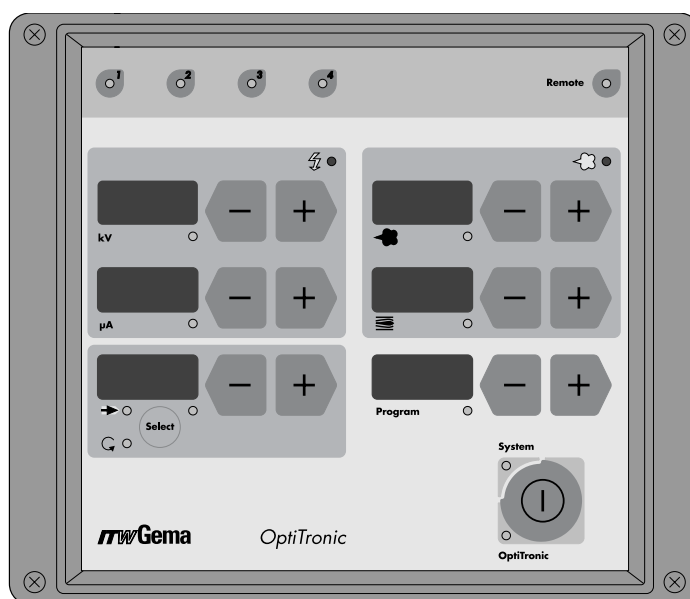


Operating Instructions and Spare Parts List

OptiTronic Powder Gun Control (CG02)



⚠ IMPORTANT

Before using this equipment, carefully read all instructions in this manual. Keep this Manual for future reference!



APPROVED

TWGema

CE 0102 Ex II (2) D

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Safety regulations for stationary electrostatic powder spraying equipment

1 Safety symbols (pictograms)

This chapter sets out the fundamental safety regulations that must be followed by the user and third parties using the powder spraying equipment. These safety regulations must be read and understood before the spraying paint equipment is used.

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



Danger!

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



Warning!

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



Information!

useful tips and other information.

2 Conformity of use

1. The stationary powder spraying equipment is built to the latest specification and conforms to the recognized technical safety regulations. It is designed for the normal application of powder coating.
2. Any other use is considered as non-conform. The manufacturer is not responsible for damage resulting from improper use of this equipment; the end-user alone is responsible. If the powder spraying equipment is to be used for other purposes or other substances outside of our guidelines then ITW Gema AG should be consulted.
3. Observance of the operating, service and maintenance instructions specified by the manufacturer is also part of conformity of use. The stationary powder spraying equipment should only be used, maintained and started up by trained personnel, who are informed about and are familiar with the possible hazards involved.
4. Start-up (i.e. the execution of a particular operation) is forbidden until it has been established that the powder spraying equipment has been set up and wired according to the guidelines for machinery (98/37 EG). EN 60204-1 (Machine safety) must also be observed.
5. Unauthorized modifications to powder spraying equipment exempts the manufacturer from any liability from resulting damage.
6. The relevant accident prevention regulations, as well as other generally recognized safety regulations, occupational health and structural regulations are to be observed. (see Appendix „Standards“)
7. Furthermore the country-specific safety regulations must be observed.

Explosion protection	Type of protection	Temperature class
0102 II (2) D	IP5x	T6 (zone 21) T4 (zone 22)

3 Technical safety regulations

3.1 General information

The powder spraying equipment from ITW Gema is designed with safety in mind and is built according to the latest technological specifications. This equipment can be dangerous if it is not used for its specified purpose. It should also be noted that because of this there exists:

- A danger to life and limb of the user or third party.
 - A danger of damage to the equipment and other machinery belonging to the user.
 - A hazard to the efficient operation of the equipment.
1. The powder spraying equipment should only be started up and used once the operating instructions have been carefully studied. Improper use of the controlling device can lead to accidents, malfunction or damage to the control itself.
 2. Before every Start-up check the equipment for operational safety (regular servicing is essential)!
 3. Safety regulations BGI 764 and VDE regulations DIN VDE 0147, Part 1, must be observed for safe operation.
 4. Safety precautions specified by local legislation must be observed.
 5. The plug must be disconnected before the machine is opened for repair.
 6. The plug and socket connection between the powder spraying equipment and the mains network should only be taken out when the power is switched off.
 7. The connecting cable between the controlling device and the spray gun must be set up so that it cannot be damaged during operation. Safety precautions specified by local legislation must be observed !
 8. Only original ITW-Gema replacement parts should be used, because the explosion protection will also be preserved that way. Damage caused by other parts is not covered by guarantee.
 9. If ITW-Gema powder spraying equipment is used in conjunction with machinery from other manufacturers then their safety regulations must also be taken into account.
 10. Before starting work familiarize yourself with all installations and operating elements, as well as with their functions!
Familiarization during operation is too late!
 11. Caution must be exercised when working with a powder/air mixture! A powder/air mixture in the right concentration is flammable ! No smoking during powder coating!
 12. As a general rule for all powder spraying installations, persons with pacemakers should never enter high voltage areas or areas with electromagnetic fields. Persons with pacemakers should not enter areas with powder spraying installations!



Warning!

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

3.2 Safety conscious working

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

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

The powder spraying equipment should only be used by trained and authorized personnel.

This applies to modifications to the electrical equipment, which should only be carried out by a specialist.

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

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

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

1. Any operating method which will negatively influence the technical safety of the powder spraying equipment is to be avoided.
2. The operator should see to it that no non-authorized personnel work on the powder spraying equipment (e.g. this also includes using the equipment for non-conform work).
3. The operator is under obligation to check the powder spraying equipment at least once every shift for signs of external damage, defects or changes (including the operating characteristics) which could influence safety and to report them immediately.
4. The operator is obliged to check that the powder spraying equipment is only operated when in satisfactory condition.
5. As far as is necessary, the operating firm must ensure that the operating personnel wear protective clothing (e.g. facemasks).
6. The operating firm must guarantee cleanliness and an overview of the workplace with suitable instructions and checks in and around the powder spraying equipment.
7. No safety devices should be dismantled or put out of operation. If the dismantling of a safety device for set-up, repair or servicing is necessary, reassembly of the safety devices must take place immediately after maintenance or repair work is finished. The powder spraying device must be turned off while servicing is carried out. The operator must train and commit the responsible personnel to this.
8. Activities such as checking powder fluidization or checking the high-voltage spray gun etc. must be carried out with the powder spraying equipment switched on.

3.4 Notes on special types of hazard

3.4.1 Power:

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

3.4.2 Powder:

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

3.4.3 Static charges

Static charges can have the following consequences: Charges from people, electric shocks, sparking. Charges from objects must be avoided – see Earthing.

3.4.4 Earthing

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

3.4.5 Compressed air:

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

3.4.6 Crushing and cutting

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

3.4.7 Access under exceptional circumstances

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

3.5 Prohibition of unauthorized conversions and modifications to machines

All unauthorized conversions and modifications to electrostatic spraying equipment are forbidden for safety reasons.

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

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

4 Safety requirements for electrostatic powder coating

1. This equipment is dangerous if the instructions in this operating manual are not followed.
2. All electrostatic conductive parts, and in particular the machinery within 5 m of the coating equipment, must be earthed.
3. The floor of the coating area must conduct electricity (normal concrete is generally conductive).
4. The operating personnel must wear electricity conducting footwear (e.g. leather soles).
5. The operating personnel should hold the gun with bare hands. If gloves are worn, these must also conduct electricity.
6. The supplied earthing cable (green/ yellow) must be connected to the earthing screw of the electrostatic powder spraying hand appliance. The earthing cable must have a good metallic connection with the coating booth, the recovery unit and the conveyor chain and with the suspension arrangement of the objects.
7. The electricity and powder supply to the hand guns must be set up so that they are fully protected against heat and chemical damage.
8. The powder coating device may only be switched on once the booth has been started up. If the booth cuts out then the powder coating device must be switched off.
9. The earthing of all electricity conducting devices (e.g. hooks, conveyor chains) must be checked on a weekly basis. The earthing resistance must amount to $\leq 1 \text{ M}\Omega$.
10. The control device must be switched off if the hand gun is cleaned or the nozzle is changed.
11. When working with cleaning agents there may be a risk of hazardous fumes. The manufacturers instructions must be observed when using such cleaning agents.
12. The manufacturers instructions and the applicable environmental requirements must be observed when disposing of powder lacquer and cleaning agents.
13. If any part of the spray gun is damaged (broken parts, tears) or missing then it should not be used.
14. For your own safety, only use accessories and attachments listed in the operating instructions. The use of other parts can lead to risk of injury. Only original ITW-Gema replacement parts should be used.
15. Repairs must only be carried out by specialists and under no circumstances should they be carried out in the operating area. The former protection must not be reduced.
16. Conditions leading to dangerous levels of dust concentration in the powder spraying booths or in the powder spraying areas must be avoided. There must be sufficient technical ventilation available, to prevent a dust concentration of more than 50% of the lower explosion limit (UEG) (UEG = max. permissible powder/air concentration). If the UEG is not known then a value of 20 g/m^3 should be used.

5 A summary of the rules and regulations

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

5.1 Guidelines and Regulations, German professional association

BGV A1	General Regulations.
BGV A2	Electrical equipment and material.
BGI764	Electrostatic coating
BGR132	Guidelines for the avoidance of the dangers of ignition due to electrostatic charging (Guideline "Static Electricity")
VDMA 24371	Guidelines for electrostatic coating with synthetic powder ¹⁾ - Part 1 General requirements. - Part 2 Examples of use.

5.2 Leaflets

ZH 1/310	Leaflet on the use of tools in locations where there is danger of explosion. ¹⁾
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5.3 European Standards EN

RL94/9/EG	The approximation of the laws of the Member States relating to apparatus and safety systems for their intended use in potentially explosive atmospheres
EN 292-1 EN 292-2	Machine safety ²⁾
EN 50 014 to EN 50 020 identical DIN VDE 0170/0171	Electrical equipment for locations where there is danger of explosion ³⁾
EN 50 050	Electrical apparatus for potentially explosive atmospheres - Electrostatic hand-held spraying equipment ²⁾
EN 50 053 Part 2	Requirements for the selection, installation and use of electrostatic spraying equipment for flammable materials - Hand-held electrostatic powder spray guns ²⁾
EN 50 177	Stationary electrostatic spraying equipment for flammable coating powder ²⁾
PR EN 12981	Coating plants - Spray booths for application of organic powder coating material - Safety requirements
EN 60529 identical DIN 40050	IP-Type protection: contact, foreign bodies and water protection for electrical equipment. ²⁾
EN 60 204 identical DIN VDE 0113	VDE Regulations for the setting up of high-voltage electrical machine tools and processing machines with nominal voltages up to 1000 V ³⁾

5.4 VDE (Association of German Engineers) Regulations

DIN VDE 0100	Regulations for setting-up high voltage equipment with nominal voltages up to 1000V. ⁴⁾
DIN VDE 0105	VDE Regulations for the operation of high voltage equipment. ⁴⁾
Part 1	General regulations.
Part 4	Supplementary definitions for stationary electrical spraying equipment.
DIN VDE 0147	Setting up stationary electrostatic spraying equipment ⁴⁾
Part 1	
DIN VDE 0165	Setting up electrical equipment in locations where there is a danger of explosion. ⁴⁾

Source:

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

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

³⁾ Generalsecretariat, Rue Bréderode 2, B-1000 Brüssel, or the appropriate national committee.

⁴⁾ VDE Verlag GmbH, , Bismarckstrasse 33, 1000 Berlin 12

TECHNICAL DATA

OPTITRONIC - BASIC MODEL

Mains connection:	
Input voltage:	24 V DC
Power consumption:	48 VA
Type of protection:	IP5x
Temperature range:	0° C to +40° C (+32° F to +104° F)
Pneumatic data:	
Input pressure:	5.0 bar
Max. water vapour content:	1.3 g/m ³
Max. oil vapour content:	0.1 mg/kg (Oil/Water)
Max. compressed air consumption:	11 m ³ /h
Dimensions:	
Width:	203 mm
Height:	174 mm
Depth:	222 mm
Weight:	4.8 kg
Attachable electrostatic guns:	
Nominal output voltage:	12 V (G2 guns)* 10 V (G1 guns)*
Automatic guns:	GA02 OptiGun 2†
Manual guns:	GM01 EasySelect*
Tribo guns:	Connection possible
FlowControl (Option)	
Input pressure:	5.0 bar
Operating temperature range:	0° C to +50° C (+32° F to +122° F)
Air volume range FL:	0-7 Nm ³ /h
Air volume range ZL:	0-7 Nm ³ /h
Air volume working range FL:	0.5-6.5 Nm ³ /h
Air volume working range ZL:	0.5-6.5 Nm ³ /h
Resolution:	0.01 Nm ³ /h
Accuracy:	<±0.1 Nm ³ /h
Reaction time (Step 0-100 %):	<400 ms

OPTITRONIC TYPE DEFINITION AND POSSIBLE OPTIONS

(see Control unit rear wall)

Example:

Label with Version number and Order number: **V 8 384 593**
(see Version table)

ABBREVIATIONS:

FL	Conveying air
ZL	Supplementary air
*G1	GA02 OptiGun 2
*G2	GM01 EasySelect Guns

OPTITRONIC POWDER GUN CONTROL

ABOUT THESE OPERATING INSTRUCTIONS

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

ABBREVIATIONS USED IN THESE OPERATING INSTRUCTIONS:

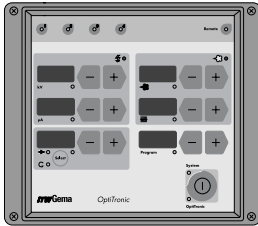
DB	DigitalBus
EL	Electrode rinsing air
FC	FlowControl
FL	Conveying air
FL_min	Minimum powder output
GL	Total air volume
HV_BG	High-voltage setting
I_BG	Setting for current
PA%	Powder output (percent)
SL	SystemLock
SKW%	Powder output correction value
ZL	Supplementary air

OPTITRONIC CONTROL UNIT

FIELD OF APPLICATION

The OptiTronic Control Unit is the heart of a modern powder coating plant. The optimized and intelligent **powder gun control** is very flexible, in respect to the expendability of the applicable stages in automation.

