Operating instructions and spare parts list

OptiTronic (CG03)
Powder gun control unit

Important!
Before using this equipment, please carefully read all instructions in this manual. Keep this manual ready to hand on the equipment for future reference!
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General safety regulations

This chapter sets out the fundamental safety regulations that must be followed by the user and third parties using the OptiTronic CG03 Powder gun control unit.

These safety regulations must be read and understood before the OptiTronic CG03 Powder gun control unit is used.

Safety symbols (pictograms)

The following warnings with their meanings can be found in the ITW Gema operating instructions. The general safety precautions must also be followed as well as the regulations in the operating instructions.

DANGER!
Danger due to live electricity or moving parts. Possible consequences: Death or serious injury

WARNING!
Improper use of the equipment could damage the machine or cause it to malfunction. Possible consequences: minor injuries or damage to equipment

INFORMATION!
Useful tips and other information

Conformity of use

1. The OptiTronic CG03 Powder gun control unit is built to the latest specification and conforms to the recognized technical safety regulations. It is designed for the normal application of powder coating.

2. Any other use is considered as non-conform. The manufacturer is not responsible for damage resulting from improper use of this equipment; the end-user alone is responsible. If the OptiTronic CG03 Powder gun control unit is to be used for other purposes or other substances outside of our guidelines then ITW Gema AG should be consulted.

3. Observance of the operating, service and maintenance instructions specified by the manufacturer is also part of conformity of use. The OptiTronic CG03 Powder gun control unit should only be used, maintained and started up by trained personnel.
personnel, who are informed about and are familiar with the possible hazards involved.

4. Start-up (i.e. the execution of a particular operation) is forbidden until it has been established that the OptiTronic CG03 Powder gun control unit has been set up and wired according to the guidelines for machinery (98/37 EG). EN 60204-1 (machine safety) must also be observed.

5. Unauthorized modifications to OptiTronic CG03 Powder gun control unit exempts the manufacturer from any liability from resulting damage.

6. The relevant accident prevention regulations, as well as other generally recognized safety regulations, occupational health and structural regulations are to be observed.

7. Furthermore the country-specific safety regulations must be observed.

<table>
<thead>
<tr>
<th>Explosion protection</th>
<th>Protection type</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 0102 Ex II (2) D</td>
<td>IP5X</td>
<td>T6 (zone 21)</td>
</tr>
<tr>
<td></td>
<td>IP54</td>
<td>T4 (zone 22)</td>
</tr>
</tbody>
</table>

### Technical safety regulations for stationary electrostatic powder spraying equipment

#### General information

The powder spraying equipment from ITW Gema is designed with safety in mind and is built according to the latest technological specifications. This equipment can be dangerous if it is not used for its specified purpose. Consequently it should be noted that there exists a danger to life and limb of the user or third party, a danger of damage to the equipment and other machinery belonging to the user and a hazard to the efficient operation of the equipment.

1. The powder spraying equipment should only be started up and used once the operating instructions have been carefully studied. Improper use of the controlling device can lead to accidents, malfunction or damage to the control itself.

2. Before every start-up check the equipment for operational safety (regular servicing is essential)!

3. Safety regulations BGI 764 and VDE regulations DIN VDE 0147, Part 1, must be observed for safe operation.

4. Safety precautions specified by local legislation must be observed.

5. The plug must be disconnected before the machine is opened for repair.

6. The plug and socket connection between the powder spraying equipment and the mains network should only be taken out when the power is switched off.

7. The connecting cable between the controlling device and the spray gun must be set up so that it cannot be damaged during operation. Safety precautions specified by local legislation must be observed!
8. Only original ITW-Gema spare parts should be used, because the explosion protection will also be preserved that way. Damage caused by other parts is not covered by guarantee.

9. If ITW-Gema powder spraying equipment is used in conjunction with machinery from other manufacturers then their safety regulations must also be taken into account.

10. Before starting work familiarize yourself with all installations and operating elements, as well as with their functions! Familiarization during operation is too late!

11. Caution must be exercised when working with a powder/air mixture! A powder/air mixture in the right concentration is flammable! Smoking is forbidden in the entire plant area!

12. As a general rule for all powder spraying installations, persons with pacemakers should never enter high voltage areas or areas with electromagnetic fields. Persons with pacemakers should not enter areas with powder spraying installations!

**WARNING!**
We emphasize that the customer himself is responsible for the safe operation of equipment. ITW-Gema is in no way responsible for any resulting damages!

**Safety conscious working**

Each person responsible for the assembly, start-up, operation, service and repair of powder spraying equipment must have read and understood the operating instructions and the “Safety regulations”-chapter. The operator must ensure that the user has had the appropriate training for powder spraying equipment and is aware of the possible sources of danger.

The control devices for the spray guns must only be set up and used in zone 22. Only the spray gun should be used in zone 21.

The powder spraying equipment should only be used by trained and authorized personnel. This applies to modifications to the electrical equipment, which should only be carried out by a specialist.

The operating instructions and the necessary closing down procedures must be followed before any work is carried out concerning the set-up, start-up, operation, modification, operating conditions, mode of operation, servicing, inspection or repairs.

The powder spray equipment can be turned off by using the main switch or failing that, the emergency shut-down. Individual components can be turned off during operation by using the appropriate switches.

**Individual safety regulations for the operating firm and/or operating personnel**

1. Any operating method which will negatively influence the technical safety of the powder spraying equipment is to be avoided.

2. The operator should care about no non-authorized personnel works on the powder spraying equipment (e.g. this also includes using the equipment for non-conform work).

3. For dangerous materials, the employer has to provide an operating instructions manual for specifying the dangers arising for humans and environment by handling dangerous materials,
as well as the necessary preventive measures and behavior rules. The operating instructions manual has to be written in an understandable form and in the language of the persons employed, and has to be announced in a suitable place in the working area.

4. The operator is under obligation to check the powder spraying equipment at least once every shift for signs of external damage, defects or changes (including the operating characteristics) which could influence safety and to report them immediately.

