

Operating Instructions flowJET

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flowJET



Short description

The flowJET machine type is based on a low-warpage steel construction.

The linear movement of the sled is carried out via racks, driven by powerful stepper motors. The machine is therefore designed for 3D travel and high speeds. The portal sits on a pool of water with an integrated air chamber to lower and raise the water level.

These operating instructions describe the installation, commissioning and maintenance of the CNC water jet cutting system.

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1 General

1.1 Information about this Manual

This manual enables you to handle this machine safely and efficiently.

This guide is part of the machine and must be kept close to the machine accessible to the staff at any time. Before starting any work, the operator needs to have read and understood this manual. Basic condition for a safe operation of the machine is the compliance with all safety rules and instructions given in this manual.

In addition, the local accident prevention regulations and general safety rules must be applied during the operation of the machine.

Illustrations or graphical representations in this manual serve the fundamental understanding and may differ from the actual construction of the machine.

In addition to these instructions, the instructions in the annexure of the assembled components, apply accordingly.

1.2 Explanation of Symbols

Safety instructions

Safety instructions in this guide are marked by symbols. The safety instructions are initiated by key words, which show the degree of the danger.

Safety precautions must be observed strictly, and cautious action must be taken to avoid any accidents as well as damages to persons or property/objects.



DANGER!

Indicates an imminently dangerous situation which may cause serious injury or death if ignored.



WARNING!

Indicates a potentially dangerous situation which could lead to serious injury or death if ignored.



CAUTION!

Indicates a potentially dangerous situation which could lead to minor or mild injury or damage to property if ignored



ATTENTION!

The symbols or a combination of symbols highlight potential dangers that can result in injury to persons or damage to property if ignored.

Important safety symbols

To draw attention to special dangers the following symbols are used in the safety instructions:



DANGER!

A combination of this symbol and warning indicate danger of potential electrocution which could result in personal injury or death if ignored





Hints and Recommendations



NOTE! - highlights useful tips and recommendations as well as information for an efficient and trouble-free operation.

**Other symbols and icons**

The below mentioned symbols are used to indicate further information relating to the correct use of the machine:

Symbol	Description
	Step by step instructions
	Results by specific actions
	Reference to appendix or other parts of the manual
	List without a specific order

1.3 Limitation of Liability

All information and instructions in this manual have been made under consideration of the applicable standards and regulations, the state of technology as well as our long-standing knowledge and experience.

The manufacturer assumes no liability for damages due to:

- ☐ Failure to comply with the instructions in this manual
- ☐ Non-specified use
- ☐ Operations by unqualified staff
- ☐ Unauthorized alterations or modifications
- ☐ Technical changes
- ☐ Use of unauthorized spare parts

For special designs, additional ordering options or due to some late technical modifications, the actual delivery may not necessarily correspond to the presented explanations and descriptions. General terms and conditions as well as the delivery terms of the manufacturer as agreed on the delivery contract and all legal provisions valid at the time of the contract fulfilment, will apply. We reserve the right to implement technical changes and amendments to the manual and machines as part of the improvement program of the performance and further development of the platforms.

1.4 Copyright Protection

This manual is copyrighted and designed exclusively for internal purposes.

Release of the manual to third parties, reproductions of any type or form, extracts or parts thereof and communication of the contents are not permitted without the written permission of the manufacturer except for internal purposes. Any breach of this obligation shall result in liability for damages. The right to any further claims remains reserved.



2 Safety

This section provides an overview of all-important safety aspects for maximum protection of the staff as well as a safe and trouble-free operation.

Failure to follow the operating procedures and safety instructions listed in this manual may lead to significant dangers.

2.1 Intended Use

The CNC water jet cutting system is used exclusively for cutting materials of all kinds, such as plastics, wood, non-ferrous metals (aluminium, brass, etc.), glass and ceramics with high water pressure up to 3800bar. For various materials, an abrasive unit must also be used. Only purified water, but no salt-free water, may be used for cutting. The machine has its own control system.

Intended use also includes the adherence to all information in this manual as well as the instructions pertaining to the components. Any use exceeding or differing from the appropriate use is considered misuse and can lead to dangerous situations.



WARNING!

Danger resulting from misuse!

Misuse of the machine can lead to dangerous situations!

- Use of the machine outside of the given specifications
- Disabling or removal of any safety switches
- Modification or changing of the machine resulting in changes to the working area or operational parameters.
- Operation of the machine with contaminated water

- Operation of the machine with other liquids
- Cutting of materials that react to water
- Operation of the machine with a technical fault.
- Operating the machine in an explosive environment.

Any claims resulting from misuse or incorrect handling of the machine will not be entertained.

2.2 Basic Dangers

In the following section remaining risks are listed which have been identified based on a risk assessment.

The safety instructions and warnings given in the other chapters of this manual must be observed to reduce health risks and to avoid dangerous situations.

2.2.1 Danger in Electrical Systems

Electricity



DANGER!

Risk of death by electrocution!

Contact with live electrical parts present an imminent danger to a person's health. Damaged insulation or components can cause fatal electrocution if touched by a person.

- Only qualified electricians can work on the electrical systems.
- In case of damage to the insulation, disconnect the power supply immediately and arrange for repairs.
- During all work on the electrical systems, disconnect from the mains and verify that the disconnected parts are free of voltage. These five rules apply:
 - Disconnect from main supply
 - Secure against accidental reactivating.
 - Check for current.
 - Check earthing and short circuit.
 - Shield or disconnect any neighbouring machines.
- Do not bridge or disable fuses. When changing fuses observe correct amperage
- Protect live parts from moisture. Moisture can lead to short circuiting.

Stored electrical charge



DANGER!

Risk of death by electrocution from stored energy!

Electrical charge may be stored in electrical components which could result in electrocution causing injury or death.

- Before commencing work, turn off the power and wait for 10 min before continuing, to allow the capacitors time to discharge the stored current.

2.2.2 Danger of Mechanical Parts

High pressure Waterjet



WARNING!

Risk of injury from high pressure water jet! The high-pressure water jet can lead to severe personal injury or property damage.

- Before starting work, make sure that all covers, and safety devices are installed and working properly.
- Do not reach into the beam during operation.
- Before replacing the cutting nozzles or other wear parts, always pull the mains plug of the high-pressure pump and switch off the machine and secure it against being switched on again. Be sure to release pressure in the line using a manual valve before starting work.



Moving Axis



WARNING!

Risk of injury by moving axis!

Collisions between persons and machine (Y-Axis, moving parts, Rotational axis, Tools) may lead to serious injuries.

- Keep clear of moving parts and their end-stops
- Never reach between the machine and rails
- Only perform maintenance on linear guides when machine is switched off
- Always wear protective clothing in the work area.

Toothed Rack



WARNING!

Risk of injury by moving rack and pinion gear

While operating clothing, hair or body parts could get caught in the rack and pinion leading to serious injury.

- Never reach over toothed rack when machine is switched on.
- Maintenance may only be performed while the machine is turned off.
- Always wear protective clothing in the working area.



Material dropping



WARNING!

Risk of injury by falling materials!

While operating off cut debris, materials or tools may be ejected from the work area causing serious injury to face or eyes

- Always wear face and eye protection, gloves, and safety shoes
- In the event of an injury, contact the medical personnel

Uncontrolled restart



WARNING!

Uncontrolled restart can cause serious personal injury or death!

The machine could move unexpectedly or change direction unexpectedly resulting in injury

- Keep body parts away from the machine working area
- Secure work area against accidental access.

High pressure



Warning!

Risk of injury due to high pressure in the Management!

After operation, the lines and valves for conducting and regulating the water jet are still under high pressure. Work on the lines and valves can only be conducted in a pressure less state. Before any kind of maintenance of the lines and valves release the pressure via the hand valve. If an abrasive conveyor is installed, there will be pressure in the line to the abrasive dispenser. The Conveyor is to be switched off when working on the machine thereby releasing the pressure.

Tools



Caution!

Risk of injury due to negligent handling of tools!

Negligent handling of the tools can cause bruises or cut injuries.

- Tools are to be handled carefully and according to their intended standards.
- Take weight into account when transporting tools.
- Wear protective gloves and safety shoes.

Sharp edges and corners



CAUTION!

Danger of injury from edges and corners!

Sharp edges and corners can cause skin-abrasions and cuts.

- be cautious when working near sharp edges or corners
- If necessary, wear protective gloves.



2.2.3 Danger due to High or Low Temperatures

Hot Surfaces



CAUTION!

Danger of injury from hot surfaces!

Tools, workpieces, and chippings may heat up to high temperatures. Contact with these surfaces could result in severe burns to the skin

- When operating the tools or workpieces always wear heat resistant clothing and gloves.
- Before starting work ensure that all surfaces have reached ambient room temperature.

2.2.4 Danger of Fire

Highly flammable materials



WARNING!

Danger of fire through flammable materials!

- Do not smoke near the working or danger area and avoid open flames or other potential fire risks.
- Always have a fire extinguisher near the machine
- In case of fire, stop working and evacuate the area. Activate the fire alarm.



2.2.5 Danger of Radiation

Magnetic field radiation



DANGER!

Danger from magnetic field radiation!

Magnetic fields pose a danger to persons and property

- Persons with Pacemakers should not work on or approach the machine. The Pacemaker may be affected.
- Persons with metal implants should not work on or approach the machine. The implants may heat up or be pulled towards the machine.
- Do not wear any jewellery like rings, necklaces, watches etc. when operating the machine.
- Do not place any electronic equipment near the magnetic fields as these may be damaged
- Do not place any data storage devices or credit cards, etc. near the magnetic fields as these may be wiped out.



2.2.6 Danger from Chemical Compounds

Cutting water



Fig.: 1



WARNING!

Danger from exposure to Cutting water!

Exposure of the skin to the cutting water can result in irritation or chemical burning.

- Wear protective clothing and chemical-resistant protective gloves when handling contaminated water.
- Avoid direct skin contact. Remove skin impurities immediately, especially before breaks and after finishing work.
- Only eat and drink in the designated break room. (Fig.:1)



CAUTION!

Health risk from exposure to Cutting water!

Contact with cutting water can be detrimental to health.

- Avoid skin contact.
- Remove cutting water from the skin immediately.
- Do not inhale vapours.

Oil and Grease



Caution!

Health risk from exposure to oils and grease!

Contact with Oil and grease can result in illness.

- Avoid direct skin contact.
- Remove oil or grease from skin immediately
- Avoid breathing fumes or gasses from oils or grease.

2.2.7 General Dangers in the Workplace

Loud noise



WARNING!

Danger of damage to hearing from loud noise.

The noise levels in the work area can cause serious damage to your hearing.

- Always wear ear protection.
- If possible, only cut beneath Water Level
- Noise will increase dramatically when cutting above water level.
- Avoid exposure to noise where possible.

Water



Fig.: 2



WARNING!

Risk of slipping through water!

- When working with the water jet system, water can escape from the side and pose a risk of slipping for everyone involved. (Fig.:2)
- If possible, wipe up the water immediately and dispose of it according to local regulations.

Dirt and Debris in the Workplace



CAUTION!

Risk of stumbling and resulting injury through dirt and debris lying around!

Dirt and debris lying around are a source for slipping and stumbling and can result in serious injuries.

- Always keep work area clean
- Remove items no longer needed.
- Mark potential stumbling spots with yellow-black marker tape

2.3 Responsibility of the Operator

Operator

The Operator is the person using the machine for business or commercial purposes directly or through a 3rd party, who will carry the legal responsibility for the use of the machine.

Responsibility of the Operator

The machine is used in the commercial sector. Therefore, the operator of the machine is subject to the statutory requirements for operational safety.

In addition to the safety instructions mentioned in this manual the valid safety regulations and rules for accident prevention as well as the environmental protection law must be observed.

The following must be adhered to:

- ☐ The operator has to be informed about the valid industrial safety regulations and an evaluation of possible additional dangers may need to be done to determine any further potential hazards in order to enhance the safety of working conditions at place of operation.
- ☐ During the entire operating time of the machine the operator must verify that the Standard operating procedures (SOP) prepared by him or his company are in accordance with the current regulations and adjust them if necessary.
- ☐ The operator must clearly define and regulate the responsibilities for installation, operation, maintenance, and cleaning.

- ☐ The operator must ensure that all staff who deals with the machine have read and understood the instruction manual. In addition, the staff must be regularly trained and informed about the dangers.
- ☐ The operator must provide the necessary protective equipment for the staff.
- ☐ The operator is responsible for keeping the protective device technically faultless and keeping it up to date.



The safety device is part of the declaration of conformity and must function properly.

The operator is responsible for ensuring that the machine is always in perfect technical condition, therefore the following applies:

- ☐ The operator must ensure that the maintenance intervals are kept as described in this manual.
 - ☐ The operator must check and test all safety equipment regularly for functionality and completeness.
- .



2.4 Staff Requirements

2.4.1 Qualifications

This section describes the various actions and qualifications required by the operator designated to operating the machine.



WARNING!

Risk of injury in case of insufficient user training!

Improper use or handling can result in significant injury or damage to persons and property.

Therefore:

- Operations only to be carried out by qualified staff.
- Unqualified personnel are to remain clear of the working area.

Only persons whose work performance is reliable may be considered as staff. Persons whose ability to perform is influenced or impaired by drugs, alcohol, or pharmaceuticals, are not to be considered.

The manual requires the following staff qualifications for different areas of operation.

User

Staff that has been trained by the operator about the operations assigned to them and about the potential danger in case of improper or incorrect usage.

Electrician

Qualified Tradesmen (Electrician) that due to their professional training, knowledge and experience as well as their knowledge of the relevant standards and regulations and are in a position to work on electrical equipment and are able to detect and avoid potential danger independently.

The electrician is trained for his specific area of operation and knows the relevant standards and regulations.

Qualified Staff

Qualified Staff with professional training, knowledge, and experience as well as knowledge of the relevant regulations that can carry out operations or tasks assigned to them and are able to detect and avoid potential dangers independently

Manufacturer

Certain functions may only be carried out by qualified persons from the Manufacturer. For information regarding the functions described please contact the Service centre.

2.4.2 Training

The staff must be trained regularly by the operator. For better traceability, the implementation of the training must be recorded in writing.

- ☐ Date of training
- ☐ Name of person trained
- ☐ Type of training given
- ☐ Name of the instructor
- ☐ Signature of trainer and trainee

2.5 Personal Protection Equipment

While working the wearing of personal protection equipment is needed to minimize health hazards and risks of injury. The personnel must always wear the correct protective clothing (PPE) and related equipment described here when working on the machine.

Description of protective clothing and equipment

Below is a list describing the required protective clothes and equipment:



Protective Work Clothing

Must be tight-fitting work clothing with a low tensile strength, narrow or tight sleeves and no protruding parts.



