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### Spare Parts List

- Ordering spare parts: 1
- Control unit: 2
1. Before starting up the PRC 2 Powder Reciprocator Control read this operating manual carefully!
   Incorrect operation of the PRC 2 Powder Reciprocator Control can lead to accidents, false functioning and/or damage to the booth

2. IMPORTANT: The motor power of the carriage far exceeds the power of a human!
   During operation the axis should be protected against possible access by personnel. Do not stand under the carriage, even when it is standing still (When the Powder Reciprocator Control is switched off the reciprocator carriage sinks to the zero point - the absolute lowest carriage reversing point).

3. The connections between the PRC 2 module, the power supply section, and the axis should only be disconnected when the PRC 2 module is switched off.

4. The connecting cables between the power supply section, and the reciprocator axis must be routed in such a way that they cannot become damaged when the reciprocator axis is in operation. Also, please follow local safety regulations.

5. The upper reversing point must always be set according to the actual height of the reciprocator. Changes to the system should only be performed by trained personnel. Incorrect entries can cause damage to the reciprocator axis and/or the booth.

6. The PRC 2 control module, and the power supply section must be disconnected from the Mains according to local safety regulations before any repairs or replacement of parts are made.
Technical data for the
PRC 2 Powder Reciprocator Control

No. of axes per module : 1
No. of axes per APS control cabinet : 2
Maximum number of programs : 64
Maximum stroke length (Theoretical) : 9.999 m.
Positioning error : < 1 mm.
Maximum speed : 0.6 m/s.
Minimum speed : 0.05 m/s.
Acceleration : 2.0 m/s.
(*Configuration changes are necessary to the PS 1 Power supply).
Tolerance : ±10 %
Mains frequency : 48 - 62 Hz
Fuses : 100 - 120V : F1, F2 = 10A (Slow) F3 = 500 mA
200 - 240V : F1, F2 = 5A (Slow) F3 = 250mA
Power requirements : 30W
(control unit only, without the power supply)
Operating temperature range : 0° C to +40° C (+32° F to +104° F)
Storage temperature range : -20° C to +70° C (-4° F to +158° F)
Degree of protection : IP 54
Dimensions :
  Wide : 425 mm
  Deep : 270 mm
  Height : 88 mm
Weight : 6.2 kg
1. PRC 2 Powder Reciprocator Control

Attention !!
Read the operating instructions through very carefully before putting the reciprocator control unit, and the reciprocator into operation !!

Front panel with input key pad

1. Display fields.
2. Input keys.
3. Main switch (Off).

Figure 1.

1.1 Field of operation
The PRC 2 Powder Reciprocator Control has been designed to use the latest technology, and so that programming can be done by the operator.

The new user level guide simplifies programming, increases the overview, and is extremely user-friendly.

Special characteristics :

- Simple and clear programming with the user level guide.
- Up to 64 different programs can be stored in the unit.
- Individual upward and downward speed(s) of the axis can be selected.
- Program and data can be changed when the axis is running.
- All control functions can be give through the keypad on the PRC 2.
- Simple Start Up, with only one parameter to set.
- Input voltages : 110, 120, 220, 230, and 240V.
- Can be used with Reciprocators with AC or DC motors.
- Fine adjustment : 1mm.
- Error message (E 01) when wrong key is pressed.

Important : The keypad should be operated with the finger tips and under no circumstances with finger nails or hard objects!
2. Start up

2.1 Cable connection for PRC 2

Reciprocator with AC motor

1. Mains input*.
2. Power supply socket.
3. Control signal socket.

* The PRC 2 can only be operated with 220 VAC, if another line voltage is used it is necessary to fit a transformer to convert the voltage to 220 VAC.

AC Software version - PRC 2.XX.2

See also "Checking the software version", page 9.

Reciprocator with DC motor

1. Mains input**.
2. PRP 1 Power supply socket.
3. Control signal socket.

** The PRP 2 can be operated in connection with the PRP 1 at 110V, 120V, 220V, 230V or 240VAC (50 / 60 Hz). The matching of the input power supply is done by connecting bridges in the PRP 1, and PRC 2. See page 4, "2.3 Selecting the Mains input voltage".

DC Software version - PRC 2.XX.1

See also "2.9 Checking the software version", page 9.
2.2 Connections on the rear of the PRC 2

Rear Panel

1. Mains input.
2. Fuse holders - F1, F2, and F3.
3. Power supply socket - 4 pole (from PGC 1).
4. Control signal socket - 18 pole.
   (to reciprocator)
5. Cover plate.

Figure 4.

The PRC 2 Powder Reciprocator Control is supplied as part of a complete APS Automatic Powder System with all the control units mounted in one cabinet. If the cables must be disconnected, for any reason, there should be no problem on refitting the plugs as they cannot be replaced in the wrong sockets.