5. The operator is obliged to check that the powder spraying equipment is only operated when in satisfactory condition.

6. As far as it is necessary, the operating firm must ensure that the operating personnel wear protective clothing (e.g. facemasks).

7. The operating firm must guarantee cleanliness and an overview of the workplace with suitable instructions and checks in and around the powder spraying equipment.

8. No safety devices should be dismantled or put out of operation. If the dismantling of a safety device for set-up, repair or servicing is necessary, reassembly of the safety devices must take place immediately after the maintenance or repair work is finished. The powder spraying device must be turned off while servicing is carried out. The operator must train and commit the responsible personnel to this.

9. Activities such as checking powder fluidization or checking the high-voltage spray gun etc. must be carried out with the powder spraying equipment switched on.

Notes on special types of hazard

**Power**

It is necessary to refer once more to the danger of life from high-voltage current if the shut-down procedures are not observed. High voltage equipment must not be opened - the plug must first be taken out - otherwise there is danger of electric shock.

**Powder**

Powder/air mixtures can be ignited by sparks. There must be sufficient ventilation in the powder coating booth. Powder lying on the floor around the powder spraying device is a potentially dangerous source of slipping.

**Static charges**

Static charges can have the following consequences: Charges to people, electric shocks, sparking. Charging of objects must be avoided - see "Earthing".

**Grounding/Earthing**

All electricity conducting parts and machinery found in the workplace (according to DIN VDE 0745, part 102) must be earthed 1.5 meters either side and 2.5 meters around each booth opening. The earthing resistance must amount to maximally 1 MOhm. The resistance must be tested on a regular basis. The condition of the machinery surroundings as well as the suspension gear must ensure that the machinery remains earthed. If the earthing of the machinery includes the suspension arrangements, then these must constantly be kept clean in order to guarantee the necessary
conductivity. The appropriate measuring devices must be kept ready in the workplace in order to check the earthing.

**Compressed air**
When there are longer pauses or stand-still times between working, the powder spraying equipment should be drained of compressed air. There is a danger of injury when pneumatic hoses are damaged and from the uncontrolled release and improper use of compressed air.

**Crushing and cutting**
During operation, moving parts may automatically start to move in the operating area. It must be ensured that only instructed and trained personnel go near these parts. The operator should ensure that barriers comply with the local security regulations.

**Access under exceptional circumstances**
The operating firm must ensure that local conditions are met when repairs are made to the electronic parts or when the equipment is restarted so that there are additional measures such as barriers to prevent unauthorized access.

**Prohibition of unauthorized conversions and modifications to machines**
All unauthorized conversions and modifications to electrostatic spraying equipment are forbidden for safety reasons.

The powder spraying equipment should not be used if damaged, the faulty part must be immediately replaced or repaired. Only original ITW-Gema replacement parts should be used. Damage caused by other parts is not covered by guarantee.

Repairs must only be carried out by specialists or in ITW-Gema workshops. Unauthorized conversions and modifications may lead to injury or damage to machinery. The ITW Gema AG guarantee would no longer be valid.

**Safety requirements for electrostatic powder coating**

1. This equipment is dangerous if the instructions in this operating manual are not followed.
2. All electrostatic conductive parts, in particular the machinery within 5 meters of the coating equipment, must be earthed.
3. The floor of the coating area must conduct electricity (normal concrete is generally conductive).
4. The operating personnel must wear electricity conducting footwear (e.g. leather soles).
5. The operating personnel should hold the gun with bare hands. If gloves are worn, these must also conduct electricity.
6. The supplied earthing cable (green/yellow) must be connected to the earthing screw of the electrostatic powder spraying hand appliance. The earthing cable must have a good metallic connection with the coating booth, the recovery unit and the conveyor chain and with the suspension arrangement of the objects.
7. The electricity and powder supply to the hand guns must be set up so that they are fully protected against heat and chemical damage.

8. The powder coating device may only be switched on once the booth has been started up. If the booth cuts out then the powder coating device must be switched off.

9. The earthing of all electricity conducting devices (e.g. hooks, conveyor chains) must be checked on a weekly basis. The earthing resistance must amount to maximally 1 MOhm.

10. The control device must be switched off if the hand gun is cleaned or the nozzle is changed.

11. When working with cleaning agents there may be a risk of hazardous fumes. The manufacturers instructions must be observed when using such cleaning agents.

12. The manufacturers instructions and the applicable environmental requirements must be observed when disposing of powder lacquer and cleaning agents.

13. If any part of the spray gun is damaged (broken parts, tears) or missing then it should not be used.

14. For your own safety, only use accessories and attachments listed in the operating instructions. The use of other parts can lead to risk of injury. Only original ITW-Gema replacement parts should be used.

15. Repairs must only be carried out by specialists and under no circumstances should they be carried out in the operating area. The former protection must not be reduced.

16. Conditions leading to dangerous levels of dust concentration in the powder spraying booths or in the powder spraying areas must be avoided. There must be sufficient technical ventilation available, to prevent a dust concentration of more than 50% of the lower explosion limit (UEG) (UEG = max. permissible powder/air concentration). If the UEG is not known then a value of 10 g/m³ should be used.

