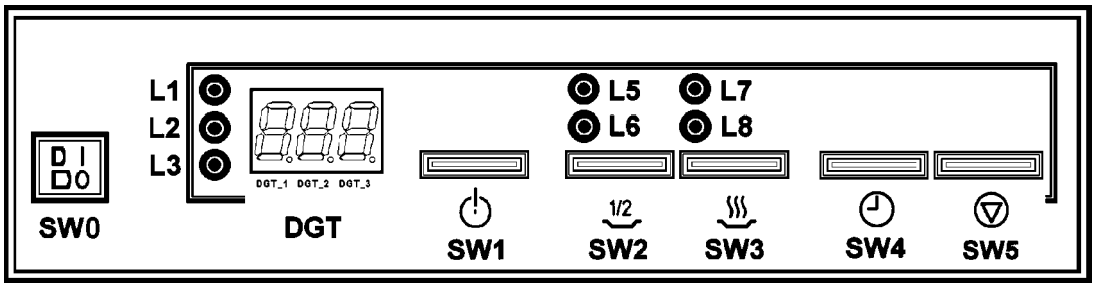
1.1 General features

Electrical supply	220 - 240 V/50 Hz (limit values 187 + 254 V)		
Total power consumption	2.300 W (incl. 2.100 W heating element)		
Water supply	pressure min./max. 5 + 80 N/cm²		
Capacity	**12** place settings		
Consumption data	water (in litres)	**19** (progr. 4)	**17** (progr. 6)
	current consumption kWh	**1.4** (progr. 4)	**1.4** (progr. 6)
Programme duration	minutes	**90** (progr. 4)	**75** (progr. 6)
Noise level	dB (A)	**33** (sound pressure)	

1.2 Application examples

Wash systems	alternating impulse
Water intake level	“LMI“ control (dynamical equilibrium)
Water heating	built-in heating element
Temperature control	temperature sensor
Drying options	active turbo
Safety systems/alarms	overall waterproofing system and software
Electronic control module	
Printed circuit board	main control (via built-in microprocessor)
Display/switch module	interface user/appliance

2. Function features



2.1 Control panel

2.1.1 ON/OFF button (SW0)

- This button is used for switching the appliance on and off.
- When the dishwasher is supplied with current, the display (Dgt) lights. If rinse aid and/or salt is required, the corresponding LEDs “L1“ and “L2“ also light up.

2.1.2 LED “Rinse aid“ (L1) (red)

- Lights if rinse aid must be refilled.
- The rinse aid level is controlled during the entire programme sequence. However, the refill indication LED only lights when the appliance door is open.

2.1.3 LED “Salt“ (L2) (red)

- Lights if regeneration salt must be refilled.
- The salt level is controlled during the entire programme sequence. However, the refill indication LED only lights when the appliance door is open.
- If the regeneration level has been set to [0] (no regeneration), this LED remains off.

2.1.4 WRD LED (L3) (red)

- Lights if a wash programme with prewash function has been selected.
- Indicates that detergent must be filled into the respective WRD detergent dosing device.

2.1.5 Display [DGT_1] [DGT_2] [DGT_3] (green)

- Display by means of letters and digits.
- Display of the programme number.
- Display of time down-counting (in hours) in case of preselected start time (1-12).
- Display of running down-counting timer by means of flashing decimal point.
- Display of the wash programme end by means of three illuminated (central) segments.
- Display of a possible alarm condition.

2.1.6 Programme selection button (SW1)

- Is used for setting the desired wash programme.
- The displayed programme number continuously changes with each depression of the button.

2.1.7 Half load button “Upper/Lower“ (SW2)

- Enables the optimisation of the wash programme in case of smaller dish quantities.
- The dishes can optionally be inserted into either of the two dish baskets.

2.1.8 LED Half load “Upper“ (L5) (green)

- Lights if only the upper dish basket is loaded and thus the wash operation mainly takes place in the upper basket.

2.1.9 LED Half load “Lower“ (L6) (green)

- Lights if only the lower dish basket is loaded and thus the wash operation mainly takes place in the lower basket.

2.1.10 Selector button DRYING (SW3)

- Enables setting of the desired drying option:
  - active
  - economic drying
  - no drying.

2.1.11 LED “Economic drying“ (L7) (green:

- Lights if the additional function “economic drying“ has been selected.

2.1.12 LED “No drying“ (L8) (green)

- Lights if the drying function has been deactivated.

2.1.13 Standard drying

- Both LEDs (L7 and L8) have gone off.
- Dishwashers with ACTIVE drying system execute the active drying cycle.
- Dishwashers with TURBO drying system execute the ventilated drying cyle.

2.1.14 Preselected start button (SW4)

- Pressing this button postpones the start of the wash programme.
- The start of the programme is postponed by one hour each time the button is depressed (number of hours).

2.1.15 Button CANCEL/REMAINING CYCLE TIME DISPLAY (SW5)

FUNCTION

- Pressing this button after the wash programme B has started (with the appliance door open) cancels the previously selected wash programme.
  In this case, an acoustic signal (BUZZER) (sequence_F) will sound and three illuminated segments [- - -] indicating the end of the programme will appear in the display for two seconds. Afterwards the previously selected wash programme with the corresponding additional functions is displayed again.
- If this button is pressed during the running time countdown (preselected start), the timer is reset. All other settings remain stored.
  The number of the preselected programme is indicated in the display.
  The user may now change the settings, start the wash programme or select a new programme start time.

REMAINING CYLE TIME DISPLAY

- If this button is pressed during the programme selection phase, the time is displayed during the running time of the selected programme.
  As soon as the button is released, the number of the selected programme is indicated in the display.

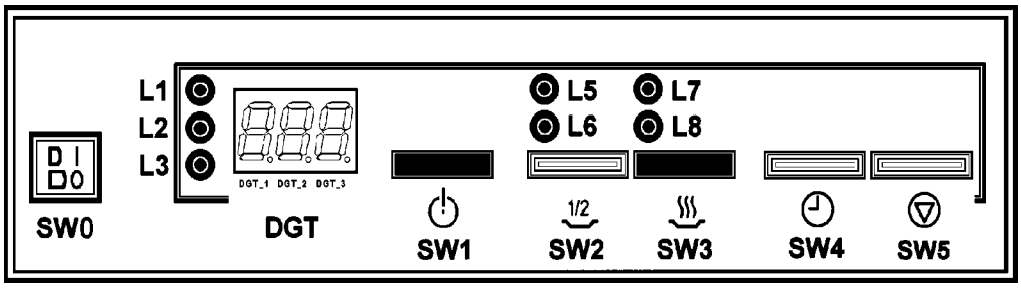
2.2 Acoustic signal (buzzer)

The piezoelectric buzzer installed on the printed circuit board sounds at the beginning and end of the programme and for confirmation each time a button is pressed.
If desired, the user may switch off (deactivate) this acoustic signal by pressing a fixed button combination.

Sequence_A:	Depression of the button	Buzzer signal sounds for 80 ms
Sequence_B;	Programme start	Buzzer signal sounds for 500 ms
Sequence_F:	Programme end	Intermittent buzzer signal of 2 seconds (500 ms ON/ 500 ms OFF)
Sequence_E:	Alarm	Intermittent buzzer signal of 15 seconds (2 seconds ON/ 3 seconds OFF)

2.2.1 Deactivation of buzzer

The buzzer function can be deactivated by pressing two determined buttons at the same time.
Deactivation and reactivation of the buzzer function may only be performed during the programme selection phase, upon programme start and when the appliance door is open.



Proceed as follows to deactivate the buzzer:

- Simultaneously press the buttons “SW1“ and “SW3“ for at least 3 seconds. Afterwards the buzzer will sound (sequence_A) to indicate the deactivation of this additional function.
- When the buzzer has been deactivated, no more acoustic signal will sound upon pressing of a button, at the start or end of the programme and in case of an alarm condition.

