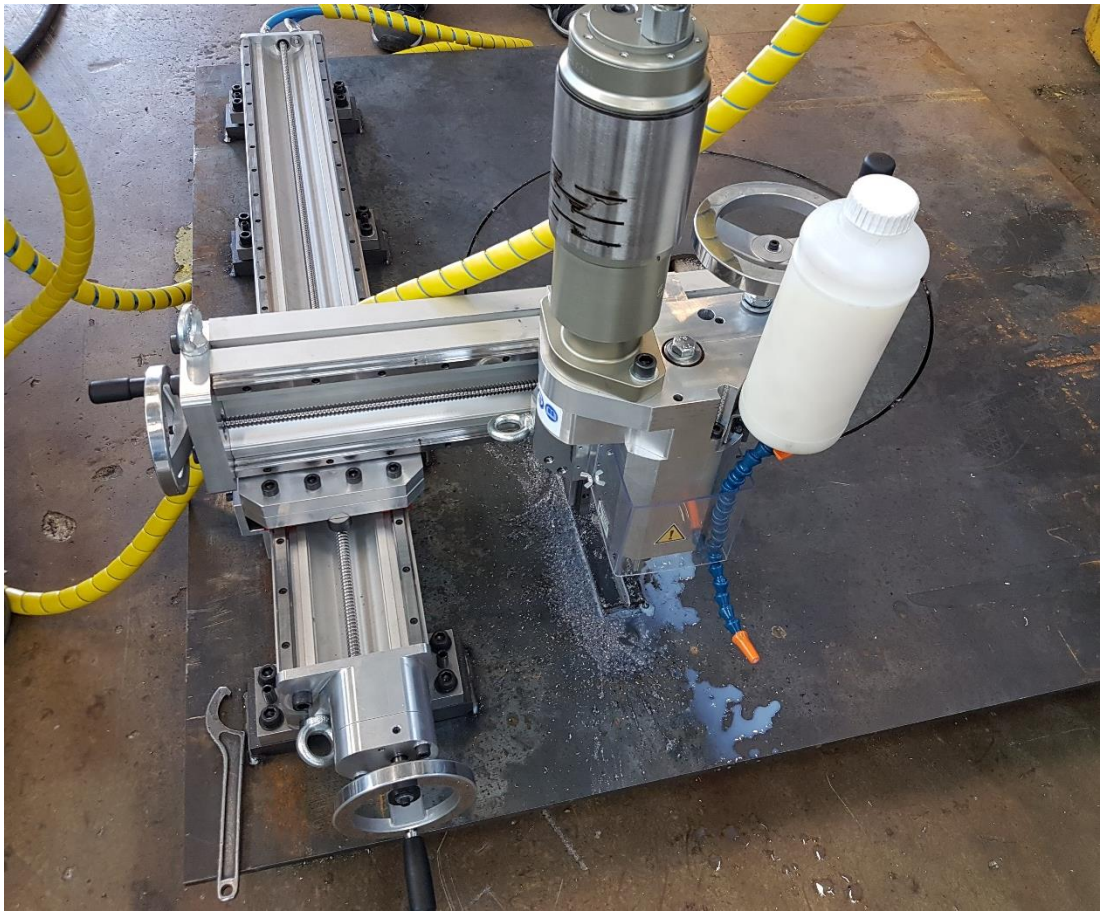
normaco

Portable 3-Axis Milling Machine



Operating Manual

Foreword

Dear customer,

After receiving the product please check if the delivered product is delivered according to what is listed in delivery note. Also make sure that it has not been damaged during transport. Damages are compensated only in case of immediate reclamation.

Before taking into use it is necessary to read through this manual, especially the safety instructions.

In case of questions you are welcomed to contact us.

Normaco Tools

DECLARATION OF CONFORMITY

Name of Manufacturer: **Normaco Tools OÜ**

Address: Sinikivi tee 12

Rae Vald 75306

Country of Origin: Estonia

Description of Product: Portable 3-Axis Milling Machine

In accordance with the following regulations:

2006/42/EC The Machinery Directive

EN ISO 12100-1

EN ISO 12100-2

EN 1005-2:2003+A1:2008

EN 12717:2001 +A1:2009

Place of issue: Tallinn, Estonia

Notes: This declaration is only valid for the equipment supplied Normaco Tools

Name of authorized representative: Erno Nieminen

Position: Managing Director

Declaration:

I declare that as the authorized representative, the above information in relation to the supply / manufacture of this product, is in conformity with the stated standards and other related documents following the provisions of the above Directives and their amendments.

Signature of authorized representative…… Date…06.12.2017.

