

TECHNICAL NOTE No. 005 LB - Apr. 7, 2008

SUBJECT: Washing Machines and Wash & Dryers: functionality check of the electric, electromechanic and electronic components.

(Information in Handbook: LB2 - Updated on: October 2007 - Update: 1)

1) FOREWORD:

This Technical Note resumes the all the necessary procedures, to check the functionality of the main electric, electromechanical and electronic components, installed on the Candy designed washing appliances produced from 2001 until today.

2) SUGGESTED TOOLS AND ACCESSORIES:

To easily carry out the checks listed in this Note, we suggest the use of the hereunder listed instruments and tools:

- **DIGITAL MULTIMETER:** the Multimeter must be capable of measuring Voltage (**V**) and Current values (**A**) for both Alternated (**AC**) and Continuous (**CC**) Currents; the Ohmic values (**Ω**), the Diodes and Continuity check (**with Buzzer**). The Multimeter must be equipped with Test Leads with safety plugs connectors (like the Multimeter offered by GIAS in the Technical Note No. 001GE - 2001, updated in the year 2006).
- **DIGITAL THERMOMETER:** the Digital Thermometer can be either a classic one with wire thermocouple and contact probe, or an "infrared" one with the possibility of connecting a wire thermocouple as well (like the Infrared Thermometer offered by GIAS in the Technical Note No. 001GE - 2001, updated in the year 2006).
- **PATCH CORD EXTENSION:** managed by GIAS with P/N. **91941051** (Technical Note No. 001GE - 2001, updated in the year 2006) is equipped with a magnetic-thermic main safety switch and allows to carry out "safe" checks on all components of the appliance and the Self-diagnosis as well. It comes equipped with a couple of black/red Multimeter's cables with safety plugs.

For the easy and safe check of the motorized selectors, potentiometers and electric motors, GIAS has made available some specially designed Test Leads with safety plugs, suitable to be directly plugged-in the Multimeter's sockets (see **ATTACHMENT A** and **ATTACHMENT B**).

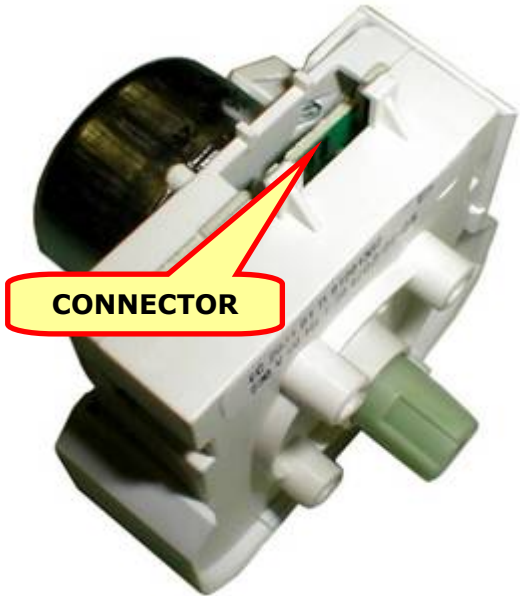
- **MAINS CABLE:** it can be a whatever original GIAS Washing Machine's spare mains cable, equipped by you with **INSULATED** (covered) **MALE AMP** connectors. It's necessary to check the Motorized Selectors.

3) FUNCTIONAL CHECK OF THE PROGRAMS SELECTORS:

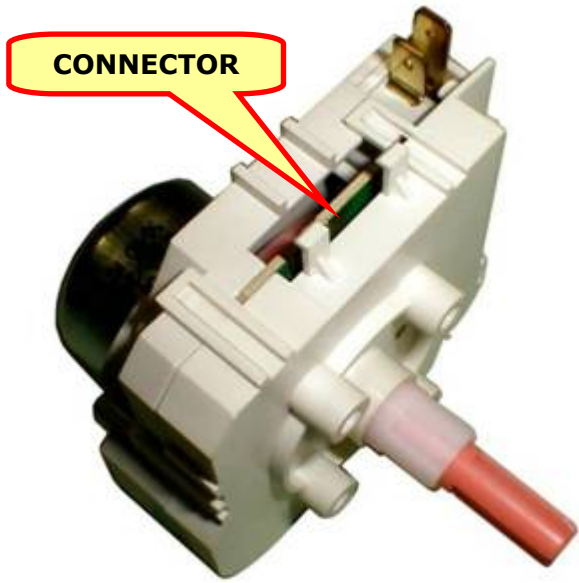
3a) Check of MOTORIZED SELECTORS with "Short Shaft" and "Long Shaft" (16, 22, 30 positions)

The Motorized Selectors (both with Short and Long shaft – see pictures) were used on the Washing Machines with mechanical water distribution system (with **rod** and **movable spray nozzle**), with all types of available electronics. These selectors include a **potentiometer** with several (16,22,30) setting positions, mechanically coupled with an **electric motor** that was used to move the rod connected with the movable spray nozzle. Each Potentiometer's setting is corresponding to a precise and unique ohmic (Ω) value, each one being related to a different washing program. The Cuore Control Module is sending a low voltage current to the selector, the current voltage being lowered when crossing the resistance of the set position. Then the current returns to the Control module. Reading the voltage value of the returning current, the Control Module is then able to understand what the Selector's setting is.

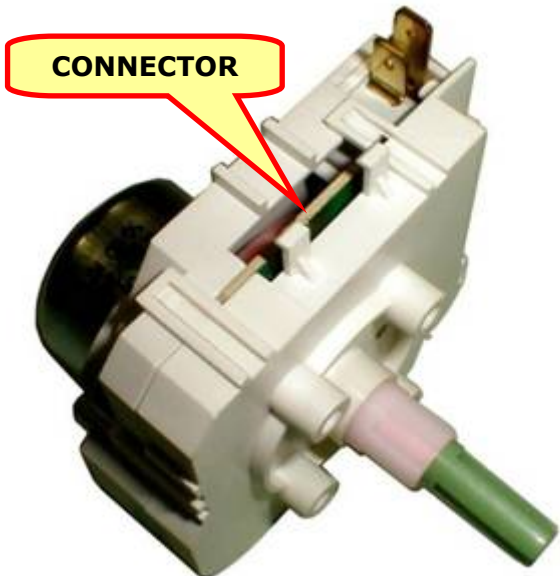
INVENSYS- 30 POS. SHORT SHAFT



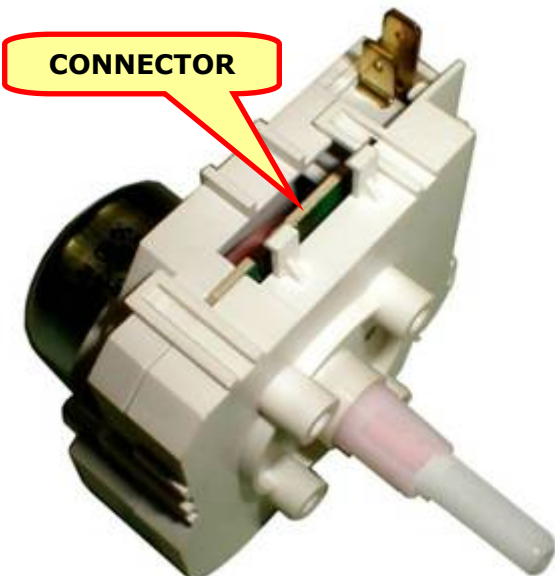
INVENSYS- 30 POS. LONG SHAFT



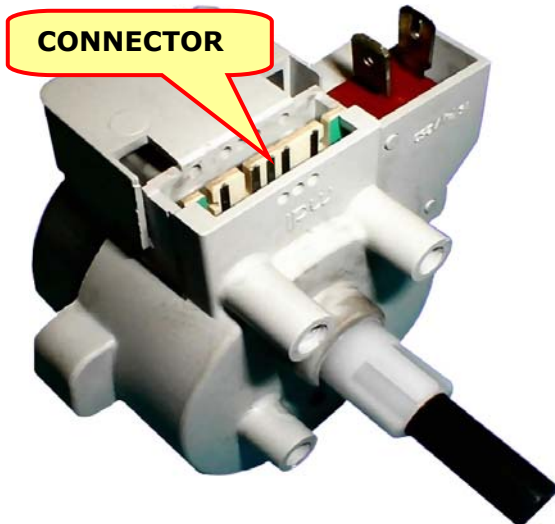
INVENSYS- 22 POS. LONG SHAFT



INVENSYS- 16 POS. LONG SHAFT



MDL – 22 POS. LONG SHAFT



MDL – (REAR VIEW)



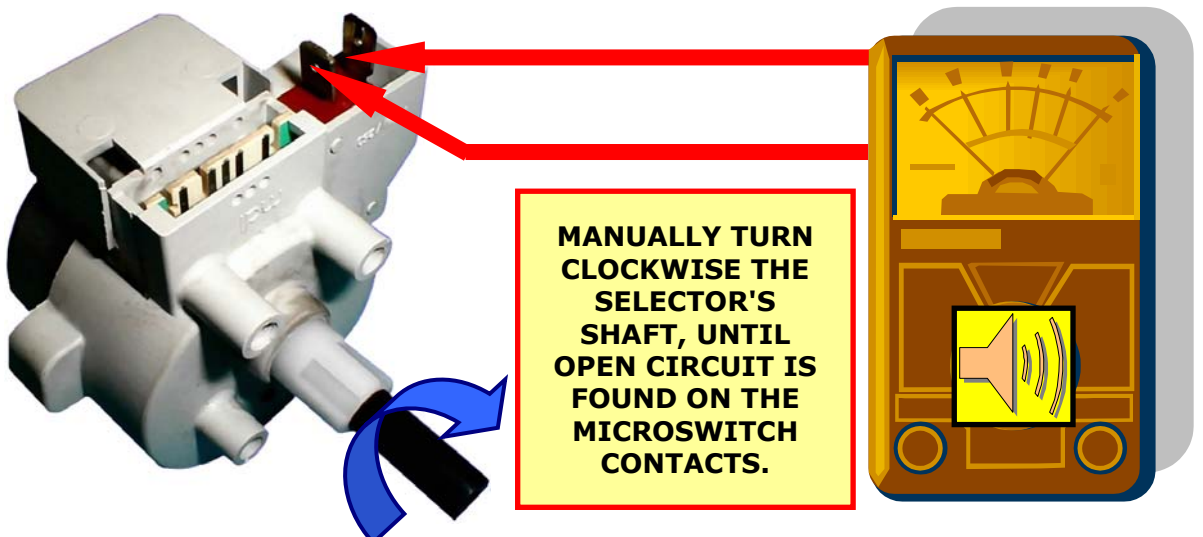
NEEDED MATERIALS TO CHECK THE MOTORIZED SELECTORS:

Digital Multimeter with sockets for cables with safety plugs connectors, **Testing Cable** for Motorized Selectors (P/N. **49009656** – See **ATTACHMENT A**). **Mains Cable** with insulated AMP connectors and SHUKO plug (See Chapter 2).

SUGGESTION: It's possible to check the Motorized Selector's functionality directly on the Washing Machine, without any need of removing it. The Machine must be **UNPLUGGED** and without the Top Cover. Just remove all Selector's connectors.

3a1) TESTING THE SELECTOR'S MICROSWITCH ON THE (OFF) POSITION:

- With the **Selector (long shaft)** on the Machine, **set the Programs Knob to OFF**.
- **Set Multimeter on Continuity Check (with buzzer)** and **set the Test Leads on the contacts of the microswitch**. The reading must be **Open Circuit**. If the Selector is not mounted on the Machine, rotate clockwise its shaft, until a setting with **no continuity** on the microswitch contacts is found. Otherwise, the Selector's microswitch must be short circuited (contacts glued).



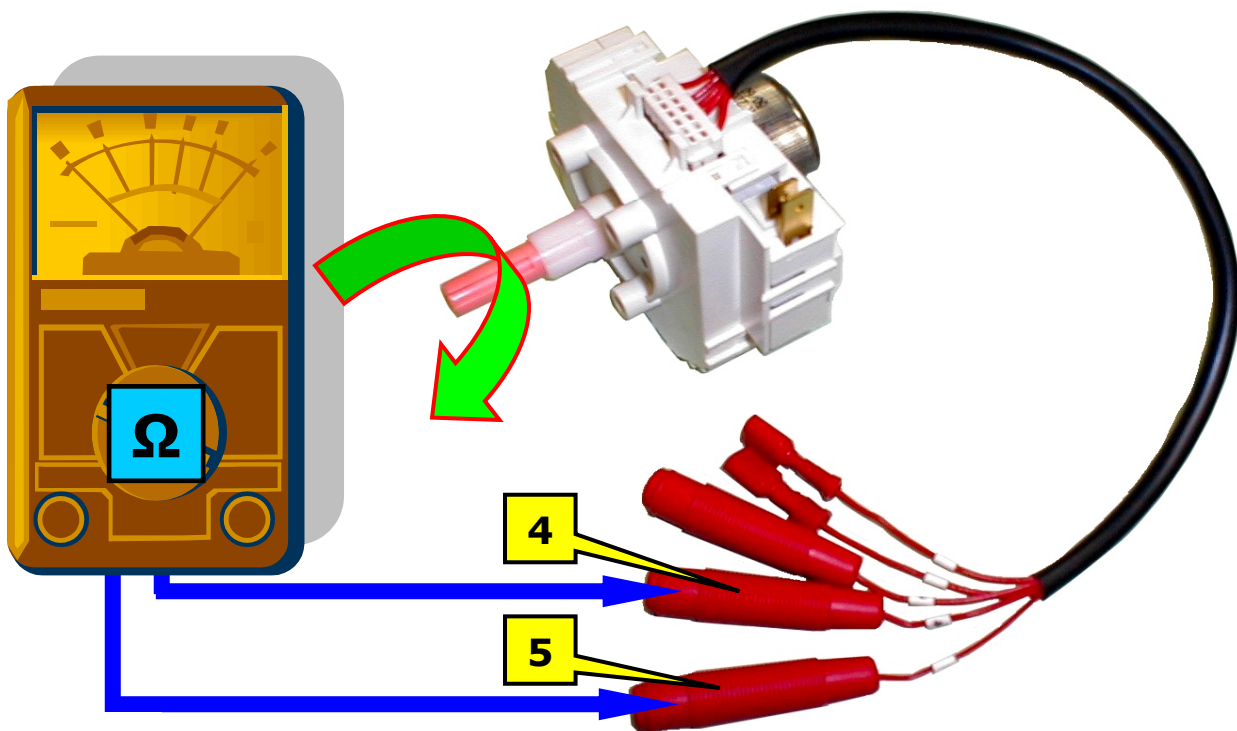
3a2) CHECKING THE OHMIC (Ω) VALUES OF EACH SINGLE SETTING POSITION:

Connect the GIAS Test Cable P/N. **49009656** to the Selector to be tested. Connect the Plugs **4 – 5** of the Test Cable to the Multimeter and set it to Ohmic (Ω) values reading.

IMPORTANT: it's possible to carry out three different Multimeter's readings, being the Test Cable connected to the Multimeter through its Safety Plugs **3 – 5**, **3 – 4** or **4 – 5**.

The best reading is got by plugging-in the Cable's Safety Plugs 4 and 5.

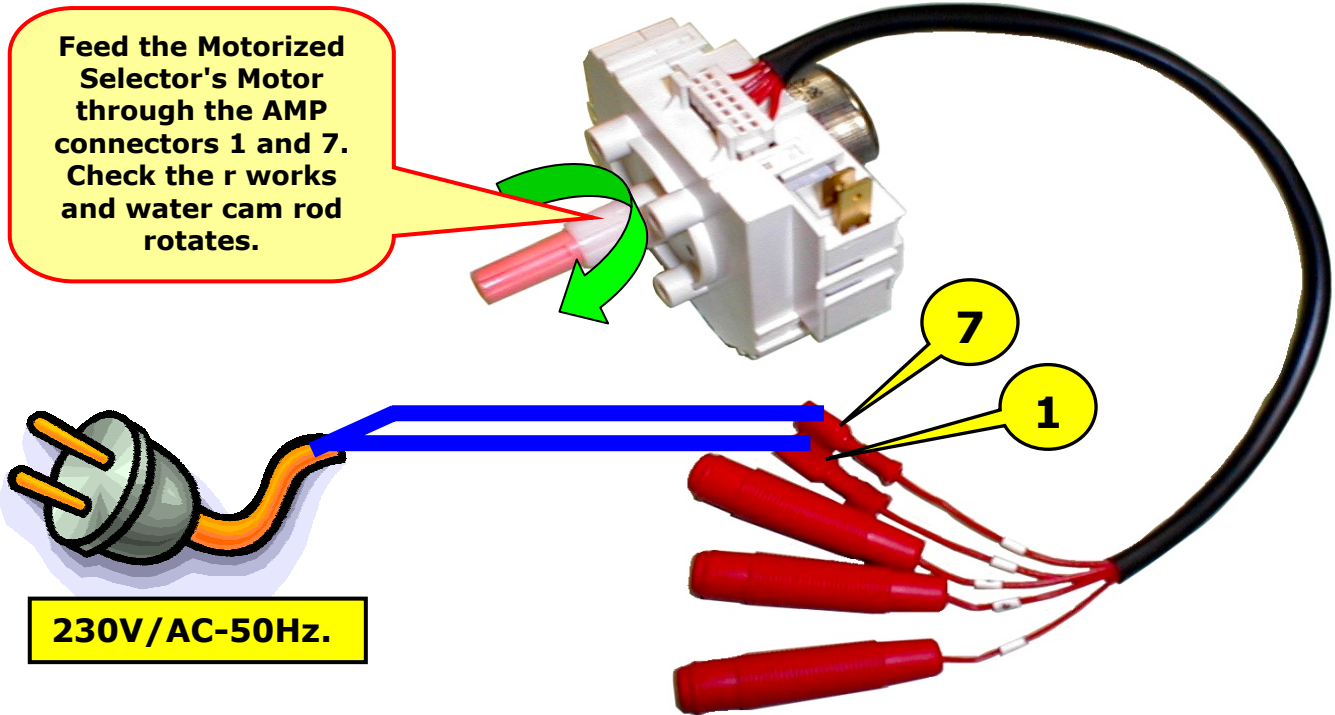
- Starting from the **OFF (0)** position (see par. 3a1), manually turn clockwise the Selector's shaft and read on the Multimeter's display the corresponding Ohmic value. Check for corresponding values, on the next Tables, specific for the Motorized Selectors. Data on Tables are different, depending on the Selector's make (**INVENSYS** or **MDL – Pages 6 and 7**). The herebelow picture shows a reading carried out through Safety Plugs **4 – 5** of GIAS Test Cable, on a Motorized Selector by **INVENSYS**.



3a3) CHECKING THE WORKING OF THE SELECTOR'S MOTOR:

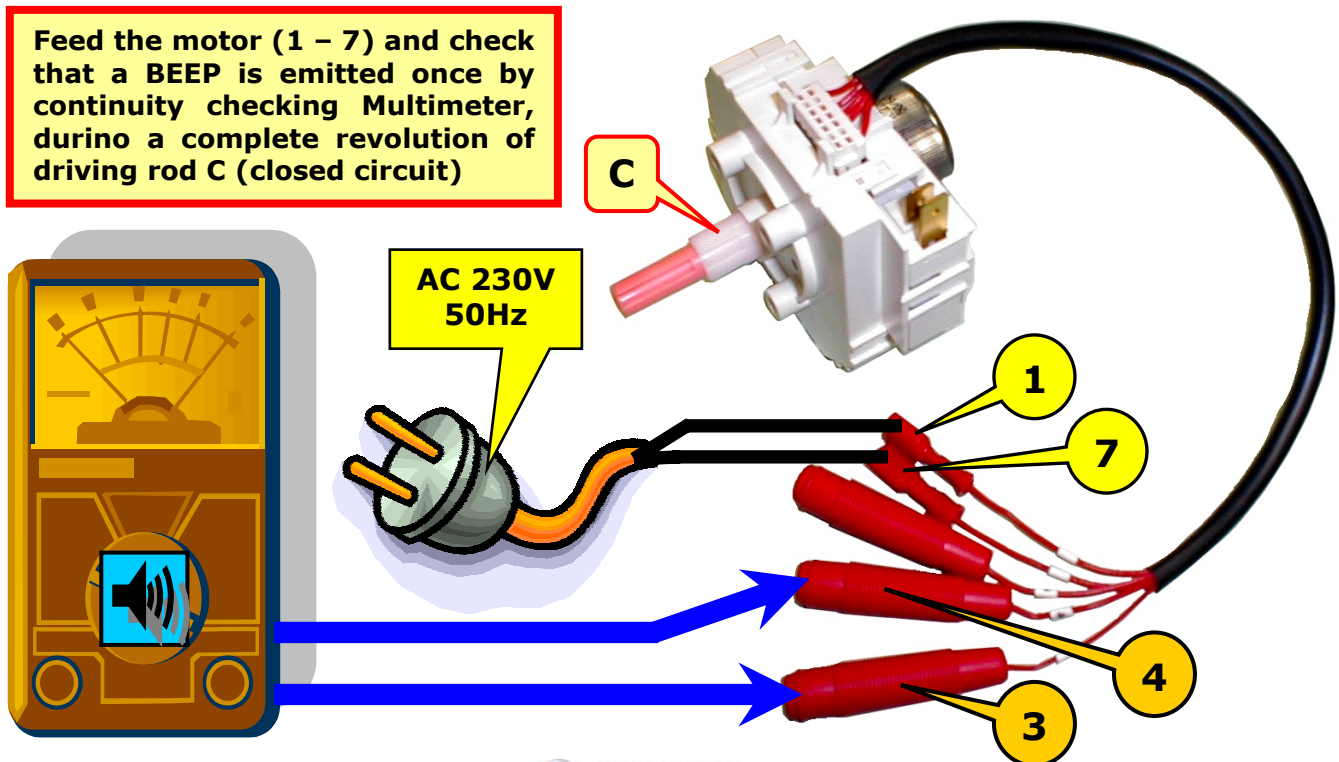
- Connect the GIAS Test Cable P/N. **49009656** to the Selector to be tested. Connect the insulated male AMP connectors of a Mains Cable to the insulated female AMP connectors of the GIAS Test Cable (**1** and **7** – see next picture). Plug the Mains Cable into a 230V/AC – 50Hz socket. Check that the Motor is working.