Chemical resistant gloves

As protection for the hands against chemical irritants.



Ear protection

As a protection against hearing damage due to noise



Safety helmet

Industrial safety helmet to prevent possible head injuries from falling items or other risks.



Protective Goggles

To protect the eyes from flying debris and liquid splashes.



Protective Gloves

As protection for the hands against friction, abrasion, grazing or cuts as well as possible contact with hot surfaces.



Hair Net

To protect the hair from being caught in machinery or rotation tools.



Safety Shoes

As a protection against heavy falling objects and to provide traction on slippery surfaces.

2.6 Safety Systems



WARNING!

Danger of injury or death by non-functioning safety systems!

Safety is only ensured with fully functioning safety devices.

- Before start of work verify that the safety devices are functional and installed properly.
- Never disable safety devices
- Ensure that safety devices such as emergency stop buttons, interrupt switches or emergency trip switches are accessible

2.6.1 Description of the Installed Safety Devices

Emergency Stop Switch



Fig. 3: Emergency Stop Switch

By pressing the emergency stop button (Fig.:3) an emergency stop is triggered, and the drive motors are physically disconnected preventing any movement.

After the emergency stop button has been pressed it must be unlocked by twisting so that restarting is possible.



WARNING!

Danger to life through uncontrolled restart!

Uncontrolled restart can cause serious personal injury or death.

- Before restart ensure that the cause for the emergency stop has been eliminated, that all safety devices have been reassembled and are functional.
- Only unlock the emergency stop button if there is no further danger

Location of the Emergency Switches

The illustration shows the location of the Emergency Stop Switches



This symbol indicates an Emergency Stop Switch

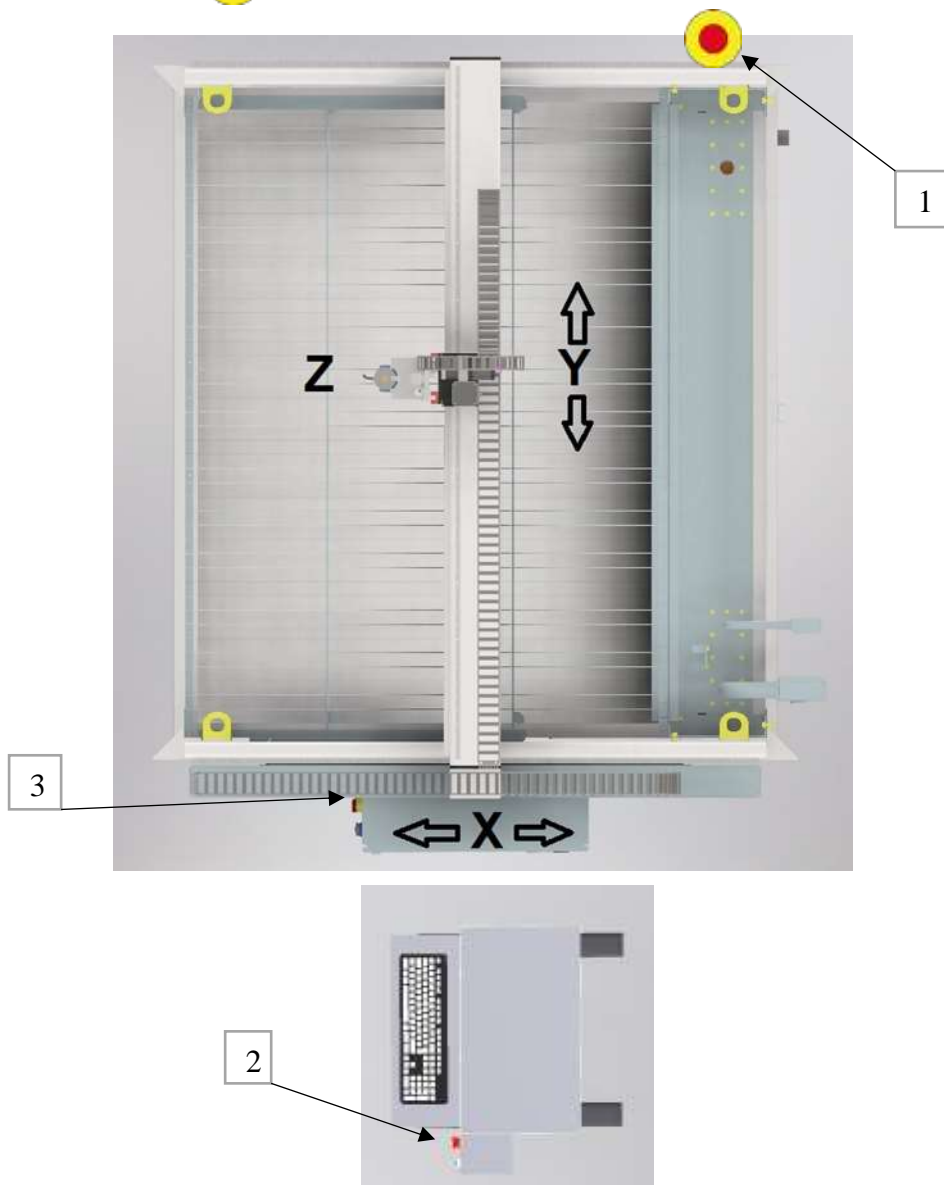
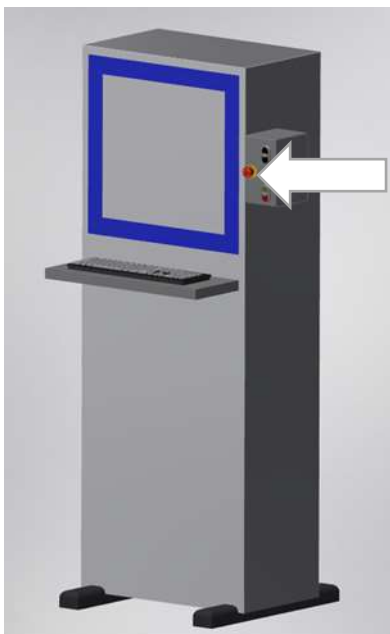


Fig. 4: Position of the Emergency stop switches (Top view)

- | | |
|--|--|
| 1 Emergency Stop switch on left front of machine | 3 Emergency Stop switch on right back of machine |
| 2 Emergency Stop switch on Control panel | |



The emergency stop button on the control panel (Fig. 4/2 und Fig. 5/Arrow) must be unlocked twice.

Fig. 5: Emergency stop switch on control panel

Main Switch with Emergency Function

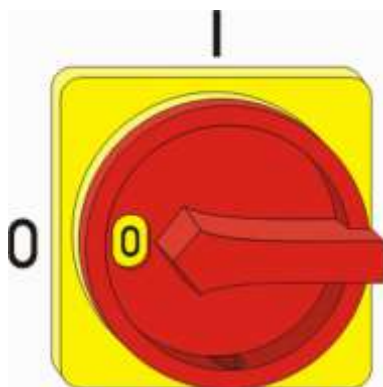


Abb. 6: Main switch

The main switch is also an emergency stop button. By turning the main switch to the "0" position the power supply is immediately disconnected and an emergency stop is triggered.



WARNING!

Danger to life through uncontrolled restart!

Uncontrolled restart can cause serious personal injury or death!

- Before restarting ensure that the cause for the emergency stop has been eliminated, that all safety devices have been reassembled and are functional.
- Only turn the main switch to the "I" position when it is safe to do so.



Location of the Main Switch

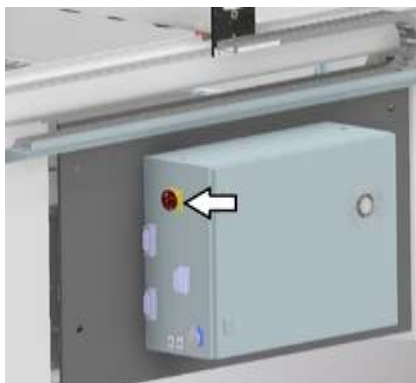


Fig. 7: Controller box

The Main switch is located on the controller box (Fig. 7/Arrow).

2.6.2 Safety Devices

Safety Fences and Covers

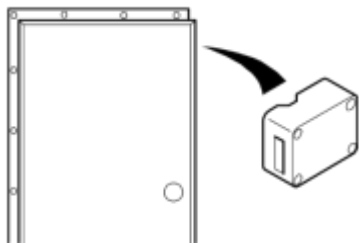
The Machine is to be installed as part of a system. Before using the machine, ensure that all safety fences or covers are installed and connected to the main controller on the safety circuit.

Covers serve to protect against debris, dust or parts that may eject from the working area

Fences serve to protect the working area from intrusion while machine is running.

Use the correct entrance to access the machine and never turn on power while persons are in the working area.

Limit switches as access control

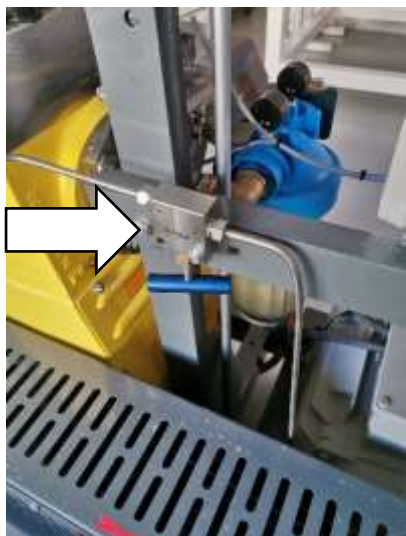


Limit switches are installed as accident prevention devices on doors and maintenance accesses. They prevent starting when open or turn off the machine if opened while running the machine.

Fig. 8: Limit Switch

2.6.3 Device for releasing pressure in Lines and valves

Manual Pressure Release Valve



If the machine is not in use for a longer period or when working on the machine for maintenance the pressure in the lines and valves must be released. This is done through a manual valve (Fig.9 / Arrow) that sits directly at the pump outlet.

Fig.9 Manual valve

2.7 Securing against Accidental Starting



WARNING!

Danger to life through uncontrolled restart!

Uncontrolled or un-authorized restart can cause serious personal injury or death!

- Before restarting ensure that the cause for the emergency stop has been eliminated, that all safety devices have been reassembled and are functional.
- Observe the following instructions to prevent un-authorized starts.

Securing Main Switch

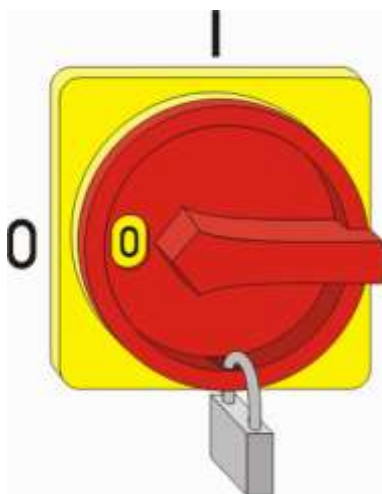


Fig.10: Securing main switch

1. To turn off the power supply move the switch to the "0" position.
2. Lock the switch with a Pad-Lock (Fig. 10).
3. Keep the pad-lock key in a secure area to prevent un-authorized access.

2.8 Behaviour in case of Fire or Accident

Preventative measures

- ☐ Always be prepared for accidents or fire!
- ☐ Keep first-aid equipment (first-aid kit, blankets etc) and fire extinguisher within reach.
- ☐ Familiarize staff with accident reporting and first-aid equipment as well as rescue facilities
- ☐ Keep access roads clear for emergency vehicles

Measures in case of accident or fire

- ☐ Trigger Emergency-Stop immediately.
- ☐ Rescue persons from the danger area when it is safe to do so.
- ☐ Start first-aid measures if necessary.
- ☐ Alert rescue services
- ☐ In case of fire, if there is no immediate danger to life, use fire extinguishers to control the fire until fire services arrive.
- ☐ Inform the responsible persons immediately.
- ☐ Keep access roads clear for emergency vehicles.
- ☐ Direct rescue services onto the premises.

2.9 Environmental Protection



NOTE!

Danger to the environment from incorrect handling!

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

- Observe instructions below.
- Take appropriate action immediately if environmentally hazardous substances enter the

environment accidentally. When in doubt, inform the competent local authority about the damage.

The following environmentally hazardous substances are used:

Lubricants

Lubricants such as greases and oils contain toxic substances. These must not enter the environment. The waste disposal must be done by a specialized waste company

Gearbox Oils

Gearbox oils contain toxic substances. These must not enter the environment. The waste disposal must be done by a specialized waste company

Cutting Water

Cutting water contains substances after use from the material that has been cut. This water may only be disposed of via the normal sewer with the help of a cleaning system and an official permit (in Germany).

The operator must inform himself about the respective obligations in other countries regarding disposal and observe these laws and regulations.

Abrasives

The abrasive mixes with the cutting water and the removed material during cutting. This settles in the tank after the cutting process and fills it up over time. It is possible to suck it off via a canal trolley for appropriate fees or you can "dig out" the material yourself and dispose of it according to the local regulations. One possibility would be to consult with the supplier of the abrasive whether to withdraw the abrasive used. Some companies recycle this and sell it again.

2.10 Labels and Signs

The following symbols and signs will be visible in the work-space. These will be relevant to the area where the symbol or sign is displayed.



WARNING!

Risk due to illegible signs or symbols!

Over time labels, signs and symbols might become unreadable or obscured resulting in risk of injury due to hazards not recognized in the absence of a visible warning sign.

- Regularly maintain all labels, signs, and symbols so they are clearly visible and readable.
- Replace any damaged or illegible labels or signs.

2.10.1 Advisory Signs

Refer to User Manual



Do not use the machine until the described signs and symbols have been understood by referring to the user manual.

2.10.2 Prohibition Signs

Persons with Pacemakers prohibited



No persons with a Pacemaker should approach the area where this sign is displayed. There is danger of electromagnetic radiation which may disrupt the function of a Pacemaker resulting in death.



**Persons with metal implants
prohibited**



Persons with metallic implants should avoid the area where this sign is displayed. Radiation may cause implants to heat up causing bodily harm.

**Operating while wearing
jewellery prohibited**



Wearing jewellery which may get caught in the workings of the machine, possibly causing injury or death is prohibited in the areas displaying this sign.

**Operating while wearing
neckties prohibited**



Persons wearing a necktie are prohibited from entering the area displaying this sign. The necktie may get caught in the workings of the machine causing injury or death.

**Operating with long hair is
prohibited**



Persons with long hair are prohibited from operating the machine unless they are wearing a hair net or hair protection. The hair may be caught in the working parts causing injury or death.



2.10.3 Warning Signs

Electrical Current



Only qualified electricians can work on the electrical systems displaying this sign.

No unauthorized persons can open doors with this sign and should keep clear of the area.

