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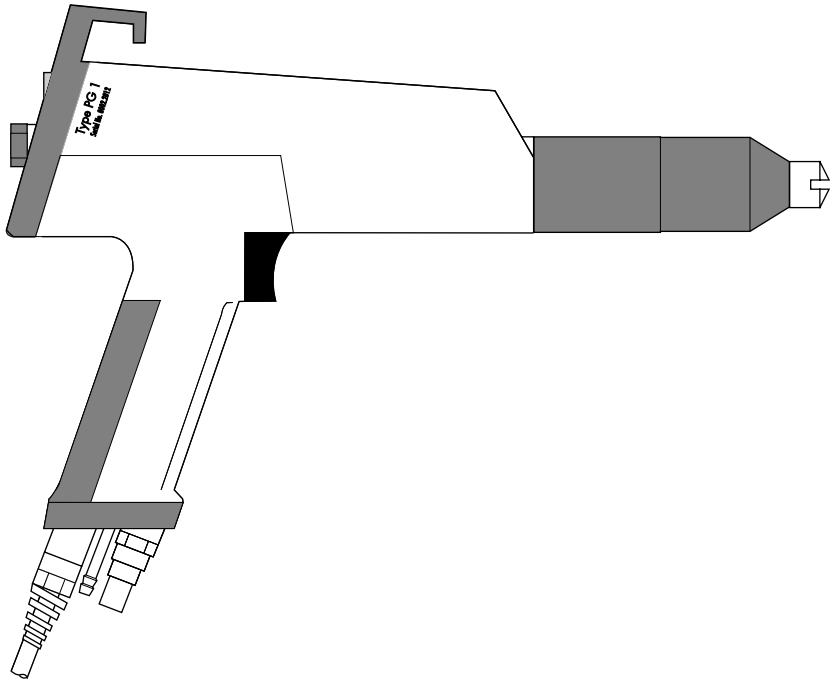
Operating Instruction and Spare Parts List

PG 1 Powder Gun



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Safety rules

Safety rules for electrostatic powder coating operations

1. This equipment is dangerous when not operated according to the following standards: EN 50 050 (or VDE 0745, Part 100), EN 50 053, Part 2 (or VDE 0745, Part 102).

2. All electrostatically conductive parts located within 5 m of the coating area and especially the workpieces *must* be properly grounded.

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

4. The operating personnel *must* wear electrostatically conductive footwear (e.g. leather soles).

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

6. Connect the grounding cable (yellow/green) supplied to the grounding terminal on the control module. The grounding cable *must* have a good metal to metal connection with the coating booth, recovery unit, and the workpiece conveyor system, especially with the workpiece suspension.

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

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

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

10. When cleaning the gun or changing nozzles the control module *must* be switched off

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PG 1 Powder Gun

The PG 1 extremely lightweight powder gun with integrated high voltage generator has a very high penetration power and a high, constant transfer efficiency because of its patented air-cleaned central electrode. The gun can be dismantled, making it easy to maintain and repair. Due to its revolutionary concept, the PG 1 inaugurates a new era in electrostatic powder coating.

Scope of delivery:

- PG 1 Powder Gun
- Powder hose
- Rinsing air hose
- 40 mm nozzle holder
- ø 16, 24, and 32 mm vented deflectors
- Deflector electrode holder and nozzle
- Flat jet spray electrode holder and nozzle
- Velcro straps
- Cleaning brush
- Spare parts case with plastic bolt, three O-rings, and a grounding plate lock screw

Technical data of the PG 1 Powder Gun

Rated input voltage:	10 V eff.
Frequency:	17 kHz
Rated output voltage:	98 kV
Polarity:	negative (Option - positive)
Maximum output current:	100 µA
HV indication:	LED
Flash protection	EEx 5 mJ
Approval:	EN 50050 and PTB test No. Ex-91.C.9102 Date PTB tested 10/1991 FM No. J.I. OW 7 A 6.AE (7264) Date tested 10/1993

The PG 1 Powder Gun Control should only be connected to the PGC 1 Powder Gun Control (and with PGC 2, PGC 3 or RGC-HV only after consultation with ITW Gema).

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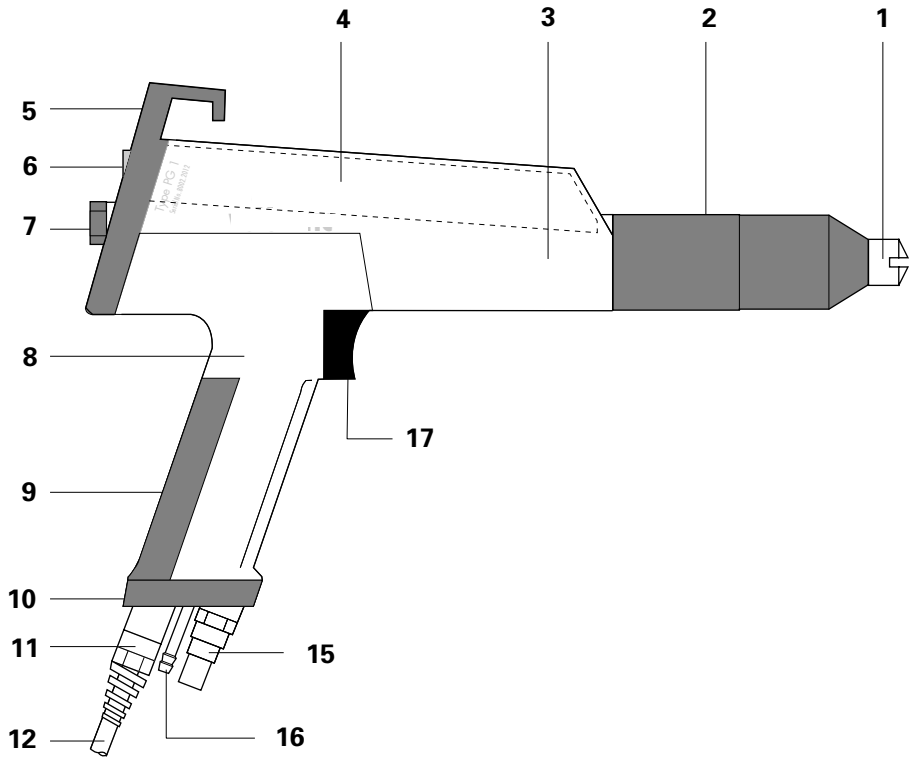
PG 1 Powder Gun



1 Atomizing system
2 Threaded sleeve
3 Shaft
4 HV cascade
5 End plate with hook
6 LED window
7 Plastic screw
8 Grip
9 Grounding plate
10 Locking screw
11 Gun cable connection (bayonet catch)
12 Gun cable
15 Powder hose connection
16 Rinsing air connection
17 Trigger

Figure 1.