SUGGESTION: Use for this test, the GIAS Safety Patch Cord P/N. **91941051**.



3a4) VALID ONLY FOR "LONG SHAFT" MOTORIZED SELECTORS - CHECKING THE RESETTING OF THE WATER DISTRIBUTION CAM DRIVING ROD:

- Connect the GIAS Test Cable P/N. **49009656** to the Selector to be tested. Connect the insulated male AMP connectors of a Mains Cable to the insulated female AMP connectors of the GIAS Test Cable (**1** and **7** – see picture).
- Set Multimeter to **Continuity Check (BUZZER)**. Plug-in GIAS Test Cable **3** and **4** in the Multimeter.
- Electrically feed the Selector's Motor through the connected Mains Cable. The Motor must work and the Water Distribution Cam driving Rod must rotate.
- Check that the Multimeter's buzzer BEEPS once, during a complete revolution of the Water Distribution Cam driving Rod.



Ohmic Values Chart Valid For Motorized Selectors By "MDL" ("Short Shaft" and "Long Shaft" versions, both 22 and 30 positions)			
Position	Value (Ω) (Contacts 4 - 5) 30 P. SHORT SHAFT	Value (Ω) (Contacts 4 - 5) 22 P. LONG SHAFT	Value (Ω) (Contacts 4 - 5) 30 P. LONG SHAFT
0 (OFF)	Open Circuit	Open Circuit	Open Circuit
1	480	558	480
2	333	367	333
3	940	968	940
4	600	627	600
5	1367	1382	1367
6	857	866	857
7	1765	1773	1765
8	1111	1125	1111
9	2132	2122	2132
10	1363	1377	1363
11	2470	2449	2470
12	1615	1626	1615
13	2779	2749	2779
14	1867	1881	1867
15	3058	3030	3058
16	2117	2150	2117
17	3308	3250	3308
18	2368	2395	2368
19	3529	3468	3529
20	2619	2664	2619
21	3720	3640	3720
22	2869	NOT AVAILABLE VALUES	2869
23	3882		3882
24	3120		3120
25	4014		4014
26	3370		3370
27	4117		4117
28	3620		3620
29	4191		4191

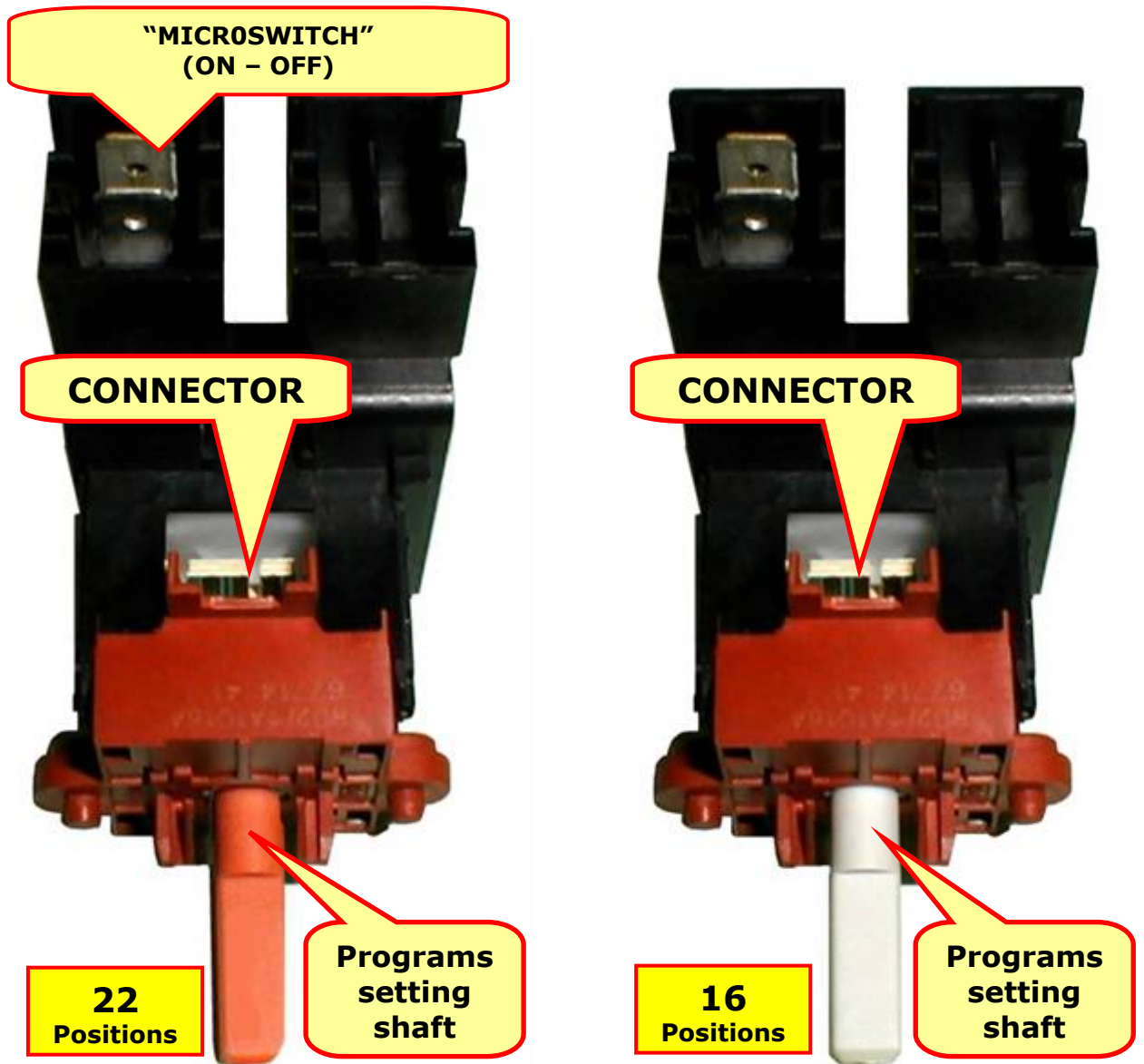
NOTE: the Ohmic Values as read in the Setting "0" (OFF Position) may slightly differ from what reported in the hereunder chart.

Ohmic Values Chart valid for Motorized and Not Motorized Programs Selectord by "INVENSYS" and "ROLD" (All 12,16,22,30 Positions Versions)				
Position	Value (Ω) (Contacts 3 - 5)	Value (Ω) (Contacts 3 - 4)	Value (Ω) (Contacts 4 - 5)	
0 (OFF)	Variable value	Variable value	~ 100	$\sim 0,2$
1	3200	3000	200	
2	3200	2900	300	
3	3200	2800	400	
4	3200	2700	500	
5	3200	2600	600	
6	3200	2500	700	
7	3200	2400	800	
8	3200	2300	900	
9	3200	2200	1000	
10	3200	2100	1100	
11	3200	2000	1200	
12	3200	1900	1300	
13	3200	1800	1400	
14	3200	1700	1500	
15	3200	1600	1600	
16	3200	1500	1700	
17	3200	1400	1800	
18	3200	1300	1900	
19	3200	1200	2000	
20	3200	1100	2100	
21	3200	1000	2200	
22	3200	900	2300	
23	3200	800	2400	
24	3200	700	2500	
25	3200	600	2600	
26	3200	500	2700	
27	3200	400	2800	
28	3200	300	2900	
29	3200	200	3000	

3b) FUNCTIONAL CHECK OF NOT MOTORIZED SELECTORS "Long Shaft" (12,16,22 positions)

These types of Programs Selectors are uniquely used where a New Water Distribution System is present (**double solenoid valve, directly feed by the Cuore Control Module and 3 Compartments Detergent Drawer**).

The "**NOT MOTORIZED**" Programs Selectors (see hereunder pictures) basically are fixed positions potentiometers, each position of setting corresponding to a different Ohmic value of resistance that can be read by the Cuore Control Module. An **OFF (0)** position is always present as well.



IMPORTANT: All presently used "**NOT MOTORIZED PROGRAM SELECTORS**" are produced by the "**ROLD**" maker. Of course, these Selectors are NOT INTERCHANGEABLE with the previously described MOTORIZED ones. Please always check for their part numbers on the related **GIASSTECH** spare parts lists.

3b1) SET SELECTOR TO "0": connect Multimeter's Test Leads to the Selector's microswitch contacts (see previous pictures). Slowly rotate the Selector's shaft, until the **OPEN CIRCUITED** setting position is found. Should no open circuited setting be found, the Selector's microswitch is **SHORT CIRCUITED** and the Selector must be replaced. **The Selector's "0" (OFF) position is the only open circuited one.**

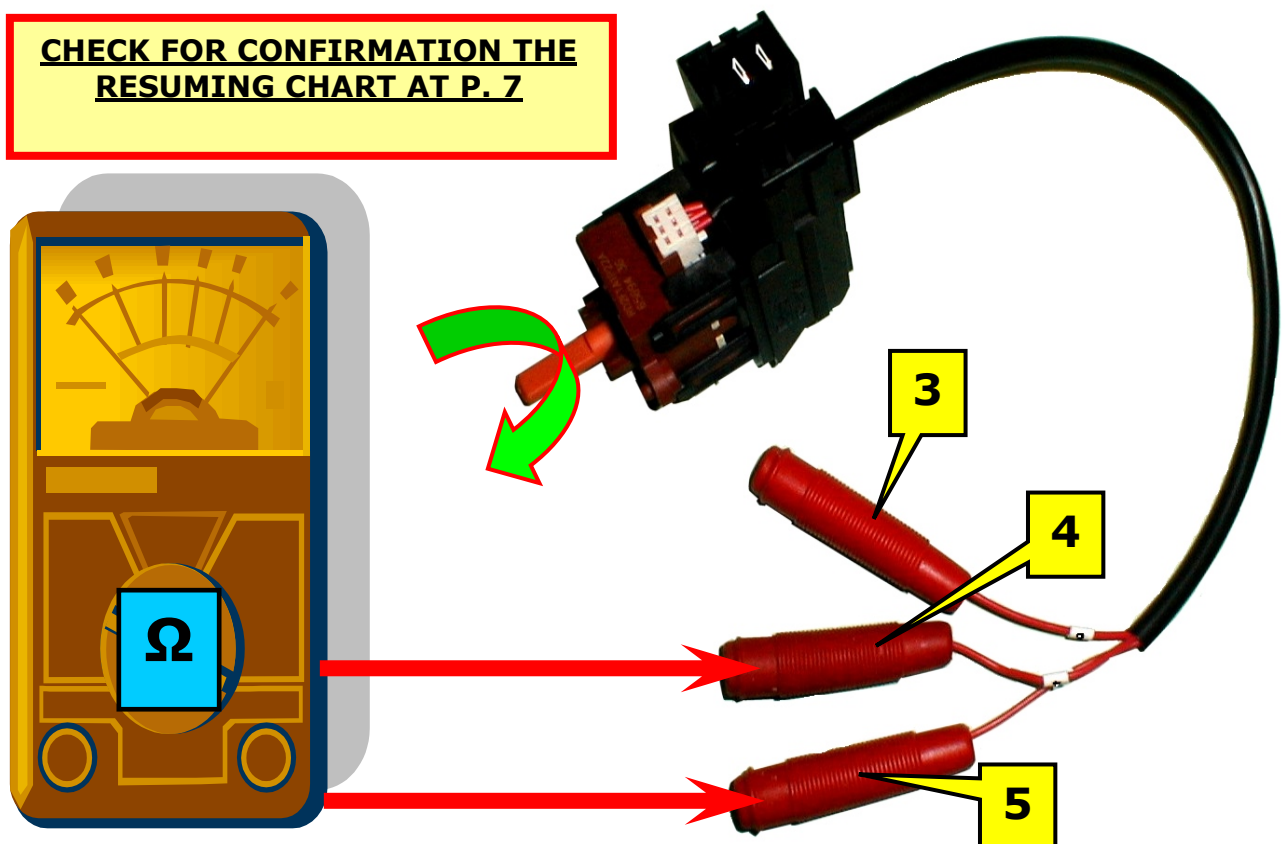
3b2) CARRY OUT THE CHECK OF THE DIFFERENT OHMIC (Ω) VALUES AVAILABLE IN EACH POSITION OF SETTING:

- To carry out this check, the **GIAS Test Cable P/N. 49009657** (see **ATTACHMENT A**) must be used. Connect it to both the Multimeter and the Selector, as it's shown in the hereunder picture. **Test Cable's Safety Plugs 4 and 5 must be connected to the Multimeter set to Ohmic (Ω) Values reading.**
- Starting from the "0" (OFF) position of setting, rotate step-by-step the Selector's shaft in clockwise sense, and verify that the Ohmic Values displayed by the Multimeter correspond to the ones listed in the Chart at P. 7.

IMPORTANT:

Ohmic Values of NOT MOTORIZED Selectors by ROLD are exactly same as the ones of the MOTORIZED Selectors by INVENSYS.

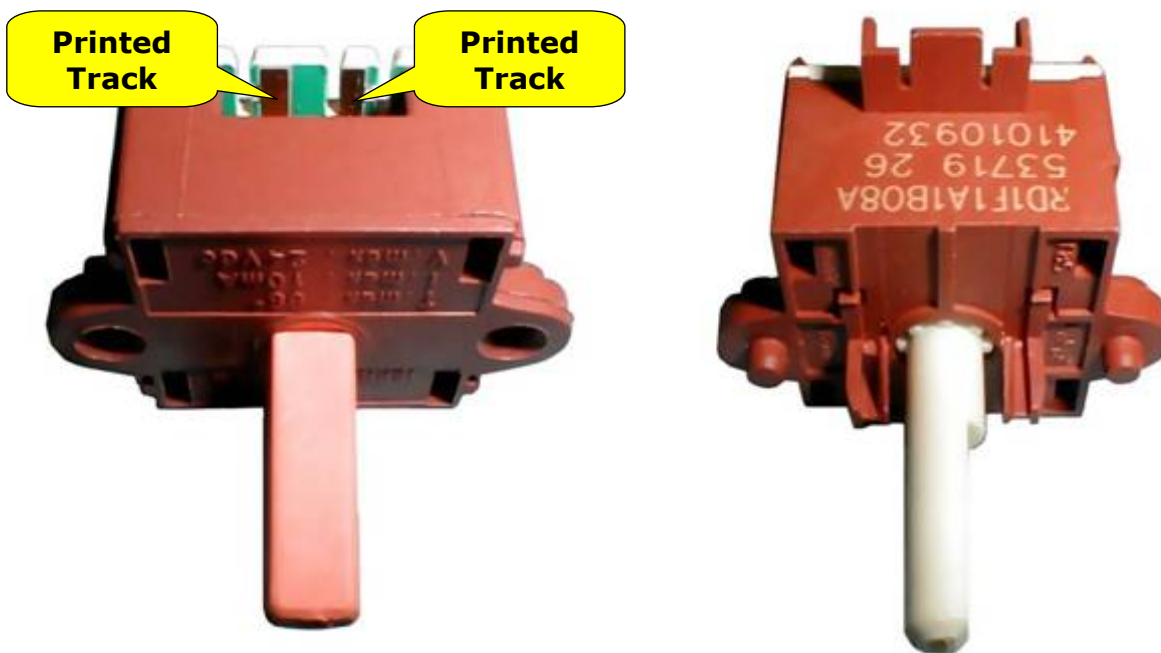
CHECK FOR CONFIRMATION THE RESUMING CHART AT P. 7



4) FUNCTIONAL CHECK OF POTENTIOMETERS:

4a) FUNCTIONAL CHECK OF 8 POSITIONS POTENTIOMETERS (P/N. 41010932 and P/N. 41000769)

- The Potentiometers with 8 Positions of Setting, are used on all electronically controlled Washing machines, for the selection of the following parameters; **Water Temperature, Spin Speed Spin and Start Delay Time**. Each single available position of setting corresponds to a single and specific Ohmic Value of Resistance (Ω). These values are read by the Cuore Control Module, same as it happens for the Programs Selectors.
- Use to carry out this check the **GIAS Test Cable P/N. 49009657** (see picture at next P.).



INFORMATION: should a Potentiometer be OPEN or SHORT CIRCUITED, the Washing Machine's troubles could be somewhat as follows:

- **SHORT CIRCUITED POTENTIOMETER:** THE CONTROLLED WASHING PARAMETER IS CARRIED OUT AT THE MAXIMUM AVAILABLE VALUE, notwithstanding what was the value set by the user.

(Examples: should the "temperature" potentiometer be set at 30°C, THE WATER WILL NEVERTHELESS BE HEATED UNTIL 90°C, likewise should the "spin speed" potentiometer be set to 400 RPM, the spin will be carried out at the maximum speed available).

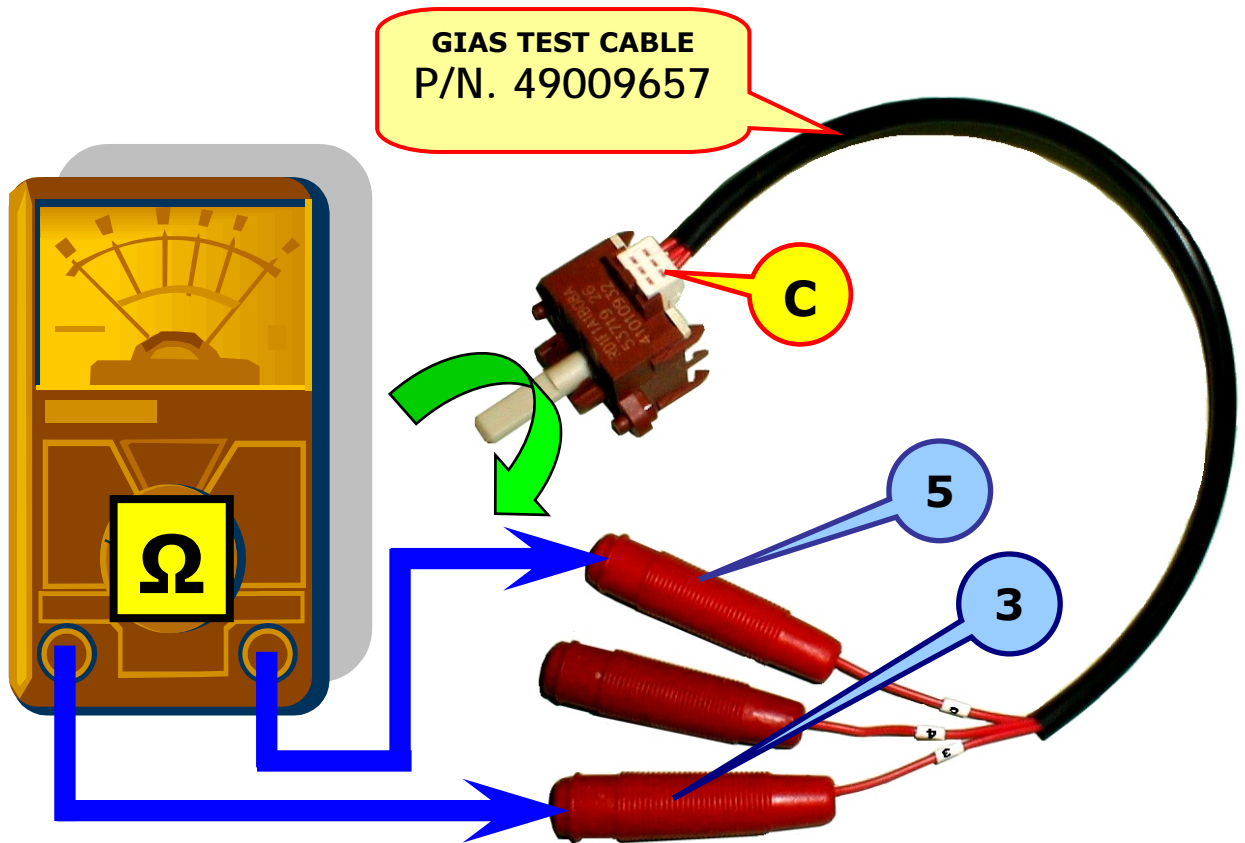
- **OPEN CIRCUITED POTENTIOMETER:** THE CONTROLLED WASHING PARAMETER IS ZEROED, notwithstanding what was the value set by the user.

