

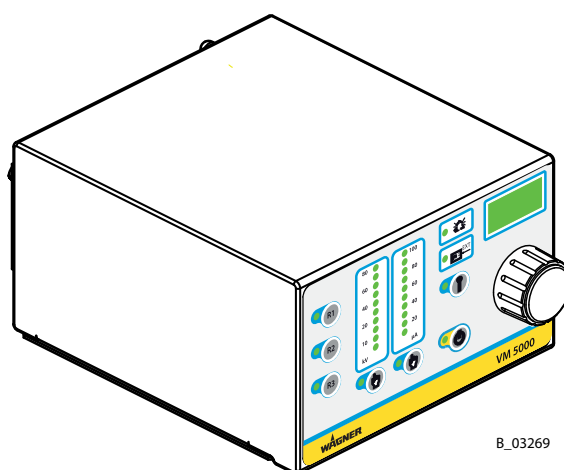


Translation of the Original Operating Manual

VM 5000

Version 07/2014

Electrostatic Control Unit for Electrostatic Manual Spray Guns



B_03269



Contents

1	ABOUT THIS OPERATING MANUAL	5
1.1	Preface	5
1.2	Warnings, Notices, and Symbols in this Operating Manual	5
1.3	Languages	6
1.4	Abbreviations in the Text	6
2	CORRECT USE	7
2.1	Device Type	7
2.2	Type of Use	7
2.3	Safety Parameters	7
2.4	Reasonably Foreseeable Misuse	8
2.5	Residual Risks	8
3	IDENTIFICATION	9
3.1	Explosion Protection According to FM	9
3.2	Permissible Device Combinations	9
3.3	Notes to German Regulations and Guidelines	9
4	GENERAL SAFETY INSTRUCTIONS	10
4.1	Safety Instructions for the Operator	10
4.1.1	Electrical Equipment	10
4.1.2	Staff Qualifications	10
4.1.3	Safe Work Environment	11
4.2	Safety Instructions for Staff	11
4.2.1	Safe Handling of WAGNER Spray Devices	12
4.2.2	Grounding the Device	12
4.2.3	Material Hoses	13
4.2.4	Cleaning	13
4.2.5	Handling Hazardous Liquids, Lacquers and Paints	14
4.2.6	Touching Hot Surfaces	14
4.3	Correct Use	14
4.4	Safety Information on Discharges	15
4.5	Protective and Monitoring Equipment	15
5	DESCRIPTION	16
5.1	Areas of Application	16
5.2	Functional Description	16
5.3	Technical Data	16
5.4	Scope of Delivery	17
5.5	Operating Elements and Connections	18
5.5.1	Operating Elements Front Side	18
5.5.2	Connections on the Rear Side	20
6	COMMISSIONING AND OPERATION	21
6.1	Training Assembly/Commissioning Staff	21
6.2	Storage Conditions	21
6.3	Installation Conditions	21
6.4	Additional Components	22
6.5	Placement of the Device	23
6.6	Grounding	24
6.7	Example: AirCoat Spraying System	26

Table of Contents

6.8	Device Configuration	28
6.8.1	Parameter Overview of Level 1 for Users	28
6.8.2	Access to the Device Configuration Mode	30
6.8.3	Setting Example "Parameter C11"	31
6.9	Operating Hours Counter / Service Display	33
6.9.1	Maintenance Counter Set Up and Reading	34
6.10	External Interface	35
7	OPERATION	37
7.1	Training the Operating Staff	37
7.2	Safety Instructions	37
7.3	Control Unit Start Up	38
7.4	Setting and Saving Recipes	39
7.4.1	Setting the High-voltage	40
7.4.2	Setting the Current Limiting	41
7.4.3	Display During Spraying	42
7.5	Standby Mode	43
7.6	Display "Conduct Service"	44
8	TROUBLESHOOTING AND RECTIFICATION	45
9	MAINTENANCE AND REPAIR	47
9.1	Maintenance	47
9.2	Repair	47
10	PRODUCT DISPOSAL	47
11	ACCESSORIES	48
12	SPARE PARTS	49
12.1	How Can Spare Parts Be Ordered?	49
12.2	Spare Parts List VM 5000	50
13	WARRANTY	52
13.1	Important Notes Regarding Product Liability	52
13.2	Warranty Claim	52

1 ABOUT THIS OPERATING MANUAL

1.1 PREFACE

The operating manual contains information about safely operating, maintaining, cleaning and repairing the device.

The operating manual is part of the device and must be available to operating and service staff.

Operating and service staff should be instructed according to the safety instructions.


The device may only be operated in compliance with this operating manual.

This equipment can be dangerous if it is not operated according to the instructions in this operating manual.


1.2 WARNINGS, NOTICES, AND SYMBOLS IN THIS OPERATING MANUAL

Warning instructions in this operating manual highlight particular dangers to users and to the device and state measures for avoiding the hazard. These warning instructions fall into the following categories:


Danger - immediate risk of danger.
Non-observance will result in death or serious injury.

	<p>! DANGER</p> <p>This notice warns you of a hazard! Possible consequences of not observing the warning instructions. The signal word indicates the hazard level.</p> <p>→ The following are measures which can be taken to prevent the hazard and its consequences.</p>
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Warning - possible imminent danger.
Non-observance may result in death or serious injury.

	<p>! WARNING</p> <p>This notice warns you of a hazard! Possible consequences of not observing the warning instructions. The signal word indicates the hazard level.</p> <p>→ The following are measures which can be taken to prevent the hazard and its consequences.</p>
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Caution - a possibly hazardous situation.
Non-observance may result in minor injury.

	<p>! CAUTION</p> <p>This notice warns you of a hazard! Possible consequences of not observing the warning instructions. The signal word indicates the hazard level.</p> <p>→ The following are measures which can be taken to prevent the hazard and its consequences.</p>
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Notice - a possibly hazardous situation.
Non-observance may result in material damage.

<p>NOTICE</p> <p>This notice warns you of a hazard! Possible consequences of not observing the warning instructions. The signal word indicates the hazard level.</p> <p>→ The following are measures which can be taken to prevent the hazard and its consequences.</p>	
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Note - provides information about particular characteristics and how to proceed.

1.3 LANGUAGES

The operating manual is available in the following languages:

German

English

2344501

1.4 ABBREVIATIONS IN THE TEXT

Stk	Number of pieces
Pos	Position
K	Marking in the spare parts lists
Order No.	Order number
ET	Spare part
SSt	Stainless steel
2K	Two components

2 CORRECT USE

2.1 DEVICE TYPE



Control unit for controlling GM 5000EA or GM 5000EAC electrostatic spray guns and the high-voltage Universal cascade.

2.2 TYPE OF USE

WAGNER's electrostatic control unit VM 5000 controls and regulates the high-voltage supply to the GM 5000EA or GM 5000EAC spray guns used to apply liquid coating media and the high-voltage Universal cascade.

The VM 5000 may only be operated together with the above-mentioned manual spray guns or the high-voltage Universal cascade. If the control unit is operated in combination with devices other than the above-mentioned spray guns, the FM authorizations (type approvals) cease to be valid.

These electrostatic manual spray guns are suitable for spraying liquid products, in particular coating products that follow AirCoat or Airspray techniques. Coating products containing solvents of explosion class II A may be used.

	 WARNING
	<p>Incorrect use! Risk of injury and equipment damage.</p> <ul style="list-style-type: none"> → Only connect original Wagner spray guns or the high-voltage Universal cascade to the VM 5000 control unit. → Only connect the GM 5000EA, GM 5000EAC spray guns or the high-voltage Universal cascade.

2.3 SAFETY PARAMETERS

The control unit is only suitable for controlling spray guns and the Wagner high-voltage Universal cascade. J. Wagner AG forbids any other use!

The control unit may only be operated under the following conditions:

- The operating staff have previously been trained on the basis of this operating manual.
- The safety regulations listed in this operating manual must be observed.
- The operating, maintenance, and repair information in this operating manual must be observed.
- The statutory requirements and accident prevention regulation standards in the country of use must be observed.

The control unit may only be operated if all parameters are set and all measurements / safety checks are carried out correctly.



2.4 REASONABLY FORESEEABLE MISUSE

- Coating work pieces which are not grounded
- Use of defective components, spare parts or accessories
- Use with non-authorized spray guns

2.5 RESIDUAL RISKS

Residual risks are risks which cannot be excluded even in the event of correct use.

If necessary, warning and prohibition signs at the relevant points of risk indicate residual risks.

Residual risk	Source	Consequences	Specific measures	Lifecycle phase
Skin contact with solvent-based paints and cleaning agents	Handling of solvent-based paints and cleaning agents	Skin irritations, allergies	Wear protective clothing, observe safety data sheets	Operation, maintenance, disassembly
Solvent-based paint in air outside the defined working area	Painting outside the defined working area	Inhalation of substances hazardous to health	Observe work and operation instructions	Operation, maintenance

3 IDENTIFICATION

3.1 EXPLOSION PROTECTION ACCORDING TO FM

Authorization (type approval) of FM for class 1, div. 1 (spray gun)



For Electrostatic Finishing Applications using Class I, Group D, Spray Material

In accordance with 2316160

This device has been manufactured and tested by FM, according to the FM (Factory Mutual) standard "Class Number 7260" (Approval Standard for Electrostatic Finishing Equipment). All tested combinations of devices including accessories are given in the FM Control Document with part number 2316160.

3.2 PERMISSIBLE DEVICE COMBINATIONS

The following spray guns may be connected to the VM 5000 control unit:

● GM 5000EA spray gun
● GM 5000EAC spray gun

Other gun types may only be connected to the control unit after first checking their suitability with Wagner.

3.3 NOTES TO GERMAN REGULATIONS AND GUIDELINES

- | | | |
|----|--------------|---|
| a) | BGV A3 | Electrical devices and equipment |
| b) | BGR 500 | Part 2, Chapter 2.36 Working with Liquid Ejection Devices |
| c) | BGR 500 | Part 2, Chapter 2.29 Working with Coating Products |
| d) | BGR 104 | Explosion protection rules |
| e) | TRBS 2153 | Avoiding ignition risks |
| f) | BGR 180 | Equipment for cleaning work pieces with solvents |
| g) | ZH 1/406 | Guidelines for liquid ejection devices |
| h) | BGI 740 | Painting rooms and equipment |
| i) | BGI 764 | Electrostatic coating |
| j) | Betr.Sich.V. | Plant Safety Ordinance |

Note: All titles can be ordered from Heymanns Publishing House in Cologne, or they can be found on the Internet.

4 GENERAL SAFETY INSTRUCTIONS

4.1 SAFETY INSTRUCTIONS FOR THE OPERATOR

- Keep this operating manual at hand near the device at all times.
- Always follow local regulations concerning occupational safety and accident prevention.



4.1.1 ELECTRICAL EQUIPMENT

Electrical devices and equipment

- To be provided in accordance with the local safety requirements with regard to the operating mode and ambient influences.
- May only be maintained by skilled electricians or under their supervision.
- Must be operated in accordance with the safety regulations and electrotechnical regulations.
- Must be repaired immediately in the event of problems.
- Must be decommissioned if they pose a hazard.
- Must be de-energized before work is commenced on active parts. Inform staff about planned work. Observe electrical safety regulations.



Control units

- Place the control unit outside the spray booth / spray zone.
- If possible, place the control unit outside the explosion zone (placement in Ex Zone 2 is permissible).
- Protect the control unit from extreme temperature and moisture changes.
- Protect the control unit from contamination.
- Lay and fix the connecting cable correctly.
- Ensure that the local mains voltage and tension of the device match.

4.1.2 STAFF QUALIFICATIONS

- Ensure that the device is operated and repaired only by trained persons.

4.1.3 SAFE WORK ENVIRONMENT

- Ensure that the floor in the working area is static dissipative in accordance with EN 61340-4-1 (resistance must not exceed 100 Mohm).
- Ensure that all persons within the working area wear static dissipative shoes. Footwear must comply with EN 20344. The measured insulation resistance must not exceed 100 Mohm.
- Ensure that during spraying, persons wear static dissipative gloves. The grounding takes place via the spray gun handle.
- If protective clothing is worn, including gloves, it has to comply with EN 1149-5. The measured insulation resistance must not exceed 100 Mohm.
- Paint mist extraction systems must be fitted on site according to local regulations.
- Ensure that the following components of a safe working environment are available:
 - Product/air hoses adapted to the working pressure.
 - Personal safety equipment (breathing and skin protection).
- Ensure that there are no ignition sources such as naked flames, sparks, glowing wires, or hot surfaces in the vicinity. Do not smoke.