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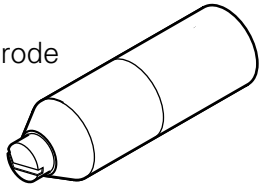
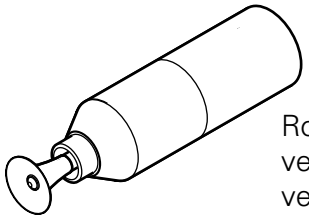
The powder gun PG 1 can be equipped with the following nozzles:

40 mm nozzles

Flat jet nozzle with vented centre electrode

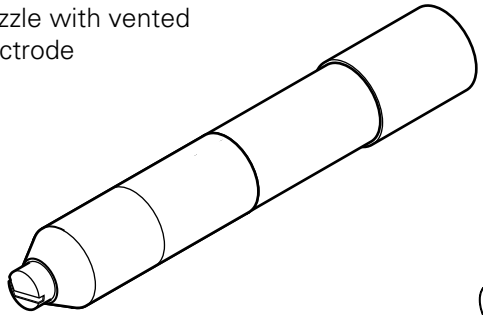


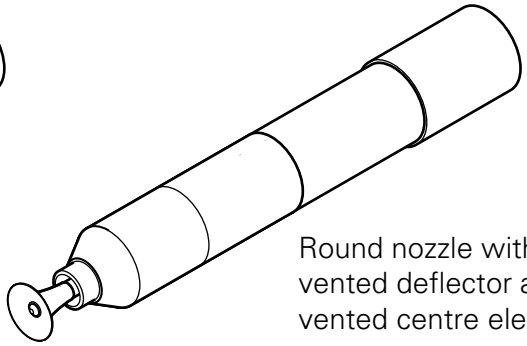


Round nozzle with vented deflector and vented centre electrode

150 mm nozzles

Flat jet nozzle with vented centre electrode

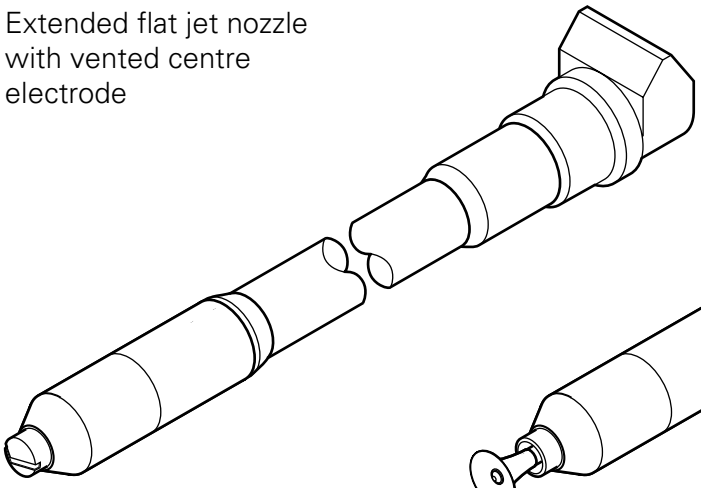


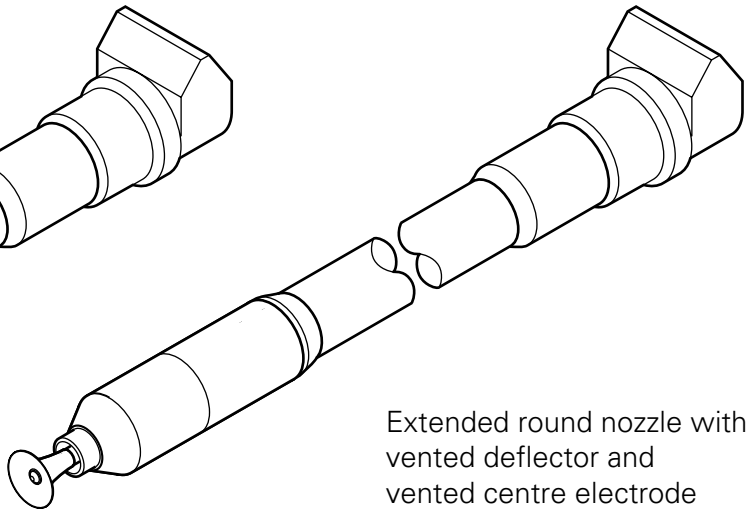


Round nozzle with vented deflector and vented centre electrode

300 or 500 mm nozzles (*not part of the standard nozzle set - see spare parts list)*

Extended flat jet nozzle with vented centre electrode





Extended round nozzle with vented deflector and vented centre electrode

Figure 2.

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Functional description

1. High-Voltage generation

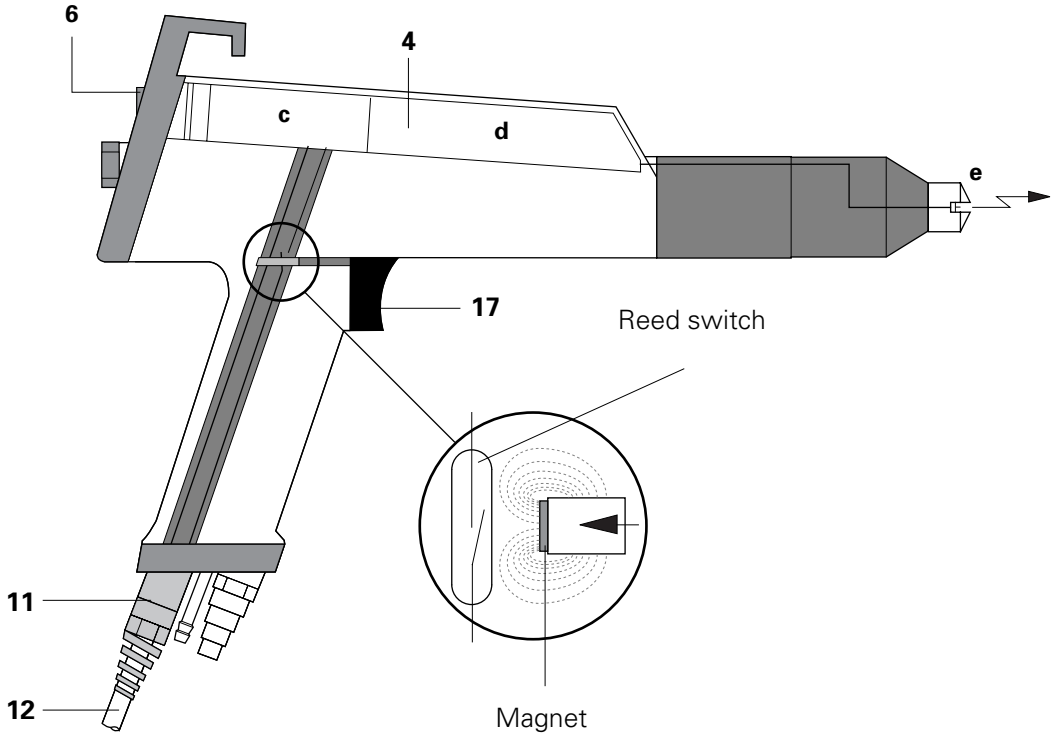

Figure 3.

The voltage generator module (Control module) supplies high-frequency low-voltage.
This voltage is conducted by the gun cable (**12**) and the gun connector (**11**) in the grip to the high-voltage cascade (**4**).
In the cascade (**4**) this low voltage is stepped up (**c**). This primary high-voltage is subsequently rectified and multiplied in several stages in the cascade (**d**) until the required high-voltage is attained.
The high-voltage is then fed from the spray nozzle to the electrode (**e**). See also Figures 7 & 8.
When the high-voltage is adjusted on the control module (see page 10), the intensity of the LED (**6**) also changes. The user has the assurance that high-voltage is present and can control this function.