Automatic Start



The signals, a flashing light or acoustic siren denote the automatic starting of production line machines. At this point all work in the area must be complete. After the signal, clear the area immediately.

Avoid any moving parts that may cause injury.

Hot Surfaces



Hot surfaces, tools, liquids, and other potential hazards may not be recognizable. Where this sign is displayed be sure to wear protective gloves before handling any items.



2.10.4 Fire Protection Signs

Emergency Phone



This phone may only be used in an emergency.

Before commencing firefighting activities, use the phone to alert the emergency services.

A conventional telephone may be used in an emergency to contact emergency services and alert responsible persons.

The following information will be required:

- ☐ Who is calling?
- ☐ Nature of the emergency?
- ☐ How many persons affected/injured?
- ☐ Where did the incident take place?
- ☐ Respond to any questions asked!

Fire Extinguisher



Guideline for using fire extinguisher.

Before activating the fire, extinguisher ensure that all persons are clear of the area and warn persons before commencing with extinguisher.

Only use fire extinguisher to shut down a fire.

2.10.5 Rescue Signs

First Aid



This sign indicates a first aid kit placement.

If this sign is accompanied by any other signs i.e. Medic, this will indicate that a medic is on duty.

In an emergency use the contents of the kit to provide first aid to patients.

If any items are used in the first aid kit, this must be noted, and replacements provided.

Emergency Exit



In case of emergency use this exit to leave the area.

Emergency Phone



This phone may only be used in an emergency.

Use the phone to alert the emergency services.

The following information will be required:

- ☐ Who is calling?
- ☐ Nature of the emergency?
- ☐ How many persons affected/injured?
- ☐ Where did the incident take place?
- ☐ Respond to any questions asked!

Escape Route



In an emergency use the escape route to leave the area. The escape routes must always be kept clear and free.

3 Technical Specifications

3.1 General Specifications

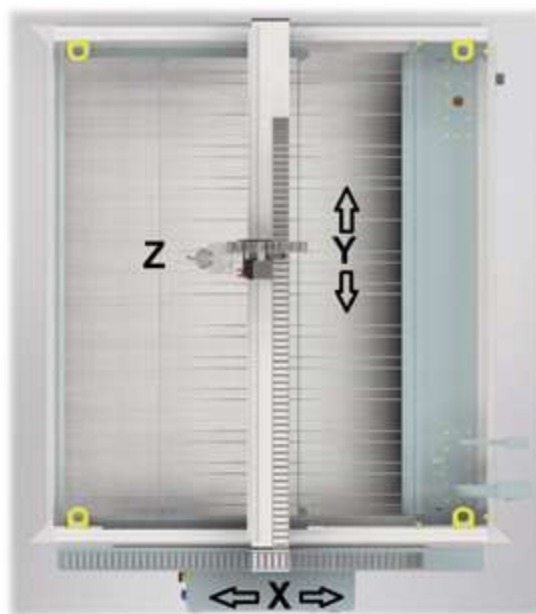


Fig.11: Machine (Top View)

Machine in General

Specification	flowJET 2015	flowJET 2515	flowJET 3015
Length (X)	2400 mm	2400 mm	2400 mm
Width (Y)	2900 mm	3400 mm	3900 mm
Height (Z)	4000 mm	4000 mm	4000 mm
Weight distributed on 6 feet	ca. 1500 kg	ca. 1900 kg	ca. 2300 kg
Overall weight with Pump and Water	ca.4200 kg	ca.4850 kg	ca.5500 kg
Clamping area (LxW)	1700 x 2200 mm	1700 x 2700 mm	1700 x 3200 mm
Bridge Clearance	300 mm (machining possible up to 200 mm dependant on Focusing tube)		

Machining Area

Angabe	flowJET 2015	flowJET 2515	flowJET 3015
X-Axis	1510 mm	1510 mm	1510 mm
Y-Axis	2010 mm	2510 mm	3010 mm
Z-Axis	200 mm	200 mm	200 mm

Other Parameters

Parameter	Description
positioning speed, maximum	40.000 mm/min ¹
Working Speed (depending on form and ramp), maximum	20.000 mm/min ¹ (depending on form complexity and ramp speed)
Steps X/Y+Z	0,0213/0,0113 mm
Reverse direction correction	ca. +- 0,045 mm
Position Error	Can be calibrated
Reference/Limit switches	3x Magnetic contactless on all axis
Work Area Monitoring	Software Controlled
Linear guides X/Y/Z	HIWIN 20 mm / Pre-tensioned with 4 slides per axis
Drives X/Y/Z	3x Stepper Motor 9.4 Ampere / 9.3 Nm holding Torque.
Drive type X/Y/Z	Low back-lash precision planetary gears with 110 Nm output torque
Spindle Clamp	20 H7 Euro neck (for ALLFI Cutting Tools)

¹ Measured in the diagonal drive X + Y (depending on contour shape)

If the speed is >7200mm/min you need the software WinPCNC USB or Profi!

3.2 Power Supply

Electrical (total)

Description	Value	Unit
Voltage	380	V
Frequency	50	Hz
Power consumption, maximum	17 or 32	kW

Pneumatik Port

Description	Value	Unit
Dry Pressured Air without oil	min.8 max. 10	bar

Water connection

Description	Value	Unit
Water pressure	min.3	bar
Flow Rate 15 kW	min.2	l/min
Flow Rate 30 kW	min.5	l/min

3.3 Power Usage

High Pressure Pump (optional)

Description	Value	Unit
Current, maximum	32	A
Power consumption, maximum	15 or 30	kW

Drive motors X/Y/Z

Description	Value	Unit
Max current per Motor	9,4	A
Holding Torque	9,33	Nm

3.4 Operating Requirements

Environment

Description	Value	Unit
Temperature range	16-30	°C
Max. Humidity	60	%

Duty Cycle

Description	Value	Unit
Max run time without stopping	Runtime of the orifice	h
Rest period required to next run	none	h

3.5 Lubricants

Lubricant	Type	Amount	Unit
Light machine grease	OKS 425 Synthetic Long-life Grease	20	Grams per Ball Nut

3.6 Emissions

Description	Value	Unit
Sound emissions (without Waterjet)	ca. 50	dB(A)
Sound emissions (with Waterjet) under Water	>70	dB(A)
Sound emissions (with Waterjet) over water	>110	dB(A)

3.7 Name Plate



Fig. 12: Name Plate

The name plate is attached to the frame of the machine next to the controller box and contains the following information:

- ☐ Manufacturer
- ☐ Type/Model
- ☐ Year of Manufacture
- ☐ Serial Number

4 Assembly and Commissioning

4.1 Overview

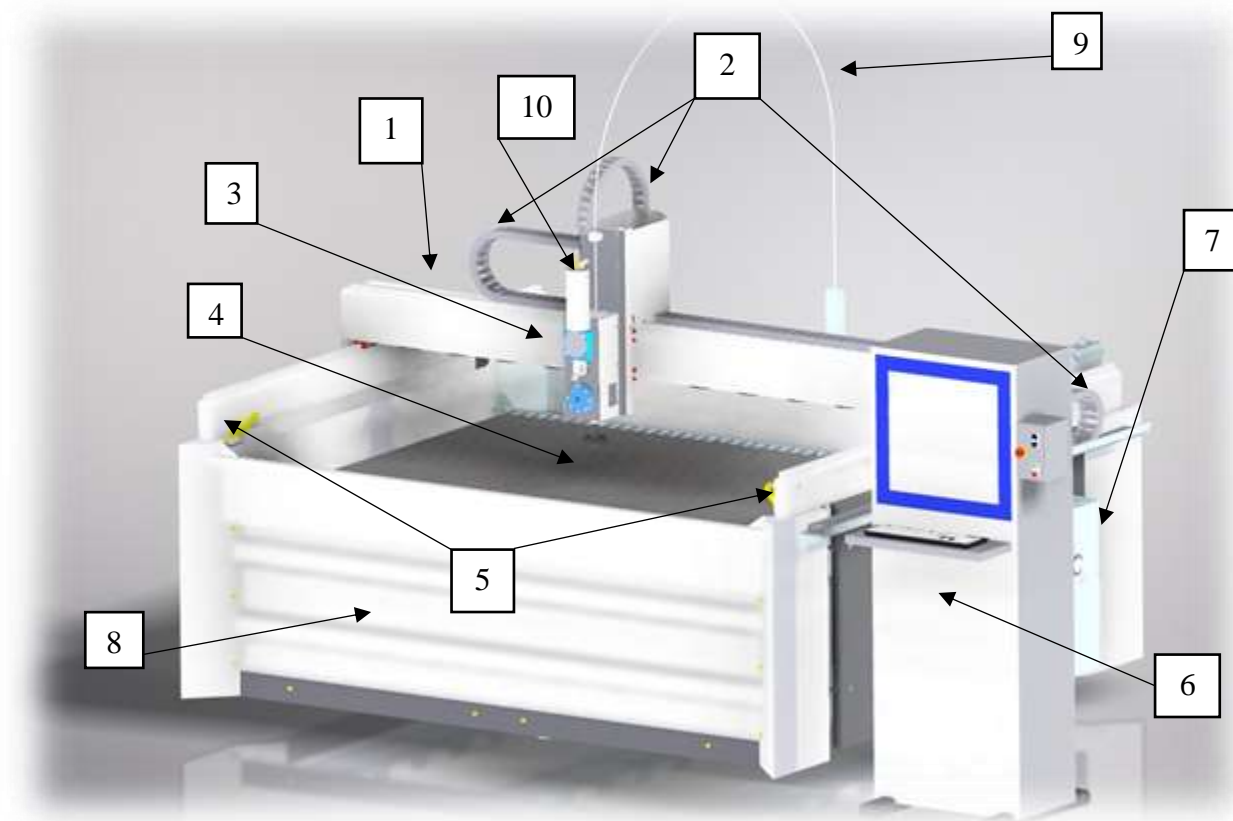


Fig. 13: flowJET overview

- | | |
|---|--|
| <p>1 Y-Axis with slide (Y-Bridge)
□ Chapter 4.3.1 "Y-Axis with Slide", page 49</p> <p>2 Cable channel</p> <p>3 Z- Axis with slide
□ Chapter 4.3.2 "Z-Axis with Slide" page 50</p> <p>4 Working table</p> <p>5 X-Axis with slide □ Chapter 4.3.3 "X-Axis with Slide" page 51</p> | <p>6 Operator station with software
□ Chapter 4.3.4 "Operating Software", page 51</p> <p>7 Controller □ Chapter 4.3.5 "Controller", page 52</p> <p>8 Water Basin</p> <p>9 High Pressure Line</p> <p>10 Abrasive Feeder (Separate Manual)</p> |
|---|--|

4.2 Short Description

Intended use of Machine

This machine may be used for the following applications:

- ☐ Water Jet cutting with or without Abrasives

Materials

The following materials may be processed:

- ☐ Plastic
- ☐ Wood
- ☐ Non-ferrous metals (Aluminium, Brass etc.)
- ☐ Glass
- ☐ Ceramic etc.
- ☐ Steel, Stainless steel etc.

Description

The machine will require some accessories which must be installed before the machine will be ready for cutting:

- ☐ **High-Pressure Pump** to produce the High-Pressure Water Jet
- ☐ **Abrasive feed** to cut harder materials

On the work table (Fig. **Fehler! Verweisquelle konnte nicht gefunden werden.** /4) the workpiece is clamped. In the accessory holder (Fig. **Fehler! Verweisquelle konnte nicht gefunden werden.** /8) the cutting head is attached to process the workpiece. All movements of the tool are centrally controlled by the operating software (Fig. **Fehler! Verweisquelle konnte nicht gefunden werden.** /6). The tool is changed manually.

- ☐ **Reservoirs**

The machine consists of a steel frame construction that includes a water basin with at least 600mm deep water to reduce the energy of the water jet and to collect cutting particles.

Controlling software

The files that will be run on the machine will be created in a CAD or graphic design program. The drawing or text will be saved in either HPGL/dxf, AI, etc. formats. This data will be opened in the CNC-controlling software e. g. WinPCNC (optional) to be run on the machine.

All operational parameters can be set up in the software to control feed rates, cutting depths, scale etc. The motion commands are given from the software to the CNC stepper motors to perform the required movements.

The four stepper motors X-, Y-, Z- and 4th axis will receive respective commands from the software and perform the movements via the gearing.

4.3 Description of Sub-Assemblies

4.3.1 Y-Axis with Slide

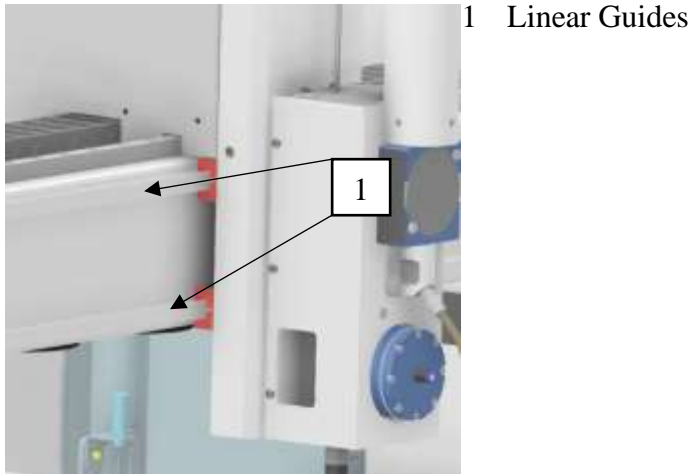


Fig. 14: Y-Slide

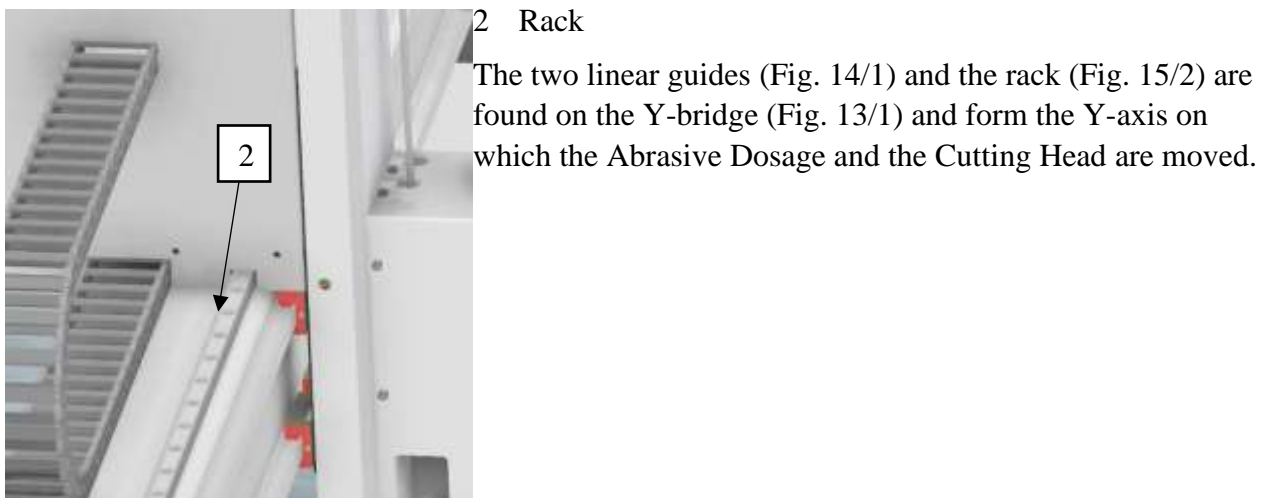
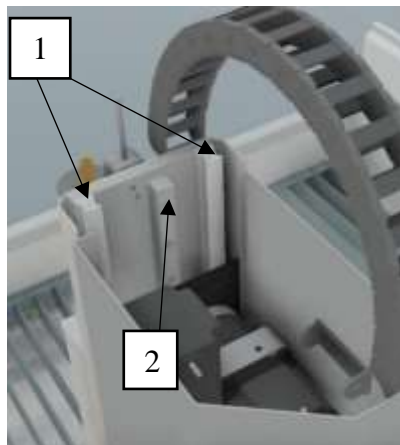


