
Operating instructions and spare parts list

MagicCylinder II

Powder coating booth



Translation of the original operating instructions

Documentation - MagicCylinder II

© Copyright 2007 Gema Switzerland GmbH

All rights reserved.

This publication is protected by copyright. Unauthorized copying is prohibited by law. No part of this publication may be reproduced, photocopied, translated, stored on a retrieval system or transmitted in any form or by any means for any purpose, neither as a whole nor partially, without the express written consent of Gema Switzerland GmbH.

OptiTronic, OptiGun, EasyTronic, EasySelect, EasyFlow and SuperCorona are registered trademarks of Gema Switzerland GmbH.

OptiMatic, OptiMove, OptiMaster, OptiPlus, MultiTronic and Gematic are trademarks of Gema Switzerland GmbH.

All other product names are trademarks or registered trademarks of their respective holders.

Reference is made in this manual to different trademarks or registered trademarks. Such references do not mean that the manufacturers concerned approve of or are bound in any form by this manual. We have endeavored to retain the preferred spelling of the trademarks, and registered trademarks of the copyright holders.

To the best of our knowledge and belief, the information contained in this publication was correct and valid on the date of issue. Gema Switzerland GmbH makes no representations or warranties with respect to the contents or use of this publication, and reserves the right to revise this publication and make changes to its content without prior notice.

Printed in Switzerland

Gema Switzerland GmbH
Mövenstrasse 17
9015 St. Gallen
Switzerland

Phone: +41-71-313 83 00

Fax.: +41-71-313 83 83

E-Mail: info@gema.eu.com

Homepage: www.gemapowdercoating.com

Table of contents

General safety regulations	3
Safety symbols (pictograms).....	3
Conformity of use	3
Technical safety regulations for stationary electrostatic powder spraying equipment.....	4
General information.....	4
Safety conscious working.....	5
Individual safety regulations for the operating firm and/or operating personnel.....	6
Notes on special types of hazard	6
Safety requirements for electrostatic powder coating	8
A summary of the rules and regulations.....	9
Product specific security measures.....	10
Installation	10
Grounding.....	10
Operating the equipment.....	10
Inspection check.....	11
Entering the booth	11
Repairs	11
About this manual	13
General information	13
Structure and function	15
Field of application	15
Function description	15
Operational procedure.....	16
Powder flow.....	17
Booth - superstructure.....	18
Booth - basement	18
Floor blow-off system	19
Powder suction.....	20
Exhaust air system with After Filter	20
Fire protection	21
Cleaning operation mode	21
Automatic booth cleaning	21
Powder recovery	21
Automatic guns.....	22
Cleaning the guns	22
Technical data	25
MagicCylinder II Powder coating booth.....	25
Electrical data.....	25
Pneumatic data	25
Compressed air consumption	25
Dimensions.....	25

Start-up	27
Set-up and assembly	27
Installation	27
Cable connections / junctions	27
Grounding	27
Operation	29
Before switching on the booth	29
Switch on the booth	29
Switching off the booth.....	29
Alarm messages	30
Filter cleaning.....	30
Color change and cleaning	30
Maintenance	33
Maintenance and repair	33
Daily or after each shift	33
Weekly	33
Biannually	33
Maintenance and repair of the cyclone separator	34
Maintenance and repair of the sieve machine	34
Maintenance of the After Filter pressure gauges (filter and ventilator).....	34
Replacing spare parts	34
Functional check	35
General information	35
Procedure of the function check	35
Troubleshooting	37
General information	37
Problem fixing	37
Setting values	39
Spare parts list	41
Ordering spare parts	41
MagicCylinder II - spare parts list	42
MagicCylinder II - flap drive unit	44
MagicCylinder II - pressure tank for floor blow-off system.....	46
MagicCylinder II - pressure tank for ring blow-off system.....	48
MagicCylinder II - gun blow off equipment.....	50
MagicCylinder II - door drive unit	52
MagicCylinder II - fan control unit	54

General safety regulations

This chapter sets out the fundamental safety regulations that must be followed by the user and third parties using the MagicCylinder II Powder coating booth.

These safety regulations must be read and understood before the MagicCylinder II Powder coating booth is put into operation.

Safety symbols (pictograms)

The following warnings with their meanings can be found in the 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

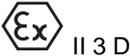
**INFORMATION!**

useful tips and other information

Conformity of use

1. The MagicCylinder II Powder coating booth is built to the latest specification and conforms to the recognized technical safety regulations and is designed for the normal application of powder coating.
2. Any other use is considered as non-conform. The manufacturer is not responsible for any damage resulting from this - the risk for this is assumed by the user alone! If the MagicCylinder II Powder coating booth is to be used for other purposes or other substances outside of our guidelines, then Gema Switzerland GmbH should be consulted.

3. Observance of the operating, service and maintenance instructions specified by the manufacturer is also part of conformity of use. The MagicCylinder II Powder coating booth 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 MagicCylinder II Powder coating booth has been set up and wired according to the guidelines for machinery (2006/42 EG). EN 60204-1 (machine safety) must also be observed.
5. Unauthorized modifications to MagicCylinder II Powder coating booth 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.
7. Furthermore, the country-specific safety regulations also must be observed.

Explosion protection	Protection type	Temperature class
 	IP54	T6 (zone 21) T4 (zone 22)

Technical safety regulations for stationary electrostatic powder spraying equipment

General information

Stationary Gema Switzerland GmbH electrostatic spraying equipment is built to the "state of the art" and is operationally safe. This equipment can be dangerous if it is not used for its specified purpose. Consequently it should be noted that 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 and 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. Incorrect operation of the control unit can lead to accidents, malfunctions or damage to the control itself or to the plant.
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. Please observe the local safety regulations!
5. Disconnect the plugs before the machines are opened for repair.
6. The plug connections between the powder spraying equipment and the mains should only be removed when the power supply is switched off.

7. The connecting cables between the control unit and the spray gun must be installed in such a way, that they cannot be damaged during the operation. Please observe the local safety regulations!
8. Only original Gema spare 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 Gema Switzerland GmbH 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! Smoking is forbidden in the entire plant area!
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 point out that the customer himself is responsible for the safe operation of the equipment. Gema Switzerland GmbH is in no way responsible for any resulting damage!

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 regulations" 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 units for the spray guns must be installed and used in zone 22. Spray guns are allowed 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.

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 care about no non-authorized personnel works on the powder spraying equipment (e.g. this also includes using the equipment for non-conform work).
3. For dangerous materials, the employer has to provide an operating instructions manual for specifying the dangers arising for humans and environment by handling dangerous materials, as well as the necessary preventive measures and behavior rules. The operating instructions manual has to be written in an understandable form and in the language of the persons employed, and has to be announced in a suitable place in the working area.
4. 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.
5. The operator is obliged to check that the powder spraying equipment is only operated when in satisfactory condition.
6. As far as it is necessary, the operating firm must ensure that the operating personnel wear protective clothing (e.g. facemasks).
7. The operating firm must guarantee cleanliness and an overview of the workplace with suitable instructions and checks in and around the powder spraying equipment.
8. 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 the maintenance or repair work is finished. All maintenance activities must take place when the powder spraying equipment is switched off. The operator must train and commit the responsible personnel to this.
9. 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.

Notes on special types of hazard

Power/tension

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

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 equipment is a potentially dangerous source of slipping.

Static charges

Static charges can have the following consequences: Charges to people, electric shocks, sparking. Charging of objects must be avoided - see chapter "Earthing".

Grounding

All electricity conducting parts and machinery found in the workplace (according to DIN VDE 0745, part 102: 1,5 meters either side and 2,5 meters around each booth opening) have to be grounded. The earthing resistance of each object must amount to maximally 1 MOhm. The resistance must be tested regularly. The condition of the work piece attachments, as well as the hangers, must guarantee that the work pieces remain grounded. 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 grounding.

Compressed air

When there are longer pauses or stand-still times between working, 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.

Crushing and cutting

During 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.

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.

Prohibition of unauthorized conversions and modifications to machines

All unauthorized conversions and modifications to the 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 Gema spare parts may be used! Damage caused by other parts is not covered by guarantee.

Repairs must only be carried out by specialists or by authorized Gema service centers. Unauthorized conversions and modifications can lead to injuries and damage to the equipment. The Gema Switzerland GmbH guarantee would no longer be valid.

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, in particular the machinery within 5 meters 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 electrically conductive 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 grounding cable (green/yellow) must be connected to the grounding screw of the electrostatic manual powder coating equipment. The grounding cable must have a good metallic connection with the coating booth, the recovery unit and the conveyor chain, respectively 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 equipment may be able to be switched on only if the booth is in operation. If the booth stops, the powder coating device must switch off too.
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 maximally 1 MOhm.
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, fractures) 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 Gema spare 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 = max. permissible powder/air concentration). If the UEG is not known, then a value of 10 g/m³ should be considered.

A summary of the rules and regulations

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

Guidelines and regulations, German professional association

BGV A1	General regulations
BGV A2	Electrical equipment and material
BGI 764	Electrostatic coating
BGR 132	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

EN European standards

RL94/9/EC	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⁾
EN 12981	Coating plants - Spray booths for application of organic powder coating material - Safety requirements
EN 60 529, 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 setting-up high voltage electrical machine tools and processing machines with mains voltages up to 1000 V ³⁾

VDE (Association of German Engineers) Regulations

DIN VDE 0100	Regulations for setting-up high voltage equipment with mains voltages up to 1000 V ⁴⁾
DIN VDE 0105, part 1 part 4	VDE regulations for the operation of high voltage equipment ⁴⁾ General regulations Supplementary definitions for stationary electrical spraying equipment
DIN VDE 0147 part 1	Setting up stationary electrostatic spraying equipment ⁴⁾
DIN VDE 0165	Setting up electrical equipment in locations in areas with danger of explosion ⁴⁾

*Sources:

- 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) General secretariat, Rue Bréderode 2, B-1000 Bruxelles, or the appropriate national committee
- 4) VDE Verlag GmbH, Bismarckstrasse 33, 1000 Berlin 12

Product specific security measures

Installation

Installation work to be done by the customer must be carried out according to local safety regulations.

