Translation

CNC-STEP GmbH & Co. KG

Operating instructions

T-Rex Servo-Serie

Rev. 1.3 (April 2021)

T-Rex 0609 ▪ T-Rex 0615 ▪ T-Rex 1212 ▪ T-Rex 1218
T-Rex 1325 ▪ T-Rex 1530 ▪ T-Rex 2030 ▪ T-Rex 2040

Technical and optical changes reserved.

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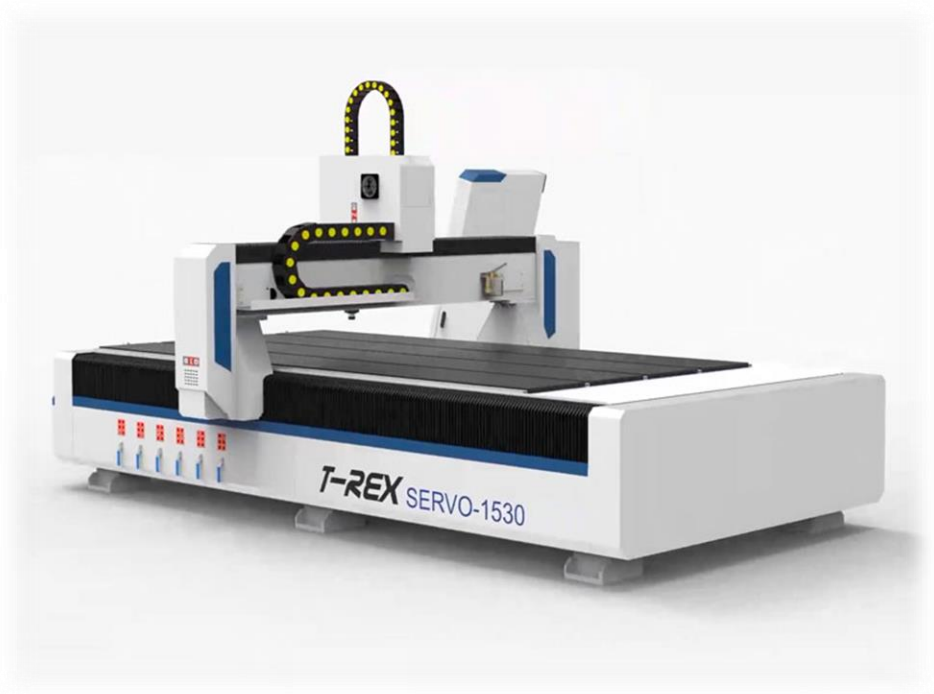
T-Rex Servo-Serie



Brief description

The machine includes the complete mechanics for a three-dimensional movement. The linear movement of the slides takes place via gear drives in X and Y and ball screws in the Z-axis, driven by Servo motors. The Servo motors for the process of the individual axes are controlled via further interfaces.
This operating manual describes the installation, commissioning, and maintenance of the CNC gantry system.

This guide refers to the T-Rex servo series in the standard configuration with a 3.5KW HF spindle from HQD.

There are many other options available, which are then described in separate instructions.

Table of Contents

1 General

This manual allows the safe and efficient handling of the machine. The instructions are part of the machine and must always be kept in the immediate vicinity of the machine accessible to the personnel.

Staff must have carefully read and understood these instructions before commencing all work. The basic prerequisite for safe working is compliance with all specified safety instructions and instructions in this manual.

In addition, the local accident prevention regulations and general safety regulations apply to the area of application of the machine.

Illustrations in this manual are for basic understanding and may differ from the actual execution. In addition to these instructions, the instructions for the built-in components in the appendix apply.

1.1 Description of Symbols

Safety instructions are marked by symbols in this manual. The safety instructions are introduced by signal words that express the extent of the hazard.

HINT:
This combination of symbol and signal word indicates a potentially dangerous situation that can lead to property and environmental damage if not avoided.

WARNING:
This combination of symbol and signal word indicates a potentially dangerous situation that can lead to death or serious injury if not avoided.

CAUTION:
This combination of symbol and signal word indicates a potentially dangerous situation that can lead to minor or minor injuries if not avoided.

DANGER:
This combination of symbol and signal word indicates an immediately dangerous situation that leads to death or serious injury if not avoided.

Prohibition for people with pacemakers
This mark precedes activities in areas that are prohibited for people with pacemakers.

Warning of dangerous electrical voltage
This mark precedes activities on live system components.

Hot Surface Warning
This sign stands before activities in the handling of hot objects.

1.2 Limitation

All information and notes in this manual have been compiled considering the applicable standards and regulations, the state of the art, as well as our many years of knowledge and experience.

In the following cases, the manufacturer assumes no liability for damages:

- Failure to follow these instructions
- from improper use
- Use of non-trained personnel
- arbitrary conversions of any kind
- technical changes of any kind
- Use of non-approved spare parts or third-party accessories

The actual scope of delivery may deviate from the explanations and illustrations described here in the case of special designs, the use of additional order options or due to the latest technical changes.

The obligations agreed in the delivery contract, the general terms, and conditions as well as the delivery conditions of the manufacturer and the legal regulations valid at the time of conclusion of the contract apply.

1.3 Copyright

2 Safety

This section provides an overview of all important safety aspects for the protection of persons as well as for safe and trouble-free operation. Further task-related safety instructions are contained in the sections on the individual phases of life.

2.1 Intended use

The CNC gantry system is used exclusively for the purpose of accommodating the tools provided for this purpose, which are used for processing different materials and surfaces.

The intended use also includes compliance with all information in these instructions.

Any use that goes beyond the intended use or is otherwise deemed to be misuse.

WARNING:
Danger in case of misuse!

Misuse of the CNC portal milling machine can lead to dangerous situations.

- Operation outside the values specified in the "Technical Data".
- Bypassing and overriding safety devices.
- Conversion, conversion or modification of the construction or individual pieces of equipment with the aim of changing the area of application or the usability of the machine.
- Operation of the machine with flammable cooling lubricants.
- Machining of light metal alloys such as magnesium, aluminium and titanium without suction device and appropriate safety measures.
- Operation of the machine if it is not in perfect technical condition.
- Operation of the machine within potentially explosive atmospheres.

Claims of any kind due to damage due to improper use are excluded.

2.2 Basic dangers

The following section identifies residual risks that may arise from the machine even when used as intended.
To reduce the risks of personal injury and property damage and to avoid dangerous situations, the safety instructions listed here and the safety instructions in the further sections of this guide must be observed.

2.2.1 Dangers from electrical energy

Electric current

DANGER:
Danger to life due to electric current!
In the event of contact with live parts, there is an immediate danger to life due to electric shock. Damage to insulation or individual components can be life-threatening.

- Work on the electrical system can only be carried out by qualified electricians.
- In the event of damage to the insulation, switch off the power supply immediately and arrange for repair.
- Before starting work on active parts of electrical systems and equipment, ensure the voltage-free state and ensure it for the duration of the work. Observe the 5 safety rules:
  - Unlock.
  - Secure against re-activation.
  - Determine freedom from tension.
  - Ground and short-circuit.
  - Cover or barrier adjacent live parts.
- Never bridge fuses or put them out of operation. When replacing fuses, comply with the correct current specification.
- Keep moisture away from live parts. This can lead to a short circuit.

Stored charge

DANGER:
Danger to life due to stored charges!

Electrical charges can be stored in electronic components, which are retained even after switching off and disconnecting from the power supply. Contact with these components can lead from serious to fatal injuries.

- Before working on the components mentioned, completely disconnect them from the power supply. Allow 10 minutes to ensure that the internal capacitors are completely discharged.

2.2.2 Dangers from mechanics

Rotating tools

WARNING:
Risk of injury due to rotating tools!

Clamped tools such as a milling spindle can lead to serious personal injury or property damage.

- Before starting work, ensure that all covers, and safety devices are installed and functioning properly.
- Do not reach into moving tools during operation.
- Before replacing the tools, always unplug the milling motor or switch off the machine and secure it against reactivation.

Movement of the Axis

WARNING:
Risk of injury due to axis movements!

Collision of persons with components of the machine (Y-bridge, mobile unit, rotary table with workpiece, tool) can lead to the most serious injuries.

- Do not hold body parts between the moving components and end stops of the axles.
- Do not reach into a gap between the recirculating ball screw and adjacent components.
- Do not reach into a column between the mobile unit and the Y-bridge.
- Carry out work on the machine only at a standstill.
- Wear personal protective equipment when working with the machine.

Falling materials

WARNING:
Injuries caused by falling materials!

During operation, chips, tools (or parts of them) can fall or be ejected uncontrollably, causing serious injuries to the skin and eyes.

- Wear face protection or closed glasses, protective clothing, protective gloves and safety shoes (PPE).
- If particles penetrate the eye, immediately seek medical attention.

Unexpected start-up of the machine

WARNING:
Risk of injury due to unexpected start-up of the machine!

The machine and the tools used with it can start unexpectedly, change direction, or stop. This allows limbs to be detected.

- Make sure that no body parts get into the danger area of the machine.
- Secure workspace from accidental access.

Tools

CAUTION:
Risk of injury due to negligent handling of tools!

Negligent handling of the tools can cause bruises or cuts.

- Handle tools carefully and as intended.
- When transporting tools, consider the weight.
- Wear protective gloves and safety shoes.

Sharp edges and pointed corners

CAUTION:
Risk of injury on sharp edges and sharp corners!

Sharp edges and pointed corners can cause abrasions and deep cuts onto the skin.

- When working near sharp edges and pointed corners, proceed carefully.
- If in doubt, wear protective gloves.

2.2.3 Hazards from high or low temperatures

Hot surfaces

WARNING:
Risk of injury due to hot surfaces!

Tools, workpieces, and chips can heat up strongly during operation. Skin contact with hot surfaces causes severe burns of the skin.

- When working with tools, workpieces, and chips, always wear heat-resistant protective clothing and protective gloves.
- Before all work, ensure that all surfaces have cooled to ambient temperature

2.2.4 Fire hazards

Highly flammable substances

WARNING:
Fire hazard due to highly flammable substances!

Organic dusts of coal or wood or inorganic dusts of magnesium, aluminum, zinc, or titanium can catch fire and cause serious to fatal injuries.

- Do not smoke within the danger zone and in the immediate vicinity. Do not deal with open fire or ignition sources.
- Have fire extinguishers ready.
- Avoid processing light metal alloys such as magnesium, aluminum, zinc and titanium without suction device and appropriate safety measures.
- In the event of a fire, stop work immediately. Leave the danger zone until the all-clear is given.

2.2.5 Dangers from radiation

Magnetic fields

DANGER:
Danger to life due to magnetic fields!

Magnetic fields from Servomotors can cause serious injury and even death, as well as significant property damage.

- People with pacemakers should not be near the machine. The function of the pacemaker could be impaired.
- Persons with metal implants must not be near the machine. Implants can heat up or even be attracted by the magnetic field.
- Before maintenance work, place metal objects (jewelry, watches, writing instruments, etc.).
- Do not bring electronic devices near the magnetic source. These could be damaged.
- Do not bring storage media, credit cards, etc. close to the magnetic source. Data can be deleted.

2.2.6 Hazards from chemical substances

Cooling Emulsion

WARNING:
Risk of damage to health due to contaminated cooling emulsion!

Contaminated cooling emulsion can lead to inflammation when in contact with the skin.

- Check cooling emulsion at regular intervals.
- When handling contaminated cooling emulsion, wear protective clothing and chemical-resistant protective gloves.
- Avoid direct skin contact. Remove skin impurities immediately, especially before breaks and after the end of work.
- Eat and drink exclusively in the designated break room.

CAUTION:
Risk of damage to health due to contact with cooling emulsion!

Contact with cooling emulsion can lead to damage to health.

- Avoid skin contact.
- Remove cooling emulsion from the skin immediately.
- Do not inhale vapors.

Oil and fat

CAUTION:
Risk of damage to health due to contact with oil and grease!

Contact with oil and fat can lead to damage to health.

- Avoid skin contact.
- Remove oil and fat from the skin immediately.
- Do not inhale vapors.

2.2.7 General hazards in the workplace

Noise

WARNING:
Risk of injury due to noise!

The noise level occurring in the work area can cause severe hearing damage.

