Operating instructions and Spare parts list

Vertical axis

ZA13

Translation of the original operating instructions
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About these instructions

General information
This operating manual contains all important information which you require for the working with the ZA13. It will safely guide you through the start-up process and give you references and tips for the optimal use when working with your powder coating system.

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

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

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

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

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

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

⚠️ ATTENTION
Indicates a potentially harmful situation. If not avoided, the equipment or something in its surrounding may be damaged.
ENVIRONMENT
Indicates a potentially harmful situation which, if not avoided, may have harmful consequences for the environment.

MANDATORY NOTE
Information which must be observed.

NOTICE
Useful information, tips, etc.

Structure of Safety Notes
Every note consists of 4 elements:
– Signal word
– Nature and source of the danger
– Possible consequences of the danger
– Prevention of the danger

Structure of Safety Notes

Presentation of the contents

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

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

Basic safety instructions

– This product is built to the latest specification and conforms to the recognized technical safety regulations and is designed for the normal application of powder coating.

– Any other use is considered non-compliant. The manufacturer shall not be liable for damage resulting from such use; the user bears sole responsibility for such actions. If this product is to be used for other purposes or other substances outside of our guidelines then Gema Switzerland GmbH should be consulted.

– Start-up (i.e. the execution of intended operational tasks) is forbidden until it has been established that this product has been set up and wired according to the guidelines for machinery. The standard "Machine safety" must also be observed.

– Unauthorized modifications to the product exempt the manufacturer from any liability from resulting damage.

– The relevant accident prevention regulations, as well as other generally recognized safety regulations, occupational health and structural regulations are to be observed.

– Furthermore, the country-specific safety regulations also must be observed.

Product specific security regulations

– This product is a constituent part of the equipment and is therefore integrated in the system's safety concept.

– If it is to be used in a manner outside the scope of the safety concept, then corresponding measures must be taken.

– The installation work to be done by the customer must be carried out according to local regulations.

– It must be ensured, that all components are earthed according to the local regulations before start-up.

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

- The vertical axis may only be switched on and operated after careful reading of this manual. Incorrect operation of the axes control unit can lead to accidents, malfunctions or damage to the plant.

**WARNING**

The power of the vertical axis is much stronger than that of a human being!
- All axes must be secured against access during operation (see local regulations).
- Never stand under the Z carriage when the vertical axis is not operating!

- The plugs and sockets of the axis control unit and the power unit of the vertical axis should only be unplugged when the power supply is disconnected.
- The connecting cables between the control unit and the reciprocator must be laid in such a way, that they cannot be damaged during axes operation. Please observe the local safety regulations!
- The maximum upper stroke limit of the vertical axis must always be set with reference to the maximum height of the booth gun slots. If an incorrect (too high) stroke limit is set, this can lead to damage to the reciprocator and/or the booth!

**ATTENTION**

During a test run, it must be guaranteed that the unit is not damaged by the test!
- In particular, the limitations of the stroke range have to be observed (for further information, see chapter "Setting the upper mechanical stop")!

- When repairing the reciprocator, both the reciprocator control unit and the reciprocator must be disconnected from the mains according to the local safety regulations!
- Repairs may be done only 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.
- Only original Gema spare parts should be used! The use of spare parts from other manufacturers will invalidate the Gema guarantee conditions!
- 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.

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

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

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

Introduction

This chapter describes special precautions that must be taken during internal transport of the product if:

– the customer himself must pack, transport and ship the product, such as to have renovations or service work carried out by the manufacturer

or

– the product must be shipped for disposal (recycling).

Requirements on personnel carrying out the work

All work must be carried out by personnel trained in packing machines.

Packaging

Selection of packing material

Suitably stable wood packing material must be used.

Procedure when packing

Transport the unit only in a horizontal position.

Reciprocators with a stroke length of more than 1800 mm must be supported in the center of the column.

Transport

Data concerning goods to be transported

The space requirements correspond to the size of the axes of motion plus the packaging.

Loading, transferring the load, unloading

At least one fork lift must be available.
Product description

Intended use

The ZA13 axis serves exclusively to move vertically powder applicators in automatic coating equipment.

fig. 1

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

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

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

The ZA13 type axis is used as the basis for all stages of automation, from a simple vertical stroke to complex, multi-dimensional processes. Depending on the design of the applicators, this unit may be used with all types of powder coating.

Reasonably foreseeable misuse

- Operation in rooms with gases
- Incorrect setting of the mechanical stroke limiters
- Incorrect programming of the upper and lower turning points
- Use in connection with not permissible control units
- Loading the Z carriage with more weight than allowed (see "Technical Data")
- Operation without the proper training
- Operating the reciprocator without the protective fence

Function

The reciprocator carries out a linear, oscillating up-and-down motion in the vertical direction (called Z motion). The movement sequences (stroke and stroke speed) are controlled by the reciprocator control unit.

The gun holders are fitted on the gun holder plate of the Z carriage. The Z carriage is moved up and down on the central column by a drive belt inside the reciprocator. This vertical column serves also as a runway for the rollers. The drive unit and the electrical connection are installed in the vertical axis base. A pulse generator, which is installed in the motor case, enables the exact positioning of the Z carriage.

