Operating instructions and Spare parts list

Gun control unit OptiStar 4.0 (CG23-P)

Translation of the original operating instructions

Gema

Documentation OptiStar 4.0 (CG23-P)

For the latest information about Gema products, visit **www.gemapowdercoating.com**.

For information regarding patents, see **www.gemapowdercoating.com/patents** or **www.gemapowdercoating.us/patents**.

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About these instructions

General information

This operating manual contains all the important information that is needed to operate the OptiStar 4.0 (CG23-P). It will safely guide you through the start-up process and give you references and tips for the optimal use when working with your powder coating system.

Information about the functional mode of the individual system components should be referenced in the respective enclosed documents.

Keeping the Manual

Please keep this Manual ready for later use or if there should be any queries.

Safety symbols (pictograms)

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

⚠ DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

ATTENTION

Indicates a potentially harmful situation. If not avoided, the equipment or something in its surrounding may be damaged.

ENVIRONMENT

Indicates a potentially harmful situation, which, if not avoided, may have harmful consequences for the environment.

MANDATORY NOTE

Information that must be observed.

NOTICE

Useful information, tips, etc.

Structure of Safety Notes

Every note consists of 4 elements:

– Signal word
– Nature and source of the danger
– Possible consequences of the danger
– Prevention of the danger

⚠ SIGNAL WORD

Nature and source of the hazard!

Possible consequences of the danger

▶ Prevention of the danger

Software version

This document describes the operation of the product OptiStar 4.0 (CG23-P) with software version starting from 1.00.0.

See chapter "Checking the software version" on page 52.

Presentation of the contents

Figure references in the text

Figure references are used as cross references in the descriptive text.

Example:

*"The high voltage (**H**) created in the gun cascade is guided through the center electrode."*

Safety

Basic safety instructions

- This product is built to the latest specification and conforms to the recognized technical safety regulations and is designed for the normal application of powder coating.
- Any other use is considered non-compliant. The manufacturer shall not be liable for damage resulting from such use; the user bears sole responsibility for such actions. If this product is to be used for other purposes or other substances outside of our guidelines then Gema Switzerland GmbH should be consulted.
- Start-up (i.e. the execution of intended operational tasks) is forbidden until it has been established that this product has been set up and wired according to the guidelines for machinery. The standard "Machine safety" must also be observed.
- Unauthorized modifications to the product exempt the manufacturer from any liability from resulting damage.
- The relevant accident prevention regulations, as well as other generally recognized safety regulations, occupational health and structural regulations are to be observed.
- Furthermore, the country-specific safety regulations also must be observed.

Product specific security regulations

- This product is a constituent part of the equipment and is therefore integrated in the system's safety concept.
- If it is to be used in a manner outside the scope of the safety concept, then corresponding measures must be taken.
- The installation work to be done by the customer must be carried out according to local regulations.
- It must be ensured, that all components are earthed according to the local regulations before start-up.

▶ **For further security information, see the more detailed Gema safety regulations!**

⚠ WARNING

Working without instructions

Working without instructions or with individual pages from the instructions may result in damage to property and personal injury if relevant safety information is not observed.

- ► Before working with the device, organize the required documents and read the section "Safety regulations".
- ► Work should only be carried out in accordance with the instructions of the relevant documents.
- ► Always work with the complete original document.

Product description

Intended use

The Gun control unit is designed exclusively for controlling the Gema powder coating guns and the OptiSpray AP01 application pump (see also in chapter "Technical data").

Fig. 1

Up to 2 Application pumps can be controlled by this control unit:

– for supplying one powder gun with the powder (individual operation)

– to increase the supply rate (parallel operation).

The desired operation can be selected with the P09 system parameter (see also "Entering the system parameters").

Observance of the operating, service and maintenance instructions specified by the manufacturer is also part of conformity of use. This product should only be used, maintained and started up by trained personnel, who are informed about and are familiar with the possible hazards involved.

Any other use is considered non-compliant. The manufacturer is not responsible for any incorrect use and the risks associated with such actions are assumed by the user alone!

For a better understanding of the interrelationships in powder coating, it is recommended that the operating instructions for all other components be read as well, so as to be familiar with their functions too.

A summary of the directives and standards

This product is built according to the current state of the art. The product is subject to the European directives and complies with the following standards.

The product is suitable for the intended purpose and can be used in the appropriate areas.

▶ **For further information, also refer to the enclosed Declaration of Conformity.**

European directives RL

EG-RL 2006/42/EU	Machinery
EG-RL 2014/34/EU	Equipment and Protective Systems in Potentially Explosive Atmospheres (ATEX)
EG-RL 2014/30/EU	Electromagnetic compatibility

EN European standards

EN 50177	Stationary electrostatic application equipment for ignitable liquid coating material - Safety requirements
EN 50050-2	Electrostatic equipment for areas where there is danger of explosion - electrostatic hand held equipment Part 2: Electrostatic hand-held spraying equipment
EN 16985	Spray booths for organic coating material - Safety requirements

Recognized safety-related regulations

764 / DGUV Information 209-052	Electrostatic coating Trade Union information concerning health and safety during work (BGI)

Reasonably foreseeable misuse

- Operation without the proper training
- Use with insufficient compressed air quality
- Use in connection with unauthorized coating devices or components

Technical Data

Connectable guns

OptiStar	connectable
OptiSelect Pro Type GM04	yes, with diffuser
OptiSelect type GM03	yes*, with diffuser

* The PowerBoost functionality is not available.

ATTENTION

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

Electrical data

OptiStar 4.0 (CG23-P)	
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 max. 100 W
Connection for rinsing function (valve)	24 VDC max. 3 W
Protection type	IP54
Max. surface temperature	85 °C
Approvals	CE 1809 Ex II 3 (2) D PTB17 ATEX 5002
	FM APPROVED CL. II, Div 2, Gp F, G T6, Ta 32 to 104 °F (0 to 40 °C)

Pneumatic data

OptiStar	
Compressed air connection	8 mm
Max. input pressure (while unit in operation)	6.0 bar / 87 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)

OptiStar 4.0 (CG23-P)	
Conveying hose till 20 m – internal Ø 7 mm Suction hose max. 1.5 m – internal Ø 4.5 mm	50-300 g/min

Air flow rates

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

OptiStar	
Transport air flow rate	0-3.5 Nm³/h
Spraying air flow rate	0-4.5 Nm³/h
Electrode rinsing air flow rate	0-3.0 Nm³/h

The total air consumption for the device is determined based on the configured air values.

– These values apply for an internal control pressure of 6.0 bar!

Environmental conditions

OptiStar 4.0 (CG23-P)	
Utilization	in the interior
Height	up to 2 000 m
Temperature range	+5 °C - +40 °C (+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 (CG23-P)	
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 is used with following types of manual equipment:

– **B Spray** (with powder box)

– **F Spray** (with fluidized powder hopper)

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.

