Operating Instructions and Spare Parts List

MPS 1-L Manual Powder System
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Directions for use

The electrostatic manual coating system consists of:

- PG 1 Electrostatic manual powder coating gun
- PGC 1 Control module with CB 1 electronics control board
- 5 l Powder hopper

This equipment is matched and should only be operated in this configuration.

- This equipment combination was tested by PTB: PTB No 91.C.9102, PTB year 1991

Safety rules for the electrostatic powder coating

1. This equipment can be dangerous when it is not operated according to the following standards:
   - EN 50 050 (or VDE 0745 Part 100),
   - EN 50 053 Part 2 (or VDE 0745 Part 102), and
   - Specification Sheet for Electrostatic Powder Coating ZH 1/444

2. All electrostatic conductive parts which are within 5 metres of the coating area and especially the work pieces must be grounded.

3. The floor in the coating area must be electrostatic conductive. Normal concrete is generally conductive.

4. The operating personnel must wear electrostatic conductive footwear, i.e. leather soles.

5. The operating personnel should hold the gun in the bare hand. If gloves are worn they must be electrostatically conductive.

6. Connect the grounding cable (green/yellow) supplied to the grounding terminal on the transport trolley column. The grounding cable must have a good metal to metal contact with the coating booth, recovery unit, and the workpiece conveyor system, especially with the work piece suspension.

7. The electrical cables and powder feed hoses to the gun must be laid out so that they are protected from possible mechanical damage.

8. The powder coating equipment should only be switched on after the coating booth is in operation. If the booth breaks down then the powder coating equipment must also be switched off.

9. Check the grounding of all electrostatic conductive parts at least once a week.

10. When cleaning the gun or changing nozzles the control module must be switched off.
Technical data for the MPS 1-L Electrostatic manual powder system

### Electrical data

- **Single-phase AC**
- **Selectable voltage**: 100 V, 110V, 120V, 200V, 220 V or 220 V

  Voltage selection is made on the inside of the electrical unit by resoldering the tag of the transformer. The value of the fuse for 100, 110, and 120 V is 0.5 AT and for the higher voltages is 0.25 AT.

  **The equipment is delivered for operation at 230 V from the factory.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerance</td>
<td>+10% / -15%,</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Connected load</td>
<td>70 VA</td>
</tr>
<tr>
<td>Rated output voltage (to gun)</td>
<td>10 V</td>
</tr>
<tr>
<td>Rated output current (to gun)</td>
<td>1.2 A</td>
</tr>
<tr>
<td>Type of protection</td>
<td>IP 54</td>
</tr>
<tr>
<td>Temperature range</td>
<td>+10°C to +40°C (+50°F to +104°F)</td>
</tr>
<tr>
<td>Approval</td>
<td>EN 50 050</td>
</tr>
<tr>
<td></td>
<td>FM No J. I. OW 7 A 6.AE (7264)</td>
</tr>
<tr>
<td></td>
<td>Date tested 10/1993</td>
</tr>
<tr>
<td></td>
<td>PTB test No 91.C.9102</td>
</tr>
<tr>
<td></td>
<td>Date tested 1991</td>
</tr>
</tbody>
</table>

### Pneumatic data

- **Maximum input pressure**: 10 bar
- **Minimum input pressure**: 5 bar
- **Maximum water vapour content of compressed air**: 1.3 g/m³
- **Maximum oil vapour content of compressed air**: 0.1 mg/kg (oil/air)
- **Maximum compressed air consumption**:
  - Powder hose - ø 11 mm: 8 m³/h
  - Main compressed air input connection thread: 1/4" B.S.P (female)

### Dimensions

- **Width**: 530 mm
- **Depth**: 310 mm
- **Height**: 510 mm
- **Weight**: 16.5 kg
- **Capacity**: 5 l (~2.5 kg)
About these Operating Instructions

This operating manual contains all the important information which you require to operate your MPS powder coating equipment. It will guide you through the installation procedure, give you advice and tips to optimize your new powder coating system. Information about the functioning of individual components; PGC 1 Powder Gun Control, PG 1 Manual Powder Gun or PI Powder Injector, are found in the corresponding documentation supplied with the equipment.
MPS 1-L Manual powder system for electrostatic coating

Fields of application

The MPS 1-L Electrostatic manual powder coating system with the PG 1 powder gun are especially suited for manual coating of workpieces in laboratories, test or demonstration coating, and for powder quality control tests.