The power unit as well as the corresponding wiring are housed in an electronics module, which is plugged into the axis. One module is needed for each axis. Empty space is available for additional axes (e.g. X axis).

If the power is interrupted, the motion of the Z carriage is stopped momentarily with the holding brake built into the drive unit. The holding brake can be activated manually during maintenance or in an emergency.

To ensure that the reciprocator cannot become a hazard during normal operation, the axes are shielded by a protective fence that is 2.3 m high. The fence has doors that are released by the control unit to allow authorized technical personnel access to the axes.
fig. 2: Structure

1 Basement  5 Z carriage
2 Drive unit  6 Power unit
3 Drive belt  7 Holding brake
4 Gun holder plate

Schematic presentation

fig. 3: Schematic presentation

1 Axis control  4 Motor cables
2 Position regulator  5 Drive motor
3 Pulse generator wiring
Special characteristics

This axis is conspicuous because of its rugged construction, a new drive system and an improved Z axis carriage design.

Further characteristics:
- 100 kg load capacity for automatic gun and gun holders
- Built-in holding brake
- Quiet running
- High speed, maximum acceleration and braking action
- Safe operation and simple maintenance
- High efficiency due to low energy consumption
- Designed for continuous operation
- Mobile version available
- IP54 protection type
- 4 standard stroke heights available: 1.3 m / 1.8 m / 2.3 m / 2.8 m
Expansion with additional axes of motion

The vertical axis can be equipped with UA04 gun axes to expand its functionality. A maximum of 6 gun axes can be mounted.

fig. 4: ZA13 with UA04
CDB position regulator with CAN BUS (Power unit)

fig. 5: CDB position regulator with CAN BUS

X1 Load connections (Mains voltage, Motor)  
X2 Control connection  
X3 Motor winding temperature monitoring (optional)  
X4 RS 232 Interface  
X5 not occupied  
X7 Pulse generator connection  
S3 CAN address
Technical Data

Versions

The vertical axis is available, depending on operational area, in four versions with different standard stroke heights.

<table>
<thead>
<tr>
<th></th>
<th>ZA13-13</th>
<th>ZA13-18</th>
<th>ZA13-23</th>
<th>ZA13-28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reciprocator height - H</td>
<td>2.385 m</td>
<td>2.885 m</td>
<td>3.385 m</td>
<td>3.885 m</td>
</tr>
<tr>
<td>Stroke length – L</td>
<td>up to 1.3 m</td>
<td>up to 1.8 m</td>
<td>up to 2.3 m</td>
<td>up to 2.8 m</td>
</tr>
<tr>
<td>Weight</td>
<td>235 kg</td>
<td>260 kg</td>
<td>280 kg</td>
<td>300 kg</td>
</tr>
<tr>
<td>Stroke speed</td>
<td>0.08 up to 0.4 m/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceleration</td>
<td>0.1-1.5 m/s²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position detection</td>
<td>by pulse generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. lifting weight</td>
<td>max. 100 kg on the Z carriage (= max. 6 UA04 axes)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Electrical data

<table>
<thead>
<tr>
<th></th>
<th>ZA13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>230 VAC (from control unit)</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10%</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.1 kW</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Protection type</td>
<td>IP54</td>
</tr>
<tr>
<td>Isolation</td>
<td>Class F</td>
</tr>
<tr>
<td>Control unit</td>
<td>CM30</td>
</tr>
<tr>
<td>Temperature range</td>
<td>10 °C - 40 °C (50 °F - 104 °F)</td>
</tr>
</tbody>
</table>

Drive unit data

<table>
<thead>
<tr>
<th></th>
<th>ZA13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive unit</td>
<td>Motor/gearbox unit</td>
</tr>
<tr>
<td>Output</td>
<td>0.75 kW</td>
</tr>
<tr>
<td>Motor voltage/frequency</td>
<td>230 VAC, 87 Hz</td>
</tr>
<tr>
<td>Electrical wiring</td>
<td>Triangle/three phase</td>
</tr>
<tr>
<td>Motor RPM</td>
<td>1400 rpm</td>
</tr>
<tr>
<td>Drive torque</td>
<td>188 Nm</td>
</tr>
<tr>
<td>Brake torque</td>
<td>10 Nm</td>
</tr>
<tr>
<td>Approval</td>
<td>II 3D Ex tc IIIC T160°C Dc</td>
</tr>
</tbody>
</table>
Sound pressure level

<table>
<thead>
<tr>
<th>ZA13</th>
<th>&lt; 60 dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal operation</td>
<td></td>
</tr>
</tbody>
</table>

The sound pressure level was measured while the unit was in operation; measurements were taken at the most frequent operator positions and at a height of 1.7 m from the ground.

The specified value is applicable only for this product itself and does not take into account external noise sources or cleaning impulses.

The sound pressure level may vary, depending on the product configuration and space constraints.

fig. 6: Dimensions
Rating plate

Fields with a gray background contain contract-specific data!

fig. 7: Rating plate
Assembly / Connection

⚠️ CAUTION

Uncontrolled vertical axis movement
If a free-standing reciprocator is not anchored firmly to the floor, uncontrolled movement of the machine or insufficient stability can cause injuries.