Proceed as follows to reactivate the buzzer:

- Simultaneously press the buttons “SW1“ and “SW3“ for at least 3 seconds. During this time no buzzer signal will sound. Afterwards the buzzer function is activated again.

The selected setting will be stored when the appliance is switched off.
Standard setting: buzzer activated.

2.3 Remaining cycle time display

The printed circuit board is programmed with an algorithm calculating the remaining programme time to be indicated in the display.

This algorithmic system considers:

- Fixed times for the following programme phases:
  - Draining
  - Washing/cold rinses
  - Programme pauses
  - Drying
- Variable times for the following programme phases:
  - Water intake
  - Water heating
    and for the number of dishes put into the dishwasher

The fixed times are directly determined for each wash programme.

The variable times are changed for each wash programme in accordance with the parameters that have been measured during the preceding wash programmes. In this way, the duration of the wash programme can be changed and adapted in accordance with the conditions under which the appliance is working.

This adaption is made in real time during the execution of the wash programme at the end of each individual programme phase.

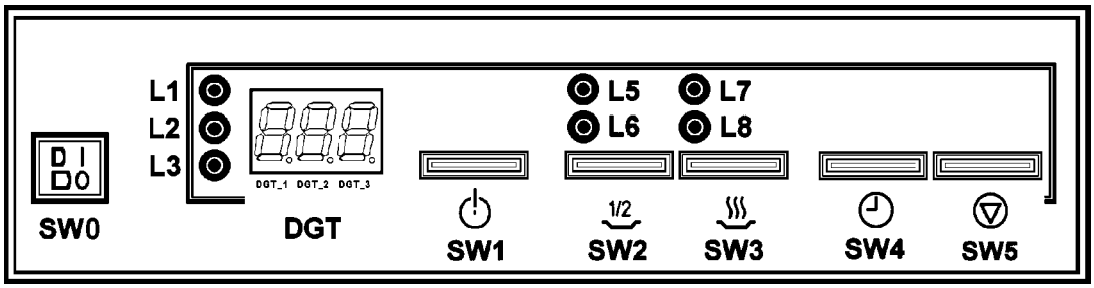
2.4 Power failure

The function “power failure“ ensures that all information concerning the programme sequence and programme parameters remain stored in case of a sudden power failure so that the wash programme may be continued from the point where it has been interrupted when the power supply is activated again.

Basic principle of the “power failure“ function:

In case of a power failure, all electric loads are simultanenously deactivated, and the energy stored in the capacitor is used to store the operational data in the EEPROM.
Therefore the interrupted wash programme can be continued from the point where it has been interrupted in case of repeated power failure.

2.5 Programme selection - programme execution - programme end (without preselected start time)



Programme selection

1. Switch on the dishwasher by pressing the button “SW0“ when the door is open.
   - ◆ The programme that has been executed last [P ..] and the additonal functions that have been optionally selected by the user are shown in the display.
   - ◆ The LEDs “L1“ and/or “L2“ optionally light up.

2. For selecting the desired wash programme press the button “SW1“ several times.
   - ◆ The LED “L3“ lights when the programmes 2 and 3 have been selected.

3. Press the buttons “SW2“ and “SW3“ if these additional functions are desired.
   - ◆ When the programme No. 1 (soaking) is selected, no further additional function can be selected.
   - ◆ In order to display the programme run time, press the button “SW5“.

Programme execution

4. The selected wash programme automatically starts after closing the appliance door.
   - ◆ A brief acoustic signal (sequence_B) confirms the start of the programme.

5. When the programme is started (appliance door closed), the cycle time that remains until the end of the programme is shown in the display. All LEDs have gone out.

6. When the appliance door is open, the remaining cycle time until the end of the programme is shown in the display.
   - ◆ The LEDs “L1“ and/or “L2“ optionally light up.
   - ◆ By pressing the button “SW1“ the running wash programme is displayed.
   - ◆ The LEDs “L5“, “L6“, “L7“ or “L8“ light when the respective additional functions have been selected.
   - ◆ All buttons, except for “SW1“ and “SW5“, are deactivated.

7. In order to cancel the running wash programme, press the button “SW5“.

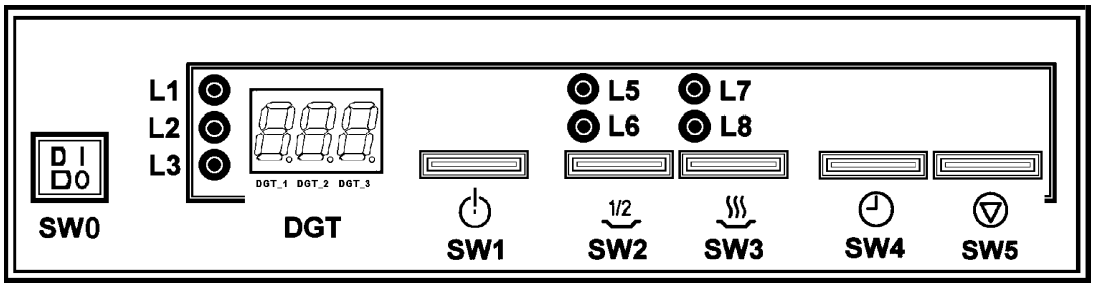
Programme end

8. At the end of the wash programme a buzzer signal will sound (sequence_F).
   - The end of the wash programme is indicated by 3 illuminated segments [- - -] in the display.
   - All LEDs, except for “L1“ and “L2“ (optional), go out.
   - All buttons, except for the button “SW1“, are deactivated.

9. The dishwasher can be switched off by pressing the button “SW0“ or a new wash programme can be selected by pressing the button “SW1“ when the dishwasher door is open.
   - If the button “SW1“ is pressed once, the dishwasher returns to the originally set operating conditions including corresponding additional functions.

2.7 Setting of the water softening unit

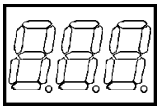
The water hardness may only be changed prior to the start of the wash programme.



Proceed as follows to change the water hardness level:

1. Switch on the dishwasher (setting condition).

2. Simultaneously press the buttons “SW2“ and “SW3“ for at least 5 seconds.
   [L . .] is shown in the display:
   - Dgt_1 = [**L**] (flashes)
   - Dgt_2 = extinguished
   - Dgt_3 = display of the preset water hardness level (between 0 and 9)



Example: Display of the factory-set hardess level.

3. To change the setting, press the button “SW3“, which is marked by the flashing LED “L8“ , within 5 seconds. All other buttons are deactivated.

- 5 seconds after the button “SW3“ has been pressed for the last time, the dishwasher stores the set water hardness level and then automatically returns to the original operating mode.
- The set water hardness level remains stored when the appliance is switched off.
- Factory-set water hardness: level 4.

2.7.1 Special regeneration programme

With the new water softening system IWMS the water hardness level for an individual wash programme can be adjusted as follows (calculation of the cycle intervals starting from a programme with 5 intake phases per cycle):

Water hardness level	Autonomous cyles	Intake phases	Treated water hardness °F (TH)	Treated water hardness °D (dh)
0	no regeneration	-	0 - 8	0 - 4
1	8 cycles: regeneration during the 9th cycle	40	9 - 14	5 - 8
2	6 cycles: regeneration during the 7th cycle	30	15 - 20	9 - 11
3	4 cycles: regeneration during the 5th cycle	20	21 - 30	12 - 17
4	3 cycles: regeneration during the 4th cycle	15	31 - 40	18 - 22
5	2 cycles: regeneration during the 3rd cycle	10	41 - 50	23 - 28
6	1 cycle: regeneration during the 2nd cycle	5	51 - 60	29 - 33
7	0 cycles: regeneration during each cycle	1	61 - 70	34 - 39
8	0 cycles: regeneration during each cycle	1	71 - 80	40 - 45
9	0 cycles: regeneration during each cycle	1	81 - 120	46 - 70

- The cycle counting for the performance of the “special“ regeneration programme is based on the number of intake phases rather than on the actual cycle number. Therefore, this process is not dependent on the number and type of the executed programmes.