ATTENTION! Before disconnecting the cables from the sockets (3 and 4, Fig. 4) at the rear of the PRC 2 the mains cable must always be disconnected first.
2.3 Selecting the Mains power voltage

Before the PRC 2 Powder Reciprocator is connected to the Mains the built-in power pack must be matched to the local Mains power supply.

**ATTENTION!** A variation in the voltage of ±10% can cause damage to the control printed circuit board and/or the control electronics.

Selectable voltages: 110 V, 120 V, 220 V, 230 V, and 240 V.

In order to set the correct input voltage of the PRC 2, proceed as follows:

1. Remove all the electrical connections from the rear of the control unit and remove the control unit from the drawer housing.
2. Unscrew the quick-release screws of the cover of the electrical section of the control unit and carefully lift off.
3. The bridges on the 10 pole plug on the power pack board must be correctly set for the corresponding voltage required.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Zero conductor connected to contact</th>
<th>Phase connected to contact</th>
<th>Bridges from - to</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 V</td>
<td>2</td>
<td>4</td>
<td>3 - 8 and 5 - 9</td>
</tr>
<tr>
<td>120 V</td>
<td>2</td>
<td>6</td>
<td>3 - 8 and 7 - 10</td>
</tr>
<tr>
<td>220 V</td>
<td>2</td>
<td>9</td>
<td>4 - 8</td>
</tr>
<tr>
<td>230 V</td>
<td>2</td>
<td>9</td>
<td>6 - 8</td>
</tr>
<tr>
<td>240 V</td>
<td>2</td>
<td>10</td>
<td>6 - 8</td>
</tr>
</tbody>
</table>

The numbers in the table correspond to the contacts on the plug

1 2 3 4 5 6 7 8 9 10

**Figure 5.**

Example:

For 120 V the zero conductor must be connected to contact 2, and to the phase to contact 6. A wire bridge joins contact 3 and contact 8. A second wire bridge joins contact 7 to contact 10.

For 240 V the zero conductor must be connected to contact 2, and to the phase to contact 10. A wire bridge joins contact 6 and contact 8.
2.4 Setting bridges on the control board: AC or DC operation

The bridges on the control board Micro 3 is set at the factory for AC or DC operation for the corresponding PRC 2 version.

If a Micro 3 control board must be exchanged or a Micro 3 control board converted from an AC version to a DC version then all bridges must be checked and/or changed to suit the correct operating mode.

**ATTENTION!** Incorrectly set bridges on the Micro 3 control board can lead to faulty operation and/or damage to the electronics.

Figure 6.
2.5 PRC 2 control panel display and key pad symbols

Seven segment display panel

Display field 1. Display fields 2 and 3.

Display field 4.

Display fields 5, 6, and 7.

Figure 7.

Display field 1 (top left on the control panel) indicates the initial "P" for program (with or without the decimal point. The decimal point indicates that the axis is running) or the stroke limiting symbol or the "E" for error message (see page 10, 2.10 "Description of display symbols").

Display fields 2, and 3 indicate the program or error message number.

Display field 4 When programming - indicates the first part of an input value (with a decimal point - > 1m).

When operating - indicates either the first part of an input value (with a decimal point) or the first part of a theoretical value (with a decimal point).

Display fields 5, 6, and 7 indicate input values (after the decimal point - < 1m).

Important: The keypad should be operated with the finger tips and under no circumstances with finger nails or hard objects!
2.6 Key pad symbols

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>![start_key]</td>
<td>Start key Axis &quot;ON&quot;</td>
</tr>
<tr>
<td>![stop_key]</td>
<td>Stop key Axis &quot;STOP&quot;</td>
</tr>
<tr>
<td>![reference_point_key]</td>
<td>Reference point key Start &quot;Travel to reference point&quot;</td>
</tr>
<tr>
<td>![acknowledgment_key]</td>
<td>Acknowledgment key Acknowledges all errors except E10</td>
</tr>
<tr>
<td>![plus_key]</td>
<td>Plus key Increases values</td>
</tr>
<tr>
<td>![minus_key]</td>
<td>Minus key Decreases values</td>
</tr>
<tr>
<td>![select_input_key]</td>
<td>Select input key Reversing point, Speed</td>
</tr>
</tbody>
</table>

When two keys are illustrated as on the left they must be pressed at the same time.

Figure 8.

Important: The keypad should be operated with the finger tips and under no circumstances with finger nails or hard objects!
2.7 RAM Reset

1. Turn the Main switch of the PRC 2 to "OFF"
2. Hold the operation key down and switch the main switch "ON"
3. The error message E 11 appears on the display.
4. All the data is written over with default data with RAM Reset. The input values and height limits must therefore be re-entered.
   In order to set the Reciprocator height limit the keys \[F \uparrow\] must be pressed simultaneously.

