KARL SUSS,

# CONTENTS

RC 8

COPY

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# 1. PREFACE

## DISCLAIMER

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This machine is guaranteed for 1 year against all defects in construction, parts and labour, excluding spare parts not manufactured by KS TEC for which the length of guarantee is that given by the manufacturer, eg motors, solenoid valves, integrated circuits, transformers etc, on condition that the defect is acknowledged by KS TEC.

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**FOR CERTAIN PIECES OF EQUIPMENT THIS GUARANTEE IS ONLY VALID IF THE MACHINE IS RETURNED TO OUR WORKSHOP. IF THE SERVICE CALL IS CARRIED OUT ON SITE THE TECHNICIAN'S TRAVEL EXPENSES ARE BILLED TO THE USER.**

## CONDITIONS OF OWNERSHIP

After the delivery and installation of the equipment and in compliance with the law (article 80.335 of 12 May 80), KS TEC remains owner of the equipment supplied until complete payment for it has been received.

Furthermore, in the eventuality of non-payment of amounts due, KS TEC does not undertake to respect the guarantee. The guarantee will, however, be respected once payment has been made, without the prolongation in time which late payment implies.

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In order to avoid abuse, every request for the service call of a KS TEC after-sales technician must be confirmed by telex. No other form of request will be acknowledged.

In addition, for service calls outside the guarantee period, the telex should include an order number in order to facilitate rapid settlement.

The payment of service calls carried out outside the guarantee period is to be made upon receipt of our invoice.

No service calls will be carried out if these conditions are not respected.

# 2. SPECIFICATIONS

## 2.1 RC33

| | | |
|---|---|---|
| MAXIMUM SPEED (no load) | : | 1 000 rpm or 1 500 rpm according to configuration |
| MINIMUM STEP | : | 10 rpm |
| SPEED DISPLAY | : | LED indicators / 3 digits / 7 segments |
| SPEED REGULATION | : | Brushless motor & resolver |
| SPEED CONTROL | : | Galvanometric coil |
| MAXIMUM ACCELERATION (no load) | : | 300 rpm/s |
| MINIMUM STEP | : | 100 rpm/s |
| ACCELERATION DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME RANGE | : | from 0 to 999 seconds |
| TIME DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME CONTROL | : | Countdown displayed by LED indicators |
| RS 232 C CONFIGURATION | : | 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. |
| MAXIMUM SUBSTRATE SIZE | : | 33"Ø/24"□ |
| MAXIMUM SUBSTRATE THICKNESS | : | 12 mm |
| POWER CONNECTION | : | 200/240 VAC 3P – 340/415 VAC 3P+N+G 47/63 Hz 8kVA |
| AIR | : | Pressure : 6 - 10 bar |
| | : | Quality : Dry air |
| VACUUM | : | -0.7 bar minimum |
| NITROGEN (according to option) | : | 4 – 7 bar |
| EXHAUST | : | 5 000 l/min |

## 2.2 RC22

| | | |
|---|---|---|
| MAXIMUM SPEED (no load) | : | 2 000 rpm |
| MINIMUM STEP | : | 10 rpm |
| SPEED DISPLAY | : | LED indicators / 3 digits / 7 segments |
| SPEED REGULATION | : | Brushless motor & resolver |
| SPEED CONTROL | : | Galvanometric coil |
| MAXIMUM ACCELERATION (no load) | : | 500 rpm/s |
| MINIMUM STEP | : | 100 rpm/s |
| ACCELERATION DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME RANGE | : | from 0 to 999 seconds |
| TIME DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME CONTROL | : | Countdown displayed by LED indicators |
| RS 232 C CONFIGURATION | : | 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. |
| MAXIMUM SUBSTRATE SIZE | : | 22"Ø/16"□ |
| MAXIMUM SUBSTRATE THICKNESS | : | 10 mm |
| POWER CONNECTION | : | 200/240 VAC 3P – 340/415 VAC 3P+N+G 47/63 Hz 4kVA |
| AIR | : | Pressure : 6 - 10 bar |
| | : | Quality : Dry air |
| VACUUM | : | -0.7 bar minimum |
| NITROGEN (according to option) | : | 4 – 7 bar |
| EXHAUST | : | 3 600 l/min |

## 2.3 RC16

| | | |
|---|---|---|
| MAXIMUM SPEED (no load) | : | 3 000 rpm |
| MINIMUM STEP | : | 10 rpm |
| SPEED DISPLAY | : | LED indicators / 3 digits / 7 segments |
| SPEED REGULATION | : | Brushless motor & resolver |
| SPEED CONTROL | : | Galvanometric coil |
| MAXIMUM ACCELERATION (no load) | : | 1 000 rpm/sec |
| MINIMUM STEP | : | 100 rpm/s |
| ACCELERATION DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME RANGE | : | from 0 to 999 seconds |
| TIME DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME CONTROL | : | Countdown displayed by LED indicators |
| RS 232 C CONFIGURATION | : | 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. |
| MAXIMUM SUBSTRATE SIZE | : | 16"Ø/12"□ |
| MAXIMUM SUBSTRATE THICKNESS | : | 10 mm |
| POWER CONNECTION | : | 200/240 VAC 3P – 340/415 VAC 3P+N+G |
| | | 47/63 Hz 4kVA |
| AIR | : | Pressure      : 6 - 10 bar |
| | : | Quality      : Dry air |
| VACUUM | : | -0.7 bar minimum |
| NITROGEN (according to option) | : | 4 – 7 bar |
| EXHAUST | : | 2 200 l/min |

## 2.4 RC13

| | | |
|---|---|---|
| MAXIMUM SPEED (no load) | : | 3 000 rpm |
| MINIMUM STEP | : | 10 rpm |
| SPEED DISPLAY | : | LED indicators / 3 digits / 7 segments |
| SPEED REGULATION | : | Tachometric dynamo associated with motor |
| SPEED CONTROL | : | Galvanometric coil |
| MAXIMUM ACCELERATION (no load) | : | 2 000 rpm/sec |
| MINIMUM STEP | : | 100 rpm/s |
| ACCELERATION DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME RANGE | : | from 0 to 999 seconds |
| TIME DISPLAY | : | LED indicators / 3 digits - 7 segments |
| TIME CONTROL | : | Countdown displayed by LED indicators |
| RS 232 C CONFIGURATION | : | 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. |
| MAXIMUM SUBSTRATE SIZE | : | 13"Ø/9"□ |
| MAXIMUM SUBSTRATE THICKNESS | : | 10 mm |
| POWER CONNECTION | : | 200/240 VAC 3P – 340/415 VAC 3P+N+G |
| | | 47/63 Hz 8kVA |
| AIR | : | Pressure      : 4 – 9 bar |
| | : | Quality      : Dry air |
| VACUUM | : | -0.7 bar minimum |
| NITROGEN (according to option) | : | 4 – 9 bar |
| EXHAUST | : | 800 l/min |

## 2.5 RC8

| | | | |
|---|---|---|---|
| MAXIMUM SPEED (no load) | : | RC 8 GYRSET 8 | : 3 000 rpm |
| | : | RC 8 GYRSET 5 | : 5 000 rpm |
| | : | RC 8 GYRSET 3 | : 7 000 rpm |
| | : | RC 8 with Standard Plate | : 7 000 rpm |
| | : | RC 8 with cover open (CE Safety Limitation) | :≈ 1 000 rpm |
| MINIMUM STEP | : | 10 rpm | |
| SPEED DISPLAY | : | LED indicators / 3 digits / 7 segments | |
| SPEED REGULATION | : | Tachometric dynamo associated with motor | |
| SPEED CONTROL | : | Galvanometric coil | |
| MAXIMUM ACCELERATION (no load) | : | 5 000 rpm/sec | |
| MINIMUM STEP | : | 100 rpm/s | |
| ACCELERATION DISPLAY | : | LED indicators / 3 digits - 7 segments | |
| TIME RANGE | : | from 0 to 999 seconds | |
| TIME DISPLAY | : | LED indicators / 3 digits - 7 segments | |
| TIME CONTROL | : | Countdown displayed by LED indicators | |
| RS 232 C CONFIGURATION | : | 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. | |
| MAXIMUM SUBSTRATE SIZE | : | RC 8 GYRSET 8 | 8"Ø/6"□ |
| | : | RC 8 GYRSET 5 | 5"Ø/4"□ |
| | : | RC 8 GYRSET 3 | 3"Ø/2"□ |
| MAXIMUM SUBSTRATE THICKNESS | : | RC 8 GYRSET 8 | 4 mm |
| | : | RC 8 GYRSET 5 | 5 mm |
| | : | RC 8 GYRSET 3 | 5 mm |
| | : | RC 8 with HIGH GYRSET (3, 5 and 8) | 12 mm |
| POWER CONNECTION | : | 115/230 VAC – 47-63 Hz 300 VA | |
| AIR | : | Pressure     : 4 – 9 bar | |
| | : | Quality     : Dry air | |
| VACUUM | : | - 0.6 bar minimum | |
| NITROGEN (according to option) | : | 4 – 9 bar | |
| EXHAUST | : | 600 l/min | |

## 2.6 RC5 GYRSET

| | | |
|---|---|---|
| MAXIMUM SPEED (no load) | : RC 5 GYRSET 5 | 5 000 rpm |
| | : RC 5 GYRSET 3 | 7 000 rpm |
| MINIMUM STEP | : 10 rpm | |
| SPEED DISPLAY | : LED indicators / 3 digits / 7 segments | |
| SPEED REGULATION | : Tachometric dynamo associated with motor | |
| SPEED CONTROL | : Galvanometric coil | |
| MAXIMUM ACCELERATION (no load) | : 5 000 rpm/s | |
| MINIMUM STEP | : 100 rpm/s | |
| ACCELERATION DISPLAY | : LED indicators / 3 digits - 7 segments | |
| TIME RANGE | : from 0 to 999 seconds | |
| TIME DISPLAY | : LED indicators / 3 digits - 7 segments | |
| TIME CONTROL | : Countdown displayed by LED indicators | |
| RS 232 C CONFIGURATION | : 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. | |
| MAXIMUM SUBSTRATE SIZE | : RC 5 GYRSET 5 | 8"Ø/6"□ |
| | : RC 5 GYRSET 3 | 8"Ø/6"□ |
| MAXIMUM SUBSTRATE THICKNESS | : 5 mm | |
| POWER CONNECTION | : 115/230 VAC – 47 to 63 Hz 300 VA | |
| AIR | : Pressure    : 4 to 6 bar | |
| | : Quality    : Dry air | |
| VACUUM | : - 0.5 bar minimum | |
| NITROGEN (according to option) | : 4 to 9 bar | |
| EXHAUST | : 600 l/min | |

## 2.7 RC5 STANDARD

| | |
|---|---|
| MAXIMUM SPEED (no load) | : 10 000 rpm |
| MINIMUM STEP | : 10 rpm |
| SPEED DISPLAY | : LED indicators / 3 digits / 7 segments |
| SPEED REGULATION | : Tachometric dynamo associated with motor |
| SPEED CONTROL | : Galvanometric coil |
| MAXIMUM ACCELERATION (no load) | : 20 000 rpm/s |
| MINIMUM STEP | : 100 rpm/s |
| ACCELERATION DISPLAY | : LED indicators / 3 digits - 7 segments |
| TIME RANGE | : from 0 to 999 seconds |
| TIME DISPLAY | : LED indicators / 3 digits - 7 segments |
| TIME CONTROL | : Countdown displayed by LED indicators |
| RS 232 C CONFIGURATION | : 9600 BAUDS / 8 BITS / 1 BIT STOP / no parity. |
| MAXIMUM SUBSTRATE SIZE | : φ 125 mm |
| MAXIMUM SUBSTRATE THICKNESS | : 5 mm |
| POWER CONNECTION | : 115 - 230 VAC - 50/60 Hz - 300 VA |
| AIR | : Pressure    : 4-6 bars |
| | : Quality    : Dry air |
| VACUUM | : - 0.5 bar minimum |
| NITROGEN (according to option) | : 2 - 6 bars |
| EXHAUST | : 600 l/min |

# 3. GENERAL DESCRIPTION

The SUSS **RC** spin coaters have been designed and developed using a modular concept which makes them multi-purpose tools adapted to various technical requirements. All machines use our unique and patented **GYRSET System** that offers unrivalled coating uniformity.

## 3.1 GYRSET SYSTEM PRINCIPLE

The following drawing shows the **GYRSET System** applied to the RC8 spin coater:
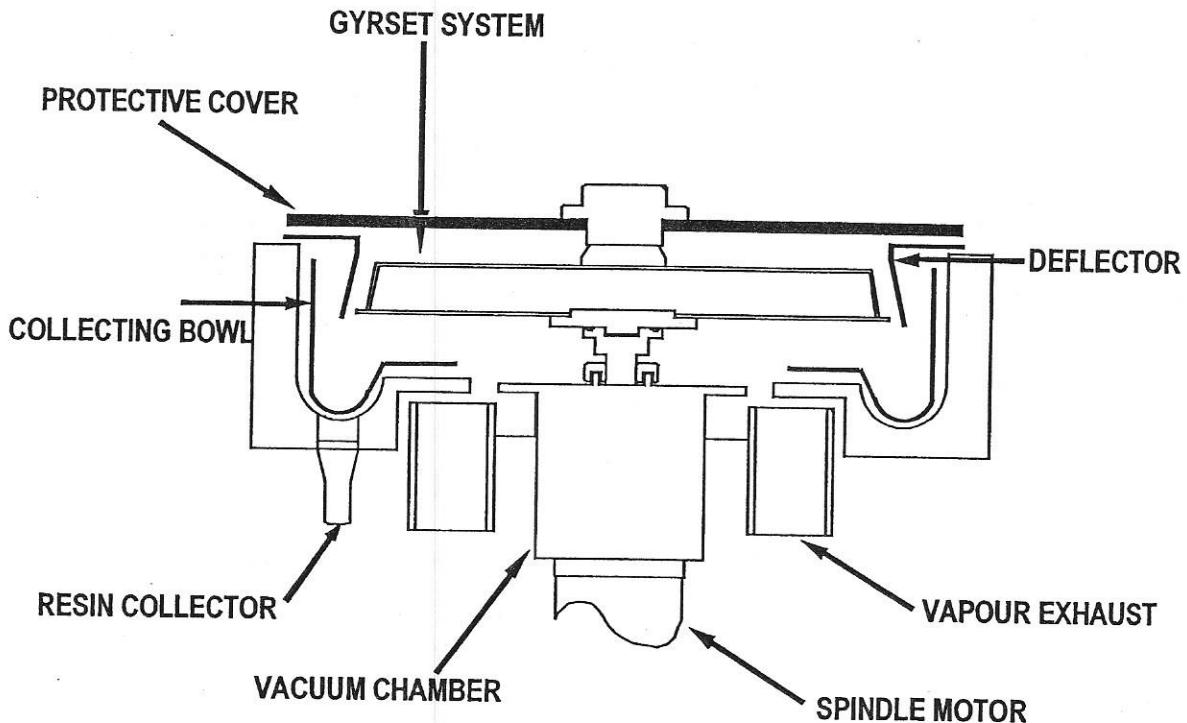


Figure 1: The GYRSET System on an RC8 Spin Coater

The **GYRSET System** comprises a bell-shaped cover placed over the chuck and the substrate. During a spin cycle, the cover closes, creating a solvent-saturated atmosphere. All the parts involved in the **GYRSET System** rotate synchronously as does the confined air inside the cover. Turbulence, which can cause excessive thickness in the corners of the substrate, is thus eliminated. The photoresist coating is spread evenly over the entire surface.

Because of the solvent saturated atmosphere, all the usual spinning defects (rebounding, splashback, comet and striation) are eliminated. Any substrate shapes and thicknesses can be processed with our **GYRSET System** with the guarantee of unrivalled coating performance. The **GYRSET System** uses at least **4 times less resist** than the best classical spinner. Photoresist recycling is then possible due to a very low risk of contamination in the atmosphere.

With the **GYRSET System**, lower speed and acceleration are used during the spin cycle which means less vibration and so less stress on your substrate. This also saves on wear on the spin motor and the mechanics, increasing the lifetime of your spin coater.

## 3.2 GYRSET SYSTEM ADVANTAGES

▲ **IMPROVEMENT** in uniformity, which means a better quality of production

▲ **REDUCTION** in speed & acceleration, which means less stress on the substrate

▲ **REDUCTION** in spin time, which means a higher throughput

▲ **REDUCTION** in resist consumption, which means reduction in production cost
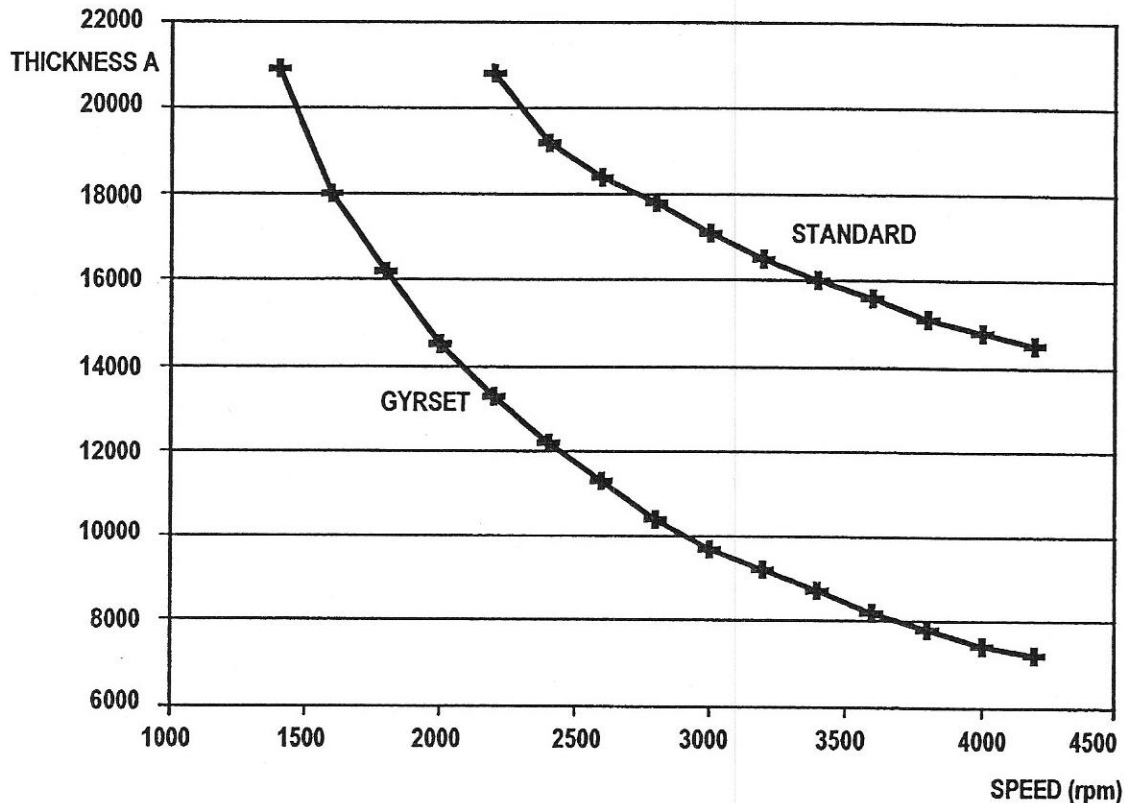


**Figure 2: Thickness v Spin Speed for 43 cps(resist sp25-15)**

## 3.3 MECHANISM DESCRIPTION

The mechanics of the **RC** is composed of:

▲ A motor connected to a tachogenerator

▲ An intermediary body (called a *vacuum chamber*) containing the coupling between the motor and the spindle. This intermediary body also acts as a reservoir for the vacuum. On top of the vacuum chamber is a chuck holder under permanent positive air pressure. This increases the lifetime of the upper bearing by preventing the photoresist or any other solvent from passing into the mechanics.

▲ An interchangeable chuck whose dimensions will vary according to the substrate diameter. The centring of the substrate is performed with locating pins, which permit a precise loading of the substrate.

▲ A bowl and protective deflector. The deflector is specially designed to collect the surplus resin ejected during spinning and to avoid photoresist fall-back on the substrate.

▲ On the RC 5 (formerly TP6000), additional disposable bowls and deflectors can be adapted to permit the user to keep the spin coater in good condition and limit cleaning time. These additional bowls are easily replaced by the user as required.

# 4. INSTALLATION

## 4.1 DIMENSIONS

### 4.1.1 RC33 CABINET
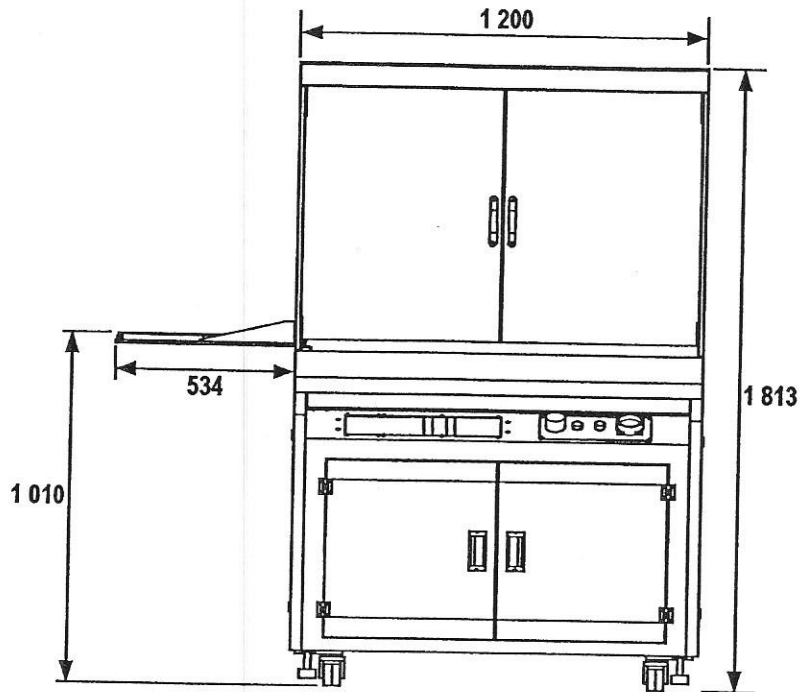


Figure 3: RC33 Cabinet Front
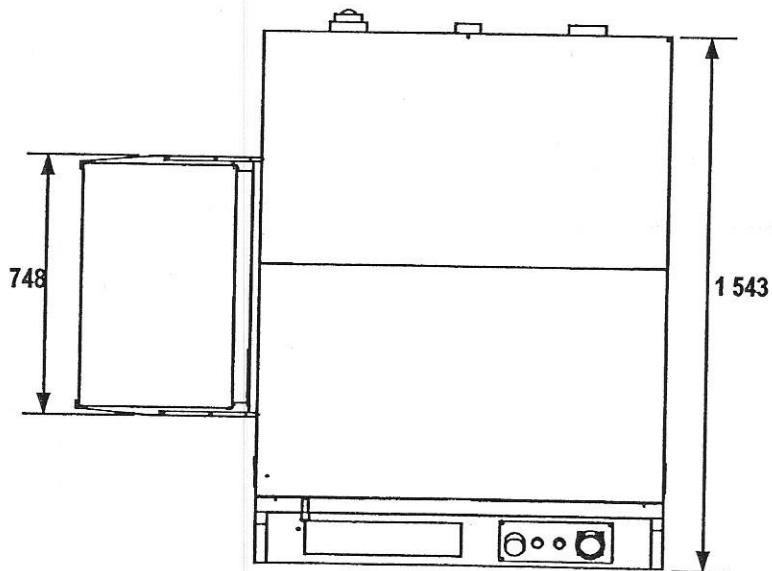


Figure 4: RC33 Cabinet Top
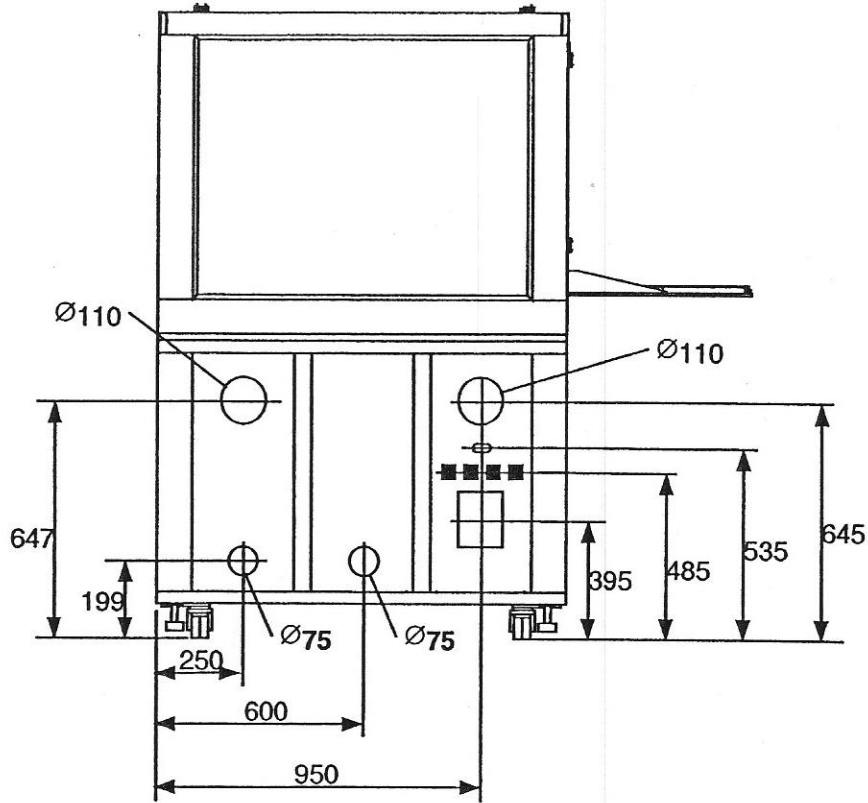
**Figure 5: RC33 Cabinet Rear**
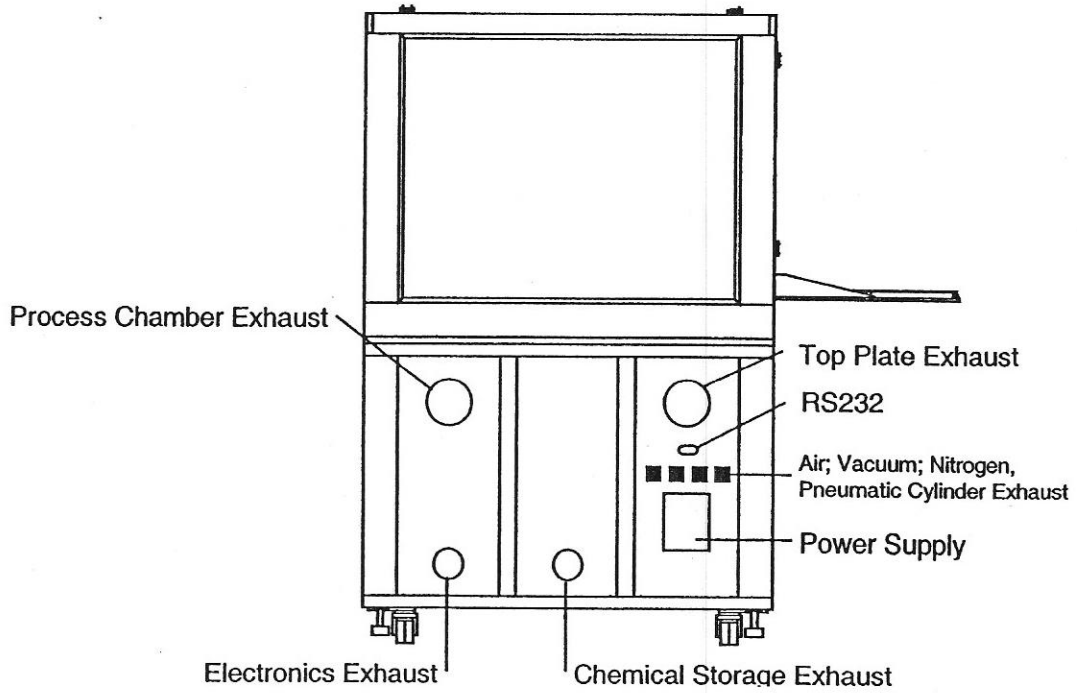


**Figure 6: RC33 Cabinet Utility Connection**

### 4.1.2  RC16 CABINET



**Figure 7: RC16 Cabinet Top**

1045
806

1. Cabinet exhaust                50 mm Ø
2. Process chamber exhaust        75 mm Ø
3. Mains               200/240 3p or 340/415 3p+N+G
4. Cabinet air inlet              50 mm Ø
5. Compressed air                 6 mm Ø
6. Vacuum                         6 mm Ø
7. Nitrogen                       6 mm Ø
8. Pneumatic cylinder             6 mm Ø
9. Canister level detector
10. Canister level detector
11. RS232 connector



1829
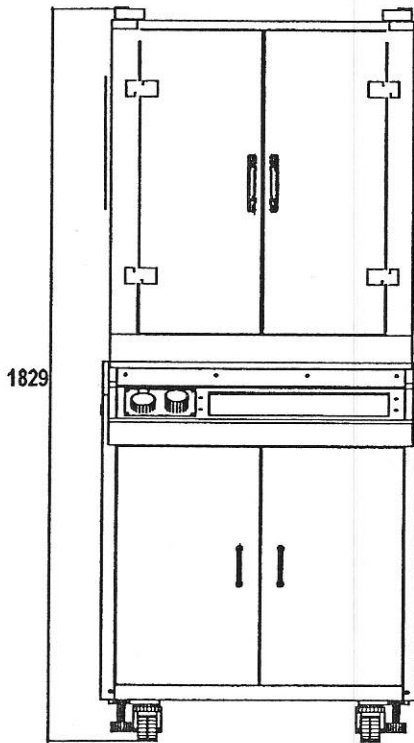
**Figure 8: RC16 Cabinet Front**



5 6 7 8
9 10
11

662   642
88   298   573
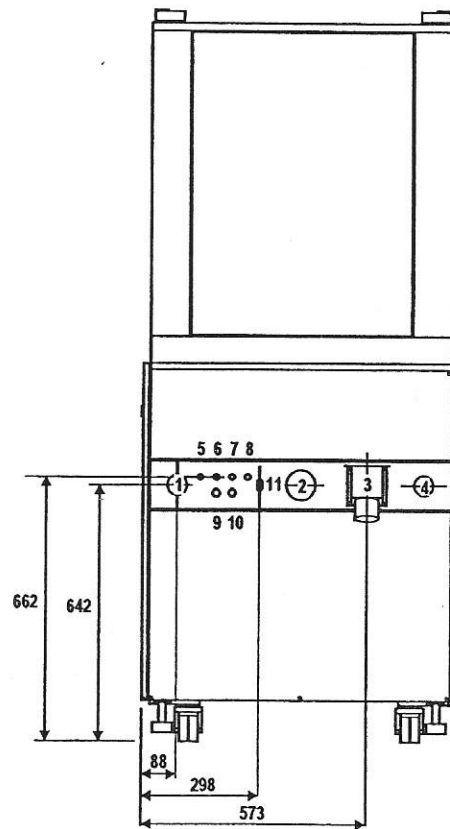
**Figure 9: RC16 Cabinet Rear**

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**Note**
**Make sure the process chamber exhaust is connected and is of sufficient power.**
**If it is not, the machine will not start.**

