# *Operating and maintenance manual*

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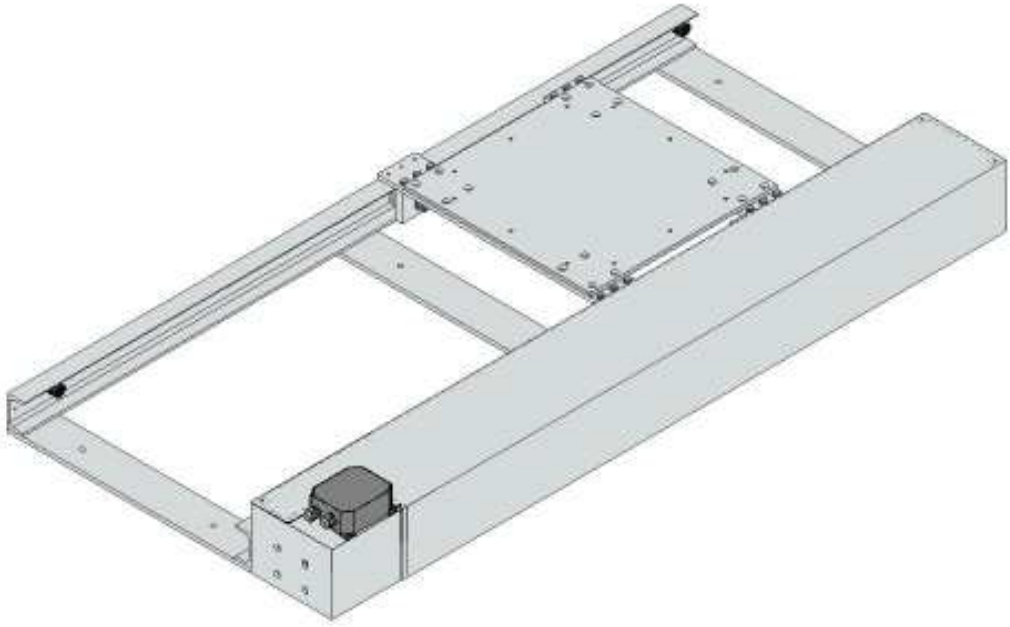

Machine

***Z-AXIS***

Model

***HBM _ _***

Serial No./Year of manufacture

IMPORTER

CUSTOMER

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.....



**NB:** descriptions and illustrations in this publication are simplified.

For eventual technical reasons ***Nordson®*** reserves the right to modify their product data or features without any prior notice.

| TITLE OF THE DOCUMENT : **OPERATING AND MAINTENANCE MANUAL** | NO.: |
|---|---|
| | ISSUE NO. : **1.3** |

| CUSTOMER: | JOB ORDER NO.: |
|---|---|
| SERIAL NO. : | DATE : |

| ISSUE NO. | DATE | DESCRIPTION |
|---|---|---|
| 1.0 | 12/09/03 | General revision |
| 1.1 | 07/09/06 | General revision |
| 1.2 | 01/09/08 | General revision |
| 1.3 | 16/07/10 | General revision |
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| Prepared | Controlled | Approved | |

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**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

## 0.0 INTRODUCTION

Page 1 to 9

# CHAPTER 0.0 INTRODUCTION

## 0.1 Document identification

The operating and maintenance manual is a document issued by ***Nordson***® against a specific job order and it is an integral part of the machine.
Such a document is marked with a serial number that corresponds to that of the machine, in order to permit tracing and identification.


## 0.2 Object of the document

This manual sets out:

- To provide technicians, workers and maintenance people with instructions, information and advice on how to work in the best safety conditions.
- To put the worker in a position to use the machine correctly and safely and to maintain it in a good and efficient condition.
- To be able to prove, through the provided information, the compliance of the machine with the directives in force regarding industrial safety standards.

## 0.3 General conditions

During the drawing up of this document the following directives have been considered:

- UNI EN ISO 12100-1:2009, Safety of machinery - Basic concepts; general principles for design:
  Part 1 - Basic terminology, methodology (UNI EN ISO 12100-1:2009)
  Part 2 - Technical principles and specification (UNI EN ISO 12100-2:2009)
- UNI EN ISO 13849-1:2008, Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
- UNI EN ISO 14121-1:2007, Safety of machinery - Principles or risk assessment - Part 1: Principles
- UNI EN ISO 13857:2008, Safety of machinery - Safety distances to prevent danger zones being reached by the upper and lower limbs
- UNI EN 349:1994 + A1:2008, Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
- UNI EN ISO 13850:2008, Safety of machinery - Emergency stop equipment - Functional aspects - Principles for design
- CEI EN 60204-1:A1:2009,Safety of machinery - electrical equipment of the machines - Part 1:General rules

**ATTENTION :** If this machine is an integral part of a plant , it is forbidden to start it unless the whole plant is in compliance with the **"Machine directive" 2006/42/ CE"** and those that follow.

## 0.4 Identification data of the manufacturer

The identification of ***Nordson***® as machine manufacturer, is in compliance with the legislation in force through these certificates:

- **Declaration of conformity** (see attached)
- **CE plate**
- **Operation and maintenance manual**

A special identification plate, applied to the machine, permanently carries information regarding CE mark. The copies of the identification plates **"CE MARK"**, applied on each single machine, and the relevant **"DECLARATION OF CONFORMITY"** are attached.

The machine has been manufactured by:

***NORDSON CORPORATION***

## 0.5 Nordson International

***Europe***

| COUNTRY | | PHONE | FAX |
|---|---|---|---|
| **Austria** | | 43-1-707 5521 | 43-1-707 5517 |
| **Belgium** | | 31-13-511 8700 | 31-13-511 3995 |
| **Czech Republic** | | 4205-4159 2411 | 4205-4124 4971 |
| **Denmark** | *Hot Melt* | 45-43-66 0123 | 45-43-64 1101 |
| | *Finishing* | 4543-66 1133 | 45-43-66 1123 |
| **Finleand** | | 358-9-530 8080 | 358-9-530 80850 |
| **France** | | 33-1-6412 1400 | 33-1-6412 1401 |
| **Germany** | *Erkrath* | 49-211-92050 | 49-211-254 658 |
| | *Lüneburg* | 49-4131-8940 | 49-4131-894 149 |
| | *Düsseldorf-Nordson UV* | 49-211-3613 169 | 49-211-3613 527 |
| **Italy** | | 39-02-904 691 | 39-02-9078 2485 |
| **Netherlands** | | 31-13-511 8700 | 31-13-511 3995 |
| **Norway** | *Hot Melt* | 47-23 03 6160 | 47-22 68 3636 |
| | *Finishing* | 47-22-65 6100 | 47-22-65 8858 |
| **Poland** | | 48-22-836 4495 | 48-22-836 7042 |
| **Portugal** | | 351-22-961 9400 | 351-22-961 9409 |
| **Russia** | | 7-812-11 86 263 | 7-812-11 86 263 |
| **Slovak Republic** | | 4205-4159 2411 | 4205-4124 4971 |
| **Spain** | | 34-96-313 2090 | 34-96-313 2244 |
| **Sweden** | *Hot melt* | 46-40-680 1700 | 46-40-932 882 |
| | *Finishing* | 46 (0) 303 66950 | 46 (0) 303 66959 |
| **Switzerland** | | 41-61-411 3838 | 41-61-411 3818 |
| **United Kingdom** | *Hot Melt* | 44-1844-26 4500 | 44-1844-21 5358 |
| | *Finishing* | 44-161-495 4200 | 44-161-428 6716 |
| | *Nordson UV* | 44-1753-558 000 | 44-1753-558 100 |

***Distributors in Eastern & Southern Europe***

| | | | |
|---|---|---|---|
| **DED, Germany** | | 49-211-92050 | 49-211-254 658 |

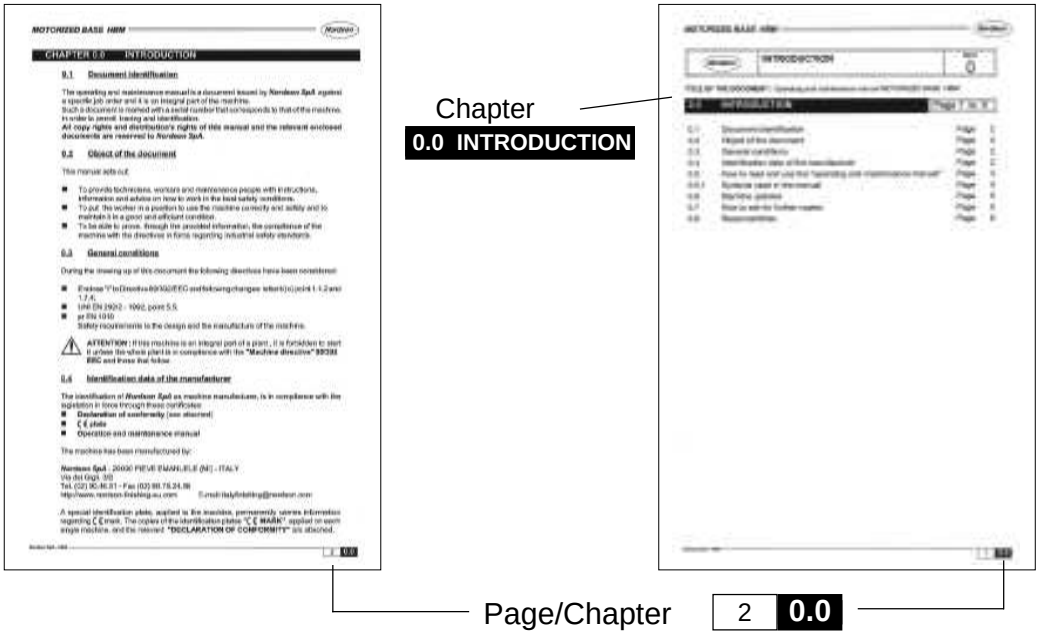
## Outside Europe

For Your nearest **Nordson**® office outside Europe contact the Nordson offices below for detailed information.

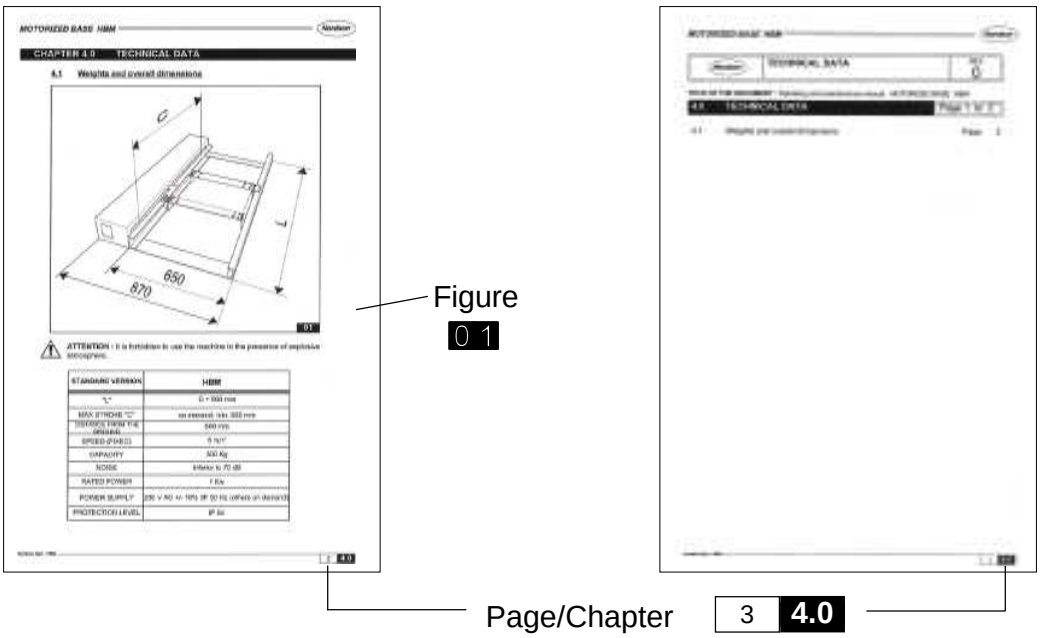
| | CONTACT NORDSON | | PHONE | FAX |
|---|---|---|---|---|
| ***Africa/Middle East*** | **DED, Germany** | | 49-211-92050 | 49-211-254 658 |
| ***Asia/Australia/ Latin America*** | **Pacific South Division, USA** | | 1-440-988-9411 | 1-440-985-3710 |
| ***Japan*** | **Japan** | | 81-3-5762 2700 | 81-3-5762 2701 |
| ***North America*** | **Canada** | | 1-905-475 6730 | 1-905-475 8821 |
| | **USA** | *Hot Melt* | 1-770-497 3400 | 1-770-497 3500 |
| | | *Finishing* | 1-440-988 9411 | 1-440-985 1417 |
| | | *Nordson UV* | 1-440-985 4592 | 1-440-985 4593 |

## 0.6 How to read and use the "operating and maintenance manual"

This manual is an integral part of the machine, therefore it must be preserved and appropriately used for the whole operating life of the machine, also in case of transfer to outside parties.
The manual is subdivided into chapters each identified by a summarizing first page.
Each page reports its progressive number depending on the chapter and to the number of the chapter itself.




The graphic illustrations, reported in the manual, are identified by a progressive number depending on the chapter.



## 0.6.1 Symbols used in the manual

To make the reading and the understanding of this manual easier and immediate the following symbols have been used:

**"Conductor"**: qualified and authorized person that has been instructed to start the machine with the necessary protections in place via the use of the commands on the push-button panel.

**Mechanical maintenance person:** a technician, qualified and authorized to install, repair and carry out special maintenance that is exclusively mechanical.

**Electrical maintenance person:** a technician, qualified and authorized to install, repair and carry out special maintenance exclusively electrical.


**Manufacturer's technician with mechanical competences:** for complex and/or special operations.


**Manufacturer's technician with electrical or electronic competences:** for complex and/or special operations.

## 0.7 Machine updates

In the case of technical changes made by ***Nordson***® during the operating life of the machine an appropriate revision of the document itself will be supplied with the essential data specified on the page "**DOCUMENT IDENTIFICATION**".

In the case that ***Nordson***® submits a copy of the document with revisions, the costumer should see to the elimination of the parts concerned and to the replacement.

## 0.8 How to ask for further copies

Further copies should be ordered from ***Nordson***® offices (see tables page 3 and 4).

## 0.9 Responsibilities

This manual reflects the technical state of the machine at the moment of sale and it is open to changes, depending on the firm opinion of the manufacturer.

In case of manual changes the manufacturer is not obliged to update those manuals that accompany machines already sold.

The manufacturer is released from any responsibility in any case of improper or incorrect use such as, for example:

- the use of the machine by not trained staff;
- use without following the regulations in force;
- incorrect installation;
- mains supply defects;
- serious lack of maintenance;
- not authorized modifications to the machine;
- the use of unsuited spare parts;
- inobservance of the "operating and maintenance manual";

It must be remembered that any total or partial reproduction of this manual is forbidden unless authorised by ***Nordson***®.

| | | |
|---|---|---|
| Nordson | **TECHNICAL ASSISTANCE** | *REV.* 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

# 1.0 TECHNICAL ASSISTANCE

# CHAPTER 1.0 TECHNICAL ASSISTANCE

For any technical or commercial requirements, please contact:

| | GENERAL SAFETY INSTRUCTIONS | REV. 1.3 |
|---|---|---|

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

## 2.0 GENERAL SAFETY INSTRUCTIONS

Page 1 to 6

# CHAPTER 2.0 GENERAL SAFETY INSTRUCTIONS

Each interaction between the worker and the machine has been carefully studied and analysed during the planning stages.
The choice in construction, the technical features of the machine and the indications reported in this document are intended to guarantee the greatest safety level to the exposed people and the worker.
According to the **"Machine directive" 2006/42/CE** it is useful to remember the following definitions:

**“Dangerous zones”:** every zone inside and/or in proximity to a machine where the presence of an exposed person is a danger to safety and health.

**“Exposed person”:** any person situated entirely or partially in a dangerous zone.

**“Worker”:** a person instructed to operate, regulate and carry out ordinary maintenance and/or clean the machine.

To better define the limit of operation, the relevant qualifications of the **"worker”** and to make the immediate reading and the understand of the manual easier, the following classifications have been used:

**"Conductor"**:
qualified and authorized person that has been instructed to start the machine with the necessary protections in place via the use of the commands on the push-button panel.

**Mechanical maintenance person:**
a technician, qualified and authorized to install, repair and carry out special maintenance that is exclusively mechanical.

**Electrical maintenance person:**
a technician, qualified and authorized to install, repair and carry out special maintenance exclusively electrical.

**Manufacturer's technician with mechanical competences:**
for complex and/or special operations.

**Manufacturer's technician with electrical or electronic competences:**
for complex and/or special operations.

The employer should provide the necessary training to the staff regarding the risks of accidents, and safety devices to protect the worker, and must also insist on the observance of rules and company instructions about safety and protection measures.

The worker has to respect the instructions given by the employer or other authorised people and particularly:

- Use correctly the machine, equipment, tools, and safety's devices;
- Use correctly the individual protective devices;
- Notify immediately any dangerous conditions;
- Must not remove or modify safety devices or control signal;
- Follow scrupulously the indications in this manual;

The unauthorised tampering and substitution of one or more parts or groups of the machine, the use of equipment or normal wear material other than that indicated by ***Nordson***®, can pose a risk of accidents and hence release the manufacturer from civil or penal responsibilities.

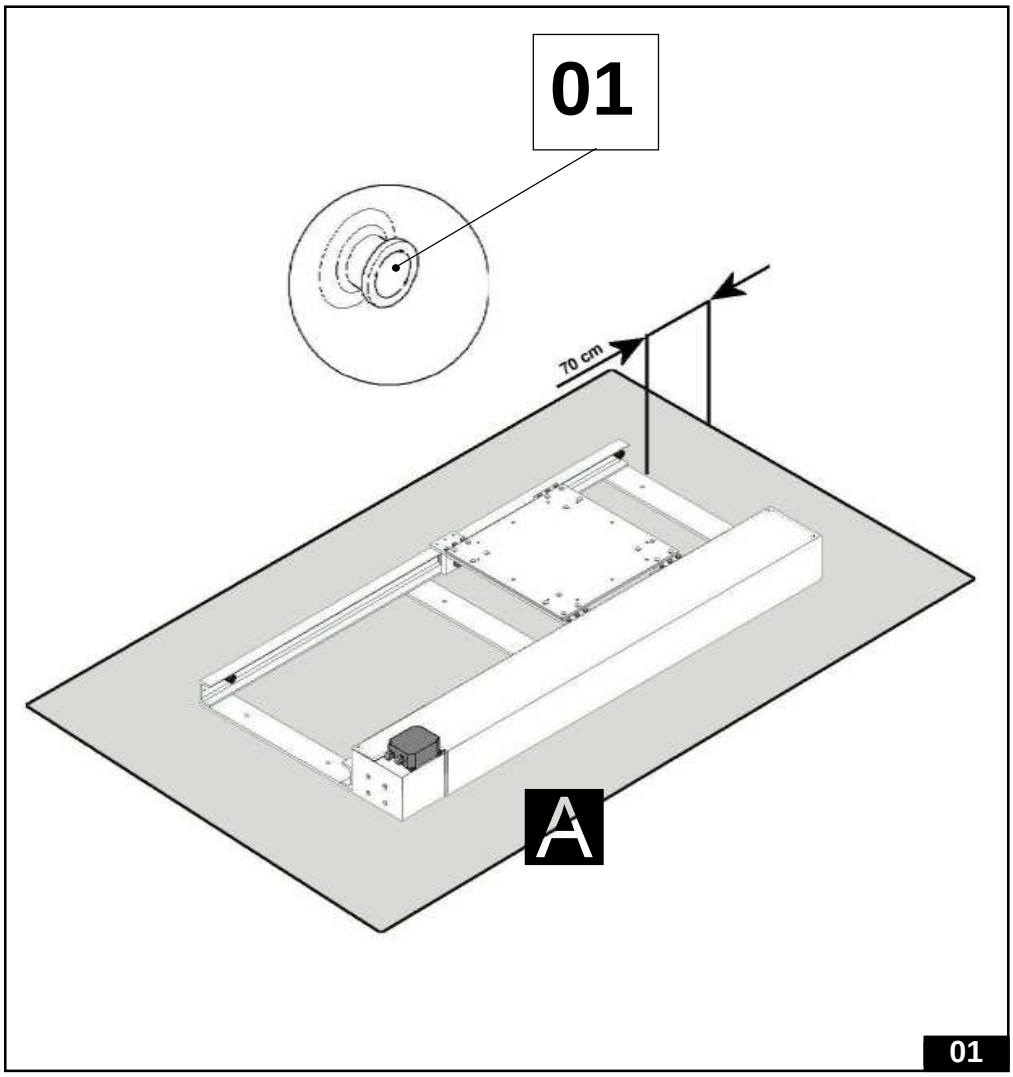
**ATTENTION :** Before starting up the machine and carrying out working operations, electric boards, control panels, and all protections, must be closed and the working area must be free and clean.

**ATTENTION :** If this machine is an integral part of a plant, it is forbidden to start it unless the whole plant is in compliance with the **"Machine directive" 2006/42/CE"** and those that follow.

## 2.1 Dangerous areas and placing of safety devices

- Due to the structural typology of the machine that is integrated in painting plants, it is necessary to determine and fence an area A where the operator must not enter when the plant is in function.

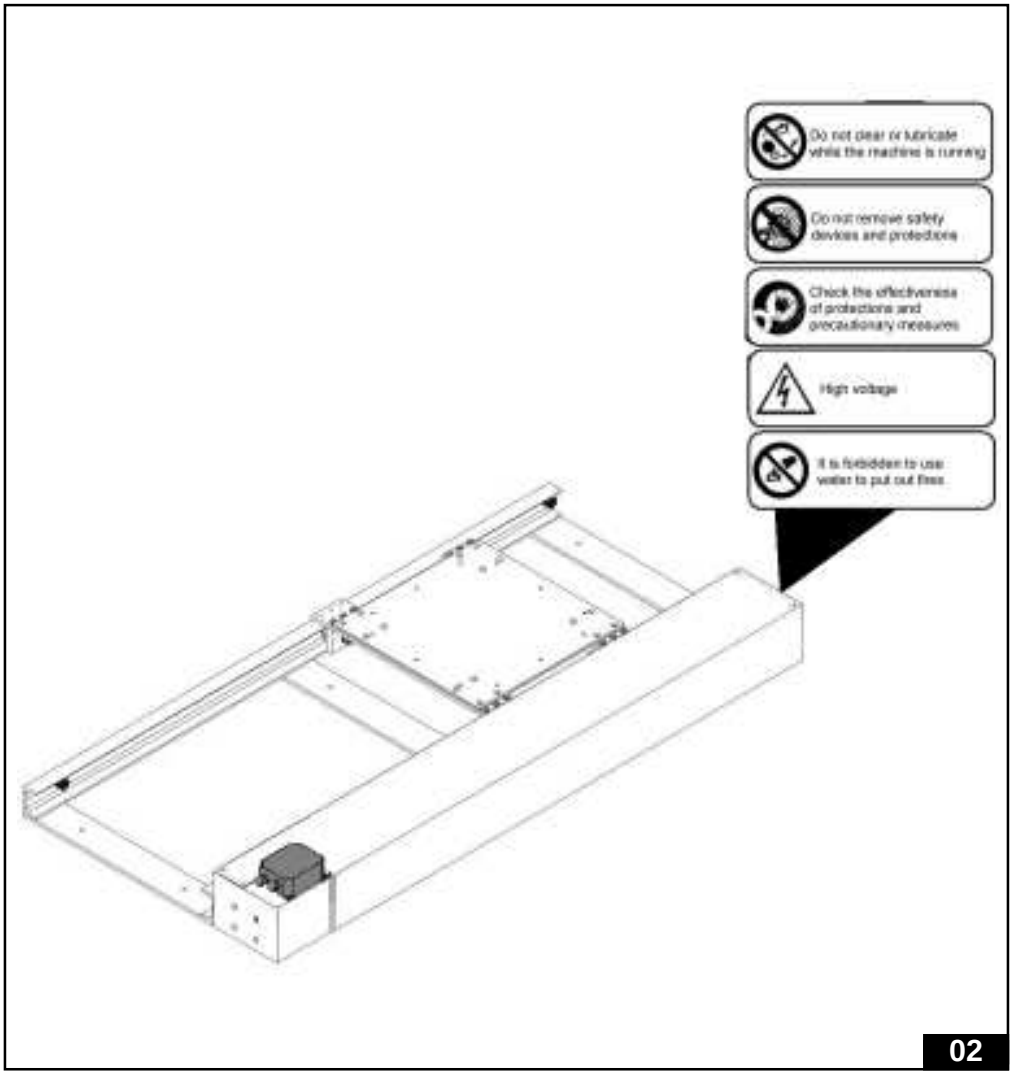
The position of the emergency/stop button 0 1 **(01)** depends on the type of control module connected to the machine: in case of a complex plant, with more machines, the emergency/stop button is located on the general board of the plant.



## 2.2 Position of warning labels

The warning labels that are clearly visible and attached to the machine are additional and not alternative measures to the already foreseen protections.

Such labels further improve the operator's safety, in that they give correct information regarding requirements and cautions.



## 2.3 General prohibitions

Do not remove safety devices and protections.

**Temporary removal of protections -** protections and safety devices of the machine must NOT be removed during maintenance; it is necessary to adopt immediately measures to reduce risks, under the supervision of authorised people.

It is forbidden for any person, except the conductor, to access to the operating area of the machine.

Do not clear or lubricate while the machine is running.

It is forbidden to use water to put out fires.

## 2.4 General obligations

Switch off at the mains supply before unplugging electrical devices.

Check the effectiveness of protections and precautionary measures.

Notify immediately faults and lack of protections and precautionary measures and any dangerous situation.

## 2.5 Dangers

High voltage.

## 2.6 Advice about lighting

The machine is not provided with an autonomous lighting system, because a normal working environment condition, that is at least 300 lux, is sufficient.

The customer should supply a similar lighting value, to carry out the normal working operations.

For maintenance work a portable lamp is recommended.

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| Nordson | DESCRIPTION OF THE MACHINE | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

# 3.0 DESCRIPTION OF THE MACHINE

Page 1 to 4

# CHAPTER 3.0 DESCRIPTION OF THE MACHINE

In many painting automating plants, it is necessary to move guns on more than one axes. On this subject ***Nordson***® has studied and realised the **Z-axis mod. HBM**, to satisfy the requirements of an horizontal movement, besides the vertical one.
The **Z-axis mod. HBM** is constituted by: the **Manual translator system HBA** and the **Translation motorized system HM**; on the grounds of the necessities, these two unit can be supplied separately.
This machine can move, using simple manual controls or programmable systems, loads to 300 kg.
The **Z-axis mod. HBM** can achieve a parallel or a perpendicular movement to the axe.
Many other uses are also possible besides painting.
Anyway they have to be considered by ***Nordson***® technical office.