- Always wear hearing protection when working.
- Only stop in the danger zone if necessary.

Dirt and objects lying around

CAUTION:
Risk of injury due to falling over dirt and objects lying around!

Dirt and objects lying around form sources of slipping and tripping. In the event of a fall, injuries can be caused.

- Always keep work area clean.
- Remove objects that are no longer needed from the work area and especially from the ground.
- Mark unavoidable tripping points with yellow-black marking tape.

2.3 Responsibility of the operator

Operator

Operator is the person who operates the machine himself for commercial or economic purposes or leaves it to a third party for use/application and who bears the legal product responsibility for the protection of the user, the staff or third parties during operation.

Operator obligations

The machine is used in the commercial sector. The operator of the machine is therefore subject to the legal obligations for occupational safety.

In addition to the safety instructions in this manual, the safety, accident prevention and environmental protection regulations applicable to the area of use of the machine must be complied with.

In particular, the following shall apply:

- The operator must find out about the applicable occupational health and safety regulations and determine in a risk assessment additional hazard arising from the special working conditions at the place of use of the machine. He must implement these in as operating instructions for the operation of the machine.
- During the entire period of operation of the machinery, the operator must check whether the operating instructions he has drawn up correspond to the current state of the regulations and, if necessary, adapt them.
- The operator must clearly regulate and define the responsibilities for installation, operation, troubleshooting, maintenance, and cleaning.
- The operator must ensure that all persons handling the machine have read and understood these instructions. In addition, he must train the staff at regular intervals and inform them about the dangers.
- The operator shall provide the personnel with the necessary protective equipment and make it mandatory to wear the necessary protective equipment.

Furthermore, the operator is responsible for ensuring that the machine is always in technically perfect condition. Therefore, the following applies:

- The operator must ensure that the maintenance intervals described in these instructions are adhered to.

The operator must have all safety devices regularly checked for functionality and completeness.

2.4 Staff requirements

2.4.1 Qualifications

The different tasks described in this guide require different demands on qualifications of the persons entrusted with these tasks.

WARNING:
Danger in case of insufficient qualification of persons!
Insufficiently qualified persons cannot assess the risks of handling the machine and expose themselves and others to the risk of serious or fatal injury.

- Have all work carried out only by qualified persons.
- Keep insufficiently qualified people out of the work area.

For all work, only persons are allowed who are expected to carry out this work reliably. People whose responsiveness is affected, for example by drugs, alcohol, or medications, are not approved.

This guide identifies the following qualifications of the persons for the various tasks:

Operator

The operator has been instructed by the operator about the tasks assigned to him and possible dangers in the event of improper behavior. Tasks that go beyond operation in normal operation may only be carried out by the operator if this is specified in these instructions and the operator has expressly entrusted him with this.

Electrician

Due to his professional training, knowledge, and experience as well as knowledge of the relevant standards and regulations, the electrician can carry out work on electrical systems and to independently recognize and avoid possible dangers.

The electrician is specially trained for the working environment in which he works and knows the relevant standards and regulations.

Professionals

Due to their professional training, knowledge, and experience as well as knowledge of the relevant standards and regulations, specialist personnel can carry out the work assigned to them and to independently identify possible dangers and avoid hazards.

Manufacturer

Certain work may only be carried out by specialist personnel of the manufacturer. Other personnel is not authorized to carry out this work. To carry out the work involved, please contact our customer service.

2.4.2 Instruction

The operator must regularly instruct the staff. For better follow-up, a training protocol must be created with the following minimum content:

- Date of instruction
- Name of the instructor
- Contents of the instruction
- Name of the instructor
- Signatures of the instructed and the instructor

2.5 Personal protective equipment

Personal protective equipment is used to protect people from adverse effects on safety and health at work.

Personnel must wear personal protective equipment during the various tasks on and with the machinery, which will be referred to separately in the various sections of this manual.

Description of personal protective equipment

The personal protective equipment is explained below:

Protective Clothing

Protective clothing is tight-fitting workwear with low tear resistance, with tight sleeves and without protruding parts.

Chemical-resistant protective gloves

Chemical-resistant protective gloves are used to protect hands from harsh chemicals.

Hearing protectors

Hearing protection is used to protect against hearing damage caused by noise exposure.

Safety Helmet

Industrial safety helmets protect the head against falling objects, oscillating loads and bumps on fixed objects.

Eye Protection

The goggles are used to protect the eyes from flying parts and liquid splashes.

Gloves

Protective gloves are used to protect the hands from friction, abrasions, punctures, or deeper injuries as well as from contact with hot surfaces.

Protective Hair Cover

The protective cover is used to protect the hair from being pulled in by moving and rotating parts, such as example when drilling.

It is mandatory to wear protection if hair lengths are longer than the circumference of the movable shaft.

Safety shoes

Safety shoes protect the feet from bruises, falling parts and slipping on slippery surfaces.

2.6 Safety

WARNING:
Danger to life due to non-functioning safety devices!

In the case of non-functioning or suspended safety devices, there is a risk of the most serious injuries up to death.

- Before starting work, check whether all safety devices are functional and correctly installed.
- Never override or bridge safety devices.
- Ensure that all safety devices are always accessible.

2.6.1 Description of the safety devices installed

Emergency stop button

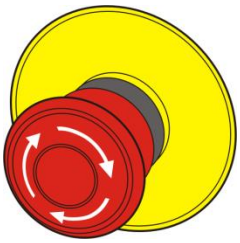


Fig.1: Emergency stop button

By pressing the emergency stop button (Fig.1), the machine is shut down by immediately switching off the energy supply or by mechanical separation from the drives. After an emergency stop button has been pressed, it must be unlocked by turning it so that it can be switched back on.

WARNING:
Danger to life due to uncontrolled reactivation!

Uncontrolled reactivation of the machine can lead to serious injuries and even death.

- Before switching back on, make sure that the cause of the emergency stop has been eliminated and that all safety devices are installed and functional.
- Do not unlock the emergency stop button (*Fig. 2/1)* until the danger has been removed

Location of the emergency stop buttons

The EMERGENCY stop switch (Fig.2/2) is located at the terminal directly next to the touch panel. The main switch (Fig.2/1) also serves as an EMERGENCY stop switch. This is only rotated and switches off the machine completely.

1 Main switch
2 Emergency stop button

Fig.2: Operator terminal

2.6.2 Safety devices that the operator must retrofit

Suction

For the processing of light metal alloys such as magnesium, aluminium, titanium and wood-based materials, a suction device must be installed if it has not already been factory-installed.

NOTE: Danger to people and the environment!
In case of incorrect handling, for example without suction, there is a risk of particulate matter development. This can at high concentrations lead to a fire.

Since fine dust acts inhaled, it mainly damages the respiratory tract.

The following effects of high concentrations of particulate matter in the air can generally be observed:

- Temporary impairment of the respiratory tract
- Increased need for medication in asthmatics
- Increased hospital admissions
- Increase in mortality due to respiratory diseases and cardiovascular problems

2.7 Behaviour in the event of a fire outbreak and accident

Preventive measures

- Always be prepared for fire and accidents!
- Keep first aid kits (first aid kits, blankets, etc.) and fire extinguishing equipment functional and at hand.
- Familiarize personnel with accident reporting, first aid and rescue facilities.
- Keep access roads clear for emergency vehicles.

Measures to be taken in the event of a fire outbreak and accidents

- Immediately trigger emergency stop by emergency stop device.
- If there is no danger to one's own health, rescue people from the danger zone.
- If necessary, initiate first aid measures.
- Alert the fire and/or rescue service.
- In the event of a fire outbreak: If there is no danger to your own health, fight fires with fire extinguishing devices and continue firefighting until the arrival of the fire brigade.
- Inform those responsible at the place of use.

- Clear access roads for emergency vehicles.
- Instruct emergency vehicles.

2.8 Environmental protection

NOTE: Danger to the environment due to incorrect handling of environmentally hazardous substances!

Incorrect handling of environmentally hazardous substances, especially incorrect disposal, can cause considerable damage to the environment.

- Always observe the instructions below on the handling of environmentally hazardous substances and their disposal.
- If environmentally hazardous substances accidentally enter the environment, take appropriate measures immediately. In case of doubt, inform the competent local authority about the damage and inquire about appropriate measures to be taken.

Lubricants Lubricants such as greases and oils contain toxic substances. They must not be allowed to enter the environment. Disposal must be carried out by a specialist waste management company.

Gear oil Gear oil contains toxic substances. They must not be allowed to enter the environment. Disposal must be carried out by a specialist waste management company.

Kühlemulsion Cooling emulsion can contain toxic and environmentally hazardous substances. They must not be allowed to enter the environment. Disposal must be carried out by a specialist waste management company. Observe the manufacturer's safety data sheet.

It is recommended to use a Umwelt-friendly cooling lubricant.

2.9 Signage

The following icons and signs are located in the workspace. They refer to the immediate environment in which they are installed.

WARNING:
Danger with illegible signage!

Over time, stickers and signs can become dirty or otherwise unrecognizable, so that dangers cannot be detected, and necessary operating instructions cannot be followed. As a result, there is a risk of injury.

- Keep all safety, warning, and operating instructions in an easy-to-read condition at all times.
- Replace damaged signs or stickers immediately.

2.9.1 Mandatory Symbols

Follow the instructions

Use the marked machine only after reading the instructions.

2.9.2 Prohibition signs

Bans for people with pacemakers

In the area of this shield, strong electromagnetic or magnetic fields are to be expected, which can disturb pacemakers or render them inoperable.

Persons wearing a pacemaker are not allowed to approach a machine marked with this safety mark.

Caution for people with metal implants

In the case of strong magnetic and electromagnetic fields, it must be expected that all implants made of metal can heat up and thus harm humans. Wearers of metallic implants must avoid the area marked with the safety mark.

Operation with necklace prohibited

There is a risk from retraction or entanglement on moving parts.

Remove necklaces before entering the marked area.

Operation with tie prohibited

There is a risk from retraction or entanglement on moving parts.

Remove the tie before entering the marked area.

Operation with long hair prohibited

There is a risk from retraction or entanglement on moving parts. People with long hair must use a hairnet or hood.

2.9.3 Warnings

Voltage

Only electricians are allowed to work in the work area marked in this way.

Unauthorized persons may not enter the marked workstations or open the marked cabinet.

Automatic start-up

The start-up of machines in production plants is indicated by a flashing light or an acoustic signal. From this moment on, all work must be completed.

Leave the danger zone after signaling.

Keep enough distance to all parts that can move, there is a risk of crushing or moving in.

Hot surface

Hot surfaces, such as hot machine parts, containers, or materials, but also hot liquids, are not always perceptible. Do not touch them without protective gloves.

2.9.4 Fire Safety Sign

Fire Alarm Telephone

The fire alarm telephone may only be used in an emergency.

Before starting to extinguish the fire, trigger an alarm via the fire alarm telephone.

As an exception, a fire alarm telephone can also be a simple telephone that directly establishes a telephone connection to the fire brigade, the company guard or to a person who is constantly present.

In such cases, the following information is required:

- WHO reports?
- What happened?
- HOW MANY are affected/injured?
- WHERE did something happen?
- Waiting for questions!

Fire Extinguisher

Reference to a fire extinguisher.

Before fire extinguishers are brought to the source of the fire, warn, or rescue all persons in the danger zone.

Remove the fire extinguisher only to extinguish a fire.

2.9.5 Safety Signs

First aid

The safety sign without additional signs indicates a first aid kit.

If the additional signs "medical center" or "first responder" are attached, this indicates that first aid specialists are also available.

In an emergency (even in the case of minor injuries), use the material in the first aid kit for the first aid of the injured person.

When using or removing first aid materials, entries must be made in the Accident book.

Emergency exit

In an emergency, leave the danger zone through this door.

Emergency phone

In case of emergency, use the phone to alert.

Transmit the following information to the emergency call center:

- Who reports?
- What happened?
- How many are affected/injured?
- Where did something happen?
- Wait for questions!

Escape route

In an emergency, follow the specified escape route in the direction of the arrow. Escape routes must always be kept clear.

