Operating Instructions and Spare Parts List

PMC 3  Powder Master Control

![PMC 3 Powder Master Control Interface Diagram]
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PMC 3 Powder Master Control

1. Description of the PMC 3 Powder Master Control

1. Display lamp "Plant in Operation" (green)
2. Display lamp "Powder hopper empty" (red)
3. Display lamp "Powder hopper full" (green)
4. Button/Display lamp "Alarm OFF" (green)
5. Key switch/Main switch

Figure 1

In order to control the operation of electrostatic powder coating plant it is absolutely necessary to have interlocking functions. The PMC 3 controls all the interlocking functions: Control and non-potential contact permit individual adaptation to all plant specific requirements.

Figure 2
1.1 Interlocking signals from the PMC 3

- Conveyor
- Powder recovery plant
- Fire protection
- Grounding control

All APS components, including the PRC, can be switched on or off with the key switch of the PMC 3 control unit (Operating main switch).

**CAUTION**

It is not permitted to switch off the power with the PMC 3 key switch for maintenance purposes. The power must be switched off with the Mains switch on the APS control cabinet (The red handle on a yellow base, which should normally be locked with a small padlock).

1.2 Control signals of the PMC 3

- Clears the PGC 1 Powder gun control.
- Clears the main compressed air input.
- Clears the powder level monitoring.
- Clears the prefluidization / Fluidization.
- Clears the Airmover (Reserve connection possibility).
- Clears for rinsing at a conveyor stop
- Clears for rinsing at a gap in the workpieces on the conveyor.

1.3 Functions

- Release of PRC / PGC control units for manual equipment (Switching on the power supply)
- Release of Main solenoid valves
- Release PGC control units for automatic equipment
- Guns rinsed through HRC 3
- Fluidizing (ADU 2 controlled)
- „Powder full“ display
- Request for fresh powder
- „Powder empty“ display
- Horn control
- Axes controlled with PRC 2
Definition of Functions

Release of PRC 2 / PGC control units for Manual guns

When the Mains switch is switched on the power supply for the PGC control units for Manual guns and PRC 2 are switched on.

Main solenoid valve

When the three interlocking signals of the booth are ready, fire protection - O.K, and grounding control - O.K are on, the Main solenoid valve is switched on.

Fluidizing

When the Main solenoid valves are switched on, prefluidizing is started. The prefluidizing valve switches alternately on for 0.5 second and off for 0.5 second. The prefluidizing time can be set between 0 and 102 seconds with the Potentiometer 1. The Main solenoid valve repeats this procedure each time it is switched on.

Powder Level control

After prefluidizing the Level control becomes active. When the upper level sensor is covered the display lamp ‘Powder full’ illuminates. If the upper sensor is uncovered for more than 60 seconds the display goes out and the output ‘Fresh powder required’ is activated. When the lower sensor is uncovered for more than 60 seconds the ‘Powder empty’ lamp illuminates. At the same time the Alarm horn sounds. The Alarm horn is acknowledged with the button ’Horn off’, the Horn switches off and the ’Horn off’ illuminates. This procedure cannot be reset, the lower powder sensor must be covered with powder, then the procedure can be restarted. The control of the ‘Powder full’ display is not interlocked with the ‘Powder empty’ display.

Rinsing on Conveyor Stop

When the PMC 3 detects a Conveyor Stop, the guns are rinsed with air (when an HRC Hose Rinising control and a PI 2 or PI 4 injector are fitted)

Rinsing at gaps between workpieces

The time interval of the gaps between two workpieces being coated are detected using an object recognition unit (Light barrier). When the time interval of the gap exceeds the set control time the powder hoses are rinsed and the powder spray command is locked until the next workpiece is detected.

The time interval of the gap is set with Potentiometer 0 (See page 8) Additional equipment required : Light barrier (See next page).
Light barriers in addition to the "Rinsing on Conveyor Stop"

One-way system:
- Transmitter and receiver are separate.