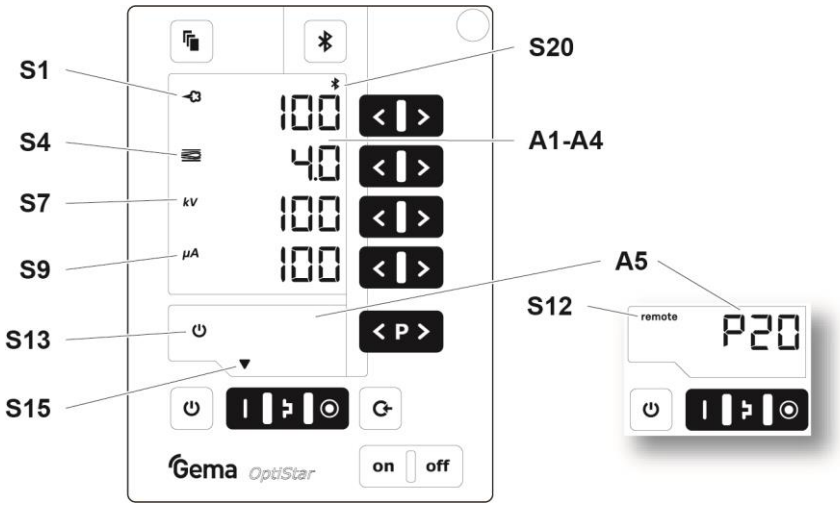


fig. 4: Displays, Level 1

Designation	Function
A1-A4	Display of actual values, desired values and system parameters – 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 – 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) – Display of an active connection (blue)

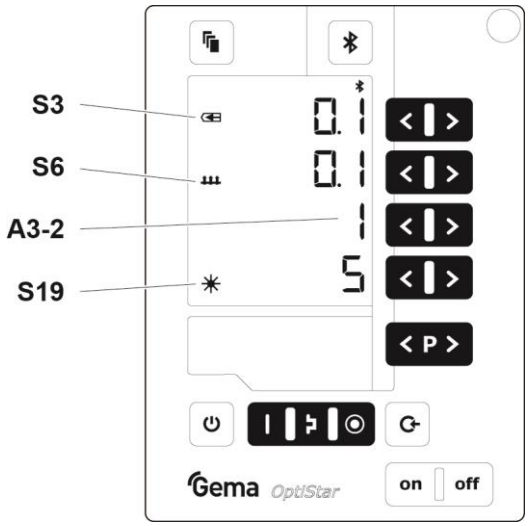


fig. 5: Displays and LEDs, Level 2

Designation	Function
A3-2	Display of the active pump
S3	Electrode rinsing air (display in Nm³/h)
S6	Fluidizing (display in Nm³/h)
S19	Display background illumination (0-8)

Input keys and switches

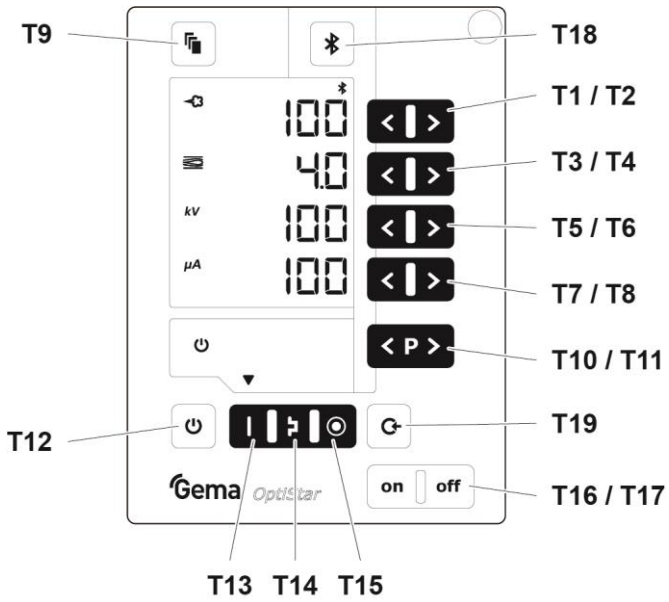


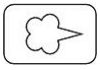
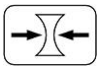
fig. 6: Input keys and switches

Designation	Function
T1-T8	Input keys for desired values and system parameters
T5-T6	Switching between the pump no. 1 and pump no. 2 in the level 2
T9	Switch between display levels
T10-T11	Program change
T12	– Switching on and off the fluidization (equipment type F) – Switch on/off for vibration and fluidization (equipment type B) – 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) – Display of the ID number (press for a short time)
T19	Cleaning function activation

Connections

Compressed air hoses / cables

fig. 7: Connections

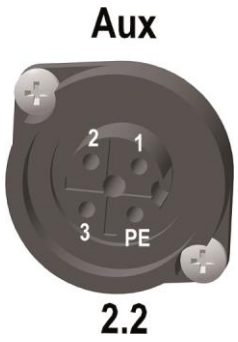
Connection	Description
1.1 Main air IN	Compressed air connection
2.1 Power IN	Mains cable connection
2.2 Aux	Vibration motor connection for equipment type B
2.3 Gun	Gun cable connection
2.5 Ext.	AP01 Application pump no. 1 connection
2.6 Ext.	AP01 Application pump no. 2 connection
1.2 	Transport air connection
1.3 	Spraying air connection
1.4 	Electrode rinsing air connection
1.6 	Pinch valve air connection
	Grounding connection

Pin assignment

Power IN connection

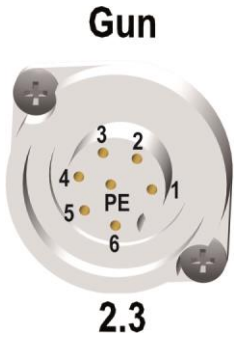
1	Neutral conductor (power supply)
2	Phase (100-240 VAC)
3	Output vibrator or stirrer
PE	PE grounding

Aux Connection



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

Gun connection



1	Ground
2	Remote control 1 (GM03/GM04)
3	Ground
4	Trigger
5	Remote control 2 (GM03/GM04)
6	Oscillator
7	PE grounding

Connection Application pump 1 (2.5) and 2 (2.6)

A-H	Control signal
J-M	+24 VDC
	Body – grounding PE

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:

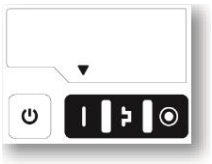


Fig. 8

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, and the OptiStar can be controlled individually or as a participant in a group. System information and diagnostic data can easily be retrieved and sent as e-mail. The firmware of the control unit can also be updated directly.
 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

Cleaning mode

The Cleaning mode is used to blow powder accumulations out of the powder hose, application pump, and gun using compressed air. A pinch valve diagnostic is also integrated.