3 Technical specifications

3.1 General information

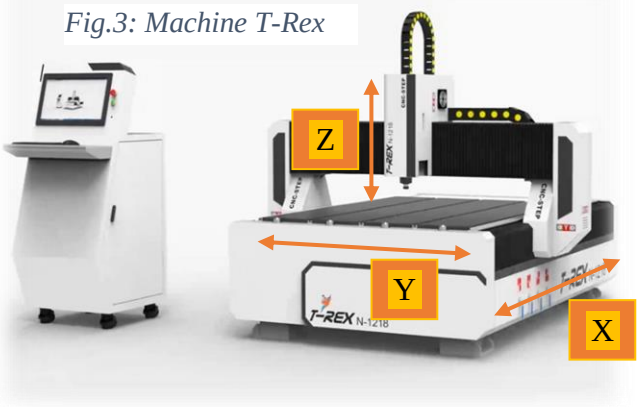


Fig.3: Machine T-Rex

Machine

Specification	T-Rex 0609	T-Rex 0615	T-Rex 1212	T-Rex 1218
Length (L)	1650 mm	2250 mm	1970 mm	2570 mm
Width (W)	1440 mm	1440 mm	2150 mm	2150 mm
Height (H) Standard Z-axis 300mm (Opt.) Z-axis 400mm (Opt.)	**2050 mm** 2400 mm 2850 mm	**2050 mm** 2400 mm 2850 mm	**2050 mm** 2400 mm 2850 mm	**2050 mm** 2400 mm 2850 mm
Weight	approx. 350 kg	approx. 500 kg	approx. 700 kg	approx. 1000 kg
Clamping Area (L xW)	930x630mm	1530x630mm	1230x1320mm	1830x1320mm
Passage height Standard Z-axis 300mm (Opt.) Z-axis 400mm (Opt.)	**220 mm** 320 mm 420mm	**220 mm** 320 mm 420 mm	**220 mm** 320 mm 420 mm	**220 mm** 320 mm 420mm
Passage height measured	Lower edge bridge to the vacuum table - without accessories!			
Load capacity Z-axis attachment weight	25 KG	25 KG	35 KG	35 KG

Specification	**T-Rex 1325**	**T-Rex 1530**	**T-Rex 2030**	**T-Rex 2040**
Length (L)	3270 mm	3780 mm	3780 mm	4820 mm
Width (B)	2150 mm	2350 mm	2850 mm	2850 mm
Height (H) Standard Z-axis 300mm (Opt.) Z-axis 400mm (Opt.)	**2050 mm** 2400 mm 2850 mm	**2050 mm** 2400 mm 2850 mm	**2050 mm** 2400 mm 2850 mm	**2050 mm** 2400 mm 2850 mm
Weight	approx. 1200 kg	approx. 1400 kg	approx. 1500 kg	approx. 1700 kg
Clamping Area (LxW)	2530x1320mm	3030x1520mm	3030x2020mm	4030x2020mm
Passage height Standard Z-axis 300mm (Opt.) Z-axis 400mm (Opt.)	**220 mm** 320 mm 420 mm	**220 mm** 320 mm 420 mm	**220 mm** 320 mm 420 mm	**220 mm** 320 mm 420 mm
Passage height	Lower edge bridge to the vacuum table - without accessories!			
Load capacity Z-axis attachment weight	**35 KG**	**35 KG**	**35 KG**	**35 KG**

Working Space

Specification	**T-Rex 0609**	**T-Rex 0615**	**T-Rex 1212**	**T-Rex 1218**
X-axis	900 mm	1500 mm	1200 mm	1800 mm
Y-axis	600 mm	600 mm	1200 mm	1200 mm
Z-axis (200 mm is standard)	**200**/300/400 mm	**200**/300/400 mm	**200**/300/400 mm	**200**/300/400 mm
Specification	**T-Rex 1325**	**T-Rex 1530**	**T-Rex 2030**	**T-Rex 2040**
X-axis	2500 mm	3000 mm	3000 mm	4000 mm

Y-axis	1300 mm	1500 mm	2000 mm	2000 mm
Z-axis (200 mm is standard)	**200**/300/400 mm	**200**/300/400 mm	**200**/300/400 mm	**200**/300/400 mm

Other Parameters

Specification	**T-Rex 0609**	**T-Rex 0615**	**T-Rex 1212**	**T-Rex 1218**
Positioning Speed (Rapid XY)[1]	50m/min	50m/min	50m/min	50m/min
Working Speed (XY)	33m/min	33m/min	33m/min	33m/min
Positioning Speed (Rapid Z)	12m/min	12m/min	12m/min	12m/min
Module size rack X/Y axis Steps per mm Programmable resolution X/Y	1,25 ca. 800 approx. 0.00125mm	1,25 ca. 800 approx. 0.00125mm	1,25 ca. 800 approx. 0.00125mm	1,25 ca. 800 approx. 0.00125mm
Ball Screw Z-axis Slope Steps per mm Programmable resolution Z	Ø25mm 10mm 1000 0,001mm	Ø25mm 10mm 1000 0,001mm	Ø25mm 10mm 1000 0,001mm	Ø25mm 10mm 1000 0,001mm
Steps/U at 1/10-step control	10000	10000	10000	10000
Linear guides X /Y/Z axis	20mm	20mm	20mm	20mm
Repeatability	0,01mm	0,01mm	0,01mm	0,01mm
Backlash	+- 0,015mm	+- 0,015mm	+- 0,015mm	+- 0,015mm
Servo drive	400Watts	400Watts	750Watts	750Watts

[1] Measured in diagonal travel X+Y (depending on the contour shape)

X/Y/Z axis				
Homing switch	Omron reference switch inductive			
Specification	**T-Rex 1325**	**T-Rex 1530**	**T-Rex 2030**	**T-Rex 2040**
Positioning Speed (Rapid XY)[2]	50m/min	50m/min	50m/min	50m/min
Working Speed (XY)	33m/min	33m/min	33m/min	33m/min
Positioning Speed (Rapid Z)	12m/min	12m/min	12m/min	12m/min
Module size rack X/Y axis Steps per mm Programmable resolution	1,25 ca. 800 approx. 0.00125mm	1,25 ca. 800 approx. 0.00125mm	1,25 ca. 800 approx. 0.00125mm	1,25 ca. 800 approx. 0.00125mm
Ball Screw Z-axis Slope Steps per mm Programmable resolution Z-axis	 Ø25mm 10mm 1000 0,001mm	 Ø25mm 10mm 1000 0,001mm	 Ø25mm 10mm 1000 0,001mm	 Ø25mm 10mm 1000 0,001mm
Steps/U at 1/10-step control	10000	10000	10000	10000
Linear guides X /Y/Z axis	20mm	20mm	20mm	20mm
Repeatability	0,01mm	0,01mm	0,01mm	0,01mm
Backlash	+- 0,015mm	+- 0,015mm	+- 0,015mm	+- 0,015mm
Servo drive X/Y/Z axis	750 watts	750 watts	750 watts	750 watts
Homing switch	Omron reference switch inductive			

[2] Measured in diagonal travel X+Y (depending on the contour shape)

3.2 Connected values

Electrical (total)
Supply line: 380V /20A
(32A CEE-Plug)

Specification	Value	Unit
Voltage	380	In
Frequency	50	Hz
Power consumption	Max. 7.50	KW

3.3 Performance

Feed Drive X/Y/Z

Specification	Yaskawa Servo Driver	Unit
Servodrive Motor X-axis	5,40	A
Servodrive Motor Y-axis	5,40	A
Servodrive Motor Z-axis	5,40	A
Stepmotor Drive Motor 4th axis	Max. 4.28	A

3.4 Service conditions

Environment

Specification	Value	Unit
Temperature range	15-30	°C
Relative humidity, maximum	60	%

Duration

Specification	Value	Unit
Maximum operating time without a break	100	h
Break until the next operation	2	h

3.5 Supplies

Specification	
Track Lubricating Oil GLP 68 Optimal Products	Central lubrication

3.6 Emissions

Specification	Value	Unit
Noise emission (machine only)	ca. 50	dB(A)

3.7 Nameplate

The nameplate (Fig. 4) is located at the back of the terminal and contains the following information:

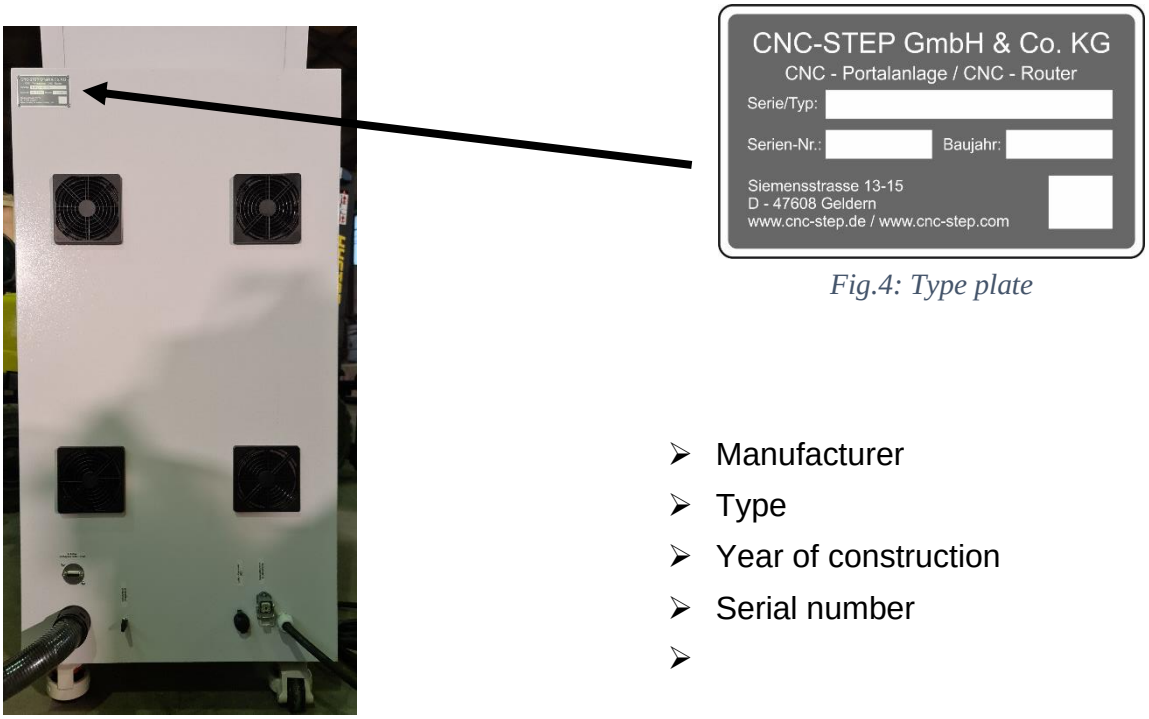


Fig.4: Type plate

- Manufacturer
- Type
- Year of construction
- Serial number
-

4 Construction and functions

4.1 Overview

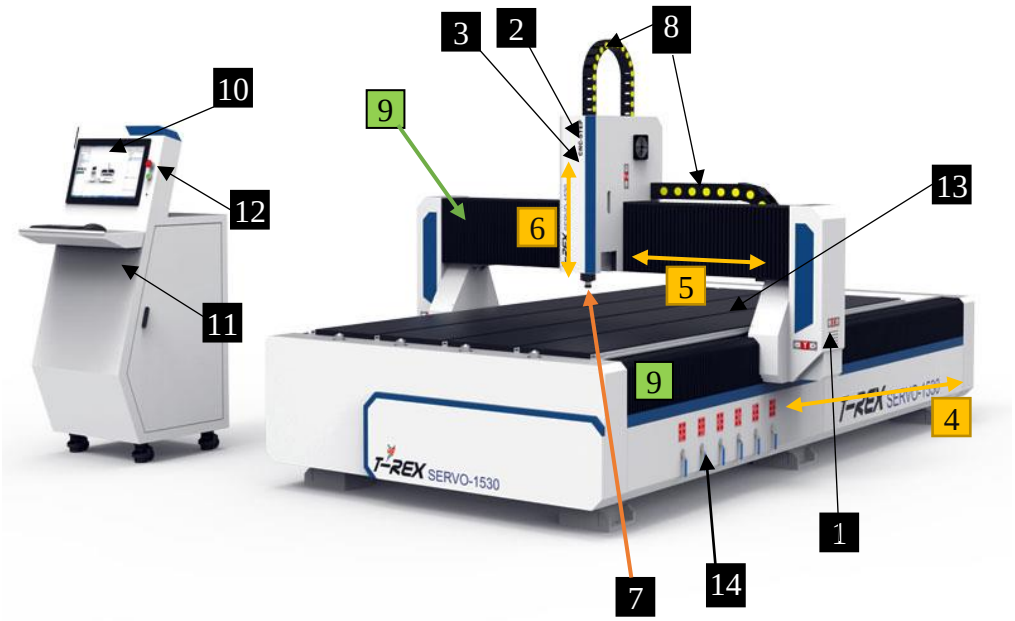


Fig.5: Machine

1 Servomotor of the X-axis (under the cover)
2 Servomotor of the Y-axis (under the cover)
3 Servomotor of the Z-axis (under the cover)
4 X-axis with slide
5 Y-axis with carriage (bridge)
6 Z-axis with slide
7 HF Spindle
8 Cable Carrier
9 Bellows
10 Operator minimum / control
11 Main switch
12 Emergency Stop Button
13 Vacuum table
14 Vacuum sections

4.2 Brief description of the scope of application

Use of the machine

The machine can be used in conjunction with a tool for:

- Milling
- Engraving
- Cutting
- Drilling
- Laser engraving (with appropriate precautions)
- Grooving
- Dosaging
- Measuring
- Positioning

Control via KinetiC-NC operating software

The CNC machine is controlled via the CNC control system KinetiC-NC.