► Firmly anchor the vertical axis to the floor with the supplied steel bolts if it is not mounted to another axis of motion. The mounting holes are located in the axis base.

⚠️ CAUTION

The movement of the reciprocator can cause injuries.

► Erect a protective fence around the reciprocator so that there is no danger of injury during normal operation.

⚠️ CAUTION

Injuries can occur inside the protective fence due to the movement of the reciprocator!

► In order to enter the inner area, the door interlocks must be released by the control unit. This release signal may only be activated by technical personnel.

► Except for normal operation, all other operating modes must be set up by an authorized technical representative.
Grounding of the axis

⚠️ DANGER

Missing or incorrect grounding

A bad or missing ground connection can be dangerous to the operator.

► Ground all metal parts of the axis according to the general, local safety regulations.
► Check regularly the grounding of the axis.

At least one corresponding connection point at the axis is reserved for the potential equalization.

fig. 8: Potential equalization – connection point
Electrical connections / cable connections

fig. 9: Connections: vertical axis – CM30 control unit

As an option, the connection 2.2 (24 V control) may be tied into a constant 24 VDC source so that in event of an interruption of power to the reciprocator the reference point remains in memory, i.e. after rewiring the power feed it is not necessary to reference the axes again.
Start-up

Preparation for start-up

ATTENTION
Incorrect setting of the upper and lower stroke limits will cause damages to the reciprocator, to the booth or to the applicators!

► Before connecting or switching on the reciprocator, read carefully these operating instructions!
► Before the vertical axis is put into operation, the upper and the lower stroke limit must be set!
► See the user manual of the axis control unit!

General information

WARNING
Before start-up works are done, make certain that nobody can switch on the reciprocator!
► Switch off and lock the mains switch!

Before starting up, check the following:

– Check the gun holder and hose holder if they are firmly fitted. Mount the gun holder in such a way that they do not hit the bottom of the booth slots on start-up and cause damage.

– Lay out the cables and hoses in such a way that even at the highest stroke no strain can arise.

– Check the grounding of the guns and hose carriers.

– Check if the upper and the lower reversing point of the Z carriage are set correctly. The stroke length of the reciprocator must be in the range of the booth opening (collision danger!).

– Make sure that the automatic guns cannot collide with the work pieces (incorrectly adjusted stroke parameters on the reciprocator control unit).
Reference point

At every start-up after the mains have been interrupted, the reference point of the axis must be referred again (see "Reference point and mechanical stops"). After the reference point is reached, the axis begins to carry out the movements set on the axis control unit.

Before the reciprocator is put into operation, the upper stroke limit must be set on the reciprocator control unit (see therefore the corresponding reciprocator control unit operating manual)!

**ATTENTION**

Incorrect setting of the upper and lower stroke limits will cause damages to the reciprocator, to the booth or to the applicators!

► Before connecting or switching on the reciprocator, read carefully these operating instructions!

► See the user manual of the axis control unit!

Reference point and mechanical stops

The reference point serves as starting point for the reciprocator control unit for calculating the upper and lower reversing point and the maximum stroke.

Each time the axis is switched on, the control unit requests that the Z carriage travels to the reference point (proximity switch). The axes control units are programmed in such a way that the reference point is always located 50 mm above the mechanical stop.

For transport reasons, the vertical axis is delivered with the rubber buffer and the carriage in lowest position.

**ATTENTION**

Damages to the booth, to the gun holders etc.

Reference point incorrectly set

► Set the reference point before the first start-up!

► Consider the lower edge of the gun slot!

Setting the reference point

1. Move the stop plate with rubber buffer and proximity switch to the desired position and fasten it
2. Set the response gap of the proximity switch to approx. 2 mm
3. Consider the lower edge of the gun slot!
 ATTENTION

Damages to the booth, to the gun holders etc.
Reference point incorrectly set
► Check the reference point before the first start-up and if necessary, reset!
► Fit the mechanical stop to the gun slots because the axis moves up to 25 mm below the control’s zero point, when referencing!

The position of the upper and the lower stop plate is set by a Gema service engineer when the reciprocator is assembled.

The reference point must be referenced before each start-up (at each switching on, after an interruption of the power supply etc.)!
Setting the lower mechanical stop

The setting of the lower mechanical stop must take place without load and the reciprocator must be disconnected from mains!

Procedure:
1. Switch off the electric power
2. Release the brake switch manually
3. Let the Z carriage sink down until the powder gun holder is approximately 50 mm above edge of the gun slot
4. Remove the boarding/side panels
5. Loosen the screws and move the lower stop plate up to the Z carriage
6. Tighten the screws
   
   **Tightening torque: 55 Nm**
7. Refit the boarding/side panels

Setting the upper mechanical stop

The setting of the upper mechanical stop must take place without load and the reciprocator must be disconnected from mains!

In order to set the upper mechanical stop, the stop position has to be measured – for this reason, consider the maximum height of the booth gun slots!

**ATTENTION**

An incorrect (too high) set stroke limit will lead to damage to the vertical axis and/or the booth!

▶ Before connecting or switching on the reciprocator, read carefully these operating instructions!

▶ See the user manual of the axis control unit!