Fig. 25: Y-Rack

4.3.2 Z-Axis with Slide

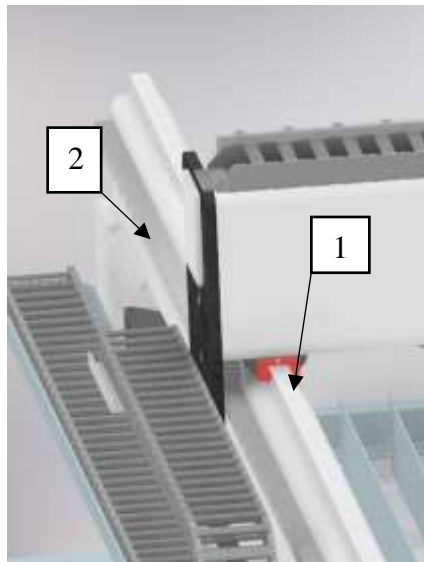


- 1 Linear Guides
- 2 Rack

The two linear guides (Fig. 16/1) form the Z-Axis on which the milling spindle (optional) will be moved in the Z-direction.

Fig. 16: Z-Slide (Top View)

4.3.3 X-Axis with Slide



- 1 Linear Guides
- 2 Rack

The figure shows the X-linear guides (Fig. 17/1) and the X-rack (Fig. 17/2) on one side of the machine. The second X-axis with rack and guide is found on the other side of the machine. Both the X rails form the X-axis on which the Y-bridge (Fig. 13/1) is traversed.

Fig. 17: X-Slide

4.3.4 Operating Software

KineticNC



Fig. 18: Screenshot

The machine is controlled by CNC-CAM-Software.

The CAM-Software KineticNC (Fig. 18) is Windows PC based software.

The Software is supplied with the machine.



Further information is available in the software user manual supplied with the software.

4.3.5 Controller

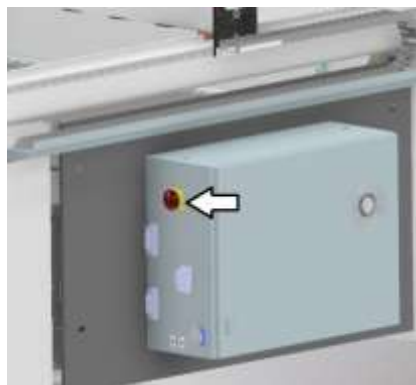


Fig.19: Controller

The controller controls the stepper motors for each axis.

The controller (Fig. 19) is connected to the PC by a parallel port connection (RS232). It is possible to connect the PC directly to the controller via parallel port if one is using WinPCNC Economy.

WinPCNC Profi has an axis controller and will connect to the controller via serial port or USB connection.

The controller has a main switch (Fig. 19/arrow) for turning the machine on or off and the controller box may be opened with the supplied key.

4.3.6 High Pressure Pump



Fig.20: Hammelmann High Pressure Pump

The high-pressure pump increases the pressure of the cutting water to the programmed value. This is passed on to the machine via the high-pressure line. The pump is controlled by a frequency inverter and therefore has its own control system, which is activated via a signal 0-10V. There is a separate user manual for the unit.

4.3.7 Abrasive Conveyor (Optional)



Fig.21:: Abrasive Conveyor 100 kg

When cutting materials, such as steel, an abrasive is required to cut them. For this purpose, this is stored in a conveyor as seen in the picture. The abrasive conveyor pushes it forwards it to the abrasive dosage with the help of air pressure. There is a separate operating manual for setting and maintenance for this unit.

4.3.8 Abrasive Dosage (Optional)



Fig.22: Abrasive Dosage

The abrasive dosing is activated via the control of the machine. Depending on the material, the amount of the abrasive is fed to the cutting water in the mixing chamber inside the cutting nozzle. This can range from 0 to up to 600 g/min depending on your pump option.

4.3.9 Cutting Valve



Fig.23: Cutting Valve

The cutting valve helps to maintain the pressure in the line. This reduces the on-and-off time of the pump and reduces downtime between cuts. The valve also holds back the water when driving over workpieces without cutting. There is a separate maintenance manual for this purpose. In case of malfunction, the rupee disc of the HD pump may break. The valve is controlled by compressed air

4.4 User Controls

The machine does not have any controlling systems and all commands are given by the controlling software installed on a PC.



Further information is available in the software user manual supplied with the software disc.

4.5 Connections

Connections on the controller

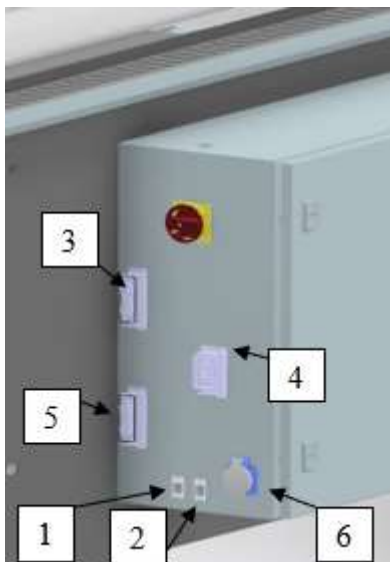


Fig. 24: controller (front view)

- 1 Connection □ computer with software
- 2 Connection □ Handwheel
- 3 Connection □ High-Pressure Pump
- 4 Connection □ Abrasive Conveyor and Dosage
- 5 Connection □ Control panel
- 6 Connection □ Power for Controller

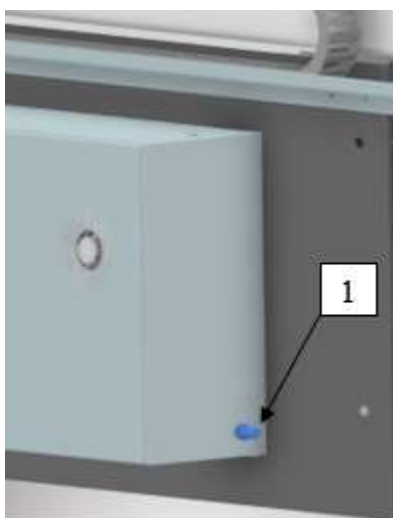


Fig.25: controller (Rear view)

- 1 Connection Pressurized Air
- 2 Power supply 380 V 16A

4.6 Working and Danger Areas

Working areas

- ☐ PC (not supplied)
- ☐ Inside the clamping area while the machine is switched off
- ☐ Inside the cutting area while the machine is switched off
- ☐ Abrasive Conveyor while filling

Danger areas

- ☐ Complete machine while in operation

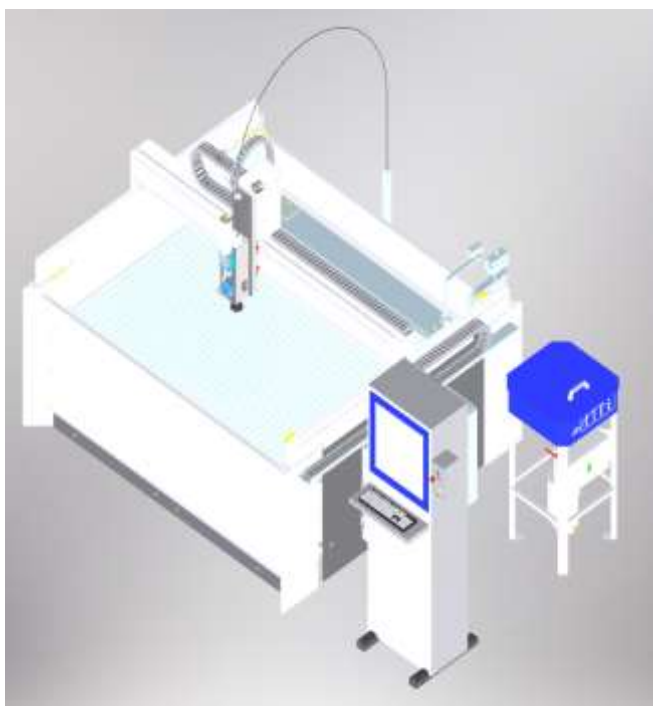


Fig.26: Complete Machine

5 Transportation, Packaging and Storage



Users and service staff of the operator should be informed about the handling of packaging when installing equipment and during further usage. It is necessary to pay attention to the following information:

5.1 Safety Instructions for Transportation

Hanging or suspended loads



WARNING!

Danger to persons through hanging or suspended loads!

When lifting loads, life threatening danger exists by falling or uncontrolled swinging of objects.

Therefore:

- Before moving the machine drain the water in the tub and dispose of it in an environmentally friendly manner as well as residues.

The attachment points aside the basin are only designed for the weight of the tub without water!

- Never lift tub full of water
- Never step under hanging or suspended container or loads
- Only move loads under supervision
- Use only approved lifting devices and sling gear with sufficient carrying capacity.
- Do not use torn or damaged ropes or straps
- Do not fasten ropes and straps at sharp edges and corners, do not knot or twist them.
- When leaving the workplace ensure that the load has been put down.



Off balance centre of gravity



WARNING!

Falling hazard by load off balance or centre of gravity

Containers can be harnessed off the centre of gravity. Incorrect harnessing can tip the container and cause life-threatening injuries.

Therefore:

- Pay attention to the markings on the container
- Attach the hoists hook that it is above the centre of gravity
- Lift carefully and observe if the load starts tipping over. If necessary, modify or move the sling or harness.

Inappropriate Transportation



CAUTION!

Damage caused by inappropriate transportation!

Inappropriate transportation can cause significant material damage to property.

Therefore:

- Take care while unloading the container on delivery and internal transport and obey the symbols or icons and markings on the packaging.
- Use only intended attachment points.
- Remove packaging only shortly before assembling.



5.2 Transport Inspection

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

In case of visible damage proceed as follows:

- ☐ Do not accept the delivery or accept only under reservation.
- ☐ Record the extent of the damage on the delivery note of the transporter or forwarding agent.
- ☐ Initiate a customer complaint.



Complain about any deficiency once it is detected. Damage claims can be asserted only within the applicable time limits.

5.3 Packaging

5.3.1 About Packaging

The individual containers are packed according to the expected transportation conditions. Only environmentally friendly materials are used for the packaging.

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

5.3.2 Dealing with packaging material

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



CAUTION!

Environmental damage caused by inappropriate disposal!

Packaging materials are valuable raw materials. In many cases these may be used further or can be sensibly re-used and recycled.

Therefore:

- Dispose of the packaging material in an environmentally friendly manner.
- Observe the locally applicable disposal regulations. If necessary, contract a recycling company.

5.4 Icons on the Packaging

The following icons can be found on the packaging. These icons descriptions must be observed during transportation.

Fragile



Indicates items with fragile or delicate contents.

Handle container with caution, do not drop or expose to collisions.

Do not stack



Do not stack anything on top of the marked packages or containers.

Keep dry



Protect packages or containers against moisture and keep them dry.



5.5 Transportation

Attachment points

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

Transportation of pallets with the crane

Containers which are mounted on pallets can be transported with a crane under the following conditions:

- ☐ Cranes and hoisting devices must be designed for the weight of the containers.
- ☐ The operator must be authorized to operate the crane or hoist.

Attaching

Safety equipment: ☐ Safety helmet

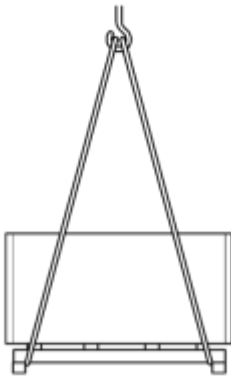


Fig.27: Attach lifting straps

1. Attach ropes, belts, or multi-position hanger according to fig. 27 and secure pallet against sliding.
2. Check, whether the containers are going to be damaged by harnessing or lifting gear. If necessary, use other harnesses or belts.
3. Ensure that the pallet cannot tip by incorrect centre of gravity.
4. Start transportation.