2. Circuitry

In addition to the low-voltage a switching voltage is taken to the gun. When the gun switch (**17**) is actuated, a reed switch closes the circuit. The control module switches the low voltage, the powder feed, and the gun air (supplementary air) on. This reed satisfies the safety regulations of most major standards.

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3. Powder flow and supplementary air

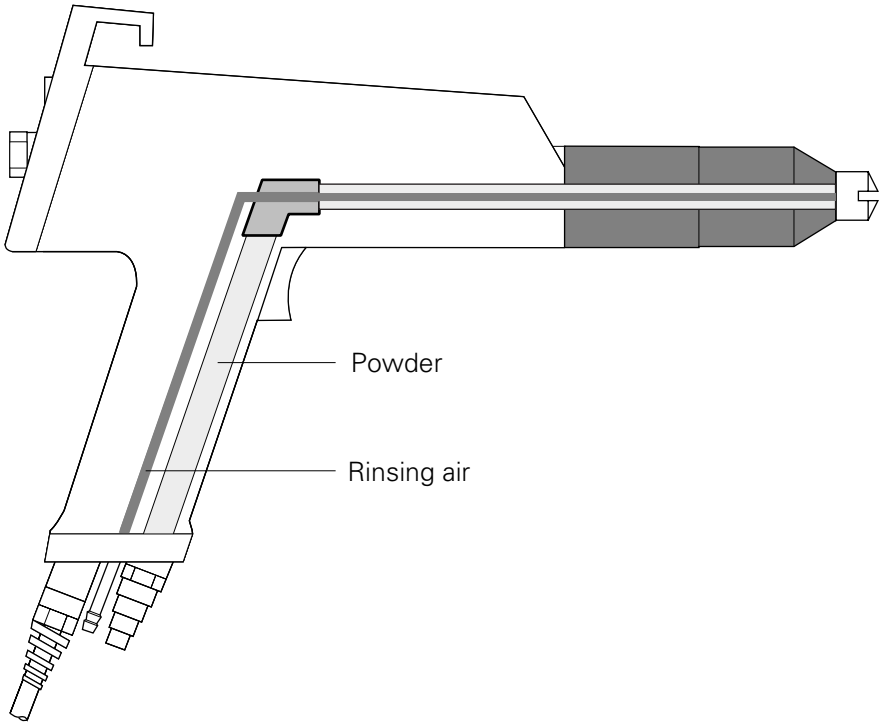

Figure 4.

The supplementary air, functioning as rinsing air, is connected to the gun, shown in Figure 7, when air-cleaned nozzles are used.
The air control is described in the applicable section (see page 9, section a).

The function of the nozzles are described in the applicable sections (see page 6).

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4. Flat jet nozzle with vented centre electrode

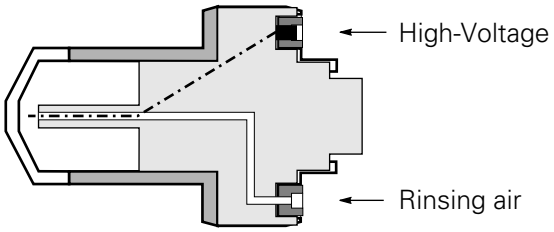

Figure 5.

The air-cleaned flat jet nozzle atomizes and charges the powder. The slotted opening shapes the powder cloud in such a way that an oval spray pattern is achieved.
The powder is charged by means of a central electrode. The high-voltage, generated inside the gun, is conducted via the black contact ring of the nozzle holder to the centre electrode.
In order to prevent powder from sintering on the electrode, the latter is cleaned by compressed air during the spraying process. For this purpose the rinsing air (see page 5, Section 3) is fed via the small hole in the black contact ring in the nozzle holder into the hole in the electrode holder.
The rinsing air control is described in the applicable section (see page 9, Section a)

5. Round nozzle with vented deflector and vented centre electrode

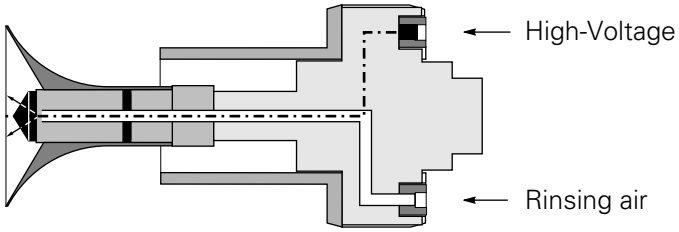

Figure 6.

The deflector plate is used for shaping the powder jet emerging from the gun to form a powder cloud. The powder is charged by means of a central electrode. The High-Voltage, generated inside the gun, is conducted via the black contact ring of the nozzle holder to the centre electrode.

Powder can build up on the deflector plate, the plate has to be rinsed with air. For this purpose the rinsing air (see page 5, Section 3) is fed via the small hole in the black contact ring in the nozzle holder, then into the hole in the electrode holder and deflected in such a way that it blows across the inside cone of the deflector plate. The intensity of the rinsing air is dependent on the powder and its sintering ability.

The rinsing air control is described in the applicable section (see page 9, Section a).

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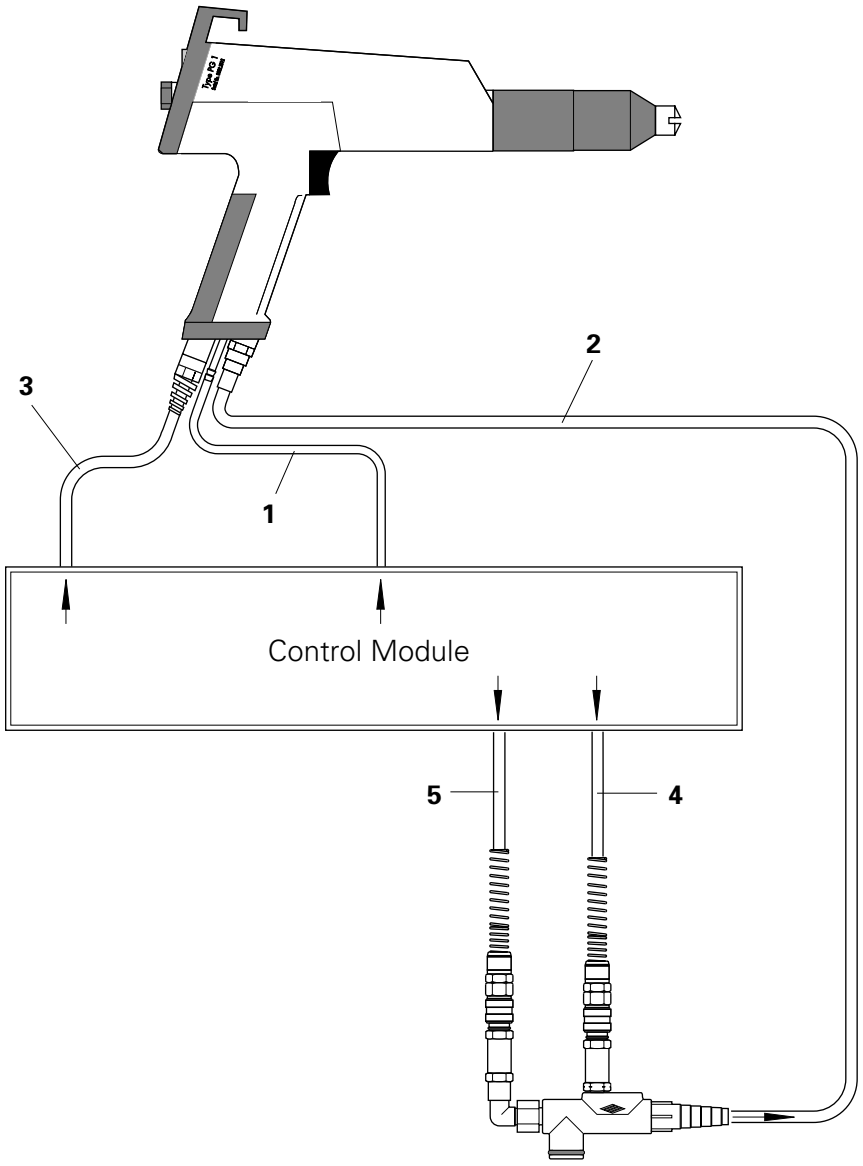
Preparatory steps for initial start-up