In a CAD or CAD/CAM program (for example ConstruCam 3D, EstlCam, Fusion360, Corel Draw, AutoCAD etc.) the drawings are created and then saved in a compatible file format.

The interface between the CAD/CAM program and the KinetiC-NC software is the postprocessor. This outputs the finished G-code for the KinetiC-NC.

Many CAD/CAM programs on the market already include the postprocessor for KinetiC-NC. This data can then be collected from the control software (for example KinetiC-NC).

The motors for the axis movement are controlled via the control system. The motors and the recirculating ball screw in Z or the racks in X and Y convert rotating displacement into linear movement.

4.3 Description Assembly Group

4.3.1 X-axis

The complete Y-bridge is moved back and forth via the linear guides of the X-axis.

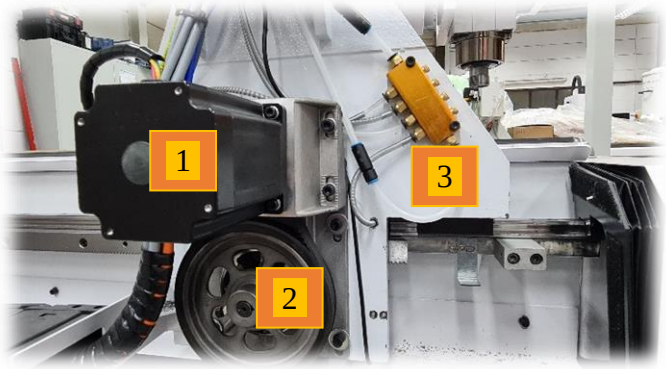


Fig.6: X-axis

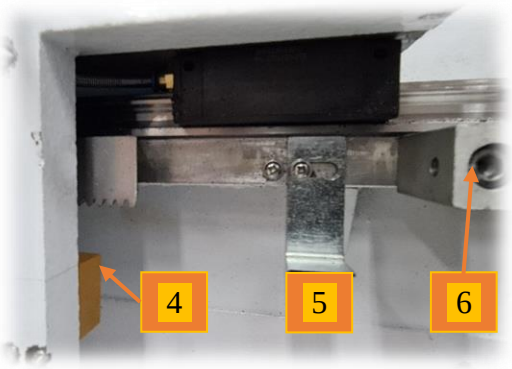


Fig.6.1: X-axis

1. Servo motor with gearbox X-axis
2. Transmission via timing belt
3. Distributor central lubrication
4. Reference switch, inductive
5. Reference
6. Mechanical end stop

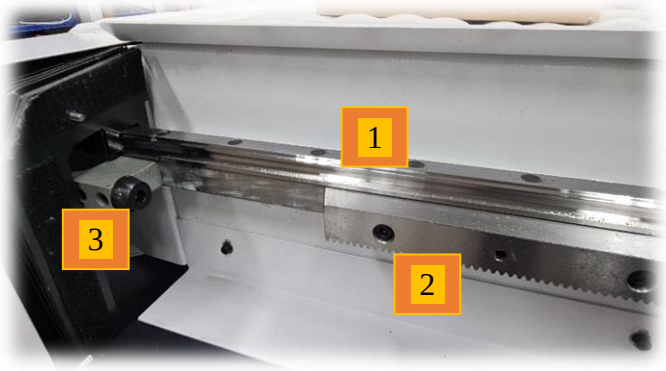


Fig.6.2: X-axis

1. Linear Guides
2. Rack
3. Mechanical end stop

The conversion of the rotary movement of the motor into the linear movement of the X-axis takes place via the gear wheel on the rack.

4.3.2 Y-axis

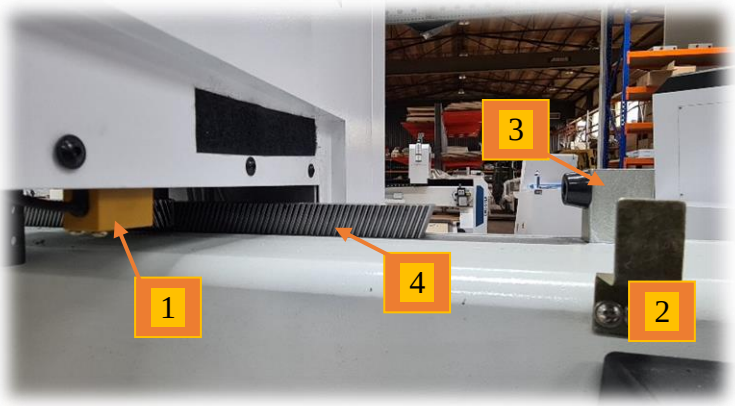


Fig.7: Y-axis

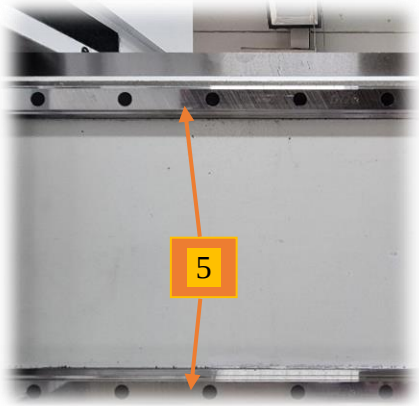


Fig.7.1: Y-axis

1. Reference switch, inductive
2. Reference Aktivator
3. Mechanical end stop
4. Rack
5. Linear Guide

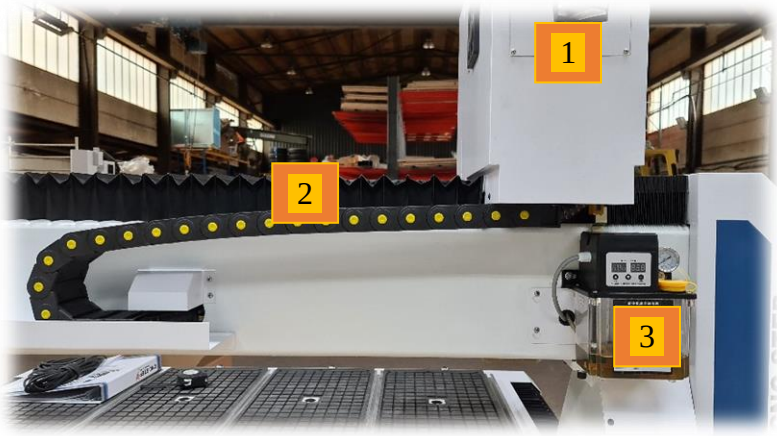


Fig.7.2: Rear Y-axis (bridge)

1. The servo motor with gearbox of the Y-axis can be found behind the sheet metal of the Z-axis
2. Energy cable chain
3. Central lubrication – oil tank with pump

The conversion of the rotational movement of the motor into the linear movement of the Y-axis takes place via the gear wheel on the rack.

4.3.3 Z-axis

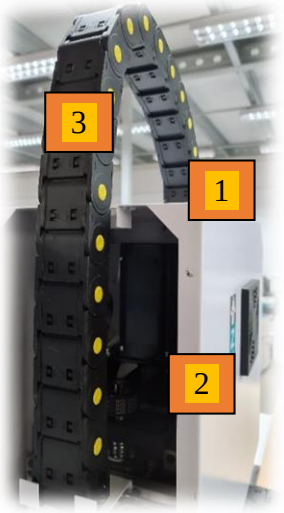


Fig.8: Z-axis

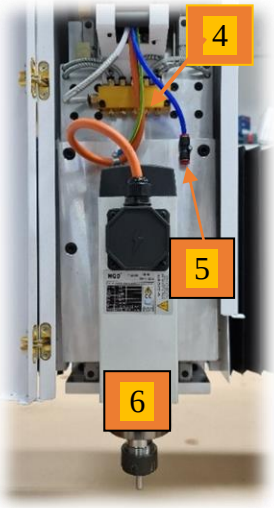


Fig.8.1: Z-axis

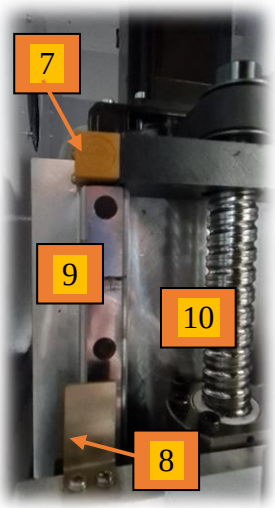


Fig.8.2: Z-axis

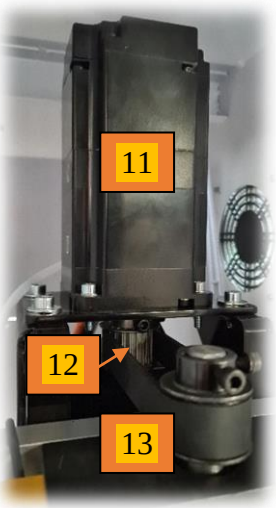


Fig.8.3: Z-axis

1. Z-axis
2. Protective cover
3. Energy Cable Chain
4. Distributor central lubrication
5. Air connection for optional accessories
6. HF Spindle
7. Reference switch, inductive
8. Reference Aktivator
9. Linear guide
10. Ball Screw
11. Servo motor with gearbox and brake
12. Gear motor
13. Timing belt

The two Linear guides (Fig. 8.2 / 7) guide the Z-axis.

Using Ball Screw (Fig. 8.2 / 8), the Z-axis is moved up and down on the profile rails. The transmission from the Servo motor to the ball screw is carried out via a timing belt with a ratio of 1:1.

4.3.4 Z-axis 300mm (Option)

With the Z-axis 300mm option, the travel of the Z-axis increases from 200mm to 300mm.
At the same time, the passage height between the bridge and the vacuum plate is correspondingly greater. Technically, the structure is identical to the 200mm Z-axis.

4.3.5 Z-axis 400mm (Option)

With the Z-axis 400mm option, the travel of the Z-axis increases from 200mm to 400mm.
At the same time, the passage height between the bridge and the vacuum plate is correspondingly greater.

The structure of the Z-axis differs from the two smaller variants. The hood is firmly connected to the Z-axis and moves up and down together with the HF spindle.

Fig.8.3: Z-axis 400mm


Fig. 8.4: Pressure control valve for cylinders

1 Cylinder for Z-axis support

The cylinder supports the Z-axis. The pressure is set to **2-2,5 bar** at the pressure control valve.

4.3.6 Toolholder

Optionally, it is possible to equip the machine with different tool holders or Z-plates on the Z-axis. Thus, in addition to the standard HF spindle, many other tools can be attached to the Z-axis. For example, oscillating knives, milling spindles.

4.3.7 Central lubrication

The machines of the T-Rex series all have central lubrication.

It works automatically via an electric pump and is controlled by the software.

The pump with the oil reservoir is located at the back of the machine at the Y-bridge.

The display on the storage container is deactivated! The system is controlled via the Sofware Kinetic-NC!

The software also monitors the oil level and issues an error message if it falls below it.