4.2 SAFETY INSTRUCTIONS FOR STAFF

- Always follow the information in this manual, particularly the general safety instructions and the warning instructions.
- Always follow local regulations concerning occupational safety and accident prevention.
- Under no circumstances may people with pacemakers enter the area where the high-voltage field between the spray gun and the work piece to be coated builds up!

Control units

- When commissioning and for all work, read and follow the operating manual and safety regulations for the additionally required system components.
- Do not open the control unit.



4.2.1 SAFE HANDLING OF WAGNER SPRAY DEVICES

The spray jet is under pressure and can cause dangerous injuries.

Avoid injection of paint or cleaning agents:

- Never point the spray gun at people.
- Never reach into the spray jet.
- Before all work on the device, in the event of work interruptions and functional faults:
 - Switch off the energy/compressed air supply.
 - Relieve the pressure from the spray gun and device.
 - Secure the spray gun against actuation.
 - In the event of functional faults: remedy the fault as described in the "Troubleshooting" chapter.
- The liquid ejection devices are to be checked for safe working conditions by an expert (e.g. Wagner Service Technician) as often as necessary or at least every 12 months, in accordance with the guidelines for liquid emitters (ZH 1/406 and BGR 500 Part 2 Chapter 2.36).
 - For shut down devices, the examination can be suspended until the next commissioning.
- Carry out the work steps as described in the "Pressure Relief/Work Interruptions" chapter:
 - if pressure relief is required.
 - if the spraying work is interrupted or stopped.
 - before the device is cleaned on the outside, checked, or serviced.
 - before the spray nozzle is installed or cleaned.

In the event of skin injuries caused by paint or cleaning agents:

- Note down the paint or cleaning agent that you have been using.
- Consult a doctor immediately.

Avoid danger of injury through recoil forces:

- Ensure that you have firm footing when operating the spray gun.
- Only hold the spray gun briefly in a position.



4.2.2 GROUNDING THE DEVICE

Depending on the high-voltage on the spray electrode and the flow speed during spraying, an electrostatic charge may occur in the device. This may result in the formation of sparks or flames when discharging.

- Ensure that the device is grounded at all times.
- Ground the work pieces to be coated.
- Ensure that all persons inside the working area are grounded, e.g. that they are wearing static dissipative shoes.
- Wear static dissipative gloves for grounding via the spray gun handle when spraying.



4.2.3 MATERIAL HOSES

- Ensure that the hose material is chemically resistant to the sprayed products.
- Ensure that the material hose is suitable for the pressure generated in the device.
- Ensure that the following information can be seen on the high-pressure hose:
 - Manufacturer
 - Permissible operating overpressure
 - Date of manufacture
- Make sure that the hoses are laid only in suitable places. In no case, should hoses be laid in the following places:
 - in high-traffic areas,
 - on sharp edges,
 - on moving parts, or
 - on hot surfaces
- Make sure that the hoses are never used to pull or move the equipment.
- The electrical resistance of the complete high-pressure hose must be less than 1 Mohm.



4.2.4 CLEANING

- De-energize the device electrically.
 - Disconnect the pneumatic supply line.
 - Relieve the pressure from the device.
 - Ensure that the flash point of the cleaning agent is at least 15 K above the ambient temperature or that cleaning is undertaken at a cleaning station with technical ventilation.
 - To clean, use cloths and brushes moistened with solvent. Abrasive agents or objects must not be used. Ensure that the spray gun is not damaged in any way while cleaning.
 - Parts of the spray gun must not be sprayed with or immersed in cleaning agent.
 - Preferably, non-combustible cleaning agents should be used.
 - The choice of the appropriate cleaning agent for cleaning purposes of the spray gun depends on which parts of the spray gun have to be cleaned and which product has to be removed. When cleaning the spray gun only use non-polar cleaning agents to prevent conductive residues on the surface of the spray gun. Should it however, be necessary to use a polar cleaning agent, all residues of this cleaning agent have to be removed by using a non-conductive and non-polar cleaning agent, once the cleaning is finished.
 - Ensure that no electrical component is cleaned with nor even immersed into solvent.
- An explosive gas/air mixture forms in closed tanks.**
- When cleaning devices with solvents, never spray into a closed tank.
 - Only use electrically conductive tanks for cleaning liquids.
 - The tanks must be grounded.



4.2.5 HANDLING HAZARDOUS LIQUIDS, LACQUERS AND PAINTS

- When preparing or working with lacquer and when cleaning the device, follow the working instructions of the manufacturer of the lacquers, solvents and cleaning agents being used.
- Take the specified protective measures, in particular wear safety goggles, protective clothing and gloves, as well as hand protection cream if necessary.
- Use a mask or breathing apparatus if necessary.
- For sufficient health and environmental safety: operate the device in a spray booth or on a spraying wall with the ventilation (extraction) switched on.
- Wear suitable protective clothing when working with hot products.



4.2.6 TOUCHING HOT SURFACES

- Only touch hot surfaces if you are wearing protective gloves.
- When operating the device with a coating product with a temperature of $> 43\text{ }^{\circ}\text{C}$; $109.4\text{ }^{\circ}\text{F}$:
 - Identify the device with a warning label "Warning - hot surface".

Order No.

9998910 Instruction label

9998911 Protection sticker

Note: Order the two stickers together.

4.3 CORRECT USE

WAGNER accepts no liability for any damage arising from incorrect use.

- Use the device only to work with the products recommended by WAGNER.
- Only operate the device as a whole.
- Do not deactivate safety fixtures.
- Use only WAGNER original spare parts and accessories.



4.4 SAFETY INFORMATION ON DISCHARGES

The plastic parts of the spray gun are charged electrostatically by the high-voltage field of the spray gun. In case of contact with plastic parts harmless discharges (brush discharges) may occur. They are completely non-hazardous for human health.

When keeping a distance of 4 to 10 mm; 0.15 to 0.4 inch between spray gun and object to be sprayed, the corona discharge at the end of the electrode is visible in the dark.

Surface spraying of the control unit

→ Never spray device parts using electrostatic equipment (electrostatic spray gun!).



Cleaning the control unit



If there are deposits on the surfaces, the device may form electrostatic charges. Flames or sparks can form during discharge.

→ Remove deposits from the surfaces to maintain conductivity.

→ Only use a damp cloth to clean the device.




4.5 PROTECTIVE AND MONITORING EQUIPMENT

	 WARNING
	<p>Protective and monitoring equipment! Risk of injury and equipment damage.</p> <ul style="list-style-type: none"> → Protective and monitoring equipment must not be removed, modified or rendered unusable. → Regularly check for perfect functioning. → If defects are detected on protective and monitoring equipment, the system must not be operated until these defects are remedied.

5 DESCRIPTION

5.1 AREAS OF APPLICATION

	<p>! WARNING</p> <p>Incorrect use! Risk of injury and equipment damage.</p> <p>→ Only connect original Wagner spray guns or the Wagner high-voltage Universal cascade to the VM 5000 control unit. → Only connect the GM 5000EA or GM 5000EAC spray guns.</p>
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5.2 FUNCTIONAL DESCRIPTION

The VM 5000 control unit, together with the matching GM 5000EA or GM 5000EAC spray gun and other components, form an electrostatic hand spray system. The VM 5000 supplies the control voltage for the spray gun, in which high-voltage is subsequently produced. The set value for high-voltage and the spray current limiting are adjusted on the control unit and can be saved in three different recipes. The high-voltage supply is switched on and off with the trigger of the spray gun.

The special linear characteristic for high-voltage ensures that if the spray gun is brought too close to the work piece (or to earth) the high-voltage is reduced automatically to prevent an accidental spark discharge.

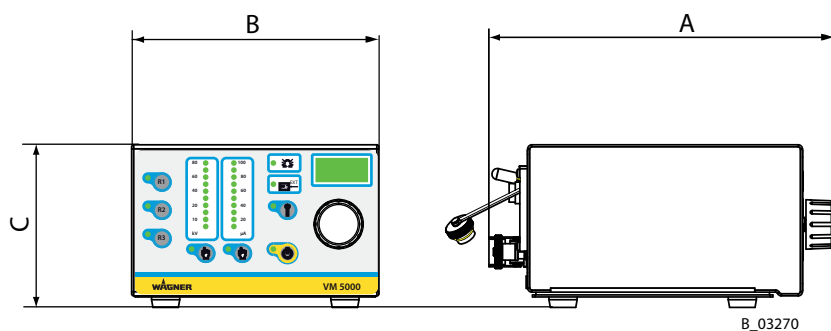
Additionally, the VM 5000 control unit can be used as a universal high-voltage generator, in combination with the high-voltage Universal cascade.

In addition, the VM 5000 control unit has a wide range of other functions, such as an operating hours counter, service interval display, external approval, fault display and an easy-to-use interface.

5.3 TECHNICAL DATA

Input voltage	115 VAC – 240 VAC, 50 Hz / 60 Hz
Input power	max. 40 W
Input current	max. 0.5 A
Output voltage	max. 20 Vpp
Output current	max. 1.0 A AC
High-voltage limiting	70 kV DC
Spray current limiting	100 µA DC
Polarity	for negative high-voltage generators
Protection class	IP 54 *
Weight (without cables)	2.3 kg; 5.07 lbs.
Operating temperature range	0 – 40 °C; 32 – 104 °F

- * Splash water protection is only guaranteed when the gun cable socket is screwed to the device plug and the mains cable plug is fixed to the control unit plug with the safety clip.

Dimensions:

VM 5000		
	mm	inch
A	250	9.84
B	180	7.09
C	120	4.72

5.4 SCOPE OF DELIVERY

Quantity	Order No.	Designation
1	2344480	VM 5000 control unit

The standard equipment includes:

Quantity	Order No.	Designation
1	264626	Mains cable USA; 2 m; 6.56 ft
1	130215	Grounding cable, 10 m, 32.8 ft
2	9951117	Delay-action fuse 1.0 AT
1	2316160	FM Control Document GM 5000E
1	2344501	VM 5000 operating manual, English
1	see 1.1	Operating manual in local language

The delivery note shows the exact scope of delivery.

5.5 OPERATING ELEMENTS AND CONNECTIONS

5.5.1 OPERATING ELEMENTS FRONT SIDE

1 Push button "Recipe 1"

2 Push button "Recipe 2"

3 Push button "Recipe 3"

4 Illuminated display "R1"

Lights up if recipe 1 is used.

5 Illuminated display "R2"

Lights up if recipe 2 is used.

6 Illuminated display "R3"

Lights up if recipe 3 is used.

7 Declaration of values for high-voltage in kV

8 Illuminated display "High-voltage"

- Lights up green
- Display range: 0-80 kV
- Single LED display: Nominal voltage
- Bar display: Working voltage

9 Illuminated display "Spray current"

- Lights up green
- Display range: 0 – 100 μ A
- Single LED display: Spray current limiting
- Bar display: Actual spray current

10 Declaration of values for spray current in μ A

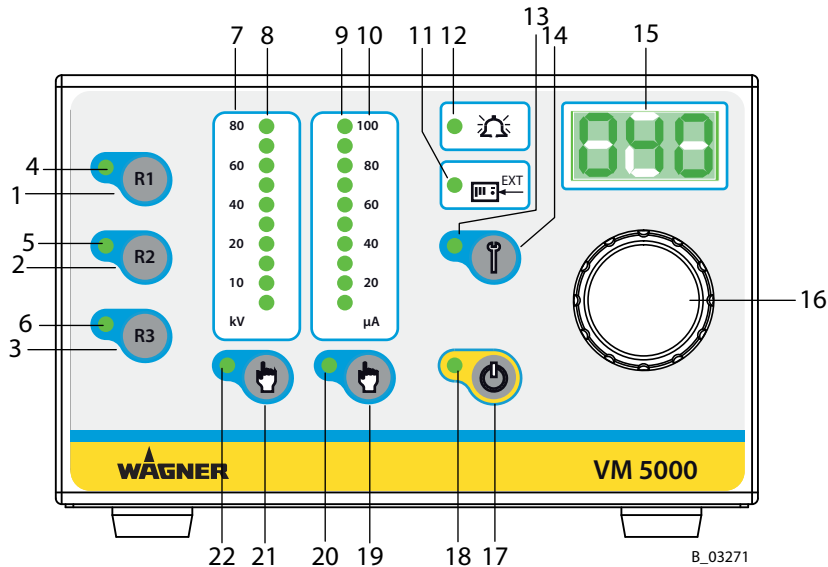
11 Illuminated display "External release"