## 4.1.3 RC13 CABINET
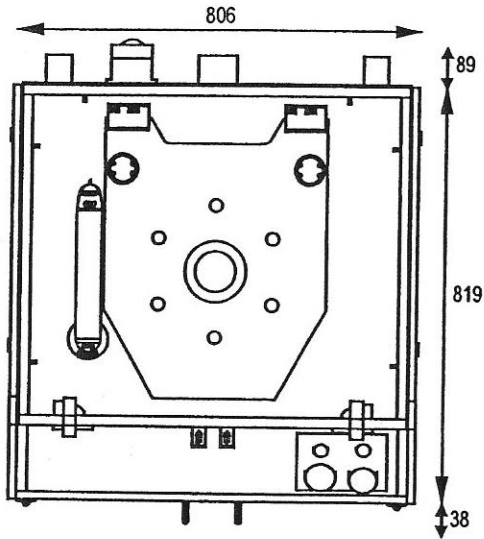


Figure 10: RC13 Cabinet Top

1. Cabinet exhaust     50 mm Ø
2. Process chamber exhaust     75 mm Ø
3. Mains     200/240 3p or 340/415 3p+N+G
4. Cabinet air inlet     50 mm Ø
5. Compressed air     6 mm Ø
6. Vacuum     6 mm Ø
7. Nitrogen     6 mm Ø
8. Pneumatic cylinder     6 mm Ø
9. Canister level detector
10. Canister level detector
11. RS232 connector



Figure 11: RC13 Cabinet Front
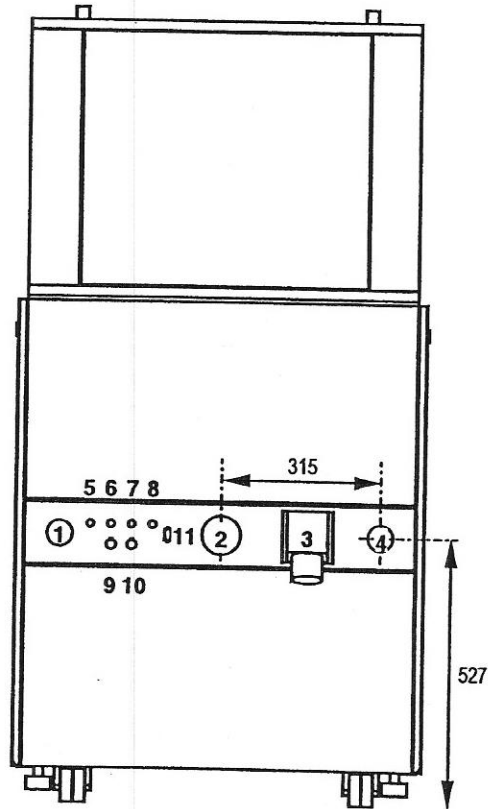


Figure 12: RC13 Cabinet Rear

### 4.1.4 RC8/RC5 CABINET
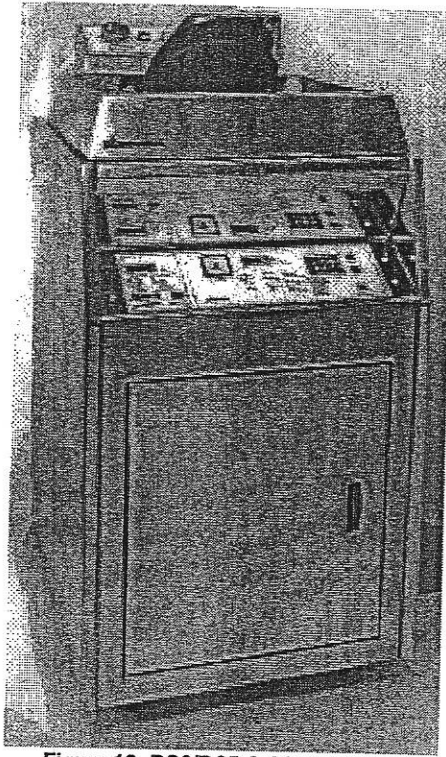


Figure 13: RC8/RC5 Cabinet Option



VACUUM
6 mm OD

AIR
6 mm OD

NITROGEN
4 ID/6 OD

PROCESS CHAMBER EXHAUST
75 mm OD

UPPER CABINET EXHAUST
75 mm OD

MAINS SUPPLY
115V/5A or 230V/2.5A

LOWER CABINET EXHAUST
40 mm OD

815

765

685

389

230

300
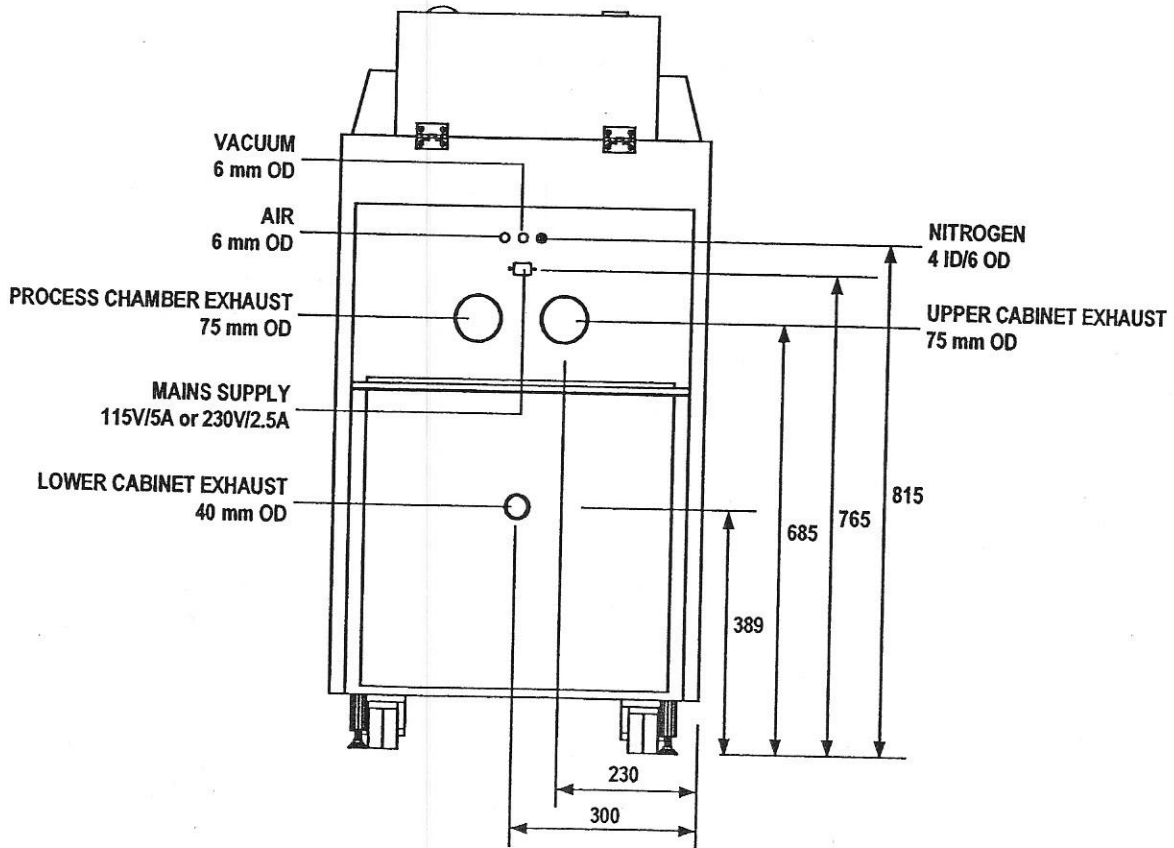
Figure 14: RC8/RC5 Cabinet Rear
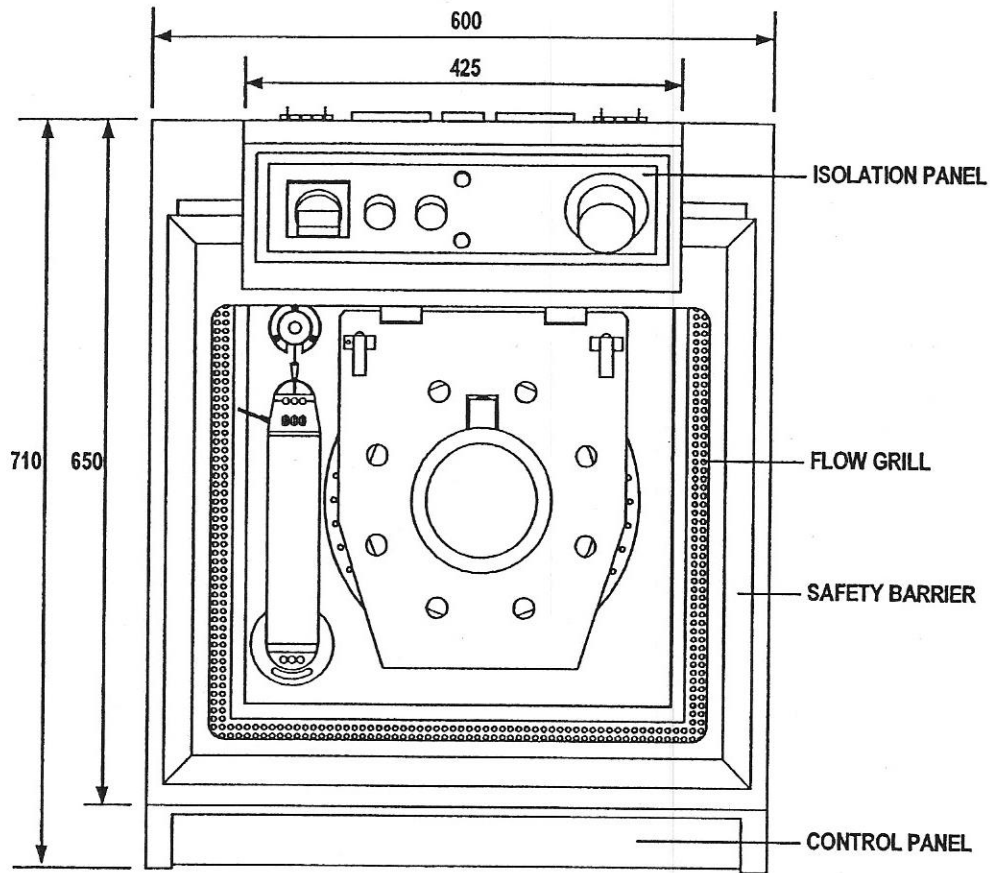
**Figure 15: RC8/RC5 Cabinet Top**

ISOLATION PANEL

FLOW GRILL

SAFETY BARRIER

CONTROL PANEL
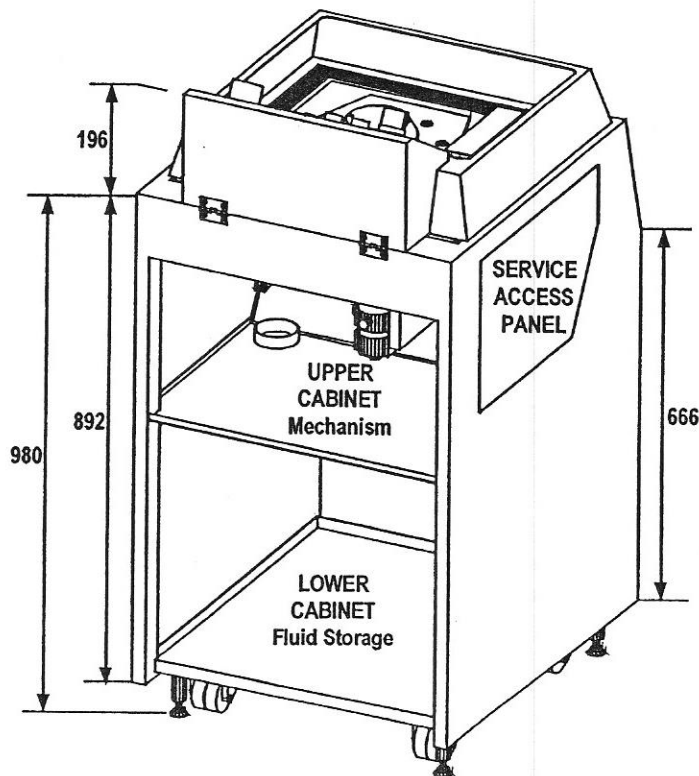


**Figure 16: RC8/RC5 Cabinet Interior**

SERVICE ACCESS PANEL

UPPER CABINET Mechanism

LOWER CABINET Fluid Storage

## 4.2 UNPACKING AND INSTALLATION

### 4.2.1 SYSTEM WITH CABINET

The cabinet is optional on both the RC5 and the RC8. When the system is delivered with a cabinet, the spin coater and its associated options, such as solvent dispense or dispensing pumps, are already installed inside. Unpacking is then very simple;

1. Remove the plastic film around the cabinet.

2. Remove the packing material that has been placed to secure the arm and the **GYRSET** cover during transportation.

3. Open the cabinet and remove the packing material that has been placed to secure the bottles and/or canister during transportation.

### 4.2.2 SYSTEM WITHOUT CABINET

When the system is ordered without a cabinet, it is packed in a cardboard box. The spin coater and its associated options, such as solvent dispense or dispensing pumps, are packed separately. Prior to unpacking, ensure that the system which is going to house the spin coater has been prepared.

### 4.2.3 CONTROLLER INTEGRATION

Both the RC 5 and RC 8 are driven by the same controller. The cabinet which houses the spin coater controller must be prepared as shown in the following diagrams:



A=390.5 B=495.5
A=376 B=480
MINIMUM DEPTH 380 mm
57   135
4 x M5 or 5.5 dia
A = Spin Coater Controller Only
B = Spin Coater + Pump Controllers
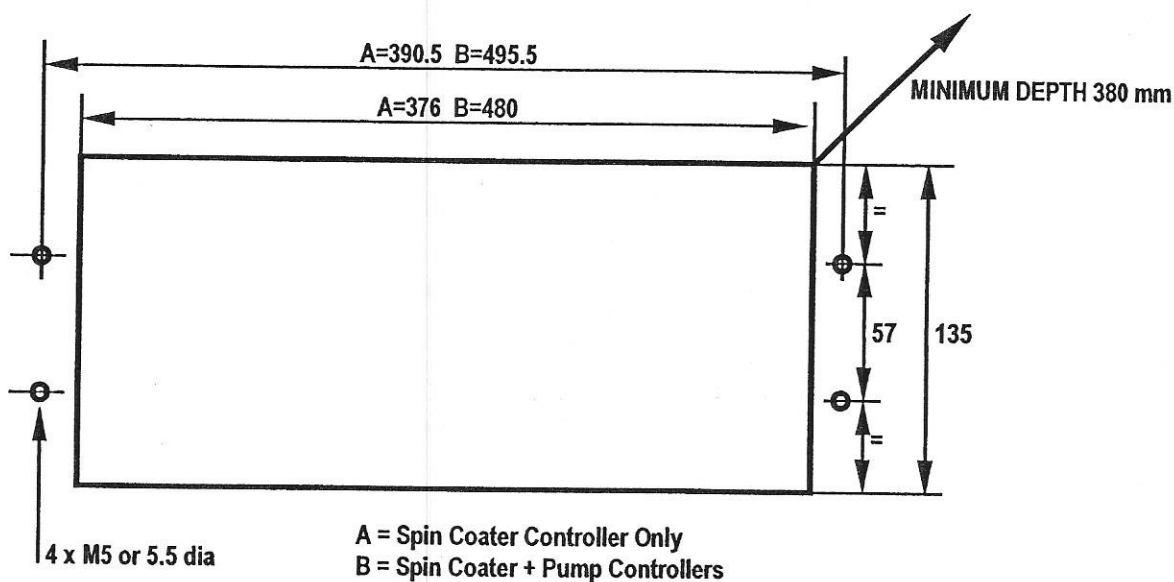
**Figure 17 : The Dimensions of the Spin Coater Controller Cabinet**

**REAR VIEW**

**J1 : MECHANISM INTERFACE (TO THE COATER)**

**J2 : SOLVENTS INTERFACE (TO THE SOLVENTS)**

**J3 : CONTROL POWER (TO THE PUMP CONTROL BOX)**

**J4 : DRAINS LEVEL INTERFACE (TO THE LEVEL MONITOR)**

**J6 : POWER SUPPLY (TO THE ISOLATION BOX AND ON TO THE MAINS)**

**J7 : RS232C SERIAL INTERFACE (TO THE PUMP CONTROL BOX)**

**J8 : REMOTE START/STOP INTERFACE**

**J30 : RS422/485 SERIAL OPTION INTERFACE**

**J31: MOTORISED DISPENSE ARM OPTION INTERFACE**

**TOP VIEW**

Figure 18: Spin Coater CT62 Controller Connections

### 4.2.4  MECHANISM INTEGRATION

#### 4.2.4.1  LARGE AREA SPIN COATERS (RC33, RC22, RC16, RC13)

These are always delivered with a cabinet, so no integration is necessary.

#### 4.2.4.2  RC5

For the RC 5 (formerly TP6000), the top surface of the system which houses the spin coater must be prepared as shown in the following diagrams:
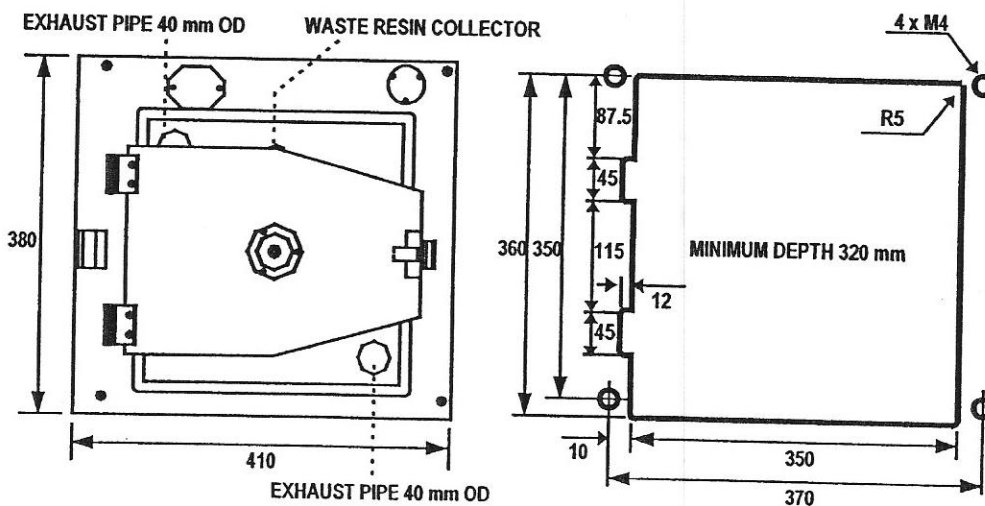


Figure 19: Surface Cut-out for RC5

### 4.2.4.3 RC8

For the RC 8 (formerly TP6010), the top surface of the system which houses the spin coater must be prepared as shown on the following diagrams:
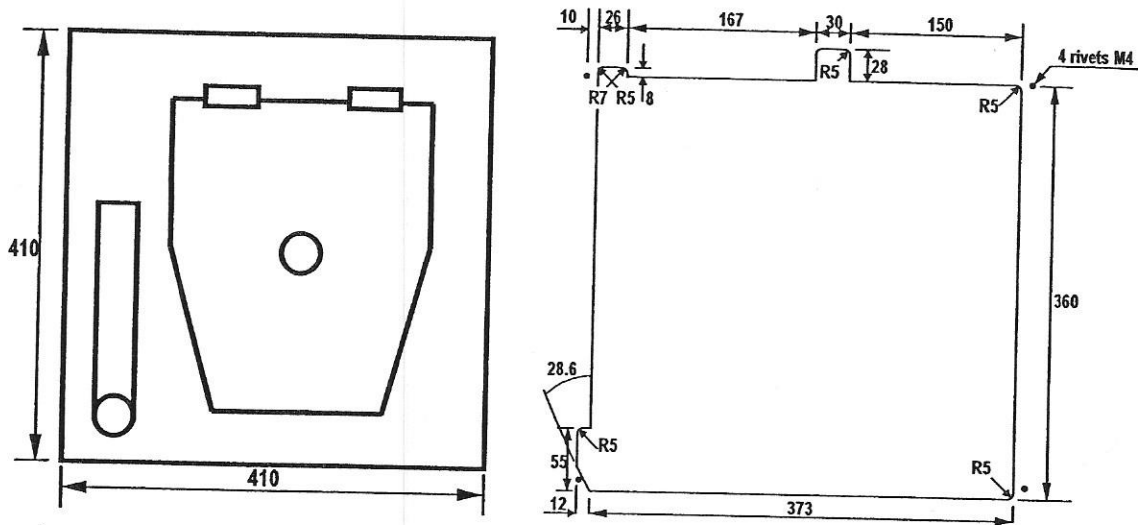


Figure 20: Surface Cut-out for RC8

### 4.2.5 DISPENSING PUMP INTEGRATION

If system is supplied with a Karl Suss *Virgin 30* dispenser, refer to its technical manual for information about dispensing pump installation (positioning and connection).
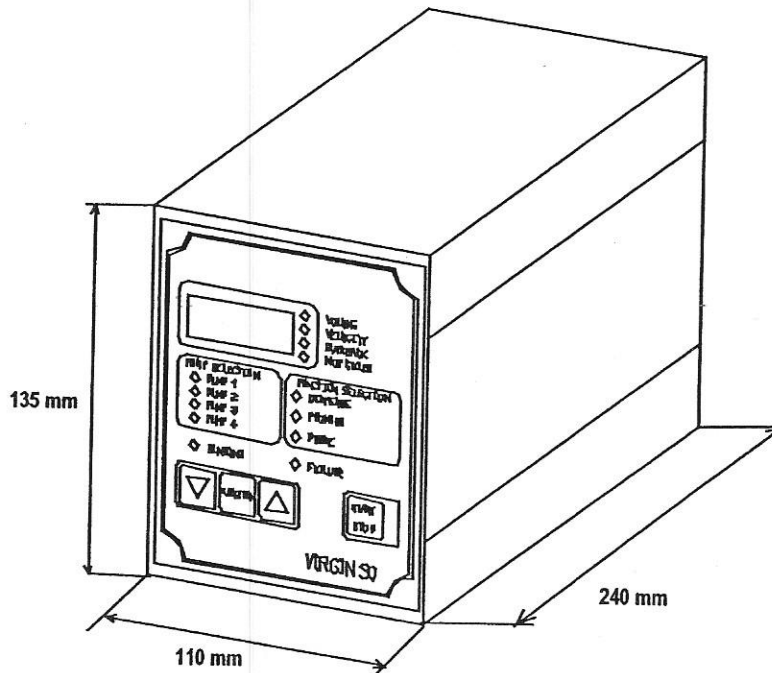


Figure 21: The Pump Controller
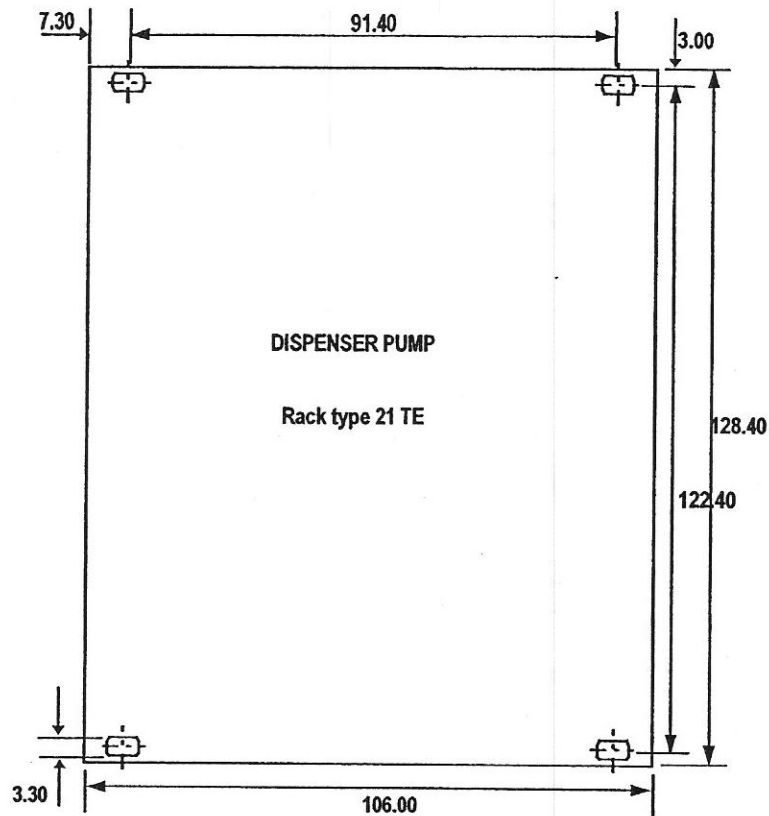
**Figure 22: Pump Controller - Front**

## 4.3 CONNECTION

### 4.3.1 SYSTEM WITH CABINET

When the system is delivered with the cabinet, interconnections between the spin coater controller and the spin coater mechanism are already made. If a dispenser type *Virgin 30* is delivered with the system, interconnections between the spin coater controller and the pump controller, as well as connection between the pump controller and the pump mechanism are made. To connect other dispensers, refer to the following chapter.

### 4.3.1.1 UTILITIES

The utilities panel is located at rear of the cabinet:

| | | |
|---|---|---|
| Main Power | : | 220 V - 50 Hz (110 V optional) |
| | : | Connect the main power cable supplied with the system at rear of the cabinet. |
| Vacuum | : | Black pipe 4 x 6 to connector **(J20)** |
| Air pressure | : | Blue pipe 4 x 6 to connector **(J21)** |
| Nitrogen | : | Blue pipe 4 x 6 to connector **(J37)** |

### 4.3.1.2 SERIAL INTERFACE (RS 232 C)

Connect the serial interface cable to connector **J38** at rear of the cabinet.

## 4.3.2 SYSTEM WITHOUT CABINET

### 4.3.2.1 RC8 PNEUMATIC MECHANISM UNIT

**UTILITIES**

**INTERNAL CONNECTION**

EV3

NITROGEN   J13

AIR   J12

VACUUM   J11

MA 2   LIM 2   LIM 1

EV2   EV1

MA 1

N2 BLOW OFF

AIR SUPPLY

TO DISPENSER

CHUCK VACUUM

SPINDLE COOLING

CHUCK COOLING

COVER LIFT

DISPENSE ARM

NOZZLE SELECTION

Z1

AIR EXHAUST
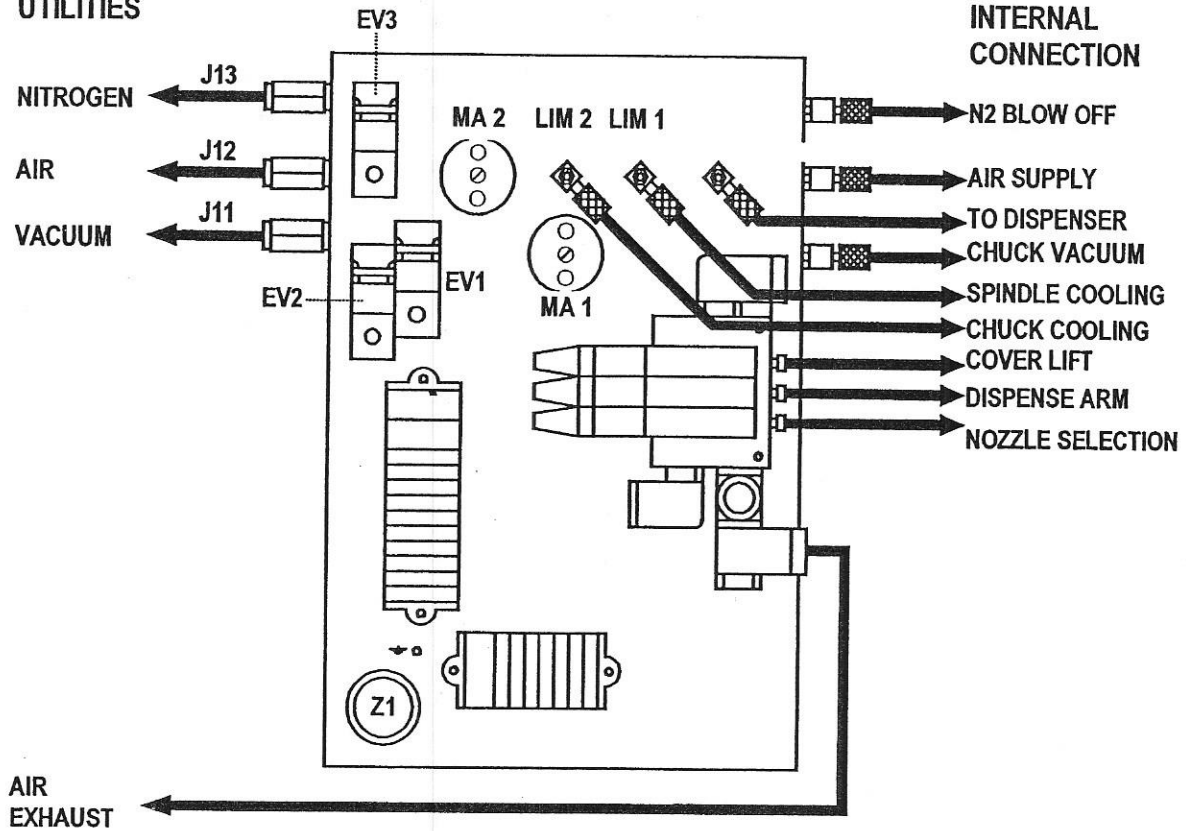
**Figure 23: RC8 Utility Connections**

### 4.3.2.2 RC5 PNEUMATIC MECHANISM UNIT

**UTILITIES**

**INTERNAL CONNECTIONS**

EV3

NITROGEN   J13

AIR   J12

VACUUM   J11

MA2   LIM 2   LIM 1

EV1

EV2   MA1

CHUCK COLING

N2 BLOW OPTION

AIR SUPPLY DISPENSER OPTION

HEAD BLOW

CHUCK VACUUM

B1

DECANTER

Z1
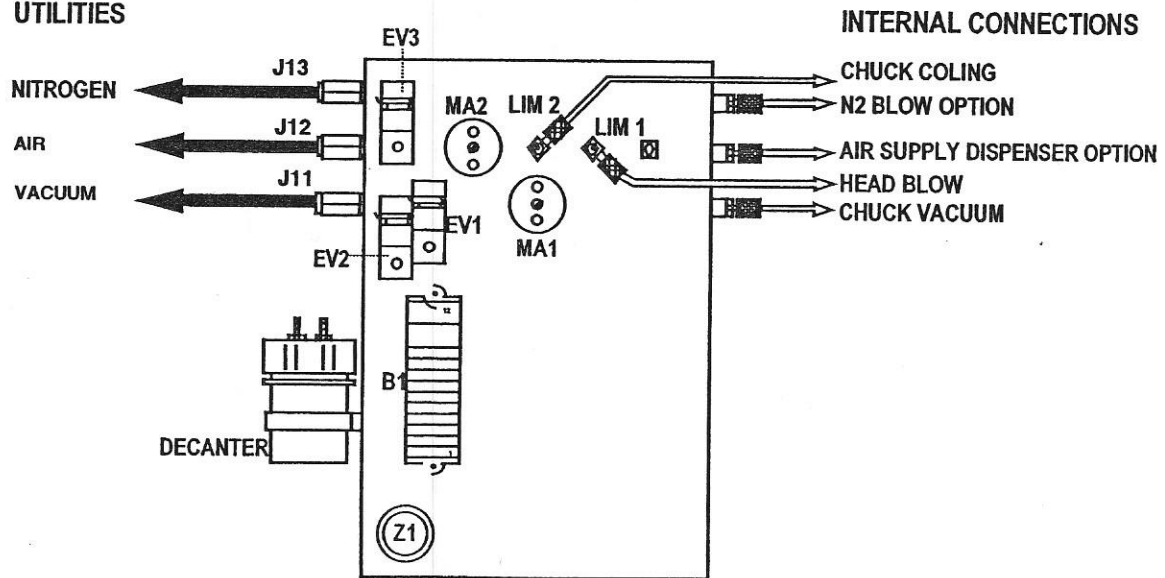
**Figure 24: RC5 Utility Connections**

### 4.3.2.3 MECHANISM

The internal connections in the mechanism (arm cylinder, nozzle selection, spindle and chuck cooling, chuck vacuum) are already made. Interconnection with other options (dispensing pump, solvent) must be made;

1. The electrical connection of the mechanism is made through the controller. Cable Z1, which is attached to the mechanism, is to be plugged into connector **J1** on the back panel of the spin coater controller.