(Examples: should the "temperature" potentiometer be set at 50°C, the water will NOT BE HEATED (COLD WASHING), likewise should the "spin speed" potentiometer be set to 600 RPM, the spin will be excluded (NO SPIN CYCLE).

PLEASE REMEMBER TO ALWAYS CHECK BOTH THE CONNECTORS AND THE WIRING

"FUNCTIONAL CHECK OF POTENTIOMETERS"

- Set Multimeter to Ohmic Values (Ω) reading. Connect GIAS Test Cable Safety Plugs "3" and "5" to the Multimeter.
- Rotate the Potentiometer's Shaft step-by-step in clockwise sense and compare the displayed Ohmic Values (Ω) with the ones in the chart.



Potentiometer's Ohmic Values resuming chart:

Position	Values - $K\Omega$	Water Temperature	Spin Speed
0	~ 102,6	Heater is OFF	NO SPIN
1	~ 40,7	30 °C	INTERMEDIATE SPIN SPEEDS
2	~ 18,7	40 °C	
3	~ 12,6	50 °C	
4	~ 6,6	60 °C	
5	~ 4,0	70 °C	
6	~ 2,0	80 °C	
7	~ 0,3	90 °C	MAXIMUM SPIN

5) FUNCTIONAL CHECK OF THE "NTC" TEMPERATURE SENSING PROBES:

WATER TEMPERATURE

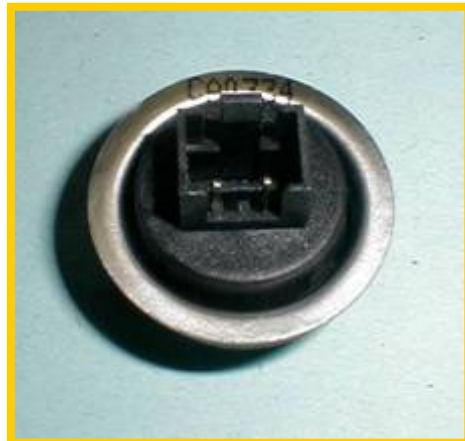
NTC READING SENSORS (P/N. 92743616, 91201325, 41020334, 41022107).

These components are used on all Electronically Controlled Washing Machines equipped with a Cuore Control Module. They are located in the back part of the appliance's tank, in the same position where the sensible element of the previous thermostats was found. The NTC Sensors now used can be equipped with both conventional AMP male connectors and a special **electronic type connector**. In this last case, use for the check the **GIAS Test Cable P/N. 49009657** (see **ATTACHMENT A**).



NTC Sensor with AMP leads

Temperature (°C)	Ohmic Values (Ω)
25	19500
30	15760
35	12825
40	10506
45	8660
50	7181
55	5989
60	5022
65	4233
70	3586
75	3053
80	2610
85	2242
90	1933
95	1674



NTC Sensor with electronic type connector

DRYING AIR TEMPERATURE

NTC READING SENSOR (P/N. 41013142).

This NTC Sensor is fitted onto the Drying Heaters Container, on top of tank of our Wash & Dryers. The check of this Sensor is done by connecting the Ammeter's Test Leads to its AMP male connectors.

Ohmic Values should be as in chart herebelow:

Temperature (°C)	Ohmic Values (Ω)
25	~ 48500
140	~ 1044



NTC Sensor for Drying

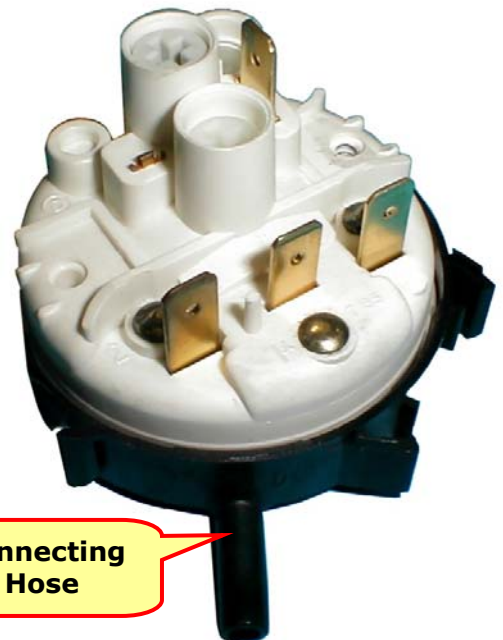
6) FUNCTIONAL CHECK OF PRESSURE SWITCHES (OR "PRESSOSTATS"):

Pressostats are used to manage the amount of water loaded by the machine. On our present range of Candy designed Washing Machines and Wash & Dryers, are only used 2 levels pressostats, with similar technical features but different regulations, depending on the type and capacity of the Machine. The position and number of male AMP connectors can be different as well, depending on the maker.



Connecting
Hose

WM Pressostat – Version "1"



Connecting
Hose

WM Pressostat – Version "2"

WARNING:

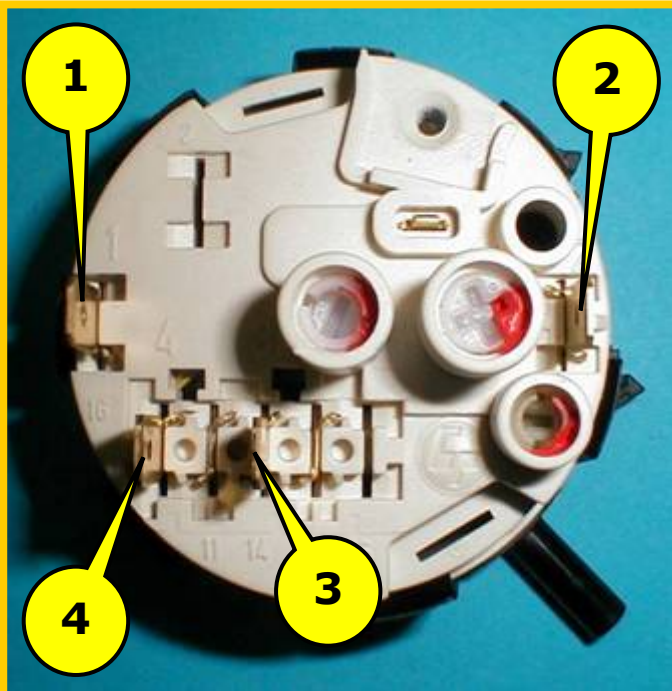
IN NO CASE THE ORIGINAL ADJUSTMENT OF THE ORIGINALLY FITTED OR OF THE SPARE PRESSURE SWITCH, CAN BE MODIFIED OR ADAPTED TO SUIT ANY SPECIFIC REQUEST OF THE CUSTOMER. NOR A DIFFERENT PRESSOSTAT THAN THE ONE ON THE GIASTECH SPARES LIST OF THE MACHINE CAN BE USED, WITHOUT AN OFFICIAL AUTHORIZATION BY GIAS ITALY. MISHANDLING OF PRESSOSTAT NULLIFIES THE WARRANTY AND FREES CANDY GROUP FROM ANY LEGAL LIABILITY ABOUT RELATED CLAIMS.

Possible **checks** to be carried out on **Pressostats**, are as follows:

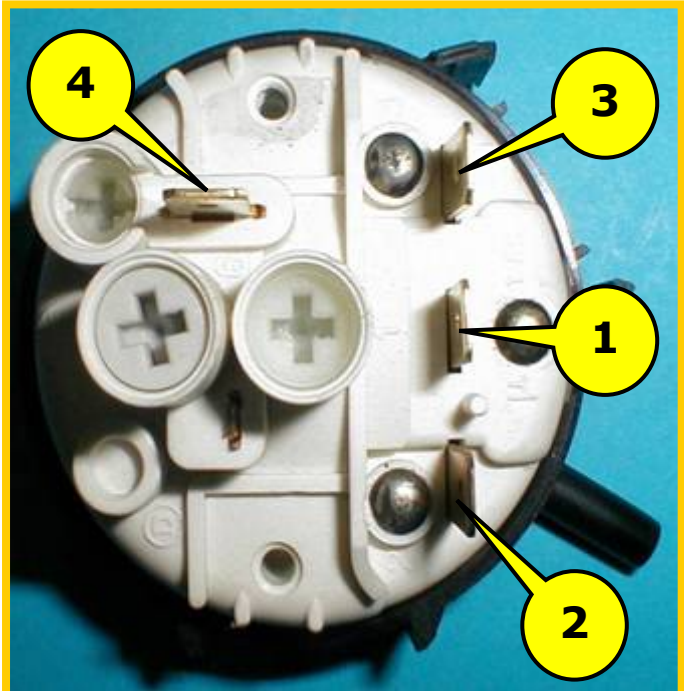
CHECK OF THE ELECTRIC CONNECTIONS: location and numbering of Pressostat's contacts may differ, due to different makers. The presently found configurations are the two shown in the pictures at the next P..

Please always see the related GIASTECH wiring diagrams, in any case of doubts on the propriety of the electric connections to the pressostat.

Contact's Location on Version 1

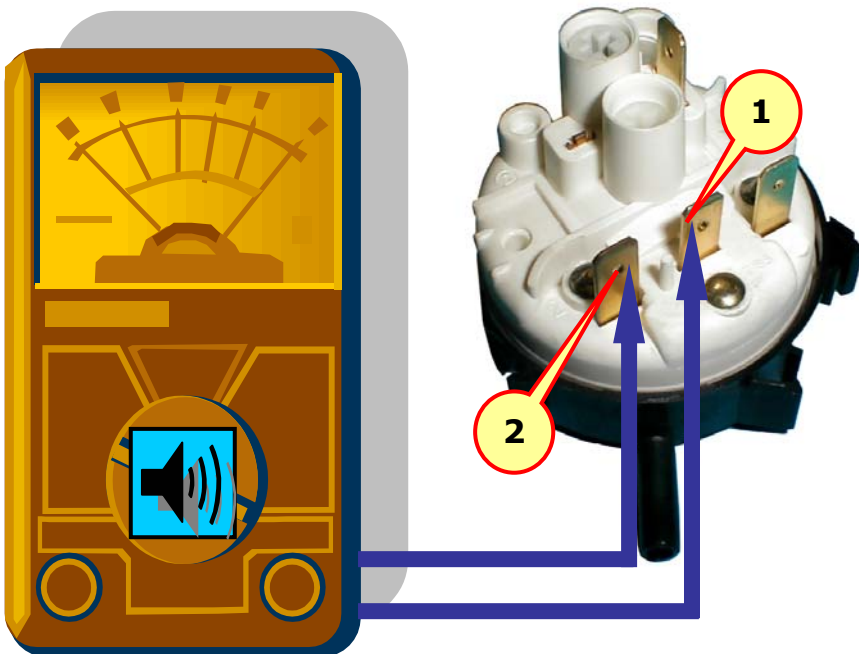


Contact's Location on Version 2



READING KEY OF PRESSOSTAT'S CONTACTS:

- Contact **1** : "**COMMON**" CONTACT
- Contact **2** : "**EMPTY TANK CONTACT**" (Not used)
- Contact **3** : "**FULL TANK CONTACT**" (1st Level)
- Contact **4** : "**ANTI-FLOOD CONTACT**" (2nd Level)



PRESSOSTAT'S BENCH TESTING:

Set Multimeter on **Continuity Check** (with buzzer):

- 1 - 2** (Closed Circuit)
- 1 - 3** (Opened Circuit)
- 1 - 4** (Opened Circuit)

7) FUNCTIONAL CHECK OF THE VOLTMETRIC DOOR LOCK SAFETY DEVICES:

The **Door Lock Safety Devices** is present in compliance with all the approvals, on every Washing Machine and Wash & Dryer. It prevents the opening of the Appliance's door as soon as the washing cycle is started. Once the washing cycle has ended (or once it's manually halted by the User), the Door Lock Safety Device holds the door closed for a couple of additional minutes, due to a designed opening delay. This because the Door Lock Safety Device works with a PTC component (Positive Thermal Coefficient), that soon becomes overheated as soon as it's crossed by the network voltage, but needs a couple of minutes to cool down, once it's powered OFF. The PTC's overheating causes the deformation of a bi-metal that pushes out the locking device, engaging it. The locking device stays engaged as long as the PTC is fed and will release the door's catch only when the bi-metal pushing it goes back to its original shape, once the PTC has completely cooled down:

POSSIBLE CHECKS ON DOOR LOCK SAFETY DEVICE:

- **VISUAL CHECK:** check the Door Lock Safety Device doesn't show any overheating or burning traces. Manually move the moving parts, to confirm they're free.
- **CHECK OF THE PTC COMPONENT:** being the Door Lock Safety Device unplugged, measure the Ohmic value at his AMP Connectors. It must be near the values declared in the following boxes, being the values different depending on the type and make of the Device.
- **FUNCTIONAL CHECK:** manually "load" the Door Lock Safety Device with the help of a scre driver (to put it in operative conditions). Feed the Device with network current for about a minute (feeding contacts change, depending on the type and make). Power it OFF and within 30 seconds check that the circuit between the "working" contacts is closed. See boxes hereafter, for the identification of the feeding and working contacts of the Door Lock Safety Device.

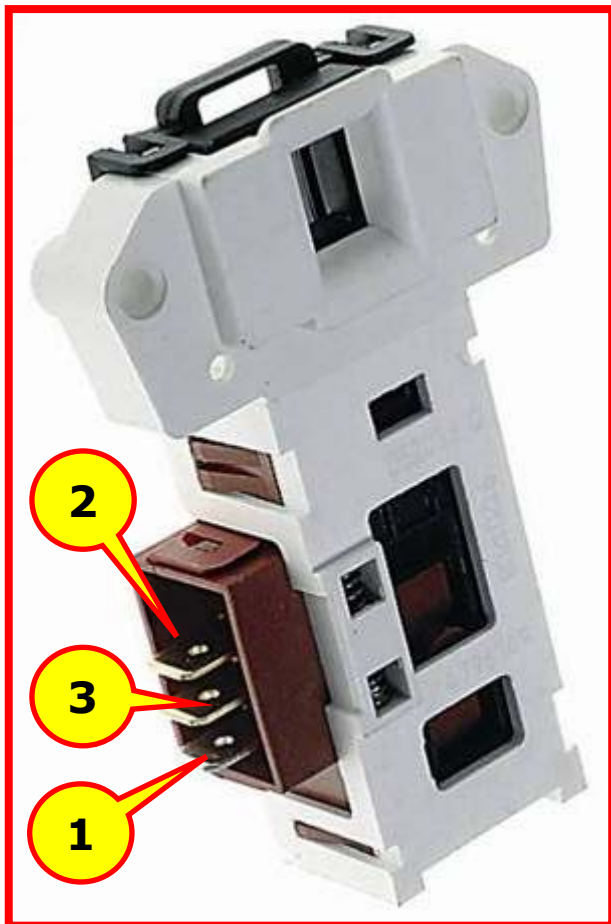


VOLTMETRIC DOOR LOCK DEVICE

Used on **Front Loaders** with **Door Opening Button** on the control panel. This device is **fitted BEHIND THE DOOR BUTTON**. Once the Device is fed, the Door Latch is pushed outwards and blocks the Door Catch.

Ohmic Value (at 25°C) : **~ 8000 Ω**

Electrically feed and visually check that the latch **goes out from the Device**.

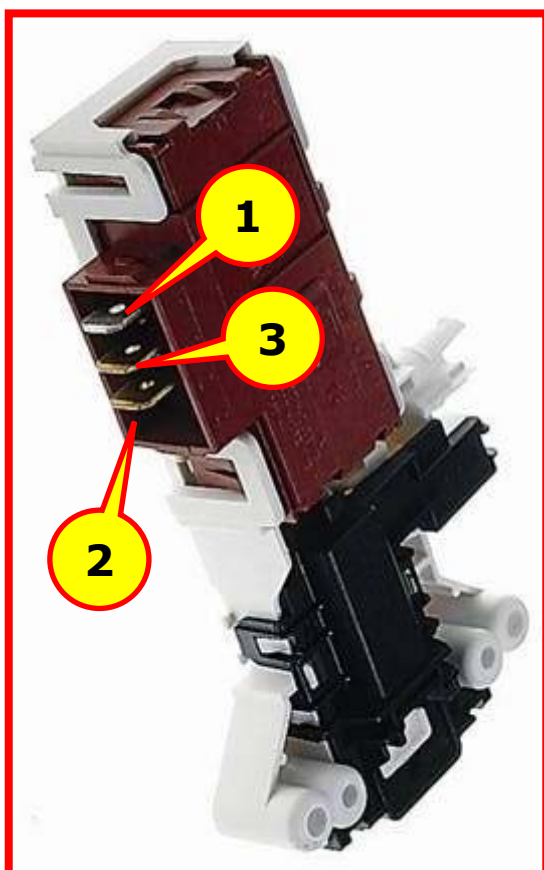


VOLTMETRIC DOOR LOCK DEVICE

P/N. 91201208

This type is used on the **Front Loaders** with **Door Opening Handle**. Once it's fed by network tension at his contacts **1 - 3**, an inner latch protrudes and mechanically blocks the Door's catch. Simultaneously, an inner mechanism closes its electric contacts **1 - 2**.

- **NOT FED:** Ohmic Value measured between leads **1 - 3** at 25°C is within **500 Ω** and **1500 Ω**. **OPENED CIRCUIT** between contacts **1** and **2**.
- **FED:** Electrically feed the Device with network tension, between contacts **1** and **2** for 2 minutes. Power OFF and check within 30 seconds the **CLOSED CIRCUIT** between contacts **1** and **2**.



VOLTMETRIC DOOR LOCK DEVICE

P/N. 90489300

This type is for **Front Loaders** with **Door Opening Button and Bowden cable**. Once it's fed by network tension at his contacts **1 - 3**, an inner latch protrudes and mechanically blocks the Door's catch. Simultaneously, an inner mechanism closes its electric contacts **1 - 2**.

- **NOT FED:** Ohmic Value measured between leads **1 - 3** at 25°C is within **500 Ω** and **1500 Ω**. **OPENED CIRCUIT** between contacts **1** and **2**.
- **FED:** Electrically feed the Device with network tension, between contacts **1** and **2** for 2 minutes. Power OFF and check within 30 seconds the **CLOSED CIRCUIT** between contacts **1** and **2**.

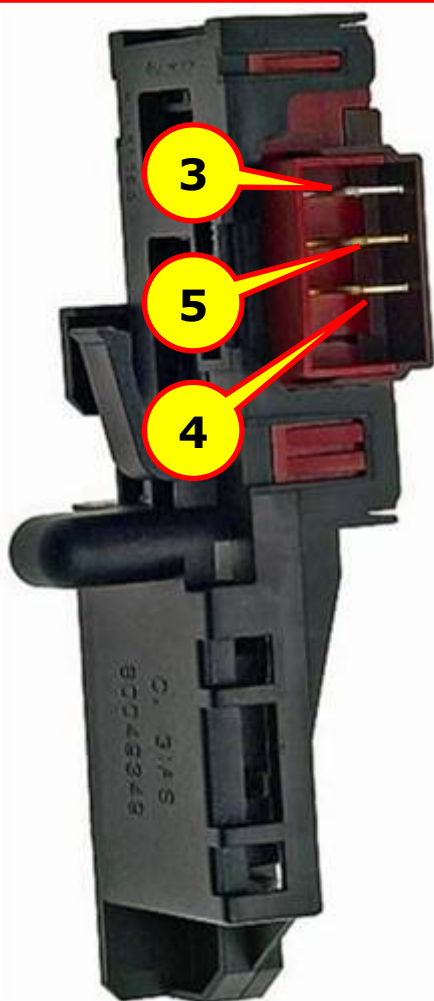
P/N. 80049349



VOLTMETRIC DOOR LOCK DEVICE

This type is for **Top Loaders**. Once it's fed by network tension at his contacts **3 - 5**, an inner latch protrudes and mechanically blocks the Door's catch. Simultaneously, an inner mechanism closes its electric contacts **4 - 5**.