## Description

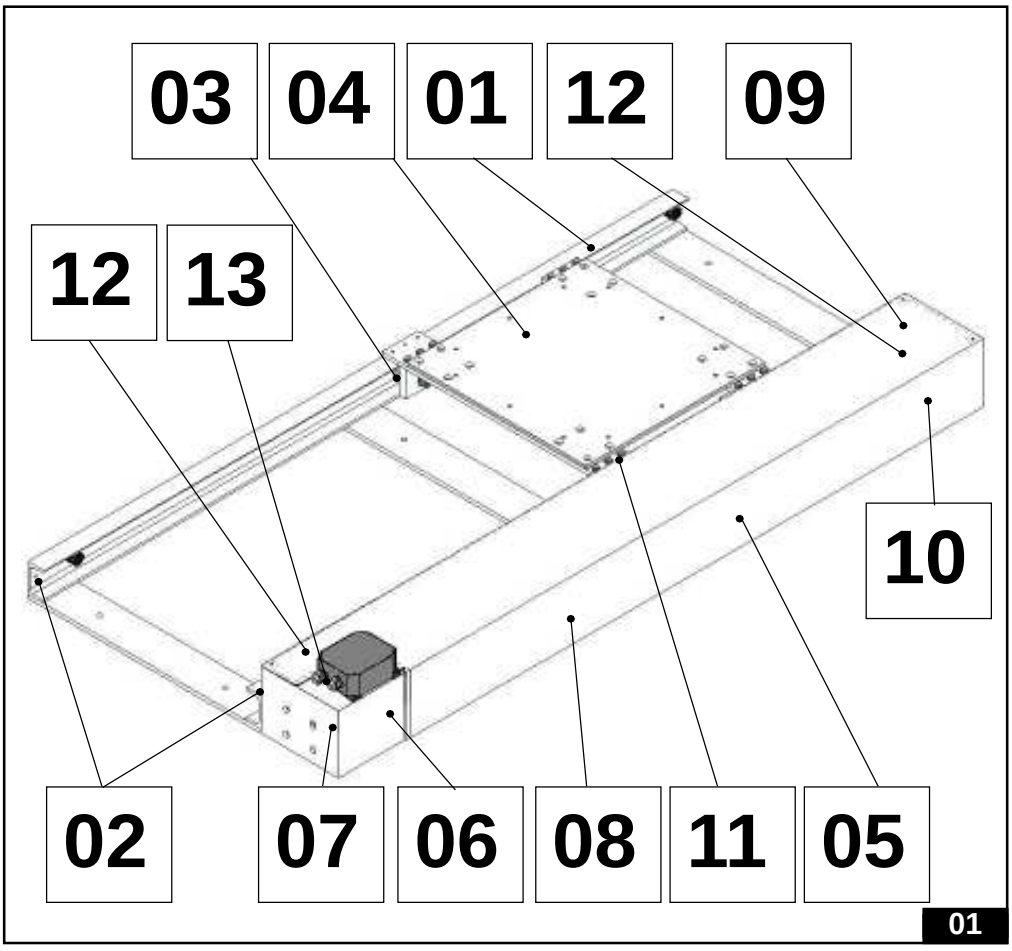
The **Z-axis mod. HBM** is a rugged steel structure 0 1**(01)** with two "C" lateral tracks 0 1**(02)**, where the shaped wheels 0 1**(03)** of the movable part (trolley) 0 1**(04)** slide.
This group is called **Manual translation system HBA**.
On one side, the **Translation motorized system HM** is fixed, via socket head screws: it is constituted by a covered part 0 1**(05)**, with a steel cover, which contains the gearmotor 0 1**(06)** with the driving pulley 0 1**(07)**, the toothed belt 0 1**(08)** which transmits the movement to the trolley, and the snub pulley 0 1**(09)**. The stroke width is controlled by an encoder 0 1**(10)**

The upper plate of the trolley supports the reciprocator; it is endowed with assembling holes, and it is projected in order to be fixed to the draft group 0 1**(11)** from both sides.

The maximum stroke is determined by a couple of end of stroke 0 1**(12)**, assembled at the extremity of a guide, parallel to the toothed belt.

The machine is not endowed with anti-vibrating feet, but it is based directly on the ground through screws anchor and relative screws.

At the top of the covered part, where there is the gearmotor, the cables outlets 0 1**(13)** (power supply and signal) to the control module are located.



## 3.1 Terminology used

- **TROLLEY:** part of the machine on which the reciprocator is fixed..
- **ARM:** part of the machine for fitting the spray gun.
- **GUN:** apparatus not supplied by ***Nordson***® suitable for the spraying of epoxidic powders or paints.

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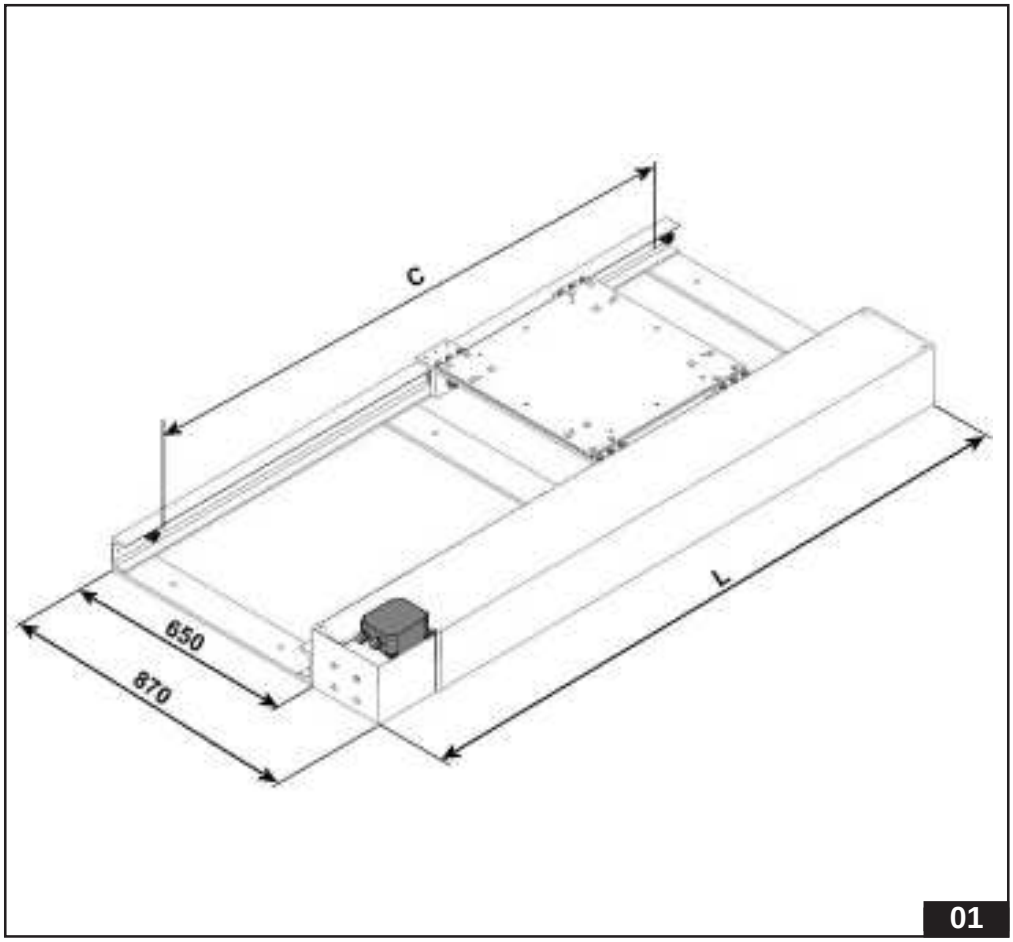
# 4.0 TECHNICAL DATA

Page 1 to 2

# CHAPTER 4.0 TECHNICAL DATA

## 4.1 Weights and overall dimensions

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**ATTENTION :** It is forbidden to use the machine in the presence of explosive atmosphere.

| STANDARD VERSION | HBM |
|---|---|
| "L" | C + 800 mm |
| MAX STROKE "C" | on demand; min. 500 mm |
| SPEED (FIXED) | 5 m/1' |
| CAPACITY | 300 Kg |
| NOISE | Inferior to 70 dB |
| RATED POWER | 1 Kw |
| POWER SUPPLY | 230 V AC +/- 10% 3F 50 Hz (others on demand) |

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| Nordson | IDENTIFICATION OF THE MACHINE | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

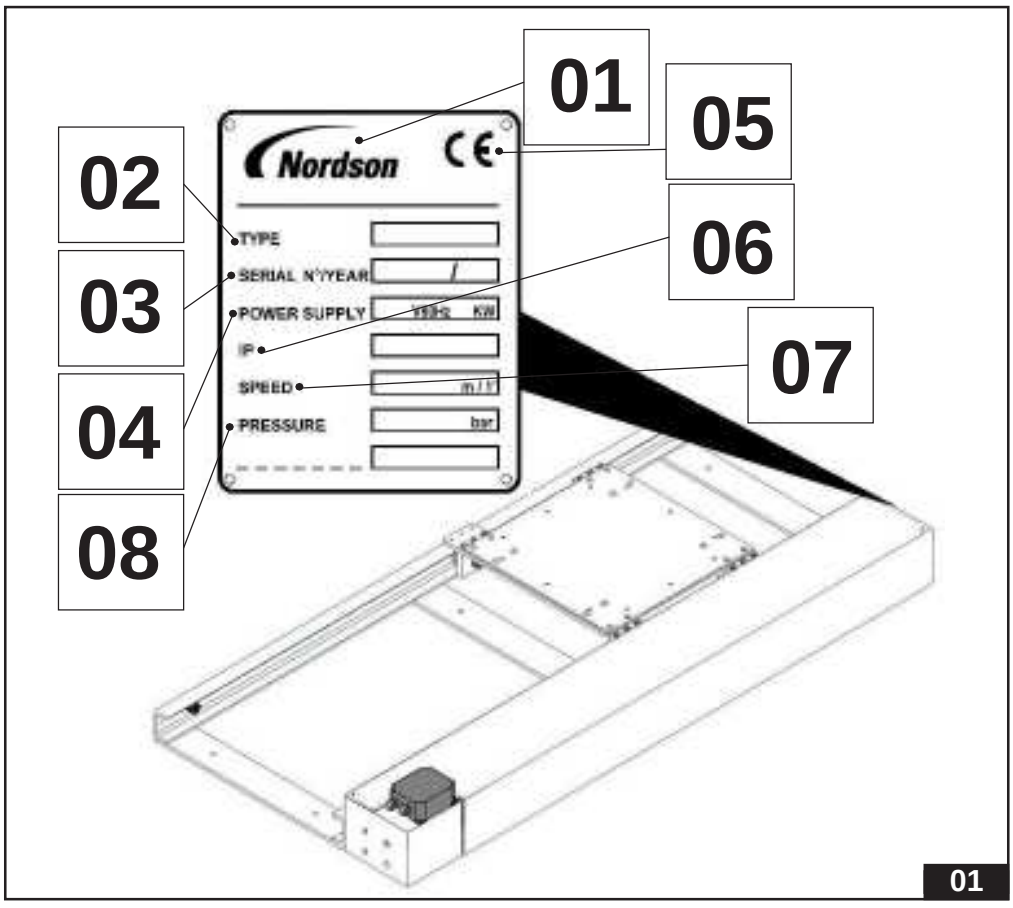
# 5.0 IDENTIFICATION OF THE MACHINE

# CHAPTER 5.0 IDENTIFICATION OF THE MACHINE

**5.0.1 -**This manual contains the operating and maintenance instructions for the machine manufactured by ***Nordson***®.
The figure 0 1 shows the location of the identification plate of the machine, that specifies the following information:

- 0 1**(01)** Name of the manufacturer
- 0 1**(02)** Model
- 0 1**(03)** Serial No. and year of manufacture
- 0 1**(04)** Power supply
- 0 1**(05)** Certification mark
- 0 1**(06)** Protection level
- 0 1**(07)** Speed
- 0 1**(08)** Pressure (only for pneumatic releases)

**ATTENTION :** the serial no. 0 1**(03)** on the plate must be mentioned whenever contacting the Manufacturer for information or spare parts.



01

**5.0.2** - Copies of the plates **"CE MARK"**, applied to each machine, and the relevant **"DECLARATION OF CONFORMITY"** are attached.

**5.0.3 -** If the plate **CE MARKING** is accidentally damaged , removed from the machine or simply the manufacturer mark is removed, the customer must inform ***Nordson***®.

| | | |
|---|---|---|
| Nordson | FORESEEN AND UNFORESEEN USE OF THE MACHINE | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

# 6.0 FORESEEN AND UNFORESEEN USE OF THE MACHINE

Page 1 to 2

# CHAPTER 6.0 FORESEEN AND UNFORESEEN USE OF THE MACHINE

The use of the **Z-axis HBM** is foreseen **exclusively** in automatic systems of spray-coating with thermosetting powders or paints.
It has been planned for automatic guns that perform vertical and horizontal movements.

**ATTENTION :** If this machine is an integral part of a plant , it is forbidden to start it unless the whole plant is in compliance with the **"Machine directive" 2006/42/CE** and those that follow.

The use of the machine must be carried out **exclusively** by staff that knows its work and have acknowledged all that is described on this manual.

It is absolutely forbidden to use the machine for any use other than that for what it is intended unless a specific request has been made to ***Nordson***®.

The incorrect use of the machine could cause risks both to the operator and to the machine itself.

## 6.1 Residual risks

The normal automatic modality of the machine does not forsee risks, on condition that the whole plant, where the machine is integrated, is in compliance with the **"Machine directive" 2006/42/CE.**

The only residual risk is the possibility to reach the movable sliding horizontal parts with the upper limbs.
This risk can occur only during the maintenance operations where the operator is close contact with the machine.
In any case the risk has been limited by using special protections and safety plates that inform and make the reaching of the dangerous zone difficult.

| | | |
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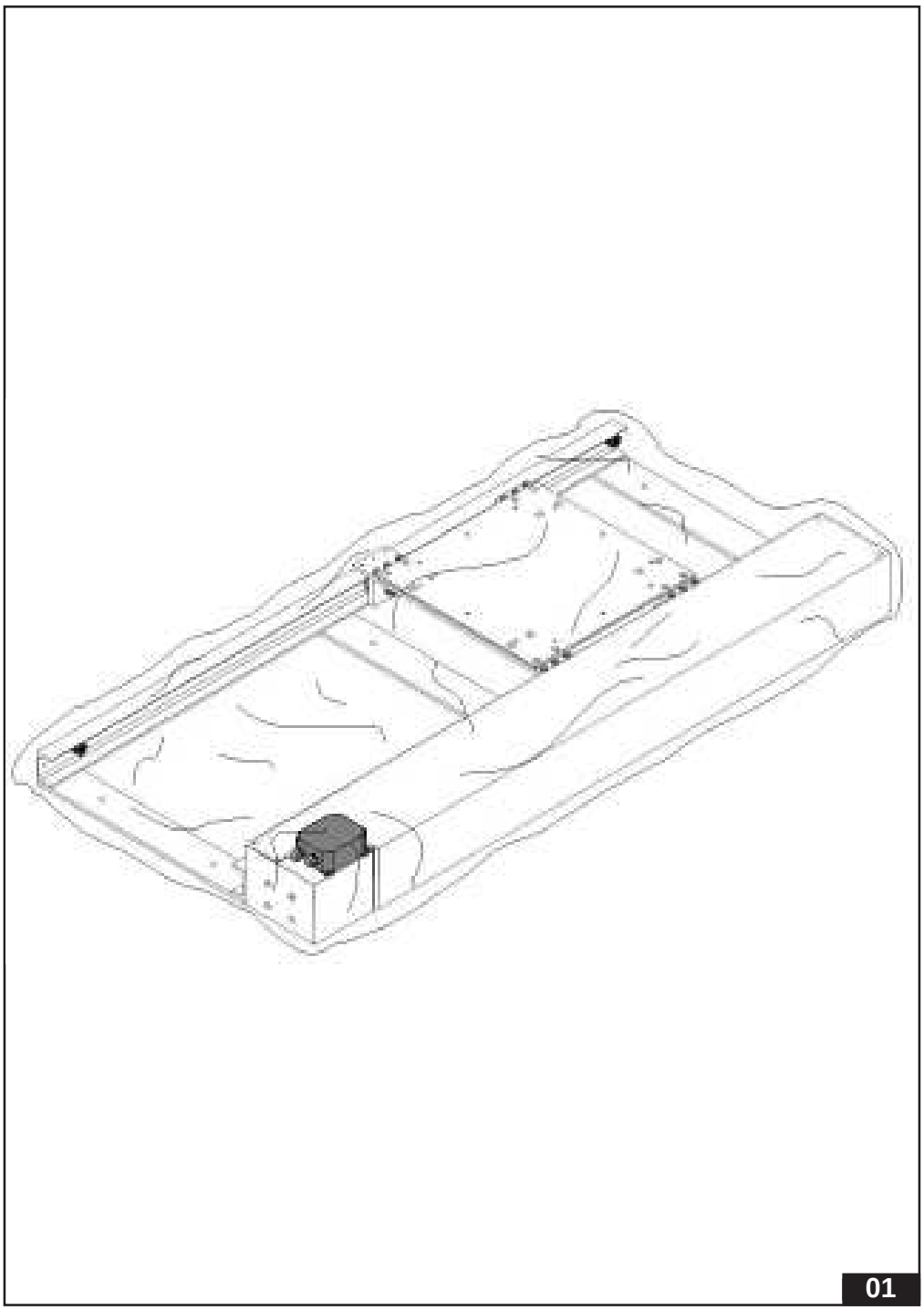
| Nordson | MOVING AND TRANSPORT | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

## 7.0 MOVING AND TRANSPORT — Page 1 to 5

# CHAPTER 7.0 MOVING AND TRANSPORT

The machine is normally sent completely wrapped up with Pluriball, but depending on distance and type of contractual agreements it may be also blocked to a pallets or in a crate.



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## 7.1 Staff qualification

During the movement and unloading from the means of transport qualified staff for the use of fork lift trucks, cranes or hoists should be used.

## 7.2 Equipment and means to use

**ATTENTION:** Before carrying out any moving operations of the machine, make sure there is nobody in the proximity.

Use chains and ropes and make sure that their characteristics are compatible with the weight and the overall dimension of the machine to move and in accordance with the regulations in force.

**ADVICE**

- Slings must be in accordance with the regulations ISO 4878 - ISO 9351.
- Only use slings, if the label, indicating all manufacturer's data, is attached and the capacity is clearly shown.
- Check slings before each lifting.
- Do not used in case of damage, cuts or wear.
- Follow the load factors indicated for each standard configuration.
- Use suitable protections to lift loads with sharp corners.
- Do not twist or knot the belt.
- Follow the instructions for use indicated by the supplier.
- Hook the other ends of the slings on to the hook of the lifting machineries.

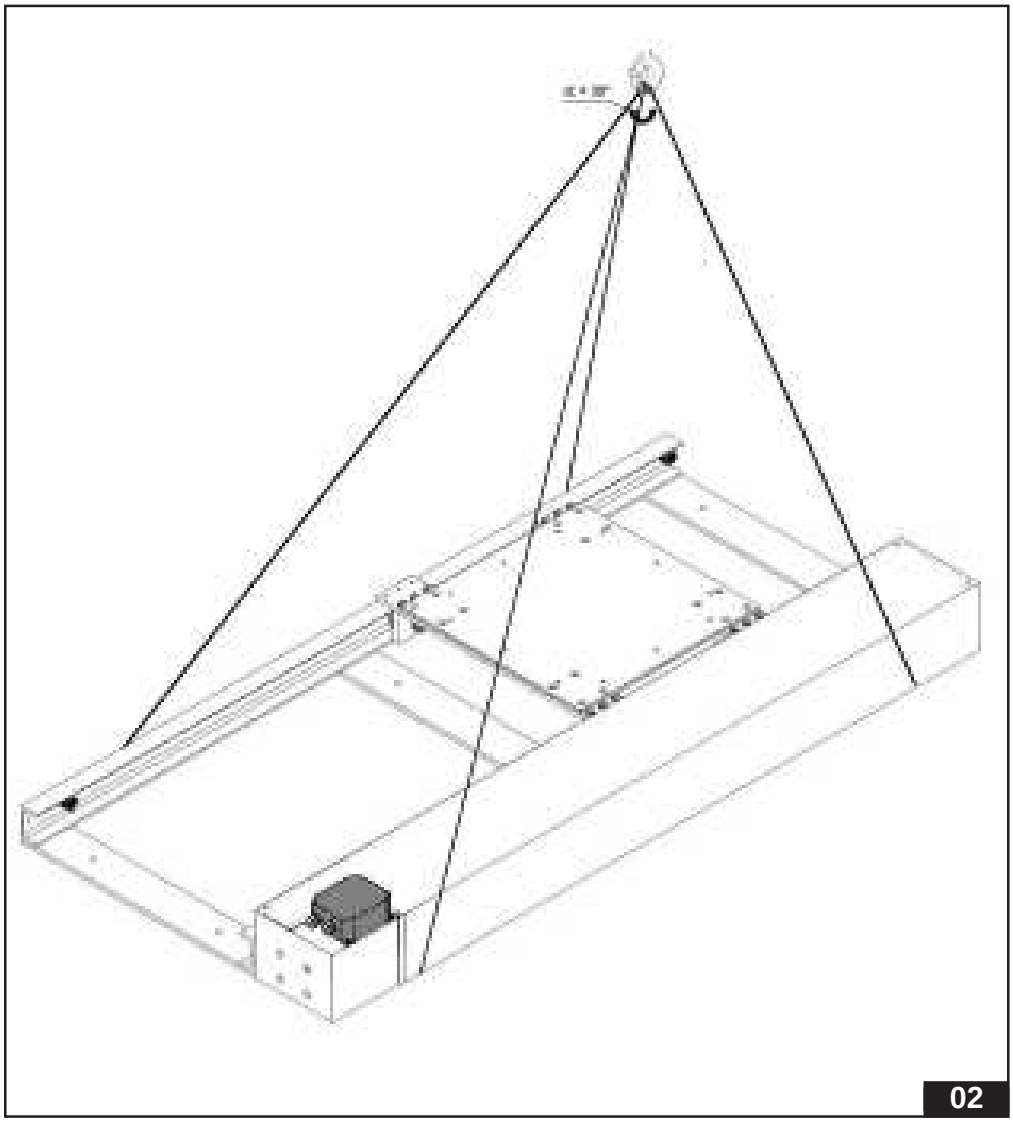
## 7.3 Advice about lifting

Depending on transport conditions, the z-axis by ***Nordson***® can be moved by lifting with ropes or fork lift trucks.
**NB**: it is necessary to carry out the charging and discharging operations keeping the x-axis horizontal.

### 7.3.1 Lifting with ropes

Place the lifting ropes in the points near the blocks, as indicated in figure 0 2 using two ropes, with maximum corner $\alpha$ equal to 30° and rope characteristics adapted to the lifting of loads indicated.

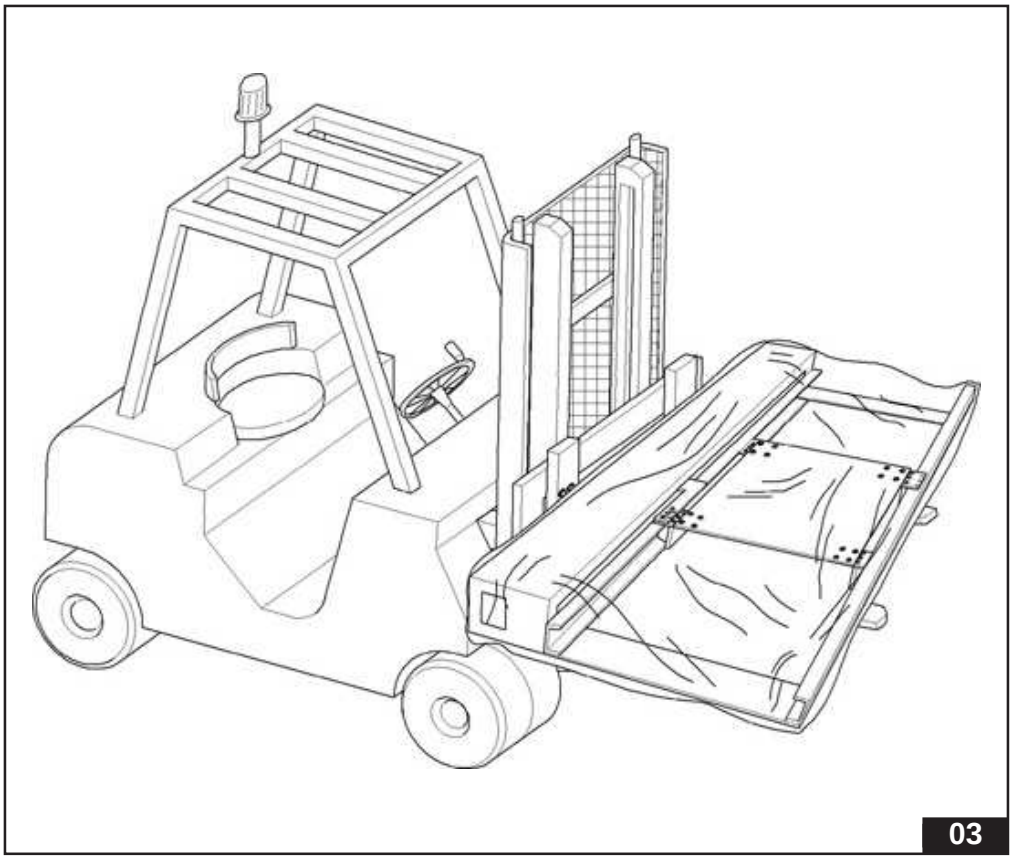
**ATTENTION:** take care to position the ropes, in order to avoid that they move during the machine lifting.



02

### 7.3.2 Lifting with machines

If the Z-axis by ***Nordson***® is moved horizontally, it is necessary to lay it down on the forks of the forklift, facing down, as in figure **03**.



**03**

**ATTENTION:** Do not lay the machine on the cover side, or lifting it vertically.

## 7.4 Storage conditions

If the machine has already been installed and a storage period, during which the machine will not be used, is necessary, all precautions must be taken to avoid contact with dust dirt, humidity and all moving mechanical parts that are prone to rust must be covered with a layer of grease. If the machine has to be moved, wrap it up with Pluriball and follow the previous procedures in order to move it.

## 7.5 Checking the machine

When unpacking the machine, check immediately that during transport none of the parts have been damaged.

Any damage to the machine, loss of additional or supplied parts must be communicated immediately to ***Nordson***®**.**

| | | |
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| Nordson | MACHINE INSTALLATION | REV. 1.3 |

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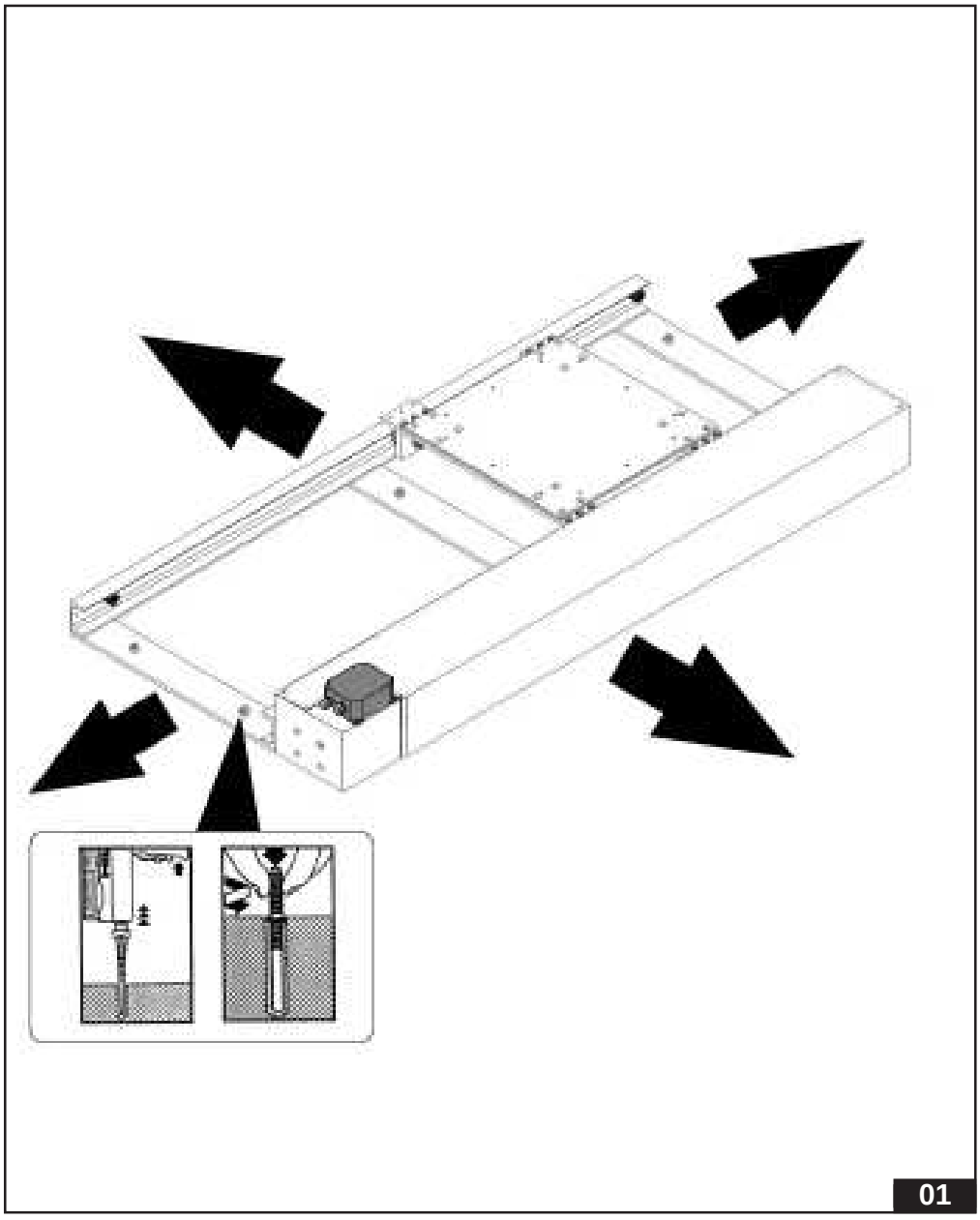
# 8.0 MACHINE INSTALLATION

Page 1 to 3

# CHAPTER 8.0 MACHINE INSTALLATION

During the installation, position the motorized base, keeping it horizontal.
The machine can be placed on any kind of floor.
To place the machine in a paint plant, it is sufficient to lift it and transport it up to the required position.
Once it is installed, adjust the machine, getting round any gradient of the ground, through the use of suitable shims.
Block the machine to the ground, fixing it through screws and screw anchors.