a) Connecting the powder gun - PG 1

1. Connect the gun connector to control module
2. Connect the hose for rinsing air to the gun
3. Connect the powder hose to the gun and to the injector



1 Rinsing air hose
2 Powder hose
3 Gun cable
4 Dosing air hose
5 Conveying air hose

Figure 7.

b) Functional check

For malfunctions see trouble shooting guide

1. Decrease the High-Voltage on the control module to the left-hand limit stop with the control knob.
2. Increase the High-Voltage by turning the control knob 45° to 90°.
3. Switch on the Control module.
4. Pick up the gun and point it toward a ***grounded*** workpiece, distance approx. 20 cm.
5. Press the gun trigger
   - Green illuminating push-button of control module should now light up.
   - High-Voltage meter indicates the voltage.
   - It is adjustable by turning the control knob.
6. Press the gun trigger and green illuminating push button (keep pressed)
   - The current intensity in µA can now be read .
7. Slowly increase the High-Voltage:
   The high-voltage reading should slowly increase. At the same time the LED on the back of the gun lights up. The intensity of the LED increases as the voltage rises.
8. Press gun trigger and open conveying air
   - The pressure gauge should indicate the pressure.
9. Press gun trigger and open rinsing air
   - The pressure gauge should indicate the pressure .
10. Press gun trigger, close conveying air and open dosing air
    - The pressure gauge should indicate the dosage.

When all these checks have been successfully completed, the gun is ready for use. If it fails to function correctly, consult the trouble shooting guide.

Start-up

a) Adjusting the powder output and powder cloud

The powder output is dependent on the type of powder, the powder hose length, the powder hose diameter, the conveying air pressure, and the dosage.
The operating principle of the injector and the influence of the dosing air are explained in the "Operating Manual" for control module.

1. Switch the control module on
2. Direct the gun into the booth and press the gun switch
3. Open the conveying air
4. Adjust the dosing air according to the instructions of the control module.
5. Adjust the rinsing air pressure

   When using a flat jet nozzle

   - Adjust the rinsing air to approx. 1 bar.
   - Adjust the powder feed according to the instructions of the control module.
   - Decrease the rinsing air pressure (not under 1 bar) until the powder cloud attains its normal shape.

   When using a round nozzle with vented deflector

   - Adjust the rinsing air pressure to approx. 1 bar
6. Adjust the powder cloud

   When using a flat jet nozzle

   - Loosen the threaded nut by turning it approx. 45° so that the flat jet nozzle (or the extension) can barely be turned.
   - Turn the flat jet nozzle in the desired axial direction.
   - Retighten the threaded nut.

   When using a round nozzle with vented deflector

   - Change the deflector (ø 16, 24, and 32 mm are supplied with the gun)

Caution: Never turn the deflectors, they are pushed on an O-ring fitting!

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b) Powder coating - Start-up

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

1. Switch on the control module
2. Pick up the gun and point it into the coating booth, but not at the workpiece to be coated.
3. Actuate the gun trigger (**17** - Fig. 8).
4. Adjust the High-Voltage:
   Check by observing the LED (**6** - Fig. 8).
5. Wait until the first powder surge has been expelled.
6. The workpiece(s) can now be coated.

c) Shut-down

1. Release the gun switch
2. Switch off the control module
   The adjustment for High-Voltage, rinsing air, and powder output must not be changed.
3. For work interruptions such as lunchbreaks, overnight, etc. it is not only necessary to shut off the control module, but also to disconnect the compressed air supply or to close the input pressure reducing valve.

d) Rinsing the powder hose

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

1. Unfasten the clamping nut of the injector and pull out the hose connection (refer to instructions of the control module).
2. Point the gun into the booth.
3. Blow out the hose manually by means of the compressed air gun.
4. Insert the hose connection into the clamping nut again and tighten the nut.

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Maintenance schedule

Conscientious maintenance at regular intervals increases the service life of the PG 1 powder gun and will result in uniform coating quality over a longer period!

a) Daily maintenance

1a Clean gun, see below

b) Weekly maintenance

1b Clean powder hopper, injector, and gun. Do not refill the powder hopper until coating is to be resumed!

2b Check ground connections between control module, coating booth, suspension device of workpieces or the conveyor chain.

Cleaning and repairs

PG 1 Powder Gun

a) Cleaning

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

Important: **Before cleaning the gun, switch off the control module and detach the gun connector (13 - Fig. 8).**
The compressed air used for cleaning should be free of oil and water.

Daily:

1. Clean the outside of the gun.

Weekly:

2. Detach the powder hose at the connector.
3. Detach the nozzle from the gun and clean it.
4. Blow out the gun through the powder inlet in the flow direction.
5. Clean the gun tube (**19** - Fig. 8) by means of the spiral brush supplied .
6. Blow out the gun again with compressed air.
7. Reassemble and reconnect the gun.

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b) Gun disassembly:

I*mportant:* ***The gun should only be disassembled if this becomes necessary due to a defect or contamination.***
Disassemble only to the point where access to the corresponding part is achieved.
Before cleaning the gun, switch off the control module and detach
The cascade must not be removed because it has been installed according to a special process. If the cascade is defective, send the entire shaft (3) to an authorized ITW Gema service centre.