See 2.12 "Setting the Reciprocator height"

2.8 Off set compensation (for Gema-Volstatic service technicians only)

The Off set compensation is only effective with the DC power pack (PRP - Powder Reciprocator Power)

When setting the Off set compensation the PRP Operating Instructions should be consulted.

Proceed as follows :

1. Turn the main switch of the PRC 2 to "OFF"
2. Press the input key \(\downarrow\) and switch the main switch "ON"
3. The following appears on the display :

   
   \[\text{OFF} \]

   
   \[\text{000} \]

   The PRP Off set compensation can now be made and is set correctly when the digits on the lower display have stopped computing.
4. The Off set compensation is ended by pressing the input key \(F\) and this level can now be left.
2.9 Checking the software version

1. Turn the main switch of the PRC 2 "OFF".

2. Switch the main switch "ON" while pressing the input key [0].

3. The following appears on the display:

```
PRC
2021
```

**PRC** designation

```
2.02.1
```

1: DC for DC Reciprocators
2: AC_P for AC Reciprocators (Powder)
3: AC_N for AC Reciprocators (Liquid)
2.10 Description of the display symbols

The seven segment displays shown below only appear in the display field 1 on the PRC 2 front panel (see page 6).

Symbol for Program (followed by the program number. With decimal point = Axis running).

Symbol for Program (followed by the program number. Without decimal point = Axis stopped).

Symbol for Upper stroke limit setting*  
(This setting should be made at the time of setting up the equipment and normally only needs to be done once. Allow for height of the booth openings, max. stroke, etc).

Symbol for Error message.  
(followed by error code number)

Symbol for Upper reversing point  
(Allowances must be made for the height of the booth openings etc, when setting the upper/lower reversing point, due to the danger of collision).

Speed - Upwards  
(Does not have to be the same value as the downward movement)

Position for the Lower reversing point*  
(The range of the lower reversing point is limited by the zero point).

Speed - Downwards  
(Does not have to be the same value as the upward movement)

*see "Reference point", page 11
2.11 Reference point

The reference point on the ACR Reciprocator is a theoretical position on the Z axis which is always 50 mm above the lowest possible point of travel of the carriage and should correspond approximately with the height of the bottom of the gun slot of the booth (not the workshop floor), and the bottom of the carriage at its lowest working position. By moving the proximity switch the reference point, and the zero point are also displaced.

*Under normal working conditions it is not necessary to alter this setting.* However, if the zero point has to be displaced, for any reason, it should only be in an upward direction.

The stroke can be set anywhere between the maximum stroke height and the lowest reversing point (zero point).

**ATTENTION !!**

Displacing the proximity switch (upward) will shorten the maximum stroke length correspondingly, therefore, always allow for this when setting the upper reversing point.

Incorrect setting of the proximity switch can lead to damage to the booth and reciprocator! *Before changing the setting of the proximity switch please contact your local Gema-Volstatic service centre.*

Reference point, and zero point

![Diagram of reference point and zero point](image)

Maximum stroke height (X.XXX m)

(See 2.12 Setting the initial Reversing point height)

Carriage

Reference point (0.050 m)

50 mm

Lowest (absolute) reversing point (Zero point - 0.000 m)

Figure 10.
2.12 Setting the initial reciprocator stroke height

This setting only needs to be done when the reciprocator is set up for the very first time.

The upper stroke limit sets the working height of the carriage. The stroke length is limited by the combination of settings of the maximum height of the reciprocator, the height of the gun slots in the booth, and the lowest reversing point (zero point). When setting up allowance must also be made for the height of the guns and supports on the carriage!

For safety reasons the upper stroke height is always set to 0.80 m on the PRC 2 at the factory. Before starting up the reciprocator the working stroke height must, therefore, be reset on the PRC 2.

ATTENTION !!
The upper stroke height must always be set allowing for the actual height of the reciprocator. If the wrong stroke limits (too high/too low) are set then this can lead to damage to the booth and/or the reciprocator.

In order to set the stroke limit proceed as follows:

1. Place the reciprocator against the booth and connect with the PRC 2 Powder Reciprocator Control (See Cable connection, page 2).

2. Switch on the main switch of the PRC 2 control unit.
The display shows:

3. Press any key. The display shows:

4. Press the two keys $\uparrow \uparrow$ simultaneously for approximately 3 seconds.
The PRC 2 control switches to the level "Stroke limiting".
The display shows:
5. Before leaving the "Stroke limiting" level it is absolutely essential to **recheck** the input height of the maximum stroke limit:
   a) Is the stroke limit defined to the height of the reciprocator?
   b) Is the stroke height limited by the gun slots of the booth?

   **Attention!!**
   Incorrect data input can lead to damage to the booth and/or the reciprocator!!

6. Simultaneously press the two keys.

   ![Keys](image)

   The PRC 2 control leaves the "Stroke limiting" level.