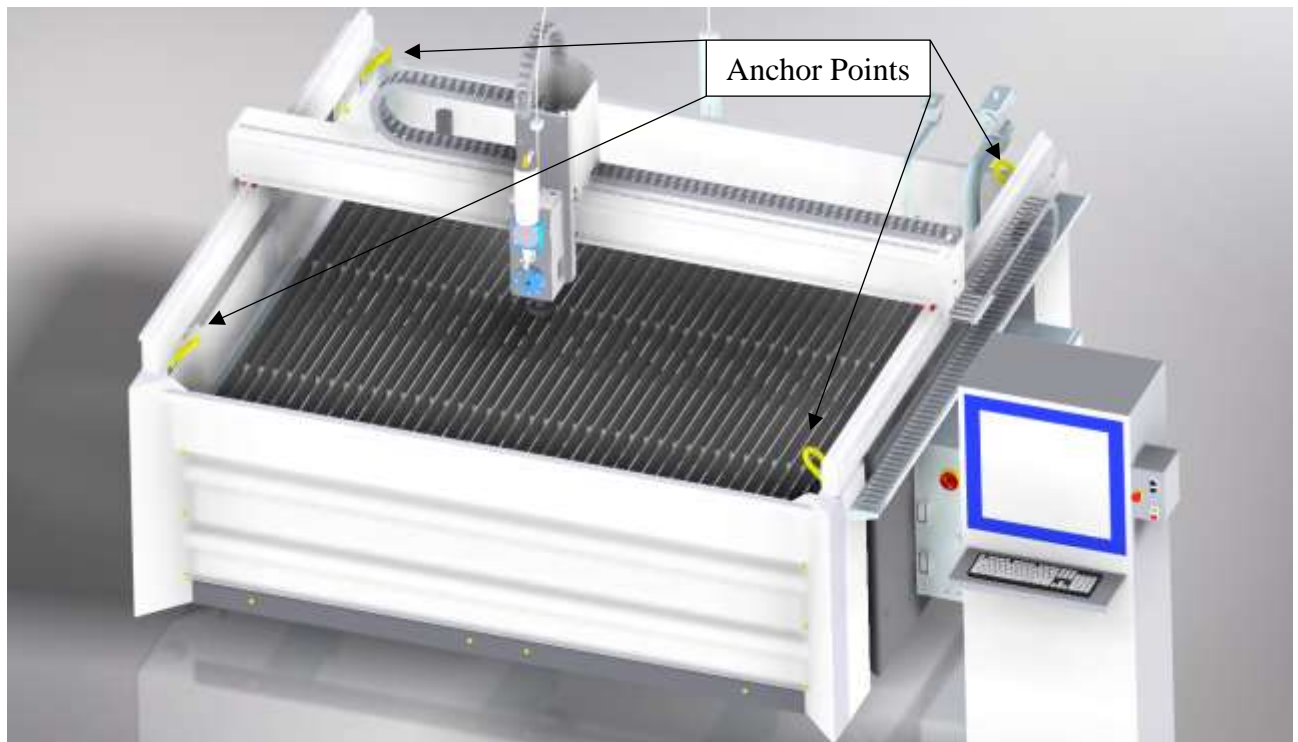


Fig.28: Hoisting points

Transportation of pallets with a forklift

Containers which are mounted on pallets can be transported with a forklift under the following conditions:

- ☐ The forklift must be designed for the weight of the container.
- ☐ The container must be firmly secured to the pallet.
- ☐ The operator of the forklift must be authorized to use the equipment according to the local industrial regulations.



Transportation

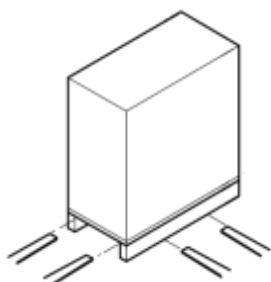


Fig.29: Transportation with forklift

1. Drive the forklift with the forks under the beams of the pallet.
2. Insert the forks so far that they protrude the opposite side.
3. Ensure that the pallet cannot tip by incorrect centre of gravity.
4. Lift the pallet with the container and start transportation.

5.6 Storage

Storage of the containers

Store containers under the following conditions:

- ☐ Do not store outdoors.
- ☐ Store dry and dust-free.
- ☐ Do not expose to aggressive media.
- ☐ Protect from solar radiation.
- ☐ Avoid mechanical agitation.
- ☐ Storage temperature: 15 to 35 °C.
- ☐ Relative Humidity: max. 60 %.
- ☐ During storage longer than 3 months, the general condition of all parts and the packaging needs to be controlled regularly. If necessary, refresh or renew the preservation materials.



It is possible that there are instructions for storage on the packages which override the before mentioned requirements. Comply with them accordingly.



6 Installation and Commissioning

6.1 Safety Information for Installation and Commissioning

Hanging or suspended loads



WARNING!

Danger to persons through hanging or suspended loads!

When lifting loads, life threatening danger exists by falling or uncontrolled swinging of objects.

Therefore:

- Never step under hanging or suspended container or loads
- Only move loads under supervision
- Use only approved hoisting devices and sling gear with sufficient carrying capacity.
- Do not use torn or damaged ropes or straps
- Do not fasten ropes and straps at sharp edges and corners, do not knot or twist them.
- When leaving the workplace ensure that the load has been put down.



Incorrect installation and commissioning



WARNING!

Risk of injury caused by incorrect installation and commissioning!

Incorrect installation and commissioning can cause serious personal injuries or property damage.

Therefore:

- Prior to starting installation, ensure that there is sufficient space for the assembly work.
- Handle sharp-edged parts with care.
- Pay attention to orderliness and cleanliness at the assembly place! Loosely stacked or spread parts and tools may cause accidents.
- Mount components correctly. Comply with required bolt torques
- Secure components to ensure that they do not fall
- Before commissioning the following steps must be adhered to:
 - Ensure, that all installation steps have been followed according to the instruction manual
 - Ensure that no persons are inside the working area of the machine

Torque wrench for screws



CAUTION!

Damage caused by incorrect tightening of bolts!

All screws on the CNC milling station have been tightened to the correct torque. Additional tightening of bolts can lead to unwanted tension within the CNC milling station and can cause inaccurate machining of work pieces.

Therefore:

- Do not retighten screws on the machine



6.2 Preparation

6.2.1 Placing Machine

- Staff: ☐ Qualified staff
- Safety equipment: ☐ Protective clothing
☐ Safety shoes
☐ Safety helmet

Inadequate load-bearing structures



WARNING!

Danger to persons due to inadequate load-bearing structures!

Overloading of floors could lead to serious injury or death as well as damage to property!

- If the machine is installed on a suspended floor the dynamic load capability must be observed.

Uneven surface



CAUTION!

Damage resulting from installation on uneven surfaces!

An installation on an uneven surface may cause deformation within the CNC machine. This leads to inaccurate machining of work pieces and can cause damage to the machine.

- Install the CNC machine on a plane and level surface.

Setting-up machine

1. The machine must be installed with the prescribed method of attachment on a level, vibration-resistant and fully hardened foundation, or floor.



In doubt have all the required loads checked by a qualified building engineer.

2. Remove all transportation equipment and packaging on the machine at the place of installation.

Levelling of the machine



Fig.30: machine spirit level

A precision spirit-level capable of 0.02mm accuracy (Fig. 30) is included in the scope of delivery. Use the supplied spirit level to level out the CNC machine correctly. This is best done on the Linear guides. Adjustments can be made on the feet found on each corner of the machine. This is to be done before filling with water and checked after filling the water basin.

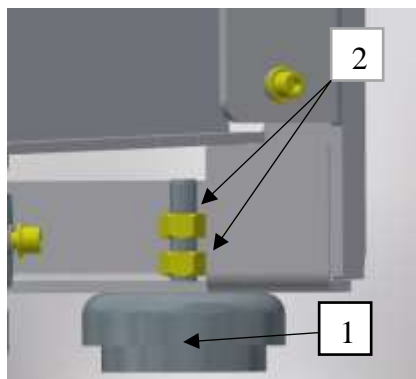


Fig.31: adjustable foot

1. Loosen the lock nut (Fig. 31 /2) with a 17mm spanner.
2. Adjust height by using 17mm spanner on adjusting nut (Fig. 31 /1).
 - ☐ turn clockwise to raise table,
 - ☐ turn anti-clockwise to lower the table.
3. Use the spirit level to check the accuracy and if required repeat step 2.
4. When done, secure the lower lock nut (Fig. 31 /2) with a 17mm spanner. Then fasten the upper one.
5. Check that all axis are free to move.

6.2.2 Water Basin



Fig.32: Water Basin

The water basin (Fig.25a) must have at least a water level of 600mm within the Basin to absorb the residual energy of the high-pressure water jet. The basin is also used to collect the remains of the abrasive.

6.2.3 Water level measurement

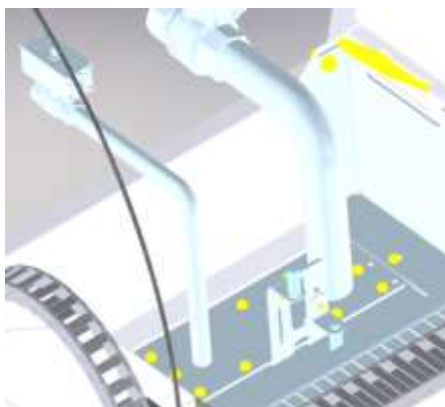


Fig.33: Water Level Sensors

The basin has sensors (Fig.33/arrow) that continuously check the water level in a specified range. The lower one is to check the minimum water level. This is used to maintain the 600mm of water under the beam, which absorbs the residual energy of the beam. The upper one is against overflowing of the pelvis in case the overflow (Fig.33) should be clogged. If one of the sensors is hit, it will send an error message to the controller, causing a stop

6.2.4 Overflow

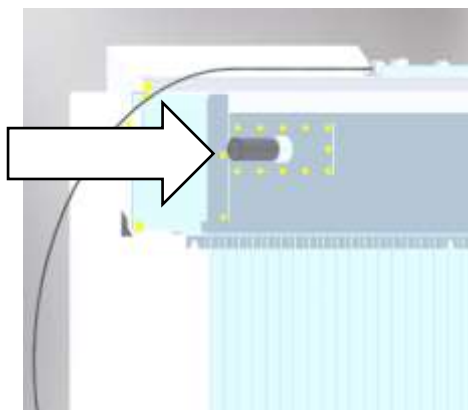


Fig.:34 Overflow

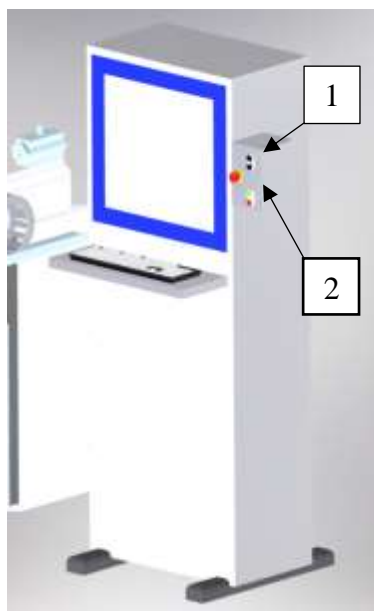
The water level is limited to a maximum via the overflow (Fig.34/arrow) at the rear left corner.



The overflowing water must be disposed of at the back of the machine (Fig.35 / arrow) via a hose according to local regulations.

Abb.35 Back side of the machine

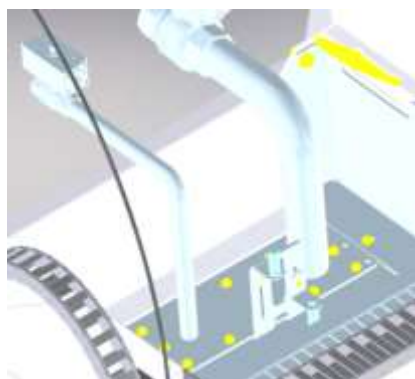
6.2.5 Lowering and raising Water level



The water level can be adjusted to the workpiece height. By pressing the upper button (Fig.36 / 1), a valve at the air inlet of the tank is opened and filled with compressed air. This allows the water level to be raised by up to 70mm.

Pressing the lower button (Fig.36 / 2) opens a valve to release the pressure. The water level can be lowered as a result.

Fig.36: Control Panel with Switches



The valves for lifting and lowering (Fig.37 / arrow) are located on the right rear side of the basin together with the water level sensors.

Fig.37: Valves for lifting and lowering

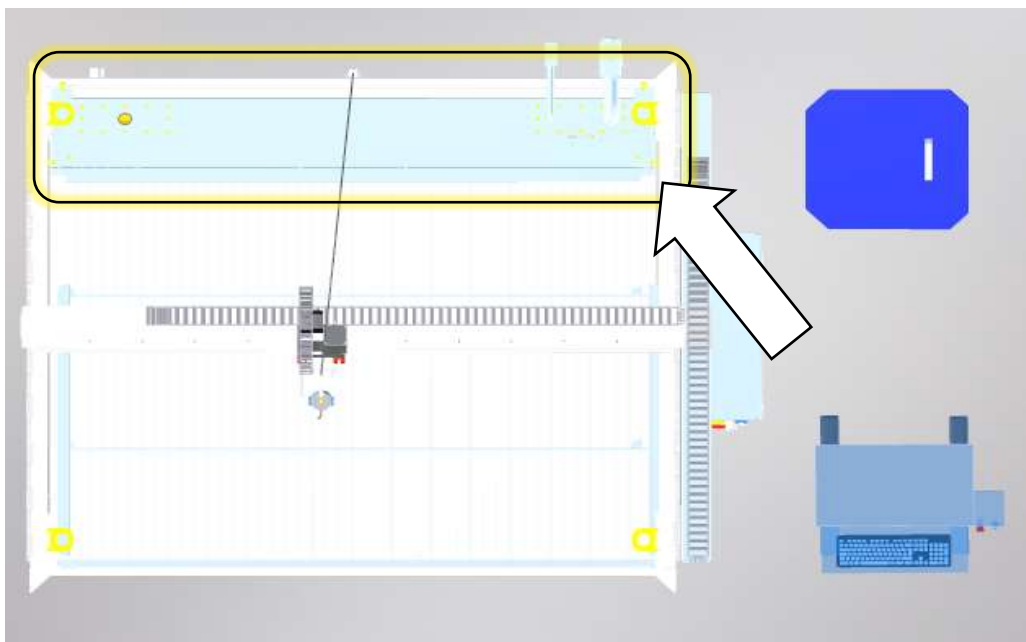
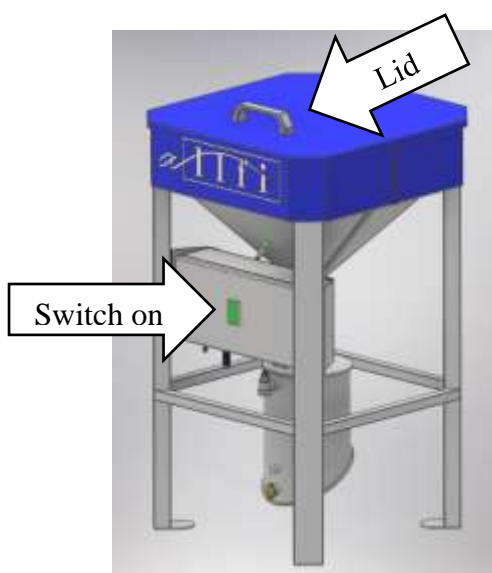


Fig.38: Complete machine from above

The air tank for the water level lifting or lowering is located at the rear of the machine. (Fig.38: rectangle with yellow border) The amount is sufficient to lift the water in the range of 70mm.

6.2.6 Abrasive Conveyor and Dosage (Optional)



The Abrasive Conveyor is an added option that is delivered in Combination with the abrasive Dosage.

The abrasive conveyor is connected to the control cabinet via a 5-pin Harting plug. The conveyor is switched on via the switch at the front (Fig.39 / arrow – switch on). The conveyor is loaded with the appropriate abrasive from above by opening the lid (Fig.39: arrow - lid). Filling should only be done in a decompressed state as the abrasive could strike back in the worst case. There is a separate guide to this product. The abrasive is pushed via a hose to the abrasive Dosage with pressure.