THE BASIC OPTITRONIC UNIT



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

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

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

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

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

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

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

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

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

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

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

The most important characteristics of the OptiTronic are:

- 255 stored coating programs possible
 - A coating program is composed of:
 - High-voltage (kV)
 - Spraying current (μA)
 - Electrode rinsing air (Nm^3/h)
 - Powder output (%)
 - Total air volume (Conveying air + Supplementary air - Nm^3/h)
- Individual inputs, and display windows for high-voltage, spraying current, electrode rinsing air, powder output, total air volume, and programs.
- High-voltage or spraying current setting
- Diagnostic functions
- Modular equipment concept, expandible at any time with FlowControl, DigitalBus or SystemLock
- 24 V DC Power supply

OPTIONAL SYSTEM EXTENSIONS

The well-thought out equipment concept permits the operator to select corresponding automated solutions for individual application requirements.

The possibility to expand the basic unit with additional system extensions, such as, the FlowControl, DigitalBus or SystemLock will add flexibility, and cost optimization to the customer's solutions.

FLOWCONTROL MODULE

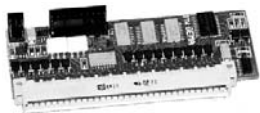


The FlowControl, together with the basic OptiTronic powder gun control, permits the highest precision measurement and regulation of the conveying air, and the supplementary air up to the injector (Injector anomalies, powder hose coils or powder hose lengths etc. are not taken into account).

The air volume is continuously measured and compared with the desired values and automatically regulated by the FlowControl sensor. Fluctuations in the compressed air or dynamic air pressure caused by the system are automatically compensated for with this component. The reproducibility of the desired values for conveying air, and supplementary air are increased and lead to more uniform coating results.

- Precise air volume measurement
- The highest regulating dynamic
- Air volume calibration based on a micro-controller
- Higher air volume regulation range
 - Conveying air up to 6.5 Nm³/h
 - Supplementary air up to 6.5 Nm³/h

DIGITALBUS MODULE



The basic OptiTronic powder gun control fitted with a DigitalBus opens up the possibility to decentralize automated solutions. Individual process requirements, tailored of the process control, support automated and reliable plant operation.

- Digital parallel interface connection to a PLC (Programmable Logical Control)
- On-line control of all coating parameters
 - Gun
 - High-voltage
 - Spraying current
 - Electrode rinsing air
 - Injector
 - Powder output
 - Total air (conveying air + supplementary air)
- Control of up to 255 decentralized coating programs stored in the OptiTronic control unit.

(continued)

OPTIONAL SYSTEM EXTENSIONS (CONTINUED)

CANBUS



The OptiTronic Powder Gun Control Unit fitted with a CANBus interface is a simple CANopen Slave. It operates in a network with a central control unit (Master). Communication takes place exclusively between the Master and the Slaves.

The following data can be accessed through CANopen:

- All Theoretical values (Process data)
- All Rated data (Process values)
- All Control values
- All System parameters (except Baud Rate and CAN_Address)
- All Error messages
- All Special parameters, such as:
Software version, Daily correction values, Powder output correction, etc.

SYSTEMLOCK (OPERATING PANEL INTERLOCKING)

The SystemLock option serves to interlock the OptiTronic operating panel. In addition, the operator has a collective error message available. The signal can be accessed through the 5 pin Aux. - 2.4 socket. Only the following operating functions can be released when the operating panel is interlocked:

- Switching of desired value display / actual value display
- Acknowledgement of error messages

Activation of the operating panel interlocking can be undertaken centrally with the aid of a key switch for all OptiTronic control units. Operating panel interlocking is indicated by the green Remote LED. The SystemLock option must be initialized with the System parameter P4 = 1 in the control unit.

OPTITRONIC CONVERSION

When converting from one version to another, first make sure which parts are contained in the original version, see the label on the rear of the equipment then look in the Version table below, and compare it with the Retrofit parts table for the parts required for the new version.



Order only that/those part(s) which is/are not already supplied with the original version.

OPTITRONIC VERSION TABLE

Version	OptiTronic Order No.	Flow Control	System Lock	Digital Bus	CANBus	G1*	G2*
5	384 569		X				X
6	384 577		X			X	
7	384 585			X			X
8	384 593			X		X	
11	384 623	X		X			X
12	384 631	X		X		X	
15	388 874				X		X
16	388 882				X	X	
17	388 890	X			X		X
18	388 904	X			X	X	

*G1 = GA02 OptiGun 2

*G2 = GM01 EasySelect

(continued)

OPTITRONIC VERSION TABLE (CONTINUED)

EXAMPLE:

Expanding from Version 6 to Version 5.

From the System expansion table above can be seen that Version 6 consists of an SL (SystemLock), and a G1 powder gun, from this table can also be seen that Version 5 consists of an SL (SystemLock), and a G2 powder gun.

The only parts required for this conversion is the G2 gun and the G2 gun cable (see Order numbers in the Retrofit parts table below).

Because the SL, and SL cable are already supplied these parts are, therefore, not required.

When making this conversion, please see also "Equipment configuration for converting to a different gun type".



Order only that/those part(s) which is/are not already supplied with the original version.

CONVERSION TABLE

Version	Flow Control 379 743	System-Lock cable 379 891	DigitalBus 379 883	DigitalBus cable 379 816	CANBus 386 227	G1 cable 384 933	G2 cable 379 840
5		X					X
6		X				X	
7			X	X			X
8			X	X		X	
11	X		X	X			X
12	X		X	X		X	
15					X		X
16					X	X	
17	X				X		X
18	X				X	X	

ABBREVIATIONS:

- SL** SystemLock
- G1** Gun 1 = GA02 OptiGun 2
- G2** Gun 2 = GM01 EasySelect

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

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

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

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

PLUG AND SOCKET CONNECTIONS

The OptiTronic control unit is ready for use from the factory.
Only certain cables and hoses must be connected by the customer.

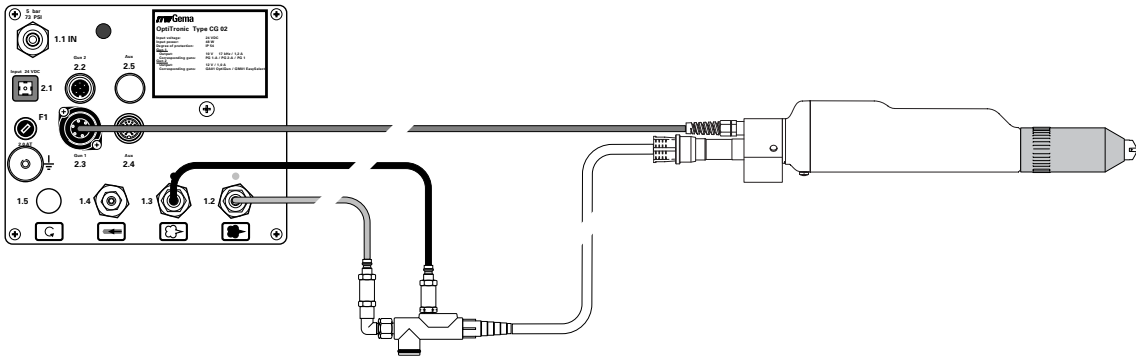
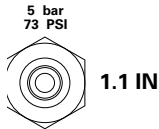


Figure 1



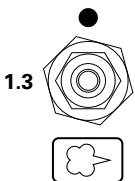
The hose for the compressed air supply from the compressed air circuit is connected directly to the main air connection - **1.1 IN** on the rear of the control unit



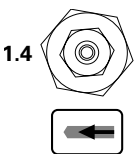
The main compressed air **input pressure** must be set at **5.0 bar**.
The compressed air must be free from oil and water.



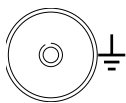
The red hose for the conveying air (Air1) is connected to the corresponding output - **1.2** on the rear of the control unit and to the injector.



The black hose for the supplementary air (Air2) is connected to the corresponding output - **1.3** on the rear of the control unit and to the injector.



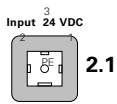
The hose for the rinsing air is connected to the electrode rinsing air output -**1.4** and on the powder gun.



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

(continued)

PLUGS AND SOCKETS (CONTINUED)



Input 24 V DC - 2.1 - The Main power supply cable is connected to the socket.

*This plug must **never** be disconnected while the unit is switched on!!*



Only suitable for 24 V DC power supply from a Power Main Board. The Power Main Board can be fitted with a maximum of 12 power modules (1 power module per OptiTronic) according to the type(s) of gun(s) used. See Spare Parts List. When retrofitting the equipment a further Power Module must be ordered with each OptiTronic Control unit. This can be easily inserted onto the Power Main Board.

Gun 2
2.2



Gun 2 - 2.2 (GM01 EasySelect).

The gun cable plug is connected to the socket with a 6 pin plug.

or



Gun 1
2.3

Gun 1 - 2.3 socket (GA02 OptiGun 2) The gun cable plug is connected to the socket with a 7 pin plug.



Aux
2.4

Aux. - 2.4 socket (Option).

The 19 pin socket is used with the DigitalBus option for connecting a higher hierarchy control unit (PLC).

or



Aux
2.4

Aux. - 2.4 socket (Option - **SystemLock** - Operating panel interlock)

The 5 pin socket is used for carrying the signal releasing the interlocked operating panels of the individual control units.

or



Aux
2.4

Aux. - 2.4 socket (Option - **CANBus** Input)

The 4 pin socket is used to carry the input signal coming from a CANBus type control unit (see Fig. 2 or Fig. 13).

and

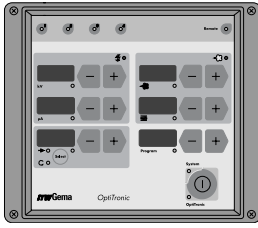
Aux
2.5



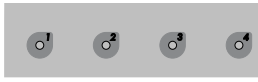
Aux. - 2.5 socket (Option - **CANBus** Output)

The 4 pin socket is used to carry the output signal from a CANBus type control unit to the further control units connected in series (see Fig. 2 or Fig. 13).

DESCRIPTION OF FUNCTIONS



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

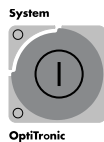


The Fault Diagnostic LEDs indicate certain equipment faults. The OptiTronic control unit is functioning correctly when the **Diagnostic LEDs 1, 2, 3, and 4** are illuminated (green).

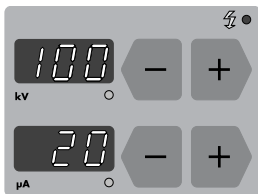
If any of the Diagnostic LEDs do not illuminate, please contact an ITW Gema Service Centre.

Functions of the Diagnostic LEDs:

- 1: +24 V DC power supply present - green
- 2: +15 V DC Internal power supply present - green
- 3: +5 V DC Internal power supply present - green
- 4: Main solenoid valve operating - green



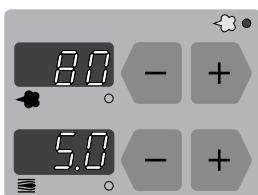
The equipment is activated or deactivated with the Main Key pad. When the control is active the green *OptiTronic LED* (lower left) is illuminated. In addition, if the green *System LED* (upper left) is illuminated the equipment is released by the external control and coating can be started.



- **kV** window for display and setting of High-voltage output (Setting range: 0-100 kV).
- **μA** window for display and setting of Spray current output (Setting range: 0-100 μA).



- **Electrode rinsing air** ➔ window for display and setting of the electrode rinsing air output. (Setting range: 0-2.8 m³/h. Default value 0.2 Nm³/h). The **Select** key pad is used for Swirl Air. (Setting range: 0-6.2 Nm³/h. Default value: 2.0 Nm³/h)



- **Powder output** ☁ window for display and setting of the powder output (Setting range: 0-100%, or if P7=2 then 0 - 6,2 Nm³/h).
- **Total air volume** ≡ window for display and setting of the total air volume (Setting range: 1.8-8.0 Nm³/h, or if P7=2 then 0 - 6,2 Nm³/h).



- **Program Number** window for display and setting of the program number (Setting range: 1-255), as well as Fault message display and Fault message acknowledgement.



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



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



This LED (green) - **Remote** illuminates when the control unit is remotely controlled from a PLC control (higher hierarchy control).

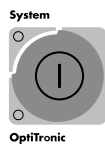
SPECIAL FUNCTIONS

Special functions are:

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

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

ENTERING THE SPECIAL FUNCTIONS MODE



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



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

EXITING SPECIAL FUNCTIONS MODE



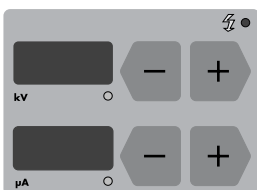
The Special Functions mode can be exited by pressing the **Main Key pad**.

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

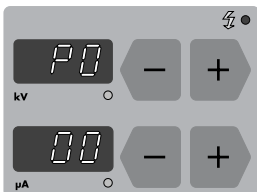
SYSTEM PARAMETER SELECTION



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



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



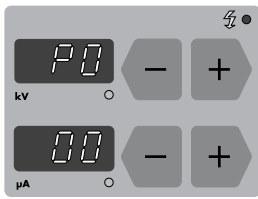
3. Select the system parameter (**P00-P08/PE/PL**) with the **+** or **-** key.
4. Change the system parameter value with the **+** or **-** key. (see System Parameter Table).