- When the water hardness level is changed, a water softening procedure is automatically executed for the subsequent program, i. e. independent of the number of inflow phases that have been performed beforehand.

- After installation of the new circuit board, a regeneration cycle is automatically performed during the first wash programme, independent of the preset water hardness level.

Note: The time-out of the solenoid regeneration valve is set to 10 minutes.

- After a regeneration process, the subsequent water intake is automatically performed with a static intake phase of 45 seconds (instead of 30 seconds).

2.8 Washing: with full load/half load

With respect to the distribution of the dishes, the serial settings of the alternating wash phases can be changed by pressing the button “½ LOAD“ (SW2).

The times of the alternating wash phases are factory-set.

Duration of the alternating wash phases with full and half load

Programme phase	Full load ↑ ↓		½ LOAD ⇑ ↓		½ LOAD ↑ ⇓	
	upper spray arm t = sec.	lower spray arm t = sec.	upper spray arm t = sec.	lower spray arm t = sec.	upper spray arm t = sec.	lower spray arm t = sec.
PREWASH	25	25	40	25	25	40
CLEAN	25	25	40	25	25	40
PAUSE	25	25	40	25	25	40
COLD RINSE CYCLES *)	25 / 40	25	40	25	25	40
HOT RINSE CYCLE*)	25 / 40	25	40	25	25	40

Explanation of symbols:

↑ ↓ = balanced changing function
⇑ ↓ = function mainly in upper dish basket
↑ ⇓ = function mainly in lower dish basket
*) variable changing function (specific variant, see programme table)

When the button “½ LOAD“ is pressed:

- The prewash cycle is not executed in the programmes 3, 4, 6 and 9.
- In the programme 2, total drainage of the water during the prewash cycle is replaced by partial drainage.
- In all programmes (except for programme 8) one cold rinse cycle is cancelled.

2.9 Specification of drives and sensors

2.9.1 Components

Component type	Power consumption	Control type
Circulating pump	max. 250 W	Triac & Relay
Wash water pump	max. 100 W	Triac & Relay
Heating element Wash	max. 2300 W	Relay
Water intake solenoid valve	max. 10 W	Triac
Reset/fan solenoid valve	max. 10 W	Triac
Detergent/rinse aid solenoid valve	max. 10 W	Triac
Regeneration/resin cleaning solenoid valve	max. 20 W	Triac

2.9.2 Sensors

Sensor type	Type of reading	Component type
Salt sensor	Digital 5 V	Reed
Rinse aid sensor	Digital 5 V	Reed
Temperature sensor	Analog 5 V	NTC
Tachometric sensor	Frequency 5 V	Tacho-generator
Door locking sensor	Digital, high voltage	Switch
Sensor for protection against leakage	Digital, high voltage	Switch

2.10 Motor operation

This dishwasher is equipped with an asynchronous single-phase motor with variable speed setting.

A built-in tachometric probe constantly measures the motor speed and transfers it to the electronic control system.

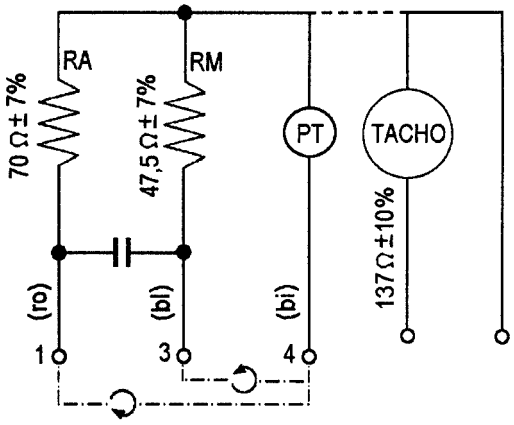
Measurement of the motor speed

- The motor operation is monitored by the electronic control system which changes the motor speed for optimisation of the individual wash programmes.
- The signal transferred from the tachometric sensor to the electronic control system (microprocessor) indicates the motor speed.
  The microprocessor performs a number of calculations via the “supply reduction“ system and then switches on the Triac in order to generate the respective speed.

- The following motor speeds are used during the wash programme:
  - 1600 rpm: pressure impulse protection routine
  - 1900 rpm: mainly during the prewash cycle and during the water cleaning phases
  - 2100 rpm: mainly during the hot rinse cycle
  - 2300 rpm mainly during the cold rinse cycles
  - 2700 rpm: during the impulse wash cyle

Features

- Power supply: 220-240V 50Hz
- Capacitor: 4µF
- Direction of rotation: bidirectional
- Cleaning phase: counterclockwise
- Draining phase: clockwise



Cleaning/draining

The functions CLEANING and DRAINING are activated by alternating supply of the main coil (RM) and the auxiliary coil (RA).

The control of the motor circuit is realised via the control circuit board. This board:

- supplies the two coils via TRIAC (TY1) and determines the speed of rotation;
- determines the alternating supply of the two coils via RELAY (R1).

Functional priniciple of the motor control circuit:

CLEANING phase

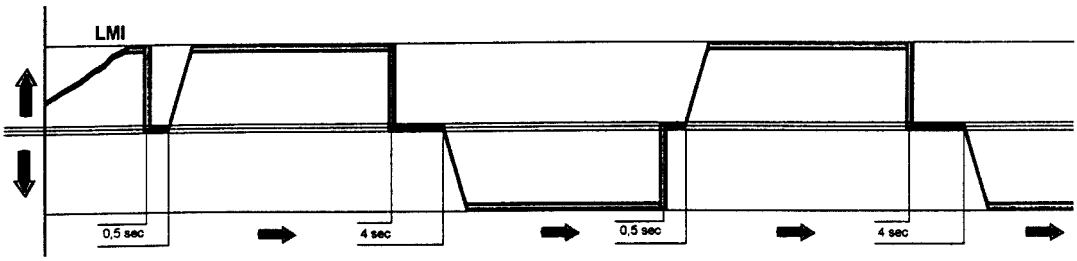
- RELAY not supplied

DRAINING phase

- RELAY supplied

Alternating wash cycle

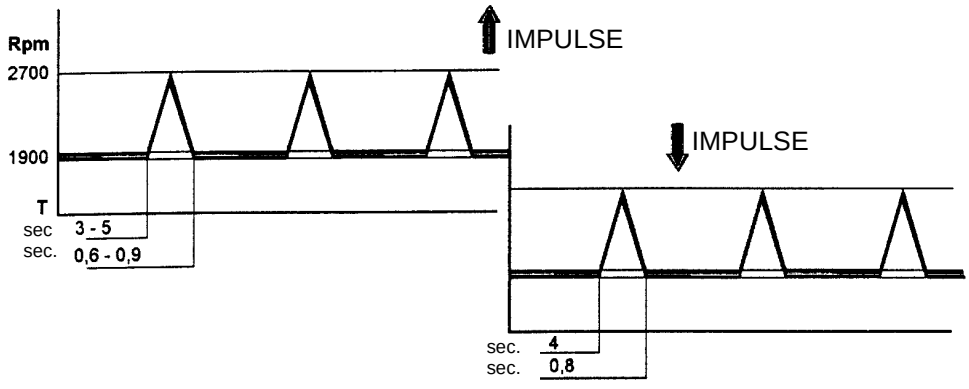
The ALTERNATING WASH FUNCTION is achieved by supplying the motor via a control system, which provides pauses of a fixed duration when both spray arms are operating.



