Operating manual
DC5 Dental Milling System

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Operating manual
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1.0	June.2014	Initial version of English translation
1.3	-	-
1.2	-	-
1.3	06/16/2014	Adaption to the German revision 1.3
1.4	06/27/2014	New machine feet (07/2014). Changes in chapter 6.1.3 “Unpacking” and chapter 9.1 “Assembly”

Contents

1 Preface

Dear customer,

We are delighted that you have chosen the DC5 Dental Milling System from Dental Concept Systems and we hope that you will find working with it pleasant.

The constant further development of our technology is based on co-operation with experienced dental technicians. The main aim is to make the milling and grinding of materials for dental applications efficient and safe. The focus is placed on performance and economy, combined with ease of use.

Detailed training by experts from Dental Concept Systems GmbH is required in order to be able to get the maximum performance out of the DC5 Dental Milling System and to ensure its readiness for operation.

This operating manual is part of the DC5 Dental Milling System. The operating personnel must have carefully read and understood the entire manual before commencing with any work. Adherence to all safety instructions and procedural instructions given in the operating manual is a prerequisite for safe working.

This operating manual also serves as a training document and reference book. It must be available to the operating personnel at all times.

The operating manual must be kept in the direct vicinity of the machine and must be accessible to the personnel at all times.

On a personal note…

Constant and intensive co-operation with successful users is a prerequisite for innovative and practical solutions. We are therefore thankful for every proposal and suggestion for improvement. If you should have any questions or suggestions, please contact Dental Concept Systems GmbH directly:

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2 Important fundamental information

2.1 Product

2.1.1 Product identification

The product is clearly identified by a serial number on the type plate. For the position of the type plate on the machine, see *section 2.6 'Identification on the DC5 Dental Milling System'.*

2.1.2 Designation of the system

«DC 5 Dental Milling System»

2.1.3 Manufacturer

Dental Concept Systems GmbH
Buchbrunnenweg 26
D- 89081 Ulm
Germany

2.1.4 Proof of origin

The DC5 Dental Milling System was designed and manufactured in Germany.

2.1.5 Document

This document is part of the product.

Operating manual for the DC5 Dental Milling System. Published March 2014.

This operating manual was written taking in consideration the EU Machinery Directive 2006/42/EC, Annex 1, Number 1, 7.4 'Instructions'.

Documentation and design: Dental Concept Systems GmbH, Ulm, GERMANY.

2.1.6 Validity of this operating manual

The operating manual describes the DC5 Dental Milling System at the time of delivery by Dental Concept Systems.

2.2 Limitation of liability and guarantee

All specifications and instructions in this manual have been compiled taking into consideration the applicable standards and regulations, the state of the art and our many years of findings and experience.

The manufacturer does not accept any liability for damage caused by:

- disregard of the manual
- use for purposes other than that intended
- employment of untrained personnel
- unauthorised conversions
- technical modifications
- use of non-approved spare parts

The actual scope of delivery can differ from the explanations and illustrations given here in the case of special versions, the taking up of additional ordering options or due to the latest technical changes.

The obligations agreed in the delivery contract apply, together with the manufacturer's General Terms and Conditions of Business and Terms of Delivery as well as the legal regulations valid at the time of signing the contract.

We reserve the right to make technical changes in the interest of improvement of the performance characteristics and further development.

2.3 Warranty terms

The warranty terms and the General Terms & Conditions of Business can be read on our website and downloaded from there.

http://www.dental-concept-systems.com/

2.4 Scope of delivery

The scope of delivery of the DC5 Dental Milling System encompasses the following components:

2.4.1 Basic equipment

'Dental Concept DC5 dry' - basic configuration	**Art. no. 10-010001**
Milling machine as a free- standing device with 5 axes for the dry machining of zircon oxide, aluminium oxide, PMMA, plastics, wax and all commercially available modelling materials. Machine with fixed underbody. Including post-processor and direct connection for DC conceptCAM.	
Operating manual	

2.4.2 Modules

'DC5 Co-Cr alloy milling module'	**Art. no.: 10-100001**
DC5 milling machines are equipped with high-performance spindles for NEM machining.	
'DC5 ceramic grinding module'	**Art. no.: 10-100002**
Module for DC5 milling machine for the wet machining of grindable ceramics.	
'DC5 wet metal module'	**Art. no.: 10-100003**
Module for DC5 milling machine for the dry milling of CoCr alloys and the wet milling of titanium.	
'DC5 ceramic grinding module & DC5 wet metal module'	**Art. no.: 10-100004**
Milling of alloys and grinding of ceramics in combination.	
'DC5 workpiece automation module'	**Art. no.: 100010**
Module for DC5 milling machine with automated blank changer for 7 blanks (8 mm - 30 mm).	
'DC5 extraction module'	**Art. no.: 10-100005**
Extraction unit for the continuous extraction of all machinable materials in the DC5 with automated control of the extraction power.	

2.4.3 Software

'DC5 CAM V3 software' - basic configuration	**Art. no.: 10-300101**
CAM software with direct co-ordination for DC5 control software for 5-axis machining. Including one machine licence. With one licence up to 4 machines can be operated for 5-axis milling. One DC machine licence must be purchased for each additional machine.	
'DC CAM machine licence'	**Art. no.: 10-300121**
Additional machine licence for the connection of further milling machines for all versions.	
'DC5 CAM V3 module for sub-programs'	**Art. no.: 10-300112**
Auxiliary module for the manufacture of supraconstructions. Including 4 sub-programs of your choice.	
'DC5 CAM V3 sub-program per geometry'	**Art. no.:**
'DC5 CAM V3 module for grinding ceramics'	**Art. no.: 10-300111**
Auxiliary module for grinding ceramic blocks.	

2.4.4 Accessories

'DC5 tool magazine'	**Art. no.: 10-101001**
Exchangeable tool magazine for 10 tools in pick-up stations.	
'DC5 pick-up station'	**Art. no.:**
Pick-up station for tool positions in the DC5 tool magazine.	
'DC5 blank holder Blue 44 for DC5 without automation'	**Art. no.: 10-101005**
Workpiece holder for individual blank form Blue 44.	
'DC5 blank holder Blue 44 for DC5 with automation'	**Art. no.: 10-101002**
Workpiece holder for individual blank form Blue 44.	
'DC5 spare blank holder for automation'	**Art. no.: 10-101004**
Workpiece holder for blanks up to 32 mm in thickness.	
'DC5 high-pressure grease gun, hand lever grease gun set'	**Art. no.: 10-102005**
High-pressure grease gun for lubrication via the DC5 central lubrication stations. Delivery including DC5 machine grease.	
'DC5 machine grease for lubrication'	**Art. no. 10-102006**
Machine grease for long-life lubrication, grease cartridge 400 g.	
'DC5 CeramCool ceramic fluid'	**Art. no.: 10-102002**
Abradant for ceramic machining with DC5 ceramic grinding module. Ready-mixed in a 12-litre can.	
Concentrate in a 1-litre container	Art. no.: 10-102001
'DC5 titanium fluid TitanMill'	**Art. no.: 10-102004**
Coolant for the machining of titanium and titanium alloys in the DC5 wet metal module. Ready-mixed in a 12-litre can.	
Concentrate in a 1-litre container	Art. no.: 10-102003
'DC5 filter cartridge wound Polydent 10.5'	
Filter cartridge for DC5 ceramic grinding module and wet metal module	
'DC5 filter bag for CAD/CAM extraction system'	
Filter bag for filter system of the dry extraction.	
'DC5 filter cage for CAD/CAM suction system'	
Filter cage for filter system of the dry extraction.	
'DC5 filter mats'	
Set of 2 filters for insertion into collecting pans for materials with fluid system.	

2.4.5 Available complete systems

The combination of the basic system ‘Dental Concept DC5 dry’ with modules and/or accessories results in the following available complete systems:

‘Dental Concept DC5 dry & CrCo’	**Art. no.: 10-010002**
Milling machine as a free- standing device with 5 axes for the dry machining of zircon oxide, aluminium oxide, PMMA, plastics, wax and all commercially available modelling materials. Machine with fixed underbody. Including post-processor and direct connection for DC conceptCAM.	
‘Dental Concept DC5 basic 1 x wet metal’	**Art. no.: 10-010003**
Milling machine as a free- standing device with 5 axes for the dry machining of zircon oxide, aluminium oxide, PMMA, plastics, wax and all commercially available modelling materials. Machine with fixed underbody. Equipped with the DC5 CoCr alloy dry milling module and DC5 wet metal (titanium) module Including post-processor and direct connection for DC conceptCAM.	
‘Dental Concept DC5 basic 1 x wet ceramic’	**Art. no.: 10-010004**
Milling machine as a free- standing device with 5 axes for the dry machining of zircon oxide, aluminium oxide, PMMA, plastics, wax and all commercially available modelling materials. Machine with fixed underbody. Equipped with the DC5 ceramic grinding module. Including post-processor and direct connection for DC conceptCAM.	
‘Dental Concept DC5 2 x wet’	**Art. no.: 10-010005**
Milling machine as a free- standing device with 5 axes for the dry machining of zircon oxide, aluminium oxide, PMMA, plastics, wax and all commercially available modelling materials. Machine with fixed underbody. Equipped with the DC5 CoCr alloy milling module, DC5 ceramic grinding module and DC5 wet metal (titanium) module Including post-processor and direct connection for DC conceptCAM.	
‘Dental Concept DC5 Expert’	**Art. no.: 10-010006**
Milling machine as a free- standing device with 5 axes for the dry machining of zircon oxide, aluminium oxide, PMMA, plastics, wax and all commercially available modelling materials. Machine with fixed underbody. Equipped with the DC5 CoCr alloy milling module, DC5 ceramic grinding module, DC5 wet metal (titanium) module and DC5 automation module Including post-processor and direct connection for DC conceptCAM.	

2.5 Structure of the operating manual and conventions

2.5.1 Structure and basics

The operating manual consists of individual, sequentially numbered sections. The table of contents provides information about the structure of the individual sections.

The operating manual has been prepared with great care and should enable you to operate, maintain and repair the DC5 Dental Milling System as quickly and efficiently as possible.

Further developments for our customers necessitate the constant revision and adaptation of the operating manual. It is therefore not transferable to another system. So that the operating manual is complete at all times and corresponds to the current status, please do not remove any individual documents.

Current versions of the installation manual are available for download on the Dental Concept Systems GmbH website:

http://www.dental-concept-systems.com/service/download/login-fuer-kunden

Enter your login details here:

User name: _____

Password: _____

2.5.2 Definitions of terms

The following terms are used in the operating manual:

The DC5 Dental Milling System from Dental Concept Systems GmbH is referred to as DC5 milling system, DC5 milling machine or DC5 machine.