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

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



SYSTEM PARAMETER TABLE



Parameter (**P00-P08/PE/PL**)

Value

Abbreviations used on these pages:

EL = Electrode rinsing air

FL = Conveying air







GL = Total air

PA% = Powder output (in percent)

ZL = Supplementary air

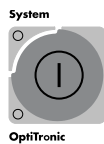
Parameter number	Description	Values (The bold numbers [0 or 1 etc.] in this column are default values)	Remarks
P0:	Option: FlowControl	0: Basic model without FlowControl 1: with FlowControl	FlowControl Initializing Fault <i>H01</i> appears with wrong input. Acknowledge with +/- and input correct value.
P1:	Gun type	0: Gun type - OptiGun 2 1: Gun type - EasySelect 2: Tribo Gun type	Select gun type.
P2:	Swirl air Not used	0: without Swirl air 1: with Swirl air	Release of the Select key for Swirl air
P3:	Injector type	(Nozzle ø in mm) FL ZL 0: PI 3 = 1.6 1.4 1: PI 3 = 1.8 1.4 2: PI 3 = 2.0 2.0 3: OptiFlow / EasyFlow = 1.6 1.4	Select injector type, e.g.: - ø 1.6 mm - with notch. - ø 1.8 mm - without notch. Match the injector nozzle (FL), and throttle (ZL) with the corresponding injector.
P4:	Gun deselection (OptiTronic key pad) See also "Remote Operation".	0: Gun deselection condition is not taken into account in Remote operation 1: Gun deselection condition is taken into account in Remote operation	For normal Remote operation Remote operation is used as key locking function (Option: SystemLock)
P5:	System Signal	0: Automatic equipment, External system signal in manual and remote operation necessary 1: Internal System release No external signal necessary (Demo Unit only) 2-4: Not used	
P6:	Communication	0: DigitalBus 1: CAN 2-4: Not used	Communication initialization (continued)

SYSTEM PARAMETER TABLE (CONTINUED)

Parameter number	Description	Values (The bold numbers [0 or 1 etc.] in this column are default values)	Remarks
P7:	Display variant	0:  = PA%,  = GL m ³ /h 1:  = FL m ³ /h,  = GL m ³ /h 2:  = Air1 m ³ /h  = Air2 m ³ /h	<ul style="list-style-type: none"> - Standard display - Display of individual air volumes FL and GL for checking purposes - Individual control of the two air channels
P8:	Tolerance band (FlowControl only)	0: 0.05 m ³ /h 1: 0.1 m ³ /h 2: 0.2 m ³ /h	Tolerance band for air volume regulation
P9:	Tolerance band error message FlowControl	3-6: Tolerance band error message for FlowControl in Ndm ³ /h (e.g.: 3 = 0.3 Nm ³ /h. 6 = 0.6 Nm ³ /h)	
PE:	CAN Baud rate	3: = 125 kBaud (Default value) 0-7 CAN Baud rate (See "Setting of the Baud Rate").	
PL:	CAN Address	1: 1-100 CAN Node ID (See "Setting of the Baud Rate").	

RESETTING THE THROTTLE MOTORS

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



1. Enter the Special function mode by pressing the **Main Key pad** (for approx. 10 secs) until the display no longer illuminates.
2. The throttle motors can be reset (Zero setting for conveying air [FL], supplementary air [ZL], electrode rinsing air [EL]). The throttle motor reset is initiated by pressing the + key or – key of the → display window.
3. Pressing a key once shows the number of times the main power supply has been switched on since the last throttle motor reset. The diode on the lower right, below the display window blinks. The throttle motor reset is activated by pressing the + or – key a second time. There should be three fairly loud noises, one for each motor, one after the other. The display returns to 00.
Switch-on counter
If the control unit is switched on 30 times and throttle motor referencing has not been done within this number of times, a throttle motor referencing will take place automatically.
The counter will reset to zero.



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

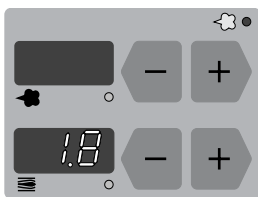
POWDER OUTPUT CORRECTION MODE


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

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



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



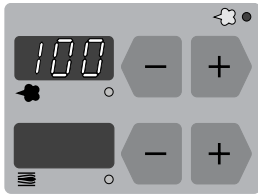
1. The value for minimum powder output (**FL_min**) is set with the + or – keys in the  display window.


(continued)

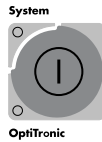
ABBREVIATIONS:

EL Electrode rinsing air
FL Conveying air

FL_min Minimum powder output
SKW% Powder output correction value
ZL Supplementary air



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



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

CARRYING OUT A POWDER OUTPUT CORRECTION

The settings in the following example are carried out on each gun individually.

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

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

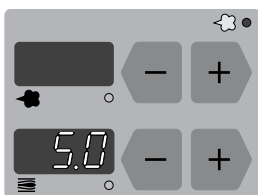
The following table contains values which can be used for setting up the OptiTronic Powder Control Unit



Total air volume (Nm³/h)	5
Correction value	
FL_min	1.8
SKW%	100

STARTING POSITION



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



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

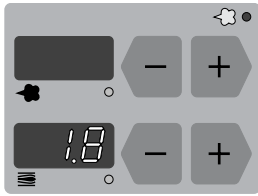


3. Switch to the Special Functions mode by pressing the **Main Key pad** (for approximately 10 seconds) until the display no longer illuminates.

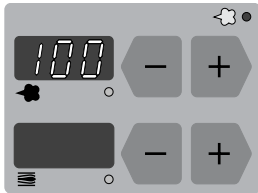
(continued)

ABBREVIATIONS:

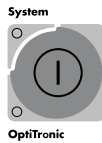
- FL** Conveying air
- SKW%** Powder output correction value



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



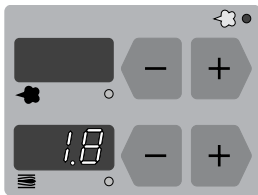
5. Set the Powder output correction value (**SKW%**) for a maximum powder output to **100 %** in the display window.



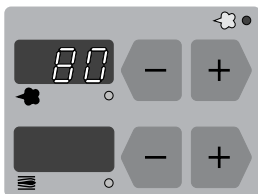
Exit the Special Function mode by pressing the **Main Key pad**.

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

6. Place the neck of the empty measuring bag tightly over the powder gun nozzle so that it does not slide off during the measuring and switch on the powder gun for *60 seconds*.
7. After the time has elapsed, switch off the gun and remove and weigh the bag. The weight of the powder should be between 10-15 g.
8. If no powder is expelled from the gun, return to the Special Functions mode and increase the powder output to between **1.8-2.4 (Nm³/h)** for a minimum powder output.
9. Repeat Steps 6 and 7 until the weight of the powder output is within 10-15 g. Note the minimum powder output value in the table.



10. Exit the Special Functions mode by pressing the **Main Key pad**.



11. Now set the powder output to **80 (%)** in the display window.
12. Place the empty measuring bag tightly over the powder gun nozzle and switch on the powder gun for *60 seconds*.
13. Weigh the bag.
14. Enter the value of the maximum powder output (**g/min**) in the table.

Calculate the powder output correction according to the formula:

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

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

(continued)

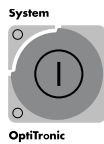
ABBREVIATIONS:

FL_min	Minimum powder output air
SKW%	Powder output correction value

EXAMPLE OF A POWDER OUTPUT CORRECTION TABLE.

Gun	Powder output correction		Powder output w/o correction
No.	FL_min (Nm ³ /h)	SKW (%)	Powder output at 80 %
1	1.7	100 %	200 g/min.
2	1.8	$(200/250) \cdot 100 = \mathbf{80 \%}$	250 g/min.
3	2.6	$(200/280) \cdot 100 = \mathbf{71 \%}$	280 g/min.
Gun n			

SOFTWARE VERSION



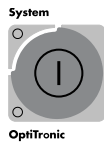
1. To determine the Software Version, press the **Main Key pad** (for approx. 10 secs) until the display no longer illuminates.



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



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



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

Because different memory moduls have been used for the different Print versions, the correct Order number must be given when ordering:
 Serial no. 14101.XXXXXX → Software version 1.03 EPROM 27C256-70-
Order No. 380 873
 Serial no. 14102.XXXXXX → Software version 2.XX EPROM 27C512-70-
Order No. 387 037

SYSTEM RESET

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



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



1. Switched off the OptiTronic control unit with the **Main power switch** on the control cabinet. Do not switch off the booth etc.

(continued)

ABBREVIATIONS:

FL_min Minimum powder output air
SKW% Powder output correction value

SYSTEM RESET (CONTINUED)

2. Hold the **Main Key pad** pressed and switch on the **Main power switch**. After approximately 15 seconds the actual program numbers 001-255 appear in the **Program** display window and the programs are individually reset to the factory default values. The **Main Key pad** only has to be pressed until the program numbers start to run through in rapid succession in display window.
Fault diagnostic LED 4 is OFF during a Reset
After a **System Reset** the system parameters must be checked that they are correct.

DAILY CORRECTION VALUE FOR POWDER OUTPUT

The Daily Correction Value for powder output can be set through the DigitalBus via the PLC Control unit. The Daily Correction Value can be addressed with the Identification Number 7. The value range is between 50-150 %.

This means that an actual powder output value is multiplied by the correction value X,

$$\text{e.g. } M\% = 50$$

A Daily Correction value of 60 % corresponds to the new powder output value:

$$= 50 \times 0.6 = 30 \%$$

Values outside this range are rejected with an H31 Error Message.

When the Correction value is multiplied by a Desired value higher than 100 % the output is limited to 100 % and displayed with an H09 error message. This check takes place at a change of program and when a new correction value is set.

After switching the equipment on the correction value is 100 %. The correction value is not stored in the EEPROM. After each Power-up the PLC control must correct the Daily Correction Value in the OptiTronic.

The Daily Correction Value for the powder output can be displayed on the OptiTronic.

Displaying the Correction Value: Press the OptiTronic key and continue to hold it down, then press POWDER KEY + or POWDER KEY -. The value is displayed, until none of the keys are pressed any more. All displays are not illuminated except the powder output display with the Daily Correction value.

CANBUS

The OptiTronic Powder Gun Control Unit fitted with a CANBus interface is a simple CANopen Slave. It operates in a network with a central control unit (Master). Communication takes place exclusively between the Master and the Slaves. The implementation of CANopen on the OptiTronic is held to an absolute minimum.

The following data can be accessed through CANopen:

- All Theoretical values (Process data)
- All Rated data (Process values)
- All Control values
- All System parameters (except Baud Rate and CAN_Address)
- All Error messages
- All Special parameters, such as:
Software version, Daily correction values, Powder output correction, etc.

HARDWARE

The OptiTronic Controls are connected to the central PLC Control through a 4 pole CANBus cable. The last Bus participant is fitted with a terminal plug with a terminal resistor in order to terminate the network correctly. A maximum of up to 127 OptiTronic Controls can be connected in a network.

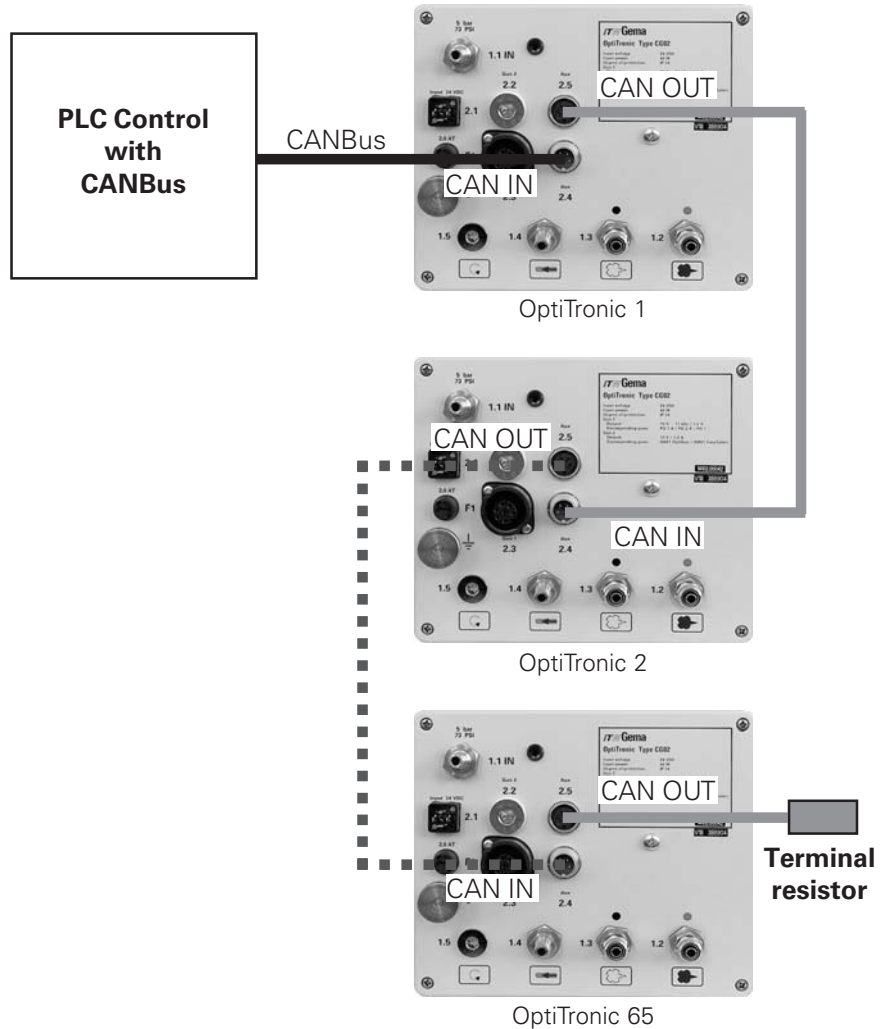
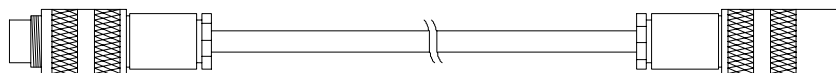


Figure 2

CANBus

Cable designation

Pin	Signal	Colour
1	GND	White
2	+ 24 VDC	Brown
3	CAN H	Green
4	CAN L	Yellow



SYSTEM RELEASE IN NETWORK OPERATION

The release of the OptiTronic Powder Gun Control Unit in network operation is released through the digital input system (LED System ON - Power Module X4) for reasons of safety. The gun triggering is given by a CAN command through the CANopen interface (LED OptiTronic ON).