01

## 8.1 Environmental conditions

The machine can work with the following environmental and climatic conditions:

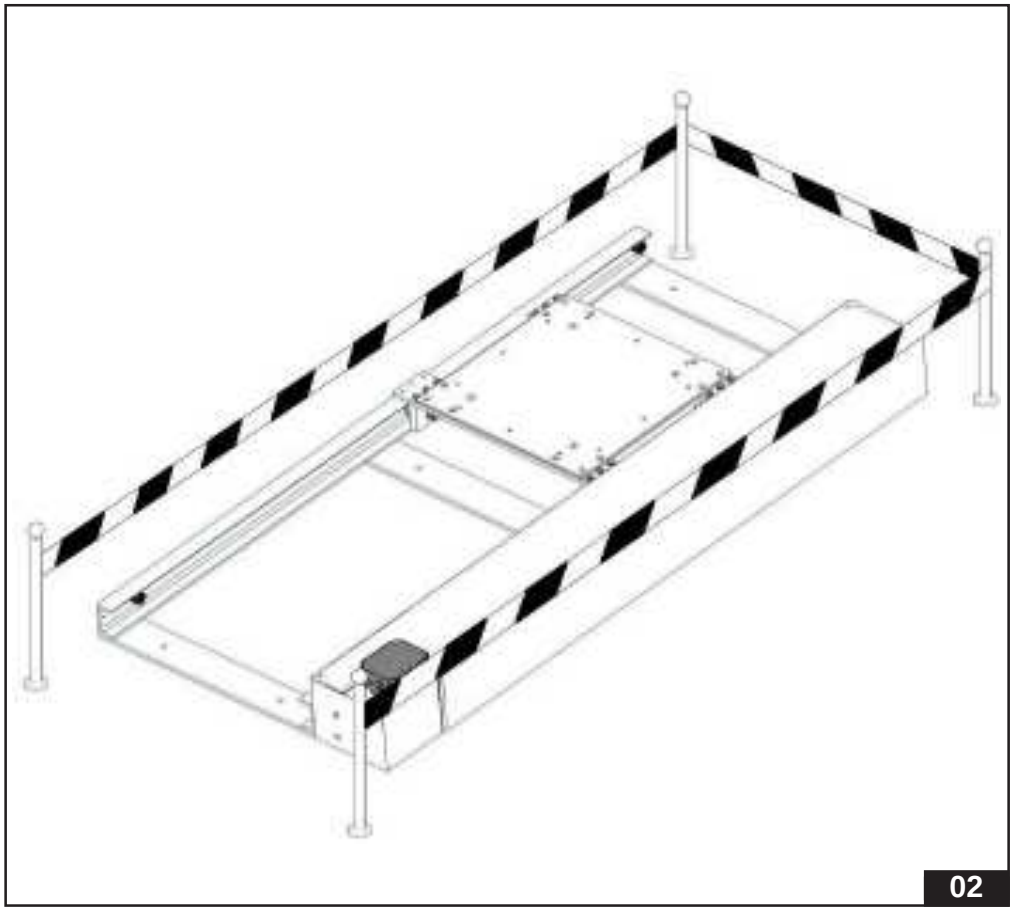
- Environmental luminosity **min.300 Lux.**
- Environmental temperature **+5°/+40° C**
- Relative humidity maximum **50%** at **40° C**
- Relative humidity maximum **90%** at **20° C**

**ATTENTION :** It is forbidden to use the machine in explosive atmospheres.

**ATTENTION :** In case of use in explosive atmospheres, it is possible to supply the version according to the ATEX directive (to advise during the order).

## 8.2 Need of free spaces

**ATTENTION :** When the z-axis is positioned, it is necessary to define the area, where the moving parts (gun supporting arm) have their range, according to the EEC laws regarding the security on working stations 0 2



02

| | | |
|---|---|---|
| Nordson | SETTING UP THE MACHINE | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

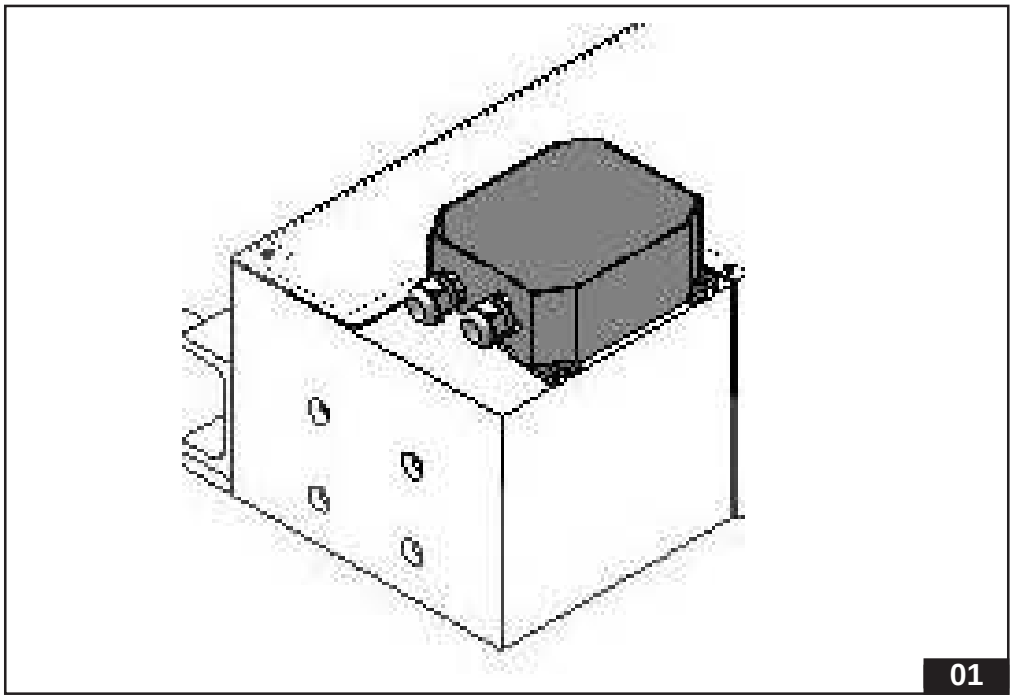
## 9.0 SETTING UP THE MACHINE

Page 1 to 4

# CHAPTER 9.0 SETTING UP THE MACHINE

## 9.1 Connection of the z-axis to the control module

Connect the machine with the control module, by using the cables already connected to the junction box located on the side of the motor gear. 0 1



01

The emergency push button is inserted in the control keyboard.

In case of special executions, see the wiring diagrams of the plant.

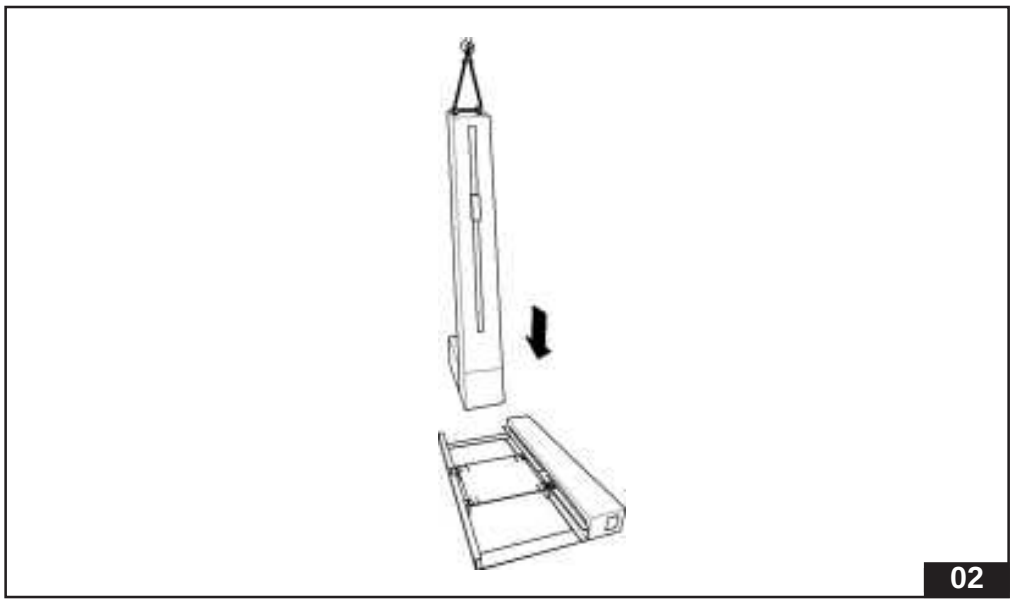
**ATTENTION:** on the grounds of the plant features, the z-axis HBM is predisposed to be connected to modules series HQ; for further explanations about connections, contact in advance ***Nordson***® technical office.

**N.B.:** for the electrical connections, see the wiring diagram attached.

## 9.2 Assembly of the reciprocator on the z-axis

On the z-axis there is a support plate, on which it is possible to assemble the reciprocator.
**NB:** the plate is endowed with holes for reciprocators mod. HEN and HS; the oscillator is assembled directly on the trolley tracks without using the plate.
To assemble, do as follows:

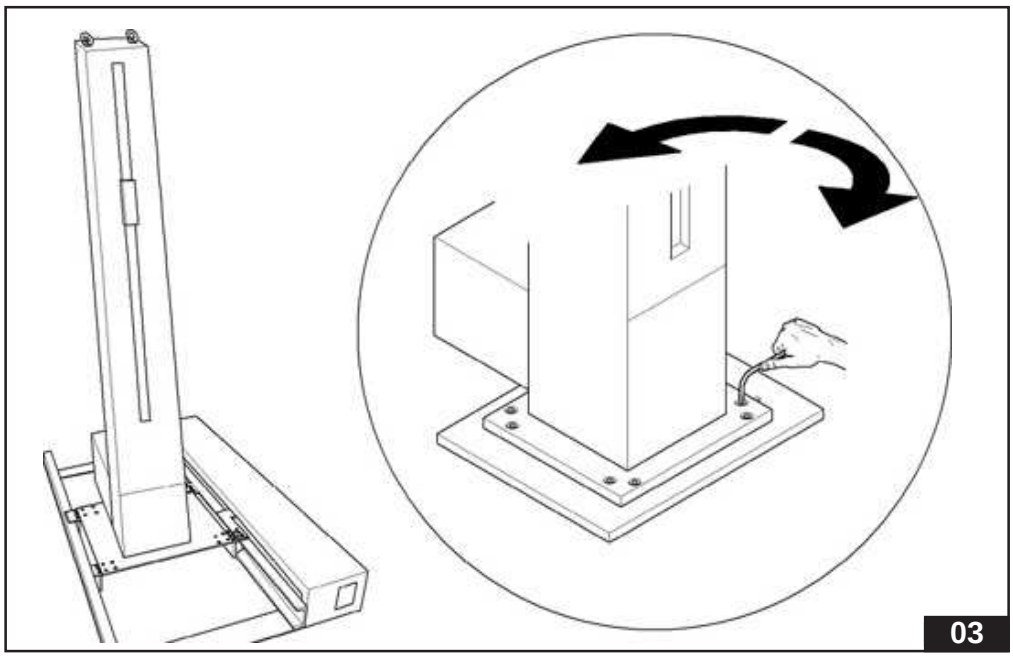
- Lift the reciprocator above the support plate. 0 2




- Position the reciprocator so as the flange holes correspond to those located on the plate or on the trolley.

**ATTENTION:** the z-axis has a capacity of 300 kg.

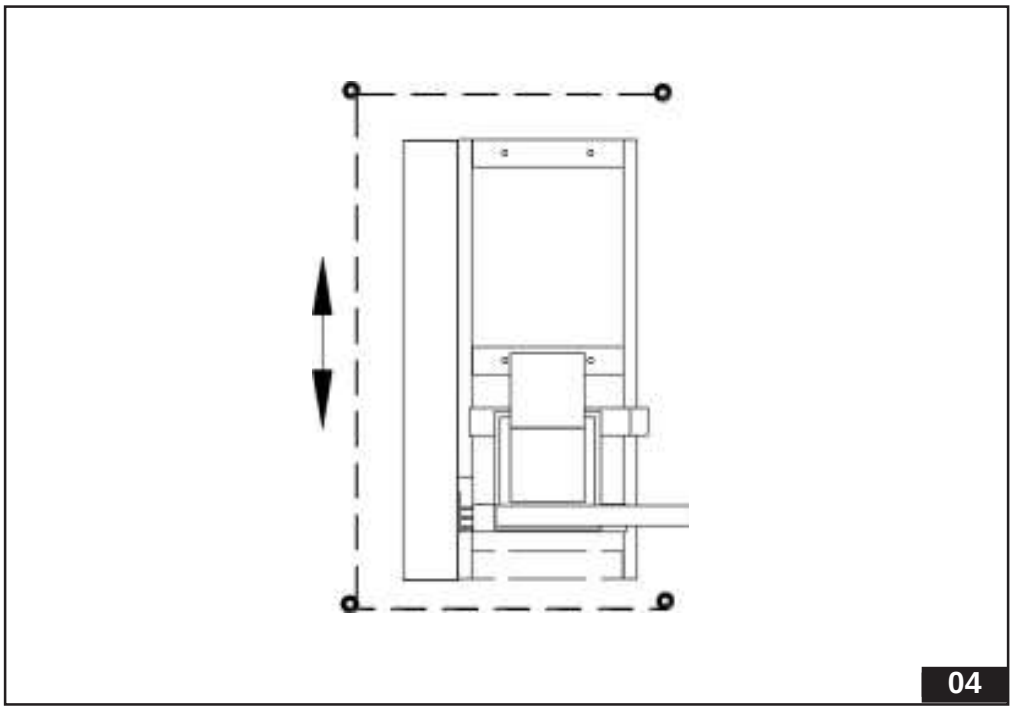
- Fix the reciprocator with socket-flat-head screws M10x25 0 3



**ATTENTION: The covering plate is not to be trample.**

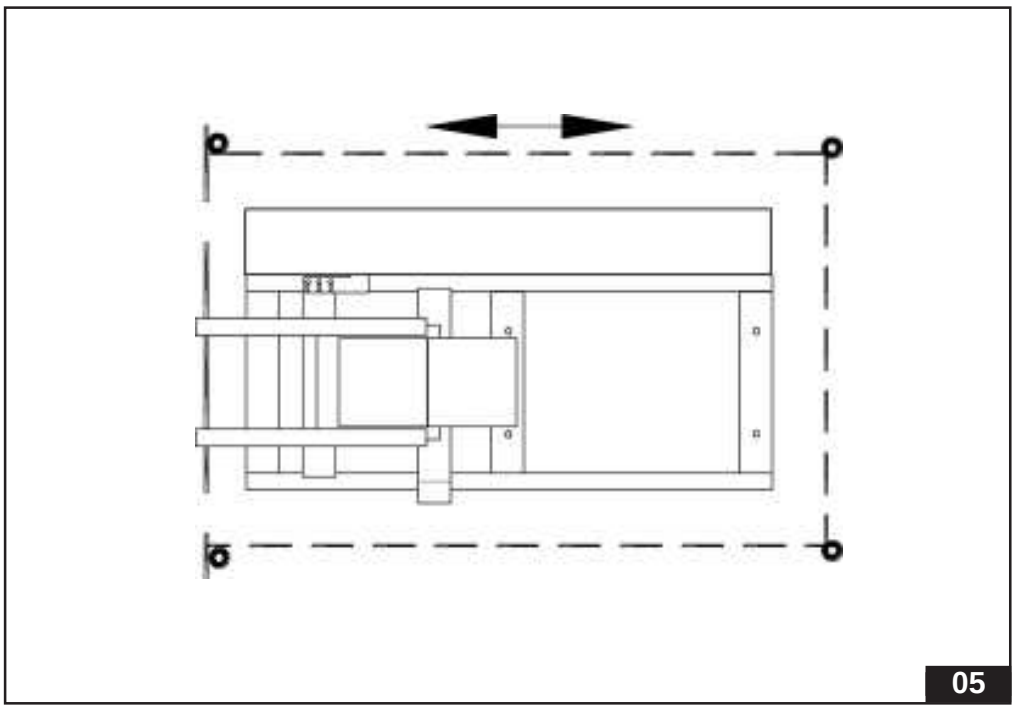
Examples of assembly/use of reciprocators on the z-axis are now shown.

**PARALLEL ASSEMBLY:** fitted to every tracking or step-to-step systems.



04

**PERPENDICULAR ASSEMBLY:** fitted to approach or move away the dispensers.



05

| | | |
|---|---|---|
| Nordson | **BEFORE START UP** | *REV.* 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

## 10.0 BEFORE START UP — Page 1 to 3

# CHAPTER 10.0 BEFORE START UP

When starting the machine no particular preparatory procedures are necessary because the machine is tested and adjusted in all its functions by ***Nordson***®.

## 10.1 Staff qualification

The operator of the machine, before carrying out any kind of productive cycle, must know all the information, shown in this technical manual about the machine.

## 10.2 Foreseen control positions

The machine has been projected to be commanded and controlled in all its functions by one operator only.

The foreseen working position is in front of the control panel, integrated in the control system of the plant, from where the operator can verify the correct working of the plant.

## 10.3 Control boards

The **Z-axis** by ***Nordson*** is projected to be connected to control modules with manual commands.

For the descriptions of modules refer to the operating manual supplied.

## 10.4 Stop-commands and their placing

In case of danger, failure or any emergencies it is necessary to press the **EMERGENCY STOP** push button common to the whole plant.

**ATTENTION:** To reset press the **EMERGENCY** push button, with rotating it.

**NB:** the emergency/stop push button is not located on the machine, but on the general panel of the plant.

| | | |
|---|---|---|
| Nordson | USE OF THE MACHINE | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

# 11.0 USE OF THE MACHINE

# CHAPTER 11.0 USE OF THE MACHINE

**For a correct use and programming, see the operating manual of the control module.**

| | | |
|---|---|---|
| Nordson | **MAINTENANCE** | *REV.* 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

## 12.0 MAINTENANCE

Page 1 to 27

# CHAPTER 12.0 MAINTENANCE

In order to have a safe, efficient and reliable machine, careful and constant maintenance is essential.

## 12.1 General safety advice

It is compulsory, before any maintenance to turn off the power and use any protective devices necessary during all intervention phases.

## 12.2 Technical competences

There are three kinds of maintenance interventions:

**INTERVENTIONS THAT REQUIRE SPECIFIC THECNICAL COMPETENCES**
Can be carried out by not specific staff and usually regard cleaning duties.

**INTERVENTIONS THAT REQUIRE SPECIFIC TECHNICAL COMPETENCES**
Can only be carried out by staff qualified by customer and regard ordinary maintenances.
Mechanical or electric competences may be required.

**INTERVENTIONS THAT REQUIRE PARTICULAR TECHNICAL COMPETENCES**
Can only be carried out by ***Nordson***® qualified mechanical or electrical technicians***.***

At the beginning of each paragraph, referring to the various maintenance subjects, the relative symbol referring to the necessary qualification of the operator is indicated.

## 12.3 Periodical maintenance table

| PERIODICAL MAINTENANCE TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NOTE | | | | | | | | | |
| BIENNIAL | | | | | | | | | |
| ANNUAL | | | | | | | | | |
| SEMIANNUAL | | | | | | | | | |
| TRIMESTRIAL | | | | | | | | | |
| MONTHLY | | | | | | | | | |
| SEMIWEEKLY | | | | | | | | | |
| WEEKLY | | | | | | | | | |
| DAILY | | | | | | | | | |
| Check belt tension | | | | | |  | | | The 1st time after one week |
| Guide cleaning | | | |  | | | | | |
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## 12.4 Summery table of suggested spare parts

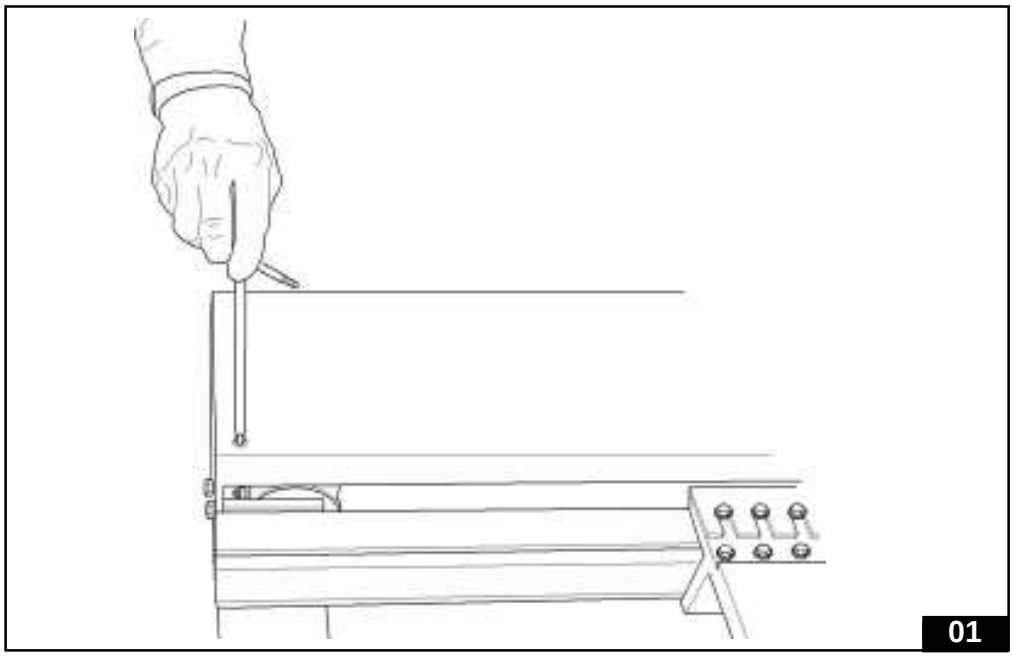
The following components are subject to wear and so a suitable stock should be kept for spare parts.

| DESCRIPTION | PART NUMBER |
|---|---|
| 120.1401 - Toothed belt | - |
| 220.1105 - Driving pulley | - |
| 220.1105 - Snub pulley | - |
| 500.0012 - Set sliding wheels HBA | - |
| 310.8061.03 - Encoder | 736404 |
| 120.0002 - Encoder joint | - |
| 310.8207 - End of stroke sensors | 736339 |

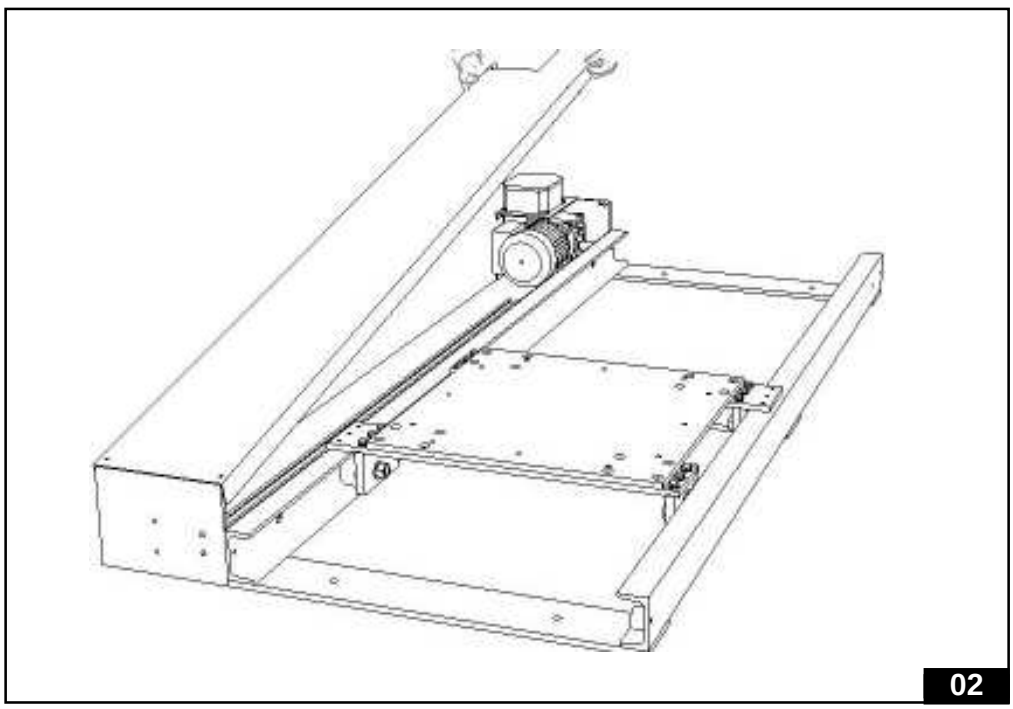
## 12.5 Replacing gear-motor

To replace the gearmotor, do as follows:

- Position the reciprocator at the opposite side of to the cables output.
- Switch off the machine.
- Unscrew the socket head screw (Nr. 4) that fix the cover, then lift it and remove it. 0 1, 0 2.

