User Manual
Zfx™ Inhouse5x

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1. Basic information

1.1 Intended use

Zfx™ Inhouse5x is a 5-axis milling machine for the production of dental restorations utilizing conventional milling techniques.

The operator must be familiar with the operation of the entire system and follow the procedures as outlined in this manual. Any other use of the system is considered to be improper.

Zfx assumes no liability for any damages resulting from improper use, not following approved Zfx processes or using non-Zfx materials/Zfx approved materials. The intended use also includes the observance of the safety instructions including all attachments.

Unattended operation of the Zfx Inhouse5x is prohibited. Zfx assumes no liability from any resulting damage.

The Zfx Inhouse5x is intended for:

• Milling of Zirconium, PMMA, Wax, CoCr, Titanium and Glass ceramic provided exclusively by Zfx and machined following the Zfx processes.

1.1.1 Wet processing

Use only Zfx approved cooling liquid (article number ZFX02002077 - Zfx™ Cutting Oil for Zfx™ Inhouse5x). The irrigation nozzle should be adjusted correctly.
Not recommended cooling liquids can lead to damages and bad results.
Before wet processing all residual swarfs and material must be removed, to guarantee a unproblematic function of the cooling system.

1.1.2 Inflammable materials

During the milling of titanium exists generally risk of fire!
Therefore, Zfx highly recommends to add/install an automatic or manual fire alarm and extinguishing system.
Consult a qualified safety expert to determine any possible risk.
Before wet processing all residual swarfs and material must be removed, to reduce the fire hazard.

In the event of fire or explosion the following should be observed:

<u>Minimizing hot surfaces and "other sources of ignition":</u>

- In most cases fire is caused by sparks or over-heated tools or milling materials. Reliable and adequate cooling is required. Only use Zfx approved cooling liquid. The irrigation nozzle should be adjusted correctly.

- In general, tools should be checked regularly and replaced routinely. Safety-critical conditions can be detected through a routine monitoring process.

<u>Vacuum system and ventilation:</u>

To reduce an accumulation of flammable and potentially explosive cooling liquid fumes the immediate area work should be ventilated.

A continuous negative pressure inside the mill should be maintained to prevent cooling liquid aerosols and vapors from escaping.

Extinguishing materials:

The appropriate type of extinguisher should be used for flammable coolant liquid fires:

- Extinguishing gases (oxygen-displacing gases such as CO_2, N_2)
- Foam
- Powder of fire classes ABC or BC (oil fires in accordance to the fire class B)

Metal fires (e.g., Mg, Al, Ti) cannot be extinguished with fire class A, B and C extinguishing materials! Noble gases (for example argon) and fire class D powdered extinguishing materials should be utilized.

1.1.3 Staff training and staff response in case of fire:

The employer shall instruct the employees in accordance to the requirements of the Occupational Safety and Health Act and the Accident Prevention Regulation. Instructions should be reviewed and practice drills conducted at suitable time intervals (at least once a year).

When working on machines with flammable coolants, training should address aspects related to fire and explosion protection/safety.

Let the machine never mill unattended.
During milling without observation of a qualified employee, it is absolutely necessary to install an automatic fire extinguishing system.

1.2 Transport Damage

In case of outward damage of the packaging at the time of delivery, customers should proceed as follows:

1. The recipient documents the loss or damage. The product and packaging are to be left unaltered and unopened.
2. The product is not to be used.
3. The damage is to be communicated to Zfx GmbH (contact information Zfx GmbH on Page 1).
4. The damaged product should not be sent back without prior authorization from Zfx GmbH.

If the product is damaged without recognizable damage to the packaging at the time of delivery, please proceed as follows:

1. The damage is to be communicated without delay to Zfx GmbH (contact information Zfx GmbH on Page 1).
2. The product and packaging are not to be altered.
3. The product and packaging are not to be used.

Please Note!
In case of the recipient violating any obligation indicated above, the damage is to be considered as having occurred after delivery (as set forth in ADSp. Art. 28 / CMR law, Chapter 5, Art. 30).

1.3 Content of this manual

• Chapter 1 contains general advice about the system
• Chapter 2 contains security information about the system
• Chapter 3 provides information on the technical data and the structure of the system
• Chapter 4 provides information on the implementation and installation of the system
• Chapter 5 describes the handling of the system
• Chapter 6 provides information on trouble-shooting problems that might occur
• Chapter 7 provides information on maintenance
• Chapter 8 provides information about the disposal of the system
• Chapter 9 contains general information for the user

These operating instructions should be maintained for the duration of use of the device.

2. Safety instructions

Attention!

Please read this operating manual carefully before attempting to connect or operate the machine! As with all technological systems, also with this machine reliability and impeccable operation can only be guaranteed if the standard security measures and the specific safety instructions in this manual are followed.

1. The installation and set-up of the machine must be done by an authorized Zfx ™ Inhouse5x technician.
2. The machine can only be used in accordance to the instructions in this operating manual. It excludes all liability arising from the use of the machine for other applications.
3. Please do not connect the machine to power sources of a different voltage or frequency than indicated on the machine label. Instructions and warnings attached to the components are to be followed closely. Any unplugging or connecting of cables during active system operation is strictly prohibited.
4. To avoid electric shock, do not introduce objects in the machine except for the intended replacement of parts in accordance to these operating instructions.
5. Before performing maintenance, always disconnect the unit from the electric source.
6. The integrated control cabinet in the back of the machine should only be opened when the power plug is disconnected. The control cabinet and the right side door can only be opened by a qualified electrician or by a specially trained person.
7. Never use the machine in a location where there is a risk that water or other liquids can enter into the electrical panel.
8. The floor below the machine must be stable. Please take note of the allowable load of your floor.

9. The opening of the housing and machine repairs must be done only by authorized Zfx ™ Inhouse5x technicians.
10. Please note that a milling tool mounted in the spindle is an injury risk.
11. The milling machine can only be used with original accessories or accessories approved by Zfx GmbH. Zfx GmbH does not take on any support queries for problems resulting from the use of non-approved nor non-original spare parts.
12. The milling machine must not be installed in hazardous areas.
13. Avoid damage to the power lines as well as the risk of tripping over cords.
14. In case of a change on the milling machine or parts of it, without the written permission of Zfx GmbH, the validity of the EC declaration of conformity is void.
15. Avoid inhaling the dust created during the cleaning process of the machine.
16. The collection tray below the Vacuum filter has a weight of about 5 kg. Please consider this when you remove and reinsert the chip tray.
17. Clean the machine only with approved cleaning supplies.

Explanation of symbols used:

Warning, dangerous electrical voltage! There is a danger of electric shock!

Caution, risk of injury to the hands! Fingers can be crushed between the sliding door and the housing of the machine. There is a risk of injury to the hands!

Caution, risk of injury to the hands! The movement of the machine axes behind the tool magazine can cause crushing or breaking of your fingers. There is a risk of injury to the hands!

2.1 Dangers when handling coolants and lubricants

18. Do not use coolants and lubricants which produce flammable or explosives gases.
19. Do not use mixtures of different coolants and lubricants.

20. Do not store flammable liquids near the machine.

Note: Follow the instructions of the manufacturer for different coolants and lubricants.

2.2. Safety instructions

The machine is equipped with an emergency stop switch. It is located on the right side of the machine.
If the emergency stop switch is turned to "0/OFF", all sources for the individual components are interrupted.
To bring the machine back in operation, the emergency stop switch must be turned to position "1/ON".

Note: The power supply is still active after actuating the emergency stop switch. This also applies to the electrical panel of the machine. The power supply can only be cut off by unplugging the power cable.

3. Description

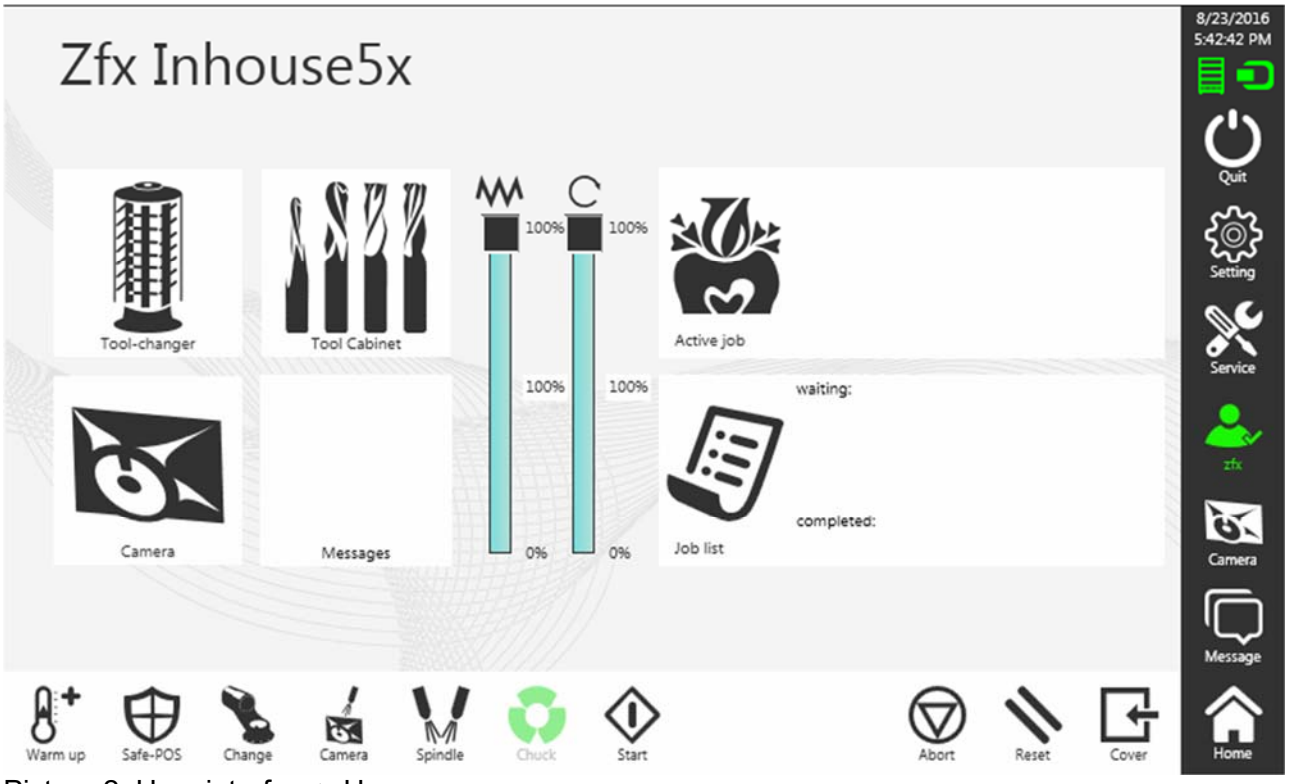
This is a high precision milling machine (5-axis system) controlled by a computer. It is used for the automatic production of dental prostheses. The machine is suitable for 5-axis simultaneous machining (wet and dry). It is designed and equipped with a high-frequency spindle, so a fast and cost-effective production process is guaranteed.

The Zfx™ Inhouse5x has a tool magazine with 28 milling tools. The milling tools are loaded automatically.

The machine enables continuous and unattended operation, even at night or on weekends, therefore, provides an economical utilization.

The operation of the machine occurs through a built-in PC with touch screen.