Impulse wash cycle

In case of the IMPULSE WASH FUNCTION the motor is alternatingly supplied with two rotational speeds by means of a control system. These phases are interrupted by brief impulses (each interval of (t) seconds is followed by an interval of (t) seconds).

Impulse wash cycle	Upper spray arm	Lower spray arm
Motor speed (rpm)	1.900	1.900
Intervals (t)	3 + 5 sec.	4 sec.
Impulses (t) Motor speed (rpm)	0.6 + 0.9 sec. 2.700	0.8 sec. .,700



2.10.1 Pressure impulse protection

- When the motor operation is interrupted by opening and repeated closing of the appliance door during the warm water cleaning phases, pressure impulses may occur when the motor is started again.
- A pressure impulse may lead to a leakage of water at the appliance door sealing.
- The control circuit board performs a special control procedure in order to monitor the motor operation and to prevent the generation of pressure impulses.
- This control procedure includes a phase (approx. 20 seconds) in which the motor runs at a speed of **1600 rpm.**
- This procedure only takes place in the cleaning phases and when the wash programme is continued after a power failure or when the appliance door has been opened and closed again.
- In this phase all power consumers are deactivated.

2.11 Water intake

The latest software permits the control of the water intake by means of a motor speed measuring system “RVM“ for dishwashers equipped with a motor with tachometric sensor.

The intake phase consists of three subphases:

a) Static intake
b) Dynamic intake
c) Additional intake

a) Static intake phase

- The intake solenoid valve opens and the water flows into the wash container.
- The duration of the intake phase is limited to 30 seconds (45 seconds if a regeneration procedure has been performed during the preceding wash programme). This phase is followed by a:

b) Dynamic intake phase

- During the dynamic water intake phase the water volume required for the correct functioning of the water circuit flows into the water collecting container.
- The water circuit operates correctly when the water volume in the water collecting container enables a smooth and continuous pump operation without variations of speed and generation of cavitation.
- When this operating condition is reached, the dishwasher is dynamically balanced.
- In case of a generation of cavitation, the motor speed is increased.

- The extent of the generation of cavitation can be measured by comparing the effective motor speed with a determined objective speed.
  This comparison permits the determination of the “speed fault“, i. e. when the motor speed exceeds the objective speed.

At this point in time the system detects a possible generation of cavitation under consideration of the following parameters:

1. speed fault
2. duration of the generation of cavitation

1. Speed fault

- The speed fault must exceed the respective threshold value.
- In order to determine this condition, the electronic control system adds the objective speed value to the threshold value.

Objective speed rpm	Threshold value rpm	Speed fault rpm
2300	40	> 2340

2. Duration of the generation of cavitation

Test results have shown that a typical generation of cavitation normally lasts approx. 200 msec.

The task of this system is thus to detect a generation of cavitation and to determine the exact point in time when the water circuit reaches the dynamical equilibrium.

In order to recognise the occurrence of a generation of cavitation, a speed fault to which the following parameters are applicable, must be detected:

- higher than the threshold value
- duration longer than 200 msec.

Detection of the “LMI“ water level

When the water intake control system detects the condition of dynamical equilibrium, a number of tests are conducted in order to check the stability of this operating condition and to determine whether the “LMI“ water level has been reached.

Stability control:

This control phase lasts for a time period of max. **20 seconds** during which:

- the “LMI“ water level is considered as reached when no generation of cavitation has been recognised for more than 20 seconds. The phase of the dynamic water intake is thus completed and the additional water intake phase starts.
- If the generation of cavitation is detected (within the defined time period of 20 seconds and for a longer duration than 200 msec), the intake solenoid valve opens intermittently in order to enable the intake of new water.
- Afterwards the stability tests are repeated.

Intake time

The maximum total intake time amounts to **2.5** minutes. The solenoid valve may be open during this time period. The time period comprises the following intake phases:

a) static intake phase

b) dynamic intake phase

Besides that, a time of max. 4 minutes has been defined during which a time-out will be triggered. This time-out puts the appliance in an alarm condition if the “LMI“ equilibrium is not reached within the dynamic intake phase due to the generation of cavitation.

c) Additional water intake

If the “LMI“ level is reached, an additional water intake phase of variable duration (approx. 3 + 5 sec.), varying from phase to phase, is executed.

3. Safety/control and alarm systems

3.1 Description of the safety and alarm systems

During the execution of the wash programme, a number of safety systems is activated for the protection of all appliance components.

If one of the following safety systems is activated (e. g. in case of an operating condition that may impair the appliance operation), a time-out function which brings the wash programme to a stop, is triggered. Optical indications on the control panel and an acoustic signal (buzzer) indicate that an alarm has been triggered.

.

Safety system	Programme interruption	Automatic programme reset		Alarm code	
NTC detector short-circuited	Yes	No		**A1**	
NTC detector circuit open	Yes	No		**A2**	
Heating ramp	Yes	No		**A3**	
Protection against leakage	Yes		Yes		**A4**
Water intake level control	Yes		Yes		**A5**
No draining	Yes	No		**A6**	
Pump motor blocked	Yes	No		**A7**	
Motor Triac short-circuited	Yes	No		**A8**	

If a time-out is triggered, the corresponding alarm code is indicated in the display and an acoustic buzzer signal (sequence_E) will sound.

In case of an alarm condition:

- The three digits in the display indicate the respective alarm code.
- All LEDs go out.
- All buttons (SW1, SW2, SW3, SW4, SW5) are deactivated.
- The function CANCEL cannot be executed.

In order to reset the alarm condition, switch the appliance off by pressing the button “SW0“.

If the button “SW0“ is pressed a second time to switch the appliance on again, two different operating conditions may occur (depending on the alarm that has been triggered):

1. Automatic programme reset “Yes“ (alarms A4, A5):
   the wash programme is cancelled. The same programme can either be repeated or a new programme selected.
2. Automatic programme reset “No“ (alarms A1, A2, A3, A6, A7, A8):
   the wash programme is interrupted and afterwards continued from the point of interruption.

   Note: In both cases the appliance will return to the alarm condition, if the failure occurs again.

3.2 Description of the control systems

3.2.1 NTC temperature detector control

This alarm system is active from the end of the first water intake phase until the end of the last cleaning phase.

The impedance of the NTC detector is permanently controlled.

If too high values (> +85 °C) or too low values (< -5 °C) occur with respect to the impedance/temperature conversion executed by the electronic control system, an alarm is triggered.

ALARM **[A 1]** (short circuit)
ALARM **[A 2]** (open circuit)

Possible causes:

a. sensor / wiring short circuit
b. sensor / wiring separated/interrupted
c. too low temperature (< -5 °C)
d. too high temperature (> +85 °C)

3.2.2 Heating ramp control

This control procedure comprises three phases:

1) In the first minute of the heating phase

If the NTC temperature detector detects a water temperature that is **7 °C** above the initial temperature during the first minute of heating, an alarm is triggered.

2) From the second minute of the heating phase

From this point of time a minimum heating time required to reach the desired temperature is calculated. A minimum temperature increase of **5 °C per minute** is permissible in this case.
If the desired water temperature is reached before the determined minimum time period has expired, this means that a temperature increase of **5 °C per minute** has been exceeded and thus an alarm is triggered.

3) Poor heating ramp performance

A maximum heating time of **45 minutes** has been determined for heating the water. If the water is not heated to the temperature required for the selected programme within this time period, an alarm is triggered.

ALARM **[A 3**]

Possible causes:

a. poor water circulation in the water collecting container
b. NTC detector defective/in a bad position/
thermal contact too weak
c. main filter clogged
d. excessive foam formation
e. heating resistor disconnected
f. safety thermostat open

3.2.3 Protection against leakage

This control system is active during the entire wash programme (except for the water intake phases).