Grounding

The booth grounding is to be checked at every start-up. The grounding connection is customer specific and fitted on the booth basement, on the cyclone separator and on the filter housing. The grounding of the workpieces and other plant units must also be checked.

Operating the equipment

In order to be able to operate the equipment safely, it is necessary to be familiar with the safety regulations, the operational characteristics and functioning of the various plant units.

For this purpose, read the safety notes, this operating manual and the operating instructions of the control unit with touch panel, before starting up the plant.

In addition, all further equipment-specific operating instructions, e.g. the OptiFlex, OptiMatic or APS series and all additional components should also be studied.

To obtain practice in operating the plant, it is absolutely essential to start the operation according to the operating instructions. Also later on, they serve as a useful aid on possible malfunctions or uncertainty and will make many enquiries unnecessary. For this reason, the operating manual must always be available at the equipment.

Should difficulties arise, however, your Gema service center is always ready to assist.

Inspection check

The following points are to be checked at every booth start-up:

- No foreign material in the central suction unit in the booth and in the powder suction
- Sieve machine is connected to the cyclone separator, the clamp is tightly locked
- Pneumatic conduction and powder hose are connected to the dense phase conveyor
- Pneumatic conduction to the After Filter is connected, the filter element door is closed, the waste container is placed and fitted

Entering the booth

Because of its design, the booth needs nearly never to be entered. Checks or cleaning can take place from the booth openings without problems



Attention:
Danger of slipping and/or injury!

Repairs

Repairs inside the booth (coating area) must be carried out by trained personnel only. The current supply to the booth must be interrupted and the local safety regulations must be considered.

About this manual

General information

This operating manual contains all the important information which you require for the working with the MagicCylinder II Powder coating booth. It will safely guide you through the start-up process and give you references and tips for the optimal use of your new powder coating system.

Information about the function mode of the individual system components - booth, gun control unit, manual gun or powder injector - should be referenced to their corresponding documents.

Structure and function

Field of application

MagicCylinder II Powder coating booths are used for the electrostatic powder coating of all types of workpieces in large batches with frequent color changes. As part of the process controlled coating plant, they are laid out for fully automatic operation.

The most important characteristics of the MagicCylinder II coating booths are:

- Superstructure and booth basement in plastic material
- Low booth basement height
- Permanent powder suction from the entire booth floor (suction openings integrated into the booth floor)
- Automatic floor cleaning (no powder accumulation)
- Integrated exhaust air main collector
- Fast color change by one person
- The guns are arranged vertically

Function description

The principle of function is determined by the requirements placed on the booth, which are:

- The protection of the coating process from external influences, combined with keeping the area around the booth clean
- The powder recovery
- The avoidance of an explosive powder/air mixture inside the booth

An efficient exhaust air system is used to keep the area around the booth clean and to prevent explosive powder/air mixtures.

The ventilator in the After Filter extracts the air from the inside of the booth through the cyclone and afterwards through the filter elements. The air stream created thereby, flowing from the outside to the inside of the booth, prevents powder escaping to the environment of the booth, so that keeping the area around the booth clean is guaranteed. The maintenance of the air flow prevents as well the creation of dangerous powder/air mixtures.

The powder recovery takes place by the powder separation in the cyclone separator during operation.

The booth control takes place by the corresponding control unit with operating interface.

The gun control units are fitted into one or two control cabinets. The switching on and off of the guns takes place by the gap detection unit in the automatic mode.



Note:

More detailed information about the control units/components and the operating interfaces are found in the corresponding user manuals!

Operational procedure



Note:

Only the multiple color version is described in this user manual!

By switching on the booth, the ventilator in the After Filter starts up and after the start-up phase, the plant units which are interlocked with the booth are released.

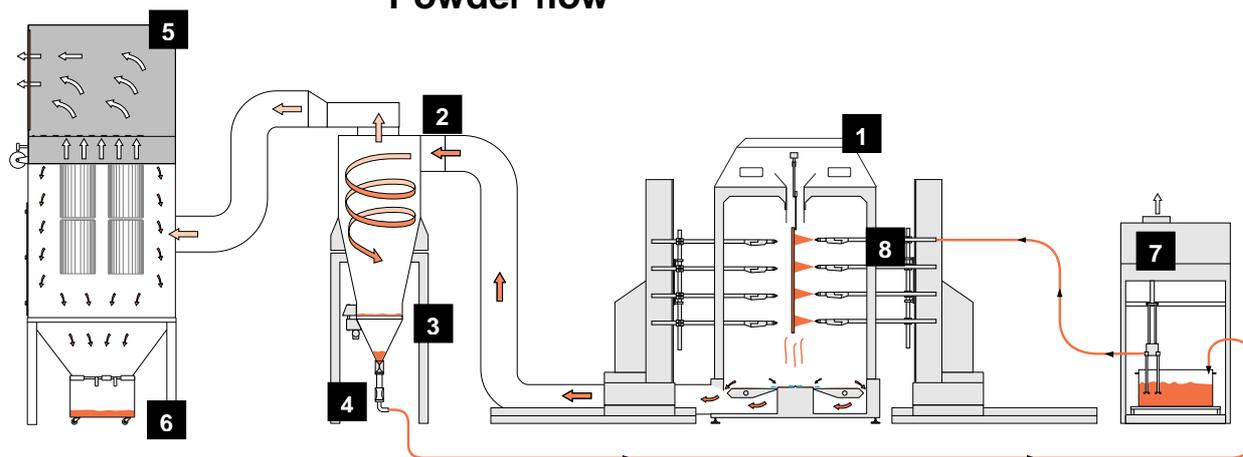
The operational condition is reached as soon as all external plant units, such as chain conveyor, powder center, reciprocators (optionally), fire protection (optionally) etc. are switched on.

The operating functions in the powder center can be released now and the coating process can begin. This process is interrupted only if a ventilator motor malfunction is present. Other malfunctions are indicated by an alarm or a message, displayed on the control cabinet.

The suction effect of the filters is monitored during operation. Therefore, the differential pressure and thus the suction performance of the exhaust air system is measured. A blockage of the filter elements is indicated by a decrease of the suction performance (the differential pressure arises). By reaching a fixed preset value, a signal lamp on the control cabinet illuminates and at the same time an alarm sounds.

(Detailed information about the After Filter is found in the corresponding operating manual).

Powder flow



MagicCylinder II - powder flow in the plant

- | | |
|------------------------|--------------------|
| 1 Booth | 5 After Filter |
| 2 Cyclone separator | 6 Refuse container |
| 3 Sieve | 7 Powder center |
| 4 Dense phase conveyor | 8 Automatic guns |

The powder container is located in the powder center (7). Here, the powder is vibrated and fluidized. The injectors transport the powder through the hoses to the guns (8). The guns spray the powder/air mixture onto the workpieces to be coated.

The powder which does not adhere on the workpieces falls on the booth floor and is sucked off through the slots in the booth floor, and delivered to the cyclone separator (2) as powder-air mixture.

In the cyclone separator, the powder is separated by the influence of centrifugal force. The separated powder is cleaned in the integrated sieve (3) and transported back to the powder container by a dense phase conveyor (4), where it is available again for the coating process.

The rest of the non-separated powder (most of it is fine particles) goes into the After Filter (5). The After Filter separates the powder into a refuse container (6), which is positioned directly under the filter elements and is very easy to empty. Then, the cleaned air leaves the filter and is fed directly back into the workshop environment.

Booth - superstructure

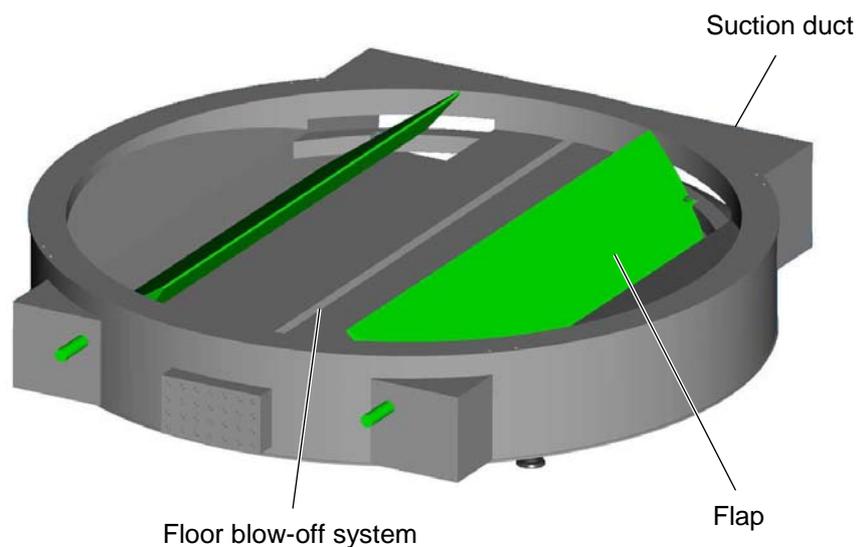
The MagicCylinder II booth superstructure is a double walled plastic panel construction, forming a side section and a half roof on each side. Horizontal spacing ribs guarantee high stability of the booth walls, and the necessary distance between the inner and outer liners for an optimum powder repelling effect.