Specially suitable for:
- detecting opaque, and reflecting objects.
- bad environmental conditions (dust, rain, contamination, etc).
- the accurate positioning, and detection of small objects.

Limitations:
- requires accurate setting.
- not suitable for detecting transparent objects.

The optical axes of the equipment facing each other must be aligned exactly.
The transmitter and receiver must be fitted to stable structures.

Release of PGC control units for Automatic guns, and PRC 2

If the Start light barrier is activated then the signal, 'PGC Release' is set. At the same time the 'PRC Start' signal is set. When the Start light barrier is free again, a set time (0 - 15 min) is started (set with setting Potentiometer 0). After the elapse of this time the guns, and the axes are switched off. The guns are rinsed for 5 seconds.

If a chain conveyor stop is released during coating the guns are switched off and the axes travel to the lower reversing point. When the axes have stopped in the lower reversing point the guns are rinsed. As soon as the chain conveyor runs again, the guns are immediately switched on, and after a 3 second delay the axes are switched on. When the chain conveyor stops, the set time is stopped so that when the conveyor is restarted, the time on the Gap control has not already expired.

Test operation

If the PMC 3 is switched to Test operation all functions are retained, the guns are however, are controlled independent of the Start light barrier, and the 'Conveyor running' signal.
2. Technical data of the PMC 3 Powder Master Control

Electrical data:

- Selectable voltage: 100 V, 110 V, 120 V, 200 V, 220 V, 230 V or 240 V
- Tolerance: ±10%

Voltage selection is made inside of the electrical unit by resoldering the tag of the transformer. The equipment is delivered for operation at the voltage required from the factory.

- Frequency: 50 / 60 Hz
- Rated output of the solenoid valve: 24VAC
- Fuse F1: 1.25 AT
- Type of protection: IP 54
- Temperature range: +10 °C to +40 °C

Dimensions:

- Width: 435 mm
- Depth: 300 mm
- Height: 96 mm
- Weight: 9.5 kg

2.1 Number of PGC 1 Powder Gun Control units which can be connected

With a voltage setting other than 220 / 240 V the number of PGC 1 units which can be connected is reduced as follows:

- for 200 V: Maximum 31 PGC 1 control units
- for 120 V: Maximum 18 PGC 1 control units
- for 110 V: Maximum 16 PGC 1 control units
- for 100 V: Maximum 15 PGC 1 control units
3. **Setting the correct line voltage**

The factory always sets the voltage to 220 V (See Fig. 3). If the local line voltage is not 220 V, the voltage setting of the transformer must be changed by a qualified specialist.

**CAUTION**

*If the incoming voltage is ±10% than the voltage selected damage may be done to internal components. If the incoming voltage is 10% or more below the selected setting then the unit may operate erratically or not at all.*

1. Pull out the control module from the control cabinet as far as it will go.
2. Open the eight quick-release screws holding the cover plate of the control unit. Carefully remove the cover plate.
3. Unsolder the connecting wire from the 220 V terminal post on the transformer and re-solder onto the desired voltage terminal post.

   The connections on the transformer are numbered as follows:

   1 = 0
   2 = 100 V
   3 = 110 V
   4 = 120 V
   5 = 200 V
   6 = 220 V
   7 = 230 V
   8 = 240 V
   9 = No connection

   **Do not unsolder the other wire (0) on the transformer.**

4. Replace the cover plate and close the eight quick-release screws.
5. Push the module back into the housing until it locks back into place.

![Figure 3](image-url)
4. Starting up the PMC 3 Powder Master Control unit

The cable inputs/outputs are found on the rear panel of the PMC 3. The lead-through fittings are prepared for cables of ø 5-8 mm. **Cable fittings which are not used must be sealed completely.**

Also fitted on the rear panel (at the left-hand side) are three fuse holders, F1, F2, and F3 (1), one above the other.