The pump transports the oil via hoses to the lubrication points.

There are also oil distributors on all axles.

Fig. 9.1: Oil tank for central lubrication

Fig. 9.2: Oil distributor Z-axis

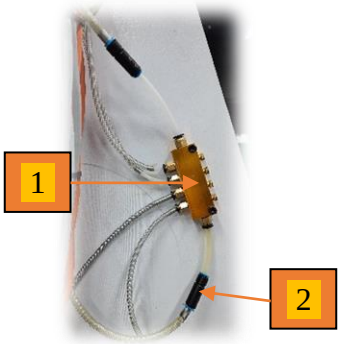


Fig. 9.3: Oil distributor X-axis

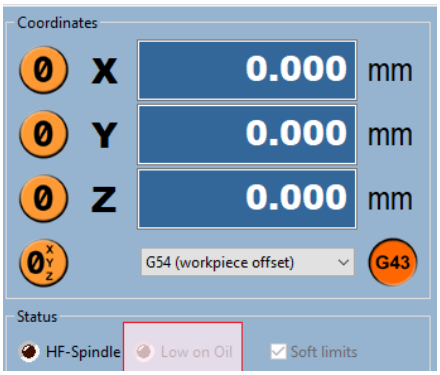
1 Oil distributor

2 Non return valve

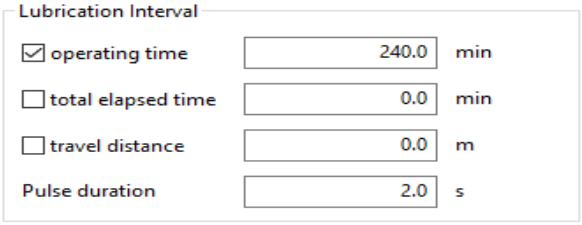
Settings in the KinetiC-NC software

In the KinetiC-NC software, the oil level of the central lubrication is monitored.

If the minimum filling **quantity is not reached**, the software issues an error message.



Adjustment options for central lubrication



These settings can be found in the software under the tabs:

Configuration - Machine - Maintenance

Fig. 9.5: Central lubrication interval

Runtime: (Standard - 240min)

The machine runtime is recorded in the background. All movements >1sec are considered, both during manual driving and in program mode.

Total elapsed time:

The recorded total time is independent of the machine or software runtime.

Distance travelled:

Here it is looked at how many meters all axes have moved together.

Length of pulse: (Standard - 2sec)

Duty cycle of the oil pump when the lubrication interval is reached.

The lubricant intervals should be checked regularly, so that all Linear guides, spindles etc. get enough oil.

4.4 Operator terminal

The machine has a control element via which all functions are called and the

Movement of the machine is controlled.

In addition to the actual machine control, the terminal contains an industrial PC with touch screen and the KinetiC-NC control software.

1 - Main switch

2 - Emergency stop button

3 - Control On (Reset)

4 - Vacuum pump(s) on/off

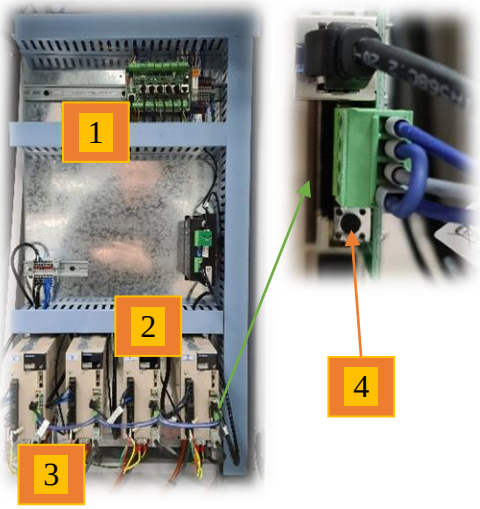
5 - Industrial PC

6 - USB-Connectors

Fig.10: Operator terminal

4.4.1 Machine Controller

On the right side you can find the main control board and the Servomotor power amplifiers for the X, Y, Z and C axes. The controller is thus already prepared for the operation of a 4th axis, such as a rotary axis or an oscillating knife (cutting module).



1 - Main Control Board

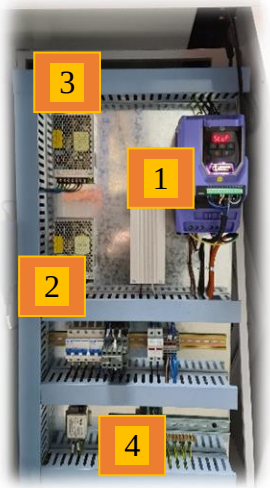
2 -Stepper amplifier 4. Axis

3 - Servo amplifiers X1/X2/Y/Z

4 - Reset button Servo amplifier

Fig.10.1: Control

Here is the main power supply and the converter for the operation of the HF spindle.



1 - Inverter for HF spindle

2 - Power supply 24V motherboard etc.

3 - Power supply 48V for power amplifier 4. Axis

4 - Line

Fig.10.2: Control

4.4.2 Connections on the Terminal

On the back of the Terminal, you will find the other connections to the machine.

Additional inputs and outputs (24V DC) can be connected directly to the motherboard inside the Terminal.

Fig.10.3: Rear panel control

1 - Connection 4. Axis

2 - Connection safety fence

3 - Connection possibility network (LAN) *

4 - Connection vacuum pump(s) (on / off)

5 – Power Source 380V (32A)

***Attention:**

The LAN connection for integrating the machine into the company's network or the Internet can only be used if a network switch has been ordered for the machine. This is then installed and connected in the controller.

4.5 Connections on the machine

4.5.1 Tool length probe

As standard, it is possible to connect a tool length switch to the machine itself. This connector is located at the side down at the beginning of the energy chain of the X-axis.

Fig. 10.4: Connection of tool length probes

4.5.2 Compressed Air Supply Accessories (Optional)

Depending on the accessories purchased, the connections for the compressed air supply are also located at this point. Either as a simple connection nipple or with one or two compressed air control valves with pressure monitor etc.

Fig. 10.5: Pressure control valve with pressure monitor

Fig. 10.6: Two pressure control valves with pressure monitor

Air pressure monitor

For critical applications, we use pressure monitors to monitor the applied compressed air.

This is the case, for example with tool changing systems, where without compressed air the change process could not be carried out and then a crash can occur.

If the pressure is not reached, the software interrupts the process and issues an error message.

4.6 HF Spindle

The machine is supplied with a 3.5 KW HF spindle as standard.

Specifications:

- Power: 3.5 KW
- Voltage/Current: 380V / 7.0A
- Max. Speed at Frequency: 18,000 rpm / 300Hz
- Air-cooled
- Collet: ER25
- Weight: 8,0KG
- Inverter ESCO EDS3-4037PL: 3.7KW

Fig. 11: HF spindle 3.5 kW

Fig. 11.1.: Tool change

2 keys are required to change the tool. The wrench holds the spindle tightly while the ER key is used to loosen or tighten the nut. All tools used must work clockwise.

If other HF spindles or interchangeable systems are used, please refer to the separate instructions of these systems!

4.7 Vacuum clamping system

4.7.1 Vacuum table

The machine is equipped with a vacuum table as standard. This is divided into different vacuum zones (depending on the machine size)
The required vacuum zones can be activated on the side of the machine by the shut-off valves. To use the vacuum table, the individual fields must be provided with a sealing cord to create a seal. The sealed surface must reach the maximum area of the part to be clamped but be smaller than the material to be stretched.

In addition, a vacuum pump (optional) must be connected to the pipe system to create a vacuum. Depending on the size of the table, the required power of the pump also varies.

See Chapter 4.7.2

To activate the vacuum, the vacuum pump must be switched on and the covers of the corresponding fields must be removed.

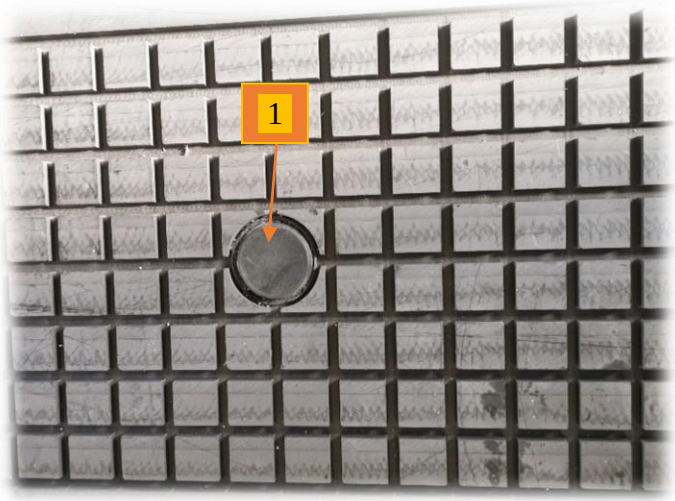
Expiration

1) Measuring the workpiece
2) Select vacuum fields and select the closure plugs (Fig.12. 3) remove
3) Sealing vacuum fields to match the workpiece with sealing cord (Fig.12. 4)
4) If necessary, put on the sacrificial plate
5) Place and align the workpiece
6) Open shut-off valves belonging to the fields (Fig.12.1)
7) Switch on the vacuum pump at the operator terminal
8) Vacuum meter (Fig.12. 2) control. The display should show min. -0.1.
9) Check the fixed fit of the workpiece.

Fig.12: Machine with vacuum table and T-rails

Fig.12.1: Vacuum zones and shut-off valves

Fig.12.2: Vacuum meters



1 Plug for Vacuum zone

Fig. 12.3: Plugs for vacuum zone

1 Open Vacuumline
2 Sealing cord

Fig. 12.4: Vacuum opening / vacuum sealing cord

4.7.2 Side channel compressor (Option)

The optional available side channel compressor can be connected to the controller via a control cable and switched on via the operating terminal.

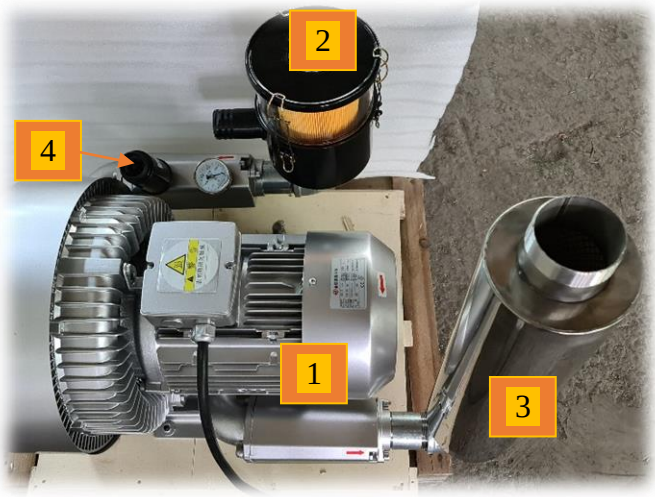


Fig. 13: Vacuum pump / side channel compressor

1 Side channel compressor
2 Filtration device
3 Silencer
4 Vacuum limitation valve

Fig. 13.1: Connection cable

1 Contactor
2 Power connection
3 Control cable for machine control

The side channel compressor has its own power connection. The control cable is connected to the machine control. For example, the side channel compressor can be switched on and off via the button on the control panel.

Fig. 13.2: Vacuum limiting valve

When the vacuum has been reached, the vacuum limiting valve opens the valve so that the pump can draw fresh air and does not overheat.

Recommendations for the appropriate side channel compressor:

Machine Type	Size of Channel Compressor	Remark
T-Rex 0609	1x 2.2KW	
T-Rex 0615	1x 2.2KW	
T-Rex 1212	1x 5.5KW	
T-Rex 1218	1x 5.5KW	
T-Rex 1325	1x 5.5KW	
T-Rex 1530	1x 7,5KW	
T-Rex 2030	1x 7,5KW / 2x 5,5KW	Selection depends on the material
T-Rex 2040	2x 5,5KW / 2x 7,5KW	Selection depends on the material

4.8 T-Slot plates (Option)

For customers who do not want to/cannot clamp their workpieces by vacuum and prefer to work with clamping elements, vices, etc., a T-slot plate can be optionally mounted on the vacuum table. This can be ordered for the entire work surface as well as for individual segments.
The individual plates are 160mm wide and have the length corresponding to the width of the machine. They are mounted on the C-rails of the vacuum table.