Picture 1. Zfx™ Inhouse5x



Picture 2. User interface> Home screen

3.1 Technical specifications

3.1.1 Input connections (Details on chamber 4.1)

Line voltage	200-240 V AC +/- 10%	100-120 V AC
Rated frequency	50 Hz	60 Hz
Rated current	1,3 A – 2,7 A	0,80 – 2,3 A
Power rating	0,23 KW – 0,25 KW	0,22 kW – 0,26 kW
Fuse (external)	10 A	10 A
Network connector	LAN RJ45 (NC-Data interface)	LAN RJ45 (NC-Data interface)
Interfaces	USB interface for the control of the machine	USB interface for the control of the machine
Air pressure	6,5 bar	6,5 bar
Amount of air	250 l/min	250 l/min
Air purity level	Class 344 DIN ISO 8573-1	Class 344 DIN ISO 8573-1

3.1.2 Size and weight

Width	695 mm
Height	1673 mm
Height (open door)	2060 mm
Depth	1161 mm
Weight	406 kg

3.1.3 Environment / Installation Conditions

Operating temp. range	18-25 °C
Relative humidity	90%, non- condensing
Installation category	II
Degree of pollution	2

3.1.4 Protection Class

Protection Class	Machine IP 20

3.1.5 Continuous sound level at the workplace

Continuous sound pressure level	65 dB (A)

We reserve the right to make technical changes.

3.2 Tool changer

The tool changer is located on the right side of the workspace.

Picture 3. Tool changer

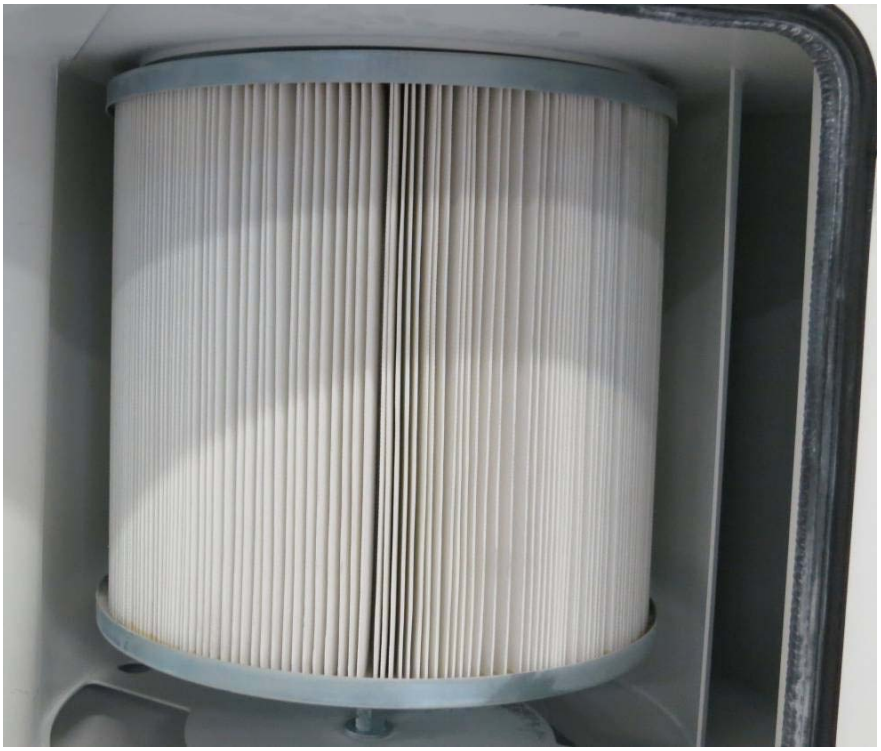
The tool changer contains a total of 28 milling tools.

For more information, see Section 5.4

3.3 Vacuum

The Vacuum system is integrated in the machine frame (Picture 4).

Picture 4. Vacuum



Picture 5. Suction filter for Zfx™ Inhouse5x

To ensure a proper performance of the integrated Vacuum system, the filter should be cleaned regularly. The milling particles falls into the specially designed chip tray. The chip tray must be emptied regularly. For this purpose, remove and empty the chip tray, then reinsert it into the machine.

Note: The chip tray has a weight of about 5 kg. Please consider this when you remove it and reinsert. When emptying the chip tray, avoid inhalation of milling particles. Damage to the filter (e.g. a tear, etc), can lead to particle build-up and potentially clog up the machine. The proper condition of the filter must therefore be guaranteed. In case of damage notify the Zfx™ Inhouse5 Support & Service.

3.4 Universal clamping system

The clamping system holds the milling material (Blankholder, Single Blockholder, Multi-Blockholder for Zfx™ Inhhouse5x) during the milling process and is connected to the rotary A- and B-axes.

The 160° rotation of the B-axis and the 360° rotation of the A-axis makes it possible to machine the top and bottom of the milling material.

Furthermore, the A- and B-axes can be angled for allowing milling of complex geometries.

Picture 6. Universal clamping system

Picture7. Blankholder for Zfx™ Inhouse5x

The insertion of the the Blankholder for Zfx™ Inhouse5x:

⚠	***The door must be open!***

- Bring all axes in change position with the button 

.
- Open the door with the 

button.
- Press the 

button once, to open the clamping system.
- Insert the holder only in the following position

Picture 8. Blankholder

Picture 9. Clamping the blankholder

- Press the 

button once to close the clamping system. Close the door!

3.5 Control unit

The control unit is located in the rear of the machine. The integrated computerized control unit is used to control the milling machine.

The element for handling the machine is the touch display. It displays information and service messages, errors and suggestions.

3.6 Transportation and storage

Note: The Zfx™ Inhouse5x is a high-precision milling machine. Transportation and installation can only be performed by trained personnel. Therefore, if necessary, contact the Zfx™ Inhouse5x Support & Service team.

4. Installation and putting into operation

For this milling machine the environmental conditions complying with the installation category II and pollution degree 2 are valid. The unit is suitable for operation up to an altitude of 2000 m above sea level.

The milling machine is designed to be used in closed spaces.

The machine must be placed on a suitable position and free of vibration. The load capacity of the floor should be at least 150 kg/m².

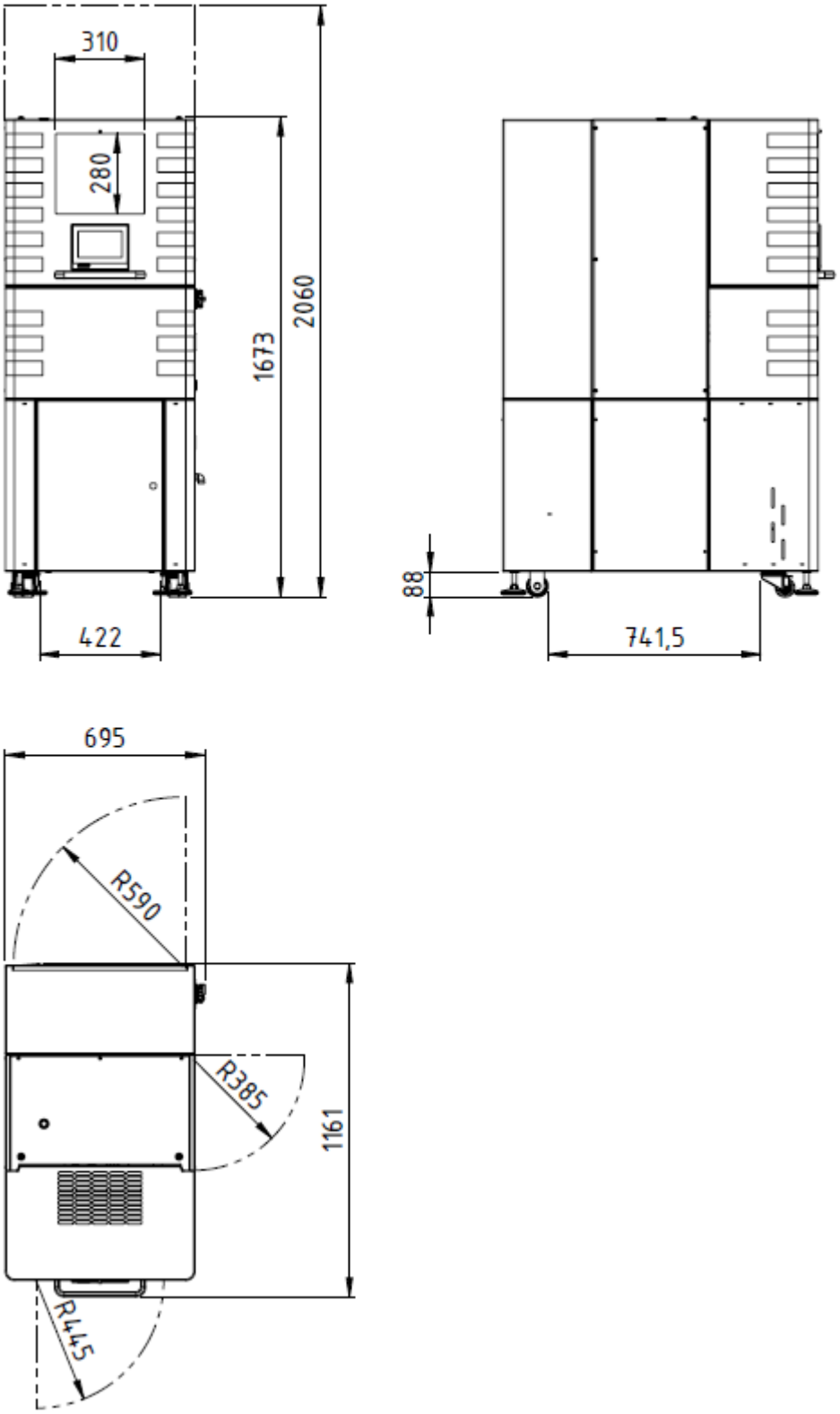
To ensure smooth operation of the milling machine, the unit must be positioned in an adequately ventilated room, whose internal temperature should not be above 25 ° C. Moreover, the machine should not be placed in proximity of heat sources. The openings at the top of the machine must not be covered.

The electrical connection of the machine must be done by a qualified electrician. According to the installation manual the electrician should connect the country-specific main voltage (200V - 240V) to the transformer.

A network cable (LAN RJ45) is available for the transmission of NC data. The connection is located in the electrical cabinet.

The connection must be performed by a qualified technician.

4.1 Floor space of the machine



Picture 10: Dimensions of the milling machine

Note: Make sure that the power supply and air cable cannot be damaged. The condition of the cables should be checked regularly by qualified personnel.

4.2 Connections

Please check the following points before you turn on the machine:
• Is the compressed air supply (6bar) connected to the machine →Picture 11
• Is the power cable connected to the power source →Picture 12
• Is the network cable connected (if necessary) →Picture 13

Picture 11. Compressed air connection

Picture 12. Power supply

Picture 13. Network connection

Picture 14. Front-USB

Note:
When the power is off, the door to the working chamber is locked.
The door safety switch is released after the machine is turned on.

Once satisfied with the points listed above the machine can be turned on.

5. Operation

5.1 Operating elements

5.1.1 Main switch

The main switch is located on the right side of the machine. To put the machine into operation, the main switch must be turned to position "I-ON".

Picture 15. Main switch

5.1.2 EMERGENCY STOP

If you turn the main switch to position “0-OFF" the machine will stop immediatly.
>> The message “100: Emergency Stop triggered” will appear on the display
The door to the work chamber can only be opened after the absolute arrest of the spindle.