2. Fluids (air pressure, nitrogen, vacuum) are connected directly to the mechanism.

| | | |
|---|---|---|
| Vacuum | : | Black pipe 4 x 6 to connector |
| Air pressure | : | Blue pipe 4 x 6 to connector |
| Nitrogen | : | Blue pipe 4 x 6 to connector |
| Air Exhaust | : | Blue pipe 4 x 6 |

### 4.3.2.4 SOLVENT DISPENSE OPTION
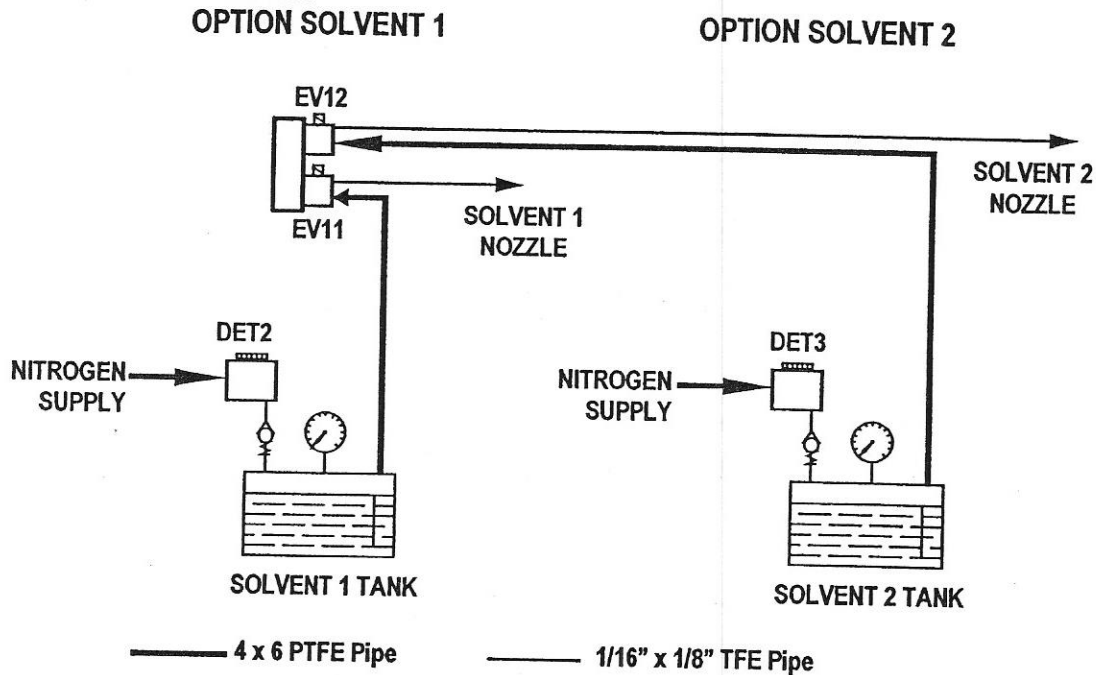


Figure 25: Solvent System Layout

Solenoid valves EV11 to E14 (depending on the number of solvents fitted, from 1 to 4) control the solvent flow from the tanks to the nozzle. Restrictors DET2 to DET5 control the nitrogen flow from the supply to the solvent tanks.

Each solenoid valve has an electrical connector, J14 to J17. The electrical connection of the valves to the controller is made by a single cable (Z2). One end is connected to the CT62 controller, the other to each of the pumps fitted, as follows:

1. Connect one end (J2) of cable (Z2) to connector J2 (Solvents Interface - see Figure 18: Spin Coater CT62 Controller Connections on p18) on the controller panel
2. Solvent 1: Connect (J14) of cable (Z2) to connector (J14) on solenoid valve (EV11).
3. Solvent 2: Connect (J15) of cable (Z2) to connector (J15) on solenoid valve (EV12).
4. Solvent 2: Connect (J16) of cable (Z2) to connector (J16) on solenoid valve (EV13).
5. Solvent 2: Connect (J17) of cable (Z2) to connector (J17) on solenoid valve (EV14).

### 4.3.2.5 DISPENSER PUMP
SUSS VIRGIN 30
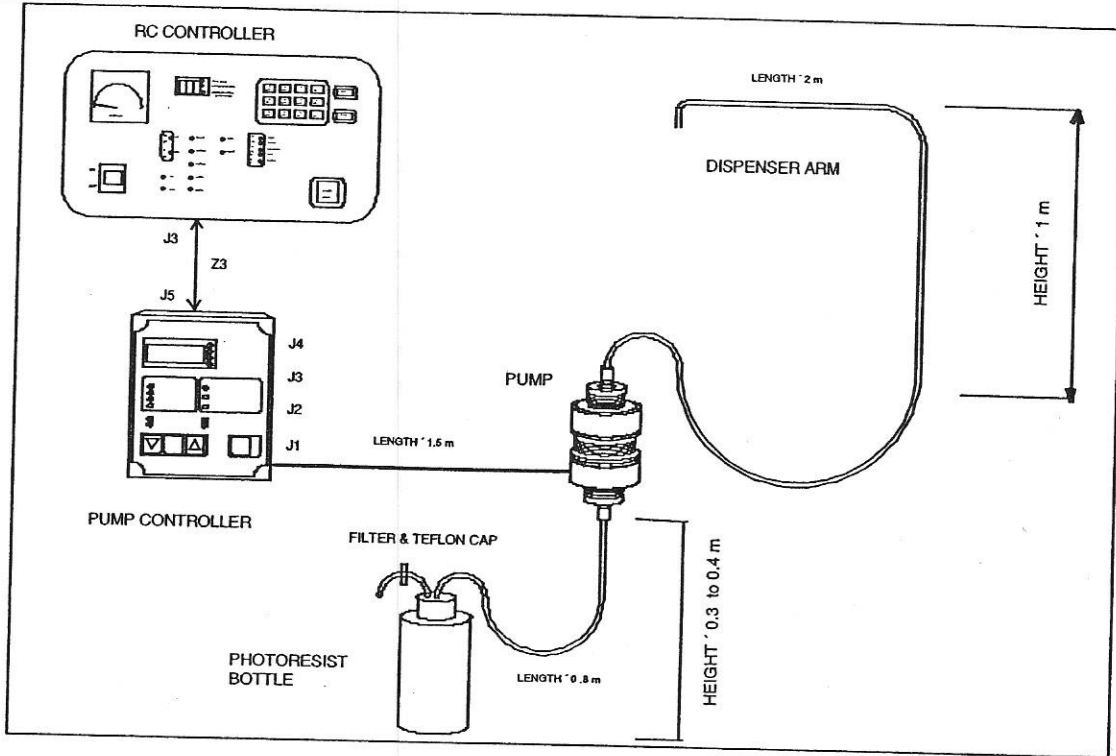
Figure 26: Dispenser Pump Integration
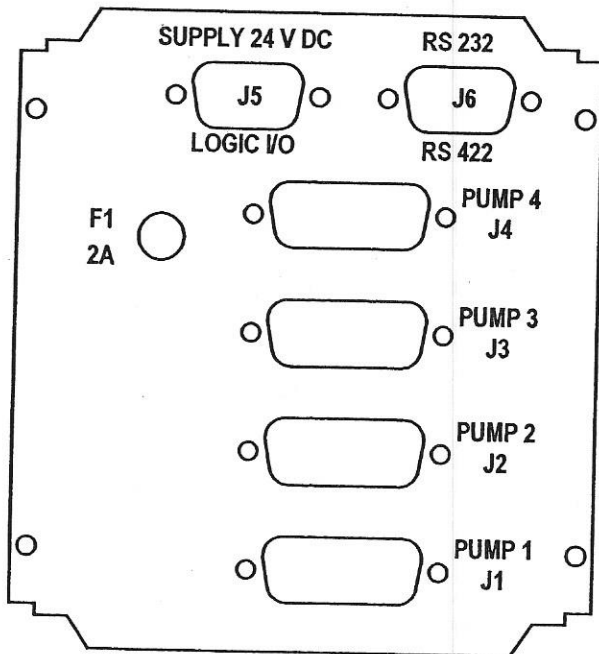
Figure 27: Pump Control Box Connections
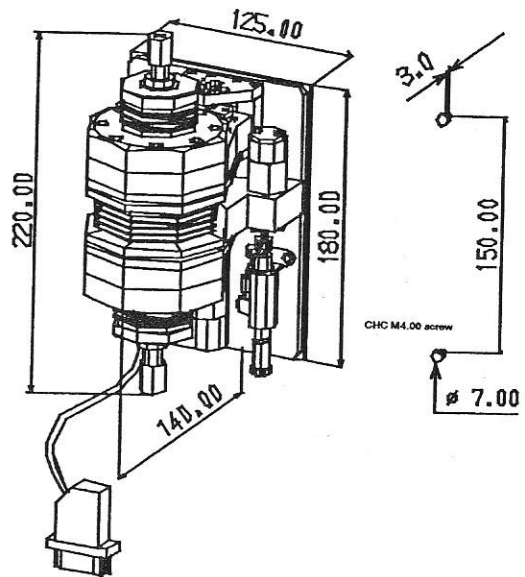
Figure 28: The Dimensions Of The Pump

Installation Procedure

1. Make sure that the pump is installed in the vertical position

2. Do not connect Air or Nitrogen pressure to the photoresist INLET or OUTLET. It will damage the pump

3. All damage due to incorrect connection or installation will immediately cancel the warranty. Repair costs will be charged to the customer.

4. The pump must be fixed at a reasonable distance from the dispenser arm with no stress on the pre-formed dispenser pipe

The following parts are delivered with the pump :

1. A tool kit for purging, including TEFLON adapter and PTFE 4(ID) x 6(OD) pipe

2. One filter with a TEFLON cap to plug in the resist bottle

3. One "S" shape pre-formed TEFLON pipe to connect between the resist bottle and the dispenser pump

4. 2 metres PTFE 4(ID) x 6(OD) pipe for the connection between the dispenser arm and the dispenser pump

If the SUSS *Virgin 30* dispenser is fitted, the connection with the spin coater controller uses cable (Z3). The power supply as well as the control signals come through cable (Z3). Plug (Z3) to connector (J3) at spin coater rear panel and to (J5) at the dispenser control box.

Each pump has a separate cable to be connected to the rear of the pump control box;

1. Connect pump 1 to connector (**J1**).
2. Connect pump 2 to connector (**J2**).
3. Connect pump 3 to connector (**J3**).
4. Connect pump 4 to connector (**J4**).

**Pneumatic connection for the pump**

Connect fluid "INLET" to dispense reservoir and dispense line "OUTLET" to the TEFLON pipe.

OTHER DISPENSERS

| Pin Number | Description |
| --- | --- |
| A | Dispenser1 start pulse |
| F | Dispenser2 start pulse |
| H | Dispenser3 start pulse |
| K | Dispenser4 start pulse |
| B | End of dispense pulse |
| E | Power supply input (GNU) |
| D | Power supply input (+24V DC) |
| M | Ground |

Dispensers from other suppliers can be controlled by the spin coater. Signals for controlling a dispenser are available on connector (J3) on the rear panel of the spin coater controller.

Five signals are provided:

1. Start dispense "ST" (1, 2, 3 & 4)
2. End of dispense "EOD"

### 4.3.2.6 SERIAL INTERFACE (RS 232 C)

Connect the RS 232 C cable to connector (**J7**) on the back of the spin coater controller. Refer to the technical manual for further details about module interconnection, especially drawing n° 6 47 XX 0 001.

## 4.4 PROCEDURE FOR FITTING AND CENTRING THE GYRSET HUB

**WARNING**

**Any adjustment to the hub must always be carried out at a maximum of 1000 rpm.**



Size Detection

Hub Lock Screw for setting height of GYRSET

3 x M3 Hub Screws for centring hub

2 x M4 screws for fixing hub to cover

Locating Pin
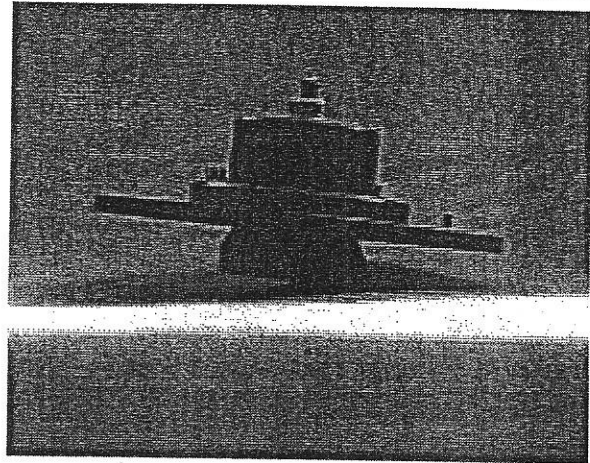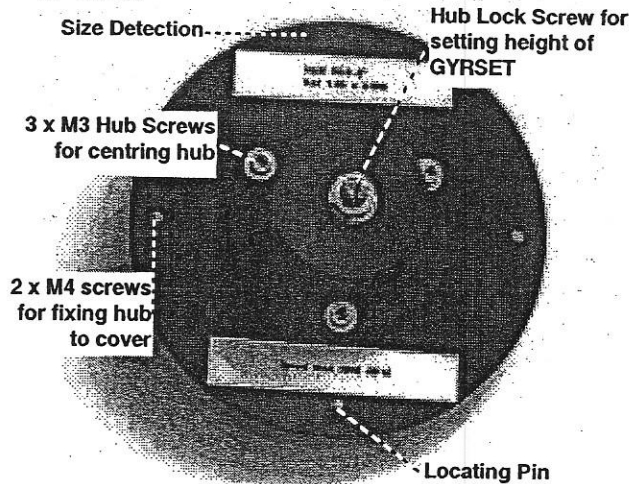


Figure 29: The GYRSET Hub Assembly
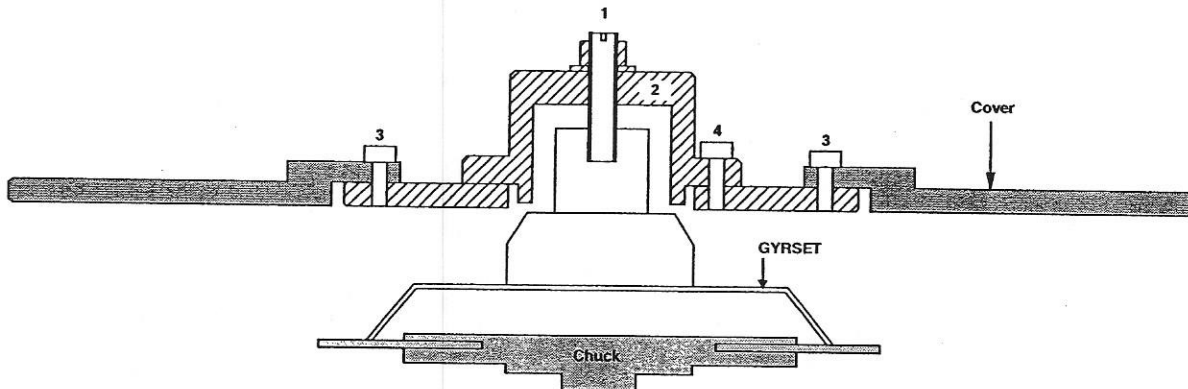


1. Remove the conic cover to access the hub assembly
2. Open the cover.
3. Centre the GYRSET and hub assembly on the chuck.
4. Turn the hub lock screw (1) anti-clockwise, lowering the hub (2) as far as possible.
5. Close the cover by switching off or disconnecting the compressed air.
6. Turn the hub lock screw (1) clockwise, raising the hub (2) until the cover just begins to lift up.
7. Fix the hub to the cover with the 2 x M4 screws (3).
8. Make sure the GYRSET is well inside the locating pins located around the edge of the chuck.
9. Switch the compressed air back on.
10. Loosen the 3 x M3 hub screws (4).
11. Program a spin cover closed cycle at 500 rpm/1000 rpm/s/999s
12. With the cycle running, centre the hub assembly manually to minimise vibration and noise.
13. Tighten the hub lock screw nut.
14. Tighten the 3 x M3 hub screws (4).
15. Increase the speed to 1000 rpm.
16. Fine tune the centring if necessary.
17. Check the centring at increasing steps of 1000 rpm and 1000 rpm/s up to the maximum speed. If the centring is not satisfactory, return to 1000 rpm and repeat steps 8 - 13.

## 4.5  PROCEDURE FOR CHANGING THE CHUCK

1.  Switch the machine off. This will automatically bring the arm to the home position, and lower the lift pins if up.
2.  Push the arm out until it reaches the negative travel stop.
3.  Take out the screw from the centre of the chuck.
4.  Exchange the chuck.
5.  Replace the screw.
6.  Switch the machine back on.

## 4.6  CHECKING THE DECANTER

Check the decanter every two months and remove any solvent present.

The purpose of the decanter is to secure the vacuum line (solenoid valve and vacuum sensor). If there is solvent inside the bottle it means the machine had not been used correctly eg the chuck is not the correct size or too much solvent is being used.

Contact SUSS service to identify the problem.

## 4.7  ADJUSTING THE GYRSET MOTOR AMPLIFIER

Before adjusting the motor amplifier, the PMW has to be de-validated. To do this, set set-up parameter value 59 "Type Of Spinning Power" to 0.

1.  With the machine on stand-by (the cycle number is displayed), press <DEL>.
2.  Confirm by pressing <ENTER>.
3.  The display shows 3 zeros; All the LED's are off.
4.  Type <59>, then press <ENTER>.
5.  The parameter value flashes on the display, and the corresponding LED's light up.
6.  Type <0>, then press <ENTER>. A beep is emitted.
7.  Step 2 returns. Press <START/STOP> to end parameter editing and re-initialise the machine.

When adjustment is finished, re-set to 1.
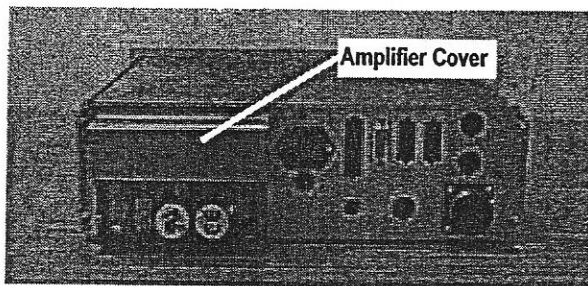


Figure 30: The Back of the CT62 Coater Controller Showing the Motor Amplifier
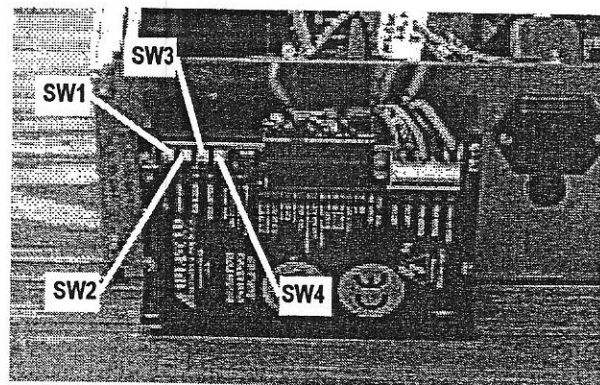


Figure 31: The Motor Amplifier with the Lid Off

The GYRSET Motor Amplifier controls the speed and movement of the GYRSET. Occasionally, this control may become unbalanced. This is evident when the machine is switched on, and the GYRSET turns.

To adjust the amplifier, there are 4 screws which can be rotated in both directions. To access these screws, slide off the CT62 lid, then take out the 2 x 2.5 mm Allen screws and remove the amplifier cover.

## SW1: LOOP GAIN

1. Turn full clockwise until you hear a "click"
2. Turn 2 rotations anti-clockwise. If oscillations occur, turn anti-clockwise until oscillations stop.

## SW2: CURRENT LIMIT

1. Turn full clockwise a maximum of 1 revolution
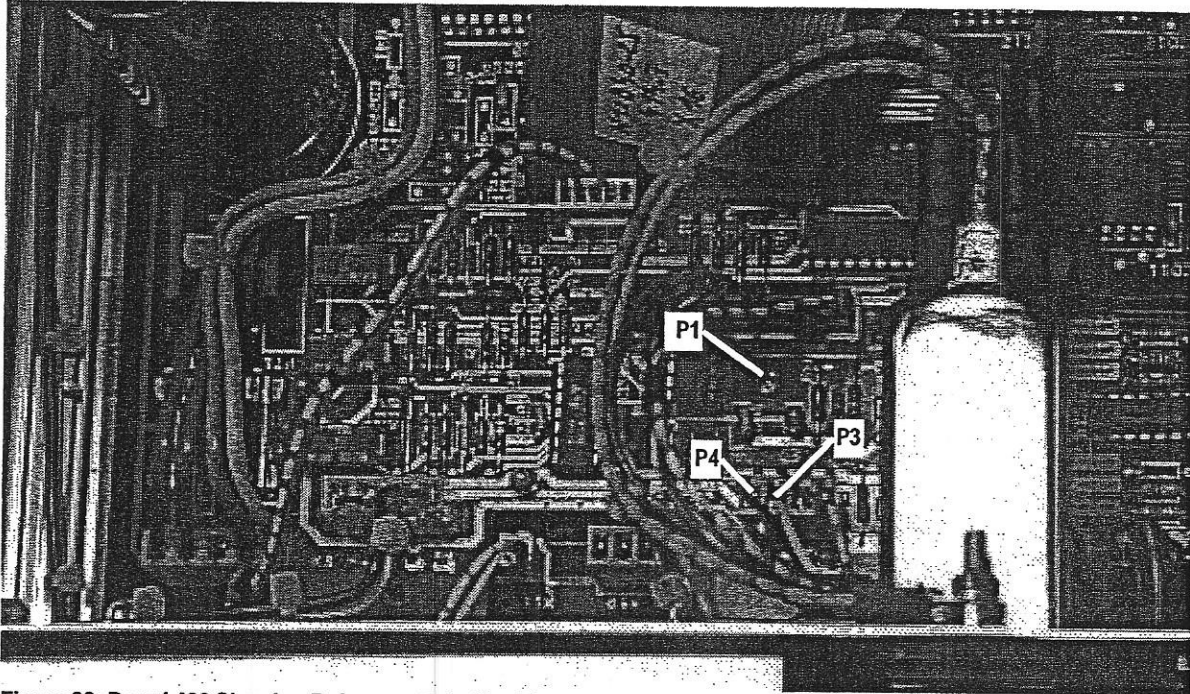


**Figure 32: Board 463 Showing Reference Gain Fine Tune**

## SW3: REFERENCE GAIN

This procedure adjusts the real speed to correspond with the set speed.

1. Program and run a motor speed of 1000 rpm.
2. Place a voltmeter across P3 (white) and P4 (black)
3. Adjust the voltage with SW3 to give a reading of 10V on the voltmeter.
4. To fine tune the voltage, adjust P1.
5. Measure the real spin speed with tachometer. If necessary, adjust P1 until the tachometer reads 1000 rpm.

## SW4: OFFSET

1. Apply 0V input signal and adjust to obtain 0V on motor outputs.

## 4.8 LOCATION OF THE FUSE
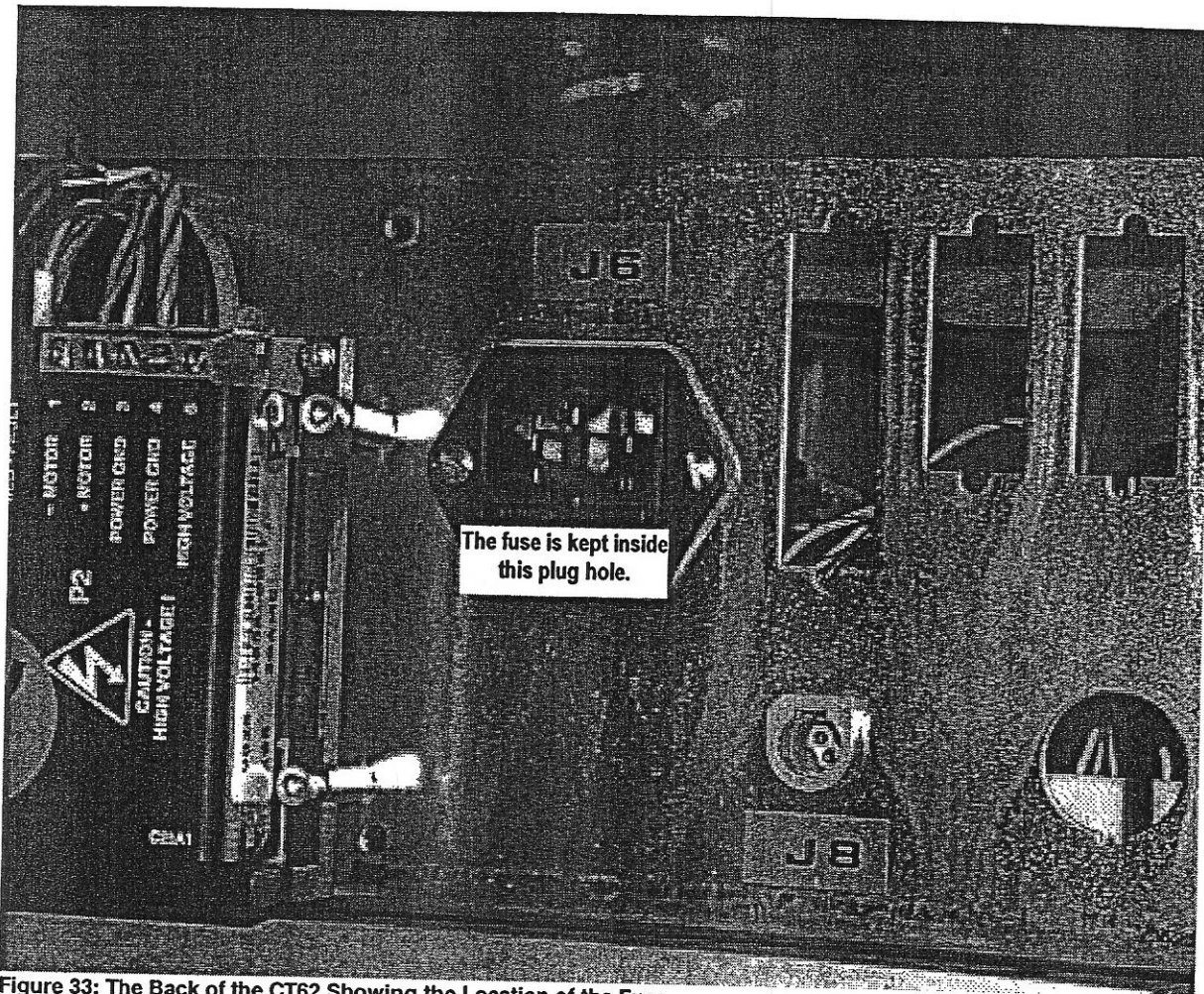


**Figure 33: The Back of the CT62 Showing the Location of the Fuse**

## 4.9 CHANGING THE EPROM

---

**CAUTION**

**Versions Kxx and Vxx are compatible up to version V099. V099 is the most complete Vxx version.**

**Versions Vxx are incompatible with versions Cxx. Version Cxx cannot replace version Vxx without changing the CT62 coater controller.**

---

If SUSS pumps are used, changing the CT62 EPROM also necessitates changing the MP25 pump controller EPROM, the ACS software (if applicable) the PC software (if applicable) etc.

1.  Furnish yourself with the parameter table for the installed version
2.  Furnish yourself with the parameter table for the new version
3.  Understand the equivalence between the parameters of the two versions
4.  Note the current parameter values in the first table
    1.  Switch the coater on while keeping <RESET> pressed. The parameters in use flash.
    2.  Press <ENTER> to read the next parameter. Attention: any parameters not used are not displayed. The parameters in the table and those on the display are linked by the LEDs.

5. Note which cycles are used and their parameters
6. Switch off the coater
7. Disconnect the CT62 from the coater and take it out of the cabinet
8. Take off the CT62 lid and exchange EPROMS. Note: an antistatic band is compulsory for ISO9000.
9. Connect a mains lead to the CT62
10. Re-enter the parameters:
    1. Switch the machine on while keeping <RESET> pressed
    2. Re-program the parameters with those previously noted

---

**CAUTION**

**New parameters could appear in the list. These are usually set to 0. Others could disappear. Check the link with the LEDs.**

---

11. Disconnect the mains lead from the CT62
12. Re-connect the mains lead. An error should appear on the CT62 display eg o28
13. If the display flashes, certain parameters are incorrect. Check.
14. Disconnect the mains lead from the CT62
15. Re-connect the mains lead while keeping <INS> pressed
16. The CT62 should display a cycle number eg oo2
17. Zero all the cycles (1 to 9)
    1. Select the cycle.
    2. Press <RESET>. The display flashes.
    3. Press <ENTER>
18. Reprogram all the cycles with the values taken in step (5)

---

**CAUTION**

**Certain steps may require new parameters**

---

19. Disconnect the mains lead from the CT62
20. Reconnect all the CT62 cables to the coater
21. Reconnect the mains lead to the CT62
22. Switch the coater back on and test the new version
23. Note the parameters for the new version in the table
24. Send the table, version, date and checksum of the new EPROM to the field service department at KSF

# 5. SAFETY START/STOP

## 5.1 ISOLATION

The machine is fitted with a safety isolation panel. This panel is integrated into the process area on the top back of the cabinet. This panel is inserted between the machine and the mains power supply.
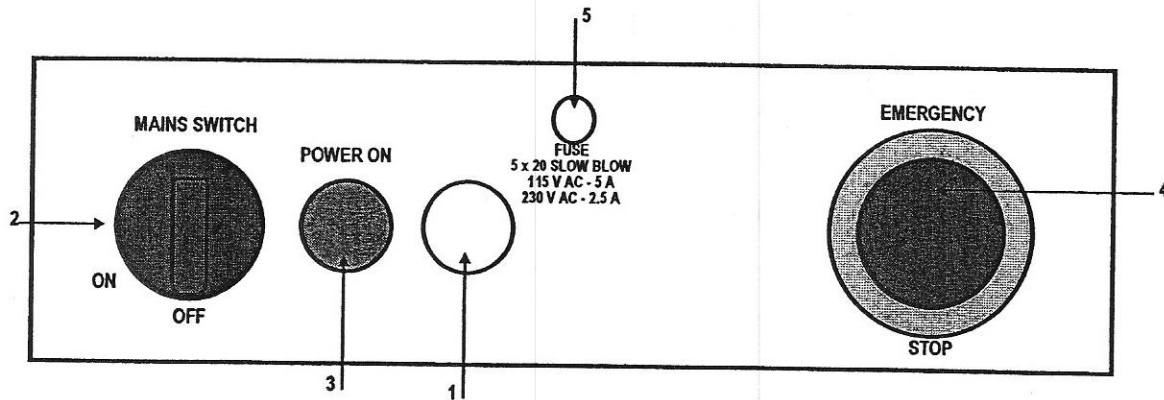


**Figure 34: Isolation Panel**

| | |
|---|---|
| 1 Mains Switch Light: | Indicates whether the machine is connected to the mains. Lights up green if connected. |
| 2 Mains Switch: | Connects or disconnects the machine to the mains power supply. Turn to the "on" position to connect the machine to the mains. The mains switch light glows green if connected. |
| 3 Machine Power On Switch: | Press to switch the machine on. Glows green if on. |
| 4 Stop Mushroom Button: | Hit this button to stop the machine. Once activated, the button needs to be pulled up to deactivate. To re-start the machine, press the power on button. |
| 5 Machine Fuse | |

## 5.2 SAFETY

The large area spin coaters (RC13, 16, 22 & 33) have an enclosure around the process area. The enclosure is fitted with interlocked doors. A spin cycle can only be run if these doors are shut. If they are not, error 30 is returned. If this happens, close the doors and press <Enter> to clear the error. Similarly, the machine will not initialise if the doors are open. Make sure they are shut when switching on the machine.