Contents

1 About the Manual

1.1 General

This operating manual is supplied as non-separable part of the Normaco Portable Milling Machine (The Machine). It contains important information that allows the user to safely and successfully operate and maintain the machine. Also, the manual helps in using the machine economically ensuring maximum performance and lifetime. Prior commencing work or maintenance on the machine, the operation manual must be familiarized with. During the operation of the machine, the manual must be kept readily available for the operators and service personnel who use the machine.

1.2 Warnings and Symbols

Attention to these symbols and warnings helps to avoid dangers, decrease repair costs and down-time and to increase the reliability and life span of the Machine.

There are different warning signs on the machine and in the user manual.

Following marking is used to emphasize sections that directly affect machines integrity or users' safety:

This is a warning sign, which is used to emphasize dangerous situations that may cause possible injuries material loss. Instructions following the sign must be followed to avoid possible injuries or death.

DANGER

DANGER marks **hazardous situations that cause** serious injuries, death or significant material loss.

WARNING

WARNING marks **hazardous situations that may cause** serious injuries, death or significant material loss.

CAUTION

CAUTION marks **hazardous situations that may cause** minor injuries, or insignificant material loss.

NOTICE

NOTE marks specific mounting, handling or service instructions, that are important but do not involve any hazard to personnel of material.

2 Safety

2.1 Obligation and responsibility

WARNING

IF THE FOLLOWING INSTRUCTIONS ARE DISREGARDED, IT MAY CAUSE SERIOUS INJURIES, DEATH OR SIGNIFICANT LOSS OF MATERIAL.

Owner or operations management must ensure that:

- All personnel working with this machine have passed safety instruction and are aware of important safety rules.
- All personnel working with this machine have read and understood this user manual.
- All stickers and signs on this machine are readable.
- Worn out stickers and signs are replaced.
- This manual is stored in a location easily accessible for the operators (Machine crate).

Operators are obliged to:

- Follow safety rules.
- Read and follow all the safety rules of this manual.
- Familiarize oneself with the design and operating methods of this machine before use.

This machine is meant for use only by qualified engineers and metalworkers.

NOTICE

Upon reception of this machine it must be inspected and supplier must immediately notified of all damages or missing parts.

2.2 Manufacturers responsibility

The machine is designed and manufactured following best practices and applicable legislation to ensure the safety of it.

NOTICE

The manufacturer is not responsible for damage if it is caused by:

- Misuse of the machine.
- Improper handling, mounting and servicing of this machine.
- If the machine is used with malfunctioning or broken safety and security devices.
- If safety rules of this manual are not followed.
- In case of unauthorized reconstruction of this machine or its parts.
- In case of repairing this machine with spare parts not accepted by manufacturer.

- In case of harm caused by foreign objects or force majeure.

2.3 Intended Use

The Normaco Portable Milling Machines are designed for on-site **milling work of metal.**

It is strictly forbidden to use the machine for any other purpose beyond the intended use and limits of the machine.

2.4 Safe Work Area

- Keep work site clean. Remove non-essential tools, cables and materials from the work area
- Keep the work area well lit.
- Make sure there is adequate space around the work area.
- Keep non-essential personnel away from the work area.

2.5 Safe Operation and Service

- Make sure machine is disconnected from power source before setup, mounting maintenance.
- Make sure that machine is assembled properly and all parts are securely fixed.
- Make sure to support the workpiece, in case there is a possibility that the workpiece can move during or after the machining.
- Before switching on the Machine remove all adjusting tools and wrenches.
- Use brush to keep machine clean from metal shavings.
- While cleaning the machine, wear safety gloves.
- While operating the machine always wear eye protection.
- Only original spare parts are to be used with the Machine.
- Maintenance and service must be done only by qualified and properly trained personnel.
- While operating always wear safety gloves and hearing protection.
- Never wear loose clothing or jewelry, which can get caught in the machine.
- Tooling can get extremely hot during machining operation; do not touch the tool before it has cooled down.
- Only engage the tool, after the Machine achieved full speed.
- Never reach into the working area with hands!
- Never run the machine unattended or without qualified supervision.
- Ensure machine has come to full stop, before disconnecting the power source.
- Do not use the machine if it is faulty!

2.6 Potential Hazards

Normaco Portable Milling Machine has been designed to maximize the work safety. However there remain hazards that the operator must consider during the work.

- **Rotating tools and spindle** - Keep clear of moving parts! Avoid entanglement of clothing!