Picture 16. EMERGENCY STOP

5.1.3 Unlock „EMERGENCY STOP“

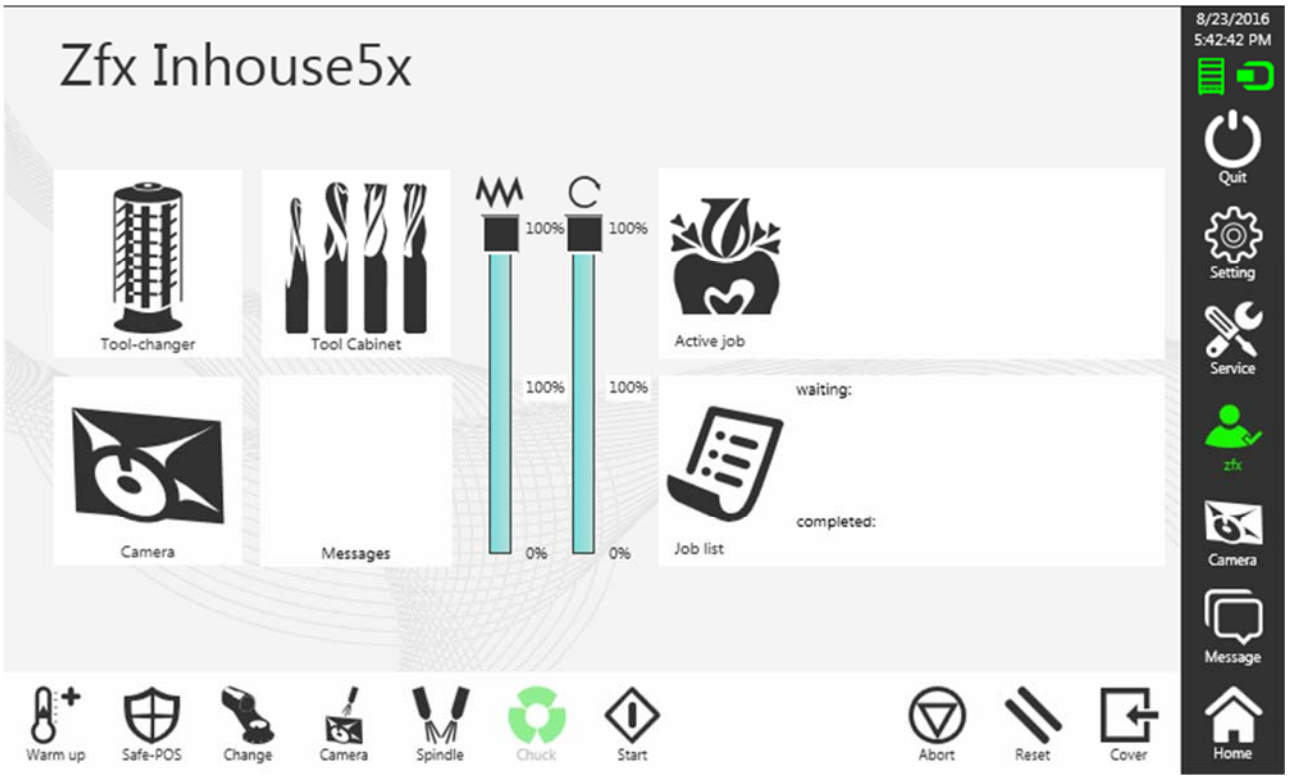
The Emergency Stop can be unlocked by turning the main switch to “I- ON” (see Picture 16).
The machine can be operated by deleting the message on the touch screen.

5.2. User interface

5.2.1 Startup screen

The Zfx™ Inhouse5x has an embedded PC.

After starting the machine, the start-up window appears on the touch screen (Picture 17).



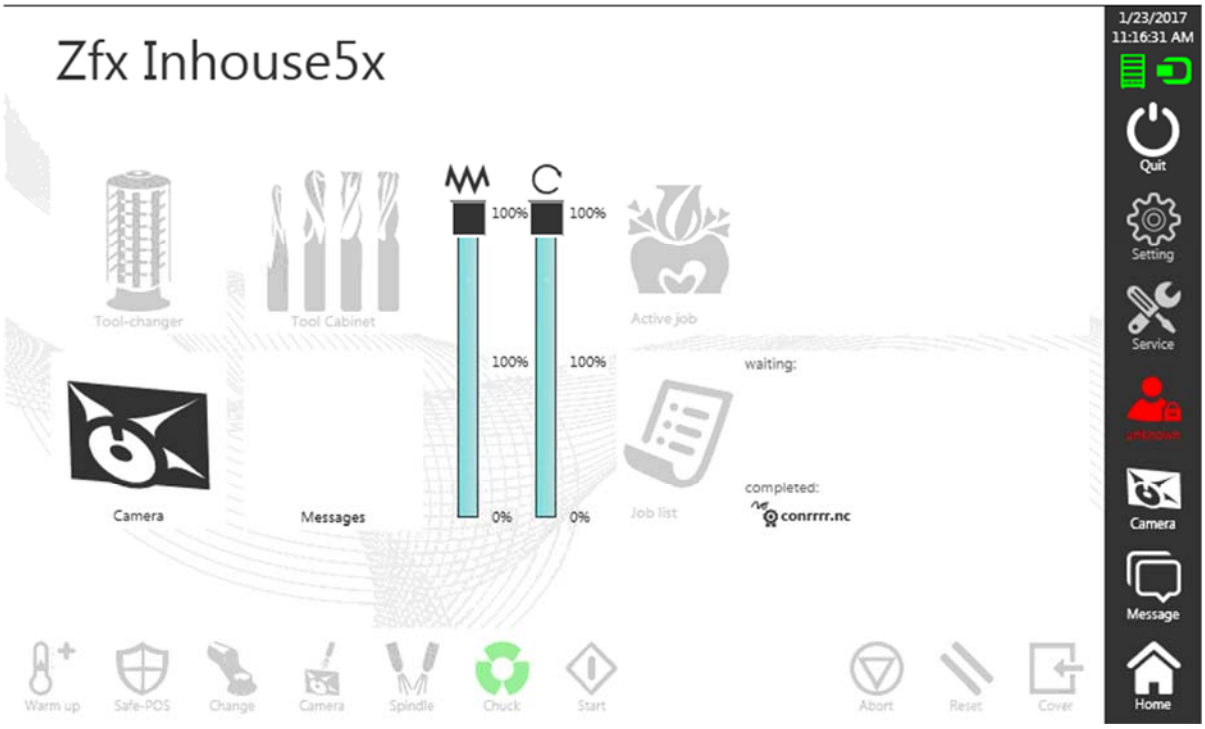
Picture 17. Startup window

The initial screen shows the commands for the main functions and menus, that can be selected with the touch screen.

5.2.1.2 Sign in

To use the machine, it's necessary to do the login, otherwise is no access to the control.

Push the  button.



Picture 18. Startup window

Enter your login data and "Sign In". If the login data are not known, please contact the Zfx Support.

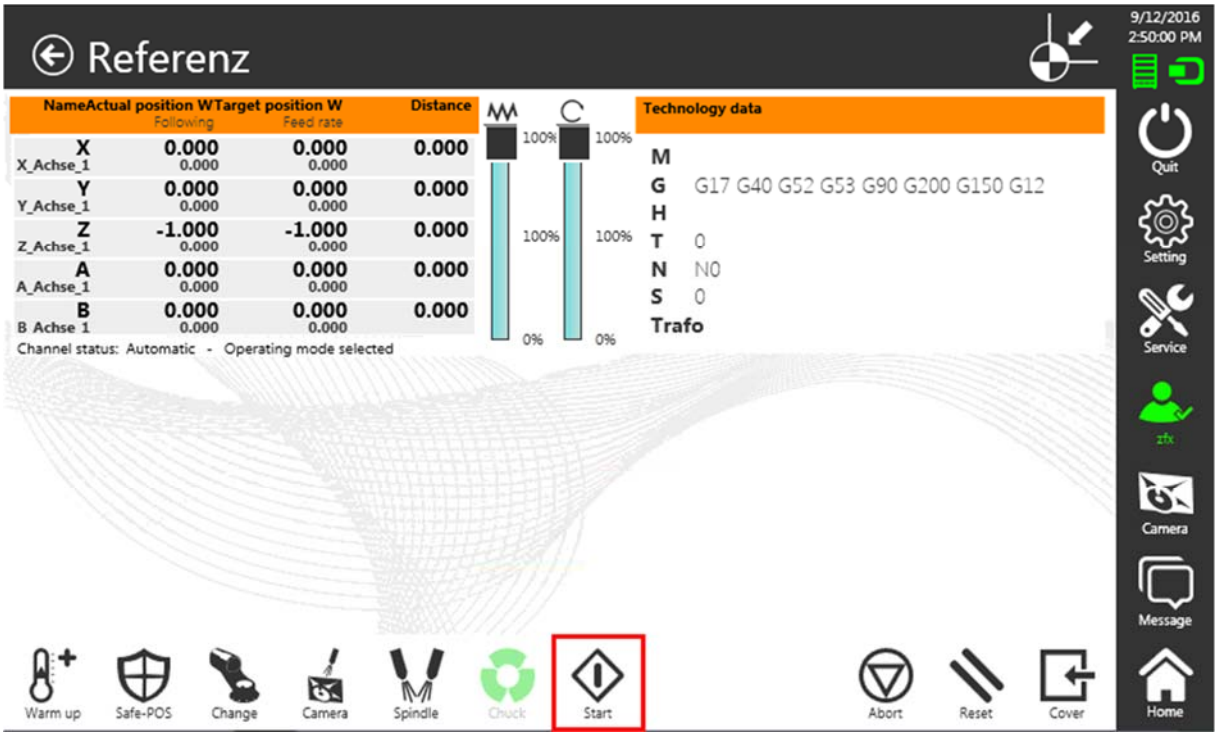
Picture 19. Log In

5.2.2 Referencing and startup

After starting the machine, the reference starts automatically when the door was closed.
If the reference is not starting automatically you can do it manually.
Therefor the “Reference” tab has tobe choosen in the Service menu (Picture 20).

Picture 20. Service menu

The referencing can be started manually by clicking on "Start".



Picture 21. Reference

After the message “Reference active” disappeared the reference is finish.

5.2.3 Stop, restart and cancel a program execution

A running program is indicated by the green 

button.

You can hold it by pressing the green button.
When you hold a running program, only the movements of the axes are stopped. The spindle drive and all other functions are not stopped. The door of the machining area remains locked.

By pressing

the button the holded program restarts and continues processing.

By pressing 

the button the program execution will be completely canceled.

To bring all axes in starting/home position use the softkey 

.

Note: Ongoing programs should first be holded and then eventually aborted. Avoid, if possible, the use of the “Abort” button to change the milling material, the milling tool or measurement of the milling tool.