---

**NOTE**

**Make sure the process area doors are shut when switching the machine on.**

**If they are not, the machine will not initialise.**

---

The enclosure prevents the operator from putting his hand in the process area when spinning with the cover open.

The smaller spin coaters (RC8, RC5 GYRSET and RC5) do not have an enclosure. Instead, the operator is prevented from programming a fast spin cycle with the cover open. The speed is limited to 1 000 rpm by European safety standards.

## 5.3 EXHAUST DETECTION

The large area spin coaters are fitted with a mechanical exhaust gate. If the exhaust is not sufficient, this gate remains closed. If the Mains Switch is then turned on, an error is returned, and the Machine Power On Switch is defeated.

The flow rate of the exhaust must be sufficient to open the gate. The value is determined during installation of the machine.

---

**NOTE**

**Make sure that the machine is connected to an aspirator with an adequate flow rate. The machine will not switch on if it is not.**

---

## 5.4 STARTING THE MACHINE

1. For large area spin coaters, connect to an exhaust at least 1 minute before turning on the machine.
2. For large area spin coaters, shut the process area doors
3. Turn the Mains Switch to "ON". The mains switch light lights up.
4. Press the power on button. This button lights up.

**STOPPING THE MACHINE**

1. Press the stop mushroom button. To re-start, lift up the stop button and press the power on button.
2. At the end of a session, disconnect the machine from the mains by turning the mains switch to the "OFF" position.

# 6. LOADER OPTION (RC33)

Your machine may be fitted with a loader. This comprises a manual fork for helping you to load and unload large substrates. Configuration parameters for this option are included in the software, which are set up at the factory.
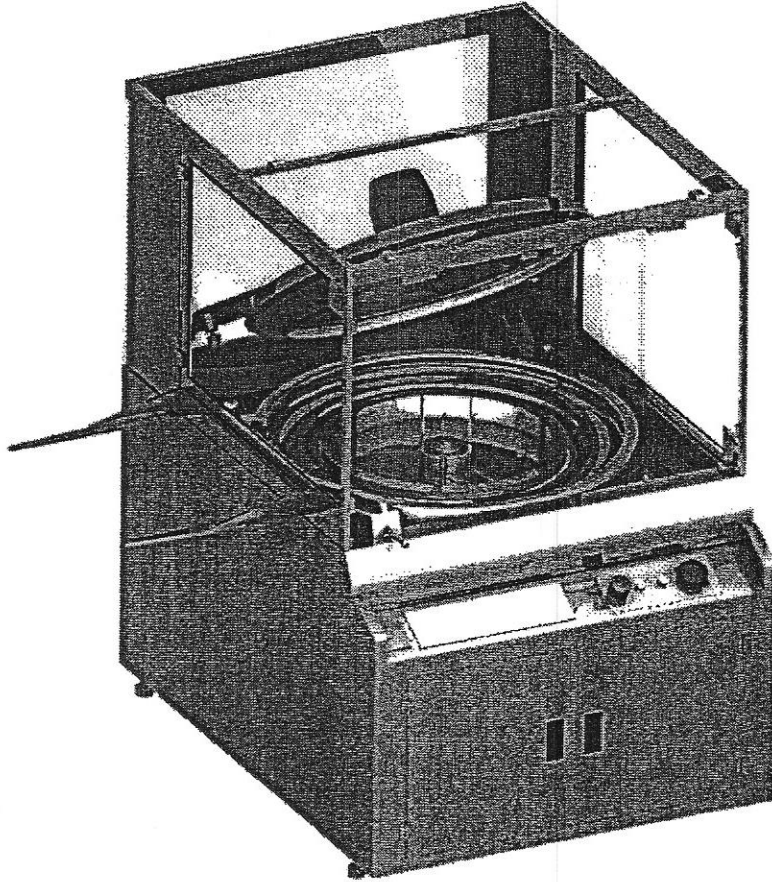


**Figure 35: RC33 Fitted With Loader Option**
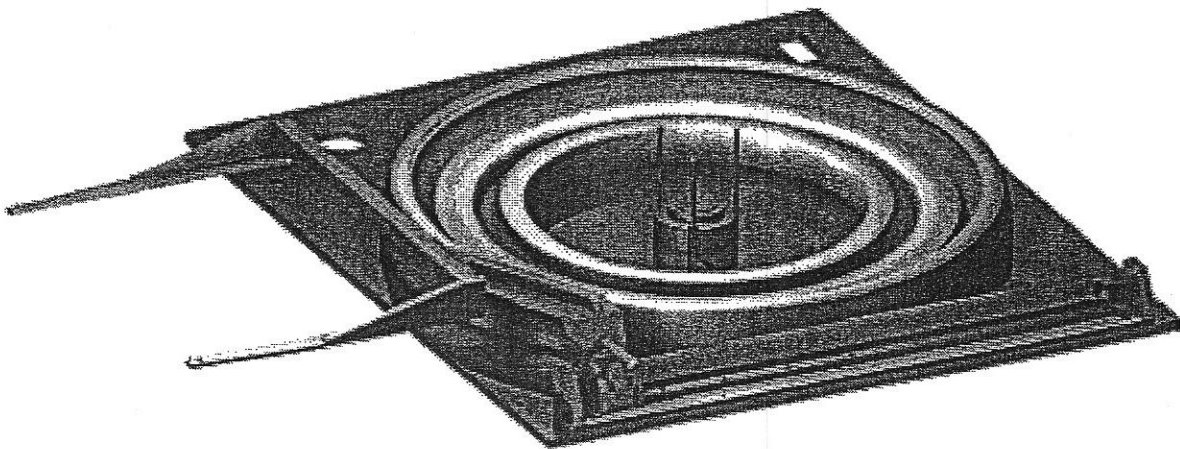


**Figure 36: RC33 Loader Option**

The loader comprises a loader fork, a handle and a rail. The loader fork has four sets of pins on it for positioning the substrate. The handle is used to move the fork in and out of the machine long the rail, enabling loading of the substrate onto the chuck. The rail has a suction pad at each end, which holds the fork in place for loading and unloading.
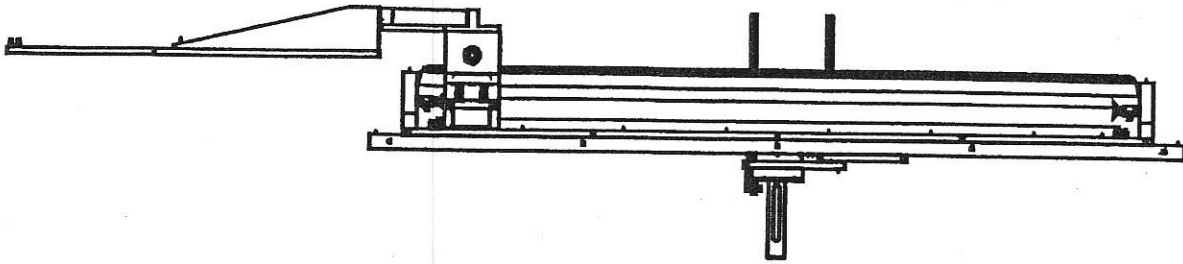


**Figure 37: RC33 Loader - Side View**
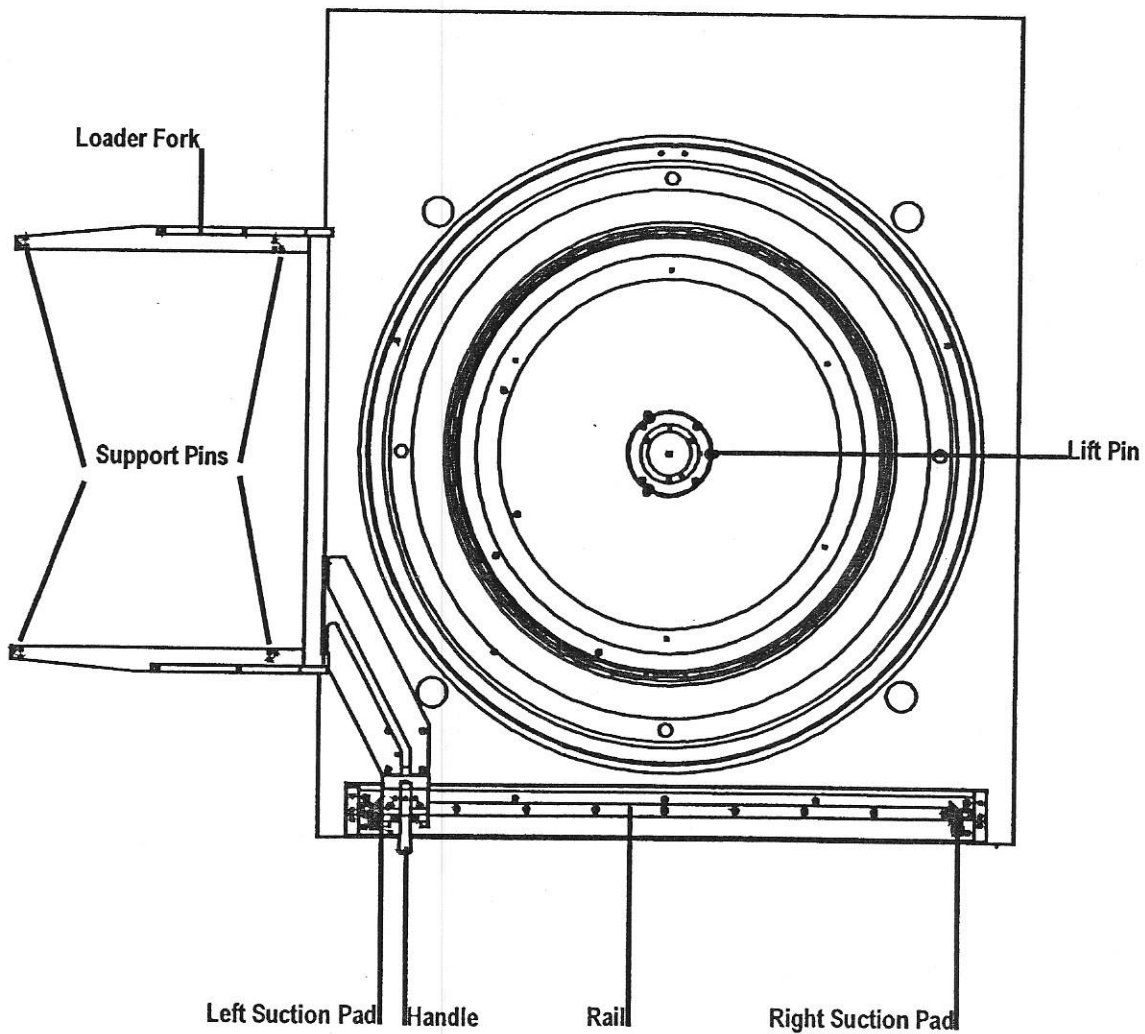


**Figure 38: RC33 Loader - Top View**

Loading and unloading procedures are as follows:

## LOADING

1. At rest, the loader fork is held outside (to the left of the machine) by the left suction pad vacuum. The lift pins are down.
2. Place the substrate on the loader fork. There are two locating pins and one support pin for each corner of the substrate.
3. Run your cycle: press<START/STOP>.
4. The substrate vacuum is tested.
5. If a substrate is detected in the machine, the cycle will not be run.
6. If a substrate is not detected in the machine, the cycle will run, and the substrate can be loaded.
7. The vacuum to the left suction pad is cut off, freeing the loader fork.
8. A line flashes across the display, telling you to move the loader fork above the chuck.
9. When the loader fork is detected above the chuck, the vacuum to the right suction pad is switched on, holding the loader fork.
10. The lift pins rise up, lifting the substrate off the loader fork.
11. The vacuum to the right suction pad is cut off, freeing the loader fork.
12. A line flashes across the display, telling you to move the loader fork back outside.
13. When the loader fork is detected outside, the vacuum to the left suction pad is switched on, holding the loader fork.
14. The lift pins descend and the substrate vacuum is switched on, holding the substrate to the chuck.
15. The cycle starts.

## UNLOADING

1. At rest, the loader fork is held outside (to the left of the machine) by the left suction pad vacuum. The lift pins are down.
2. The loader fork must be empty.
3. At the end of the spin cycle, the lift pins rise up, lifting the substrate off the chuck.
4. The vacuum to the left suction pad is cut off, freeing the loader fork.
5. A line flashes across the display, telling you to move the loader fork above the chuck.
6. When the loader fork is detected above the chuck, the vacuum to the right suction pad is switched on, holding the loader fork.
7. The lift pins descend, placing the substrate on the loader fork.
8. The vacuum to the right suction pad is cut off, freeing the loader fork.
9. A line flashes across the display, telling you to move the loader fork back outside.
10. When the loader fork is detected outside, the vacuum to the left suction pad is switched on, holding the loader fork ready for you to unload the substrate.

Machine initialisation finishes with a chuck vacuum check. If a substrate is present, the operator is requested to unload it. Unloading is also accessible through function 0 in cycle 0. Use this to recuperate a substrate after an incorrect loading.

## RELATED CONFIGURATION PARAMETERS

| N° | Description | Limits | LED's | Comments |
|----|-------------|--------|-------|----------|
| 58 | Type of loader | 0, 1, 2 | TIME (y), REMOTE (g) | 0: Loader not fitted<br>1: Loader fitted<br>2: Loader fitted but not used |

# 7. EXTENDED CABINET WITH MANUAL LOADER OPTION (RC8)

## 7.1 INTRODUCTION

This section describes the manual loader. This is a transfer arm that helps the user move a wafer between the spin coater and the hot plate in an extended cabinet configuration.

## 7.2 MACHINE OVERVIEW
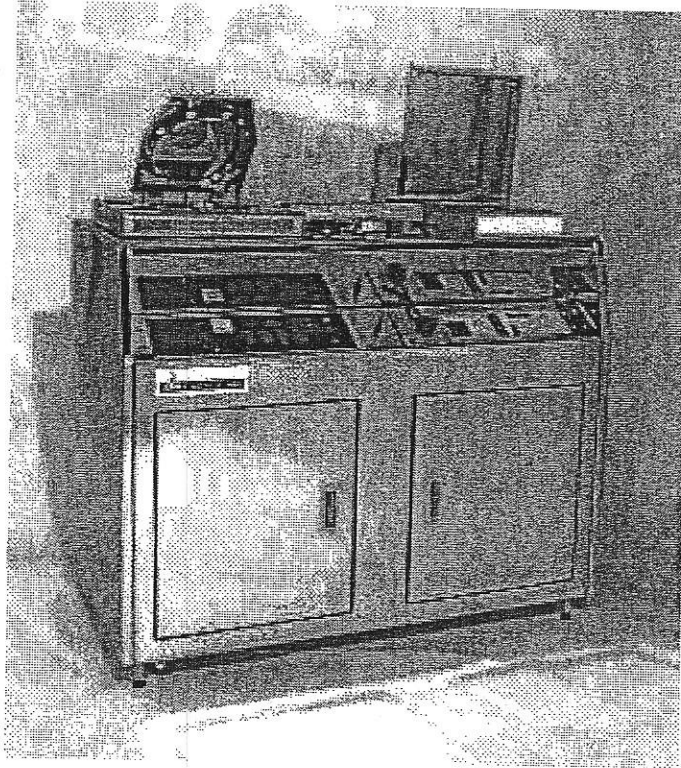


**Figure 39: The RC8 THP Transfer Hot Plate**

The loader helps the user to move the wafer from the spin coater to the hot plate. It limits human contact with the wafer which could damage or dirty it, and assures an accurate positioning on the chuck and in the hot plate. It also keeps the wafer flat between the coater and the hot plate, especially useful for thick resist applications. The substrate is carried on a fork, called an "end effector", on the end of the loader arm, and is held in position by locating pins and vacuum.

The loader can be rotated through 180° (with the substrate always moving away from the user) and displaced through 265 cm. Rotation (T+/-) and translation (X+/-) detectors activate suction pads during the program sequence. These in turn manage the lift pin movements of the spin coater and the hot plate, and the end effector vacuum.

The loader has 3 positions:

1. Rest, when the spin coater and hot plate are processing
2. Spin coater, for loading and unloading substrates on the spin coater
3. Hot plate, for loading and unloading substrates on the hot plate

2 lights show the status of the loader and a function knob selects one of 5 pre-set functions. In any case, both the spin coater and the hot plate can be used manually.
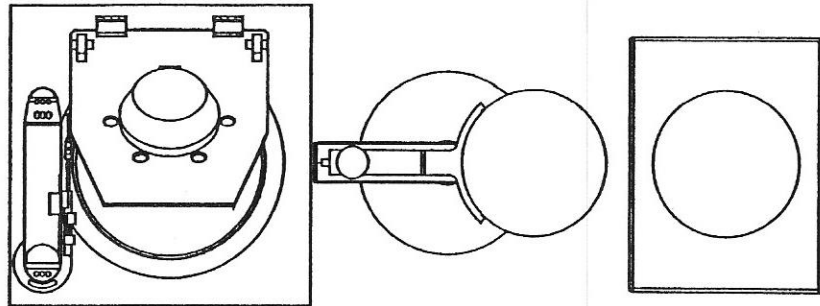
**Figure 40: The loader in the rest position**
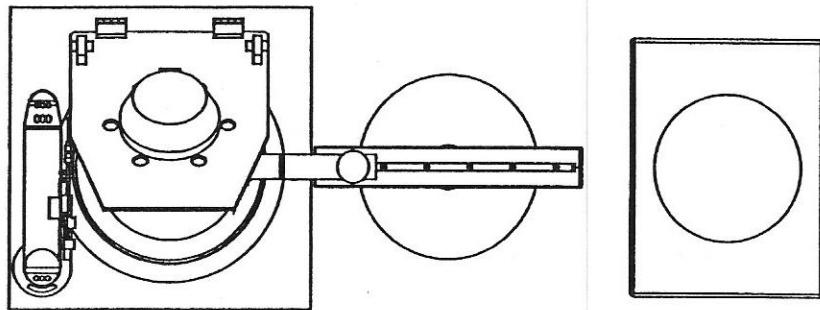
**Figure 41: The loader in the spin coater position**
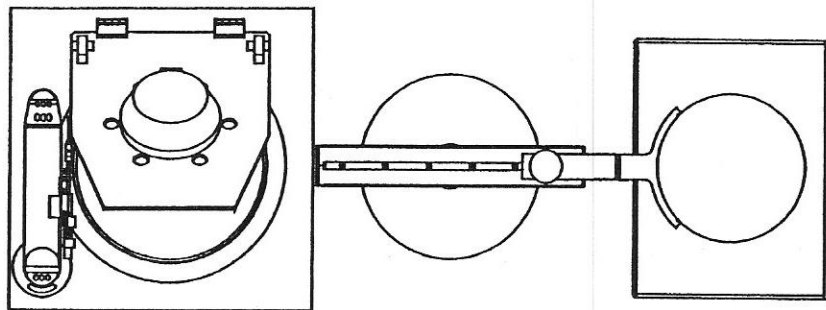
**Figure 42: The loader in the hot plate position**

X- suction pad    Locating pin    X+ suction pad

T+ suction pad

End effector vacuum

T- suction pad

-T    -X ⟶ +X    +T
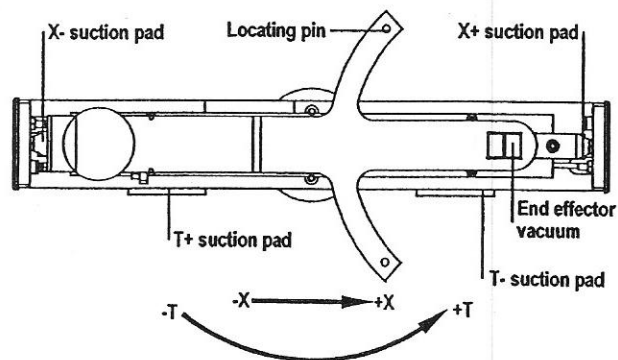
**Figure 43: The loader (without covers) showing suction pads**

## 7.3  USE
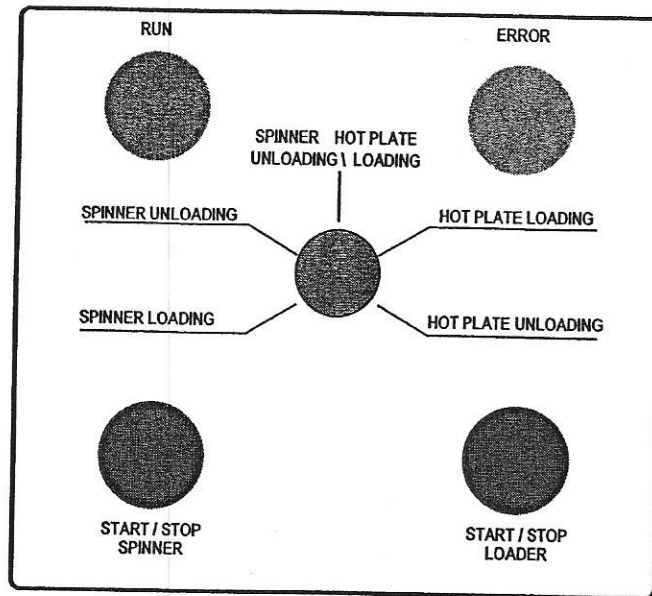


Figure 44: The Loader Control Panel

The loader should be in the rest position X-, T+ , with the lights RUN and ERROR off. If the loader is not detected in this position, the yellow light ERROR comes on. Move the arm so that the suction pads hold it in the rest position. The ERROR light goes out.

The user selects one of the five pre-set functions

1. Spinner loading
2. Spinner unloading
3. Spinner hot plate unloading/loading
4. Hot plate loading
5. Hot plate unloading

Place a substrate on the loader for the loading functions (n° 1, 3 and 4) and take the substrate off the loader for the unloading functions (n° 2, 3 and 5).

Validate your selection the selection by pressing <START/STOP LOADER>.

The green light RUN comes on.

Release the <START/STOP LOADER> button to start the function.

When the green light flashes, place the loader in the next position. All functions finish with the arm in the rest position.

The RUN light goes out.

After loading the spin coater (function 1), press <START/STOP SPINNER>. This has the same effect as pressing <START/STOP> on the CT62 spin coater controller.

After loading the hot plate (function 3 or 4), move the loader back to its rest position. The hot plate cycle starts automatically.

If an error occurs during a function, the yellow light ERROR comes on. Return the loader to its rest position and the light goes out.

If the user presses <START/STOP LOADER> during a cycle, the function stops. Return the loader to its rest position.

The loader memorises the functions and stops the spin coater or oven being loaded twice if a complete unload has not already been carried out. The same applies for unloading. This memory feature can be switched on or off by keeping the <START/STOP LOADER> button pressed for longer than 5 seconds. The green light goes out.

When switching the memory back on, there must be no substrate in the spin coater or the oven as the program will not know it is there.

## 7.4 FUNCTION1: SPINNER LOADING

1. Place a substrate on the loader in the rest position and make sure there is no substrate in the spin coater.
2. Check the function selector knob and press <START/STOP LOADER>. The RUN light comes on.
3. The substrate vacuum comes on. If it is not strong enough, the ERROR light flashes, and the function fails.
4. The spin coater display goes out, the keyboard is deactivated and the lift pins retract.
5. The vacuum to suction pad T+ is switched off, freeing the loader to rotate. The green light RUN flashes.
6. Push the loader round anti-clockwise. When it arrives at the stop T-, the vacuum to this suction pad is switched on, holding the loader.
7. The vacuum to suction pad X- is switched off, freeing the loader to move laterally. The green light RUN flashes.
8. Push the loader to the left over the spin coater. The vacuum to suction pad X+ is switched on, holding the loader.
9. The end effector vacuum is switched off, the lift pins move up and pick up the substrate.
10. Push the loader to the right then turn it clockwise to its rest position. The vacuum to suction pads X- and T+ are switched on, locking the loader in position.
11. The green light goes out.
12. The spin coater display re-appears, and the keyboard becomes operational.
13. Set the spin coater parameters as required and validate, then press <START/STOP SPINNER>. The spin coater runs its cycle.

## 7.5 FUNCTION2: SPINNER UNLOADING

1. The loader is in the rest position. If there is a substrate on it, take the substrate off.
1. Check the function selector knob and press <START/STOP LOADER>. The green light RUN comes on.
2. The spin coater display goes out and the keyboard is deactivated.
3. The vacuum to suction pad T- is switched off, freeing the loader to rotate. The green light RUN flashes.
4. Push the loader round anti-clockwise. When it arrives at the stop T+, the vacuum to this suction pad is switched on, holding the loader.
5. The vacuum to suction pad X- is switched off, freeing the loader to move laterally. The green light RUN flashes.
6. Push the loader to the left over the spin coater. The vacuum to the suction pad X+ is switched on, holding the loader.
7. The end effector vacuum is switched on. The spin coater lift pins retreat, leaving the substrate on the loader.
8. Push the loader to the right then turn it clockwise to its rest position. The vacuum to suction pads X- and T+ are switched on, locking the loader in position.
9. The green light goes out.

10. The spin coater display re-appears, and the keyboard becomes operational.

## 7.6 FUNCTION3: SPINNER HOT PLATE UNLOADING/LOADING

This function transfers the substrate from the spin coater to the hot plate. It links function 2 and function 4. After loading the spin coater, it is not necessary to validate the loading of the hot plate.

## 7.7 FUNCTION4: HOT PLATE LOADING

1. Place a substrate on the loader in the rest position and make sure there is no substrate on the hot plate. Set up the hot plate.
2. Check the function selector knob and press <START/STOP LOADER>. The RUN light comes on.
3. The substrate vacuum comes on. If it is not strong enough, the ERROR light flashes, and the function fails.
4. The hot plate lift pins retract.
5. The vacuum to suction pad X- is switched off, freeing the loader to move laterally. The green light RUN flashes.
6. Push the loader to the right over the hot plate.
7. The vacuum to the suction pad X+ is switched on, holding the loader.
8. The end effector vacuum is switched off, the lift pins move up and pick up the substrate.
9. The vacuum to suction pad X+ is switched off, freeing the loader to move laterally. The green light RUN flashes.
10. Push the loader to the left to the rest position. The vacuum to suction pads X- and T+ are switched on, locking the loader in position.
11. The green light goes out. And the hot plate cycle is run.

## 7.8 FUNCTION5: HOT PLATE UNLOADING

1. The loader is in its rest position. If there is a substrate on it, take the substrate off.
2. Check the function selector knob and press <START/STOP LOADER>. The green light RUN comes on.
3. The vacuum to suction pad X- is switched off, freeing the loader to move laterally. The green light RUN flashes.
4. Push the loader to the right over the hot plate.
5. The vacuum to suction pad X+ is switched on, holding the loader.
6. The end effector vacuum is switched on. The lift pins retreat, leaving the substrate on the loader.
7. The vacuum to suction pad X+ is switched off, freeing the loader to move laterally. The green light RUN flashes.
8. Push the loader to the left to the rest position. The vacuum to suction pads X- and T+ are switched on, locking the loader in position.
9. The green light goes out.
10. The hot plate lift pins move back up.

# 8. SYSTEM CONFIGURATION

## 8.1 INTRODUCTION

The following configurations, either switch positions or memory values are pre-set prior to shipment according to the hardware configuration. They should never be changed. Explanation follows for trouble shooting purposes only.

## 8.2 SOFTWARE CONFIGURATION SWITCHES

The set of switches 'SW1' on the KSF 414 board allows the system software configuration to be adapted according to the actual hardware configuration as follows:

| | | |
|---|---|---|
| SW1.1: | ON | No chuck indexing |
| | OFF | Chuck indexing fitted |
| SW1.2: | ON | No automatic dispense arm (or manual arm) |
| | OFF | Automatic dispense arm fitted |
| SW1.3: | ON | Manual |
| | OFF | Cover is automatic |
| SW1.4: | ON | No cover |
| | OFF | Cover fitted |

Note:    SWI.3 = OFF and SWI.4 = ON   Cover with indexed GYRSET.

## 8.3 SOFTWARE MACHINE PARAMETERS

Some specific parameters are required by the software to run the machine correctly. These parameters are not to be modified by the user. Only the service engineer should modify these parameters. There are two parameter access modes: sequential and direct. For the values set at the factory see section Appendix 1.on page 75.

### SEQUENTIAL

To access the software parameters, keep the <RESET> key pressed down while switching on the system. In case an incorrect parameter is detected at power ON, the software configuration mode is automatically activated. The three-digit display flashes to inform the user that he is running the software programming sequence. LED's light up on the control panel corresponding to the parameter displayed (see table).

It is not necessary to pass through every remaining parameter to change a single parameter value. After you have made the modification, press <START/STOP> to validate and stop sequential access and start machine initialisation.

### DIRECT

25. When the machine is on stand-by (the cycle number is displayed), press <DEL>.
26. Confirm by pressing <ENTER>.
27. The display shows 3 zeros; All the LED's are off.
28. Enter the parameter to be modified, then press <ENTER>.
29. The parameter value flashes on the display, and the corresponding LED's light up.
30. Modify the parameter value as required, then press <ENTER>. A beep is emitted.
31. Step 2 returns. Another parameter value can be modified.
32. At any moment, press <START/STOP> to end parameter editing and re-initialise the machine.