   The following appears on the display:

   ![Display](image)

   A new "Travel to Reference point" command must be given.
3. Setting the parameters of the reciprocator stroke(s)

3.1 Stroke Parameter(s) / Positioning on the Reciprocator

The speeds up and down can have different values, as required.

3.2 Stroke parameter symbols

Setting example:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Display field 1</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper reversing point</td>
<td>n</td>
<td>= 2.00 m</td>
</tr>
<tr>
<td>Speed - up</td>
<td>-</td>
<td>= 0.200 m/s</td>
</tr>
<tr>
<td>Lower reversing point</td>
<td>u</td>
<td>= 1.00 m</td>
</tr>
<tr>
<td>Speed - down</td>
<td>-</td>
<td>= 0.300 m/s</td>
</tr>
</tbody>
</table>

Figure 11.
3.3 Stroke parameter display on input
(Data input procedure is described on page 16 onward)

Upper reversing point display

Display: 01  : Symbol for upper reversing point and Program number
           2000  : Required position

Speed - Up display

Display: 01  : Symbol for Speed - Up and Program number
           0200  : Required value

Lower reversing point display

Display: 01  : Symbol for lower reversing point and Program number
           1000  : Required position

Speed - Down display

Display: 01  : Symbol for Speed - Down and Program number
           0300  : Required value

When the PRC 2 control unit is switched off at the main switch the carriage will slowly sink to its lowest point (Zero point).
3.4 PRC 2 user programming instructions

One of the main criteria in designing the PRC 2 Powder Reciprocator Control has been maximal user-friendly operation. The program overview and the user programming instructions make programming very simple.
Up to 64 different programs can be stored in or called up from the memory. Each program contains data about the speed(s) of the axis movement, and the stroke reversing points. Programming or program selection can be done when the axis is stopped or operating.

On the next page is a diagram giving a complete overview of the program structure. Each level (the boxes marked STOP, START, EDIT, and SET UP in bold print) shows the keys which influence the programming on that particular level. Each level can be switched back and forth, making access to the desired level very simple.

Programming sequence (Complete overview)

Basically, the PRC 2 has four user levels:

STOP
After switching the main switch to ON "PRC 2" appears on the display. Press any key and "E10" appears on the display. The "Travel to reference point" command can now be give. After the reference point has been reached the display always switches to the level "STOP". Any desired program can be selected from here, the levels "START", "EDIT" or "SET UP".

START
The axis is switched on by pressing the key I. The program number can be selected in the level "START" while the Reciprocator is running. The program number can also be selected in the level "START". The reciprocator always carries out the rest of a stroke from the previous program which has been started. When the carriage reaches a reversing point the new program is started with the new stroke. The axis can be switched off again with the key 0. Pressing the keys F+ simultaneously switches the PRC 2 directly to the "EDIT" level.

EDIT
By switching to the "EDIT" level all the input values or any combination of these values of the program selected in the "STOP" level can now be input or changed, e.g. the upper reversing point, the upward speed, the lower reversing point, and the downward speed. The input values can be selected with the keys 1 or 1. The values can be changed with the keys + or -.

SET UP
By switching to the "SET UP" level the program preselected in the "STOP" level can be altered. This level is specially suitable for setting up with parts on the conveyor as the axis travels to the position set on the PRC 2. This way all the positions and values can be checked exactly in the booth.
Programming sequence (Complete overview)

START

STOP

Axis "ON"

Select program number

F

Axis "OFF"

Select program number

Acknowledge error message

Select program

Select input parameter

Increase value

Decrease value

Switch axis on

Switch axis off

Press any key

Travel to Reference point

Acknowledgment message

Travel to Reference point

EDIT

SELECT UP

Program "EDIT"

Select input parameter

Increase value

Decrease value

Switch axis on

Switch axis off

Acknowledgment message

Figure 12.

Make a photocopy of this page to keep by the PRC 2 as a programming reference.
3.5 Programming sequence (Simplified overview)

The PRC 2 Powder Reciprocator Control program memory is set with default values, at the factory, so the user will have to reset the values to his own requirements. There is a blank table at the end of this section (pages 30 and 31) where the part designation, program numbers, and corresponding parameters etc. can be recorded. This will help keep track of the axis movements, and speed(s) for a variety of workpieces.

It is recommended to make photocopies of these pages for future use!

The diagram opposite shows where the relevant information for programming a specific level is found. The initial starting position for all the input functions is the "STOP" level. By pressing the key(s) shown on the desired arrow entry into the corresponding level is given.

If the PRC 2 is switched off it can be started by simply turning the main switch (see Fig. 1) from the '0' position to the 'I' position. ‘PRC2’ appears on the display. Press any key and the error message ‘E10’ (for travel to reference point) appears on the display. The carriage does not move until the “Reference point” key is pressed. The error message ‘E10’ on the display changes to ‘P01’ and below it ‘0.05’. The PRC 2 is now ready operation.