A mechanical float switch located at the base of the dishwasher is connected in series with the water intake solenoid valve. This floater activates a microswitch which interrupts the power supply of the solenoid valve.

The electronic control system detects the activation of the sensor and the wash water pump is switched on for 1 minute. Afterwards an alarm is triggered.

ALARM **[A 4**]

Possible causes:

a. leakage of water at the sealing of the water collecting container / at various connections
b. float switch mechanically blocked

3.2.4 Control of the water intake level

Control is achieved by means of a time-out that is active during the water intake phases.

After expiry of a determined time **("T")** the control system finally switches off the water intake solenoid valve.

The maximum opening time **("T")** of the solenoid valve is set to **2.5** minutes. The maximum delivery rate of the water intake solenoid valve (4 l/min.) and the overflow volume of the appliance (approx. 11 l) have been considered for the determination of this value.

In the additional water intake phases, the time-out amounts to **1/2T** (half of the time).

The counting of time "**T**" is started when the solenoid valve is opened and ends when the dynamical equilibrium is reached ("LMI" water level).

ALARM **[A 5**]

Possible causes:

a. shut-off valve of intake hose closed
b. system pressure < than 0.3 bar
c. activation of the Aquastop device
d. activation of the overflow protection unit
e. intake solenoid valve / interrupted connections
f. connection hose between water collector and IWMS clogged
g. impeller filter clogged
h. siphon effect in the drainage hose
i. pump running wheel set: friction / loose
k. sensor of the tacho-generator defective

3.2.5 Control - Bad draining procedure

This time-out is active during all water draining phases.

The maximum draining time **("T")** amounts to **60 seconds.**

If the "LMD" water level is not reached within the determined time **("T")** during the draining phase, an alarm is triggered.

ALARM **[A 6**]

Possible causes:

a. draining system not working properly (clogged/blocked)
b. wash water pump defective (difficulties during commissioning)
c. float valve in resin container open
d. wash water pump outlet clogged/blocked

3.2.6 Control - Pump rotor blocked

This control system is active during the entire wash programme.

A blocked rotor is detected by the tachometric sensor. This sensor also enables detection of a defective tacho-generator as follows:

When the motor is switched on, it must reach a speed of 2,000 rpm within 5 seconds. If this is not the case, an alarm is triggered.

ALARM **[A 7]**

Possible causes:

a. motor coil short circuit
b. motor coil interrupted
c. motor mechanically blocked
d. electrical connections interrupted / loose
e. tachometric sensor defective/short circuit

3.2.7 Control - Motor Triac short circuit

This control system is active during the entire wash programme.

The electronic control system checks whether the power supply to the motor is correct and detects the reason for a possible failure.

If the microprocessor receives a signal from the tachometric sensor indicating that the motor is running while it should actually be switched off, an alarm is triggered.

ALARM **[A 8]**

Possible causes:

a. control circuit board Triac short circuit

3.2.8 Control - Dishwasher door open

Control is achieved via a high-voltage sensor connected on the load side of the door switch.

If the dishwasher door is opened, all electrical loads (motor, heating element, etc.) are automatically deactivated. The electrical control system recognises that the dishwasher door is open and stores the executed programme phase.

3.2.9 Control of the rinse aid level

This control system consists of a reed sensor that is activated via a float switch located at the rinse aid container.

3.2.10 Control of the salt level

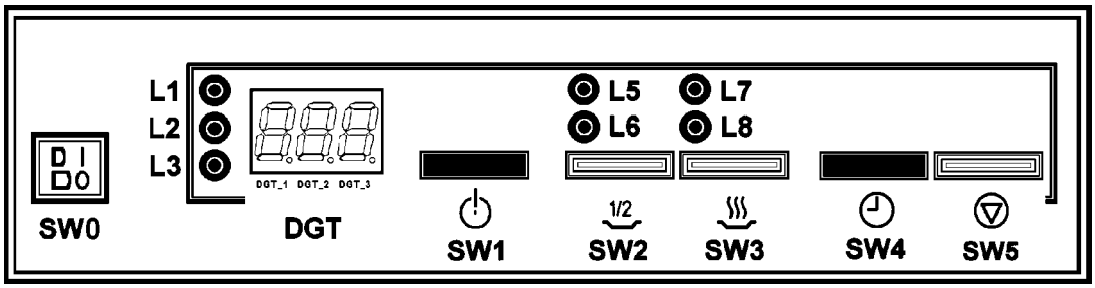
This control system consists of a reed sensor that is activated via a float switch located at the salt container.

4. Service: Diagnosis programmes and additional functions

4.1. Component diagnosis programme

The diagnosis programme is composed of two sections:

- The **first section** provides the after-sales service technician with various information concerning the condition of the dishwasher.
- The **second section** enables the functional testing of the electrical components.



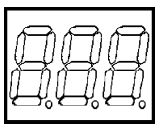
Setting of the component diagnosis programme:

When the dishwasher door is open and the appliance has been switched off (setting phase):

1. Press the buttons “SW1“ and “SW4“ simultaneously and keep them depressed.
2. Press the button “SW0“ and switch the dishwasher on.
   - After approx. 5 seconds all segments of the display light up and an acoustic signal sounds for 5 seconds (sequence_B) in order to confirm the start of the test programme.

In the **first test programme section** the following information is successively displayed:

a) SOFTWARE VERSION
The following indication is shown in the display:

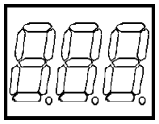


DGT_1 & DGT_2	[. . .] one or two digits (0-99)
DGT_3	[.] one letter (A,B,C,D,E,F)
Example: [**. 4**] =	Software version of the control circuit board (first dishwasher series)

If the button “SW1“ is pressed again, the following information is shown in the display:

b) FACTORY-SET CUSTOMER-SPECIFIC SETTINGS;
SETTINGS OF THE AFTER-SALES SERVICE

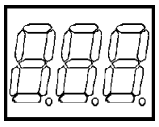
The following is shown in the display:



DGT_1 & DGT_2 [**- - .**] the central segments are illuminated
DGT_3 [**.**] one digit [0, 1, 2, 3] that indicates possibly activated additional functions

Example: **[- - 0]** = no additional function activated (factory-set standard setting.

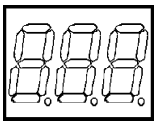
c) NUMBER OF WASH PROGRAMMES EXECUTED



The display shows the number of wash programmes executed by the dishwasher in two successive phases:
DGT_1= [**C . .**] (programmes)
DGT_2 = digit (thousands)
DGT_3= digit (hundreds)
and then, after pressing the button SW 1:
DGT_2= digit (tens)
DGT_3= digit (units)
The total number of all wash programmes results from the sum of the display indications.

Example: [**C 1 5**] + [**. 1 3**] = 1513 programmes

d) LAST ACTIVATED ALARM



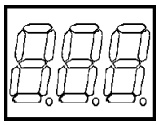
The code of the last activated alarm is shown in the display as follows:
DGT_1= [**A . .**] flashing (abbreviation for ALARM)
DGT_2 = [**. .**] extinguished
DGT_3= [**.**] (alarm code) [1,2,3,4,5,6,7,8]

Example: [**A , 4]** = alarm overflow protection
In the **second section** the following information is successively displayed:
In order to access the component diagnosis programme press the button “SW1“ again.

WHEN THE DISHWASHER DOOR IS CLOSED:

◆ Repeatedly press the button “SW1“ in order to successively check the correct operation of the following electric components:

e) The following is shown in the display:



DGT_1 & DGT_2= [**C d .**] (abbreviation for component diagnosis progamme)
DGT_3= [**.**] (component code) (0,1,2,3,4,5,6,7,8)

0. water intake solenoid valve (time-out 60 seconds)
1. built-in detergent and rinse aid distributor (time-out 60 seconds)
2. circulating pump motor (time-out 60 seconds)
3. heating element (time-out 20 seconds)
4. fan (time-out 60 seconds)
5. regeneration and resin cleaning solenoid valve (time-out 60 seconds)
6. wash water pump motor (time-out 60 seconds)

Note: The codes **7, 8** and **9** shown in the display are deactivated.