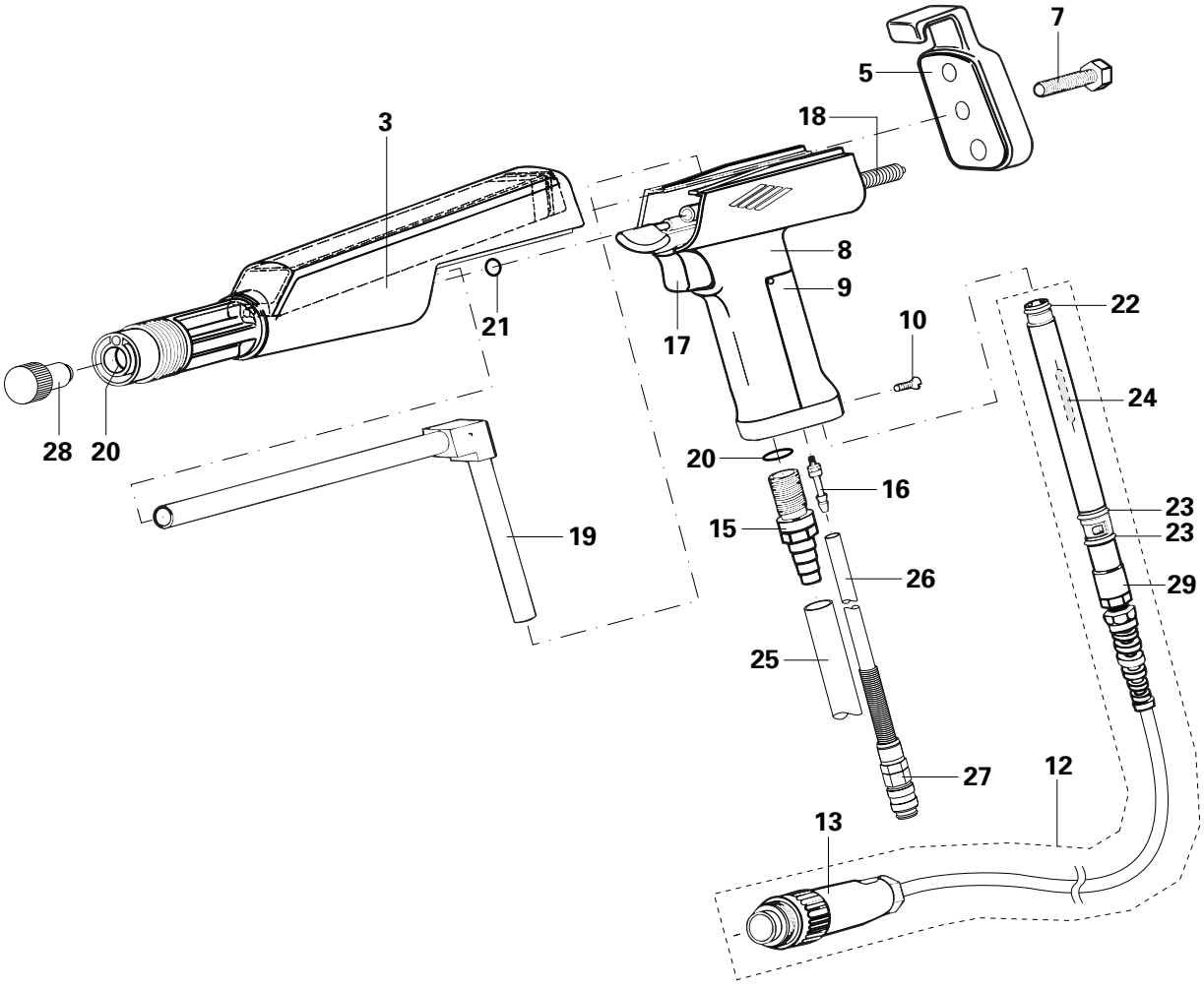

Figure 8.

b) Gun disassembly: (Forts.)

1. Detach the powder hose at corresponding connection.
2. Detach the rinsing air hose at corresponding connection.
3. Remove the nozzle.
4. Unscrew the lock screw (**10** - Fig. 8).
5. ***Give the cable connector (11*** - Fig. 8***) a 1/4 turn counter-clockwise (align the marks) and pull out in a straight line.***
6. Screw in the lock screw provisionally so that it cannot get lost.
7. Unfasten the plastic bolt (**7** - Fig. 8) and remove the connecting plate (**5** - Fig. 8).
8. Separate the grip (**8** - Fig. 8) from the shaft (**3** - Fig. 8).
9. Pull the powder tube (**19** - Fig. 8) out of the grip (**8** - Fig. 8).

The connections for the powder hose and the rinsing air should not be unscrewed if they are not defective.

c) Gun assembly

- The gun is reassembled by performing the previously described disassembling steps in the reverse order.
- Careful handling is recommended.
- If the gun cable connector cannot be inserted properly without applying force, disassemble the gun again and reassemble it.

After the gun has been reassembled check that:

- the gun cable connector (**11** - Fig. 8) is properly seated: it should be possible to turn the lock screw (**10** - Fig. 8) all the way into the countersink.
- there are no gaps between the joints.
- the gun trigger can be smoothly actuated and that it returns to the neutral position on its own.

d) Gun repair

Except for the replacement of possibly defective parts, virtually no repairs should be required. The replacement of the cascade (**4** - Fig. 8) and the repair of the gun cable connector (**11**) should only be performed by an *authorized* ITW Gema service centre – please consult your local ITW Gema Agent.

Replacing the trigger (**17** - Fig. 8) or the spring (**18** - Fig. 8):

1. Disassemble the gun
2. Remove the spring (Pulling the yoke with forefinger)
4. Insert the (new) trigger into the grip (**8** - Fig. 8)
5. Fit the (new) spring on the guide ribs of the trigger and push to the stop
6. Reassemble the gun

Replacing the gun connector (**13** - Fig. 8):
A soldering iron is required

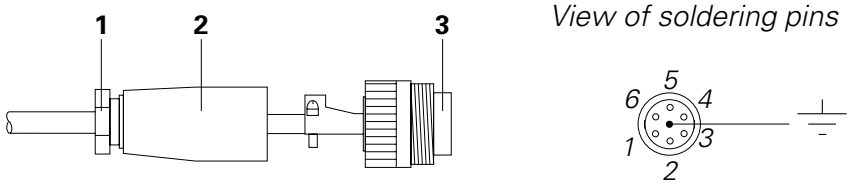

Figure 9.

1. Open the connector :
   - Unfasten the sealing gland (**1**)
   - Unscrew the sleeve (**2**)

   In case the sleeve cannot be unscrewed, put the gun plug into the gun connection and try again!
2. Unfasten the 2 screws of the cable clamp
3. Unsolder the wires of connector (**3**)
4. Pull the cable out of the connector and the sleeve (**2**)
5. Introduce the cable into the new sleeve and connector
6. Solder on the wires:

Pin assignment:	1 - *black wire*	4 - *white wire*
	2 - *vacant*	5 - *vacant*
	3 - *blue wire*	6 - *brown wire*
	centre - *screening (ground)*	

7. Tighten the 2 screws of the cable clamp
8. Screw on the sleeve (**2**) and tighten
9. Tighten the sealing gland (**1**)

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Spray nozzles

e) Cleaning

Daily or after each shift:

- Clean the outside of the spray nozzles with compressed air, solvents or any other liquids.
- Check the seating of the spray nozzle.

Make sure that the threaded sleeve is always tightened correctly. If the flat jet nozzle is loosely mounted, the high-voltage from the gun can "flash over" and damage the gun!

Weekly:

- Remove the spray nozzles and clean the inside with compressed air

Sintered powder accumulations should be removed.

Monthly:

- Check the spray nozzles for wear.

Replace the flat jet nozzle if:

- the spray pattern is no longer a perfect oval.
- deep grooves are present in the nozzle slot, or if the wall thickness has decreased.
- the wedge at the rear of the electrode holder is worn.

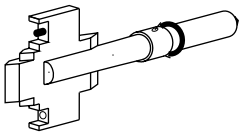
By nozzles with deflectors

- if the wedge at the rear of the electrode holder is worn, change the electrode holder.