The cleaning 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 "Cleaning mode" on page 48.

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

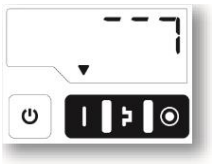


fig. 12: Cleaning mode active

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) – 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 51.

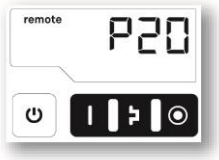


fig. 13

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.

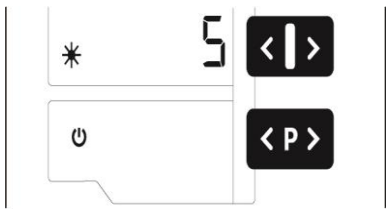


Fig. 14

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 "Entering the correction values" on page 46.

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. 15

Connection instructions

The Gun control unit and the Application pump(s) are supplied ready for use by the manufacturer. Just a few cables and hoses must be connected.

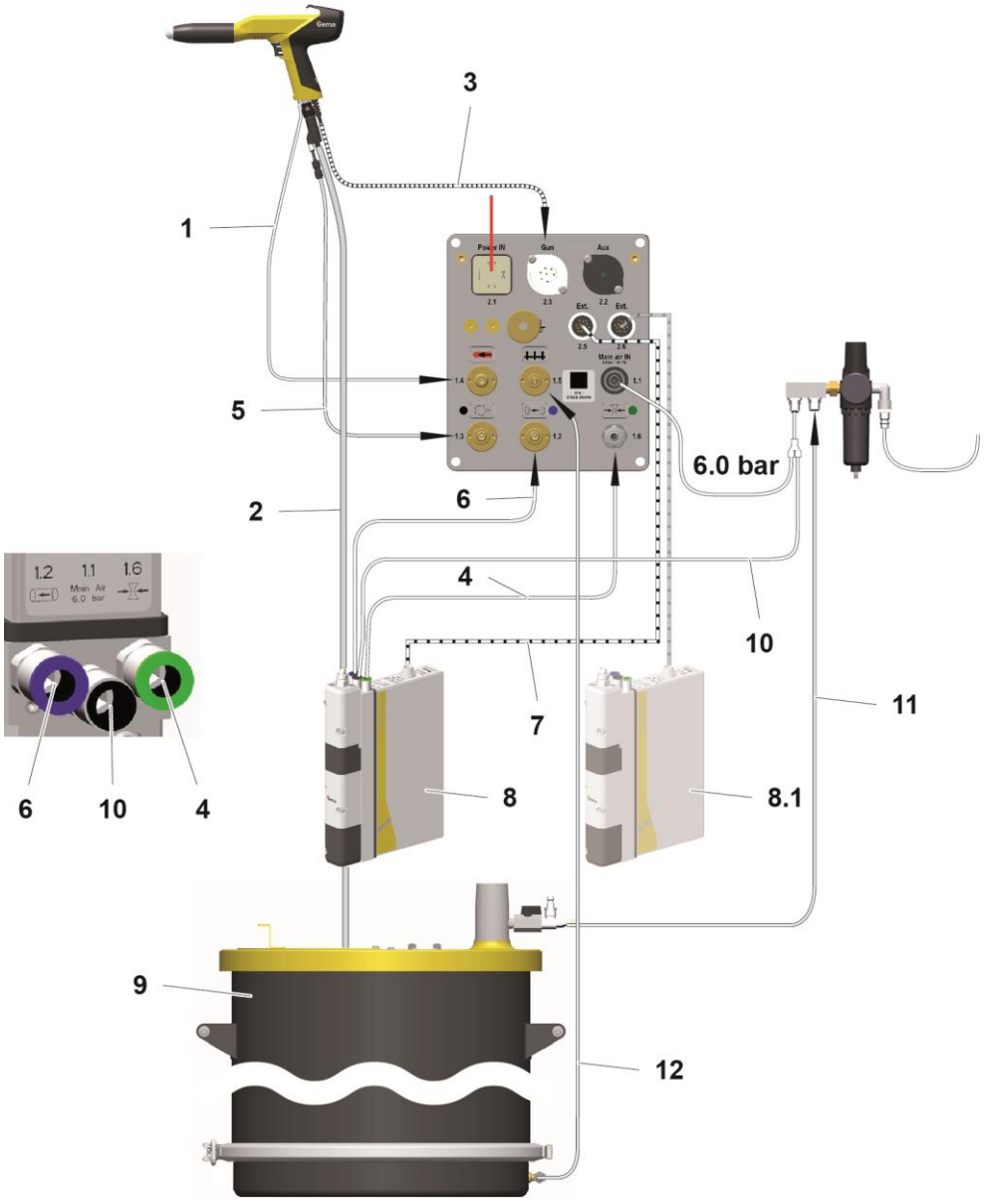


fig. 16: Connecting guide – overview

1 Electrode rinsing air hose
2 Powder hose
3 Gun cable
4 Pinch valve air hose
5 Spraying air hose
6 Transport air hose
7 Control signal cable
8 Application pump no. 1
8.1 Application pump no. 2
9 Powder container
10 Compressed air hose
11 AirMover air hose
12 Fluidizing air hose

Connect grounding cable to the booth or the suspension arrangement!

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

The source electrical connections for the Control Units are to be connected in an unclassified location only.

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:

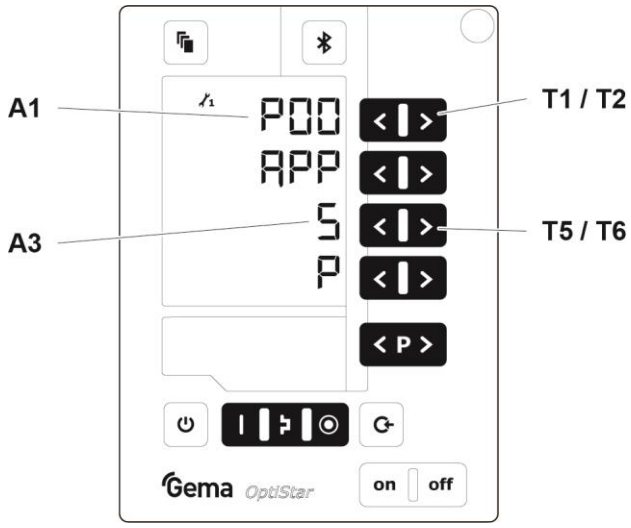
– Gun control unit correctly connected
– Gun correctly connected
– Corresponding power and compressed air supply available
– Powder preparation and powder quality

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
P03	Unit of measurement (air)	**0: Nm³/h** 1: scfm	**nn3** scf
P09	Pump operating mode	**0: Individual operation** 1: Parallel operation	**SoLo** dUo