DETERMINING THE PARTICIPANT ADDRESS (NODE-ID) AND BAUD RATE

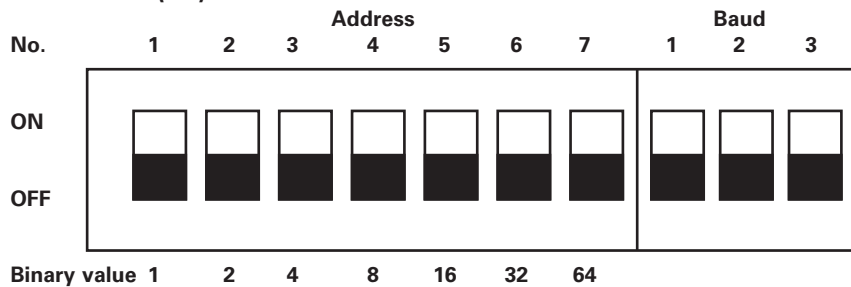
Each OptiTronic Gun Control Unit which operates in the CAN-Network operation, must have an individual participant address (Node-ID) allocated. The Baud rate setting serves for setting the transmission speed.

PARTICIPANT ADDRESS (NODE-ID) AND BAUD RATE

The Node ID and Baud rate are set principally in the System parameters of the OptiTronic PL = Node-ID and PE = Baud rate. The DIP switch (S1) on the CAN Bus Interface must be set to zero (OFF) so that the values of the Node ID and Baud rates of the System parameters PL and PE can be accepted.

Node ID and Baud rate are determined when the equipment is started. When changes are made, the equipment must be switched off and then on again to activate the new changes.

DIP Switch (S1) for Node ID and Baud rate



The basic setting so that the Address and Baud rate can be taken from the System parameters PL and PE.

SETTING THE PARTICIPANT ADDRESS (NODE ID) WITH SYSTEM PARAMETER PL

System parameter PL: 1-100 Participant address

SETTING OF THE BAUD RATE WITH SYSTEM PARAMETER PE

System parameter PE:

PE Allocation <-- --> Baud rate

PE Setting	CAN Baud rate
0	20 kBit/s
1	50 kBit/s
2	100 kBit/s
3	125 kBit/s (Default)
4	250 kBit/s
5	500 kBit/s
6	800 kBit/s
7	1 Mbit/s

(continued)

SETTING OF THE BAUD RATE (CONTINUED)

The Baud rate is selected with 125 kBits as Standard. This setting allows a maximum cable length of approximately 500 m from the first to the last CANBus participant. With longer length cables the Baud rate selected should be lower.

DIP SWITCH FOR PARTICIPANT ADDRESS (NODE ID) AND BAUD RATE

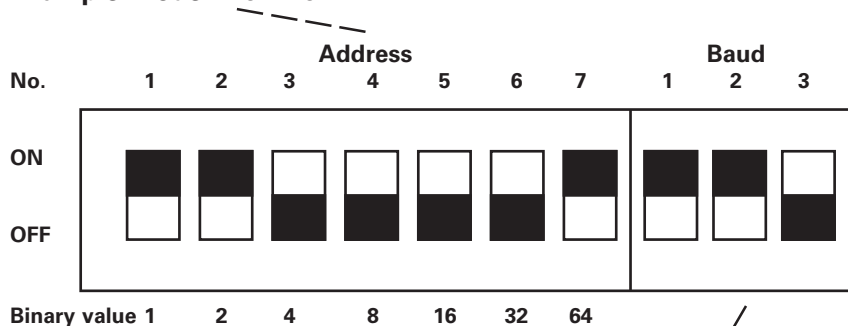
The Node ID and Baud Rate are set principally in the System Parameters of the OptiTronic PL = Node ID and PE = Baud Rate.

The DIP Switch (S1) on the CANBus Interface are only used when no input unit is present on the OptiTronic (Front panel) and the input of System parameters is not possible.

The Node ID and Baud Rate can be set with the DIP Switch S1 on the Interface board. The Node ID and Baud Rate must lie within the range 1- 100. The Node ID set is the sum of the binary value of all switches which are "ON". The input setting of the switches are displayed in the System Parameter PL.

The Node ID and Baud Rate are determined on starting the equipment. The equipment must be switched off then on again to activate a change.

Example: Node ID 67 = 64 + 2 + 1



SETTINGS FOR BAUD RATE

Baud rate	1	2	3
20k	OFF	OFF	OFF
50k	ON	OFF	OFF
100k	OFF	ON	OFF
125k*	ON	ON	OFF
250k	OFF	OFF	ON
500k	ON	OFF	ON
800k	OFF	ON	ON
1000k	ON	ON	ON

*Default value

FAULT MESSAGE TABLE



Fault code No.

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

Air Supply	Fault description
H01	FlowControl not fitted Connection cable from FlowControl to base electronics missing. Wrong FlowControl software configuration: Check system parameter P0.
H02 <i>(only when FlowControl is fitted)</i>	Conveying air (FL) fault: 1 Check conveying air hose to injector. 2 Detach the conveying air hose from the control unit and acknowledge the fault. 3 When a fault still registers after acknowledgement, deselect the FlowControl module with the system parameter P0 = 0. 4 Contact an ITW Gema Service centre.
H03 <i>(only when FlowControl is fitted)</i>	Supplementary air (ZL) fault: 1 Check the supplementary air hose to injector. 2 Detach the supplementary air hose from the control unit and acknowledge fault. 3 When a fault still registers after acknowledgement, deselect the FlowControl module with the system parameter P0 = 0. 4 Contact an ITW Gema Service centre.
H04	EL 1 Solenoid valve error, set System parameter P5 = 0 for Automatic equipment. P5 = 1 for Demo equipment.
H05	The desired Total Air is too little. Increase the programmed value for the Total Air or make the FL_min of the powder output correction smaller
H06	Main solenoid valve fault. Connection cable from the main solenoid valve to the basic electronics missing. Check the main solenoid valve.
H07	The desired supplementary air volume is too large (ZL_max.). Decrease the programmed value for the total air volume and/or increase the programmed value for the powder output volume.
H08	The desired conveying air volume is too large (FL_max.). Decrease the programmed value for the total air volume and/or decrease the programmed value for the powder output volume.
H09	The Daily Correction Value multiplied with the desired value of the powder output is greater than 100 %. (Acknowledge error and decrease the Daily Correction Value via the PLC)
High-voltage	
H10	Cascade produces a too high voltage (only on Gun 1). Check the basic electronics and gun
H11	Check the system parameter P1 (Gun type) Check the gun cable for breaks. Replace gun.

(continued)

FAULT MESSAGE CODE (CONTINUED)

Air Supply	Fault description
General Faults	
H19	EL 2 Solenoid valve error (not used).
H20	Check the 24 V DC Power supply. The input voltage is higher than the nominal voltage - 24 V DC +10 %
H21	Check the 24 V DC Power supply. The input voltage is lower than the nominal voltage - 24 V DC -10 %
H22	Fault in the 15 V DC power supply to basic electronics. Contact an ITW Gema Service Centre.
H23	EEPROM fault. Contact an ITW Gema Service Centre.
H24	EEPROM writes Timeout. Contact an ITW Gema Service Centre.
DigitalBus/CANBus	
H30	Data validation fault. Selection fault from the higher hierarchy control (PLC). Set the PLC program correctly.
H31	Desired value not within the value range. Selection fault from the higher hierarchy control (PLC). Set the PLC program correctly.
H40	Permanent CANBus error (BUS_OFF), i.e. No external power supply or cable not connected.
H41	Number of transmission errors overstep limit value (ERROR_PASSIVE).
H42	Overflow on reception.
H43	Overflow on transmission.
H44	Master failed.
H45	Desired value not within limit value (only with PDO transfer).
H46	Invalid Node ID set.
H47	No CAN Interface card installed.

OPERATING MODES

The OptiTronic control unit differentiates between two operating modes, **Manual** and **Remote**.

OPERATING MODE - MANUAL

In the Manual operating mode all the operation functions are released through the operating panel.

dig. Input Remote / Manual = low Operating mode: Manual

For technical safety reasons the OptiTronic control unit should only be released after fulfilling all the required safety conditions. The release is activated through the „System ON / OFF „ digital input.

dig. Input System ON / OFF = high OptiTronic
System release

The control unit is ready for coating operation when:

dig. Input System ON / OFF = high (green System LED) and
the control unit is selected
(green OptiTronic LED)
and the gun trigger is
activated

OPERATING MODE - REMOTE



If the control unit is in the Remote operating mode, this is indicated by the green Remote LED.

In the operating mode - Remote only the following operating functions are possible through the operating panel:

- Desired value display / Actual value display switching
- Acknowledgement of fault messages

dig. Input Remote / Manual = high Operating mode: **Remote**

For technical safety reasons the OptiTronic control unit should only be released after fulfilling all the required safety conditions. The release is activated through the „System ON / OFF „ digital input.

dig. Input System ON / OFF = high OptiTronic
System release

The control unit is ready for coating operation when:

dig. Input System ON / OFF = high (green System LED /
green OptiTronic LED)
and the gun trigger is
activated

REMOTE OPERATION

SYSTEM PARAMETER P4

P4 = 0: Setting for normal Remote operation

P4 = 1: Remote operation is used as Key lock function.

The System parameter P4 = 1 communicates to the OptiTronic control unit that the condition of the gun deselect key "OptiTronic LED remains as it is when there is a change of mode from Manual to Remote. Selected or deselected guns also remain in their previous condition at a change from the Manual to Remote mode.

DIGITALBUS PARALLEL INTERFACE

The control unit is connected to a higher hierarchy control (PLC) through the DigitalBus. The DigitalBus has a 16 Bit parallel interface. The interface comprises 14 digital inputs and 1 digital output. The digital inputs are divided into a Data Bus, consisting of 11 Bits, and a Control Bus, comprising 3-Bits. The digital output is an error message bit.

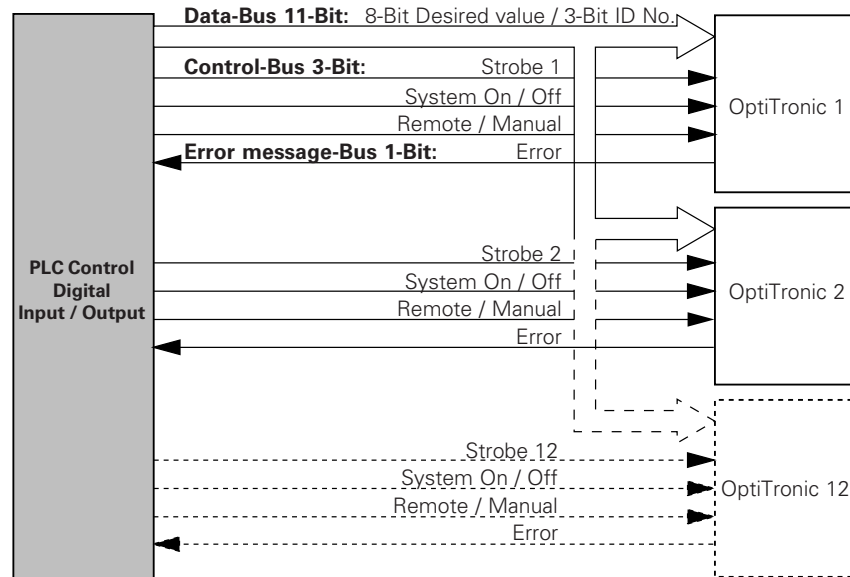


Figure 3

DATA BUS

The Data Bus width is 11 Bits. With the first 8 Bits the data for the different operating parameters (desired value) can be transferred to the control unit. The data for the corresponding desired values (powder output, total air, electrode rinsing air, High-voltage limiting value, current limiting value, program number) are assigned with an identification number consisting of 3-Bits.

DATA TRANSMISSION BYTE (BIT 1-8)

Binary Values	Designation	Value range	Resolution
Bits 1-8 Binary values 2 ⁰ -2 ⁷ See also "Option DigitalBus: 19 pin plug - Aux. - 2.4"	PA [%]	0-100	1
	Air 1 [m ³ /h] #	0-8	0.1
	GL [m ³ /h]	1.8 to 8	0.1
	Air 2 [m ³ /h] #	0-8	0.1
	EL, [m ³ /h]	0-2.8	0.1
	SWA* [m ³ /h]	0-6.4	0.1
	HV_BG [kV]	0 / 10-100	1
	I_BG [µA]	0-100	1
	Program No. PGN	1-255	1
	Daily Correction Value Powder output [%]	50-150	1

* not used

if P7 = 2

ABBREVIATIONS:

(continued)

EL	Electrode rinsing air	I_BG	Setting for current
GL	Total air	PA	Powder output
HV_BG	High-voltage setting	SWA	Swirl air

DIGITAL PARALLEL INTERFACE (CONTINUED)

DATA IDENTIFICATION (BIT 9-11):

Identification number 3-Bit (Binary code)	Classification	Classification if P7 = 2
0	PA [%]	Air 1 [m ³ /h]
1	GL [m ³ /h]	Air 2 [m ³ /h]
2	EL [m ³ /h]	EL [m ³ /h]
3	SWA* [m ³ /h]	SWA* [m ³ /h]
4	HV_BG [kV]	HV_BG [kV]
5	I_BG [μA]	I_BG [μA]
6	Program No. PGN	Program No. PGN
7	Daily Correction Value Powder output [%]	Daily Correction Value Powder output [%]

* not used

CONTROL BUS

The Control Bus consists of 3 Bits.