- **Moving Axis** - Keep hands away from the moving feed screws, axis and spindle!
- **Tools and chips** - Beware of sharp edges and hot tools and materials!
- **Workpiece** - Secure work piece properly, including the fall-off-piece!
- **Lifting the machine**– Use proper lifting methods when working with the machine.
- **Disassembling the machine** – make sure to secure all parts when disassembling the machine.
- **Noise** – Machine operation generates noise. Always wear hearing protection.
- **Unexpected start-up** – Always disconnect the machine form power source before maintenance, setup or adjustment.
- **Loss of balance** – While working on elevated locations it is necessary to uses stable platforms. Working while standing on a ladder is not allowed.

2.7 Safety Equipment and Labels

	**Safety glasses** Wear eye protection throughout the work, to protect eyes from metal fragments, chips and hydraulic liquid.
	**Read the instructions!** Operator should read instructions before use of the machine.
	**Safety gloves** Wear hand protection throughout the work, to protect hands from sharp and hot items.
	**Hearing protection** Use suitable ear protection while working. **Noise level 90 dB (A)**
	**Steel toe boots** Safety boots with steel toe caps must be worn during the work and setup.

	**Disengage from a power source** Before maintenance or adjustment, the machine must be disconnected form the power source.

2.8 Noise Level

The noise emitted by the Normaco Portable Milling Machine was measured according to DIN 45635.
Noise level of the Machine (with Pneumatic Motor) is **90 dB (A)**
Always wear ear protection while machine is operated!

3. About the Equipment

3.1 General

Normaco Portable Milling Machine is a portable machining tool designed to do milling and drilling.

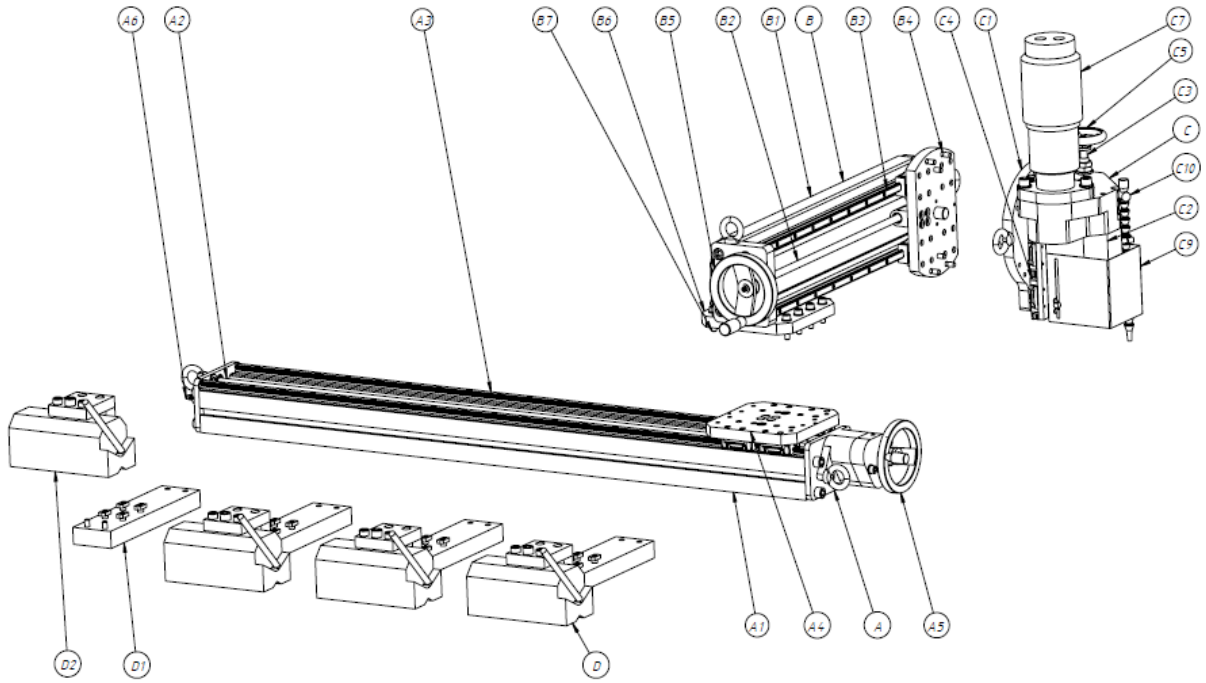
Machine can be powered by hydraulic, pneumatic motor. Pneumatic motor allows use in hazardous environments.

3.2 Design and Components

The Normaco Portable Milling Machines comprises of subunits with weight less than 30 kg. The units are X-axis (A), Y-axis (B), Z-axis, spindle unit (C), mounting accessories (D) and control unit (E). All the units are equipped with lifting eyes (F).

