Operating instructions and Spare parts list

# Gun control unit OptiStar 4.0 (CG21)


Translation of the original operating instructions

Gema

**Documentation OptiStar 4.0 (CG21)**



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Gema Switzerland GmbH
Mövenstrasse 17
9015 St.Gallen
Switzerland

Phone: +41-71-313 83 00
Fax.: +41-71-313 83 83

E-mail: info@gema.eu.com

# Technical Data

## Connectable guns

| OptiStar 4.0 (CG21) | connectable |
|---|---|
| OptiSelect Pro Type GM04 | yes |
| OptiSelect Pro Type GM04-CF | yes** |
| OptiSelect type GM03 | yes* |
| TriboJet | yes** |

* The PowerBoost functionality is not available

** The gun type must be configured (refer to chapter "Typical properties – Characteristics of the functions").
The Tribo gun the gun is not type approved (ATEX).

**WARNING**

**The gun control unit may only be used with the specified gun types!**

## Electrical data

| OptiStar 4.0 (CG21) | |
|---|---|
| Nominal input voltage | 100-240 VAC |
| Frequency | 50-60 Hz |
| Fluctuations of the power supply | ± 10 % |
| Overvoltage category | OVC II |
| Connected load | 40 VA |
| Nominal output voltage (to the gun) | 12 V |
| Nominal output current (to the gun) | 1.2 A |
| Connection and output for vibrator (on Aux output) | 110/230 VAC<br>max. 100 W |
| Connection for rinsing function (valve) | 24 VDC<br>max. 3 W |
| Protection type | IP54 |
| Approvals | CE 0102 Ex II 3 (2) D<br>PTB17 ATEX 5002 |

## Pneumatic data

| OptiStar 4.0 (CG21) | |
|---|---|
| Compressed air connection | 8 mm |
| Max. input pressure | 5.5 bar / 80 psi |
| Max. water vapor content of the compressed air | 1.3 g/m³ |
| Max. oil vapor content of the compressed air | 0.1 mg/m³ |

## Dimensions

| OptiStar | |
|---|---|
| Width | 173 mm |
| Depth | 250 mm |
| Height | 177 mm |
| Weight | approx. 2.6 kg |

## Powder output (reference values)

### *General conditions for the OptiFlow Injector*

| Powder type | Epoxy/polyester |
|---|---|
| Powder hose Ø (**mm**) | 11 |
| Type of powder hose | POE with guide strips |
| Input pressure (**bar**) | 5.5 |
| Correction value C0 | Powder output zeroing adjustment |

### *Guide values for OptiStar with OptiFlow Injector*

All values in these tables are guide values for new nozzle inserts. Differing environmental conditions, wear and different powder types can affect the table values.

| **Hose internal diameter (mm)** | | **Ø 11** | | | | | |
|---|---|---|---|---|---|---|---|
| **Hose length (m)** | | **6** | | **12** | | **18** | |
| **Total air volume (Nm³/h)** | | **3.5** | **5.5** | **3.5** | **5.5** | **3.5** | **5.5** |
| | | **Powder output (g/min)** | | | | | |
| **Powder output (%)** | **20** | 90 | 105 | 65 | 75 | 45 | 60 |
| | **40** | 170 | 205 | 135 | 150 | 100 | 120 |
| | **60** | 235 | 280 | 185 | 215 | 145 | 170 |
| | **80** | 290 | 350 | 235 | 270 | 185 | 220 |
| | **100** | 340 | 405 | 280 | 320 | 220 | 260 |

## Air flow rates

The total air consists of conveying air and supplementary air, in relation to the selected powder quantity (in %). As a result the total air volume is maintained constant.

| OptiStar 4.0 (CG21) | Range | Factory setting |
|---|---|---|
| **Flow rate – fluidizing air:** | | |
| – Device type B | 0-1.0 Nm³/h | 0.1 Nm³/h |
| – Device type F (without AirMover air requirements) / L | 0-5.0 Nm³/h | 1.0 Nm³/h |
| – Device type S (with optional fluid plate) | 0-1.0 Nm³/h | 0.1 Nm³/h |
| **Electrode rinsing air flow rate** | 0-5.0 Nm³/h | 0.1 Nm³/h |
| **Flow rate total air (at 5.5 bar)** | 5 Nm³/h | |
| – Conveying air flow rate | 0-5.5 Nm³/h | |
| – Supplementary air flow rate | 0-5.5 Nm³/h | |

▶ **The max. total air consumption during the coating operation is < 5,5 Nm³/h:**
- Total air = 5 Nm³/h (conveying air + supplementary air)
- Electrode rinsing air = 0,1 Nm³/h (flat jet nozzle)

▶ **The total air consumption for the device is determined based on the 3 configured air values (without AirMover air value for device type F).**
- These values apply for an internal control pressure of 5.5 bar!

## Environmental conditions

| OptiStar 4.0 (CG21) | |
|---|---|
| Utilization | in the interior |
| Height | up to 2 000 m |
| Temperature range | +5 °C - +40 °C<br>(+41 °F - +104 °F) |
| Max. surface temperature | +85 °C (+185 °F) |
| Maximum relative humidity | 80 % for temperatures to 31 °C, linearly decreasing to 50 % relative humidity at 40 °C |
| Environment | not for wet environment |
| Degree of pollution of the intended environment | 2 (in accordance with DIN EN 61010-1) |

## Sound pressure level

| OptiStar 4.0 (CG21) | |
|---|---|
| Normal operation | < 60 dB(A) |

The sound pressure level was measured while the unit was in operation; measurements were taken at the most frequent operator positions and at a height of 1.7 m from the ground.

The specified value is applicable only for this product itself and does not take into account external noise sources or cleaning impulses.

The sound pressure level may vary, depending on the product configuration and space constraints.

## Rating plate

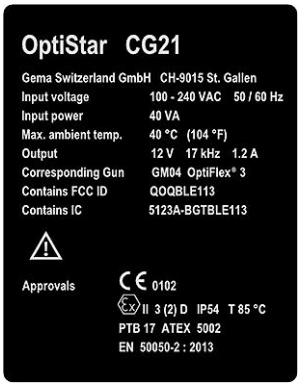



*fig. 2*

# Compatibility and interactions

The gun control unit is used for the following manual equipment from the OptiFlex line:

- OptiFlex B/Q (with powder box)
- OptiFlex F (with fluidized powder hopper)
- OptiFlex S (with stirrer container)
- OptiFlex C (with application cup)
- OptiFlex CF (with funnel cup)
- OptiFlex L (with lab device)
- OptiFlex W, K (Kits)
- OptiFlex Dual Gun Kit B, F
- OptiFlex Dual Gun Wall Kit B, F

# Design and function

## Overall view


*Fig. 3*

1 Front plate with control and display elements
2 Enclosure
3 Back panel with interfaces

# Operating elements

## *Displays*

**The desired and actual values are distributed across several levels.**

- The key is used to switch between the levels.
- If no controls are used within 6 s, the device automatically returns to level 1.