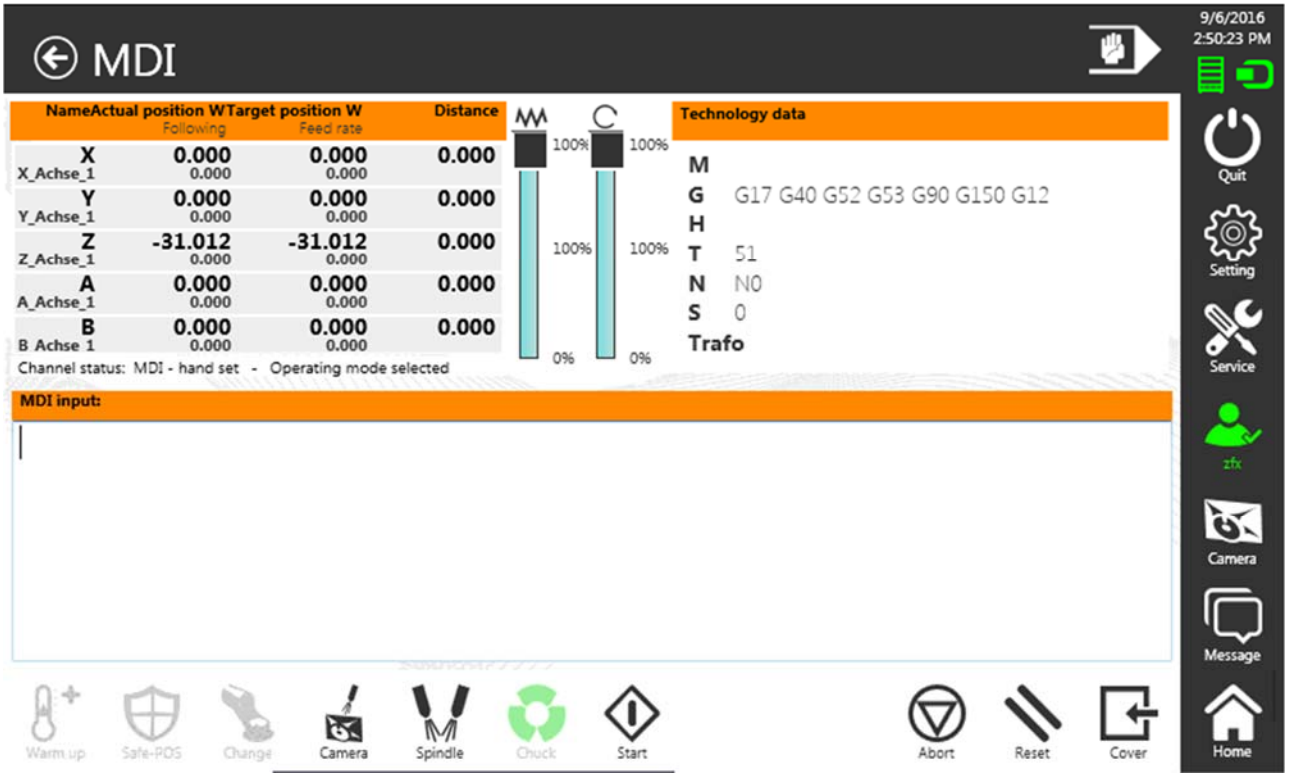
Note: Make sure that there are sufficient milling tools in the tool changer and they still have adequate life time. If a required milling tool is not in position, the milling process can not be started! The loading of the tool changer with new tools for milling is described in Chapter 5.4.3.

5.2.3.1 Manual Data Imput (MDI)

In hand setting mode (MDI) the selected NC commands (Command G/ Command M) can be executed.

- Input of the desired NC command (e.g. G54)
- Run with Start button

⚠	***The door must be closed!***



Picture 22. Service > MDI

5.2.4 Overview of commands

5.2.4.1. G-Commands

Additional commands	Meaning	Note	modal	global
G0 / G00	Movement with **fast speed**			
G1 / G01	**Linear interpolation** with Cartesian kinematics **S-PTP movement** without Cartesian kinematic	**Define feed rate F**		
G2 / G02	**Circular interpolation clw** with Cartesian kinematic	With **I/J/K** to define the **center point**		
G3 / G03	**Circular interpolation cclw** with Cartesian kinematic	With **I/J/K** to define the **center point**		
G4	**Permanence time**	**in m sec or R-Variable**		
G17	Select X-Y plane			
G18	Select X-Z plane			
G19	Select Y-Z plane			
G40	Tool cutter compensation off (radius comp.)			
G41	Tool cutter compensation left (radius comp.)			
G42	Tool cutter compensation right (radius comp.)			
G43	Apply tool length compensation (plus)			
G44	Apply tool length compensation (minus)			
G49	Tool length compensation cancel			
G80	Base position			
G81	HSC Filter off			
G82	HSC Roughing filter			
G83	HSC Finishing filter			
G84	HSC Precise			
G85	Safe position			
G90	The coordinates are **(Absolut Value)**			
G91	The coordinates are relating information **(Incremental)**			

5.2.4.2. M-Commands

Additional commands	Meaning	modal	global
M00	Interrupting the planned program (Abort) requires operator intervention		
M01	Interrupting the planned program (Stop) requires operator intervention		
M02	Program termination >In contrast to the M30 a working Spindle will not be stopped		
M03	Start the spindle (Clockwise rotation)		
M04	Start the spindle (Counterclockwise rotation)		
M05	Turn off the spindle		
M06	Manual tool-change		
M08 / M09	Pump On / Off		
M10	Loosen clamping system		
M11	Free		
M30	End of Program, Rewind and Reset Modes		
M44 / M45	Clamping system open / close		
M143	Tighten clamping system		
M144	Clean camera (e.g. M144=10000)		
M145	Open Tool Magazine hood		
M146	Close Tool Magazine hood		
M147 / M148	Air-cooling On / Off		
M149 / M150	Exhaust slide open / close		

Nr.	**Description**	**Meaning**
10	Werkzeuglänge Bruchkontrolle pos. Toleranz	Tool-breakage control pos. tolerance
11	Werkzeuglänge Bruchkontrolle neg. Toleranz	Tool-breakage control neg. tolerance
15	Abblasluft Einschaltdauer	Air-cooling turn-on duration
16	Abblasluft Ausschaltdauer	Air-cooling turn-off duration

5.4 Automatic tool changer

5.4.1 In general

Picture 23. Tool changer with tools

The tool changer consists of a cylinder in which are positioned 27 tools and 1 setting pin. The individual tools are marked with numbers 0-27. These correspond to the numbers of the tool changer positions in the user interface.

The setting pin is placed in the "0" position. The pin is inserted in the spindle during recharging operations of the tool changer. In this occasion, you can also change the milling tool that was previously inserted into the chuck.

The probe for the automatic measurement of the length of the milling tool is located on the right side of the automatic clamping system. Before the milling process begins, the length of the milling tool is meassured and stored as a reference length in the system. At the end of a milling operation, the length of the milling tool is meassured again. The system gives a warning message if during the verification process a deviation from the previously measured reference length is detected.

See Chapter 5.4.4

Description tool change:

- The tool changer is turned simultaneously with the B-axis
- After changing, all the milling tools are measured in length.
- If the milling tool is already in the spindle, only the length is measured.
- Breakage Control with M commands (eg. define tolerances µm 30).
- Sister tool management: Each instrument has a designated working life. If this expires, the milling tool.

	A milling tool outside the tolerance may stop the NC-program. ➢ The unit stops and the instrument is blocked!

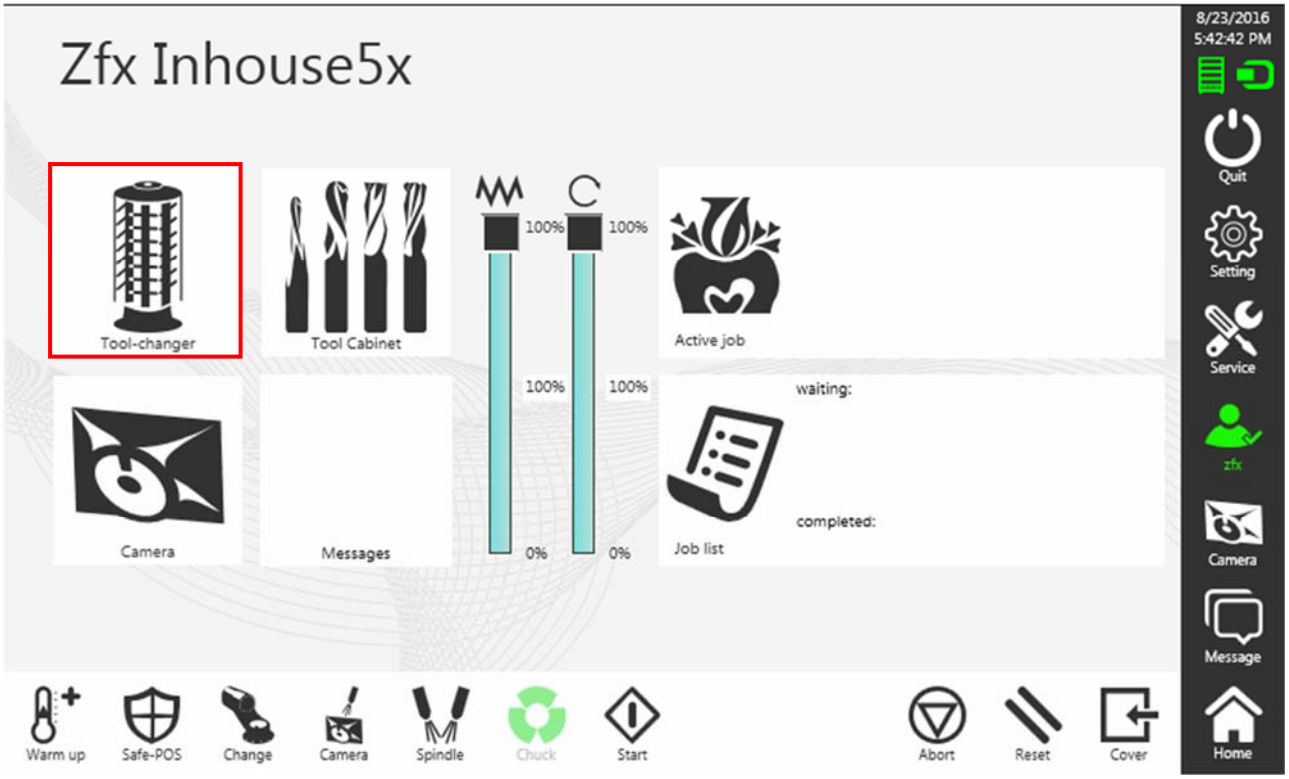
Description tool	**Description / tool name (free text)**	**Annotation**
ID	Nr° tool	
Length (mm)	Milling tool length in mm	
Offset length (mm)	Modify tool length in mm	As needed, e.g. to extend: +5 mm or shorter, eg: -4 mm
Tolerance Positive (mm)	Tolerance clamping depth in mm	An error message appears if the tool is outside the fixed tolerance!
Tolerance Negative (mm)	Tolerance clamping depth in mm	An error message appears if the tool is outside the fixed tolerance!
Radius (mm)	Radius in mm	
Offset radius (mm)	change radius	Tolerance lower / higher An error message appears if the tool diameter Ø is outside the fixed tolerance!
Time max (min)	Work time in minutes/ 0 = any monitoring	
Distance max (mm)		Not used!
Valid		***A check mark must be set to use the tool!***

5.4.2 Tool changer – Tool acquisition

Inserting a new milling tool:

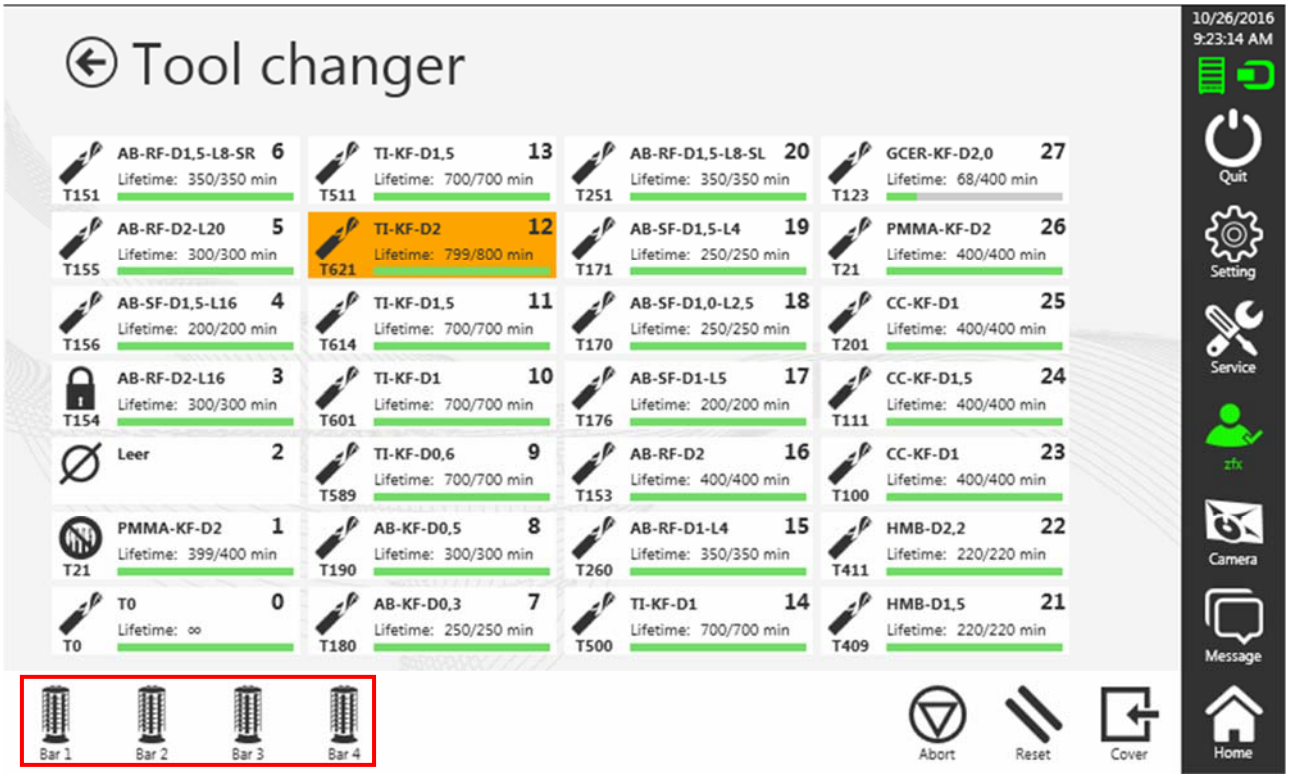
It is possibile to define 28 different milling tools. Each milling tool place must be defined and managed by entering the tool.

⚠	***The door must be closed!***



Picture 24. Home > Tool Changer

Choose tool change position 1, 2, 3 or 4

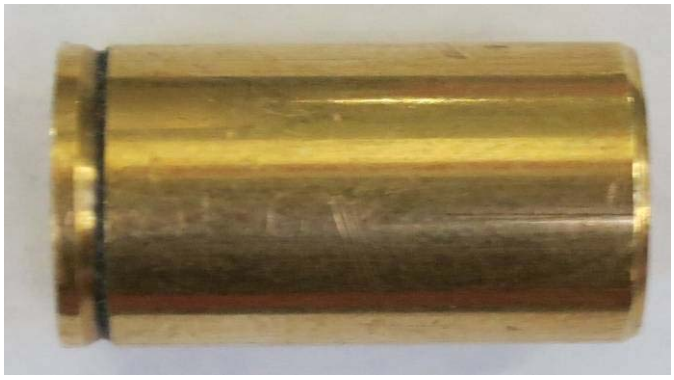


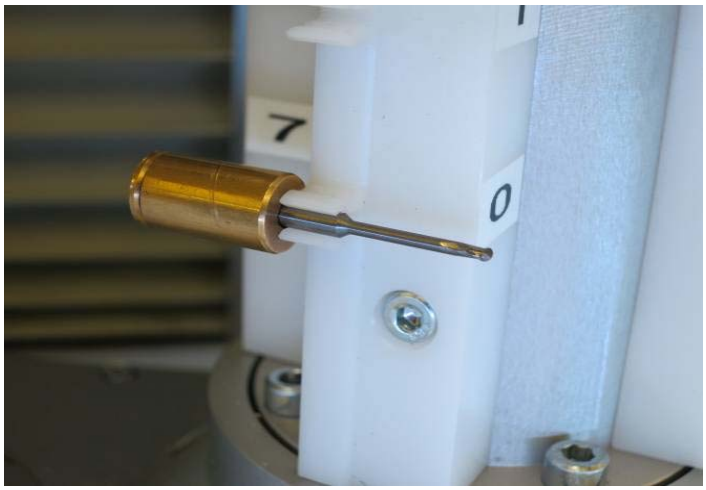
Picture 25. Tool changer

- Open the door with the button 

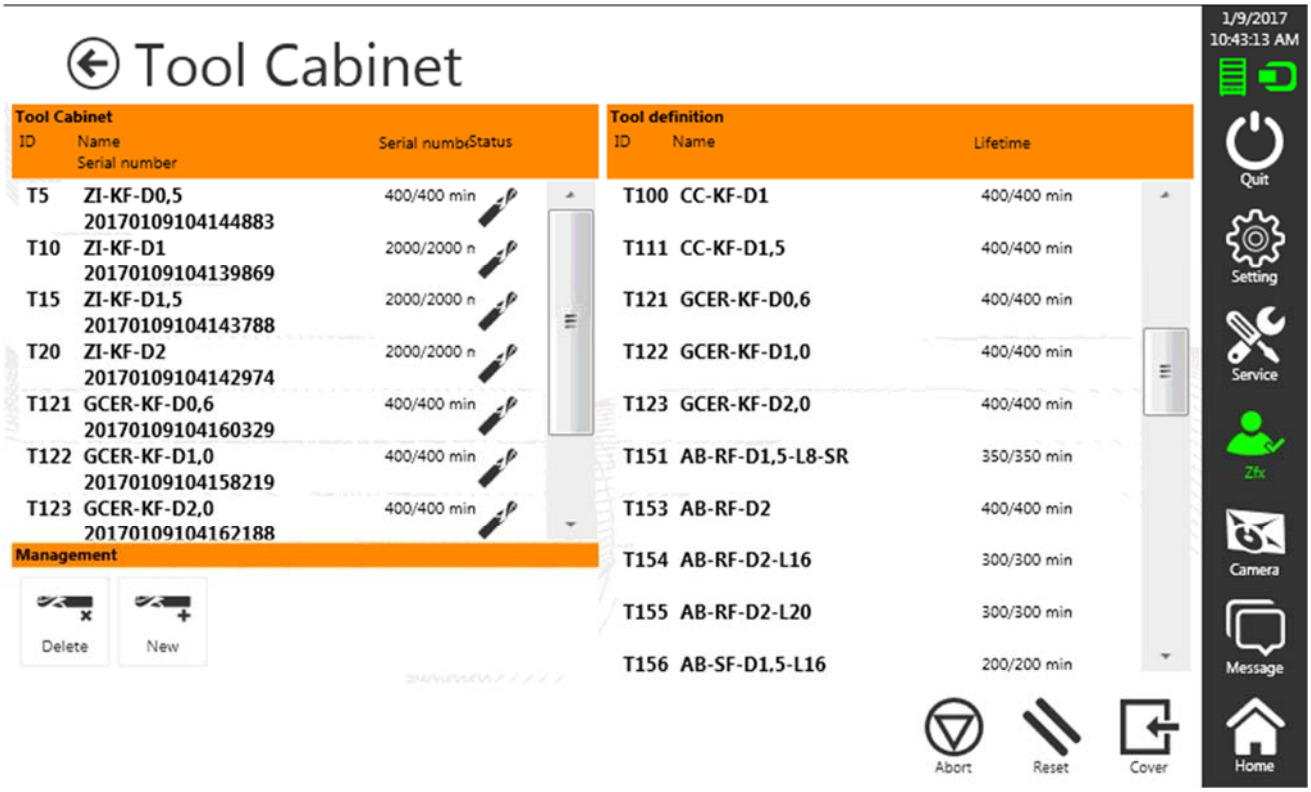
- Place the milling tool in one of the positions from 0 to 27. The milling tool must be aligned (Pictures 27 and 28).

  To insert the milling tool into the selected position, use the set-up tool. Afterwards remove the set-up tool.