No.	Description	Values	Display
P10	Log level	0, 1, **2**, 3, 4, 5	**LoG**
P11	Bluetooth ID no.	0: Bluetooth deactivated **1** - 255	**blid**
P12	Remote Manual Gun	**0: Powder output +/- PowerClean (Activation)** 1 : Program change PowerClean (Activation) 2: Powder output +/- PowerBoost (Activation)	**PAC** PrC 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)

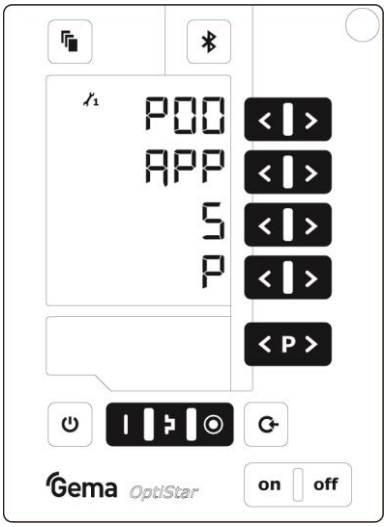


fig. 17: System parameter P00

ATTENTION

A wrong parameterization leads to various malfunctions!

► The system parameter P00 must be set to 5 (Application pump)!

System parameter P03 (measuring unit)

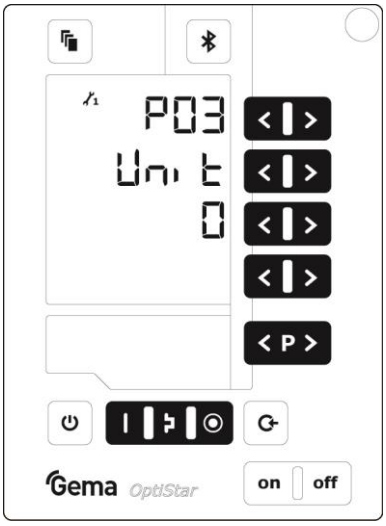


fig. 18: System parameter P03

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

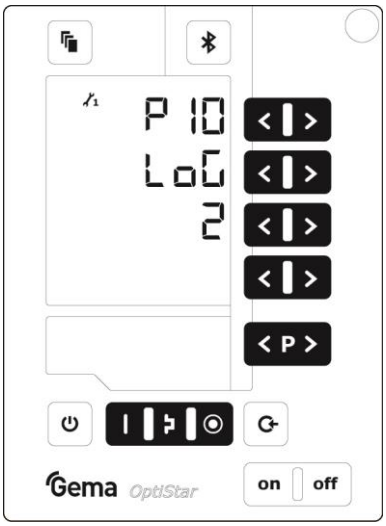


fig. 19: System parameter P10

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.)

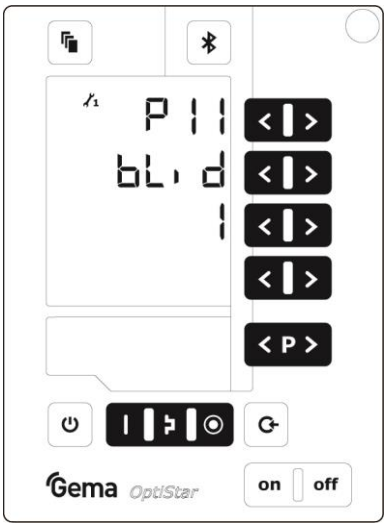


fig. 20: System parameter P11

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.

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.

Further information on how to use Gema's e-app can be found either on the website **www.gemapowdercoating.com** or in the E-App under the heading "**Service**".

Operation

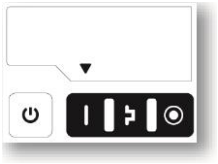
Operation

During the initial commissioning of the device, the functional check must 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 % (50% for device type CF)
	Total air	4.0 Nm³/h (2.5 Nm³/h for device type CF)
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) 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.

The AP01 Application pump should be operated with powder at least 1/2 hour after starting up.

– After the running-in of the filter elements a stable powder output value will be reached.

As a factory default value, a powder rate of 60% 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

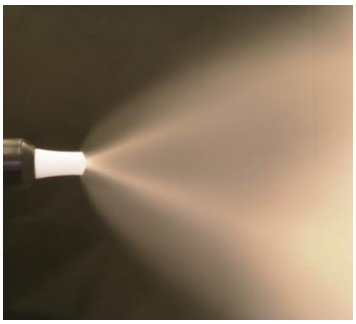
   – Adjust the total air volume according to the corresponding coating requests

correct powder cloud

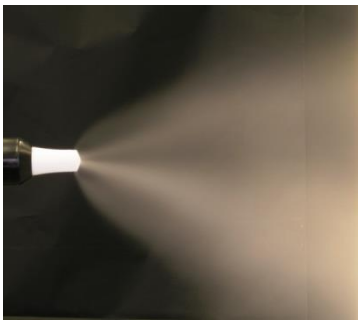
too little total air

Setting the powder output

1.  OR 



much powder



little powder

Adjust the powder output volume (e.g. according to the desired coating thickness)

– Factory default setting of 50% is recommended for initial operation. The total air volume is thereby kept constant automatically by the control unit.

▶ **To achieve maximum efficiency, we recommend avoided an overly high powder volume where possible!**

2. Check fluidization of the powder in the powder container
3. Point the gun into the booth, switch the gun on and visually check the powder output

Setting the spraying air

The spraying air (**ZL**) will be set in accordance to the calculated transport air (**TL**) and the adjusted total air volume (**GL**).

Formula:

GL = ZL + TL

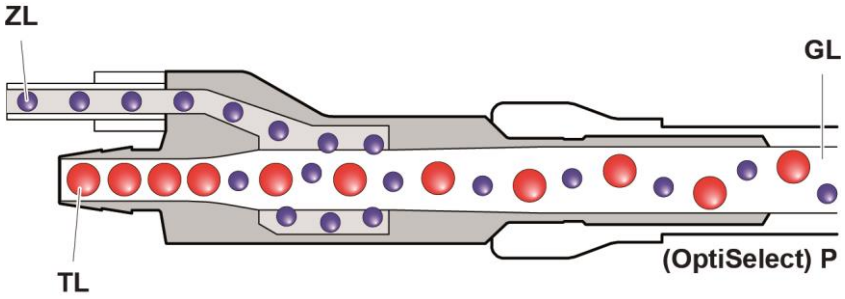


fig. 21: Air streams in the diffuser adapter

GL	Total air	**TL**	Transport air
ZL	Spraying air	**P**	Gun

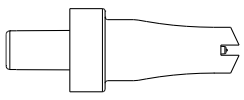
Setting the electrode rinsing air

1. Press the key.

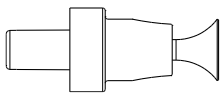
   The second display level will be shown.