At the end of the test programme:
- The display and all LEDs light up for 2 seconds.
- The BUZZER sounds (sequence_B) and
- the code of the SOFTWARE version is shown in the display again [**. . .**].

In order to quit the diagnosis programme, press the button (SW0).

4.2 Function diagnosis programme

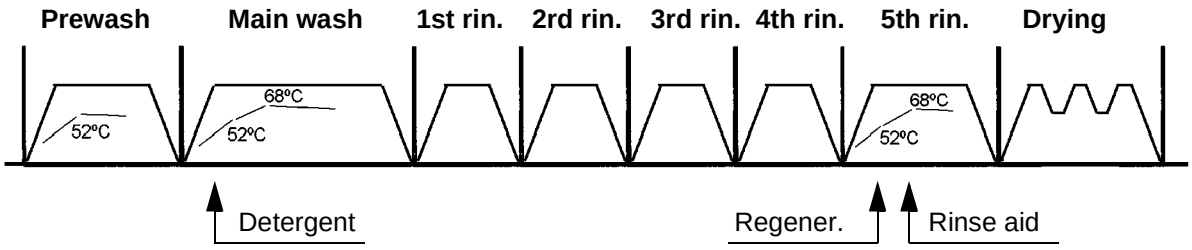
The purpose of the function diagnosis programme is to offer the after-sales service technician a fast function test of all wash programme subphases by means of a sequential execution of the individual wash programme phases.

Every programme phase consists of various subphases.

In this way all functions executed during a wash programme can be checked by the sequential execution of the individual programme subphases. It is also possible to skip certain subphases so that only the desired functions are checked while the remaining functions are excluded.

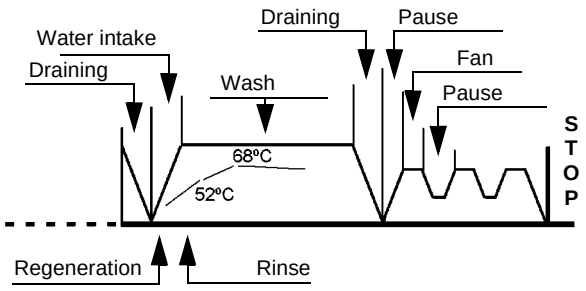
Cycle phases of a wash programme

Programme phases



A specific identification code is assigned to every subphase. This code is shown in the display during the test programme run.
Composition of the programme subphases
(Example: 5th rinse cycle and drying)

Programme subphases



Programme subphase CODES
[**F d 0**] = water intake

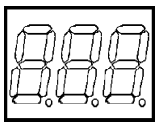
[**F d 1**] = water drainage

[**F d 2**] = alternating wash
water heating

[**F d 3**] = fan

[**F d 4**] = pause

After the diagnosis programme has been started, the code of the subphases executed is shown in the display. Individual subphases can be skipped if the determined programme sequence is observed.



The following is shown in the display:

DGT_1 & DGT_2= [**F d .**] (abbreviation for function diagnosis programme)
DGT_3= [0,1,2,3,4] one digit for the programme subphase executed

Example: [**F d 1**] = water drainage

Information for the after-sales service

It is possible to choose any programme for the execution of the diagnosis programme. However, it is recommended to choose the programme **No. 10** (PLATE WARMING).

This programme is ideally suited as it consists of two programme phases (washing and drying). In these two programme phases all subphases required for checking the main functions are executed.
During the execution of the subphases [**F d 2**] it is also possible to check the heating and regeneration functions (see diagram “Structure of the programme subphases“). For this purpose, first of all the water hardness level [**L . 9**] must be set.

Setting of the function diagnosis programme:

When the dishwasher door is open and the dishwasher has been switched off (setting condition):

1. Simultaneously press the buttons “SW1“ and “SW5“ and keep them depressed.
2. Switch on the dishwasher by pressing the button “SW0“.
   - ◆ After approx. 5 seconds an acoustic signal (buzzer) will sound for 5 seconds (sequence_B) to confirm access to the diagnosis programme.
   - ◆ The programme last executed (e. g. programme 3) and the letters “**F d**“ are alternately shown in the display [**- - -**]: [**P 3**] & [**F d .**].
3. Select programme No. 10 (or another).
   - ◆ [**P 10**] & [**F d .**] are alternately shown in the display.
4. Close the dishwasher door to start the diagnosis programme.
   - ◆ The start of the programme is confirmed by an acoustic signal (BUZZER) (sequence_B).
   - ◆ [**F d 1**] (number of the subphase) is shown in the display as every start of the programme is followed by a draining phase.
5. Press the button (SW1) in order to change to the next subphase.
   - ◆ If the button (SW1) is not pressed, the normal programme sequence in accordance with the programme diagram is executed.
   - ◆ If the dishwasher is switched off, the diagnosis programme is quitted when the dishwasher is switched on again. The normal wash programme is continued from the point where it was interrupted.
   - ◆ At the end of the programme, three illuminated segments [**- - -**] are shown in the display.
   - ◆ In order to quit the diagnosis programme, press the button “SW0“.

The safety systems are also active during the execution of the diagnosis programme. In case of failures, the respective alarm code is shown in the display.

4.3 Options for improving the washing result

In order to change the washing parameters, the access was changed. This depends on the built-in electronics.

Dishwashers: Production starting from Oct. ’98 - Serial No. 843 ... to Nov. ’98 - Serial No. 847

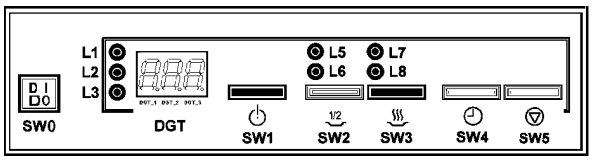
SOFTWARE - Identification	Update
[- 7 E]	Improved electronics
[- 8 E]	Updating of the remaining cycle time display after a power failure (did not always function before).
	Switching off of the buzzer function (function was deactivated before).

Dishwashers: Production starting from Nov. ’98 - Serial No. 848

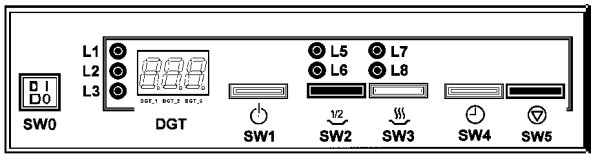
SOFTWARE - Identification	Update
[- 9 E]	Modification of the access to the diagnosis programme (before this modification was made, the service technician could access the diagnosis programme unwillingly.)
	Wrong starting of the dosing combination (in some cases the dosing combination opened when the direction of rotation of the motor was changed).

The door must be opened and the dishwasher must be switched off.

1. **Dishwashers: Production starting from Oct. ’98 - Serial No. 843 ... to Nov. ’98 - Serial No. 847**
   Keep **SW1** and **SW3** depressed.



   Dishwashers: Production starting from Nov. ’98 - Serial No. 848
   Keep **SW2** and **SW5** depressed.

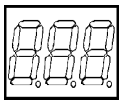


2. Press **SW0** to switch on the dishwasher.

   ◆ After 5 seconds the display lights up and the buzzer sounds to confirm that the test programme has been activated.

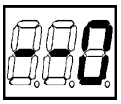
4.4 Additional functions for improving the washing result

In order to start the diagnosis programme or to change over from one additional function to the other, press the button “SW1“.