Procedure:
1. Remove the boarding/side panels
2. Loosen the screws and move the upper stop plate up to the measured position
3. Tighten the screws
   
   **Tightening torque: 55 Nm**
4. Refit the boarding/side panels

After the adjustment of the mechanical stops, check the system parameter for the upper stop on the axis control unit!

The value must not be larger than the maximum stroke possible between the stops!
Operation

The axis is operated exclusively by the MagicControl CM30 axis control unit.

![MagicControl CM30 axis control unit](image)

fig. 11: MagicControl CM30 axis control unit

The axis control unit permits the selection and the start/stop of the travel programs by the operator on the panel.

In addition, the operator has the possibility to:

- create up to 255 programs
- change the program number
- directly modify the running program
- acknowledge the error message
- input the system parameters
- etc.

For further information, see the corresponding operating manual!
Decommissioning / Storage

Introduction

Safety regulations
Before lifting a reciprocator off of its horizontal axes, it must be secured from falling over with a lifting device such as a crane, fork lift, etc. The point of attachment is the eye bolt (D) at the top of the reciprocator.

fig. 12: Top view

Requirements on personnel carrying out the work
All work should be carried out only by authorized technical personnel.

Storage conditions

Hazard notes
There is no danger to personnel or the environment if the unit is stored properly.
Type of storage
For safety reasons, reciprocators should only be stored in a horizontal position.

Storage duration
If the physical conditions are maintained, the unit can be stored indefinitely.

Space requirements
The space requirements correspond to the sizes of the axes of motion. The load-bearing capacity of the floor should be at least 200 kg/m². There are no special requirements concerning distance to neighboring equipment.

Physical requirements
Storage must be inside a dry building at a temperature between +5 – 50 °C.

Decommissioning

Putting out of service
Before starting any kind of work, the axes of motion must be disconnected from the power supply:

- Unplug the power cable
- Unplug the ground cable

Cleaning
The running surfaces of reciprocators must be thoroughly cleaned.

Preservation
The cleaned running surfaces of the column on reciprocators must be preserved with a suitable corrosion inhibitor (oiled).
Maintenance during storage

**Maintenance schedule**
No maintenance schedule is necessary.

**Maintenance works**
During long-term storage, periodically perform a visual check for corrosion.
Maintenance / Repairs

⚠️ CAUTION
Injuries can occur inside the protective fence due to the movement of the reciprocator!

► In order to enter the inner area, the door interlocks must be released by the control unit. This release signal may only be activated by technical personnel.
► Except for normal operation, all other operating modes must be set up by an authorized technical representative.

General information

⚠️ WARNING
Before start-up works are done, make certain that nobody can switch on the reciprocator!

► Switch off and lock the mains switch!
► The reciprocator has to be free of load!

The vertical axis was designed to operate with a minimum of maintenance. The motor gear box is self-lubricating and maintenance-free.

Regular maintenance and inspection of the reciprocator increases the working reliability and avoids damages, repair downtimes etc.!
Maintenance schedule

The following maintenance schedule is based on operation of 8 hours per day.

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Maintenance works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>– Blow off the outside of the vertical axis with compressed air or clean it with a soft cloth from top to bottom at least once a week.</td>
</tr>
</tbody>
</table>
| monthly       | – Check the drive unit gearbox for oil loss  
|               | – Check the motor case in the reciprocator base for deposits of powder dust and if present, clean it |
| every 6 months| – Check the drive belt for wear and tension  
|               | – Check the rollers on the Z carriage for free movement and wear  
|               | – Check the column for wear and deposits and, if present, clean it  
|               | – Check the grounding connection |

The parts to be replaced during maintenance work are available as spare parts.

– Please refer to the spare parts list too!

Drive unit

⚠️ DANGER

During assembly, cleaning, maintenance and commissioning when close to energized components, an electric shock can cause serious injury or death.

➤ All work must be carried out only by technical personnel and when no power is applied!

➤ The reciprocator has to be free of load!

The motor gear box is self-lubricating and maintenance-free.

Observe the contamination of the enclosure – strong contamination on the outside can increase the operating temperature of the drive unit!

Therefore, clean the drive unit from time to time (with a vacuum cleaner etc.). If the drive unit gearbox has to be changed for any reason, the complete unit has to be replaced!
Replacing the drive unit

⚠️ CAUTION

Burn danger
There is the risk of burns if contact is made with electrical components that have become overheated!

► All work must be carried out only by technical personnel and when no power is applied!

If it is necessary to replace a drive unit gearbox, the complete motor unit must be dismantled from the reciprocator base. Therefore, the reciprocator has to be free of load and disconnected from mains.

⚠️ CAUTION

Danger of injury
► For safety reasons, two people should always carry out the following maintenance work!

Procedure:

1. Switch off the electric power
2. Release the motor brake manually, let the Z carriage move down onto the lower stop
3. Remove all cover plates from the reciprocator
4. Remove the locking plates (A) and loosen the tensioning screws (B), so that the toothed belt is slack
   - These screws may not be loosen for any reason (factory setting)!