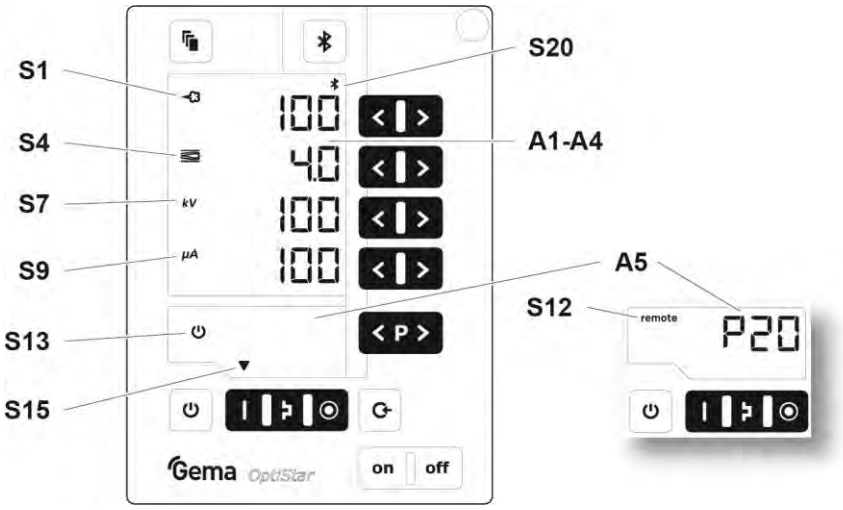



*fig. 4: Displays, Level 1*

| Designation | Function |
|---|---|
| **A1-A4** | Display of actual values, desired values and system parameters<br>– Flashes if the possible range is exceeded. |
| **A5** | Display of program numbers, error diagnosis codes and status information |
| **S1** | Powder output (display in %) |
| **S4** | Total air volume (display in Nm³/h) |
| **S7** | High voltage (display in kV) |
| **S9** | Spraying current (display in µA) |
| **S12 remote** | Remote operation mode, no local operation possible<br>– Remote operation mode is used as keyboard lock, reduced operation is possible |
| **S13** | Activation of vibration/fluidization |
| **S15** | Display of predefined operating modes or display of cleaning mode during cleaning |
| **S20** | – Display of readiness for pairing the Bluetooth module with a mobile device (green)<br>– Display of an active connection (blue) |

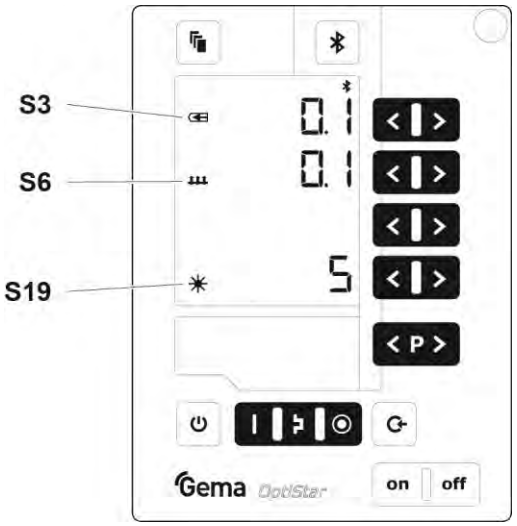



*fig. 5: Displays and LEDs, Level 2*

| Designation | Function |
|---|---|
| **S3** | Electrode rinsing air* (display in Nm³/h) |
| **S6** | Fluidizing* (display in Nm³/h) |
| **S19** | Display background illumination (0-8) |

* The value for this function cannot be set for the OptiSelect Pro GM04-CF gun type.

## *Input keys and switches*

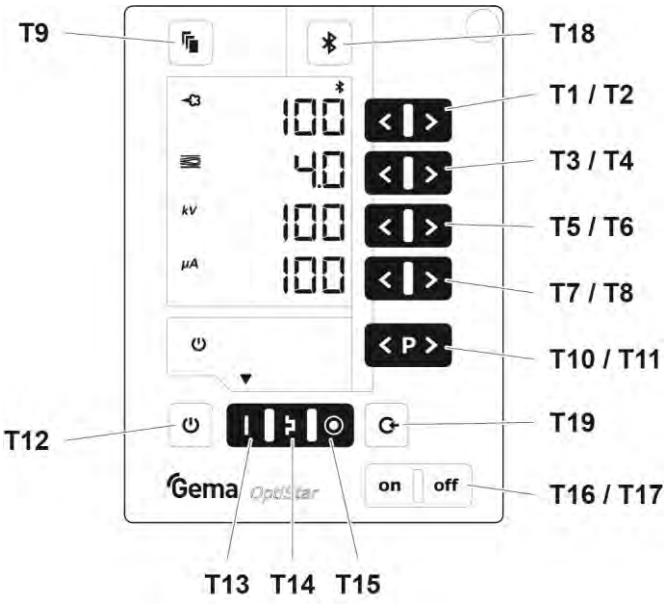



*fig. 6: Input keys and switches*

| Designation | Function |
|---|---|
| **T1-T8** | Input keys for desired values and system parameters |
| **T9** | Switch between display levels |
| **T10-T11** | Program change |
| **T12** | – Switching on and off the fluidization (equipment type F)<br>– Switch on/off for vibration and fluidization (equipment type B)<br>– Switching on and off the stirrer (equipment type S)<br>– Switchover to system parameter mode (press for at least 5 secs.) |
| **T13** | Preset mode for flat parts (fixed values) |
| **T14** | Preset mode for complex parts with depressions (fixed values) |
| **T15** | Preset mode for overcoating parts already coated (fixed values) |
| **T16/T17** | Power switch On/Off |
| **T18** | – Activation of the pairing readiness from the Bluetooth module to the mobile device (press for at least 2 seconds)<br>– Display of the ID number (press for a short time) |
| **T19** | – Switching on the rinsing mode (PowerClean) with optional PowerClean module<br>– Terminating the rinsing mode (PowerClean) with optional PowerClean module |

# Connections

## *Compressed air hoses / cables*


*fig. 7: Connections*

| Connection | Description |
|---|---|
| **1.1 Main air IN** | Compressed air connection |
| **2.1 Power IN** | Mains cable connection |
| **2.2 Aux** | Vibration motor connection for equipment type B |
| **2.3 Gun** | Gun cable connection |
| **2.4 Power Clean** | Connection to rinsing module |
| **1.2** | Conveying air connection |
| **1.3** | Supplementary air connection |
| **1.4** | Electrode rinsing air connection |
| **1.5** | Fluid air connection |
| | Grounding connection |

## *Pin assignment*

2.1

**Power IN connection**

| | |
|---|---|
| 1 | Neutral conductor (power supply) |
| 2 | Phase (100-240 VAC) |
| 3 | Output vibrator or stirrer |
| PE | PE grounding |

2.2

**Aux Connection**

| | |
|---|---|
| 1 | Neutral conductor |
| 2 | Output vibrator, phase |
| 3 | Not used |
| PE | PE grounding |

2.3

**Gun connection**

| | |
|---|---|
| 1 | Ground |
| 2 | Remote control 1 (GM03) |
| 3 | Ground |
| 4 | Trigger |
| 5 | Remote control 2 (GM03) |
| 6 | Oscillator |
| 7 | PE grounding |

2.4

**PowerClean Connection**

| | |
|---|---|
| 1 | Ground |
| 2 | +24 VDC |
| 3 | Not used |
| PE | PE grounding |

# Scope of delivery

– Power cable (country-specific)

– Quick-start guide and operating manual

# Typical properties – Characteristics of the functions

## Operating modes

The gun control unit has two operating modes.

### *Predefined operating mode (Preset mode)*

The gun control unit has three preset application modes:

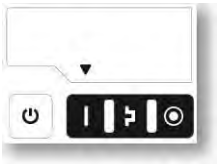


*Fig. 8*

**Application mode for flat parts**
This application mode is suitable for the coating of simple, flat workpieces without larger cavities.

**Application mode for complicated parts**
This application mode is suitable for the coating of three-dimensional workpieces with complex shapes (e.g. profiles).

**Application mode for recoating parts already coated**
This application mode is suitable for the overcoating of workpieces which are already coated.

In this operating modes, current (**µA**) and high voltage (**kV**) are preset, while powder and air volumes can be set and stored for each application mode.

### *Adjustable operating mode (Program mode)*

In this operating mode, 20 individually definable programs (P01-P20) are available. These programs are automatically saved and can be recalled again as the application requires.

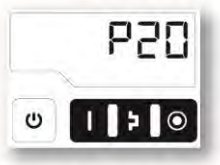



*fig. 9*

The values for current, high voltage, powder output, total air and electrode rinsing air can be set as needed for a given application.

**The settings defined in the 20 programs and 3 application modes are automatically stored, without confirmation!**

### *Precise Control of spraying Current (PCC Mode)*

For coating components with both complex and simple geometries, a spraying current of below 10 µA can be selected to prevent unintended overcoating on the simpler surfaces. This is especially important in combination with high loading powders (such as metallic). The controller automatically switches into "PCC mode". This allows for very fast yet highly precise control. The high voltage and spray current values and their symbols are depicted in red:


*Fig. 10: PCC mode*

### *Maximum coating performance (PowerBoost Mode)*

For maximum coating performance, both the spray voltage and the spray current can be set to a fixed value of 110 kV / 110 µA. This functionality is particularly suitable for coating large-surface components with both simple and complex geometries in combination with high powder output.