All grounded parts, including the booth superstructure supports, are positioned at the necessary required distance outside of the booth. This ensures the powder repelling effect of the booth, also for a longer coating period.

The interior of the booth is illuminated by lightings, which are fitted into the booth ceilings.

The basic version of the MagicCylinder II booth has no hand coating openings. The booth can be equipped either on one or both sides with manual coating equipment, as pre-coating or touch-up station alternatively.

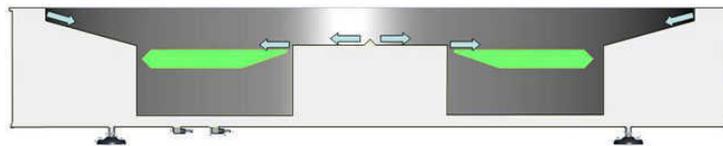
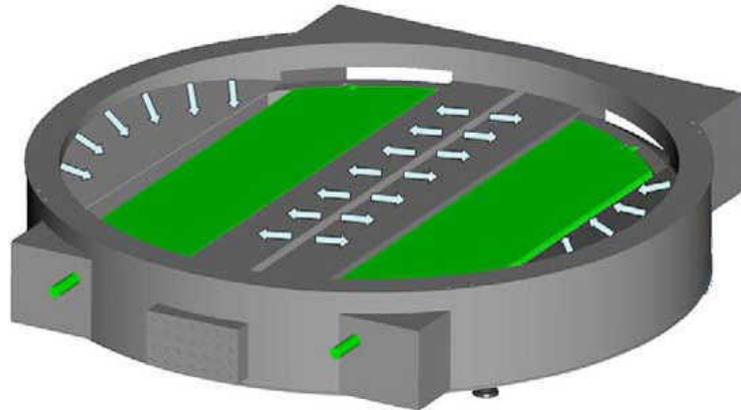
Booth - basement



MagicCylinder II - basement

The booth basement consists of reinforced plastic material. The booth basement contains the floor blow-off unit and the powder suction (suction ducts with flaps).

Floor blow-off system



MagicCylinder II - floor blow-off system (arrows = blow-off direction)

A blow-off rail with blow nozzles is integrated lengthwise into the MagicCylinder II booth floor. The blow-off rail consists of various segments, which can be pneumatically controlled one by one.

The required blow-off pressure depends on the booth size and the powder type. In preset intervals, the nozzles blow the powder, located on the floor, in the direction of the suction slots. The powder is aspirated by the slots, cleaning the booth floor in this way.

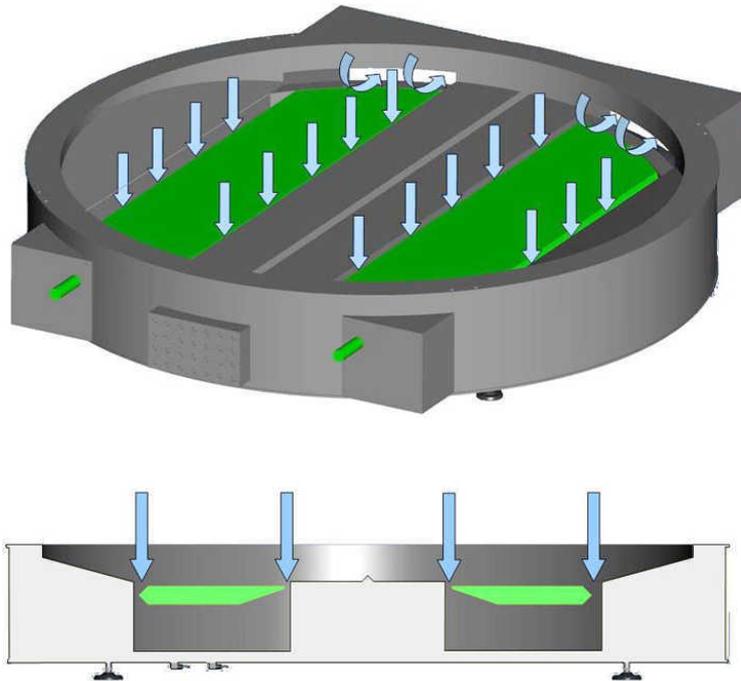
The valve battery for the control of the floor blow-off segments is located at the front of the booth on the booth basement.



Note:

The compressed air input pressure for the floor blow-off system must be set at 5.0 bar!

Powder suction



MagicCylinder II - powder suction (cutaway view)

The powder suction takes place via 2 lengthwise suction ducts with flaps in the booth floor. The powder, which has been blown by the floor blow-off system in the direction of the suction slots, is then sucked in along the entire booth length.

The suction ducts are gathered in a cross duct at the booth end, which can be visually controlled through a service lid. The ducts are auto-cleaning and can be blown off with compressed air. The pressure adjustment for the powder suction is located beside the booth basement.

The collected powder is delivered to the cyclone separator.

Any deposited overspray powder on the walls must sometimes be moved manually.

Exhaust air system with After Filter

An efficient exhaust air system is used to keep the area around the booth clean and to prevent explosive powder/air mixtures. The exhaust air is created by the ventilator in the After Filter.

Detailed information about the After Filter is found in the corresponding operating manual.

Fire protection

For safety reasons, it is recommended to equip the plant with a CO₂ fire extinguishing system. An existing fire protection is merged in the security concept of the plant and assumes the plant interlocking release.

Cleaning operation mode

During the automatic gun cleaning, the work piece entrance and exit door are closed, thereby an increased air inlet speed results at the remaining openings at the booth.

This ensures a dust-free environment around the booth during the color change procedure.

Automatic booth cleaning

The cleaning of the booth floor takes place automatically with the combination of the floor blow-off system and the powder suction (see the chapter on "Booth - basement")

Powder recovery

A safe and clean powder recovery is ensured by following components:

- Cyclone separator
- Sieve machine
- Dense phase conveyor
- Powder center

The powder which does not adhere on the workpiece (overspray) is fed from the central suction opening in the funnel, through a pipe, to the cyclone intake. The powder is separated in the cyclone and then sieved in the sieve machine. The recovered powder is fed by the dense phase conveyor to the powder center and back into the powder container.

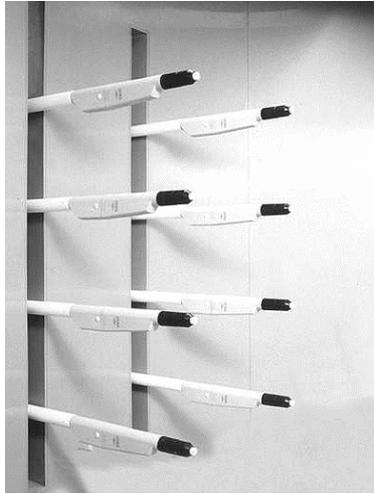


Note:

Further information about the powder recovery components you will find in the corresponding user manuals!

Automatic guns

OptiGun-AX or PG 2-AX automatic powder gun types are used in the MagicCylinder II powder coating booth. These guns were particularly developed for an automatic, simple cleaning.



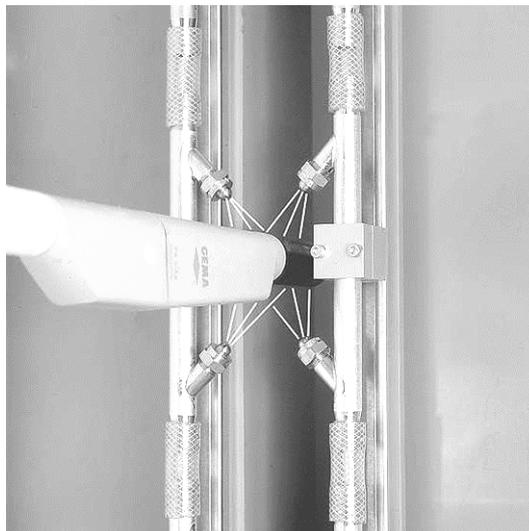
MagicCylinder II - automatic guns

The connections for the powder hose, the high voltage and the electrode rinsing air are outside of the coating booth. These supply attachments are integrated into the gun, enabling the guns to be cleaned automatically by blow-off nozzles.

The powder hose connection makes possible a perfect fixing of the powder hose by the clamping device. This is a prerequisite for the automatic rinsing of the powder transport equipment (further information about automatic guns, see in the corresponding user manual).

On the MagicCylinder II booth, a distinction between light and dark colors is principally made. As a result of this, the powder hoses are double placed from the powder center.

Cleaning the guns



MagicCylinder II - cleaning the guns

The automatic guns are cleaned very simply and quickly. The cleaning of the automatic guns takes place by the gun blow off equipment on the MagicCylinder II coating booth.

By activating the cleaning function on the control unit, the reciprocators and the guns move out of the booth. At the same time, each gun is blown off cleanly from the outside, by four flat jet blow-off nozzles.

These flat jet blow-off nozzles are found on the gun slots, on the outside of the booth. If necessary, this cleaning sequence can be repeated.

Technical data

MagicCylinder II Powder coating booth

Electrical data

MagicCylinder II	
Input voltage	3x400 V / 50 Hz (other voltages and frequencies on request)

Pneumatic data

MagicCylinder II	
Input pressure	min. 6 bar / max. 10 bar
Air entry speed	0.7 m/sec
Rinsing air in filter housing	max. 18 Nm ³ /h
Water vapor content of compressed air	max. 1.3 g/m ³
Oil content of compressed air	max. 0.1 mg/kg

Compressed air consumption

MagicCylinder II	
Rinsing air in filter housing	max. 18 Nm ³ /h

Dimensions

MagicCylinder II	
Booth diameter	2.5 m (in the interior)
Booth basement height	0.5 m

Start-up

Set-up and assembly

Installation

Installation work to be done by the customer must be carried out according to local safety regulations!

