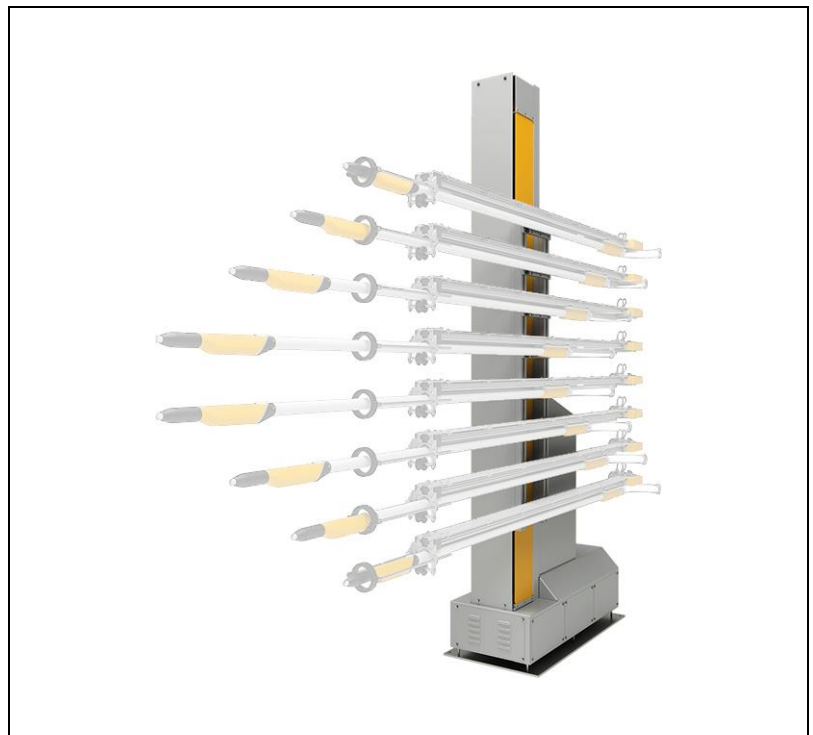


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Operating instructions and Spare parts list

# Vertical axis ZA16



Translation of the original operating instructions

**Documentation ZA16**

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# Table of contents

<b>About these instructions</b>	<b>7</b>
General information .....	7
Keeping the Manual .....	7
Safety symbols (pictograms).....	7
Presentation of the contents .....	8
Figure references in the text .....	8
<b>Safety</b>	<b>9</b>
Basic safety instructions .....	9
Product specific security regulations .....	9
Special safety regulations .....	10
<b>Transport</b>	<b>13</b>
Introduction .....	13
Requirements on personnel carrying out the work .....	13
Packaging .....	13
Selection of packing material .....	13
Procedure when packing .....	13
Transport.....	13
Data concerning goods to be transported.....	13
Loading, transferring the load, unloading .....	13
<b>Product description</b>	<b>15</b>
Intended use .....	15
Utilization.....	16
Reasonably foreseeable misuse.....	16
Function .....	16
Schematic presentation .....	17
Special characteristics .....	18
Expansion with additional axes of motion.....	18
CDB position regulator with CAN BUS (Power unit).....	19
Technical Data .....	20
Versions .....	20
Electrical data .....	20
Drive unit data .....	20
Dimensions .....	21
Sound pressure level .....	21
Rating plate .....	22
<b>Assembly / Connection</b>	<b>23</b>
Grounding of the axis.....	24
Electrical connections / cable connections .....	25
<b>Start-up</b>	<b>27</b>
Preparation for start-up .....	27
General information .....	27

Reference point .....	28
Reference point and mechanical stops .....	28
Setting the reference point .....	28
Setting the lower mechanical stop.....	29
Setting the upper mechanical stop .....	30
<b>Operation</b>	<b>31</b>
<b>Decommissioning / Storage</b>	<b>33</b>
Introduction .....	33
Safety rules.....	33
Requirements on personnel carrying out the work.....	33
Storage conditions .....	33
Hazard notes .....	33
Type of storage.....	34
Storage duration .....	34
Space requirements .....	34
Physical requirements .....	34
Decommissioning .....	34
Putting out of service .....	34
Cleaning.....	34
Preservation .....	34
Maintenance during storage .....	35
Maintenance schedule.....	35
Maintenance works.....	35
<b>Maintenance / Repairs</b>	<b>37</b>
General information .....	37
Maintenance schedule.....	38
Drive unit.....	38
Replacing the drive unit .....	39
Toothed belt.....	40
Replacing the toothed belt.....	41
Tensioning the drive belt .....	41
Tension the toothed belt with the belt tension measuring device.....	42
Toothed wheel .....	42
Replacing the upper toothed drive wheel .....	42
Rollers – Z carriage .....	44
Maintenance of the position regulator .....	45
Replacing the position regulator .....	45
<b>Fault clearance</b>	<b>47</b>
<b>Disposal</b>	<b>49</b>
Introduction .....	49
Safety regulations .....	49
Requirements on personnel carrying out the work.....	49
Disposal regulations .....	49
Materials .....	50
Disposal of operating material.....	50
Disassembly of component groups .....	50
Preparation .....	50
<b>Spare parts list</b>	<b>51</b>
Ordering spare parts.....	51
ZA16 – complete .....	52
ZA16 – complete .....	53

Toothed wheel.....	54
Toothed wheel.....	55
Z carriage.....	56
Drive unit (complete).....	57
Proximity switch .....	58
Electrical module.....	59



# About these instructions

---

## General information

This operating manual contains all the important information which you require for the working with the ZA16. 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.

---

## 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.

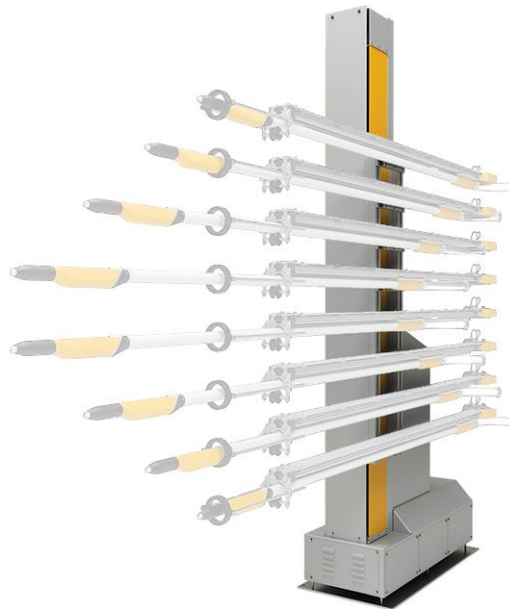


# Product description

---

## Intended use

The ZA16 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 ZA16 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 U-axis brackets are screwed onto 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.