X- Axis consists of an aluminium profile housing (A1), feed screw (A2), linear ball bearings (A3), drive unit and a connection plate (A4). The drive unit can be operated by a hand wheel (A5) or pneumatic motor mounted inside the housing. Pneumatic motor is fed with compressed air via quick connection ports (A6).

Y- Axis consists of an aluminium profile housing (B1), feed screw (B2), linear ball bearings (B3), drive unit and a connection plate (B4). The drive unit can be operated by a hand wheel (B5). The housing sits on top of a sub-plate (B6), which is equipped with connection pins and bolts (B7) for attaching to the X-axis connection plate (A4).



The spindle (C6) is designed for holding ISO taper tool holders. The tool holders are fastened to the spindle by pulling bolt (C8). The spindle unit is equipped with an adjustable shield (C9) and coolant system (C10).

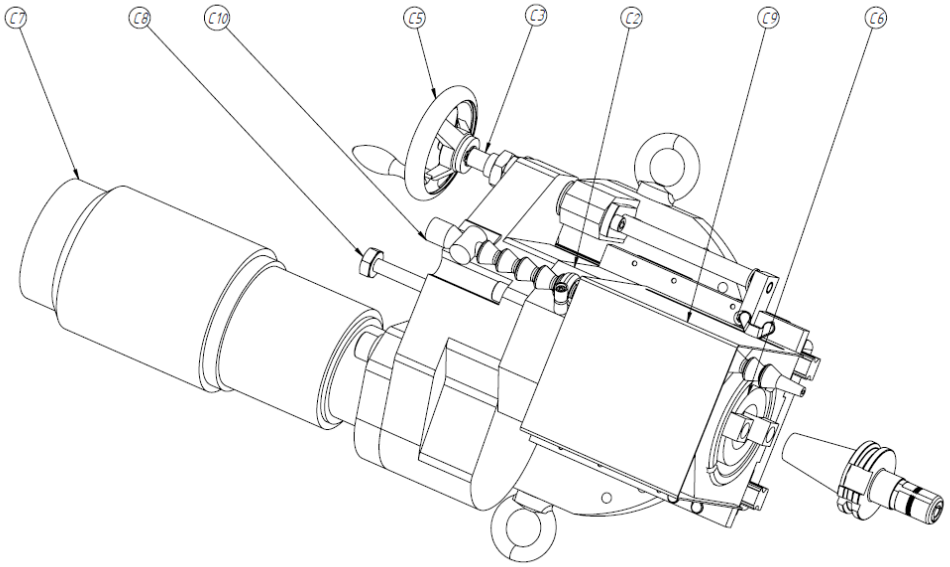
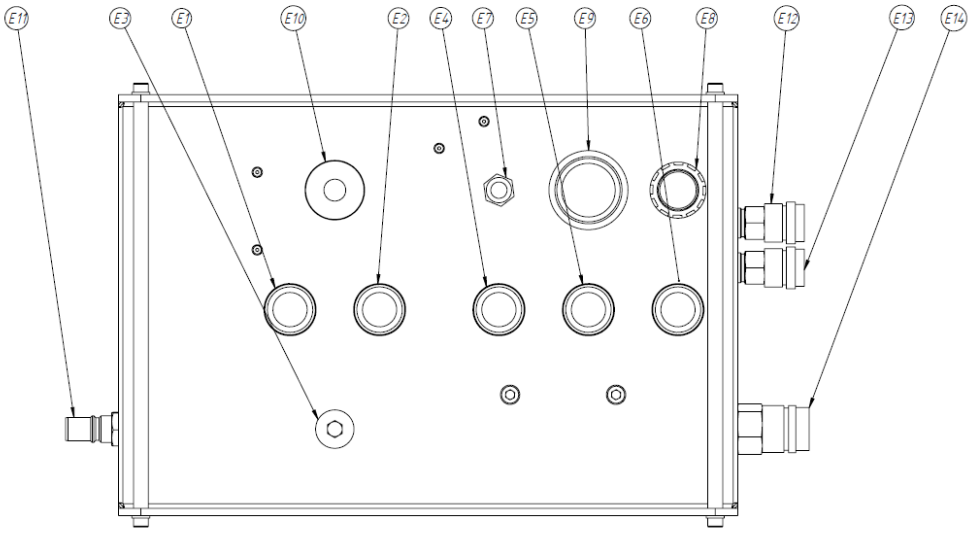


Fig. 2. Z-axis and spindle unit

The control unit consists of housing, valves inside, quick connection ports and control buttons and knobs on the panel.
For spindle control, there are start (E1) and stop (E2) buttons and a flow control valve knob (E3), which allows controlling the speed of the motor.
For feed motor control, there are start FW (E4), start BW (E5), stop (E6) buttons. For speed control, there is a flow control valve knob (E7). Feed motor power can be controlled by pressure regulator (E8) and manometer (E9).
Pushing emergency stop button (E10) stops all motions and returns control actions to neutral. For restarting the machine, start button must be pushed.