For a details of the specific level, see the corresponding pages (18, 20, 22, and 24).
Programming sequence (Simplified overview)

**STOP**

Axis "ON"

(see pages 20/21)

**START**

(See page 23)

Select program

Press any key

Travel to Reference point

Program "EDIT"

Program "SET UP"

Acknowledge error message

Main switch (ON)

Figure 13.
3.6 Programming sequence (STOP)

STOP

After switching the main switch on and travelling to the reference point the PRC 2 will always switch to the "STOP" level. The levels, "START", "EDIT" or "SET UP" can be selected from the "STOP" level by pressing the corresponding keys (see the page opposite). Any desired program (number) can also be selected on this level.

Attention!!

When the PRC 2 is switched off at the main switch the carriage will sink slowly, under its own weight to its lowest point. Care should be taken to see that nobody stands under the carriage and that nothing protrudes below the bottom of the carriage when setting up the gun(s) and support(s) etc on the carriage as the cabin floor or the filter belt (if a powder recovery unit is fitted) can be damaged.
Programming sequence (STOP)

STOP

Axis "ON"

START

Select program

↑
↓

Press any key

Main switch (ON)

Travel to Reference point

Program "EDIT"

EDIT

Program "SET UP"

SET UP

Acknowledge error message

Figure 14.
3.7 Programming sequence (START)

START

The axis is switched on by pressing the key 1 on the PRC 2 front panel. The program number can be selected on the level "START". When a program number is selected the reciprocator always carries out a previously set axis value (or a default value) until it reaches a reversing point. The new program is initiated immediately after the axis has passed the reversing point. The axis can be switched off again by pressing the 0 key. Pressing the keys simultaneously switches the PRC 2 directly into the "EDIT" level.
Programming sequence (START)

STOP

Select program

Axis "ON"

Select program number

Axis "OFF"

Select program number

Press any key

Press any key

Travel to Reference point

START

F

Acknowledge error message

EDIT

Figure 15.
3.8 Programming sequence (EDIT)

EDIT

By switching to the level "EDIT" the input (or default) values (upper reversing point, speed - up, lower reversing point, speed - down) given on the level "STOP" can be changed.

The input parameters can be selected with the ↑ or ↓ key.
The values for these parameters can be changed with the + or - key.

Select the program number to be altered in the level "STOP".
Display : 
003
Press ↑ or ↓ to select a program number.
0363

Switch to the level "EDIT" by pressing the ± keys simultaneously.
Display :
003
The program number appears in the display
2114

This value can now be increased or decreased by pressing the + or - key.

Pressing the ↑ or ↓ key switches to the next input parameter.
Display :
003
0400
This value can now be increased or decreased by pressing the + or - key.

Pressing the ↑ or ↓ key switches to the next input parameter.
Display :
003
0320
This value can now be increased or decreased by pressing the + or - key.

Pressing the ↑ or ↓ key switches to the next input parameter.
Display :
003
0400
This value can now be increased or decreased by pressing the + or - key.

Pressing the ↑ or ↓ key switches to the next input parameter.
Press ± simultaneously to return to "STOP"
Programming sequence (EDIT)

1. **STOP**
2. **Select program**
   - Up (↑)
   - Down (↓)
3. **Press any key**
4. **Program “EDIT”**
5. **Return to “STOP”**
   - F

- **Select input parameter**
- **Select input parameter**
- **Increase value**
- **Decrease value**
- **Switch axis off**
- **Switch axis on**
- **Acknowledge error message**

- **Main switch (ON)**
- **Travel to Reference point**
- **Acknowledge error message**
   - F

Figure 16.
3.9 Programming sequence (SET UP)

SET UP

In the “SET UP” mode all the input values can be programmed while the axis is running. This level is specially suitable for setting up when the parts to be coated are hanging on the conveyor.

When the upper reversing point is reprogrammed the axis travels to the new position. In this way the accuracy of all the input values can be checked visually with the reciprocator in action.

By switching to the level "SET UP" the preselected program in the level "STOP" can be changed by pressing the keys.

The following appears on the display:

Blinking

The input parameters can be set in exactly the same way as in the "EDIT " mode.

The reciprocator travels to the previously input position by pressing the key .

The reversing points, and the carriage stroke speeds for the corresponding parts can thus always be visually checked. In order to return to the "STOP" mode from the "SET UP" mode the keys must be pressed simultaneously.

The input values must always be programmed in pairs, for example, upper reversing point and upward stroke speed, then by further pressing the key the lower reversing point and the downward stroke speed.
Programming sequence (SET UP)

STOP

Select program

↑

↓

Press any key

Travel to Reference point

Main switch (ON)

Program "SET UP"

Next step

Select input parameter

Select input parameter

Increase value

Decrease value

Acknowledge error message

Return to "STOP"

SET UP

Figure 17.
3.10 Error messages

E01 : **Incorrect input.**
The "E01" error message appears as soon as a wrong key is pressed for a value that is not valid.
The "E01" message only appears as long as the wrong key is pressed.