- **NOT FED:** Ohmic Value measured between leads **3 - 5** at 25°C is within **800 Ω** and **1200 Ω**. **OPENED CIRCUIT** between contacts **5** and **4**.
- **FED:** Electrically feed the Device with network tension, between contacts **3** and **5** for 2 minutes. Power OFF and check within 30 seconds the **CLOSED CIRCUIT** between contacts **4** and **5**.



VOLTMETRIC DOOR LOCK DEVICE

P/N. 80049349

This type is for **Top Loaders**. Once it's fed by network tension at his contacts **3 - 5**, an inner latch protrudes and mechanically blocks the Door's catch. Simultaneously, an inner mechanism closes its electric contacts **4 - 5**.

- **NOT FED:** Ohmic Value measured between leads **3 - 5** at 25°C is within **800 Ω** and **1200 Ω**. **OPENED CIRCUIT** between contacts **5** and **4**.
- **FED:** Electrically feed the Device with network tension, between contacts **3** and **5** for 2 minutes. Power OFF and check within 30 seconds the **CLOSED CIRCUIT** between contacts **4** and **5**.

This Door Lock Safety Device is perfectly interchangeable with the previously shown Door Lock Safety Device P/N. 80049349.

8) VISUAL CHECK OF THE THE CUORE CONTROL MODULES:

Cuore Control Module by MDL Versions: 24K and 32K

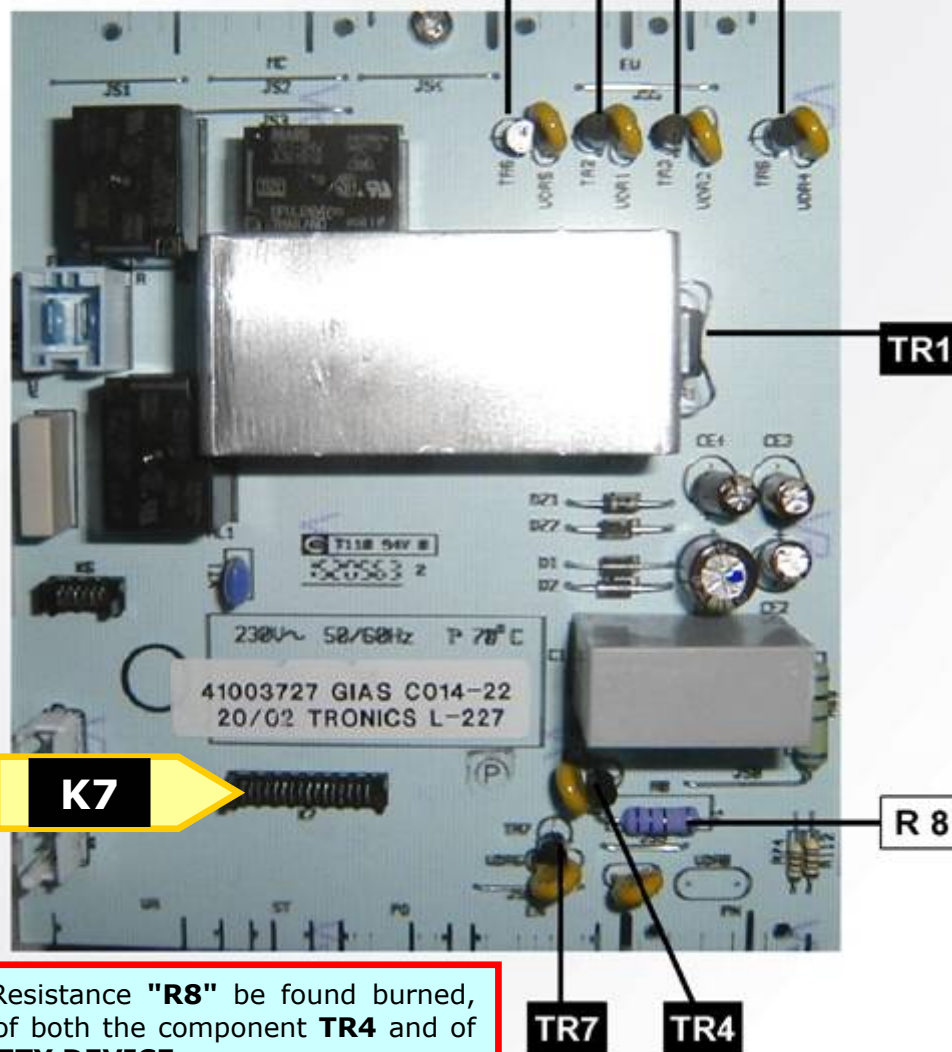
IMPORTANT

The number of contacts in the **K7** connector identifies the version of the Module:

12 Contacts
"24K"

16 Contacts
"32K"

K7



WARNING: Should Resistance "R8" be found burned, check the conditions of both the component TR4 and of the **DOOR LOCK SAFETY DEVICE**.

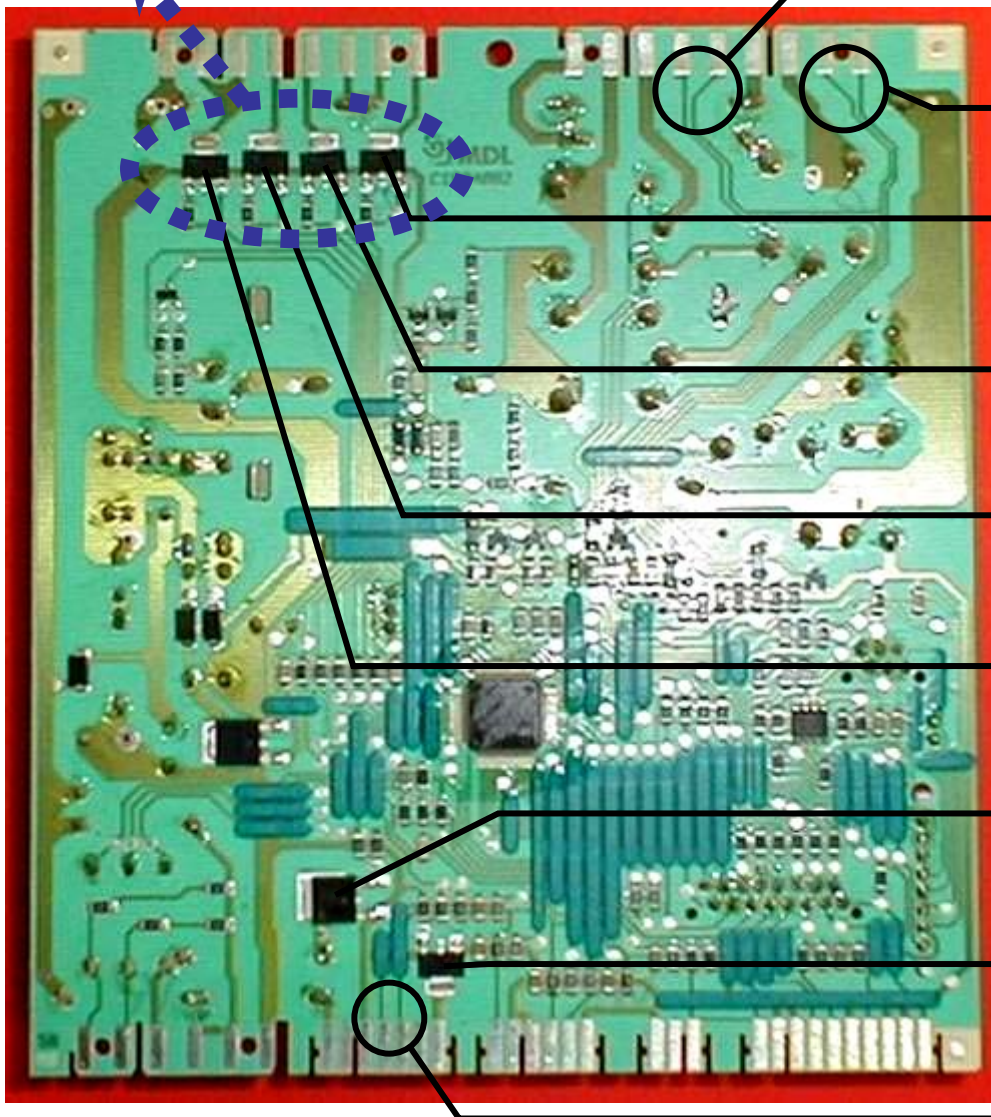
Component	Controlled Electromechanical Component
TR1	Synchronous Motor With Brushes & Commutator
TR2	Hot Water Fill Solenoid Valve
TR3	Cold Water Fill Solenoid Valve
TR4	Door Lock Safety Device
TR5	Drain Pump
TR6	Recycling Pump
TR7	Selector of Washing Programs
R8	Resistance protecting TR4 (Door Lock Safety)

Cuore Control Module by MDL Version: 48K

Resistance protecting the components circled by the dotted blue line.



If the "R8" Resistance should be spoiled, check visually the conditions of the Door Lock controlling component and of Door Lock itself.



Tachometric Coil Tracks

NTC Probe Tracks

Recycling Pump Cold Water Fill Solenoid Valve

Hot Water Fill Solenoid Valve

Cold Water Fill Solenoid Valve

Drain Pump

Door Lock Safety Device

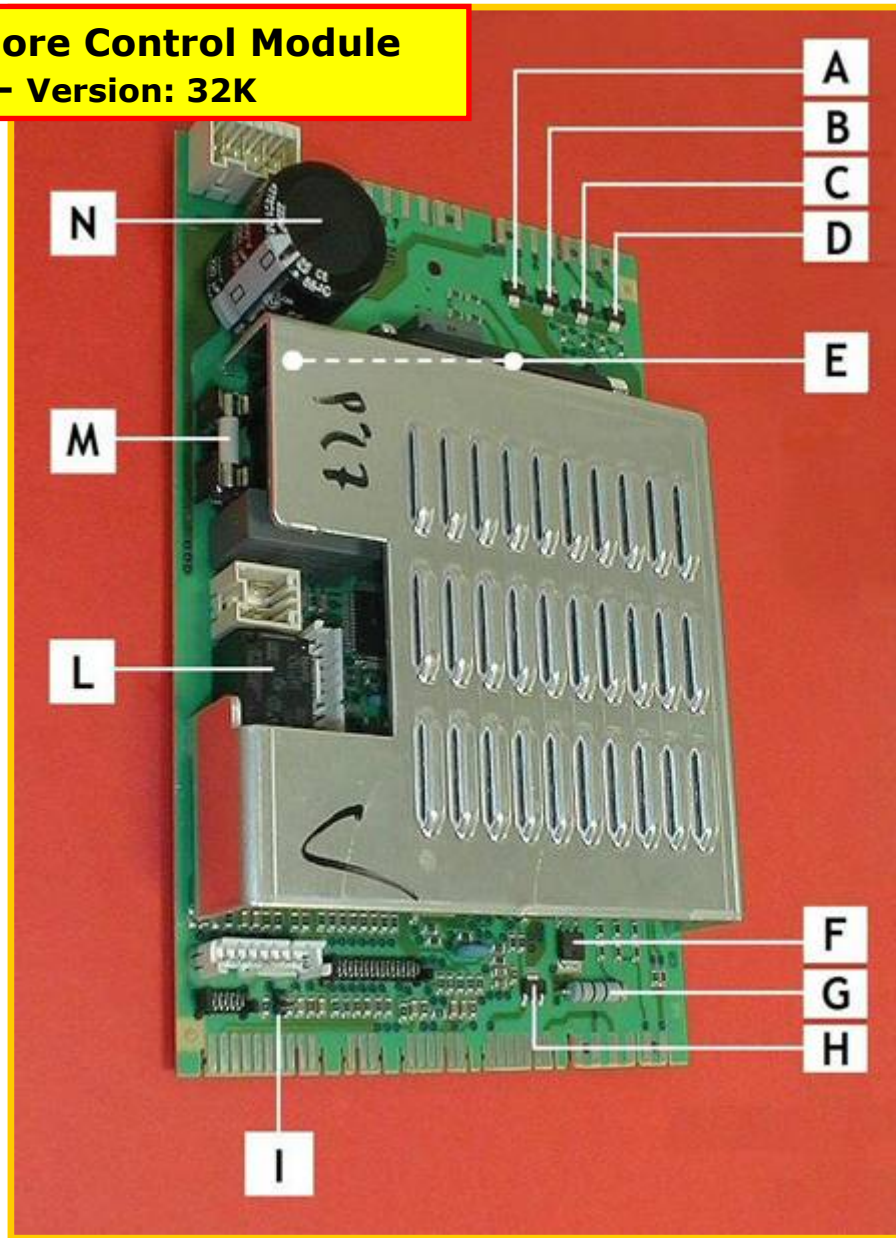
Washing Programs Selector

Washing Programs Selector Tracks

**Three-phase Cuore Control Module
by MDL - Version: 32K**

IMPORTANT

Resistance "G"
protects the "F"
component,
dedicated to the
**Door Lock
Safety Device.**

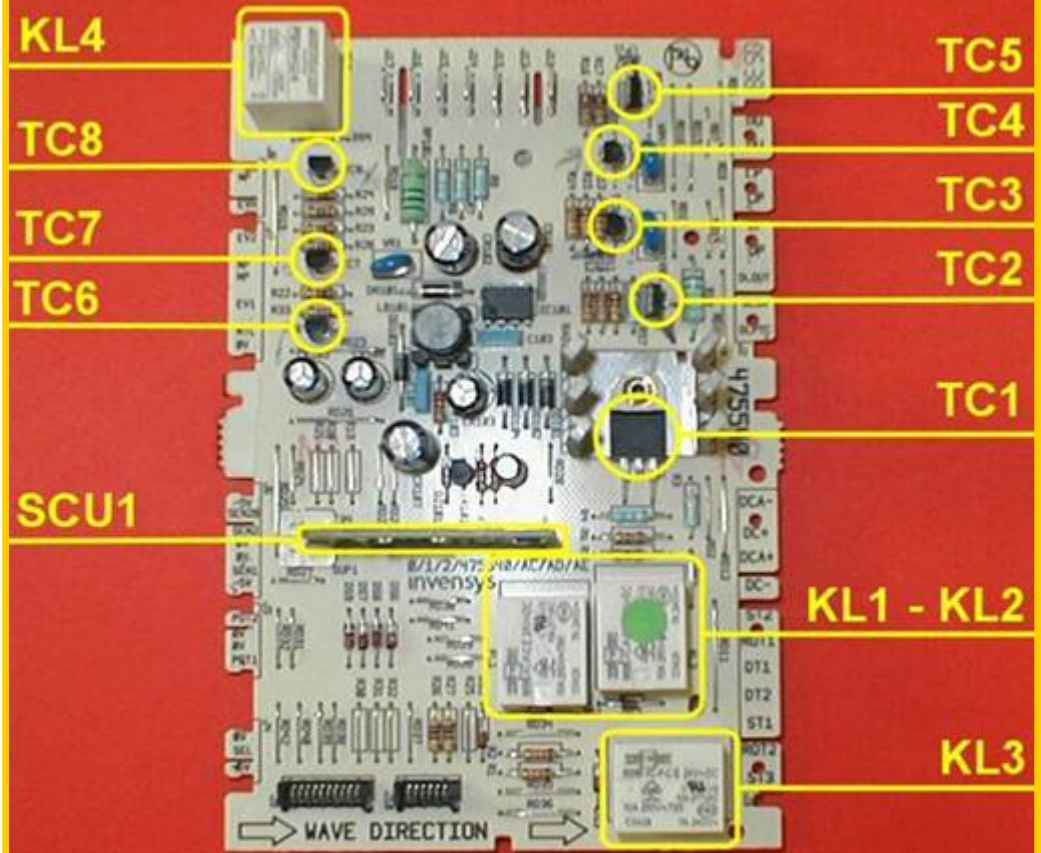


Component	Controlled Electromechanical Component
A	Recycling Pump or Cold Water Fill Solenoid Valve
B	Hot Water Fill Solenoid Valve
C	Cold Water Fill Solenoid Valve
D	Drain Pump
E	Ic IGBT – Control of Three-phase Motor
F	Door Lock Safety Device
G	Resistance protecting the Door Lock Device circuit
H	Washing Programs Selector
I	Jumper contacts – bridge for Errors reading
L	Relais – Water heating Element
M	6.3 A Fuse (retarded) – Board's General Protection
N	Capacitor – Three-phase Motor

Cuore Control Module by "INVENSYS"

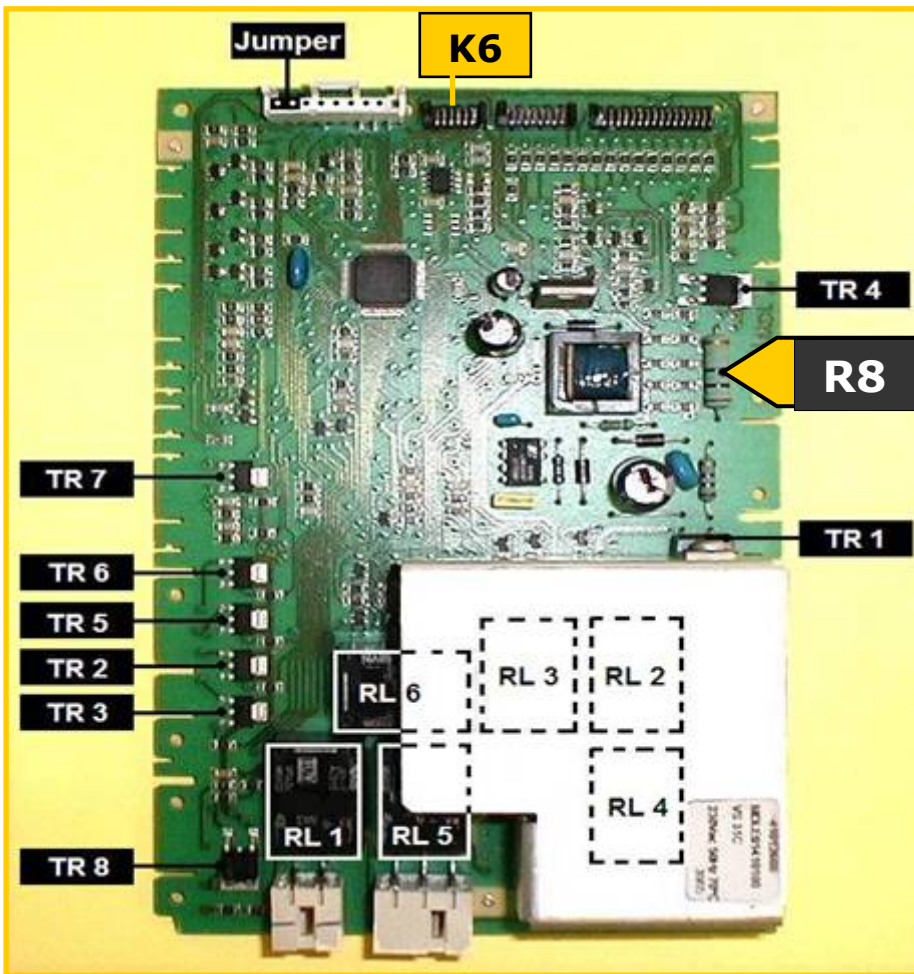
Versions: **32K** and **64K**

This type of Cuore Control was used in production since date 0623



Component	Controlled Electromechanical Component
TC1	Synchronous Motor With Brushes & Commutator
TC2	Door Lock safety Device
TC3	Drain Pump
TC4	Recycling Pump
TC5	Drum Braking Device (Top Loaders only)
TC6	Cold Water Fill Solenoid Valve (Pre-wash)
TC7	Cold Water Fill Solenoid Valve (Washing)
TC8	HOT Water Fill Solenoid Valve (Washing)
KL1 - KL2	Reversal of Motor's Rotation Sense
KL3	Tapped Field Winding (Some Motors Only)
KL4	Relays - Water Heating Element
SCU1	Eeprom Memory (Programs Files)

Cuore Control Module by MDL with integrated Drying Module
 Versions: 32k and 48K



IMPORTANT

If the "R8" Resistance should be spoiled, check visually the conditions of Door Lock controlling component and of Door Lock itself.