Control unit

Note: Air filter-lubricator must be used with the control unit!

Table 1. Main parameters of the Machine (fully assembled)

Length	1440	mm
Height	610	mm
Width	845	mm
Weight (fully assembled)	108	kg
X-axis (heaviest component)	28	kg
Y-axis	20	kg
Z-axis	22	kg
Magnet assembly (one magnet)	2,5	kg
Spindle		
Speed	1500	rpm
Power	3	kW
Pressure	6 bar	
Air flow	3000	l/min
Toolholder		ISO 30
Tool diameter	max 50	mm
Feed		
X- axis	1000	mm
Y-axis	275	mm
Z- axis	100	mm
Feed motor (x-axis)		
Power	0,12	kW
Pressure	6	bar
Air flow	380	l/min

3.3 Standard Equipment

Normaco Portable Milling Machine is delivered with following equipment

- Normaco Portable Milling Machine
- Transportation box
- Set of handtools
- Control unit
    - Note: Air filter-lubricator must be used with pneumatic motors!

3.4 Manufacturer, service address

Manufacturer: Normaco Tools OÜ
Sinikivi tee 12
Lehmja küla, Rae vald
75306 Harjumaa,
ESTONIA

Phone +372 6003704
www.normaco-tools.com
sales@normaco-tools.com

4. Machine Setup

4.1 Lifting of the Machine and its parts.

WARNING

Lifting heavy weights in uncomfortable positions may cause serious injuries.

Normaco Portable Milling Machine is designed for work on different construction sites. As its total weight 108 kg exceeds weight that may be lifted in working situation the Machine is designed to be assembled on the working place. On figure 1 main components of it can be seen. The heaviest component is X- axis (A).

If possible, use lifting equipment (simple hoister) for positioning the Machine or it parts.

There are M10 eye bolts attached to each component of the portable mill.

4.2 Installing the Machine

The Machine can be attached to the working part via base plates (D1) and purpose made mounting bracket or a magnetic base (D2).

4.4 Positioning the Machine

WARNING

If the Machine is used on vertical surfaces or upside down, it is imperative that safety chains are attached at all times to the machine!

Adjust the machine parallel to the workpiece by using the adjustment screws on the mounting brackets. Use a measuring clock to measure the distance from the Machine to the workpiece.

4.4 Machine Reassembly

CAUTION

Before attaching other components, X-axis must be firmly secured in place! If it is not connected the machine is prone to tipping over.

Y- axis is connected to the X-axis connection plate (A4) via sub-plate (B6), which is equipped with connection pins and bolts (B7). The bolts should be left into the holes of the sub plate.

Z-axis and spindle unit (C) is mounted to the Y- axis through a pivoting plate (C1), which allows tilting the spindle up to 45° with an increment of 15°. All the connection bolts must be tightened.

The spindle (C6), driven by pneumatic motor (C7), is designed for holding ISO 30 taper tool holders. The tool holders are fastened to the spindle by pulling bolt (C8). For attaching the tool holder, it must be placed into the spindle so that the spigot on the spindle is in the cut-out of tool holder flange. Then the pulling bolt must be inserted and tightened.
To detach the tool holder the pulling bolt must be loosened. If the tool holder has been wedged into the spindle it may be loosened by taping against the bolts head.

⚠ CAUTION

Pushing the toolholder out of spindle must be done with the pulling bolt loosened only 1 turn. This ensures that the thread is not damaged.

The spindle unit is equipped with an adjustable shield (C9) and coolant system (C10).

5. Operation

5.1 Feeding

Before engaging the feeding, make sure the axis lock is not engaged!

To engage the automatic feed on the X-axis, press the yellow X- or X+ buttons.

⚠ CAUTION

Always stop the feed motor before using the manual feeding.

To use the manual feeding, pull the handle to disengage the auto feed, and rotate the handle to achieve feeding in desired direction.

Y-axis feeding is done manually with the handwheel.

To adjust the depth of the tool, move the Z-axis by turning the handwheel. The movement can be read from the digital indicator. After the correct position is achieved, lock the axis with the locking screws.

⚠ CAUTION

Never drive the feed while the milling tool is not rotating, but in contact with the workpiece.

5.2 Machining

Spindle can be engaged disengaged by pressing the Spindle Start Button. Spindle speed can be adjusted by turning the spindle speed button.