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.



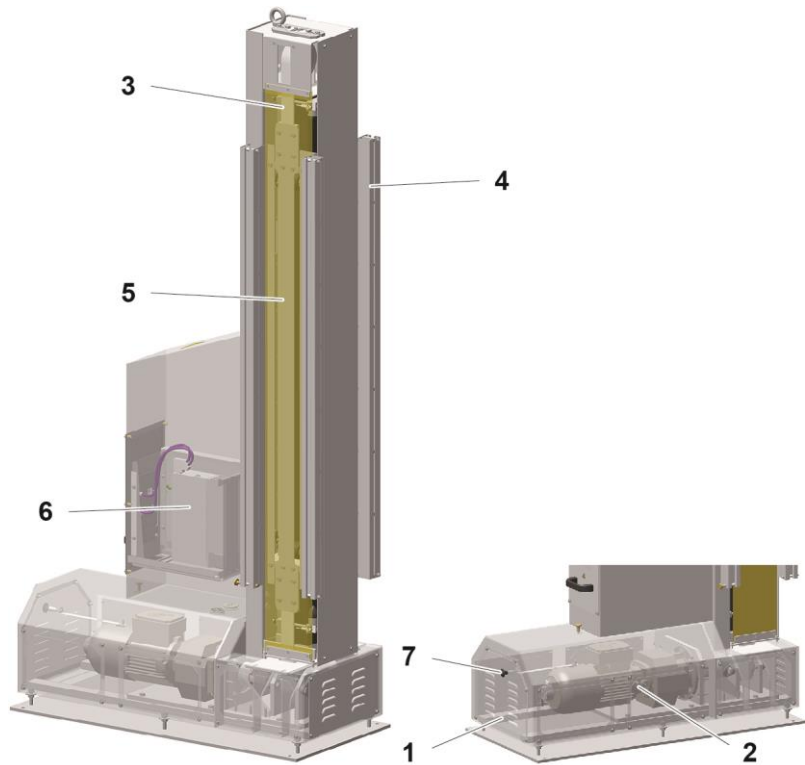


fig. 2: Structure

- |   |                |   |               |
|---|----------------|---|---------------|
| 1 | Basement       | 5 | Z carriage    |
| 2 | Drive unit     | 6 | Power unit    |
| 3 | Toothed belt   | 7 | Holding brake |
| 4 | U-axis bracket |   |               |

### Schematic presentation

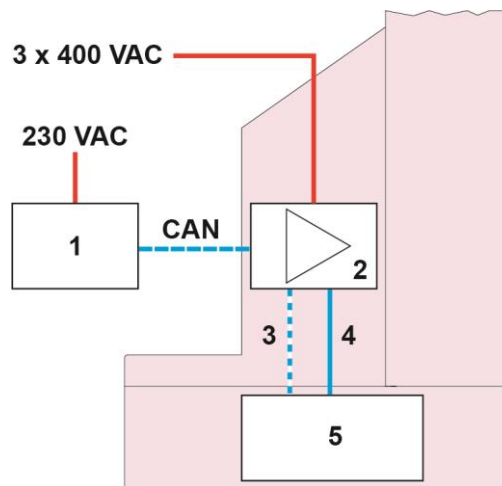


fig. 3: Schematic presentation

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

## Special characteristics

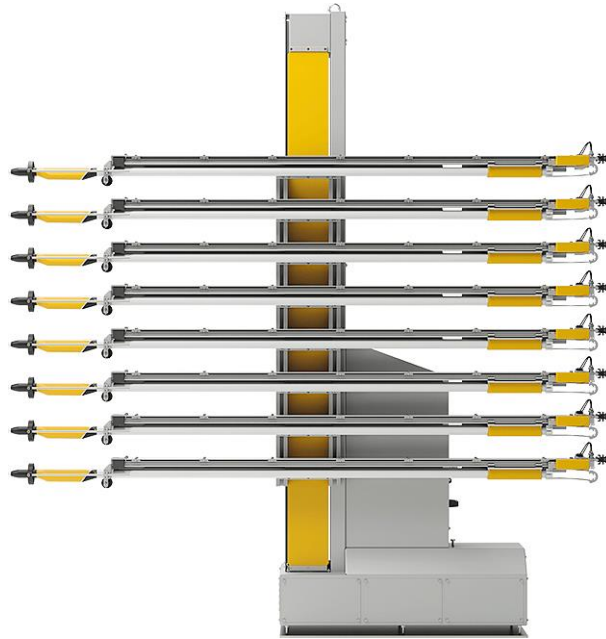
This axis is conspicuous because of its rugged construction, a new drive system and an improved Z axis carriage design.

Further characteristics:

- 130 kg load capacity for max. 8 gun axes type UA05
- 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
- IP54 protection type
- 5 standard stroke heights available: 1.3 m / 1.8 m / 2.3 m / 2.8 m / 3.3 m

## Expansion with additional axes of motion

The vertical axis can be equipped with UA05 gun axes to expand its functionality. A maximum of 8 gun axes can be mounted.



*fig. 4: ZA16 with eight UA05*

---

## CDB position regulator with CAN BUS (Power unit)



*fig. 5: CDB position regulator with CAN BUS*

- |  |                               |
|--|-------------------------------|
| X1 Load connections (Mains voltage, Motor)         | X4 RS 232 Interface           |
| X2 Control connection                              | X5 CAN addresses              |
| X3 Motor winding temperature monitoring (optional) | X6 not occupied               |
|  | X7 Pulse generator connection |

## Technical Data

### Versions

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

ZA16-	13	18	23	28	33
Reciprocator height – H	2.385 m	2.885 m	3.385 m	3.885 m	4.385 m
Max. object height – L	1.795 m	2.295 m	2.795 m	3.295 m	3.795 m
Weight	195 kg	220 kg	240 kg	261 kg	281 kg
Stroke speed	0.08 up to 0.4 m/s				
Acceleration	0.1-1.5 m/s <sup>2</sup>				
Position detection	by pulse generator				
Max. lifting weight	max. 130 kg on the Z carriage (max. 8 UA05 axes)				

### Electrical data

ZA16	
Power supply	3 x 400 VAC
Tolerance	± 10%
Frequency	50/60 Hz
Power consumption	1.5 kW
Protection type	IP54
Isolation	Class F
Control unit	CM40
Temperature range	+10°C - +40°C (50°F - 104°F)