The fuseholder - F1 is the Mains fuse and is rated at 1.25 AT (for 200 - 240 V).
The fuseholder - F2 is by-passed.
In countries where primary fuses are required the bridge must be removed (See wiring diagram).

The fuseholder - F3 is for the low voltage supply (24 V) for operating the PMC 3 unit and is rated at 4 AT.
5. Set times

It is not permitted to switch off the power with the PMC 3 key switch for maintenance purposes. The power must be switched off with the Mains switch on the APS control cabinet (The red handle on a yellow base, which should normally be locked with a small padlock).

- The time delay of the gap is set with Potentiometer 0

Gap control: 0-15 minutes - variable (Potentiometer 0)
Prefluidizing: 0-102 seconds - variable (Potentiometer 1)
Fluidizing impulse: 0.5 second
Pauses between two impulses: 0.5 second
Time after the release of the Level sensor to Alarm: 60 seconds
Delayed switching on of the axes after a conveyor: 3 seconds
Gun rinsing: 5 seconds

Analog potentiometer

Operating mode switch

Figure 5

Gap rinsing

The duration of a gap between two workpieces being coated is determined by an object recognition unit (Light barrier). When the time delay between two workpieces set on the Potentiometer 0 is exceeded the spray operation is stopped and the powder hoses are rinsed with air. The PGC 1 Powder Gun Control remains switched off until a workpiece is detected by the object recognition unit.

- The time delay of the gap is set with Potentiometer 0
Prefluidization / Fluidization

The fluidization of the powder in the powder hopper depends on the characteristic of the powder, the humidity, and the ambient air temperature. For this reason the fluidization system comprises the prefluidization and the continuous fluidization. When the PMC 3 Powder Master Control is switched on the prefluidization is automatically switched on after the interlocking requirements (Booth, Powder recovery - "ON", etc) have been fulfilled. The prefluidization time can be set on the Potentiometer 1. The value can be corrected and adjusted to the fluidization characteristics of the powder later.

![Diagram of fluidization process](image)

- **t1** = Air blast
- **t2** = Pause
- **t3** = Prefluidization time
- **f1** = Continuous fluidization

Alarm Signal Delay

When using the float type Level sensor the alarm signal sounds immediately after the „float“ has sunk down with the powder. That does not mean that the hopper is empty, only that it must be topped up with powder. The time, or more correctly, the delay between the sinking down of the „float“ and the sounding of the alarm can be set with the time relay K1.

- For plant without a fresh powder supply system it is recommended that the time relay K1 be set to 0 (zero), the alarm signal starts immediately.
- For plant with a fresh powder supply system however, a time range should be selected on the time relay K1 which corresponds to the number of powder guns, and the size of the powder hopper used.

The time set on time relay K1 is done on assembly of the equipment and should only be done by trained personnel.
6. Fitting cables to the terminal clamps

If it is necessary to change or reconnect a cable to the central terminal block in the PMC 3 unit the following procedures should be followed:

**To remove a cable:**
1. Make a note of the contact numbers (at each end of the cable) to be removed to avoid connecting a cable to the wrong contact. Contact is only made with the contact on the opposite side of the terminal element.
2. Place a small screwdriver with a strong, tapered blade (maximum ø 3 mm) into the square hole (1) in the terminal element (See Fig. 7).
3. Push the screwdriver blade down until the contact spring (3) rests on the stop (See Fig. 8).
4. Carefully remove the cable and then pull out the screwdriver (See Fig. 9).
To replace a cable:

1. Make sure that the cable has 4-6 mm of the insulating material stripped from the end to be connected. Twist the wires neatly together if they are frayed out.
2. Before continuing, check that the cable will be connected to the correct contact. Contact is only made with the contact on the opposite side of the terminal element.
3. Place a small screwdriver with a strong, tapered blade (*maximum* ø 3 mm) into the square hole (1) in the terminal element (See Fig. 10).
4. Push the blade down until the contact spring (3) rests on the stop (see Fig. 11).
5. Insert the cable into the round hole (2), making sure that the cable is seated in the hole of the contact spring, carefully remove the screwdriver from the square hole (See Fig. 12). Check that the wire is securely clamped.