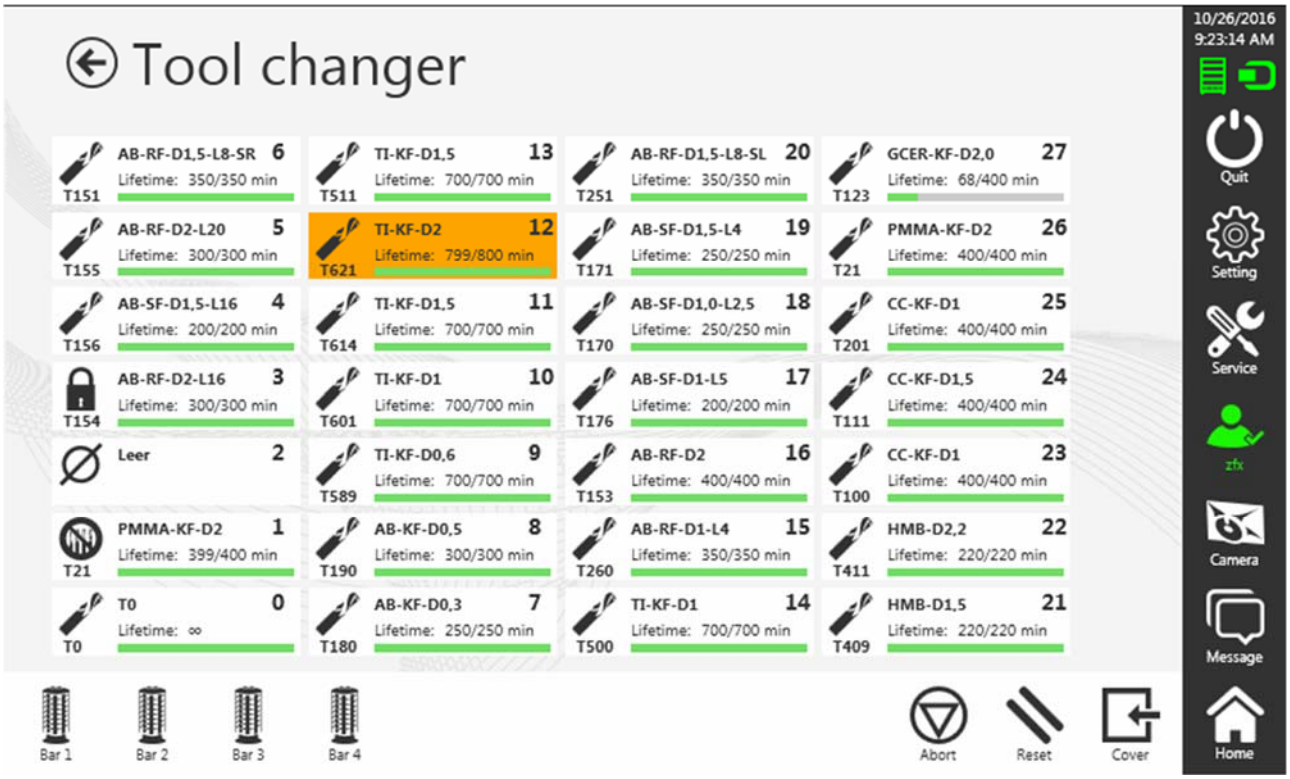

Picture 26. Set-up tool



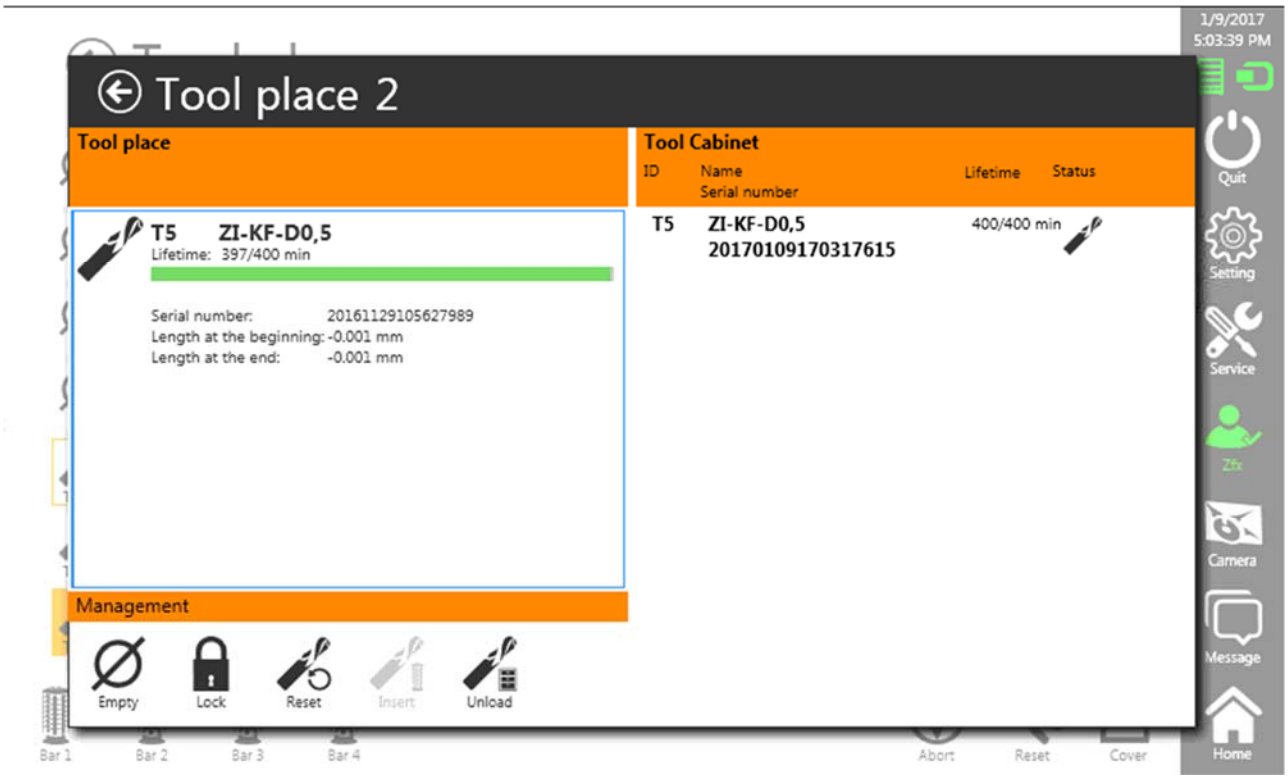
Picture 27. Push out the instrument



Picture 28. Tool cabinet



Picture 29. Tool changer



Picture 30. Tool changer – Tool management

5.4.3 Tool breakage

If tool breakage occurs during the milling process, the milling program will be interrupted. The broken tool will be locked in the menu "Tool Magazine" and the life time of the tool will be set to 0.

> The milling process will stop.

> The broken milling tool is locked.

The broken milling tool must be replaced and unlocked as described above in the menu “5.4.3 Tool changer – Tools acquisition".

Unlock tool:

After opening the door, remove all remnants of the broken milling tool from the collet chuck.

To do so, unscrew the Collet chuck 5° D4 for Zfx Inhouse5x from the spindle, as described in the extra instruction.

Note: Be aware that the broken milling tool can be a source of injury!

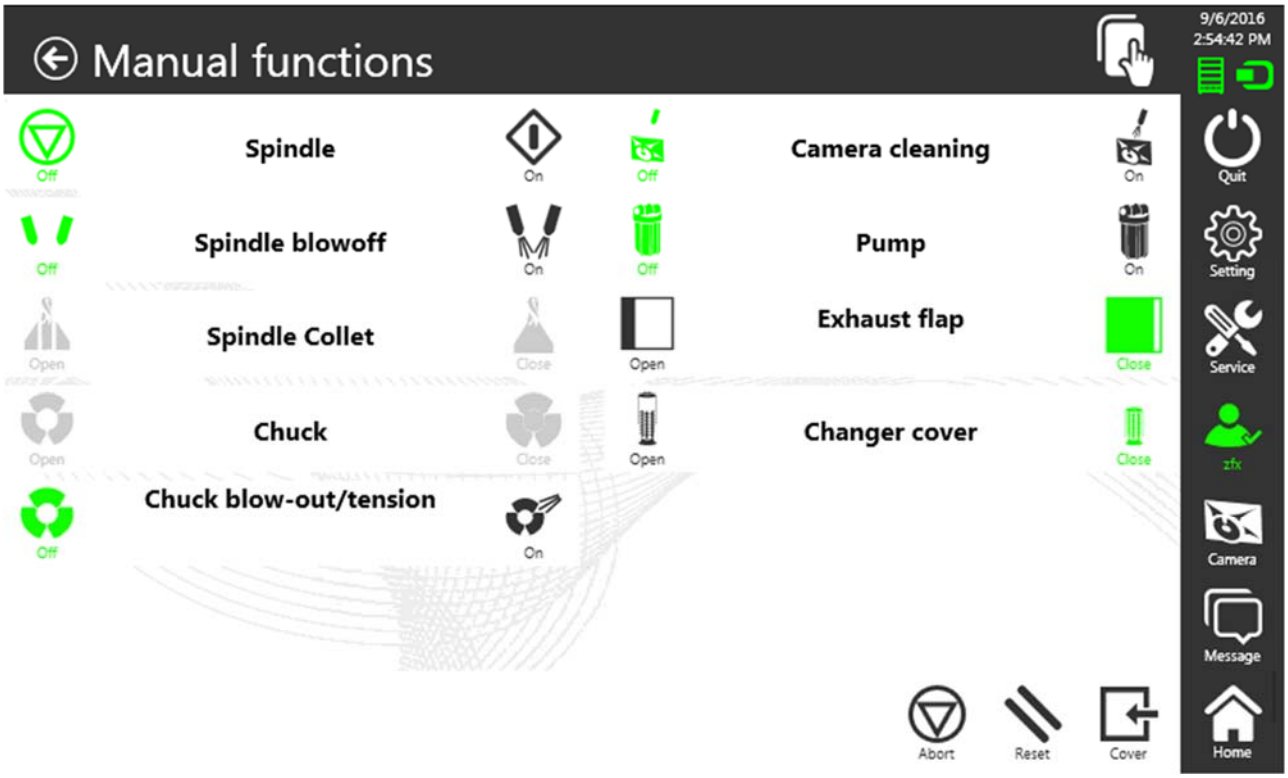
After the Collet chuck 5° D4 for Zfx Inhouse5x has been unscrewed from the spindle, make sure that there are no more remnants of the milling tool in the collet. In this case, push a thin object, such as a milling tool through the collet. Then clean the collet from the outside with a cloth, and if necessary, blow out the inside with compressed air.

After cleaning the Collet chuck 5° D4 for Zfx Inhouse5x, ensure it is still intact. The clambing elements of the collet could be damaged by the milling tool breakage.

In this case, the Collet chuck 5° D4 for Zfx Inhouse5x must be replaced.

5.5 Manual functions

To perform manual functions, click on the listed buttons (Picture 31):
If Softkeys are shown greyed out, some conditions are not given. For example, door is not closed or an Error is active.

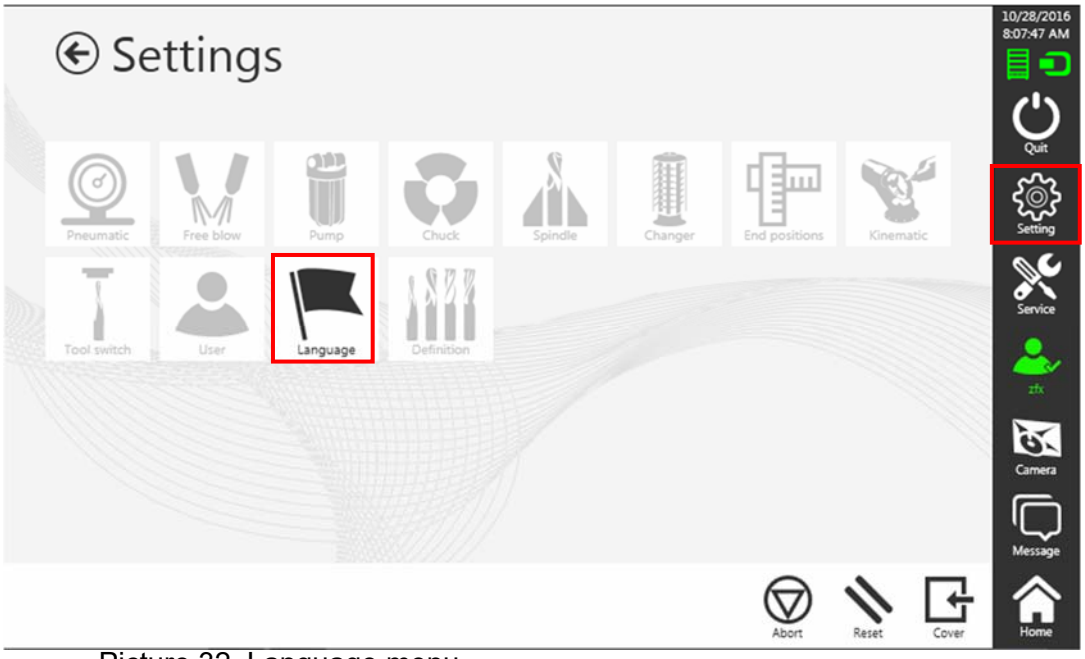


Picture 31. Manual functions

5.6 Language settings

To set the language, proceed as follows:

- Settings
- Language
- Select the requested language



Picture 32. Language menu

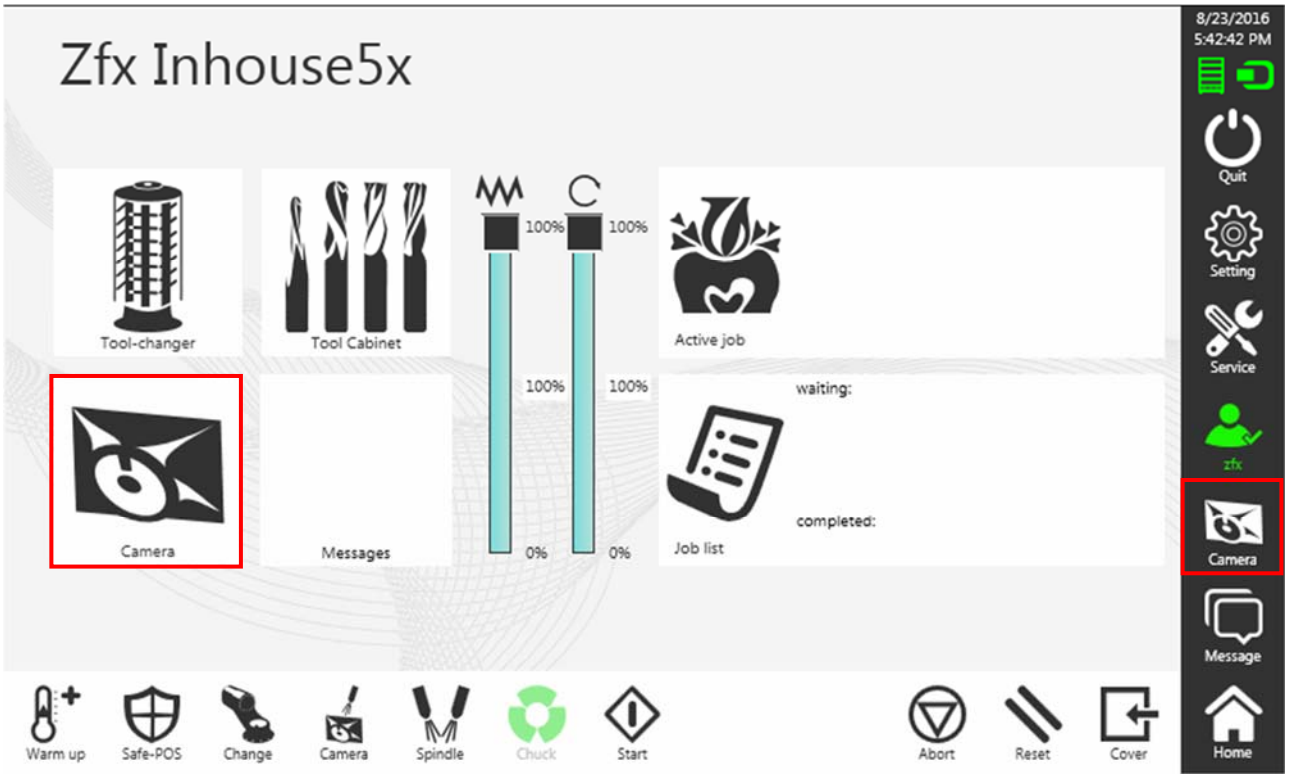
Picture 33. Select language

The green writing is indicating the selected language.