Cable connections / junctions

The connecting cables between control unit and guns must be laid out in such a way that they cannot be damaged during operation. Observe the safety regulations!

Grounding

The booth grounding is to be checked at every start-up. The grounding connection is customer specific and fitted on the booth basement, the cyclone separator and the filter housing.

Operation

Before switching on the booth

- Observe the safety regulations (see also "General safety regulations")
- Check the grounding of the booth and the other plant units and ensure it, if necessary
- If necessary, carry out a function check before starting work

After long stops/standstills

1. Fill in or refill powder
2. Check the tight seating of the filter cartridges
3. Place the refuse container under the After Filter

Switch on the booth

1. Open the compressed air supply and set the input pressure for the After Filter
2. Turn on the main switch (the main switch is located on the control cabinet)
3. Turn the key switch, the control unit is activated, the operating unit is activated and the key switch returns to its starting position.
4. Start the system, the main menu appears on the operating unit, the ventilator in the powder center runs up
5. Activate the powder center (see therefore the corresponding user manual)

Switching off the booth

1. Quit the automatic operation mode
2. Switch off the gun control units and all additional plant units
3. Switch off the system in the main menu
4. Switch off the powder center
5. Switch off the main switch

Alarm messages

If malfunctions take place, the signal horn sounds and an alarm message is shown (see the chapter "Troubleshooting" and the control unit user manual).

Filter cleaning

The filter cartridges in the After Filter are blown off cyclically from the inside during operation (jet cleaning). The predetermined cycle times are set at the factory, but must be reset if the maximum differential pressure is repeatedly exceeded (this initiates an alarm).

The differential pressure is displayed on the pressure gauge:

- Pressure monitoring on the filter - is only displayed optically on the pressure gauge
- Pressure monitoring on the ventilator - is displayed optically and the alarm is initiated by 2 manostats (optically and acoustically)

The upper limiting value, by which the alarm is initiated, is plant-specific and is set by our trained service personnel when assembling the booth.

The setting of the cycle times must be done only by trained service personnel. The input is entered directly on the operating unit of the plant control (see also the operating manual of the plant control unit).

Color change and cleaning

The color change can begin, when the last workpieces have left the booth. In automatic operation mode, the coating is stopped automatically.

Following, a step by step description of the color change procedure from bright to dark (or vice versa) is given. A prerequisite for a quick and efficient color change is that it is done by 2 people, so that some of these steps can be carried out simultaneously.

1. Prepare the booth for cleaning
 - The booth must be empty of hangers
 - Stop the conveying system
 - Close the booth doors
 - Switching over the booth control to cleaning operation
 - Move the guns to the cleaning position
2. Prepare the powder center for cleaning
 - Remove the powder container from the powder center (the recovery hose remains on the powder container)
 - Set the powder center to the cleaning mode
 - Coarse cleaning of the powder center
3. Clean the guns externally and move them to the blow off position
4. Blow off (internal cleaning) the powder hoses in direction from the powder center

5. Coarse cleaning of the booth
 - Coarse cleaning of the booth with the air lance
 - Open the cyclone cone and remove the sieve, leave the cyclone open
 - Remove the recovery hose from the powder container
6. Clean the booth
 - if necessary, move the guns out of the booth
 - if necessary, clean the muzzles etc.
 - Blow off the booth with the air lance, clean the suction opening
 - if necessary, wipe off the booth walls
7. Clean the powder center
 - if necessary, change the powder hoses (bright/dark)
 - Initiate the filter cartridges cleaning manually
 - Clean the powder center (floor, vibrating table, collecting container etc.)
8. Clean the recovery system
 - Connect the recovery hose to the blow off connector
 - Open the cyclone cone and clean the sieve
 - Blow off the recovery system
 - if necessary, wipe off the cyclone cone
 - Blow off the inside of the monocyclone with the air lance
9. Prepare the equipment for coating
 - Make the recovery system ready for operation
 - Put the powder center into coating operation (insert the powder container with the new color, move down the injectors)
 - Put the booth into coating operation (switch on the plant, move the XT axis into coating position, start the correct reciprocators program)
10. Check the guns for functioning (high voltage and powder output)

Remark:

This short instructions should facilitate, above all, the handling of the plant for the daily, always recurring works. They do not replace by any means the enclosed manuals of the components, and presuppose that you read and understand the corresponding chapters in the operating manual as well as the safety regulations.

Maintenance

Maintenance and repair

Daily or after each shift

- Blow off the powder hoses
- Clean the guns externally and the check wearing parts
- Check the vibrating sieve of the cyclone separator and clear away contamination with an industrial vacuum cleaner

Weekly

(in single-shift works, or in each fifth shift in multi-shift works)

- Check the clean air chamber in the After Filter housing for powder deposits through the inspection window of the filter housing above the door. If powder deposits are present, this is an indication of defect filter elements (replace the filter elements, see the After Filter operating instructions).
- Check all oil separators and if necessary, empty (if oil is present, the compressed air preparation must be checked)

Biannually

- Disconnect the measuring lines of the manostats on the manometer and blow it off from the manometer to the measuring point (beginning of the line). Definition of the lines: H = high, L = low



Note:

The indicated blowing direction is absolutely to be observed!
The parts to be replaced during maintenance are available as spare parts, see the spare parts list!

Maintenance and repair of the cyclone separator

The following activities on the cyclone should be carried out regularly:

- Remove powder deposits and caked powder
- Check the gaskets, sealing strips and locking mechanisms (covers etc.) for functioning and sealing
- Replace the material abraded from the cyclone inside walls by abrasive powders (by build-up welding)

Further information, see the corresponding operating manual!

Maintenance and repair of the sieve machine

The following activities on the sieve machine should be carried out regularly:

- Check the gaskets and if necessary, replace them
- Check the clamping force of the clamping levers and if necessary, reset them
- Clean the sieve mesh, or if damaged, replace it

Further information, see the corresponding operating manual!

Maintenance of the After Filter pressure gauges (filter and ventilator)

The following check should be carried out regularly:

- Notice the pressure on the pressure gauges and compare with the original pressure values which were set by the Gema service engineer at the first start-up
- If errors arise, see the troubleshooting guide and the After Filter operating instructions
- If it is not possible to adjust the original settings, please contact an Gema service center

Further information, see the corresponding operating manual!

Replacing spare parts

Spare parts are to be replaced by trained personnel only. The plant must always be switched off, when replacing spare parts. Spare parts can be ordered from the spare parts list.



Note:

Only original Gema spare parts may be used!

Functional check

General information

A function check is to be carried out:

- After a replacement of spare parts on the booth or on the electrical part of the booth, or on plant units connected to the booth
- After manipulations on the electrical part, or on external plant units connected to the booth control unit, or on the booth control unit itself
- after long stops/standstills

Procedure of the function check

1. Switch on the main switch, control units and all interlocked equipment should not be able to be switched on
2. Turn the key switch, the control unit is activated, the operating unit is activated and the key switch returns to its starting position. Control units and all interlocked equipment should not be able to be switched on
3. Start the system, the main menu appears on the operating unit, the ventilator in the powder center runs up
4. The operation of the powder center is described in the corresponding user manual
5. If the powder container is positioned on the vibrating table in the powder center, the coating function can be initiated. The injectors move downwards and the level control unit is activated. The vibrator and the fluidization are switched on
6. Switch on the gun control units
7. Activate the automatic function on the operating unit, the reciprocators move to the reference point. All interlocked plant units are enabled (ES control unit etc.)
8. The control units and all interlocked plant units are ready for operation
9. The message "too little powder" appears on the operating unit after a delay, and the alarm horn sounds

Troubleshooting

General information



Attention:
Faults are to be fixed by trained personnel only!

Malfunctions, which arise during operation, are registered together with emergency stops in a list with date and time indications. An error message is displayed on the operating unit of the control unit.

If a fault arises, the plant is not stopped. However, if an emergency stop arises, the whole plant (or units) are switched off and the emergency stop mask is displayed on the operating unit.

The alarm horn sounds at the same time with every message (malfunction or emergency stop).