The control unit automatically switches to PowerBoost mode when the spray voltage value above 100 kV is selected.

The high voltage and spray current values and their symbols are depicted in red:


*fig. 11: PowerBoost Mode*

## Communication with the Gema electrostatic app

The control unit is prepared for communication* with the Gema electrostatic app.

**The electrostatic app is optimized for mobile devices with a screen diagonal up to 15 cm (6").**

The app enables customers to improve their productivity by providing the following areas:

| | |
|---|---|
|  Application | All important application parameters are clearly displayed on the mobile device and can be adapted immediately. |
|  Line management | The coating productivity data can be retrieved at any time. Statistics and cost estimates of the order are generated automatically. Maintenance can be scheduled. |
|  Setup | This configures the OptiStar control unit. The OptiStar can be controlled individually or as a participant in a group.<br>System information and diagnostic data can easily be retrieved and sent as e-mail. |
|  Service | Enables direct access to the operating instructions of the system components and to the Gema website. |

The secure connection between the control unit and the device can be established very easily with the help of the key.

The prerequisite for this is that every control unit in the system already has its own Bluetooth ID number. See chapter "System parameter P11 (Bluetooth ID no.)" on page 37.

A description of the app can be found in a separate manual.

* Disabled in network operation

## Rinsing mode

The PowerClean mode is used to blow powder accumulations and moisture out of the powder hose, injector, and gun using compressed air.

The device provides three rinsing modes:

| Rinsing mode | PowerClean™ module (Option) | Compressed air volume flow |
|---|---|---|
| simple rinsing mode | without | approx. 10 Nm³/h |
| PowerClean™ Mode | with | approx. 25 Nm³/h |
| PowerClean™ Mode (for equipment type Q) | with | approx. 25 Nm³/h |

The desired rinsing mode must be set in the system parameter P01 (see "Entering the system parameters").

▶ **The rinsing mode can only be activated from standby mode, namely by pressing the P key on the gun remote control or the key on the gun control unit.**

– See chapter "Rinsing mode" on page 47.

The rinsing mode is signalized by a circling LCD segment on the display:

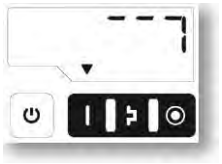


*fig. 12: Rinsing mode active*

The rinsing procedure is stopped by pressing the gun trigger.

Once the cleaning mode is quit, the unit automatically returns to the last program.

## Remote control by gun

Various functions can be remotely controlled using the buttons on the rear side of the powder gun (OptiSelect Pro GM04 gun type).

▶ **The respective option is set in the OptiStar control unit in accordance with system parameter P12.**

| | |
|---|---|
| **0** | – Modify the powder output (press the **Λ** or **V** key on the gun. The powder output will be increased or decreased accordingly)<br>– Switch to PowerClean mode (Press **P** button) |

or

| | | |
|---|---|---|
| **1** | – | Change programs (press the **Λ** or **V** key on the gun. It is switching between programs P01-P20. To be able to use this function, it must first be activated. |
| | – | Switch to PowerClean mode (Press **P** button) |

or

| | | |
|---|---|---|
| **2** | – | Modify the powder output (press the **Λ** or **V** key on the gun. The powder output will be increased or decreased accordingly) |
| | – | direct temporary activation of the PowerBoost function (press **P** key) |

**The remote control is blocked as long as the keyboard lock is activated or while in system parameterization mode.**

**Pressing one of the keys calls up the desired values instead of the actual values!**

## Keyboard lock

The gun control unit has a keyboard lock to prevent modification of individual parameter values (kV, µA etc.) within the operating modes (Program and Preset). Following is not affected by the keyboard lock:

– Program selection

– Display of the desired values of the current program

– Display of the actual values

– Error acknowledgment

An active keyboard lock is indicated by a blinking of the **remote** display. To be able to use this function, it must first be activated. See chapter "Activate/deactivate the keyboard lock" on page 50.


*fig. 13*

The keyboard lock status remains stored, when switching the equipment off and on. The keyboard lock is cancelled if a RAM reset is performed.

## Background illumination

### *Brightness*

8 different brightness settings are available for the display. The setting remains in place when the machine is switched on/off.

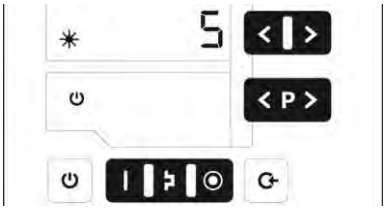



*Fig. 14*

### *Auto Power Save mode*

If no powder is being applied, then the background lighting turns off automatically 5 minutes after a button has been pressed last time.

## Correction values

The Gun control unit can be adapted with the correction values optimally to local conditions (e.g. the adjustment of different powder outputs in the plant).
See chapter "Setting correction factor for powder output" on page 45.

## Operation and configuration of the cup gun

The cup gun type OptiSelect Pro GM04-CF can be connected to the manual gun control unit. The gun control must first be set to this gun type in system parameter **P00** before start-up.
See chapter "System parameters" on page 31.

## Operation and configuration of the Tribo gun

The Tribo gun can be connected to the manual gun control unit. The Tribo gun can be configured by holding the keys **T5** and **T6** when switching on. The selected adjustment remains stored, when the device is switched off. The settings are also retained if the device type is changed. The Tribo gun mode can also be deactivated using the procedure mentioned above.

The charging current (µA) is displayed in the main menu during coating process:

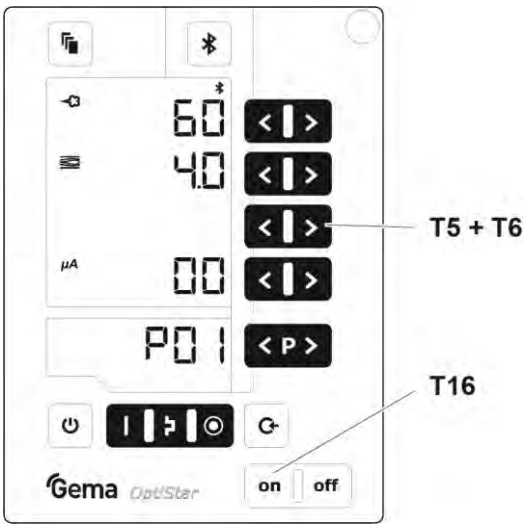



*fig. 15:*

# Assembly / Connection

## Assembly guide

The gun control unit is mounted into place using 2xM6 screws on the front side. Please contact Gema for other installation possibilities.