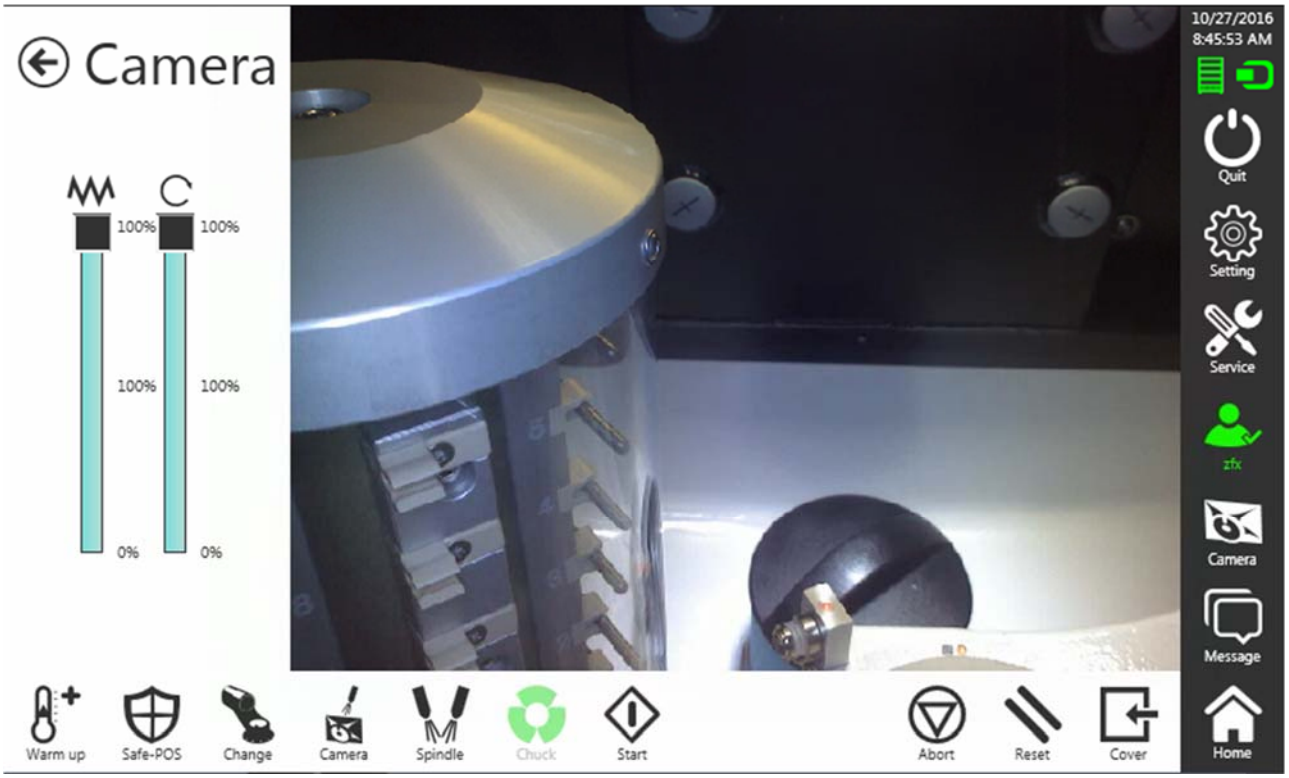
To make sure that everything is translated into the requested language, close the control by pressing “Quit” and reopen it again.

5.7 Camera

To activate the integrated camera, press one of the two camera buttons.



Picture 34. Home screen



Picture 35. Camera

With the buttons 

you can operate the machine while the camera is active.

With the button 

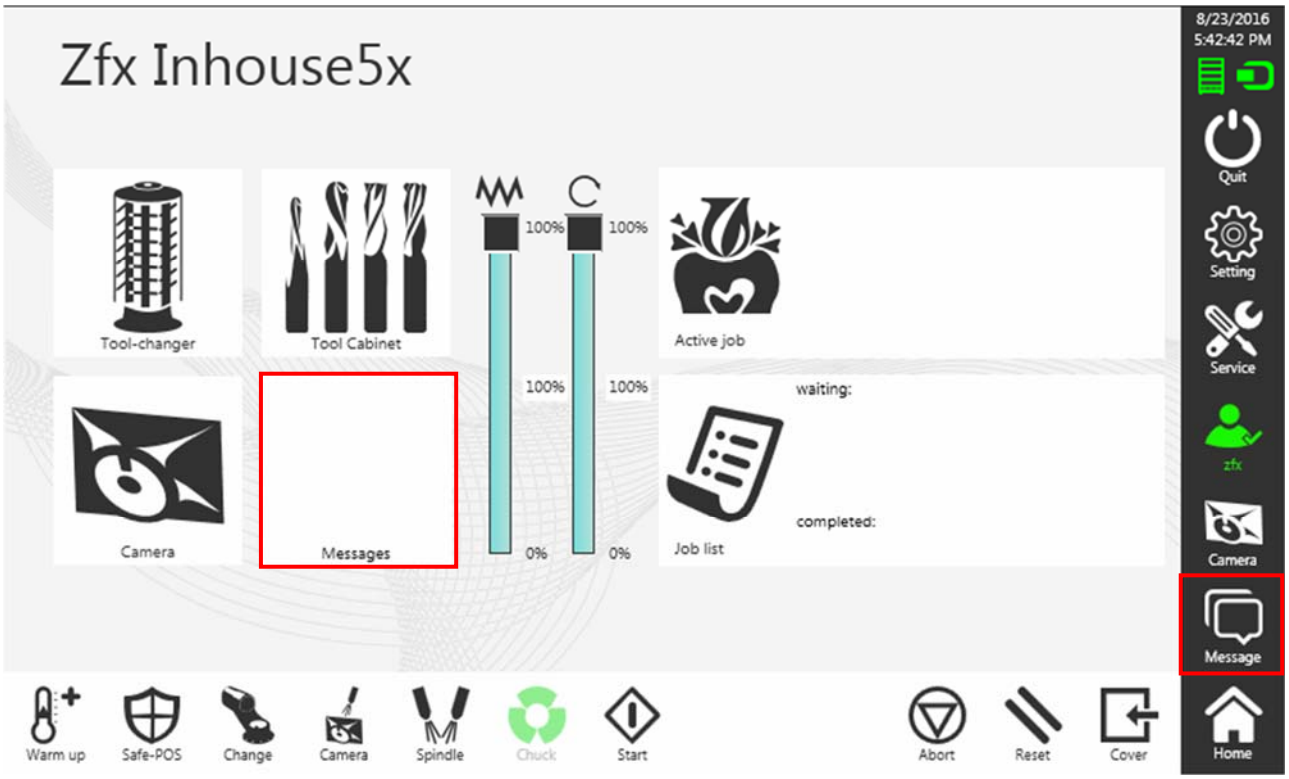
you will return to the home screen.

6. Problem and error messages

Note: Most of the error messages already contain references to the corrective measures.

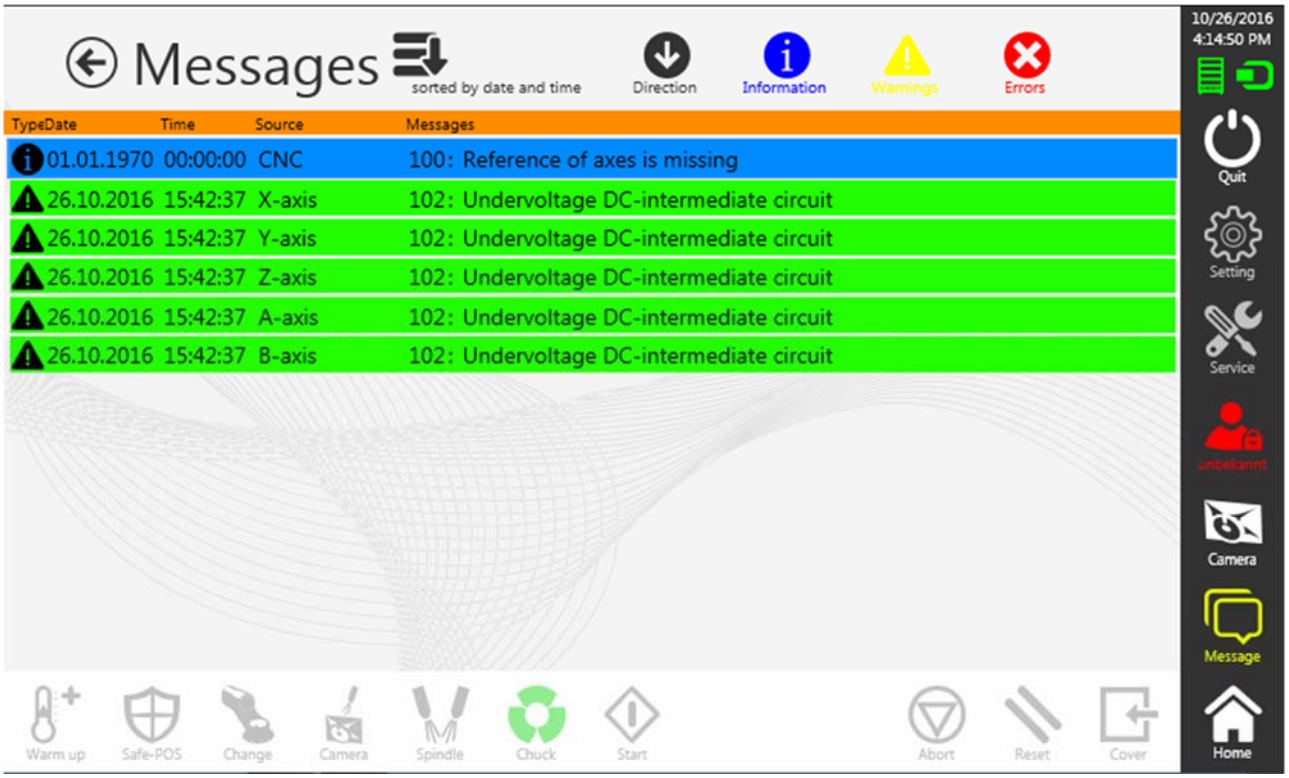
Some messages, such as "Compressed air failure!" automatically disappear after eliminating the root cause.

Other errors need to be deleted, after eliminating the cause, by selecting the button “delete error message”.