Problem fixing

Problem/error/malfunction	Procedures/remedy
Alarm has been released: Message too little powder bright (dark) Display flashes in the powder center Powder shortage in the powder container	Acknowledge error, fill in fresh powder Switch off the alarm, fill in fresh powder
Alarm has been released: Message EMERGENCY STOP protective switch Motor malfunction exhaust air fan, corresponding motor protection switch has reacted	Let the motor cool down, switch on the corresponding motor protection switch again (see wiring diagram), see also the "Troubleshooting" section in the After Filter operating manual. In the case of repeated alarm, contact your Gema service center

Problem/error/malfunction	Procedures/remedy
<p>The pressure increase is indicated on the filter manometer</p> <p>Pressure increase on the filter cartridges</p>	<p>Switch off the gun control units, wait until the differential pressure returns to normal again. Check the cleaning cycles by ear, if necessary, shorten the pause times in the cleaning cycle. Check, if the cleaning pressure is set on 5 bar on the pressure input valve (see also the section "Troubleshooting" in the After Filter operating manual)</p> <p>Attention: If the pressure gauge shows a pressure rise greater than 3 kPa, contact your Gema representative immediately!</p>
<p>Alarm has been released:</p> <p>Message Ventilator overpressure</p> <p>Minimum pressure in filter housing not reached - corresponding pressure gauge responding</p>	<p>Too little pressure, too much exhaust air, because too little or no air resistance</p> <p>Filter housing door is open</p> <p>Sieve machine not fitted tightly on the cyclone separator</p> <p>Waste container not fitted tightly (see also the troubleshooting section in the After Filter manual)</p>
<p>Alarm has been released:</p> <p>Message Ventilator low pressure</p> <p>Maximum pressure in the filter housing exceeded - corresponding pressure gauge responding</p>	<p>Pressure too high, insufficient exhaust air because the air resistance is too high</p> <p>Filter clogged (valves defect or cleaning pressure too low, at least 5 bar)</p> <p>Poor compressed air quality (contains oil or water)</p> <p>Malfunctions on running-in, until the filter cake is built up on the filter cartridges (see also the "Troubleshooting" section in the After Filter operating manual)</p>
<p>Alarm has been released:</p> <p>Message Guns not OK</p> <p>Diagnostic adaptor of the guns indicates, that no high voltage is being produced</p>	<p>Turn on the gun control unit, or correct the fault in the gun control unit or gun with the information in the corresponding operating instructions</p>

Problem/error/malfunction	Procedures/remedy
Bad separation efficiency of the cyclone	<p>Check all gaskets, above all, on the powder separation of the cyclone and if necessary, repair them</p> <p>Check the exhaust air volume flow, if necessary, clear blocked tubes or repair the After Filter</p> <p>Check the cyclone casing for holes, caused by wear</p> <p>Check the pretension force of the closings</p>
Sieve clogged up	<p>Check the powder for dampness</p> <p>Check, if too much powder was fed through the cyclone, e.g. during the booth cleaning</p> <p>Check, if the vibration motor is switched on</p> <p>Check, if the vibration is strong enough</p> <p>If necessary, adjust the oscillating weights on the vibration motor</p>
Automatic floor blow off system not OK	<p>Check the compressed air supply</p> <p>Pressure reducing valve defective or adjusted incorrectly</p> <p>Solenoid valve defective (coil, cable) or missing signal</p>

Setting values



Note:

The setting values for the powder center and other plant units you will find in the corresponding operating instructions!

Spare parts list

Ordering spare parts

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

- Type and serial number of your powder coating equipment
- Order number, quantity and description of each spare part

Example:

- **Type** MagicCylinder II
Serial number 1234 5678
- **Order no.** 203 386, 1 piece, Clamp - Ø 18/15 mm

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

The wearing parts are always marked with a #.

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

Example:

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



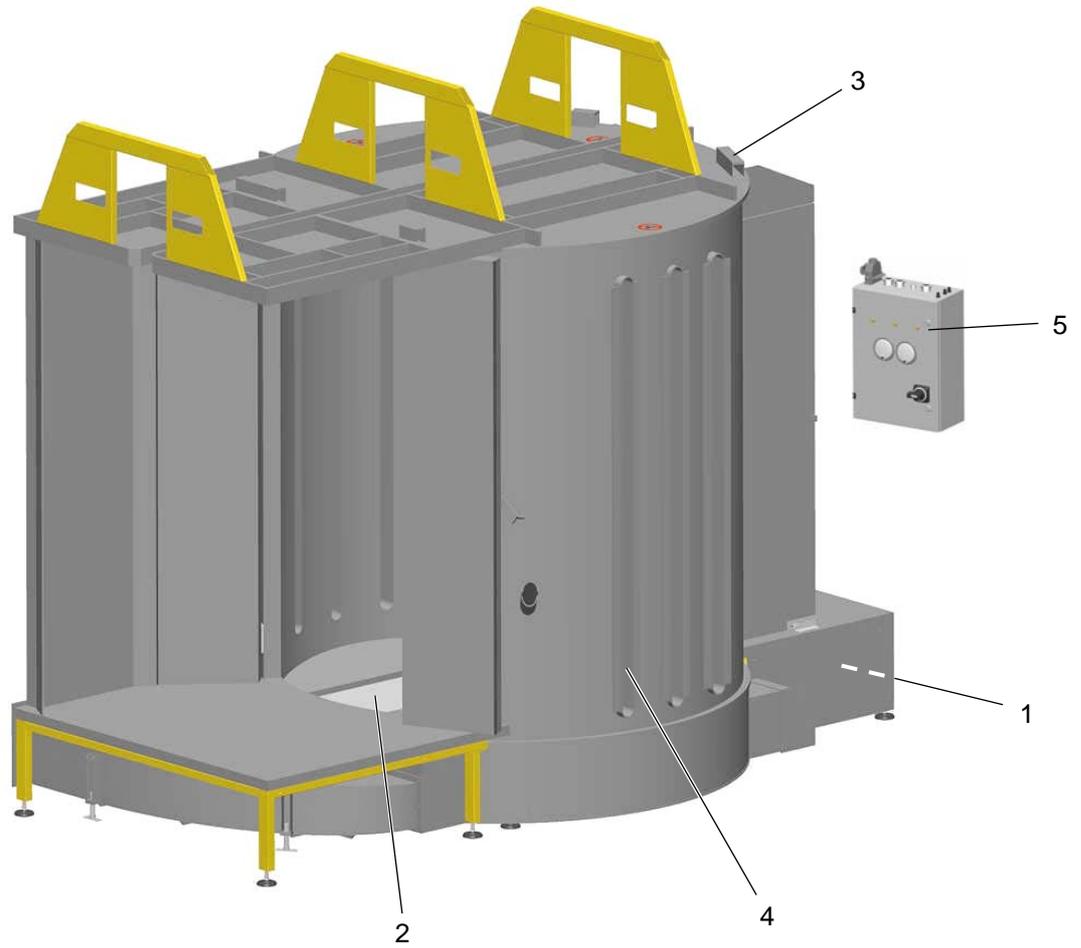
WARNING!

Only original Gema spare parts should be used, because the explosion protection will also be preserved that way. The use of spare parts from other manufacturers will invalidate the Gema guarantee conditions!

MagicCylinder II - spare parts list

- | | |
|---|---|
| 1 | Pressure tank for the floor blow-off system (see separate spare parts list) |
| 2 | Flap drive unit (see separate spare parts list) |
| 3 | Door drive unit (see separate spare parts list) |
| 4 | Gun blow off equipment (see separate spare parts list) |
| 5 | Fan control (see separate spare parts list) |
-