The following definitions of terms also apply:

- The system part for the storage and exchange of blanks is called the magazine.
- The system part for the withdrawal of the material units from the magazine is called the gripper.
- The material unit to be machined is called a blank.
- The DC5 Dental Milling System is called the machine or system.
- The order to be processed is called the job or milling job.
- The owner of the DC5 system is called the user.

2.5.3 Symbols and signal words

Symbol / signal word	Meaning
	Draws your attention to the handling and effect of safety information.
 **DANGER**	Draws your attention to a dangerous situation that will lead to serious injury or death if it is not avoided.
 **WARNING**	Draws your attention to a dangerous situation that can lead to serious injury or death if it is not avoided.
 **CAUTION**	Draws your attention to a dangerous situation that can lead to minor or moderate injuries if it is not avoided.
 **NOTE!**	Draws your attention to possible damage to property and other important information.

2.5.4 Target group

All work with and on the DC5 Dental Milling System is to be carried out by trained and instructed personnel only. A recognised technical education and thus knowledge of usual technical procedures is required. The personnel must read and understand the manual.

The system user is responsible for the selection, instruction and checking of the personnel.

2.5.5 Presentation conventions

The following presentation conventions are used in this operating manual:

- Bold letters for emphasis or paragraph headings
- Numbers or letters in brackets after terms as references to items in illustrations.

For example: ‘Select item **(1)** of the ... menu’

2.6 Identification on the DC5 Dental Milling System

CE	The CE-mark is attached to the rear side of the machine. The DC5 Dental Milling System meets the fundamental safety requirements of all applicable European Union directives.
	Front door Warning of hand injuries

The type plate is attached to the rear side of the machine.

1 Machine type

2 Serial number of the machine

3 Date of manufacture (year and month)

4 Overall weight in kg

5 Ambient temperature (operation) in °C

6 Mains power supply

7 Power consumption

2.7 Applicable documents

The following additional instructions belong to the system documentation:

- Warranty terms
- Check list
- Transport instructions
- Original operating manual from the spindle manufacturer (IBAG)

3 Safety

3.1 Essentials

This section contains information on all important aspects of safety for the optimum protection of the personnel as well as safe and trouble-free operation.

Observe the safety and procedural instructions given in this section without fail.

Disregard can lead to considerable danger!

The dental milling system is submitted to a quality inspection following manufacture and is delivered in an operationally safe condition. Before handover a functional test as well as detailed checking of the safety systems takes place.

Nevertheless, the dental milling system can be a source of residual hazards.

Therefore: read the section entitled ‘Safety’ in its entirety and observe all safety instructions!

Disregarding safety instructions can lead to accidents, resulting in serious injuries to persons as well as damage to property and the environment!

NOTE!

The manufacturer accepts no liability for damage caused by failure to follow or disregard of the safety instructions!

3.2 Meaning of the safety instructions

3.2.1 General safety instructions

General safety instructions inform you about residual dangers that can exist and occur unexpectedly even when the DC5 Dental Milling System is used as intended.

For the avoidance of injuries and damage to property and the environment, these must be adhered to and followed without fail by all persons who work on the DC5 Dental Milling System.

For that reason it is compulsory for these persons to read this section!

3.2.2 Special safety instructions

This operating manual contains safety instructions that apply to certain situations. These instructions must be observed without fail in order to avoid injuries and damage to property and the environment.

3.2.3 National safety instructions

Legal regulations applicable in the user's country, local regulations and safety regulations for the prevention of accidents and the protection of the environment must be complied with.

3.3 Conduct in case of emergency

In case of an accident or a malfunction, the machine must be stopped directly by actuating the 'STOP' button on the front side of the milling machine.

3.3.1 Emergency stop control device (front panel)

3.3.2 Procedure

DANGER

Risk of injury!

Stop the DC5 Dental Milling System immediately in case of emergency.

(1) Press the STOP button (1) on the front side of the machine.

For the position of the *STOP* button, see the picture in *section 3.3.1 Emergency stop control device* and the section *Structure and function*.

(2) Press the 'ON | OFF' button (2) on the front side of the machine.

For the position of the *ON | OFF* button, see the picture in *section 3.3.1 Emergency stop control device* and the section *Structure and function*.

(3) Switch the main switch of the machine off.

See section entitled *Control elements.*

(4) Pull the mains plug out of the socket.

(5) Disconnect the compressed air supply to the machine from the central compressed air supply.

(6) Immediately summon authorised personnel who can determine and rectify the cause of the emergency.

3.4 Purpose of use

3.4.1 Principle

The dental milling system may only be operated in a technically perfect condition, for its intended purpose, in a safety-conscious manner being mindful of the dangers, and in compliance with this operation manual.

Nevertheless, dangers to persons, material and the environment can occur during the operation.

3.4.2 Technical state

Operational malfunctions as well as defects, in particular those that can impair the safety of the DC5 Dental Milling System, must be rectified immediately. Dental Concept Systems GmbH is to be informed immediately in case of malfunctions and defects.

In addition to that, the DC5 Dental Milling System is to be taken out of service immediately until full rectification.

3.4.3 Use as intended

The DC5 milling system is intended exclusively for the milling of dentures.

Use as intended also includes observing the instructions in this operating manual and carrying out the inspection and maintenance work as well as the required personnel qualifications.

Any other use or use extending beyond that is considered to be inappropriate. The manufacturer accepts no liability for the resulting damage! The user alone bears the risk!

3.4.4 Inappropriate use

- Incorrect use
- Use for a purpose other than that intended
- Milling of materials other than those recommended by Dental Concept Systems
- Carrying out of repairs without the written permission of Dental Concept Systems GmbH
- Use of accessories or spare parts from other manufacturers
- Commissioning of the DC5 milling machine without authorisation
- Commissioning of the DC5 milling machine without instruction

In the case of inappropriate use there is a danger of:

- Injuries to persons
- Damage to the machine
- Damage to the machined product and other damage
- Malfunctions of the DC5 milling system

3.5 Impermissible modifications, spare parts and power supply

3.5.1 Unauthorised conversion or spare part manufacture

As a matter of principle, conversions of, or modifications to the DC5 Dental Milling System are not permitted. Conversions of, or attachments to the system may only be carried out by Dental Concept Systems GmbH.

As a matter of principle, only those spare parts specified by Dental Concept Systems are to be used.

NOTE!

Original spare parts and accessories authorised by the manufacturer serve the purposes of safety. The use of other parts renders any liability for the resulting consequences void!

3.5.2 Safety and protective devices

The safety and protective devices of the dental milling system may not be disabled or removed during normal operation.

3.5.3 Safety instructions for assembly, inspection and maintenance work

As a matter of principle, work on the machine may only be carried out when the machine is stopped.

All safety and protective devices must be attached again and/or activated immediately after completion of the work. Their effectiveness must be checked before restarting, taking into consideration the valid rules and regulations.

3.5.4 Power supply

The DC5 Dental Milling System may be operated only with the power supply values specified on the type plate and in *section 4 'Technical data'.*

3.6 Duties

3.6.1 Observation of the operating manual and duty to safekeep it

This operating manual is oriented to the understanding of the trained operating personnel of the DC5 Dental Milling System. A recognised technical education is required.

– Read this manual carefully and completely before installing and putting the DC5 Dental Milling System into operation. It contains everything that you need to know in order to avoid injuries and damage to property, so that operation can proceed without trouble and so that the environment is not harmed.

– Carefully observe all safety instructions and other instructions, requirements and information in this operating manual.
– Always keep this operating manual ready to hand by the DC5 Dental Milling System.
– Forward the operating manual to the new location if you internally relocate the DC5 milling system.
– The place where the operating manual is kept must be clearly marked by the user. Further folders with the spare part documentation and manufacturer's data must be accessible to the maintenance and service personnel from Dental Concept Systems GmbH.

3.6.2 Duties of the manufacturer

Dental Concept Systems GmbH is responsible for product safety. It thereby transfers essential duties to the user.

3.6.3 Duties of the user

The user must obtain an operating permit from the responsible authority and must obey the associated laws and regulations, e.g.:

- Safety for personnel
- Safety for material
- Disposal

– The user must ensure that the system is used as intended.
– The user is responsible for the training of the personnel.
– The user of the machine must ensure that all activities on the machine are carried out only by qualified personnel.
– The user of the machine must ensure that the machine is operated only under the constant supervision of qualified personnel.
– The user of the machine must make the following documents accessible to those persons who work on the machine:
  - This operating manual
  - The respectively applicable rules for the prevention of accidents related to the workplace
  - Other nationally applicable regulations.

– The user must ensure that all danger and safety instructions are obeyed.
– The user is responsible for the provision of the required protective equipment.
– The user must clearly define the responsibilities of the personnel.
– Personnel undergoing training or instruction as well as apprentices may only operate the machine under the constant supervision of a qualified person.

– The operator ensures that the DC5 milling system is always in a technically perfect condition and is only operated in such a condition. The user informs Dental Concept Systems of any repair work that is required.

3.6.4 Duty to observe and provide information

It is the user's duty to report all (residual) dangers and risks that arise during operation and are not described in this manual to the manufacturer without delay.

Directions and measures stipulated by the manufacturer on account of a report must be followed without fail.

3.7 Health and safety at work

As a matter of principle, the local regulations for health and safety at work and the prevention of accidents apply.

The safety and protective devices must be checked each time before putting the DC5 Dental Milling System into operation.

As a matter of principle, refrain from carrying out any work that compromises the safety of the DC5 Dental Milling System!

As a matter of principle, all maintenance and repair work may be carried out only by employees of Dental Concept Systems GmbH.

Maintenance and repair work is to be carried out with the system switched off.

Unauthorised conversions, maintenance work and modifications are not permitted!

3.8 Requirements for the personnel

The DC5 Dental Milling System may be operated only by trained and instructed or qualified persons.

Personnel undergoing training or instruction as well as apprentices may only work on the DC5 Dental Milling System under the constant supervision of an instructed person.

Instructed person:
A person of at least 18 years of age who is sufficiently informed or supervised by a skilled worker and is thus capable of recognising risks and avoiding dangers arising from the DC5 Dental Milling System.

Qualified person:
A person who, on account of his professional knowledge, education and experience and recent occupational activity, has a reliable understanding of safety concerns. The qualified person must have knowledge of the state of the art regarding the task to be performed and the dangers to be observed and must uphold them.

3.9 Local requirements

The place of installation must meet the structural requirements for the installation of the DC5 Dental Milling System.

The floor must be capable of absorbing the static and dynamic forces of the machine.

The electrical and pneumatic installations must meet the specifications for the DC5 Dental Milling System (see *section 4 'Technical data'*) and must be installed in accordance with applicable standards and regulations.

3.10 Disposal

If no return or disposal agreement is in force, recycle dismantled components.

NOTE!

The environment can be harmed by improper disposal!

Lubricants and other auxiliary materials are subject to special waste handling and may only be disposed of by approved specialist companies!