### Drive unit data

ZA16	
Drive unit	Motor/gearbox unit
Performance	1.5 kW
Motor voltage/frequency	3 x 400 VAC, 50 Hz
Gear ratio	24.58
Motor RPM	1420 rpm
Drive torque	430 Nm
Brake torque	10 Nm
Approval	II 3D ExtD T<160°C

### Dimensions

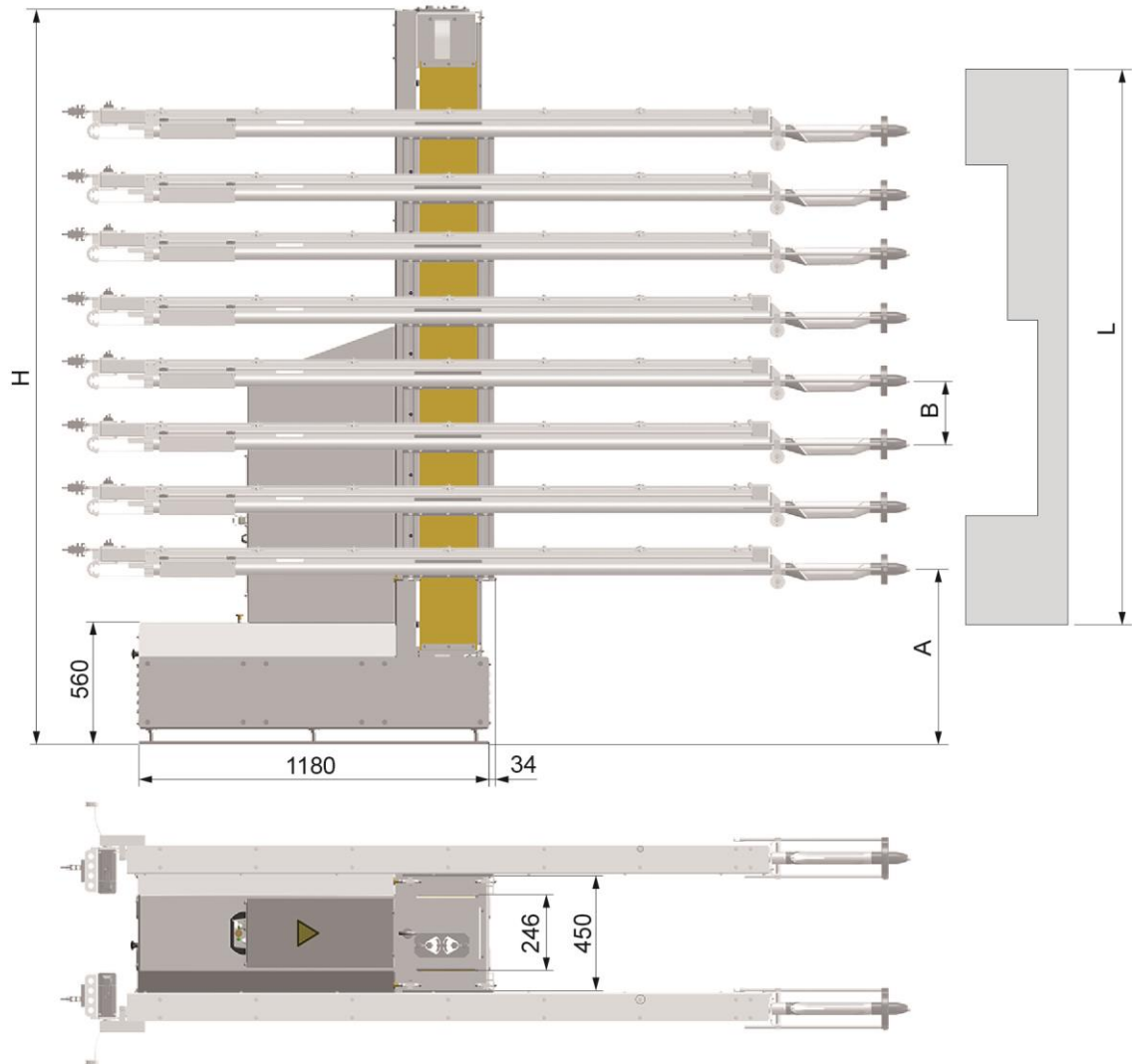


fig. 6: Dimensions (in mm)

- A = 450 mm Lower reversing point
- B = 110 mm Min. vertical distance

### Sound pressure level

<b>ZA16</b>	
Normal operation	< 60 dB(A)

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.

## Rating plate

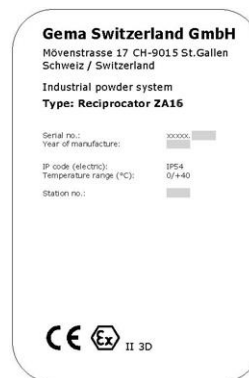


fig. 7: Rating plate



---

**Fields with a gray background contain contract-specific data!**

---

# 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

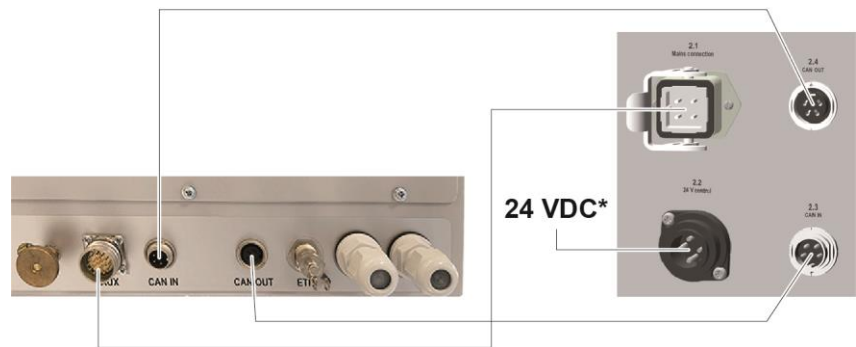


fig. 9: Connections: CM40 control unit – vertical axis

- \* 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!