A summary of the rules and regulations

The following is a list of relevant rules and regulations which are to be observed:

**Guidelines and regulations, German professional association**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGV A1</td>
<td>General regulations</td>
</tr>
<tr>
<td>BGV A2</td>
<td>Electrical equipment and material</td>
</tr>
<tr>
<td>BGI 764</td>
<td>Electrostatic coating</td>
</tr>
<tr>
<td>BGR 132</td>
<td>Guidelines for the avoidance of the dangers of ignition due to electrostatic charging (Guideline “Static Electricity”)</td>
</tr>
<tr>
<td>VDMA 24371</td>
<td>Guidelines for electrostatic coating with synthetic powder</td>
</tr>
<tr>
<td></td>
<td>- Part 1 General requirements</td>
</tr>
<tr>
<td></td>
<td>- Part 2 Examples of use</td>
</tr>
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</table>

**Leaflets**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>ZH 1/310</td>
<td>Leaflet for the use of tools in locations where there is danger of explosion</td>
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</tbody>
</table>

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General safety regulations OptiTronic CG03 Powder gun control unit
### EN European standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tbody>
<tr>
<td>RL94/9/EC</td>
<td>The approximation of the laws of the Member States relating to apparatus and safety systems for their intended use in potentially explosive atmospheres</td>
</tr>
<tr>
<td>EN 292-1</td>
<td>Machine safety 2)</td>
</tr>
<tr>
<td>EN 292-2</td>
<td></td>
</tr>
<tr>
<td>EN 50 014 to EN 50 020, identical: DIN VDE 0170/0171</td>
<td>Electrical equipment for locations where there is danger of explosion 2)</td>
</tr>
<tr>
<td>EN 50 050</td>
<td>Electrical apparatus for potentially explosive atmospheres - Electrostatic hand-held spraying equipment 2)</td>
</tr>
<tr>
<td>EN 50 053, part 2</td>
<td>Requirements for the selection, installation and use of electrostatic spraying equipment for flammable materials - Hand-held electrostatic powder spray guns 2)</td>
</tr>
<tr>
<td>EN 50 177</td>
<td>Stationary electrostatic spraying equipment for flammable coating powder 2)</td>
</tr>
<tr>
<td>PR EN 12981</td>
<td>Coating plants - Spray booths for application of organic powder coating material - Safety requirements</td>
</tr>
<tr>
<td>EN 60 529, identical: DIN 40050</td>
<td>IP-Type protection: contact, foreign bodies and water protection for electrical equipment 2)</td>
</tr>
<tr>
<td>EN 60 204, identical: DIN VDE 0113</td>
<td>VDE regulations for the setting up of high-voltage electrical machine tools and processing machines with nominal voltages up to 1000 V 3)</td>
</tr>
</tbody>
</table>

### VDE (Association of German Engineers) Regulations

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tbody>
<tr>
<td>DIN VDE 0100</td>
<td>Regulations for setting-up high voltage equipment with nominal voltages up to 1000V 4)</td>
</tr>
<tr>
<td>DIN VDE 0105</td>
<td>VDE regulations for the operation of high voltage equipment 4)</td>
</tr>
<tr>
<td>part 1</td>
<td>General regulations</td>
</tr>
<tr>
<td>part 4</td>
<td>Supplementary definitions for stationary electrical spraying equipment</td>
</tr>
<tr>
<td>DIN VDE 0147</td>
<td>Setting up stationary electrostatic spraying equipment 4)</td>
</tr>
<tr>
<td>part 1</td>
<td></td>
</tr>
<tr>
<td>DIN VDE 0165</td>
<td>Setting up electrical equipment in locations in areas with danger of explosion 4)</td>
</tr>
</tbody>
</table>

*Sources:*

1) Carl Heymanns Verlag KG, Luxemburger Strasse 449, 5000 Köln 41, or from the appropriate employers association

2) Beuth Verlag GmbH, Burgrafenstrasse 4, 1000 Berlin 30

3) General secretariat, Rue Bréderode 2, B-1000 Bruxelles, or the appropriate national committee

4) VDE Verlag GmbH, Bismarckstrasse 33, 1000 Berlin 12
Product specific security measures

- The installation work, to be done by the customer, must be carried out according to local regulations
- Before starting up the plant a check must be made that no foreign objects are in the booth or in the ducting (input and exhaust air)
- It must be observed, that all components are grounded according to the local regulations, before start-up
TECHNICAL DATA

OPTITRONIC - BASIS MODEL

Mains connection:
- Input voltage: 90-264 VAC
- Power consumption: 48 VA
- Frequency: 47-463 Hz
- Type of protection: IP5X ◀ FM ▶ IP54
- Temperature range: 0° C to +40° C
  (+32° F to +104° F)

Pneumatic data:
- Input pressure: 5.0 bar
- Max. water vapour content: 1.3 g/m³
- Max. oil vapour content: 0.1 mg/kg
  (Oil/Water)
- Max. compressed air consumption: 11 m³/h

Dimensions:
- Width: 203 mm
- Height: 174 mm
- Depth: 222 mm
- Weight: 4.8 kg

Attachable electrostatic guns:
- Nominal output voltage: 12 V (G2 guns)*
  10 V (G1 guns)*
- Automatic guns:
  PG 1-A* / PG 2-A* /
  GA 01 OptiGun 1*
- Manual guns:
  PG 1* / GM 01 EasySelect*
- Tribo guns:
  Connection possible

OPTITRONIC TYPE DEFINITION AND POSSIBLE OPTIONS
(see Control unit rear wall)

Example:
Label with Version number and Order number: V 2 386 162
(see Version table)

ABBREVIATIONS:

<table>
<thead>
<tr>
<th>FL</th>
<th>ZL</th>
<th>G1</th>
<th>G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL</td>
<td>ZL</td>
<td>GA 02 OptiGun 2 / PG 1 / PG 1-A / PG 2-A Guns</td>
<td></td>
</tr>
<tr>
<td>ZL</td>
<td>Supplementary air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1</td>
<td>GA 01 OptiGun 1 / GM 01 EasySelect Guns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G2</td>
<td></td>
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</tbody>
</table>
OPTITRONIC POWDER GUN CONTROL

ABOUT THESE OPERATING INSTRUCTIONS

These operating instructions contain all important information which is required to operate your OptiTronic powder coating equipment. It will guide you safely through the installation stage, give you notes and tips for the optimum use of your new powder coating equipment. Information about the functioning of individual system components will be found in the respective documentation.

Abbreviations used in these Operating Instructions:

- **EL**: Electrode rinsing air
- **FL**: Conveying air
- **FL_min**: Minimum powder output
- **GL**: Total air volume
- **HV_BG**: High-voltage setting
- **I_BG**: Current setting
- **PA%**: Powder output (percent)
- **SKW%**: Powder output correction value
- **ZL**: Supplementary air
The OptiTronic Control Unit was designed to meet the special requirements of job coaters.