- Lights up, if Parameter C11 is set
- Blinks if the spray gun trigger is pulled, without external approval, while Parameter C11 is set

12 Illuminated display "Fault"

13 Illuminated display "Service"

14 Push button "Service"

**15 Display LED: 7 segments, three-digit number**

- Displays set values and actual values for high-voltage and for the spray current
- Display showing error number in the event of warnings and malfunctions

16 Universal control dial

- Dynamic digital control dial with 32 positions per revolution
- Adjustment speed is proportional to rotational speed
- Used to adjust high-voltage and spray current
- For setting parameter values in configuration mode

17 Push button "Standby mode"**18 Illuminated display "Standby"****19 Push button "Spray current"**

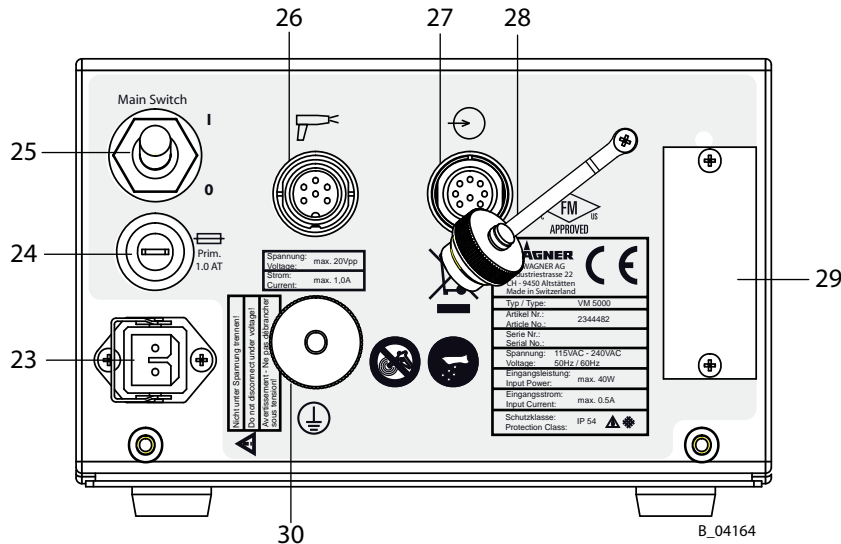
- To activate the function, the current limiting is set with the control dial (16) and is indicated in the LED display 9
- Adjusting range: 5 – 100 µA
- Resolution: 1 µA

20 Illuminated display "Spray current"**21 Push button "High-voltage"**

- To activate the function, the high-voltage is set with the control dial (16) and is indicated in the LED display 8
- Adjusting range: 5 to 70 kV
- Resolution: 1 kV

22 Illuminated display "High-voltage"

5.5.2 CONNECTIONS ON THE REAR SIDE



23 Mains input terminal

Connection for mains cable with safety clip
Warning - Do not disconnect under voltage.

24 Primary fuse

1.0 ampere slow-acting

25 Mains supply switch

0 = The control unit is deactivated
1 = The control unit is activated

26 Gun connection

To connect a GM 5000EA or GM 5000EAC gun
When operating with high-voltage Universal cascade -> high-voltage Universal cascade connection
Warning - Do not disconnect under voltage.

27 Interface

Warning - Do not disconnect under voltage.

28 Cover of the interface connection

29 Cover of the service connection



Only for Wagner service personnel

30 Knurled nut grounding

Grounding cable connection to the signal ground

6 COMMISSIONING AND OPERATION

6.1 TRAINING ASSEMBLY/COMMISSIONING STAFF

	<p> WARNING</p> <p>Incorrect installation/operation! Risk of injury and equipment damage.</p> <ul style="list-style-type: none"> → The commissioning staff must have the technical skills to safely undertake commissioning. → When commissioning and for all work, read and follow the operating manual and safety regulations for the additionally required system components.
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6.2 STORAGE CONDITIONS

Until the point of assembly, the control unit must be stored in a dry location, free from vibrations and with a minimum of dust. The control unit must be stored in closed rooms. The air temperature at the storage location must be between -20 – +60 °C; -4 – +140 °F. The relative air humidity at the storage location must be between 10 and 95% (without condensation).

6.3 INSTALLATION CONDITIONS

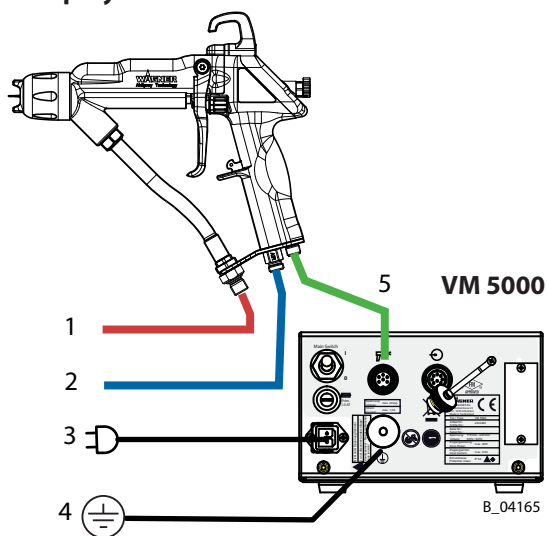
The air temperature at the installation site must be between 0 – 40 °C; 32 – 132 °F. The relative air humidity at the installation site must be between 10 and 95% (without condensation).

6.4 ADDITIONAL COMPONENTS

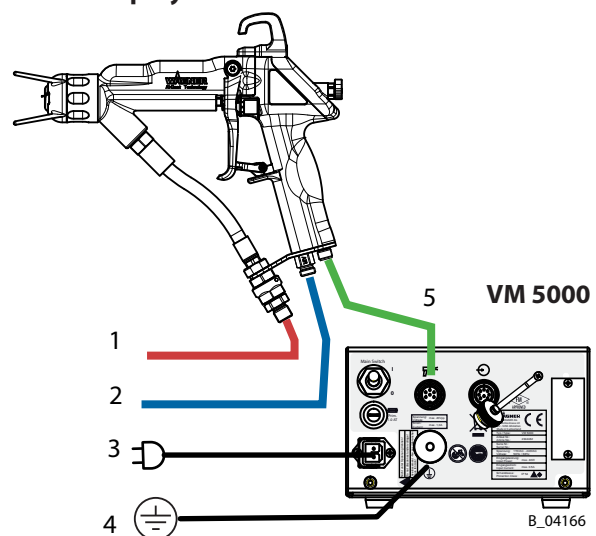
This control unit can be used to complete an electrostatic hand spray system. To do so, a suitable spray gun and the relevant components for the selected spray process are required (see WAGNER accessories).

Spray guns that are compatible with the VM 5000:

Air-Spray GM 5000EAR or GM 5000EAF



AirCoat-Spray GM 5000EACR or GM 5000EACF



1	for the product supply system	3	Mains cable	5	Gun cable
2	for the compressed air supply	4	Grounding cable to the signal ground		

The operation of the VM 5000 in combination with the high-voltage Universal cascade is described in detail in the operating manual of the high-voltage Universal cascade.

	WARNING
	<p>Incorrect installation/operation! Risk of injury and equipment damage.</p> <p>→ When commissioning and for all work, read and follow the operating manual and safety regulations for the additionally required system components.</p>



NOTICE

Impurities in the spraying system!



Spray gun blockage, products harden in the spraying system.

→ Flush the spray gun and paint supply with a suitable cleaning agent.

6.5 PLACEMENT OF THE DEVICE


	 DANGER
	<p>Incorrect installation of the device! Explosion hazard and damage to equipment.</p> <ul style="list-style-type: none"> → Set up the device outside the spray booth / spray zone. → If possible, place the device outside the explosion zone. → Protect the device from extreme temperature and moisture changes. → Protect the device from contamination. → Lay and fix the connecting cable correctly.


All sealed elements on the control unit must be present and undamaged. During operation, all electric control unit connections have to be tightly sealed to the corresponding plug connectors or closing elements. While under voltage, neither plug connectors nor closing elements may be separated or opened.

	 WARNING
	<p>Sparks form when live components are separated or connected! Explosion hazard from electric sparks.</p> <ul style="list-style-type: none"> → Do not disconnect plug connections under voltage. → Do not open fuse holders under voltage. → Do not remove the service plug cover under voltage.

6.6 GROUNDING

It is important for systems safety and to achieve an optimum coating, that all system components such as work pieces, conveyors, paint supply, control unit and booth or spraying stand are perfectly grounded.

	<p>! WARNING</p> <p>Discharge of electrostatically charged components in atmospheres containing solvents! Explosion hazard from electrostatic sparks or flames.</p> <p>→ Ground all device components. → Ground the work pieces to be coated.</p>
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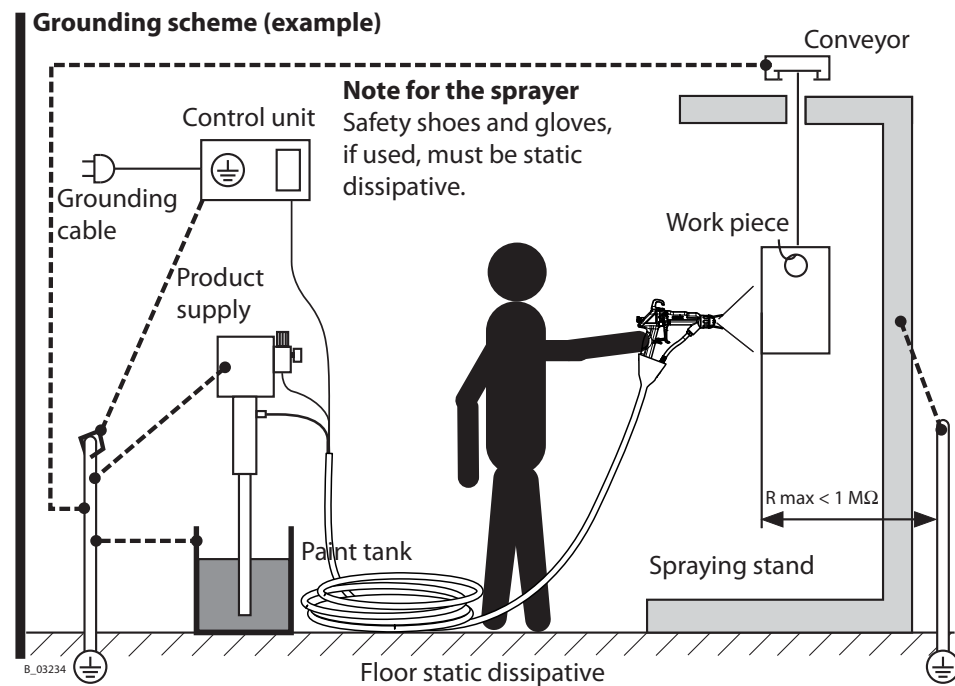
	<p>! WARNING</p> <p>Heavy paint mist if grounding is insufficient! Danger of poisoning. Insufficient paint application quality.</p> <p>→ Ground all device components. → Ground the work pieces to be coated.</p>
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A poorly grounded work piece causes:

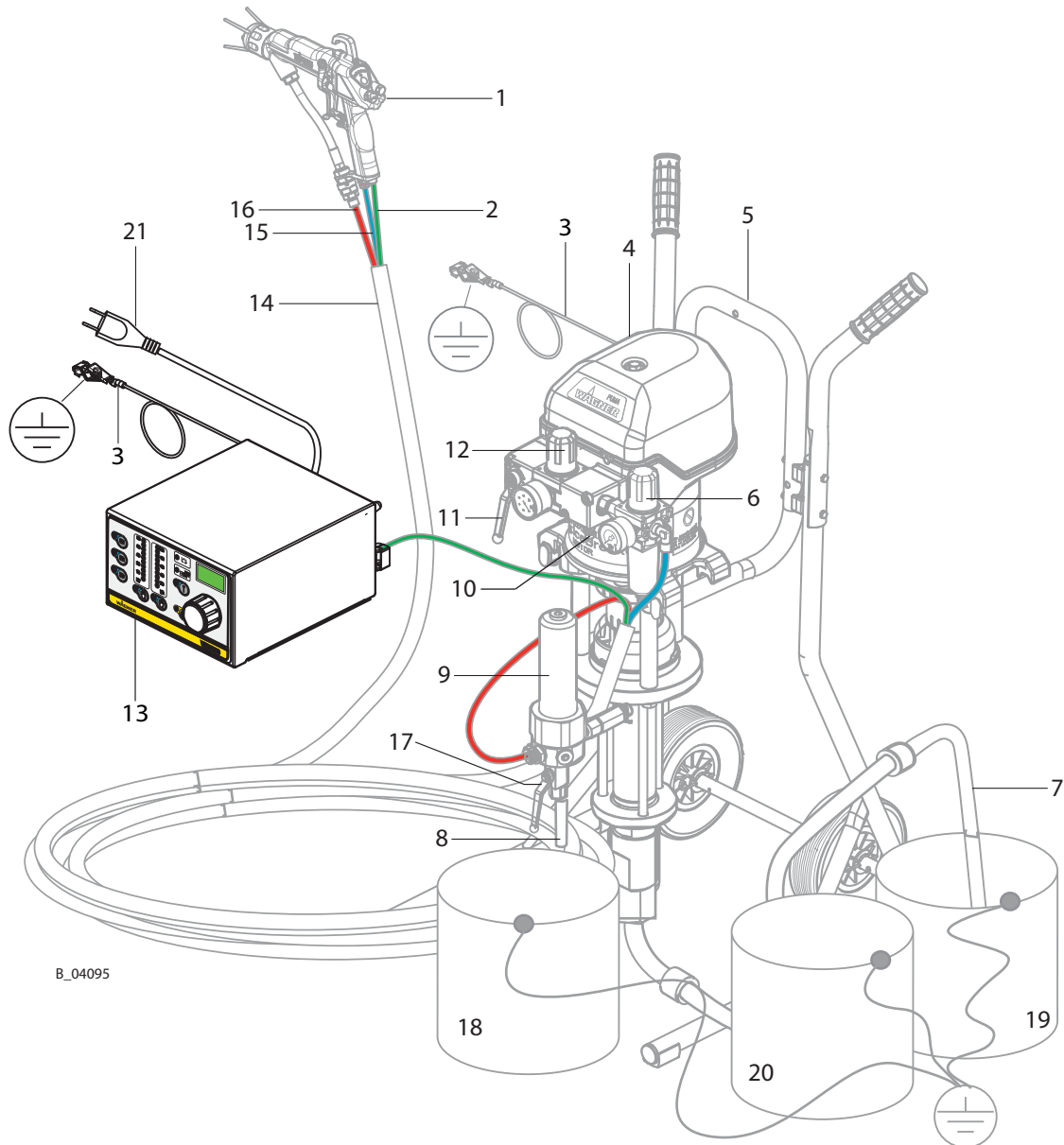
- Very bad wrap around
- Uneven coating
- Back spraying to the spray gun (contamination) and coater

Prerequisites for perfect grounding and coating are:

- Clean work piece suspension.
 - Grounding of spray booth, conveyor system and suspension on the building side in accordance with the operating instruction or the manufacturer's information.
 - Grounding of all conductive parts within the working area.
 - The grounding resistance of the work piece may not exceed 1 MΩ (Megohm).
- Note:
- Resistance to ground measured at 500 V or 1000 V.
- Connect the control unit to the system ground.

**Minimum cable cross-section**

Control unit	4 mm ² (AWG 12)	Conveyor	16 mm ² (AWG 6)
Product supply	4 mm ² (AWG 12)	Booth	16 mm ² (AWG 6)
Paint tank	4 mm ² (AWG 12)	Spraying stand	16 mm ² (AWG 6)

6.7 EXAMPLE: AIRCOAT SPRAYING SYSTEM

B_04095

Pos	Description	Pos	Description	Pos	Description
1	GM 5000EACF spray gun	8	Return hose	15	Air hose
2	Gun cable	9	High-pressure filter	16	Product hose
3	Grounding cable	10	Compressed air connection	17	Return valve
4	Pneumatic pump	11	Stop valve	18	Tank for return flow
5	Trolley	12	Air pressure regulator	19	Paint tank
6	Air pressure regulator + air filter	13	VM 5000 control unit	20	Tank, cleaning agent
7	Product suction system	14	Protective hose	21	Mains cable

The following points should be noted before commissioning:

- Lay grounding cable from the grounding screw on the device to the signal ground and ensure that all other conductive parts within the working area are grounded.
- Connect the VM 5000 electrostatic control unit via the mains cable to the socket interlocked with the extraction system.
- Connect the gun cable to the connector socket and screw into place.
- Connect the gun to the adjustable, clean air supply.
Compressed air quality class 3.5.2 according to ISO 8573.1.
- Connect the GM 5000EA or GM 5000EAC to the paint supply as described in the relevant operating manuals.
- Check that all product-conveying connections are correctly connected
- Check that all air-conveying connections are correctly connected.
- Visually check the permissible pressures for all the system components.
- Check the level of the separating agent in the pump and fill up if necessary.
- Provide product tank, tanks for flushing agent and an empty tank for return flow.
- The interface on the rear of the control unit must be protected with a cover.
- Connect the system to the air supply.
- During first commissioning of the system -> flush the system in accordance with the data given in the operating manuals for the other components.

6.8 DEVICE CONFIGURATION

Overview of the device configuraton levels:

There are 3 levels:

- Level 1: for operator
- Level 2: for Wagner Service
- Level 3: for Wagner production plant

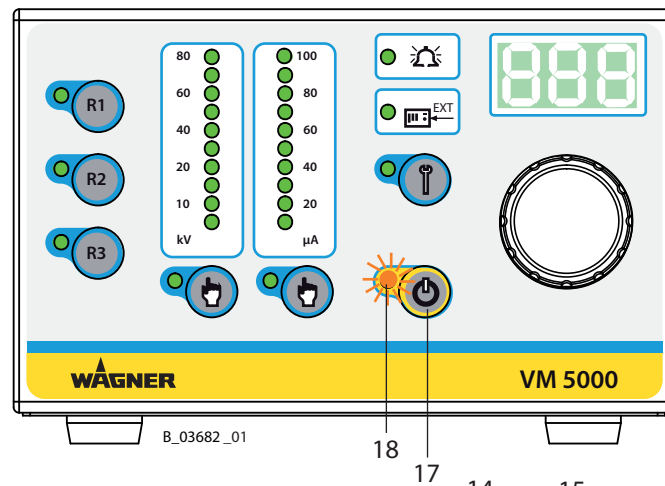
6.8.1 PARAMETER OVERVIEW OF LEVEL 1 FOR USERS

	Parameter	Value	Description
C11	External release (remote)	off (factory setting)	The device functions as a standalone device. External release by interface does not have to be defined. The bypass is activated.
		on	If parameter C11 is set, the LED "External release" on the control unit lights up continuously. The external release by interface must be issued. If the trigger is pulled despite the fact that no release has been issued, the LED display "External release" starts to flash quickly. Release is present when input is connected to GND.
C12	External set value specification	off (factory setting)	The set values for high-voltage in kV and current limiting in μ A are set at the operating panel.
		on	The set values for high-voltage in kV and current limiting in μ A are predefined using the interface's two analog power inputs. Application example: Set value specification by superordinate control (PLC) Set values can no longer be adjusted at the front control panel. All recipe functions (save, call up recipe, etc.) are locked.
C13	Lock	off (factory setting)	Lock is deactivated.
		on	Lock is activated, set values (kV and μ A) cannot be changed, user can only select recipes and control functions.
		pro	Lock pro (program) You can select recipes and control functions. The set values (kV and μ A) can be adjusted but cannot be saved in the recipes.

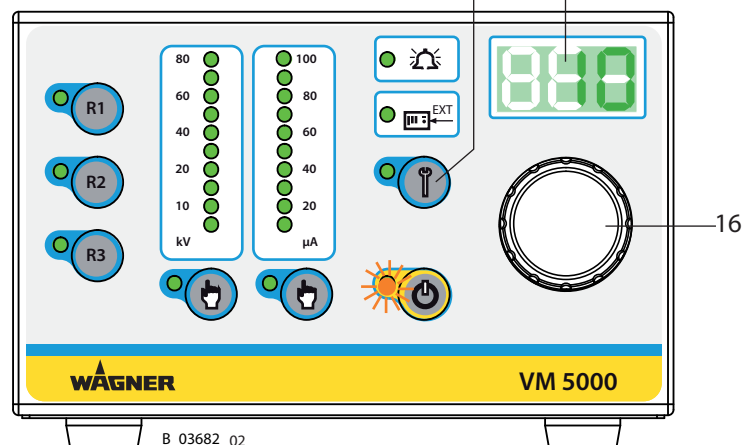
C14	Operating mode This parameter is linked to parameter C11. If parameter C14 is set, parameter C11 is automatically switched to "off".	off (factory setting)	Operation with GM 5000EA or GM 5000EAC manual spray gun
		2	Automatic electrostatic spray gun
		3	High voltage Universal 3 G cascade
		4	High voltage Universal 7.5 G cascade
C15	Lock gun operating button	off (factory setting)	Lock is switched off
		1	Partial Lock the gun operator button: - Standby function disabled. - Recipe change is possible.
		2	Partial Lock the gun operator button: - Recipe change are disabled. - Standby is possible.
		3	Full Lock the gun operator button: - Recipe change are disabled. - Standby function disabled.
C19	Reset recipes	no (factory setting)	No reaction
		res	All programs are set to delivery condition, if "res" is saved with the "Service" button.
C20	Reset configuration	no (factory setting)	No reaction
		res	All configuration parameters are set to delivery condition (factory setting), if "res" is saved with the "Service" button.

6.8.2 ACCESS TO THE DEVICE CONFIGURATION MODE**Procedure:**

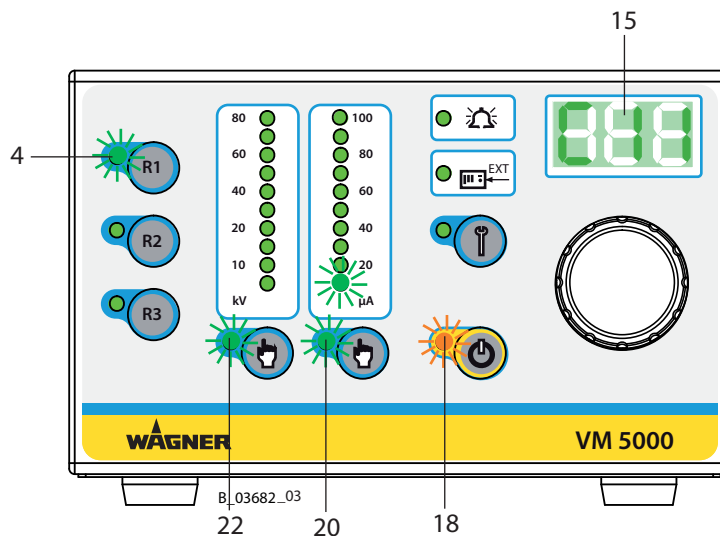
1. Switch to "Standby" by pressing the "Standby" button (17).
The orange LED "Standby" (18) lights up.

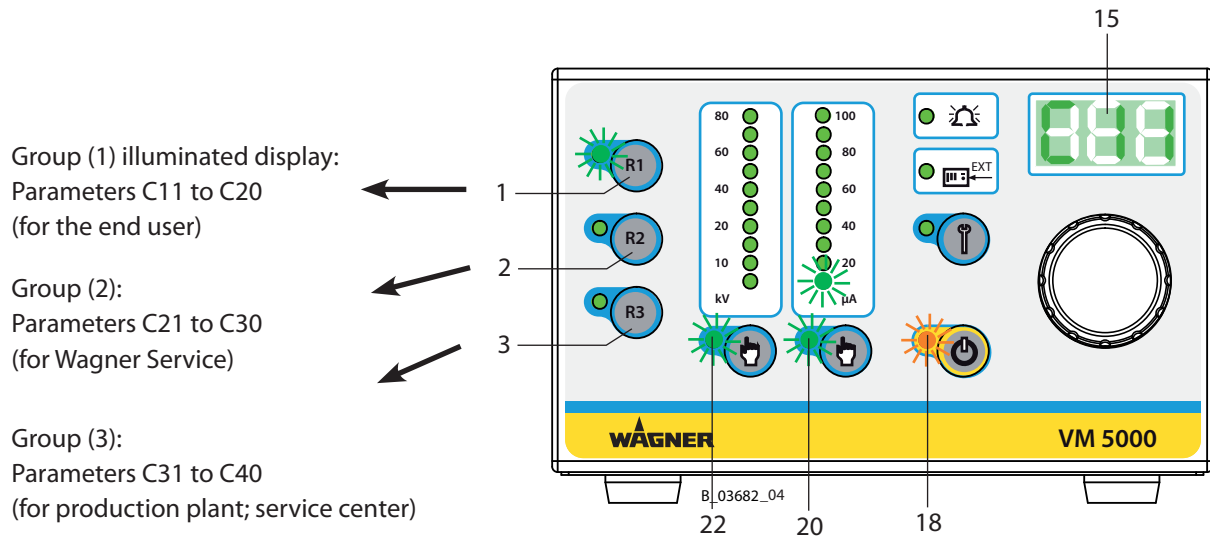


2. Press and hold the "Service" push button (14).
3. Turn the universal control dial (16) with the other hand until the display (15) shows the number "10".
Then release the "Service" button (14).
The scrolling text "Configuration" is displayed.
The device is now in configuration mode.