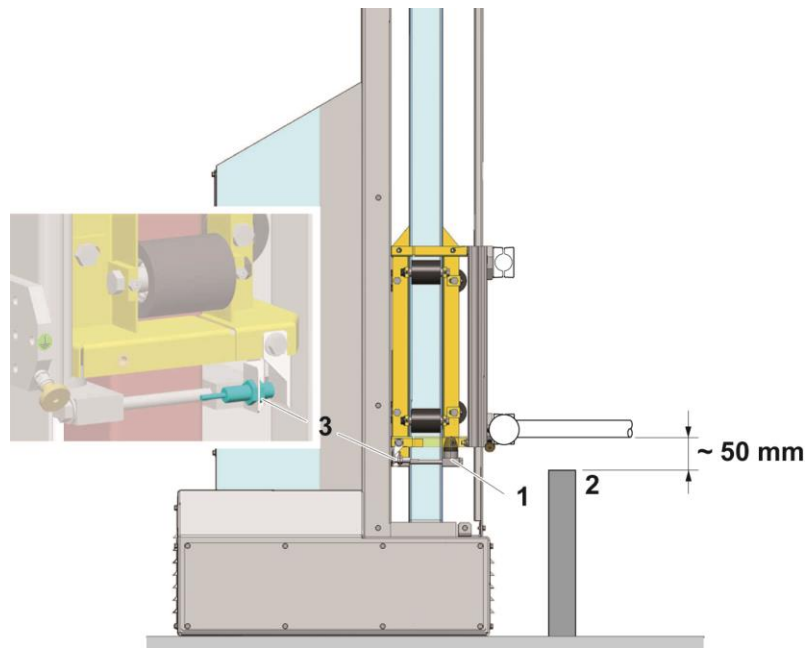


fig. 10: Reference point and mechanical stops

- |   |                               |   |                     |
|---|-------------------------------|---|---------------------|
| 1 | Stop plate with rubber buffer | 2 | Gun slot lower edge |
|   |                               | 3 | Proximity switch    |

### 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 covers



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 covers



**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 CMxx control unit.



*fig. 11: MagicControl CM40 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!





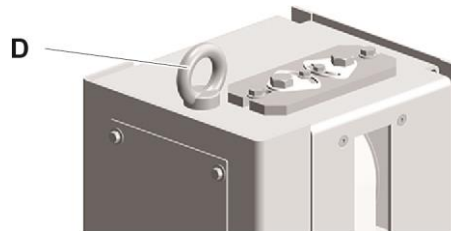
# Decommissioning / Storage

---

## Introduction

### Safety rules

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 trained 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.



fig. 13

## 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/m<sup>2</sup>.

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

---

## 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!

### WARNING

**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.

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 components or modules are subject to a maintenance schedule:

	Component	Activity	Tool	Interval
1		Check for unusual noises	–	1 x weekly
2	Side walls	Check for powder residues and clean	Air guns Soft cloth	1 x weekly
3	Drive unit	Check for oil loss	–	1 x monthly
4	Motor case in the reciprocator base	Check for powder dust deposits and clean	–	1 x monthly
5	Toothed belt	Check for wear and tension	–	1 x every 6 months
6	Rollers – Z carriage	Check for free movement and wear	–	1 x every 6 months
7	Column	Check for wear and deposits and clean it	–	1 x every 6 months
8	Ground connection	Check	–	1 x annually
9	All electrical screw and clamp connections	Check if firmly fitted	–	1 x annually



**The specified intervals are based on operation of 8 hours per day.**

## Drive unit

### DANGER

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

- ▶ All work must be carried out only by trained personnel and when no power is applied!
- ▶ Verify that the parts are deenergized by means of a voltmeter!
- ▶ The vertical axis 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!

#### Risk of burns

**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 trained 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.

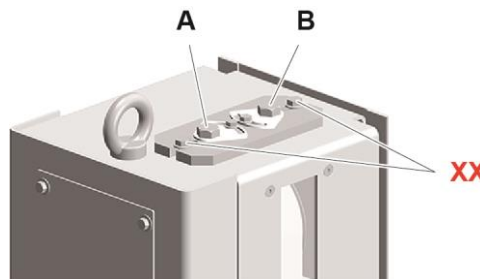
### ⚠ Caution!

#### Danger of injury

- ▶ For safety reasons, two people should always carry out the following maintenance work!

#### Procedure:

1. Switch off the power supply.
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 lateral covers
5. Remove the locking plates (A) and loosen the tensioning screws (B), so that the toothed belt is slack

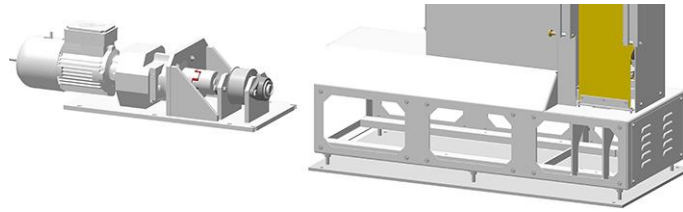


#### XX

These screws may **not** be loosened for any reason (factory setting)!

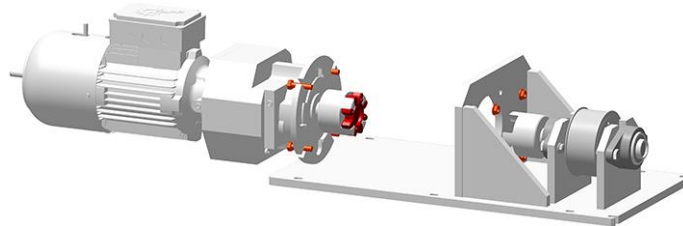
fig. 14: Top plate

6. 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 during assembly.
7. Unfasten and remove the pulse generator from the motor spindle
8. Loosen the screws and pull out the electric module
9. Release the motor cable on the position regulator and pull it out through the cable lead-through
10. Loosen 6 screws and carefully remove the base plate and drive unit from the base

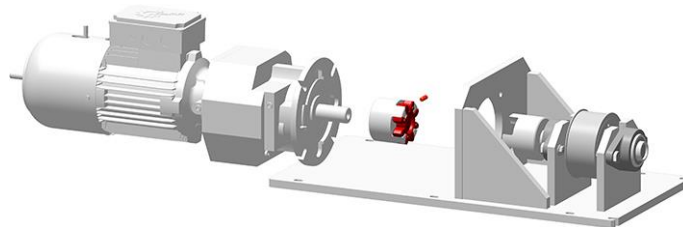


- The individual parts can now be removed and replaced

11. Loosen 4 flange bolts and remove the defective motor-gearbox unit



12. Loosen the grub screw and pull the coupling half off the motor shaft



13. Install new motor-gearbox unit

**The installation takes place exactly in the reverse order!**

### ATTENTION

**Incorrectly assembled parts may cause malfunctions or defects**

- ▶ Reassembly is in reverse order!
- ▶ Observe the tightening torques when assembling!

## Toothed belt

### ⚠ Caution!

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

- ▶ All work must be carried out only by trained personnel.