The local authority or special disposal companies can provide information on environmentally-friendly disposal.

3.11 Residual dangers and protective measures

3.11.1 Work ergonomics

CAUTION

Ergonomics at work!

Eye damage, back injuries and joint problems are possible.

Ensure optimum lighting, working height and seating position.

3.11.2 Work clothes

CAUTION

Wearing of work clothes and protective equipment!

Crushing and drawing-in of limbs and items possible.

Wear tight-fitting work clothes.

3.11.3 Personal protective equipment

CAUTION

Wear ear protection!

Loss of hearing and hearing impairment due to high sound pressure level possible. Wear ear protection when working directly on the running machine.

3.11.4 Cleanliness of the workplace

CAUTION

Cleanliness of the workplace and environment!

Injuries are possible due to slipping, tripping and falling.

Ensure that the workplace is clean. In addition, work carefully.

3.11.5 Conduct in case of malfunctions

CAUTION

Troubleshooting during operation!

Personal injuries and damage to property possible.

Press the EMERGENCY STOP button before commencing with this work.

Troubleshooting work may be carried out exclusively with the machine stopped.

Dental Concept Systems GmbH is to be informed of malfunctions.

3.11.6 Danger of electric shock

Work on the electrical supply may only be carried out by employees of Dental Concept Systems GmbH.

WARNING

Fatal or serious injuries possible in case of the occurrence of

- **loose plug connectors,**
- **damage and**
- **mechanical and thermal stresses!**

Switch the system off and inform Dental Concept Systems GmbH immediately.

3.11.7 Danger due to pneumatic energy

Work on the pneumatic equipment may only be carried out by employees of Dental Concept Systems GmbH.

WARNING

Danger due to whipping of hosepipes,

danger due to parts being flung and

danger due to the escape of compressed air!

Serious injuries are possible in the case of

– **open pneumatic connections and**
– **loose pneumatic connections.**

Switch the system off and inform Dental Concept Systems GmbH immediately.

3.11.8 Danger to the environment

Dispose of the used-up material, milling swarf, grinding residues and coolant in accordance with the locally applicable laws.

The following operating resources must be disposed of as special waste:

– Metal coolant 014
– Ceramic coolant 016

The following operating resources must not get into the soil and groundwater:

– Metal coolant 014
– Ceramic coolant 016

3.11.9 Safety systems

(1) Switch panel with *'STOP'* and *'ON | OFF'* buttons

System stops immediately when pressed.

(2) Front door

Closes the machining compartment.

3.11.10 Product-specific danger instructions

The protection and safety systems must always be in perfect working order.

The front door of the DC5 Dental Milling System is very heavy and is held by counterweights connected to the door by wire cables.

WARNING

Danger when closing the front cover!

Crushing and cuts possible.

Before commencing with any work, it is essential to check the ease of movement of the front door and whether the counterweights hold the front door in position.

4 Technical data

4.1 Weight and dimensions

Weight	
Overall weight	680 kg
Dimensions	
Width	730 mm
Height	1950 mm
Depth	750 mm

For the weight and dimensions, see also *section 8 'Installation conditions'.*

4.2 Environmental conditions

Ambient temperature	
Storage	5 – 40 °C
Operation	15 – 30 °C
Humidity	
Relative humidity	< 50%

For the environmental conditions during operation see also *section 8 'Installation conditions'.*

4.3 Electrical connection

Electricity	
Voltage	220 V / 50 Hz
Power	1250 VA

For the electrical power supply see also *section 8 'Installation conditions'.*

4.4 Pneumatic connection

Compressed air	
Pressure (constant)	7 – 9 bar
Flow rate	100 l/min
Water content	Class 4
Solid contaminants	Class 3
Total oil content	Class 3

For compressed air supply see also *section 8 'Installation conditions'.*

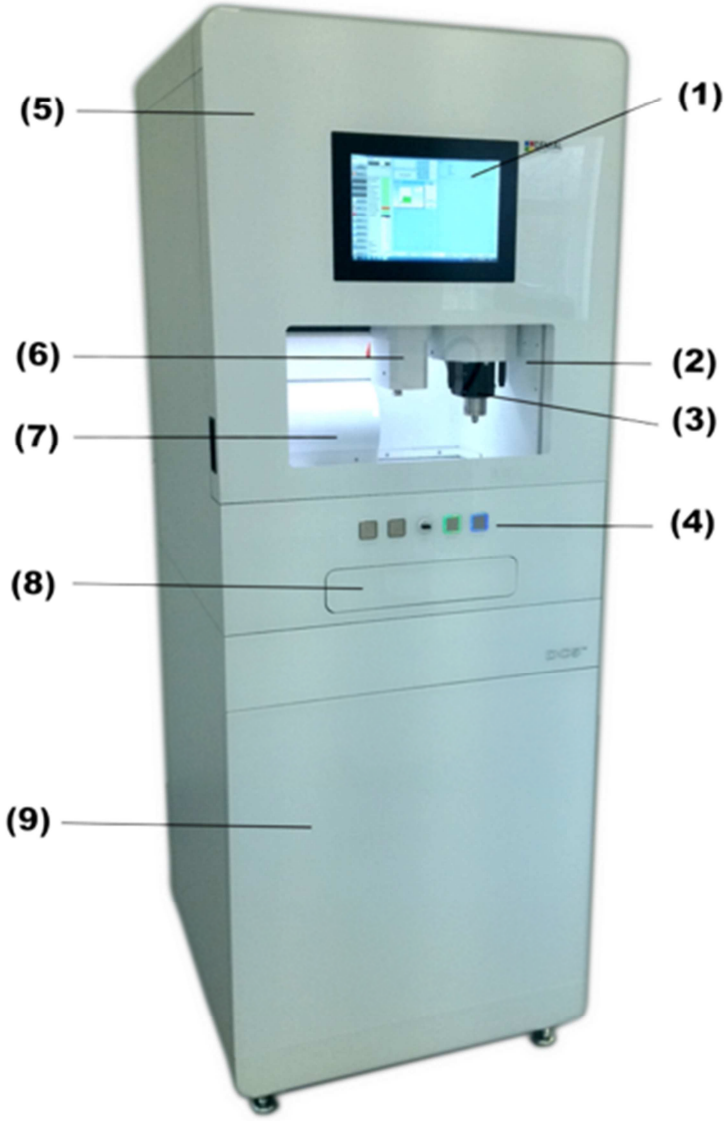
4.5 Network connection

Network interface	
Connection	RJ-45 socket
Network protocol	TCP/IP

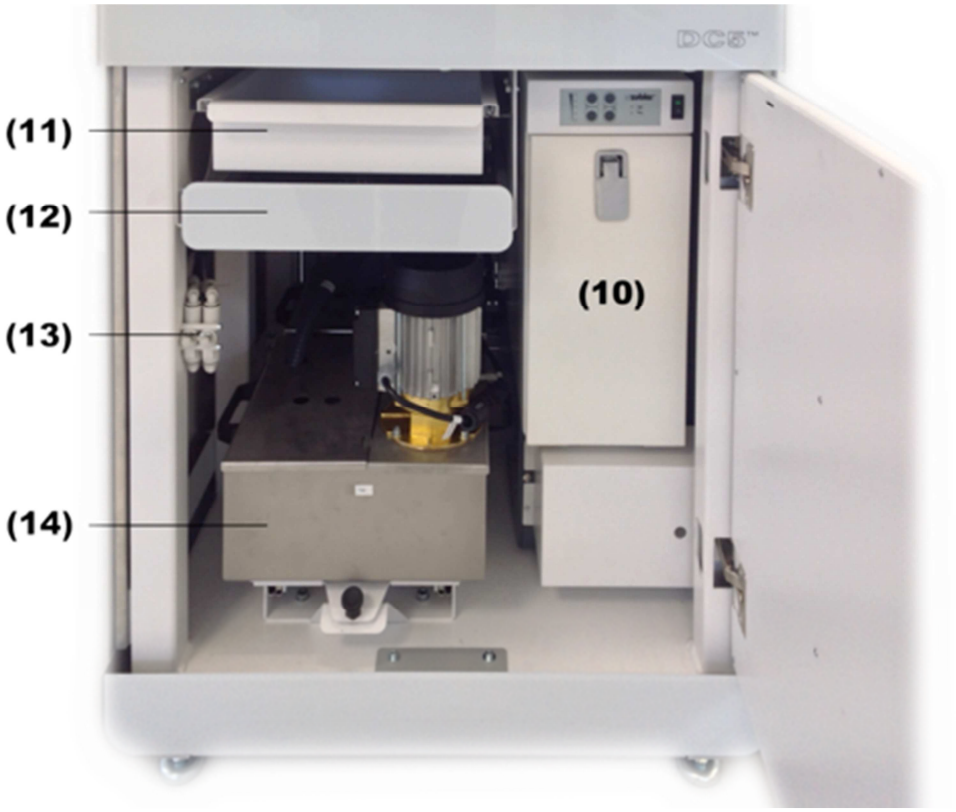
5 Structure and function

5.1 Overview of DC5 Dental Milling System

The following two illustrations show the most important operating elements and components of the DC5 Dental Milling System.



(1)	Touch screen
(2)	Window of the machining compartment
(3)	High-frequency spindle
(4)	Operating panel
(5)	Front door for covering the machining compartment
(6)	Gripper for blank holder (optional)
(7)	Blank magazine (optional)
(8)	Coolant tub
(9)	Front door to coolant pumps with coolant tubs (optional) and extraction module



(10)	Integrated extraction module with filter bag
(11)	Drawer
(12)	Coolant tub for second coolant circuit (optional)
(13)	Control valves for cooling circuits 1 & 2 (optional)

(14)	Coolant tank with pump for milling titanium (optional). *A further coolant tank with pump for the grinding of ceramics (optional) is located behind the coolant circuit for titanium.*

The DC5 is a five-axis dental milling system with a portal design in whose basic version zircon oxide, aluminium, PMMA, composites, occlusal splint plastics, waxes and various commercially available modelling materials can be dry-machined.