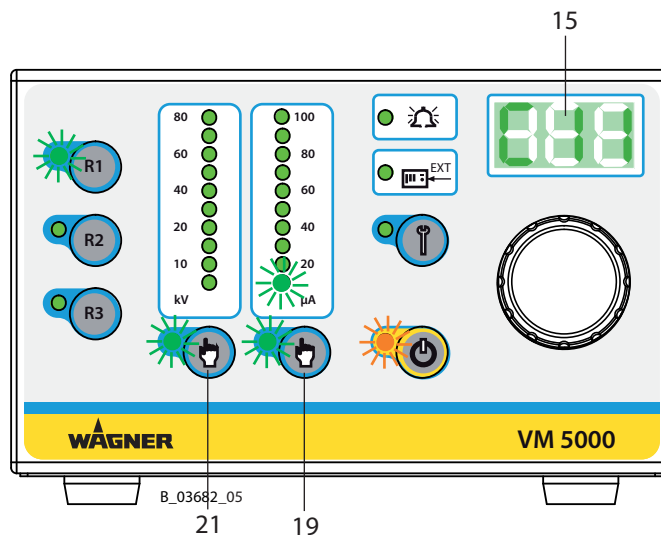
4. The LED display (15) now shows the first configuration setting C11.
At the same time, the two LED displays "High-voltage" (22) and "Spray current limiting" (20) start to flash.
The illuminated display "Standby" (18) flashes quickly.





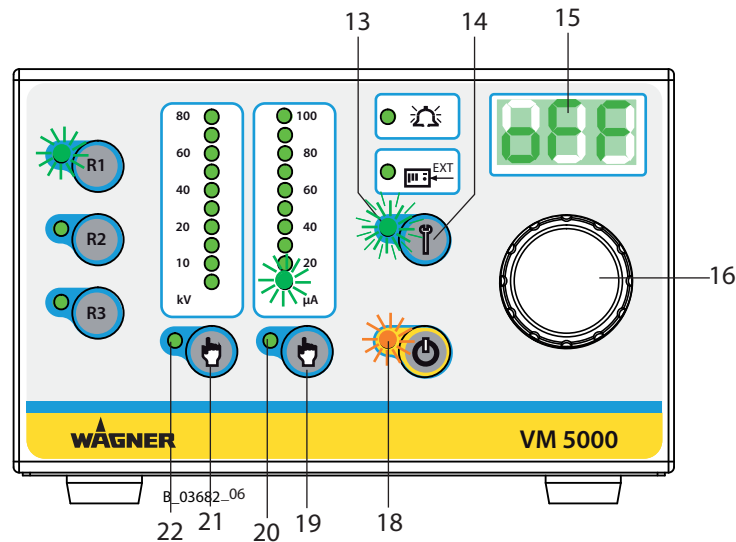
For ease of operation the configuration settings are divided into three groups. The first group is for the end user, the other two groups are password protected and reserved for Wagner Service and the Wagner production sites or the Wagner Service Center, which have the necessary infrastructure.

6.8.3 SETTING EXAMPLE "PARAMETER C11"

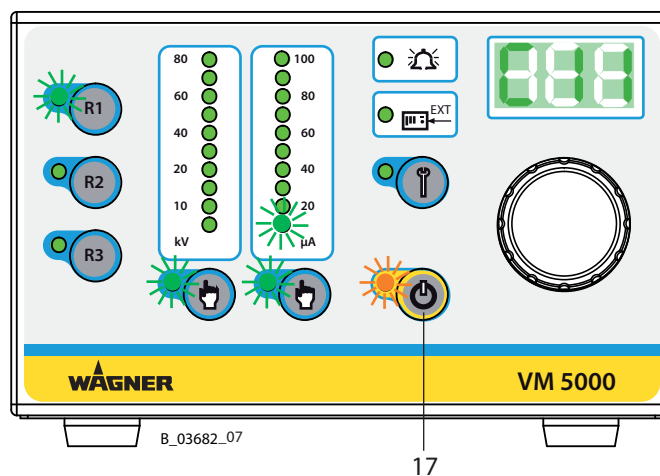


After getting started in configuration mode, the display (15) shows parameter "**C11**" by default.

Press one of the push buttons (21) or (19) to select all kinds of parameters for the end user. To change a selected parameter value (e.g. C11), press push button (14). The content of C11 is displayed (15).



The flashing LED display (13) indicates that the parameter value "oFF" in the display (15) can be changed with the universal control dial (16). Possible values in C11 are "on" or "oFF". Press and hold the push button (14) for a longer time to have the set value saved to C11. As soon as storage took place, all LEDs will extinguish except for the "Standby" LED.



Going from the configuration mode back to the operating mode:

Press the "Standby" button (17).

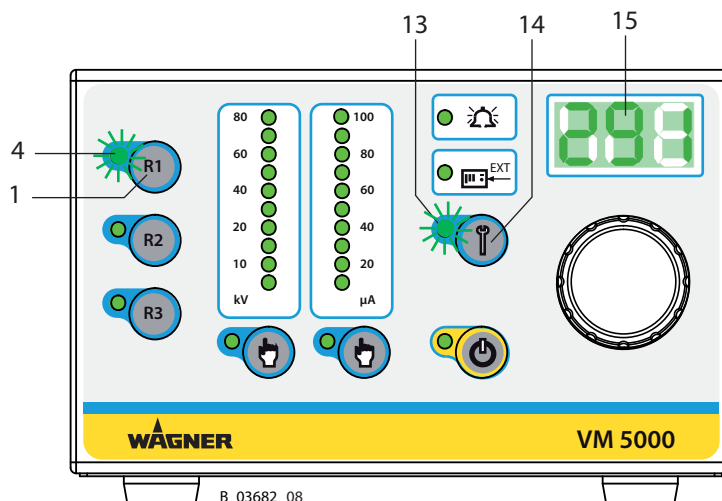
6.9 OPERATING HOURS COUNTER / SERVICE DISPLAY

Two hour counters are integrated into the control unit. The absolute counter measures the spray gun's current operating hours and with the maintenance hours counter, the spray gun's maintenance intervals can be determined and monitored.

When the control unit is in the ready position, you can access the maintenance menu screen using the push button (14).

Maintenance menu structure (illuminated display (13) is activated)

Push button	Description of display
R1	Display of the spray gun's absolute accrued operating hours. Display format: Counter reading < 999 hours: 001 = 1 h; 291 = 291 h Counter reading < 1000 hours: 1.23 = 1230 h; 45.2 = 45200 h Maximum display value = 99.9 = 99900 h Afterwards it shows flashing dashes.
R2	Display of temporary maintenance counter and how to reset this counter
R3	Setting the maintenance interval in hours or activation or blocking of this function

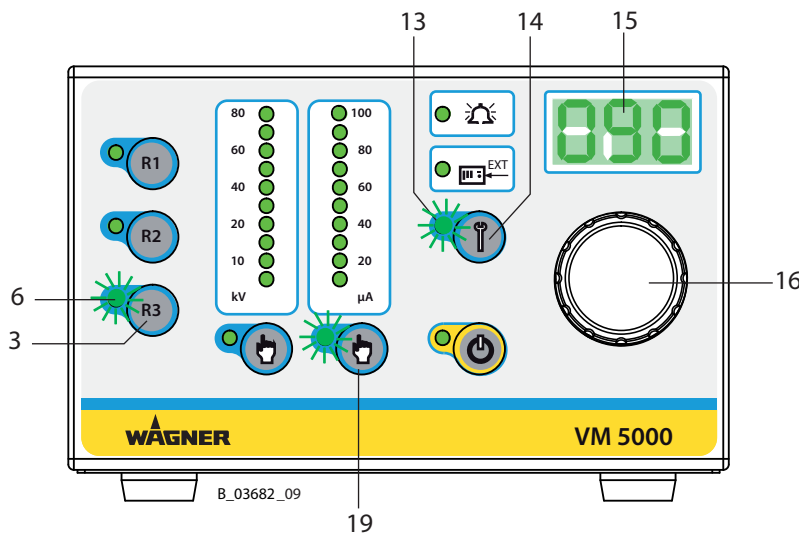


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6.9.1 MAINTENANCE COUNTER SET UP AND READING

When using the device for the first time, the function for the maintenance hours counter is deactivated. This function can be activated with the "R3" push button (3). The maintenance interval limit can be set within a range of 0 to 999 hours.

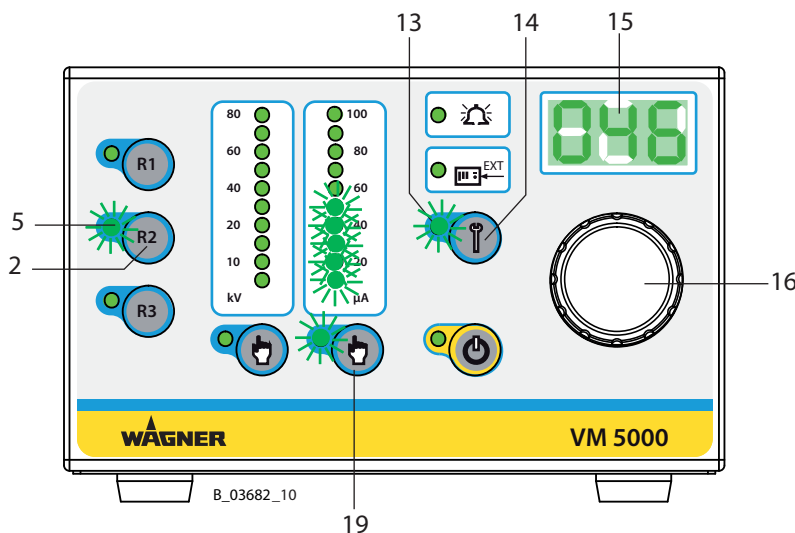
Setting and saving the service interval limit in hours



Procedure:

1. Press the push button (3) briefly. Illuminated display (6) lights up.
2. Use the control dial (16) to set the maintenance interval limit you want (e.g. 90 hours).
3. Check setting on the display (15).
4. The value can be saved by pressing and holding the push button (19) until the indication in the display (15) starts flashing.

Review counter reading since last service carried out on the gun

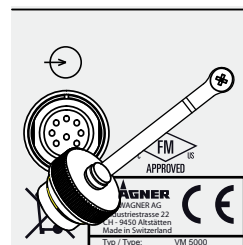


Procedure:

1. Press the push button (2) briefly. Illuminated display (5) lights up.
2. Read display (15). In the example, 46 hours have passed since realization of the last spray gun service.
The vertical graph on the left indicates that 50% of the set interval time has passed.
3. By pressing and holding the push button (19), you can reset the display (15) to 0 (reset upon expiry of set interval limit).

6.10 EXTERNAL INTERFACE

The control unit is equipped with an interface.
Before using it, you have to select the respective parameters in the device configuration.