Strobe:	Activates data reception
System On / Off:	OptiTronic system release
Remote / Manual:	Operating mode

DIGITAL OUTPUT COMPOSITE ERROR MESSAGE:

The composite error message Error shows all errors which are present in the control unit.

dig. Output	Error = high	Composite error Control unit
-------------	--------------	---------------------------------

BUS CONTROL

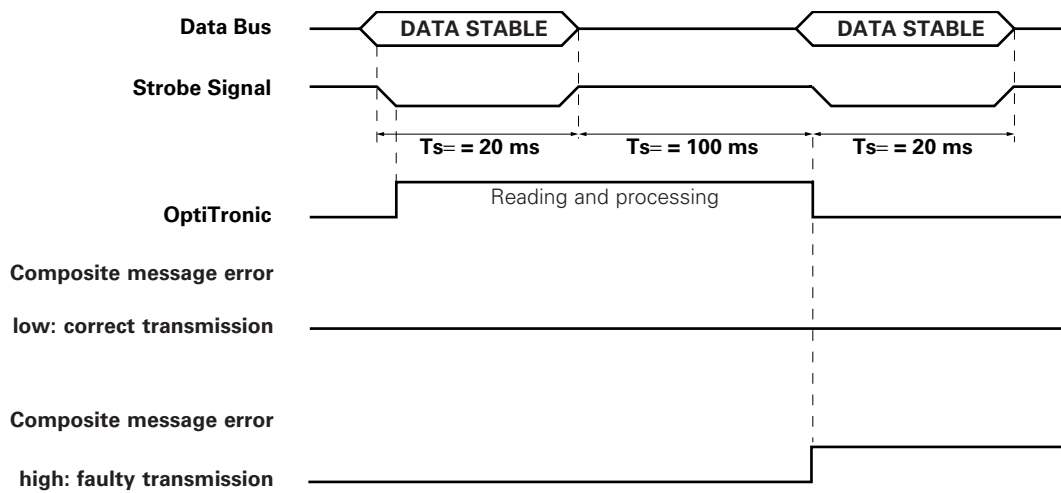
The data transmission from a higher hierarchy control (PLC) to the control unit is done with the aid of the Data Bus (11-Bit) and the Control Bus (3-Bit). All the desired values can be transmitted with the first 8 Bits (Bit 1-8) of the Data Bus in binary code (value range 0-255). The identification number is transmitted in binary code (value range 0-7) with the last 3 Bits (Bit 9-11) of the Data Bus. Reception of data from the Data Bus is initiated by a negative flank of the **Strobe** control signal.

ABBREVIATIONS:

EL	Electrode rinsing air
GL	Total air
HV_BG	High-voltage setting
I_BG	Setting for current
PA	Powder output
SWA	Swirl air

CONTROL SEQUENCE - TIME DIAGRAM

CONTROL SEQUENCE FOR SWITCHING THE PROGRAM NUMBER (IDENTIFICATION NUMBER 6)



CONTROL SEQUENCE FOR PROGRAM PARAMETER (IDENTIFICATION NUMBERS 0-5)

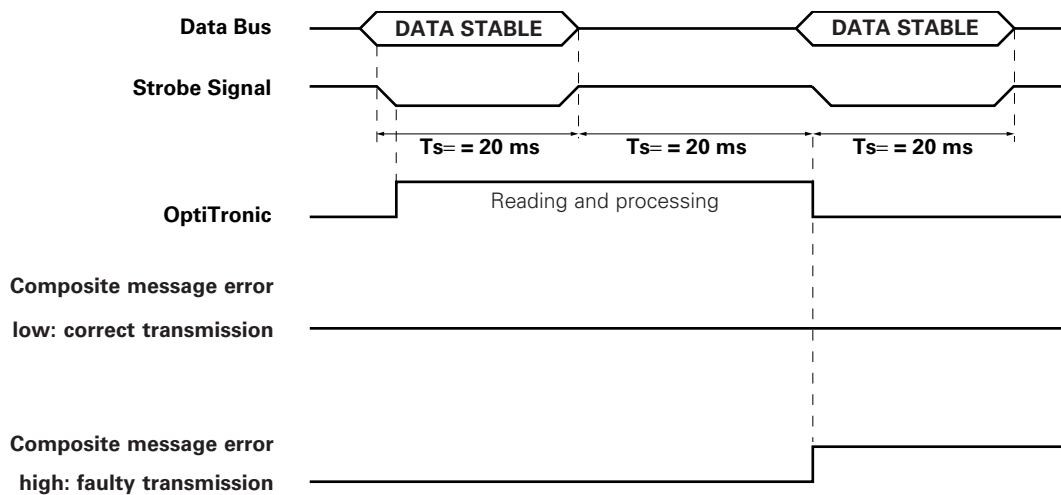


Figure 4

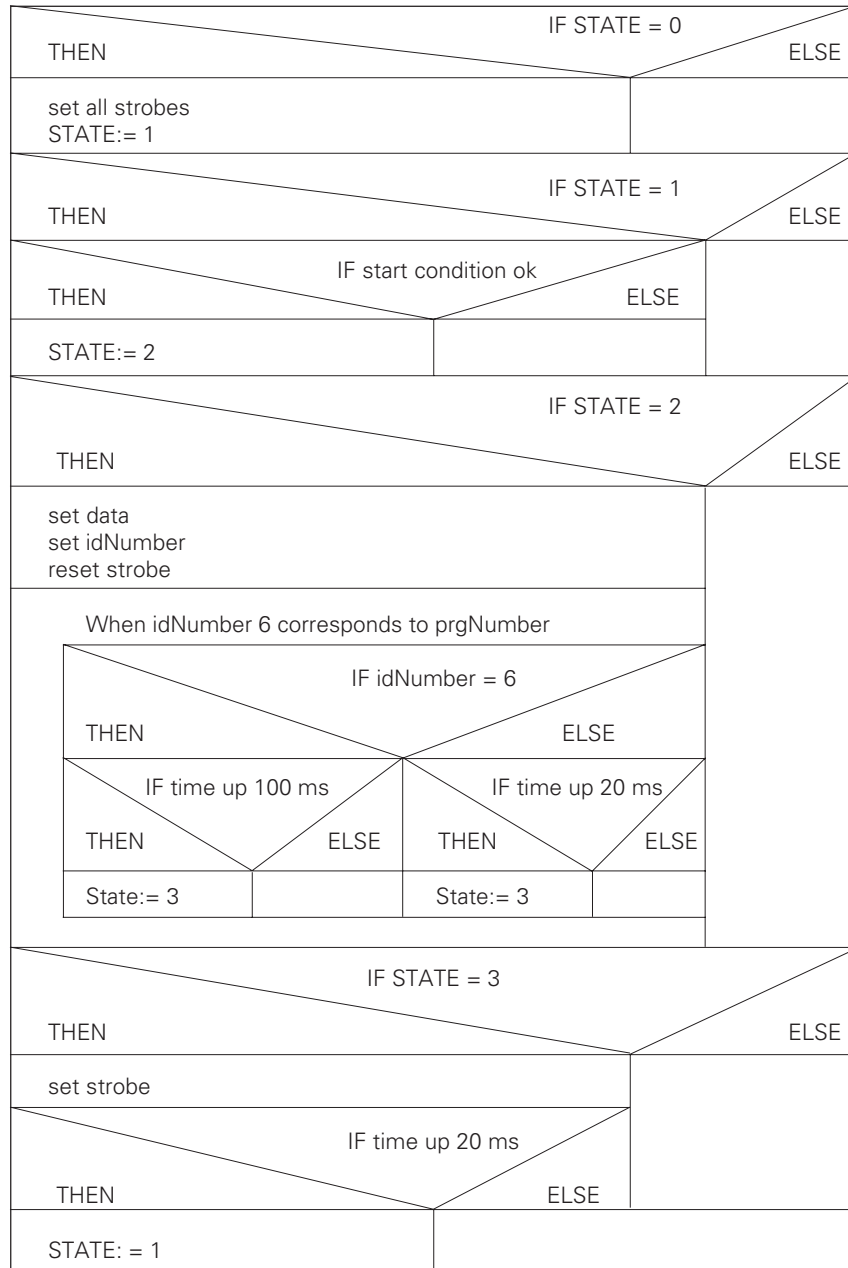
CONTROL SEQUENCE - SITUATION DIAGRAM

There is one strobe signal, and one error signal per gun. The data signals and identification number signals are parallel. When the same data is sent to the guns simultaneously the strobe signal for the corresponding guns can also be deleted simultaneously and reset again.

Example of a PLC Program:

Function block statements

BEGIN



END

Figure 5



GUIDE VALUES - APPLICATION

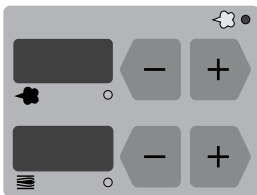
All values in these tables are guide values. Different ambient conditions, wear, and different types of powder can alter the values in the tables.

GENERAL CONDITIONS FOR OPTIFLOW / EASYFLOW / PI 3 INJECTORS

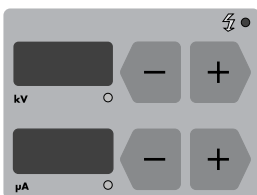
Powder type:	Epoxy/Polyester	
Powder output	[m]	10
Powder hose ø	[mm]	11
Input pressure	[bar]	5.0
Conveying air nozzle ø - OptiFlow / EasyFlow / PI 3	[mm]	1.6
Supplementary air nozzle ø - OptiFlow / EasyFlow / PI 3	[mm]	1.4

GUIDE VALUES FOR OPTITRONIC WITH OPTIFLOW / EASYFLOW / PI 3 INJECTORS

Total air 		4 Nm ³ /h	5 Nm ³ /h	6 Nm ³ /h
		Powder output [g/min]		
Powder output  [%]	10	30	35	45
	20	60	75	90
	30	85	100	120
	40	110	130	150
	50	130	160	175
	60	150	180	210
	70	175	200	235
	80	200	240	270
	90	215	260	
	100	235	290	



SPRAY CURRENT LIMITING GUIDE VALUES



Spraying current limiting enables:

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

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

High-voltage	with SuperCorona		without SuperCorona	
100 kV	<i>Flat parts:</i>	50 µA (± 20)	<i>Flat parts:</i>	15 µA (± 10)
100 kV	<i>Profiles:</i>	60 µA (± 10)	<i>Profiles:</i>	25 µA (± 5)
100 kV	<i>Spray-over:</i>	20 µA (± 10)	<i>Spray-over:</i>	5 µA (± 5)

MANUAL COATING WITH EASYSELECT

REMOTE CONTROL FROM THE GUN

Various functions are remotely controlled with the aid of the **+** and **-** keys on the rear of the gun:

Select the application settings - Programs 001 to 003

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

Press 1x = Prog. no. 1 LED: red

Press 2x = Prog. no. 2 LED: green

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

Set with OptiTronic control:

Program no. 4-255 LED: red/green blinking (approx. 2 Hz)

Check by observing the LED display on the gun.

Remote control locked due to:

Error display,

Local operation or

Remote OptiTronic operation.

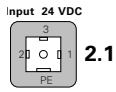
LED: red and green

2. Change the powder output.

Press the **+** or **-** key on the gun. The powder output will be correspondingly increased or decreased.

PIN ALLOCATION

MAIN POWER SUPPLY CABLE SOCKET 2.1



Pin	Function
1	GND 24 V DC (Power supply)
2	+ 24 V DC (Power supply)
3	System ON /OFF (Gun release)
PE	Ground PE

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

Pin	Function
1	+ 15 V DC power supply Gun electronics
2	Oscillator control 0-10 V DC
3	GND / Trigger connection 1
4	Trigger connection 2
5	Remote control
6	Ground PE
Housing	Screen

SOCKET 2.3 - GUN 1 (GA02 OPTIGUN 2 POWDER GUN PLUG)

Pin	Function
1	GND Oscillator signal
2	-----
3	Trigger connection 1
4	Trigger connection 2
5	Tribo electrode
6	Signal Oscillator
7	Ground PE

OPTION: DIGITALBUS: 19 PIN - AUX. - 2.4 SOCKET

Pin	Bit	Function	(Binary value)
A	1 IN - D0	Desired value, Program No.	$2^0 (= 1)$
B	2 IN - D1	Desired value, Program No.	$2^1 (= 2)$
C	3 IN - D2	Desired value, Program No.	$2^2 (= 4)$
D	4 IN - D3	Desired value, Program No.	$2^3 (= 8)$
E	5 IN - D4	Desired value, Program No.	$2^4 (= 16)$
F	6 IN - D5	Desired value, Program No.	$2^5 (= 32)$
G	7 IN - D6	Desired value, Program No.	$2^6 (= 64)$
H	8 IN - D7	Desired value, Program No.	$2^7 (= 128)$
J	9 IN - A0	Identification number	$2^0 (= 1)$
K	10 IN - A1	Identification number	$2^1 (= 2)$
L	11 IN - A2	Identification number	$2^2 (= 4)$
M	12 IN	System ON / OFF (Gun release)	
N	13 IN	Strobe (Data transfer from Data Bus)	
O	14 IN	Remote / Manual	
P	15 IN	Reserve - IN	
R	16 IN	GND_External	
S	1 OUT	Composite error message (Signal: Error)	
T			
U		24 VDC_External	
Housing		Screen	

(continued)

PIN ALLOCATION (CONTINUED)

OPTION: SYSTEMLOCK: 5 PIN AUX. - 2.4 SOCKET

Pin	Function
1	GND_External
2	24 VDC_External
3	System ON / OFF (Gun release)
4	SystemLock (Operating panel release ON/OFF) (System parameter P4 = 1 / Signal: Remote / Manual)
5	Composite error message (Signal: Error)
Housing	Screen

OPTION: CANBUS: 4 PIN AUX. - 2.4 SOCKET (INPUT) AND 4 PIN AUX. - 2.5 SOCKET (OUTPUT)