**THE BASIC OPTITRONIC UNIT**

The OptiTronic Control Unit is a complete control unit for one powder gun.

The concept of the OptiTronic control unit permits the operator to adapt his individual solution requirements to his individual applications.

The control electronics, based on a micro-controller, makes it possible to expand the functions, with corresponding electronic modules, at any time.

The basic equipment contains all the control and monitoring functions required to operate a manual or an automatic powder gun.

See the Version tables to determine the equipment version, and for expanding existing equipment (Retrofitting) to another version.

All coating parameters (desired values and actual values) have their individual display and input unit to give the highest user-friendly operation.

Up to 255 coating programs can be stored and instantly recalled.

The stored programs help considerably to increase the repeatability of uniform coating results and quality, at any time, independent of the operator and type of powder used.

The powder volume is set independent from the total air volume. The allotment of the conveying air and supplementary air takes place automatically.

With freely selectable high-voltage or spraying current optimum high-voltage generation is guaranteed, also for the highest application demands.

Various diagnostic functions, indicated through LEDs and seven segment displays, increase the process reliability and make operation easier.

The most important characteristics of the OptiTronic are:

- 255 stored coating programs possible
  A coating program is composed of:
  - High-voltage (kV)
  - Spraying current (µA)
  - Electrode rinsing air (Nm³/h)
  - Powder output (%)
  - Total air volume (Conveying air + Supplementary air - Nm³/h)

- Individual inputs, and display windows for high-voltage, spraying current, electrode rinsing air, powder output, total air volume, and programs.
- High-voltage or spraying current setting
- Diagnostic functions
<table>
<thead>
<tr>
<th>Version</th>
<th>OptiTronic Order No.</th>
<th>G1*</th>
<th>G2*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>384 640</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>386 162</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

*G1 = GA02 OptiGun 2 / PG 1 / PG 1-A / PG 2-A
*G2 = GA01 OptiGun 1 / GM 01 EasySelect
The OptiTronic control unit is ready for use from the factory. Only certain cables and hoses must be connected by the customer.

The hose for the compressed air supply from the compressed air circuit is connected directly to the main air connection - **1.1 IN** on the rear of the control unit.

**NOTICE**

The main compressed air **input pressure** must be set at **5.0 bar**. The compressed air must be free from oil and water.

The red hose for the conveying air is connected to the corresponding output - **1.2** on the rear of the control unit and to the injector.

The black hose for the supplementary air is connected to the corresponding output - **1.3** on the rear of the control unit and to the injector.

The hose for the rinsing air is connected to the electrode rinsing air output - **1.4** and on the powder gun.

The grounding connection cable is connected to the control unit with the grounding screw, and the 5 m long grounding cable with the clamping clip on the booth or on the hanger device.

(continued)
Mains connection - 2.1 - The Main power supply cable is connected to the socket.

Gun 2 - 2.2 (Automatic Powder Gun OptiGun 1 / Manual Powder Gun EasySelect - Alternatively). The gun cable plug is connected to the socket with a 6 pin plug.

or

Gun 1 - 2.3 socket (GA02 OptiGun 2 / PG 1 / PG 1-A / PG 2-A Powder Guns - Alternatively) The gun cable plug is connected to the socket with a 7 pin plug.
DESCRIPTION OF FUNCTIONS

Each of the coating parameters of the OptiTronic control unit has its own display and its own operating area.

The Fault Diagnostic LEDs indicate certain equipment faults. The OptiTronic control unit is functioning correctly when the Diagnostic LEDs 1, 2, 3, and 4 are illuminated (green).

If any of the Diagnostic LEDs do not illuminate, please contact an ITW Gema Service Centre.

Functions of the Diagnostic LEDs:
1: +24 V DC internal power supply present - green
2: +15 V DC Internal power supply present - green
3: +5 V DC Internal power supply present - green
4: Main solenoid valve operating - green

The equipment is activated or deactivated with the Main Key pad. When the control is active the green OptiTronic LED (lower left) is illuminated. In addition, if the green System LED (upper left) is illuminated the equipment is released by external control and coating can be started.

- **kV** window for display and setting of High-voltage output
  (Setting range: 0-100 kV).
- **µA** window for display and setting of Spray current output
  (Setting range: 0-100 µA).
- **Electrode rinsing air** window for display and setting of the electrode rinsing air output.
  (Setting range: 0-2.8 m³/h. Default value 0.2 Nm³/h). The **Select** key pad is used for Swirl Air.
  (Setting range: 0-6.2 Nm³/h. Default value: 2.0 Nm³/h)
- **Powder output** window for display and setting of the powder output
  (Setting range: 0-100 %).
- **Total air volume** window for display and setting of the total air volume
  (Setting range: 1.8-8.0 Nm³/h).
- **Program Number** window for display and setting of the program number
  (Setting range: 1-255), as well as Fault message display and Fault message acknowledgement.

This LED (red) illuminates when there is a fault in the high-voltage system.

This LED (red) illuminates when there is a fault in the pneumatic system.

This LED (green) - **Remote** is not used.
SPECIAL FUNCTIONS

Special functions are:
1. System parameter selection
2. Throttle motor referencing
3. Powder output correction
4. Software version

Special functions can be activated after entering the Special Function mode, see below, by pressing any + or – key in the corresponding display area.

ENTERING THE SPECIAL FUNCTIONS MODE

Press the Main key pad (for approx. 10 secs) until the display no longer illuminates.

All the green Diagnostic LEDs should illuminate. If not, see “Description of Functions - Fault Diagnostic LEDs”

EXITING SPECIAL FUNCTIONS MODE

The Special Functions mode can be exited by pressing the Main Key pad. The switch-on counter will automatically reset to 30 when exiting the Special functions mode, irrespective of the number of times the control unit was switched on previously. The next time the control unit is switched on an automatic throttle motor referencing will take place.