B_04167

External release

GND >> Release
white

Fault reset

neg. edge >> Reset
brown

Fault output

24VDC >> Fault
green

HV input

7V >> 70kV
yellow

 μ A input

10V >> 100 μ A
gray

HV output

8V >> 80kV
pink

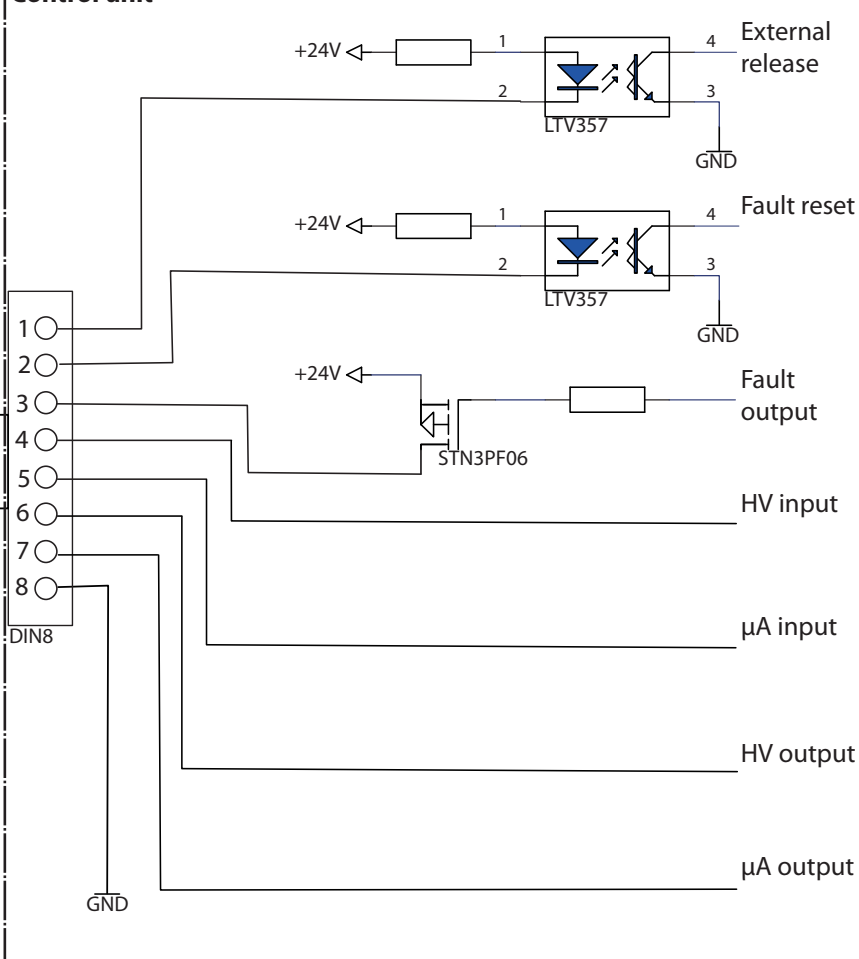
 μ A output

10V >> 100 μ A
blue

Ground

red

Control unit





B_03415

Pin no.	Designation	Description
1 in	External release	Potential-free contact between pin 1 and pin 8 (ground) - Closed → Release issued - Open → Release not issued
2 in	Fault reset	Potential-free contact (button) between pin 2 and pin 8 (ground) - If there is a fault, it can be acknowledged by pressing a button. - Acknowledgement is only given via the negative edge.
3 out	Fault output	If there is a fault, +24VDC is issued at pin 3 in reference to pin 8 (ground). - Maximum current 0.5 A
4 in	DC kV in	Set value specification for high-voltage Analog DC current input between pin 4 in reference to pin 8 (ground) - 0.1V corresponds to 1kV - 8.0V is the maximum specification and corresponds to 80kV
5 in	DC µA in	Set value specification for spray current limiting Analog DC current input between pin 5 in reference to pin 8 (ground) - 0.1V corresponds to 1µA - 10.0V is the maximum specification and corresponds to 100µA
6 out	DC kV out	Output of current working voltage Analog DC current output between pin 6 in reference to pin 8 (ground) - 0.1V corresponds to 1kV - 8.0V is the maximum output and corresponds to 80kV
7 out	DC µA out	Output of current working spray current Analog DC current output between pin 7 in reference to pin 8 (ground) - 0.1V corresponds to 1µA - 10.0V is the maximum output and corresponds to 100µA



7 OPERATION



→ Observe safety instructions in Chapter 4.


7.1 TRAINING THE OPERATING STAFF

	<p> WARNING</p> <p>Incorrect operation! Risk of injury and equipment damage.</p> <ul style="list-style-type: none"> → The operating staff must be qualified to operate the entire system. → Before work commences, the operating staff must receive appropriate training.
---	--

7.2 SAFETY INSTRUCTIONS

	<p> WARNING</p> <p>Incorrect operation! Risk of injury and equipment damage.</p> <ul style="list-style-type: none"> → If contact with solvent-based paints or cleaning agents causes skin irritation, appropriate precautionary measures must be taken, e.g. wearing protective clothing. → The footwear worn by operating staff must comply with EN ISO 20344. The measured insulation resistance must not exceed 100 MΩ. → The protective clothing, including gloves, must comply with EN ISO 1149-5. The measured insulation resistance must not exceed 100 MΩ.
---	--

	<p> WARNING</p> <p>Discharge of electrostatically charged components in atmospheres containing solvents! Explosion hazard from electrostatic spark-over.</p> <ul style="list-style-type: none"> → Use gun only with fitted nozzle, air cap and union nut.
---	---



⚠ DANGER

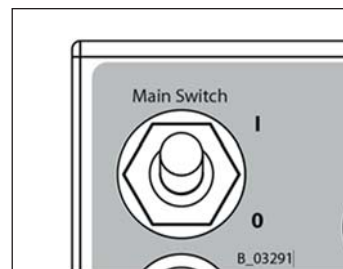
High-voltage field!
 Danger to life from malfunction of heart pacemakers.

Make sure that persons with pace makers:

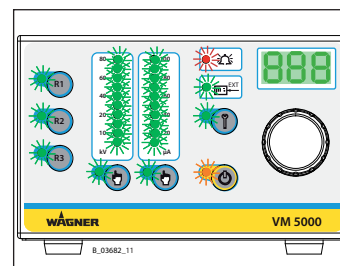
- Do not work with the electrostatic spray gun.
- Stay outside the area of the electrostatic spray gun/work piece.

7.3 CONTROL UNIT START UP

1. Set toggle switch to position I.



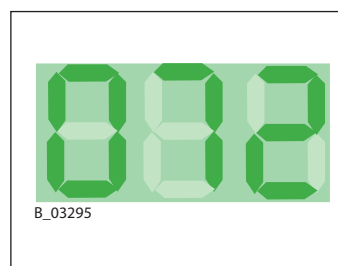
2. For approx. 1 second all LEDs light up
 -> Display test



B_03294

3. The hardware and

← and software versions
 are briefly shown,
 → one after the other, on
 the display.

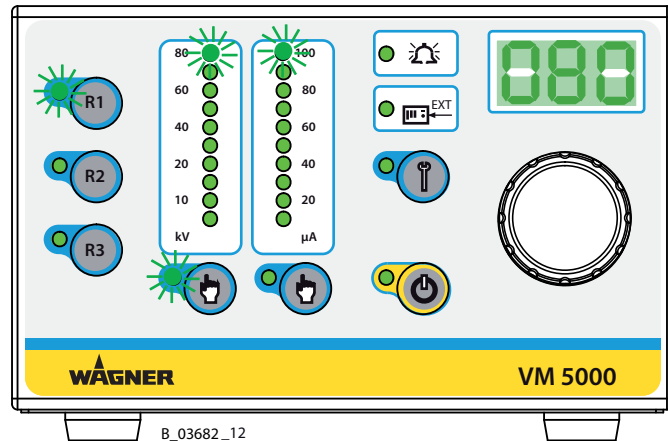


B_03295

4. The control unit is ready for operation.

Note:

Each starting sequence is concluded by allocating the saved set data in recipe "R1".



7.4 SETTING AND SAVING RECIPES

Set values for the high-voltage (kV) and for the spray current limiting (μA) are stored in a recipe. By default, the following values are saved at the factory in the 3 storage places available for recipes:

Recipe No.	Set value - high-voltage in kV	Set value - spray current limiting in μA
R1	70	100
R2	60	100
R3	40	80

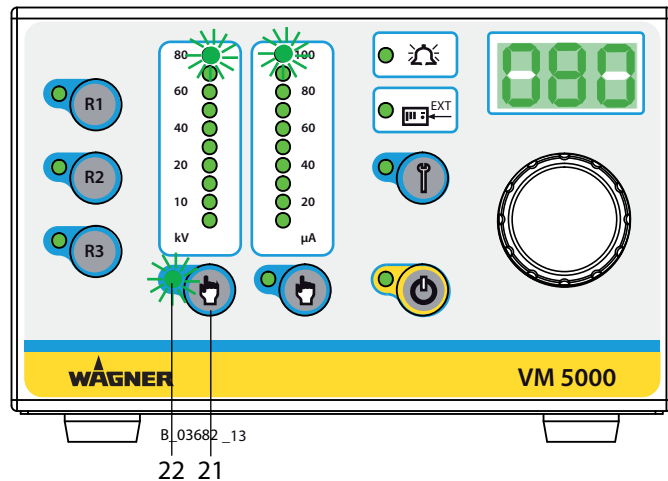
Recipes 1-3 can be selected and saved directly with the program buttons "R1", "R2" and "R3". Once the recipe required has been called up, the individual coating parameters can be called up and modified with the corresponding selection buttons (see Chapter 7.2.1 and 7.2.2). When a parameter is changed, the LED on the left of the program button goes out and indicates to the user that a parameter value has been changed.

The process for saving parameters is described below.

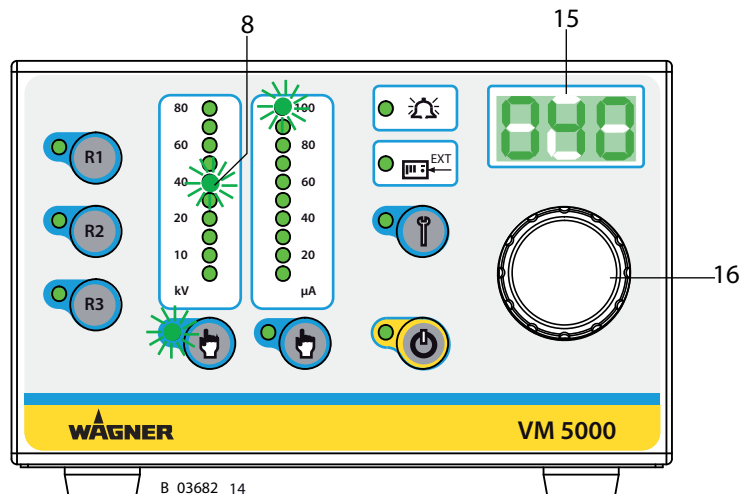
- To reuse the originally set values, press the program button briefly.
The modified values are not taken over.
- However if the modified values should be saved, press and hold the corresponding program button for approx. 2 seconds, until the LED beside the button starts to flash quickly.
The modified values are then saved.

7.4.1 SETTING THE HIGH-VOLTAGE**Procedure:**

1. Press the "High-voltage" button (21) to adjust the high-voltage.
The LED (22) indicates that high-voltage is selected.



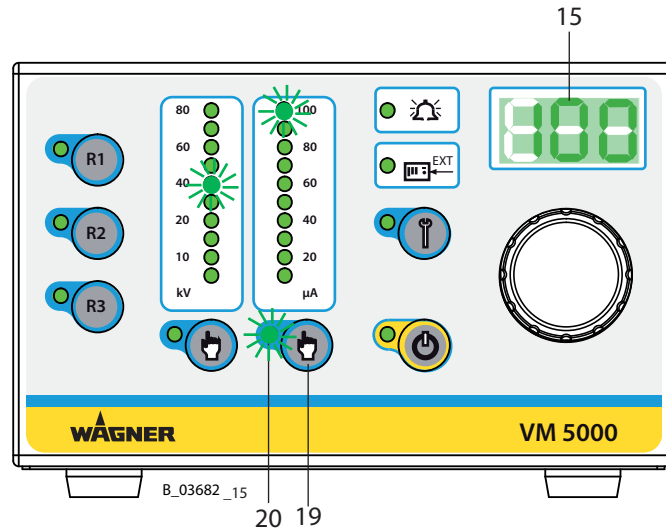
2. The high-voltage can now be adjusted with the universal control dial (16) between 5 to 70 kV with a resolution of 1 kV.
The corresponding value is indicated in the LED display (15).



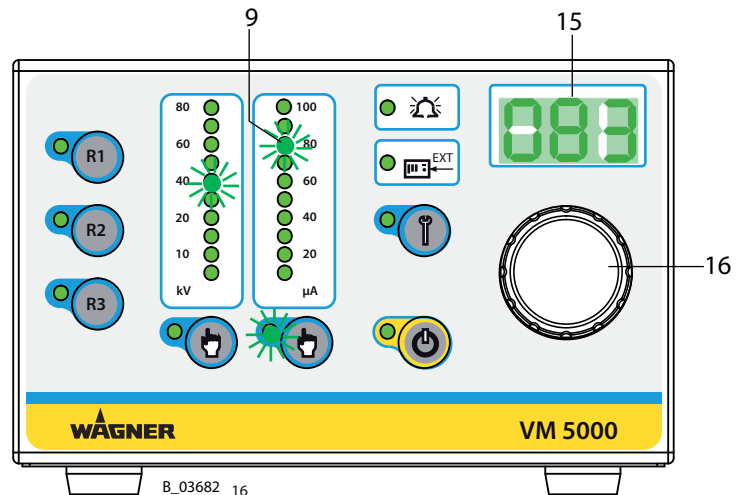
The "High-voltage" bar graph display (8) is located above the "High-voltage" button (21).
If the control unit is in the ready position, this light strip shows the set value as a dot.