Only one cable should be fitted per hole.

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**The above-mentioned procedures are valid only for the central terminal contact block, the other contacts are conventional screw type clamps!**
Notes
Spare Parts List

Ordering Spare Parts

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

1. Type and serial number of your powder coating equipment
2. Order number, quantity, and description of each spare part

Example:

1. Type PMC 3, Serial no: 8001 1496
2. Order no: 201 618, 5 pieces, fuse - 1.25 AT

When ordering cable or hose material the length required must also be given. The spare part numbers of this yard/metre ware is always marked with an *.

The spare part number of yard/metre ware always begins with 1.. ...

All wear parts are marked with a #.

All dimensions of plastic hoses are given as external and internal diameters:
   e.g. ø 8 / 6 mm = 8 mm outside diameter (o/d) / 6 mm inside diameter (l/d).
## PMC 3 Powder Master Control

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Assembly board complete</td>
<td>359 939</td>
</tr>
<tr>
<td>3</td>
<td>Cover plate</td>
<td>339 490</td>
</tr>
<tr>
<td>4</td>
<td>Cable lead-through</td>
<td>359 726</td>
</tr>
<tr>
<td>7</td>
<td>Button/Display PCB TP 1 complete</td>
<td>360 104</td>
</tr>
<tr>
<td>8</td>
<td>Cable tree (not shown)</td>
<td>361 992</td>
</tr>
<tr>
<td>9</td>
<td>Key switch</td>
<td>362 530</td>
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<tr>
<td>13</td>
<td>Fuse holder</td>
<td>200 131</td>
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<tr>
<td>14</td>
<td>Fuse F1 1.25AT</td>
<td>201 618</td>
</tr>
<tr>
<td>15</td>
<td>Fuse F3 4.00 A</td>
<td>200 182</td>
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<tr>
<td>21</td>
<td>Hex-Screw M 6 x 30 mm</td>
<td>216 445</td>
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<tr>
<td>22</td>
<td>Screw M 4 x 12 mm</td>
<td>216 798</td>
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<tr>
<td>23</td>
<td>Hex-Nut M 3</td>
<td>202 142</td>
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<tr>
<td>24</td>
<td>Washer ø 3.7/8.0 x 0.5 mm</td>
<td>248 096</td>
</tr>
<tr>
<td>25</td>
<td>Washer ø 3.2/7.0 x 0.5 mm</td>
<td>201 944</td>
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<tr>
<td>26</td>
<td>Spacing sleeve ø 4.3/8.0 x 7.5 mm</td>
<td>238 120</td>
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<tr>
<td>27</td>
<td>Sealing strip 9 x 2 mm</td>
<td>100 250*</td>
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<td>28</td>
<td>PLC-CPU</td>
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<td>Transformer</td>
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<td>Time relay 24 VDC</td>
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<td>Contact plate P</td>
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<td>Contact plate PE</td>
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<td>36</td>
<td>End plate 3-contact</td>
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<tr>
<td>37</td>
<td>Contact bridge (single)</td>
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<tr>
<td>38</td>
<td>Contact bridge (double)</td>
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<tr>
<td>39</td>
<td>Bridging piece 1 to 4</td>
<td>250 481</td>
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<tr>
<td>40</td>
<td>Terminal plate</td>
<td>238 368</td>
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<td>41</td>
<td>Wire bridge</td>
<td>241 806</td>
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<tr>
<td>42</td>
<td>Light barrier pair (Transmitter, and Receiver)</td>
<td>252 166</td>
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<tr>
<td>43</td>
<td>Cable with connector for Item 42 (L = 5 m)</td>
<td>252 158</td>
</tr>
</tbody>
</table>

* Indicate length required  
# Wear parts
PMC 3 Powder Master Control

Figure 13