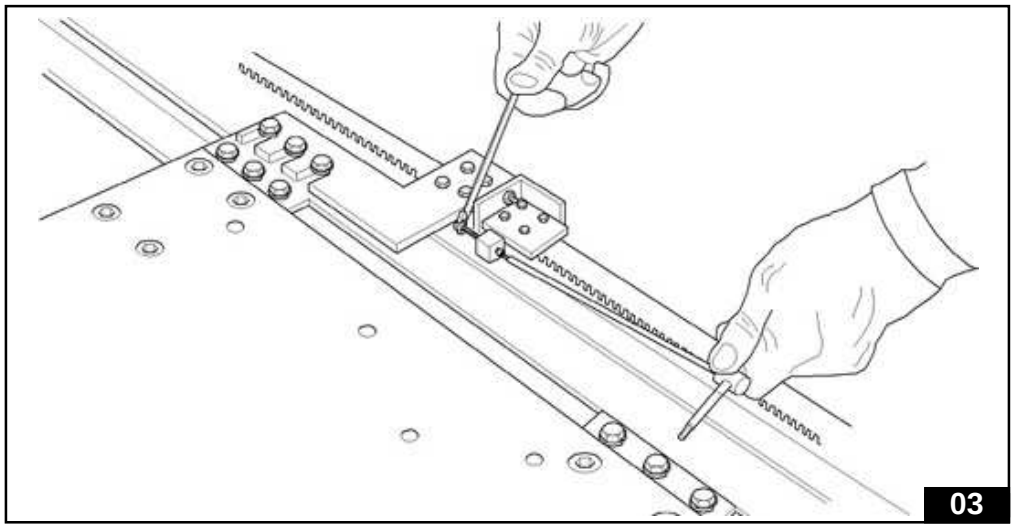


01

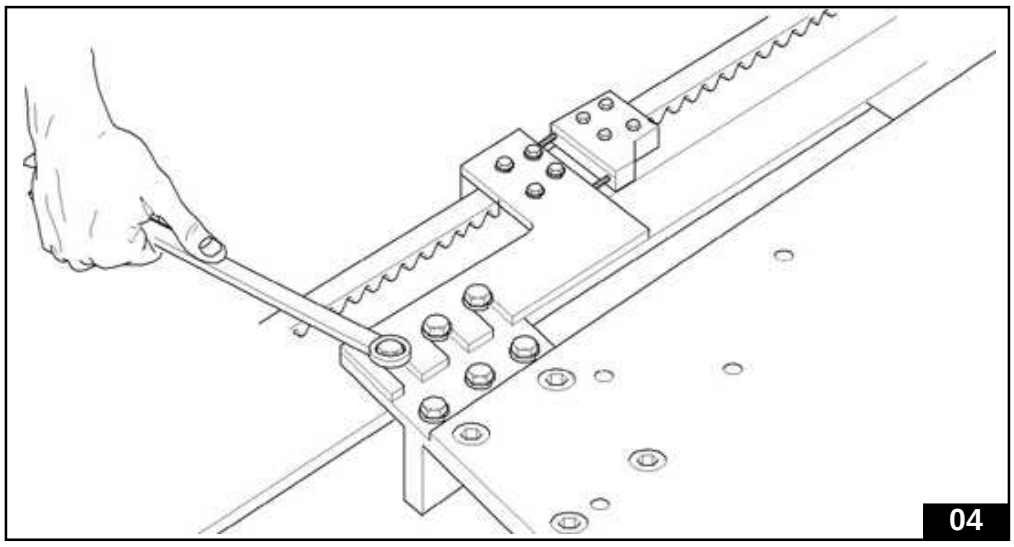


02

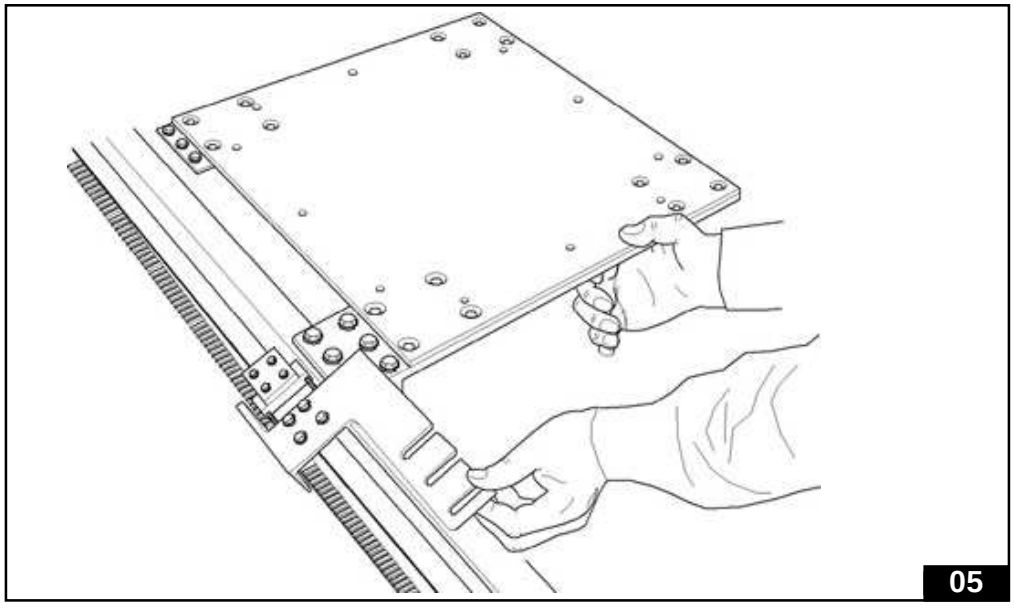
- Loosen the toothed belt, by unscrewing the screws (Nr. 5) from the tightener. 0 3



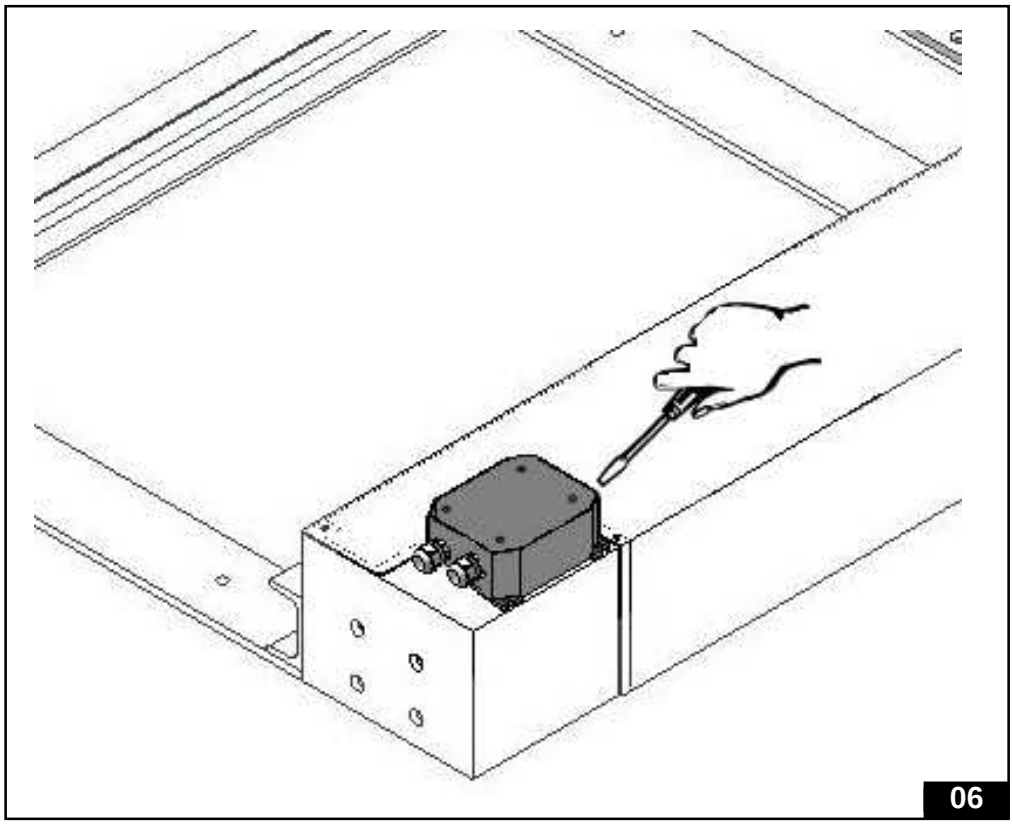

- Unscrew the hexagonal-head screws that fix the draft group to the trolley. 0 4



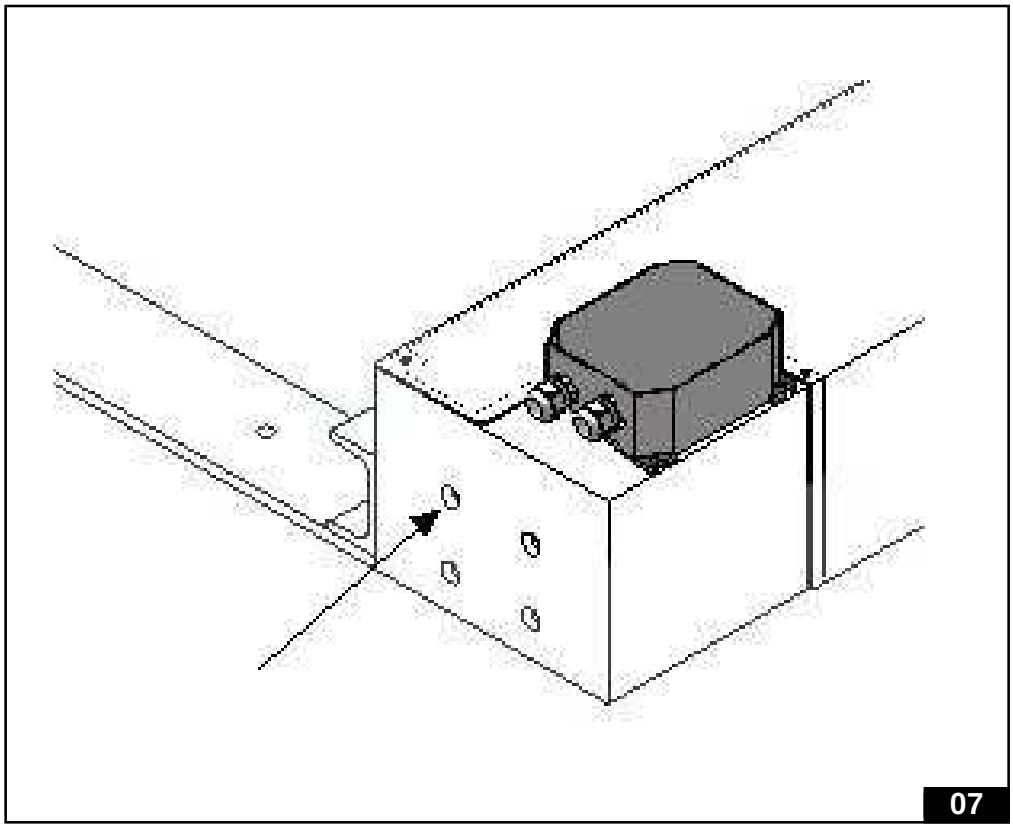

- Remove the draft group from the trolley plate. 0 5
- Remove the belt from the driving and snub pulley.



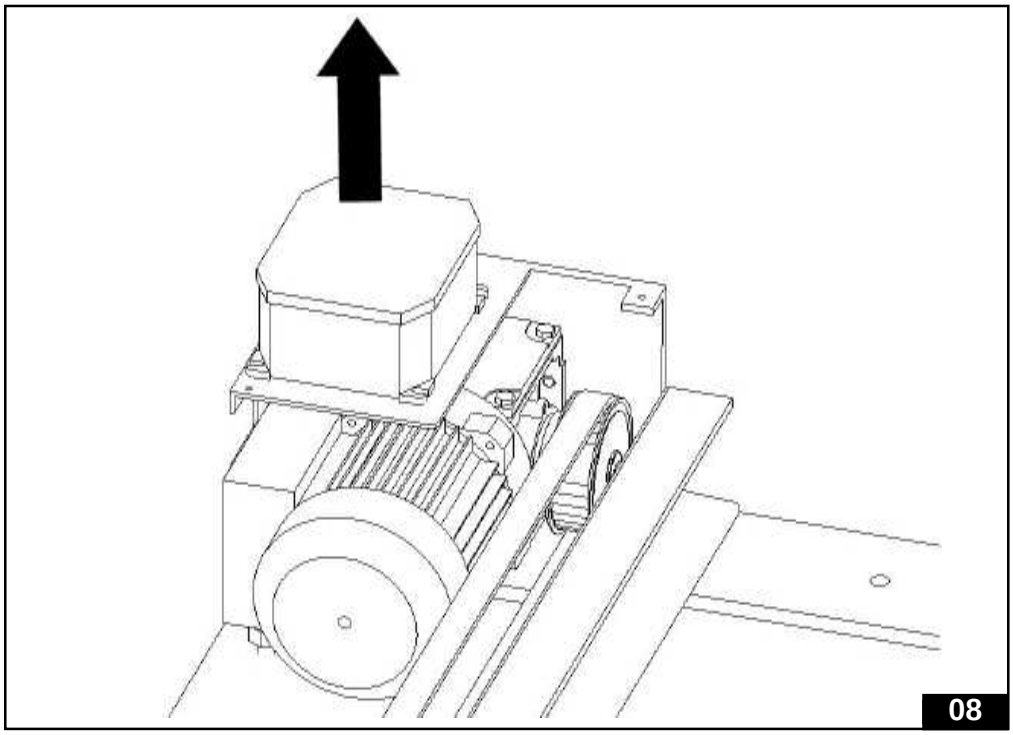
- Open the connection box and disconnect the motor. 06




- Remove the box and unscrew the four screws (No. 6) that fix the gearmotor. 07



■ Then remove it from the machine. 08

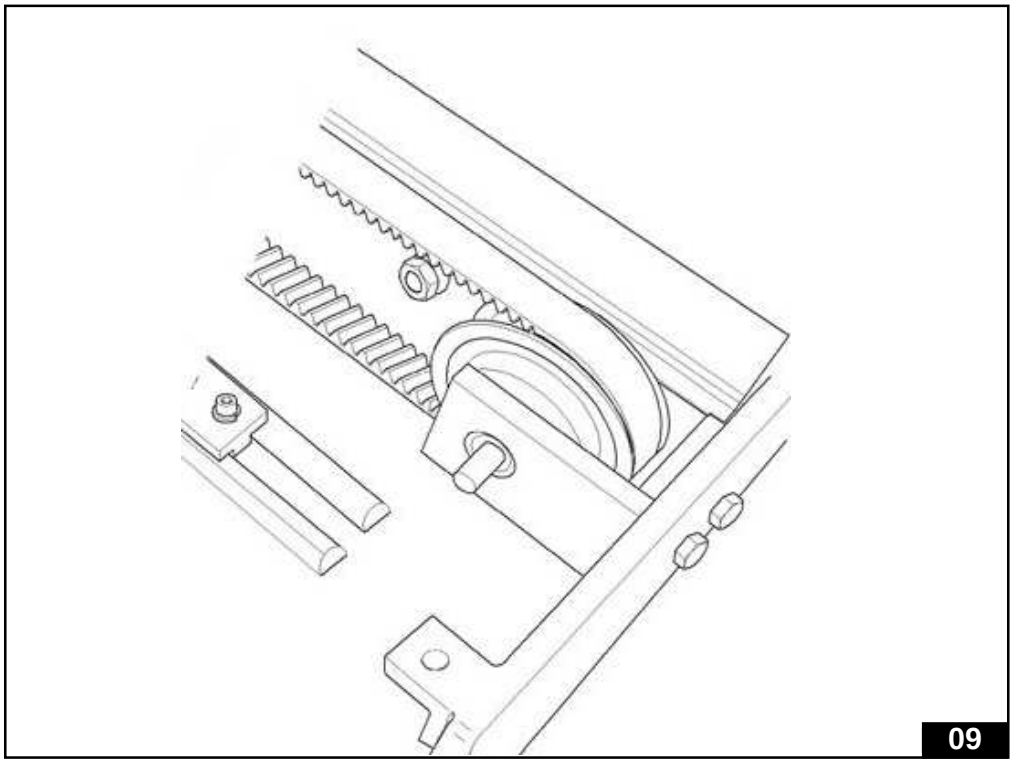



■ Remove the pulley from the old gearmotor and place it in the new one.

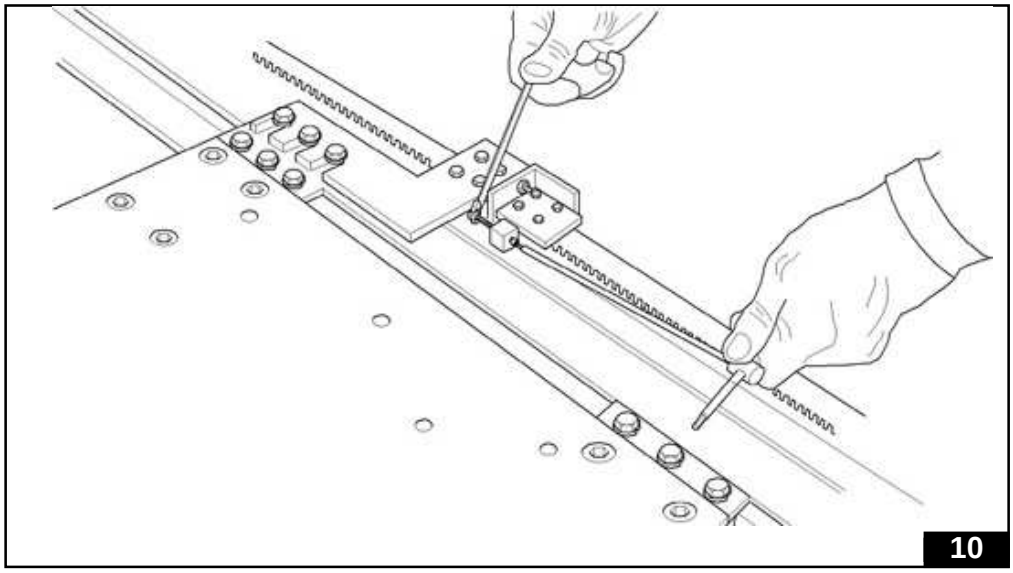
**NB:** to disassemble the pulley see following paragraph.

■ Assemble the new gearmotor repeating the reverse operations.

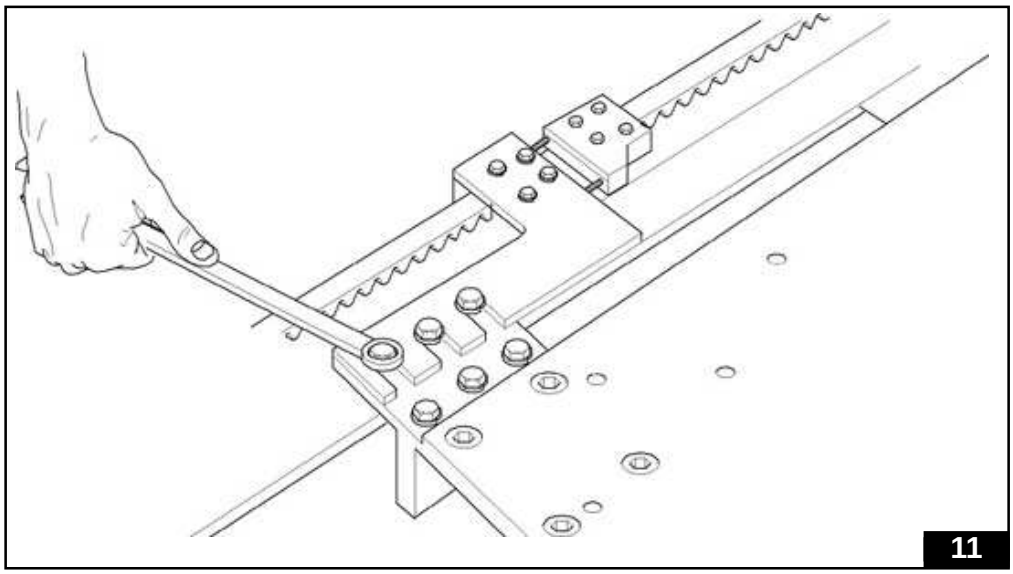
■ Position the belt on the pulleys (driving and snub). 09



- Adjust the belt tension operating on the two socket head screws (Nr. 5) of the tightener (see paragraph 12.10) 10 and fix the draft group. 11

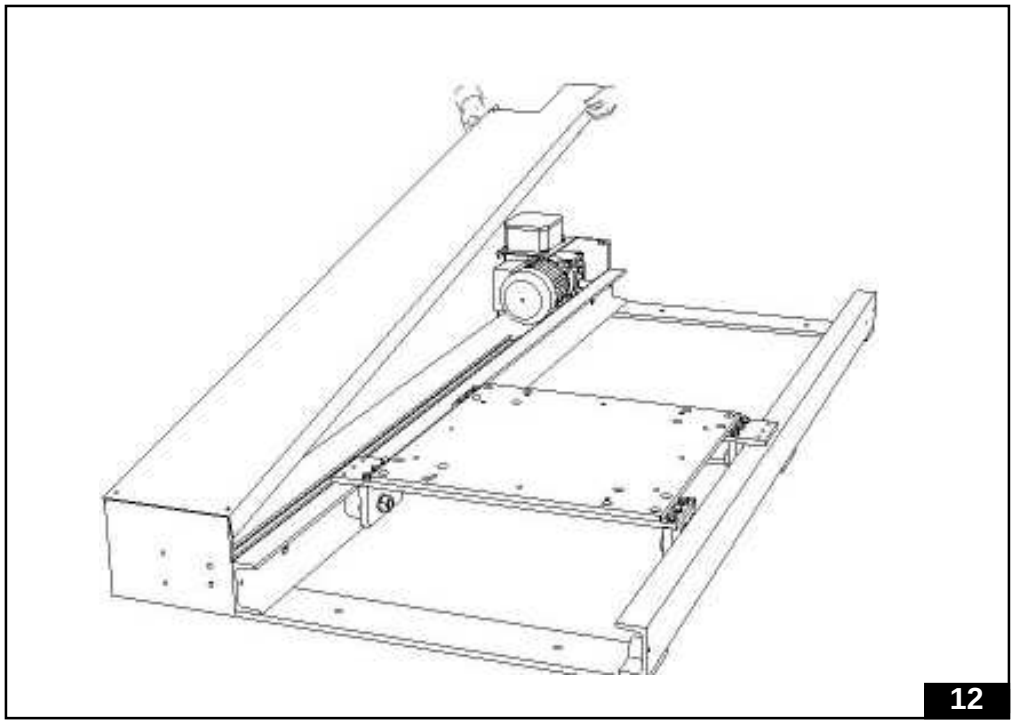


10

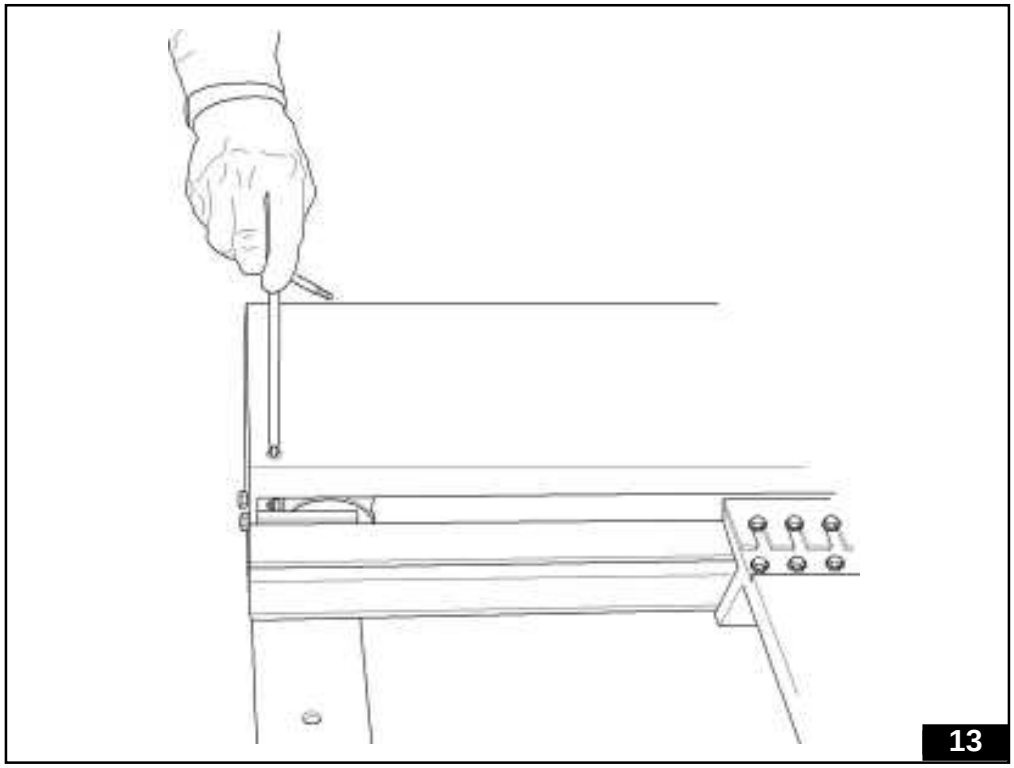


11

■ Close the machine by reassemble the cover, fixing it with the relative screws. 12 13



12



13

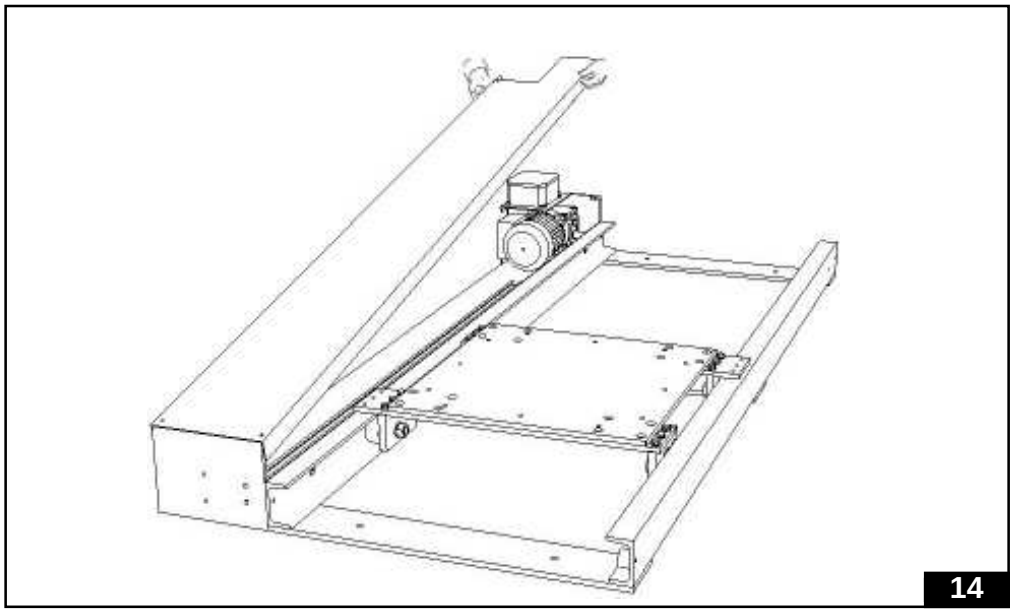
**ATTENTION:** Once the belt has been tensioned, apply Loctite to the adjusting screws.

**ATTENTION:** During the connection of the motor, check its correct direction of rotation

## 12.6 Pulley replacement

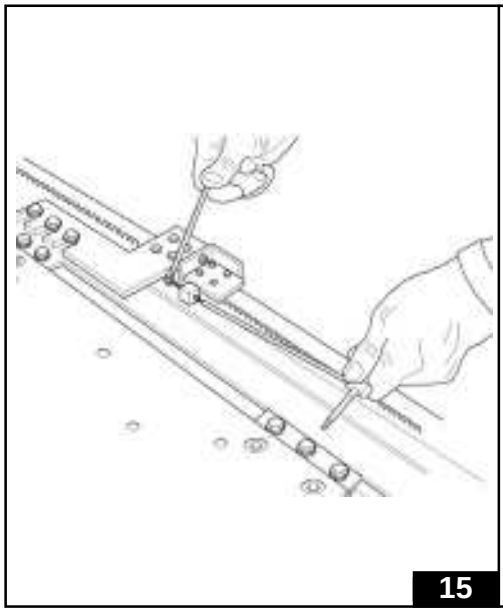
Because of the position of the motor gear (located at the side of the machine) in order to remove the pulley it is necessary to do as follows:

- Position the trolley with the reciprocator at the opposite side of the cables output.
- Switch off the machine.
- Unscrew the socket head screws (Nr. 4) of the cover, lift it and remove it. 14

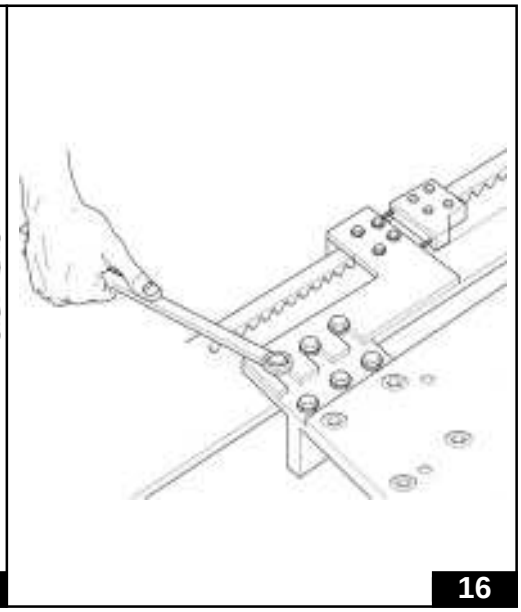


14

- Unloosen the toothed belt, unscrewing the two screws (Nr. 5) of the tightener. 15
- Unscrew the three hexagonal head screws that fix the draft group to the plate. 16



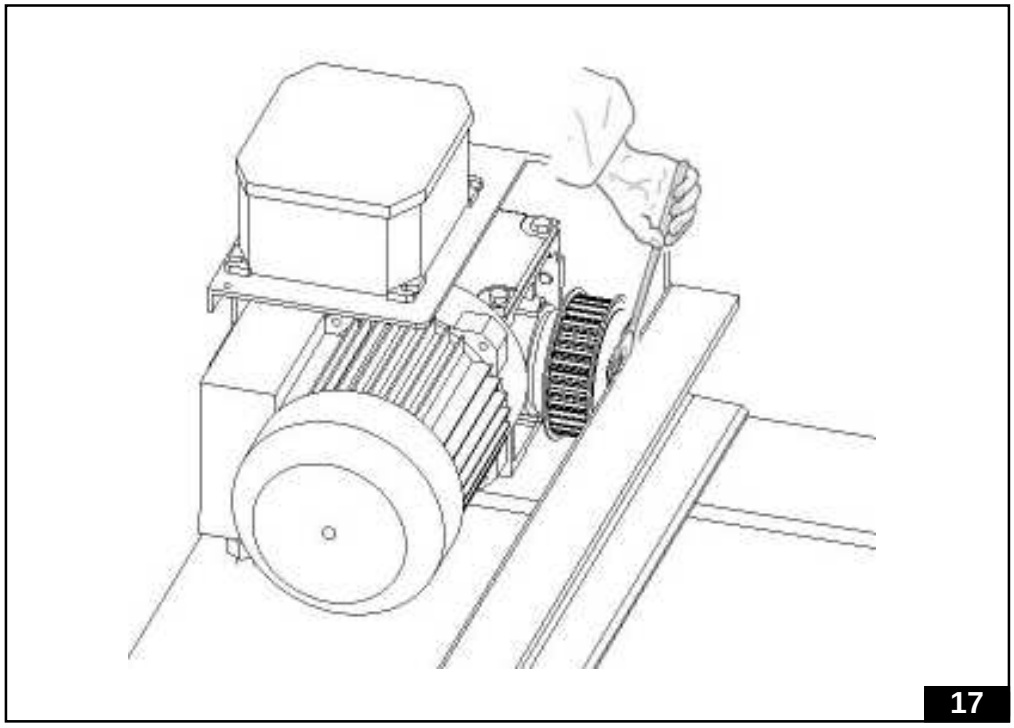
15



16

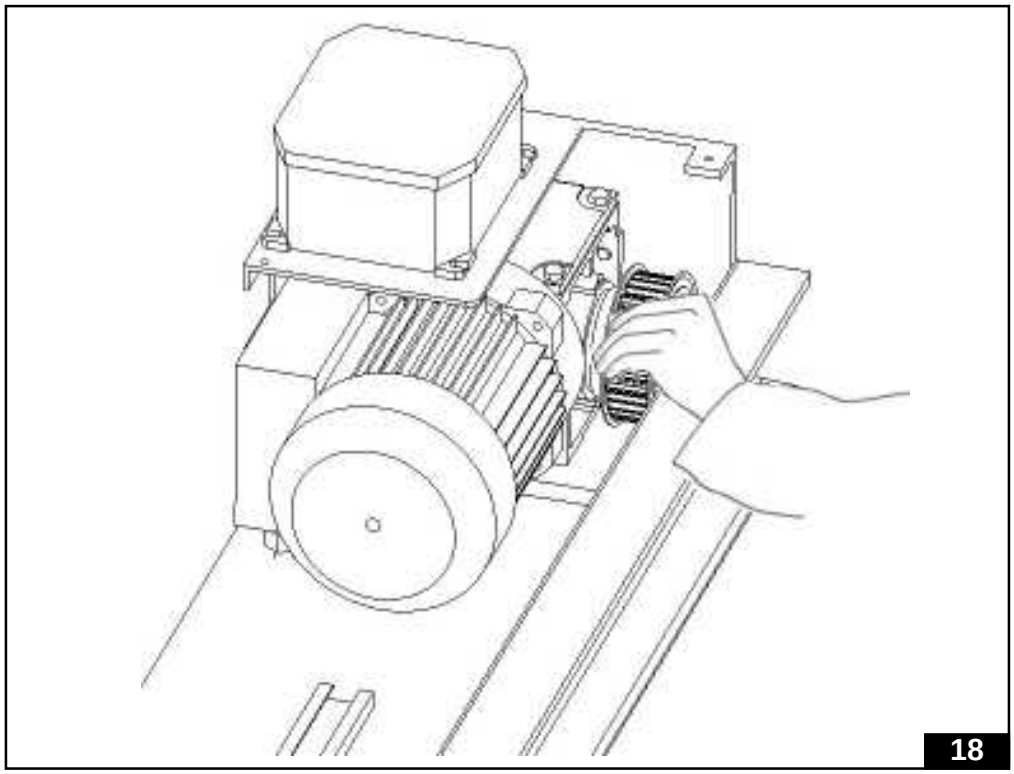
- Holding the pulley with a hand, loosen the socket head screws (Nr. 5) that fix it to the shaft. 17

**NB:** the movement from the shaft to the pulley is transmitted via a key inserted in the special seat (on the shaft and on the pulley); the screws keeps the pulley in position.