Picture 36. Viewing error information

Note: If the root cause of the problems and error messages are not removed, the message will continue to appear.



Picture 37. Messages

For more details, double click on the error.

Messages which are green are only informations which can be deleted with Reset.
Messages which are blue are always informing that something has to be done.
Messages which are red are errors, they can only be deleted if the cause is not present anymore.

6.1 Zfx™ Inhouse5x Messages

Reference of axes is missing
Referencing active
Writing of transmitter data is not possible because the B-axis has an error.
New transmitter data, please open the hood.
Writing of transmitter data is not possible because of a wrong status.
Error on writing log axis number of B-axis through ADS.
Error on writing file with transmitter data for B-axis.
A-axis is to be turned on, although the chuck is open!
Compressed air failure
Pressure sensor (pressure available with actuator off)
Main channel not in automatic mode, job cannot be started.
Auxiliary channel not in automatic mode, job cannot be started.
Main channel not in selected mode, job cannot be started.
Main channel should be in active mode but is in suspend mode (Timeout)!
Main channel should be in suspend mode but is in active mode (Timeout)!
Auxiliary channel should be in active mode but is in suspend mode (Timeout)!
Cnc reports an error in the program back!
CNC auxiliary channel was aborted by Reset!
CNC program tool measurement was stopped with error!
The release for executing a system program is missing!
The tool life has expired and no T0 is available in the changer!
Open machine hood for initialization.
Machine hood could not be locked
Machine hood has safety after locking
Closure should be taken out, but is still connected!
Pump could not be turned on, since compressed air is missing
Closure should be inserted but is unavailable!
Closure should be taken out, but is inserted!
Duration for opening the air slide has been exceeded
Duration for closing the air gate has been exceeded
Air gate could not be controlled, because compressed air is missing.
Clamping system is open
Attempt to open the clamping system with moving axes
Attempt to close the clamping system with moving axes
Tool in spindle is invalid.
Unknown tool in spindle.
The collet is empty - pick tool in Mdi or in automatic mode.
Collet is open
Spindle has not reached the target speed in the ramp-up time
Spindle has not reached the target rotation speed in the turn-off time
Spindle has not reached the target speed in the modification time
Inverter no longer controls the spindle
Collet should be opened while spindle is moving
Emergency triggered
Breakage check outside tolerance

7. Care and maintenance

	**The following operations are only exerts from the complete maintenance plan:** **“fb wartung inhouse5x_2015-06-25_rev1_en“**

Note: Do not clean the machine with compressed air. Milling chips and lubricants could get into the axis system and damage the machine.

Installation, maintenance and servicing should only be carried out by trained and authorized personnel.

7.1 Maintenance interval

Note: The maintenance intervals refer to normal operating conditions. Greater use increases the frequency of maintenance.

7.1.1 Daily maintenance

Activity	Description	Remark
Clean Collet	Check to make sure that the collet in the spindle is working properly. Clean Spindle taper and collet with brush without removing.	Collet chuck 5° D4 for Zfx™ Inhouse5x ZFX02010001
Clean Milling Chamber	Remove residual material from the milling chamber by using a brush and a vacuum cleaner. **Caution: Don´t use compressed air to blow out the milling chamber!**	
Clean Tool Changer	We recommend cleaning of the tool places after milling 10-15 elements. **Caution: After cleaning the Tool changer, check all tool positions with the supplied “set-up tool”!**	
Spindle warm up	If the spindle has not been running for 24 hours, run the quick start program “Warm-up”.	
Clean Swarf filter	Clean the Swarf filter in the milling chamber under running water, to minimize the residual titanium dust and shavings, which are very combustible.	
Clean Viewing Window	Clean the viewing window to the milling chamber	

Removing residual material from the machining area.

Press the door release button and open the door to clean the machine.
If the machine is extremly dirty, the maintenance door may also need to be cleaned. After the machine is turned off with the Emergency Stop button, open the right-side door and the flaps of the maintenance door. Then open the maintenance door toward the front.

Note: The service port can be opened only if the machine is switched off. Opening the maintenance door during operation can lead to a damage to the unit.

7.1.2 Weekly maintenance

Activity	Description	Remark
Clean Collet / Adjust	Check to make sure that the collet chuck in the spindle is working properly. **Disassemble, clean and adjust collet correctly.** (instruction “clean collet chuck.pdf”).	Collet chuck 5° D4 for Zfx™ Inhouse5x ZFX02010001
Cleaning of the bellows	Clean bellows and lamellas from the X- and Y-axis. Replace them if necessary.	
Cleaning of the machine housing	Clean the complete machine housing with a clean, non-abrasive tissue. If necessary, use a suitable liquid cleaner.	
Lubricate Spindle housing	Lubricate spindle housing with extended Z-axis. Use a suitable maintenance spray. **Caution: Risk of collision!**	
Lubricate the plunger rod of the Tool Changer	Lubricate the plunger rod of the tool changer with a suitable maintenance spray.	
Emptying the chip tray	Remove, empty the tray and then reinsert it.	
Lubricate the rotary seal of the Tool Changer	Lubricate the rotary seals of the tool changer with a silicone spray.	
Replace Swarf Filter	Replace the filter. (Every two weeks) Residual Titanium dust and shavings are very combustible, also after cleaning the filter.	Swarf filter 45ppi for Zfx Inhouse5x: ZFX02010030
Cleaning of the probe for tool length measurement	Clean the sensor with a brush / cloth and check function. Note: Ensure that the cleaning is not done with too much pressure, as this leads to an error message.	
Suction System (incl. Suction filter) and clean/ emptying chip tray	Clean suction system (instruction “suction filter.pdf”) and be sure chip tray is empty.	Suction Filter for Zfx™ Inhouse5x: ZFX02010000

Emptying the chip tray

Remove, empty the tray and then reinsert it.

Note: the tray has a weight of about 5 kg. Please consider this when you remove and reinsert it. When emptying the tray, make sure that milling particles are not inhaled. Damage to the filter, such as a tear, may lead to particle build-up and block the machine. The proper condition of the filter must therefore be guaranteed. In case of damage contact the Zfx ™ Inhouse5x technical service.

Cleaning of the probe for length measurement

Wipe the contact surface of the probe (which is located on the left of the universal clamping system) throughly with a dry cloth.

Note: Ensure that the cleaning is not done with too much pressure as this leads to an error message.

Picture 38. Probe for length measurement

7.1.3 Bimonthly maintenance

Activity	Description	Remark
Milling Test Body	To verify the accuracy of the milling machine, mill a test body every two months. The milling program for these samples must not be calculated as they are saved in the system. (C:\Multimill\Cnc-Programme\Kinematic\12mm\ Zfx_Kinematic_V2_hM_12mm_T162_T21.nc.nc) Before milling the test body, make sure that both tools T162 and T 21 are in the tool magazine with a sufficiently lifetime.	Zfx™ Accurate grey 98x20: ZFX08002269 PMMA_KF_D2/4 L15/25 - T21: ZFX06000954 PMMA_SF_D4/4 L16/27- T162: ZFX06000952
Clean Coolant System incl. Filter, and replace Filter	Replace the coolant filter.	Coolant Filter 100 µm for Zfx™ Inhouse5x: ZFX02010010
Clean Metal Mesh / Splash Guard of the Front Door	Dismantle the splash guard of the front door and clean it for example with a steam jet	

7.1.4 Semiannual maintenance

Activity	Description	Remark
Replace Zfx™ Cutting Oil		Zfx™ Cutting Oil: ZFX02002077

7.1.5 Yearly maintenance

Activity	Description	Remark
Maintenance by Zfx	Yearly maintenance by authorized Zfx service technicians	ZFX-Maintenance-Package - Zfx Inhouse5x: ZFX17000301
Lubricate all Axes	Yearly maintenance by authorized Zfx service technicians	

8. Disposal

8.1 Qualification of personnel

The operator can recycle the machine in accordance to the provisions of the law. To disassemble the machine correctly and to separate useful materials requires a good understanding of the mechanical work and the distinction of waste materials.

8.2 Legal basis

8.2.1 Responsabilities

The operator is responsible for the proper disposal of the ZFX™ Inhouse5x. For this purpose, he may give the machine to an authorized public or private disposal plant.

Note: If the operator disposes of ZFX™ Inhouse5x through a company for disposal of waste, this user manual has to be given to them. The manual contains important notes regarding the disposal of the machine.

8.2.2 Mandatory reporting

Companies that dispose or recycle their waste are subject to regulatory approval and control. You may be exempted under certain conditions from the permit requirements, provided that they comply with the requirements of environmental protection. These companies are subject to the reporting obligation. Please see the official body responsible for environmental protection.

8.2.3 Environmental constraints

The waste must be recovered or disposed of in such a way that human health is not compromised. Only methods that do not compromise or harm the environment should be followed. In particular, care must be taken that:
• air, water and soil are not contaminated
• the animal and plant world is not compromised
• no harassment coming from noise or odors does occur
• the environment and the landscape are not involved.

8.2.4 Individual components

After the machine is disassembled, the individual parts must be divided into groups of waste. This is done in accordance to the directive of the current European Waste Catalogue (EWC) or under comparable conditions. The catalog ERC applies to all kind of waste, regardless of whether they are destined for disposal or recycling.

8.3 Disposal: Waste electrical and electronic equipment

8.3.1 RAEE

The European Commission has adopted a directive on Waste Electrical and Electronic Equipment (WEEE 2002/96/EC). As of August 2005, if there is no exemption, producers are responsible for the return and recycling of electrical and electronic equipment. The company Zfx GmbH for the Zfx milling™ Inhouse5x is exempt from this requirement.

8.4 Disposal: other parts and components

The components are made from the following materials:

1. Metals and alloys

   - Aluminium (plates, cases, etc.)
   - Copper (cooling plates, electric cables)
   - Steel (structure, housing, profiles, mounting hardware such as screws, etc.)
   - Stainless steel

2. Glass materials

   - Glass (monitor and door)

3. Resins and rubbers

   - Resins (pipes, siding, wheels etc.).
   - Rubber (gaskets, pipes, etc.)

4. Composites

   - Electrical equipment (cables, motors, components etc.).
   - Electronics (circuits, PC etc.).

5. Packaging

   - Plastic foam
   - Films, plastic
   - Wood

9. Important Customer Information

No one is authorized to give any information which deviates from those contained in these instructions.

9.1 Warranty

Warranty:
Zfx GmbH guarantees that this product is free from defects in materials and workmanship. All parts which prove to be defective within 12 months from delivery due to any circumstance having occurred before the passing of the risk must, at Zfx GmbH's choice, either be subsequently improved or substituted by new goods. Zfx GmbH must be informed of any detected defects in writing without undue delay ("unverzüglich"). The warranty is in particular excluded in the following cases: unsuitable or improper use, defective installation/ assembly resp. commissioning by the customer or third parties, regular wear and tear, defective or careless treatment, improper maintenance, unsuitable operating means or facilities, defective construction work, unsuitable building ground, chemical, electrochemical or electric influences – unless Zfx GmbH is responsible for such circumstances. For legitim warranty claims the service call including labor and the repair or replacement of spare parts will not be charged. The travel and accommodation expenses will be charged according to actual costs. Zfx GmbH MAKES NO OTHER WARRANTIES INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The user is responsible for the use and the intended use of the product outlined in the user manual. If damage occurs during the warranty period of the product, and is purported only obligation ZFX GmbH in the repair or replacement of the product.

9.1.1 Limitation of Liability

Zfx GmbH does not assume any responsibility for any loss or damage arising from this product, regardless of whether they are direct, indirect, special, incidental or consequential, regardless of the legal basis, including warranty, contract, negligence or misconduct.