   ![fig. 14: Top plate]

5. Loosen the lower clamp plate of the toothed belt on the Z carriage and set it down.
   - Note the position of the clamp plate on the drive belt holder, because it must be fitted in approximately the same position on assembly.
6. Loosen the grub screw on the clamp ring in front of the flange bearing
fig. 15: Flange bearing

7. Use an appropriate iron rod (from the side, in the hole of the clamp ring) and release the clamp ring from the motor spindle (counter-clockwise) with a hammer

8. Remove the clamp ring, but do not remove the flange bearing!

9. Release the clamping bracket and pull out the motor cable connector

10. Unfasten and remove the pulse generator from the motor spindle

11. Support the back of the motor in such a way it remains balanced and does not tilt backwards, when the motor flange screws are loosen

12. Loosen the motor flange screws

13. Remove the screws and carefully remove the motor from the rear of the reciprocator base

The installation takes place exactly in the reverse order!

**ATTENTION**

Incorrectly assembled parts may cause malfunctions or defects

► The assembly takes place in reverse order!

► The tightening torques are to be observed, when assembling!

---

**Toothed belt**

**CAUTION**

Injuries can arise if fingers, hair or articles of clothing get caught between the drive belt and the drive wheel or toothed wheel.

► All work must be carried out only by technical personnel.

The toothed drive belt should be checked regularly because it is exposed to large loads when in operation.

- The drive belt should be checked for wear and tension every 6 months. Powder deposits should be removed with a vacuum cleaner, because this can influence the quiet running and shorten the service life of the drive belt

- Switch on the reciprocator and check the Z carriage for quiet running. Check the toothed belt for elongation or wear (noisy running, strong vibration of the belt when reversing the direction of travel)
For safety reasons, two people should always carry out the following maintenance work!

Replacing the drive belt

Procedure:
1. Switch off the electric power
2. Release the motor brake manually, let the Z carriage move down onto the lower stop
3. Remove the side panels
4. Remove the locking plates (A) and loosen the tensioning screws (B), so that the toothed belt is slack
5. Loosen the lower clamp plate of the toothed belt on the Z carriage and set it down.
   – Note the position of the clamp plate on the drive belt holder, because it must be fitted in approximately the same position on assembly.
6. Remove the damaged drive belt from the reciprocator column
7. Loosen the screws on the upper clamp plate and remove the drive belt when it is completely outside of the reciprocator
8. Screw on the new drive belt at the upper clamp plate
9. Pass the loose end of the drive belt over the upper toothed drive wheel from inside the reciprocator column
10. Screw on the drive belt at the lower clamp plate
11. Tension the drive belt, but do not overstretch (see chapter “Tensioning the drive belt”)

Tensioning the drive belt

1. Remove the locking plates (A)
2. Tighten the drive belt evenly with the tensioning screws (B)

XX
These screws may not be loosen for any reason (factory setting)!

fig. 16: Top plate

3. Let the Z carriage slowly run up and down the column a few times, to see if the drive belt does not ride up on the toothed wheel
Drive wheel

Replacing the upper toothed drive wheel

The following workings should only be carried out by trained personnel!

Procedure:
1. Switch off the electric power
2. Release the motor brake manually, let the Z carriage move down onto the lower stop
3. Remove the side panels
4. Remove the locking plates (A) and loosen the tensioning screws (B), so that the toothed belt is slack
5. Completely remove the front tensioning screw

⚠️ CAUTION

Danger of accident!
► The Z carriage must definitely rest on the rubber buffer, before this tensioning screw is removed!

6. Hold the toothed drive wheel tight in one hand whilst the eye bolt is being removed from the spindle
7. Remove the toothed belt from the toothed wheel
8. Remove the toothed wheel and replace it

The installation takes place exactly in the reverse order!
– If necessary, remove the service cover on the base, to check if the toothed belt is sitting correctly on the toothed drive wheel
– Let the Z carriage slowly run up and down the column a few times, to see if the drive belt must be tensioned more (see chapter "Tensioning the drive belt")
Rollers – Z carriage

If the Z carriage starts to vibrate excessively during operation, especially at the reversing points, in most cases the cause lies in too much play in the carriage rollers, or even loose rollers!

![Rollers - Z carriage diagram]

**fig. 17: Rollers – Z carriage**

**In this case, proceed as follows:**

1. Switch off the electric power
2. Release the motor brake manually, let the Z carriage move down onto the lower stop
3. Remove the boarding (front and side panels)
4. Loosen the lock nut (32) on the grub screw (33)
5. Loosen the nut (34) on the roller axle bolt (30)

▶ Never loosen more than one roller at the same time!
▶ Adjust only one roller after another!

6. Adjust the roller pressure with the grub screw, in such a way that the roller (31) can just be turned by hand
7. Tighten the roller axle bolt (30) and the nut (34)

**Tightening torque: 50 Nm**
8. Tighten the grub screw (33) and secure it
9. Fit the panels again and fasten them firmly

The Z carriage should run evenly and quietly again!
Maintenance of the position regulator

The position regulator does not require a preventive maintenance. However, it is recommended to carry out the following inspections by the user in regular intervals:

- Check condition and tightness of the cable connections.

Replacing the position regulator

If a position regulator exchange was made, it is to be noted, that all shielded cables are properly attached again!

⚠️ WARNING

Electric shock hazard in contact with energized components

Keep the cover plate of the position regulator closed at all times!