MagicCylinder II - spare parts



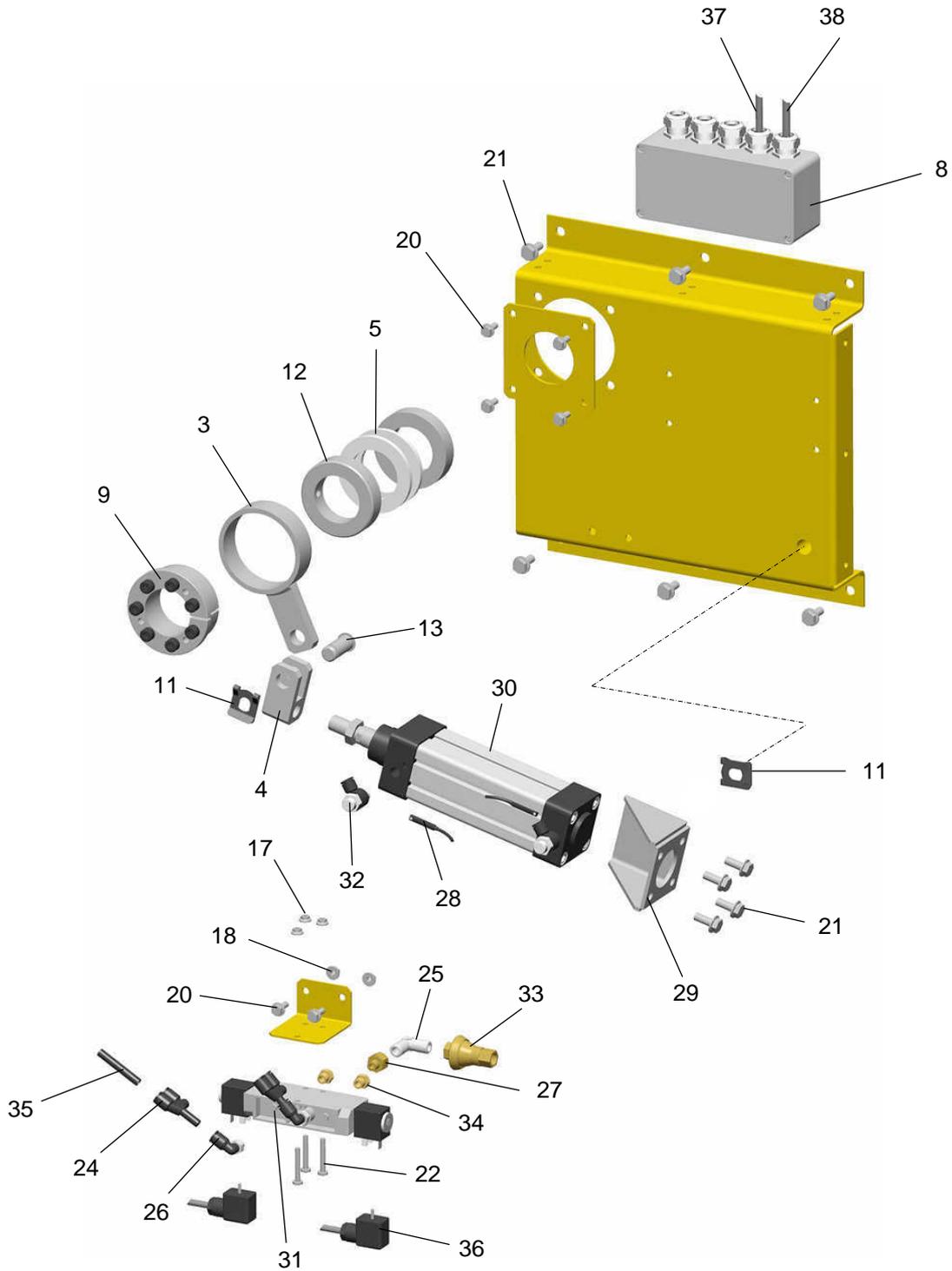
MagicCylinder II - spare parts

MagicCylinder II - flap drive unit

3	Lever - L=110 mm	1001 391
4	Clevis	1002 276
5	Glide disk	386 383
8	Connection case - complete	386 413
9	Clamping set - Ø 50/80x25 mm	264 075
10	Spring clip - A-12	261 017
11	Spring clip - A-16	1002 438
12	Adjusting ring - Ø 50/80x18 mm	225 991
13	Bolt - Ø 16x38x32 mm	1002 439
17	Hexagon flange nut - M5	243 892
18	Hexagon shakeproof nut - M6	244 430
20	Hexagon shakeproof screw - M6x16 mm	244 503
21	Hexagon shakeproof screw - M8x20 mm	244 422
22	Cap screw - M5x35 mm	201 715
24	Y-plug connection - Ø 8 - 2 x Ø 8 mm	264 814
25	Elbow joint - 1/4"a-1/4"a	253 910
26	Elbow joint - 1/8"a, Ø 8 mm	251 372
27	Adapter nipple - 1/4"i-1/8"a	202 584
28	Proximity switch - PNP N.O. 24 VDC	267 651
29	Angled support	1004 245
30	Cylinder - Ø 50 mm, stroke=100 mm	1002 440
31	Solenoid valve - Jmfh-5-1/8", 220 VAC	259 705
32	Pressure check valve - 1/4", A-008-AI	254 924
33	Inline regulator - 1/4"i, 6 bar	263 320
34	Silencer - 1/8"a	251 305
35	Plastic tube - Ø 8/6 mm, black, antistatic	103 756*
36	Valve cable - 2 m	368 202
37	Cable - 4x1 mm ²	100 579*
38	Cable - 5x0.75 mm ² , shielded	104 477*

* Please indicate length

MagicCylinder II - flap drive unit



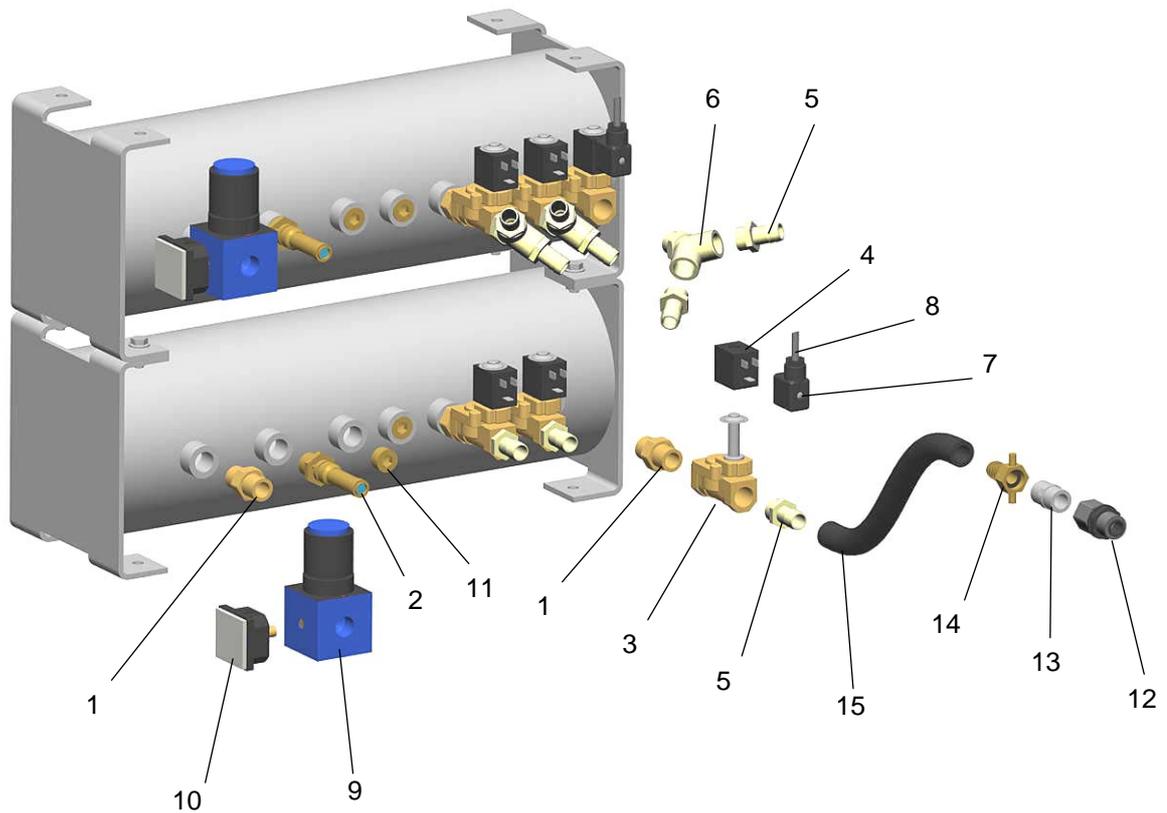
MagicCylinder II - flap drive unit

MagicCylinder II - pressure tank for floor blow-off system

1	Double nipple - 1/2"a-1/2"a, divisible	243 582
2	Safety valve - G1/2", 5,1-7 bar	244 910
3	Solenoid valve - 1/2", NW 11.5; 24 VDC	259 195
4	Valve coil for pos. 3 - Z610a-24 VDC	243 930
5	Hose connector - Ø 17 mm, 1/2"a	223 069
6	Y-piece - 1/2"i-1/2"a-1/2"i	267 171
7	Valve cable - complete, 2 m	368 202
8	Cable - 3x0,75mm ²	103 578
9	Pressure regulator - 334a001, 1/2", 4 bar	240 028
10	Pressure gauge - 1/8"a, 0-4 bar	235 814
11	Plug cap - 1/2"a	259 306
12	Lead-through connection - Ø 12 mm, 1/2"i	1002 226
13	Double nipple - 1/2"a-1/2"a	243 540
14	Hose connection - Ø 16 mm, 1/2"i	1002 512
15	Hose	105 155*

* Please indicate length

MagicCylinder II - pressure tank for floor blow-off system



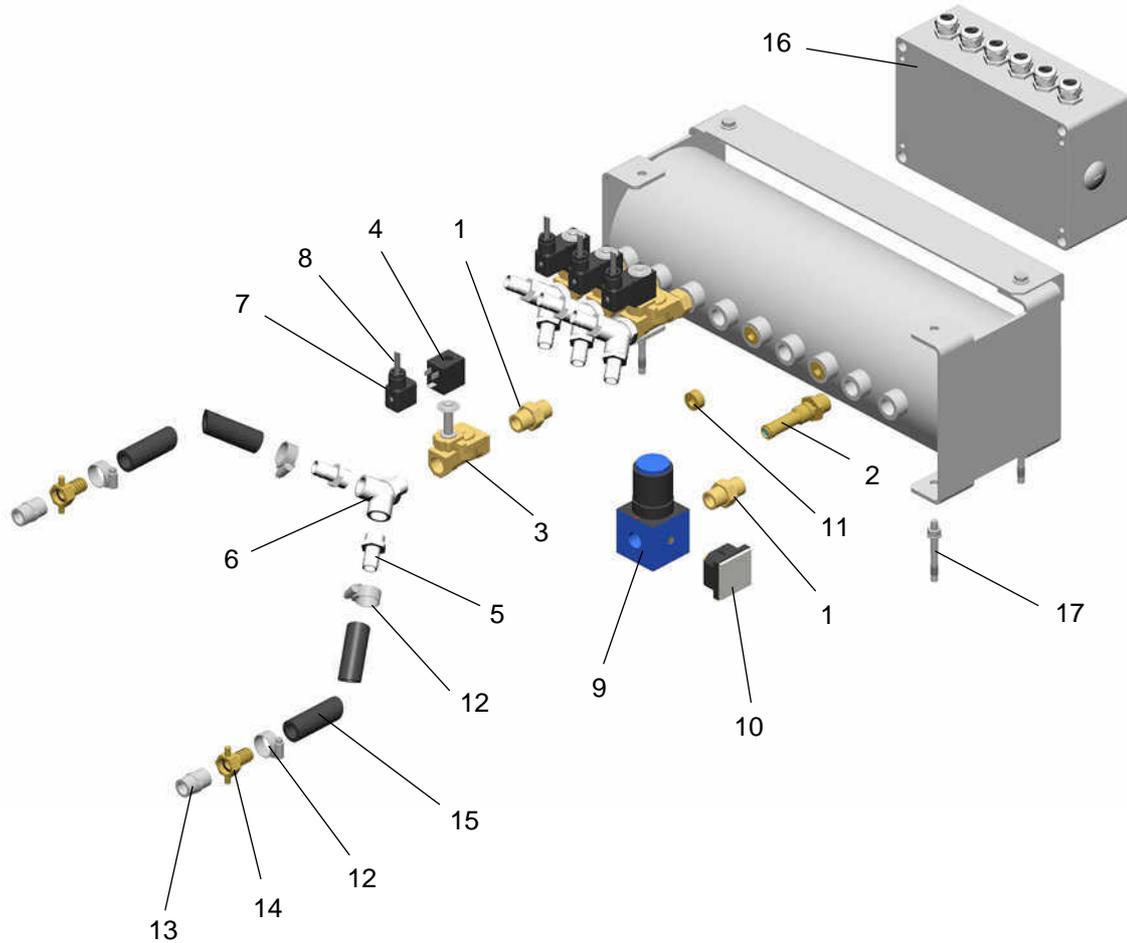
MagicCylinder II - pressure tank for floor blow-off system