E08 : **EPROM is incorrectly "burnt-in" (Check sum error)**

E10 : **Reference point not approached.**
The "E10" message means that the reference point has not yet been approached. Reference point travel is initiated by pressing the key shown below:

E11 : **RAM Reset.**
This error message appears when a RAM Reset is carried out. All data in the memory is erased and the system parameter values, and the program parameter values are given as default values.

E12 : **Data in the memory is changed (RAM Error) or Stroke limiting parameter is not set.**
When the data in the memory is changed or the stroke limit is not correctly input, the error message "E12" appears. After acknowledging the error message "E12" with the key 

E20 : **End position error.**
This error message appears when the actual position of the axis is larger than that defined by the software.

E21 : **Increment error.**
The error message "E21" appears on the display when the PRC 2 control does not receive any impulses from the incremental encoder of the reciprocator.

E22 : **Tacho error.**
The error message "E22" appears when the tachometer does not transmit a signal (DC drive only).
4. Automatic starting and stopping of the axis movements controlled through object gaps

The PRC 2 Powder Reciprocator Control can recognize gaps between objects through the digital input "Start/Stop lower reversing point" and start the actual movement program or stop at the lower reversing point accordingly. The required control signal must be made available through an external light barrier.

4.1 Digital input - Start/Stop - lower reversing point

This input indicates the presence of an object, and starts the axis movement.

Start/Stop LRP = Low => Axis stopped at a reversing point
Start/Stop LRP = High => Axis starts the actual movement program

This digital input is activated only after "Travel to Reference point", that is to say, during system parameter editing, and the Start-up phase the input is ignored. As long as the input is "Low" the axis can be operated through the keypad without reservation. When the input is "High" the axis cannot be stopped through the keypad and the following reservations are valid:

<table>
<thead>
<tr>
<th>Input Low</th>
<th>from Low to High</th>
<th>from High to Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop mode</td>
<td>Run mode</td>
<td>Run mode</td>
</tr>
<tr>
<td>Run mode</td>
<td>Run mode</td>
<td>Axis travels to LRP, Stop mode</td>
</tr>
<tr>
<td>Step mode</td>
<td>Run mode</td>
<td>Axis travels to LRP, Stop mode</td>
</tr>
<tr>
<td>Stop-Edit mode</td>
<td>Run-Edit mode</td>
<td>Axis travels to LRP, Stop-Edit mode</td>
</tr>
<tr>
<td>Run-Edit mode</td>
<td>Run-Edit mode</td>
<td>Axis travels to LRP, Stop-Edit mode</td>
</tr>
</tbody>
</table>

Keypads during input on High:

**Run mode:**

- Permitted: [↑] Switch program, [↓] Edit program
- Blocked: [0] Stop

**Run-Edit mode:**

- Permitted: [↑] Select value, [↓] Change value
- Blocked: [0] Stop

4.2 Digital output - Program run

This output indicates that the axis is in a started or stopped state.

Program run = Low - Axis in stopped state
- Travel to Reference point
- Step mode (Set up operation)

Program run = High - Program started
5. Connections and Plug assignment

Die PRC 2 Powder Reciprocator Control is supplied fitted in a housing.

5.1 Connections on BP 1.

Key to the Printed Circuit Board

1. **x1**: Power supply (POWER IN)
2. **x2**: Position determination (POS)
3. **x3**: Drive signal (DRIVE)
4. **x4**: Not used
5. **x5**: Not used
6. **x6**: External control signal (CONTROL - INPUT - OUTPUT)

Figure 18.
5.2 Mains supply - POWER IN (Plug - X1 on BP 1)

By setting the corresponding bridges on the BP1 Power Board the PRC 2 Powder Reciprocator Control can be used with any available Mains power supply.

<table>
<thead>
<tr>
<th>Mains</th>
<th>N</th>
<th>P</th>
<th>Bridges - X1</th>
<th>BR1</th>
<th>BR2</th>
<th>BR3</th>
<th>BR4</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2</td>
<td>4</td>
<td>3-8 / 5-9</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>110</td>
<td>2</td>
<td>4</td>
<td>3-8 / 5-9</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>120</td>
<td>2</td>
<td>6</td>
<td>7-10 / 3-8</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>200</td>
<td>2</td>
<td>9</td>
<td>4-8</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>220</td>
<td>2</td>
<td>9</td>
<td>4-8</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
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<tr>
<td>230</td>
<td>2</td>
<td>9</td>
<td>6-8</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>240</td>
<td>2</td>
<td>10</td>
<td>6-8</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