Scope of delivery for MPS 1-L (standard):

A PGC 1 control module (3), installed in a metal housing, complete with gun support and power cable.
A powder hopper (4) with filter cover.
A pressure reducing valve for fluidizing air (2), mounted on the control module.
A PI 3-H (5) plug-in injector.
A PG 1 manual powder gun (6) with electric cable, powder hose, rinsing air hose, and a standard PG 1 nozzle set (see PG 1 Operating Instructions).
Pneumatic hoses for the conveying air (red), supplementary air (blue), and fluidizing air (black), also pneumatic connection from the pressure reducing valve (2) to the control module.
Functional description

The fluidized powder in the powder hopper is sucked up into the injector by the conveying air (1.2 - red hose) passing through it. The powder/air mixture reaches the gun through the transparent powder hose. The powder is electrostatically charged shortly before it leaves the gun nozzle. An electrostatic field also exists between the gun nozzle and the grounded workpiece. The electrostatically charged powder sprayed onto the workpiece adheres to the latter’s surfaces. The powder is fluidized in the hopper by forcing air from below through a porous plastic plate. The fluidized powder acquires liquid-like properties. The conveying air (1.2) and the supplementary air (1.3) are regulated on the control module, and the fluidizing air with the pressure reducing valve.

The function of the injector is explained in the PI 3 Powder Injector Operating Instructions. The arrows in Figure 2 show the directions of flow. The numbers and grounding symbol indicate the connection points at the rear of the PGC 1 Control module.
Preparatory steps for initial start-up

a) Setting the correct line voltage

The factory always sets the voltage to 230 V. If the local line voltage is not 230 V, the voltage setting of the transformer must be changed by an electrician.

If the incoming voltage is 10% or higher 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. Unfasten all connections (pneumatic and electrical) at the rear of the control module.
2. Unscrew the retaining screw at the rear of the control module.
3. Slide the module out carefully and place on a clean, flat surface.
   *When removing the unit do not pull on the control knobs, push the unit from the back if necessary.*
4. Unscrew the two Phillips screws holding the cover of the electrical section.
   Carefully remove the cover.
5. Unsolder the connecting wire from the 230 V terminal post on the transformer and resolder onto the desired voltage terminal post.
   *Do not unsolder the other wire (0) on the transformer.*
6. Replace the cover and tighten the two Phillips screws. *When replacing the cover care should be taken that the gasket is not displaced.*
7. Insert the module into the housing and slide back into place. Screw in the retaining screw tightly.
8. Fasten all connections (pneumatic and electrical).

b) Connection to the compressed air supply

Compressed air is fed into the connection on the pressure reducing valve mounted on the control module. Thread connection: 1/4” B.S.P.

*Before connecting, the fluidizing air must be switched off!*  
The compressed air must be free of oil and water.

Atmospheric pressure should prevail in the powder hopper while it is in operation!

c) Establishing the ground connection

Connect the cable with the ground connection clip to the booth or the workpiece suspension device, and the end with the eye to the ground connector post at the rear of the control module.
d) Connecting the PG 1 powder gun

1. Connect the cable (1) with the 7-pin connector to the socket labelled ‘A Gun’ at the rear of the control module.
2. Connect the hose for rinsing air (9) to rinsing air outlet 1.4 and to the gun.
3. Connect the powder hose (7) to the gun and to the injector (6).

Figure 4

1. Gun cable.
2. Solenoid valve cable.
3. Mains power input cable.
4. Internal air input hose.
5. Conveying air hose.
6. PI 3-H injector.
7. Powder hose.
8. Supplementary air hose.
9. Rinsing air hose.
10. External compressed air input.
11. Fluidizing air setting knob.
12. Fluidizing air hose connection.
13. Fluidizing air gauge.
e) Function check

See trouble shooting guide on pages 11 and 12 for malfunctions.

1. Switch on the main switch (9) of the control module. The MPS 1-L is under power when the lamp inside the green main switch illuminates.
2. Switch on the motor control switch.
3. Depress the high-voltage control knob (8) on the control module, if not already in this position, and turn to the left-hand stop.
4. Squeeze the gun trigger. The lowest left-hand LED on the high voltage/corona current meter (7) should illuminate. The equipment is active.
5. Pick up the gun and point it towards a grounded work piece approximately 20 cm away.
6. Set the pressure for the desired rate of powder deposit (in grammes/min, see PGC 1 Operating Instructions) on the conveying air pressure gauge (2). The maximum output is 3,5 bar.
7. Check on the supplementary air flowmeter (4) if the ball “floats” within the green sector of the scale. If it does not, turn the supplementary air control knob (3) to the left or right, while pulling the trigger once or twice, until the ball is positioned correctly.
8. Set the rinsing air by turning the rinsing air control knob (5) until the ball in the rinsing air flowmeter (6) “floats” within the respective green sector of the scale depending on the type of jet nozzle being used (flat jet nozzle or round jet nozzle).