► Before interventions take place in the device, the power supply must be switched off!
► After switching off the power supply, wait at least 10 min. before working on the equipment, because the internal condensers need this time for discharging!
# Fault clearance

**ATTENTION**

Malfunctions may be fixed by trained personnel only!

Error messages on the axis control or on the position regulator are also to be observed!

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Z carriage does not move</td>
<td>Z carriage overloaded</td>
<td>check the load</td>
</tr>
<tr>
<td></td>
<td>control unit defective</td>
<td>repair or replace</td>
</tr>
<tr>
<td></td>
<td>Connecting cables between the control unit and the axis not connected or defective</td>
<td>connect, repair</td>
</tr>
<tr>
<td></td>
<td>Drive motor defective</td>
<td>replace</td>
</tr>
<tr>
<td></td>
<td>position regulator defective</td>
<td>replace</td>
</tr>
<tr>
<td>No stroke or stroke too short</td>
<td>incorrect settings on the axis control</td>
<td>set correctly</td>
</tr>
<tr>
<td>Vertical axis is waggling</td>
<td>loose connecting bolts between vertical axis and horizontal axis or floor</td>
<td>check, if firmly fitted, otherwise tighten</td>
</tr>
<tr>
<td>The guns are vibrating badly during operation</td>
<td>rollers not tightened well or worn</td>
<td>adjust the counter rollers without clearance or replace them</td>
</tr>
<tr>
<td></td>
<td>loose gun clamping elements</td>
<td>tighten</td>
</tr>
<tr>
<td>Cracking noise during operation</td>
<td>rollers tightened too strong</td>
<td>adjust the counter rollers without clearance, ensure the correct tightening torque</td>
</tr>
<tr>
<td>Fault</td>
<td>Cause</td>
<td>Corrective action</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Squeaking noise during operation</td>
<td>toothed belt rides up on the flanged wheel</td>
<td>check the toothed belt, tension correctly, if necessary</td>
</tr>
<tr>
<td>The Z carriage runs into the lower stroke limit or into the lower stop and stops</td>
<td>pulse generator defective</td>
<td>replace the motor</td>
</tr>
<tr>
<td></td>
<td>control unit defective</td>
<td>repair or replace</td>
</tr>
<tr>
<td>The Z carriage runs into the upper stop</td>
<td>control unit defective</td>
<td>repair or replace</td>
</tr>
<tr>
<td></td>
<td>maximum upper stroke limit incorrectly set</td>
<td>set correctly</td>
</tr>
</tbody>
</table>
Disposal

Introduction

Safety regulations

⚠️ WARNING
Heavy components!
Falling components can lead to severe injuries
► Secure heavy components before and during disassembly

ENVIRONMENT
Improper disposal of operating material
Environmental hazard
► Drain the operating material into suitable containers
► Remove escaping operating material immediately
► Dispose of operating material in an environmentally friendly manner

Requirements on personnel carrying out the work

The disposal of the product is to be carried out by the owner or operator.
When disposing of components that are not manufactured by Gema, the instructions in the respective third-party manufacturer’s documentation must be observed.

Disposal regulations

⚠️ The product must be disassembled and disposed of properly at the end of its service life.
► When disposing of the product, the applicable local and regional laws, directives and environmental regulations must be complied with!
Materials
The materials must be sorted according to material groups and taken to the appropriate collection points.

Disposal of operating material
The operating material is very harmful to the environment if it is improperly disposed of. Therefore, the instructions and information contained in the safety data sheets must be adhered to when disposing of the operating material.

! The gear oil is considered to be a hazardous waste and must be disposed in an environmentally friendly manner.

Disassembly of component groups

Preparation

⚠️ WARNING
Live components!
Risk of fatal injury from electric shock if touched
- Only trained, authorized staff may open the electrical compartment
- Observe the safety symbols

1. Disconnect the mains supply, supply cables and additional units.
2. Remove all product covers.
3. Drain all existing lubricant supplies and dispose of accordingly.

The product is now prepared for disassembly.

! The instructions in the third-party manufacturer’s documentation must be followed!
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** OptiGun GA03 automatic powder gun
  - Serial number 1234 5678
- **Order no.** 203 386, 1 piece, Clamp – Ø 18/15 mm

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

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)

---

**ATTENTION**

Use of non-original Gema spare parts

When using the spare parts from other manufacturers the explosion protection is no longer guaranteed. If any damage is caused by this use all guarantee claims become invalid!