2. 

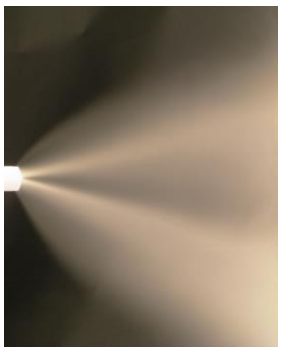
   Adjust the correct electrode rinsing air according to the applied nozzles (deflector plate, flat jet nozzle)



≈ 0.1 Nm³/h



≈ 0.5 Nm³/h



too much electrode rinsing air

3. If in this display level is no operation for 3 seconds, the dispay will automatically switch back to main default display level.

Setting the fluidization

The powder fluidization depends on the powder type, the air humidity and the ambient temperature. Fluidizing and vibration start by switching on the control unit.

Procedure:

1. Configure AirMover by opening the ball valve complete and adjusting with the flow control valve (equipment type F only)
2. Open the powder container cover (equipment type F only)
3. Press the  key

   The second display level will be shown
4. 

   Adjust the fluidizing air with the keys **T5/T6**

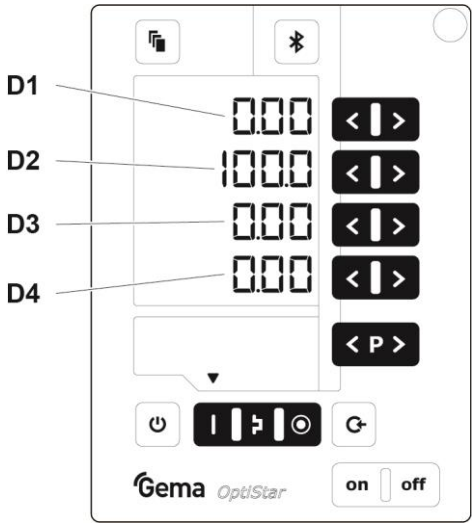
   – If in this display level is no operation for 3 seconds, the device switches back to the first display level

   – The powder should only be touched gently, but should be "cooked" regularly and is also to be stirred using a rod
5. Close again the cover

Pinch valves and system backpressure monitoring display

1. Turn on the gun control unit with the **ON** key
2. Hold key down for 5 seconds

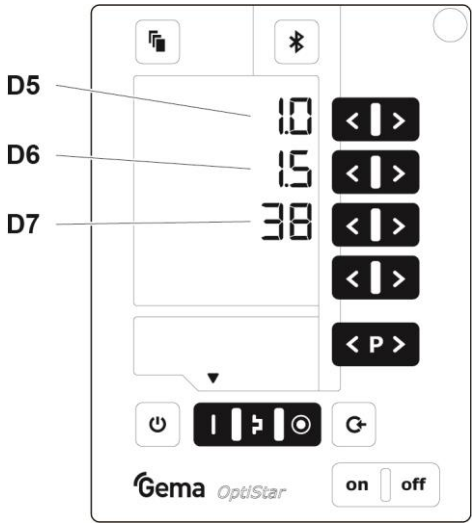
   The display switches to the following level:



Designation	Description	Unit
D1	Current pinch valves pressure	bar
D2	Opening time of control solenoid valve for pinch valves pressure (leak-tightness control)	%
D3	System backpressure 1	bar
D4	System backpressure 2	bar

3. Press key 1x

   The display switches to the following level:

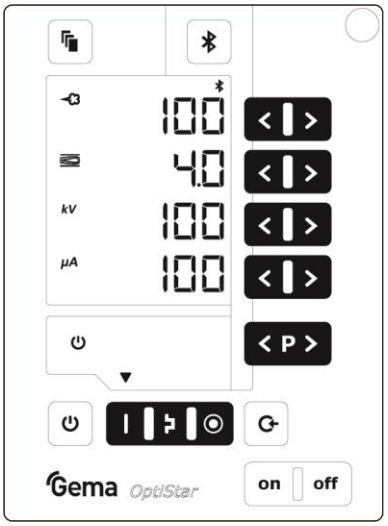


Designation	Description	Unit[1)]
D5	Current transport air	Nm³/h
D6	Current spraying air	Nm³/h
D7	Pressure drop per each pinch valve closing	mbar/bar

1) Depending on the unit set, airflows are displayed in Nm³/h or scfm.

4. Press key 2x

   The display switches to the main level:



Correction values

With the correction values, the gun control unit can be adapted optimally to local conditions (e.g. the adjustment of different powder outputs in the plant).

ATTENTION

Incorrectly set correction values can lead to damage to the Application pump

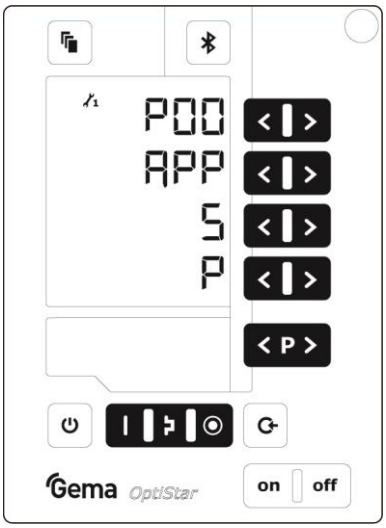
The plant was optimally set by the Gema service engineer at the first start-up.

► Changes of correction values may only be made by Gema trained personnel.

Entering the correction values

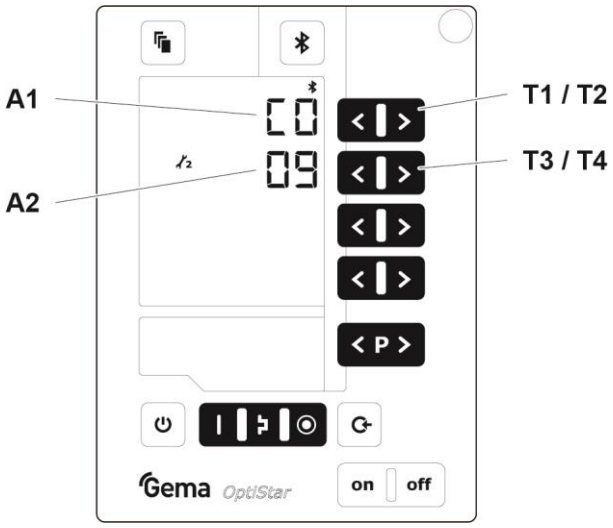
1. Hold the key down for 5 seconds

   The display switches to the following level:



2. Press the key

   The display switches to the following level:



3. The correction factor number is shown in the display **A1** with a **C** placed in front
4. Set the corresponding correction value with the **T3** or **T4** key.