## PARAMETER LIST

| N° | Description | Parameter Limits | LEDs on (g or y) | COMMENTS |
|---|---|---|---|---|
| 1 | Motor type | 1, 2, 3, 4, 5, 6 | TIME (y) ACCELERATION (y) | |
| | | 1: 10 000 rpm | | |
| | | 2: 5 000 rpm | | |
| | | 3: Infranor | | |
| | | 4: 3 000 rpm | | |
| | | 5: 7 000 rpm | | |
| | | 6: GYRSET configuration | | |
| 2 | Spin speed gear | 1 to 999 | TIME (y) SPEED (y) ACCELERATION (y) | |
| 3 | Maximum spin speed with cover closed. | 0 to the maximum speed of the motor type | SPEED (y) CLOSE (g) | |
| 4 | Maximum spin speed with cover open | 0 to the maximum speed of the motor type | SPEED (y) OPEN (g) | Irrespective of the value entered, the maximum speed is limited to approx 1000 rpm for EU safety reasons. Therefore, if the user programs a value of more than 1000, error 28 is returned. |
| 5 | Rotation speed of chuck during indexing sequence | 10 to 90 (corresponding to 10 to 90 rpm) | SPEED (y) | Only if chuck indexing option is fitted (SW1.1=OFF). |
| 6 | Maximum speed of the chuck on the cover closing | 0 to 50 (corresponding to 0-500rpm) | SPEED (y) OPEN (g) CLOSE (g) | Only cover (SW1.4=OFF). |
| | | 0: The chuck will stop at each cover close | | |
| 7 | Maximum acceleration allowed | 1 to 200 (corresponding to 100-20000 rpm/s) | ACCELERATION (y) | |
| 8 | GYRSET indexing type | 0 or 1 | ACCELERATION (g) OPEN (g) CLOSE (g) | SW1.3 = OFF and SW1.4 = ON |
| | | 0: Stand GYRSET | | |
| | | 1: GYRSET up/down | | |
| 9 | Use of lift pins | 0, 1, 2, 3 | OPEN (g) CLOSE (g) | only if chuck indexing is fitted (SW1.1=OFF) |
| | | 0: lift-pins not fitted | | |
| | | 1: robot: pins lift up at beginning and end of cycle | | |
| | | 2: manual: pins remain down at beginning of cycle for user to place substrate on chuck locating pins. Pins lift up at end of cycle. | | |
| | | 3: lift pins are fitted but not used. They are kept down. | | |
| 10 | Use of serial interface ports | 0, 1, 2, 3, 4, 5, 6 | DISPENSER1 (g) DISPENSER2 (g) TIME (y) | |

| N° | Description | Parameter Limits | LEDs on (g or y) | COMMENTS |
|---|---|---|---|---|
| | | 0: there is no serial communication. | | |
| | | 1: Virgin KSF414 pump is connected to the main RS232. Predispense is available. | | |
| | | 2: Host KSF414 is connected to the main RS232. | | |
| | | 3: Virgin KSF414 is connected to the main RS232, host 455 is connected to the auxiliary RS422. | | |
| | | 4: Host is connected to the auxiliary RS422. | | |
| | | 5: Host = RS232, Virgin/Vulcan = RS422 | | |
| | | 6: RS422 predispense + TTL dispense | | |
| 11 | Address of the RS232 interface port | 0 to 9 | REMOTE (g) | The ASCII code of a non-zero value must come before each remote command |
| | | 0: No address needed. Other values are the interface numbers | | |
| 12 | Number of drain level alarm sensors fitted | 0, 1, 2, 3 | | |
| 13 | Dispense Arm Positioning Type | 2, 6 or 999 | All LEDs in fluid column (g) | |
| | | 2: standard automatic arm | | |
| | | 6: extension for three (3) dispense lines is fitted | | |
| | | 999: motorised arm | | |
| 14 | Arm position in count | 1 to 999 | SUBSTRATE SIZE (mm) (g) ARM SPEED (g) | For motorised arm (13=999) only |
| 15 | Dispenser arm home position | 0 to 999 | SPEED (y) SUBSTRATE SIZE (g) | |
| 16 | Maximum diameter allowed (mm) | 1 to 999 | SUBSTRATE SIZE (mm) (g) | only for motorised arm (13=999) |
| 17 | Number of dispenser lines fitted | 0, 1, 2, 3, 4 | DISPENSER1 (g) DISPENSER2 (g) | Available only with the 6 position dispenser arm (13=6) or motorised arm (13=999). |
| 18 | Auto Clean Solvent 1 - SET UP | 0, 1, 2 | SOLVENT1 (g) SOLVENT2 (g) | |
| | | 0: Solvent 1 is not used | | |
| | | 1: Solvent 1 is dedicated to autoclean | | |
| | | 2: Solvent 1 is standard | | |
| 19 | Arm position for nitrogen blow-off | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | NITROGEN (g) | |
| 20 | Arm position for Dispenser1 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | DISPENSER1 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) and if at least 1 dispenser (17 ≥ 1). |
| 21 | Arm position for Dispenser2 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | DISPENSER2 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) and if at least 2 dispensers (17 ≥ 2). |
| 22 | Arm position for Dispenser3 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | DISPENSER1 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) and if 3 dispensers (17>=3). |
| 23 | Arm position for Dispenser4 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | DISPENSER2 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) and if 4 dispensers (17>=4). |
| 24 | Arm position for Solvent1 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | SOLVENT1 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) |

| N° | Description | Parameter Limits | LEDs on (g or y) | COMMENTS |
|---|---|---|---|---|
| 25 | Arm position for Solvent2 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | SOLVENT2 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) |
| 26 | Arm position for Solvent3 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | SOLVENT1 (g) | Only with the 6 position arm (13=6) or motorised arm (13=999) |
| 27 | Arm position for Solvent4 | 1 to 6 when parameter 13=6, 0 to 999 when parameter 13=999 | SOLVENT2 (g) | only with the 6 position arm (13=6) or motorised arm (13=999) |
| 28 | Cotton Candy Remover (CCR) Solvent 3 - SET UP | 0, 1, 2 | SOLVENT1 (g) <br> NITROGEN (g) <br><br> 0: Solvent 3 is not used <br> 1: Solvent 3 is dedicated to cotton candy remover <br> 2: Solvent 3 is standard | |
| 29 | Edge Bead Remover (EBR) Solvent 2 - SET UP | 0, 1, 2 | SOLVENT2 (g) <br> NITROGEN (g) <br><br> 0: Solvent 2 is not used <br> 1: Solvent 2 is dedicated to edge bead remover <br> 2: Solvent 2 is standard | |
| 30 | Unused | 0 | N/A | Speed for EBR is now a step parameter |
| 31 | Servicing position | 0 to 999 | TIME (y) <br> SUBSTRATE SIZE | only for motorised arm (13=999) |
| 32 | Back Side Rinse (BSR) Solvent 4 - SET UP | 0, 1, 2 | TIME (y) <br> SOLVENT1 (g) <br><br> 0: Solvent 4 is not used <br> 1: Solvent 4 is dedicated to back side rinse <br> 2: Solvent 4 is standard | |
| 33 | Return position for the Back Side Rinse nozzle | 0 to 999 | SPEED (y) <br> SOLVENT1 (g) | only if back side rinse option active (32≠0) |
| 34 | Dispenser Nozzle Resist Auto clean (DNR) Solvent 5 - SET UP | 0,1, 2 | SOLVENT1 (g) <br> SOLVENT2 (g) <br> DISPENSER1 (g) <br><br> 0: Solvent 5 is not used <br> 1: Solvent 5 is dedicated to dispenser nozzle rinse <br> 2: Solvent 5 is standard | |
| 35 | Arm position for resist nozzle autoclean of Dispenser1 | 0 to 999 | SOLVENT1 (g) <br> DISPENSER1 (g) | Only if resist nozzle autoclean activated (34≠0) and at least 1 dispensers (17>0) |
| 36 | Arm position to resist nozzle autoclean of Dispenser2 | 0 to 999 | SOLVENT1 (g) <br> DISPENSER2 (g) | Only if resist nozzle autoclean activated (34≠0) and at least 2 dispensers (17>1) |
| 37 | Arm position to resist nozzle autoclean of Dispenser3 | 0 to 999 | SOLVENT1 (g) <br> DISPENSER1 (g) | Only if resist nozzle autoclean activated (34≠0) and at least 3 dispensers (17>2) |
| 38 | Arm position to resist nozzle autoclean of Dispenser4 | 0 to 999 | SOLVENT1 (g) <br> DISPENSER2 (g) | Only if resist nozzle autoclean activated (34≠0) and at least 4 dispensers (17>3) |
| 39 | Swinging Resist (SR) Dispenser1 - SET UP | 0, 1, 2 | NITROGEN (g) <br> DISPENSER1 (g) | Only if at least 1 dispenser (17>0) |

| N° | Description | Parameter Limits | LEDs on (g or y) | COMMENTS |
|---|---|---|---|---|
| | | 0: Dispenser 1 is not used | | |
| | | 1: Dispenser 1 has a rotative nozzle | | |
| | | 2: Dispenser 1 is standard | | |
| 40 | Unused | 0 | N/A | Speed for BSR is now a step parameter |
| 41 | Index for swinging resist dispense | 0 to 999 | REMOTE (g) ARM SPEED(g) | only if swinging dispenser (39≠0) |
| 42 | Type of dispenser1 | 0, 1, 2, 3, | SPEED (y) DISPENSER1 (g) | |
| | | 0: SUSS Pump: Virgin, Vulcan, Mp25 | | |
| | | 1: TTL pulse used for dispense | | |
| | | 2: TTL pulse used for predispense + a second TTL pulse for dispense | | |
| | | 3: TTL pulse starts dispense then counts down a delay (P54..P57 in s) | | |
| 43 | Type of dispenser2 | 0, 1, 2, 3, | SPEED (y) DISPENSER2 (g) | |
| | | 0: SUSS Pump: Virgin, Vulcan, Mp25 | | |
| | | 1: TTL pulse used for dispense | | |
| | | 2: TTL pulse used for predispense + a second TTL pulse for dispense | | |
| | | 3: TTL pulse starts dispense then counts down a delay (P54..P57 in s) | | |
| 44 | Type of dispenser3 | 0, 1, 2, 3, | SPEED (y) DISPENSER (g) | |
| | | 0: SUSS Pump: Virgin, Vulcan, Mp25 | | |
| | | 1: TTL pulse used for dispense | | |
| | | 2: TTL pulse used for predispense + a second TTL pulse for dispense | | |
| | | 3: TTL pulse starts dispense then counts down a delay (P54..P57 in s) | | |
| 45 | Type of dispenser4 | 0, 1, 2, 3, | SPEED (y) DISPENSER2 (g) | |
| | | 0: SUSS Pump: Virgin, Vulcan, Mp25 | | |
| | | 1: TTL pulse used for dispense | | |
| | | 2: TTL pulse used for predispense + a second TTL pulse for dispense | | |
| | | 3: TTL pulse starts dispense then counts down a delay (P54..P57 in s) | | |
| 46 | Remote address for controller of dispenser1 | 1 to 9 | DISPENSER 1 (g) | only for cluster config (10=5) |
| 47 | Remote address for controller of dispenser2 | 1 to 9 | DISPENSER 2 (g) | only for cluster config (10=5) |
| 48 | Remote address for controller of dispenser3 | 1 to 9 | DISPENSER 1 (g) | only for cluster config (10=5) |
| 49 | Remote address for controller of dispenser4 | 1 to 9 | DISPENSER 2 (g) | only for cluster config (10=5) |
| 50 | Delay between starting dispense1 and arm moving (1/10s) | 0 to 250 | TIME (y) DISPENSER1 (g) | only if dispenser line active (17>0) |
| 51 | Delay between starting dispense2 and arm moving (1/10s) | 0 to 250 | TIME (y) DISPENSER2 (g) | |
| 52 | Delay between starting dispense3 and arm moving (1/10s) | 0 to 250 | TIME (y) DISPENSER1 (g) | |
| 53 | Delay between starting dispense4 and arm moving (1/10s) | 0 to 250 | TIME (y) DISPENSER2 (g) | |
| 54 | Delay between ending dispense1 and arm moving (1/10s) | 0 to 250 | ACCELERATION (y) DISPENSER1 (g) | If 42=3, delay is in seconds |

| N° | Description | Parameter Limits | LEDs on (g or y) | COMMENTS |
|---|---|---|---|---|
| 55 | Delay between ending dispense2 and arm moving (1/10s) | 0 to 250 | ACCELERATION (y) DISPENSER2 (g) | If 43=3, delay is in seconds |
| 56 | Delay between ending dispense3 and arm moving (1/10s) | 0 to 250 | ACCELERATION (y) DISPENSER3 (g) | If 44=3, delay is in seconds |
| 57 | Delay between ending dispense4 and arm moving (1/10s) | 0 to 250 | ACCELERATION (y) DISPENSER4 (g) | If 45=3, delay is in seconds |
| 58 | Type of loader | 0, 1, 2 | TIME (y) REMOTE (g) | |
| | 0: No loader fitted | | | |
| | 1: Loader fitted | | | |
| | 2: Loader fitted but not used | | | |
| 59 | Type of spin power | 0, 1 | TIME (y) ACCELERATION (y) NITROGEN (g) | |
| | 0: Linear amplifier (standard) | | | |
| | 1: PWM servo amplifier (option) | | | |
| 60 | Edge bead remover delay at the internal diameter (s) | 0 to 250 | TIME (y) SOLVENT1 (g) | Only if edge bead remover (29=1) |
| 61 | Back side rinse delay between solvent and moving back the arm (s) | 0 to 250 | TIME (y) SOLVENT2 (g) | Only if back side rinse (32=1) |
| 62 | Maximum deceleration allowed (100 rpm) | 1 to 200 | ACCELERATION (y) | |
| 63 | Arm position for Solvent5 | 0 to 999 | SOLVENT1 (g) | |
| 64 | Solvent6 – SET UP | 0, 1, 2 | ACCELERATION (y) SOLVENT2 (g) | |
| | 0: Solvent 6 is not used | | | |
| | 1: Reserved | | | |
| | 2: Solvent 6 is standard | | | |
| 65 | Arm position for Solvent6 | 0 to 999 | SOLVENT1 (g) | |
| 66 | Solvent7 – SET UP | 0, 1, 2 | ACCELERATION (y) SOLVENT1 (g) | |
| | 0: Solvent 7 is not used | | | |
| | 1: Reserved | | | |
| | 2: Solvent 7 is standard | | | |
| 67 | Arm position for Solvent7 | 0 to 999 (mn) | SOLVENT1 (g) | |
| 68 | Solvent8 – SET UP | 0, 1, 2 | ACCELERATION (y) SOLVENT2 (g) | |
| 69 | Arm position for Solvent8 | 0 to 999 (s) | SOLVENT2 (g) | |
| 70 | Period in minute for refilling tank | 0..999 | SPEED (y) REMOTE (g) | Only if P68=1 Power OFF/ON spinner after change |
| 71 | Duration in second for refilling tank 0..999 | | TIME (y) REMOTE (g) | Only if P68=1 Power OFF/ON spinner after change |

Note: Parameters are requested according to the switch configuration (chuck index etc.) and to the answers to other parameter requests (number of solvents, number of dispensers, etc.). For instance, if the answer is zero for the number of solvents (f=0), the number of the solvent dedicated to washing the GYRSET will not be requested.

# 9. SPIN COATER CONTROL PANEL

## 9.1 INTRODUCTION
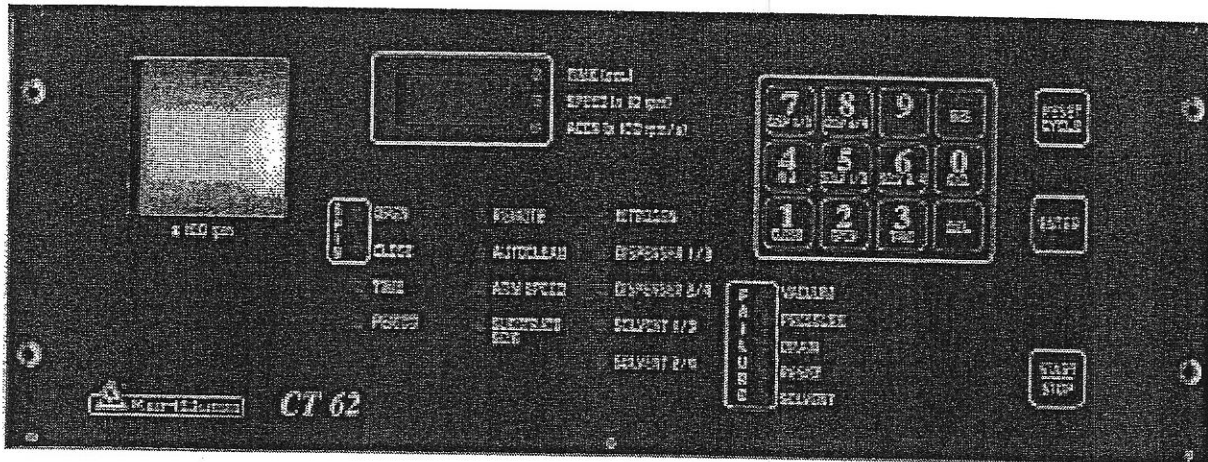


**Figure 45: The CT62 RC Spin Coater Control Panel**

The control panel is composed of:

▲ Yellow LEDs to indicate the selected parameter step

▲ Red LEDs to indicate the error types

▲ Three-digit display and yellow LEDs to indicate parameter value and/or error messages

▲ Numerical keypad to select and program cycles

▲ <RESET> key to clear a cycle

▲ <ENTER> key to validate the entered data

▲ <START/STOP> key to start a cycle

▲ Speed indicator

## 9.2 KEYBOARD DESCRIPTION

| 1 |
|---|
| CLOSE |

**SPINNING WITH GYRSET COVER CLOSED (CENTRIFUGATION)**

The function <1/CLOSE> allows the programming of a spin sequence with the GYRSET cover closed. The main use of this function is the centrifugation of the substrate in order to spread out the fluid (resist, polyimide or other) and obtain a uniform coating over the substrate.

The speed and acceleration are to be programmed according to the thickness of the film to be obtained and vary according to the fluid viscosity and the substrate material.

This function starts the centrifugation, but does not stop it. The centrifugation time is not programmed at this step. There is a specific sequence for programming the duration of this function. Subsequently, another command is needed to stop the chuck rotation.

| 2 |
|---|
| **OPEN** |

### SPINNING WITH GYRSET COVER OPEN (DRYING)

The function <2/OPEN> allows the programming of a spin sequence with the GYRSET cover open. The maximum allowed speed is approx 1000 rpm (depending on the parameters) for safety CE reasons. Error 28 is returned if a value of higher than 1000 rpm is programmed. This function can be used for various purposes:

#### Drying of the fluid film

As explained in a previous chapter, the GYRSET cover forms a closed cabinet with the chuck which prevents solvent evaporation. This results in a significant improvement in coating uniformity. The drawback is that the coat is still wet at the end of centrifugation. To dry the coated film faster, it is then possible to spin the substrate at a speed low enough to avoid turbulence, but high enough to evaporate the solvent faster.

#### Dynamic dispense

at low speed is used for dynamic dispense of solvent or coating fluid. It allows the emphasis of fluid spreading over the chuck (cleaning) or the substrate (coating fluid dispense).

Speed and acceleration are to be programmed according to the fluid viscosity and the final result to be obtained. Usually, a slow spin speed is used. This function starts the chuck rotation, but does not stop it. The spin time is not programmed at this step. There is a specific sequence to program the duration of this function. Subsequently, another command is needed to stop the chuck rotation.

### SPINNING WITH COVER DOWN AND GYRSET UP (DRYING ONLY FOR INDEXED GYRSET TYPE 1)
Step 12 is activated by pressing <1/CLOSE> key then <2/OPEN> key.

| 3 |
|---|
| **TIME** |

### TIME (DELAY PRIOR TO JUMPING TO NEXT FUNCTION)

The function <3/TIME> allows the programming of a duration for sequences which do not have a duration parameter. This allows several functions simultaneously to be run. For example, to make a dynamic dispense, it is necessary to start chuck rotation and to send the dispense command, then a time is entered prior to jumping to the next function.

### MANUAL DELAY (DELAY STOPPED BY <ENTER> KEY)
Step 33 is activated by pressing <3/TIME> twice.

| 4 |
|---|
| **N2** |

### NITROGEN BLOW-OFF (SUBSTRATE CLEANING)

The function <4/N2> allows dust to be blown off the substrate surface prior to dispensing the fluid. This function is not suitable for highly sensitive applications for which it is recommended to clean the substrate away from the spin coater. The blow-off function induces a temperature gradient along the surface of the substrate which can cause non-uniformity. During the blow-off sequence, the arm moves in, the nitrogen valve turns on for a duration which is programmed as a parameter. Then the nitrogen valve turns off and the arm moves out to the park position.

| 5 |
|---|
| **SOLV1/3** |

### SOLVENT1 DISPENSE (MACHINE CLEANING)

Solvent1 is dedicated to automatic machine cleaning, although the function <5/SOLV1/3> allows the programming of a solvent dispense on the outer ring of the chuck. The arm moves into the chuck centre, but the solvent dispense nozzle is oriented in such a way as to dispense the solvent on the outer ring of the chuck only. During the Solvent1 sequence, the chuck rotates, the solvent 1 valve turns on for a duration which is programmed as a parameter. Then the solvent valve turns off and the arm moves out to the park position.

### SOLVENT3 DISPENSE

Solvent 3 is activated by pressing the <5/SOLV1/3> key twice.

| 6 |
|---|
| **SOLV2/4** |

### SOLVENT2 DISPENSE (GYRSET CLEANING)

Solvent2 is dedicated to GYRSET cleaning. The dispense nozzle is located between the GYRSET and the cover. During the Solvent2 sequence, the arm does not move in. The cover must be closed or error 70 occurs. The solvent2 valve turns on for a duration which is programmed as a parameter. Then the solvent valve turns off.

### SOLVENT4 DISPENSE

Solvent4 is activated by pressing the <6/SOLV2/4> key twice.

| 7 |
|---|
| **DISP1/3** |

### DISPENSE1

The function <7/DISP1/3> allows the start pulse to be sent to dispensing pump1. There is no parameter for this function. The system waits for the end-of-dispense signal which is sent by the dispenser. To avoid any lock-up of the system due to a malfunction of the dispenser, a thirty seconds time-out allows the cycle to be exited and error to be generated.

### DISPENSE3

Dispenser3 is activated by pressing the <7/DISP1/3> key twice.

| 8 |
|---|
| **DISP2/4** |

### DISPENSE2

The function <8/DISP2/4> allows you to send the start pulse to the dispensing pump2. There is no parameter for this function. The system wait for the end of dispense signal which is sent by the dispenser. To avoid any lock up of the system due to a malfunction of the dispenser, a thirty seconds time out allows to exit the cycle and to generate an error.

### DISPENSE4

Dispenser4 is activated by pressing the <8/DISP2/4> key twice.

### MOTORISED ARM

The above description of the fluid dispense is for a pneumatic arm (2 or 6 positions). With the motorised arm dynamic dispenses are available, but additional parameters to those above are needed. This sequence proceeds as follows:

1. The arm moves to the starting diameter programmed as fluid parameter #1 at full speed
2. The valve turns on
3. The arm moves to the ending diameter programmed as fluid parameter #2 at the speed pre-set as fluid parameter #3.
4. The valve turns off

5. The arm moves out to the park position at full speed.

> Diameters are relative to the centre of the substrate. These values are defined for each fluids and programmed in the parameters.

> For a resist dispense, the end of dispense must occur (a) before the arm reaches the programmed diameter or (b) during a 120 seconds time out which exits the cycle and generates an error. The arm moves out to the park position as the dispense ends.

## SWINGING RESIST

Swinging resist is a rotational dispenser nozzle at the end of the dispenser arm which is used to dispense a thick ring of resist. Fix a needle at the end of the nozzle to be more accurate. The dispenser1 line which is used for the swinging resist needs to be enabled. Set parameter 39 equal to 1 to do this. For a swinging resist dispense the first diameter is the internal diameter of the dispense, the second is the outer diameter of the dispense, the third is the arm speed. In addition, there is a further machine parameter: n° 41, which is an offset from the internal diameter.

1. The arm moves to the internal diameter (first position) plus the offset (41).
2. A finger presses the dispenser nozzle close to the substrate.
3. The arm moves to the inter diameter (first position).
4. Then It moves back out to the outer diameter (second position) at the programmed speed.
5. The finger releases the dispenser nozzle.

Example: For swinging resist set to dispenser1, ID of 20 mm, OD of 80 mm and SD of 5:

| | |
|---|---|
| <7/DISP1> | select dispenser1/swinging resist |
| <ENTER> | validate function, move to parameter setting |
| <2><0> | enter ID 20 mm |
| <ENTER> | validate ID, move OD |
| <8><0> | enter OD 80 mm |
| <ENTER> | validate OD, move SD |
| <5> | enter SD 5 |
| <ENTER> | validate swinging resist, move to next function |

## Cotton Candy Remover

After a lot of dispense cycles, the resist sticks to the outside of the gyrset and makes threads like a cotton candy. To clean it a solvent nozzle is fixed on the cover. The solvent3 line which is going to be used for the cotton candy remover needs to be enabled. Set parameter 28 equal 1 to do this.

Remember, the cover must be closed when using this function. If it isn't, error n°70 will be returned.

For the cotton candy remover there is one parameter: time.

Example: For cotton candy remover set to solvent3, dispense duration of 10s:

| | |
|---|---|
| <5/SOLV3><5/SOLV3> | select solvent2/cotton candy remover |
| <ENTER> | validate function, move to parameter setting |
| <1><0> | enter duration 10s |
| <ENTER> | validate cotton candy remover, move to next function |

## EDGE BEAD REMOVER

During centrifugation, the resist is centrifuged out of the substrate and falls on the chuck. This step causes turbulence which solidifies more resist than on the substrate and increases the height of the resist on the edge of the substrate. The edge bead remover is a rotating solvent nozzle at the end of the dispenser arm which is used to clean a thick ring of resist. Fix a needle to the end of the nozzle to be more accurate. Remove edge bead after baking. The solvent2 line which is used for the edge bead remover needs to be enabled: set parameter 29 equal 1.

For the edge bead remover the first diameter is the outer diameter of the dispense in mm (some mm larger than the substrate diameter), the second is the internal diameter of the dispense (some mm smaller than the substrate diameter). The third is the speed of removing.

1. The arm moves to the first outer position at full speed.
2. A finger presses the solvent nozzle close to the substrate.
3. It moves into the substrate diameter (second position) at the speed programmed as parameter #3
4. It stays at this position for a delay programmed as machine parameter n° 60
5. It moves back to the first position at the speed programmed as parameter #3.
6. The solvent washes the substrate by capillary reaction.
7. The finger releases the solvent nozzle.
8. The arm moves out to the park position at full speed.

Example:  For edge bead remover set to solvent2, OD of 155 mm, ID of 145 mm and SD of 5:

| | |
|---|---|
| <6/SOLV2> | select solvent1/edge bead remover |
| <ENTER> | validate function, move to parameter setting |
| <1><5><5> | enter OD 155 mm |
| <ENTER> | validate OD, move to ID |
| <1><4><5> | enter ID 145 mm |
| <ENTER> | validate ID, move to SD |
| <5> | enter SD 5 mm |
| <ENTER> | validate edge bead remover, move to next function |

## BACK SIDE RINSE

During dispense, resist may return under the substrate due to use of low spin speed. To avoid pollution rinse the back side of the substrate with this solvent. It is fixed on the right side of the dispenser arm and has a up and down movement. When the nozzle is down, the arm rotates and place it under the substrate allowing the rinsing. We recommend to rinse the back side of the substrate before baking. The solvent4 line which is going to be used for the back side rinse needs to be declared. Set parameter 32 equal 1 to do this. The rinse is static, being carried out at the position specified when entering the function.

For the back side rinse the first and second parameter are equal to the substrate rinsing diameter in mm, the third is the rinse duration. In addition, there is two further machine parameter: n° 33, which is the position at which the nozzle lowers and n°61 which is a delay after stopping rinsing and before moving the dispenser arm.

1. The arm moves to the position programmed as machine parameter 33 at full speed.
2. A finger presses the solvent nozzle against the underside of the substrate.
3. It moves into the substrate diameter (first position) at full speed
4. The valve turns on and rinses during the time programmed as the second parameter. Then the valve turns off.
5. Countdown parameter 61
6. The arm moves to the position programmed as machine parameter 33 at full speed.

7. The finger releases the solvent nozzle.
8. The arm moves out to the park position at full speed.

Example:  For back side rinse set to solvent4, substrate diameter of 150 mm, rinse duration of 10 s:

| | |
|---|---|
| <6/SOLV4><6/SOLV4> | select solvent4/ back side rinse |
| <ENTER> | validate function, move to parameter setting |
| <1><5><0> | enter substrate diameter 150 mm |
| <ENTER> | validate substrate diameter, move to substrate diameter |
| <1><5><0> | enter the same diameter for static rinse |
| <ENTER> | validate substrate diameter, move to rinse duration |
| <1><0> | rinse duration 10 s |
| <ENTER> | validate back side rinse, move to next function |

## RESIST NOZZLE AUTOCLEAN

When a dispenser is not used for a long time, a bubble of resist at the end of the dispenser nozzle solidifies. A pre-dispense could not be enough to clean it. So the resist nozzle autoclean is fixed in front of the dispenser nozzles when arm is at the parking position. This solvent nozzle has such a design it cleans inside the resist tube by capillarity. The solvent5 line which is going to be used for the resist nozzle autoclean needs to be enabled. Set machine parameter n° 34 equal to 1 to do this. In this case, the first parameter of a dispense is the cleaning duration in seconds. The other parameters are standard: diameter and arm speed. If the duration is set to zero, the nozzle is not rinsed.

Cycle with resist nozzle autoclean:

1. The arm moves to the position programmed as a machine parameter to align resist and autoclean nozzles.
2. Nozzle autoclean is turned on for the programmed duration, which is the first parameter entered when programming a dispense.
3. Waits for pre-dispense to end.
4. The arm dispenses normally.

## BOWL REFILLING

To avoid the solid bubble of resist at the end of the dispenser lines, a stream of solvent blow the dispenser nozzles when parked. The solvent vapour use solvent from the bowl. This bowl needs to be periodically refilled. The solvent8 line which is going to be used for the bowl refilling needs to be enabled. Set parameter 68 to 1. Set parameter 70 equal to the period in minute. Then set parameter 71 equal to the duration of refilling. While parameters 68, 70 and 71 are set to a non zero value, bowl refilling is running up the spinner is powered off.

| | |
|---|---|
| **0**<br>**END** | **END (END OF CYCLE)**<br>The <0/END> key is an editing key. It allows, in an existing cycle, to change the end of cycle. When this function is activated when modifying a program, all functions, from the current step to the end of the cycle, are deleted. |
| **INS** | **INSERT (INSERT FUNCTION)**<br>The <INS> key is an editing key. It allows, in an existing cycle, to insert a new function before an existing function. |

| | |
|---|---|
| **DEL** | **DELETE (RESET PARAMETER OR DELETE FUNCTION)**<br>The <DEL> key is an editing key. It has two different functions according to the current status of the display when modifying an existing program. If the display shows a function code (the associated green lamp lights on), press this function to delete the current function and its associated parameters if applicable. If the display shows a parameter (the associated yellow lamp lights on), press this function to set the current parameter to zero. |
| **RESET CYCLE** | **RESET CYCLE (CLEAR THE ENTIRE FUNCTION LIST OF AN EXISTING CYCLE)**<br>The <RESET/CYCLE> function allows the deletion of the contents of an existing cycle. It is recommended to use this function each time a new cycle is programmed to avoid leaving any wrong data in the memory. Refer to the corresponding chapter for further information on this function. |
| **ENTER** | **ENTER (VALIDATION)**<br>The <ENTER> key is an editing key. When in the programming or modifying mode, it allows validation of the entered datum (function or parameter) and to jump to the next datum. It also validates the resetting cycle command. |
| **START STOP** | **START/STOP (CYCLE EXECUTION CONTROL)**<br>The <START/STOP> key controls the execution of the cycle. When in standby mode (cycle number on display, eg: oo2), press the <START/STOP> key to start the cycle. Then, if the cycle must be stopped before its end, press the <START/STOP> key again. When modifying an existing cycle, press the <START/STOP> key to return to standby mode without saving the modification. To validate the modification, the user must go through the whole program and exit using the <ENTER> key. |

## 9.3 DISPLAY AND PARAMETER FLAGS DESCRIPTION

The keyboard, described previously, and the three-digit display make up the user interface. The following diagram shows the three-digit display in standby mode and the three yellow lamps or flags which identify the parameters. The standby mode is easily identified by two small zeros followed by the cycle number.



○ TIME (sec)

○ SPEED (x 10 rpm)

○ ACCN (x 100 rpm/s)
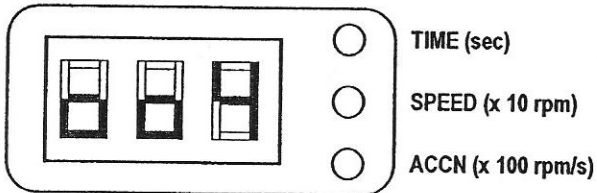
**TIME (SEC.)**

When this lamp blinks, the 'time' parameter can be modified using the keyboard. The step is one second (1 sec.). The range is 1 second to 999 seconds (1-999 on the display).