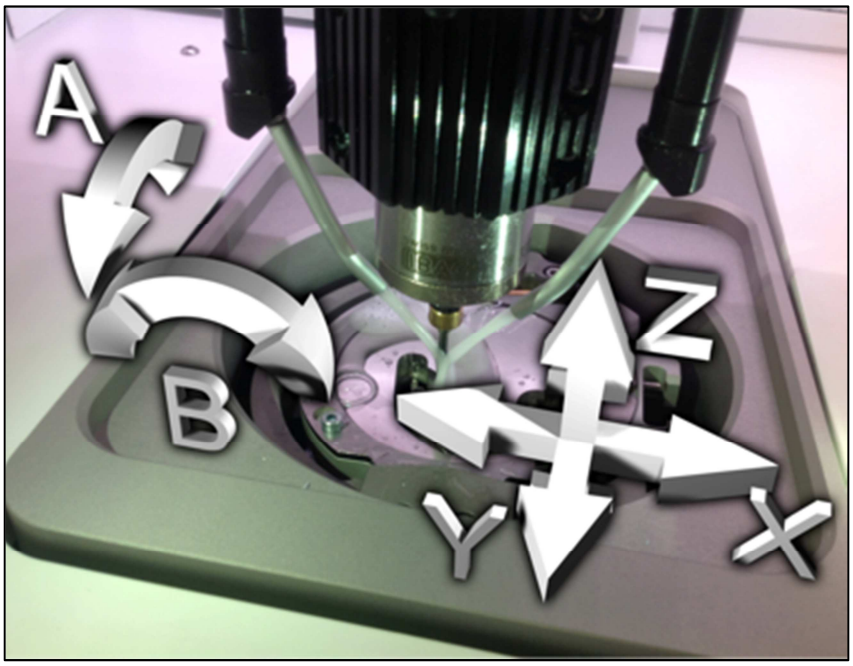
Five servo motors enable the simultaneous control of all axes. The high-resolution rotary encoders of the motors supply up to 160,000 pulses per revolution.

The three translatory axes – X, Y and Z – are equipped with quality ball screws with a repeatability of up to 0.01 mm. The two rotary axes are each equipped with a precision reduction from the Harmonic Drive company and permit high-precision rotation by +/- 32° for the A-axis and by 360° for the B-axis.

The integrated tool change system with exchangable tool magazines and digital tool length measuring system manages up to 100 tools.

The complete control and power electronics are located inside the milling machine. The machine is controlled by the integrated industrial PC on Microsoft Windows 7 basis with touchscreen control.

The illustration below shows the arrangement of the translatory axes (X, Y, Z) and rotary axes (A, B).



5.2 High-frequency spindle

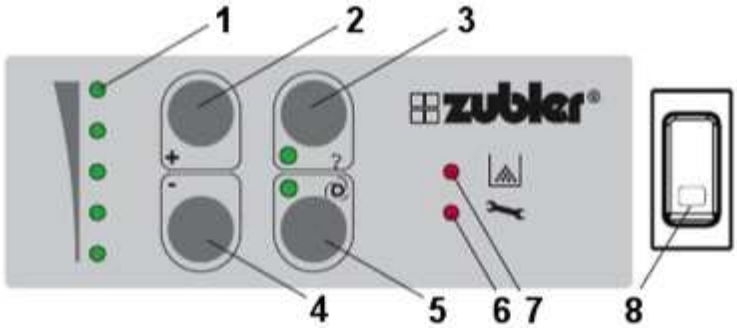
The DC5 Dental Milling System is equipped with a high frequency spindle from the IBAG company. The spindle has a pneumatic direct-change system with a 6 mm collet chuck holder. The encapsulated quadruple hybrid ceramic bearing and the automatic collet chuck cleaning reduce maintenance to a minimum

High-frequency spindle	
Manufacturer	IBAG, Switzerland
Type	HF 45 DCS (custom made)
Diameter	45 mm
Tool draw-in force	800 N
Collet chuck holder	6 mm
Power	750 – 975 W
Max. rotary speed	60,000 rpm

5.3 Vacuum (optional)

The DC5 Dental Milling System is supplied in the basic configuration with a connection for an external extraction system. Optionally the DC5 can also be supplied with an integrated V7000 extraction module from Zubler Gerätebau GmbH. The V7000 is advantageously conceived for longer running times. At the same time, the fan with 4 suction stages creates a high maximum vacuum and a high air flow rate.

Vacuum	
Manufacturer	Zubler Gerätebau
Type	V7000
Width	200 mm
Height	650 mm
Depth	600 mm
Weight	31 kg
Rated power	700 W
Suction capacity	20 – 40 l/s
Noise level	54 – 66 dB(A)



(1)	Suction stage display
(2)	Plus button
(3)	Input button
(4)	Minus button

(5)	Fan button
(6)	Excess pressure indicator
(7)	Filter exchange indicator
(8)	Mains switch

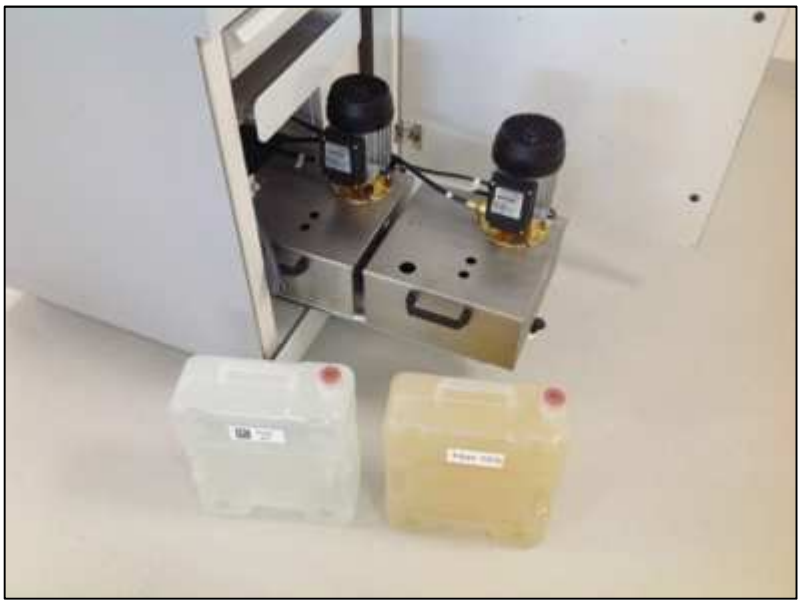
See also the operating manual for the V7000, Zubler Gerätebau GmbH

5.4 Wet machining (optional)

The optional modules ‘DC5 ceramic grinding module’ and ‘DC5 wet metal module’ extend the system by the wet machining of titanium and the wet grinding of glass ceramics.

The two coolant circuits are separate from each other. The integrated cooling lubricant tanks including filter systems and pumps are permanently installed in the lower cabinet.

The flow rate can be adjusted separately for each cooling lubricant circuit by means of control valves in the lower cabinet.



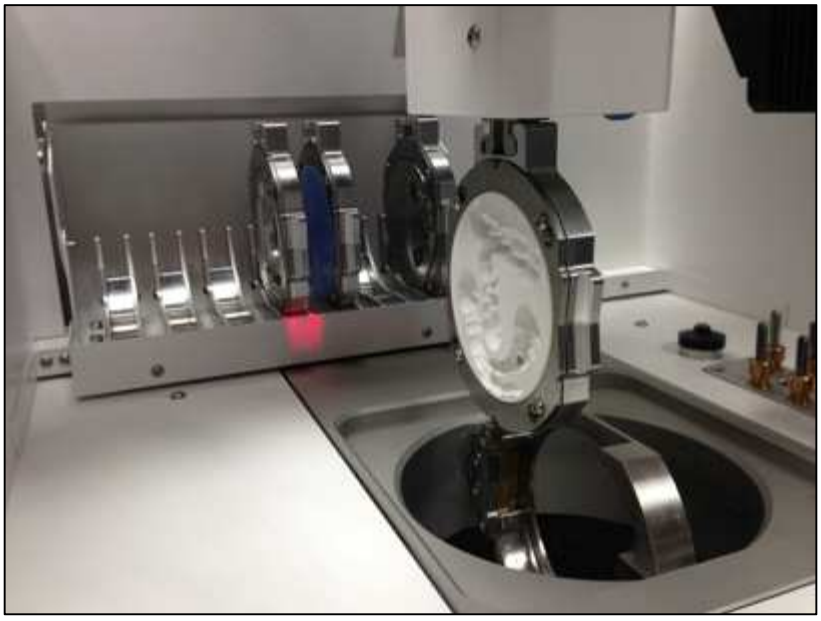
Cooling lubricant circuit	
Pump	
Manufacturer	Speck Pumpen
Type	T-201/130.0004 MS
Connections	G ¾”
Immersion depth	130 mm

Voltage	230 V
Rotary speed	2800 rpm
Power	0.35 W
Weight	10 kg
Filter	
Type	Filter cartridge, wound
Material	Polypropylene
Pore size	5 µm
Length	10”
Coolant tank	
Volume	12 l

5.5 Automatic blank changer (optional)

The material magazine can accept up to 7 blanks, each with a thickness of > 32 mm. The automated gripper system is equipped with triple sensor monitoring.

The DC5 Dental Milling System can optionally be equipped with an automatic workpiece changer.



Automatic blank changer	
Max. number of blanks	7
Thickness of each blank	Up to >32 mm

5.6 Tools

The DC5 milling machine is designed for milling tools and mounted points with a shaft diameter of 6 mm.

NOTE!

We urgently recommend the use of milling tools from Dental Concept Systems. These tools were developed exclusively for dental automation and are suitable for the machining of all commercially available dental materials.

In addition, DC milling tools are adapted directly to the requirements of the milling systems from Dental Concept Systems and provide dental technicians with the necessary process reliability for the full range of materials. The substrate, cutting edge geometry, finishing treatment and coating have been developed taking into account state-of-the-art milling strategies in the DC conceptCAM and adapted to suit the most diverse materials.

The following tools are currently available:

- **Blueline** for the machining of CoCr steels, pure titanium and titanium alloys
- **Silverline, Yellowline and Redline** for the machining of unfired high-performance ceramics such as zircon oxide and aluminium oxide with various coatings as well as PMMA and wax.

- **Silverline** ball-nose milling cutters for the machining of premium zircon oxides, PMMA and wax.
- **Yellowline** tools have additionally been provided with a special coating that ensures an extremely smooth surface finish and optimises resistance to wear.
- **Redline** for translucent and sensitive zircon oxides.
- **Whiteline** for the machining of composite fibre-reinforced materials.
- **Greenline** for grinding all commercially available glass ceramics on the dental market as well as grinding new-type composites and hybrid ceramics.

6 Delivery, in-plant transport, unpacking

Delivery, in-plant transport and unpacking of the DC5 milling machine may be carried out only by technical personnel using suitable means of transport. It is essential to observe legal regulations for the prevention of accidents.

CAUTION

Heavy loads!

The DC5 Dental Milling System weighs 680 kg with accessories (approx. 710 kg including packaging).

Use only suitable means of transport and lifting equipment to transport the machine. Transport only on the frame!

WARNING

Transport of the machine!

When lifting, swivelling and lowering, there is a danger of injury due to parts falling down. The machine can be damaged or destroyed by improper transport.

Therefore, as a matter of principle, observe the following safety instructions:

– Use only approved lifting equipment and attachment devices with a sufficient load-bearing capacity.
– Fasten the machine only by the attachment points provided, not by protruding machine parts or by the lifting eyes of attached components. Make sure the attachment devices are firmly seated!
– Ropes and straps must be equipped with safety hooks. Do not use torn ropes or ropes with chafe marks. Do not place ropes and straps against sharp edges, do not knot them and do not twist them. When rigging, observe the centre of gravity of the machine.
– Never lift, swivel or lower loads above people.
– Always move the machine with the greatest of care and caution.