Component	Controlled Electromechanical Component
TR1	Synchronous Motor with Brushes and Commutator
TR2	HOT Water Fill Solenoid Valve (Washing)
TR3	COLD Water Fill Solenoid Valve (Washing)
TR4	Door Lock Safety Device
TR5	Drain Pump
TR6	COLD Water Fill Solenoid Valve (Pre-wash)
TR7	Washing Programs Selector
TR8	Vapor Condensation Water Solenoid Valve and Ventilator for Drying
RL1	Relays – Water heating Element
RL2	Relays – Motor's Reversals
RL3	Relays – Motor's Reversals
RL4	Tapped Field Motor's Winding (Some Motors)
RL5	Relays – Strong Drying Heating Element – 4A
RL6	Relays – Drying Heating Element – 2A

9) VARIOUS WASHING MACHINES MOTORS AND THEIR BENCH TESTING

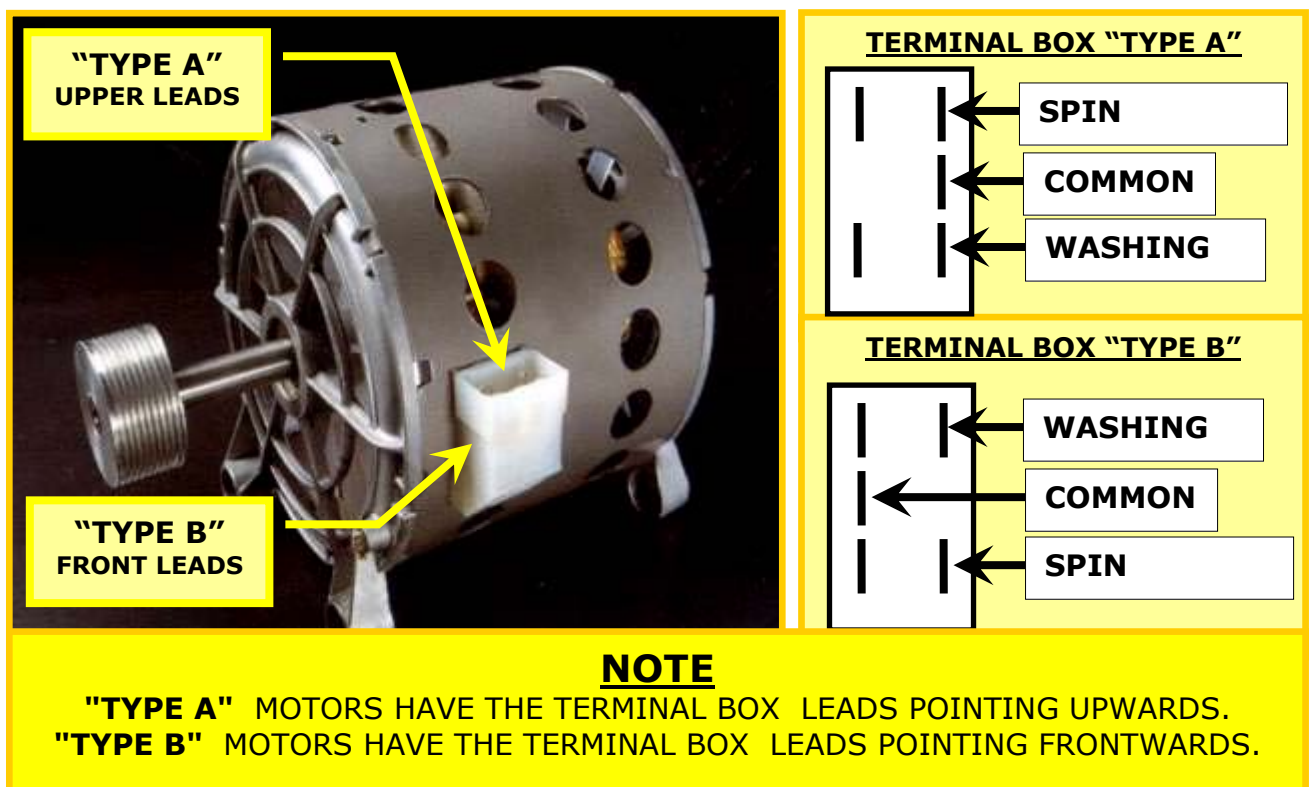
These are the different Motors presently used on the Candy design Washing machines:

- **INDUCTION MOTORS** (see par. 9a and 9b)
- **SYNCHRONOUS MOTORS WITH BRUSHES AND COMMUTATOR** (see par. 9c)
- **THREE-PHASE MOTORS** (see par. 9d)
- **CONTINUOUS CURRENT COMMUTATOR MOTORS** (see par. 9e)

Possible checks to be carried out on the **Tachometric Dynamo**, are listed in par. 9f

9a) INDUCTION MOTORS

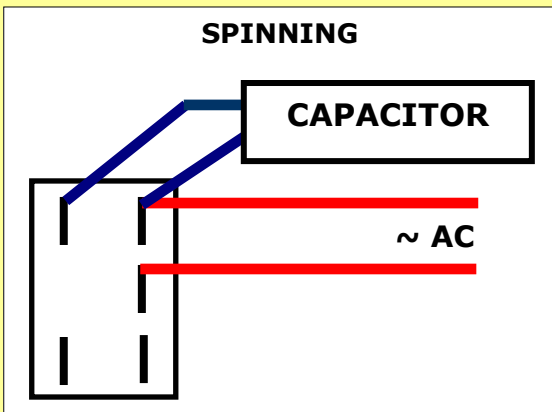
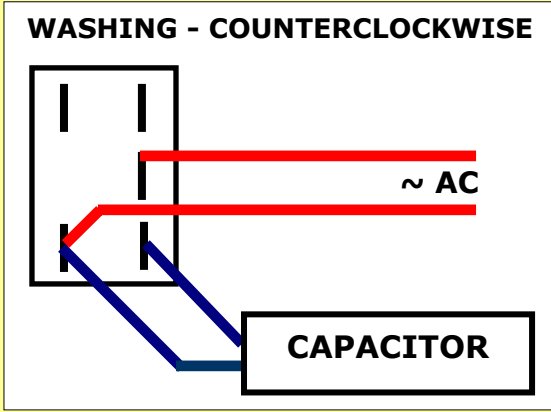
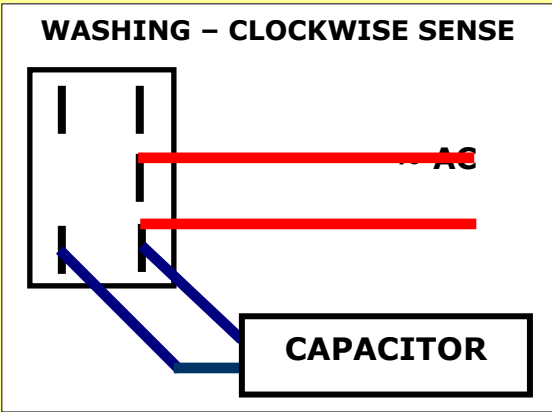
These motors are presently used only for the electromechanically controlled Washing Machine (with traditional TIMER). Induction motors feature two separate windings, each one with a different number of poles. This means that different speed of rotation can be obtained, by separately feeding the separate windings (washing winding and spin winding). The inversion of the sense of rotation is obtained by changing the feeding circuit of the washing winding and with the help of a start capacitor.



In the following P. we resume the procedures to carry out the bench testing of both versions of Induction Motors.

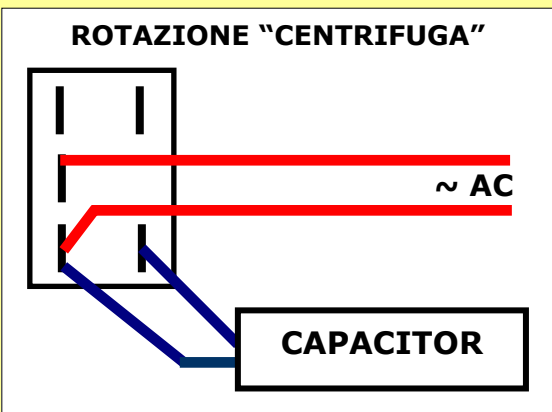
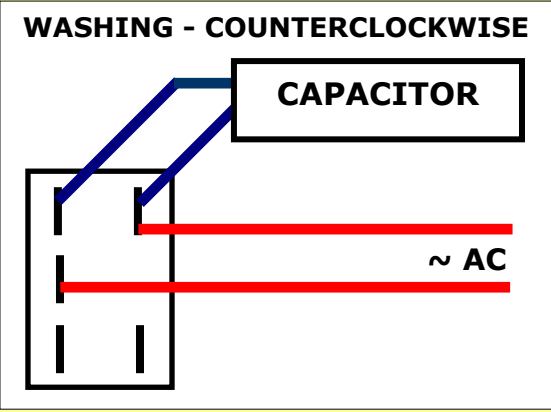
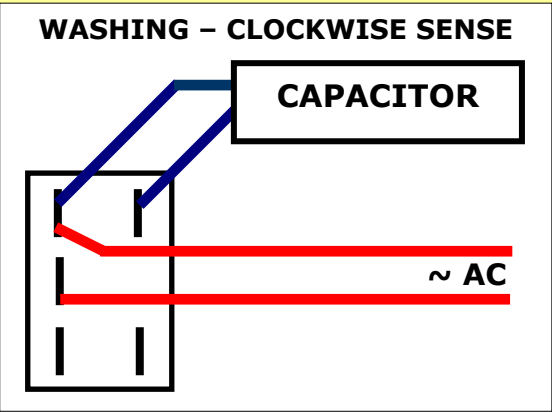
IMPORTANT: To be bench tested, each Induction Motor needs its original Start Capacitor. Please find the Capacitor's parts numbers on the related GIASTECH spares lists.

Bench Test of INDUCTION MOTOR with TYPE "A" junction box:



IMPORTANT: To be bench tested, each Induction Motor needs it's original Start Capacitor. Please find the Capacitor's part number on the related GIASTECH spares lists.

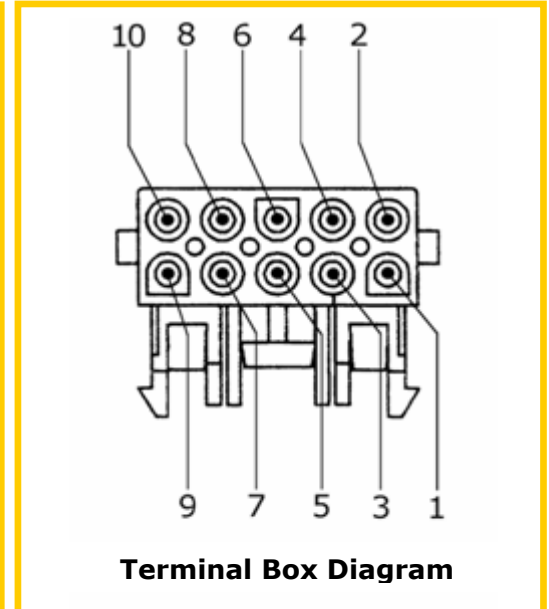
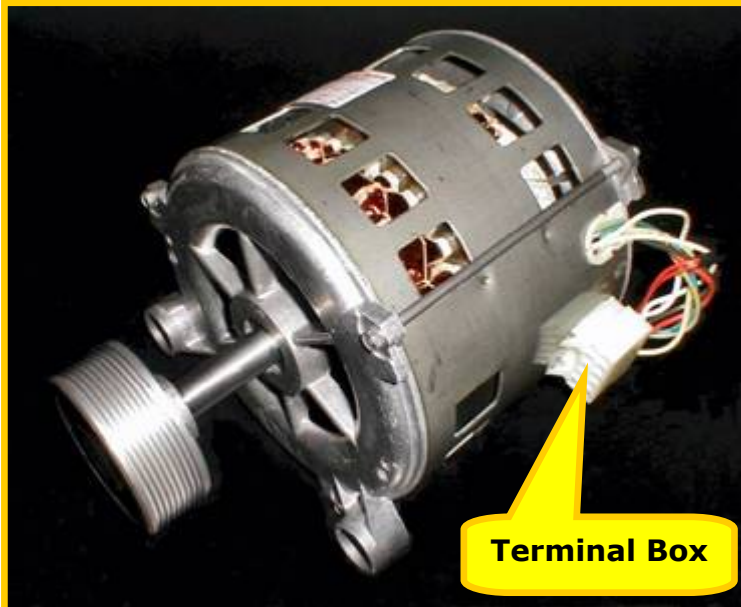
Bench Test of INDUCTION MOTOR with TYPE "B" junction box:



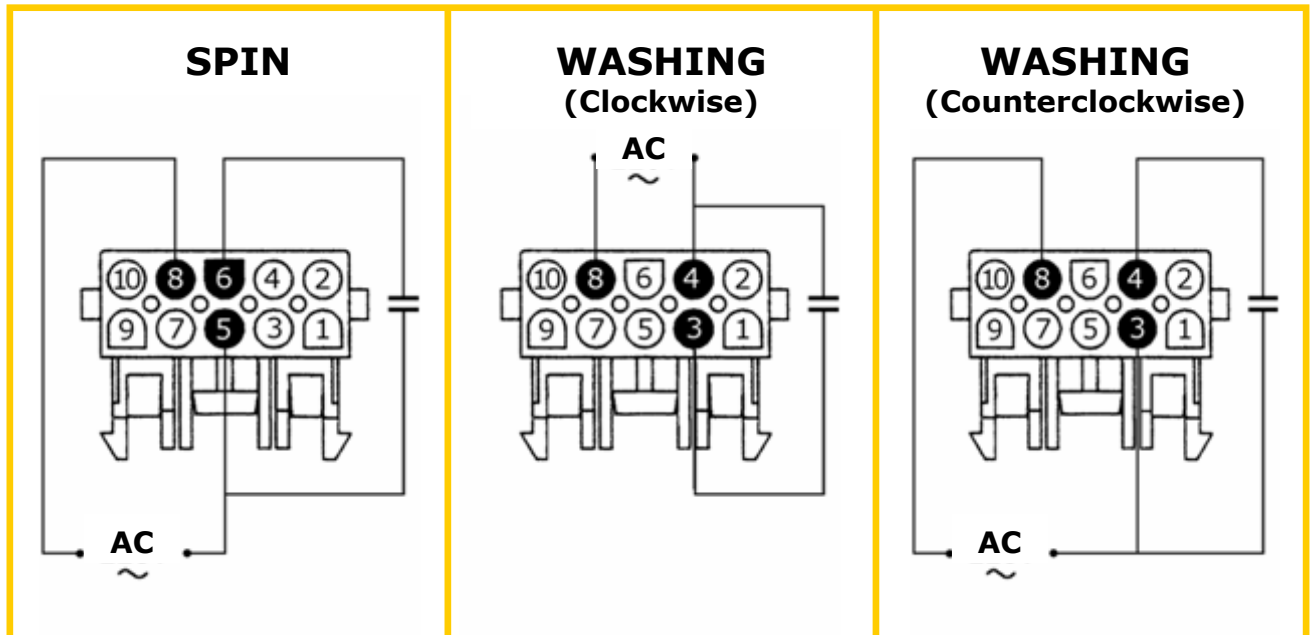
IMPORTANT: To be bench tested, each Induction Motor needs it's original Start Capacitor. Please find the Capacitor's part number on the related GIASTECH spares lists.

9b) INDUCTION MOTORS WITH TACHOMETRIC DYNAMO:

This type of Motor was uniquely used to power some few models of **Top Loaders**. It's a **SINGLE-PHASE ASYNCHRONOUS MOTOR**, equipped with two separate windings, each one bearing a different number of poles. Each separate winding is coupled to a specific **START CAPACITOR**. This Motor is equipped with a **TACHOMETRIC DYNAMO** as well, with a permanent magnet rotor and coaxial to the Motor's shaft. This type of Motor is controlled by an **ELECTRONIC MODULE**, that reads the output signal from the Tachometric Dynamo in order to manage the Motor's speed of revolution and the Appliance Anti-unbalancement function too. Here follows the bench testing procedure:



- | | |
|---------------------------|--|
| Contacts N° 9 – 10 | : TOC (internal thermal overheating control) |
| Contacts N° 8 | : Common Lead |
| Contacts N° 7 | : (NOT USED - EMPTY) |
| Contacts N° 6 - 5 | : 2 Poles Winding (Spin) |
| Contacts N° 4 - 3 | : 12 Poles Winding (washing) |
| Contacts N° 2 - 1 | : Tachometric dinamo (Ohmic Value: $\sim 30 \Omega$) |



9c) SYNCHRONOUS MOTOR WITH BRUSHES & COMMUTATOR:

This Motors are mostly used on Electronically Controlled (Cuore Control Module) Washing Machines. It features only **one winding** and a **TACHOMETRIC DYNAMO**, coaxial to the Motor's shaft. The value of the frequency of the AC current generated by the Tachometric Dynamo, is understood by the Cuore Control Module as the value of the speed of rotation of the Motor. Moreover, whatever strain in generating the correct value of frequency in time, is understood as an unbalancement of the drum. The reversal of the sense of rotation of the Motor, is controlled by the Cuore Module through two dedicated relays. Hereunder are the instructions for the bench testing of these Motors:

IMPORTANT: to perform the different speeds of rotation, each Commutator Motor needs a specifically dedicated software, loaded into the Eeprom memory of the related Cuore Control Module. Therefore, when bench tested the Commutator Motor can only be run at the maximum speed. Do not feed it for more than 30 seconds, not to exceed "RPM Max" for the specific motor.



Commutator Motor by "CESET"

Terminal Box:

TYPE C or TYPE D

Carbon Brush and Holder assy:

P/N. **92126721** (2 pcs.)

Noise Damper Foam Cover:

P/N. **92955111**

Tacho Coil Ohmic Value:

Between Leads **4 - 5 : ~ 42 Ω**



Commutator Motor by "SOLE - ACC"

Terminal Box:

TYPE C or TYPE D

Carbon Brush and Holder assy:

P/N. **49000466** (2 pcs.)

Noise Damper Foam Cover:

P/N. **41002482**

Tacho Coil Ohmic Value:

Between Leads **4 - 5 : ~ 184 Ω**



**Commutator Motor
by "ATB - SELNI"**

Terminal Box:

TYPE E

Carbon Brush and Holder assy:

P/N. **49008106** (2 pcs.)

Tacho Coil Ohmic Value:

Between Leads **4 - 5 : ~ 90 Ω**



**Commutator Motor
by "HOOVER"**

Terminal Box:

TYPE C

Carbon Brush and Holder assy:

P/N. **91212332** (1 pcs.)

Noise Damper Foam Cover:

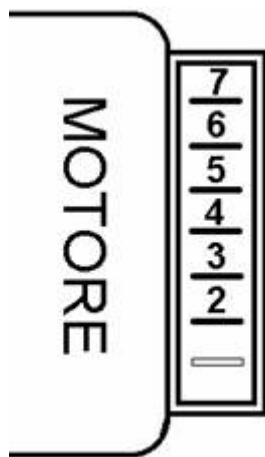
P/N. **92955111**

Tacho Coil Ohmic Value:

Between Leads **4 - 5 : ~ 156 Ω**

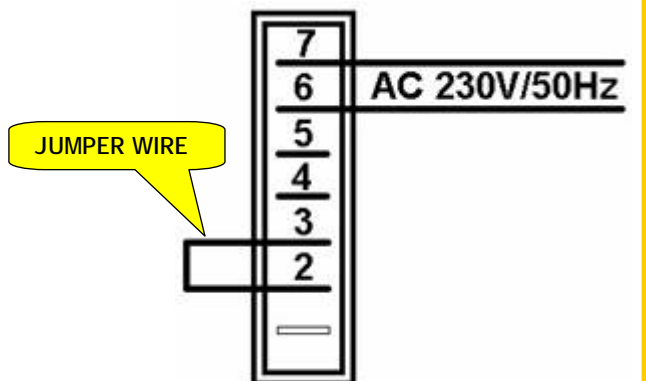
IMPORTANT: For Bench Testing, carefully identify the type of Terminal Box. Detach the connector of the Washing Machine's wiring and do not feed for more than 30 seconds.