![Figure 5](image)

f) Filling the powder hopper

1. Release the clamp ring holding the cover, and lift off (complete with the injector, and the grounding cable) from the powder hopper. Take care that the suction tube is not damaged.
2. Fill the hopper 3/4 full with powder.
3. Carefully replace the cover and refasten the clamp ring.

When all the above checks have been successfully completed, the equipment is ready for use. If it fails to function correctly, consult the trouble shooting guide on pages 11 and 12.
Start Up

a) Powder fluidization:

The fluidizing of the powder is dependent on the type of powder, the air humidity, and the ambient temperature. Fluidization functions after the control module is switched on.

1. Release the clamp holding the cover, and lift off (complete with the injector, and the grounding cable) from the powder hopper.
2. Slowly increase fluidizing air. The powder should “boil” only lightly, but constantly. If necessary increase the fluidizing air until the “boiling” in the hopper is even, then reduce the air until a low "boil" is obtained.
3. Lock the setting of the pressure reducing valve (mounted on the control module) by pushing the knob in until it locks down.
4. Replace the cover and refasten the clamp.

b) Adjusting the powder output and powder cloud

The powder output is dependent on the type of powder, the powder hose length and the number of coils, the powder hose diameter, the conveying air pressure, and the dosing air. The operating principle of the injector and the influence of the supplementary air are explained in PI 3 Powder Injector Operating Instructions.

1. Switch the control module on.
2. Check powder fluidization.
3. Direct the gun into the booth and press gun trigger
4. Set the conveying air (see PGC 1 Operating Instructions).
5. Adjust the supplementary air (see PGC 1 Operating Instructions).
6. Adjust the rinsing air pressure.

   **Using a flat jet nozzle**
   - Adjust the pressure gauge on the control module to the desired powder feed rate.
   - Adjust the supplementary air on the flowmeter so that the ball "floats" within the respective green sector on the scale.
   - Adjust the rinsing air on the flowmeter so that the ball "floats" in the lower green sector on the scale.

   **Using a round nozzle with vented deflector**
   - Adjust the pressure gauge on the control module to the desired powder feed rate.
   - Adjust the supplementary air on the flowmeter so that the ball "floats" within the respective green sector on the scale.
   - Adjust the rinsing air on the flowmeter so that the ball "floats" in the upper green sector on the scale.

(continued)
Start Up (cont.)

7. Adjust the powder cloud.
   
   Using a flat jet nozzle.
   - Loosen the threaded nut by turning it approximately 45° so that the flat jet nozzle (or the extension) can barely be turned.
   - Turn the flat jet nozzle in the desired axial direction.
   - Retighten the threaded nut.

   Using a round nozzle with vented deflector.
   - Change the deflector (ø 16, 24, and 32 mm are supplied with the gun).

   **CAUTION** Never turn the deflectors, these are pushed on an O-ring fitting!

c) Powder coating - Start-up.

   **IMPORTANT** First check that all electrostatically conductive parts within 5 m of the coating booth are grounded.

   1. Switch on the control module.
   2. Check powder fluidization.
   3. Pick up the gun and point it into the coating booth, but not at the work piece to be coated.
   4. Press the gun trigger (see PG 1 Operating Instructions).
   5. Adjust the high voltage:
      Check by observing the LED
   6. The workpiece(s) can now be coated.

d) Shut-down.

   1. Release the gun switch.
   2. Switch off the control module.
      
      The adjustment for high-voltage, rinsing air, and powder output must not be changed.
   3. For work interruptions such as lunch breaks, over night, etc. it is only necessary to disconnect the compressed air supply.

e) Rinsing the powder hose.

Before long idle periods the residual powder must be removed from the powder hose as follows:

   1. Pull out the hose.
   2. Point the gun into the booth.
   3. Blow out the hose manually with a compressed air gun.
   4. Refit the hose to the injector sleeve.
Colour change.