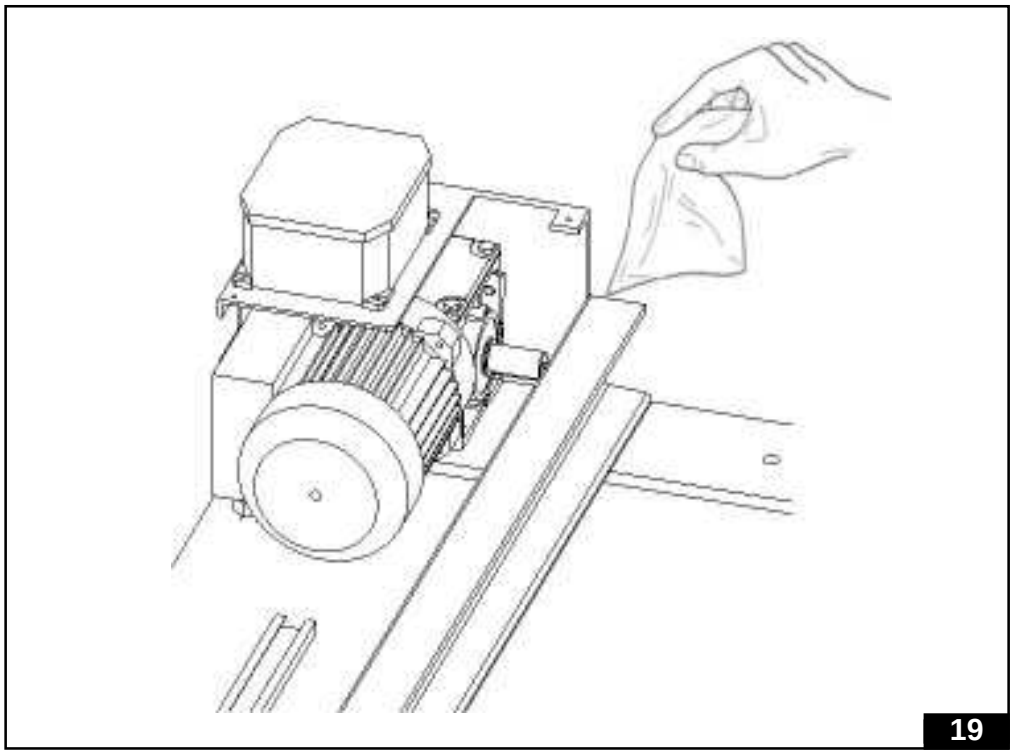
17

- Remove the pulley and the key. 18

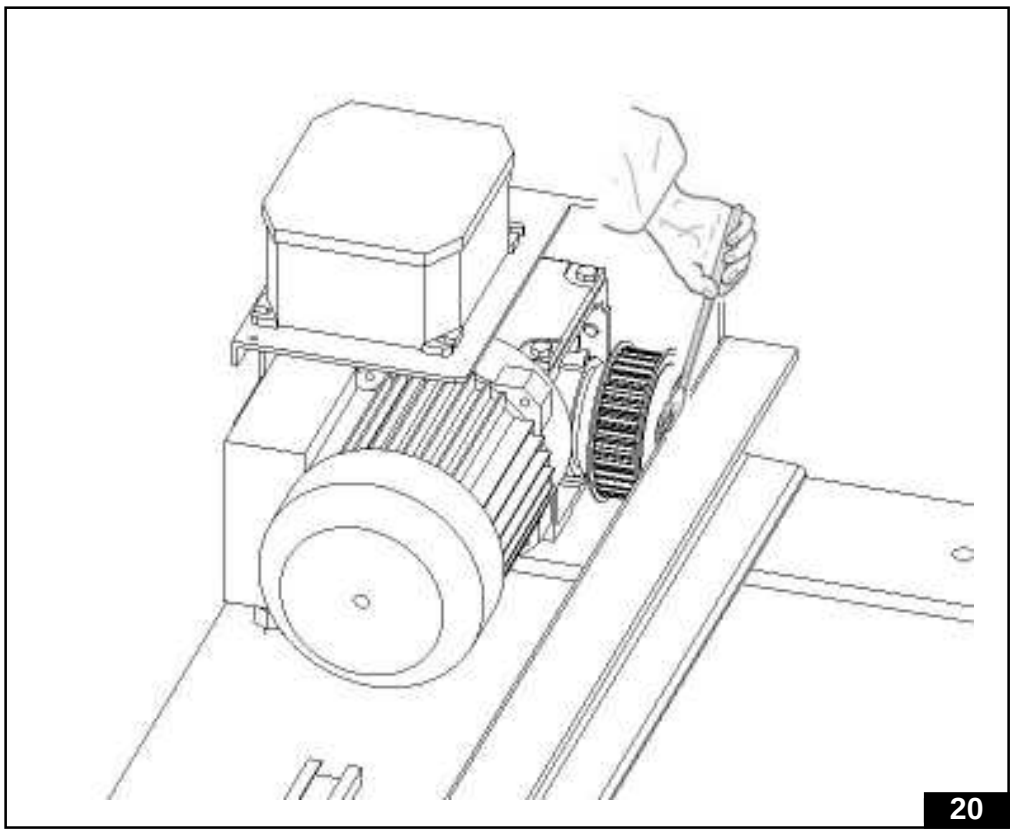


18

- To remove grease or dirt, clean the shaft. 19

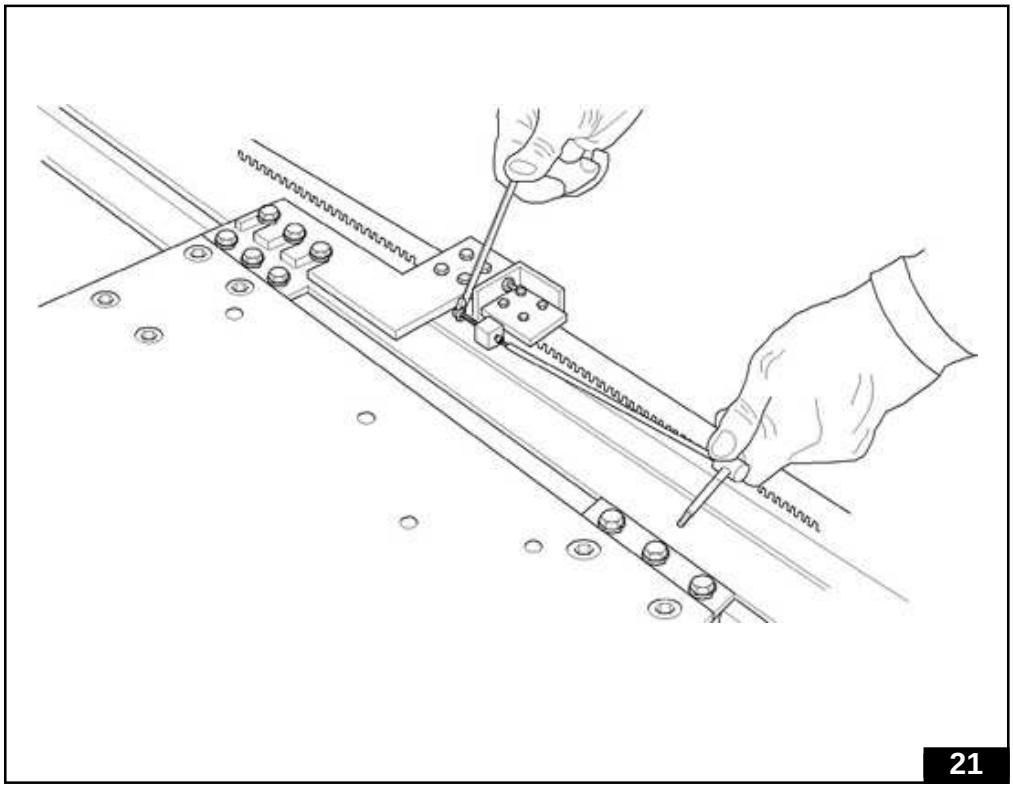



- Now it is possible to assemble the new pulley, inserting first the into its seat on the shaft.
- Screw the screw that block the pulley, tightening it with the wrench. 20

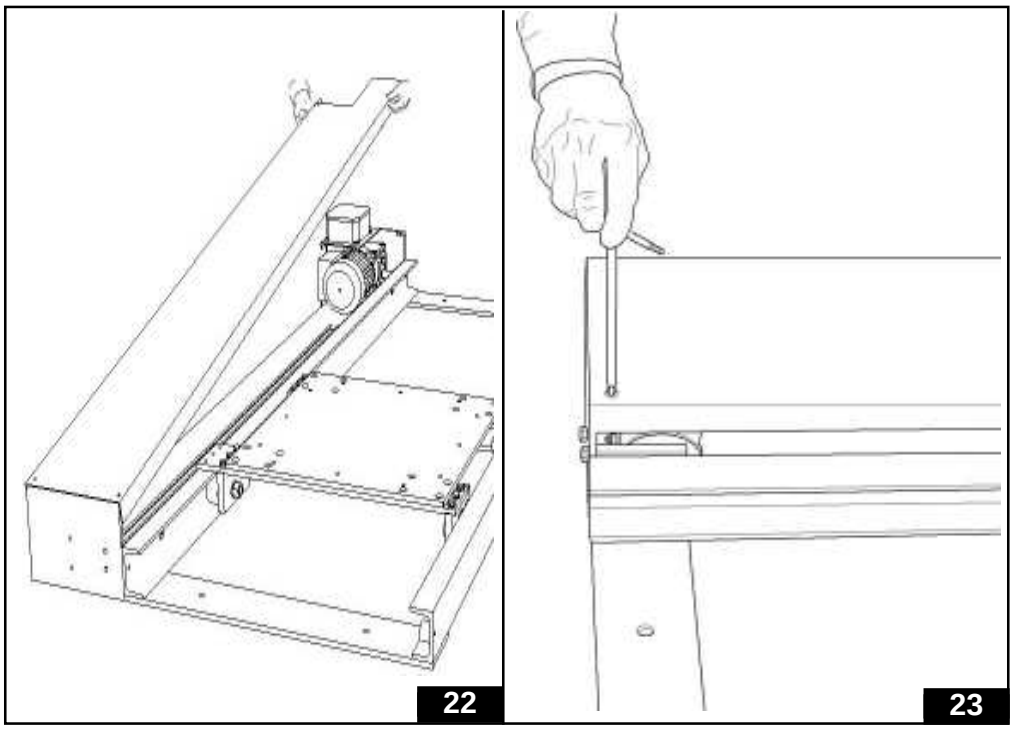


**NB:** given the specifications of the gear motor and the pulley (in cast iron) the assembling system used (with the key) is suitable; it is not necessary to use a more complex system, for ex. with the ring block.

- Reassemble the toothed belt and adjust the tension, referring to chapter 12.10. 21

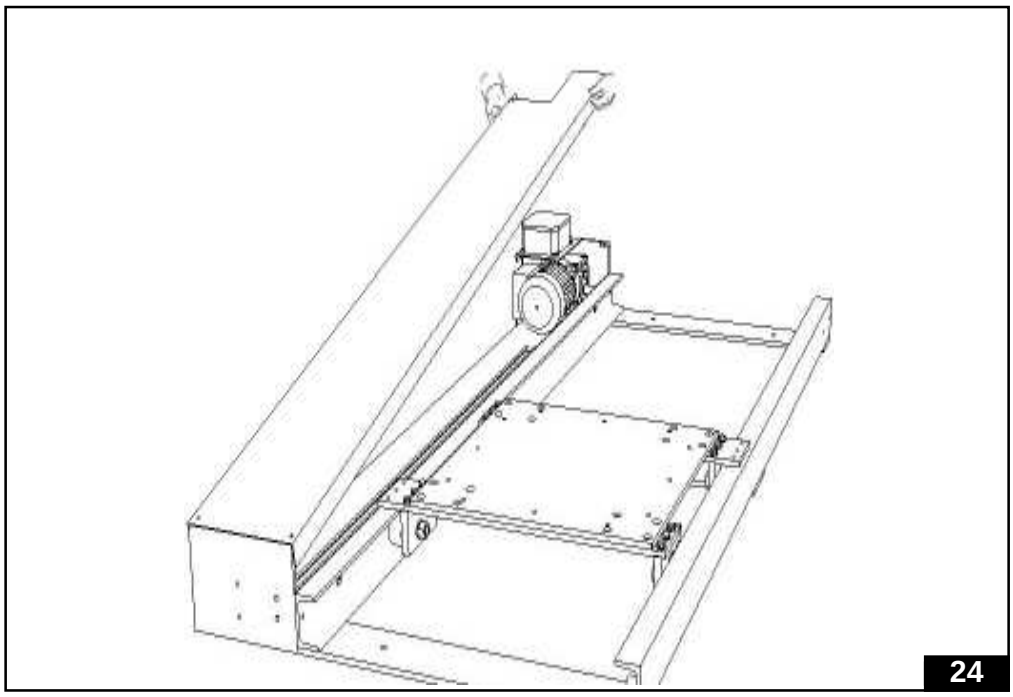



- Reassemble the cover and fix it with the relative socket head screws (Nr. 4). 22 23



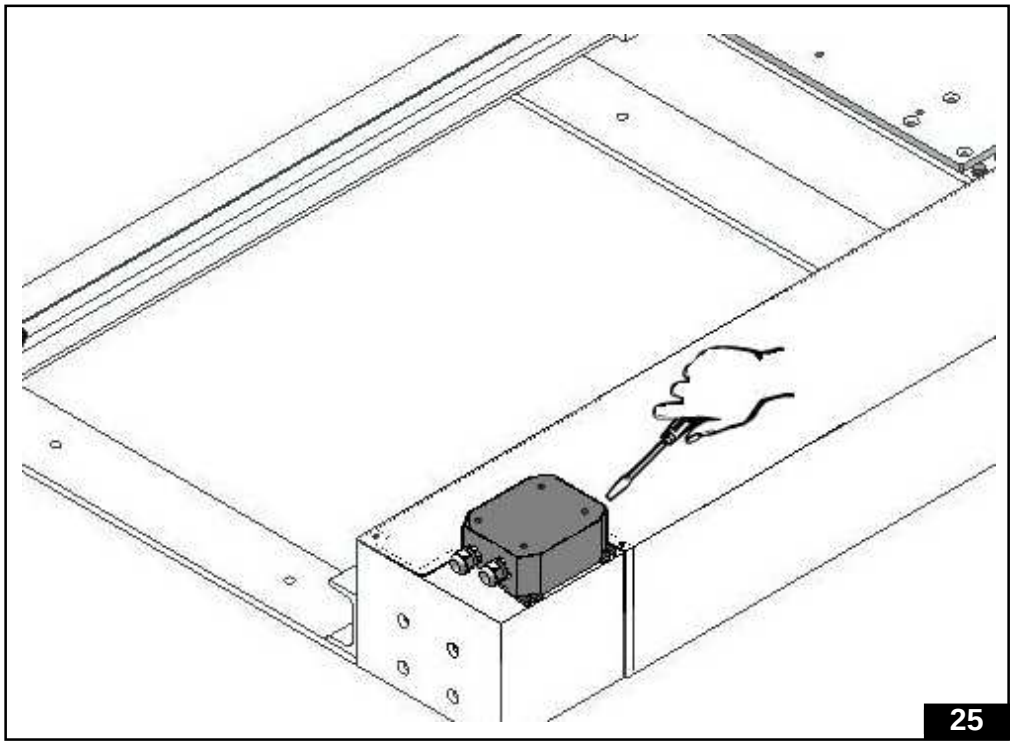
## 12.7 Replacing end of stroke sensors

- Switch off the machine, remove the cover, unscrewing the relative socket head screws (CH 4). 24



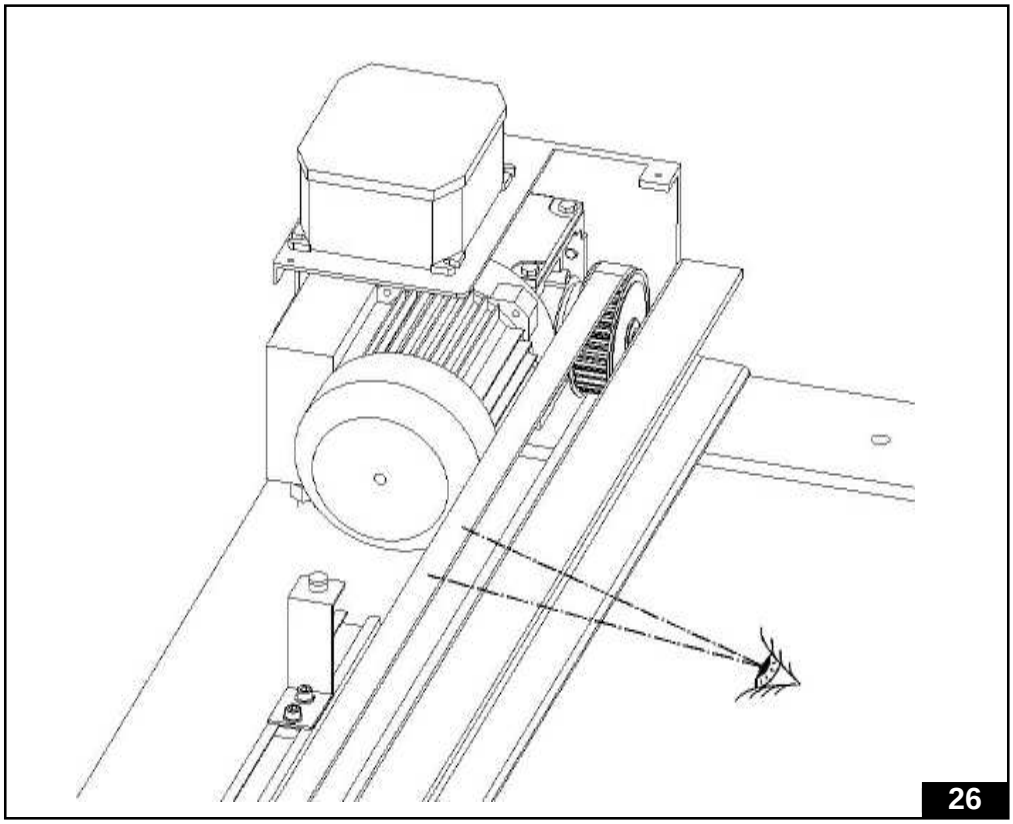
24

- Open the connection box and disconnect the two limit switches. 25

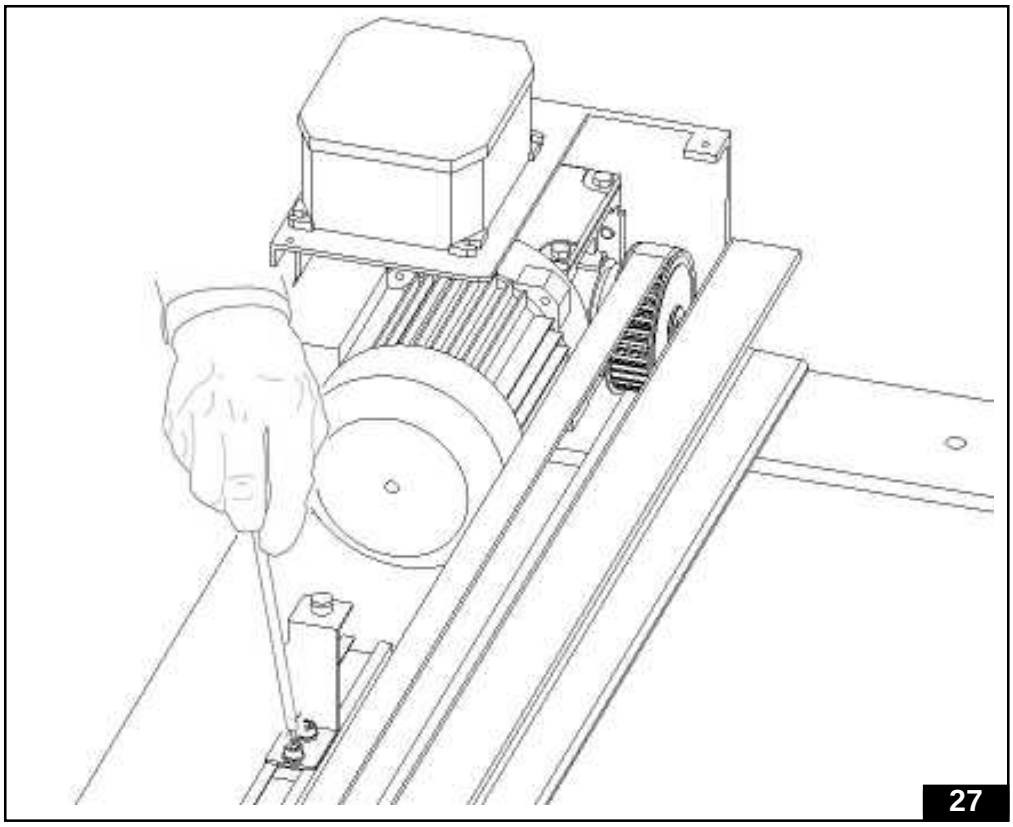


25

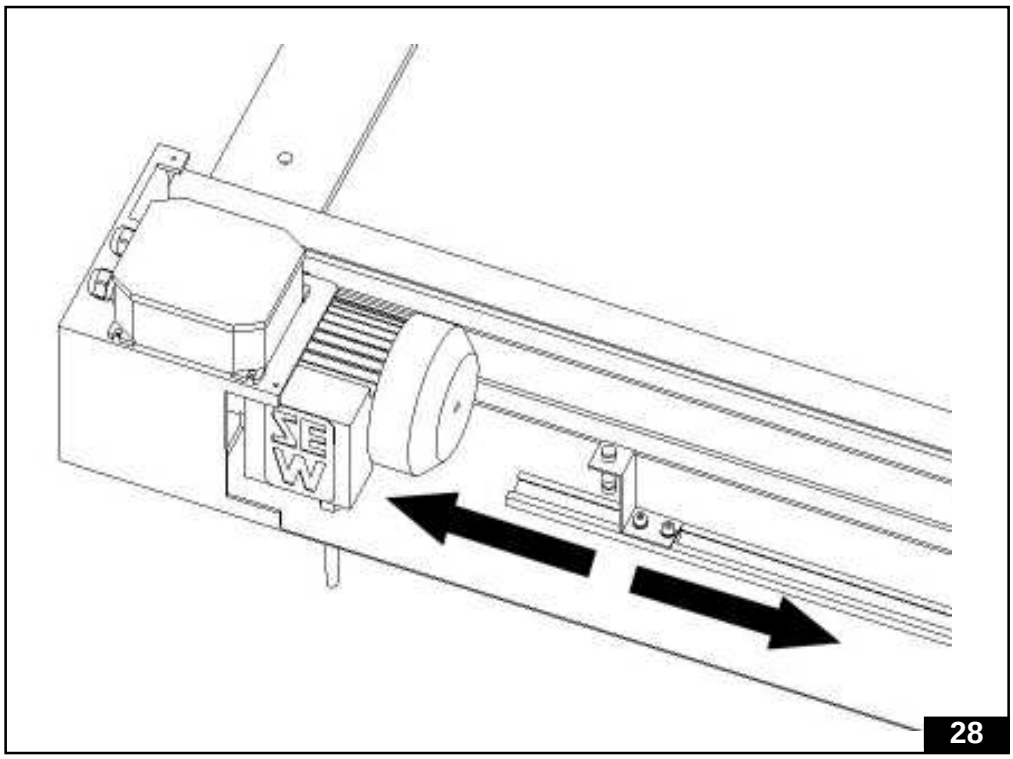
- Mark the position of the end of stroke sensor to replace. 26




- Unloosen, with a setscrew wrench, the screws that fix the sensor to the guide and remove the electric connections. 27

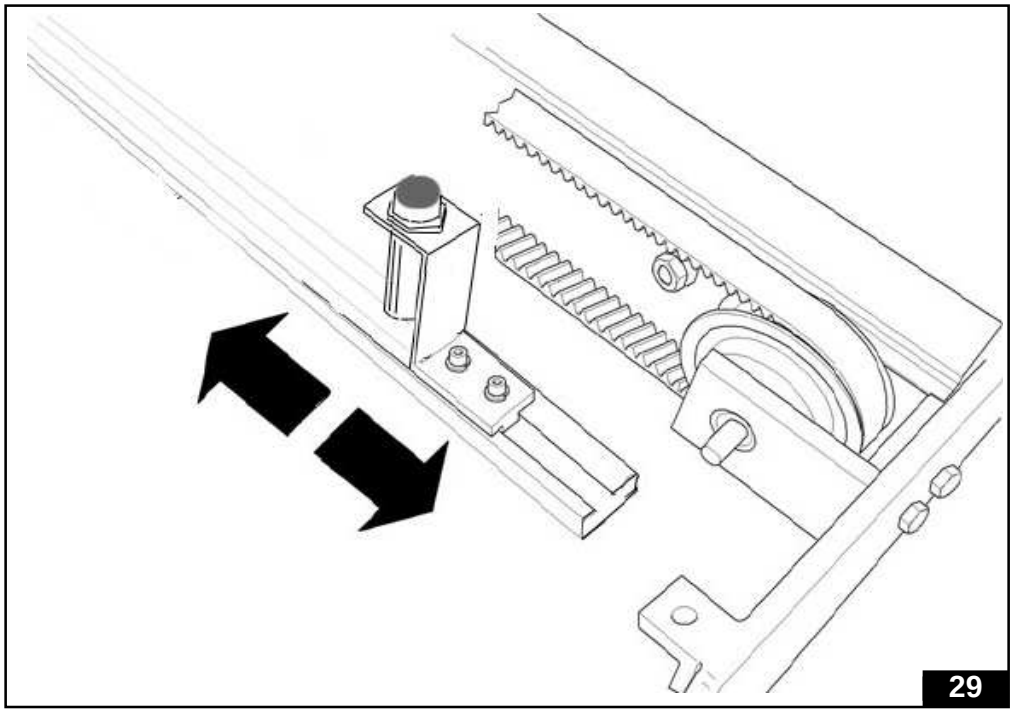


- Replace the sensor and restore the connections. 28

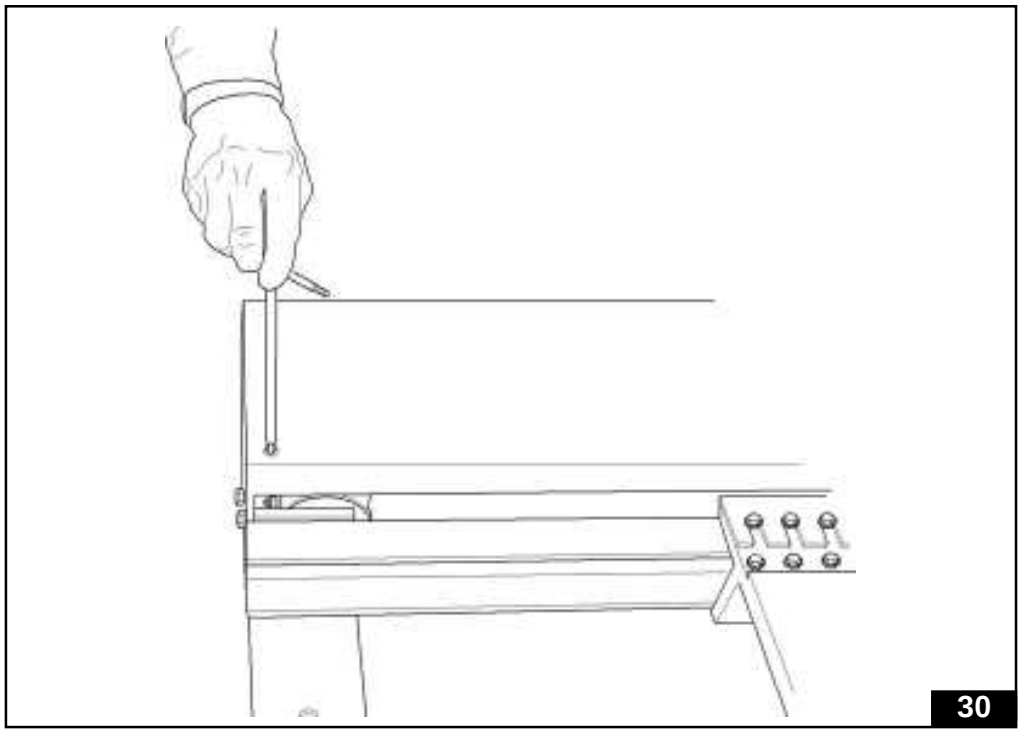


28

- Adjust the position of sensor, referring to the mark on the guide. 28
- If necessary, adjust also the position of the other sensor, in order to reach the stroke desired value. 29