*Fig. 16*

# Connection instructions

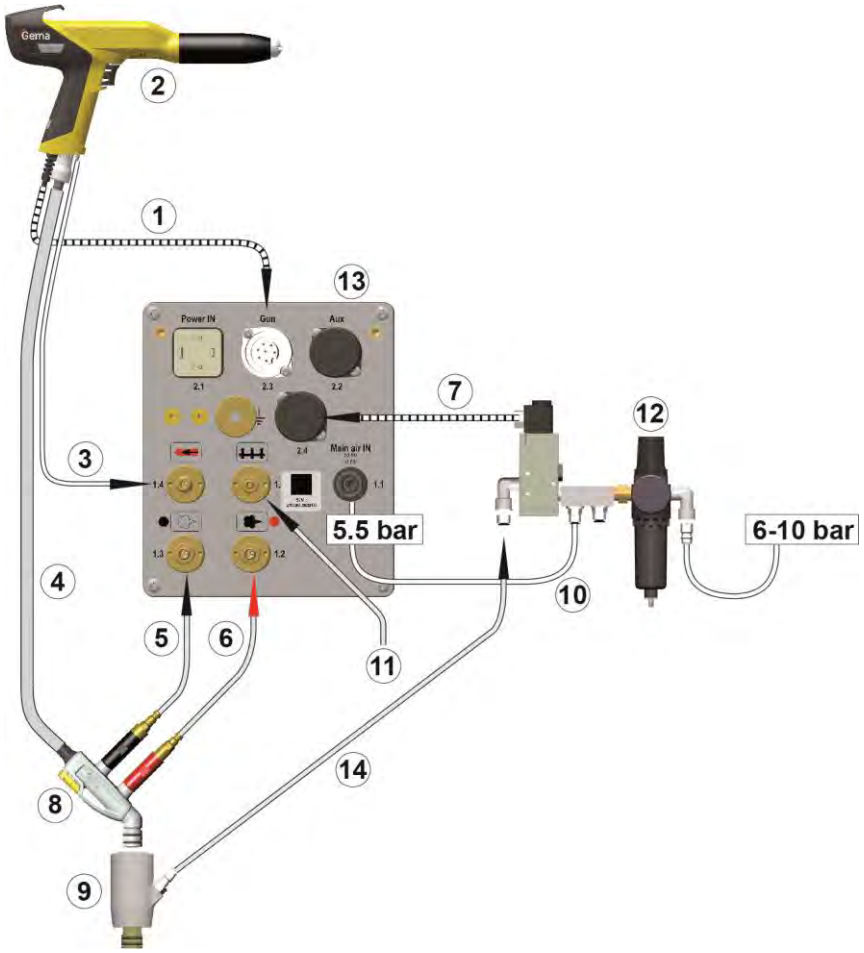



*fig. 17: Connecting guide – overview*

| | | | |
|---|---|---|---|
| 1 | Gun cable | 8 | Injector |
| 2 | Manual gun | 9 | PowerClean™ module (Option) |
| 3 | Electrode rinsing air hose | 10 | Compressed air hose |
| 4 | Powder hose | 11 | Fluidizing air hose |
| 5 | Supplementary air hose | 12 | Maintenance unit |
| 6 | Conveying air hose | 13 | OptiStar Control unit |
| 7 | Control signal cable | 14 | Rinsing air hose |

**Use clamp to connect grounding cable to the cabin or the suspension arrangement.**

– Check ground connections with Ohm meter and ensure 1 MOhm or less.

**The compressed air must be free of oil and water!**

**Close the unused connections with the provided dust protection caps!**

# Start-up

## Preparation for start-up

**The gun control unit always starts up to the last configured settings.**

### Basic conditions

When starting up the gun control unit, the following general conditions impacting the coating results must be taken into consideration:

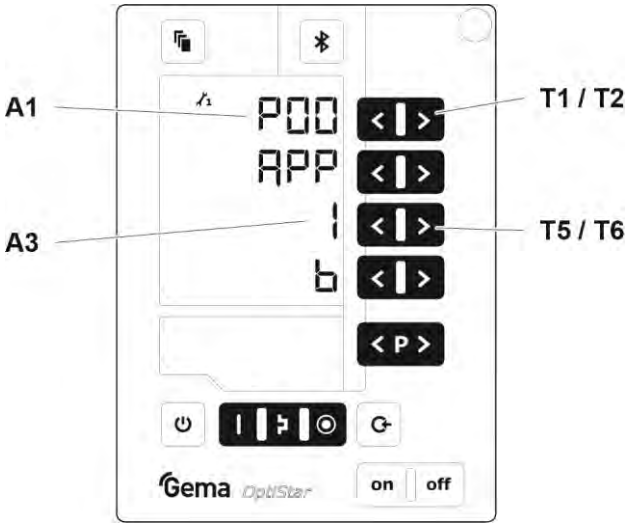
– Gun control unit correctly connected
– Gun correctly connected
– Corresponding power and compressed air supply available
– Powder preparation and powder quality

## System parameters

The Gun control unit is configured by using the system parameters. This configuration will be saved in the equipment memory.

### Entering the system parameters

1. Turn on the gun control unit with the **ON** key
2. Hold  key down for 5 seconds
   – The display switches to the following level:




3. The system parameter number is shown in the display **A1** with a **P** placed in front
4. Set the corresponding system parameter value with the **T5** or **T6** key.
   – The value of the adjusted system parameter appears on corresponding display **A3**
5. Scroll to the next or previous system parameter with the **T1** or **T2** key

▶ **Selection is cyclical, i.e. after the last system parameter, the first starts again and vice versa.**

6. Select parameter values according to the following table

| No. | Description | Values | Display |
|---|---|---|---|
| **P00**[1)] | Device type | **0: Fluidizing device type F (CG21)** | **F** |
| | | 1: Box device with vibrator Type B (CG21) | B |
| | | 2: Stirrer device Type S (CG21) | S |
| | | 3: Automatic device (CG20/CG20-C) | A |
| | | 4: Stirrer device with fluidization (CG21) | S Fd |
| | | 5: Application pump (CG23-P) | P |
| | | 6: Application pump + CAN bus (CG24-CP) | CP |
| | | 7: Cup gun unit Type CF with GM04-CF gun (CG21) | PCF |

| No. | Description | Values | Display |
|---|---|---|---|
| **P01** | Rinsing mode | **0: no PowerClean module present**<br>1: PowerClean module present<br>2: PowerClean module present (equipment type Q) | |
| **P03** | Unit of measurement (air) | **0: Nm³/h**<br>1: scfm | **nn3**<br>scf |
| **P07** | Air volume setting | **0: Standard (PA / GL)**<br>1: Advanced (FL / ZL) | **Std**<br>Adv |
| **P10** | Log level | 0, 1, **2**, 3, 4, 5 | **LoG** |
| **P11** | Bluetooth ID no. | 0: Bluetooth deactivated<br>**1** - 255 | **blid** |
| **P12** | Remote Manual Gun | **0: Powder output +/- PowerClean (Activation)**<br>1 : Program change PowerClean (Activation)<br>2: Powder output +/- PowerBoost (Activation) | **PAC**<br>PrC<br>PAb |

[1] is not overwritten, if a Memory Reset is performed

Default values are marked by **bold** print.

7. Press  key to quit the system parameter mode.
   The display switches to the standard level

### *System parameter P00 (device type)*

**If the control unit is supplied as a component of a manual coating unit, then the corresponding system parameter is set correctly by the factory!**

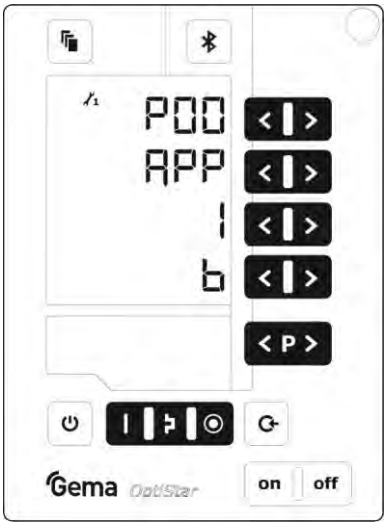



*fig. 18: System parameter P00*

**WARNING**

**A wrong parameterization leads to various malfunctions!**

- The system parameter P00 must be set to 0, 1, 2, 4 or 7!

Manual devices are subdivided into fluidizing, box or stirrer types. These sub-types differ in the control of the vibrator output and the behavior of the fluidizing air.

| Device type | Function AUX Output | Fluidizing air function |
|---|---|---|
| Fluidizing device (type F) | Always **Off** | The gun trigger switches the fluidization on.<br>The **T12** key turns the fluidization **On** and **Off.** |
| Box device (type B) | Vibration **On** during triggering, wake for 30 seconds | Fluidizing air switches on parallel to the main solenoid valve (trigger). |
| | The **T12** key turns the vibration **On** and **Off** | The **T12** key turns the fluidization **On** and **Off.** |
| Stirrer device (type S) | Stirrer **On** during triggering | |

| Device type | Function AUX Output | Fluidizing air function |
|---|---|---|
| Stirrer device with fluidization (type S Fd) | Stirrer **On** during triggering | Fluidizing air switched **On** and **Off** with trigger.<br>The **T12** key also activates or deactivates the fluidization. |
| Cup gun device (type CF) | Always **Off** | Fluidizing air always switched off |

### *System parameter P01 (rinsing mode)*

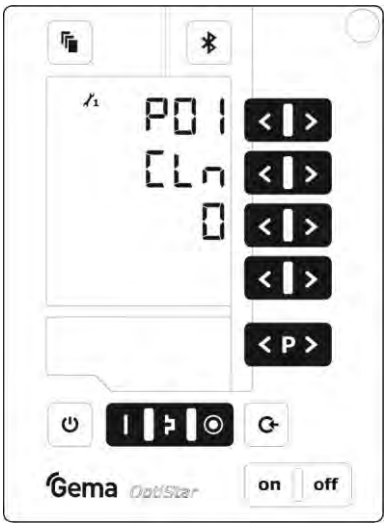



*fig. 19: System parameter P01*

See chapter "Rinsing mode" on page 47.