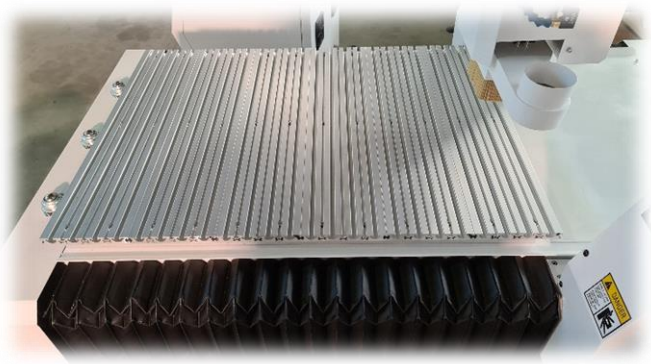


Abb. 14: T-Slot Plate

Attention:
The passage height of the machine is reduced by 18mm due to the additional construction!

4.9 Minimal Lubrication (Option)

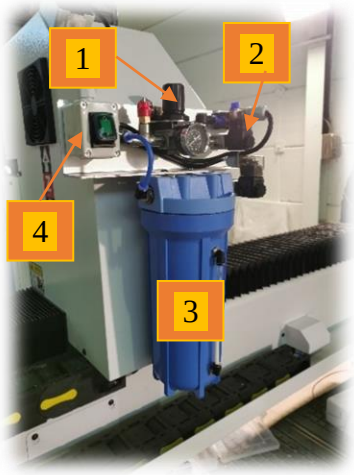
For the processing of some materials such as aluminum, it is necessary to lubricate or cool during the milling process. Various systems are available for this purpose.

Compressed air is required for all systems!

4.9.1 Dynacut MDE

This system is a low-pressure system with coaxial spray nozzle for mist-free coolant application.

With this system, the coolant tank is under a pressure between 0.3 and 1.5 bar via a pressure control valve, depending on the viscosity of the coolant. This ensures that after switching on the compressed air supply, the lubricant and the blowing air are separated from each other at different pressures to the nozzle outlet and the finest coolant droplets are pressed into the air flow at the nozzle tip. The volume of the air flow at the nozzle tip and thus also the pressure is adjusted by an adjustable needle valve on the nozzle unit. The supply of the cooling medium is also adjusted with a needle valve on the nozzle unit. With the correct setting, the system works fog-free.



1. Pressure Control Valve (Operating pressure 1-2bar)
2. Solenoid valves for spray air and lubricant
3. Storage tank for lubricant (1.5l)
4. Main switch

Fig. 16: Minimum quantity lubrication MDE

The pressure on the container must not exceed 2.0 bar. If necessary, adjust up or down via the adjusting screw of the pressure display.
The lubrication system can be switched on and off separately via the green main switch.

1. Air / Lube mixture head
2. Regulating Valve Air
3. Regulating Valve Lubrication
4. Spray nozzle

Fig. 16.1: Nozzle unit and nozzle

The amount of air and lubricant can be adjusted via the regulating valves.

The nozzle is flexible and should be brought as close to the tool as possible.

!!! Please refer to the separate user manual for this system!!!

4.9.2 Noga Minicool

Low-pressure atomizer for thin oils and liquids with a targeted range of action.

In many manufacturing processes, the atomization of oils as lubricants and coolants is essential. With Noga-Minicool the avoidance of operating errors is ensured by automation and economical use of lubricants.

Easy to use

The liquid hose is placed in or connected to a pressure less container. The Noga atomizer already responds at 2 bar overpressures. Via a throttle valve (see figure), the ratio of air / liquid quantity can be finely dosed.

Full flexibility

The atomizer can be attached to any point on the machine and can be specifically aligned to the workpiece by means of the flexible plastic hose. A built-in check valve in the hose prevents the liquid from running back into the bottle. The spray angle is infinitely adjustable from 10° to 30°.

Little effort - high performance

The higher the pressure, the finer the spray mist becomes. The Noga Mini Cool works with an operating pressure of 2 - 6 bar. In the case of upcoming compressed air, it is immediately atomized. The atomizer works permanently – but always with well-dosed quantities. In the center of the air jet, the liquid is supplied economically and evenly.

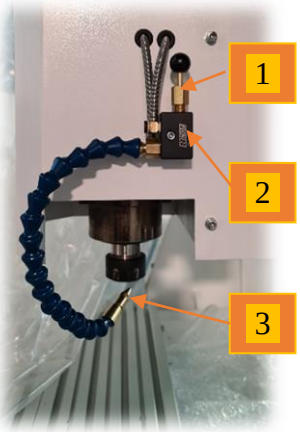


Abb. 17: Noga System

Fig. 17.1: Lubricant tanks

1. Stop valve
2. Noga valve unit
3. Spray nozzle, adjustable
4. Lubrication tank

4.10 Protective Fencing

We generally offer protective devices suitable for the machine.

It is possible to adapt the protective fence to the spatial conditions.
In addition to the standard, the complete enclosure, we also offer a special solution.

Depending on the location of the machine, a safety fence can also be designed as a U-shape or L-shape. If the machine is in a niche, you only need to secure the front.

The only important thing is that access to the running machine is not possible. As soon as the access door is opened, the machine must stop

Attention!

A machine without a safety fence is not CE compliant.

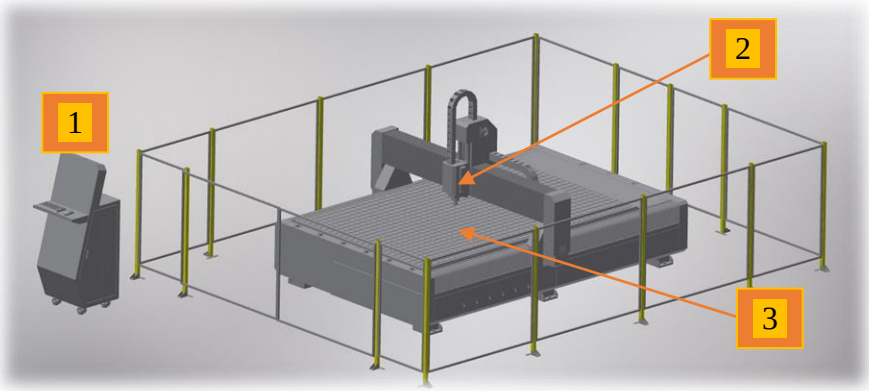
Without a safety fence, this machine does not receive a CE declaration from us.

When the machine is installed into a system other than the one we offer, the machine is delivered with an installation declaration.

The operator of this plant must then ensure the safety of the plant or ensure its own CE declaration.

5 Working and hazardous areas

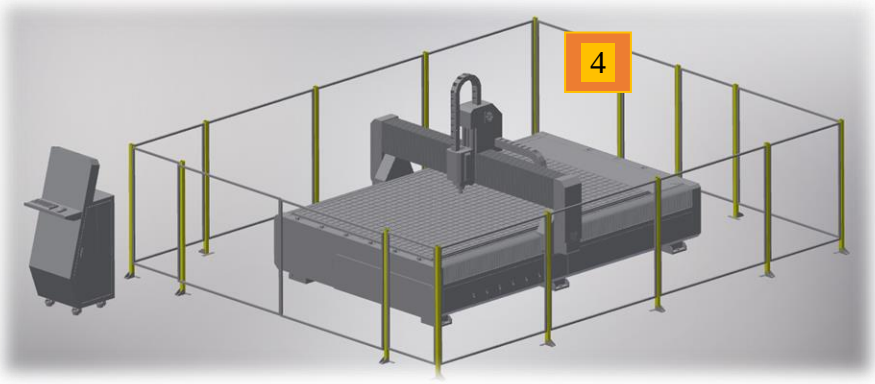
5.1 Workspace



1 Operating Terminal
2 Area of the tool holder (when switched off)
3 Range of motion of the axes (when switched off). For clamping workpieces.

Fig. 18: Work areas

5.2 Danger zone



4 Entire range of machinery within the fence during operation

Fig. 18.1: Danger zone

6 Installation and initial commissioning

6.1 Safety instructions for installation and initial commissioning

Floating loads

WARNING:
Danger to life due to floating loads!

During lifting operations, loads can swing out and fall down. This can cause serious injuries up to death.

- Never step under or into the swivel range of suspended loads.
- Move loads only under supervision.
- Use only approved hoists and slings with sufficient load capacity.
- Do not use torn or scrubbed hoists such as ropes and straps.
- Do not attach hoists such as ropes and straps to sharp edges and corners, knot and do not twist.
- Place the load when leaving the workplace.

Improper installation and initial commissioning

WARNING:
Risk of injury due to improper installation and initial commissioning!

Improper installation and initial commissioning can lead to serious injuries and significant property damage.

- Ensure sufficient freedom of installation before the start of the work.
- Handle open, sharp-edged components carefully.
- Pay attention to order and cleanliness at the assembly site! Components and tools lying loosely on top of each other or around are sources of accidents.
- Professional assembly of components. Comply with prescribed screw tightening torques.
- Secure components so that they do not fall down or fall over.
- Before initial commissioning, please note the following:

Ensure that all installation work has been completed and completed in accordance with the instructions and instructions in this guide.

Ensure that there are no people in the danger zone.

Screw tightening torques

HINT:
Property damage due to incorrect screw tightening torques!

All screws on the machine have been tightened with the appropriate torque before delivery.

Additional tightening leads to unwanted stresses within the machine and thus to inaccurate machining of the workpieces.

- **Do not tighten screws on the machine.**

6.2 Preparations

6.2.1 Setting up the machine

Personal:
- Professionals

Protective equipment:
- Protective clothing
- Safety shoes
- Industrial Protective Helmet

CAUTION:
Risk of injury due to undersized buildings!

Overloading of ceiling structures can lead to serious property damage and bodily injury!

- If the machine is placed on a self-supporting building ceiling, observe the dynamic loads resulting from the movements.

Uneven ground

HINT:
Property damage due to uneven ground!

An uneven surface causes deformations within the machine. This leads to inaccurate machining of the workpieces.

- Set up the machine on a flat and flat surface.

1 machine on a flat, vibration-resistant surface.

Screw 2 adjustable feet under the machine frame

3 machine horizontally (aid spirit level).

6.2.2 Servomotor and control cable

CAUTION:
Risk of tripping and falling!

Exposed pipes on the floor can cause stumbling or slipping.

- Cover cables and/or cables laid on the floor in a sure-footed manner.
- Do not pass corners and sharp edges.
- Avoid chafing.
- Visibly mark the course of the line.

6.2.3 Install accessories

HINT:
The installation of the accessories is carried out in accordance with the instructions for operation and assembly belonging to the accessory.

WARNING:
Risk of injury due to improperly fastened accessories!

Improperly attached accessories can fall or be ejected uncontrollably during operation, causing serious injuries to the skin and eyes.

- Assemble accessories professionally in compliance with safety regulations.

6.3 Installation

6.3.1 Power up the controller

HINT:
The PC/computer is integrated in the control element.
There is a separate manual for the software itself.

Personal:
- Professionals

1) Check all connections for exact fit
2) Inspection of all EMERGENCY STOP devices
3) Turn on the main switch
4) Turn on the control (press the reset button on the control panel) – Chapter 4.4
5) Starting the Kinetic-NC control software

6.4 First installment

Personal:
- Professionals

1 Ensure that the machine is set up and aligned.

2 Ensure that all lines are connected for operational readiness.

3 Ensure that the operator minimum is connected to the machine.

4 Ensure that required accessories are installed and connected to the power supply.

5 Ensure the firm fit of all plug connections.

6 Inspection of safety devices, such as safety fences, etc.

7 Operation

7.1 Safety instructions for operation

Improper operation

WARNING:
Risk of injury due to improper operation!
Improper operation can lead to serious injuries and significant property damage.

- Perform all operating steps in accordance with the instructions and instructions in these instructions.
- Before starting the work, note the following:
  - Ensure that all covers, and safety devices are installed and functioning properly.
  - Ensure that there are no people in the danger zone.
- Never override or bridge safety devices during operation.