The DC5 milling machine may only be transported by qualified and authorised technical personnel.

DANGER

Suspended loads!

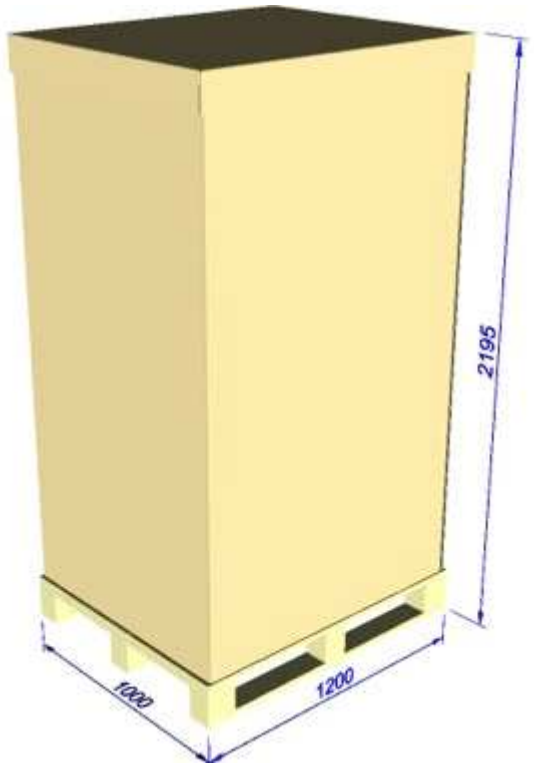
Suspended loads can fall down and lead to serious injuries.

Do not walk under suspended loads when transporting using lifting equipment!

6.1 Delivery, in-plant transport

6.1.1 Dimensions and weight in the packed condition

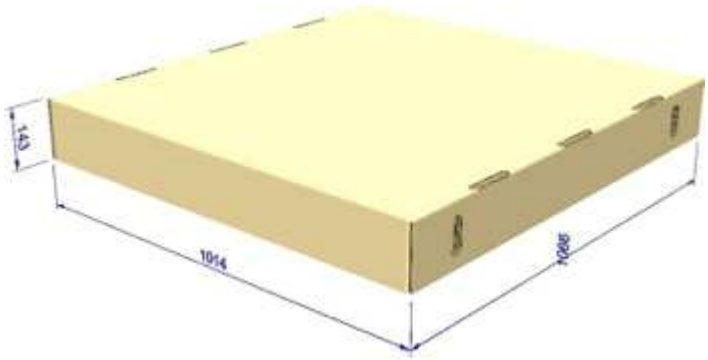
- DC5 Dental Milling System packaging unit
  The DC5 Dental Milling System is delivered standing upright on a pallet in special packaging.



- Dimensions (W x D x H): 1200 mm x 1000 mm x 2195 mm
- Weight: 760 kg

- Transportable ramp packaging unit
  The transportable ramp is delivered in an unassembled condition.

For the assembly, see *section 6.1.4 'Use of the transportable ramp'*.



- Dimensions (W x D x H): 1065 mm x 1015 mm x 145 mm
- Weight: 30 kg

6.1.2 Delivery

The shipment is delivered by a transport company and unloaded at the customer's site.

(1) Inspect the unloaded shipment immediately for transport damage (defective packaging, visible damage).
If the shipment is damaged:

– Document the damage and report it to the transport company.

– Report damage immediately in writing to Dental Concept Systems GmbH.

(2) Transport the shipment to the place of installation using a fork-lift truck or pallet truck.

WARNING

Transport of the machine!

The packaged machine standing on a pallet has a high centre of gravity!

During transport there is a danger of injury due to the machine tipping over!

During transport, be sure to use suitable transport locks (lashing straps) and raise the packed machine as little as possible.

NOTE!

Depending on the location of the place of installation, the milling machine must first be unpacked.

The unpacked machine is fitted with two slots for forks (pallet truck or fork-lift truck) at a height of approx 45 mm or 950 mm above floor level.

In addition there are fastening eyes on the top side of the machine for lifting the DC5 with a crane.

See section 6.1.3 ‘Unpacking’ and section 6.1.4 ‘In-plant transport’.

DANGER

Suspended loads!

Particular caution is required when lifting the DC5.

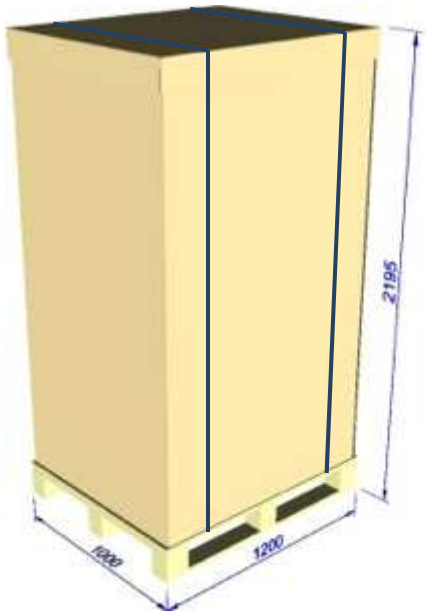
Suspended loads can fall down and lead to serious injuries.

Do not walk under suspended loads when transporting using lifting equipment!

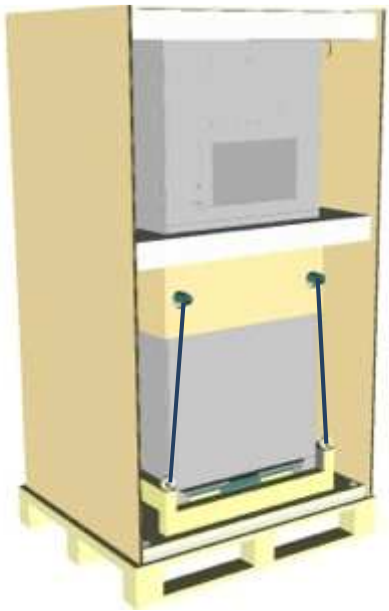
6.1.3 Unpacking

(1) Unpack the shipment. Proceed as follows:

– Remove the lashing straps from around the pallet and lid:

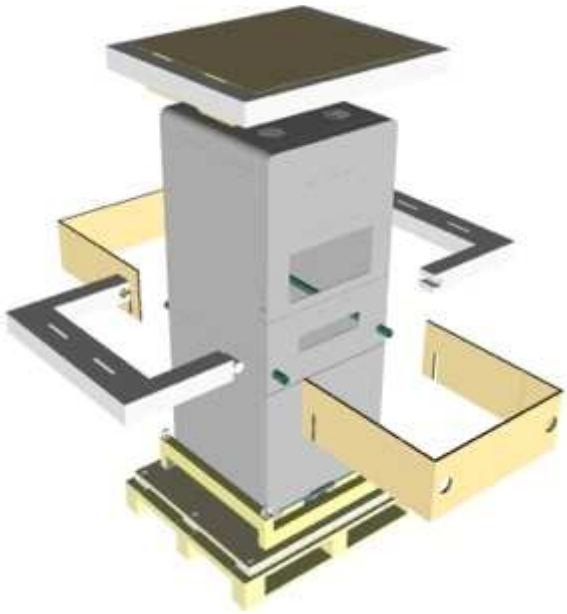


– Remove the lid on the top side and the side walls:

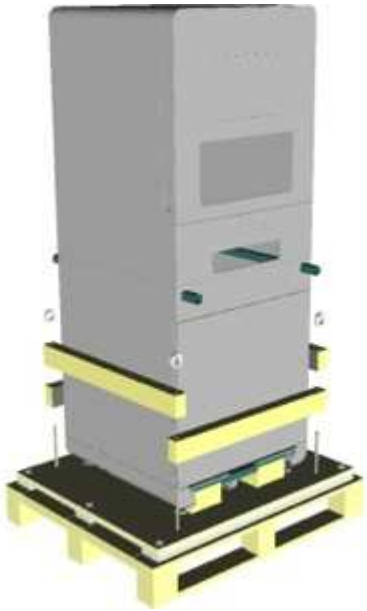


– Remove the complete side walls and the lashing straps:

– Remove the foam padding and the cardboard stacking aid:



– Unscrew the eye bolts for the fastening of the lashing straps to the pallet and remove the wooden ring:



When using a fork-lift truck the milling machinethe DC5 can now be lifted off the pallet. Proceed like described in *section 6.1.4 'In-plant transport'.* You might need to remove the covers to use the two receptacles first.

NOTE!

Use always the upper receptacles for the forks when the milling machine is lifted off the pallet by a fork-lift truck.

– Alternatively there is a possibility to roll the milling machine off the pallet by means of the transportable ramp.

See section 6.1.5 'Use of the transportable ramp'.

(2) Check the shipment for damage.

If the shipment is damaged:

– Document the damage and report it to the transport company.

– Report the damage in writing without delay to

Dental Concept Systems GmbH

Buchbrunnenweg 26

D- 89081 Ulm

(3) Check the shipment for completeness.

See *section 2.4 'Scope of delivery'.*

6.1.4 In-plant transport and transport plan

The DC5 Dental Milling System is equipped with two receptacles for the forks of fork-lift trucks.

The receptacles are located at a height of 45 mm or 950 mm. In the assembled state the receptacles are equipped with covers.

The covers must be removed before use.

When raising the machine – e.g.: lifting off the pallet – be absolutely sure to use the higher of the two receptacles due to the high centre of gravity of the machine.

Observe the transport plan without fail!

On level and non-sloping surfaces the milling machine can also be moved over short distances by means of the castors attached to the sub-frame. The milling machine has three castors in total. The single castor at the front side of the milling machine can be steered.

NOTE!

The feet must be screwed in before the milling machine can be rolled!

Use a pallet truck if possible for transport over longer distances. To do this, drive the pallet truck from the front side into the receptacles for the forks on the underside and slightly raise the milling machine.

CAUTION

Unsafe transport!

The integrated rollers of the DC5 milling machine are suitable only for rolling the machine off the pallet using the transportable ramp or for transport over short distances on a level floor.

For longer distances, or if the floor is uneven, it is essential to use a suitable lifting tool (e.g. pallet truck or fork-lift truck).