| P01 parameter value | Description | |
|---|---|---|
| **0** |  | **Manual equipment without PowerClean module** |
| **1** |  | **Manual equipment with PowerClean module** |
| **2** |  | **Type Q Manual coating equipment with PowerClean module** |

### *System parameter P03 (measuring unit)*

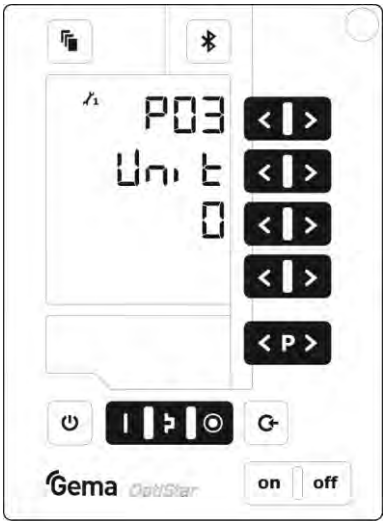



*fig. 20: System parameter P03*

This parameter is used to determine the measuring unit for all airs (total air and electrode rinsing air). If the parameter is set to **1** (**scfm**), then all air values are shown in this measuring unit. These lines are displayed in **blue**.

### *System parameter P10*

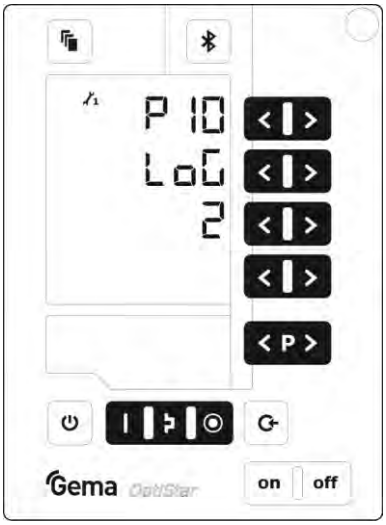



*fig. 21: System parameter P10*

The device can export log reports of the program run to an SD card for test purposes and for finding defects.

If an SD card is inserted during the switching on procedure, the log messages are also recorded onto the SD card. The data are record in the MESSAGES.LOG file in the root directory. Once this file reaches a size of 32 MB, it is renamed as MESSAGES.1 and a new MESSAGES.LOG file is then created.

| Parameter value | Level of detail of reports |
|---|---|
| 0 | no messages |
| 1 | few details |
| ... | |
| 5 | all messages |

**Real time timings can be impaired from a level of detail of 4.**

### *System parameter P11 (Bluetooth ID no.)*

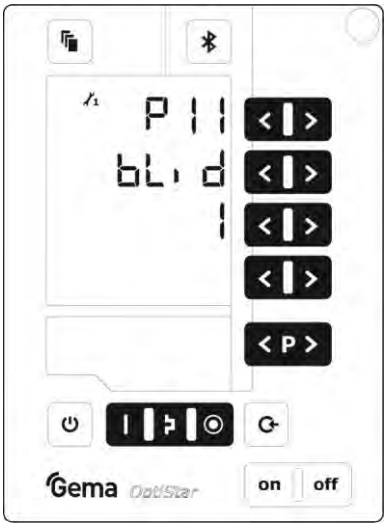



*fig. 22: System parameter P11*

The Bluetooth ID number is determined with this parameter. An individual Bluetooth ID number must be assigned to each pistol control unit that is to be accessed via the Gema electrostatic app.

### *System parameter P12 (Remote Manual Gun)*

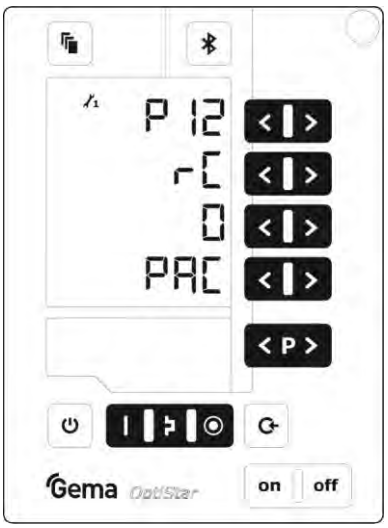



*fig. 23: System parameter P12*

| P12 parameter value | Description | |
|---|---|---|
| **0** |  | Change the powder output +/- |
| |  | Activating/Deactivating the rinse mode |
| **1** |  | Program change +/- |
| |  | Activating/Deactivating the rinse mode |
| **2*** |  | Change the powder output +/- |
| |  | Activation of the PowerBoost function |

* **ATTENTION:**
**This value must not be selected when operating devices type "Q Dual Gun"!**

# Pairing of the Bluetooth module with a mobile device

The first connection setup in which Bluetooth devices are coupled is also called pairing.

Following conditions have to prevail:

– the E app has already been downloaded and installed from an app distribution platform ( App Store or Google play ) (Keyword "**gema e-app**").

– ID number set in system parameter P11.

– Bluetooth activated on mobile device

To use Gema's E-app, proceed as follows:

1. Start the E-app
2. Keep the  key on the control unit pressed for two seconds
3. Press 
4. Select OptiStar
   – the control unit is now paired. The communication partners exchange key data so that they automatically recognize each other next time.

More information on how to use Gema's E-app can be found in a separate manual.

# Operation

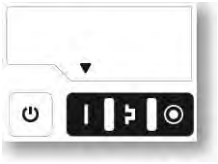
## Operation

**During the initial commissioning of the device, the functional check is to be performed without powder!**

### Select predefined operating mode (Preset mode)

1. Turn on the gun control unit with the **ON** key
2. Press the corresponding application key.

   The arrow above the desired button lights up.



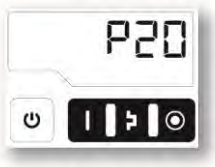
   The pre-defined application modes have preset values for high voltage and spray current:

| Application mode | | Preset kV | Preset µA |
|---|---|---|---|
| I | flat parts | 100 | 100 |
| ⅁ | complicated parts | 100 | 22 |
| ◉ | overcoat | 100 | 10 |

3. The air values for total air, powder output and electrode rinsing air can be individually defined and are saved in the programs.

## Starting the individual adjustable programs

1. Turn on the gun control unit with the **ON** key
2. Press the <P> program key
3. Select the desired program (01-20)




Program 20 active

4. Change the coating parameters as required

**Programs 01-20 are preset at the factory but can be modified at any time, after which they are automatically stored.**

| Description | | Presetting |
|---|---|---|
| | Powder output | 60 % |
| | Total air | 4.0 Nm³/h |
| kV | High voltage | 80 kV |
| µA | Spray current | 20 µA |
| | Electrode rinsing air | 0.1 Nm³/h |
| | Fluidizing air | 1.0 Nm³/h (for device type F)<br>0.1 Nm³/h (for device type B and S) |

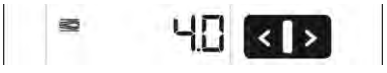
## Setting powder output and powder cloud

The powder output depends on the selected powder output (in %), and the powder cloud on the selected total air volume.

**As a factory default value, a powder rate of 50% and a total air volume of 4 Nm³/h are recommended.**

– If values are entered that the gun control unit cannot implement, then the operator is informed of this by a blinking in the relevant display and a temporary error message!

### *Setting the total air volume*

1. 


   Adjust the total air volume on the gun control unit with the **T3/T4** keys

– Adjust the total air volume according to the corresponding coating requests

# Rinsing mode

The rinsing mode enables blowing off powder accumulations in the powder hose.

## Activating the rinsing function

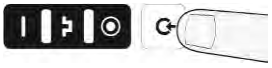
### *Manual equipment without optional PowerClean module (system parameter P01=0)*

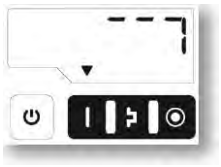
The rinsing mode can only be activated from standby mode (main menu display, no powder conveying).