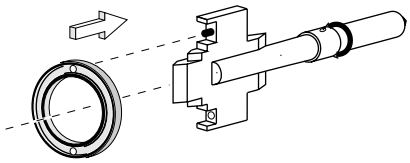
- ***Assembly - see next page***

Important notes for assembling the nozzles

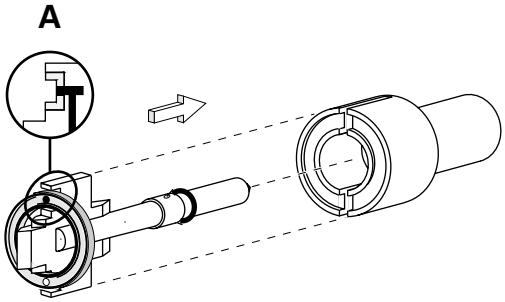
Round jet nozzle



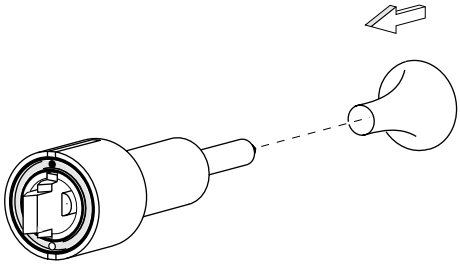
1. Hold the electrode holder.



2. Push the black contact ring with the hole on to the back of the electrode holder. **Attention! The slot in the contact ring must be visible from the rear - see Detail A !**



3. Push the electrode holder with the contact ring into the slot of the nozzle and press home.



4. Place the deflector onto the tip of the electrode holder and push it in as far as it will go.

Do not twist the deflector!

Flat jet nozzle :

Assembly of the Flat jet nozzle is the same as with the Round jet nozzle.

Figure 10.

SuperCorona® for the PG 1 Manual Powder Gun

About these assembly and operating instructions

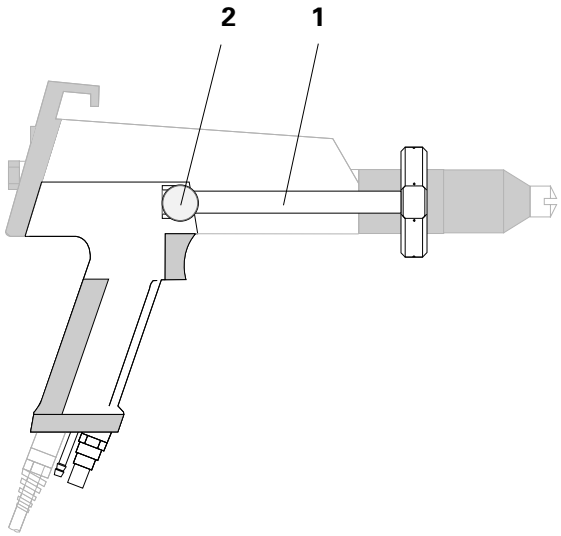
In order to be able to exploit all the advantages of the SuperCorona® the user should already be familiar with the working techniques and functioning of the powder coating equipment. It is not the purpose of this manual to give instruction on how to use powder coating equipment. If, however, problems do arise which are connected with the PG 1 manual powder gun or with the PGC 1 Powder Gun Control while working with the SuperCorona®, then the corresponding operating instruction manual should be consulted.

Field of application

SuperCorona® is an improvement for the proven PG 1 Powder gun with a Flat Spray Nozzle, with which an even better surface quality can be achieved when manual powder coating. When coating wheel rims, drawers, radiators, lamps etc it is shown that the surface quality is exceptional also in the places where the coating is thicker. With many powder types an "orange peel" finish can be avoided completely.
The performance of the PG 1 Powder gun with SuperCorona® is convincing due to its very good charging and very high deposit rate as well as improved penetration in "Faraday cages". The distance between nozzle and workpiece can be reduced to 100 mm without influencing the surface finish.
Due to the modular construction of the PG 1 Manual Powder Gun the light-weight SuperCorona® (approx. 60 g) can be fitted very quickly and easily. Even after fitting the PG 1 remains maintenance and repair-friendly.

Scope of delivery

The SuperCorona® set consists of :



1 SuperCorona® Ring
(*for 40 mm nozzle only - other lengths on request*)
2 Milled screw

Figure 11.

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b) Fitting the SuperCorona® ring

Before fitting the SuperCorona® make sure that the rod and the sleeve in the rod clamp block are free from contamination otherwise the electrical contact cannot be guaranteed.

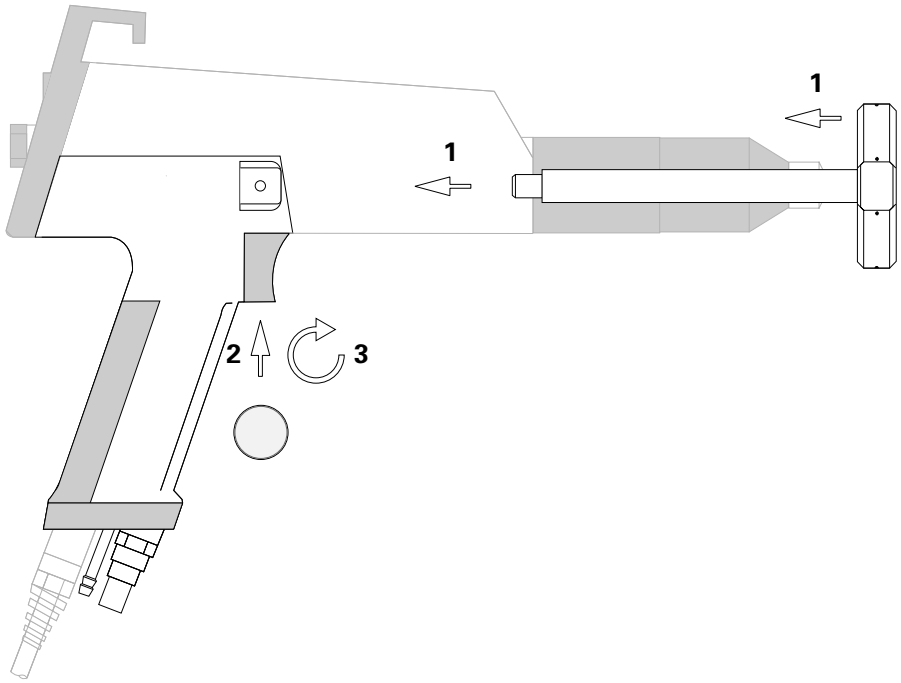

Figure 12.

Procedure:

1. Pass the PG 1 threaded sleeve through the SuperCorona® ring and at the same time position the rod in the corresponding hole (to the stop) in the rod clamp block.
2. Place the milled screw in the rod clamp block and
3. Screw tight.