**SPEED (X10RPM)**

When this lamp blinks, the spinning 'Speed' parameter can be modified using the keyboard. The resolution is ten rotations per minutes (10 rpm). Range is 0 to 9990 rpm (0-999 on display).

Note: Some models have a speed limitation of 5 000 or 3 000 rpm. At some steps of the cycle, the limitation can be programmed to 500 rpm. If one parameter is out of limits, the <ENTER> key is defeated. The CT62 beeps, the display is set to ra2, and a new value is requested.

### ACC (X100RPM/S)

When this lamp blinks, the spin 'acceleration' parameter can be modified using the keyboard. The resolution is a hundred rotations per minute (100 rpm). The range is 100 to 20 000 rpm (1-200 on the display)

The <DEL> key can be used to clear the parameter (set it to 0), then the parameter is entered as on a calculator. For instance, to program 100, type 1, then 0 and 0 again. Validate with <ENTER>.

## 9.4 FUNCTION FLAGS DESCRIPTION

A set of green lamps or flags is used to identify the function being executed or programmed.

### SPIN OPEN

When a cycle is running, this lamp lights on if the spin-with-cover-closed sequence is being started. It lights on during the acceleration phase, and lights off as soon as the pre-set speed is reached. Then, it is replaced by the next function, even if the chuck is still rotating.

When modifying a program, the 'SPIN OPEN' flag blinks to inform the user that the function can be modified. After the validation key <ENTER> has been pressed, the green flag 'SPIN OPEN' lights on and the first associated parameter blinks. The green flag 'SPIN OPEN' goes out after completion of parameter setting.

### SPIN CLOSED

When the cycle is running, this lamp lights on if the spin-with-cover-open sequence is being started. It lights on during the acceleration phase, and goes out as soon as the preset speed is reached. Then, it is replaced by the next function, even if the chuck is still rotating.

When modifying a program, the 'SPIN CLOSE' flag blinks to inform the user that the unction can be modified. After the validation key <ENTER> has been pressed, the green flag 'SPIN CLOSE' lights on and the first associated parameter blinks. The green flag 'SPIN CLOSE' goes out after completion of parameter setting.

### TIME

When the cycle is running, the green flag 'TIME' lights on while the delay is being executed. It lights on until the pre-set time has elapsed.

When modifying a program, the green 'TIME' flag blinks to inform the user that the function can be modified. After the validation key <ENTER> has been pressed, the green flag 'TIME' lights on and the yellow parameter flag 'time' blinks. The green flag 'SPIN CLOSE' goes out after completion of parameter setting.

### PERIOD

The green flag 'PERIOD' blinks while the time between two successive cleaning cycles is entered. It lights on while the number of spin cycles between two successive cleaning cycles is entered.

### NITROGEN

When a cycle is running, the green flag 'NITROGEN' lights on while nitrogen dispense is being executed. It lights on until the pre-set dispense time has elapsed.

When modifying a program, the 'NITROGEN' green flag blinks to inform the user that the function can be modified. After the validation key <ENTER> has been pressed, the green flag 'NITROGEN' lights on and the yellow parameter flag 'time' blinks. The green flag 'NITROGEN' goes out after completion of parameter setting.

### DISPENSER1/3

When a cycle is running, the green flag 'DISPENSER1/3' lights on while dispense with pump1 or 3 is being executed. It lights on until the dispense sends its end-of-dispense to the spin coater controller. If the dispenser does not respond before the end of the thirty seconds time-out, an error message is displayed.

When modifying a program, the 'DISPENSER1/3' green flag blinks to inform the user that the function can be modified. After the validation key <ENTER> has been pressed, the green flag 'DISPENSER1/3' goes out.

### DISPENSER2/4

When a cycle is running, the green flag 'DISPENSER2/4' lights on while dispense with pump2 or 4 is being executed. It lights on until the dispense sends its end-of-dispense to the spin coater controller. If the dispenser does not respond before the end of the thirty seconds time-out, an error message is displayed.

When modifying a program, the 'DISPENSER2/4' green flag blinks to inform the user that function can be modified. After the validation key <ENTER> has been pressed, the green flag 'DISPENSER2/4' goes out.

### SOLVENT1/3

When a cycle is running, the green flag 'SOLVENT1/3' lights on while solvent dispense 1 or 3 is being executed. It lights on until the pre-set solvent dispense time has elapsed.

When modifying a program, the 'SOLVENT1/3' green flag blinks to inform the user that the function can be modified. After the validation key <ENTER> has been pressed, the green flag 'SOLVENT1/3' lights on and the yellow parameter flag 'time' blinks. The green flag 'SOLVENT1/3' goes out after completion of parameter setting.

### SOLVENT2/4

When a cycle is running, the green flag 'SOLVENT2/4' lights on while solvent dispense 2 or 4 is being executed. It lights on until the pre-set solvent dispense time has elapsed.

When modifying a program, the 'SOLVENT2/4' green flag blinks to inform the user that the function can be modified. After the validation key <ENTER> has been pressed, the green flag 'SOLVENT2/4' lights on and the yellow parameter flag 'time' blinks. The green flag 'SOLVENT2/4' goes out after completion of parameter setting.

### REMOTE

The green lamp (or flag) 'REMOTE' lights on briefly each time a command is received by the controller through the RS232 serial interface.

When the debug program is used through an external terminal, the 'REMOTE' flags lights on as soon as the debug command is sent and goes out when exiting from the debug menu.

### AUTOCLEAN

This function is only available with a motorised arm. The green flag 'AUTOCLEAN' lights on either while the automatic cleaning cycle is being executed or when the automatic cleaning parameters are being programmed.

### ARM SPEED

When modifying a program, the 'ARM SPEED' green flag blinks to inform the user that the parameter can be modified using the keyboard. After the validation key <ENTER> has been pressed, the green flag 'ARM SPEED' goes out.

### SUBSTRATE SIZE

When modifying a program, the 'SUBSTRATE SIZE' green flag blinks to inform the user that the parameter can be modified using the keyboard. After the validation key <ENTER> has been pressed, the green flag 'SUBSTRATE SIZE' goes out.

## 9.5 FAILURE FLAGS DESCRIPTION

A set five green lamps or flags is used to identify the failures which are detected by the system, either at power on or during a cycle execution.

**VACUUM**

The 'VACUUM' flag lights on when a vacuum failure is detected at the beginning of cycle. A vacuum failure can be either no vacuum supplied to the spin coater, or a vacuum leak at substrate level. The vacuum failure information is provided to the controller by a vacuum sensor for which the detection threshold has been factory adjusted.

**PRESSURE**

The 'PRESSURE' flag lights on at power on or during a cycle if the air pressure is not supplied to the spin coater, or if the air pressure becomes insufficient. The air pressure failure information is provided to the controller by an air pressure sensor for which the detection threshold has been factory adjusted.

**DRAIN**

The 'DRAIN' flag lights on when the bottle receiving the waste material from the collecting bowl is full. This level sensor is optional and is fitted directly onto the bottle. This information avoids waste fluid overflow.

**RESIST**

The 'DISPENSER' flag lights up during cycle execution when the dispenser does not respond to the controller. It also lights up as 'DRAIN 2'. DRAIN 2 works as 'DRAIN' if option is fitted

**SOLVENT**

The 'SOLVENT' flag lights up as 'DRAIN 3' if option is fitted. See 'DRAIN'

**RESIST+SOLVENT**

RESIST+SOLVENT flags both light up when the GYRSET cover is not properly closed.

Note   The red failure flags signal the main hardware errors. In addition to the failure flags, error codes are displayed on the three-digit display. The error list is given later in this manual.

## 9.6  SPEED INDICATOR

An analogue meter informs the user of the real rotation speed of the spinning chuck. Graduation range is from zero to one hundred (0-100). The speed meter information is to be multiplied by one hundred to get the real speed. It is directly connected to the tachometric generator.

Note:  To avoid any risk for the user or the substrate being processed, an automatic speed level keeps the vacuum on until the complete stop of the chuck.

## 9.7  POWER ON

Prior to powering on the system, check the utilities. At power on, a self-test sequence is automatically activated to check the utilities and hardware status of the system. The software version is displayed. When the chuck indexing option is available on the system, the indexing sequence of the chuck is executed first, then, if applicable, the cover is opened. After the self-test sequence, cycle '1' is automatically selected, and the machine is placed in the standby mode.

The program number is displayed as illustrated below.
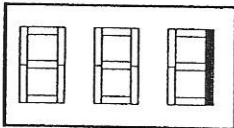


To run the same cycle as before, simply press the <START/STOP> key on the front panel.

# 10. CYCLES

## 10.1 A SHORT DESCRIPTION

Cycle '0'   A single-step cycle to allow fast programming of some specific functions which are useful for servicing or during machine cleaning. These functions are:

1. Command a fluid dispense, the arm being positioned on the collecting bowl at the park position.

2. Open or close the automatic GYRSET cover according to the initial position.

3. Turn on/off the chuck vacuum.

4. Index the chuck and lift up/down the substrate.

5. Move the dispenser arm to the servicing position and rotate the edge bead remover and swinging resist for needle adjustment

6. Unloading sequence for spinner with manual loader

Cycle '1'   A very simple cycle which is suitable for a large number of applications ie one-step spin with cover closed (speed, acceleration and time)

Cycle '2' to '8'   Programmable (customised) cycles. The user is free to program up to thirty (30) steps of program that allows the programming of sophisticated cycles for very specific applications.

Cycle '9'   Used in connection with the automatic machine cleaning sequence. It determines the cleaning frequency in automatic mode.

## 10.2 READING THE CYCLE CONTENTS

### 10.2.1 CYCLE SELECTION

In case the program number being displayed does not correspond to the program you want to read, select another one. To do so:

Enter the program number by pressing the numerical key corresponding to the program number (eg: new program number 5), the display changes as illustrated below:
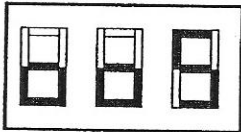


Press the <ENTER> key to validate the cycle number. The display changes as illustrated below, informing the user that the cycle can be started.
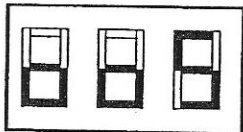


### 10.2.2 CYCLE READING

To enter the reading function of the cycle, press the <ENTER> key when the cycle number is displayed. If the cycle is empty (no function is programmed) three (3) zeros (0) are displayed as illustrated below:

To return to the cycle number display, press <ENTER> key once again, or press the <START/STOP> key. Since the system is equipped with a three-digit display, the function list and their associated parameters are displayed sequentially each time the <ENTER> key is pressed.

The function code is displayed first and the lamp (flag) corresponding to the function blinks. After the <ENTER> key is pressed, the function flag stops flashing and lights ON. The associated parameters, if applicable, are displayed sequentially and the flag corresponding to the parameter blinks until the <ENTER> key is pressed again.

For instance, the simple spin cycle '1' with the cover closed at 2000 rotations per minute, with an acceleration of 1000 rotations per minute per second for a duration of 15 seconds, is displayed as follows:

| | | |
|---|---|---|
| oo1 | Standby mode, cycle '1' | |
| 001 | Function '1' - spin cover closed | Green lamp CLOSE blinks |
| 200 | Spin Speed '200' - 2000 rpm | Green lamp CLOSE lights ON. Yellow lamp SPEED blinks |
| 010 | Acceleration '010' - 1000 rpm/sec. | Green lamp CLOSE lights ON. Yellow lamp ACCELERATION blinks |
| 003 | Function '3' - Time | Green lamp TIME blinks |
| 015 | Time '015' - 15 seconds | Green lamp TIME lights ON. Yellow lamp TIME blinks |
| 000 | End of cycle | |
| oo1 | Standby mode, cycle '1' | |

## 10.3  RESETTING A CYCLE

### 10.3.1  CYCLE SELECTION

If the cycle number being displayed does not correspond to the cycle you want to read, select another. To do so:

Enter the cycle number by pressing the numerical key corresponding to that cycle number (eg: new cycle number 5), the display changes as illustrated below:
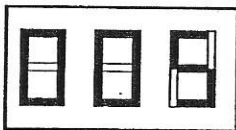


Press the <ENTER> key to validate the cycle number. The display changes as illustrated below, informing the user that the cycle can be started.
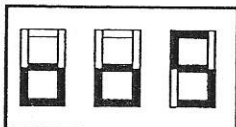


### 10.3.2  CYCLE RESET

Prior to programming a new cycle, ensure that the cycle number to be programmed is empty. To do so, press the <ENTER> key when the cycle number to be programmed is displayed. If the cycle is empty (no function is programmed) three (3) zeros (0) are displayed as illustrated below:
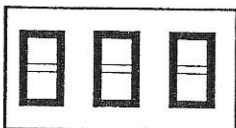
If the cycle is not empty, use the reset cycle function to clear all functions recorded in the memory for this specific cycle number:

1. Return to the cycle number display.
2. Press the <RESET CYCLE> key.
3. Immediately after the <RESET CYCLE> key has been pressed, the cycle number flashes and displayed in UPPER CASE figures as illustrated below (eg: cycle '5')
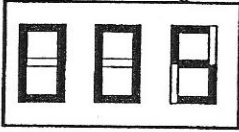


4. Press the <ENTER> key while the cycle number is flashing to clear the displayed cycle number. If the cycle is not to be erased, press the <START/STOP> key to cancel the command.

## 10.4  SERVICE CYCLE '0'

### 10.4.1  CYCLE '0' SELECTION

To select cycle '0', the system must be in the standby mode.

<ENTER> the cycle number by pressing the numerical key <0>: the display changes as illustrated below:
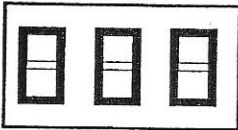


Press the <ENTER> key to validate the cycle number. The display changes as illustrated below, informing the user that the cycle can be started.



### 10.4.2  PROGRAMMING

The service cycle '0' is a single step program which allows you to check some specific functions of the system. The available functions are listed in the table on the next page

To program one of the functions available with cycle '0', proceed as follows:

1. Select cycle number '0'. To do so, press the <0> key, then the <ENTER> key

2. The display shows (000) if cycle '0' has never been used before. Otherwise, the function code corresponding to the latest function being used through this program is displayed.

3. Press the function key corresponding to the function to enter (1-8, 55, 66, 77, 88), then press the <ENTER> key to validate the function number and return to standby mode with the cycle number displayed.

4. For functions 4, 5, 55, 6 and 66, enter the time, the only requested parameter. Validate the parameter with the <ENTER> key.

5. To run the programmed sequence, press the <START/STOP> key

The functions available with cycle '0' and their associated parameters are listed in the following table:

| | SERVICE CYCLE '0' – Function list | | |
|---|---|---|---|
| Code | Function | Parameters | Description |
| 0 | Unload a substrate with the loader | no parameter | Only with manual loader (p58=1) |
| | | | See unloading sequence for loader option |
| 1 | Close or Open GYRSET Cover | no parameter | **case1: GYRSET Cover is open** |
| | | | Tests if automatic arm is out, otherwise an error oo9 is displayed (if option is fitted) |
| | | | Lift pins move down and chuck indexing is tested and corrected (if options are fitted) |
| | | | GYRSET cover closes |
| | | | **case2: GYRSET cover is closed** |
| | | | Chuck indexing is tested and corrected (if options is fitted) |
| | | | GYRSET cover opens |
| | | | Lift pins move up (if option is fitted) |
| 2 | Substrate Vacuum ON/OFF | no parameter | **Vacuum turns OFF if previously ON** |
| | | | **Vacuum turns ON if previously OFF** |
| | | | **(If vacuum failure is detected, error oo6 is displayed: clear it by pressing the <ENTER> key)** |
| 3 | Chuck Indexing and Lift pins control | no parameter | **Case1: Lift pins are up** |
| | | | Tests if automatic arm is out, otherwise error oo9 is displayed (if option fitted) |
| | | | Lift pins move down (if option fitted) |
| | | | Chuck indexing is tested and corrected (if option fitted). |
| | | | Indexing clutch is released. |
| | | | **Case2: Lift pins are down** |
| | | | Tests if automatic arm is out, otherwise error oo9 is displayed (if option fitted) |
| | | | Tests if GYRSET cover is open, otherwise error o14 is displayed (if option fitted) |
| | | | Chuck indexing is tested and corrected (if option fitted) |
| | | | Lift pins move up (if option fitted) |
| 4 | Nitrogen Blow Off | Time | **The arm stays at its rest position above the auxiliary drain. The nitrogen blow-off valve turns on for the time duration** |
| 5/55 6/66 | Solvent 1/3 dispense Solvent 2/4 dispense | Time | **The arm stays at its rest position above the auxiliary drain except if solvent #n is dedicated to the edge bead remover. For edge bead remover solvent, the arm moves to the arm servicing position. See machine parameter AH. Solvent #n turns on for time duration.** |
| 7-77 8-88 | Resist 1/3 Dispense Resist2/4 Dispense | no parameter | **The arm stays at its rest position above the auxiliary drain except if dispenser #n is dedicated to the swinging resist.** |
| | | | **For swinging resist, the arm moves to the Arm Servicing Position. See setup parameter AH. Start signal is sent to dispenser #n.** |
| | | | **Waits for the end of dispense #n signal. A 120 seconds time-out exits the cycle with error #13 if dispenser doesn't respond correctly. Then the arm moves back to the rest position.** |
| 9 | EBR or SR needle adjustment. | no parameter | **The arm moves to the Arm Servicing Position. See setup parameter AH. The nozzle rotates to bring the needles close to the substrate but no fluid is dispensed. Press the <ENTER> key when adjustment is finished. The arm returns to the rest position.** |

Note: The functions available in this cycle are mainly provided for checking purposes. Note that the Automatic Dispense Arm stays at the rest position, even if nitrogen blow-off, solvent dispense or fluid dispense is requested. Therefore we recommend using this function with great care, especially solvent dispense since solvent could be sprayed over the machine if the nozzle is not oriented towards the auxiliary drain.

## 10.5  PRESET SPIN CYCLE '1'

### 10.5.1  CYCLE '1' SELECTION

To select cycle '1', the system must be in standby mode.

Enter the program number by pressing the numerical key <1>, the display changes as illustrated below:
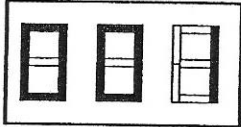
Press the <ENTER> key to validate the program number. The display changes as illustrated below, informing the user that cycle can be started:
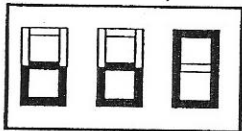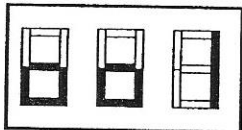
### 10.5.2  PROGRAMMING

Cycle '1' is a very simple program which suits a large number of applications. Its content depends on whether the resist nozzle autoclean is fitted or not.

#### WITHOUT RESIST NOZZLE AUTOCLEAN

It consists of a single step spin with cover closed. The associated parameters are speed, acceleration and time. There is no dispense function. This cycle is mainly used on the very basic spin coaters with no fitted options. Programming procedure is as follows:

1.  Press the <ENTER> key to enter parameter programming.

2.  The green lamp 'Spin Close' lights up, and the yellow lamp 'Speed' blinks requesting the spin speed. Enter a three digit value and validate by pressing the <ENTER> key.

3.  The green lamp 'Spin Close' remains on, and the yellow lamp 'Acceleration' blinks requesting the spin acceleration. Enter a three digit value and validate by pressing the <ENTER> key.

4.  The green lamp 'Time' lights up, and the yellow lamp 'Time' blinks requesting the duration of the spin sequence. Enter a three digit value (1-999) and validate by pressing the <ENTER> key. The system returns to standby.

Note:  If an entered parameter is out of range, the buzzer sounds briefly. The same parameter returns to zero and is requested again.

#### WITH RESIST NOZZLE AUTOCLEAN

When the resist nozzle autoclean is activated, cycle 1 is dedicated to the cleaning of the dispense nozzles. There are 3 parameters to be entered: the number of the dispense nozzle to be cleaned, the cleaning duration, and the cleaning reaction duration. Programming procedure is as follows:

1.  Press the <ENTER> key to enter parameter programming.

2.  The LED's 'Dispense1', 'Solvent1' and 'Solvent2' light up, and LED 'Dispenser2' blinks requesting the number of the dispense nozzle to be cleaned. Enter a value from 1 to 4 and validate by pressing the <ENTER> key.

3.  The LED's 'Dispense1', 'Solvent1' and 'Solvent2' light up, and the LED 'Time' blinks requesting the duration of the autoclean. Enter a value in seconds from 0 to 999 and validate by pressing the <ENTER> key.

4. The LED's 'Dispense1', 'Solvent1', 'Solvent2' and 'Time' light up requesting the duration of the reaction of the solvent. Enter a value in seconds from 0 to 999 and validate by pressing the <ENTER> key.

Note: If this parameter is set to 0, there is no pre-dispense. The arm returns to home immediately after the autoclean.

When running, the cycle works as follows:

1. The arm aligns the dispense nozzle programmed in parameter 1 to the autoclean nozzle.
2. The solvent is dispensed from the autoclean nozzle to the dispense nozzle for the cleaning duration programmed in parameter 2.
3. The reaction duration programmed in parameter 3 counts down.
4. A pre-dispense is carried out.
5. The arm returns to home.

### 10.5.3  RUNNING THE CYCLE

With the system in standby on cycle '1' (oo1), press the <START/STOP> key once to run the cycle. The cycle is run according to the pre-set functions. The flag corresponding to the function being executed lights up and, if applicable, the elapsed time is displayed.

The machine stops automatically at the end of the cycle and the display returns to the cycle number. If there is a problem during the cycle, such as vacuum or air pressure failure, the buzzer sounds and the cycle is immediately stopped. Press <ENTER> to clear the error and return to standby.

The user can stop the cycle before completion by pressing the <START/STOP> key again.



Figure 46: A Cycle Example

In standby, the cover is opened, the substrate lift pins are up waiting for a substrate to be loaded (if the machine is loaded manually, the lift pin option is not fitted).

Load and centre the substrate either on the chuck (manual loading) or on the lift pins (automatic loading with robotics arm). Press <ENTER> to start the cycle.

| Sequence 1 | 1. | Chuck vacuum turns on. |
| | 2. | If the substrate lift-up option is fitted, the Lift-pins move down. If a malfunction is detected, an error message is displayed (a) 'o02' if pins stay in the upper position, (b) 'o05' if the pins do not reach the lower position. |
| | 3. | Vacuum is tested prior to allowing continuation of cycle. If vacuum failure is detected, cycle stops and error message 'o07' is displayed. |
| | 4. | If GYRSET cover lift option is fitted, GYRSET Cover closes. If a malfunction is detected, an error message is displayed: 'o15' if cover stays in Open position. |
| Sequence 2 | Chuck accelerates to spin speed. | |
| Sequence 3 | Chuck spins at constant speed for the programmed duration | |
| Sequence 4 | Chuck decelerates until chuck comes to a complete stop. | |
| Sequence 5 | 1. | If the substrate lift-up option is fitted, the chuck is indexed to position the holes of the chuck above the pins. |
| | 2. | GYRSET cover opens. If a malfunction is detected, an error message is displayed:'o17' if the cover does not reach the Open position. |
| | 3. | Vacuum turns off. If the substrate lift-option is fitted, the pins move up. If a malfunction is detected, an error message is displayed: 'o03' if the pins do not reach the upper position. |
| | 4. | System returns to standby. |

## 10.6 CUSTOM CYCLES "2" - "8"

### 10.6.1 CYCLE SELECTION

If the program number being displayed does not correspond to the program you want to read, select another. To do so;

Enter the program number by pressing the numerical key corresponding to the program number (eg new program number 5): the display changes as illustrated below:
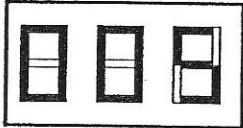
Press the <ENTER> key to validate the program number. The display changes as illustrated below, informing the user that cycle can be started:
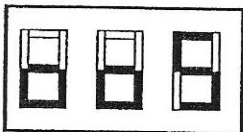
### 10.6.2 PROGRAMMING

A cycle is a sequence of functions and their associated list of parameters. The length of a program is limited to thirty (30) steps. Programming is a very simple procedure:

1. The display shows (000) indicating that the cycle is empty. If the cycle is not clear, use the reset function to clear the memory for the current program.

2. Press the function key corresponding to the function to enter, then press the <ENTER> key to validate the function number.

3. Enter the requested parameters. Validate each parameter with the <ENTER> key (If the parameter is out of range, the buzzer sounds briefly and the same parameter is requested again).

4. After the required parameters have been entered, the display shows (000) again. Should the program be completed at this step, press the <ENTER> key again to terminate the programming sequence.

5. If another function is to be performed, proceed from step (2) to (4) again.

### 10.6.3 FUNCTION DESCRIPTION

Fourteen (14) different functions are available to program the system. Some functions are available only if the associated option is fitted to the system.

| CUSTOM CYCLE '2' TO '8' - Function list | | | |
|------|----------|------------|-------------|
| Code | Function | Parameters | Description |
| 1 CLOSE | Spin Cover Closed | Speed (y) Acceleration (y) | Arm Out position is checked<br>GYRSET Cover Closes (if applicable)<br>Spinning starts<br>Moves to next function (chuck still spinning) |
| 12 CLOSE with GYRSET up | Spin Cover Closed with GYRSET up | Speed (y) Acceleration (y) | Available only with indexed GYRSET and GYRSET type 1<br>Arm Out position is checked<br>Cover Closes (if applicable) with GYRSET up<br>Spinning starts<br>Moves to next function (chuck still spinning) |
| 2 OPEN | Spinning Cover Open | Speed (y) Acceleration (y) | Spinning starts<br>Moves to next function (chuck still spinning) |
| 3 TIME | Sequence duration | Time | Pre-set time elapses<br>Moves to next function |
| 33 TIME stopped by ENTER key | Sequence duration | No parameter | Wait ENTER key pressed<br>Moves to next function |
| 4 N2 | Nitrogen Blow-Off | Time | Cover Opens<br>Automatic Arm moves in<br>Nitrogen Blow-Off Valve turns on<br>Pre-set time elapses<br>Nitrogen Blow-Off Valve turns off<br>Automatic Arm moves out<br>Moves to next function |
| 5-SOLV1<br>6-SOLV2<br>55-SOLV3<br>66-SOLV4 | Solvent Dispense1 (reserved for machine cleaning) | Time | Cover Up position is checked<br>Solvent #n Valve turns on (the solvent dispense occurs on the outer ring of the chuck)<br>Pre-set time elapses<br>Solvent #n Valve turns off<br>Automatic Arm moves out<br>Moves to next function |
| 7 - DISP1<br>8 - DISP2<br>77 - DISP3<br>88 -DISP4 | Start Dispenser1<br>Start Dispenser2<br>Start Dispenser3<br>Start Dispenser4 | no parameter | Cover Up position is checked<br>Automatic Arm moves in<br>Start signal is sent to Dispenser #n (the solvent dispense occurs at chuck centre)<br>Waits for the end of dispense #n signal. (A time out of 120 sec. exits the cycle on error #13 if dispenser does not respond properly)<br>Automatic Arm moves out<br>Jumps to next function |

Parameter ranges;

Speed (step 10 rpm)

     :   0 – 9 990 rpm (RC5 STD)
     :   0 – 7 000 rpm (RC5 GYRSET 3)
     :   0 – 5 000 rpm (RC5 GYRSET 5)
     :   0 – 7 000 rpm (RC8 GYRSET 3)
     :   0 – 5 000 rpm (RC8 GYRSET 5)

|  |  |
|---|---|
| | : 0 – 3 000 rpm (RC8 GYRSET 8) |
| | : 0 – 3 000 rpm (RC13) |
| | : 0 – 2 500 rpm (RC16) |
| | : 0 – 2 000 rpm (RC22) |
| | : 0 – 1 000 rpm (RC33) |
| Acceleration (step 100 rpm/sec.) | : 100 – 20 000 rpm/s. (RC5 STD) |
| | : 100 – 5 000 rpm/s (RC5 GYRSET & RC8) |
| | : 100 – 2 000 rpm/s (RC13) |
| | : 100 – 1 000 rpm/s (RC16) |
| | : 100 – 500 rpm/s (RC22) |
| | : 100 – 300 rpm/s (RC33) |
| Time (step 1 sec.) | : 1 - 999 sec. |

The parameter range is subject to modification according to the limitation introduced by the user in the software parameter configuration.

Note: with motorised arm, fluid functions need three parameters (substrate diameters and arm speed).

If substrate diameters are equal, the dispense is static. The arm speed parameter becomes the duration.

For the solvent dedicated to the edge bead remover, first parameter is the outer diameter, second parameter is the inner one.

For the swinging resist, first parameter is the inner diameter, second parameter is the outer one.

For the backside rinse, first and second parameter are equal to the rinse position, the third parameter is the rinse duration.