**On manual coating equipment type F, the injector must be disconnected prior to cleaning procedure, on type B, the suction unit must be lifted, and on type S, the powder container must be empty.**

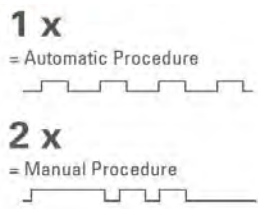
1. Detach the injector

2. 

OR 



3. **START =**

| Procedure | Effect |
|---|---|
| **Automatic (automatic)** | – The rinsing process is started<br>– Injector, powder hose, gun and spray nozzle are purged using compressed air<br>– The PowerClean function enables parallel cleaning of other components, such as the fluid intake unit, powder container, etc.<br>– The rinsing mode is exited if the automatic rinsing sequence has finished. |
| **Manual (manual)** | The operator controls the number and length of the PowerClean impulse by pressing the gun trigger a second time |

4. **STOP =**


OR


OR the cleaning mode is terminated automatically.

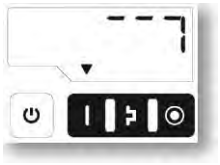
After completion of the PowerClean procedure, the controller switches back to coating mode.

### *Manual equipment with optional PowerClean module (system parameter P01= 1 or P01=2)*

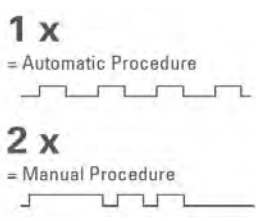
The rinsing mode can only be activated from standby mode (main menu display, no powder conveying).

1.


OR



2. **START =**

| Procedure | Effect |
|---|---|
| **Automatic (automatic)** | – The rinsing process is started<br>– Injector, powder hose, gun and spray nozzle are purged using compressed air<br>– The PowerClean function enables parallel cleaning of other components, such as the fluid intake unit, powder container, etc.<br>– The rinsing mode is exited if the automatic rinsing sequence has finished. |
| **Manual (manual)** | The operator controls the number and length of the PowerClean impulse by pressing the gun trigger a second time |

3. **STOP =**


OR

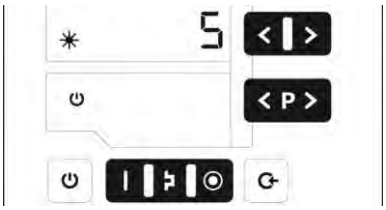

OR the cleaning mode is terminated automatically.

After completion of the PowerClean procedure, the controller switches back to coating mode.

# Setting the background illumination

1. Press the  key

   The display switches to the following level:

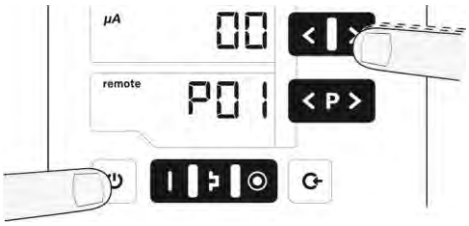



2. 


   Select the desired brightness

# Activate/deactivate the keyboard lock

1. Hold  key pressed
2. Press the corresponding key:

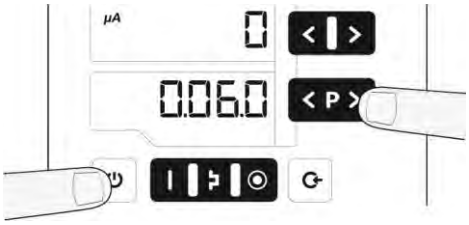



   – The keyboard lock will be activated. The **remote** display blinks.

3. The keyboard lock is cancelled by pressing the same key combination

# Checking the software version

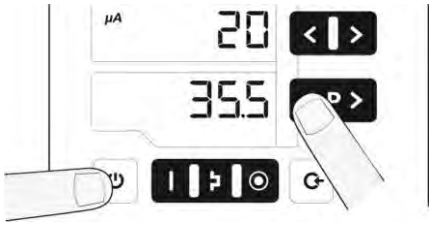
1. Press these two keys at the same time




   – The status display is shown as long as the keys are held.

# Checking the trigger time

1. Press these two keys at the same time




– The trigger counter (total time in days of trigger time) is shown in the display (e.g. 35.5 days = 852 h).

The status display is shown as long as the keys are held.

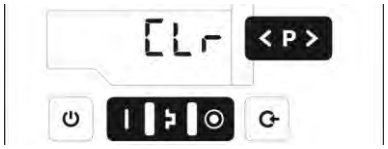
**The trigger counter can't be reset!**

# RAM Reset

The RAM reset enables a restore of factory settings of the gun control unit. All parameters (**except P00**) and correction values as well as all user-defined values in the Program mode and Preset mode will be overwritten with factory default values. An active keyboard lock will be deactivated.

**By resetting the RAM, all user-made settings will be set to factory default!**

1. Switch off the device
2. Press the key and hold it
3. Switch on the control unit, the **CLR** display blinks




4. Wait for approximately 5 seconds until **CLR** disappears
5. Release the key
   – All values are reset. The control unit must be set-up again.

# Decommissioning / Storage

## Shutdown

1. End the coating procedure
2. Switch off the control unit

**The adjustments for high voltage, powder output volume and electrode rinsing air remain stored.**

### If in disuse for several days

1. Switch off the plant with the main switch
2. Clean the gun and the components for powder conveying (see therefore the corresponding user manuals)
3. Turn off the compressed air main supply

## Storage conditions

### Hazard notes

There is no danger to personnel or the environment if the unit is stored properly.

### Type of storage

For safety reasons, the product should only be stored in a horizontal position

### Storage duration

If the physical conditions are maintained, the unit can be stored indefinitely.

### Space requirements

The space requirements correspond to the size of the product.

There are no special requirements concerning distance to neighboring equipment.

### Physical requirements

Storage must be inside a dry building at a temperature between +5 and +50 °C. Do not expose to direct sunlight!

## Maintenance during storage

### Maintenance schedule

No maintenance schedule is necessary.

### Maintenance works

During long-term storage, periodically perform a visual check.

# Maintenance / Repairs

## General information

The product was designed for a maintenance-free operation.

## Periodic checks

The periodic checks include examining all connecting cables and hoses.

The corresponding parts should be replaced immediately if any damage to cables or hoses is discovered.

All plugs must be properly tightened.

## Repair work

In the event of malfunctions or faults, the product must be checked and repaired by an authorized Gema service workshop. The repairs must only be performed by an authorized specialist.

Improper tampering can result in serious danger for user and equipment.

# Fault clearance

## Error diagnosis of the software

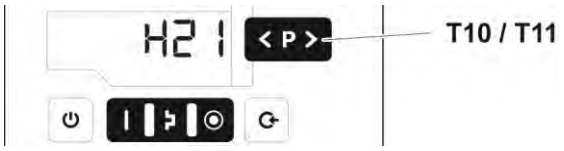
### General information

The correct function of the Gun control unit is constantly monitored. If the equipment software determines a fault, an error message is indicated with a help code. Following is monitored:

- High voltage technology
- Pneumatic system
- Power supply

### Help codes

The error diagnosis codes (help codes) are shown in red on the **A5** display.




The help codes are stored in an error list in the order of their appearance. Each error in the list must be individually acknowledged with the keys **T10** or **T11**.

The errors are displayed in the order of their appearance. The **T10** and **T11** keys cannot be used for other functions, as long as an error code is still shown.