SYSTEM PARAMETER SELECTION

1. Press the Main Key pad (for approx. 10 secs) until the display no longer illuminates.

2. The System Parameter mode is entered by pressing any + or – key in the kV or µA display area.

3. Select the system parameter (P00-P08/PE/PL) with the + or – key.

4. Change the system parameter value with the + or – key. (see System Parameter Table).

5. After the System parameters are reset, the throttle motors are also referenced when exiting the Special Functions mode.

6. The Special Functions mode can be exited by pressing the Main Key pad.
### SYSTEM PARAMETER TABLE

<table>
<thead>
<tr>
<th>Parameter number</th>
<th>Description</th>
<th>Values</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| **P0:**          | Option: FlowControl | **0: Basic setting** | Select gun type.  
- Control unit does not react to incorrect setting input.  
- No kV value displayed in normal mode |
| **P1:**          | Gun type | **0: Gun type - OptiGun 2 / PG**  
1: Gun type - EasySelect - OptiGun 1  
2: Tribo Gun type | |
| **P2:**          | Swirl air | **0: Basic setting** | |
| **P3:**          | Injector type | (Nozzle ø in mm) FL ZL  
0: PI 3 = 1.6 1.4  
1: PI 3 = 1.8 1.4  
2: PI 3 = 2.0 2.0  
3: EasyFlow = 1.6 1.4 | Select injector type, e.g.:  
- ø 1.6 mm - with notch.  
- ø 1.8 mm - without notch.  
Match the injector nozzle (FL), and throttle (ZL) with the corresponding injector. |
| **P4:**          | Gun deselection (OptiTronic Key) | **0: Basic setting** | |
| **P5:**          | System Signal | **0: Automatic equipment,**  
External system signal in manual and remote operation necessary  
1: Internal System release  
No external signal necessary (Demo Unit only)  
2-4: **Not used** | |
| **P6:**          | Communication | **0: Basic setting** | (continued) |

Abbreviations used on these pages:  
EL = Electrode rinsing air  
GL = Total air  
PA% = Powder output (in percent)  
ZL = Supplementary air
### SYSTEM PARAMETER TABLE (CONTINUED)

<table>
<thead>
<tr>
<th>Parameter number</th>
<th>Description</th>
<th>Values</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| P7:              | Display variant | 0: $\text{PA}\%$, $\text{GL m}^3/\text{h}$  
1: $\text{FL m}^3/\text{h}$, $\text{GL m}^3/\text{h}$ | Standard display. Display of individual air volumes FL and GL for checking purposes |
| P8:              | Not used | 0: Basic setting | |
| P9:              | Not used | 5: Basic setting | |
| PE:              | Not used | 3: Basic setting | |
| PL:              | Not used | 1: Basic setting | |
RESETTING THE THROTTLE MOTORS

The throttle motor reset is made at the first Start-up, after servicing or after application problems.

1. Enter the Special function mode by pressing the **Main Key pad** (for approx. 10 secs) until the display no longer illuminates.

2. The throttle motors can be reset (Zero setting for conveying air [**FL**], supplementary air [**ZL**], electrode rinsing air [**EL**]). The throttle motor reset is initiated by pressing the + key or – key of the display window.

3. Pressing a key once shows the number of times the main power supply has been switched on since the last throttle motor reset. The diode on the lower right, below the display window blinks. The throttle motor reset is activated by pressing the + or – key a second time. There should be three fairly loud noises, one for each motor, one after the other. The display returns to 00.

   **Switch-on counter**

   *If the control unit is switched on 30 times and throttle motor referencing has not been done within this number of times, a throttle motor referencing will take place automatically.*

   *The counter will reset to zero.*

4. The Special Functions mode can be exited by pressing the **Main Key pad**.

**THROTTLE MOTORS - CONVEYING AIR, SUPPLEMENTARY AIR, RINSING AIR**

The throttle motors must be calibrated after every manual change. (see Resetting the throttle motors, and Electrical Block diagram).

If the cable connections of the throttle motors are disconnected, care must be take to see that the cables are marked for the correct reconnection on the Main board (see also "Electrical diagrams")

- X11 Conveying air
- X12 Supplementary air
- X13 Rinsing air

**POWDER OUTPUT CORRECTION MODE**

The OptiTronic control unit makes possible the accommodation of the differing powder outputs in the plant caused by differing powder hose lengths and geometry to the individual guns. The minimum powder output (**FL_min**) and the maximum powder output (**SKW%**) can be accommodated for with two parameters.

**ABBREVIATIONS:**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EL</strong></td>
<td>Electrode rinsing air</td>
</tr>
<tr>
<td><strong>FL</strong></td>
<td>Conveying air</td>
</tr>
<tr>
<td><strong>FL min</strong></td>
<td>Minimum powder output</td>
</tr>
<tr>
<td><strong>SKW%</strong></td>
<td>Powder output correction value</td>
</tr>
<tr>
<td><strong>ZL</strong></td>
<td>Supplementary air</td>
</tr>
</tbody>
</table>
POWDER OUTPUT CORRECTION MODE (CONTINUED)

Powder output correction is made at the first Start-up, after servicing, after application problems or when hoses with a different diameter to that used previously.

To enter the Powder Output Correction mode, press the Main Key pad (for approx. 10 secs) until the display no longer illuminates.

1. The value for minimum powder output (FL_min) is set with the + or – keys in the display window.

2. The Output correction value for the maximum powder output (SKW%) is set with the + or – keys in the display window.

3. The Special Functions mode can be exited by pressing the Main Key pad.

CARRYING OUT A POWDER OUTPUT CORRECTION

The settings in the following example are carried out on each gun individually.
Powder output correction is made at the first Start-up, after servicing, after application problems or when hoses with a different diameter to that used previously.

Create a table with an entry for each powder gun similar to that illustrated in section “Example of a table for powder output correction” The table will be useful after a System Reset.