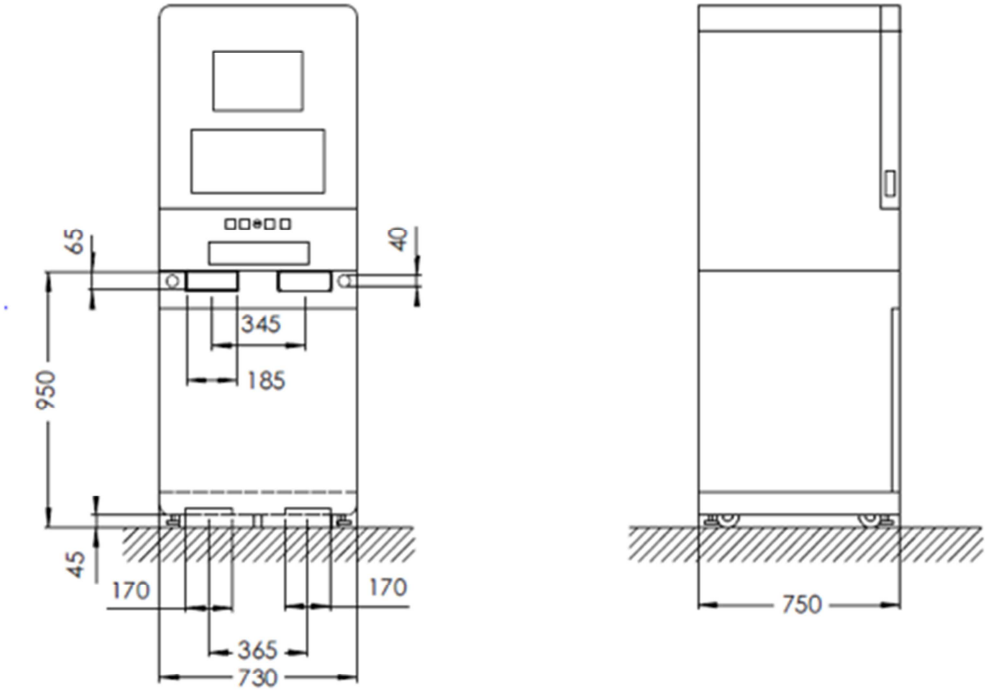
WARNING

Danger of tipping over!

Always raise the machine as little as possible due to its high centre of gravity.

There is a danger of serious injuries if the machine tips over!

When transporting with a fork-lift truck, use the upper receptacles for the forks if possible!



Technical data:

Width x height x depth:	730 mm x 1950 mm x 750 mm
Weight:	530 kg without vacuum
Transport system:	Carrying rails, fork-lift truck pallet truck, crane

6.1.5 Use of the transportable ramp

Using the transportable ramp the DC5 milling machine can be rolled off the pallet without having to use a fork-lift truck.

Due to its heavy weight the DC5 must be secured against uncontrolled rolling using straps when doing this.

WARNING

Transport on sloping surfaces!

Heavy loads can roll uncontrollably on sloping surfaces and cause serious injuries.

The machine can be damaged.

Secure the DC5 milling machine against uncontrolled rolling using suitable straps when transporting via the ramp!

NOTE!

The DC5 has two fixed rollers under the back side and a steering roller under the front side.

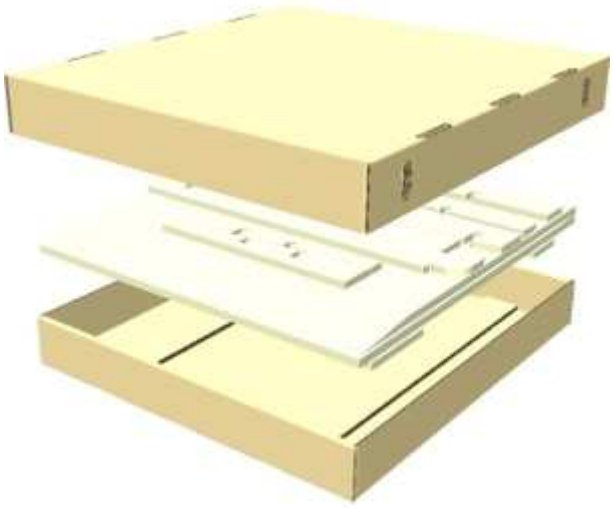
When using the ramp take care that the front side of the DC5 faces always to the ramp. Entering the pallet the two fixed rollers will enter the pallet at first, leaving the pallet the two rollers will leave the pallet at last.

If you try to leave the pallet with the two fixed rollers at first, the underfloor of the DC5 will crash into the pallet and the DC5 can’t be moved anymore.

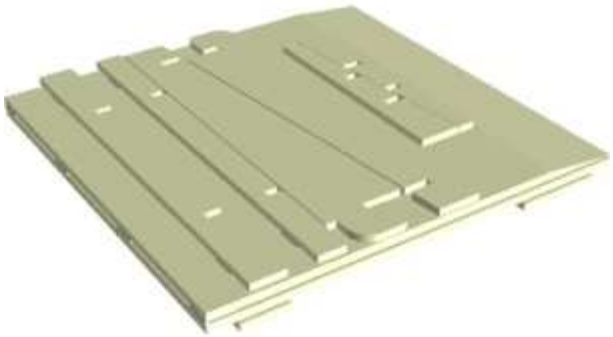
The transportable ramp is delivered in a dismantled condition and must be assembled before use.

Proceed as follows to assemble:

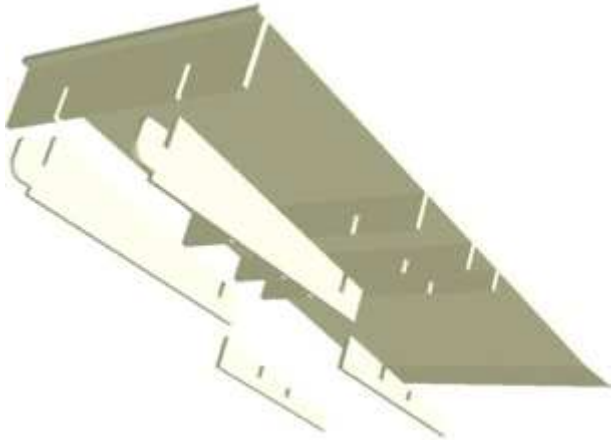
– Open the transport packaging:



– Remove the ramp components:



- Fit the components together as shown:



During transport the DC5 rests on two wooden blocks. These blocks must be removed before the DC5 can be rolled down the ramp.

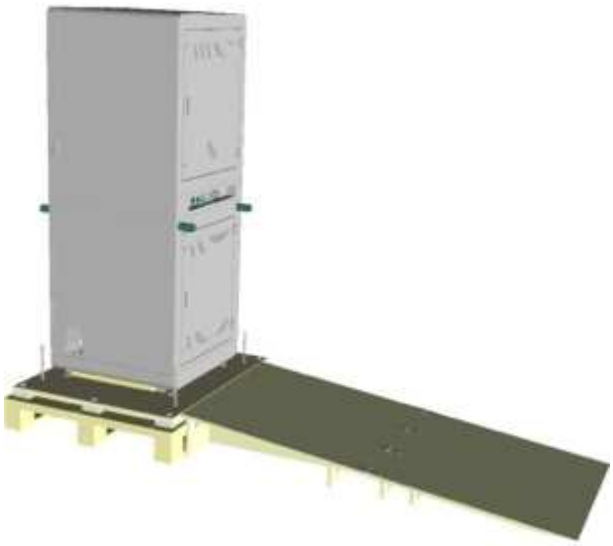
– Unscrew the four feet of the DC5 to slightly lift the machine so that the two wooden blocks in the lower fork receptacles can be removed:

From July 2014 the DC5 will be shipped with a new type of machine foot. Screw and base are separated now.

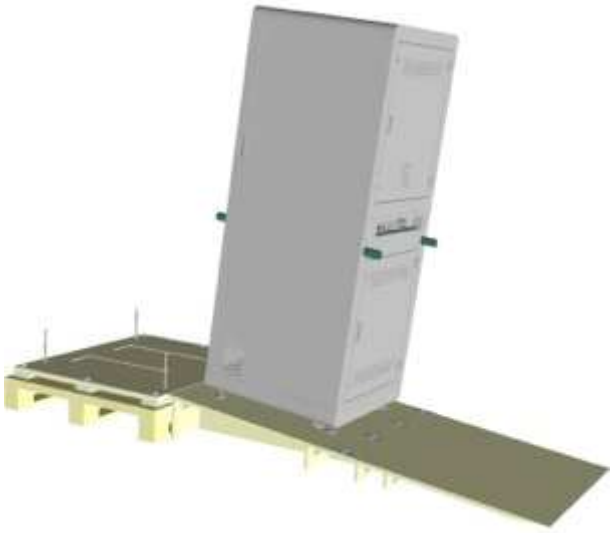
Drive in all screws entirely (until stop). Now place the two flat wooden boards into the cut-outs for the (removed) wooden blocks.

Machines with new machine feet (07(2014): Drive in the screws entirely and remove the bases.

– Position the ramp against the pallet and fix it:



– Secure the milling machine against uncontrolled rolling and roll it down the ramp:



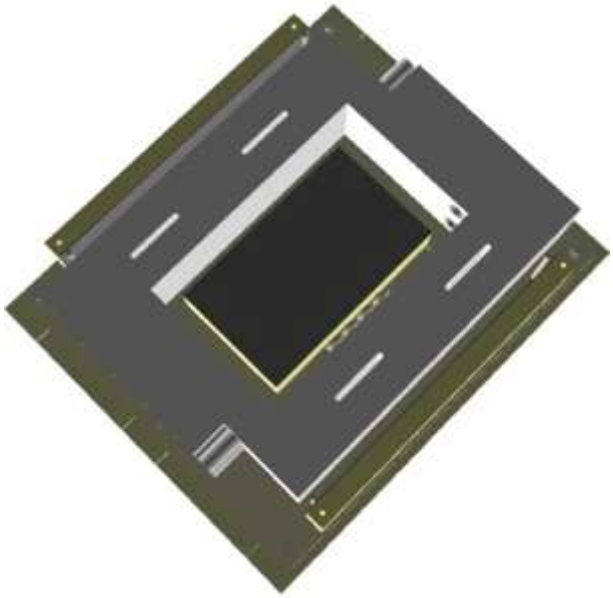
6.1.6 Packaging

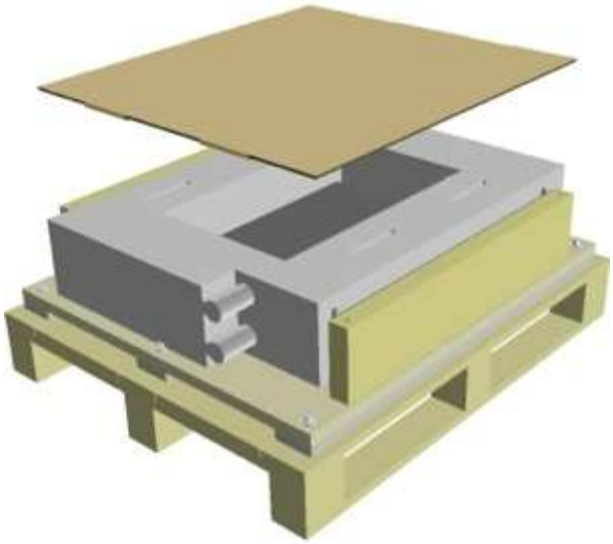
It is urgently recommended to store both the packaging of the DC5 and the transportable ramp for a possible subsequent transport.