Terminal Box **"TYPE C"** (7 Positions - **NO Tapped Field Winding**)

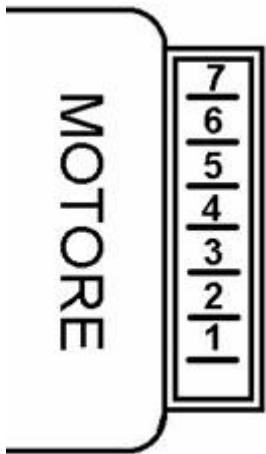


- "Stator"**
Contacts **3 - 7**
- "Rotor"**
Contacts **2 - 6**
- "Tacho Dynamo"**
Contacts **4 - 5**
- Contact **1: empty**

High Speed Rotation

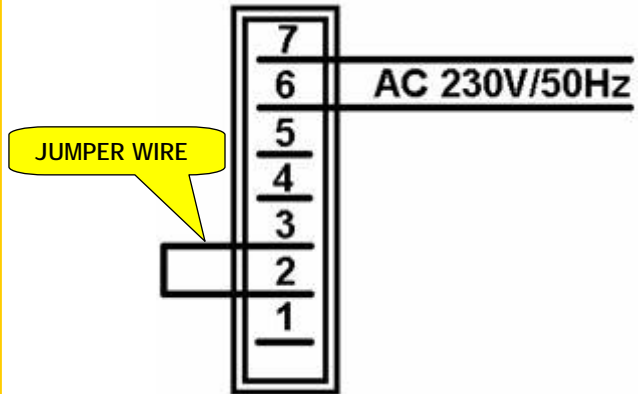


Terminal Box **"TYPE D"** (7 Positions – **WITH Tapped Field Winding**)

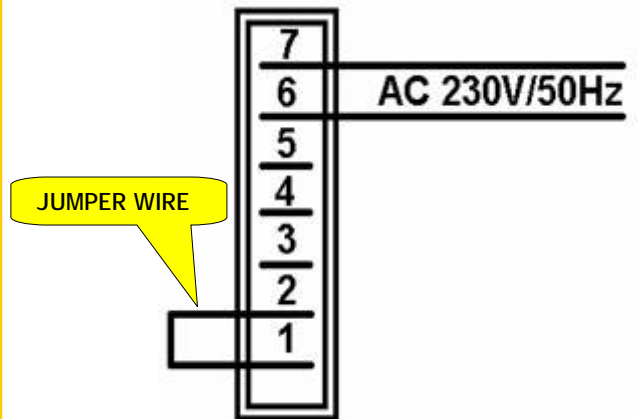


- "Rotor"**
Contacts **2 - 6**
- "Stator - Normal"**
Contacts **3 - 7**
- "Stator - High"**
Contacts **1 - 7**
- "Tacho Dinamo"**
Contacts **4 - 5**

Normal Speed Rotation



High Speed Rotation

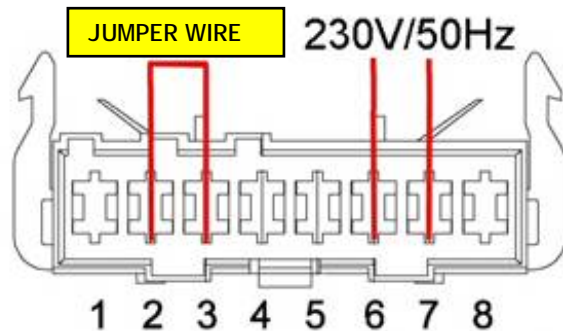


**Tapped Field Winding
Bench Testing**

Terminal Box **"TYPE E"** (8 Positions – **NO Tapped Field Winding**)

- "Rotor"**
Contacts **2 - 6**
- "Stator - Normal"**
Contacts **3 - 7**
- "Tacho Dinamo"**
Contacts **4 - 5**
- Contact **1 & 8: empty**

High Speed Rotation



9d) THREE-PHASE MOTORS:

These Motors are mainly fitted onto Electronically Controlled Top-of-the-Range Washing Machines. It's equipped with three separate windings and CANNOT WORK IF NOT CONNECTED WITH ITS SPECIFIC CUORE CONTROL MODULE. Therefore, the only possible bench tests on these motors are the measurement of the Ohmic (Ω) Values of each winding (top confirm they are not open or short circuited) and the measurement of the Ohmic (Ω) Value of the **TACHOMETRIC DYNAMO**. Being without carbon brushes, these motors are very silent; moreover, they give better general performances than the Commutator ones. Three-phase Motors can be 2 or 4 poles and this data is found on the Motor's serial label.

NOTE: The Diagrams of The Terminal Boxes with the identification of the numbers of the leads AMP terminals, can be found at P. 31 and P. 32.



Three-phase Motor 4 Poles - by "SOLE-ACC" P/N. 41006030

Omic Values of Windings (star connected) at 20°C room temp.

Between Leads 4 - 5 : $\sim 2,6 \Omega$

Between Leads 5 - 6 : $\sim 2,6 \Omega$

Between Leads 6 - 4 : $\sim 2,6 \Omega$

Ohmic Value of Tacho Coil:

Between Leads 2 - 3 : $\sim 184 \Omega$



Three-phase Motor 2 Poles - by "SOLE-ACC" P/N. 41016424 - 41016661

Omic Values of Windings (triangle connected) at 20°C room temp.

Between Leads 4 - 5 : $\sim 5,4 \Omega$

Between Leads 5 - 6 : $\sim 5,4 \Omega$

Between Leads 6 - 4 : $\sim 5,4 \Omega$

Ohmic Value of Tacho Coil:

Between Leads 2 - 3 : $\sim 184 \Omega$



**Three-phase Motor
2 Poles - by "CESET"
Stator Width: 55 mm
P/N. 41023825**

**Omic Values of Windings
at 20°C room temp.**

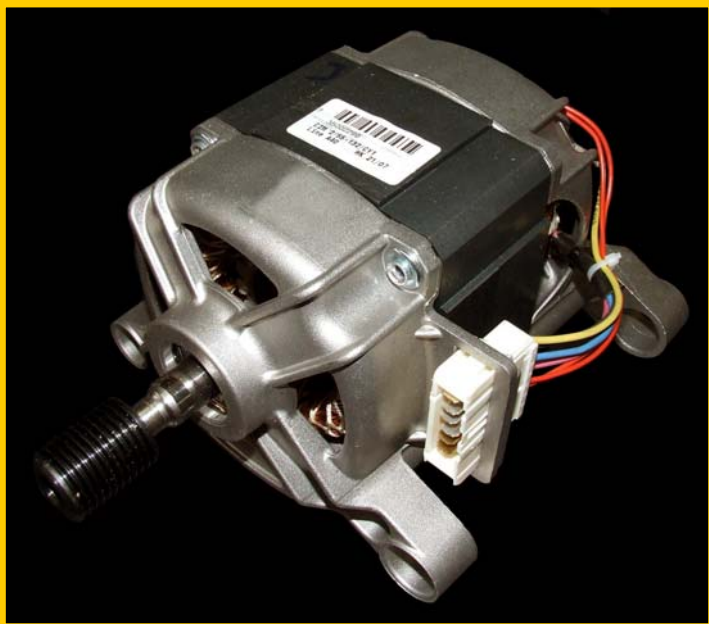
Between Leads **4 - 5** : $\sim 3,9 \Omega$

Between Leads **5 - 6** : $\sim 3,9 \Omega$

Between Leads **6 - 4** : $\sim 3,9 \Omega$

Ohmic Value of Tacho Coil:

Between Leads **2 - 3** : $\sim 116 \Omega$



**Three-phase Motor
2 Poles - by "CESET"
Stator Width: 50 mm
P/N. 41024361 - 41024362**

**Omic Values of Windings
at 20°C room temp.**

Between Leads **4 - 5** : $\sim 4,8 \Omega$

Between Leads **5 - 6** : $\sim 4,8 \Omega$

Between Leads **6 - 4** : $\sim 4,8 \Omega$

Ohmic Value of Tacho Coil:

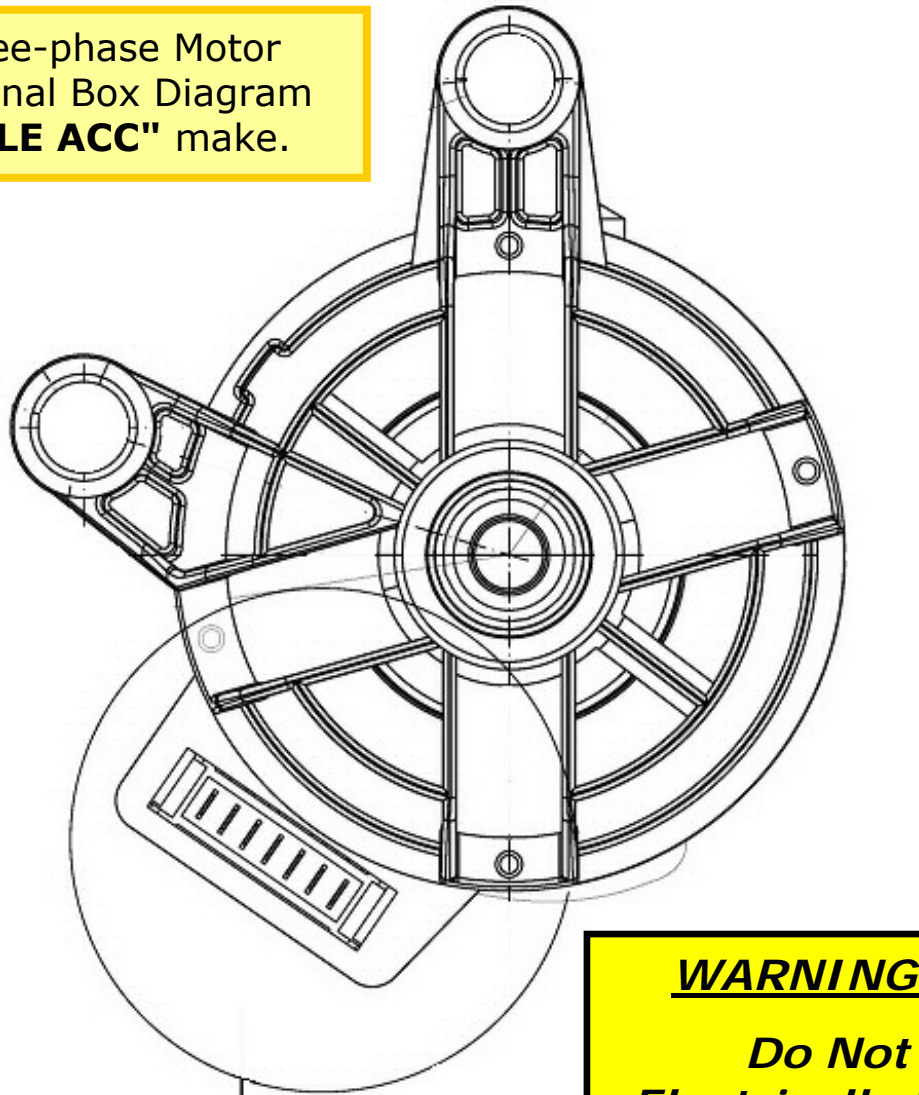
Between Leads **2 - 3** : $\sim 116 \Omega$

IMPORTANT

To carry out the bench testing of the Three-phase Motors, GIAS has made available the special Test Cable P/N. 49010012 (see Attachment 2), equipped with a suitable connector for the Motor's Terminal Box and Safety Plugs for the connection to the Multimeter. ONLY TEST AVAILABLE IS THE MEASUREMENT OF THE OHMIC VALUES OF THE THREE MOTOR'S WINDINGS.

DO NOT ELECTRICALLY FEED THE MOTOR IN ANY CASE!!!

Three-phase Motor
Terminal Box Diagram
"SOLE ACC" make.



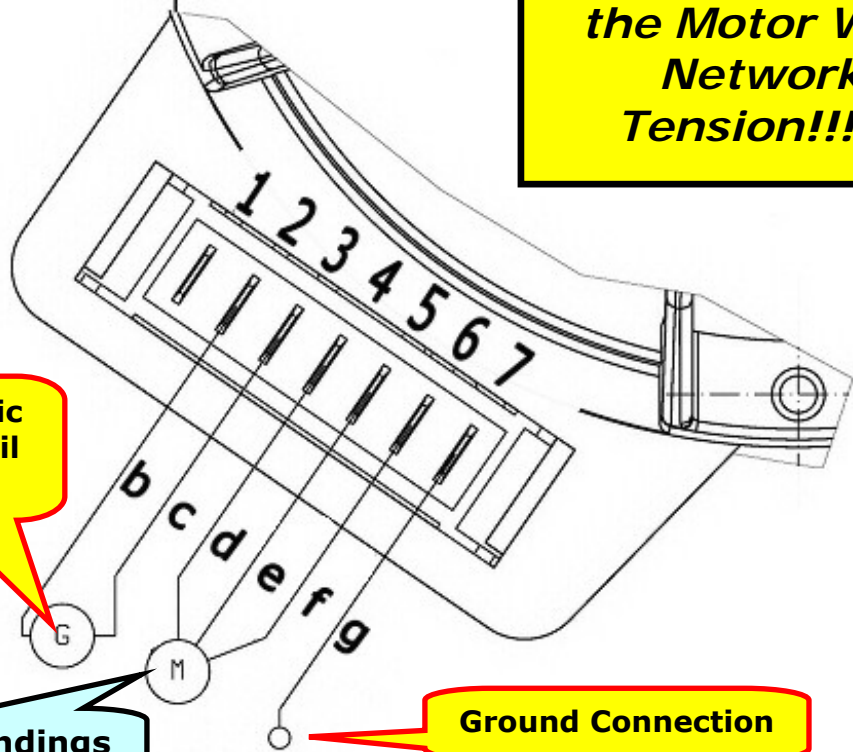
WARNING !!!

***Do Not
Electrically Feed
the Motor With
Network
Tension!!!!!!***

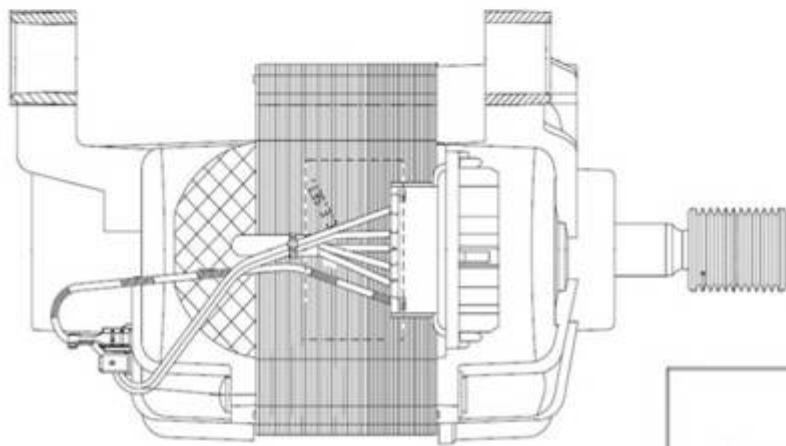
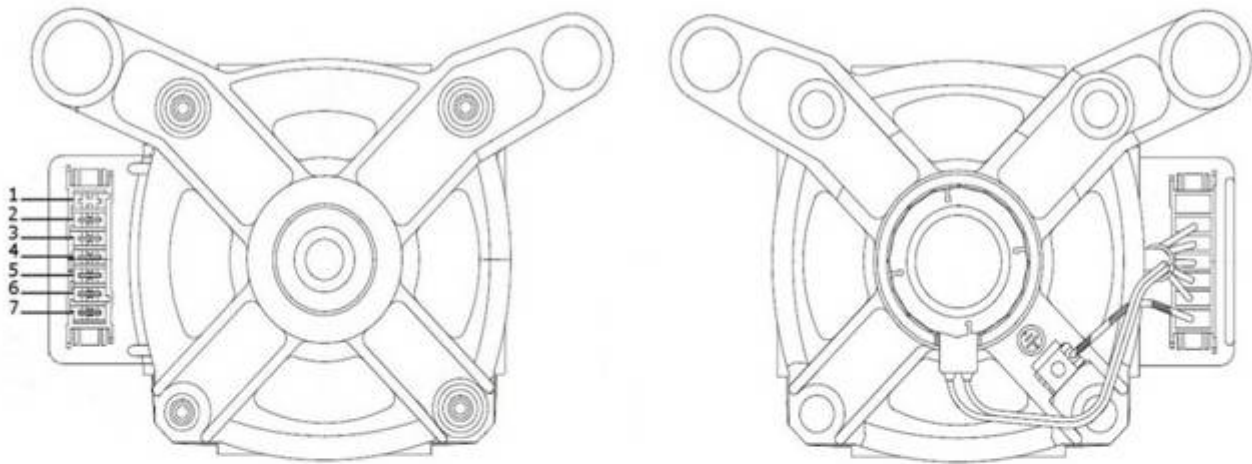
**Tachometric
Dinamo Coil
Winding**

Motor's Windings

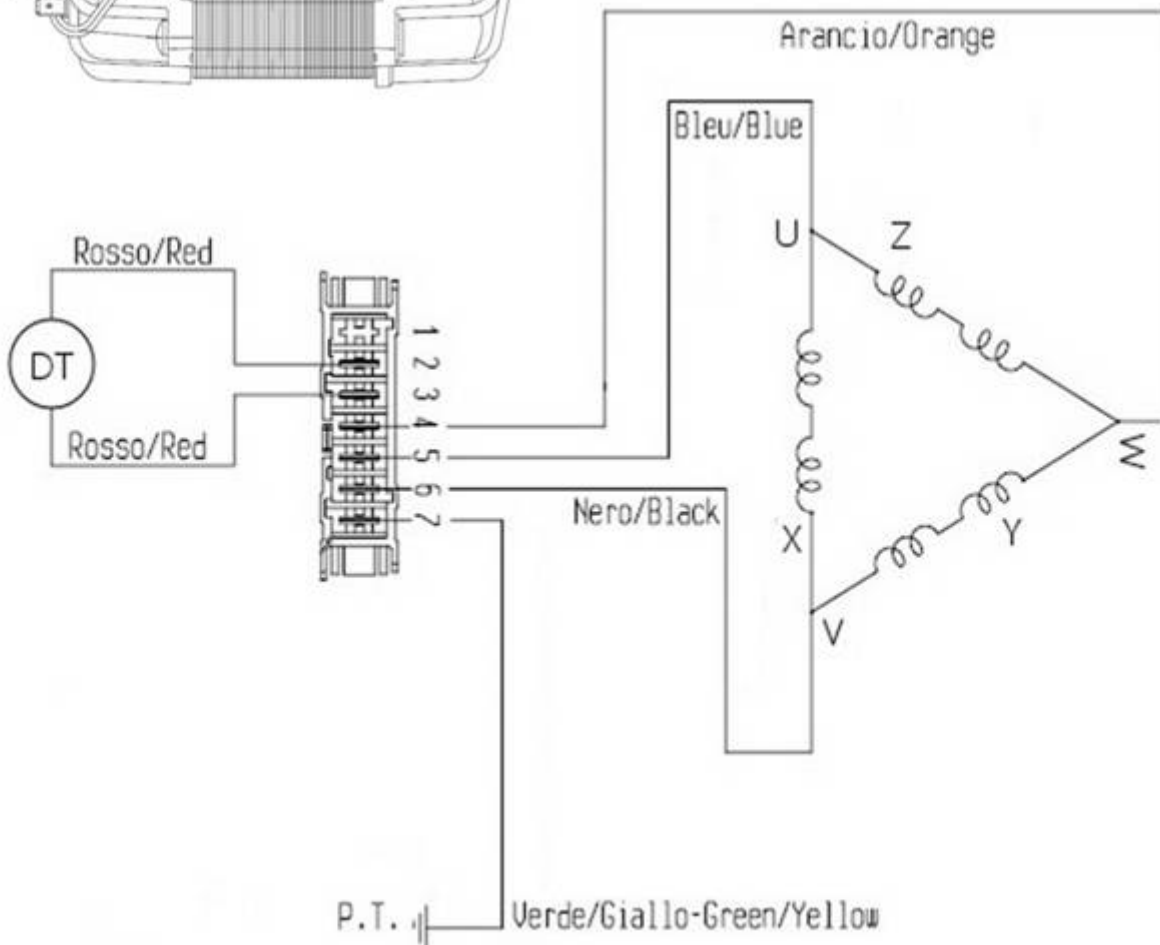
Ground Connection



Three-phase Motor Terminal Box Diagram - "CESET" make.