5.3 Removing the Machine

After the job has been completed, power must be turned off, all power sources disengaged and cutting tool removed. Disassemble the machine or fit lifting chains to the lifting eyes before loosening the retaining screws. Make sure to support the machine well so that it cannot tip over.

Remove all swarf and dirt from the machine

The machine and its equipment should be returned to the storage box.

6. Service

CAUTION

Disconnect Machine from the power source before commencing with the service!

Make sure all screws and nuts are properly re-tightened after the service!

Every time before work:

1. The Machine must be inspected to make sure that the machine is in full working order.
2. Test the guides and spindle that they move freely and without excessive play.
3. Check and tighten all bolts if necessary.
4. Make sure that hoses to the drive motors are unharmed.

After work:

1. Clean the machine from all debris.
2. Linear guides must be cleaned and oiled after each use.
3. If the machine will not be used for longer period – oil all unpainted steel surfaces.

Lubricating

The machine is provided with all bearings and transmissions lubricated.

Linear guides and ball screws must be cleaned and oiled after each use.

Apply grease to the linear guide bearings using a grease pump.

Table 0.1 Lubrication points

Greasing object	Quantity	Period	Lubricant	Amount/ method
Z- axis feed screw	1 pc.	Weekly / after 48h of use	NLGI 2	With a brush
Linear bearings	12 pc.	Weekly / after 48h of use	NLGI 2	0,3 cm^3
Ball screws	2pcs	After each use	AT-2	With a brush
Ball nuts of X and Y axis	2 pc	on need	NLGI 2	0,2 cm^3
X- axis gearbox	1 pc.	on need	NLGI 0	3 cm^3
Spindle gearbox	1 pc	on need	NLGI 0	3 cm^3

Adjust the service interval according to amount of usage and environmental conditions.

Table 0.2. Recommended greases corresponding to NLGI2 (DIN51825):

Manufacturer	Grease
HIWIN	G05
Klüber	Klüberlub GL-261
Mobil	Mobilux EP1
Fuchs Lubritech	Lagermeister BF2
Lubcon	TURMOGREASE CAK 2502

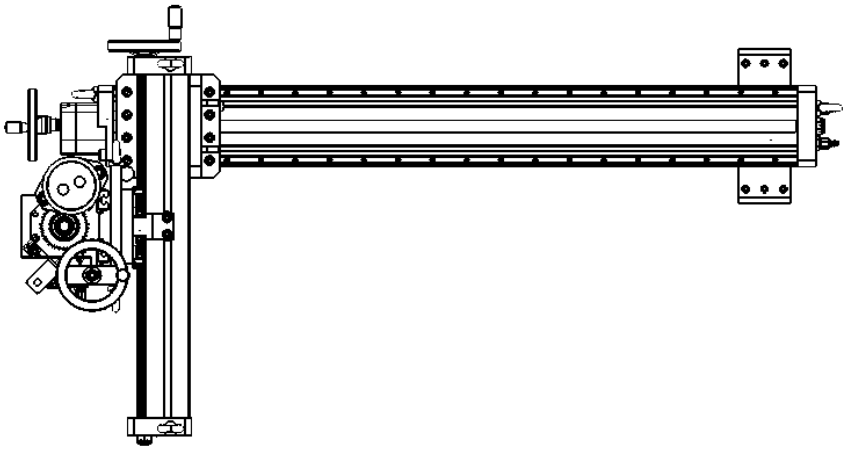
For spare parts, contact the manufacturer. We recommend keeping most common spare parts in hand.

Annually a general overhaul must be performed on the Machine in which all tear and wear parts must be inspected, and replaced if necessary. In addition to this, machine needs to be tested for functionality.