When the dispenser nozzle rinse option is enabled, dispense requires 4 parameters: nozzle rinse duration, dispense diameters and arm speed.

| Code | Function | Parameters | Description |
|---|---|---|---|
| 4 N2 | Nitrogen Blow-Off | START DIAMETER | Cover Opens |
| 5 SOLV1 | Solvent Dispense1 | END DIAMETER | Automatic Arm moves in to the programmed start diameter |
| 6 SOLV2 | Solvent Dispense2 | ARM SPEED | Fluid Valve turns on |
| 55 SOLV3 | Solvent Dispense3 | | Arm moves to the programmed end diameter at the programmed speed |
| 66 SOLV4 | Solvent Dispense4 | | Fluid Valve turns off |
| 7 DISP1 | Start Dispenser1 | | Automatic Arm moves out |
| 8 DISP2 | Start Dispenser2 | | Jumps to next function |
| 77 DISP3 | Start Dispenser3 | | |
| 88 DISP4 | Start Dispenser4 | | |

## 10.6.4  CUSTOM CYCLE EXAMPLE1



Figure 47: Graph of Custom Cycle Example1
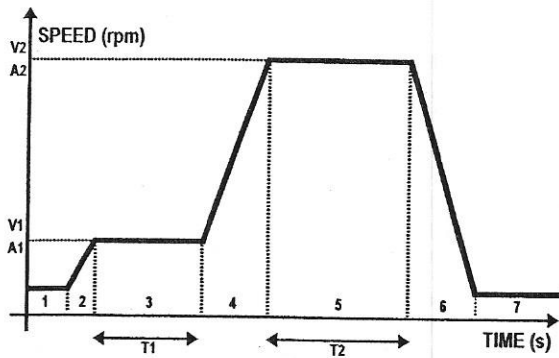
Cycle '3'

1. Static dispense at substrate centre using dispense1 (DISP1)
2. Spin cycle phase 1 - acceleration
3. Spin cycle phase 1 - plateau
4. Spin cycle phase 2 - acceleration
5. Spin cycle phase 2 - plateau
6. Deceleration
7. End of cycle

| Action | Display * blinks | Function Flags * blinks | Parameter Flags * blinks |
|---|---|---|---|
| **Select cycle '3', reset and enter programming mode** | | | |
| '3' then 'ENTER' (cycle selection) | oo3 | | |
| 'RESET' (select reset function) | 003 * | | |
| 'ENTER' (validate reset function) | oo3 | | |
| 'ENTER' (enter programming mode) | 000 | | |
| **Step 1: Start dispense #1** | | | |
| '7/DISP1' (select dispense 1 function) | 007 | DISPENSER 1 * | |
| 'ENTER' (validate function, move to parameter setting) | 000 | | SUBSTRATE SIZE (green)* |
| '0' '0' '0' (enter substrate external diameter = 0 mm) | | | SUBSTRATE SIZE (green)* |
| 'ENTER' (validate external diameter, move to next parameter) | | | SUBSTRATE SIZE (green)* |
| '0' '0' '0' (enter substrate internal diameter = 0 mm) | | | SUBSTRATE SIZE (green)* |
| 'ENTER' (validate internal diameter, jump to next step) | 000 | | |
| **Step 2: First Spinning sequence with cover closed** | | | |
| '1/CLOSE' (select spin close function) | 001 | SPIN CLOSE * | |
| 'ENTER' (Validate function, jump to parameter setting) | 000 | SPIN CLOSE | SPEED * |
| '1' '0' '0' (Enter speed 100) | 100 | SPIN CLOSE | SPEED * |
| 'ENTER' (Validate speed & jump to next parameter) | 000 | SPIN CLOSE | ACC * |
| '1' '0' (Enter acceleration 0, 1 already in) | 010 | SPIN CLOSE | ACC * |
| 'ENTER' (Validate acceleration & jump to next step) | 000 | | |
| **Step 3 : Duration of the first plateau** | | | |
| '3/TIME' (select time function) | 003 | TIME (green) * | |
| 'ENTER' (validate function, jump to parameter setting) | 000 | TIME (green) | TIME (yellow) * |
| '5' (set time to 5 seconds) | 005 | TIME (green) | TIME (yellow) * |
| 'ENTER' (Validate time & jump to next step) | 000 | | |
| **Step 4: Second Spinning sequence with cover closed** | | | |
| '1/CLOSE' (select spin close function) | 001 | SPIN CLOSE * | |
| 'ENTER' (Validate function, jump to parameter setting) | 000 | SPIN CLOSE | SPEED * |
| '3' '0' '0' (Enter speed 100) | 300 | SPIN CLOSE | SPEED * |
| 'ENTER' (Validate speed & jump to next parameter) | 000 | SPIN CLOSE | ACC * |
| '5' '0' (Enter acceleration 50) | 050 | SPIN CLOSE | ACC * |
| 'ENTER' (Validate acceleration & jump to next step) | 000 | | |
| **Step 5: Duration of the second plateau** | | | |
| '3/TIME' (select time function) | 003 | TIME (green) * | |
| 'ENTER' (validate function, jump to parameter setting) | 000 | TIME (green) | TIME (yellow) * |
| '12' (set time to 12 seconds) | 0012 | TIME (green) | TIME (yellow) * |
| 'ENTER' (Validate time & jump to next step) | 000 | | |
| **Step 6 : End of cycle** | | | |
| 'ENTER' (Validate end of cycle, return to standby) | oo3 | | |

## 10.6.5  CUSTOM CYCLE EXAMPLE2
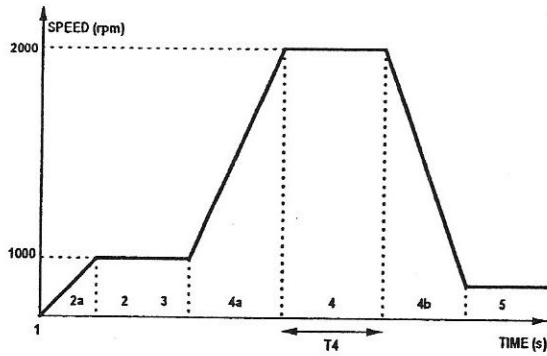


Figure 48: Graph of Custom Cycle Example2

CYCLE '6'
1.  Enter cycle
2a. Acceleration Phase1
2   Spin cover open
3   Edge bead remover with spin cover open
4a  Acceleration Phase2
4   Spin with cover open
4b  Deceleration
5   End of cycle

Substrate OD = 120mm, Substrate ID = 100mm
The time 2+3 taken to carry out the step depends on the set up parameter t "Arm speed for the edge bead remover"

| Action | Display<br>* blinks | Function Flags<br>* blinks | Parameter Flags<br>* blinks |
|---|---|---|---|
| **Step 1: Select cycle '6', reset and enter programming mode** | | | |
| '6' then 'ENTER' (cycle selection) | oo6 | | |
| 'RESET' (select reset function) | 006 * | | |
| 'ENTER' (validate reset function) | oo6 | | |
| 'ENTER' (enter programming mode) | 000 | | |
| **Step 2: Spin cover open** | | | |
| '2/OPEN' (select spin open function) | 002 | SPIN OPEN * | |
| 'ENTER' (Validate function, move to parameter setting) | 000 | SPIN OPEN | SPEED * |
| '1' '0' '0' (Enter speed 100 = 1000 rpm) | 100 | SPIN OPEN | SPEED * |
| 'ENTER' (Validate speed & move to next parameter) | 000 | SPIN OPEN | ACC * |
| '1' '0' (Enter acceleration 0, 1 already in = 1000 rpm/s) | 010 | SPIN OPEN | ACC * |
| 'ENTER' (Validate acceleration & move to next step) | 000 | | |
| **Step 3: Edge bead remover** | | | |
| '6/SOLV2' (select edge bead remover function =6) | 006 | SOLV2* | |
| 'ENTER' (validate function, move to parameter setting) | 000 | | SUBSTRATE SIZE (green)* |
| '1' '2' '0' (enter substrate external diameter = 120 mm) | 120 | | SUBSTRATE SIZE (green)* |
| 'ENTER' (validate function, move to parameter setting) | 000 | | SUBSTRATE SIZE (green) |
| '1' '0' '0' (enter substrate internal diameter = 100 mm) | 100 | | SUBSTRATE SIZE (green) |
| 'ENTER' (Validate substrate diameter & move to next parameter) | 000 | | ARM SPEED (green)* |
| '1' '0' (Enter arm speed = 10 mm) | 10 | | ARM SPEED (green)* |
| 'ENTER' (Validate substrate as & move to next step) | 000 | | |
| **Step 4: Spin cover open** | | | |
| '2/OPEN' (select spin open function) | 002 | SPIN OPEN * | |
| 'ENTER' (Validate function, move to parameter setting) | 000 | SPIN OPEN | SPEED * |
| '2' '0' '0' (Enter speed 200 = 2000 rpm) | 200 | SPIN OPEN | SPEED * |
| 'ENTER' (Validate speed & move to next parameter) | 000 | SPIN OPEN | ACC * |
| '1' '0' (Enter acceleration 10 = 1000 rpm/s) | 010 | SPIN OPEN | ACC * |
| 'ENTER' (Validate acceleration & move to next parameter) | 000 | SPIN OPEN | TIME * |
| 3/TIME (select time function) | 003 | TIME (green) * | |
| 'ENTER' (validate function, jump to parameter setting) | 000 | TIME (green) | TIME (yellow) * |
| '5' (Enter time = 5s) | 005 | TIME (green) | TIME (yellow) * |
| 'ENTER' (Validate time & move to next step) | 000 | | |
| **Step 5: End of cycle** | | | |
| 'ENTER' (Validate end of cycle, return to standby) | oo7 | | |

## 10.7  AUTOMATIC MACHINE CLEANING CYCLE '9'

### 10.7.1  CYCLE DESCRIPTION

> **Note: This cycle only functions with a motorised arm.**

Cycle '9' schedules a cleaning cycle, automatically and at regular intervals. The interval between two successive cleaning cycles can be either a given number of spin cycles, or a given pre-set time. Both the number of spin cycles and the given time can be programmed together. In this case, the first condition that is met runs the cleaning cycle and clears the other condition. The machine cleaning cycle can also be started manually by pressing the <START/STOP> key when the system is in standby on cycle 'oo9'.

Two conditions are required to allow an automatic cleaning cycle to run:

1. One of the conditions described above must be fulfilled (Pre-set time elapsed or number of spin cycles reached).
2. The machine must be in standby mode (no substrate being processed).

Once these two conditions are met, the cycle starts:

1. The chuck rotates at slowly with no substrate on it.
2. The arm moves in and solvent dispense1 is done at low pressure. The nozzle of solvent1 line is oriented in such a way that the dispensed solvent is spread onto the outer ring of the chuck. No solvent is spread on the central chuck ring, which is therefore not contaminated by resist or other fluids during the spin cycle.
3. Solvent dispense stops and the arm moves out.
4. The GYRSET cover closes, trapping the solvent inside the confined enclosure formed by the chuck and the GYRSET cover.
5. The chuck spins at low speed to spread the solvent over the chuck. Since the spin speed is low, a large amount of solvent remains on the outer chuck ring, forming a meniscus.
6. After the programmed time, the chuck speed increases.
7. The chuck spins at high speed to dry the solvent on the chuck.
8. After the programmed time, the chuck stops spinning, and the cover is opened.
9. Since the GYRSET cover is closed in contact with the outer chuck, it is also wet by solvent and is cleaned during the same sequence. The last high-speed spin cleans and dries the outer chuck and the GYRSET cover at the end of the cycle.

### 10.7.2  CYCLE '9' SELECTION

To select the machine cleaning cycle (number 9), the system must be in the standby mode.

Enter the program number by pressing the numerical key <9>, the display changes as shown below:



Press enter key to validate the program number. The display changes as illustrated below, informing the user that cycle can be started:
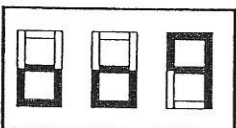
### 10.7.3 PROGRAMMING

Cycle '9' is a pre-set sequence of functions. It consists of a two step sequence including solvent dispense and spin. The programming procedure is as follows:

1. Press the <ENTER> key to enter parameter programming.

**Cleaning frequency**

2. The green lamp 'AUTOCLEAN' lights on and the yellow lamp 'Time' blinks requesting for the time between two cleaning cycles. Enter a three digit datum and validate by pressing the <ENTER> key.

3. The yellow lamp 'Time' lights on (not flashing) requesting for the number of spinning cycles between two cleaning cycles. Enter a three digit datum and validate by pressing the <ENTER> key.

**Spin at low speed (cover opened) for solvent dispense on outer chuck**

4. The green lamp 'Spin Open' lights on, and the yellow lamp 'Speed' blinks requesting for the spinning speed during solvent dispense. Enter a three digit datum and validate by pressing the <ENTER> key.

5. The green lamp 'Spin Open' lights on, and the yellow lamp 'Acceleration' blinks requesting for the spinning acceleration. Enter a three digit datum and validate by pressing <ENTER> key.

**Solvent dispense on outer chuck**

6. The green lamp 'Solvent1' Lights on, and the yellow lamp 'time' blinks requesting for the duration of the solvent dispense. Enter a three digit figure (1-999) and validate by pressing the <ENTER> key.

**Spin at low speed (cover closed) for solvent spreading**

7. The green lamp 'Spin Close' lights on, and the yellow lamp 'Speed' blinks requesting the spin speed for cleaning. Enter a three digit figure and validate by pressing the <ENTER> key.

8. The green lamp 'Spin Close' lights on, and the yellow lamp 'Acceleration' blinks requesting the spin acceleration. Enter a three digit figure and validate by pressing the <ENTER> key.

9. The green lamp 'time' lights on and the yellow lamp 'time' blinks requesting the delay before moving to the next sequence. Enter a three digit figure (1-999) and validate by pressing the <ENTER> key.

**Spin at high speed (cover closed) for solvent centrifugation and cleaning**

10. The green lamp 'Spin Close' lights on, and the yellow lamp 'Speed' blinks requesting the spin speed for cleaning. Enter a three digit figure and validate by pressing the <ENTER> key.

11. The green lamp 'Spin Close' lights on, and the yellow lamp 'Acceleration' blinks requesting the spin acceleration. Enter a three digit figure and validate by pressing the <ENTER> key.

12. The green lamp 'time' lights on and the yellow lamp 'time' blinks requesting the duration of the centrifugation. Enter a three digit figure (1-999) and validate by pressing the <ENTER> key.

Note:   When attempting to enter a parameter that is out of range, the buzzer sounds briefly. The same parameter returns to zero and is requested again.

## 10.8  MODIFYING A CYCLE

### 10.8.1  INSERTING ONE STEP

The <INS> (Insert) key adds a new step in between two existing steps of the program. The new function is inserted before the current step. To insert a new step, proceed as follows:

(1)    Select the program number. Press the key corresponding to the program to be modified (eg: <2>), then the <ENTER> key to validate the program number and return to standby.

The program number in standby is displayed as illustrated below:
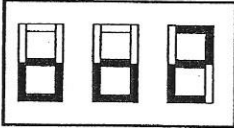


(2)    Press the <ENTER> key to enter parameter programming and to display the first function of the cycle. If the new function is to be inserted at the beginning of the cycle, proceed to step (3). Otherwise, press the <ENTER> key as many times as is necessary to display the code corresponding to the function before which a new step is to be added. The display shows the function code, and the green lamp corresponding to the function blinks.

(3)    Press the <INS> key to add the new step. Immediately after having pressed the <INS> key, the function number disappears and the green lamp goes out. The display shows three zeros ('000') awaiting the new function code:
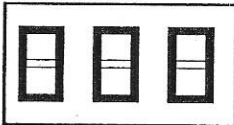


(4) Enter the function code corresponding to the new function to be inserted.

> **Caution**
>
> **Once the above display is shown, a function code must be entered. If the <ENTER> key is pressed at this step of the modification procedure, the rest of the cycle will be deleted.**

(5)    If the programmed function requires parameters, enter the requested parameters and validate each time with the <ENTER> key.

(6)    After the requested parameters have been entered, the display shows the next function code previously programmed and the corresponding green lamp blinks. Should another step need to be inserted before this function, proceed from step (2) or (3) again.

(7).    To exit the program, press the <ENTER> key until the end of the cycle is reached and the display returns to standby, or press the <START/STOP> key to return immediately to standby.

Note:   To add a function to the end of the cycle, press <ENTER> until the end of cycle ('000') is displayed. Then, a function can be entered without needing to press the <INS> key.

### 10.8.2  DELETING ONE OR SEVERAL STEPS

The <DEL> (Delete) key removes one step from the program. To delete one or several steps, proceed as follows:

(1)    Select the program number. Press the key corresponding to the program to be modified (eg: <2>), then the <ENTER> key to validate the program number and return to standby.

The program number in standby is displayed as illustrated below:
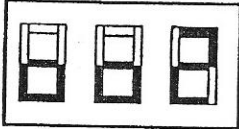
(2).  Press the <ENTER> key to enter parameter programming and to display the first function of the cycle. If the first function is to be deleted, proceed to step (3). Otherwise, press the <ENTER> key as many time as is necessary to display the code corresponding to the function to be deleted. The display shows the function code, and the green lamp corresponding to the function blinks.

(3).  Press the <DEL> key to delete the current function from the cycle. The associated parameters are automatically deleted. Immediately after having pressed the <DEL> key, the function following the step which has just been deleted is displayed and its associated green lamp blinks.

(4). Should another step need to be deleted, proceed from step (2) or (3) again.

(5).  To exit the program, press the <ENTER> key until the end of cycle is reached and the display returns to standby, or press the <START/STOP> key to return immediately to standby.

Note:  It is possible to delete in one go all functions of the cycle, from the current step to the end of cycle. To do so, once the first function to be deleted is displayed (the function code is displayed and the corresponding green lamps blink), press the <END> key. All steps from the current to the end of the program are deleted.

# 11. REMOTE CONTROL THROUGH RS232 SERIAL INTERFACE

All RC spin coaters can be remote controlled by an external ("host") computer through a RS232C serial interface. Remote control is available as standard on all spin coaters.
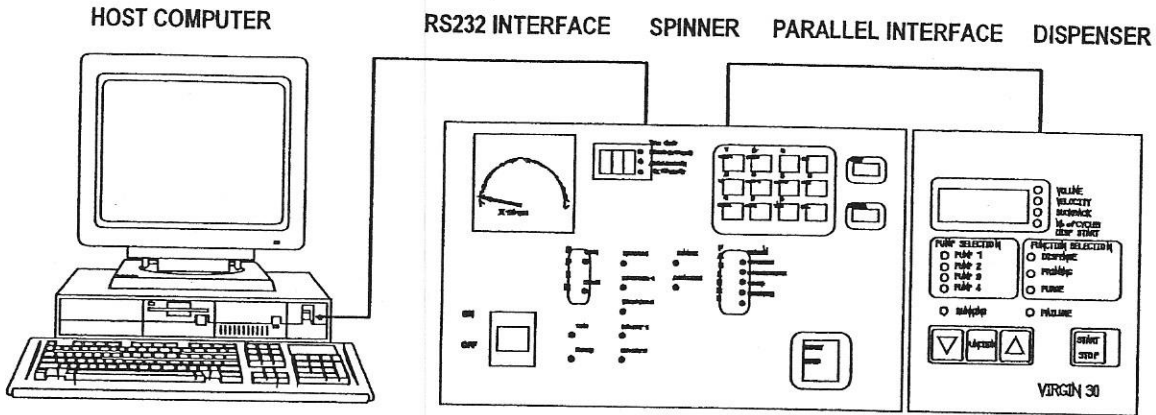


Figure 49: RS232 Interface

This chapter describes:

1. The connection between the host computer and the spin coater.
2. The communication protocol

> **IMPORTANT REMARKS**
> In order to be identified by the spin coater, each command must be terminated with the symbol Cr (0x0d). The command acknowledgement is also terminated by the characters CrLf (0x0d 0x0a). If the address of the RS interface is set in the configuration parameters, its ASCII code must come before each remote command.

## 11.1 CONNECTION

The RS232C connector of the spin coater is an SUBD 15. The following diagram shows the interconnection between this connector and the connector of the host computer. The connector of the host computer can either be an SUBD9 or an SUBD25.

Connector configuration RS 232 C on the spin coater.
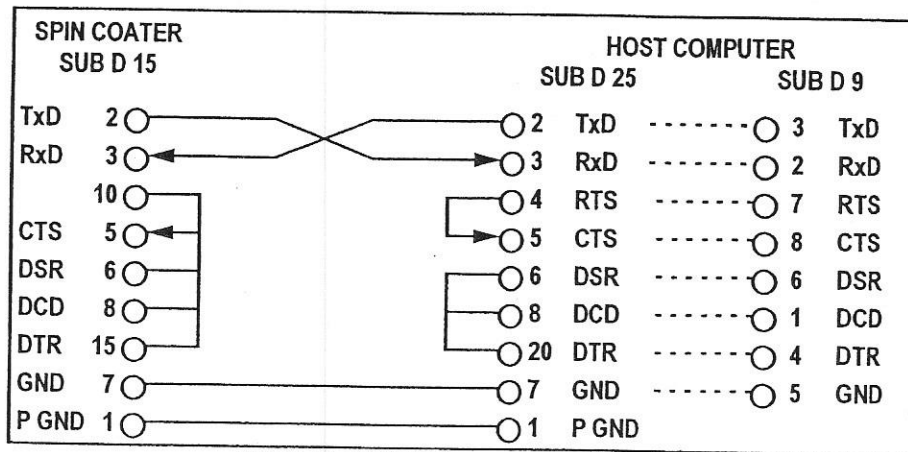


Figure 50: RS232C Connector Configuration

## 11.2  TRANSMISSION FORMAT

The transmission format is as follows:

8 bits,
1 Stop Bit,
No parity,
9600 Baud.

## 11.3  PROTOCOL DEFINITION

Each command sent by the host to the spin coater must end with the terminator CarriageReturn (Cr). Each acknowledgement sent by the spin coater to the host ends with the terminator CarriageReturn LineFeed (CrLf). The ASCII code for CarriageReturn is 0x0D (hexadecimal) or 14 (decimal ). The ASCII code for LineFeed is 0x0A (hexadecimal) or 10 (decimal ).

The remote control commands can be arranged in three categories:

1.  Cycle programming commands
2.  Cycle execution commands
3.  Status commands

The error codes sent to the host computer by the spin coater controller are shown in the 'ERROR LIST' table.

### 11.3.1  CYCLE PROGRAMMING COMMANDS

To enter programming, the cycle number must be selected (**P0** to **P9**). Then, the controller is ready to receive programming commands.

Note:  When programming cycle '1' or cycle '9', which are cycles with a pre-set sequence of functions, only the parameters can be modified through the interface. Refer to the function list, earlier in this manual, for further information about the function description.

To exit programming mode, the host must send the command **'FIN'**. No more than thirty (30) steps can be programmed in a complete cycle (parameters are not to be considered as cycle steps). The number of steps corresponds to the number of function codes included between the command **Px** and the command **FIN**. The following list gives the syntax of the commands for programming a spin coater cycle:

| Command Syntax (Host Computer) | Acknowledgement (Spinner) | Description |
|---|---|---|
| Px (x= cycle number (0-9)) | MPx (x= Cycle number) | Enter the Programming mode, and Select Cycle number |
| ! | C0 | Clear function list of the current cycle |
| 1 sss aaa<br>sss= speed<br>aaa= Acceleration | C1 | Enter function1 (spinning with cover closed) and its parameters. |
| 2 sss aaa<br>sss= speed<br>aaa= Acceleration | C2 | Enter function2 (spinning with cover opened) and its parameters. |
| 12 sss aaa<br>sss= speed<br>aaa= Acceleration | C12 | Enter function12 (spinning with cover closed and gyrset opened) and its parameters.<br>This function is available only for spinner with indexed gyrset |
| 3 ttt<br>ttt = time (001-999) | C3 | Enter function3 (time) and its parameter. |
| 33 | C33 | Enter function33 (Wait) with no parameter |
| 4 ttt<br>ttt = time (001-999) | C4 | Enter function4 (nitrogen blow-off) and its parameter. |
| 5 ttt<br>ttt = time (001-999) | C5 | Enter function5 (Solvent1 dispense) and its parameter. |
| 6 ttt<br>ttt = time (001-999) | C6 | Enter function6 (Solvent2 dispense) and its parameter. |
| 55 ttt<br>ttt = time (001-999) | C55 | Enter function55 (Solvent3 dispense) and its parameter. |
| 66 ttt<br>ttt = time (001-999) | C66 | Enter function66 (Solvent4 dispense) and its parameter. |
| 7 | C7 | Enter function7 (Dispenser1) |
| 8 | C8 | Enter function8 (Dispenser2) |
| 77 | C77 | Enter function77 (Dispenser3) |
| 88 | C88 | Enter function88 (Dispenser4) |
| 10 xxx yyy<br>xxx=Time between 2 cycles<br>yyy=Number of Processes between 2 cycles | C10 | Enter frequency parameters of the automatic machine cleaning cycle. Must be first command of cycle9. |
| FIN | FCx<br>x=current cycle number (0-9) | Exit the programming mode |
| ? | STEP n : f 111 222<br><br>STEP n : f 111 222<br>Cx<br>n= step (0 to 9)<br>f= function code (1-9)<br>111= parameter1 (function 1-6)<br>222= parameter2 (function 1-2)<br>x= number of steps + 1 | Request Function List of the Current Cycle.<br>In the acknowledgement, the Cycle Steps are separated with character<br>Cr Lf (0x0d 0x0a). |

Note: with a motorised arm, fluid functions need 3 parameters (arm start, arm end and arm speed).

| Command Syntax (Host Computer) | Acknowledgement (Spin Coater) | Description |
|---|---|---|
| 4 sss eee aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C4 | Enter function4 (nitrogen blow-off) and its parameter. |
| 5 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C5 | Enter function5 (Solvent1 dispense) and its parameter. |
| 6 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C6 | Enter function6 (Solvent2 dispense) and its parameter. |
| 55 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C55 | Enter function55 (Solvent3 dispense) and its parameter. |
| 66 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C66 | Enter function66 (Solvent4 dispense) and its parameter. |
| 7 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C7 | Enter function7 (Dispenser1) |
| 8 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C8 | Enter function8 (Dispenser2) |
| 77 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C77 | Enter function77 (Dispenser3) |
| 88 sss ddd aaa<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C88 | Enter function88 (Dispenser4) |
| 9 ff 0/1<br>ff=fluid code (0..13)<br>0: nitrogen<br>1: dispenser 1 (Swinging Resist)<br>2: dispenser 2<br>3: dispenser 3<br>4: dispenser 4<br>5: solvent 1 (Machine autoclean)<br>6: solvent 2 (Edge Bead Remover)<br>7: solvent 3 (Cotton Candy Remover)<br>8: solvent 4 (Back Side Rinse) | C9 | Fluid activation |

| | | |
|---|---|---|
| 9: solvent 5 (Dispenser Nozzle Rinse)<br>10: solvent 6<br>11: solvent 7<br>12: solvent 8 (unused)<br>0/1 = a flag<br>1: enable fluid (turn valve ON or start dispense)<br>0: disable fluid (turn valve OFF or wait end of dispense) | | |
| 99 ppp sss 0/1<br>ppp = an absolute position (0.999)<br>sss = a arm speed (0..500)<br>0/1 = a flag<br>1: wait trajectory complete (arm stop)<br>0: start movement and continue on next step | C99 | Arm move |
| 56 cc sss ddd aaa<br>cc=code for solvent (1..8)<br>1: solvent 1 (Machine autoclean)<br>2: solvent 2 (Edge Bead Remover)<br>3: solvent 3 (Cotton Candy Remover)<br>4: solvent 4 (Back Side Rinse)<br>5: solvent 5 (Dispenser Nozzle Rinse)<br>6: solvent 6<br>7: solvent 7<br>8: solvent 8 (stream)<br>sss=substrate start diameter (0..parameter #16)<br>eee=substrate end diameter (0..parameter #16)<br>aaa=arm speed (0-500) | C56 | Solvent |

## 11.3.2 CYCLE EXECUTION COMMANDS

Before executing a cycle, the mode **CY** must be selected. The controller status is **MCY**. Then, the host gives the number of the cycle to start. The controller responds with **Cn** and executes the cycle.

The controller status is: '**EXE**' during execution, **Exx** if an error occurs or **MCY** if the cycle is finished.

The host asks for the controller status with the **ST** command. So the host repeats the **ST** command until the controller status becomes **MCY** (the cycle has finished correctly) or **Exx** (an error has occurred). To exit execution mode, the host must send the command **FIN**. During execution a cycle can be stopped by the host with the **AR** command. It generates the E99 error.

When an error occurs the host must send the **QE** command. The controller returns **E00** and reinitialises the spin coater. The controller status becomes **IN0** during initialisation then **IN1** when the controller is ready.

Note: Remark: if a cycle is longer than 30 steps, several cycles can be chained without stopping the chuck rotation. To do that a substrate needs to be loaded on the chuck as the controller status is **IN1**. The host enters the mode with the **CY 1** command (the parameter **one** is added to the **CY** command). Then the host sends the number of the first cycle to be executed, asks the status until the controller returns to **MCY**, resumes with the number of the second cycles to be executed, ends the chaining with the **FIN** command.

The following commands control the execution of the cycles.

| Command Syntax (Host Computer) | Acknowledgement (Spinner) | Description |
|---|---|---|
| CY | MCY | Select Cycle Exec mode |
| X<br>ST | Cx   Start cycle X<br>EXE No Error<br>MCY     Cycle x is complete | Execute cycle number #x, error code is returned. |
| QE | E00 No error was declared<br>E55 Error clearing complete | Clear the error code. Allow to start cycle again |
| AR | E99 Cycle was still running<br>E55 Cycle was not running | Stop the current cycle execution |
| FIN | FCY | Exit Cycle Exec mode |

## 11.3.3 STATUS REQUEST COMMANDS

The following commands return the status of the spin coater, such as;

a. Ready to execute a cycle;

b. Cycle execution in progress;

c. Cycle programming in progress; etc

| Command Syntax (Host Computer) | Acknowledgement (Spinner) | Description |
|---|---|---|
| ST | IN0  Device not initialised.<br>IN1  Device ready.<br>DB  Device in debug mode.<br>CL  Device in keyboard mode.<br>EXE Cycle execution.<br>MPx Cycle x programming.<br>MCY    Cycle selection.<br>Exx Error n° xx (See error list). | Spin coater status |
| SU | WA0    No substrate on chuck.<br>WA1    Substrate on device | Check substrate presence on spinning chuck. This request can be sent only if system is ready (IN1) |

### 11.3.4  MISCELLANEOUS COMMANDS

These commands are available only if the spinner status is In1.

**RD_PIA n**

Reads the hardware inputs where **n** is the number of the PIA ©. The parameter n varies between 0 and 4 depending on which IC is read. The Spinner response takes the form **PIA n aa bb** where **n** is the number of the PIA read, **aa** is the value in hexa of port A, and **bb** is the value in hexa of port B.

**RD_PAR [nn]**

If **nn** is not entered, this reads the number of configuration parameters. Today, there are 71 parameters but this number may increase.

Otherwise, **nn** represents the number of the parameter whose value is to be read. The acknowledgement is **Pnn ppp min max** where **ppp** is the value of the parameter **nn**, **min** is the minimum value for the parameter **nn**, **max** is the maximum value for the parameter **nn**. min and max depends on the hardware configuration and on the value of the others parameters.

**WR_PAR nn vvv**

This is the command to change the value of parameter **nn** by **vvv**. **vvv** must be between **min** and **max**.  It is a good idea to first read the min and max values of a parameter before writing it. The acknowledgement is the same as for RD_PAR **nn** command.

**Example**

| Command | Acknowledgement |
|---|---|
| RD_PAR | 71 |
| RD_PAR 20 | P20 400 0 999 |
| WR_PAR 20 500 | P20 500 0 999 |

**VER**

Returns the firmware of the CT62: version + date

**INIT**

Returns **E00** then forces the spinner to initialise as when one powers on. Checks the status to await the end of the initialisation.

**REM 0/1**

Turns remote control of the spinner OFF/ON. "REM 1" returns "MR1", "REM 0" returns "MR0".
When control is remote, the keyboard of CT62 is disabled, 3 digit display is OFF, and paddle is disabled. Operator cannot use the spinner by hand. Spinner status becomes "MRE".

### 11.3.5  VIRGIN PUMP CONTROL THROUGH THE SPINNER RS INTERFACE

The Virgin pump must be connected to the main RS port, host to the auxiliary RS port. Machine parameter v = 3. While the spinner is on stand-by (status = IN1), the host can communicate with the Virgin pump by first sending the character # (ASCII code 23) before a Virgin command. Then it waits the acknowledgement of the Virgin pump. For example, the host sends "#?S" to the spinner to request the Virgin status.