1. Drain and clean powder hopper.
2. Blow out powder hose with compressed air.
   *Powder hose is easy to clean with a piece of foam rubber (approx. \( \varnothing \) 15 mm) which is blown through the hose under pressure.*
3. Disassemble and clean the gun (see PG 1 Operating Instructions)
4. Prepare control module for operation with new powder.
5. Before starting with the coating operation, “flush” powder hose and gun with the new powder.

Maintenance schedule.

Conscientious maintenance at regular intervals increases the service life of the coating equipment and will result in uniform coating quality over a longer period!

*a) Daily maintenance.*

1a. Clean injector (see PI 3 Operating Instructions).
2a. Clean gun.
3a. Clean the powder hose (see Colour change, section 2 above).

*b) Weekly maintenance.*

1b. Clean the powder hopper, injector, and gun. Do not refill the powder hopper until coating is to be resumed!
2b. Check ground connections between control module, coating booth, workpiece suspension device or the conveyor chain.

*c) If the control module remains idle for several days.*

1c. Disconnect power plug.
2c. Clean the control module (refer to 1b).
3c. Disconnect compressed air supply to the coating equipment.
Cleaning and repairs

Powder hopper

a) Cleaning

1. Disconnect quick-release couplings of fluidizing air hose.
2. Remove injector.
3. Disconnect ground cable.
4. Remove cover and wipe with a clean, dry brush and a clean cloth.
5. Clean suction tube and injector seal.
6. Empty residual powder into a container.
7. Vacuum out powder hopper, especially the bed.
8. Wipe powder hopper with a clean, dry cloth.
9. Reassemble powder hopper.

⚠️ NOTICE
Do not refill with powder until coating operation is to be resumed and do not wash hopper bed with solvent or water!

PG 1 Powder gun

a) Cleaning

Frequent cleaning of the gun is recommended for assuring the coating quality.

⚠️ IMPORTANT
Before cleaning the gun, switch off the control module and detach the gun connector (see PG 1 Powder Gun Operating Instructions) at the gun socket (1 - A Gun - Fig. 4, page 5).

The compressed air used for cleaning should be free of oil and water.

Daily:

1. Clean the outside of the gun.

Weekly:

2. Detach the powder hose at the connector.
3. Detach the nozzle from the gun and clean it (see PG 1 Manual Powder Gun Operating Instructions).
4. Blow out the gun through the powder inlet in the direction of flow.
5. Clean the gun tube (see PG 1 Manual Powder Gun Operating Instructions) with the spiral brush supplied.
6. Blow out the gun with compressed air again.
7. Reassemble and reconnect the gun.
# Troubleshooting guide

<table>
<thead>
<tr>
<th>Faults</th>
<th>Causes</th>
<th>Remedies</th>
</tr>
</thead>
</table>
| Green lamp does not illuminate although control module has been switched on. | No power:  
  – Control unit is not connected to Mains   
  – Fuse F1 defective   
  – External power line fuse defective  
In equipment:  
  – Lamp defective   
  – Electronics board (PCB) defective | Connect sprayer with power cord to Mains  
Replace  
Replace or reset  
Mail in for repair  
Replace  
Mail in for repairs  
Mail in gun for possible repairs  
Connect  
Replace |
| Powder is not fluidized                                               | Operating error:  
  – Module is not switched on   
  – Gun switch is not pressed  
In equipment:  
  – Solenoid valve defective   
  – Electronics board (PCB) defective | Switch on  
Press gun switch while regulating  
Replace  
Mail in for repair |
| Needle of pressure gauge for conveying air stays at zero when making adjustments | – O-ring defective or missing | Replace or insert |
| During spraying process air escapes from the gun shaft               | – O-ring defective or missing | Replace or insert |
### Troubleshooting Guide (continued)