Grounded lead connection PE X1.1

Example: for 220 V Mains voltage

The bridges, BR 1 to BR 4, on the printed circuit board - POWER SUPPLY are set as follows:

- BR 1 = OFF
- BR 2 = ON
- BR 3 = OFF
- BR 4 = ON
5.3 External digital control signal (CONTROL-INPUT-OUTPUT)

Plug assignment  X6 CONTROL-INPUT-OUTPUT

<table>
<thead>
<tr>
<th>INPUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield input cable</td>
</tr>
<tr>
<td>2</td>
<td>GND for input (24 V)</td>
</tr>
<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
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<td>10</td>
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<td>11</td>
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<tr>
<td>12</td>
<td>Start / Stop - LRP</td>
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<td>13</td>
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<td>24</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Shield output - Cable</td>
</tr>
<tr>
<td>15</td>
<td>+24 V for output</td>
</tr>
<tr>
<td>16</td>
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<tr>
<td>17</td>
<td></td>
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<tr>
<td>18</td>
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<tr>
<td>19</td>
<td>Program run</td>
</tr>
<tr>
<td>20</td>
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<tr>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>
5.3.1 Digital inputs and outputs

Figure 19.
5.3.2 Electrical connections for a digital output

The digital outputs are set out for operation at 24 VDC and function as galvanically isolated PNP outputs.

Connection example:

Technical data for the digital outputs:

- Maximum Collector-Emitter voltage: $U_{CE} \text{ max.} = 35 \text{ V}$
  - $-U_{CE} \text{ max.} = 6 \text{ V}$
- Maximum ballast current: $I_L \text{ max.} = 30 \text{ mA}$
- Maximum residual voltage through the switched output at maximum ballast current: $U_{CE_{sat}} \text{ max.} = 1.1 \text{ V}$
- Maximum residual voltage with inhibited output: $I_{CE_{sat}} \text{ max.} = 500 \mu\text{A}$

**Important!** *Inductive loads must be switched with a recovery diode.*

Example: A Type 1N4004 Silicon diode or similar

Figure 20.
5.3.3 Electrical connection for a digital input

Technical data of the digital inputs:

Nominal value: 24 VDC
For "0" signal: 0-1.6 V
   (Negative input voltage, max. -10.0 V)

For "1" signal: 14-30 V
   (30 V Permanent, max. 35 V for t<100 ms)

Input voltage: Typically 4.8 mA (at 24 V)

Figure 21.
5.4 Positioning - POS

The incremental pulse generator and the reference switch for positioning are connected to this plug.

Plug assignment - X2 POS:

<table>
<thead>
<tr>
<th>Connection No.</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A</td>
<td>GND 24 V POS</td>
</tr>
<tr>
<td>6B</td>
<td>+ 24 V POS</td>
</tr>
<tr>
<td>7A</td>
<td>Ch. B</td>
</tr>
<tr>
<td>7B</td>
<td>Ch. A</td>
</tr>
<tr>
<td>9A</td>
<td>Ref. Point</td>
</tr>
</tbody>
</table>

Plug designation - X2 POS: Front view

Plug type: Connectral Series 320, 18 pole, 2 row

Figure 22.
5.5 Drive control - DRIVE

The control signal for the PRP 1 Power pack or a frequency converter is connected to this socket.

Plug assignment - X3 DRIVE Housing version:

<table>
<thead>
<tr>
<th>Connection No. X3</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Analogue ground for Theoretical value</td>
</tr>
<tr>
<td>1B</td>
<td>Analogue ground for Theoretical value</td>
</tr>
<tr>
<td>2A</td>
<td>+ Direction of rotation signal (negative)</td>
</tr>
<tr>
<td>2B</td>
<td>+ Direction of rotation signal (positive)</td>
</tr>
<tr>
<td>3A</td>
<td>- Activating signal - PRP 1 (neg./Frequ. Converter</td>
</tr>
<tr>
<td>3B</td>
<td>+ Activating signal - PRP 1 (pos./Frequ. Converter</td>
</tr>
</tbody>
</table>

Plug designation - X3 DRIVE : Front view

Plug type : Connectral Serie 320, 18 pole, 2 rows

Figure 23.
List for program parameters of the PRC 2

<table>
<thead>
<tr>
<th>Program no</th>
<th>Customer</th>
<th>Object</th>
<th>Upper reversing point</th>
<th>Lower reversing point</th>
<th>Speed - Up</th>
<th>Speed - Down</th>
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</thead>
<tbody>
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</tbody>
</table>

Make photocopies of this page and the next page for future use.
List for program parameters of the PRC 2 (continued)

<table>
<thead>
<tr>
<th>Program no</th>
<th>Customer</th>
<th>Object</th>
<th>Upper reversing point</th>
<th>Lower reversing point</th>
<th>Speed - Up</th>
<th>Speed - Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
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</tbody>
</table>

Make photocopies of this page and the previous page for future use.
MICRO 3 Control board configuration possibilities

X20 : Power supply for position detection
   A : Power supply for position detection from the 24 V supply (standard).
   B : Power supply for position detection from the 15 V supply.