MagicCylinder II - pressure tank for ring blow-off system

1	Double nipple - 1/2"a-1/2"a, divisible	243 582
2	Safety valve - G1/2", 5,1-7 bar	244 910
3	Solenoid valve - 1/2", NW 11.5; 24 VDC	259 195
4	Valve coil for pos. 3 - Z610a-24 VDC	243 930
5	Hose connector - Ø 17 mm, 1/2"a	223 069
6	Y-piece - 1/2"i-1/2"a-1/2"i	267 171
7	Valve cable - complete, 0.7 m	373 605
8	Cable - 3x0.75mm ²	103 578*
9	Pressure regulator - 1/2", 4 bar	240 028
10	Pressure gauge - 1/8"a, 0-4 bar	235 814
11	Plug cap - 1/2"a	259 306
12	Hose clamp - Ø 17-25 mm	223 085
13	Double nipple - 1/2"a-1/2"a	243 540
14	Hose connection - Ø 16 mm, 1/2"i	1002 512
15	Hose	105 155*
16	Terminal box - complete	1003 115
17	Steel bolt dowel - M8x76 mm	223 581

* Please indicate length

MagicCylinder II - pressure tank for the ring blow-off system



MagicCylinder II - Pressure tank for the ring blow-off system

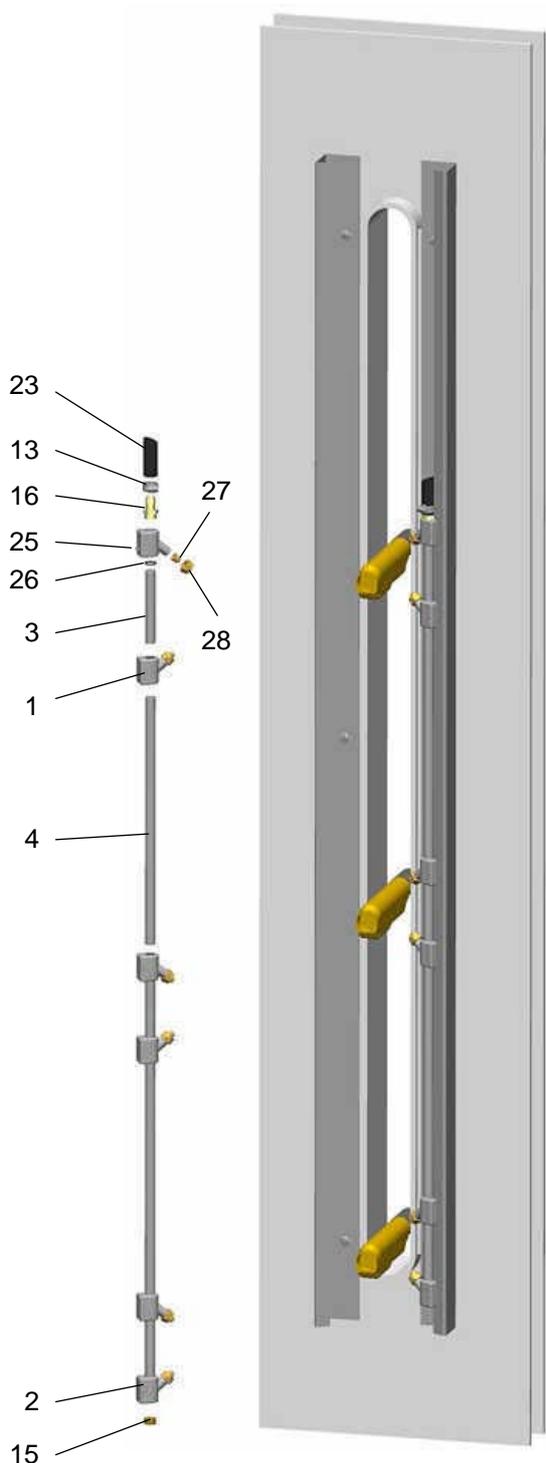
MagicCylinder II - gun blow off equipment

1	Intermediate piece - complete	381 110
2	End piece - complete	381 160
3	Tube - Ø 18/16 mm (distance between nozzles)	381 144
4	Tube - Ø 18/16, L=1950 mm	381 152
13	Hose clamp - Ø 17-25 mm	223 085
14	Plug cap - 1"	243 612
15	Plug cap - 1/2"a	259 306
16	Hose connector - Ø 17 mm, 1/2"a	223 069
17	Y-piece - 1/2"i-1/2"a-1/2"i	267 171
18	Double nipple - 1"a-1"a	1003 544
19	Adapter nipple - 1"a-1/2"i	252 875
20	Ball valve - 1", 1/1	1003 546
21	Solenoid valve	1003 547
23	Compressed air hose - Ø 16.4/26.6 mm, black	105 155*
24	Cable socket - 3 pins	227 919
25	Allen grub screw - M6x10 mm	214 841
26	O-ring - Ø 18x2 mm	244 287#
27	Flat jet nozzle	250 716
28	Nozzle nut	250 724

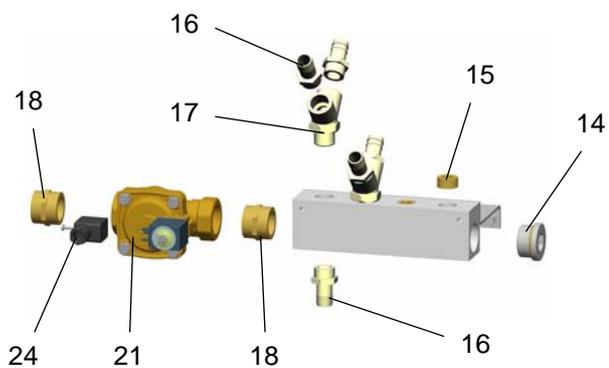
* Please indicate length

Wearing part

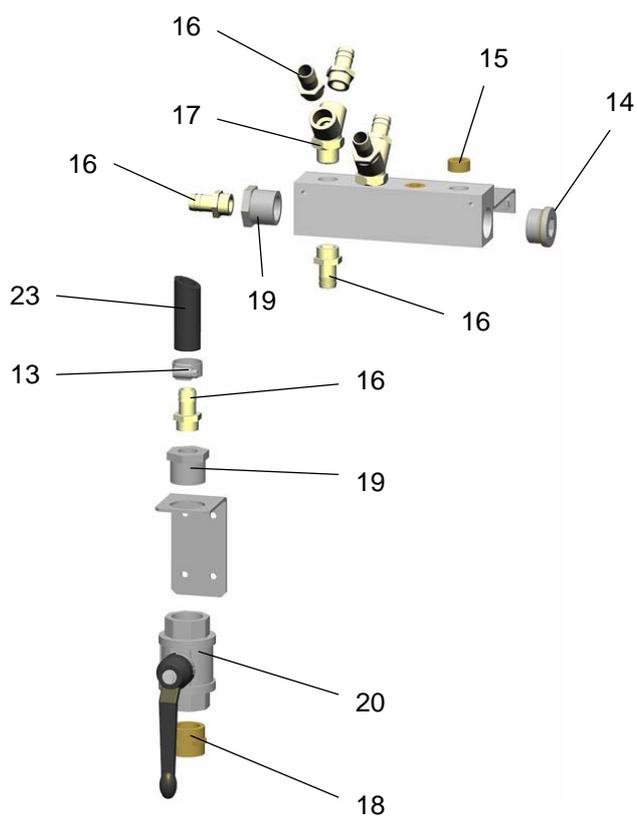
MagicCylinder II - gun blow off equipment