The following table contains values which can be used for setting up the OptiTronic Powder Control Unit

<table>
<thead>
<tr>
<th>Total air volume (Nm³/h)</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction value</td>
<td></td>
</tr>
<tr>
<td>FL_min</td>
<td>1.8</td>
</tr>
<tr>
<td>SKW%</td>
<td>100</td>
</tr>
</tbody>
</table>

ABBREVIATIONS:

FL Conveying air
SKW% Powder output correction value
STARTING POSITION

1. Select program number 001 in the Program display window.

2. Set the total air volume to 5.0 Nm³/h in the display window, if not already set to this value. Set the powder output to 00 (%) in the display window.

3. Switch to the Special Functions mode by pressing the Main Key pad (for approximately 10 seconds) until the display no longer illuminates.

4. Set the powder output value (FL_min) for minimum powder output 1.8 (Nm³/h) in the display window.

5. Set the Powder output correction value (SKW%) for a maximum powder output to 100 % in the display window.

Exit the Special Function mode by pressing the Main Key pad.

For the next steps a measuring bag is necessary for weighing the powder output. If possible, one bag should be used for each gun. Note the weight of the individual measuring bag.

6. Place the neck of the empty measuring bag tightly over the powder gun nozzle so that it does not slide off during the measuring and switch on the powder gun for 60 seconds.

7. After the time has elapsed, switch off the gun and remove and weigh the bag. The weight of the powder should be between 10-15 g.

8. If no powder is expelled from the gun, return to the Special Functions mode and increase the powder output to between 1.8-2.4 (Nm³/h) for a minimum powder output.

9. Repeat Steps 6 and 7 until the weight of the powder output is within 10-15 g. Note the minimum powder output value FL_min in the table.

(continued)

ABBREVIATIONS:

FL  Conveying air
SKW% Powder output correction value
10. Exit the Special Functions mode by pressing the **Main Key pad**.

11. Now set the powder output to **80 (%)** in the display window.

12. Place the empty measuring bag tightly over the powder gun nozzle and switch on the powder gun for **60 seconds**.

13. Switch off the gun after 60 seconds. Weigh the bag.

14. Enter the value of the maximum powder output (**g/min**) in the table.

Calculate the powder output correction according to the formula:

\[
SKW\% = \frac{\text{smallest powder output}}{\text{measured powder output}} \times 100
\]

15. Fill in the calculated value in the table and then repeat the step 3 for setting the corresponding **SKW%** value in the display window on the control unit.

### EXAMPLE OF A POWDER OUTPUT CORRECTION TABLE.

<table>
<thead>
<tr>
<th>Gun</th>
<th>Powder output correction</th>
<th>Powder output w/o correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>FL_min (Nm³/h)</td>
<td>SKW (%)</td>
</tr>
<tr>
<td>1</td>
<td>1.7</td>
<td>100 %</td>
</tr>
<tr>
<td>2</td>
<td>1.8</td>
<td>(200/250) · 100 = 80 %</td>
</tr>
<tr>
<td>3</td>
<td>2.6</td>
<td>(200/280) · 100 = 71 %</td>
</tr>
</tbody>
</table>

### SOFTWARE VERSION

1. To determine the Software Version, press the **Main Key pad** (for approx. 10 secs) until the display no longer illuminates.

2. The software version is called up by pressing the **+** or **−** keys of the **Program** display.

3. The software version number of the OptiTronic operating program is displayed.

4. The Special Functions mode can be exited by pressing the **Main Key pad**.

### ABBREVIATIONS:

- **FL_min**: Minimum powder output air
- **SKW%**: Powder output correction value
SYSTEM RESET

A System Reset is initiated at the first Start-up, and at function fault.

A System Reset over-writes all 255 programs with default values and the system parameters are returned to their original factory settings.

1. Switched off the OptiTronic control unit with the Main power switch on the control cabinet. Do not switch off the booth etc.  
2. Hold the Main Key pad pressed and switch on the Main power switch. After approximately 15 seconds the actual program numbers 001-255 appear in the Program display window and the programs are individually reset to the factory default values. The Main Key pad only has to be pressed until the program numbers start to run through in rapid succession in display window. Fault diagnostic LED 4 is OFF during a Reset After a System Reset the system parameters must be checked that they are correct.

ABBREVIATIONS:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_min</td>
<td>Minimum powder output air</td>
</tr>
<tr>
<td>SKW%</td>
<td>Powder output correction value</td>
</tr>
</tbody>
</table>
### Fault Message Table

When a fault is present in the system the cause must be eliminated before further operation is possible. When the fault has been eliminated, this is acknowledged by pressing the + or – key of the Program display.

<table>
<thead>
<tr>
<th>Air Supply</th>
<th>Fault Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H01</td>
<td>Check system parameter P0 and set P0 = 0 on the basis control without FlowControl</td>
</tr>
<tr>
<td>H02 (only when FlowControl is fitted)</td>
<td>Check system parameter P0 and set P0 = 0 on the basis control without FlowControl</td>
</tr>
<tr>
<td>H03 (only when FlowControl is fitted)</td>
<td>Check system parameter P0 and set P0 = 0 on the basis control</td>
</tr>
<tr>
<td>H04</td>
<td>EL 1 Solenoid valve error, set System parameter P5 = 0 for Automatic equipment. P5 = 1 for Demo equipment.</td>
</tr>
<tr>
<td>H05</td>
<td>The desired Total Air is too little. Increase the programmed value for the Total Air or make the FL_min of the powder output correction smaller</td>
</tr>
<tr>
<td>H06</td>
<td>Main solenoid valve fault. Connection cable from the main solenoid valve to the basic electronics missing. Check the main solenoid valve.</td>
</tr>
<tr>
<td>H07</td>
<td>The desired supplementary air volume is too large (ZL_max.). Decrease the programmed value for the total air volume and/or increase the programmed value for the powder output volume.</td>
</tr>
<tr>
<td>H08</td>
<td>The desired conveying air volume is too large (FL_max.). Decrease the programmed value for the total air volume and/or decrease the programmed value for the powder output volume.</td>
</tr>
<tr>
<td>H09</td>
<td>The Daily Correction Value multiplied with the desired value of the powder output is greater than 100 %. (Acknowledge error and decrease the Daily Correction Value via the PLC)</td>
</tr>
</tbody>
</table>