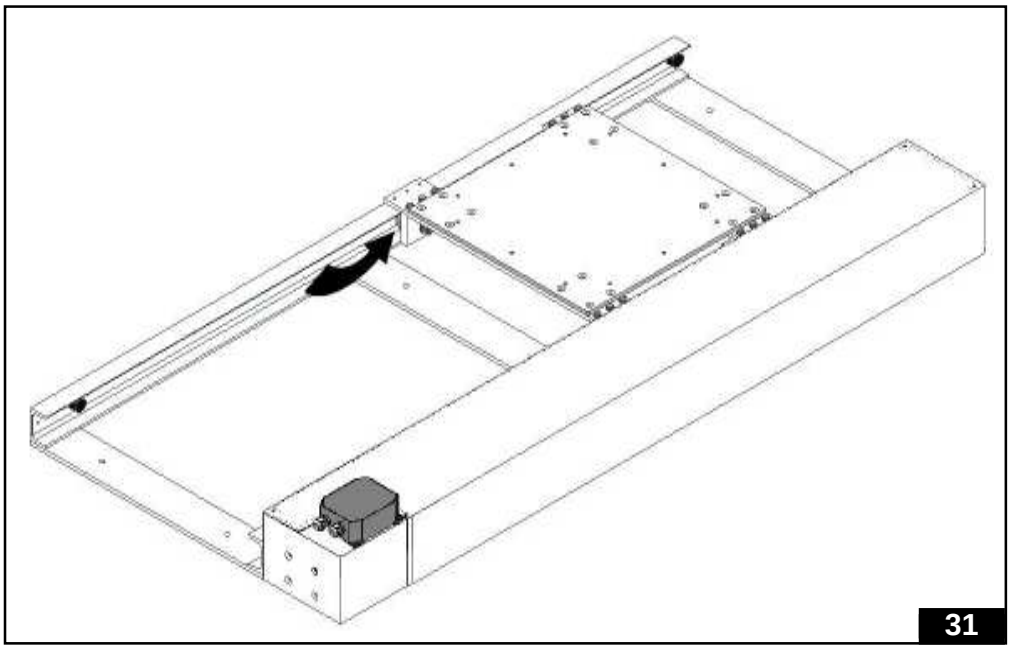

29

- Once the adjustment has been finished, close the machine assembling the cover 30



## 12.8 Replacing of trolley wheels

- Because of the constructive features, the wheels supports are fixed and no adjustment are foreseen.



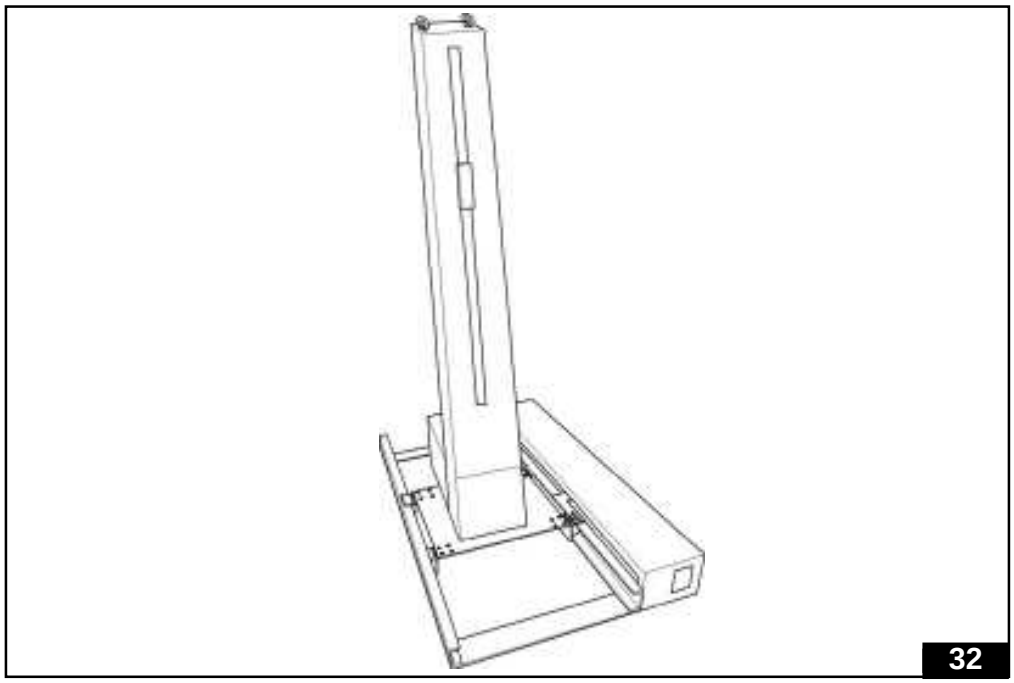

## 12.9 Replacing of trolley wheels

- To replace the wheels of the trolleys contact *the* ***Nordson***® assistance service.

## 12.10 Replacing and adjusting toothed belt

To replace the toothed belt do as follows:

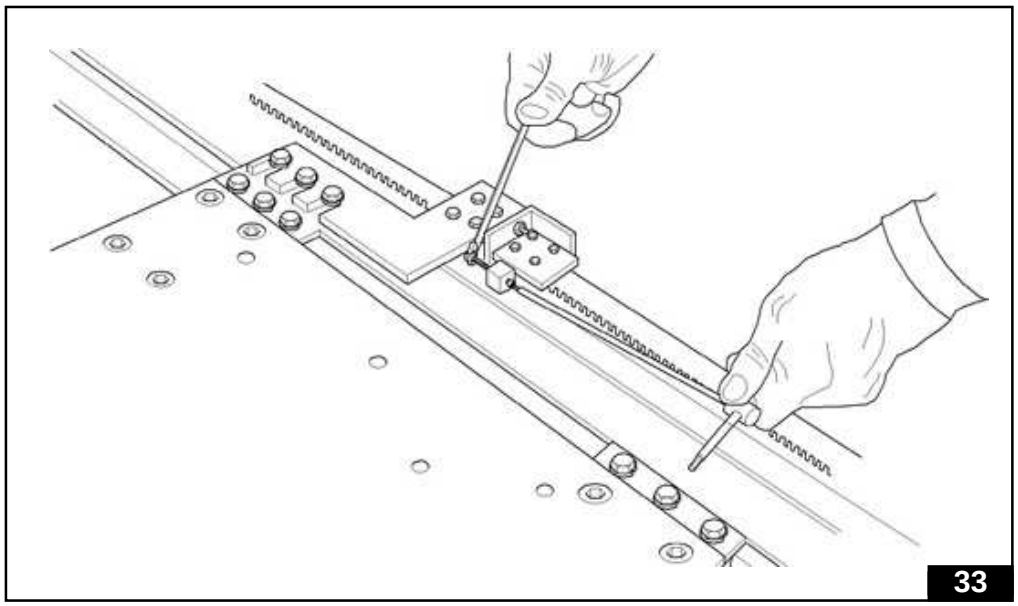
- Position the trolley in the centre of the z-axis. 32



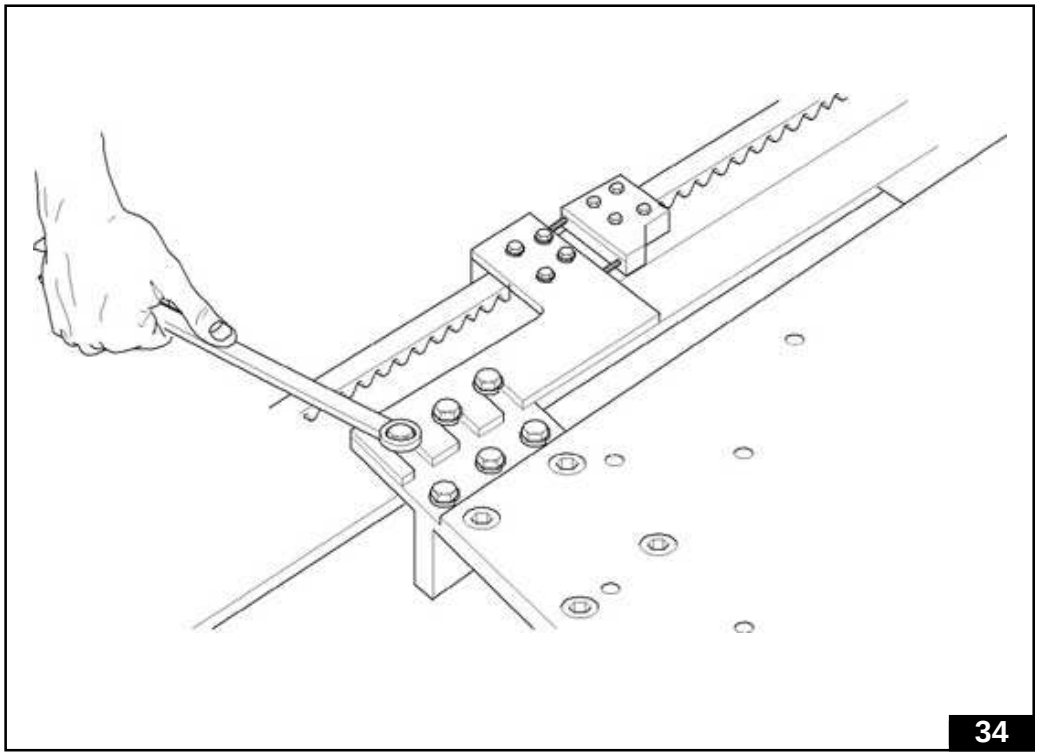

- Switch off the machine and remove the cover; unscrew completely the tie rods using a setscrew wrench Nr. 5. 33

**NB**: this operation must be carried out little by little, unscrewing the screws alternately.

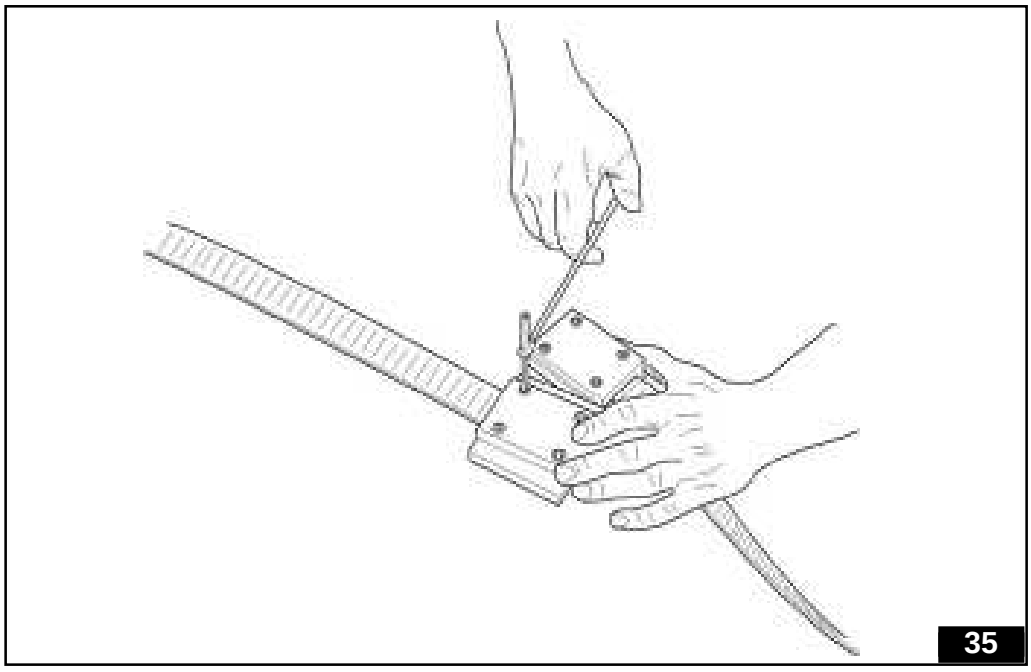
**NB:** to make the operation easier, unloosen first the lock nuts.



- Remove the belt, unscrewing the fixing screws from the draft group and extracting it from the pulleys. 34

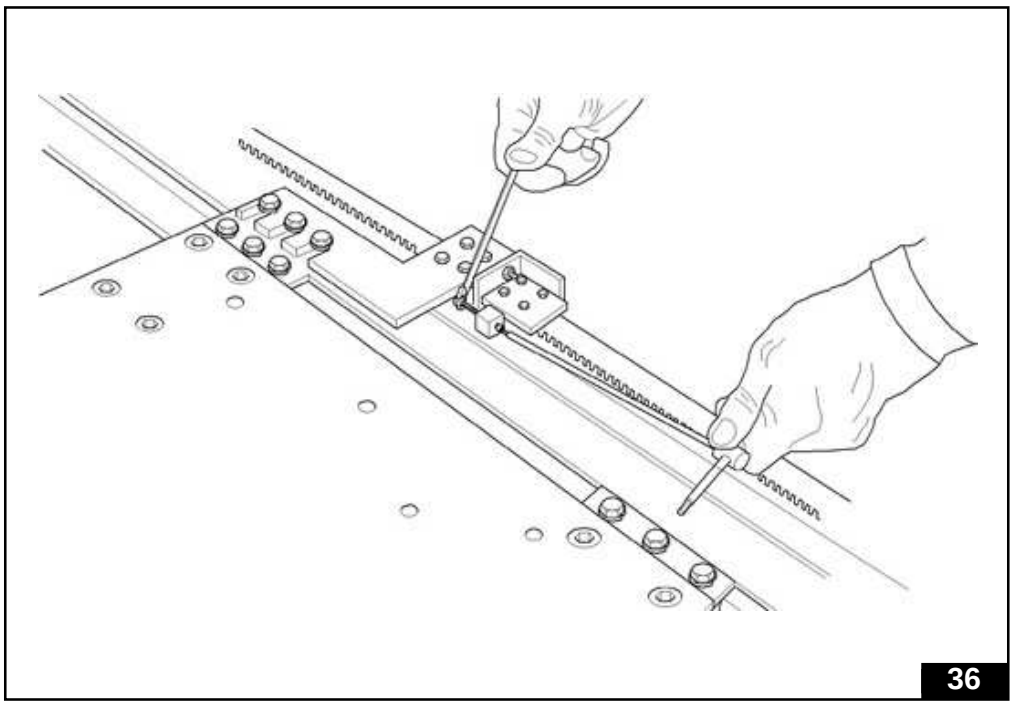



- Remove the toothed blocks from the belt, unscrewing the relative screws (setscrew wrench No. 4) 35 ; replace the belt with a new one.



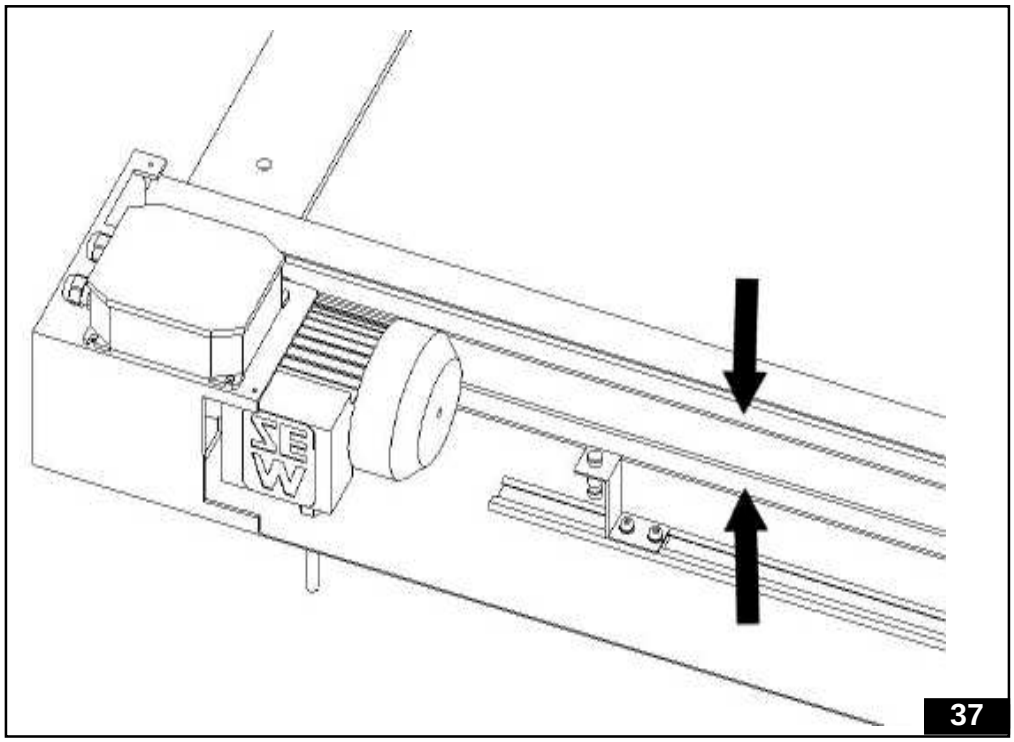
- Adjust the belt tension, operating on the tie rods so as to reach the correct value. 36

**NB**: to centre correctly the belt, it is necessary that the sides of the blocks are parallel.



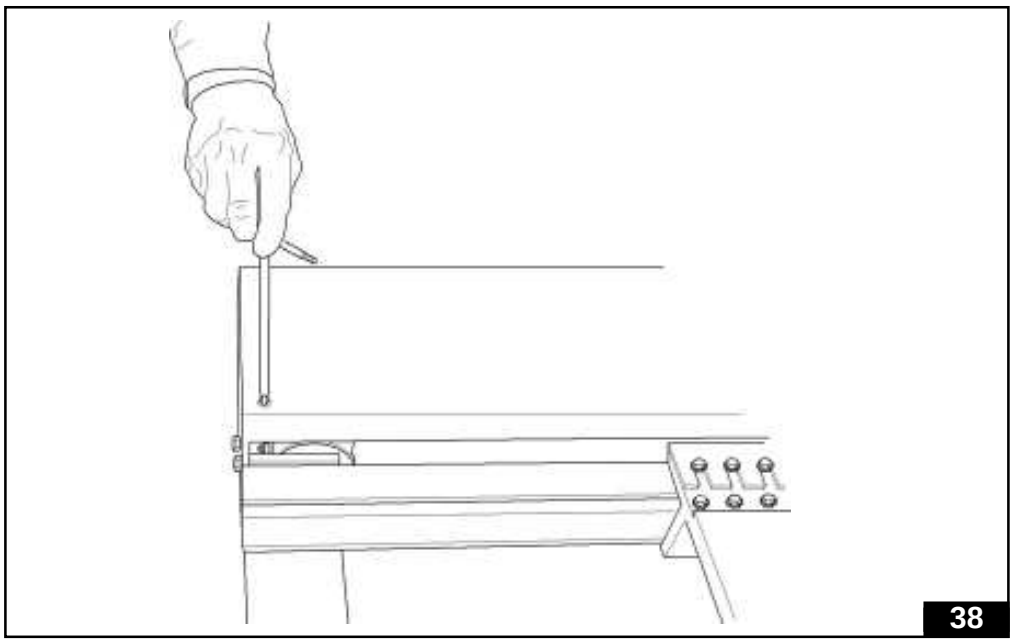
36

- Check manually the belt tension. 37




37

- Block the tie rods tightening the relative lock nuts.
- Close the machine reassembling the cover with the relative screws. 38

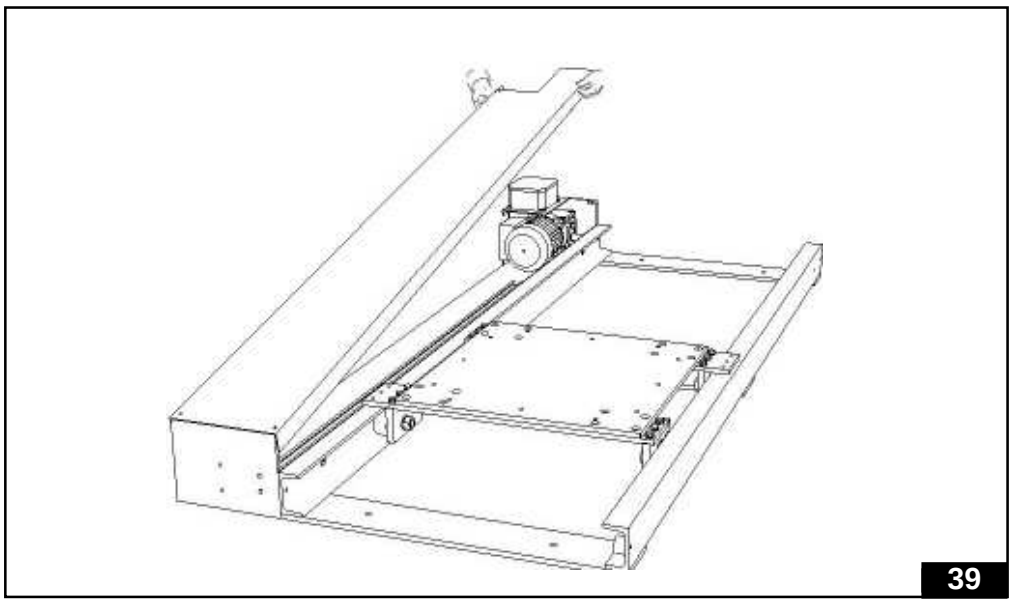



## 12.11 Replacing snub pulley

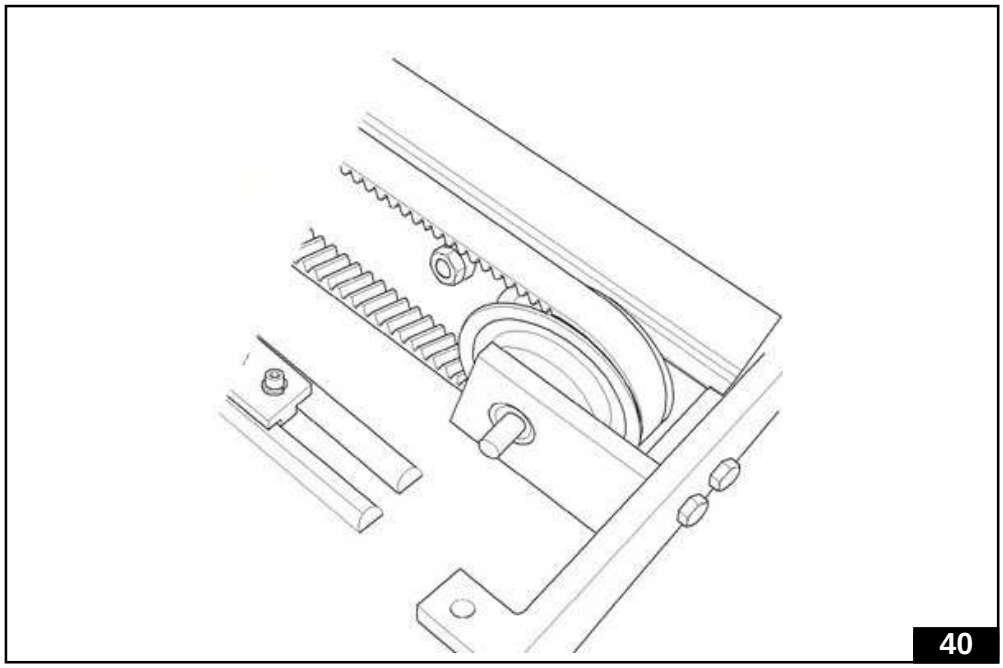
**ATTENTION:** To carry out this operation it is necessary to position the trolley at the side of the motor gear (connection box). 39

To replace the snub pulley, do as follows:

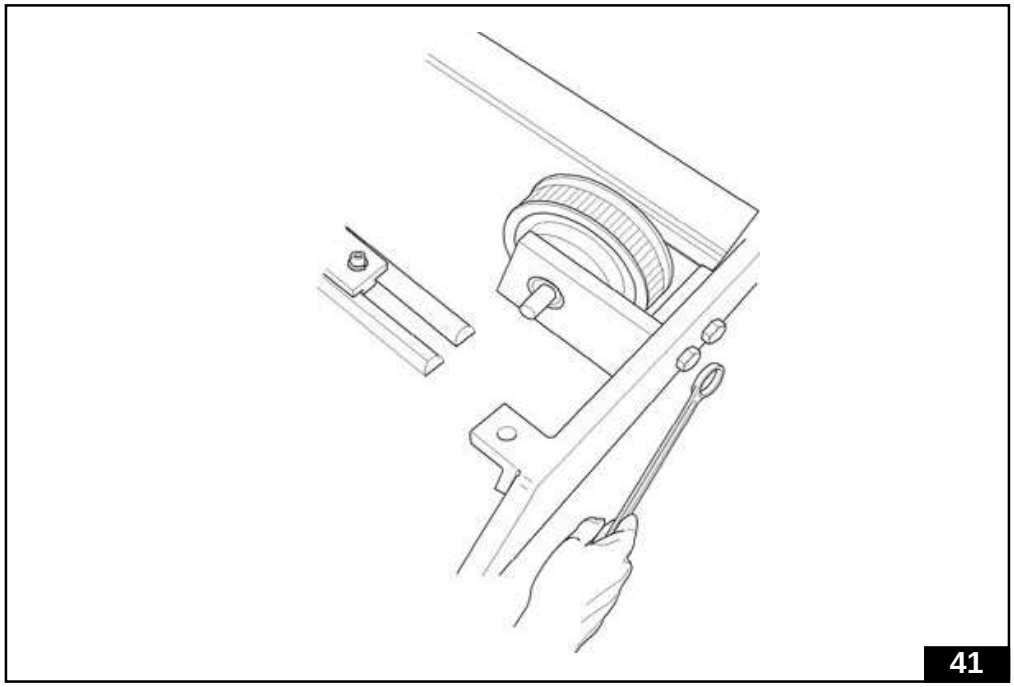
- Switch off the machine and remove the cover, by unscrewing the relative screws.