X21 : Locking of the RS 422 serial interface.
   A : Circuit termination active.
   B : Circuit termination inactive (standard).

X22 : Front display.
   A : 7 digit Front display.
   B : 5 digit Front display.

X23 : Adaptation of the EPROM
   A : 256 kB EPROM (27c - 256)
   B : 512 kB EPROM (27c - 512)

X24 : Is not evaluated (always in Position A!)

X25 : Is not evaluated (always in Position A!)

X26 : Adaptation of the RAM
   A : 16 kB RAM (DS 1220 Y, 2 k x 8 bit)
   B : 64 kB RAM (DS 1225 Y, 8 k x 8 bit)

X27 : Activating signal of the circuit termination (RUP)
   A : direct (RUN during Reset on Low)
   B : inverse (RUN during Reset on High)

INT0 : Release of the system interrupt - 0

ON : Interrupt 0 released (PRC 2, PRC 3)

OFF : Interrupt 0 locked (PRC 1, MRC, BC)

INT1 : Release of system interrupt - 1

ON : Interrupt 1 released (PRC 2, PRC 3)

OFF : Interrupt 1 locked (PRC 1, MRC, BC)
Spare Parts List

Ordering Spare Parts

When ordering spare parts for coating equipment, please indicate the following specifications:

1. Type, and serial number of your coating equipment

2. Order number, quantity, and description of each spare part

Example:

1. Type: PRC 2, Serial no: XXXX XXXX

2. Order no: 201 073, 5 pieces, fine wire fuse
## PRC 2 Powder Reciprocator Control

### Control unit (complete)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Printed circuit board - Micro 3</td>
<td>344 257</td>
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<tr>
<td>2</td>
<td>EPROM 2.XX.1 - DC</td>
<td>344 249</td>
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<tr>
<td></td>
<td><em>EPROM 2.XX.2 - AC</em></td>
<td>344 222</td>
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<tr>
<td>3</td>
<td>RAM Program memory</td>
<td>228 265</td>
</tr>
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<td>4</td>
<td>Power pack PBC - PS 1</td>
<td>340 383</td>
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<td>5</td>
<td>Front display - PRC 2</td>
<td>342 904</td>
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<td>6</td>
<td>Rear PBC - BP 1</td>
<td>342 785</td>
</tr>
<tr>
<td>7</td>
<td>Mains switch</td>
<td>235 911</td>
</tr>
<tr>
<td>8</td>
<td>Adapter fixture</td>
<td>235 920</td>
</tr>
<tr>
<td>9</td>
<td>Contact element</td>
<td>235 938</td>
</tr>
<tr>
<td>10</td>
<td>Fuse holder</td>
<td>200 131</td>
</tr>
<tr>
<td>11</td>
<td>Fuse - 0.25 AT (200-240 VAC)</td>
<td>227 161#</td>
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<tr>
<td></td>
<td><em>Fuse - 0.5 AT (100-120 VAC)</em></td>
<td>201 073#</td>
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<tr>
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<td>Fuse - 5.0 AT (200-240 VAC)</td>
<td>200 166#</td>
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<td></td>
<td><em>Fuse - 10.0 AT (100-120 VAC)</em></td>
<td>200 174#</td>
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<tr>
<td>12</td>
<td>Cable with single plug</td>
<td>303 607</td>
</tr>
<tr>
<td>13</td>
<td>Bulb, 130 V / 20 mA</td>
<td>203 688#</td>
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<tr>
<td>14</td>
<td>Cable with plug</td>
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</tr>
<tr>
<td>15</td>
<td>Cable with plug</td>
<td>344 044</td>
</tr>
</tbody>
</table>

* Wear parts
Figure 1
EPROM / Software Version

<table>
<thead>
<tr>
<th>Software version</th>
<th>Change</th>
<th>Function</th>
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<tbody>
<tr>
<td>PRC 2.01.X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRC 2.02.X</td>
<td>February 1994</td>
<td>Auto.Start/Stop (Chapter. 4)</td>
</tr>
</tbody>
</table>

Please note which EPROM or Software version is fitted to your equipment. When a replacement EPROM is ordered the newest EPROM version will always be supplied!
BACKPLANE BP1
ITEM NO. 342705

CONTROL INPUT OUTPUT

CONTROL INPUT

CONTROL OUTPUT

WIRING DIAGRAM PRC 2

ITW GEMA AG
Mövenstrasse 17
CH-9015 St. Gallen

CONTROL INPUT,
CONTROL OUTPUT

MRA07-A014-2