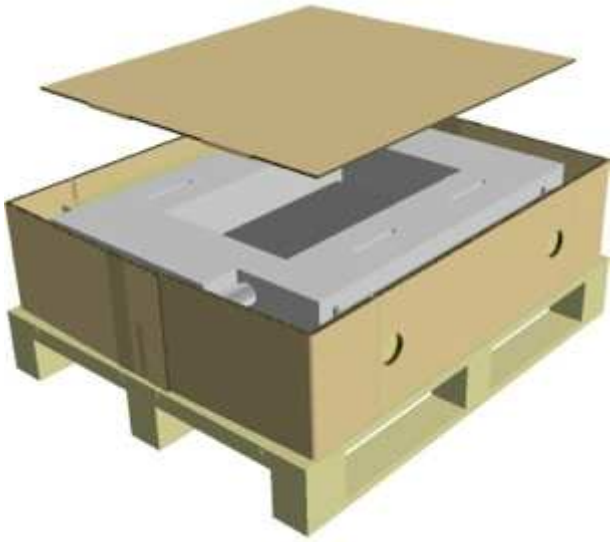
Both the packaging of the DC5 and the transportable ramp can be dismantled and packed in a very small space.

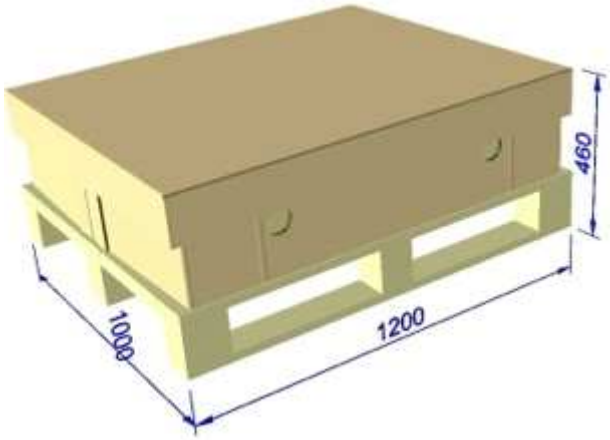
When folding up the transportable ramp, proceed in the reverse order to that given in section 6.1.5 ‘Use of the transportable ramp’.

The packaging of the DC5 is folded up and packed as follows:








460
1000
1200

7 Storage conditions

7.1 Storage conditions

Max. permissible air temperature in the storeroom:
+5 °C to +40 °C.

7.2 Shutting down the DC5 Dental Milling System

(1) Stop the DC5 Dental Milling System.

(2) Disconnect the DC5 Dental Milling System from the electrical and pneumatic energy supplies.

(3) Cover / pack the DC5 Dental Milling System

See *section 6.1.3 'Unpacking'* – proceed in the reverse order

(4) Store theDC5 Dental Milling System safe from tipping over, dry and free from dust and vibrations.

8 Installation conditions

NOTE!

The DC5 Dental Milling System must be installed by qualified personnel from Dental Concept Systems GmbH.

CAUTION

Poor stability of the machine!

Impact and crushing hazards are possible if the DC5 is not stable.

Serious injuries and crushing are possible if the DC5 Dental Milling System falls over.

Make sure that

– the stability of the system is ensured
– the floor is level
– the maximum load capacity of the floor is not exceeded.

CAUTION

Improper routing of cables and pipes!

Danger of slipping and tripping up due to the improper routing of cables and pipes.

– Lay cables and hosepipes outside of thoroughfares.
– Make sure that cables and hosepipes are not damaged by being driven over, squeezed, pulled or the like.
– If necessary, install protective devices to prevent being stepped on / driven over.
– Make sure that the connection points are not exposed to transverse loads.

8.1 Installation conditions

8.1.1 Dimensions and weight in the operating condition

– Dimensions (W x D x H): 730 mm x 750 mm x 1950 mm

  Ensure that there is an adequate distance to the ceiling (opening of the front door) and to the sides. Observe the specifications in the installation plan in *section 8.2 'Installation plan'*!

  Allow sufficient space for the working and service area.

– Weight: 680 kg

8.1.2 Environmental conditions

The following environmental conditions apply to the operation of the DC5:

– Permissible operating temperature 15-30 °C

– Max. permissible relative humidity < 50%

NOTE!

The DC5 Dental Milling System should be subjected only to small temperature fluctuations in operation.

It is essential to avoid direct exposure to the sun!

Strong temperature fluctuations can lead to milling inaccuracies!

8.1.3 Foundation and floor

– Load capacity: Take into account the machine weight (see 8.1.1).

  Take into account optional accessories.

– The floor must be level and firm with a low vibration level.

  The DC5 must be levelled horizontally.

8.1.4 Electrical connection

– The values for the electrical power supply indicated on the type plate are binding and must be adhered to.

– Voltage supply: 220 V / 50 Hz

– Power consumption: 1250 VA

NOTE!

Milling machine, IT components and heavy electrical loads (e.g. sintering furnaces) must each be connected via separately fused circuits!

If a circuit is loaded too heavily, voltage fluctuations and phase shifts can occur in addition to malfunctions. The result of this is that work processes stop unexpectedly, since complex electronic modules demand a reset and the computer or milling programs must be restarted. Your work, with work steps that have only been partly executed up to that point, will mostly be unusable or you will suffer losses of time due to references or information being lost.

If a separate wall socket exists, a check must be made to ascertain whether this is really separately cabled and fused from the distributor or whether further sockets are connected to the same line.

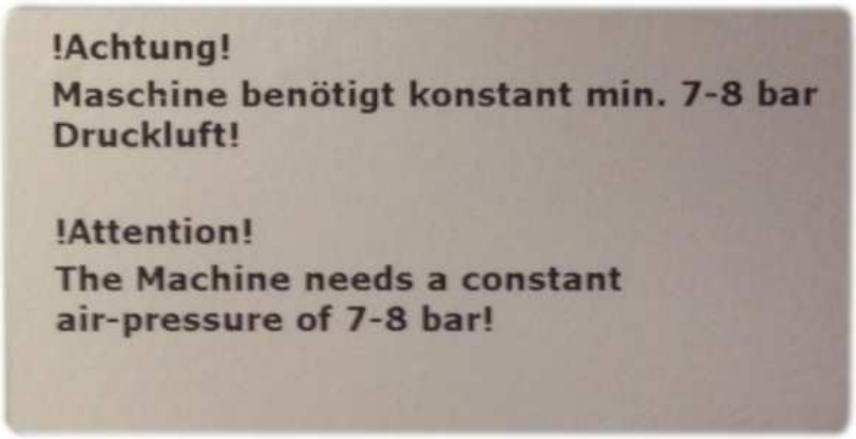
Although high standards apply to the screening and voltage stability of the components of the system and the DC5, disturbances in the mains supply due to different electrical loads in the laboratory can have an effect on the electronic controller of the CAD-CAM system. Therefore the expenditure for a direct and separate voltage supply is unavoidable.

NOTE!

The trouble-free function of electronically controlled equipment is possible only with a clean and stable power supply!

8.1.5 Pneumatic connection

- Pressure (constant): max. 9 bar
- Minimum working pressure: 7 bar
- Maximum working pressure: 8 bar
- Flow rate: 100 l/min.
- Water content: Class 4
- Solid contaminants: Class 3
- Total oil content: Class 3



The air-cooled spindles and pneumatic tool holders must operate with an accuracy of microns so that precisely-fitting objects can be produced with very high accuracy.

Contaminated or moist compressed air leads to high wear, loss of quality and errors in the milling objects extending up to strong heating and blockage of the mechanisms. Cleaning and repair are then no longer possible.

NOTE!

A condensate separator and simple filter elements do not offer sufficient protection!

Water in the sight glass is merely a sign of moisture in the compressed air and prevents the direct occurrence of water droplets at nozzles and valves. Deposits and corrosion occur unhindered as long as the specified classes of compressed air quality are not achieved.

NOTE!

Compression requires energy. Do not waste energy by generating contaminated compressed air of poor quality. With a high-quality compressor you can generate clean and dry compressed air using the same amount of energy.

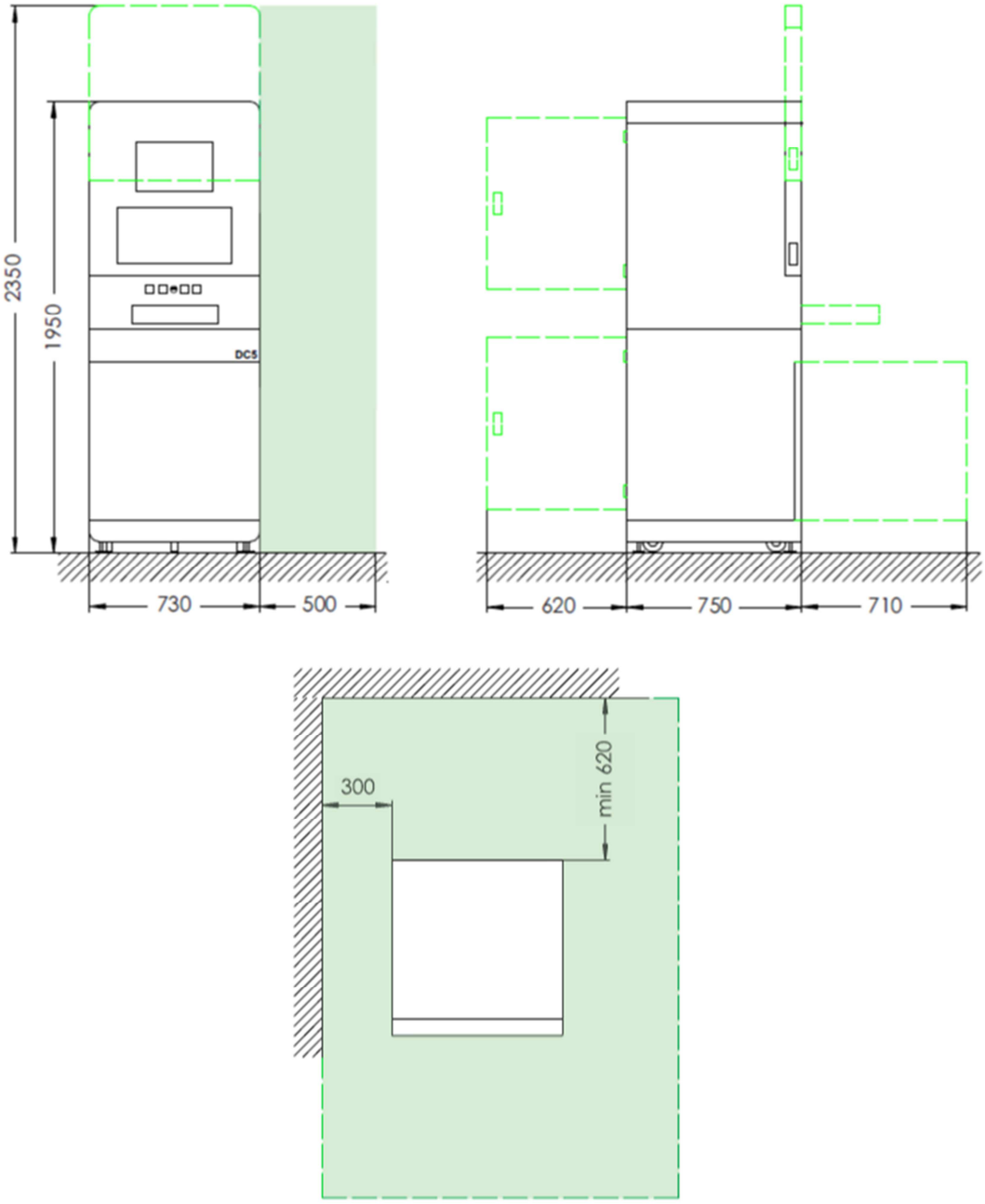
A single case of machine damage due to poor compressed air quality (verifiable) can lead to costs that are equivalent to those that you would have invested in a compressed air preparation system. Other laboratory devices with pneumatic technology also suffer from wet, contaminated compressed air. Here, too, you can save maintenance costs and considerably prolong the service life of your valuable equipment.