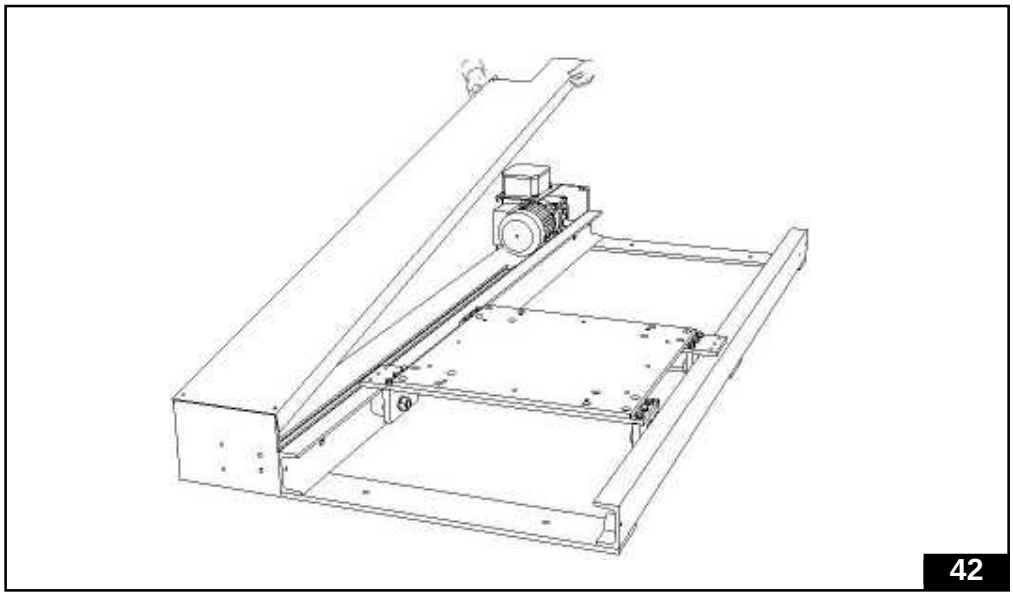
- Unloosen the belt tension, remove the blocks, following the procedure described in the previous paragraph.
- Remove the toothed belt from the snub pulley. 40




- Unscrew and remove the screws that fix the pulley support. 41
- Remove the toothed pulley and the relative pivot, removing the support
- Assemble the new pulley complete with the pivot.
- **NB:** the bearings are assembled in the pulley support



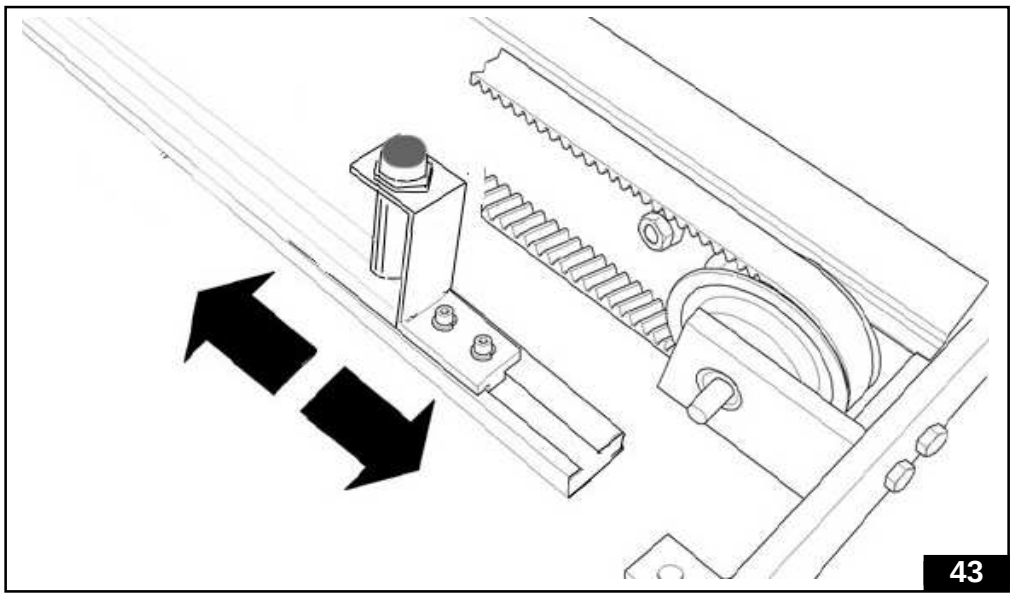
- Place the toothed belt on the pulley.
- Adjust correctly the belt tension (see paragraph12.10).
- Close the machine, reassembling the cover. 4 2




## 12.12 Adjustment maximum stroke

If not different defined in the order, the machine is supplied with stops and limit switches positioned at maximum stroke. In case of necessary changes, do as follows (as described in paragraph 12.7):

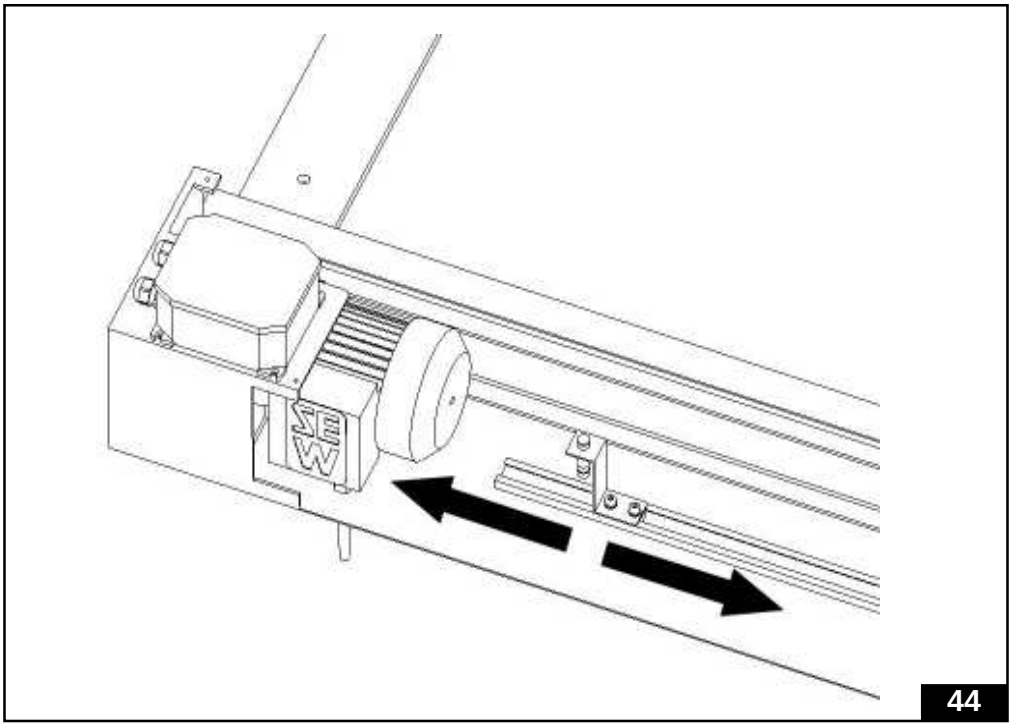
- Position the trolley in the centre of the z-axis
- Switch off the machine.
- Remove the cover.
- Unloosen the fixing socket head screws of the support.
- Let the end of stroke group slides up to the new position. 4 3



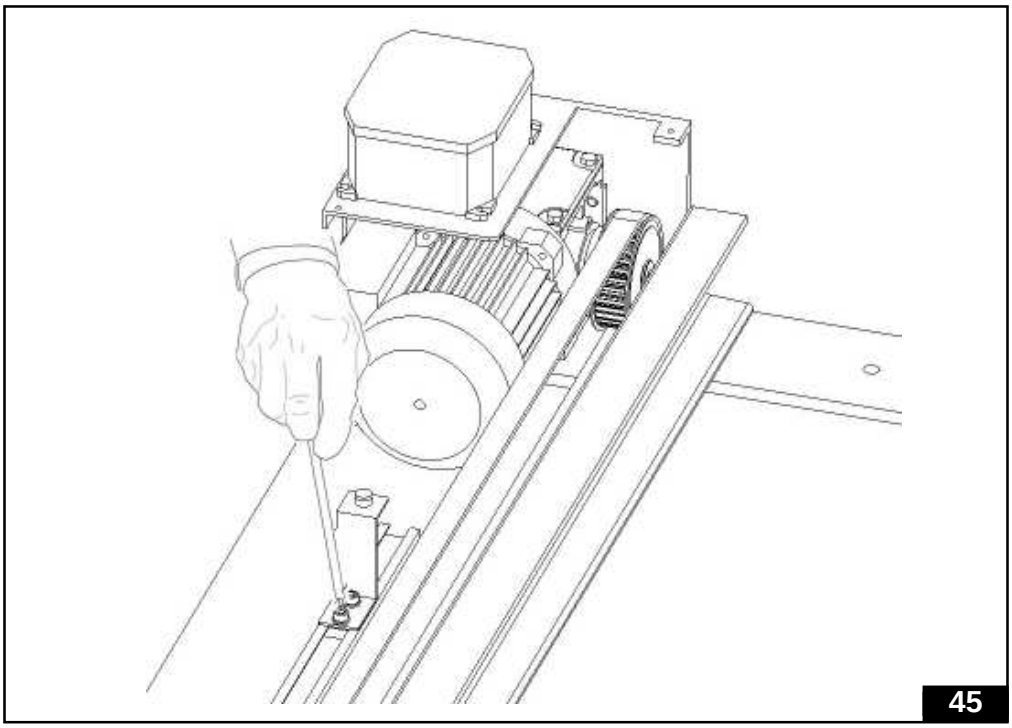
**NB:** the position of the end of stroke is below described:
- gearmotor side: end of stroke back
- opposite side: end of stroke forward

- Block the end of stroke group tightening the socket head screws. Adjust the end of stroke position. 44 45

- Reassemble the cover, by screwing the relative screws.




44

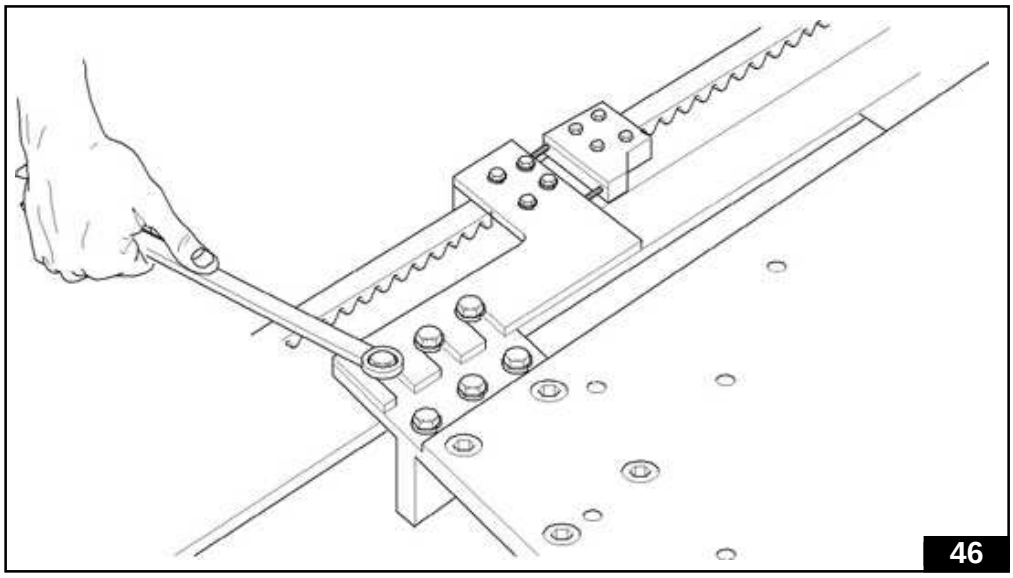


45

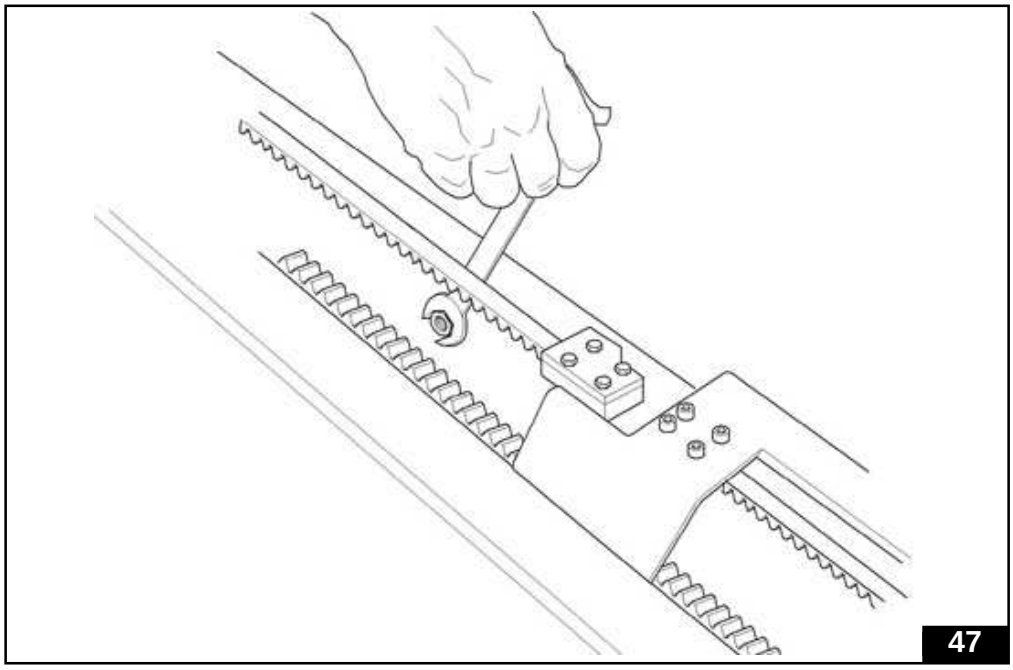
## 12.13 Disassembly of lateral part of the machine

If necessary, it is possible to disassemble the lateral side of the machine, where the motor, the belt and the pulleys are located, from the structure where the movable part slides.
Do as follows:

- Position the trolley in the centre, unscrew the screws of the cover.




- Remove the belt from the draft group, unscrewing the relative screws. 46
- Unloosen the three nuts (wrench Nr. 16) that fix the lateral side of safety guard 47 and separate the two parts.

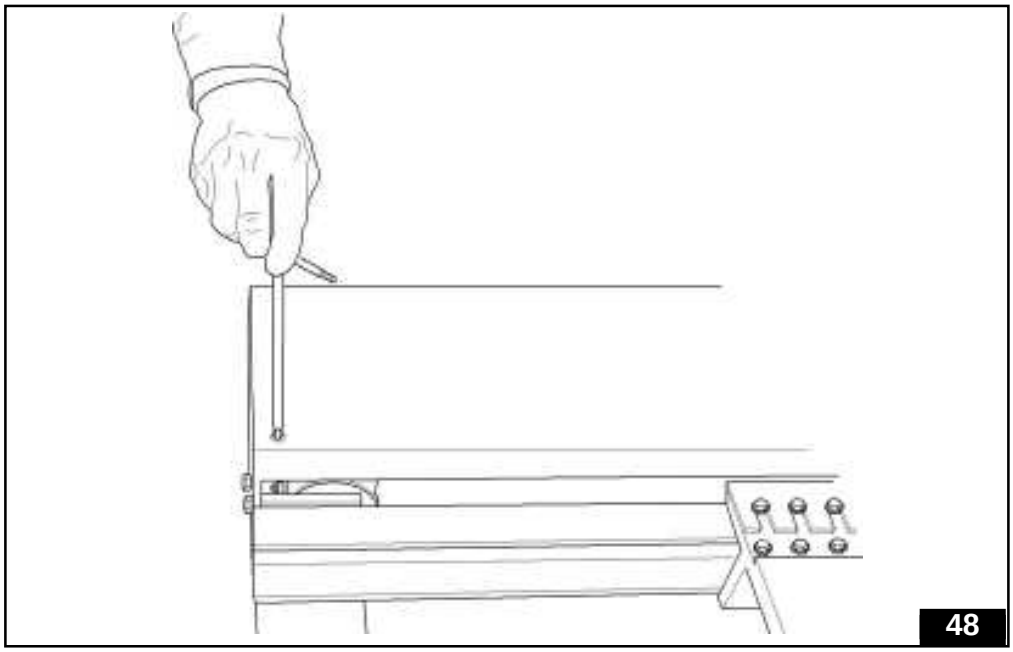



**NB:** in particular cases it is possible to use the machine without the motor part, by lifting manually the reciprocator fixed on the trolley.

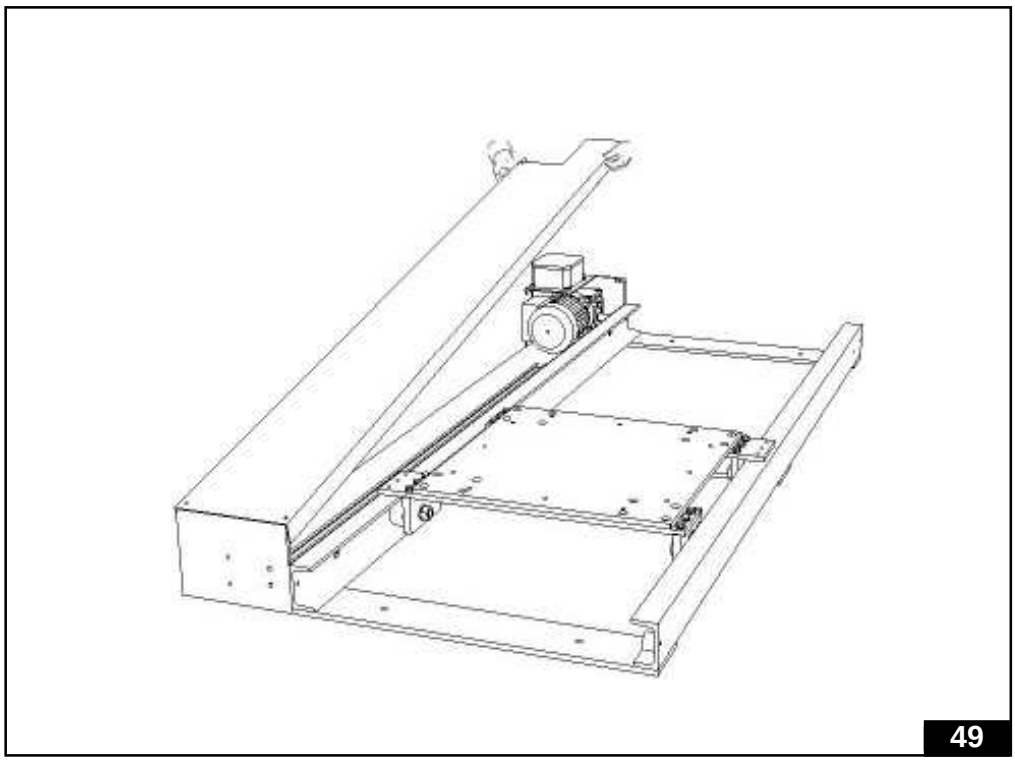
## 12.14 Replacement of encoder

To replace the gearmotor, do as follows:

- Position the reciprocator at the opposite side of to the cables output.
- Switch off the machine.
- Unscrew the socket head screw (Nr. 4) that fix the cover, then lift it and remove it. 48, 49.

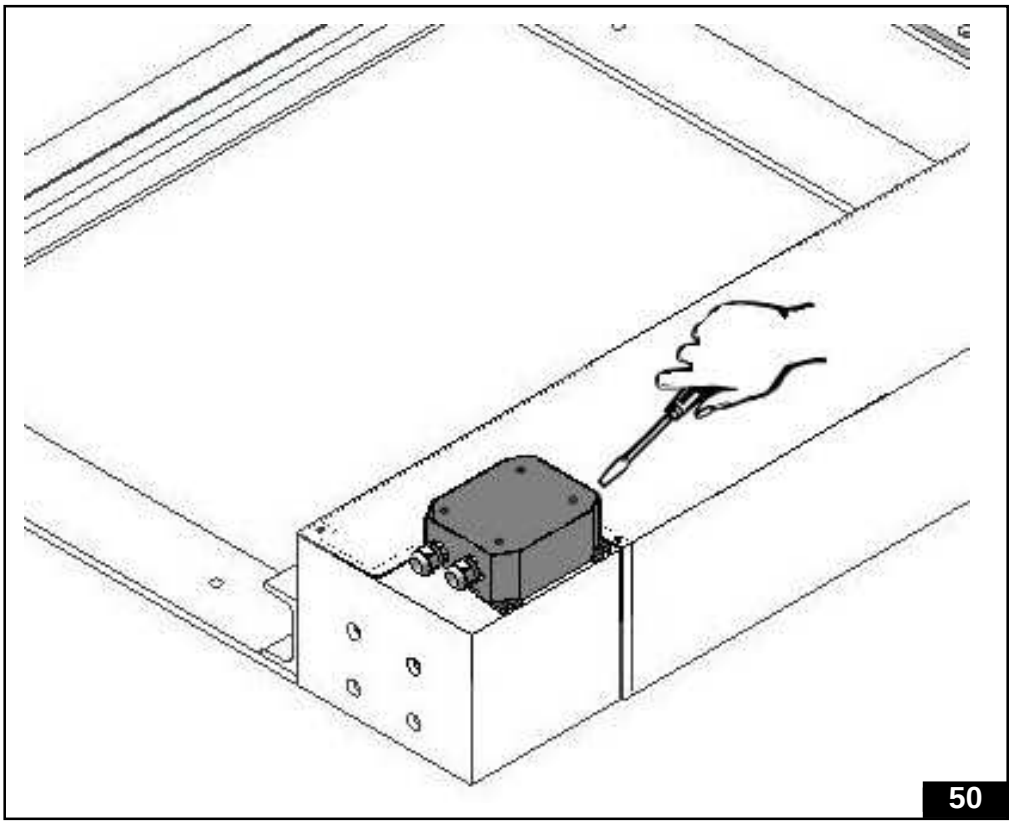


48



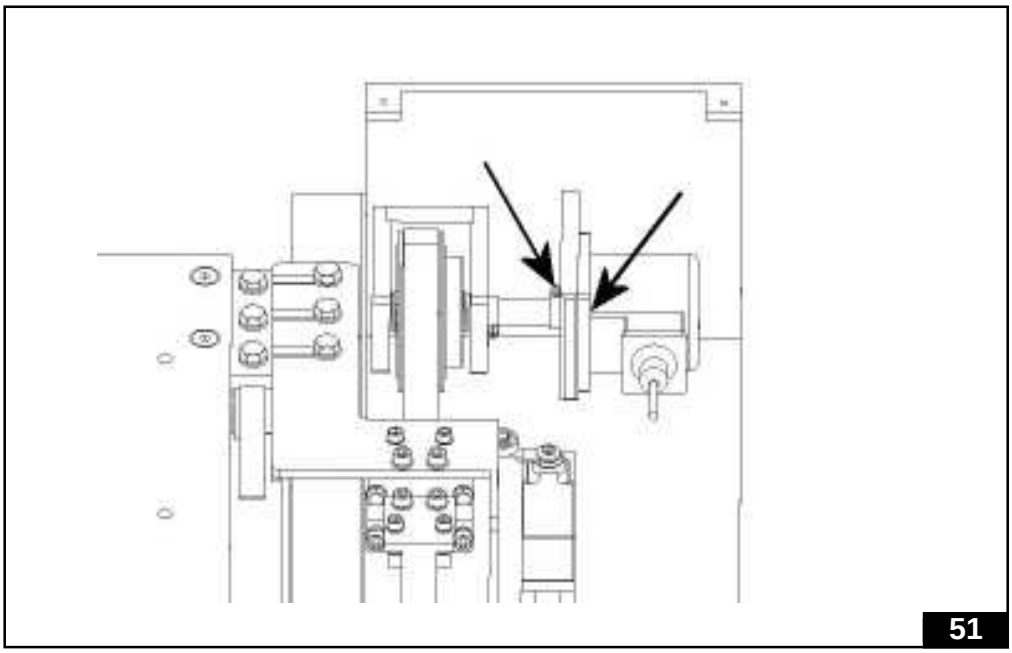
49

- Open the junction box and disconnect the encoder. 50.



50

- Loosen the joint clamp near the encoder and unscrew the screws that fix it 51.



51

- Assemble the new encoder on the support, taking care to insert the shaft into the pipe of the joint and block it with the relative clamp.
- Connect the encoder to junction box (see the wiring diagram).
- Close the junction box and the machine.

| | | |
|---|---|---|
| Nordson | ALARMS | REV. 1.3 |

**TITLE OF THE DOCUMENT :**Operating and maintenance manual Z-AXIS HBM

# 13.0 ALARMS

# CHAPTER 13.0 ALARMS

| ANOMALY | CAUSE | REMEDY |
|---|---|---|
| NOISE AND VIBRATIONS DURING THE STROKE | ■ Worn-out wheels of trolley | ■ Replace wheels (contact ***Nordson***®) |
| | ■ Dirty guide | ■ Clean guide |
| STRONG STROKES DURING MOVEMENT | ■ Belt tension insufficient | ■ Adjust belt tension |
| NOISE DURING REVERSAL | ■ Play of reductor gear | ■ Replace gear-motor |
| LOSS OF STROKE REFERENCES | ■ Breaking of one or more end of stroke | ■ Replace the end of stroke |
| ELECTRIC ANOMALIES | | ■ See manual of control module |

| | | |
|---|---|---|
| Nordson | **SPARE PARTS** | *REV.* 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

## 14.0 SPARE PARTS

Page 1 to 3

# CHAPTER 14.0 SPARE PARTS

## 14.1 General advice

- In order to optimise and address correctly the demand of spare parts and/or technical assistance, it is necessary to refer to ***Nordson®.***

- If the customer uses, above all during the period of contractual guarantee of the machine, not original ***Nordson®*** spare parts, the guarantees about functional performances and above all accident prevention safeties are no more valid. Therefore ***Nordson®*** declines each possible responsibilities direct, indirect or consequential, about accidents occurred to staff, or about possible restrictions of productive performances of the machine.
- The safety, reliability and interchangeability of ***Nordson®*** spare parts is guaranteed by the using of the same technological/productive and qualitative processes used to the achievement of the machine.

- Before removing any components of the machine and replacing them with spare parts, it is necessary to look it up in the "**OPERATING AND MAINTENANCE MANUAL**" attached.
  This is necessary to identify all information to adopt to guarantee safety during the interventions (safety and accident prevention measures).