WARNING !!!
Do Not
Electrically
Feed the Motor
With Network
Tension!!!!!!



9e) DIRECT CURRENT COMMUTATOR MOTORS:

This type of Motors are mainly used on Electronically Controlled Top-Of-The-Range Washing machines and it's most similar to a conventional Commutator Motor. To work, it needs **2 Electronic Control Modules**: a specifically dedicated **Cuore Control Module** and a **Current Rectifier Module**, usually fitted in the back lower part of the Appliance's cabinet and including a "Bridge" of diodes. These Motors are equipped with a **Tachometric Dynamo** as well. Their Terminal Box usually features 10 leads in line, out of which the contacts number **8** and **9** are for the **internal TOC** (bi-metal), connected in series with one of the two phases of the mains.



Continuous Current Motor

P/N. **41002726**

by **"SOLE – ACC"**

Terminal Box : **TYPE F**

Carbon Brush and Holder Assy

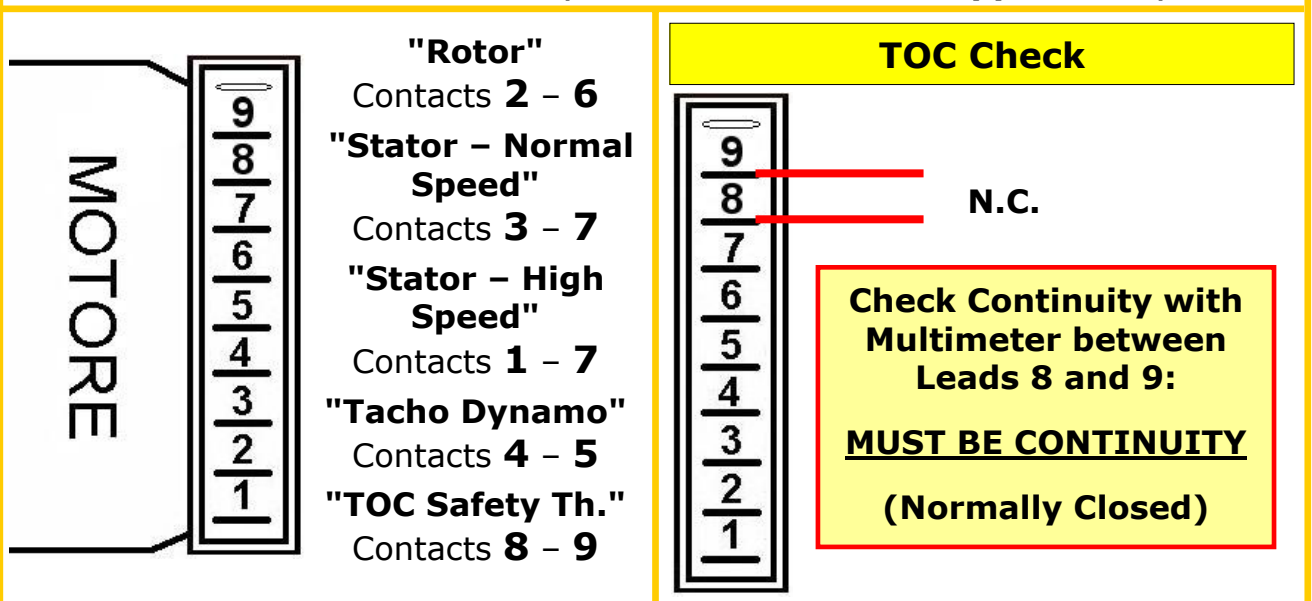
P/N. **49000466 (2 pcs.)**

Tachometric Coil Ohmic Value

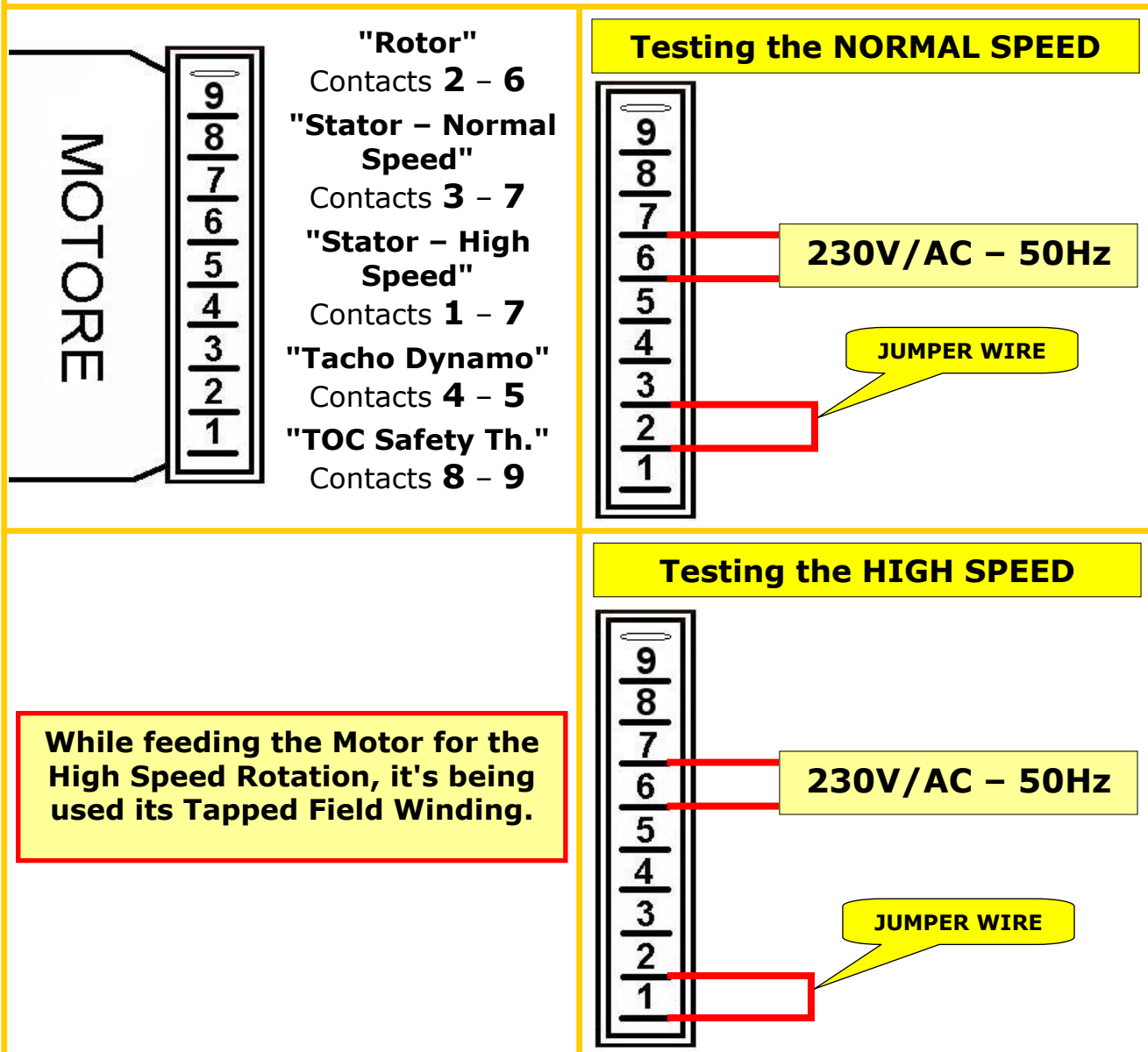
Between Leads **4 - 5** : **~ 184 Ω**

Hereunder follow the indications on how to carry out the bench testing of these motors:

Terminal Box **"TYPE F"** (10 Positions - **WITH Tapped Field**)



Terminal Box **"TYPE F"** (10 Positions - **WITH Tapped Field**)



Two different **Current Rectifier Modules** are presently used by Candy for these Motors and **they are not interchangeable between them:**

- **Current Rectifier Module P/N. 41005897 (Cuore Module by MDL)**
- **Current Rectifier Module P/N. 41021535 (Cuore Module by INVENSYS)**

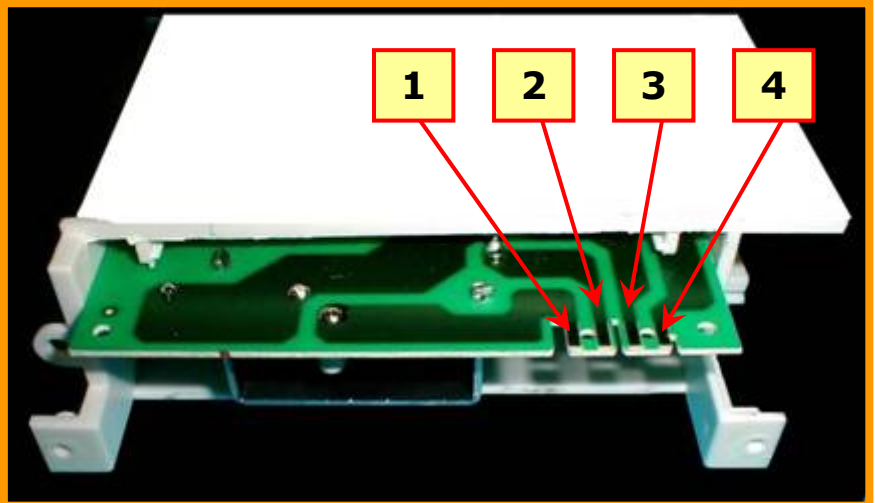
PLEASE BE CAREFUL TO COUPLE TO EACH CONTINUOUS CURRENT COMMUTATOR MOTOR THE RELATED SPECIFIC CUORE CONTROL MODULE AND RECTIFIER CONTROL MODULE, BY PICKING THEIR CORRECT PART NUMBERS FROM THE SPECIFICALLY RELATED SPARE PARTS LISTS OF THE GIASTECH WEB SITE.

Hereafter follows the description of the Bench Testing Procedures for the Continuous Current Commutator Motors:

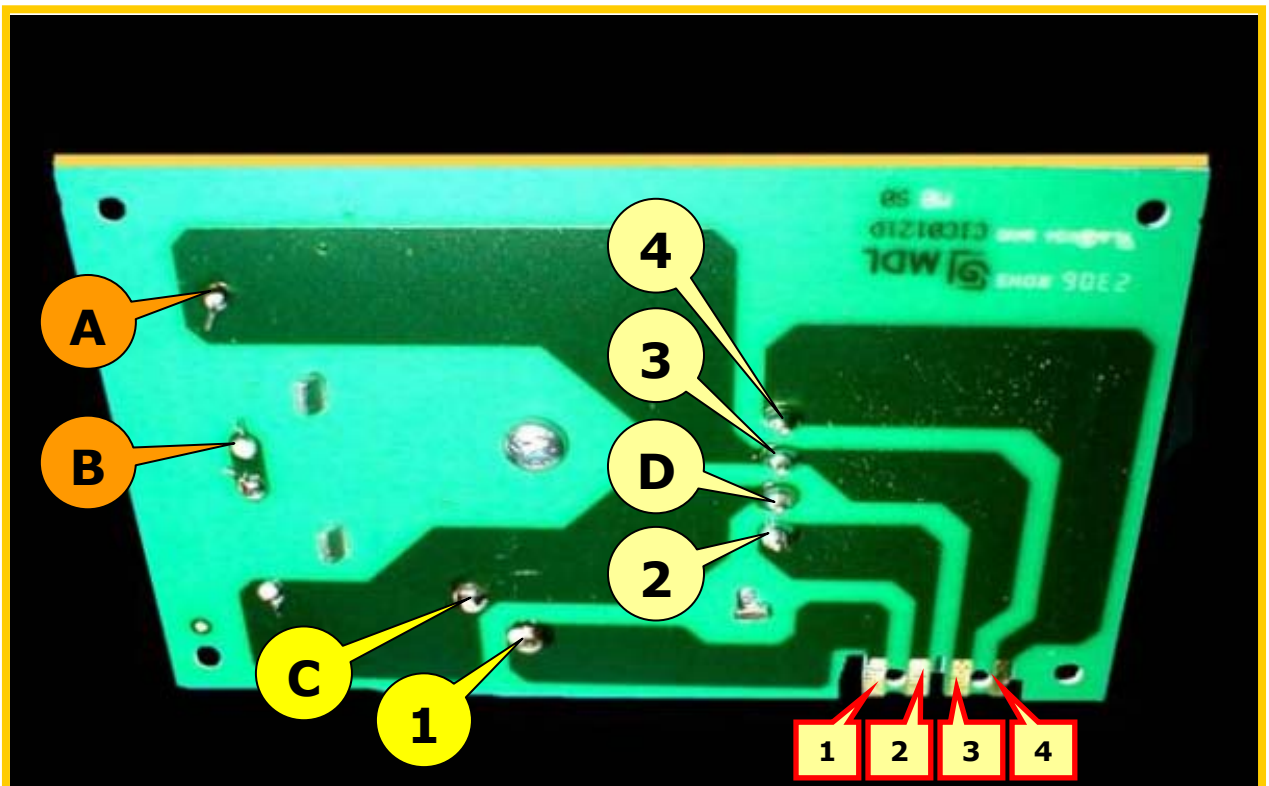
**Current Rectifier
Module for Cuore
Board by MDL:**

P/N. 41005897

Connector Type:
4 Contacts



Unplug the Washing Machine, remove the **Current Rectifier Module** from its housing and visually check its good conditions.



Set Multimeter in the OHMMETER mode (Ω) and check that:

- Between points **A** and **B** the Ohmic Value is within **90 – 100 Ω**
- Between points **C** and **1** the Ohmic Value is about: **0,4 Ω**

Set Multimeter in the DIODES METER mode ($\rightarrow|+$) and check that:

Between points **2** and **D** it's **conductivity**

Between points **2** and **3** it's **conductivity**

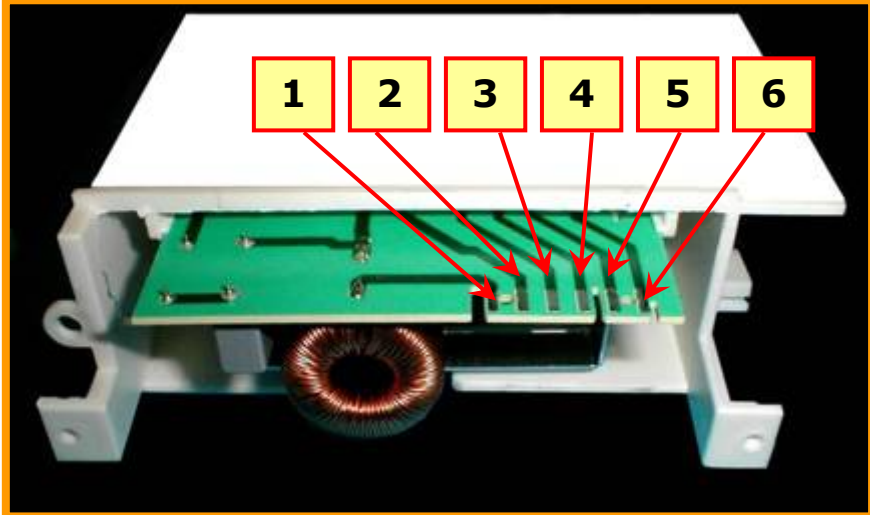
Between points **D** and **4** it's **conductivity**

WARNING:
if no conductivity is found on the diodes (current not passing through) just reverse the position of the DIODE METER Test Leads.

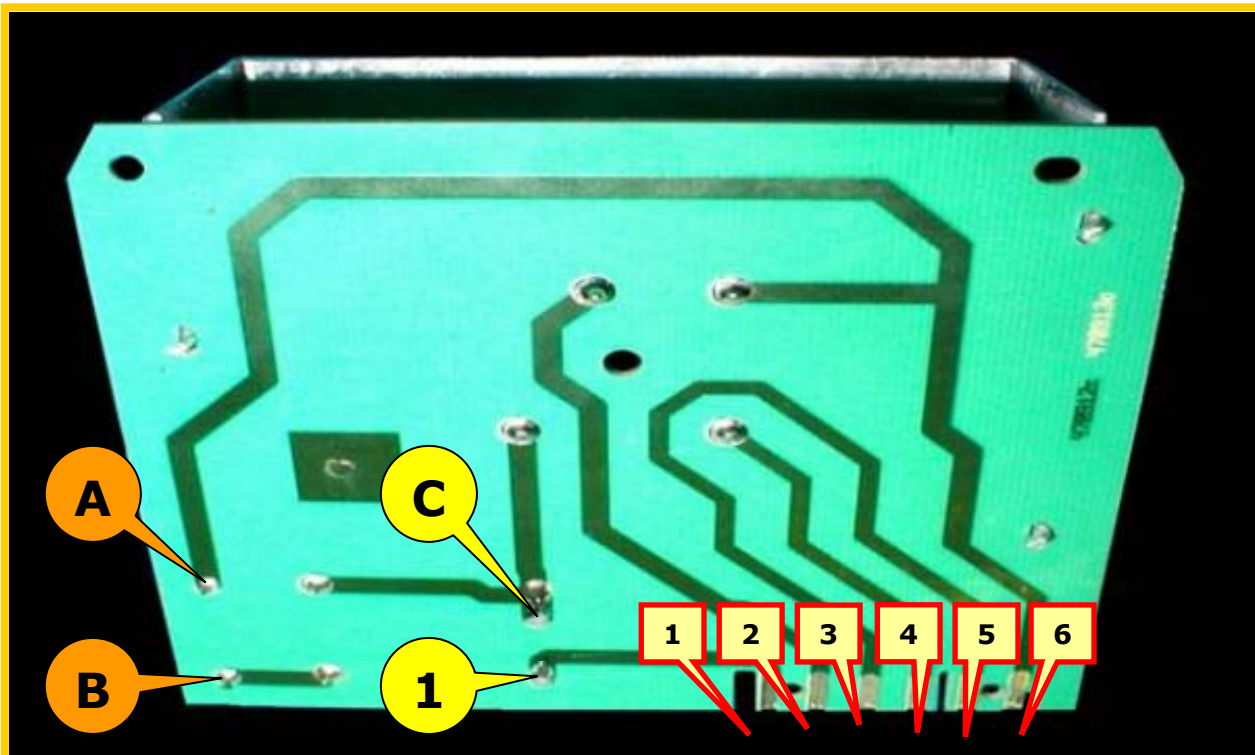
**Current Rectifier
Module for Cuore
Board by
INVENSYS:**

P/N. 41021535

Connector Type:
6 Contacts



Unplug the Washing Machine, remove the **Current Rectifier Module** from its housing and visually check its good conditions.



Set Multimeter in the OHMMETER mode (Ω) and check that:

- Between points **A** and **B** the Ohmic Value is within **140 – 150 Ω**
- Between points **C** and **1** the Ohmic Value is about: **0,3 Ω**

Set Multimeter in the DIODES METER mode ($\rightarrow|$) and check that:

- Between points **2** and **6** it's **conductivity**
- Between points **2** and **1** it's **conductivity**
- Between points **1** and **4** it's **conductivity**

WARNING:
if no conductivity is found on the diodes (current not passing through) just reverse the position of the DIODE METER Test Leads.

9f) CHECKS ON THE TACHOMETRIC DYNAMO:

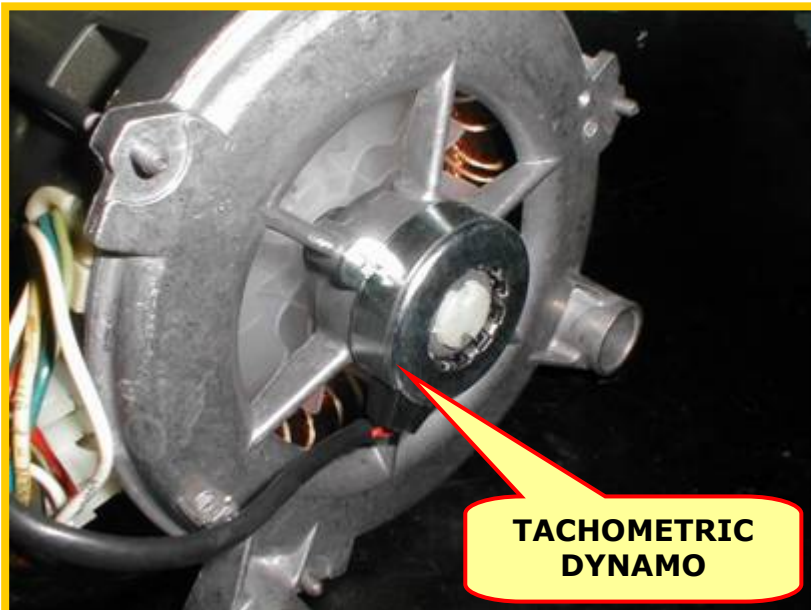
The Tachometric Dynamo is used by the Cuore Control Module, to manage the speed of rotation of the Motor and to keep under control the unbalancement of the drum.