The toothed belt is exposed to high loads during operation and must therefore be checked regularly:

- Check the toothed belt every six months for wear and tension. Powder deposits should be removed with a vacuum cleaner, because this can influence the quiet running and shorten the service life of the toothed 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!**

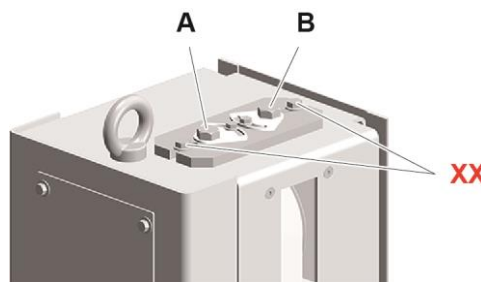
## Replacing the toothed belt

### Procedure:

1. Switch off the power supply.
2. Release the motor brake manually, let the Z carriage move down onto the lower stop
3. Remove lateral covers
4. Remove the locking plates (**A**) and loosen the tensioning screws (**B**), so that the toothed belt is slack
5. On the Z carriage, loosen the lower and upper clamping plates
  - Note the position of the clamp plate on the drive belt holder, because it must be fitted in approximately the same position during assembly.
6. Remove the damaged drive belt from the reciprocator column
7. Screw on the new drive belt at the upper clamp plates
8. Pass the loose end of the drive belt over the upper toothed drive wheel from inside the reciprocator column
9. Screw on the drive belt at the lower clamp plates
10. 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**)



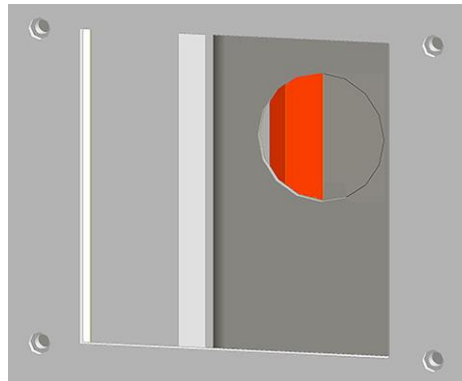
**XX**  
These screws may **not** be loosened for any reason (factory setting)!

fig. 15: 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

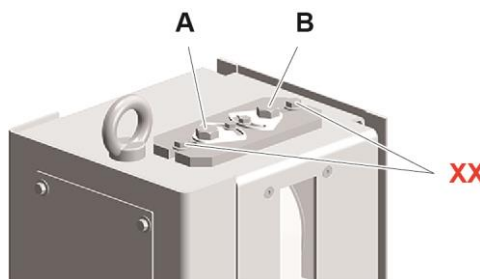
## Tension the toothed belt with the belt tension measuring device

1. Remove the cover from the inspection opening



2. Pluck the toothed belt and set it into vibration.
  - The natural frequency generated in this way is measured by the measuring device. The tension is calculated from the measured data.
3. Tighten the toothed belt evenly with the clamping screws (**B**) until the required tension is reached:

<b>1900 – 2000 N</b>	without loading the Z-carriage
<b>2000 – 2200 N</b>	with loaded Z carriage (6 UA05 axes = approx. 100 kg)



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

fig. 16: Top plate

4. 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

## Toothed wheel

### Replacing the upper toothed drive wheel



The following work must only be carried out by trained personnel!

#### Procedure:

1. Switch off the power supply.
2. Release the motor brake manually, let the Z carriage move down onto the lower stop

3. Remove the front 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!

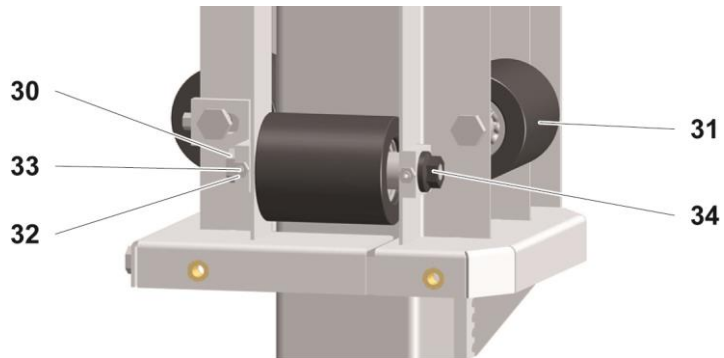


fig. 17: Rollers – Z carriage

**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!
  - ▶ Verify that the parts are deenergized by means of a voltmeter!
-



# 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!**

Fault	Cause	Corrective action
The Z carriage does not move	Z carriage overloaded	check the load
	control unit defective	repair or replace
	Connecting cables between the control unit and the axis not connected or defective	connect, repair
	Drive motor defective	replace
	position regulator defective	replace
No stroke or stroke too short	incorrect settings on the axis control	set correctly
Vertical axis is wagging	loose connecting bolts between vertical axis and horizontal axis or floor	check, if firmly fitted, otherwise tighten
The guns are vibrating badly during operation	rollers not tightened well or worn	adjust the counter rollers without clearance or replace them
	loose gun clamping elements	tighten
Cracking noise during operation	rollers tightened too strong	adjust the counter rollers without clearance, ensure the correct tightening torque

Fault	Cause	Corrective action
Squeaking noise during operation	toothed belt rides up on the flanged wheel	check the toothed belt, tension correctly, if necessary
The Z carriage runs into the lower stroke limit or into the lower stop and stops	pulse generator defective	replace the pulse generator
	control unit defective	repair or replace
The Z carriage runs into the upper stop	control unit defective	repair or replace
	maximum upper stroke limit incorrectly set	set correctly



# 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 your product, please indicate the following specifications:

- Type and serial number of your product
- Order number, quantity and description of each spare part

**Example:**

- **Type** Vertical axis ZA16  
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 \*.

The wearing parts are always marked with a #. marked.