Version with control valve



Manual control version

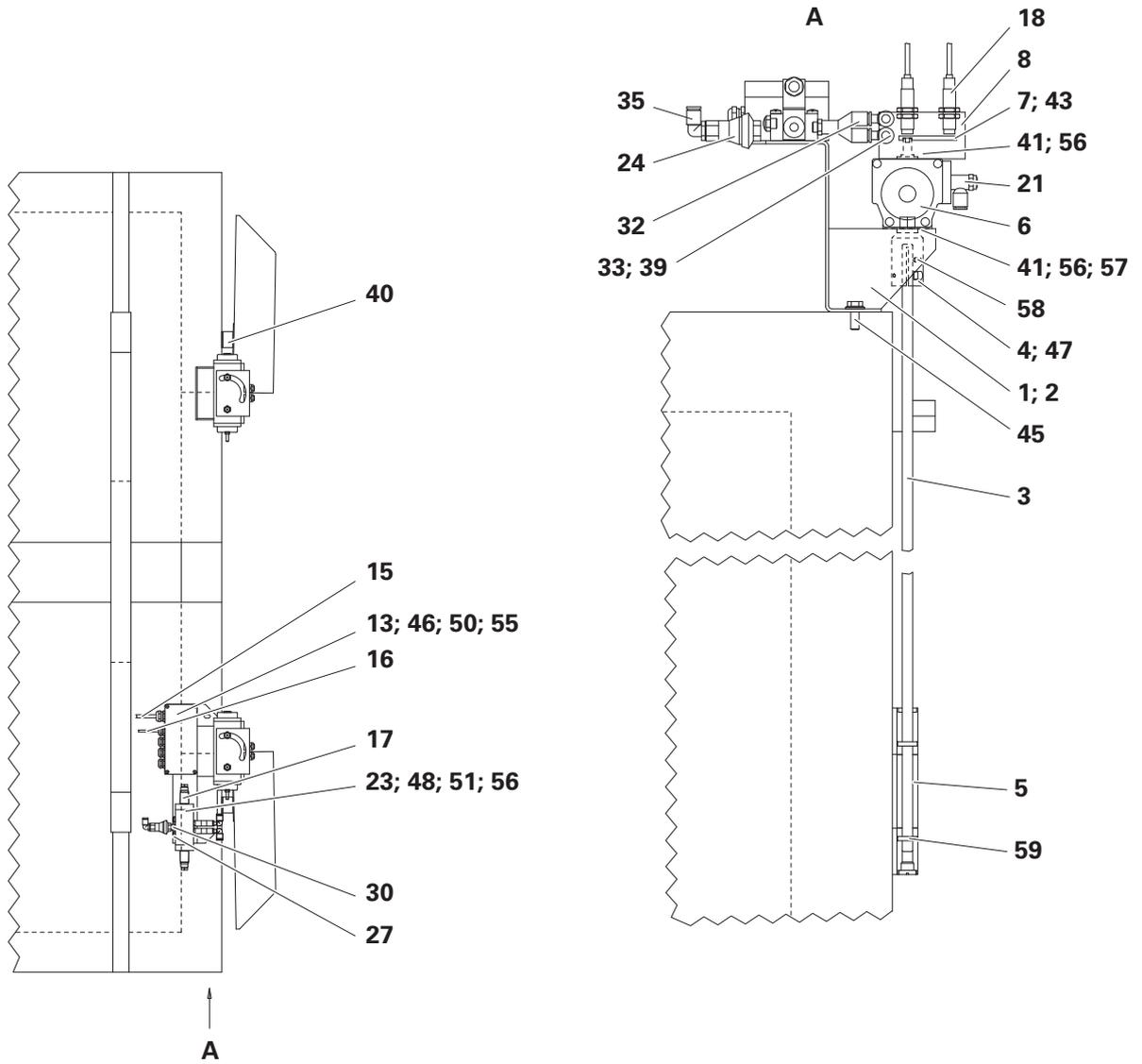


MagicCylinder II - gun blow off equipment

MagicCylinder II - door drive unit

1	Holder - large	389 714
2	Holder - small	389 706
3	Drive shaft	MKC02-A026-4
4	Coupling	389 730
5	Hinge	373 770
6	Rotary actuator	389 790
7	Lever	389 749
8	Holder	389 722
13	Connection case - complete	373 885
15	Cable - 7x0.75 mm ²	100 536
16	Cable - 4x1 mm ²	100 579
17	Valve cable - L=0.7 m	373 605
18	Proximity switch	246 760
21	Throttle check valve	266 825
23	Solenoid valve - 5-1/8", 220 VAC	259 705
24	Inline regulator - 6 bar	263 320
27	Silencer - 1/8"a	251 305
30	Double nipple - 1/8"a-1/4"a	242 209
32	Y-connection fitting - 1/8"a, Ø 8 mm	253 936
33	Adjusting elbow - Ø 8/8 mm	238 287
35	Elbow joint - 1/4"a, Ø 8 mm	254 029
39	Plastic tube - Ø 8/6 mm, black, antistatic	103 756
40	Rubber buffer - Ø 40x28 mm, M8a	248 592
41	Hexagon screw - M5x10 mm	205 699
43	Hexagon shakeproof screw - M6x12 mm	244 406
45	Hexagon shakeproof screw - M8x20 mm	244 422
46	Cylinder Allen screw - M4x20 mm	216 291
47	Cylinder Allen screw - M4x16 mm	216 283
48	Cap screw - M5x35 mm	201 715
50	Hexagon nut - M4	205 192
51	Hexagon nut - M5	205 150
55	Lock washer - M4	205 680
56	Lock washer - M5	205 168
57	Washer - Ø 5.3/10x1 mm	205 320
58	Allen grub screw - M4x8 mm	214 736
59	Coiled spring pin - Ø 4x20 mm	259 683

MagicCylinder II - door drive unit



MagicCylinder II - door drive unit

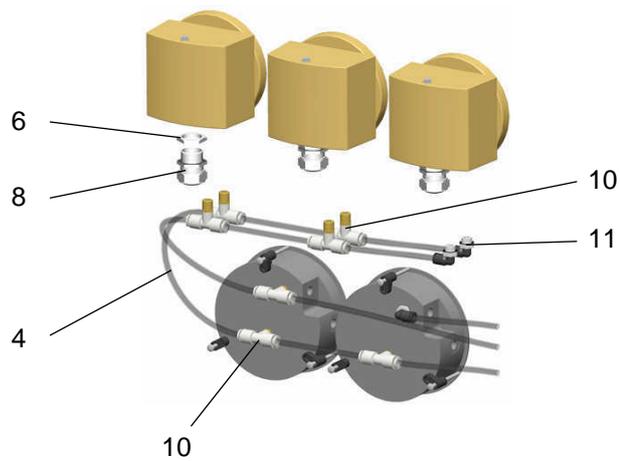
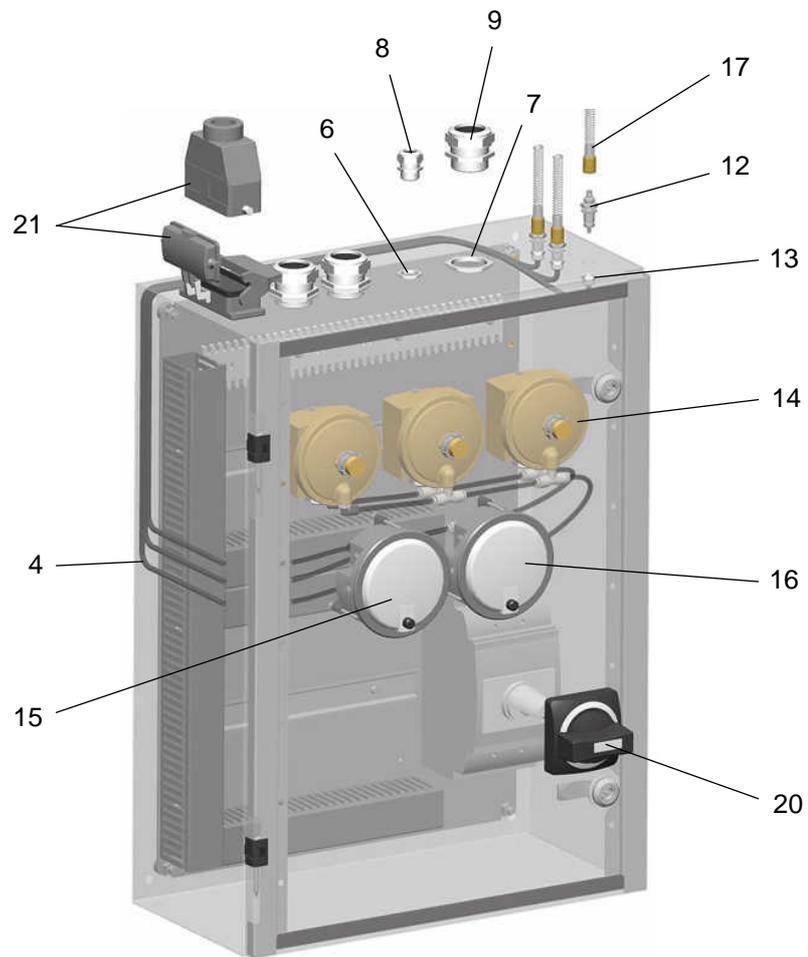
MagicCylinder II - fan control unit

	Fan control - complete	see table
4	Plastic tube - Ø 6/4 mm	103 144#
6	Locknut - M20x1.5 mm	266 035
7	Locknut - M40x1.5 mm	265 357
8	Cable connection - M20/1/8-15 mm	266 019
9	Cable connection - M40/1/28.5-33 mm	265 349
10	Elbow joint - 6-1/8"-6 mm	245 950
11	Elbow joint - 1/8"a, Ø 6 mm	254 061
12	Connection fitting - Ø 8/6-6/4 mm, M12x1 mm	1005 084
13	Nut - M12x1-Ø 8 mm	263 079
14	Switch - 0,75-5,6 kPa	243 744
	Switch - 1.25-11.0 kPa	243 752
15	Pressure gauge - 0-2.5 kPa, differential pressure	243 760
	Pressure gauge - 0-5.0 kPa, differential pressure	243 779
16	Pressure gauge - 0-5.0 kPa, differential pressure	243 779
	Pressure gauge - 0-8.0 kPa, differential pressure	251 844
17	Nut with kink protection - M12x1-Ø 8 mm	201 316
20	Main switch - see corresponding wiring diagram	
21	Connecting socket/plug - see corresponding wiring diagram	

Wearing part

Order number	Motor performance (kW)	Pressure indicator (kPa)	
		Filter (pos. 15)	Fan (pos. 16)
1004 358	5.5	5.0	8.0
1004 359	7.5	5.0	8.0
1004 937	11	2.5	5.0
1004 360	11	5.0	8.0
1004 938	15	2.5	5.0
1004 361	15	5.0	8.0
1002 178	22	2.5	5.0
1002 205	22	5.0	8.0
1002 179	30	2.5	5.0
1002 174	30	5.0	8.0
1002 180	37	2.5	5.0
1002 175	37	5.0	8.0
1002 176	45	5.0	8.0
1002 177	55	5.0	8.0

MagicCylinder II - fan control unit



MagicCylinder II - fan control unit