IMPORTANT

The Coil of the Tachometric Dynamo is connected to the Appliance's wiring through the Motor's Terminal Box.

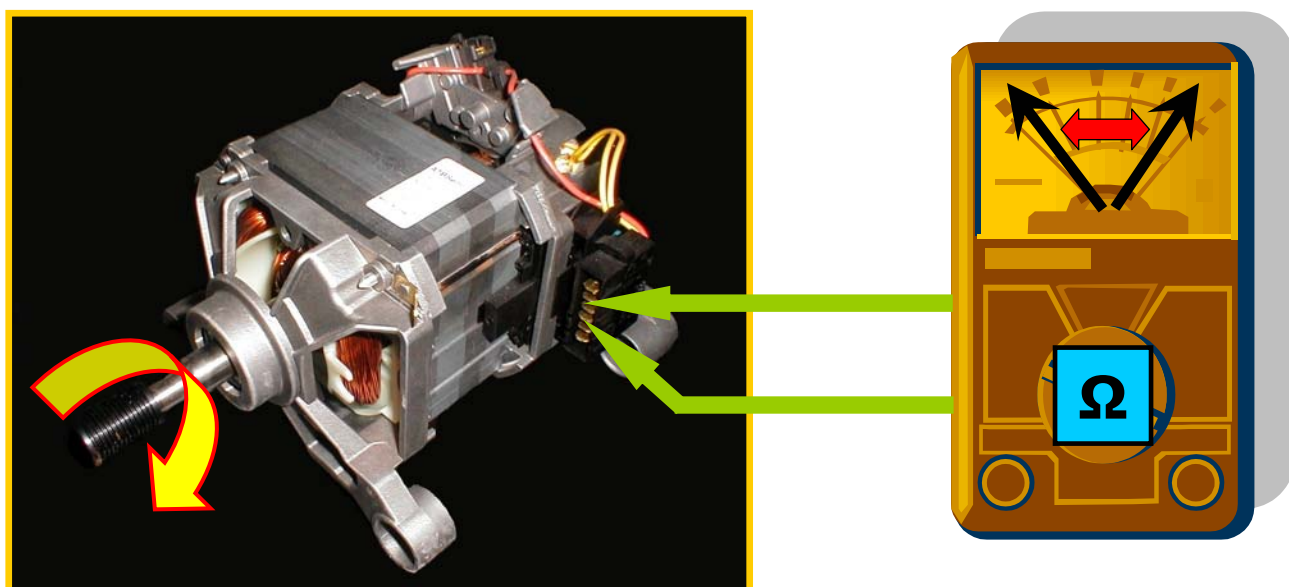
Contacts are 4 - 5 in case of INDUCTION or COMMUTATOR MOTORS

and 2 - 3 in case of THREE-PHASE MOTORS.



CHECKING THE OHMIC VALUE (Ω) OF TACHO'S COIL: remove the Appliance's wiring connector from the Motor's Terminal Box and connect the OHMMETER to contacts 4 - 5 (or 2 - 3 in case of Three-phase Motor). The Ohmic Value of the winding of the Coil of the Tachometric Dynamo is different, depending on the type of the Motor (see data in par. 9b, 9c, 9d, 9e)

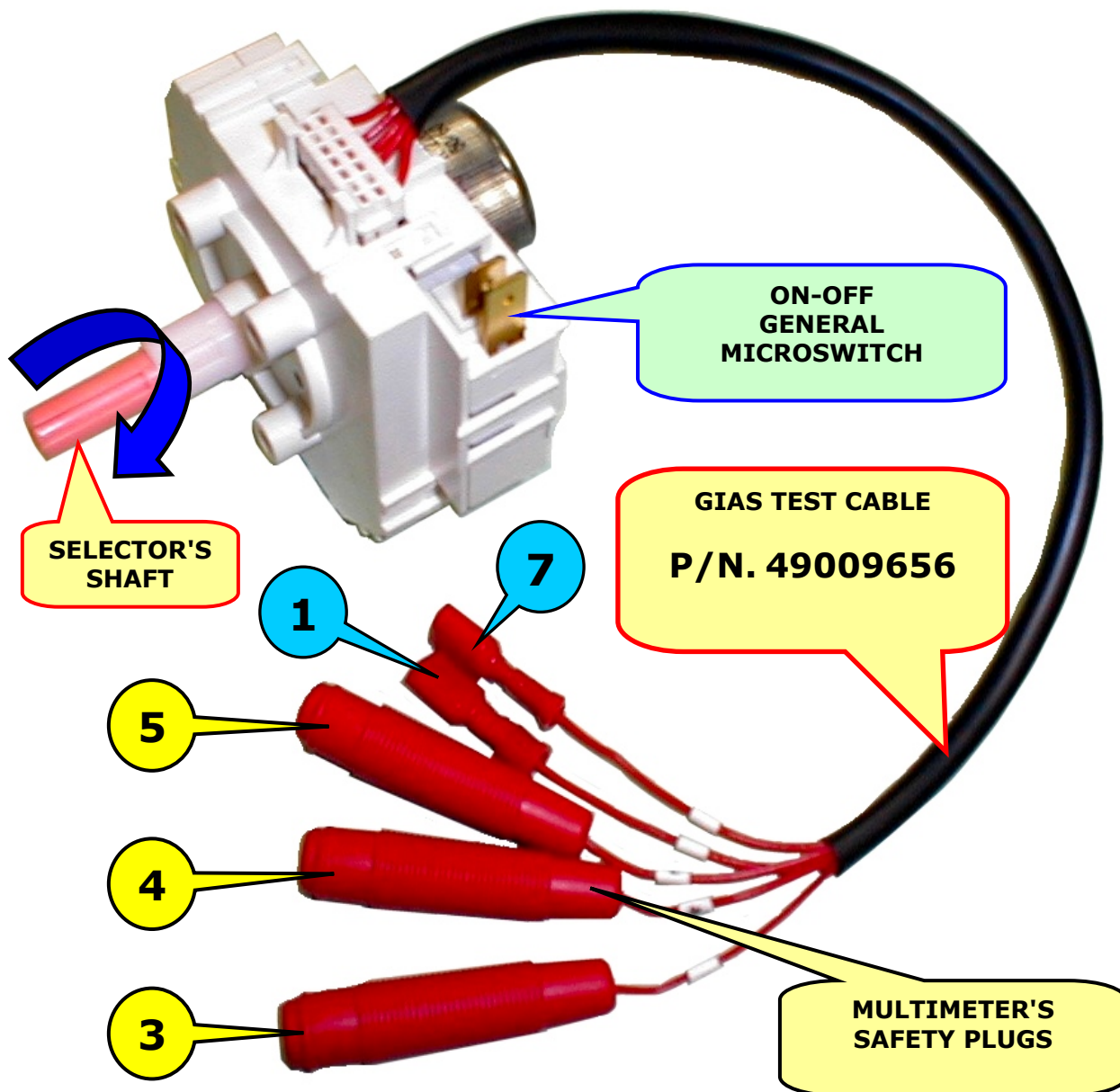
CHECKING THE MAGNETIC ROTOR OF THE TACHOMETRIC DYNAMO: being the OHMMETER connected to the Motor as previously, manually turn the shaft of the Motor. If the Ohmic value displayed by the OHMMETER **changes**, this means the Rotor is correctly working. If on the contrary the Ohmic Value stays unchanged, the Rotor is defective.



ATTACHMENT 1 – GIAS TEST CABLES:

TEST CABLE FOR CHECKING MOTORIZED SELECTORS: P/N. 49009656

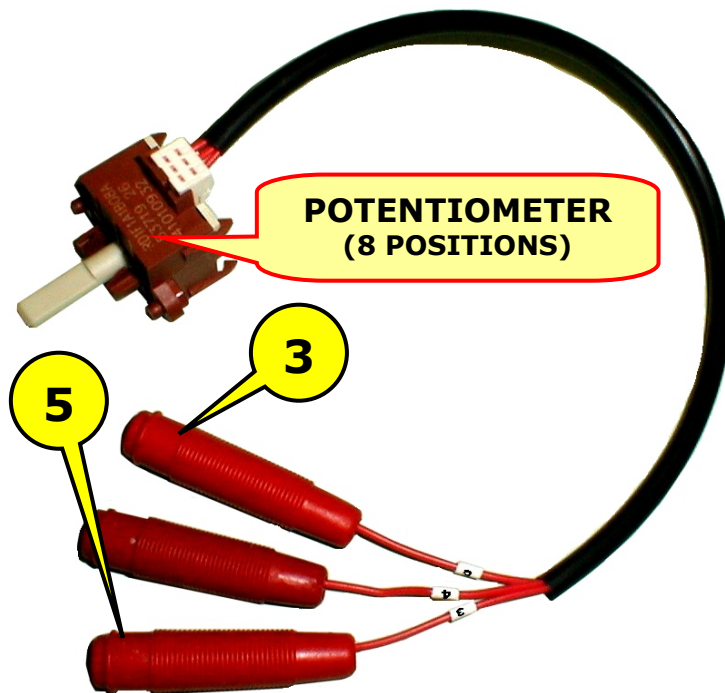
Detailed check are fully described in Chapter 3.



LEGENDA:

- **"ON-OFF" Contacts:** use to set the Selector on Position "0". With MULTIMETER connected to these leads in CONTINUITY measurement mode, the "0" position is the only **OPEN CIRCUITED** one.
- **Connectors 3 – 4 – 5: Safety Plugs Connectors,** to safely connect the TEST CABLE to the MULTIMETER, to carry out all possible measurements. (See Chapter 3)
- **AMP Connectors 1 and 7:** to perform the reading of the Ohmic Value of Motor's coil (**MDL = $\sim 13K\Omega$, INVENSYS = $\sim 6.4K\Omega$**) and to feed the Selector's Motor with network tension.

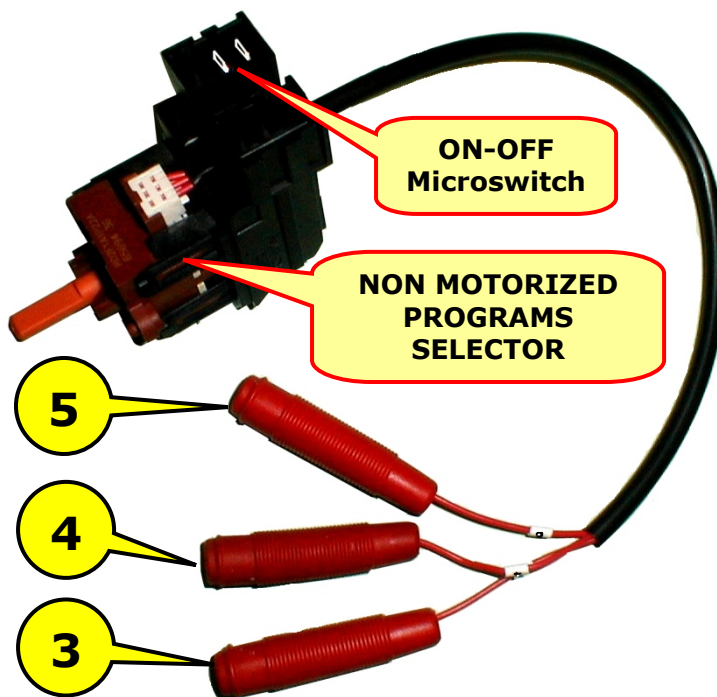
**TEST CABLE FOR CHECKING NON MOTORIZED SELECTORS,
POTENTIOMETERS, NTC PROBES, SOLENOID VALVES: P/N. 49009657**



**Functional Check of
POTENTIOMETERS
(8 Positions)**

Connect the TEST CABLE P/N. **49009657** to the connector of potentiometer and carry out the reading of all Ohmic (Ω) Values in each position of setting.

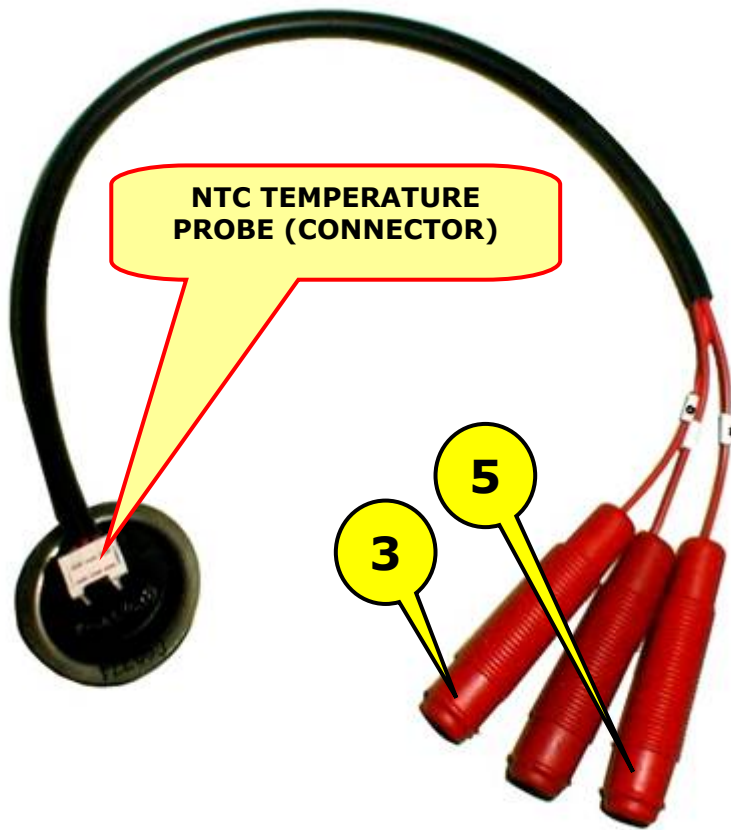
Connect to MULTIMETER through **SAFETY PLUGS 3** and **5** (See P. 11)



**Functional Check of
NON MOTORIZED
SELECTORS
(12,16,22 Posizioni)**

Connect the TEST CABLE P/N. **49009657** to the connector of potentiometer and carry out the reading of all Ohmic (Ω) Values in each position of setting.

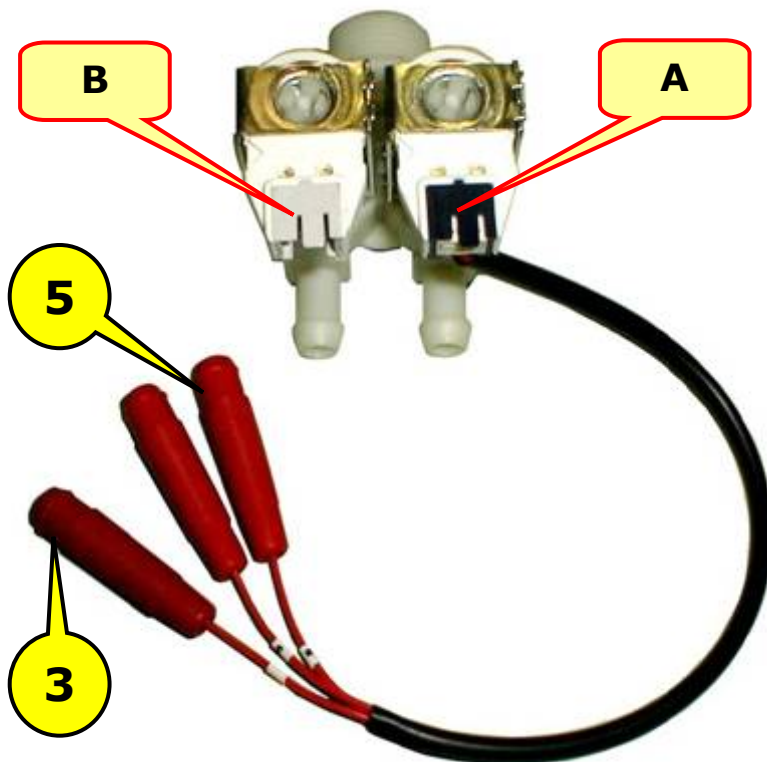
Connect to MULTIMETER through **SAFETY PLUGS 4** and **5** (See P. 7)



Functional Check of NTC SENSORS (WITH CONNECTOR)

Check the temperature of the probe with a precise electronic thermometer. Connect the TEST CABLE P/N. **49009657** to the sensor and read its Ohmic (Ω) Value with a DIGITAL MULTIMETER connected to SAFETY PLUGS **3** and **5**.

(Ω) values chart at P. **12**.



Functional Check of DOUBLE SOLENOID VALVE (WITH CONNECTORS)

Connect the TEST CABLE P/N. **49009657** to the connector of each SOLENOID VALVE (**A** or **B**).

Connect the TEST CABLE P/N. **49009657** to a MULTIMETER through its SAFETY PLUGS **3** and **5**.

Ohmic Value of Solenoid's Coil = $\sim 3,4 \text{ K}\Omega$ at 20°C

ATTACHMENT B – TEST CABLES FOR MOTORS BENCH TESTING:

(See Chapter 9)



P/N. 49010010

GIAS TEST CABLE FOR

**Commutator
Motors**

Terminal Box **TYPE C/D**

Valid for all types of Motors,
with and without Tapped
Field.

YELLOW Safety Plugs are
to Tachometric Dynamo.



P/N. 49010012

GIAS TEST CABLE FOR

**Three-phase
Motors**

YELLOW Safety Plugs are
to Tachometric Dynamo.

**WARNING: DO NOT FEED
THE MOTOR WITH ANY
NETWORK TENSION.
ONLY CHECK OHMIC
VALUES OF WINDINGS.**



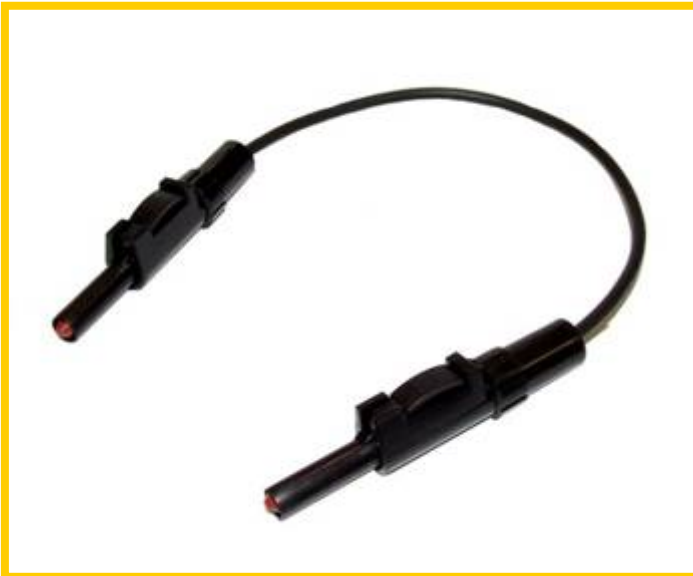
P/N. 49010014

GIAS TEST CABLE FOR

**Direct Current
Commutator
Motors**

Terminal Box **TYPE F**

YELLOW Safety Plugs are
to Tachometric Dynamo.



P/N. 49010016

Single Pole jumper wire, to connect when needed the contacts **2** and **3** of the Motor's Terminal Box.

FOR ALL TYPES OF MOTORS, THREE-PHASE EXCLUDED.



P/N. 49010017

Single Pole Round Connector, to be fitted onto whatever MAINS CABLE WITH SCHUKO PLUG, in order to feed the Motor.

FOR ALL TYPES OF MOTORS, THREE-PHASE EXCLUDED.

DO NOT FORGET TO CONNECT TO THE MOTOR'S GROUND LEAD THE EARTH WIRE OF THE MAINS CABLE.

**2 pieces needed
(phase + neutral)**

WARNING

FOR BETTER SAFETY ALWAYS CONNECT TO THE MAINS THROUGH THE GIAS PATCH EXTENSION P/N. 91941051. DO NOT FORGET THAT ALL BENCH TESTS UNDER CURRENT MUST HAVE A VALID EARTH CONNECTION.



P/N. 49010277

Couple of Multimeter's Test Leads with Safety Plugs, with special rounded terminal points (under removable insulating cover) for the easy insertion in every rounded female socket (i.e. motor terminal box).

These Multimeter Test Leads are standard equipment of Patch Cord P/N. 91941051

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Best regards.

GIAS Italy