7.2 Activities before use

1 Ensure that all covers are installed on the machine.

2 Ensure the firm fit of all plug connections.

3 Make sure none of the emergency stop switches have been pressed.

4 Make sure all doors on the safety fence are closed.

5 Check ambient temperature.

HINT:
The individual materials have different coefficients of expansion. At an ambient temperature of 20–25 °C, it is ensured that no significant influences occur during processing. Therefore, it is recommended to maintain an ambient temperature of 20–25 °C when operating the machine.

7.3 Turn on

Staff: Operator

1 Turn on the terminal via the main switch and start the software.

2 Connect the required accessories to the power supply provided for this purpose.

3 Clamping the workpiece

4 Make sure that the required tool is in the tool holder, change tools, if necessary, see separate operating instructions of the accessory.

5 Ensure that there are no tools or other foreign objects in the machine or plant.

6 Ensure that there are no people in the danger zone.

7 Carry out the reference trip (see note!)

8 Workpiece Offset

9 Start job.

Homing

When the machine is switched on, a homing must first be carried out. The reference switch runs over the reference flag and determines the reference point (zero point) of the individual axes.

After the reference run has been carried out, the machine is ready for use and can be moved.

HINT:
Reference switches are required for axes without absolute position sensors in order to have a known reference point (zero point of the axis) when initializing the axis. From this position, all other positions are then calculated **relatively for the method of the axis via software**.

7.4 Activities during operation

7.4.1 Operate the machine

Personal:
- Operator

Protective equipment:
- Protective Clothing
- Safety shoes
- Goggles
- Gloves
- Hearing protectors
-

Rotating tools

WARNING:
Risk of injury due to rotating tools!

Tools clamped in milling spindles can lead to serious personal injury or property damage.

- Before starting work, ensure that all covers, and safety devices are installed and functioning properly.
- Do not reach into moving tools during operation.
- Before replacing the tools, always unplug the milling motor or switch off the machine and secure it against reactivation.

Movement of the Axes

WARNING:
Risk of injury due to axis movements!

Collision of persons with components of the machine (Y-bridge, mobile unit, rotary table with workpiece, tool) can lead to the most serious injuries.

- Do not hold body parts between the moving components and end stops of the axes.
- Do not reach into a gap between linear guides and adjacent components.
- Carry out work on the linear guides only at a standstill.
- Wear personal protective equipment in the work area.

Magnetic fields

DANGER:
Danger to life due to magnetic fields!

Magnetic fields from Servomotors can cause serious injury and even death, as well as significant property damage.

- Persons with pacemakers must not be in the vicinity of the machine. The function of the pacemaker could be impaired.
- Persons with metal implants must not be near the machine. Implants can heat up or be tightened.
- Before maintenance work, place metal objects (jewelry, watches, writing instruments, etc.).
- Do not bring electronic devices near the magnetic source. These could be damaged.
- Do not bring storage media, credit cards, etc. close to the magnetic source. Data can be deleted.

Falling materials

WARNING:
Injuries caused by falling materials!

During operation, chips, tools (or parts of them) can fall or be ejected uncontrollably, causing serious injuries to the skin and eyes.

- Wear face protection or all-round closed glasses, protective clothing, protective gloves, and safety shoes.
- If particles penetrate the eye, immediately seek medical attention.

Unexpected start-up of the machine

WARNING:
Risk of injury due to unexpected start-up of the machine!

The machine as well as the tools can start unexpectedly, change their direction, or stop. This allows limbs to be .

- Make sure that no body parts get into the danger area of the machine.
- Secure workspace from accidental access

Highly flammable substances

WARNING:
Fire hazard due to highly flammable substances!

Organic dusts of coal or wood or inorganic dusts of magnesium, aluminum, zinc or titanium can catch fire and cause serious to fatal injuries.

- Do not smoke within the danger zone and in the immediate vicinity. Do not deal with open fire or ignition sources.
- Have fire extinguishers ready.
- Avoid processing light metal alloys such as magnesium, aluminium, zinc and titanium without suction device and appropriate safety measures.
- In the event of a fire, stop work immediately. Leave the danger zone until the all-clear is given.

Cooling emulsion

CAUTION:
Risk of damage to health due to contact with cooling emulsion!

Contact with cooling emulsion can lead to damage to health.

- Avoid skin contact.
- Remove cooling emulsion from the skin immediately.
- Do not inhale vapors.

Operation with coolant

HINT:
For more information, refer to the manufacturer's specifications of the coolant.

7.4.2 Change tool

Personal:	• Operator
Protective equipment:	• Protective clothing • Safety shoes • Gloves

1 In the case of milling motors, ensure that the tool spindle is voltage-free (power switch or power plug).

CAUTION:
Risk of burns due to hot surfaces! Risk of cutting due to tools and chips!

Contact with hot components can cause burns. Tools and chips can cause injuries when touched.

Wear protective gloves when changing tools.

2 Change tool, see separate operating instructions for tool holder.

3 Make sure that the tool spindle is again provided with voltage (power switch or power plug).

7.5 Switch off

1. Shut down your computer (Windows 10).
2. Decouple compressed air connection
3. Turn off the main switch.

7.6 Activities after use

Personal:	• Operator
Protective equipment:	• Protective clothing • Safety shoes • Gloves

1. Turn off the machine.

CAUTION:
Risk of injury due to chips!
Chips can be sharp-edged and cause deep cuts.
Always wear protective gloves when removing chips.

2. Cleaning the machine (see Maintenance).

7.7 Shutdown Emergency

In dangerous situations, the movements of components must be stopped as quickly as possible and the power supply switched off.

Shutdown in an emergency

1 Immediately trigger emergency stop by emergency stop device.

2 If there is no danger to one's own health, rescue people from the danger zone.

3 If necessary, initiate first aid measures.

4 Alert the fire and/or rescue service.

5 Inform those responsible at the place of use.

6 Switch off the machine and secure it against reactivation.

7 Clear access roads for emergency vehicles.

8 Instruct emergency vehicles.

8 Maintenance

8.1 Safety instructions for maintenance

Moving components

WARNING:
Risk of damage to health due to contact with cooling emulsion!
Contact with cooling emulsion can lead to damage to health.

- Avoid skin contact.
- Remove cooling emulsion from the skin immediately.
- Do not inhale vapors.

Electrical system

DANGER:
Danger to life due to electric current!
In case of contact with live components, there is a danger to life. Switched on electrical components can perform uncontrolled movements and lead to the most serious injuries.

- Before starting the work, switch off the electrical supply and secure it against reactivation.

Improperly performed maintenance work

WARNING:
Risk of injury due to improperly carried out maintenance work!

Improper maintenance can lead to serious injury and significant property damage.

- Ensure sufficient freedom of installation before the start of the work.
- Pay attention to order and cleanliness at the assembly site! Components and tools lying loosely on top of each other or around are sources of accidents.
- When components have been removed, pay attention to proper assembly, reinstall all fasteners and maintain screw tightening torques.
- Before recommissioning, please note the following:
  - ➢ Ensure that all maintenance has been carried out and completed in accordance with the instructions and instructions in this guide.
  - ➢ Ensure that there are no people in the danger zone.
- Ensure that all covers, and safety devices are installed and functioning properly.

Environmental protection

Observe the following information on environmental protection during maintenance work:

- At all lubrication points that are supplied with lubricant by hand, remove the leaking, used or excess grease and dispose of it in accordance with the applicable local regulations.
- Collect replaced oils in suitable containers and dispose of them in accordance with the applicable local regulations.
- Collect oil/grease-containing rags in suitable containers and dispose of them in accordance with the applicable local regulations.

8.2 Spares

WARNING:
Risk of injury due to the use of incorrect spare parts!

The use of incorrect or faulty spare parts can create risks for personnel and cause damage, malfunctions or total failure.

- Use only original spare parts from the manufacturer or spare parts approved by the manufacturer.
- If you have any doubts, always contact the manufacturer.

Loss of warranty

If non-approved spare parts are used, the manufacturer's warranty expires.

Purchase spare parts from authorized dealers or directly from the manufacturer.

The spare parts list is available on request.

Indicate the following points when ordering spare parts:

- Type
- Year of construction
- Serial No.
- Execution
- Quantity
- Designation
- Desired shipping method (post, freight, sea, air, express)
- Address for dispatch

Spare parts orders without the above information cannot be taken into account. In the absence of information about the shipping method, shipping will be at the discretion of the supplier.

8.3 Schedule of Maintenance

The following sections describe the maintenance work required for optimal and trouble-free operation of the machine.

If increased wear and tear can be detected during regular checks, to shorten the required maintenance intervals according to the actual signs of wear. If you have any questions about maintenance work and intervals, contact the manufacturer.

The maintenance of the supplier components can be found in the separate operating instructions.

Modell T-Rex

Interval	Maintenance	To be executed by
Daily	Check machine for damage and wear	Professionals
	Verify security components Emergency stop, door contacts safety fence	Professionals
10 operating hours	Verification of the function of the automatic central lubrication	Professionals
	Check the oil level of central lubrication	Operator
Monthly	Loosen bellows and push them aside to clean the guide and drive trains	Professionals
After use	Machine cleaning	Operator
	If the maintenance unit for the Supply of compressed Air Empty the oil and water separator	Operator
When required	Clean metallic machine parts and rub them with a resin- and acid-free oil/grease	Operator
	Cleaning the air filter of the vacuum pump	Operator

8.4 Maintenance work

8.4.1 Machine cleaning

Regular maintenance of the machine prevents the bonding of moving components.

HINT!
Property damage caused by compressed air!
Compressed air can damage the ball screw and rack and pinion drives of the T-Rex series machine.
Never use compressed air to clean the T-Rex series machine.

Personal:	• Operator
Protective equipment:	• Protective clothing • Safety shoes • Gloves

1 Set the power switch to the terminal in position "0" or "Off". Disconnect compressed air.

2 Free the machine from chips with the help of brushes or brooms.

CAUTION:
Risk of injury due to chips!
Chips can be sharp-edged and cause deep cuts.
Always wear protective gloves when removing chips.

3 Free recirculating ball screws and linear guides from chips.

4 Clean the entire machine with a slightly oil-soaked cleaning cloth DIN 61650

8.4.2 Lubricate machine

The lubricants reduce wear, protect against contamination, reduce corrosion, and extend the service life due to their properties.

For consumables, see Chapter 3. 5.

Personal:	• Professionals
Protective equipment:	• Protective clothing • Safety shoes • Chemical-resistant protective gloves

The machine has automatic central lubrication. See Chapter 4.3.7

The lines and distributors of the central heating system must be checked daily for leaks and replaced if necessary.

In addition to central lubrication, all metallic components of the machine should be cleaned regularly and wetted with a resin- and acid-free oil or grease.

CAUTION:
Risk of damage to health due to contact with oil and grease!
Contact with oil and fat can lead to damage to health.

- Avoid skin contact.
- Remove oil and fat from the skin immediately.
- Do not inhale vapors.

CAUTION:
Risk of damage to health due to contact with oil and grease!
Contact with oil and fat can lead to damage to health.

- Avoid skin contact.
- Remove oil and fat from the skin immediately.
- Do not inhale vapors.

8.5 Measures after maintenance

After completion of the maintenance work and before switching on the machine, perform the following steps:

1 Check all previously loosened bolted connections for a firm fit.

2 Verify that all previously removed guards and covers are properly reinstalled.

3 Ensure that all tools, materials, and other equipment used have been removed from the workspace.

4 Clean the working area and remove any leaked substances such as for example liquids, processing material or the like.

5 Ensure that all safety devices of the machine work properly.

9 Malfunctions

The following chapter describes possible causes of malfunctions and the work to eliminate them. In the event of an increased malfunction, shorten the maintenance intervals according to the actual load. In the event of malfunctions that cannot be remedied by the following information, contact the support/service of the manufacturer.

9.1 Safety instructions for troubleshooting

Electrical system

DANGER:
Danger to life due to electric current!

In case of contact with live components, there is a danger to life. Switched on electrical components can perform uncontrolled movements and lead to the most serious injuries.

Before starting the work, switch off the electrical supply and secure it against reactivation.

Moving components

WARNING:
Risk of injury due to moving components!

Rotating and/or linearly moving components can cause serious injuries.

- Before all work to eliminate faults on moving parts, switch off the machine and secure it against reactivation. Wait until all components have come to a standstill.
- Wear tight-fitting protective workwear with low tensile strength in the hazardous area.