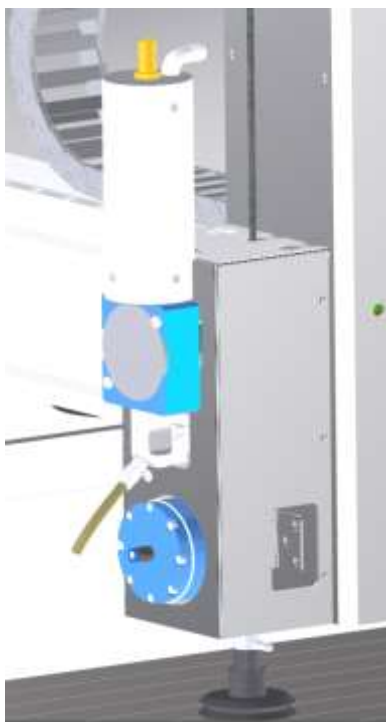


Fig.40: Abrasive Dosage

The abrasive settles in the sight glass for the first time. As soon as the high-pressure water jet is activated, the Dispenser (Fig.40) switches on and transports the programmed amount of the abrasive to the hose connected to the cutting nozzle via a belt drive. There, the abrasive is drawn in by the vacuum of the water jet and used for cutting

6.2.7 High Pressure Pump



Fig.41: High Pressure Pump

The high-pressure pump gives the water jet the 3800-bar pressure. It works like a crankshaft motor and compacts the water up to 3800bar via pistons. This is transported via the high-pressure line to the cutting nozzle for cutting materials.

6.3 Installation

6.3.1 Connecting the Computer



Fig.42: Connection to Computer

The ECU is controlled via a network connection. To do this, the cable must be connected to the one end of the network connection of the ECU (Fig. 42 /1) and at the other end to the computer's network port.

The power supply of the computer must also be connected to the ecu. (Fig. 42/2)

Staff ☐ Operator

Attach cable from computer to the controller (Fig. 42 /1).

6.3.2 Connecting the Control Panel



CAUTION!

Risk of stumbling and resulting injury through cables lying around!

Cables lying around on the floor are a source for slipping and stumbling and can result in serious injuries.

- Always cover any exposed cables lying on the floor.
- Do not route cables across sharp edges or corners.
- Avoid rubbing of cables on machine.
- Always ensure that cable channels are visible.

Staff ☐ Qualified staff



Fig.43: controller

1. Connect the connector plugs in the correctly labelled plug point on the controller (Fig. 43):
 - ☐ High Pressure Pump
 - ☐ Control Panel
 - ☐ Abrasive Conveyor
 - ☐ Handwheel (optional)
 - ☐ PC with operating software
2. Fasten clips where required.

6.3.3 Installing Accessories



The installation of the accessories must be done according to the relevant accessory instruction manual.



WARNING!

Risk of injury due to incorrectly mounted accessories!

Incorrectly mounted accessories may fall off or cause object to be ejected during operation causing injuries to persons.

- Always mount the accessories safely and correctly.

6.4 Connecting to Power Supply

Connecting the machine to the power supply



CAUTION!

Risk of stumbling and resulting injury through cables lying around!

Cables lying around on the floor are a source for slipping and stumbling and can result in serious injuries.

- Always cover any exposed cables lying on the floor.
- Do not route cables across sharp edges or corners.
- Avoid rubbing of cables on machine.
- Always ensure that cable channels are visible

Staff: ☐ Electrician

1. Compare the power supply available with the requirements of the machine and connect only if the values match.
2. Before connecting power to the machine ensure that the supply has been switched off from the main distribution.
3. Use the correct 5-pole 3-phase plug from the main power supply and on the machine.
4. Once cables have been connected the main power supply may be switched on.

6.5 Commissioning

Staff: ☐ Qualified Staff

1. Ensure that the machine has been levelled as required in
☐ *Chapter 6.2.1 "Placing Machine", page 65*
2. Ensure that the Control Panel and the High-Pressure Pump are connected to the Control cabinet
3. Connect the High-Pressure Pump to the machine via High Pressure Line at the Cutting Nozzle.
4. Connect Water to the High-Pressure Pump (min. 3bar)
5. Make sure the Computer is connected to the Control Cabinet.
☐ *Chapter 6.3.1 "Connecting the Computer" on Page 71*
6. Ensure all additional Options (e.g. Abrasive Conveyor and Dosage) are installed and connected to the Power Supply
7. Ensure the Operating Software is installed on the Computer and ready for use.
8. Ensure the fixed fit of all connectors.
9. Connect Pressurized Air to the Control Cabinet
10. Make sure Water basin is filled to the right level (min. 600mm)

The machine is put into operation via the software. When first commissioning, the machine can be slowly retracted via the software in "Manual" mode to test the function.



The Components of the machine will have different expansion coefficients. At an ambient temperature of 20-25 °C the machine will perform correctly. Operating outside of the required ambient temperature may result in loss of accuracy.

7 Operation

7.1 Safety Instruction for Operation

Incorrect operation



WARNING!

Risk of injury by incorrect operation!

Incorrect operation can cause severe injury to persons and damage to property.

- Carry out all operating steps according to the details in this instruction manual.
- Before using the machine check the following points:
 - Ensure that all covers, and safety devices are installed and work properly.
 - Ensure that no persons are inside the working area of the machine.
- Never disable or bridge safety devices.

7.2 Important Steps before Operation

1. Ensure that all covers have been installed and fastened properly.
2. Check that all plugs, sockets and High-Pressure Connections are securely mounted.
3. Ensure that all emergency stop switches have been released.
4. Ensure that the controller door is securely shut.
5. Check ambient temperature.



The Components of the machine will have different expansion coefficients. At an ambient temperature of 20-25 °C the machine will perform correctly. Operating outside of the required ambient temperature may result in

loss off accuracy. It is recommended to keep the machine operating at 20-25°C.

7.3 Switching-On Procedure

Staff: ☐ Operator

1. Switch on the computer and launch the software.
2. Clamp work pieces ☐ Chapter 7.4.1 "Clamping of Work Pieces or Materials", page 74.
3. Ensure that the correct tools have been installed in the tool holder, if necessary, change it. ☐ Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** "Changing Cutting nozzle", page **Fehler! Textmarke nicht definiert.**
4. Ensure that no other work pieces or equipment is in the working areas of the machine.
5. Check Water level of the Water Basin
6. Ensure that there are no persons inside the working area.
7. Ensure that the correct accessories (Abrasive Conveyor) have been switched on.
8. Make sure Air pressure is connected to all necessary parts.
9. Turn the main switch on the controller to the "I" or "On" position. The controller is energized.
Switch on Control Panel.
9. Perform a reference run in the software. If necessary, perform a check of the Valve for the High-Pressure Jet by typing in Manual mode (MDI) an order like: S500 M3
10. When everything has been checked start the cutting process with help of the Operating Software.

7.4 Important Steps during Operation

7.4.1 Clamping of Work Pieces or Materials

Examples of clamping flat and complex work pieces

Staff: ☐ Operator

Safety equipment: ☐ Protective clothing
☐ Safety shoes
☐ Safety goggles
☐ Safety gloves

1. Steggitter auf Schäden überprüfen und bei Bedarf Teile austauschen.
2. Parallelität und Ebenheit des Steggitters überprüfen z.B. mit einer langen Wasserwaage.
3. Auf dem Steggitter direkt die Werkstücke befestigen (z. B. mit Gewindestangen und mit Spannlaschen) oder mit Gewichten gegen Verrutschen fixieren.

7.4.2 Operating of the Machine

Staff: ☐ Operator

Safety equipment: ☐ Protective clothing
☐ Safety shoes
☐ Safety goggles
☐ Safety gloves
☐ Ear protection
☐ Hairnet



High Pressure Water Jet



WARNING!

Risk of injury by High Pressure Water Jet!

The high-pressure water jet can cause 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 the beam during operation.
- Before replacing the nozzles, always pull the mains plug of the pump or switch off the machine and secure it against turning back on.
- Use only original (OEM) accessories and spare parts

Moving Axis



WARNING!

Risk of injury by moving axis!

Collisions between persons and machine (Y-Axis, moving parts, Rotational axis, Tools) may lead to serious injuries.

- Keep clear of moving parts and their end-stops
- Never reach between the machine and rails
- Only perform maintenance on linear guides when machine is switched off
- Always wear protective clothing in the work area.



Rack and Pinion



WARNING!

Risk of injury by moving rack and pinion gear

While operating clothing, hair or body parts could get caught in the rack and pinion leading to serious injury.

- Never reach over rack and pinion when machine is switched on.
- Maintenance may only be performed while the machine is turned off.
- Always wear protective clothing in the working area.



Magnetic field radiation



DANGER!

Danger from magnetic field radiation!

Magnetic fields pose a danger to persons and property

- Persons with Pace-Maker may should not work on or approach the machine. The Pacemaker may be affected.
- Persons with metal implants should not work on or approach the machine. The implants may heat up or be pulled towards the machine.
- Do not wear any jewellery like rings, necklaces, watches etc. when operating the machine.
- Do not place any electronic equipment near the magnetic fields as these may be damaged
- Do not place any data storage devices or credit cards, etc. near the magnetic fields as these may be wiped out.

Falling materials



WARNING!

Risk of injury by falling materials!

While operating off cut debris, materials or tools may be ejected from the work area causing serious injury to face or eyes

- Always wear face and eye protection, gloves, and safety shoes
- In the event of an injury, contact the medical personnel



Uncontrolled restart



WARNING!

Uncontrolled restart can cause serious personal injury or death!

The machine could move unexpectedly or change direction unexpectedly resulting in injury

- Keep body parts away from the machine working area
- Secure work area against accidental access.

Highly flammable materials



WARNING!

Danger of fire through flammable materials!

Organic dust from wood or coal and inorganic dust from Magnesium, Aluminium, Zink, or Titanium may start combusting which may result in serious injury or death

- Do not smoke near the working or danger area and avoid open flames or other potential fire risks.
- Always have a fire extinguisher near the machine.
- When working with Magnesium, Aluminium, Zink, or Titanium an extraction system is required and caution must be observed.
- In case of fire, stop working and evacuate the area. Activate the fire alarm.

Cutting Water



CAUTION!

Health risk from exposure to cutting fluids!

Contact with Cutting fluids can result in illness

- Avoid direct skin contact.
- Wash skin immediately after contact with cutting fluid.
- Avoid breathing fumes or gases from cutting.

No special CNC programming skills are required to run the machine. The work process is done by the CNC operating software and Stepper Motor controllers.

To reduce the wear and tear of components do not exceed 80% of the maximum traverse speed, see □ *Chapter 3.3 “Power Usage (Drive Motors)”, page 44.*



For further information see user manual for the software installed.



Operation of the accessories will be explained in the user manual for the respective accessory used.

7.4.3 Changing Cutting Nozzle

Staff: ☐ Operator

Safety equipment: ☐ Protective clothing

☐ Safety shoes

☐ Safety gloves

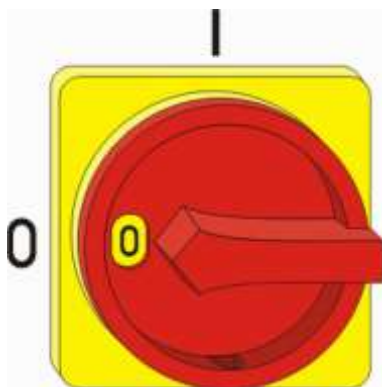


Fig.44: Main Switch

1. Turn the main switch to the "0" or "Off" position (Fig. 44).

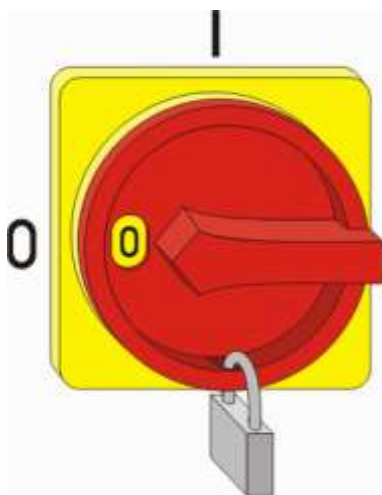


Fig.45: Lock the main switch

2. Lock the switch in the off position to prevent restart (Fig. 45).

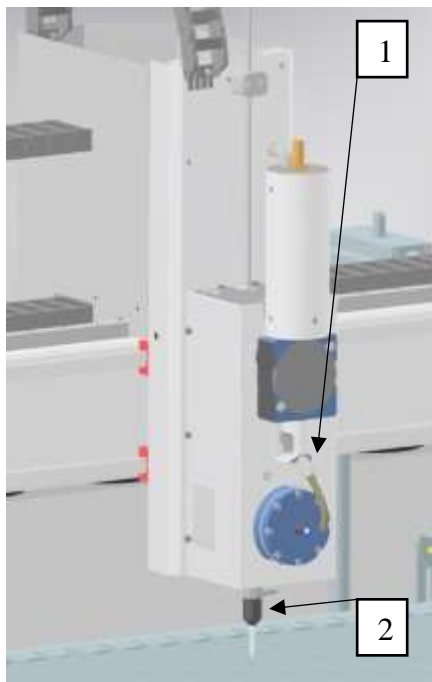


Fig. 46: Tool holder with Abrasive Dosage

3. Pull off tube from Abrasive Dosage (Fig.46/1)
4. With the help of a 24mm Spanner undo the Cutting Nozzle holder. (Fig.46/2)



CAUTION!

Danger of injury from hot surfaces!

Workpieces and the nozzle may heat up to high temperatures. Contact with these surfaces could result in severe burns to the skin.

- When changing nozzle always wear protective gloves.

5. Retract Cutting Nozzle (Fig. 47/1). This normally sits loose in a boring of the mixing chamber. After extraction thoroughly clean all parts

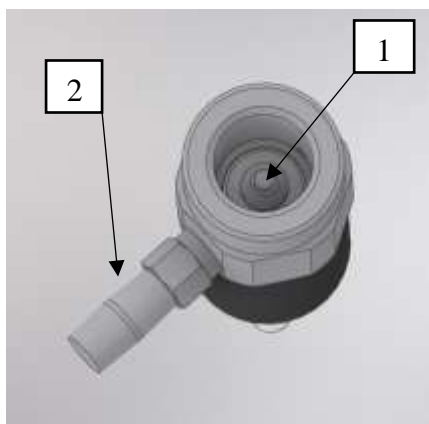


Fig.47: Cutting Nozzle Holder

6. Check Mixing Chamber for wear and tear. This can be done by loosening the Abrasive feed (Fig47/2) from the side with an 8mm Spanner

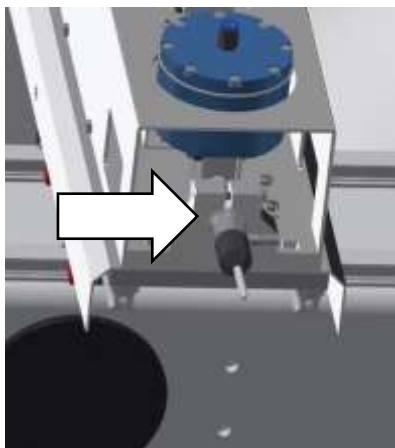


Fig.48: Tool holder

7. Clean all components and reassemble them in reverse order. Tighten the abrasive feeder only slightly. Tighten the cutting nozzle holder with 30Nm otherwise the nozzle can break. Now tighten the abrasive feed a little more (10Nm). Then put the tube back on.
8. Turn the main switch on the control unit into the "I" (ON) position.
9. Start the machine. Should some water leak out on the side of the leakage holes at the cutting nozzle – dismantle the nozzle and check cleanliness. Should the cleanliness be given, then pull the machine a little while at a standstill without pressure on the line (open the manual valve).