   The value of the adjusted correction factor appears on corresponding display **A2**
5. Scroll to the next or previous correction factor with the **T1** or **T2** key
6. Select correction values according to the following table

Corr. value	Description	Range	Default values	
			Standard	Special[4)]
C0	Minimum suction time (%)	0 – 18	9[1)]	12[1)]
C1	Powder hose correction value (%)	40 – 100	80	90
C2	Daily correction value (%)	50 – 150	100	100
C3	Transport air offset (Nm³/h)	0 – 2.0	1.0[2)]	1.0[2)]
C4	Pump operating frequency (Hz)	1.0 – 10.0	6.0[3)] (P09=0)	6.0[3)] (P09=0)
			3.0[3)] (P09=1)	3.0[3)] (P09=1)
C5	Pinch valves set pressure Conveying mode (bar)	1.0 – 6.0	2.8	2.8
C6	Pinch valves set pressure Cleaning mode (bar)	1.0 – 6.0	4.5	4.5
C7	Back flushing T1 (%)	0 – 18	0[1)]	6[1)]
C8	Back flushing T2 (%)	0 – 18	0[1)]	2[1)]
C9	Permissible compressed air consumption (mbar/bar) = Threshold value for error message H89	0 – 200	80	80

1) The adjustment range applies to the half cycle time.

2) Depending on the unit set, airflows are displayed and entered in Nm³/h or scfm.

3) Do not change!

4) Use only if blockings occur.

7. Press the key
   The display returns to the first level display.

Cleaning mode

The cleaning mode enables blowing off powder accumulations in the powder hose with preset air pressure.

Cleaning programs

Powder chamber emptying combined with hose cleaning in both directions

In this cleaning program (key **T13**), some air is blown through the filter elements in the powder chambers. The cleaning process can be additionally supported by blowing compressed air into the suction hose.

ATTENTION

Too high pressure could damage the pump parts.

– The application pump may be cleaned with a pressure of max. 4 bar.

Cleaning the hose to the gun

⚠ CAUTION

Large dust formation possible!

– The conveying hose and the powder gun must be pointed into the booth during the cleaning procedure!

In this cleaning program (key **T14**), the powder hose to the gun will be cleaned with several air blasts. During this time, the pinch valve on the suction side remains closed.

Cleaning the hose on the suction side

⚠ CAUTION

Large dust formation possible!

– The powder hopper must be empty
  or
– the suction hose must be pointed into the booth during the cleaning procedure!

In this cleaning program (key **T15**), the powder hose on the inlet of the application pump will be cleaned with several air blasts. During this time, the pinch valve on the output to the gun remains closed.

Activating the cleaning function

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

⚠ CAUTION

Bodily injury or large dust formation possible!

Uncontrolled escape of pulsating compressed air and powder can cause eye or ear damage and respiratory problems.

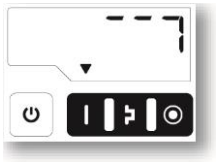
Manual coating equipment type B:

- ► Lift the fluidizing/suction unit
- ► Point the fluidizing/suction unit and the gun into a suction unit or into the booth

Manual coating equipment type F:

- ► Remove the hose feedthrough from the powder hopper
- ► Point the hose feedthrough and the gun into a suction unit or into the booth

1.  OR 



2. Select the corresponding cleaning program:

3. **START =**

– The automated cleaning procedure is started.

► **During the parallel operation (system parameter P09=1 Duo) both application pumps are cleaned one after the other.**

4. **STOP =**

or


or

the cleaning mode is terminated automatically.

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

Pinch valve diagnostic

The pinch valve diagnostic is to be carried out, in order to maintain the coating quality or after the error message **H89** is displayed.

The prerequisites for the diagnostic:

– Exhaust at suction and conveyance side must be present and in operation

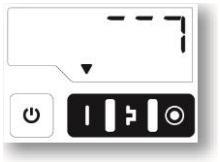
– Powder hopper must be empty

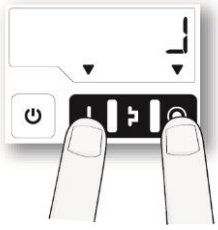
– Cleaning program completed

▶ **The pinch valve diagnostic is to start after the cleaning program has been completed!**

1. 

OR 



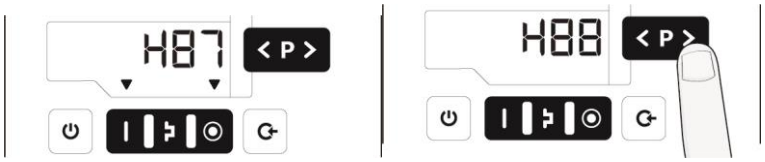
2. 

3. **START =**

– The pinch valve diagnostic is started.

4. Wait until the pinch valve diagnostic is stopped automatically

If the error message **H87/H187** (suction pinch valve) or **H88/H188** (conveying pinch valve) is displayed after the procedure has been completed, the corresponding pinch valve hoses must be replaced – see AP01 Application pump Operating manual.



Setting the background illumination

1. Press the key

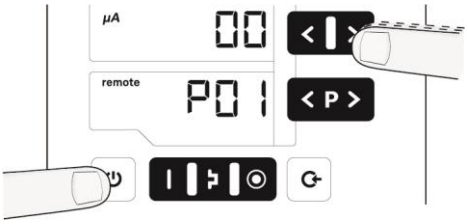
The display switches to the following level:

2. 

Select the desired brightness

Activate/deactivate the keyboard lock

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

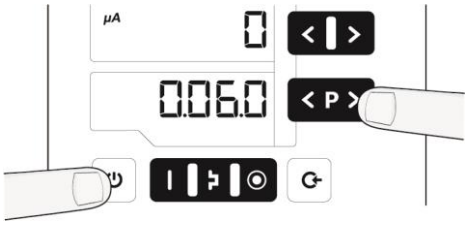


– The keyboard lock will be activated. The **remote** display blinks.

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

Checking the software version

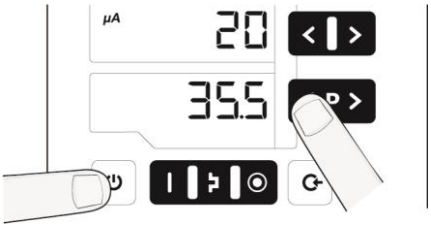
1. Press these two keys at the same time



– 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.

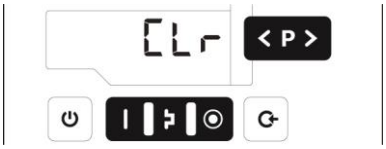
The trigger counter can't be reset!

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. Separate from power mains
2. Clean guns, application pumps and powder hoses (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

The product must be stored horizontally for safety reasons.

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 at an authorized Gema service location. The repairs must only be performed by an authorized specialist.