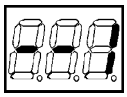


The following is shown in the DISPLAY:

DGT_1 & DGT_2	[**- - .**] two illuminated segments
DGT_3	[**.**] one digit [0, 1, 2, 3] representing the individual additional functions that are determined as follows:

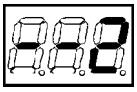


No additional function activated (factory setting).



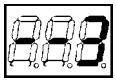
Selection of the following additional functions:

a)	Additional water intake	**+ 20 sec**
b)	Pulsation time	**+ 75 %**
c)	Extended cleaning cycle	**+ 3 min**



Selection of the following additional functions:

a)	Additional water intake	**+ 20 sec**
b)	Cold rinse	**+ 1**



Selection of the following additional functions:

-	Further additional functions	**1 & 2** (a,b,c,d)

In order to confirm the setting, press the button “SW2“.

- Press the button “SW0“ to quit the diagnosis programme.

5. Circuit diagrams

IGV 689.1 9118960-05

Legend

PLUG-IN CONNECTORS

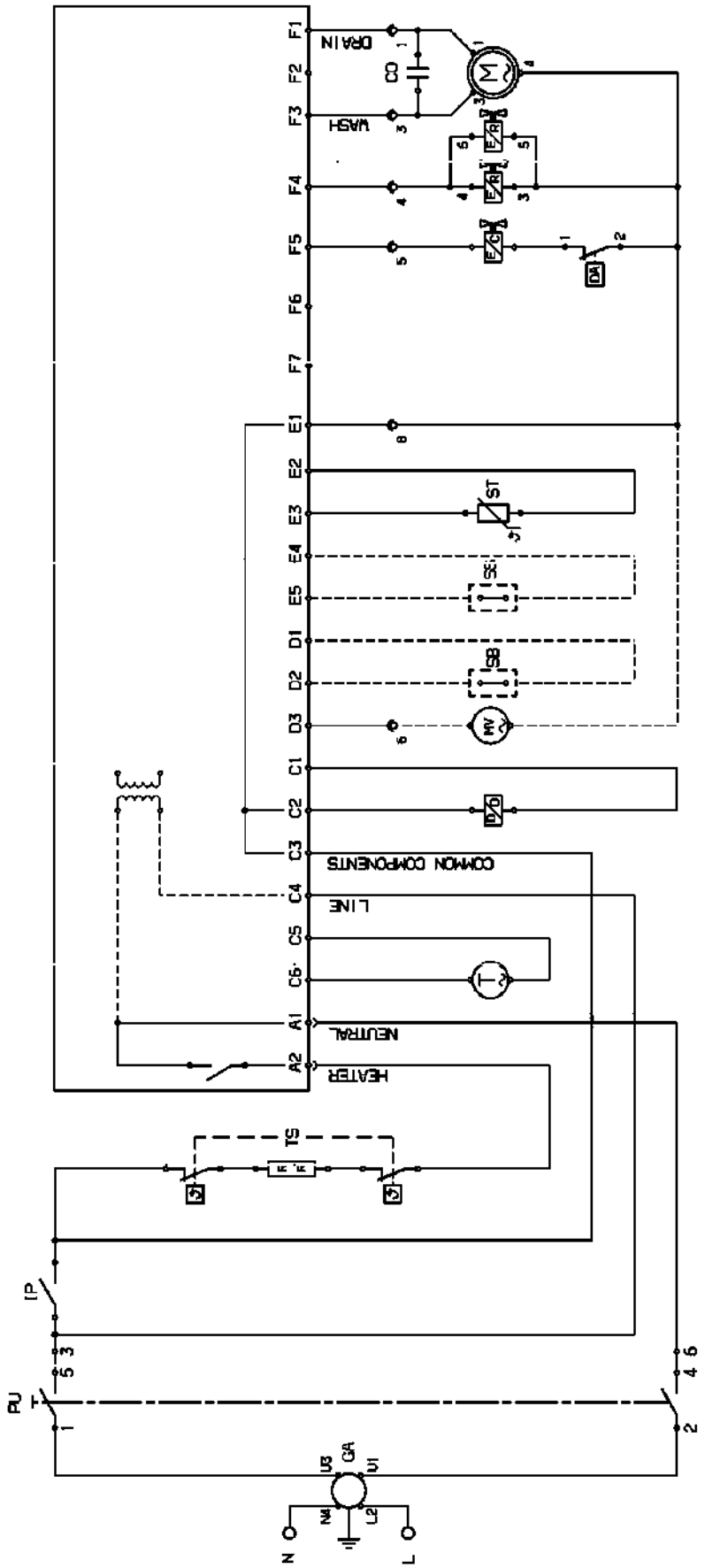
ar	=	orange
bi	=	white
bl	=	blue
ce	=	light blue
gi-ve	=	yellow/green
gr	=	grey
ma	=	brown
ne	=	black
ro	=	pink
vi	=	violet

AA	=	Overflow protection device
CO	=	Capacitor
DA	=	Protection against leakage
DB	=	Container - rinse aid
DD	=	Detergent dispenser
EC	=	Solenoid valve for the water intake
ER	=	Solenoid valve for the regeneration
ES	=	Reset solenoid valve
GA	=	Radio interference suppression
IP	=	Door switch
KM	=	Electromagnet
LS	=	Control lamp
MR	=	Terminal board
MT	=	Motor of the programme controller
MV	=	Fan motor
PL	=	Circulating pump
PL/S	=	Circulating pump/drainage pump
PS	=	Drainage pump
PU	=	Buttons on the control panel
RA	=	Overflow protection device
RE	=	Programme controller relay
RL	=	Pressure switch
RP	=	Time switch
RR	=	Heater
SB	=	Rinse aid sensor
SD	=	Detergent sensor
SS	=	Salt sensor
ST	=	Temperature detector
TA	=	Thermostat H.T.
TAC/T	=	Tacho-generator
TB	=	Thermostat L.T.
TM	=	Thermostat M.T.
TS	=	Safety thermostat