► Only original Gema spare parts should be used!
# ZA13 – complete

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drive unit – complete, see also &quot;Drive unit (complete)&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hexagon screw – M6x12 mm</td>
<td>1005 774</td>
</tr>
<tr>
<td>5</td>
<td>Cable lead-through – Ø 50 mm, 5+4</td>
<td>1004 006</td>
</tr>
<tr>
<td>6</td>
<td>Electrical module, see &quot;Electrical module&quot;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Z carriage – complete, see &quot;Z carriage&quot;</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Toothed wheel, see &quot;Toothed wheel&quot;</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Cable lead-through – Ø 50 mm, double</td>
<td>1004 007</td>
</tr>
<tr>
<td>12</td>
<td>Cable bush</td>
<td>1004 582</td>
</tr>
<tr>
<td>15</td>
<td>Cable gland for the cable feed-through</td>
<td>1003 578</td>
</tr>
<tr>
<td>16</td>
<td>Gun holder plate – complete</td>
<td>386 693</td>
</tr>
<tr>
<td></td>
<td>Gun holder plate – special (not shown)</td>
<td>1004 453</td>
</tr>
<tr>
<td></td>
<td>Spacer (not shown)</td>
<td>1004 456</td>
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<tr>
<td>17</td>
<td>Hexagon shakeproof screw – M8x20 mm</td>
<td>244 422</td>
</tr>
<tr>
<td>18</td>
<td>Hexagon shakeproof nut – M8</td>
<td>244 449</td>
</tr>
<tr>
<td>20</td>
<td>Milled nut – M6, brass</td>
<td>200 433</td>
</tr>
</tbody>
</table>

* Please indicate length
ZA13 – complete

fig. 18: ZA13 – complete
### Z carriage

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Code/Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carriage – fixed side (order specific)</td>
<td>contact Gema</td>
</tr>
<tr>
<td>2</td>
<td>Carriage – adjustable side (order specific)</td>
<td>contact Gema</td>
</tr>
<tr>
<td>3</td>
<td>Roller – complete</td>
<td>307 165#</td>
</tr>
<tr>
<td>4</td>
<td>Spacer sleeve</td>
<td>308 013</td>
</tr>
<tr>
<td>5</td>
<td>Hexagon screw – M10x110 mm</td>
<td>214 221</td>
</tr>
<tr>
<td>6</td>
<td>Hexagon screw – M10x100 mm</td>
<td>214 213</td>
</tr>
<tr>
<td>7</td>
<td>Hexagon ribbed nut – M10, black</td>
<td>234 656</td>
</tr>
<tr>
<td>9</td>
<td>Hexagon grub screw – M5x16 mm</td>
<td>237 744</td>
</tr>
<tr>
<td>10</td>
<td>Hexagon nut – M5</td>
<td>205 150</td>
</tr>
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</table>

# Wearing part

*fig. 19: Z carriage*
# Drive wheel

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eye bolt – M16</td>
<td>ZA13</td>
</tr>
<tr>
<td>2</td>
<td>Guide plate</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hexagon shakeproof nut – M8</td>
<td>244 449</td>
</tr>
<tr>
<td>4</td>
<td>Hexagon ribbed nut – M10</td>
<td>234 656</td>
</tr>
<tr>
<td>5</td>
<td>Counter profile – 40/20x115 mm</td>
<td>386 774</td>
</tr>
<tr>
<td>6</td>
<td>Drive wheel</td>
<td>386 600</td>
</tr>
<tr>
<td>7</td>
<td>Drive belt</td>
<td>1015 741</td>
</tr>
<tr>
<td></td>
<td>ZA13-13 – L=4215 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ZA13-18 – L=5215 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ZA13-23 – L=6215 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ZA13-28 – L=7215 mm</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Tensioning screw</td>
<td>386 596</td>
</tr>
<tr>
<td>9</td>
<td>Hexagon shakeproof screw – M6x12 mm</td>
<td>244 406</td>
</tr>
<tr>
<td>10</td>
<td>Locking plate</td>
<td>386 634</td>
</tr>
<tr>
<td>11</td>
<td>Hexagon shakeproof screw – M8x20 mm</td>
<td>244 422</td>
</tr>
<tr>
<td>12</td>
<td>Toothed drive wheel spindle</td>
<td>386 766</td>
</tr>
<tr>
<td>13</td>
<td>Spacer ring – Ø 31.9/28x11 mm</td>
<td>386 618</td>
</tr>
<tr>
<td>14</td>
<td>Deep groove ball bearing – Ø 15/32x9 mm</td>
<td>241 709</td>
</tr>
<tr>
<td>15</td>
<td>Snap ring – A-15</td>
<td>233 617</td>
</tr>
<tr>
<td>16</td>
<td>Snap ring – I-32</td>
<td>245 780</td>
</tr>
<tr>
<td>17</td>
<td>Eye bolt – M10x60 mm</td>
<td>264 202</td>
</tr>
<tr>
<td>18</td>
<td>Rubber buffer – Ø 35x40 mm, M8</td>
<td>211 664</td>
</tr>
<tr>
<td>19</td>
<td>Stop plate</td>
<td>386 782</td>
</tr>
<tr>
<td>20</td>
<td>Ribbed washer – M10</td>
<td>237 981</td>
</tr>
<tr>
<td>21</td>
<td>Hexagon screw – M10x180 mm</td>
<td>201 855</td>
</tr>
</tbody>
</table>