Improper interventions can result in serious danger for user or the equipment and may result in loss of warranty!

Fault clearance

Error diagnosis of the software

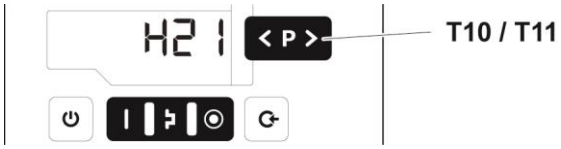
General information

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:			
H06	Trigger valve	Solenoid coil current lower than preset limiting value Valve defective, main board or cable defective	Contact a Gema service center

Code	Description	Criteria	Remedy
H07	Spraying air flow too high (Setting of spraying air on the display)	The preset value for spraying air is too high compared to the transport air setting	Lower spraying air value or increase value for transport air to equalize air volumes to the dense phase pump, delete error code
H08	Transport air volume too high (setting of powder share on the display)	The preset value for transport air is too high compared to the spraying air setting	Lower transport air value or increase value for spraying air to equalize air volumes to the dense phase pump, 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% Daily correction value too large	Reduce powder output Reduce daily correction value
H10	Transport air range lower deviation	The theoretical value for transport air falls below minimum Total air is smaller than minimum	Limit transport 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	Transport 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	Spraying 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
H64	Transport air throttle does not move	Short circuit in limit switch, motor throttle defective	Contact a Gema service center
H65	Spraying 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
H68	Transport air position lost	Lost steps, limit switch defective, throttle motor defective	Contact a Gema service center
H69	Spraying 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
Application pump:			
H80 **H180***	Pump not connected	The control unit is parameterized as pump control unit, but there is no pump connected.	Connect the pump
H82	(GLsoll – TL) < 0 (Total Air preset value – Transport Air) < 0	Total air is smaller than transport air which is resulting from powder output and daily correction value C2	Change the powder output correction value or daily correction value C2
H83	AP01 pressure control	Pressure falls below desired value longer than 5 s.	Check the compressed air supply, otherwise contact a Gema service center
H84	AP01 pressure measurement	A/D converter timeout. Possible cause: Hardware defective	Contact a Gema service center
H85	No AP01 interface	The unit is configured as pump control unit, but there is no pump interface	Check System parameter P0, otherwise contact a Gema service center
H86 **H186***	AP01 pressure drop error	During the cleaning program first phase is the pressure still too high.	Cleaning program is interrupted Contact a Gema service center
H87 **H187***	IN pinch valve leakage	Is displayed after IN pinch valve diagnostic. Pinch valve defective.	Replace the pinch valve or contact Gema Service
H88 **H188***	OUT pinch valve leakage	Is displayed after OUT pinch valve diagnostic. Pinch valve defective.	Replace the pinch valve or contact Gema Service
H89	Pinch valve leakage / too high compressed air consumption	Pinch valve diagnostic during operation Pressure drop per each pinch valve closing higher then threshold value C9	Start the cleaning and then the pinch valve diagnostic If it occurs again, replace the pinch valve or contact Gema Service
Communication Mainboard-Gun:			

Code	Description	Criteria	Remedy
H91	Communication error mainboard-gun	Gun, gun cable or Mainboard defective	Replace or contact Gema Service

***** Application pump no. 2

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 a help code is only displayed for a short time, but after the acknowledgment it will disappear. In this case, it's recommended to switch off the device 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 your product, please indicate the following specifications:

– Type and serial number of your product

– Order number, quantity and description of each spare part

Example:

– **Type** Gun control unit OptiStar 4.0 (CG23-P)

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 *****.

The wearing parts are always marked with a #. marked.

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)

⚠ WARNING

Use of non-original Gema spare parts

Use of Non-Gema replacement spare parts may invalidate some or all approval certificates and accreditations; and the user assumes all explosion risks associated with use of these parts. Use of these replacement spare parts may void any and all warranty claims.

► Use only original Gema spare parts!

OptiStar CG23-P Gun control unit

	OptiStar CG23-P gun control unit – complete, without item 4	1015 204
1	Front plate – complete, see corresponding spare parts list	
2	Enclosure	
3	Backplate – complete, see corresponding spare parts list	
4	Cover	1015 249