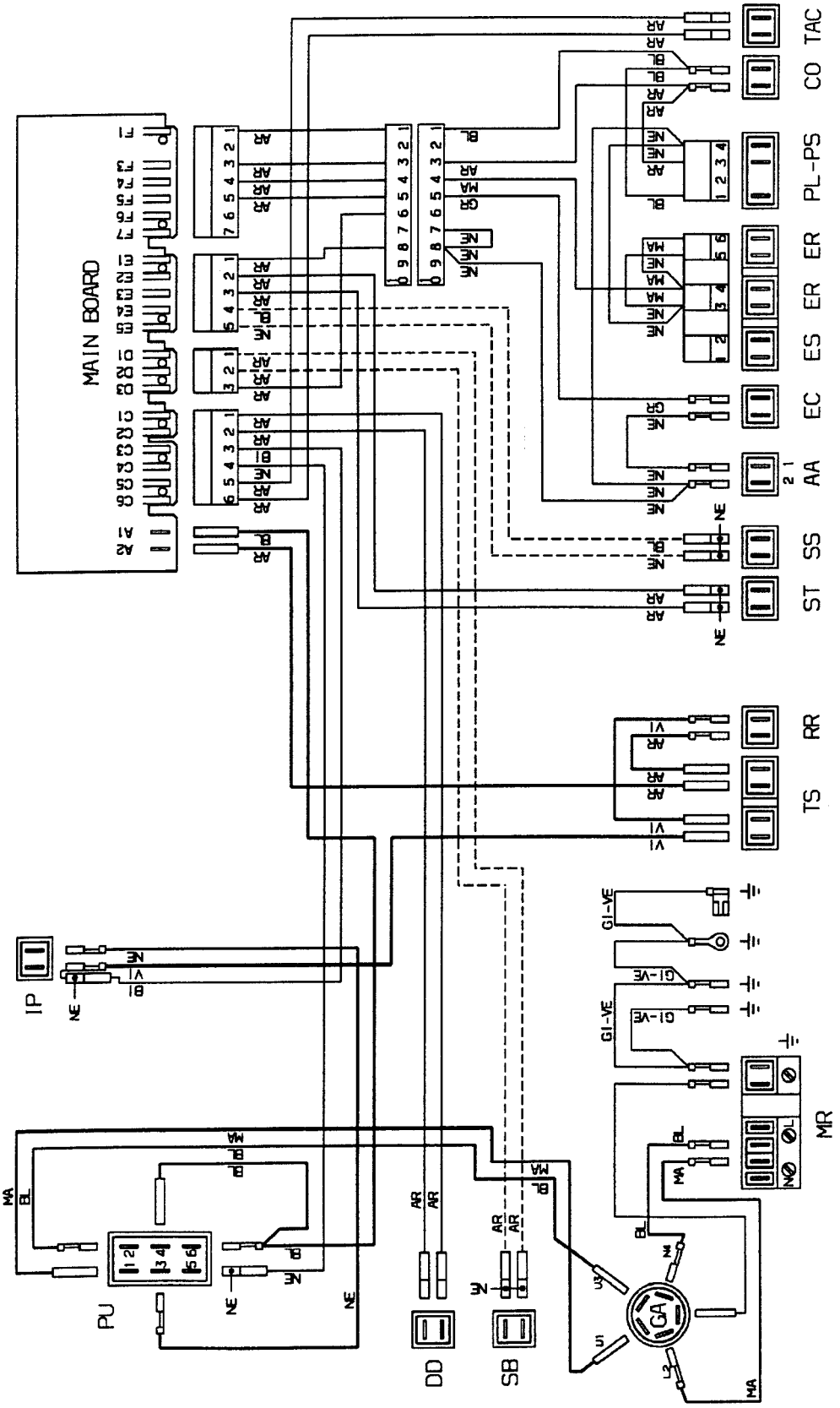
5.1 Technical data

General features		
Operating voltage	V	230
Dimensions: (H x W x D)	cm	82x60x57
Capacity (standard place settings)	N	12
Total power consumption	W	2300
Water volume in base pan (approx.)	l	4
Water pressure max./min.	N/cm²	80/5
Detergent/rinse aid dispenser		
Dosage range	cm³	1.2-5.0
Heating resistor		
1st heating rod - power consumption	W	2100
Resistance	ohm	26
IWMS softener		
Regeneration electrovalve		
Coil resistance	ohm	4950
Resin Wash electrovalve		
Coil resistance	ohm	4950
Water intake valve		
Delivery rate	l/min.	3 - 4
Coil resistance	ohm	3700
Safety thermostat		
Temperature	°C	80
Colour coding		green
Circulating/pump motor		
Insulation		F
Power consumption	W	158
Speed	rpm	2750
Current consumption	A	0.69
Circulation coil	ohm	47.5
Drainage coil	ohm	70
Starting capacitor	V/µF	450/4
Tacho-generator resistance	ohm	137

5.2 Programmme controller



5.3 Circuit diagram



5.4 Table of wash programmes

	WASH PROGRAMME		PREWASH			MAIN WASH	1. RINSE		2. RINSE	3. RINSE	4. RINSE	5. RINSE / DRYING □ - PAUSE - n° 4x180 s ■ - TURBO - n° 2x15 s + 1x30 s						DRYING ○ - PAUSE - n° 4x180 s ● - TURBO - n° 2x15 s + 1x30 s		
	OPTION KEY			ABLAUF	1/2			1/2					□■	E	□■		□	○●	E	
1	PREWASH	T°	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		EXTENDED	6'	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		CHANGE		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	INTENSIVE	T°	52°	–	52°	55°/70°	–	–	–	–	–	63°/70°	□■	58°	□■	–	□	○●	–	–
		EXTENDED	4'	N	–	4'/14'	3'/2'	–	3'/2'	3'/2'	3'/2'	–	–	–	–	10'	–	–	–	–
		WECHSEL		1/2LOAD.=D	/		/	–	/	/	/	/	–		–		–	–	–	–
3	NORMAL *WITH PREWASH.*	T°	45°	–	–	52°/65°	–	–	–	–	–	68°/70°	□■	58°	□■	–	□	○●	–	–
		EXTENDED	–	N	–	3'/8'	6'	–	6'	4'	5'	–	–	–	–	10'	–	–	–	–
		CHANGE		–	–			–				/	–		–		–	–	–	–
4	NORMAL *WITH PREWASH*	T°	–	–	–	52°/65°	–	–	–	–	–	68°/70°	□■	58°	□■	–	□	○●	–	–
		EXTENDED	6'	N	–	3'/8'	6'	–	4'	5'	–	–	–	–	–	10'	–	–	–	–
		CHANGE		–	–			–			–	/	–		–		–	–	–	–
5	NORMAL *WITHOUT PREWASH.*	T°	–	–	–	52°/65°	–	–	–	–	–	68°/70°	□■	58°	□■	–	□	○●	–	–
		EXTENDED	–	–	–	3'/8'	6'	–	4'	5'	–	–	–	–	–	10'	–	–	–	–
		CHANGE	–	–	–			–			–	/	–		–		–	–	–	–
6	BIO *WITH PREWASH*	T°	–	–	–	50°/55°	–	–	–	–	–	68°/70°	□■	58°	□■	–	□	○●	–	–
		EXTENDED	6'	D	–	5'/9'	6'	–	4'	5'	–	–	–	–	–	10'	–	–	–	–
		CHANGE		–	–			–			–	/	–		–		–	–	–	–
7	BIO *WITHOUT PREWASH*	T°	–	–	–	50°/55°	–	–	–	–	–	68°/70°	□■	58°	□■	–	□	○●	–	–
		EXTENDED	–	–	–	5'/9'	6'	–	4'	5'	–	–	–	–	–	10'	–	–	–	–
		CHANGE	–	–	–			–			–	/	–		–		–	–	–	–
8	FAST	T°	–	–	–	55°	–	–	–	–	–	58°	□■	55°	□■	–	□	○●	–	–
		EXTENDED	–	–	–	4'	2'/2'	2'/2'	–	–	–	–	–	–	–	10'	–	–	–	–
		CHANGE	–	–	–		/	/	–	–	–		–		–		–	–	–	–
9	FINE DISHES *WITH PREWASH*	T°	–	–	–	45°	–	–	–	–	–	58°	□■	55°	□■	–	□	○●	–	–
		EXTENDED	6'	N	–	14'	2'/2'	–	3'/2'	–	–	–	–	–	–	10'	–	–	–	–
		CHANGE		–	–		/	–	/	–	–		–		–		–	–	–	–
10	PLATE WARMER	T°	–	–	–	–	–	–	–	–	–	70°	□■	55°	□■	–	□	○●	–	–
		EXTENDED	–	–	–	–	–	–	–	–	–	–	–	–	–	10'	–	–	–	–
		CHANGE	–	–	–	–	–	–	–	–	–		–		–		–	–	–	–

IMPULSE-WASHING

BOTH SPRAY ARMS OPERATED

UPPER SPRAY ARM OPERATED

LOWER SPRAY ARM OPERATED

IN CASE OF THE HALF LOAD FUNCTION, THE SPRAY ARM OPERATION CHANGES IN ACCORDANCE WITH THE RESPECTIVE BASKET SELECTION.

ON THE WATER DRAINAGE UNIT "N" CHARACTERISES A NORMAL AND "D" A PARTIAL DRAINAGE.

DURING THE DRYING PHASE THE TURBO-FUNCTION CHANGES TO PAUSE; IN CASE THE APPLIANCE HAS NO FAN.