7.4.2 SETTING THE CURRENT LIMITING**Procedure:**

1. Press the "Current limiting" button (19) to adjust the limitation of the spray current.
The LED (20) indicates that current limiting is selected.



2. The current limiting can now be adjusted with the universal control dial (16) between 10 - 100 μA with a resolution of 1 μA .
The corresponding value is indicated in the LED display (15).



The "Current limiting" bar graph display (9) is located above the "Current limiting" push button (19). If the control unit is in the ready position, this light strip shows the set value as a dot.

The current limiting is an adjustable threshold. If this threshold is exceeded, for example by the spray gun having approached the object being sprayed, the high-voltage is adjusted downwards until the threshold is no longer exceeded.

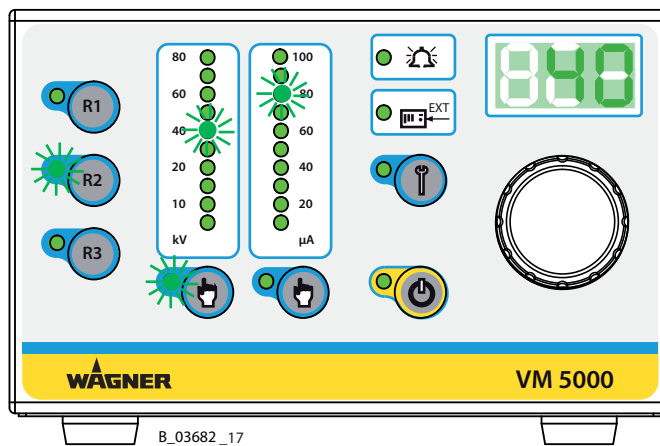
The set values for high-voltage (40 kV) and for spray current limiting (83 mA) that are shown in the examples, are saved in R2 by pressing and holding for a longer time the recipe push button (for > 2 seconds).

7.4.3 DISPLAY DURING SPRAYING

Ready to spray using R2 recipe. See figure below.

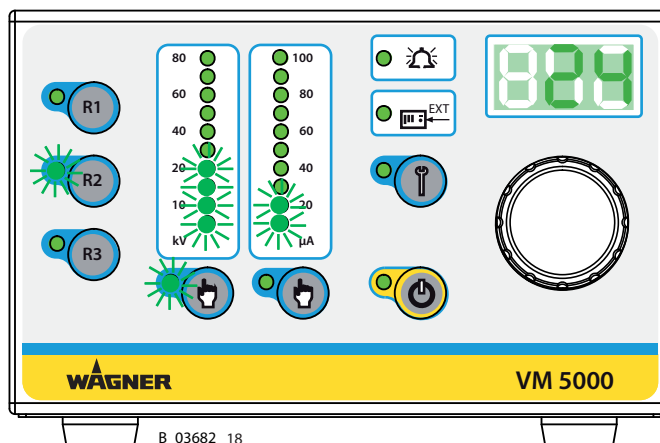
Control unit in ready position.

The LEDs for the set values light up in a dot arrangement and the value for high-voltage is displayed in digits. If you press the push button for current limiting, the adjusted set value for the spray current limiting is displayed in digits.



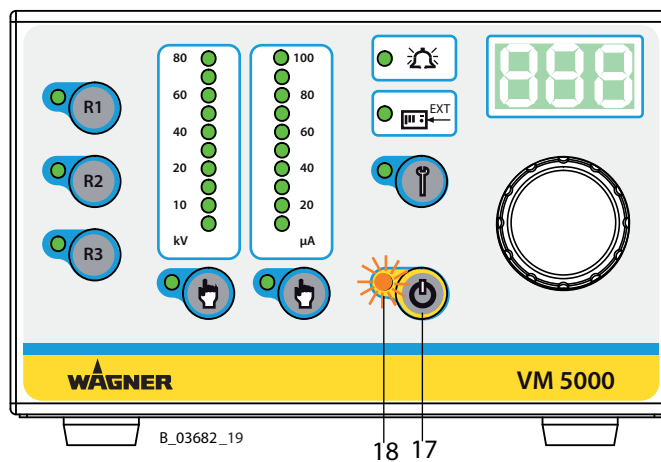
Spraying using recipe R2.

By actuating the trigger on the spray gun, high-voltage is produced. The LEDs light up in a bar and display the actual values. The current actual value for the activated push button for high-voltage (kV) is displayed in digits. If the push button for the spray current limiting is pressed, the respective LED lights up and the respective actual value appears in µA.



7.5 STANDBY MODE

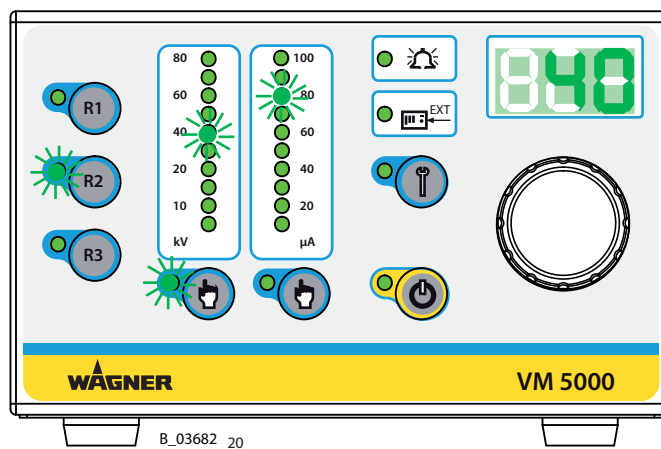
If you want to spray without high-voltage, select the standby mode.
Press push button (17) briefly and the "Standby" LED display (18) lights up. All the other LEDs go out.



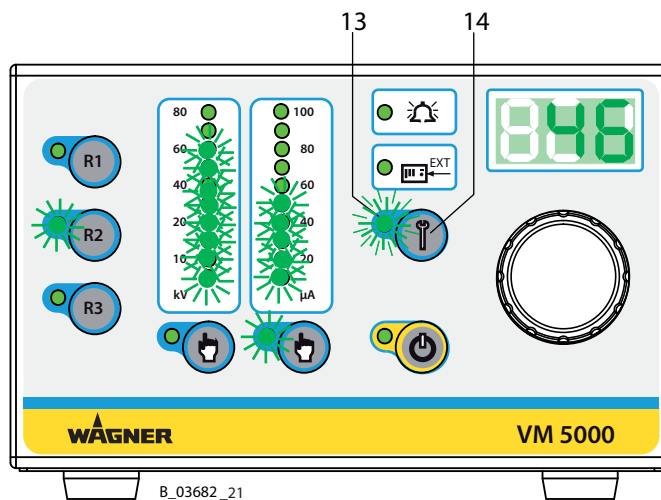
The previously saved "ready position" can be accessed from the standby mode (17) by pressing the push button (17) again. See figure below.

Note:

This function can be activated and used from the gun.



7.6 DISPLAY "CONDUCT SERVICE"



Prerequisite:

The function "Maintenance interval limit" is activated.

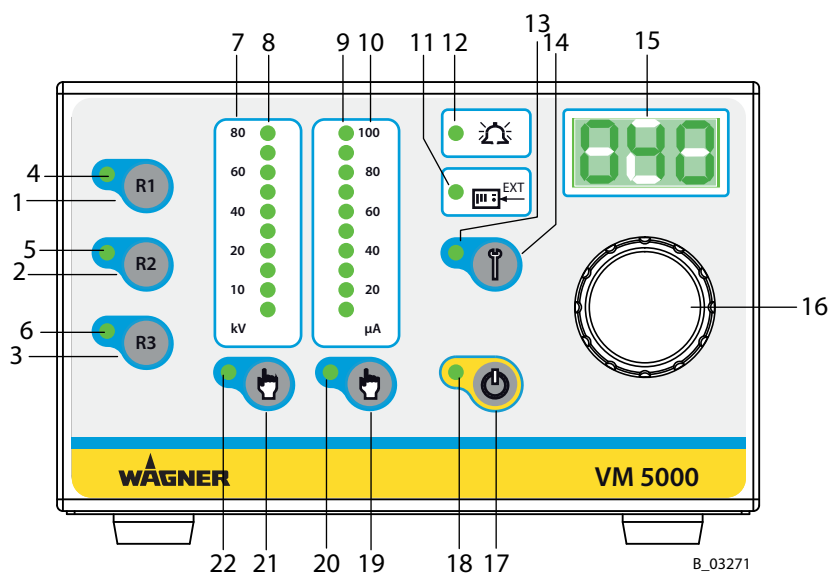
"Conduct service on spray gun"

Once the time for the defined maintenance interval has expired, the LED display (13) starts to flash.

The flashing service display merely acts as a warning. You can continue working without any limitations.

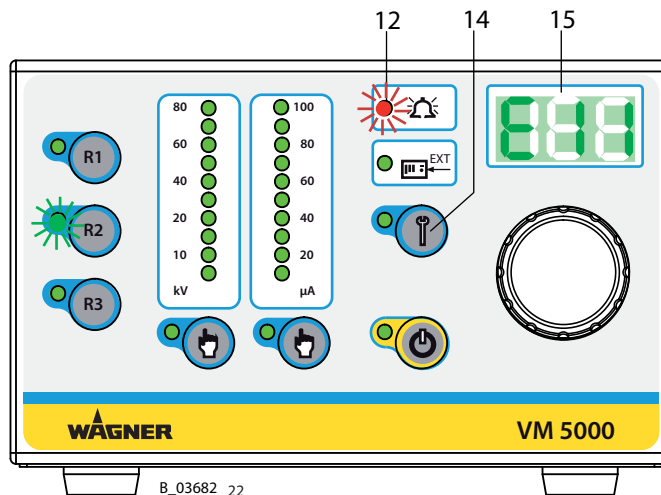
8 TROUBLESHOOTING AND RECTIFICATION

Functional fault	Cause	Remedy
No illuminated display lights up	<ul style="list-style-type: none"> Mains supply not switched on Fuses defective 	<ul style="list-style-type: none"> Check and switch on mains supply Replace fuses Wagner Service
No high-voltage	<ul style="list-style-type: none"> Spray gun cable not connected or defective Spray gun not connected or defective Excessive conductivity of the lacquer 	<ul style="list-style-type: none"> Connect spray gun cable Wagner Service See operating manual of spray gun
Fault LED (12) lights up Fault message in display (15)	<ul style="list-style-type: none"> See the following table 	<ul style="list-style-type: none"> See the following table



B_03271

The fault LED (12) indicates faults. In addition, the error number is shown in the 7-segment display (15). If a fault occurs, high-voltage is immediately switched off. Work can only be continued once the error has been remedied and acknowledged with the "Service" push button (14).



Code display	Fault	Cause	Remedy
E11	Ground monitoring	<ul style="list-style-type: none"> Grounding cable is interrupted Gun is not connected 	<ul style="list-style-type: none"> Check/replace gun cable Check/replace gun Connect gun
E12	No coil current/cascade interrupt	<ul style="list-style-type: none"> Gun is not connected Gun cable is interrupted Cascade in gun is interrupted --> defective 	<ul style="list-style-type: none"> Connect gun Check/replace gun cable Check/replace gun
E13	Coil current too big	<ul style="list-style-type: none"> Cascade of the connected gun is defective 	<ul style="list-style-type: none"> Check/replace gun
E21-E29	Exception error	<ul style="list-style-type: none"> Hardware defect has occurred 	<ul style="list-style-type: none"> If problem persists, contact Wagner Service Team
E30	Cabinet door monitoring	<ul style="list-style-type: none"> In Aquacoat operation: switching on the high-voltage with an open door 	<ul style="list-style-type: none"> Close Aquacoat cabinet door
E40-E43	Gun communication faulty	<ul style="list-style-type: none"> Gun cable defective Operating unit of spray gun defective Control unit defective 	<ul style="list-style-type: none"> Check/replace gun cable Wagner Service Wagner Service
E60	Password error	<ul style="list-style-type: none"> Password not set 	<ul style="list-style-type: none"> Password to be set by Service Center

9 MAINTENANCE AND REPAIR

9.1 MAINTENANCE



The functionality and completeness of the control unit have to be checked regularly. All sealed elements on the control unit must be present and undamaged. During operation, all electric connections of the control unit have to be tightly sealed with the corresponding plug connectors or closing elements.