**High-voltage**

| H10                 | Cascade produces a too high voltage. Check the basic electronics and gun |
| H11                 | Check the system parameter P1 (Gun type) Check the gun cable for breaks. Replace gun. |

(continued)
### General Faults

<table>
<thead>
<tr>
<th>Air Supply</th>
<th>Fault description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H19</td>
<td>EL 2 Solenoid valve error (not used).</td>
</tr>
<tr>
<td>H20</td>
<td>Check the 24 V DC internal Power supply. The 24 V DC voltage is higher than the nominal voltage - 24 V DC +10 %</td>
</tr>
<tr>
<td>H21</td>
<td>Check the 24 V internal DC Power supply. The 24 V DC voltage is lower than the nominal voltage - 24 V DC -10 %</td>
</tr>
<tr>
<td>H22</td>
<td>Fault in the 15 V DC power supply to basic electronics. Contact an ITW Gema Service Centre.</td>
</tr>
<tr>
<td>H23</td>
<td>EEPROM fault. Contact an ITW Gema Service Centre.</td>
</tr>
<tr>
<td>H24</td>
<td>EEPROM writes Timeout. Contact an ITW Gema Service Centre.</td>
</tr>
</tbody>
</table>
SYSTEM RELEASE AND POWDER COATING

For technical safety reasons the OptiTronic control unit should only be released after fulfilling all the required safety conditions (e.g. Fire protection etc.). The release is activated through the „2.1 Mains connection“ input.

Connection No. 3: System release - LED "System" illuminates green.

Input voltage: 90-264 VAC

The OptiTronic is ready for powder coating when:

a) The equipment is selected: LED "OptiTronic" illuminates (green)

b) Control voltage for System Release is present: LED "System" illuminates (green)

c) - Automatic gun connected: Powder output
   - Manual gun connected: Trigger pulled - Powder

DEMO UNIT

The control unit can be used as a "stand alone" unit for coating individual parts or small series. So that the equipment receives a system release in this function (compare above), the parameter mode of "P5" is set to “1”. Because of this, the Demo unit does not have to have an external control voltage present for system release.

The System parameter P5 must never be set to “1” in a complete powder coating plant, otherwise the powder guns will be switched on unintentionally!
GUIDE VALUES - APPLICATION

All values in these tables are guide values. Different ambient conditions, wear, and different types of powder can alter the values in the tables.

GENERAL CONDITIONS FOR PI 3 / EASYFLOW INJECTORS

<table>
<thead>
<tr>
<th>Powder type:</th>
<th>Epoxy/Polyester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powder output</td>
<td>m</td>
</tr>
<tr>
<td>Powder hose ø</td>
<td>mm</td>
</tr>
<tr>
<td>Input pressure</td>
<td>bar</td>
</tr>
<tr>
<td>Conveying air nozzle ø - PI 3 / EasyFlow</td>
<td>mm</td>
</tr>
<tr>
<td>Supplementary air nozzle ø - PI 3 / EasyFlow</td>
<td>mm</td>
</tr>
</tbody>
</table>

GUIDE VALUES FOR OPTITRONIC WITH PI 3 / EASYFLOW INJECTORS

<table>
<thead>
<tr>
<th>Total air</th>
<th>4 Nm³/h</th>
<th>5 Nm³/h</th>
<th>6 Nm³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powder output</td>
<td>g/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>20</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>30</td>
<td>85</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>40</td>
<td>110</td>
<td>130</td>
<td>150</td>
</tr>
<tr>
<td>50</td>
<td>130</td>
<td>160</td>
<td>175</td>
</tr>
<tr>
<td>60</td>
<td>150</td>
<td>180</td>
<td>210</td>
</tr>
<tr>
<td>70</td>
<td>175</td>
<td>200</td>
<td>235</td>
</tr>
<tr>
<td>80</td>
<td>200</td>
<td>240</td>
<td>270</td>
</tr>
<tr>
<td>90</td>
<td>215</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>235</td>
<td>290</td>
<td></td>
</tr>
</tbody>
</table>

SPRAY CURRENT LIMITING GUIDE VALUES

Spraying current limiting enables:
- achievement of greater stability in the coating process.
- greater reproducibility, where only the High-voltage varies.
- constant current values.

µA window for display and setting of the Spray current output with the + or – keys (Setting range: 0-100 µA).

<table>
<thead>
<tr>
<th>High-voltage</th>
<th>with SuperCorona</th>
<th>without SuperCorona</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kV</td>
<td>Flat parts: 50 µA (± 20)</td>
<td>Flat parts: 15 µA (± 10)</td>
</tr>
<tr>
<td>100 kV</td>
<td>Profiles: 60 µA (± 10)</td>
<td>Profiles: 25 µA (± 5)</td>
</tr>
<tr>
<td>100 kV</td>
<td>Spray-over: 20 µA (± 10)</td>
<td>Spray-over: 5 µA (± 5)</td>
</tr>
</tbody>
</table>
VARIOUS FUNCTIONS ARE REMOTELY CONTROLLED WITH THE AID OF THE + AND - KEYS ON THE REAR OF THE GUN:

1. **Press the + and - keys on the gun simultaneously.**

   - Press 1x = Prog. no. 1 LED: red
   - Press 2x = Prog. no. 2 LED: green
   - Press 3x = Prog. no. 3 LED: red/green blinking (approx. 1 Hz)

   **Set with OptiTronic control:**
   - Program no. 4-255 LED: red/green blinking (approx. 2 Hz)

Check by observing the LED display on the gun.