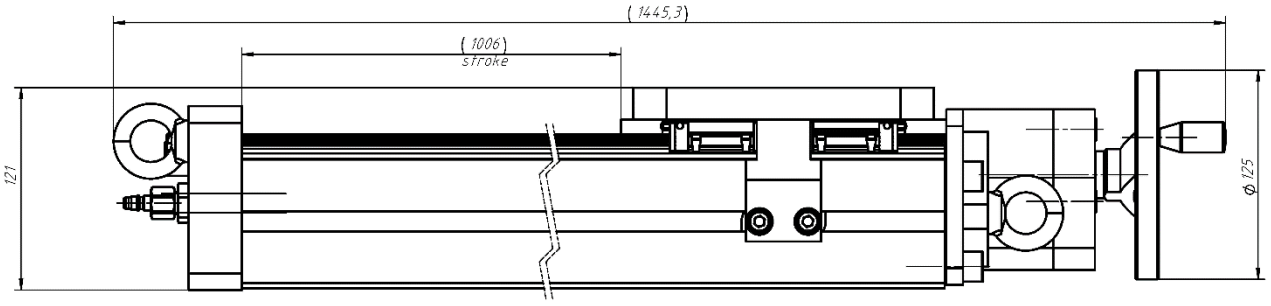
7. Troubleshooting

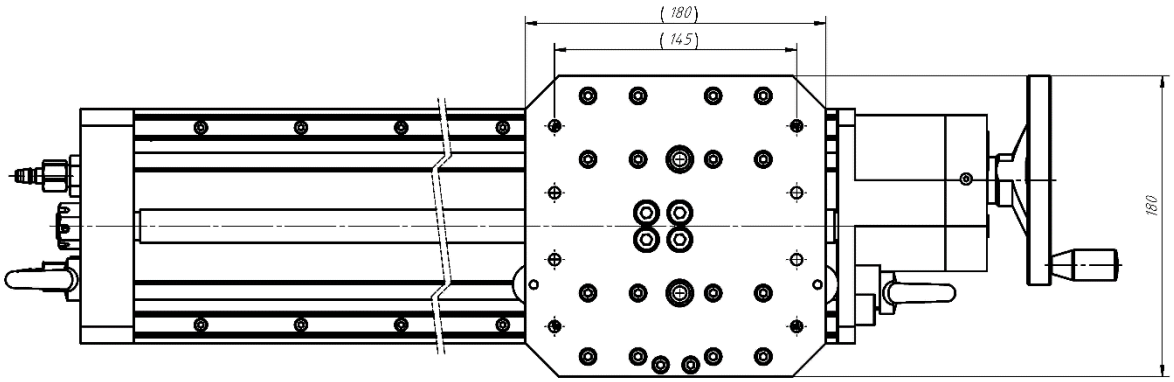
Problem	Possible Cause	Solution
Motor(s) will not operating when valve is pressed.	No air supply	Check air supply
	Faulty control valve	Check and replace valve
	Faulty motor	Replace motor
	Air supply is below the minimum required.	Check Air supply
	Faulty air hose	Check connecting cables
Axis feeding is not functioning	Feed lock is engaged	Open feed lock
	Gears are damaged	Check and replace gears
Surface finish is poor	Tool is dull or damaged	Replace tool
	Cutting coolant is required	Apply coolant
	Too heavy load	Reduce feed / tool size
Excessive vibration during machining	Machine is poorly secured	Check and tighten screws
	Depth of cut too deep	Reduce the depth
	Tool is dull or damaged	Replace tool
	Worn spindle bearings	Adjust or replace bearings
	Milling head is loose	Check and tighten screws