The leakage tightness of the device has to be checked at least every 3 years. The "Restricted breathing" requirements according to DIN EN 60079-15:2011 have to be fulfilled. This inspection may only be carried out by an authorized person or by trained Wagner Service Personnel. When carrying out the leakage tightness test, the mains input terminal serves as a test port.

9.2 REPAIR

Repairs to the control unit may only be carried out by trained Wagner Service personnel. This also includes opening the control unit.





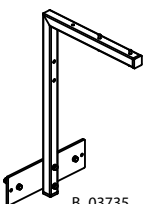
After repair has been completed, the control unit has to be checked for leaks. The "Restricted breathing" requirements according to DIN EN 60079-15:2011 have to be fulfilled. When carrying out the leakage tightness test, the mains input terminal shall serve as test port.

	 WARNING
	<p>Sparks form when live components are separated or connected! Explosion hazard from electric sparks.</p> <ul style="list-style-type: none"> → Do not disconnect plug connections under voltage. → Do not open fuse holders under voltage. → Do not remove the service plug cover under voltage.

10 PRODUCT DISPOSAL

	NOTICE
	<p>Do not dispose of used electrical equipment with household refuse! In accordance with European Directive 2002/96/EC on the disposal of used electrical equipment and its implementation in national law, this product may not be disposed of with the household refuse, but must be recycled in an environmentally correct manner. Wagner or one of our dealers will take back your used Wagner electric or electronic equipment and will dispose of it for you in an environmentally-friendly way. Please contact one of our service points, one of our representatives or us directly to arrange this.</p>

11 ACCESSORIES

Order No.	Designation	
241270	Mains cable Europe 3 m; 9.8 ft	 B_01065
2330628	Mains cable Europe 10 m; 32.8 ft	
241271	Mains cable Switzerland 3 m; 9.8 ft	
264626	Mains cable USA 2 m; 6.6 ft	
264625	Mains cable Japan 3 m; 9.8 ft	
2317600	Interface cable VM 5000, 10 m; 32.8 ft	 B_03471
130215	Grounding cable, 10 m, 32.8 ft	 B_01063
264332	Grounding cable, complete 0.75 m; 2.5 ft	 B_01064
2327509	Mounting control unit, complete	 B_03735

Note:

Hose sets and spray gun cables -> see operating manuals for spray guns

12 SPARE PARTS

12.1 HOW CAN SPARE PARTS BE ORDERED?

Always supply the following information to ensure delivery of the right spare part:

Order number, designation, and quantity

The quantity need not be the same as the number given in the quantity column "Stk" on the lists. This number merely indicates how many of the respective parts are used in each component.

The following information is also required to ensure smooth processing of your order:

- Billing address
- Delivery address
- Name of the person to be contacted in the event of any queries
- Type of delivery (normal mail, express delivery, air freight, courier etc.)



Identification in spare parts lists

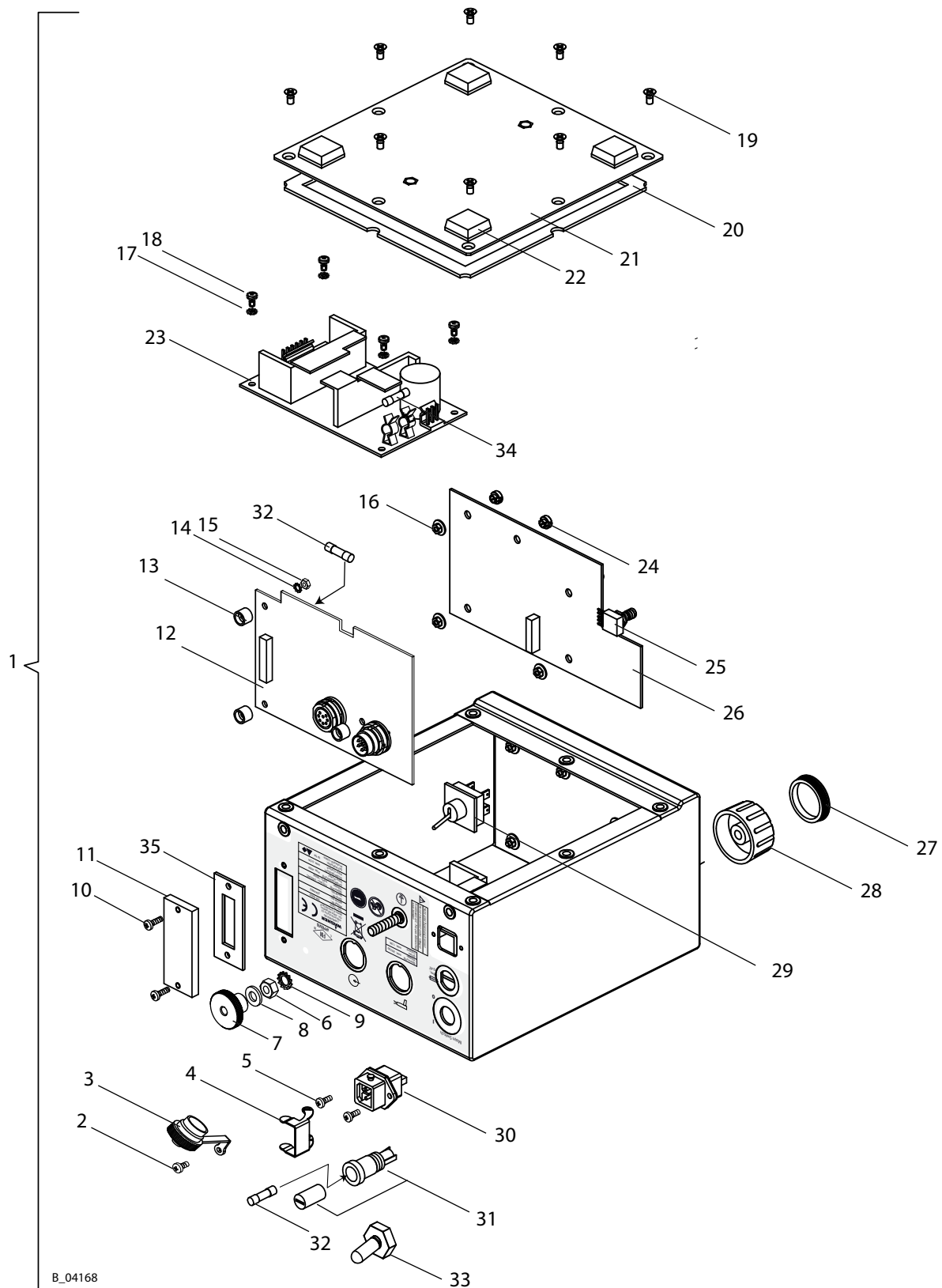
Explanation of column "K" (labeling) in the following spare parts lists:

- ◆ Wearing parts

Note: No liability is assumed for wearing parts.

- Not part of the standard equipment but available as a special accessory.

	<div style="border-bottom: 1px solid black; padding-bottom: 5px;">  WARNING </div> <p>Incorrect maintenance/repair! Risk of injury and equipment damage.</p> <ul style="list-style-type: none"> → Have repairs and part replacements be carried out only by specially trained staff or a WAGNER service center. → Before all work on the device and in the event of work interruptions: <ul style="list-style-type: none"> - Switch off the energy/compressed air supply. - Relieve the pressure from the spray gun and device. - Secure the spray gun against actuation. → Observe the operating instructions for any work.
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12.2 SPARE PARTS LIST VM 5000

Pos	Stk	Order No.	Designation
1	1	2344480	VM 5000 control unit
2	1	9903312	Recessed head raised fillister head screw, H form
3	1	9952593	Protection cap for device socket
4	1	9950330	Safety clip for device sockets
5	2	9903306	Recessed head raised fillister head screw, H form
6	1	9910102	Hexagon nut
7	1	9910522	High knurled nut
8	1	9920118	Washer
9	1	9922017	Serrated lock washer, externally toothed
10	2	9903311	Recessed head raised fillister head screw, H form
11	1	241323	Cover, white
12	1	2350436	Print VM 5000 FM rear panel, complete (ET)
13	3	263400	Distance bush
14	3	9922011	Serrated lock washer, externally toothed
15	3	9910103	Hexagon nut
16	5	2312348	Hexagon lock nut
17	4	9922011	Serrated lock washer, externally toothed
18	4	9903312	Recessed head raised fillister head screw, H form
19	8	2306405	Recessed countersunk flat head screw, Z form
20	1	2307315	Seal
21	1	2307309	Cover
22	4	9990839	Buffer
23	1	9955176	Switching power supply
24	5	2309112	Spacer
25	1	2311875	Incremental encoder
26	1	2317539	Print complete VM 5000 display (with position 25)
27	1	2304462	Cover
28	1	2304461	Rotary knob
29	1	9953536	2-pin toggle switch
30	1	9952587	Connector plug
31	1	9955021	Fuse holder
32	2	9951117	Delay-action fuse 1.0 AT
33	1	9971519	Rubber seal
34	1	9955601	Fast-acting fuse 2.5A
35	1	2325264	Seal

13 WARRANTY

13.1 IMPORTANT NOTES REGARDING PRODUCT LIABILITY

As a result of an EC regulation effective from January 1, 1990, the manufacturer shall only be liable for his product if all parts originate from him or are approved by him, and if the devices are properly mounted, operated and maintained.

The manufacturer will not be held liable or will only be held partially liable if third-party accessories or spare parts have been used.

With genuine WAGNER accessories and spare parts, you have the guarantee that all safety regulations are complied with.

13.2 WARRANTY CLAIM

Full warranty is provided for this device:

We will at our discretion repair or replace free of charge all parts which within 24 months in single-shift, 12 months in 2-shift or 6 months in 3-shift operation from date of receipt by the purchaser are found to be wholly or substantially unusable due to causes prior to the sale, in particular faulty design, defective materials or poor workmanship.

The type of warranty provided is such that the device or individual components of the device are either replaced or repaired as we see fit. The resulting costs, in particular shipping charges, road tolls, labour and material costs will be borne by us except where these costs are increased due to the subsequent shipment of the device to a location other than the address of the purchaser.

We do not provide warranty for damage that has been caused or contributed to for the following reasons:

Unsuitable or improper use, faulty assembly or commissioning by the purchaser or a third party, normal wear, negligent handling, defective maintenance, unsuitable coating products, substitute products and the influence of chemical, electrochemical or electrical agents, except when the damage is attributable to us.

Abrasive coating products such as red lead, emulsions, glazes, liquid abrasives, zinc dust paints and so forth reduce the service life of valves, packings, spray guns, nozzles, cylinders, pistons etc. Wear and tear due to such causes are not covered by this warranty.

Components that have not been manufactured by WAGNER are subject to the original warranty of the manufacturer.

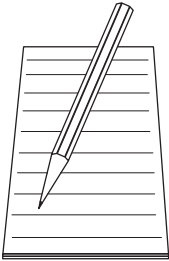
Replacement of a component does not extend the period of warranty of the device.

The device should be inspected immediately upon receipt. To avoid losing the warranty, we or the supplier company are to be informed in writing about obvious faults within 14 days upon receipt of the device.

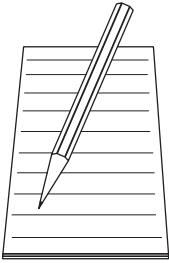
We reserve the right to have the warranty compliance met by a contracting company.

The services provided by this warranty are dependent on evidence being provided in the form of an invoice or delivery note. If the examination discovers that no warranty claim exists, the costs of repairs are charged to the purchaser.

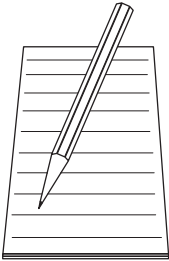
It is clearly stipulated that this warranty claim does not represent any constraint on statutory regulations or regulations agreed to contractually in our general terms and conditions.



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A series of horizontal lines for writing, starting from the top of the page and extending down to the bottom, providing a space for notes or additional information.



A large rectangular area containing numerous horizontal lines for writing, spanning most of the page width and height below the header.



Order No. 2344501
Edition 07/2014

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