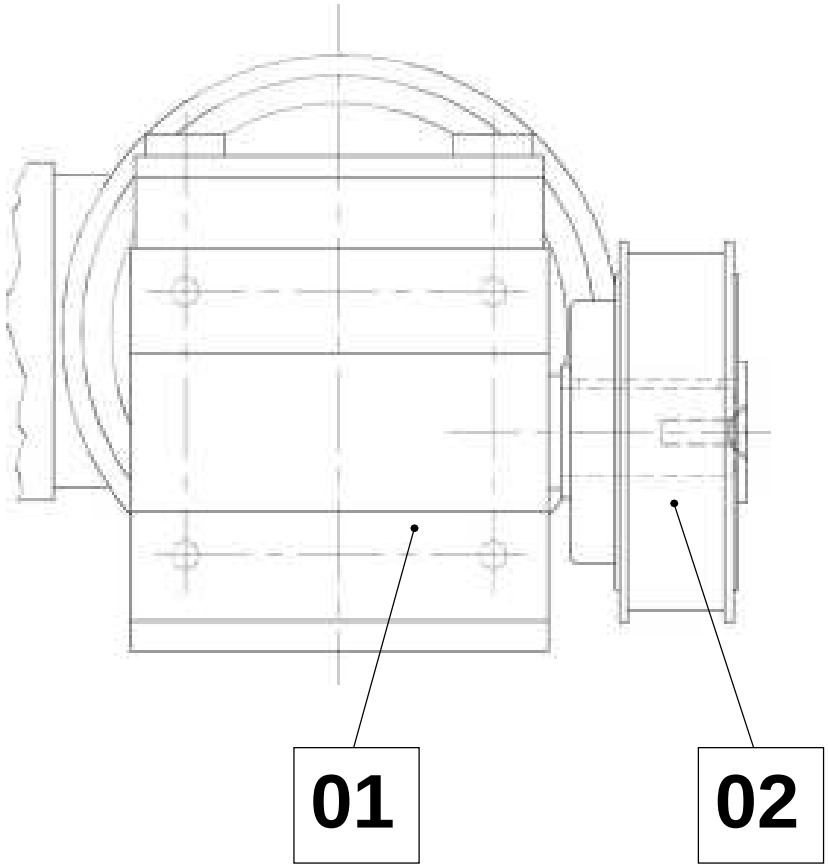
## 14.2 How to order spare parts

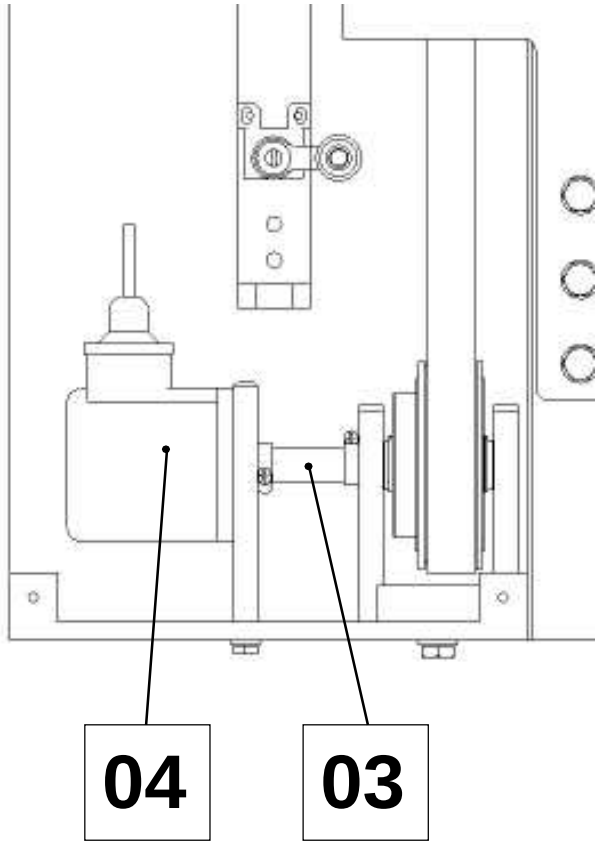
To order spare parts see the data on the CE plate.
The order will have to contain the following elements:

- Model/Type of machine
- Serial No.
- Table No.
- Position No. of spare part
- Description of spare part
- Code of spare part
- Quantity

**Example:**

- Z-axis HBM
- Serial No. 99999
- Table 1.0
- Position 02
- Pulley
- -
- No. 1 piece

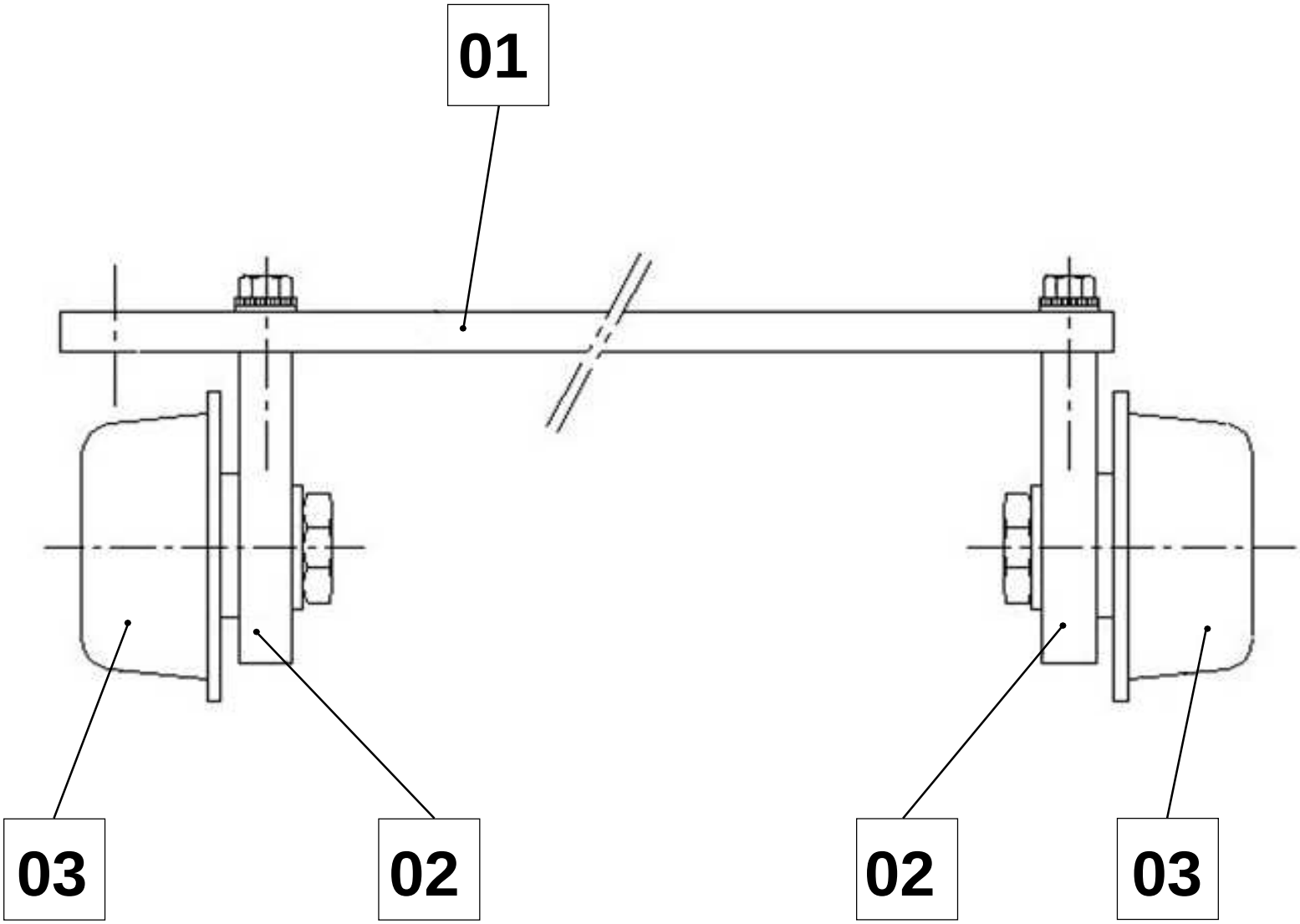



| Nordson | GROUP GEARMOTOR/ENCODER | CODE | TAB. 1.0 |
|---|---|---|---|

| Nordson | GROUP GEARMOTOR/ENCODER | CODE | TAB. 1.A |
|---|---|---|---|

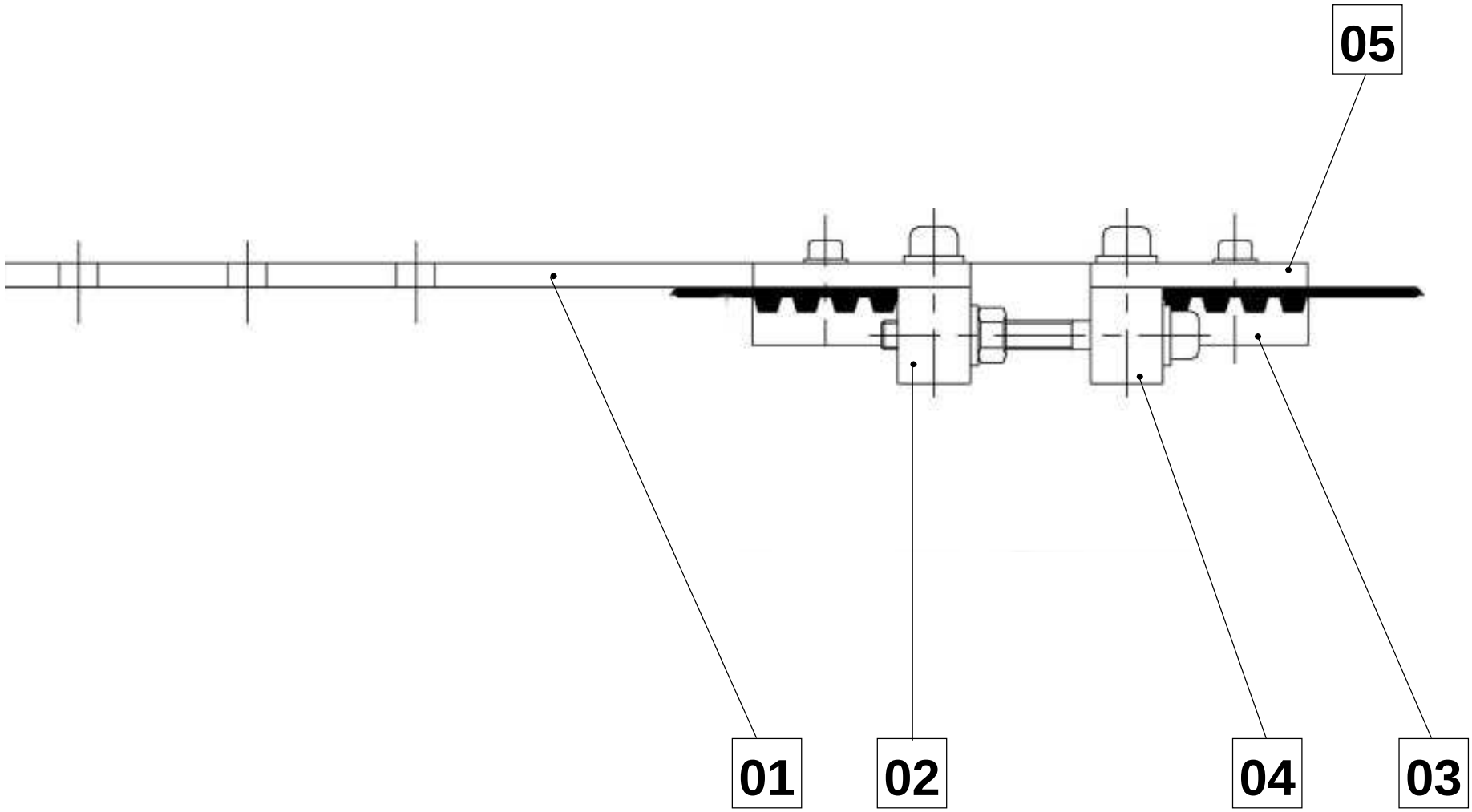
| Pos. | Part Number | Q.ty | |
|---|---|---|---|
| 1 | 736491 | 1 | 400.0002 - Three-phase gearmotor 0,18 KW |
| 2 | - | 1 | 220.1105 - Pulley |
| 3 | - | 1 | 120.0002 - Encoder joint |
| 4 | 736404 | 1 | 310.8061.03 - Encoder 2500I/G 5VDC shaft 10 MM L.D. |




| | | | |
|---|---|---|---|
| Nordson | GROUP TROLLEY | CODE | TAB. 2.0 |

| Nordson | GROUP TROLLEY | CODE | TAB. 2.A |
|---|---|---|---|

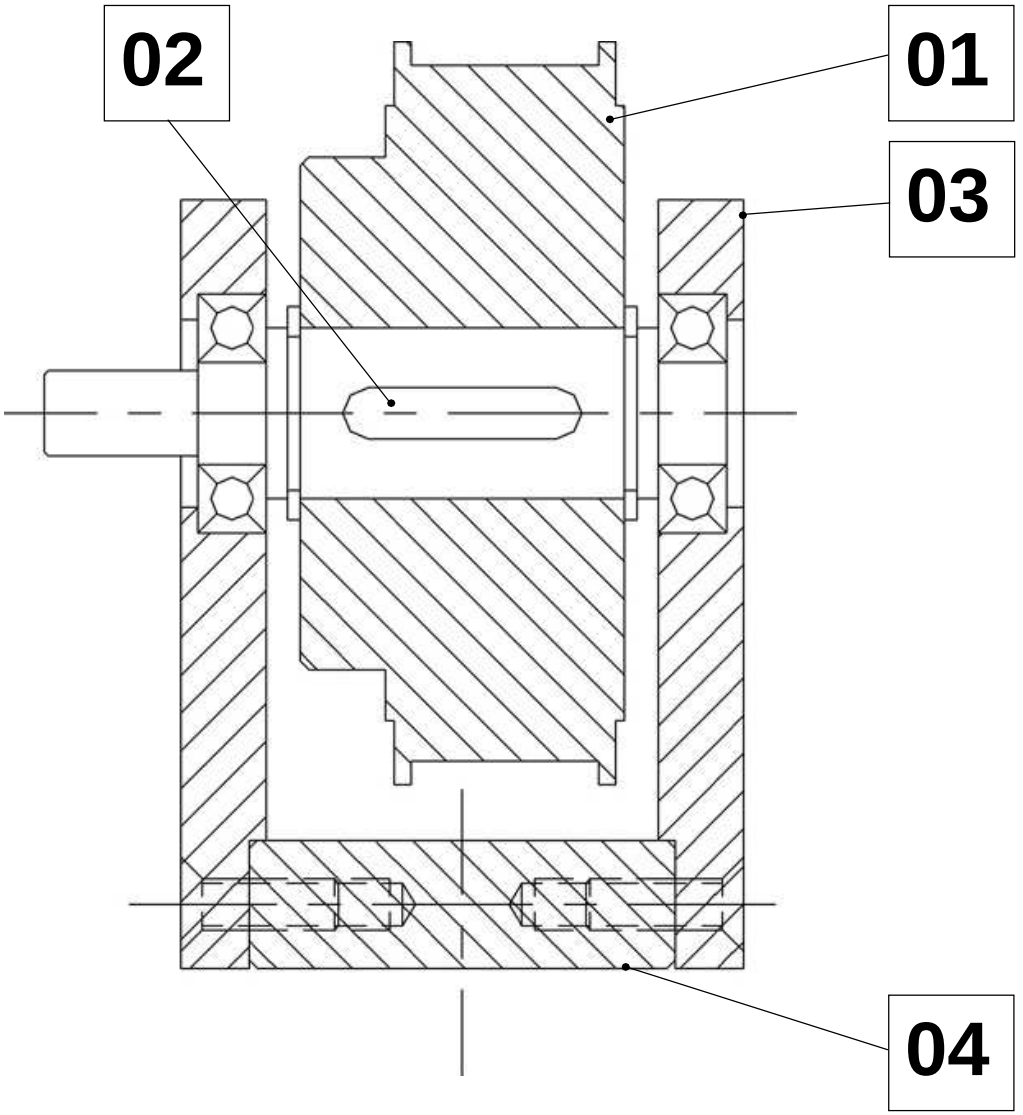
| Pos. | Part Number | Q.ty | |
|---|---|---|---|
| 1 | - | 1 | 220.1101 - Support traverse HBA |
| 2 | - | 2 | 220.1102 - Wheel support HBA |
| 3 | - | 2 | 130.1402 - Group wheel HBA |




| | | | |
|---|---|---|---|
| Nordson | GROUP TIGHTENER | CODE | TAB. 3.0 |

| Nordson | GROUP TIGHTENER | CODE | TAB. 3 .A |
|---|---|---|---|

| Pos. | Part Number | Q.ty | |
|---|---|---|---|
| 1 | - | 1 | 250.0603 - Flask |
| 2 | - | 1 | 220.1111 - Fixed plate tightener |
| 3 | - | 2 | 220.1112 - Toothed plate for belt tightening |
| 4 | - | 1 | 220.1113 - Belt movable tightener |
| 5 | - | 1 | 220.1114 - Belt fixing plate |




| | | | |
|---|---|---|---|
| Nordson | GROUP SNUB PULLEY | CODE | TAB. 4.0 |

| Nordson | GROUP SNUB PULLEY | CODE | TAB. 4 .A |
|---|---|---|---|

| Pos. | Part Nmber | Q.ty | |
|---|---|---|---|
| 1 | - | 1 | 220.1105 - Pulley |
| 2 | - | 1 | 230.0605 - Key 6 x 6 x 28 UNI 6608 |
| 3 | - | 2 | 220.1107 - Lateral support |
| 4 | - | 1 | 220.1108 - Base support |

| | | |
|---|---|---|
| Nordson | DRAINING OF HARMFUL SUBSTANCES AND DISMANTLING OF THE MACHINE | REV. 1.3 |

**TITLE OF THE DOCUMENT :** Operating and maintenance manual Z-AXIS HBM

# 15.0 DRAINING OF HARMFUL SUBSTANCES AND DISMANTLING OF THE MACHINE

# CHAPTER 15.0 DRAINING OF HARMFUL SUBSTANCES AND DISMANTLING OF THE MACHINE

The user must remember that the harmful substances used, see lubricating oil, grease etc., must be drained in accordance with the local laws in force.

The dismantling of the machine and the removal of its components must be carried out according with the local laws or directives.

The machine is prevalently composed by:

- ferrous materials (structure and mechanical parts)
- materials derived from copper (electric wires and electric motor winding)

| | | |
|---|---|---|
| Nordson | **ATTACHED** | *REV.* 1.3 |

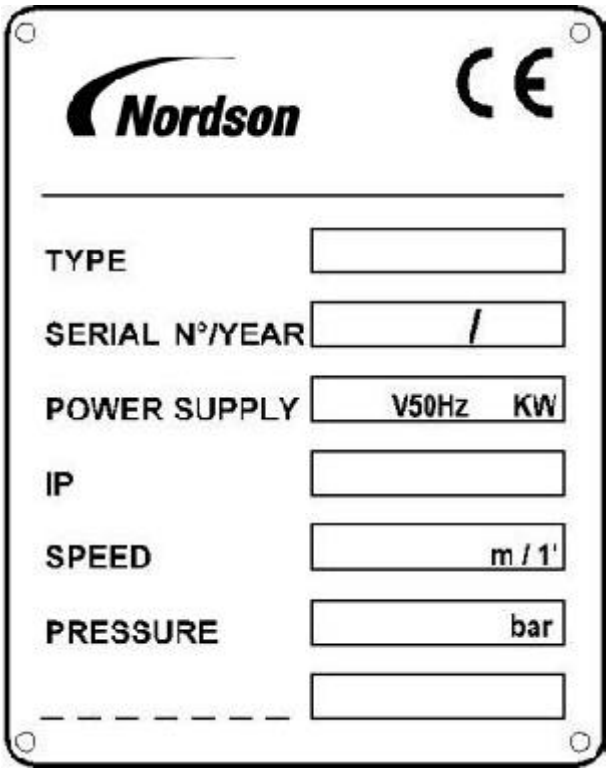
**TITLE OF THE DOCUMENT :** Operating and maintenance manaul Z-AXIS HBM

## 16.0 ATTACHED

Page1 to

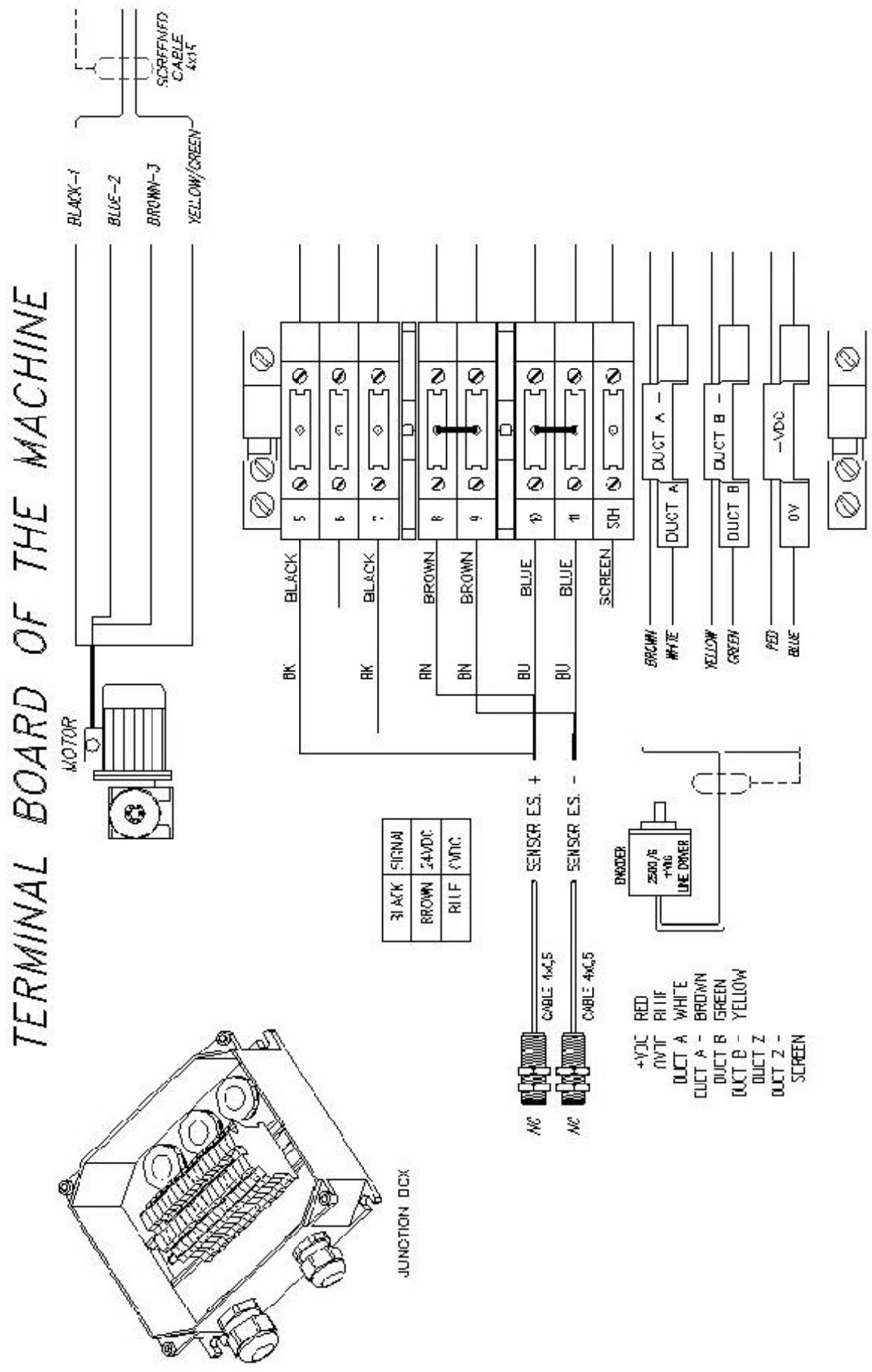
- ☐ CE plate
- ☐ Declaration of conformity
- ☐ Wiring diagrams
- ☐ Recommended oils

# CE PLATE


Nordson
CE
TYPE
SERIAL N°/YEAR
/
POWER SUPPLY
V50Hz KW
IP
SPEED
m / 1'
PRESSURE
bar

# DECLARATION OF CONFORMITY

# WIRING DIAGRAMS


TERMINAL BOARD OF THE MACHINE
MOTOR
BLACK-1
BLUE-2
BROWN-3
YELLOW/GREEN
SCHERMATO CABLE 4x1.5
BLACK
BLACK
BROWN
BROWN
BLUE
BLUE
SCREEN
SENSOR E.S. +
SENSOR E.S. -
CABLE 4x0,5
CABLE 4x0,5
DUCT A -
DUCT A
DUCT B -
DUCT B
+VDC
0V
BROWN
WHITE
YELLOW
GREEN
RED
BLUE
ENCODER
2500/6 +Vdc
LINE DRIVER
+VDC RED
0VDC BLUE
DUCT A - WHITE
DUCT A BROWN
DUCT B - GREEN
DUCT B YELLOW
DUCT Z -
DUCT Z
SCREEN
BLACK SIGNAL
BROWN 24VDC
BLUE 0VDC
JUNCTION BOX

# RECOMMENDED OILS

| | 6) °C -50 0 +50 +100 | DIN (ISO) | ISO,NLGI | Mobil® | Shell | Klüber | Aral | bp | Texaco | Castrol Tribol | Castrol Optimol | Fuchs | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R...  K...(HK...)  F...  | Standard -10 +40 | CLP(CC) | VG 220 | Mobilgear 600 XP 220 | Shell Omala 220 | Klüberoil GEM 1-220 N | Aral Degol BG 220 | BP Energol GR-XP 220 | Meropa 220 | Tribol 1100/220 | Alpha SP 220 Optigear BM 220 | Renolin CLP 220 | Carter EP 220 |
| | -25 +80 | CLP PG | VG 220 | Mobil Glygoyle 30 | Shell Tivela S 220 | Klübersynth GH 6-220 | Aral Degol GS 220 | BP Enersyn SG-XP 220 | Synlube CLP 220 | Tribol 800/220 | Alphasyn PG 220 Optiflex A 220 | | Carter SY 220 |
| | 4) -40 +80 | CLP HC | VG 220 | Mobil SHC 630 | Shell Omala HD 220 | Klübersynth GEM 4-220 N | Aral Degol PAS 220 | | Pinnacle EP 220 | Tribol 1510/220 | Alphasyn T 220 Optigear Synthetic X 220 | Renolin Unisyn CLP 220 | |
| | 4) -40 +40 | | VG 150 | Mobil SHC 629 | Shell Omala HD 150 | Klübersynth GEM 4-150 N | | | Pinnacle EP 150 | | Alphasyn T 150 Optigear Synthetic X 150 | | Carter SH 150 |
| | -20 +25 | CLP (CC) | VG 150 VG 100 | Mobilgear 600 XP 100 | Shell Omala 100 | Klüberoil GEM 1-150 N | Aral Degol BG 100 | BP Energol GR-XP 100 | Meropa 150 | Tribol 1100/100 | Alpha SP 100/150 Optigear BM 100 | Renolin CLP 150 | Carter EP 100 |
| | -30 +15 | HLP (HM) | VG 68-46 VG 32 | Mobil D.T.E. 13M | Shell Tellus T 32 | Klüberoil GEM 1-68 N | Aral Degol BG 46 | | Rando EP Ashless 46 | Tribol 1130/68 | Hyspin AWS 32 Optigear 32 | Renolin B 46 HVI | Equivis ZS 46 |
| | 4) -40 +20 | CLP HC | VG 68 | Mobil SHC 626 | | | | | | | | | |
| | -40 +15 | CLP HC | VG 32 | Mobil SHC 624 | | Klüber-Summit HySyn FG-32 | | | | | Alphasyn T32 Optileb SY 32 | | Dacnis SH 32 |
| | 4) -40 20 | HLP (HM) | VG 22 VG 15 | Mobil D.T.E. 11M | Shell Tellus T 15 | Isoflex MT 30 RDT | | BP Energol HLP-HM 15 | Rando HDZ 15 | | Hyspin AWS 22 | | Equivis ZS 15 |
| S...(HS...)  | Standard 0 +40 | CLP (CC) | VG 680 | Mobilgear 600 XP 680 | Shell Omala 680 | Klüberoil GEM 1-680 N | Aral Degol BG 680 | BP Energol GR-XP 680 | Meropa 680 | Tribol 1100/680 | Alpha SP 680 Optigear BM 680 | Renolin SEW 680 | Carter EP 680 |
| | -20 +50 | CLP PG | VG 680 1) | | Shell Tivela S 680 | Klübersynth GH 6-680 | | BP Enersyn SG-XP 680 | Synlube CLP 680 | Tribol 800/680 | Optiflex A 680 | | |
| | 4) -30 +60 | CLP HC | VG 460 | Mobil SHC 634 | Shell Omala HD 460 | Klübersynth GEM 4-460 N | | | Pinnacle EP 460 | | Optigear Synthetic X 460 | | |
| | 4) -40 +20 | | VG 150 | Mobil SHC 629 | Shell Omala HD 150 | Klübersynth GEM 4-150 N | | | Pinnacle EP 150 | | Optigear Synthetic X 150 | | Carter SH 150 |
| | -20 +10 | CLP (CC) | VG 150 VG 100 | Mobilgear 600 XP 100 | Shell Omala 100 | Klüberoil GEM 1-150 N | Aral Degol BG 100 | BP Energol GR-XP 100 | Meropa 150 | Tribol 1100/100 | Alpha SP 100/150 Optigear BM 100 | Renolin CLP 150 | Carter EP 100 |
| | -25 +20 | CLP PG | VG 220 1) | Mobil Glygoyle 30 | Shell Tivela S 220 | Klübersynth GH 6-220 | Aral Degol GS 220 | BP Enersyn SG-XP 220 | Synlube CLP 220 | Tribol 800/220 | Alphasyn PG 220 Optiflex A 220 | | Carter SY 220 |
| | -40 +30 | CLP HC | VG 68 | Mobil SHC 626 | | | | | | | | | |
| | 4) -40 0 | CLP HC | VG 32 | Mobil SHC 624 | | Klüber-Summit HySyn FG-32 | | | Cetus PAO 46 | | Alphasyn T32 | | Dacnis SH 32 |
| R...,K...(HK...), F...,S...(HS...) | 4) -30 +40 | HCE | VG 460 | | Shell Cassida Fluid GL 460 | Klüberoil 4UH1-460 N | Aral Eural Gear 460 | | | | Optileb GT 460 | | |
| | -20 +40 | E | VG 460 | | | Klüberbio CA2-460 | Aral Degol BAB 460 | | | Tribol Bio Tec 1418/460 | | | |
| W...(HW...)  | Standard -20 +40 | SEW PG | VG 460 2) | | | Klüber SEW HT-460-5 | | | | | | | |
| | 4) -40 +10 | API GL5 | SAE 75W90 (~VG 100) | Delvac Synth. GearOil LS 75 W90 | | | | | | | | | |
| | 20 +40 | CLP PG | VG 460 3) | | | Klübersynth UH1 6-460 | | | | | | | |
| R32 R302 | -25 +60 | DIN 51 818 5) | 00 | Glygoyle Grease 00 | Shell Tivela GL 00 | Klübersynth GE 46-1200 | | | Multifak 6833 EP 00 | | Spheerol EPL 0 | | Marson SY 00 |
| | Standard -15 +40 | | 000 - 0 | Mobilux EP 004 | Shell Alvania GL 00 | | Aralub MFL 00 | BP Energrease LS-EP 00 | Multifak EP 000 | | CLS Grease Longtime PD 00 | Renolin SF T - 941 | Multis EP 00 |

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