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gun does not spray powder although the control module is switched on and the gun trigger is pressed.</td>
<td>- Injector, check valve or throttling at injector, powder hose or gun clogged</td>
<td>Clean corresponding part</td>
</tr>
<tr>
<td></td>
<td>- Insert sleeve in injector is worn</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>- Fluidization does not function</td>
<td>See above</td>
</tr>
<tr>
<td></td>
<td>No conveying air:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Reducing valve defective</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>- Solenoid valve defective</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>- Electronics board (PCB) defective</td>
<td>Mail in for repair</td>
</tr>
<tr>
<td>Gun sprays powder, LED at the rear of the cascade is not illuminated, powder does not adhere to the workpiece</td>
<td>- High voltage too low</td>
<td>Increase the high voltage on the control module</td>
</tr>
<tr>
<td></td>
<td>- Gun connector, gun cable or gun cable connector is defective</td>
<td>Replace defective item or mail it in for repair</td>
</tr>
<tr>
<td></td>
<td>- High voltage cascade is defective</td>
<td>Mail in the shaft of the gun for repair</td>
</tr>
<tr>
<td></td>
<td>- Electronics board (PCB) defective</td>
<td>Mail in for repair</td>
</tr>
<tr>
<td>Gun sprays powder, high voltage present, powder does not adhere to the work piece</td>
<td>- Work piece not properly grounded</td>
<td>Check the ground connection, also refer to &quot;Safety rules&quot;</td>
</tr>
</tbody>
</table>
Assembly drawing

Figure 6
Pneumatic diagram for MPS 1-L

Figure 7
Wiring diagram

Figure 8
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 MPS 1-L, Serial no: xxxx xxxx
2. Order no: 201 073, 5 pieces, fine wire fuse

When ordering cable or hose material the length required must also be given. The spare part numbers of yard/metre ware always begins with 1.. ... and are always marked with an * in the spare parts list.

Wear parts are always marked with a #.

All dimensions of plastic powder hoses are quoted as external (o/d), and internal (i/d) diameters:

e.g. 

ø 8 / 6 mm = 8 mm outside diameter (o/d) / 6 mm inside diameter (i/d).
# Powder hopper

<table>
<thead>
<tr>
<th>Component</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopper complete (without injector)</td>
<td>338 150</td>
</tr>
<tr>
<td>Powder hopper</td>
<td>300 519</td>
</tr>
<tr>
<td>Support plate</td>
<td>312 568</td>
</tr>
<tr>
<td>Fluidizing plate</td>
<td>310 468</td>
</tr>
<tr>
<td>Filter lid</td>
<td>371 882</td>
</tr>
<tr>
<td>Suction tube holder</td>
<td>371 890</td>
</tr>
<tr>
<td>Suction tube - L= 233 mm</td>
<td>371 939</td>
</tr>
<tr>
<td>Throttle - ø 0.7 mm</td>
<td>371 904</td>
</tr>
<tr>
<td>Clamping ring - Type 160-05</td>
<td>258 237</td>
</tr>
<tr>
<td>Lock nut - PG 21</td>
<td>234 869</td>
</tr>
<tr>
<td>Quick-release connection - NW5.2° - 1/8°</td>
<td>200 859</td>
</tr>
<tr>
<td>Elbow connection - ø 6 / 6 mm</td>
<td>200 875</td>
</tr>
<tr>
<td>Protecting strip</td>
<td>100 552*</td>
</tr>
<tr>
<td>Sealing ring - ø 10.2 / 17 x 3.8 mm Dubo</td>
<td>230 626</td>
</tr>
<tr>
<td>Plastic hose - ø 8 / 6 mm (black)</td>
<td>103 756*</td>
</tr>
<tr>
<td>Quick-release hose connector - ø 8 / 6 mm</td>
<td>203 181</td>
</tr>
</tbody>
</table>

*NW = Nominal diameter
*Indicate length required

![Diagram of powder hopper](image.png)

*Figure 9*
**Fluidizing unit**

1. Air connection adapter 227 838
2. Air connection ring - ø 8 mm-1/4" B.S.P. thread 231 886
3. Main air connection - 1/4" (female) B.S.P. thread 236 063
4. Gasket - ø 13.4 x 18 x 1.8 mm 225 487
5. Solenoid valve (compl.) - 3/8" B.S.P., 24 V =, 5 W 242 217
5.1 Solenoid valve coil 243 930
6. Pressure reducing valve 242 225
7. Pressure gauge - 1/8" B.S.P. thread 237 060
8. Elbow connector - ø 8 mm-1/8" 242 853
9. Hose for rinsing air ø 8 / 6 mm (black) 103 756*
10. Quick-release connector - ø 8 / 6 mm 203 181
11. Solenoid valve cable 336 629
12. Screw connector - ø 8 mm 201 316
14. Quick-release connector - 1/4" 203 106
15. Fluidizing unit bracket (not shown) 346 110

*Indicate length required Figure 10
MPS 1-L

1. Control unit housing 336 548
2. Pressure regulator carrier plate 338 109
3. Milled nut - M4 201 090
4. Powder hopper carrier plate 338 087

Figure 11
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