fig. 22

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

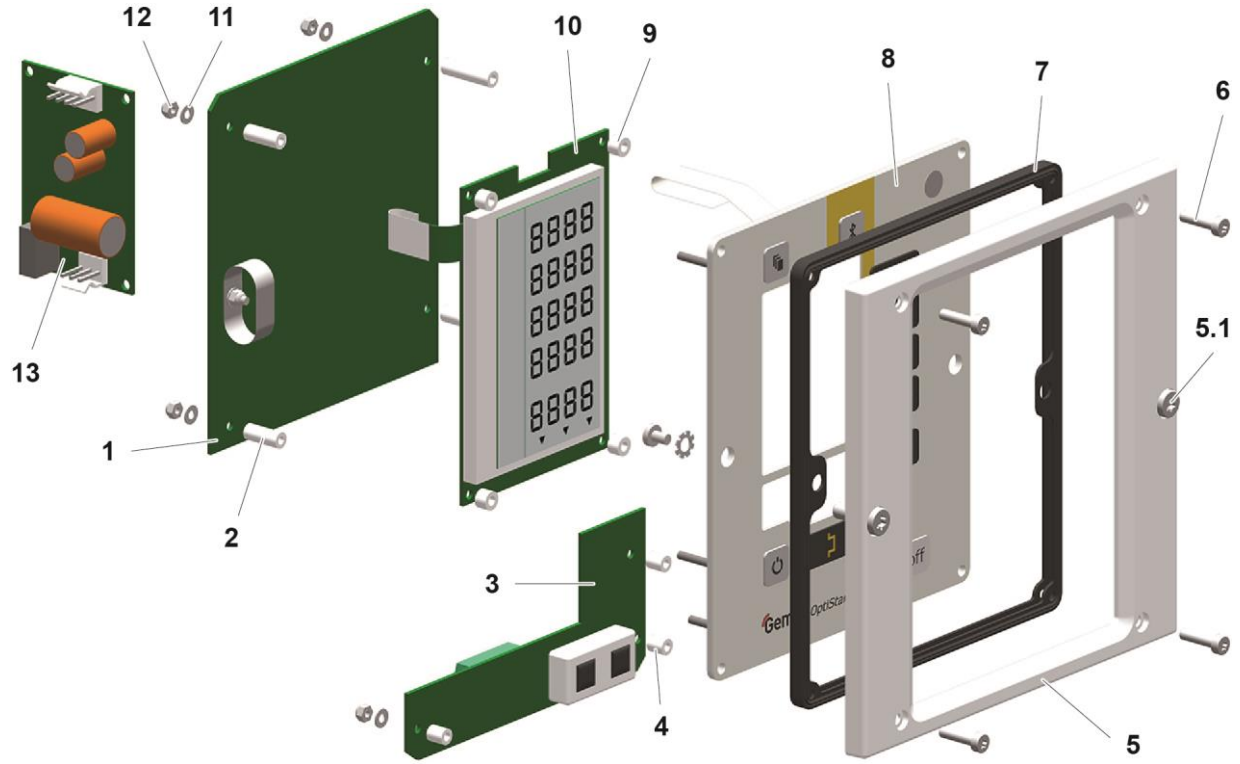


Fig. 23

Inside back plate

1	Back plate gasket	1015 198
3	Adjusting elbow – Ø 8-Ø 8 mm	1001 031
4	Solenoid valve – Ø 8-Ø 8 mm, 24 VDC	1003 914
5	Motor throttle – complete	1000 064
6	Plastic tube – Ø 8/6 mm	103 152*
7	Fluidizing pad – 1/8"	237 264
8	Screw – M4x16 mm	1013 925
9	Solenoid valve	1009 936
10	T-piece – 1/8"- Ø 8- Ø 8 mm	246 573
11	Reducer – Ø 8- Ø 6 mm	257 540
12	Valve block	1009 932
13	T-piece – 1/4"- Ø 8- Ø 8 mm	1008 040
14	O-ring – Ø 12x1.5 mm, NBR70	261 416
15	Motor throttle – complete	1009 931
16	O-ring – Ø 8x4 mm, NBR70	1001 521
17	Intermediate piece	1009 938
18	O-ring – Ø 20x1.5 mm, NBR70	268 429
19	O-ring – Ø 13x1.5 mm, NBR70	1009 943
20	Connector	1009 939
21	Elbow joint – M5-Ø 6 mm	1009 941
22	AP01 interface – complete (incl. pressure sensors)	1016 132
23	Plastic tube – Ø 6/4 mm	103 144*
24	Motor throttle – complete	1008 012
25	Elbow joint – 1/8"-Ø 8 mm	251 372

***** Please indicate length

Inside back plate

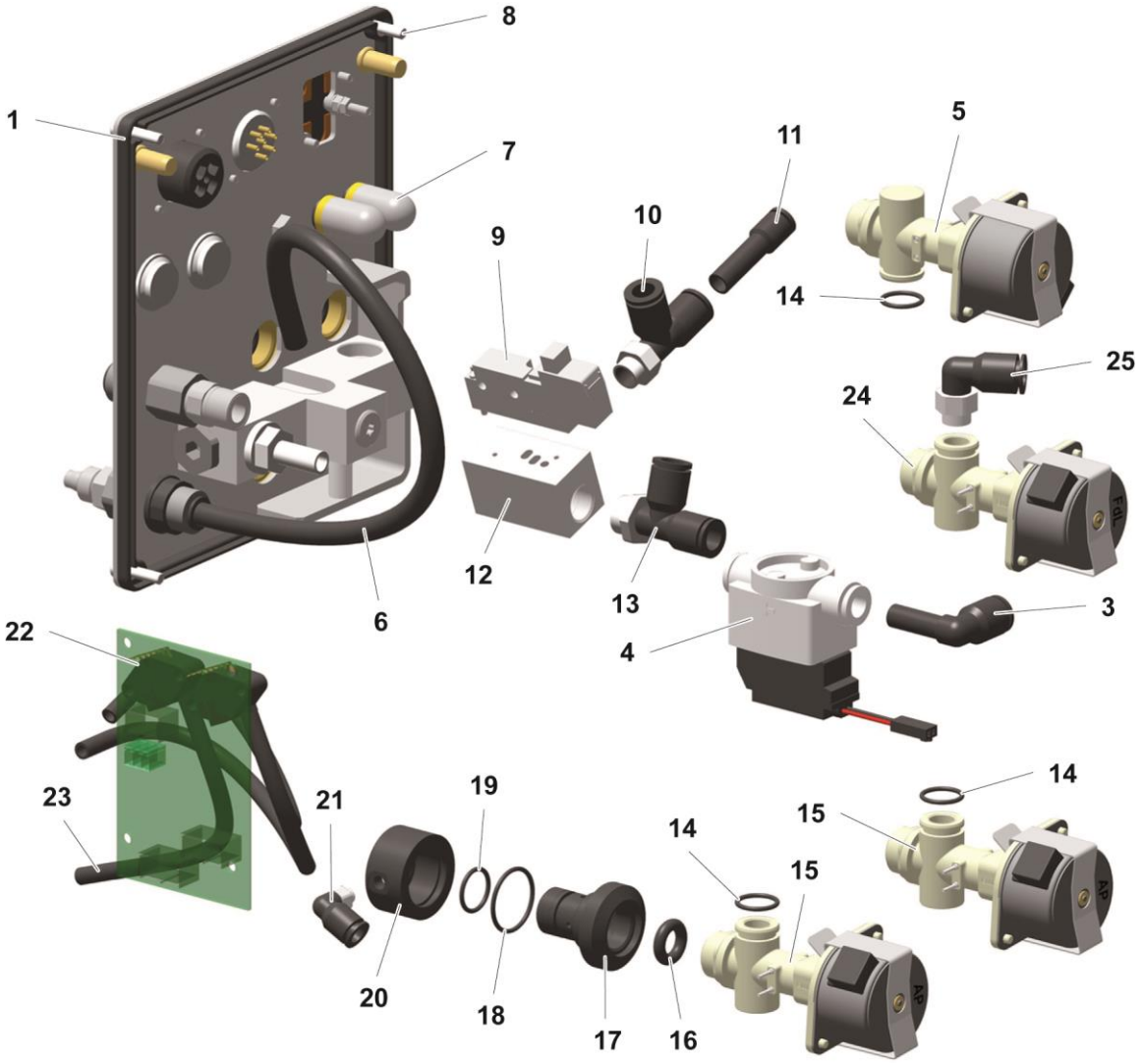


fig. 24: OptiStar CG23-P

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	Spraying air hose – Ø 8/6 mm (black)	103 756*
2.2	Quick release coupling for spraying air hose – NW5-Ø 8 mm	261 637
3	Nut with kink protection – M12x1 mm, Ø 8 mm	201 316
3.1	Transport air hose – Ø 8/6 mm (blue)	103 497*
3.2	Quick release coupling for transport air hose – NW5-Ø 8 mm	261 645
4	Hose – Ø 8/6 mm	103 756*
5	Nut with kink protection – M12x1 mm, Ø 8 mm	201 316
5.1	Pinch valve air hose – Ø 8/6 mm (green)	103 519*
6	Vibrator cable (constituent part of vibrator)	
8	Connecting cable – 12 pins, 0.5 m	1007 829
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. 25

Index

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