7.5 Switching-Off Machine

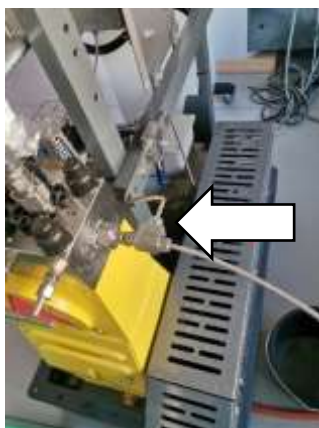


Fig.49: Manual Valve

1. Turn off main switch of High Pressure Pump.
2. Release pressure through the manual valve found on the pump (Fig.49+50/Arrow). Open Valve until you can hear a short hissing.
3. Switch the main switch on the controller into the "0" or "Off" position.
4. ☐ The controller will be switched off.
5. Switch off Computer
6. Turn off pressurized air
7. Turn off water



Fig.50: Manual Valve



7.6 Important Steps after Operation

Staff: ☐ Operator

Safety equipment: ☐ Protective clothing

☐ Safety shoes

☐ Safety gloves

1. Turning off the machine ☐ *Chapter 7.5 "Switching-Off Machine", page 85.*



CAUTION!

Danger of injury from debris!

Chips or shavings can be sharp edged and can cause deep cut wounds.

- Always wear protective gloves when removing debris from the machine.

2. Clean the machine ☐ *Chapter 8.4.1 "Cleaning Machine", page 92.*

7.7 Emergency Stop

In an emergency the movements of the machine must be stopped as quickly as possible and the power supply must be switched off.

Emergency Stop

In the event of a dangerous situation act as follows:

1. Press emergency stop immediately.
2. If there is no danger for your own health, rescue persons out of the danger area.
3. If necessary, start first-aid measures.
4. Alert fire and rescue service.
5. Inform person in charge of location.
6. Switch off machine and secure against restart.
7. Clear access roads for emergency vehicles.
8. Instruct emergency vehicles.

8 Maintenance

8.1 Safety during Maintenance

Moving parts



WARNING!

Risk of injury by moving parts!

Rotating and/or linear moving parts may lead to serious injuries.

- Prior to maintenance work switch off machine and secure against restart. Wait till all parts came to a complete standstill.
- Wear tight-fitting protective clothing with low tensile strength in the danger area.

Electrical system



DANGER!

Life threatening danger by electrocution!

Contact with live or electrified parts can present a life-threatening danger. Activated electrical components can cause uncontrolled movements and can cause serious injuries.

- Before starting work switch off the power supply and secure against restart.



Incorrect maintenance work



WARNING!

Risk of injury by incorrect maintenance work!

Incorrect maintenance work can cause severe damage to person or property.

- Prior to start working ensure that there is sufficient space for the assembly work.
- Pay attention to orderliness and cleanliness at the assembly place! Loosely stapled or spread out parts and tools may cause accidents.
- If parts have been removed, ensure correct re-assembly, re-install all fastening elements, and observe torque specification for screws and bolts.
- Before restarting observe the following:
 - Ensure that all maintenance work has been done according to user manual and has been completed.
 - Ensure that there are no persons in the working area of the machine.
 - Ensure that all covers, and safety switches are installed and working properly.

Environmental protection

Observe the following details for environmental protection during maintenance work:

- ☐ Remove any excess grease and dispose of it in accordance with the applicable local regulations.
- ☐ Collect exchanged oils in an appropriate container and dispose of it in accordance with the applicable local regulations.



8.2 Spare Parts



WARNING!

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

The use of incorrect spare parts can result in injury to persons or damage to property or incorrect functioning of the machine.

- Only use original spare parts from the manufacturer or parts authorized by the manufacturer.
- If any uncertainty exists please contact the manufacturer.



Loss of Guarantee

The use of incorrect spare parts may result in the loss of guarantee on the machine.

Spare parts may be ordered from the manufacturer or the agents.
For contact details see page 2.

A complete parts list is available on request.

When ordering spare parts please quote the following:

- ☐ Model
- ☐ Serial-No.
- ☐ Amount
- ☐ Description
- ☐ Preferred delivery method (Sea- or Air freight, post, courier, etc.)
- ☐ Delivery address

Any spare parts ordered without the above-mentioned details will not be processed. If the method of shipment has not been stated this will be decided by the supplier.

8.3 Maintenance Schedule

In the following section the maintenance work to be done is described to ensure the optimum and break-down free operation of the machine.

If in the event of a regular inspection increased wear and tear is noticed please shorten the maintenance intervals. If uncertain please contact the manufacturer, see contact details on page 2.

Interval	Maintenance Work	To be done by
Daily	Clean machine □ <i>Chapter 8.4.1 “Cleaning Machine”, page 92</i>	Operator
	Check high Pressure tubing and Connectors for leaks	Operator
	Check rubber splash protection for damage, replace it if necessary □ <i>Chapter Fehler! Verweisquelle konnte nicht gefunden werden. „Fehler! Verweisquelle konnte nicht gefunden werden.“ auf Seite 92</i>	Operator
	Check machine for damage or wear	Qualified staff
10 operating hours	Lubricate linear guides and rack □ <i>Chapter 8.4.3 “Machine Lubrication”, page 94</i>	Qualified staff
50 operating hours	Grease the machine through the grease nipples □ <i>Chapter 8.4.3 “Machine Lubrication“, page 96</i>	Qualified staff
When necessary	Clean the outside of the machine with a soft, dust free cloth	Operator



The maintenance of the accessories like the High-Pressure Pump or the Abrasive Conveyor is referred to in the respective user manual.

8.4 Maintenance Procedures

8.4.1 Cleaning Machine



Performing regular maintenance on the machine will prevent any moving parts from sticking.

- Staff: ☐ Operator
- Safety equipment: ☐ Protective clothing
☐ Safety shoes
☐ Safety gloves

1. Turn off the machine ☐ Chapter 7.5 “Switching-Off Machine“, page 85.

2.



CAUTION!
Danger of injury from debris!

Chips or shavings can be sharp edged and can cause deep cut wounds.

- Always wear protective gloves when removing debris from the machine.

Clear the machine of any debris.

3. Clean and grease the rack and linear guides
☐ separate user manual.

8.4.2 Protection Cover Inspection or Replacement

Check protective cover for damage

Staff: ☐ Operator

Safety equipment: ☐ Protective clothing

☐ Safety shoes

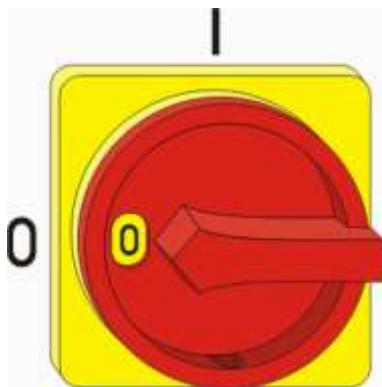


Fig. 51: main switch

1. Turn the main switch to the "0" or "Off" position (Fig. 51).



Fig.52: protective cover

2. Check the protective cover (Fig. 52/arrow) surrounding the cutting nozzle for damage.



If the protective cover is damaged, replace it.

Replace protective cover

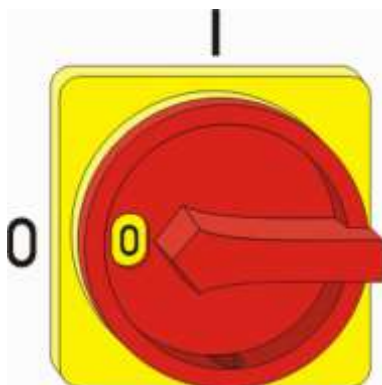


Fig. 53: main switch

1. Ensure that the main switch is in the "0" or "Off" position (Fig. 53).



Fig.54: protective cover

- 2.



CAUTION!

Danger of injury from hot surfaces through the Focussing tube and the Cutting nozzle holder!

Parts may heat up to high temperatures. Contact with these surfaces could result in severe burns.

- Ensure that the tools or tool holder have cooled to ambient temperature.
- When changing tools always wear gloves.

Push protective Cover (Fig.54 Arrow) downwards

3. Press new Cover over the Tool holder from below.

8.4.3 Machine Lubrication



Information on lubricants □ Chapter 3.5
“Lubricants“, page 45.

Lubrication of linear guides and racks

- Staff: ☐ Qualified staff
- Safety equipment: ☐ Protective clothing
☐ Safety shoes
☐ Chemical resistant glove

1. Switch off machine and secure against restarting.



Caution!

Health risk from exposure to oils and grease!

Contact with Toxic coolants can result in illness.

- Avoid direct skin contact.
- Remove oil or grease from skin immediately
- Avoid breathing fumes or gasses from oils or grease.

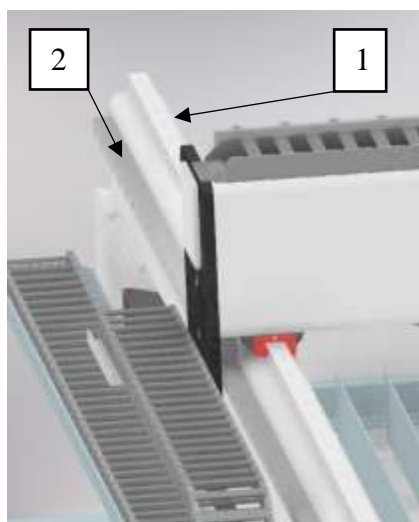


Fig.55: X-axis

2. Grease both sides of the X-axis linear guides (Fig. 55 /1) and racks (Fig. 55 /2) with a light machine grease using a lint free cloth.

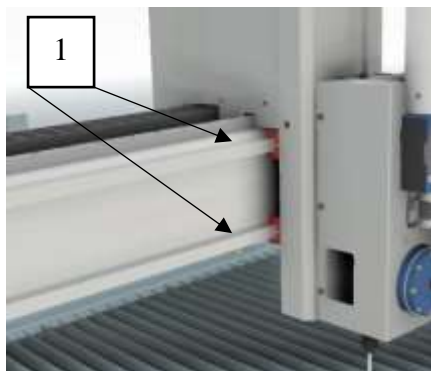


Fig.56: Y-axis

3. Grease the linear guides (Fig. 56 /1) of the Y-axis with light machine grease using a lint free cloth.

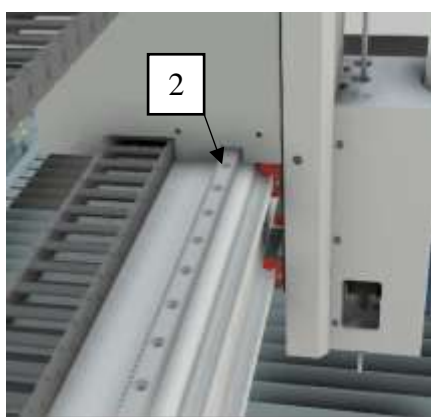


Fig.57: Y-axis

4. Grease the rack (Fig. 57 /2) of the Y-axis with a light machine grease using a lint free cloth.

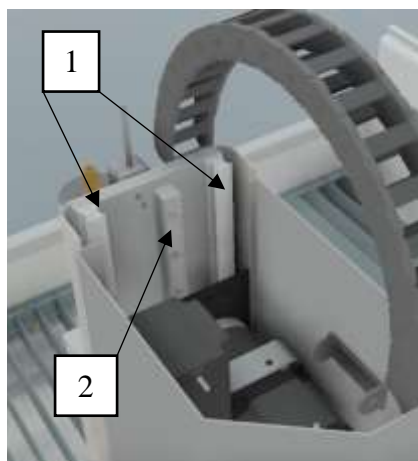


Fig.58: Z-axis

5. Grease the linear guides (Fig. 58 /1) and the rack (Fig. 58 /2) of the Z-axis with a light machine oil using a lint free cloth.

Applying grease through the grease nipples

- Staff: ☐ Qualified staff
- Safety equipment: ☐ Protective clothing
☐ Safety shoes
☐ Chemical resistant gloves
- Special tools: ☐ Grease gun

Grease nipple on the X-axis (4x)



Caution!

Health risk from exposure to oils and grease!

Contact with Toxic coolants can result in illness.

- Avoid direct skin contact.
- Remove oil or grease from skin immediately
- Avoid breathing fumes or gasses from oils or grease.



Fig.59: Grease nipple X-axis

2. Remove protective cap from the grease nipple of the X-axis (Fig. 59 /1), if present.



If there are no protective caps on the grease nipples, clean the nipples before using.

3. Attach grease gun to the grease nipple.
4. Press grease gun once or twice.
5. Remove grease gun.
6. Replace grease nipple cap.
7. Repeat steps 2-6 for all grease nipples.

Grease nipple on the Y-axis (4x)

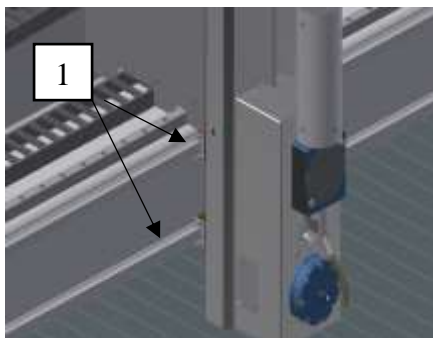


Fig.60: Grease nipple on Y-axis

1. Switch off machine and secure against restarting.
2. Remove protective cap from the grease nipple of the Y-axis (Fig. 60/1), if present.



If there are no protective caps on the grease nipples, clean the nipples before using.

3. Attach grease gun to the grease nipple.
4. Press grease gun once or twice.
5. Remove grease gun.
6. Replace grease nipple cap.
7. Repeat steps 2-6 for all grease nipples.