Trouble shooting guide

(*Bold numbers in the text refer to Figure 8.)*

Faults	Causes	Remedies
Green lamp does not illuminate although Control module has been switched on and gun switch is pressed	In the gun: – Gun cable defective – High-voltage part defective Operating error: – Gun switch is not pressed	 Replace, eventual mail in for repairs Mail in the gun for possible repairs Press gun switch while regulating
During spraying process air escapes from the gun shaft	– O-ring (**21**) defective or missing	Replace or insert
Gun does not spray powder although the Control module is switched on and the gun trigger (**17**) is pressed.	- Injector, check valve or throttling at injector, powder hose or gun clogged - Insert sleeve in injector is worn No conveying air: - Reducing valve defective - Solenoid valve defective - Electronics board (PCB) defective	Clean corresponding part Replace Replace Replace Mail in for repair
Gun sprays powder, LED at the rear of the cascade (**4**) is dark, powder does not adhere to the workpiece	- High-Voltage too low - Gun connector, gun cable or gun cable connector is defective - High-Voltage cascade is defective - Electronics board (PCB) defective	Increase the high-voltage on the control module Replace defective item or mail it in for repair Mail in the shaft of the gun for repair Mail in for repair
Gun sprays powder, High -Voltage present, powder does not adhere to the workpiece	- Workpiece not properly grounded	Check the ground connection, also refer to "Safety regulations"

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NOTES :

Spare Parts List

Ordering Spare Parts

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

1. Type, and serial number of your powder coating equipment

2. Order number, quantity, and description of *each* spare part

Example:

1. **Type** PG 1, **Serial no:** xxxx xxxx

2. **Order no:** 232 670, 5 pieces, O-ring - ø 13.1 x 1.6 mm

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

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

All dimensions of plastic powder hoses are quoted as external (o/d), and internal (i/d) diameters :
e.g. ø 8 / 6 mm = 8 mm outside diameter (o/d) / 6 mm inside diameter (i/d).

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PG 1 Powder gun

Notes:

1. Only those parts have been included in the spare parts list which can be replaced by the user without difficulty.
2. If a part of the shaft (**3**) is broken or the High-Voltage cascade in the shaft is defective, then the complete shaft must be returned to an ITW Gema service centre to be inspected and/or repaired. The High-Voltage cascade is fitted according to a special process and therefore should not be dismantled by the user.
3. If the gun cable (**12**) is defective, the complete gun cable assembly should be returned for repair.

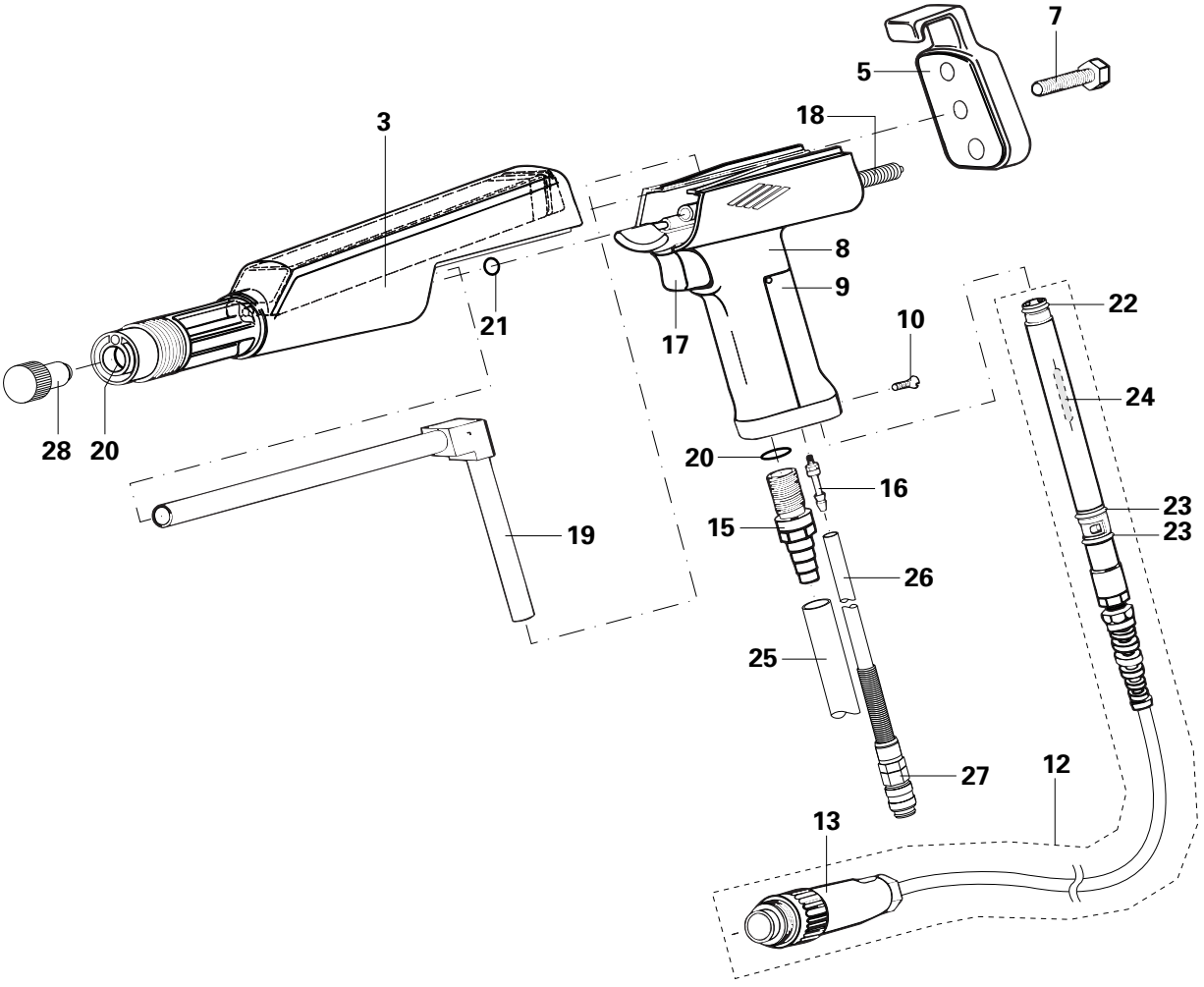

Figure 13.

PG 1 Powder gun

	PG 1 Manual Powder gun, complete including : Gun cable - 6 m, Rinsing air and powder hose - 6 m, 40 mm Flat jet nozzle, and small parts set	337 722
	PG 1 Manual Powder gun	332 348
3	Shaft assembly, complete with shaft, cascade, O-rings - Items **20** and **21**	
	- Negative polarity	338 249
	- Positive polarity	338 257
5	Cover with hook	330 043
7	Plastic bolt - M8 x 35 mm	328 847
8	Hand grip	330 035
9	Grounding plate	328 863
10	Lock screw - M4 x 10 mm	232 637
12	Gun cable, complete with 6 m cable	328 740
	Gun cable, complete with 11 m cable	336 025
12.1	Extension cable for gun cable (Item **12**)	334 464
12.2	Cable only (for Item **12**)	102 911*****
13	7 pin plug	200 085
15	Powder hose connector (with O-ring - Item **20**)	333 727
16	Rinsing air connector	328 820
17	Trigger with switching magnet	333 662
18	Spring	331 651
19	Powder tube	333 700**#**
20	O-ring - ø 13.1 x 1.6 mm	232 670
21	O-ring - ø 6.1 x 1.6 mm	233 099
22	O-ring - ø 7.65 x 1.78 mm	232 564
23	O-ring - ø 10.82 x 1.78 mm	232 556
24	Reed contact	328 910
25	Powder hose - ø 16 / 11 mm	103 128**#***
26	Rinsing air hose - ø 6 / 4 mm	100 854*****
27	Quick-release connection - ø 6 / 4 mm	200 840
28	Special extractor tool (for Item **19**)	340 839
	Spiral brush (for Item **19**)	333 514

Wear parts
***** Indicate length

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Nozzle combination for PG 1

	Flat Jet Nozzle Set (items **1**, **2**, **3**)	319 350
	Round Jet Nozzle Set (items **1**, **5**, **6**, **7**)	351 717
1	Contact ring	318 760
2	Electrode holder - complete (Flat Jet Nozzle - Tefzel - *Standard*)	318 779**#**
2.1	Electrode holder - complete (Flat Jet Nozzle - PTFE)	358 126**#**
3	Flat Jet Nozzle	318 744**#**
4	Threaded sleeve	328 774
5	Electrode holder, incl. item **6** (Round Jet Nozzle - *Standard*)	351 709**#**
5.1	Electrode holder, incl. item **6** (Round Jet Nozzle - Double electrode)	347 329**#**
6	O-Ring - ø 5 x 1 mm	231 606**#**
7	Round Jet Nozzle	331 287**#**
8	Deflector - ø 16 mm	331 341**#**
9	Deflector - ø 24 mm	331 333**#**
10	Deflector - ø 32 mm	331 325**#**
11	Extension tube - 150 mm	347 310**#**
12	Extension tube - 300 mm	353 310**#**
12.1	Extension tube - 500 mm	352 500**#**
	Other lengths on request!	