Pin	Signal	Colour
1	GND	White
2	+ 24 VDC	Brown
3	CAN H	Green
4	CAN L	Yellow

ELECTRICAL DIAGRAMS

BLOCK DIAGRAM: OPTITRONIC CONTROL UNIT

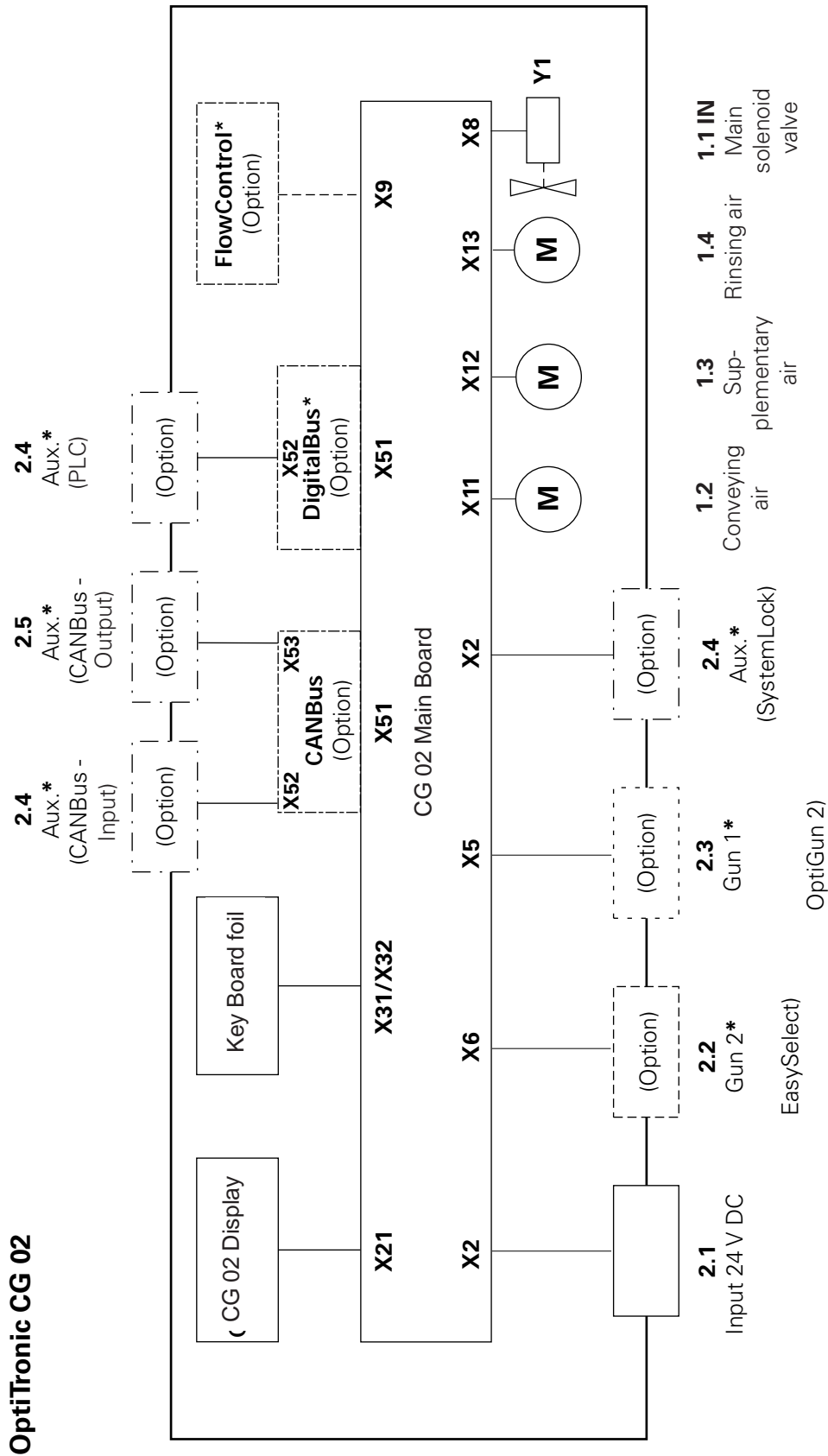


Figure 6

•M - Throttle motors
*see Version table

BLOCK DIAGRAM: CONNECTIONS TO MAIN BOARD (1) - OPTITRONIC CONTROL UNIT

See next page (from here)

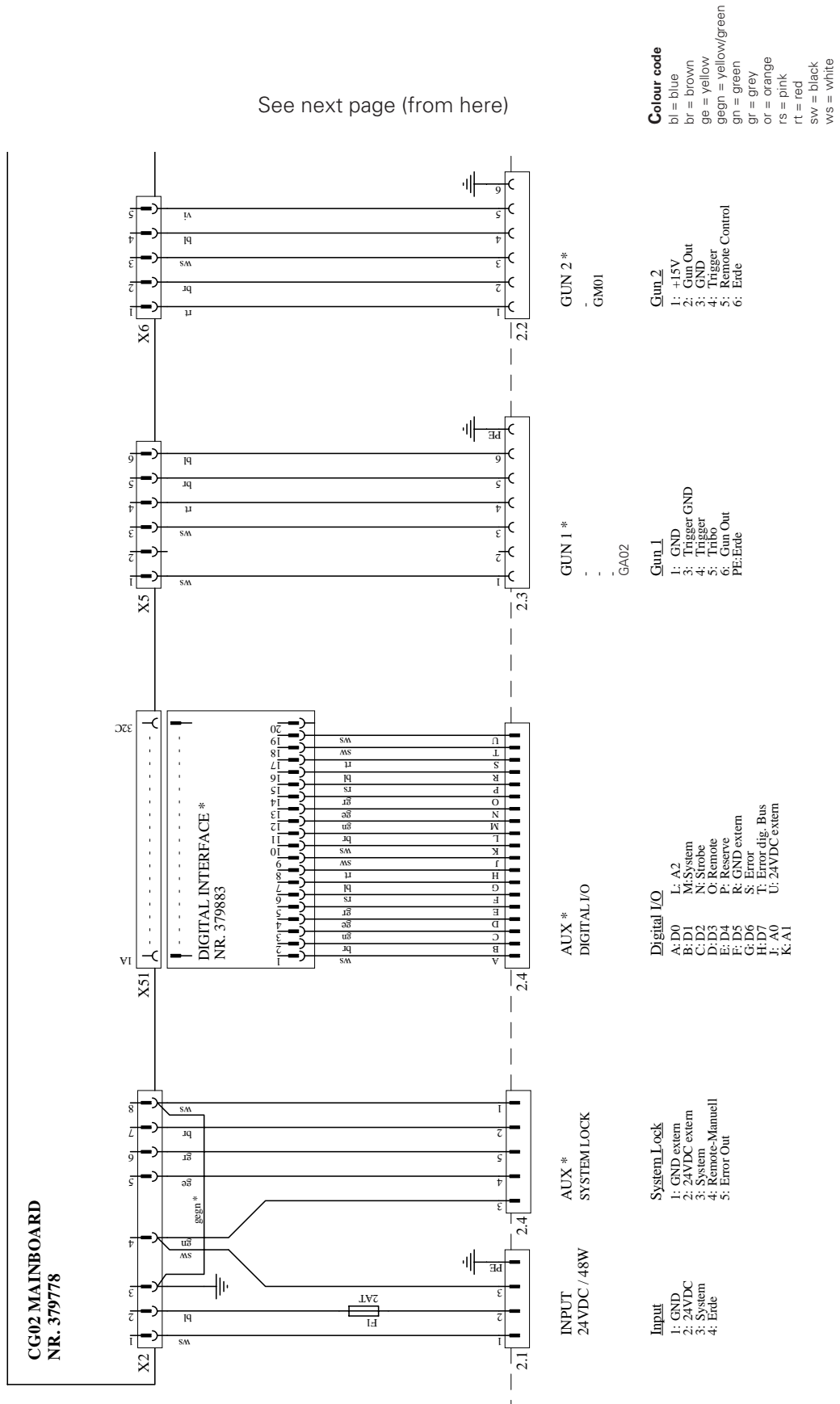


Figure 7

BLOCK DIAGRAM: CONNECTIONS TO MAIN BOARD (2) - OPTITRONIC CONTROL UNIT

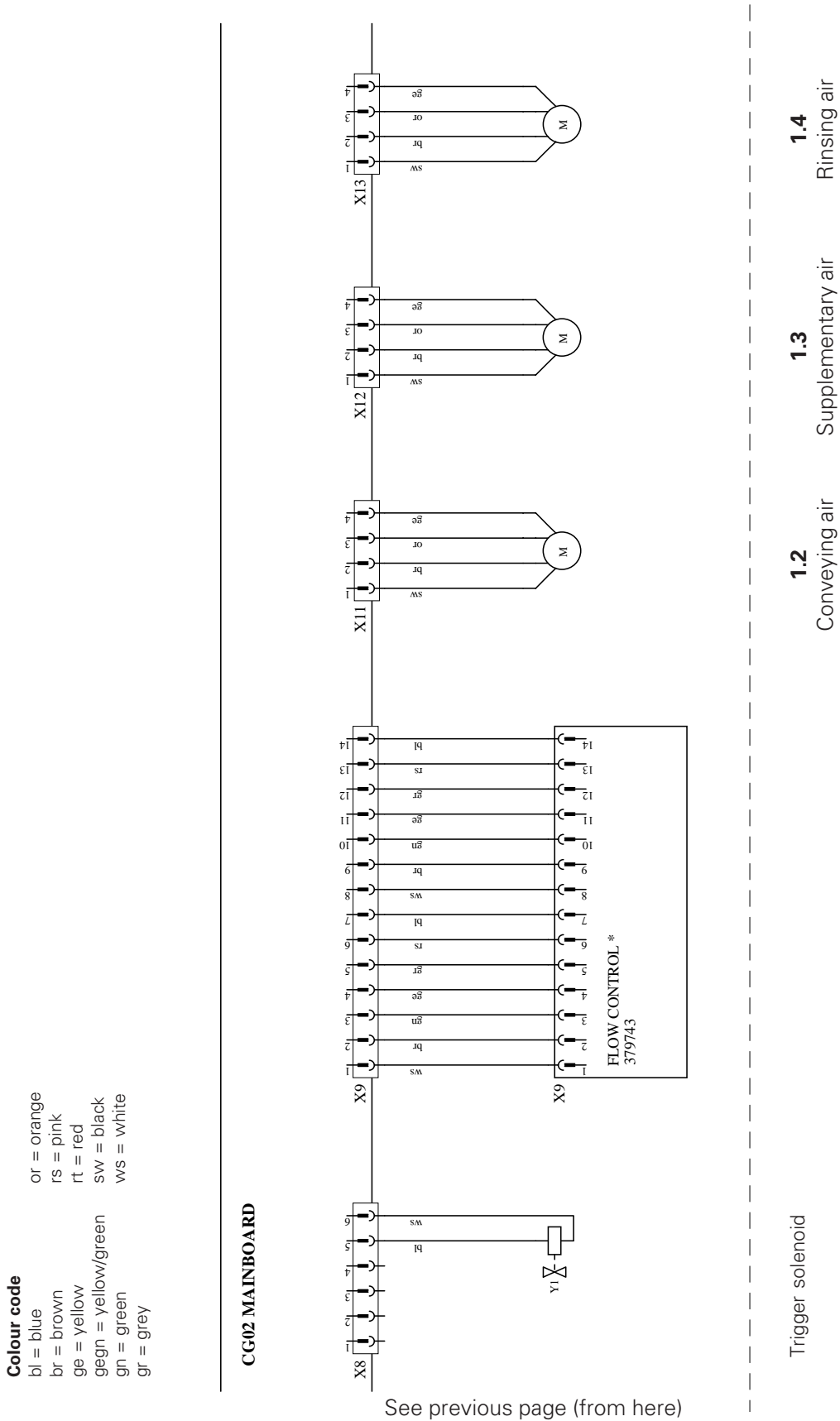
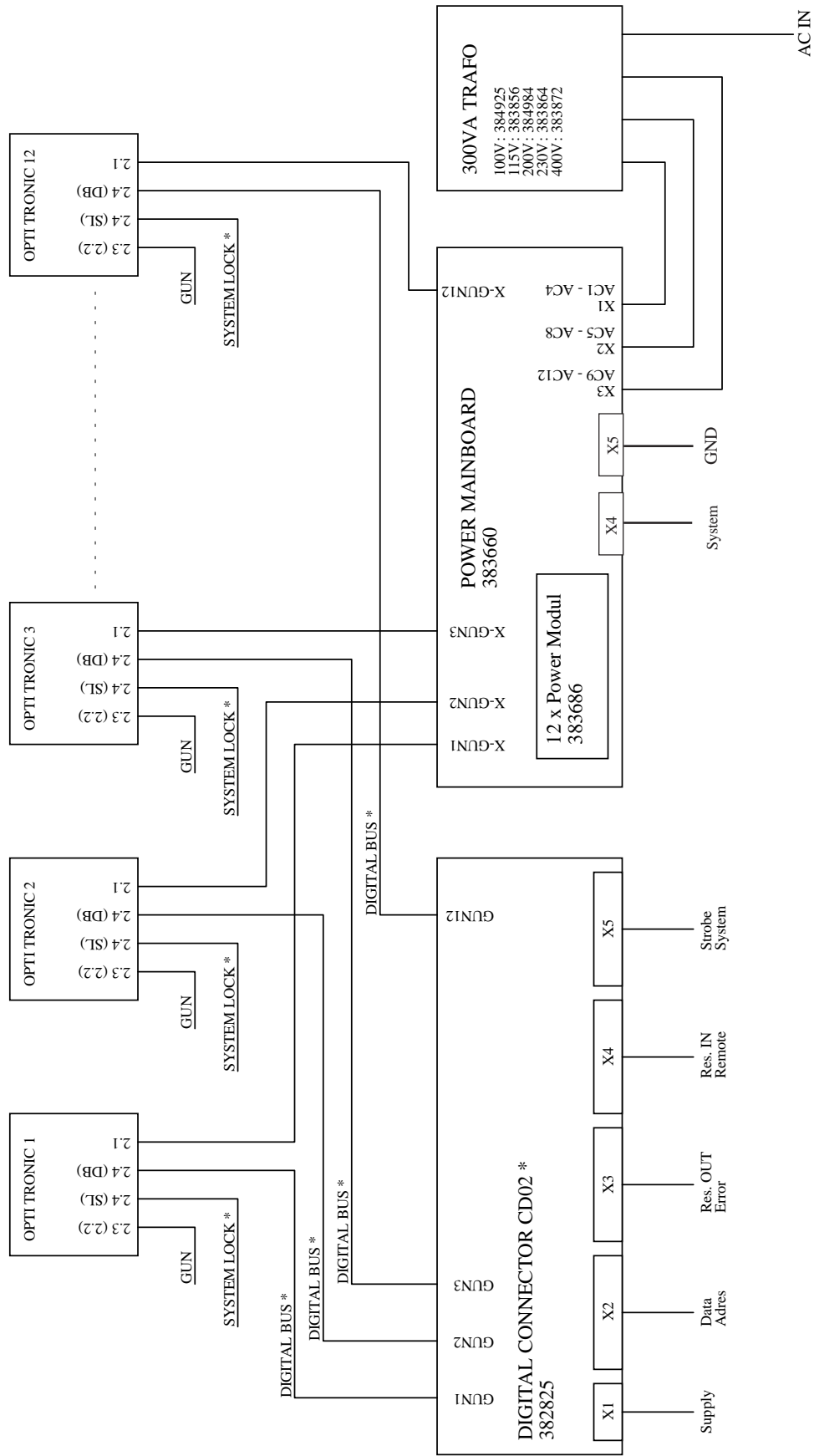