Here is a list of all possible help codes for this Gun control unit:

| Code | Description | Criteria | Remedy |
|---|---|---|---|
| **Pneumatics:** | | | |
| **H05** | PowerClean valve | – PowerClean valve not connected<br>– Valve defective<br>– Connection cable defective<br>– Mainboard defective | connect or replace<br><br>Contact a Gema service center |

| Code | Description | Criteria | Remedy |
|---|---|---|---|
| **H06** | Trigger valve | Solenoid coil current lower than preset limiting value<br>Valve defective, main board or cable defective | Contact a Gema service center |
| **H07** | Supplementary air volume too high<br>(setting of supplementary air on the display) | The preset value for supplementary air is too high compared to the conveying air setting | Lower supplementary air value or increase value for conveying air to equalize air volumes to the injector, delete error code |
| **H08** | Conveying air volume too high (setting of powder share on the display) | The preset value for conveying air is too high compared to the supplementary air setting | Lower conveying air value or increase value for supplementary air to equalize air volumes to the injector, delete error code |
| **H09** | Powder output higher than 100% | The powder output multiplied by the powder hose length factor and daily correction value is greater than 100%<br>Daily correction value too large | Reduce powder output<br><br>Reduce daily correction value |
| **H10** | Conveying air range lower deviation | The theoretical value for conveying air falls below minimum<br>Total air is smaller than minimum | Limit conveying air to its minimum value |
| **High voltage:** | | | |
| **H11** | Gun error | No vibrations in the oscillator, cable break, oscillator or gun is defective | Contact a Gema service center |
| **H13** | Gun Overload | Cable or cascade defective. The control unit is switched off. | Contact a Gema service center |
| **Power supply:** | | | |
| **H20** | Voltage supply error Mainboard | Mainboard defective | Contact a Gema service center |
| **H21** | Supply undervoltage | Power pack defective or overloaded | Contact a Gema service center |
| **H22** | Wrong internal system clock | Backup battery is empty | Contact a Gema service center |
| **EEPROM (equipment memory):** | | | |
| **H24** | EEPROM content invalid | EEPROM error | Contact a Gema service center |
| **H25** | Timeout during EEPROM writing | EEPROM error | Contact a Gema service center |
| **H26** | Values not correctly stored in EEPROM during switching off | EEPROM error | Contact a Gema service center |
| **H27** | EEPROM verification erroneous | EEPROM error | Contact a Gema service center |
| **Throttle motors:** | | | |
| **H60** | Conveying air reference position not found | Throttle motor or needle jammed, limit switch defective, error in motor throttle | Contact a Gema service center |

| Code | Description | Criteria | Remedy |
|---|---|---|---|
| **H61** | Supplementary air reference position not found | Throttle motor or needle jammed, limit switch defective, error in motor throttle | Contact a Gema service center |
| **H62** | Electrode rinsing air reference position not found | Throttle motor or needle jammed, limit switch defective, error in motor throttle | Contact a Gema service center |
| **H63** | Fluidizing air reference position not found | Throttle motor or needle jammed, limit switch defective, error in motor throttle | Contact a Gema service center |
| **H64** | Conveying air throttle does not move | Short circuit in limit switch, motor throttle defective | Contact a Gema service center |
| **H65** | Supplementary air throttle does not move | Short circuit in limit switch, motor throttle defective | Contact a Gema service center |
| **H66** | Electrode rinsing air throttle does not move | Short circuit in limit switch, motor throttle defective | Contact a Gema service center |
| **H67** | Fluidizing air throttle does not move | Short circuit in limit switch, motor throttle defective | Contact a Gema service center |
| **H68** | Conveying air position lost | Lost steps, limit switch defective, throttle motor defective | Contact a Gema service center |
| **H69** | Supplementary air position lost | Lost steps, limit switch defective, throttle motor defective | Contact a Gema service center |
| **H70** | Electrode rinsing air position lost | Lost steps, limit switch defective, throttle motor defective | Contact a Gema service center |
| **H71** | Fluidizing air position lost | Lost steps, limit switch defective, throttle motor defective | Contact a Gema service center |
| **Communication mainboard-gun:** | | | |
| **H91** | Communication error mainboard-gun | Gun not connected<br>Gun, gun cable or Mainboard defective | connect<br>Replace or contact Gema Service |

## Help codes list

The last appeared four errors are stored in a list by the software. If an error appears, which is already in the list, he will not be listed again.

## Appearance of errors

It is possible that an error is only displayed for a short time, but after the acknowledgement it will disappear. In this case, it's recommended to switch off the control unit and switch it on again (reset by restarting).

# Disposal

## Introduction

### Requirements on personnel carrying out the work

The disposal of the product is to be carried out by the owner or operator.

When disposing of components that are not manufactured by Gema, the instructions in the respective manufacturer's documentation must be observed.

### Disposal regulations

**The product must be disassembled and disposed of properly at the end of its service life.**

- ► When disposing of the product, the applicable local and regional laws, directives and environmental regulations must be complied with!

### Materials

The materials must be sorted according to material groups and taken to the appropriate collection points.

## Disassembly of component groups

**⚠ WARNING**

**Live components**

**Risk of fatal injury from electric shock if touched**

- ► Only trained, authorized staff may open the electrical compartment
- ► Observe the safety symbols

1. Disconnect the mains supply and supply cables.
2. Remove all product covers.

The product is now prepared for disassembly.

# Spare parts list

## Ordering spare parts

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

– Type and serial number of your powder coating equipment

– Order number, quantity and description *of* each spare part

**Example:**

– **Type** OptiGun GA03 automatic powder gun

Serial number 1234 5678

– **Order no.** 203 386, 1 piece, Clamp – Ø 18/15 mm

When ordering cable or hose material, the required length must also be given. The spare part numbers of this bulk stock is always marked with an *****.

Wearing parts are always marked with a **#**.

All dimensions of plastic hoses are specified with the external and internal diameter:

**Example:**

Ø 8/6 mm, 8 mm outside diameter (o/d) / 6 mm inside diameter (i/d)

**ATTENTION**

**Use of non-original Gema spare parts**

**When using the spare parts from other manufacturers the explosion protection is no longer guaranteed. If any damage is caused by this use all guarantee claims become invalid!**

► Only original Gema spare parts should be used!

# OptiStar CG21 Gun control unit

| | | |
|---|---|---|
| | OptiStar CG21 gun control unit – complete, without item 4 | 1015 203 |
| 1 | Front plate – complete, see corresponding spare parts list | |
| 2 | Enclosure | |
| 3 | Backplate – complete, see corresponding spare parts list | |
| 4 | Cover | 1015 249 |


*fig. 24*

# Front plate and power pack

| | | |
|---|---|---|
| | Front plate – complete (pos. 1-12) | 1015 219 |
| | Front plate with foil keyboard (pos. 5-8) | 1015 218 |
| 1 | OptiStar Mainboard – complete | 1015 221 |
| 2 | Spacer sleeve – Ø 3.1/6x15 mm | |
| 3 | PCB "Powerboard" – complete | 1015 223 |
| 4 | Spacer sleeve – Ø 3.2/6x7 mm | |
| 5 | Front frame – complete (incl. pos. 5.1) | 1015 232 |
| 5.1 | Screw | 1007 019 |
| 6 | Screw – M4x16 mm | 1013 925 |
| 7 | Front plate gasket | 1015 236 |
| 8 | Membrane keypad with carrier plate | 1015 217 |
| 9 | Spacer sleeve – Ø 3.6/7x5 mm | |
| 10 | Display | 1015 220 |
| 11 | Washer – Ø 3.2/7x0.5 mm | |
| 12 | Locknut – M3 | |
| 13 | Power pack – 24 VDC | 1009 849 |