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**

**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!
-

---

## ZA16 – complete

---

1	Drive unit – complete, see also "Drive unit (complete)"	
3	Hexagon screw – M6x12 mm	1005 774
5	Cable lead-through – Ø 50 mm, 5+4	1004 006
6	Electrical module, see "Electrical module"	
7	Z carriage – complete, see "Z carriage"	
8	Toothed wheel, see "Toothed wheel"	
11	Cable lead-through – Ø 50 mm, double	1004 007
12	Cable bush	1004 531
15	Cable gland for the cable feed-through	1003 578
17	Cylinder screw – M6x25 mm	216 437
18	Countersunk screw – M5x16 mm	262 986

\* Please indicate length

# ZA16 – complete

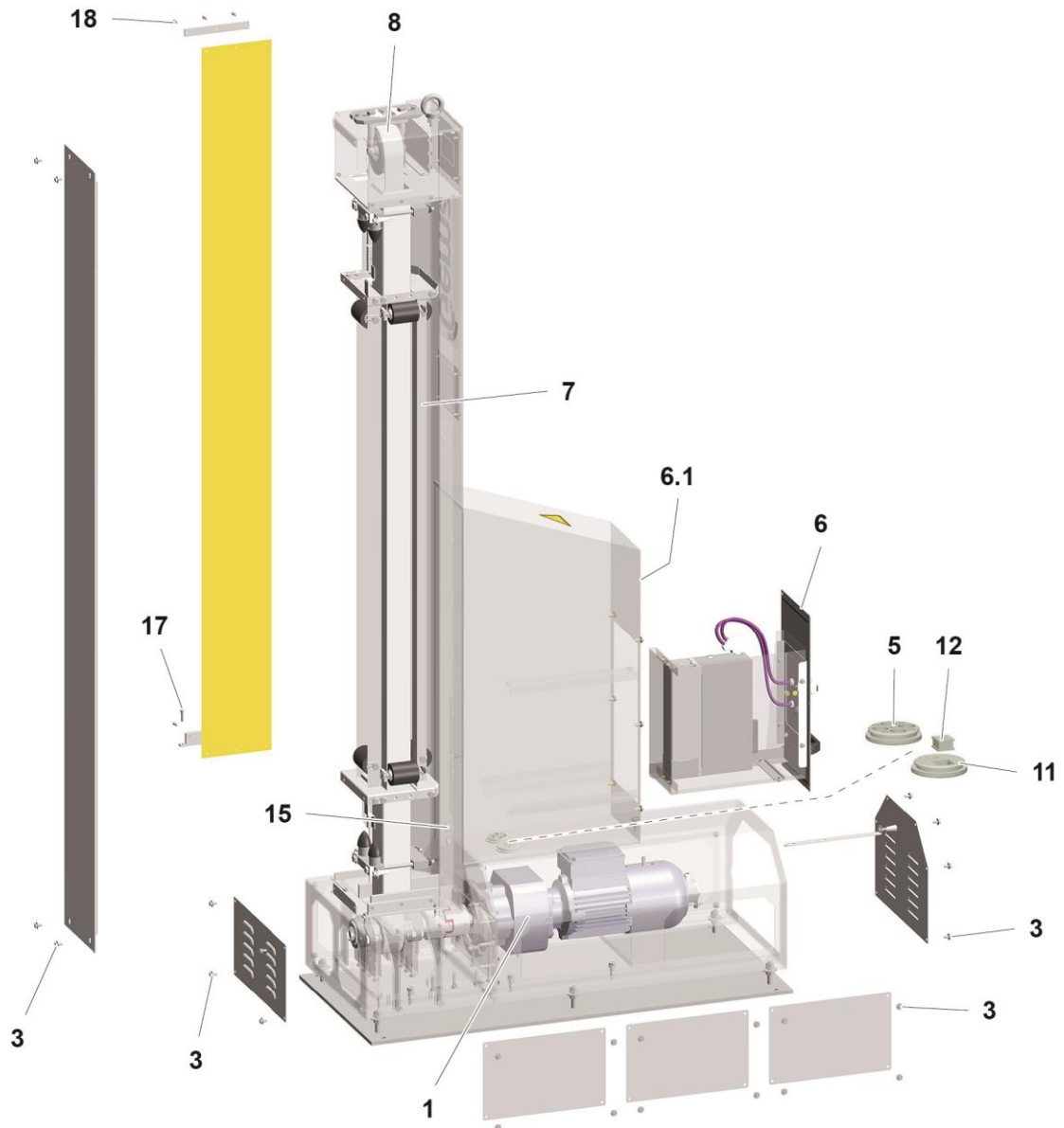


fig. 18: ZA16 – complete

## Toothed wheel

1	Eye bolt – M16	264 415
2	Guide plate	1019 229
3	Hexagon shakeproof nut – M8	244 449
4	Hexagon ribbed nut – M10	234 656
5	Counter profile – 40/20x115 mm	386 774
6	Toothed wheel	1020 717
7	Toothed belt	1019 225#*
	ZA16-13 – L=4200 mm**	
	ZA16-18 – L=5200 mm**	
	ZA16-23 – L=6200 mm**	
	ZA16-28 – L=7200 mm**	
	ZA16-33 – L=8200 mm**	
8	Tensioning screw	1019 230
9	Hexagon shakeproof screw – M6x10 mm	1010 337
10	Locking plate	386 634
11	Hexagon shakeproof screw – M8x20 mm	244 422
12	Toothed drive wheel spindle	1020 840
13	Spacer ring	1020 849
14	Deep groove ball bearing – Ø 15/52x15 mm	258 415
15	Snap ring – A-25	237 094
16	Snap ring – I-52	209 864
17	Eye bolt – M12x60 mm	1020 837
18	Rubber buffer – Ø 35x40 mm, M8	211 664
19	Stop plate	1022 575
20	Proximity switch	1017 650
21	Hexagon screw – M10x180 mm	201 855
22	Sensor holder	1022 576