* Please indicate length

# Wearing part
Drive wheel

fig. 20: Drive wheel
## Drive unit (complete)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motor-gearbox unit – 0.75 kW, complete (incl. pos. 2)</td>
<td>1014 336</td>
</tr>
<tr>
<td>2</td>
<td>Plug insert – 10-P</td>
<td>211 540</td>
</tr>
<tr>
<td>6</td>
<td>Spacer ring – Ø 30/25.2x5 mm</td>
<td>386 626</td>
</tr>
<tr>
<td>7</td>
<td>Pulse generator</td>
<td>268 925</td>
</tr>
<tr>
<td>8</td>
<td>Hexagon screw – M10x25 mm</td>
<td>214 116</td>
</tr>
<tr>
<td>9</td>
<td>Toothed drive belt wheel</td>
<td>368 610</td>
</tr>
<tr>
<td>10</td>
<td>Clamping set – Ø 25/50x22 mm</td>
<td>264 199</td>
</tr>
<tr>
<td>11</td>
<td>Hexagon ribbed nut – M10</td>
<td>234 656</td>
</tr>
<tr>
<td>12</td>
<td>Flange bearing – Ø 25 mm</td>
<td>264 210</td>
</tr>
<tr>
<td>13</td>
<td>ZA Motor-/brake cable – complete (incl. pos. 14)</td>
<td>1004 018</td>
</tr>
<tr>
<td>14</td>
<td>Socket insert – 10-P</td>
<td>211 532</td>
</tr>
<tr>
<td>15</td>
<td>Brake release plate</td>
<td>1009 806</td>
</tr>
<tr>
<td>16</td>
<td>Grip</td>
<td>1009 808</td>
</tr>
<tr>
<td>17</td>
<td>Screw – M6x60 mm</td>
<td>213 888</td>
</tr>
<tr>
<td>18</td>
<td>Compression spring</td>
<td>1000 565</td>
</tr>
<tr>
<td>19</td>
<td>Brake resistor – 100 Ohm/600 W, complete, incl. heat sink</td>
<td>800 397</td>
</tr>
<tr>
<td>20</td>
<td>Heat sink holder</td>
<td>1003 978</td>
</tr>
<tr>
<td>21</td>
<td>Cap screw</td>
<td>1002 965</td>
</tr>
</tbody>
</table>

*fig. 21: Drive unit (complete)*
### Proximity switch

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hexagon screw – M10x180 mm</td>
<td>201 855</td>
</tr>
<tr>
<td>2</td>
<td>Ribbed washer – M10</td>
<td>237 981</td>
</tr>
<tr>
<td>3</td>
<td>Stop plate</td>
<td>386 782</td>
</tr>
<tr>
<td>4</td>
<td>Rubber buffer – Ø 35x40 mm, M8</td>
<td>211 664</td>
</tr>
<tr>
<td>5</td>
<td>Counter profile – 40/20x115 mm</td>
<td>386 774</td>
</tr>
<tr>
<td>6</td>
<td>Limit switch holder</td>
<td>1003 980</td>
</tr>
<tr>
<td>7</td>
<td>Hexagon ribbed nut – M10</td>
<td>234 656</td>
</tr>
<tr>
<td>8</td>
<td>Proximity switch</td>
<td>262 927</td>
</tr>
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*fig. 22: Proximity switch*
Electrical module

For all electric components, see also the Spare parts list in the enclosed wiring diagram!

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part No.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Position regulator CDB-ZA13 (please indicate the axis serial number – see Rating plate)</td>
<td>1014 821</td>
</tr>
<tr>
<td>2</td>
<td>CAN bus cable</td>
<td>1011 646</td>
</tr>
<tr>
<td>3</td>
<td>Adhesive seal strip</td>
<td>103 357*</td>
</tr>
<tr>
<td>4</td>
<td>Relay – 24 VDC/2 W</td>
<td>269 700</td>
</tr>
<tr>
<td>5</td>
<td>Grip</td>
<td>1006 013</td>
</tr>
<tr>
<td>6</td>
<td>Mains cable – 20 m (not shown)</td>
<td>1004 113</td>
</tr>
<tr>
<td>7</td>
<td>Signal cable 24 V Control – 20 m (not shown)</td>
<td>1008 431</td>
</tr>
<tr>
<td>8</td>
<td>Signal cable CAN bus – 20 m (not shown) – for installations up to 4 axes</td>
<td>389 560</td>
</tr>
<tr>
<td>9</td>
<td>Signal cable CAN bus – 20 m (not shown) – for installations with 5 and more axes</td>
<td>1010 408</td>
</tr>
<tr>
<td>10</td>
<td>CAN bus terminal plug (not shown)</td>
<td>387 606</td>
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<tr>
<td>10.1</td>
<td>Protection cap (not shown)</td>
<td>265 446</td>
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</table>

* Please indicate length

**fig. 23: Electrical module**
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>About these instructions</td>
<td>7</td>
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<tr>
<td>Assembly</td>
<td>25</td>
</tr>
<tr>
<td>B</td>
<td></td>
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<td>Basic safety instructions</td>
<td>9</td>
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<tr>
<td>C</td>
<td></td>
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<tr>
<td>Connection</td>
<td>25</td>
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<td>Decommissioning</td>
<td>35</td>
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<td>Dimensions</td>
<td>22</td>
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<tr>
<td>Disposal</td>
<td>49</td>
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<tr>
<td>Drive unit data</td>
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<td>E</td>
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<td>Maintenance</td>
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<td>Pictograms</td>
<td>7</td>
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<td>Presentation of the contents</td>
<td>8</td>
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<tr>
<td>Product description</td>
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<tr>
<td>Product specific security</td>
<td>9</td>
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