## 11.4 REMOTE CONTROL EXAMPLES

### 11.4.1 EXAMPLE 1: PROGRAMMING CYCLE '9'

| Host Command | Spin Coater Acknowledgement | Comments |
|---|---|---|
| ST | | Status request. |
| | IN1 | System ready to run. |
| P9 | | Enter the Cycle programming mode for cycle9. |
| | MP9 | Cycle9 Programming mode validated. |
| ! | C0 | Reset the current cycle. |
| ? | | Request for the list of sequence for the current cycle. |
| | STEP 0: 10 0 0 | cleaning cycle disabled. |
| | STEP 1: 2 0 0 | spinning cover opened sequence. |
| | STEP 2: 5 0 | solvent 1 sequence. |
| | STEP 3: 1 0 0 | spinning cover closed sequence for spreading. |
| | STEP 4: 3 0 | delay sequence. |
| | STEP 5: 1 0 0 | spinning cover closed sequence for cleaning and drying. |
| | STEP 6: 3 0 | delay sequence. |
| | STEP 7: 0 | end of cycle. |
| | C6 | |
| 10 60 10 | | Program function #10 (cleaning cycle parameters) cycle 9 running every 60 seconds or every 10 cycles |
| | C 10 | Command acknowledgement (no error). |
| 2 50 5 | | Program function2 (Spin with cover open, speed 500 rpm, acceleration 500 rpm/sec). |
| | C2 | Command acknowledgement (no error). |
| 5 10 | | Program function5 (solvent 1 dispense, duration 10 sec) |
| | C5 | Command acknowledgement (no error) |
| 1 50 5 | | Program finction1 (spin with cover closed, speed 500 rpm, acceleration 500 rpm/s. |
| | C1 | Command acknowledgement (no error) |
| 3 5 | | Program function3 (time, duration 5 sec). |
| | C3 | Command acknowledgement (no error). |
| 1 300 30 | | Program function1 (Spin with cover closed, speed 3000 rpm, acceleration 3000 rpm/sec). |
| | C1 | Command acknowledgement (no error). |
| 3 15 | | Program function3 (time, duration 15 sec). |
| | C3 | Command acknowledgement (no error). |
| FIN | | exit programming mode |
| | FP9 | |
| ST | | Status Request |
| | IN1 | System ready |

## 11.4.2 EXAMPLE 2: PROGRAMMING CYCLE '5'

| Host Command | Spin Coater Acknowledgement | Comments |
|---|---|---|
| ST | | Status request |
| | IN1 | System ready to operate |
| P5 | | Enter the Cycle programming mode for cycle5 |
| | MP5 | Cycle5 Programming mode validated |
| ! | | Reset the current cycle |
| | C0 | |
| ? | | Request for the list of sequence for the current cycle. |
| | STEP 0: 0 | cycle empty. |
| | C0 | End of the list. |
| ST | | Status request |
| | MP5 | System ready to receive a cycle programming command |
| 2 50 50 | | Program function2 (Spin with cover open) |
| | | speed: 500 rpm, acceleration: 5000 rpm/sec |
| | C2 | Command acknowledgement (no error) |
| 3 10 | | Program function3 (Delay sequence, t= 10 seconds) |
| | C3 | Command acknowledgement (no error) |
| ? | | Request for sequence list for current cycle |
| | STEP 0: 2 50 60 | |
| | STEP 1: 3 10 0 | |
| | STEP 2: 0 | |
| | C2 | Command acknowledgement (no error) |
| FIN | | end of programming |
| | FP5 | |
| ST | | status request |
| | IN1 | |

## 11.4.3 EXAMPLE 3: EXECUTING A CYCLE

| Host Command | Spin Coater Acknowledgement | Comments |
|---|---|---|
| CY | MCY | Select the Cycle execution mode |
| | | Cycle number entered later |
| 5 | | Execute the number cycle 5 |
| | Cx | Cycle complete with no error |
| | Exx | Cycle aborted by error xx |
| FIN | FCY | Exit the cycle execution mode |

# 12. CYCLE EXECUTION ERRORS

## 12.1 RC33, RC16 & RC13

| ERR | CAUSE | REMEDY |
|-----|-------|--------|
| o02 | SW7 ON, Lift pins UP abnormally | Pressure, EV8 OFF, CY2 state, SW7 position, Adjust LIM12, LIM13, Power, Wiring, IC |
| o03 | SW7 OFF, Lift pins not UP | Pressure, EV8 ON, CY2 state, SW7 position, Adjust LIM12, LIM13, Power, Wiring, IC |
| o04 | SW8 ON, Lift pins DOWN abnormally | Pressure, EV8 ON, CY2 state, SW8 position, Adjust LIM12, LIM13, Power, Wiring, IC |
| o05 | SW8 OFF, Lift pins not DOWN | Pressure, EV8 OFF, CY2 state, SW8 position, Adjust LIM12, LIM13, Power, Wiring, IC |
| o06 | MA1 ON, Vacuum abnormally Detected | Remove the wafer, MA1 adjust, EV1 OFF, EV2 ON, Power, Wiring, IC |
| o07 | MA1 OFF, Vacuum not detected | Check the wafer position, MA1 adjust, EV1 ON, EV2 OFF, Power, Wiring, IC |
| o08 | M1, Null motor speed not detected | M1, Power, Wiring, IC |
| o09 | SW5 ON, Arm abnormally OUT | Pressure, EV7 OFF, CY4 state, SW5 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o10 | SW5 OFF, Arm not OUT | Pressure, EV7 ON, CY4 state, SW5 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o11 | SW6 ON, Arm abnormally IN | Pressure, EV7 ON, CY4 state, SW6 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o12 | SW6 OFF, Arm not IN | Pressure, EV7 OFF, CY4 state, SW6 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o13 | End of dispense not detected | Check dispenser connection, Power, Wiring, IC |
| o14 | SW1 ON, Cover abnormally CLOSED | Pressure, EV4-A OFF, EV4-B ON, CY1 state, SW1 position, Adjust LIM4, LIM5, LIM6, LIM7, Power, Wiring, IC |
| o15 | SW1 OFF, Cover not CLOSED | Pressure, EV4-A ON, EV4-B OFF, CY1 state, SW1 position, Adjust LIM4, LIM5, LIM6, LIM7, Power, Wiring, IC |
| o16 | SW2 ON, Cover abnormally OPENED | Pressure, EV4-A ON, EV4-B OFF, CY1 state, SW2 position, Adjust LIM4, LIM5, LIM6, LIM7, Power, Wiring, IC |
| o17 | SW2 OFF, Cover not OPENED | Pressure, EV4-A OFF, EV4-B ON, CY1 state, SW2 position, Adjust LIM4, LIM5, LIM6, LIM7, Power, Wiring, IC |
| o18 | SW9 ON, Chuck Indexer abnormally OUT | Pressure, EV9 OFF, CY3 state, SW9 position, Adjust LIM14, LIM15, Power, Wiring, IC |
| o19 | SW9 OFF, Chuck Indexer not OUT | Pressure, EV9 ON, CY3 state, SW9 position, Adjust LIM14, LIM15, Power, Wiring, IC |
| o20 | SW10 ON, Chuck Indexer abnormally IN | Pressure, EV9 ON, CY3 state, SW10 position, Adjust LIM14, LIM15, Power, Wiring, IC |
| o21 | SW10 OFF, Chuck Indexer not IN | Pressure, EV9 OFF, CY3 state, SW10 position, Adjust LIM14, LIM15, Power, Wiring, IC |
| o22 | MA2 OFF, Air default in mechanism | Line pressure (5 bar), leakage, MA2 adjust, Power, Wiring, IC |
| o23 | SW17 ON, Alarm1 | Alarm1 level, SW17 position, Power, Wiring, IC |
| o24 | SW18 ON, Alarm2 | Alarm2 level, SW18 position, Power, Wiring, IC |
| o25 | SW19 ON, Alarm3 | Alarm3 level, SW19 position, Power, Wiring, IC |
| o26 | SW2 OFF, Cover not locked | Close the cover, Pressure, EV4-B ON, CY1 state, SW2 position, Power, Wiring, IC |
| o27 | SW2 ON, Cover abnormally locked | Open the cover, Pressure, EV4-B OFF, CY1 state, SW2 position, Power, Wiring, IC |
| o28 | M1, Spinning motor braked | M1, Power, Wiring, IC |
| o29 | M1, Spinning motor variator off | M1, Power, Wiring, IC |

| ERR | CAUSE | REMEDY |
|---|---|---|
| o30 | SW15 OFF, Safety door not closed | Close the safety door, EV6 OFF, SW15 position, Power, Wiring, IC |
| o31 | SW3 OFF, Back Side Rinse nozzle not up | Pressure, EV5 ON, CY state, SW3 position, Adjust LIM, Power, Wiring, IC |
| o32 | Dispenser arm initialised but bsr nozzle not up | Pressure, EV5 ON, CY state, SW3 position, Adjust LIM, Power, Wiring, IC |
| o33 | Loader at rest not detected | |
| o34 | Loader at work not detected | |
| o35 | Loader at work vacuum not detected | |
| o36 | Parameter out of use | Check machine parameters |
| o37 | Parameter out of range | Check machine parameters |
| o40 | Undefined sequence | Check the selected step, reset cycle. |
| o41 | Speed out of range | Check the selected speed, machine speed limit |
| o42 | Unknown solvent number | Check machine parameters |
| o43 | Unknown dispenser number | Check machine parameters |
| o44 | Unknown fluid number | Check machine parameters |
| o46 | Zero acceleration | Check the selected acceleration. |
| o47 | Incorrect cycle number | Check program number |
| o48 | End of cycle not detected | Check the selected cycle. |
| o49 | Incorrect column number | Check the selected step, reset cycle. |
| o50 | Incorrect hardware configuration | Check configuration switches |
| o51 | Unknown command | Check the selected cycle, reset cycle. |
| o52 | SW13 OFF, Edge Bead Remover nozzle not UP | Pressure, EV9 OFF, CY6 state, SW13 position, Power, Wiring, IC |
| o53 | Incorrect speed parameter | Check the command |
| o54 | Incorrect acceleration parameter | Check the command |
| o55 | Syntax error or use out of context | Check the command |
| o56 | Incorrect time parameter | Check the command |
| o57 | Too many sequences in cycle | Check the cycle, reset cycle |
| o58 | Incorrect menu choice | Try again. |
| o59 | Incorrect configuration of RS232 | Check the configuration. |
| o60 | RS232 does not work properly | Check the connection. |
| o61 | Buffer RS232 FULL | Wait for the execution of the previous command |
| o62 | Arm with 2 positions. Position different to 1 or 2. | Check the cycle, reset cycle |
| o63 | Arm with 6 positions. Position different to 1,2,3,4,5 or 6. | Check the cycle, reset cycle |
| o64 | SW9 OFF, Arm with 6 positions. Position 1 not found. | SW9 position, Power, Wiring, IC |
| o65 | SW20 ON, GYRSET locked abnormally detected | Pressure, CY5 state, EV11 OFF, EV12 ON, SW20 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o66 | SW20 OFF, GYRSET locked not detected | Pressure, CY5 state, EV11 ON, EV12 OFF, SW20 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o67 | SW21 ON, GYRSET unlocked abnormally detected | Pressure, CY5 state, EV11 ON, EV12 OFF, SW21 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o68 | SW21 OFF, GYRSET unlocked not detected | Pressure, CY5 state, EV11 OFF, EV12 ON, SW21 position, Adjust LIM8, LIM9, Power, Wiring, IC |

| ERR | CAUSE | REMEDY |
|---|---|---|
| o69 | M1, Motor driver not ready. Overload. | M1, Power, Wiring, IC. Power off/on the machine. Service required if the error remains |
| o70 | Incorrect use of the solvent for washing the gyrset | Close the cover before using this solvent |
| o71 | Substrate diameter out of range | Check the selected diameter, machine parameters |
| o72 | Arm speed out of range | Check the selected arm speed, machine parameters |
| o73 | Arm driver not initialised | Power, Wiring, IC. Power off/on the machine. Service required if the error remains |
| o74 | Internal arm driver register out of range | Check machine parameters |
| o75 | SW13 OFF, Time out while searching for arm home position | M2, SW13 position, Power, Wiring, IC |
| o76 | M2, Time out while arm moving | M2, Power, Wiring, IC |
| o77 | SW12 OFF, Reverse travel stop not enabled | M2, SW12 position, Power, Wiring, IC |
| o78 | SW22 OFF, Forward travel stop not enabled | M2, SW22 position, Power, Wiring, IC |
| o79 | Read/write sequence of arm driver is out | Power, Wiring, IC |
| o80 | M2, Arm motor locked | M2, Power, Wiring, IC |
| o81 | Time out during RS232 communication with VIRGIN pump | Check cable connection, machine parameters both spinner and virgin controller |
| o82 | Suss pump acknowledgement mismatches | Check cable connection, Power, wiring, IC |
| o83 | Suss pump doesn't understand the RS command | Check cable connection, Power, wiring, IC |
| o84 | Arm driver detects position error | Check arm movement, tubes, machine parameters |
| o99 | Program stopped with Start/stop key | Press enter key, Avoid rebond key, Check SW16 |

When an ERROR is displayed the user must acknowledge by pressing the <ENTER> key, correct the ERROR, then press the <START/STOP> key to restart the cycle.

## 12.2 RC8

| ERR | CAUSE | REMEDY |
| --- | --- | --- |
| o02 | SW5 ON, Lift pins UP abnormally | Pressure, EV7 OFF, CY2 state, SW5 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o03 | SW5 OFF, Lift pins not UP | Pressure, EV7 ON, CY2 state, SW5 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o04 | SW6 ON, Lift pins DOWN abnormally | Pressure, EV7 ON, CY2 state, SW6 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o05 | SW6 OFF, Lift pins not DOWN | Pressure, EV7 OFF, CY2 state, SW6 position, Adjust LIM8, LIM9, Power, Wiring, IC |
| o06 | MA1 ON, Vacuum abnormally Detected | Remove the wafer, MA1 adjust, EV1 OFF, EV2 ON, Power, Wiring, IC |
| o07 | MA1 OFF, Vacuum not detected | Check the wafer position, MA1 adjust, EV1 ON, EV2 OFF, Power, Wiring, IC |
| o08 | M1, Null motor speed not detected | M1, Power, Wiring, IC |
| o09 | SW3 ON, Arm abnormally OUT | Pressure, EV5 OFF, CY4 state, SW3 position, Adjust LIM6, LIM7, Power, Wiring, IC |
| o10 | SW3 OFF, Arm not OUT | Pressure, EV5 ON, CY4 state, SW3 position, Adjust LIM6, LIM7, Power, Wiring, IC |
| o11 | SW4 ON, Arm abnormally IN | Pressure, EV5 ON, CY4 state, SW4 position, Adjust LIM6, LIM7, Power, Wiring, IC |
| o12 | SW4 OFF, Arm not IN | Pressure, EV5 OFF, CY4 state, SW4 position, Adjust LIM6, LIM7, Power, Wiring, IC |
| o13 | End of dispense not detected | Check dispenser connection, Power, Wiring, IC |
| o14 | SW1 (SW15 with manual cover)) ON, Cover abnormally CLOSED | Pressure, EV4-A OFF, EV4-B ON, CY1 state, SW1 (SW15) position, Adjust LIM4, LIM5, Power, Wiring, IC |
| o15 | SW1 (SW15 with manual cover) OFF, Cover not CLOSED | Pressure, EV4-A ON, EV4-B OFF, CY1 state, SW1 (SW15) position, Adjust LIM4, LIM5, Power, Wiring, IC |
| o16 | SW2 ON, Cover abnormally OPENED | Pressure, EV4-A ON, EV4-B OFF, CY1 state, SW2 position, Adjust LIM4, LIM5, Power, Wiring, IC |
| o17 | SW2 OFF, Cover not OPENED | Pressure, EV4-A OFF, EV4-B ON, CY1 state, SW2 position, Adjust LIM4, LIM5, Power, Wiring, IC |
| o18 | SW7 ON, Chuck Indexer abnormally OUT | Pressure, EV8 OFF, CY3 state, SW7 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o19 | SW7 OFF, Chuck Indexer not OUT | Pressure, EV8 ON, CY3 state, SW7 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o20 | SW8 ON, Chuck Indexer abnormally IN | Pressure, EV8 ON, CY3 state, SW8 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o21 | SW8 OFF, Chuck Indexer not IN | Pressure, EV8 OFF, CY3 state, SW8 position, Adjust LIM10, LIM11, Power, Wiring, IC |
| o22 | MA2 OFF, Air default in mechanism | Line pressure (5 bar), leakage, MA2 adjust, Power, Wiring, IC |
| o23 | SW16 ON, Alarm1 | Alarm1 level, SW16 position, Power, Wiring, IC |
| o24 | SW17 ON, Alarm2 | Alarm2 level, SW17 position, Power, Wiring, IC |
| o25 | SW18 ON, Alarm3 | Alarm3 level, SW18 position, Power, Wiring, IC |
| o26 | SW2 OFF, Cover not locked | Close the cover, Pressure, EV4-B ON, CY1 state, SW2 position, Power, Wiring, IC |
| o27 | SW2 ON, Cover abnormally locked | Open the cover, Pressure, EV4-B OFF, CY1 state, SW2 position, Power, Wiring, IC |
| o28 | M1, Spinning motor braked | M1, Power, Wiring, IC |
| o29 | M1, Spinning motor variator off | M1, Power, Wiring, IC |
| o30 | SW19 OFF, Safety door not closed | Close the safety door, EV9 OFF, SW19 position, Power, Wiring, IC |

| ERR | CAUSE | REMEDY |
|---|---|---|
| o31 | SW3 OFF, Back Side Rinse nozzle not up | Pressure, EV5 ON, CY state, SW3 position, Adjust LIM, Power, Wiring, IC |
| o32 | Dispenser arm initialised but back side rinse nozzle not up | Pressure, EV5 ON, CY state, SW3 position, Adjust LIM, Power, Wiring, IC |
| o33 | Loader at rest not detected | |
| o34 | Loader at work not detected | |
| o35 | Loader at work vacuum not detected | |
| o36 | Parameter out of use | Check machine parameters |
| o37 | Parameter out of range | Check machine parameters |
| o40 | Undefined sequence | Check the selected step, reset cycle. |
| o41 | Speed out of range | Check the selected speed, machine speed limit |
| o42 | Unknown solvent number | Check machine parameters |
| o43 | Unknown dispenser number | Check machine parameters |
| o44 | Unknown fluid number | Check machine parameters |
| o46 | Zero acceleration | Check the selected acceleration. |
| o47 | Incorrect cycle number | Check program number |
| o48 | End of cycle not detected | Check the selected cycle. |
| o49 | Incorrect column number | Check the selected step, reset cycle. |
| o50 | Incorrect hardware configuration | Check configuration switches |
| o51 | Unknown command | Check the selected cycle, reset cycle. |
| o52 | SW9 OFF, Edge Bead Remover nozzle not UP | Pressure, EV6 OFF, CY6 state, SW9 position, Power, Wiring, IC |
| o53 | Incorrect speed parameter | Check the command |
| o54 | Incorrect acceleration parameter | Check the command |
| o55 | Syntax error or use out of context | Check the command |
| o56 | Incorrect time parameter | Check the command |
| o57 | Too many sequences in cycle | Check the cycle, reset cycle |
| o58 | Incorrect menu choice | Try again. |
| o59 | Incorrect configuration of RS232 | Check the configuration. |
| o60 | RS232 does not work properly | Check the connection. |
| o61 | Buffer RS232 FULL | Wait for the execution of the previous command |
| o62 | Arm with 2 positions. Position different to 1 or 2. | Check the cycle, reset cycle |
| o63 | Arm with 6 positions. Position different to 1,2,3,4,5 or 6. | Check the cycle, reset cycle |
| o64 | SW9 OFF, Arm with 6 positions. Position 1 not found. | SW9 position, Power, Wiring, IC |
| o65 | SW20 ON, GYRSET locked abnormally detected | Pressure, CY5 state, EV11 OFF, EV12 ON, SW20 position, Power, Wiring, IC |
| o66 | SW20 OFF, GYRSET locked not detected | Pressure, CY5 state, EV11 ON, EV12 OFF, SW20 position, Power, Wiring, IC |
| o67 | SW21 ON, GYRSET unlocked abnormally detected | Pressure, CY5 state, EV11 ON, EV12 OFF, SW21 position, Power, Wiring, IC |
| o68 | SW21 OFF, GYRSET unlocked not detected | Pressure, CY5 state, EV11 OFF, EV12 ON, SW21 position, Power, Wiring, IC |
| o69 | M1, Motor driver not ready. Overload. | M1, Power, Wiring, IC. Power off/on the machine. Service required if the error remains |

| ERR | CAUSE | REMEDY |
|---|---|---|
| o70 | Incorrect use of the solvent for washing the gyrset | Close the cover before using this solvent |
| o71 | Substrate diameter out of range | Check the selected diameter, machine parameters |
| o72 | Arm speed out of range | Check the selected arm speed, machine parameters |
| o73 | Arm driver not initialised | Power, Wiring, IC. Power off/on the machine. Service required if the error remains |
| o74 | Internal arm driver register out of range | Check machine parameters |
| o75 | SW12 OFF, Time out while searching for arm home position | M2, SW12 position, Power, Wiring, IC |
| o76 | M2, Time out while arm moving | M2, Power, Wiring, IC |
| o77 | SW10 OFF, Reverse travel stop not enabled | M2, SW10 position, Power, Wiring, IC |
| o78 | SW22 OFF, Forward travel stop not enabled | M2, SW22 position, Power, Wiring, IC |
| o79 | Read/write sequence of arm driver is out | Power, Wiring, IC |
| o80 | M2, Arm motor locked | M2, Power, Wiring, IC |
| o81 | Time out during RS232 communication with VIRGIN pump | Check cable connection, machine parameters both spinner and virgin controller |
| o82 | Suss pump acknowledgement mismatches | Check cable connection, Power, wiring, IC |
| o83 | Suss pump doesn't understand the RS command | Check cable connection, Power, wiring, IC |
| o84 | Arm driver detects position error | Check arm movement, tubes, machine parameters |
| o99 | Program stopped with Start/stop key | Press enter key, Avoid rebond key, Check SW23 |

When an ERROR is displayed the user must acknowledge by pressing the <ENTER> key, correct the ERROR, then press the <START/STOP> key to restart the cycle.

## WARNINGS

If connected to a Virgin controller by the RS422, take care of the EPROM version.

CT62V07 is designed to function with version VG30A11 or higher.

VIRGIN serial mode must be RS422.

VIRGIN address must be the same as the address of the dispensers used with the CT62 controller.

VIRGIN host mode must be 2.

## APPENDIX I: SPECIFIC SET-UP PARAMETER VALUES

| | DESCRIPTION | LIMITS | USUAL | SET |
|---|---|---|---|---|
| 1 | Motor type (Time, Acceleration) | 1..6 | 6 | |
| 2 | Spin Motor Reduction Gear (Time, Speed, Acceleration) | 1..999 | | |
| 3 | Maximum spin speed with cover closed (Speed, Close) | 0..max speed | 700 | |
| 4 | Maximum spin speed with cover open (Speed, Open) | 0..max speed | 100 | |
| 5 | Rotation speed of chuck during indexing sequence (Speed) | 10..90 (rpm) | 30 | |
| 6 | Maximum speed of the chuck on the cover closing (Speed, Open, Close) | 0..50 | 0 | |
| 7 | Maximum acceleration allowed (Acceleration) | 1..200 | 50 | |
| 8 | Type of the indexed gyrset (Acceleration, Open, Close) | 0, 1 | | |
| 9 | Use o the lift pins (Open, Close) | 0..3 | 1 | |
| 10 | Use of the serial interface ports (Time, Dispenser1, Dispenser2) | 0..6 | 5 | |
| 11 | Address of the RS232 interface port (Remote) | 0..9 | 0 | |
| 12 | Number of alarm sensors fitted | 0..3 | 0 | |
| 13 | Dispense Arm Positioning Type (All leds in $3^{rd}$ column) | 2, 6, 999 | 999 | |
| 14 | Number of counts by unity for the arm positions (Arm speed, Substrate size) | 1..999 | 56 | |
| 15 | Dispenser Arm Home Position (Speed, Substrate Size) | 0..999 | 20 | |
| 16 | Maximum diameter allowed in mm (Substrate size) | 1..999 | 280 | |
| 17 | Number of dispenser lines fitted (Dispenser1, Dispenser2) | 0..4 | 3 | |
| 18 | Machine Auto Clean Solvent1 - Set up (Solvent1, Solvent2) | 0..2 | 1 | |
| 19 | Arm position for nitrogen blow-off (Nitrogen) | 0..999 | 365 | |
| 20 | Arm position for Dispenser1 (Dispenser1) | 0..999 | 385 | |
| 21 | Arm position for Dispenser2 (Dispenser2) | 0..999 | 400 | |
| 22 | Arm position for Dispenser3 (Dispenser1) | 0..999 | 415 | |
| 23 | Arm position for Dispenser4 (Dispenser2) | 0..999 | | |
| 24 | Arm position for Solvent1 (Solvent1) | 0..999 | 415 | |
| 25 | Arm position for Solvent2 (Solvent2) | 0..999 | 385 | |
| 26 | Arm position for Solvent3 (Solvent1) | 0..999 | 400 | |
| 27 | Arm position for Solvent4 (Solvent2) | 0..999 | 365 | |
| 28 | Candy Cotton Remover Solvent3 - Set up (Nitrogen, Solvent1) | 0..2 | 1 | |
| 29 | Edge Bead Remover Solvent2 - Set up (Nitrogen, Solvent2) | 0..2 | 1 | |
| 30 | Arm speed for the edge bead remover (Arm speed) | 1..500 | | |
| 31 | Servicing position (Time, Substrate Size) | 0..999 | 230 | |
| 32 | Back Side Rinse Solvent4 - Set up (Time, Solvent1)) | 0..2 | 1 | |
| 33 | Return position of the bsr nozzle (Speed, Solvent1) | 0..999 | 100 | |
| 34 | Dispenser Nozzle Rinse Solvent5 - Set up (Solvent1, Solvent2, Dispenser1) | 0..2 | 0 | |
| 35 | Arm position to rinse Dispenser1 (Solvent1, Dispenser1) | 0..999 | | |
| 36 | Arm position to rinse Dispenser2 (Solvent1, Dispenser2) | 0..999 | | |
| 37 | Arm position to rinse Dispenser3 (Solvent1, Dispenser1) | 0..999 | | |
| 38 | Arm position to rinse Dispenser4 (Solvent1, Dispenser2) | 0..999 | | |
| 39 | Swinging Resist Dispenser1 – Set up (Nitrogen, Dispenser1) | 0..2 | 0 | |
| 40 | Speed of the swinging resist (Autoclean, Arm speed) | 1..500 | | |
| 41 | Index of the swinging resist (Remote, Arm speed) | 0..999 | | |
| 42 | Type of Dispenser 1 (Speed, Dispenser1) | 0..2 | 1 | |
| 43 | Type of Dispenser 2 (Speed, Dispenser2) | 0..2 | 1 | |
| 44 | Type of Dispenser 3 (Speed, Dispenser1) | 0..2 | 1 | |
| 45 | Type of Dispenser 4 (Speed, Dispenser2) | 0..2 | | |
| 46 | Remote address for the controller of dispenser1 (dispenser1) | 1..9 | 1 | |
| 47 | Remote address for the controller of dispenser2 (dispenser2) | 1..9 | 1 | |

| | DESCRIPTION | LIMITS | USUAL | SET |
|---|---|---|---|---|
| 48 | Remote address for the controller of dispenser3 (dispenser1) | 1..9 | 1 | |
| 49 | Remote address for the controller of dispenser4 (dispenser2) | 1..9 | | |
| 50 | Delay between begin of dispense 1 and arm moving 1/10 S (Time, Dispenser1 | 0..250 | 0 | |
| 51 | Delay between begin of dispense 2 and arm moving 1/10 S (Time, Dispenser2) | 0..250 | 0 | |
| 52 | Delay between begin of dispense 3 and arm moving 1/10 S (Time, Dispenser1) | 0..250 | 0 | |
| 53 | Delay between begin of dispense 4 and arm moving 1/10 S (Time, Dispenser2) | 0..250 | | |
| 54 | Delay between end of dispense 1 and arm moving 1/10 S (Acc, Dispenser1) | 0..250 | 0 | |
| 55 | Delay between end of dispense 2 and arm moving 1/10 S (Acc, Dispenser2) | 0..250 | 0 | |
| 56 | Delay between end of dispense 3 and arm moving 1/10 S (Acc, Dispenser1) | 0..250 | 0 | |
| 57 | Delay between end of dispense 4 and arm moving 1/10 S (Acc, Dispenser2) | 0..250 | | |
| 58 | Type of loader (Time, remote) | 0..2 | | |
| 59 | Type of spinning power (Time, Acceleration, Nitrogen) | 0..1 | 1 | |
| 60 | Edge bead remover delay (Time, Solvent1) | 0..250 | 0 | |
| 61 | Back side rinse delay (Time, Solvent2) | 0..250 | 0 | |
| 62 | Maximum deceleration allowed (Acceleration) | 1..200 | 20 | |
| 63 | Arm position for solvent5 (Solvent1) | 0..999 | | |
| 64 | Use of solvent6 (Acc, Solvent2) | 0..2 | 2 | |
| 65 | Arm position for solvent6 (Solvent2) | 0..999 | 410 | |
| 66 | Use of the solvent7 (Acc, Solvent1) | 0..2 | 2 | |
| 67 | Arm position for solvent7 (Solvent1) | 0..999 | 420 | |
| 68 | Use of the solvent8 (Acc, Solvent2) | 0..2 | 0 | |
| 69 | Arm position for solvent8 (Solvent2) | 0..999 | | |
| 70 | Period in minute for refilling solvent (Speed, Remote ) | 0..999 | | |
| 71 | Duration in second for refilling solvent (Time, Remote) | 0..999 | | |

**Switches (OFF)**

1=Chuck index

2=Automatic arm

3=Automatic cover

4= Cover fitted

**Motor type**

1=10000 rpm

2=5000 rpm

3=infranor

4=3000

5=7000

6=GYRSET config

**Use of the RS**

0=without

1=Virgin KSF414

2=host KSF414

3=Virgin 414 + host 455

4=host KSF 455

5=Virgin 455 + host 414

6= host KSF 455 + Dispense TTL

**Use of the lift pins**

0=whithout

1=robot

2=manual

3=fitted but not used

**Type of dispenser**

0 = Suss Pump : Virgin, Vulcan, Mp25

1 = use TTL signal for dispense, no pre-dispense

2 = use TTL signal for pre-dispense + dispense

3 = use TTL signal for "start of dispense", countdown a delay (p54,...,p57)

**Type of loader**

0 = No loader

1 = Manual loader

2 = Manual not used

| Solvent# | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Function | Bowl cleaning | Edge Bead Remover | Cotton Candy Remover | Back Side Rinse | Dispenser Nozzle Rinse | Standard | Standard | Solvent Stream |

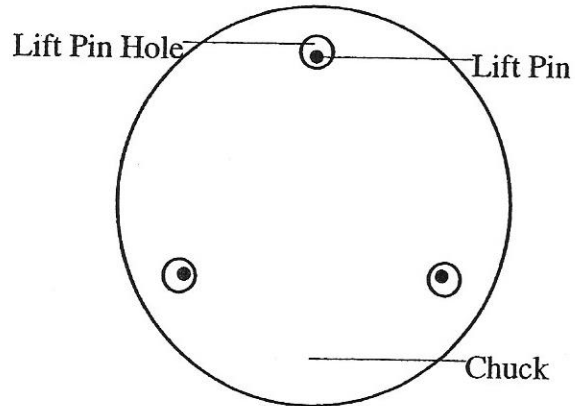**apu** = arm position unit. Related to parameter 14.

**asu** = arm speed unit

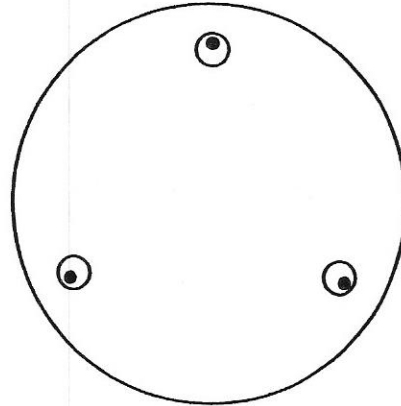\* depends on dispenser type. If set to 3 then delay is in seconds.

## APPENDIX II: LIFT PIN ADJUSTMENT FOR WAFERS AND MASKS

When changing the configuration of the spin coater between 4" wafer and mask frame, the lift pins have to be re-positioned.

The position for the wafer is:

Lift Pin Hole— Lift Pin

Chuck

The position for the mask frame is:

To move from one to the other, take the chuck off, then do the following for each pin

1.  Lift the pin up.
2.  Turn it through 180°
3.  Let it drop.

Each pin is spring loaded so will fall automatically back into place.

## APPENDIX III: DECLARATION OF CONFORMITY

## APPENDIX IV: MACHINE SPECIFICATIONS AT SHIPMENT