\* Please indicate length

\*\* Must be shortened to the effective length during assembly

# Wearing part

# Toothed wheel

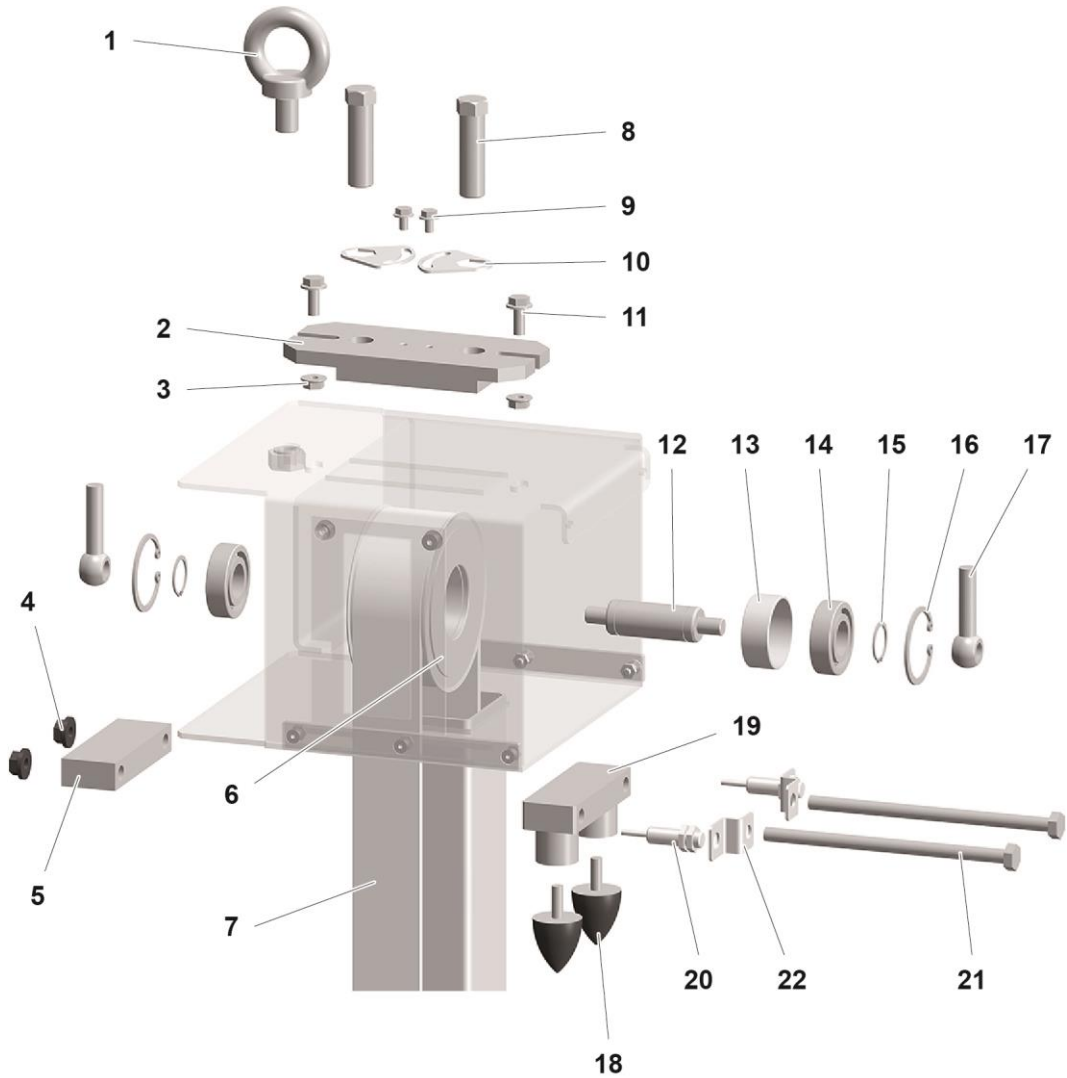


fig. 19: Toothed wheel

## Z carriage

1	Carriage – fixed side (without pos. 9, 10)	order specific
2	Carriage – removable side (without pos. 9, 10)	order specific
3	Roller – complete	307 165#
4	Spacer sleeve	308 013
5	Hexagon screw – M10x110 mm	214 221
6	Hexagon screw – M10x100 mm	214 213
7	Hexagon ribbed nut – M10, black	234 656
9	Hexagon grub screw – M5x16 mm	237 744
10	Hexagon nut – M5	205 150

# Wearing part

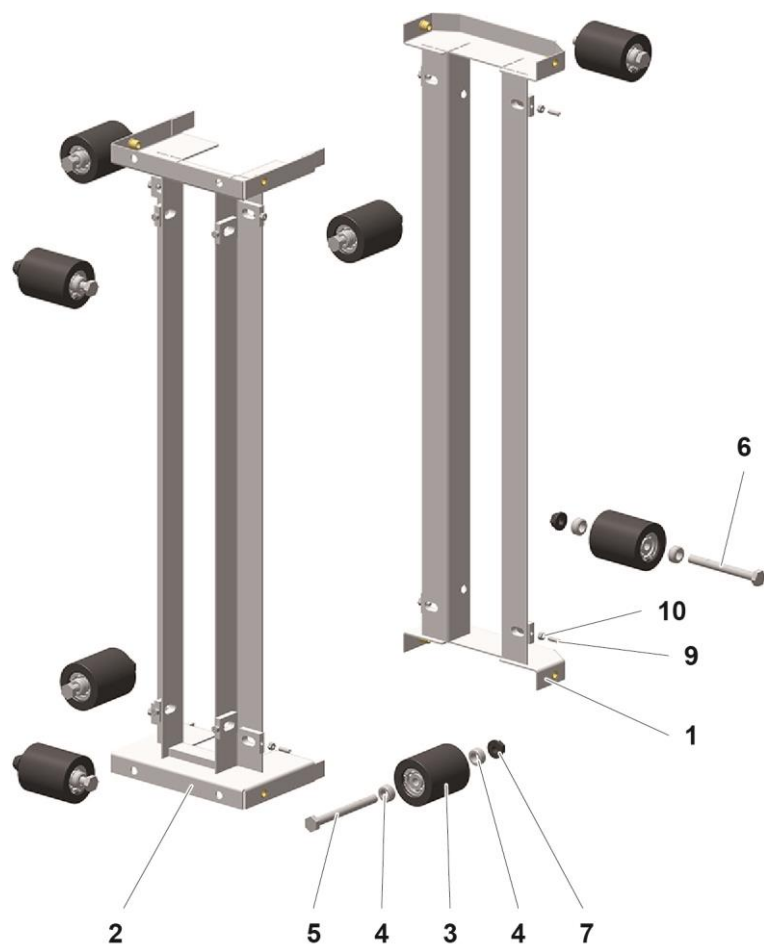


Fig. 20: Z carriage



## Drive unit (complete)

1	Motor/gearbox unit – 1.5 kW, complete	1022 545
2	Pulse generator	264 652
3	Coupling – complete (incl. pos 4 and 5)	1022 544
4	Feather key – 8x7x32 mm	1022 548
5	Grub screw – M8x25 mm	1001 315
6	Drive shaft	1022 541
7	Flange bearing – Ø 30 mm	1022 547
8	Toothed drive belt wheel	1022 543
9	Clamping set – Ø 30/55x2 mm	1022 546
10	Bearing pin	1022 542
11	Hexagon shakeproof nut – M10	1010 313
12	Brake release plate	1022 584
13	Handle	1009 808
14	Screw – M6x60 mm	213 888
15	Compression spring	1000 565