8. Drawings

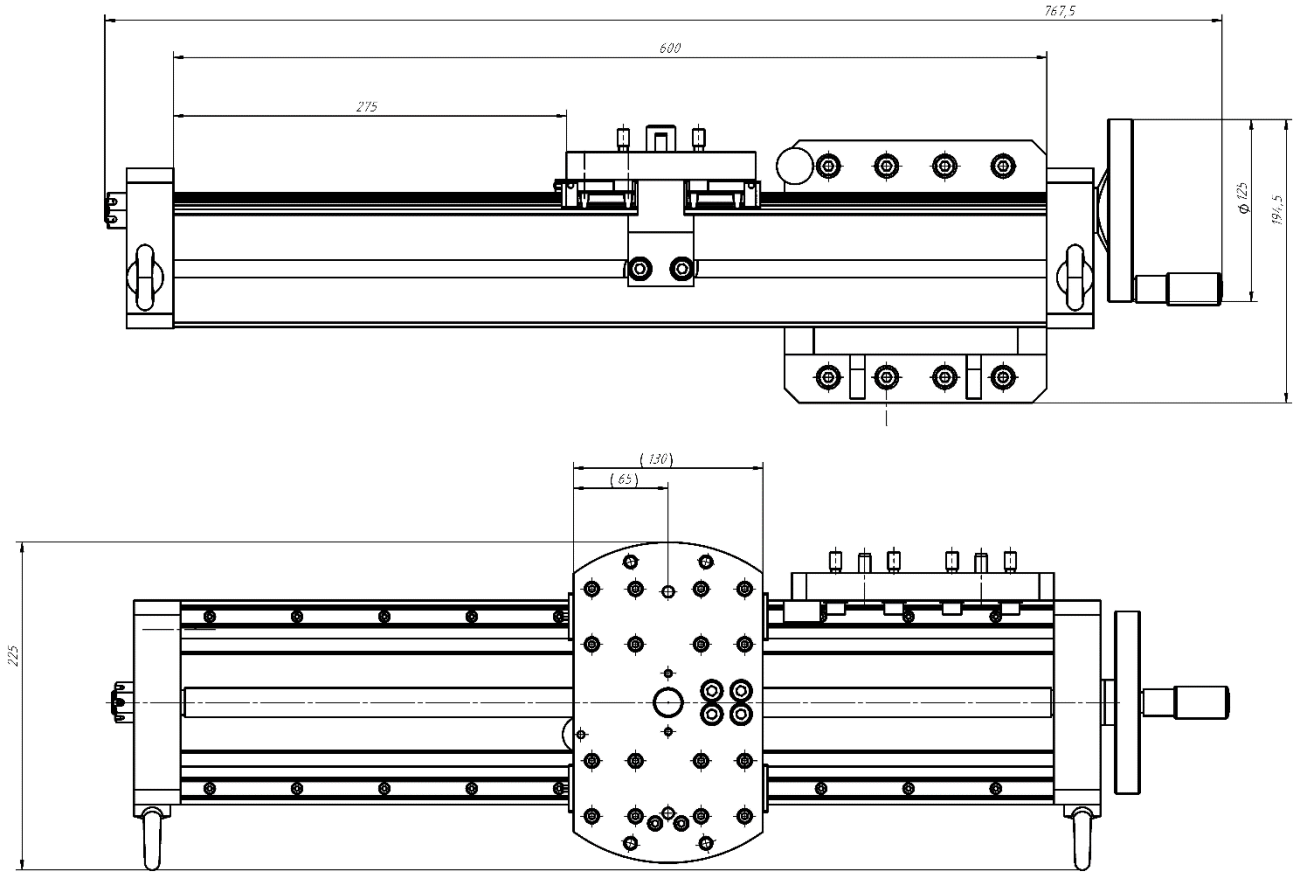


8.1 X-Axis

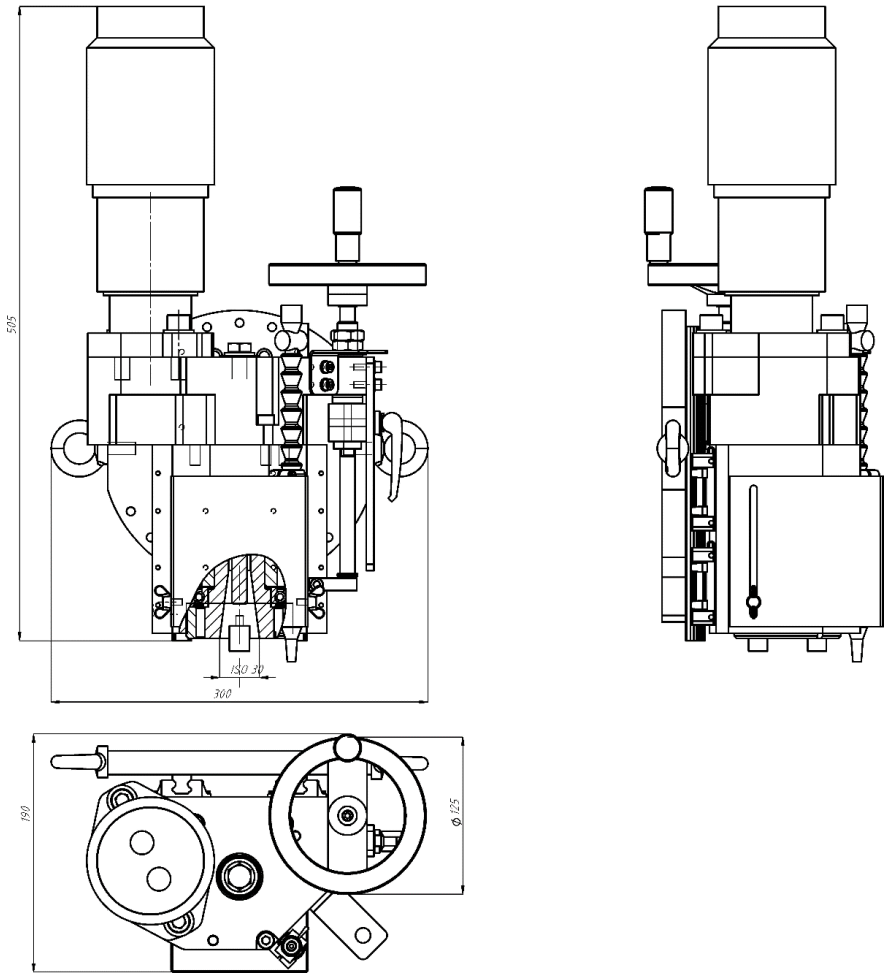




8.2 Y-Axis



8.3 Z- Axis



8.4 Mounting Assembly