Grease nipple on the Z-axis (4x)

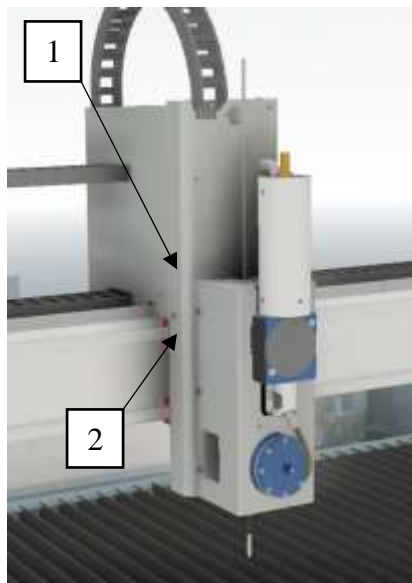
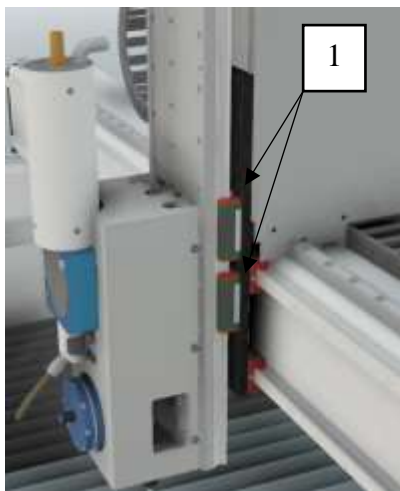


Fig.61: Grease nipples Z-axis (arrows)

The grease nipples on the Z-axis are found behind the cover plate on the Z-axis (Fig. 61 /1).



*Fig.62: position of the grease nipples
without the cover on the Z-axis*

There are four grease nipples (Fig. 62/1), two on each side of the Z-axis.

In the cover plate of the Z-axis (Fig. 61 /1) there is a hole on each side. The Z-axis must be positioned so that the grease nipples are visible through the two holes.

1. Switch off machine and secure against restarting.
2. Position Z-axis so that the grease nipples are aligned with the holes in the cover (Fig. 61/2).
3. Remove protective caps from the grease nipple of the Z-axis (Fig. 62 /1), if present.



If there are no protective caps on the grease nipples, clean the nipples before using.

4. Attach grease gun to the grease nipple.
5. Press the grease gun once or twice.
6. Remove the grease gun.
7. Replace the grease nipple cap.
8. Perform the same on the other side of the Z-axis.
9. Repeat steps 5-7.
10. Position the Z-axis so that the second set of grease nipples are aligned with the holes in the cover (Fig. 61 /2).
11. Repeat steps 3-7 with the second set of nipples.

8.5 Steps to be taken after Maintenance Procedure

After completion of maintenance work and before restarting the machine, carry out the following steps:

- 1.** Check that all screws and bolts have been replaced and tightened.
- 2.** Check if all removed safety devices and covers have been replaced and are functional.
- 3.** Ensure that all used tools, materials, and other equipment has been removed from the work area.
- 4.** Clean work area and remove any spilled liquids, working materials, tools etc.
- 5.** Ensure that all safety devices are working properly.

9 Trouble Shooting

The following chapter describes possible causes for faults and the actions to be taken to rectify the fault.

If the fault occurrence increases, shorten the maintenance intervals according to the actual load.

In the event of faults which cannot be cleared by the following instructions contact the manufacturer, contact details see Footnote of each page.

9.1 Safety during Trouble Shooting

Electrical system



DANGER!

Risk of death by electrocution!

Contact with live electrical parts presents an imminent danger to persons and may also cause uncontrolled movements of the machine which may lead to serious injury.

- Before beginning work turn off the main electricity supply to the machine and secure against being turned on accidentally.

Moving parts



WARNING!

Risk of injury by moving parts!

Rotating and/or linear moving parts may lead to serious injuries.

- Prior to maintenance work switch off machine and secure against restart. Wait till all parts came to a complete standstill.
- Wear tight-fitting protective clothing with low tensile strength in the danger area.



Incorrect repairs



WARNING!

Risk of injury caused by incorrect repairs!

Incorrect repairs can cause serious personal injuries or property damage.

Therefore:

- Prior to starting repairs, ensure that there is sufficient space for the assembly work.
- Pay attention to orderliness and cleanliness at the assembly place! Loosely stacked or spread parts and tools may cause accidents.
- Mount components correctly. Comply with required bolt torques.
- Secure components to ensure that they do not fall.
- Before restarting the machine, the following steps must be adhered to:
 - Ensure, that all installation steps have been followed according to the instruction manual
 - Ensure that no persons are inside the working area of the machine
 - Ensure that all covers, and safety devices have been properly installed and are functional

Steps to be taken in case of fault occurrence As a rule:

1. In case of faults which present an imminent danger to persons or property, activate the emergency-stop switch immediately.
2. Determine the cause of malfunction.
3. If the fault repair requires work in the danger area, switch off and secure against restart.
Inform the person in charge about the fault.
4. Depending on the nature or the type of fault, either qualified staff or the operator may clear the fault.



The following table of faults shows who may clear the fault.

9.2 Table of Faults

Fault	Possible cause	Troubleshooting	Repair by
Smoking control unit	Control unit defective	Switch off main power supply immediately and contact the manufacturer.	Manufacturer
Machine is not starting	Emergency stop activated	Release emergency stop switch □ <i>Chapter 9.3.1 "Releasing the Emergency Stop Switch", page 105</i>	Operator
	Blown fuse	Change fuse □ <i>Chapter 9.3.2 "Changing the Electrical Fuse", page 106</i>	Electrician
Crackling or scraping noise when driving the axis	Network Connection faulty / Internal Parallel Port faulty	Stop working and contact manufacturer.	Manufacturer

Real-Time module blocked	Other programs running in the Windows background.	Close any other programs which are running in Windows.	Operator
Machine runs for a short time and stops abruptly.	Connectors do not sit properly.	Check Connectors and ensure tight fitting	Operator
Cutting valve does not open	None or not enough Air pressure reaching the cutting valve	Check if Air pressure is available or increase. If no change valve needs maintenance	Operator
Pump does not deliver	Water pressure not high enough	Increase Water pressure – if necessary, install Pre-pressure Pump	Qualified Personnel
Pump does not deliver	Error message from the Controller	Eliminate error and Confirm on Controls	Operator
No sand supply	Sand is too moist	Exchange Abrasive	Operator
No sand supply	Conveyor is not switched on	Switch on Conveyor on the Panel of the Conveyor	Operator
No sand supply	Not enough or no Air pressure	Check for Air leaks within the tubing. Increase Air pressure if no les can be found.	Operator



If the fault is not listed in the fault table contact customer support. For trouble shooting of accessories refer to the respective user manual.

9.3 Fault Repair

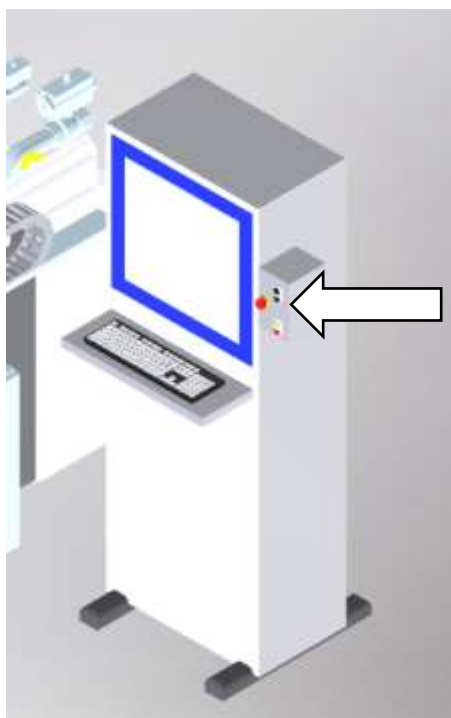
9.3.1 Releasing the Emergency Stop Switch

Staff: ☐ Operator

1. Establish the cause of the fault and repair.
2. Release the emergency stop switch by twisting (Fig. 63).



Fig.63: Emergency stop switch



If the emergency stop switch on the controller (Fig. 64 /arrow) is pressed; it will need a double unlocking action.

Then confirm errors in the control. If necessary, also confirm on the control of the High Pressure pump.

Fig.64: controller



9.3.2 Changing the Electrical Fuse

Staff: ☐ Electrician

Special tool: ☐ Square key



DANGER!

Risk of death by electrocution!

The controller is not protected by any safety devices. If the main power supply is on there is danger of touching electrified components causing injury or death.

- Always switch off the main power supply and secure against accidental switching on before working on the controller unit.

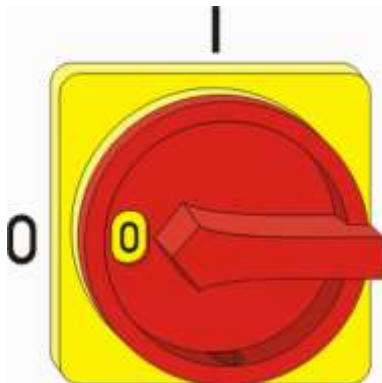


Fig.65: Main switch

1. Turn the main switch to the "0" position (Fig. 65).

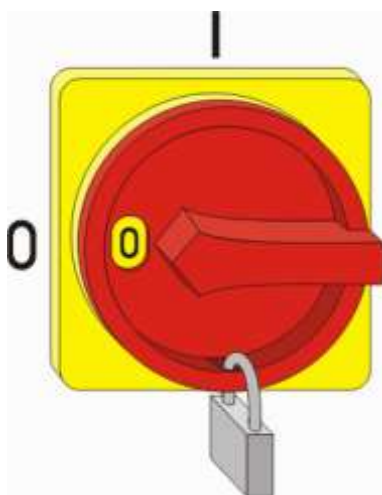


Fig.66: Secure main switch

2. Secure against restarting by using a padlock (Fig. 66).

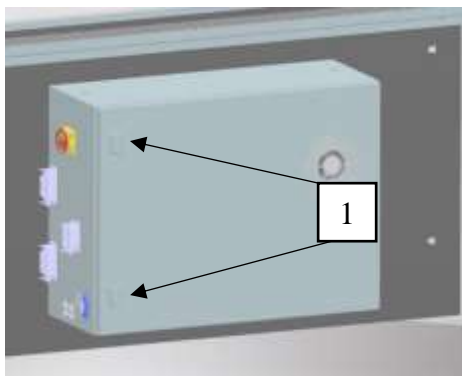


DANGER!

Risk of death by electrocution from stored energy!

Electrical charge may be stored in electrical components which could result in electrocution causing injury or death.

- Before commencing work, turn off the power and wait for 10 min before continuing, to allow condensers time to discharge the stored current.



3. Open the controller using the square key supplied (Fig. 67 /1).
4. Open the door of the controller unit.
5. Change fuse or switch on fuse.
6. Close and lock door with square key.
7. Switch on main power supply.

Fig.67: Controller

9.4 Start-up after Fault Repair

After repairing a fault, carry out the following steps to restart:

1. Reset the emergency stop switches.
2. Acknowledge the faults in the controlling software.
3. Ensure that there are no persons in the danger area.
4. Restart operating according to chapter 7 “Operation”.

10 Disassembling and Disposal

When the end of the machines useful life span is reached, the machine must be disassembled and disposed of according to environmental standards.

- .
 - ☐ Only specially trained or qualified staff may carry out the disassembly.
 - ☐ Only qualified electricians can perform work on the electrical system.

10.1 Safety during Disassembling and Disposal

Incorrect disassembling



WARNING!

Risk of injury caused by incorrect disassembling!

Stored residual energies, sharp edged parts, spikes, and corners on and in the machine or from the installed tools can cause injuries:

- Prior to starting work ensure that there is sufficient space.
- Handle sharp-edged parts with care.
- Pay attention to orderliness and cleanliness at the workplace! Loosely stacked or spread out parts and tools may cause accidents.
- Disassemble components professionally. Be aware of the heavy weight of the parts. If necessary, use hoisting devices.
- Secure parts in order that they do not fall or tumble
- If in doubt consult manufacturer.

10.2 Disassembling

Before beginning the disassembling:

- ☐ switch off machine and secure against restarting.
- ☐ Physically separate entire power supply from the machine, discharge stored residual energy.
- ☐ Make sure the lines are depressurized using the manual valve.
- ☐ Remove operating and auxiliary materials as well as remaining working materials and dispose of them according to the environmental standards.

Clean assemblies and components professionally and dispose of in accordance with the valid local labour and environmental protection regulations.

10.3 Waste Disposal

Provided that no agreement regarding return or disposal has been made, recycle disassembled parts:

- ☐ Scrap the metals.
- ☐ Recycle plastic components.
- ☐ Dispose of remaining components according to the material characteristics.



CAUTION!

Environmental damage caused by incorrect disposal!

By incorrect disposal, waste may present a danger to the environment.

- Electrical components, lubricants and other materials are special hazardous waste and may only be disposed by licensed specialists.
- The local authority or specialized waste management companies can provide information about environmentally correct disposal.

11 Appendix

11.1 Accessories

For the machine, there is a wide variety of applications.

Here is an excerpt from our catalogue of comprehensive range of accessories:

Machine extensions

- Abrasive conveyor with Dosage

Work holding

- Clamps, nuts

Tools for various applications

- Nozzles with various Diameters for different pressures
- Focusing tubes

Hardware and Software

- PC's and Monitors
- Radio remote control
- CAD / CAM software, font packs, specialized software

If interested, please contact our Customer Service by email or phone.

We will be pleased to advise you and give you an exact offer for your requirements!

Numerous suggestions and information are also available on our website.

12 Customer Service

For technical information, please contact our Technical Customer Service:

Address:	CNC-STEP GmbH & Co.KG Siemensstraße 13-15 D-47608 Geldern	
Phone:	+49 (0)2831/91021-50	(Mo. - Fr. 07.00 - 15.00 hrs.)
Mobile:	+49 (0)2831/91021-20 Only in urgent cases	(Mo. - Th. 15.30 - 18.00 hrs.)
Fax:	+49 (0)2831/91021-99	
E-Mail:	support@cnc-step.de	
Web:	https://www.cnc-step.com/	

If you have questions, please contact our customer service via e-mail or phone.
We advise you gladly.

Numerous suggestions and information can be found on our website:

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

12.1 Remote maintenance

Remote maintenance is carried out using the "TeamViewer Quick Support" remote desktop tool, which enables our support department to remotely maintain your computer.

The requirement for this is an internet-compatible control PC and the download of the TeamViewer software version from our website.

1. Download the TeamViewer version from our website

<https://www.cnc-step.com/support/teamviewer/>

and run the program. The following picture appears (Fig. 68):



Fig. 68: TeamViewer Support

2. The software directly generates your ID (identification number) and a password. With this access data you can contact our support department by phone. With the help of this data, you grant our support staff access to your desktop and they can now show and explain all relevant steps in real time by means of sound and images.