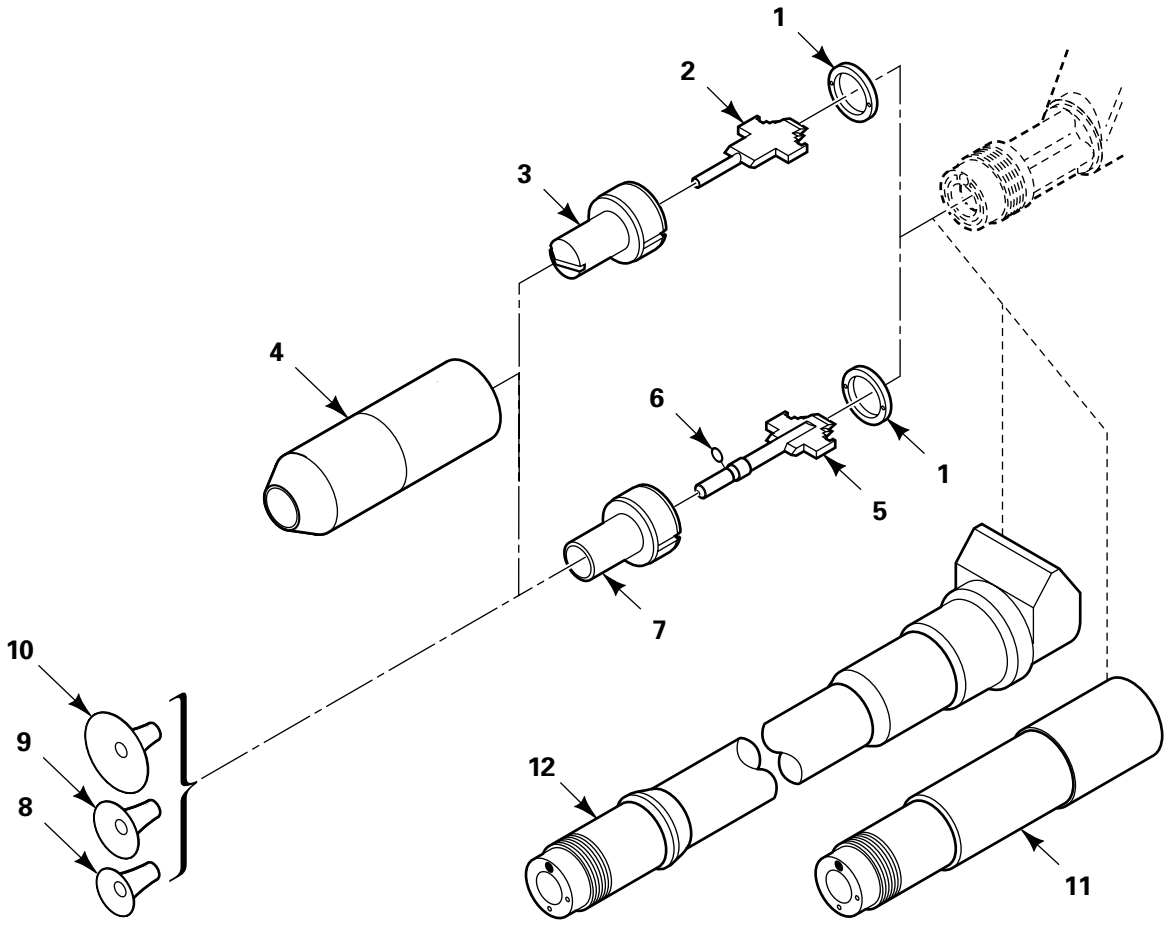

Figure 14.

Wear parts

SuperCorona® - Option

	SuperCorona® conversion kit - complete	352 730
1	SuperCorona® Ring - complete (*for 40 mm nozzle only - other lengths on request*)	352 470#
2	Milled screw - M4 x 8 mm	245 313
3	Gun hand grip - complete	352 829

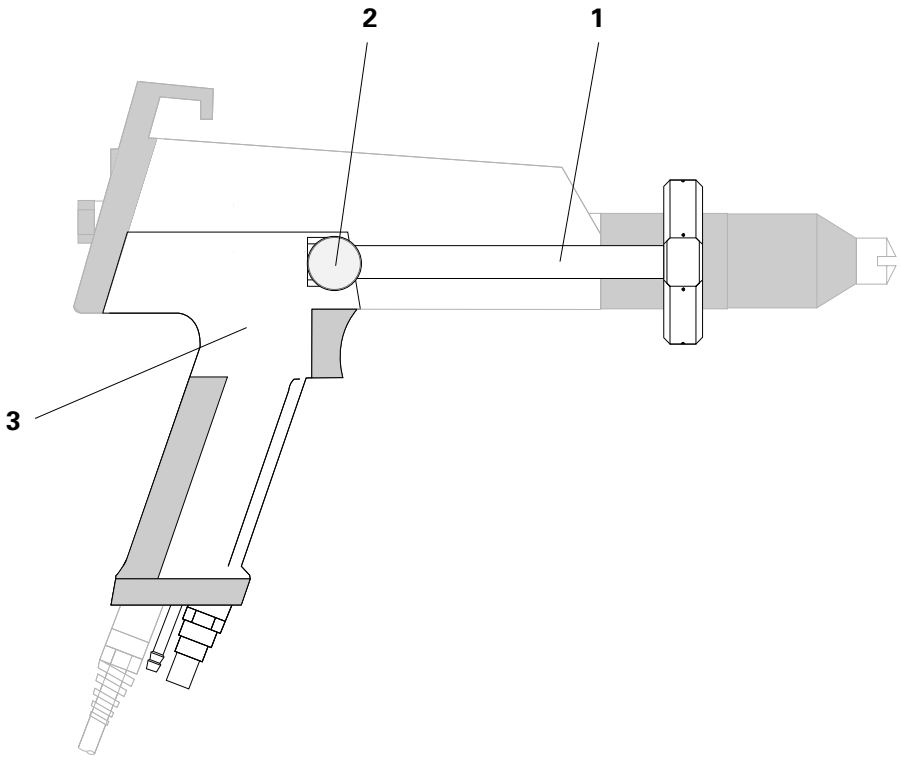

Figure 15.

Documentation PG 1

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