Figure 8

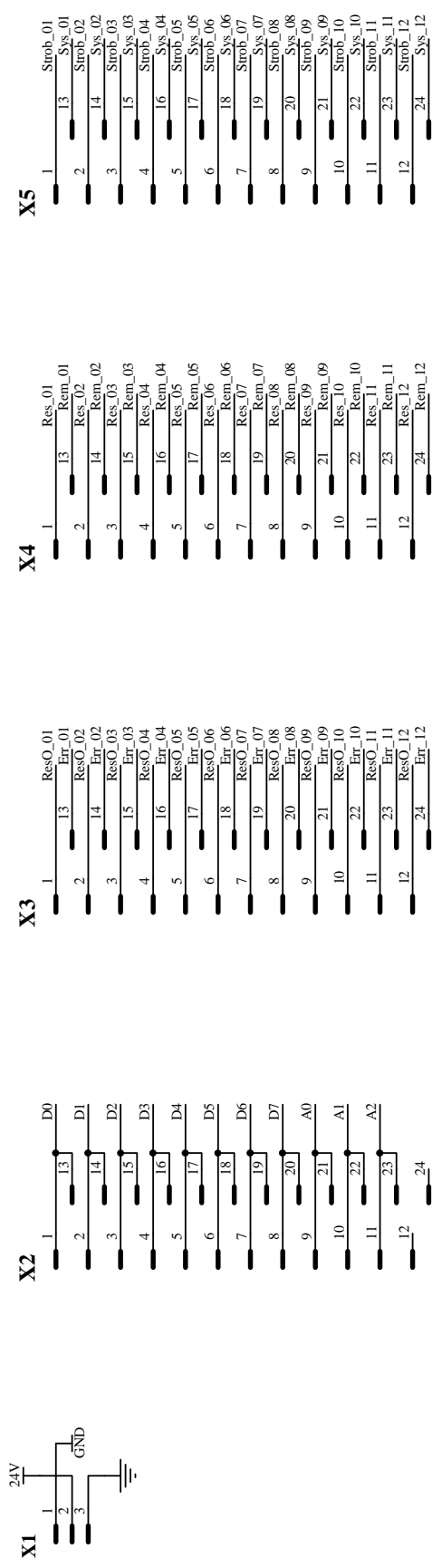
BLOCK DIAGRAM: OPTITRONIC SYSTEM



* OPTION

Figure 9

CD 02 DIGITAL CONNECTOR: CONNECTIONS X1-X5



24 V DC External Supply for all Digital In / Outputs

DataBus - 11 Bit
8 Bit Desired value
3 Bit ID No.

1-12 Guns
Collective error message

1-12 Guns
Remote / Manual

1-12 Guns
System ON / OFF
Strobe

Figure 10

BLOCK DIAGRAM - POWER MAIN BOARD: OPTITRONIC CONTROL UNIT

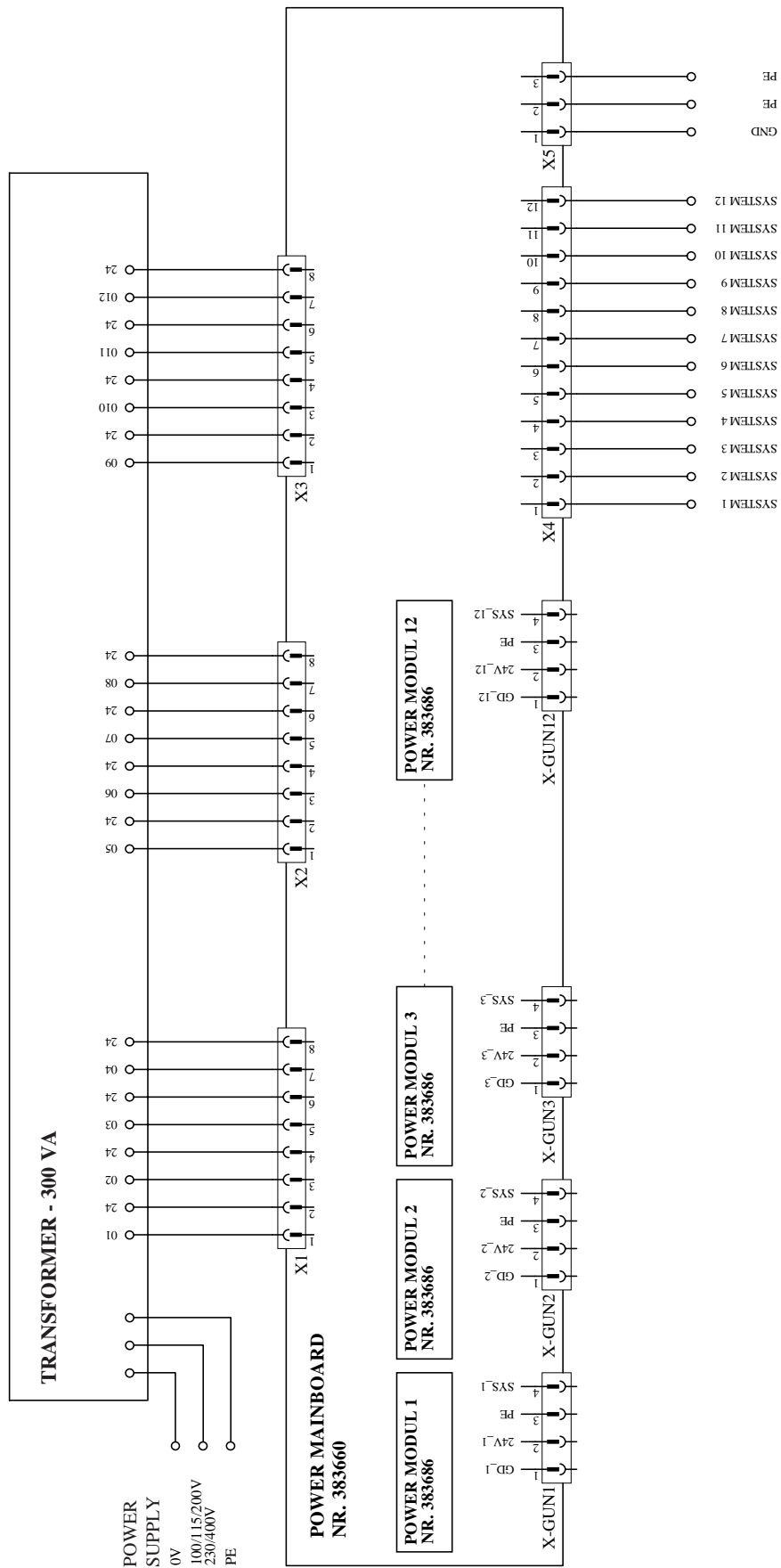


Figure 11

PNEUMATIC DIAGRAM

OPTITRONIC CONTROL UNIT

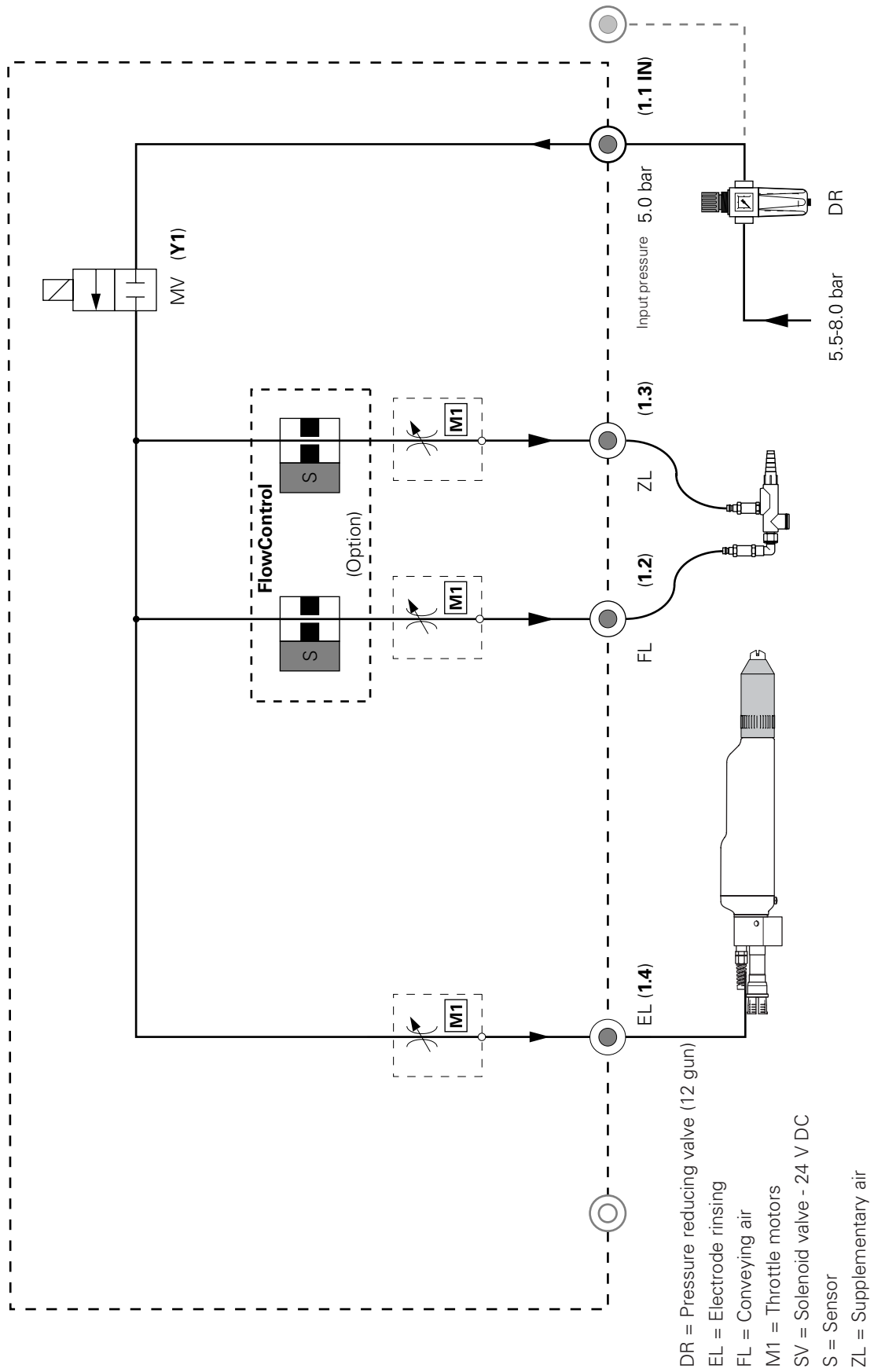


Figure 12

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** OptiTronic, **Serial No.:** XXX XXX
2. **Order No.:** 221 873, 5 pieces, 2 AT fuse

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

The spare part numbers of yard/meter ware always begins with **1.. ...** and are always marked with an ***** in the spare parts list.

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

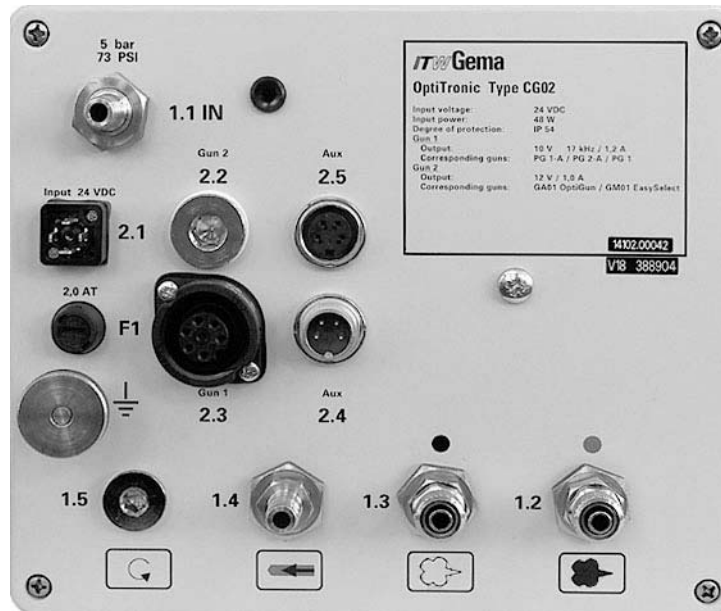
All dimensions for plastic powder hoses are given as external diameter (o/d) and internal diameter (i/d):

e. g.