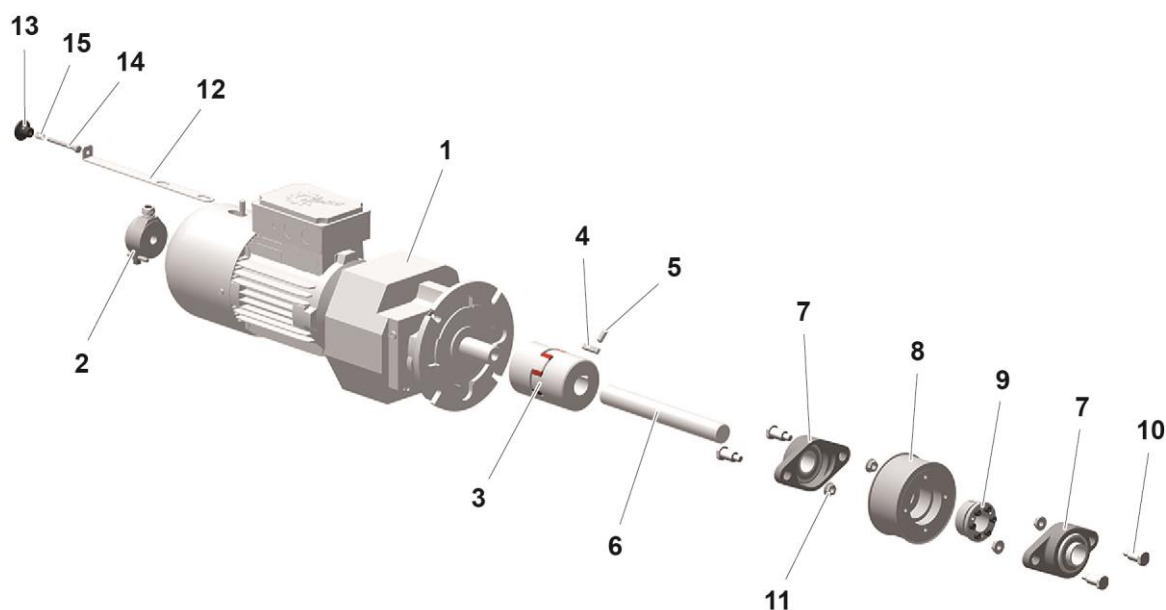


fig. 21: Drive unit (complete)

## Proximity switch

1	Hexagon screw – M10x180 mm	201 855
3	Stop plate	1022 575
4	Rubber buffer – Ø 35x40 mm, M8	211 664
5	Counter profile – 40/20x115 mm	386 774
6	Limit switch holder	1022 576
7	Hexagon ribbed nut – M10	234 656
8	Proximity switch	1017 650

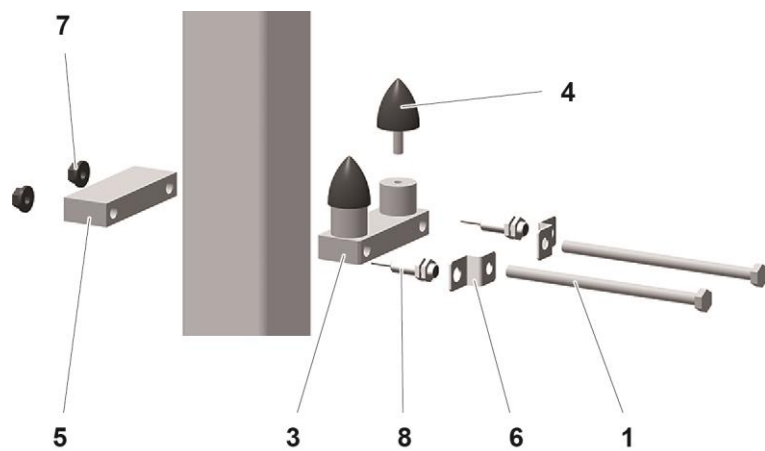


fig. 22: Proximity switch

## Electrical module



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

1	Position regulator CDB (please indicate the axis serial number – see Rating plate)	1022 553
2	CAN bus cable	1022 650
3	Adhesive seal strip	103 357*
7	Grip	1006 013
8	Mains cable – 20 m (not shown)	1022 652
9	Signal cable 24 V Control – 20 m (not shown)	1008 431
10	Signal cable CAN bus – 20 m (not shown) – for installations up to 4 axes	389 560
10.1	Signal cable CAN bus – 20 m (not shown) – for installations with 5 and more axes	1010 408
	CAN bus terminal plug (not shown)	387 606
	Protection cap (not shown)	265 446

\* Please indicate length

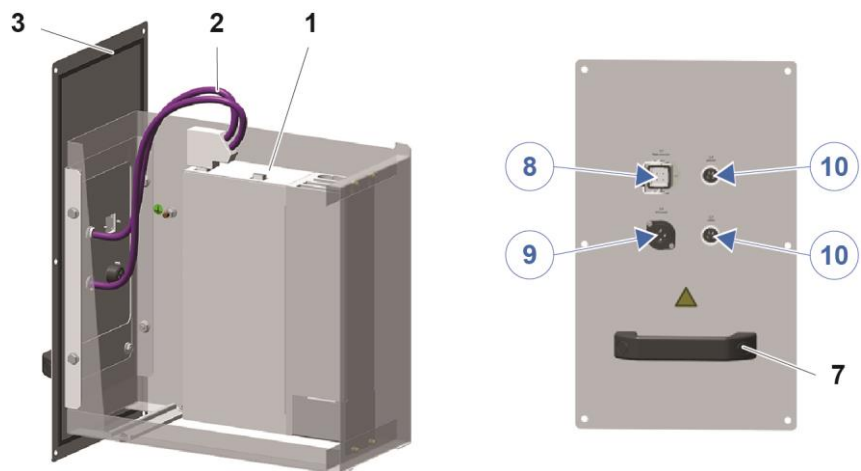


Fig. 23: Electrical module



# Index

## A

About these instructions.....	7
Assembly.....	23

## B

Basic safety instructions.....	9
--------------------------------	---

## C

Connection .....	23
------------------	----

## D

Decommissioning.....	33
Dimensions .....	21
Disposal.....	49
Drive unit data .....	20

## E

Electrical data.....	20
Electrical module.....	59

## F

Fault clearance.....	47
Figure references in the text .....	8

## M

Maintenance.....	37
------------------	----

## O

Operation.....	31
----------------	----

## P

Pictograms.....	7
Presentation of the contents.....	8
Product description.....	15
Product specific security regulations .....	9

## R

Rating plate.....	22
Repairs .....	37

## S

Safety.....	9
Safety symbols .....	7
Sound pressure level.....	21
Spare parts list.....	51
Start-up.....	27
Storage .....	33

## T

Technical Data.....	20
Transport .....	13

## V

Versions.....	20
---------------	----