Improperly performed troubleshooting work

WARNING:
Risk of injury due to improper troubleshooting!

Improperly performed troubleshooting work can lead to serious injuries and significant property damage.

- Ensure sufficient freedom of installation before work begins
- Pay attention to order and cleanliness at the assembly site! Components and tools lying loosely on top of each other or around are sources of accidents.
- When components have been removed, pay attention to proper assembly, reinstall all fasteners and maintain screw tightening torques.
- Before recommissioning, please note the following:
  - ➢ Ensure that all troubleshooting work has been carried out and completed in accordance with the information and instructions in these instructions.
  - ➢ Ensure that there are no people in the danger zone.
  - ➢ Ensure that all covers and safety devices are installed and functioning properly.

Behavior in the event of disturbances

1 In the event of disturbances that pose an immediate danger to persons or property, initiate emergency stop immediately.

2 Determine the cause of the fault.

3 If troubleshooting requires work in the hazardous area, switch off the machine and secure it against reactivation.

Inform those responsible at the place of use immediately about a malfunction.

4 Depending on the type of fault, have it eliminated by authorized personnel.

The following fault table provides information on who is entitled to rectify the fault.

9.2 Störungstabelle

Description	Cause	Remedy	Personal
Softwarefehlermeldungen:			
Emergency Stop	Emergency Stop button pressed	Check and unlock the emergency stop button	Operator
HF Spindle	Error message converter / HF spindle	Check HF spindle / inverter	Professionals
Oil Stand	No oil available	Check and fill storage tank central lubrication	Operator
Safety doors	Doors from the safety fence are open	Close doors	Operator
Servomotor	Servo power amplifier indicates interference	Operate the reset button on the servo power amplifier See Chapter 4.4.1	Professionals
Malfunctions and problems with the machine:			
Step loss	Travel speed too high	Check the setting in the software	Operator
Servomotor no longer moves	Timing belt torn	Replace the timing belt on the servo motor	Professionals
	Servo power amplifier on interference	Operate the reset button on the servo power amplifier See Chapter 4.4.1	Professionals
Insufficient lubrication	Check hoses of the central lubrication, leakage?	Checking the hoses and distributors of the central lubrication for leakage	Professionals

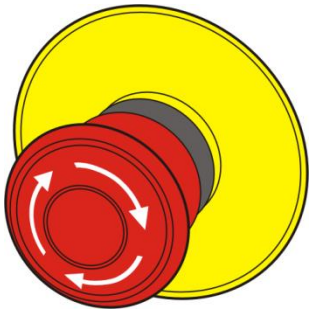
Description	Cause	Remedy	Personal
	Incorrect lubrication intervals	Adjust lubrication interval	
Too much oil (dripping down everywhere)	Lubrication intervals set incorrectly	Adjust lubrication interval	Professionals
Machine does not detect reference switch	Advance of the reference trip too fast	Setting the guideline value 50mm/sec in software Free ride with 1mm/sec	Professionals
	Reference switch defect	Replacement or repair	Qualified personnel / manufacturers
Increased reverse play	Worn spindle/ recirculating ball nut Increased backlash of the rack and pinion achieved due to lack of maintenance or service life	Replacement or repair If possible, recreate the game. Check the distance between the gear and the rack.	Manufacturer

If a fault is not included in the fault table, contact customer service.
The troubleshooting of the access components can be found in the separate operating instructions.

9.3 Troubleshooting work

9.3.1 Unlock Emergency Stop

Staff:
- Operator



1 Determine and remedy the cause of the fault.

2 unlock 2 emergency stop buttons by turning them.

9.4 Commissioning after fault has been resolved

After resolving the fault, perform the following steps for recommissioning:

1 Reset emergency stop devices.

2 Acknowledge fault in the controller.

3 Ensure that there are no people in the danger zone.

4 Start according to the instructions in the chapter "Operation".

10 Transport, packaging and storage

HINT:
As part of the installation and further use, operators or maintenance personnel of the operator must be entrusted with the handling of packages. In doing so, it is essential to observe the following information.

10.1 Safety instructions for transport

Floating loads

WARNING:
Danger to life due to floating loads!
During lifting operations, loads can swing out and fall down. This can cause serious injuries up to death.

- Never step under or into the swivel range of suspended loads.
- Move loads only under supervision.
- Use only approved hoists and slings with sufficient load capacity.
- Do not use torn or scrubbed hoists such as ropes and straps.
- Do not attach hoists such as ropes and straps to sharp edges and corners, knot and do not twist.
- Place the load when leaving the workplace.

Off-center focus

WARNING:
Risk of injury due to falling or tilting packages!
Packages may have an off-center center of gravity. If the stop is wrong, the package may tilt and fall. Falling or tilting packages can cause serious injuries.

- Observe markings and information on the focus on the packages.
- When transported by crane, hit the crane hook so that it is above the center of gravity of the package.
- Carefully lift the package and see if it tilts. If necessary, change the stop.

Improper transport

HINT:
Property damage due to improper transport!
In case of improper transport, transport pieces can fall or overturn. As a result, property damage can occur in a considerable amount.

- When unloading the transport items on delivery as well as during internal transport, proceed cautiously and observe the symbols and instructions on the packaging.
- Use only the intended anchor points.
- Remove packaging only shortly before assembly.

10.2 Inspection before transport

Check the delivery immediately upon receipt for completeness and transport damage.

In the event of externally recognizable transport damage, proceed as follows:

- Do not accept delivery or only with reservation.
- Note the extent of damage on the transport documents or on the carrier's delivery note.
- Initiate a complaint.

HINT:
Complain about any defect as soon as it is detected. Claims for damages can only be asserted within the applicable complaint periods.

10.3 Packaging

To the packaging

The individual packages are packed according to the expected transport conditions. Only environmentally friendly materials were used for the packaging.

The packaging is intended to protect the individual components from transport damage, corrosion and other damage until assembly. Therefore, do not destroy the packaging and remove it only shortly before assembly.

Handling of packaging materials

Dispose of packaging material in accordance with the applicable legal provisions and local regulations.

Off-center focus

HINT:
Danger to the environment due to incorrect disposal!

Packaging materials are valuable raw materials and in many cases can be reused or sensibly processed and recycled. Incorrect disposal of packaging materials can cause risks to the environment.

- Dispose of packaging materials in an environmentally friendly manner.
- Observe the locally applicable disposal regulations. If necessary, commission a specialist company with the disposal.

10.4 Symbols on the packaging

The following symbols are affixed to the packaging. Always observe the symbols during transport.

Fragile

Identifies packages with fragile or delicate contents.

Treat the package with caution, do not drop it and do not expose it to shocks.

Do not stack

Nothing may be stacked on the marked packages or goods

Protect from moisture

Protect packages from moisture and keep them dry.

10.5 Transport

Anchor Point

The machine may only be transported and attached to the frame.

Transport of pallets by crane

Transport items attached to pallets can be transported with a crane under the following conditions:

- Cranes and hoists must be designed for the weight of the transported items.
- The operator must be authorized to operate the crane.

Chip

Protective equipment:
- Protective helmet

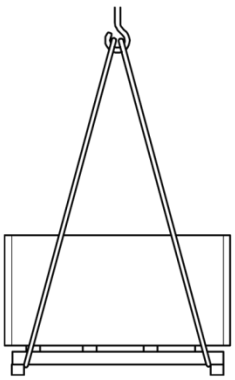


Fig. 24: Lifting equipment

1 Attach ropes, belts or multi-point hangers to the pallet accordingly (Fig. 20) and secure the pallet against slipping.

2 Check whether the transport pieces are not damaged by the slings. If necessary, use other slings.

3 Ensure that the pallet cannot tilt when the center of gravity is out of center of gravity.

4 Start transport.

Transport of pallets by forklift

Transport items attached to pallets can be transported with a forklift under the following conditions:

- The forklift must be designed for the weight of the transport items.
- The transport piece must be securely attached to the pallet.
- The forklift driver must be entitled to drive industrial trucks with a driver's seat or driver's cab in accordance with national regulations.

Transport

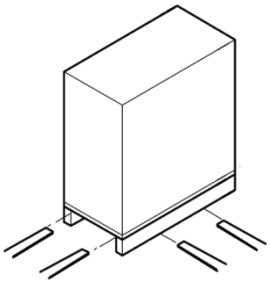


Fig. 25: Transport by forklift

1 Move the forklift with the forks between or under the bars of the pallet.

2 Retract the forks so far that they protrude on the opposite side.

3 Ensure that the pallet cannot tilt when the center of gravity is out of center of gravity.

4 Lift the pallet with transport piece and start the transport.

10.6 Storage

Storage of packages

Store packages under the following conditions:

- Do not store outdoors.
- Store in a dry and dust-free place.
- Do not expose to aggressive media.
- Protect from sunlight.
- Avoid mechanical vibrations.
- Storage temperature: 10 to 35 °C.
- Relative humidity: max. 60 %.
- When stored for more than 3 months, regularly check the general condition of all parts and packaging. If necessary, refresh or renew the preservation.

HINT:
Under certain circumstances, there may be storage instructions on the packages that go beyond the requirements mentioned here. Comply with these accordingly.

11 Dismantling and disposal

After the end of use of the machine has been reached, the machine must be dismantled and disposed of in an environmentally friendly manner.

- Dismantling may only be carried out by specially trained specialist personnel.
- Work on the electrical system may only be carried out by electricians.

11.1 Safety instructions for dismantling and disposal

Improper disassembly

WARNING:
Risk of injury in case of improper disassembly!
Stored residual energies, angular components, tips and corners on or in the machine or on the required tools can cause injuries.

- Ensure sufficient space before the start of the work.
- Handle open sharp-edged components carefully.
- Pay attention to order and cleanliness at the workplace! Components and tools lying loosely on top of each other or around are sources of accidents.
- Professionally dismantle components. Pay attention to the sometimes high dead weight of the components. If necessary, use hoists.
- Secure components so that they do not fall down or fall over.
- In case of ambiguity, consult the manufacturer.

11.2 Dismantling

Before disassembly begins:

- Switch off the machine and secure it against reactivation.
- Physically separate the entire power supply from the machine, discharge stored residual energy.
- Remove operating and auxiliary materials as well as other processing materials and dispose of them in an environmentally friendly manner.

Subsequently, assemblies and components are professionally cleaned and dismantled in compliance with applicable local occupational health and safety and environmental protection regulations.

11.3 Disposal

Unless a return or disposal agreement has been made, disassembled components can be recycled:

- Scrap metals.
- Give plastic elements for recycling.
- Dispose of other components sorted according to material properties.

HINT:
Danger to the environment due to incorrect disposal!
Incorrect disposal can create risks for the environment.

- Have electronic waste, electronic components, lubricants and other auxiliary materials disposed of by approved specialist companies.
- In case of doubt, obtain information on environmentally sound disposal from the local authority or special waste management companies.

12 Accessories

There are a wide variety of possible applications for the machine and thus also numerous accessories.

Here is an excerpt from our extensive accessory catalogue:

Maschinenerweiterungen

- Z-axis with 300mm or 400mm travel and higher passage height
- Protective fences (complete, U-shape, L-shape or only 1 wall)
- T-slot plates, for partial areas or for the complete work area
- Suction systems and suction shoes
- Minimum quantity lubrication
- Vacuum pump

Spanntechnik

- Clamping elements, groove stones, vices

Tools Milling, engraving, drilling

- ATC HF spindles for automatic tool change
- Milling cutters for various applications and materials, engraving stitches, drills

Tools for various applications

- Tangential cutting modules (oscillating or fixed), creasing modules
- Rotation axes, tailstocks and jaw lining
- 3D-Finder (Kantentaster)

Hardware and Software

- USB radio remote control, electronic handwheel (LAN)
- CAD/CAM Software, Schriftenpakete, Spezialsoftware

If you are interested, please contact our customer service by e-mail or telephone.
We will be happy to advise you and send you a corresponding offer.

Numerous suggestions and information can also be found on our website.

13 Customer service

For technical information, please contact our customer service:

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Fax	+49 (0)2831/91021-99	
Email	support@cnc-step.de	
Internet	***https://www.cnc-step.com/***	

If you have any questions, please contact our customer service by e-mail or telephone. We will be happy to advise you.

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https://www.cnc-step.com/