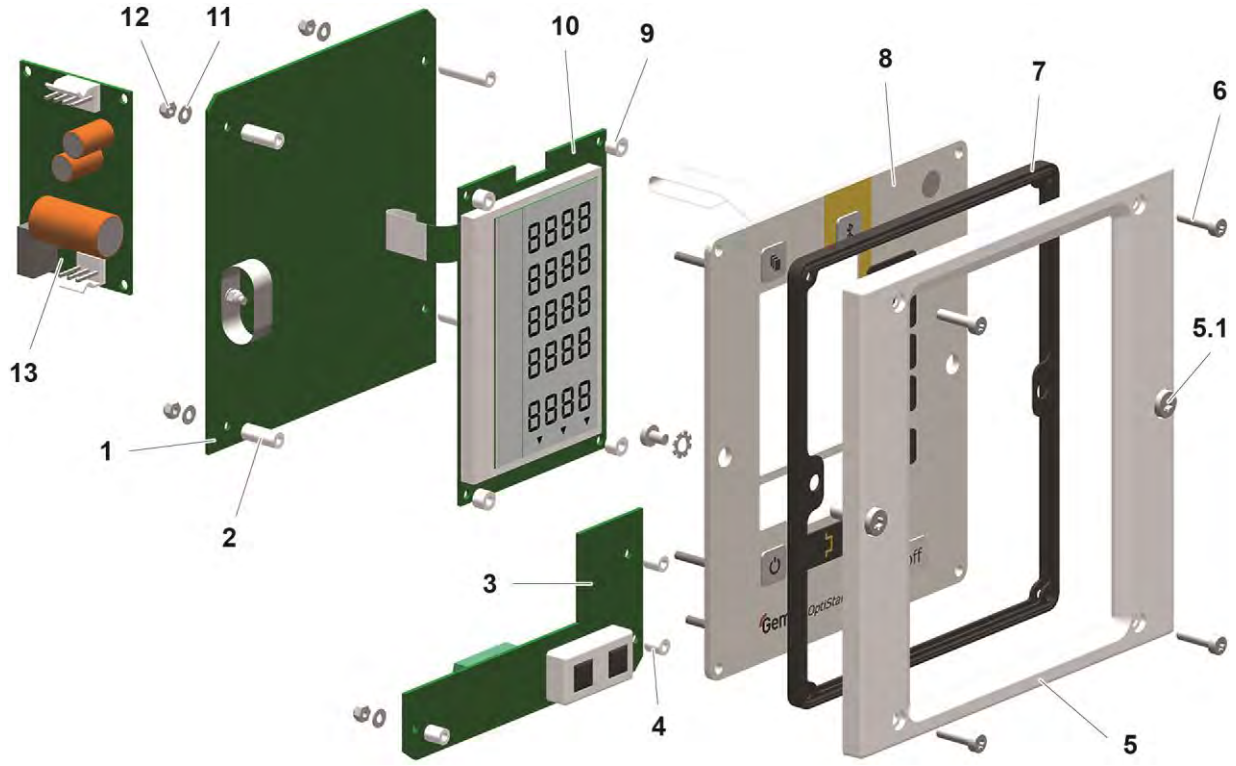



*Fig. 25*

# Inside back plate

| | | |
|---|---|---|
| 1 | Back plate gasket | 1015 198 |
| 2 | Elbow joint – 1/8"-Ø 8 mm | 251 372 |
| 3 | T-piece – 1/4"- Ø 8 - Ø 8 mm | 1008 040 |
| 4 | Solenoid valve – Ø 8-Ø 8 mm, 24 VDC | 1003 914 |
| 5 | O-ring – Ø 12x1.5 mm, NBR70 | 261 416 |
| 6 | Motor throttle – complete | 1000 064 |
| 7 | O-ring – Ø 8x4 mm, NBR70 | 1001 521 |
| 8 | Fluidizing pad – 1/8" | 237 264 |
| 9 | Screw – M4x16 mm | 1013 925 |
| 10 | Plastic tube – Ø 8/6 mm | 103 152* |
| 11 | Motor throttle – complete | 1008 012 |

* Please indicate length

# Inside back plate

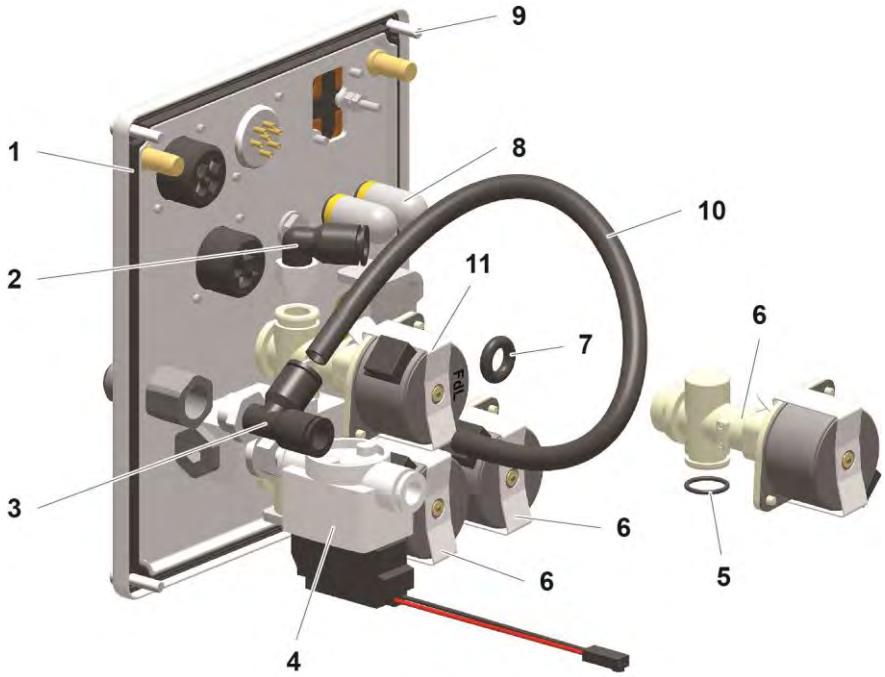



*fig. 26: OptiStar CG21*

# Connecting material

| | | |
|---|---|---|
| 1 | Quick release connection – NW5, Ø 6 mm | 200 840 |
| 1.1 | Hose – Ø 6/4 mm | 100 854* |
| 2 | Nut with kink protection – M12x1 mm, Ø 8 mm | 201 316 |
| 2.1 | Supplementary air hose – Ø 8/6 mm (black) | 103 756* |
| 2.2 | Quick release coupling for supplementary air hose – NW5-Ø 8 mm | 261 637 |
| 3 | Nut with kink protection – M12x1 mm, Ø 8 mm | 201 316 |
| 3.1 | Conveying air hose – Ø 8/6 mm (red) | 103 500* |
| 3.2 | Quick release coupling for conveying air hose – NW5-Ø 8 mm | 261 645 |
| 4 | Quick release connection – NW5-Ø 8 mm | 203 181 |
| 4.1 | Hose – Ø 8/6 mm | 103 756* |
| 5 | Quick release connection – NW 5-Ø 6 mm | 200 840 |
| 5.1 | Hose – Ø 6/4 mm | 100 854* |
| 6 | Vibrator cable (constituent part of vibrator) | |
| 8 | PowerClean module cable – 1 m (option) | 1009 879 |
| | PowerClean module cable – 15 m (option) | 1009 880 |
| 9 | Mains cable – CH | 382 493 |
| | Mains cable – Schuko | 382 485 |
| | Mains cable – USA | 382 507 |
| | Mains cable – GB | 382 515 |
| | Mains cable – AUS | 382 523 |
| | Mains cable – China | 1000 993 |

* Please indicate length

# Connecting material

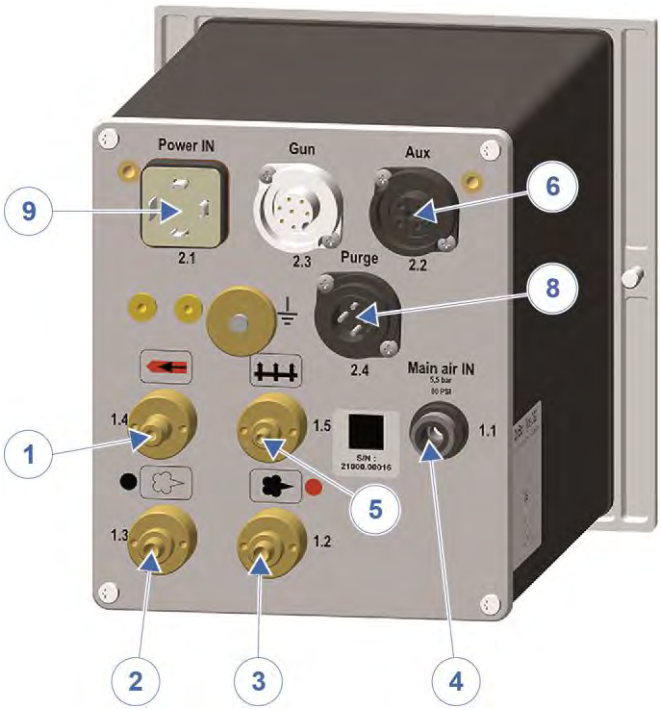



*fig. 27*

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