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

OPTITRONIC CONTROL UNIT

Version 5 - GA or GM gun, SystemLock	384 569
Version 6 - PG gun, SystemLock	384 577
Version 7 - GA or GM gun, DigitalBus	384 585
Version 8 - PG gun, DigitalBus	384 593
Version 11 - GA or GM gun, FlowControl, DigitalBus	384 623
Version 12 - PG gun, FlowControl, DigitalBus	384 631
Version 15 - GA or GM Gun, CANBus	388 874
Version 16 - PG Gun, CANBus	388 882
Version 17 - GA or GM Gun, FlowControl, CANBus	388 890
Version 18 - PG Gun, FlowControl; CANBus	388 904



Example: CG 02 OptiTronic Powder Gun Control unit, Version 18.
Rear plate with connections (see also "OptiTronic Version Table", and "Conversion Table")

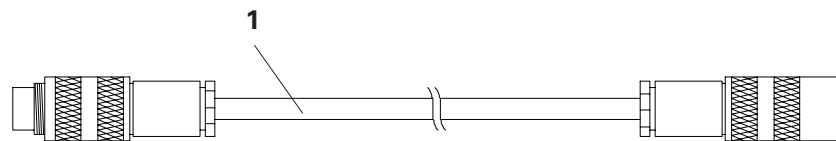
ABBREVIATIONS:

PG GA02 OptiGun 2 = **G1** = Gun 1
GA / GM GM01 EasySelect = **G2** = Gun 2

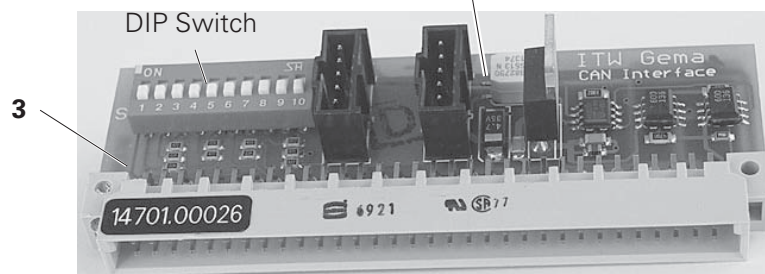
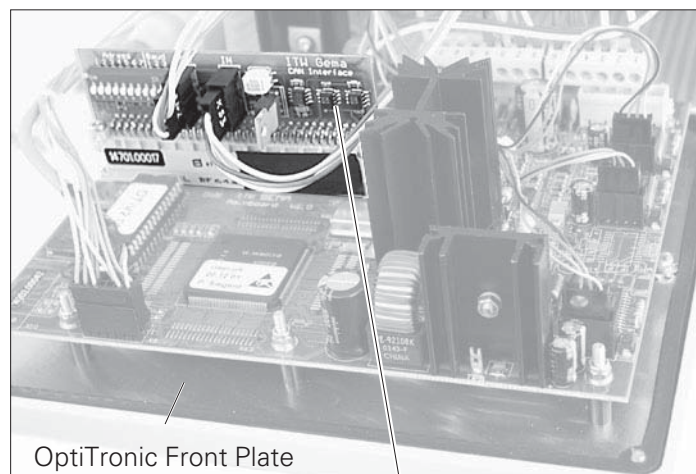
Figure 13

OPTIONAL EQUIPMENT - RETROFIT - OPTITRONIC CONTROL UNIT

FlowControl - complete (see also Fig. 14)	379 743
SystemLock internal connection cable	379 891
SystemLock external connection cable	
- L = 3,5 m - complete	387 070
- L = 4,5 m - complete	386 189
- L = 5,5 m - complete	386 197
DigitalBus Interface (see also Fig. 13)	379 883
DigitalBus connection cable	379 816
PG gun (Gun 1) connection cable	384 933
GA or GM gun (Gun 2) connection cable	379 840



1	CANBus Cable - 4 pin - complete	- L = 1.80 m	387 584
		- L = 4.50 m	387 592
		- L = 5.50 m	387 521
		- L = 6.50 m	387 530
		- L = 20.0 m	389 560
2	Terminal resistor - complete (not shown)		387 606
3	CANBus Interface (Option)		386 227



Detail - CANBus Interface Board - (Option) - complete

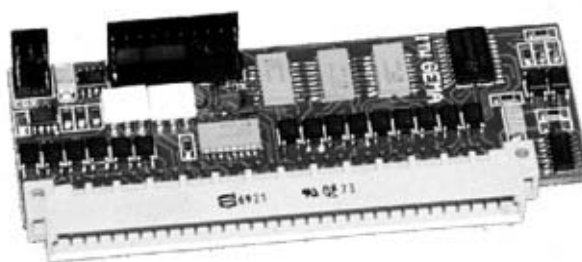
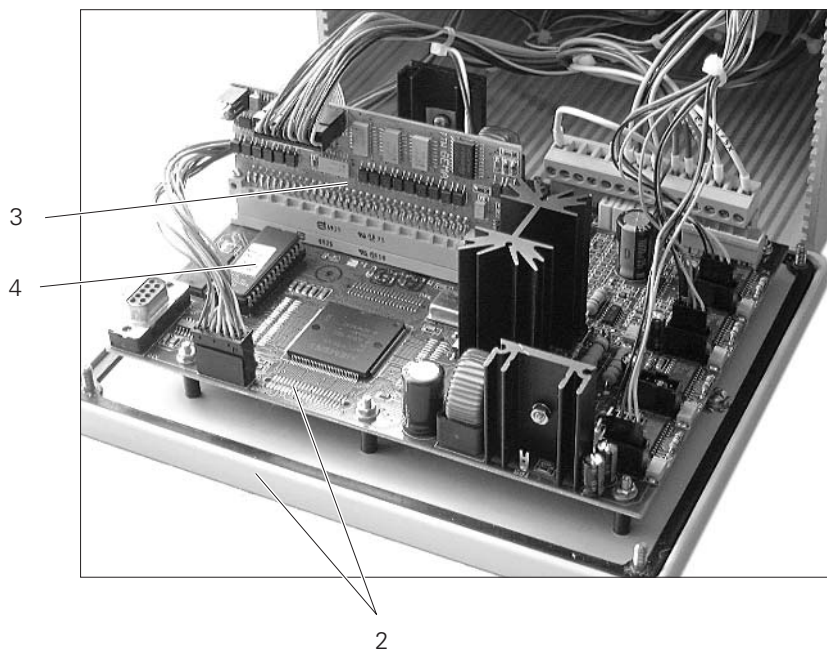
ABBREVIATIONS:

PG GA02 OptiGun 2 = **G1** = Gun 1
GA / GM GM01 EasySelect = **G2** = Gun 2

Figure 14

OPTITRONIC CONTROL UNIT - COMPLETE

2	CG 02 Front plate - complete (without Item 3)	379 794
3	DigitalBus (Option)	379 883
4	EPROM 27C256-70 - Software version 1.03* <i>For control units with Serial No. 14101.XXXXXX)</i>	380 873
	EPROM 27C512-70 - Software version 2.XX* <i>For control units with Serial No. 14102.XXXXXX)</i>	387 037



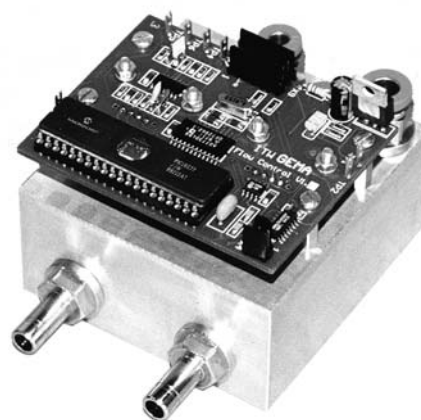
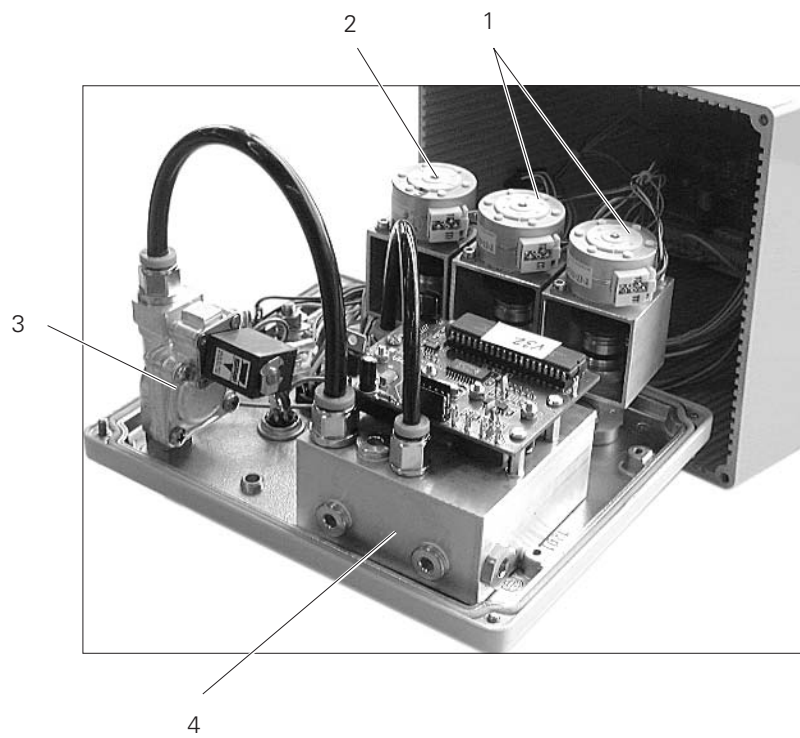
Detail - DigitalBus (Option) - complete

*Different memory moduls have been used for the different Print versions, so in order to avoid mistakes in ordering, please check that the order number is correct before ordering.

Figure 15

PNEUMATICS

1	Throttle motor - FL or ZL - complete	380 555
2	Throttle motor - EL - complete	380 563
3	Main solenoid valve - 24 V DC - complete	262 455
4	FlowControl - complete (Option)	379 743
	Fuse - 2 AT	221 872



Detail - FlowControl (Option) complete

Figure 16

POWER MAIN BOARD

1.	Power Main Board - for 12 guns	383 660
2.	Power Module - 1x per gun	383 686
	300 VA Transformer (prim. 100 V) for 12 guns	384 925
	300 VA Transformer (prim. 115 V) for 12 guns	383 856
	300 VA Transformer (prim. 200 V) for 12 guns	384 984
	300 VA Transformer (prim. 230 V) for 12 guns	383 864
	300 VA Transformer (prim. 400 V) for 12 guns	383 872
	CG 02 Power supply cable - 5 m	381 756
	CG 02 Power supply cable - 20 m	382 000

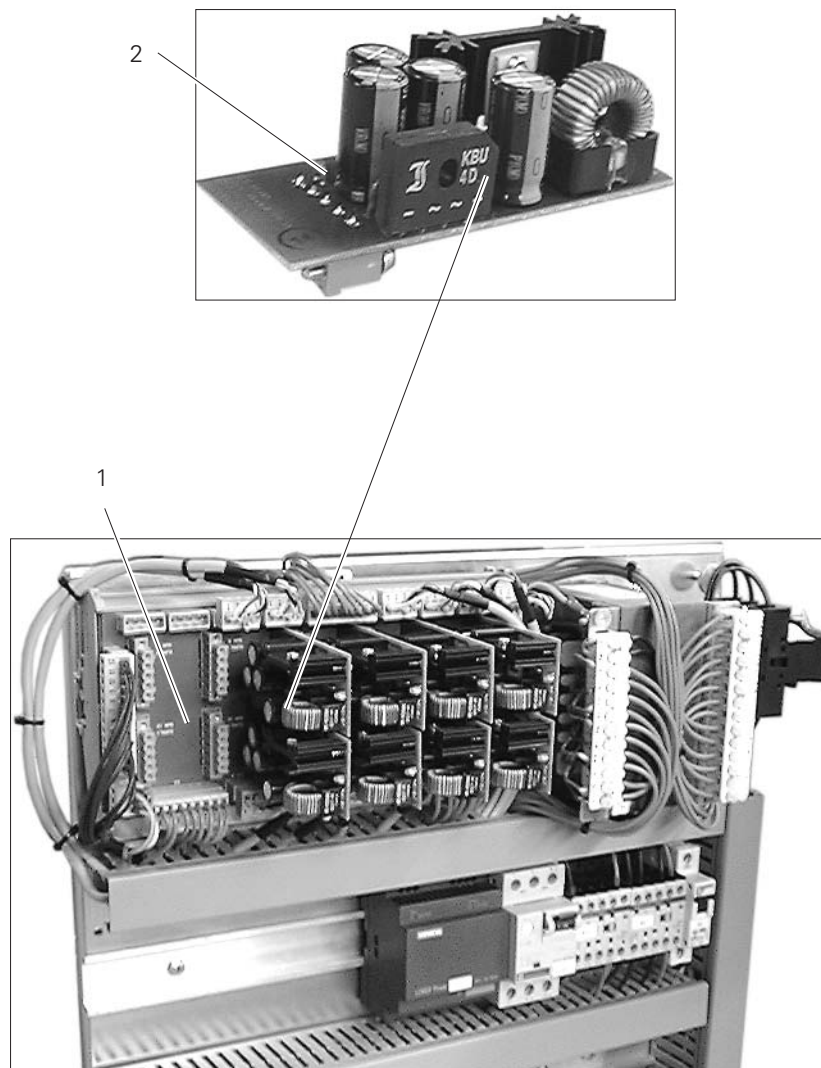


Figure 17

CD02 DIGITALCONNECTOR

- | | | |
|----|--------------------------------------|----------|
| 1. | CD02 Digital Connector - for 12 guns | 382 825 |
| 2. | Digital cable - 19 pin - 3.5 m | 1000 933 |
| | Digital cable - 19 pin - 4.5 m | 1000 934 |
| | Digital cable - 19 pin - 5.5 m | 1000 935 |
| | Digital cable - 19 pin - 6.5 m | 1000 936 |

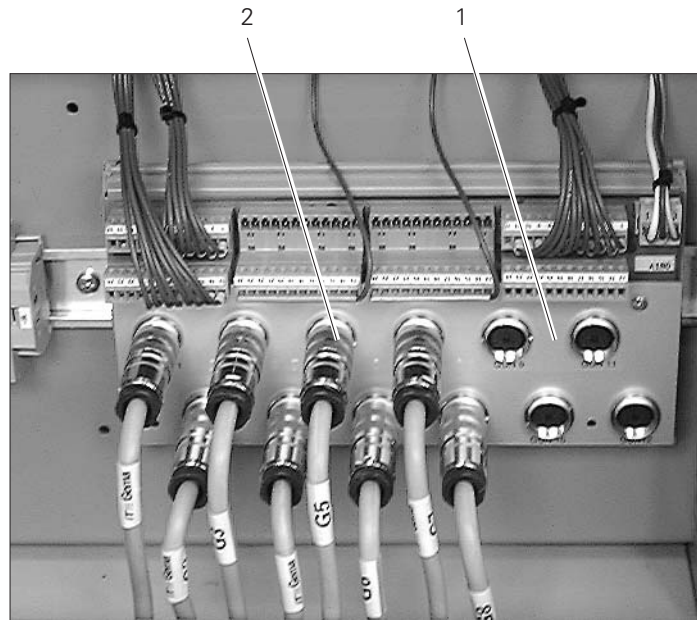


Figure 18

DOCUMENTATION

OPTITRONIC

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