**Remote control locked due to:**
- Error display,
- Local operation or
- Remote OptiTronic operation: LED: red and green

2. **Change the powder output.**
   - Press the + or - key on the gun. The powder output will be correspondingly increased or decreased.
## PIN ALLOCATION

### MAIN POWER SUPPLY CABLE SOCKET 2.1

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neutral conductor (Power supply)</td>
</tr>
<tr>
<td>2</td>
<td>Line (Power supply)</td>
</tr>
<tr>
<td>3</td>
<td>System ON /OFF (Gun release) (90-264 VAC)</td>
</tr>
<tr>
<td>PE</td>
<td>Ground PE</td>
</tr>
</tbody>
</table>

### SOCKET 2.2 - GUN 2 (EASYSELECT / OPTIGUN 1 POWDER GUN PLUG)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+15 V DC power supply Gun electronics</td>
</tr>
<tr>
<td>2</td>
<td>Oscillator control 0-10 V DC</td>
</tr>
<tr>
<td>3</td>
<td>GND / Trigger connection 1</td>
</tr>
<tr>
<td>4</td>
<td>Trigger connection 2</td>
</tr>
<tr>
<td>5</td>
<td>Remote control</td>
</tr>
<tr>
<td>6</td>
<td>Ground PE</td>
</tr>
<tr>
<td>Housing</td>
<td>Screen</td>
</tr>
</tbody>
</table>

### SOCKET 2.3 - GUN 1 (GA02 OPTIGUN 2 / PG 1 / PG 1-A / PG 2-A POWDER GUN PLUG)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND Oscillator signal</td>
</tr>
<tr>
<td>2</td>
<td>- - - - -</td>
</tr>
<tr>
<td>3</td>
<td>Trigger connection 1</td>
</tr>
<tr>
<td>4</td>
<td>Trigger connection 2</td>
</tr>
<tr>
<td>5</td>
<td>Tribo electrode</td>
</tr>
<tr>
<td>6</td>
<td>Signal Oscillator</td>
</tr>
<tr>
<td>7</td>
<td>Ground PE</td>
</tr>
</tbody>
</table>
**BLOCK DIAGRAM: OPTITRONIC CONTROL UNIT**

**ELECTRICAL DIAGRAMS**

Figure 2

- Conveying air
- Rinsing air
- Supplementary air
- Trigger valve

**CG02 DISPLAY**

- NR. 380601

**CG02 MAINBOARD**

- NR. 379778

**CG03 POWER SUPPLY**

- NR. 389277

**CG03 POWER ADAPTER**

- NR. 388297

**MAIN CONNECTION 100-240VAC**

**GUN 2**

- GA01
- GM01

**GUN 1**

- PG1-A
- PG2-A
- PG1
- GA02

"Mx" - Throttle motors

*see Version table
**BLOCK DIAGRAM: CONNECTIONS TO MAIN BOARD (1) - OPTITRONIC CONTROL UNIT**

See next page (from here)
BLOCK DIAGRAM: CONNECTIONS TO MAIN BOARD (2) - OPTITRONIC CONTROL UNIT

See previous page (from here)

Figure 4

Colour code

- bl = blue
- br = brown
- ge = yellow
- or = orange
- sw = black
- ws = white

Trigger Valve

Conveying air

Supplementary air

Rinsing air

1.2

1.3

1.4

X21

CG02 DISPLAY

NR. 380601

CG02 MAINBOARD

X11

X12

X13

CG02 DISPLAY

NR. 379875

SWITCH PANEL

NR. 359595

X8

FÖRDERLUFT

ZUSATZLUFT SPÜLLUFTTRIGGER VENTIL

See previous page (from here)
Figure 5

DR = Pressure reducing valve (12 gun)
EL = Electrode rinsing
FL = Conveying air
M1 = Throttle motors
SV = Solenoid valve - 24 V DC
ZL = Supplementary air

MV (Y1) Input pressure
ZL (1.3)
FL (1.2)
EL (1.4)

5.5-8.0 bar
5.0 bar
(1.1 IN)
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** OptiTronic, **Serial No.**: XXX XXX
2. **Order No.**: 221 873, 5 pieces, 2 AT fuse

When ordering cable and hose material the length required must be given.

The spare part numbers of yard/meter 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 for plastic powder hoses are given as external diameter (o/d) and internal diameter (i/d):

*e. g.*

ø 8 / 6 mm, 8 mm outside diameter / 6 mm inside diameter (i/d).
OPTITRONIC CONTROL UNIT

Version 1 - GA or GM Gun
Version 2 - PG Guns

Example: CG 03 OptiTronic Powder Gun Control unit, Version 2
Rear plate with connections
(see also "OptiTronic Version Table", and "Conversion Table")

ABBREVIATIONS:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG</td>
<td>GA02 OptiGun 2 / PG 1 / PG 1-A / PG 2-A = G1 = Gun 1</td>
</tr>
<tr>
<td>GA / GM</td>
<td>GA01 OptiGun 1 / GM 01 EasySelect = G2 = Gun 2</td>
</tr>
</tbody>
</table>

Figure 6
OPTITRONIC CONTROL UNIT - COMPLETE

2  CG Front plate - complete  379 794
4  EPROM 27C512-70 - Software version 2.XX*  387 037

Figure 7
### PNEUMATICS

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Throttle motor - FL or ZL - complete</td>
<td>380 555</td>
</tr>
<tr>
<td>2</td>
<td>Throttle motor - EL - complete</td>
<td>380 563</td>
</tr>
<tr>
<td>3</td>
<td>Main solenoid valve - 24 V DC - complete</td>
<td>262 455</td>
</tr>
<tr>
<td>4</td>
<td>Power adapter</td>
<td>388 297</td>
</tr>
<tr>
<td></td>
<td>Fuse - 2 AT</td>
<td>221 872</td>
</tr>
</tbody>
</table>

---

Figure 8
POWER SUPPLY

1  CG 03 Power supply  389 277
    Fuse - 4 AF - 250 V       262 897