8.1.6 Network connection

- Connection: RJ-45 socket
- Network protocol: TCP/IP

The DC5 milling machine has an Ethernet interface on the rear side of the machine and can be integrated into a network using the TCP/IP protocol.

8.2 Installation diagram



9 Assembly and installation, initial commissioning

WARNING

Damaged devices or components!

Incomplete, defective or damaged devices can lead to serious injuries to persons or damage to property.

Use only fully intact devices and components!

Observe the following before installation of the machine or plant:

– Ensure that there is sufficient space for assembly before starting work.
– Beware of exposed, sharp-edged components! Risk of injury!
– Keep the place of assembly clean and tidy! Components and tools lying around or on top of one another are sources of accidents!
– Assemble components properly. Improperly fastened components can fall down or fall over and lead to serious injuries.

WARNING

Improper assembly!

Improper assembly can lead to serious injuries and/or damage to property.

The machine may be installed only by trained technical personnel from Dental Concept Systems GmbH, observing the safety regulations!

WARNING

Sharp-edged tools and workpieces!

There is risk of injury due to sharp-edged tools and workpieces.

Operate the machine only with fully attached and intact protective devices.

CAUTION

Use of incorrect cables!

Use only the cables or mains cables supplied, which are certified according to VDE/UL/CAS/PSE/CCC.

CAUTION

Danger due to fine dust!

Lung damage and difficulty in breathing are possible.

Regularly check and clean the extraction system; exchange the filter.

9.1 Assembly

The DC5 Dental Milling System must be installed on a level and firm floor.

(1) Bring the machine into the correct position at the place of installation or move it there using the integrated castors.

(2) Now unscrew the feet on the lower cabinet until the machine is standing firmly and no longer moves.

– Use an open-ended spanner to unscrew the feet.

– Always make sure when levelling the machine that the machine is standing firmly and doesn't wobble. Adjust the feet evenly and in small steps!

  From 07/2014 the DC5 will be shipped with a new type of machine feet (see also section 6.1.3 "Unpacking" and section 6.1.5 "Use of the transportable ramp"). The new machine feet consist of two separate parts – the screw and the base.

  Place the bases under the screws and slightly drive out the screws. Proceed like described above. Adjust the position of the bases. The round ends of the screws must rest exactly in the screw entries of the bases.

NOTE (machines from 07/2014)!

If a screw was completely removed insert the edged end into the thread.

The round end must be placed on the conically shaped entry of the base.

CAUTION

Danger of tipping over!

Danger of impact and crushing injuries due to poor stability of the DC5.

– Unscrew the feet carefully and in small steps.
– Make sure that the feet are always adjusted evenly and that the machine doesn't wobble!

(3) Check the correct levelling of the DC5 with a spirit level.

9.2 Installation

The connections for power, compressed air and network are located on the rear side of the machine.

The data shown on the type plate applies to the power supply.

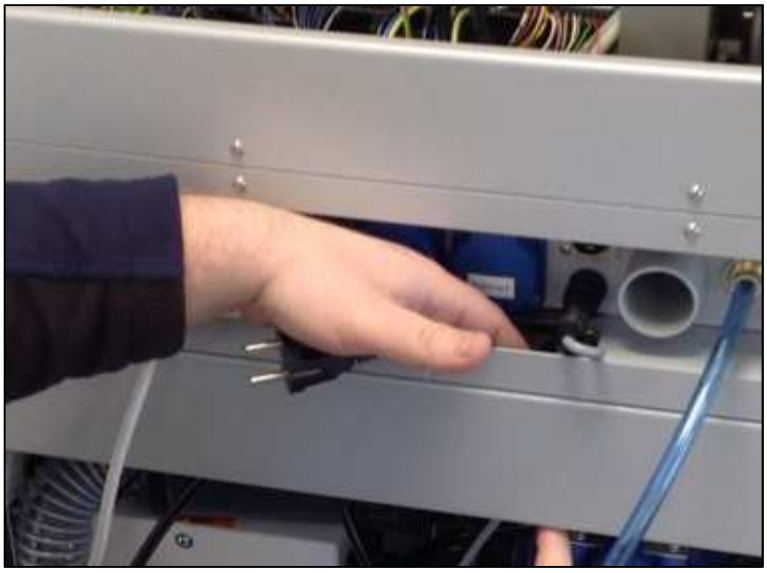
(1)	Mains switch
(2)	IEC socket 230 V
(3)	Internal 230 V connection – extraction
(4)	Internal 230 V connection – cooling lubricant pump 1
(5)	Internal 230 V connection – cooling lubricant pump 2
(6)	Network connection (RJ-45 socket)
(7)	Connection for extraction controller
(8)	Connection for central extraction system
(9)	Compressed air connection
(10)	Cooling lubricant connection 1
(11)	Cooling lubricant connection 2
(12)	Compressed air maintenance unit
(13)	Pressure gauge with monitoring of the pressure by means of adjustable lower and upper limit

9.2.1 Electrical connection

Extraction (optional), cooling lubricant circuit 1 (optional) and coolant circuit 2 (optional) are supplied with electricity by means of IEC power cables plugged into the correspondingly marked 230 V connections (3), (4) and (5) on the rear side of the DC5 .

The assembly has already been done in the factory, so that the IEC power cables do not usually need to be plugged in. If connections (3) - (5) are not yet occupied, proceed as follows:

(1) Feed the cables through the opening on the connection panel on the rear side of the DC5.



(2) Plug the cables into sockets (3) – (5) according to the attached labels.

To connect the DC5 to the electrical power supply, proceed as follows:

(1) Switch the mains switch (1) to ‘OFF’.

(2) Plug the IEC mains cable supplied into the socket (2).

(3) Plug the cable into a free 230 V mains socket.

9.2.2 Pneumatic connection

(1) Insert the compressed air hose provided into the quick-release socket (9) of the milling machine. Make sure that the hose is cut squarely at the end. If necessary, cut the end hose of the hose square using a sharp knife.

(2) Depending on local conditions, provide the other end of the hose with a connecting piece if necessary and insert it into the intended connecting socket.

Switch on the machine (1) and read off the pressure on the pressure gauge (13) of the DC5. Observe the specifications for the constant pressure!

9.2.3 Network connection

(1) Plug the network cable type Ethernet RJ-45 into the socket (6).

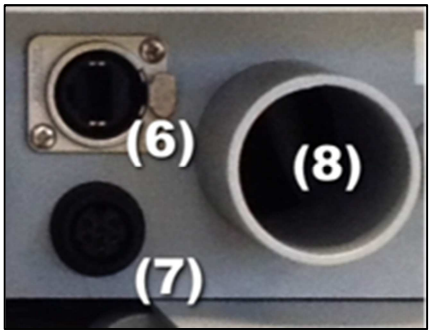
(2) Insert the network cable into the existing network hub or switch.

9.2.4 Extraction connection (optional)

Depending on the model, the milling machine is either equipped with an integrated extraction module or prepared for use with a central extraction system.

NOTE!

The DC5 cannot be operated with an integrated extraction module and at the same time with a central extraction system, since a different internal routing of the suction pipes is required for this!



Machines equipped with an integrated extraction module are usually fully assembled ex works. In this case the connection of the integrated extraction module has already taken place and is therefore no longer necessary. As a matter of principle, the procedure for connecting the power supply and control cables is as follows:

(1) Feed the IEC power cable for the power supply through the opening in the connection panel as described in *section 9.2.1 'Electrical connection'*.

(2) Plug the IEC power cable into the 230 V socket (3) labelled 'Extraction'.

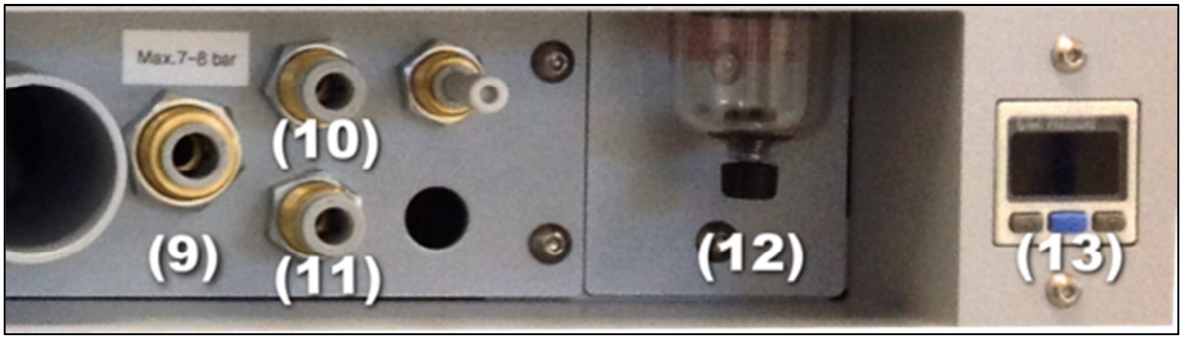
(3) Feed the control cable for the extraction through the opening in the connection panel.

(4) Insert the plug into the socket (7).

When connecting to a central extraction system, push the hose from the extraction system onto the nozzle (8) and fix it with a hose clamp.

9.2.5 Connection of the cooling lubricant circuits (optional)

Depending on the model the DC5 is equipped with a maximum of two independent cooling lubricant circuits.



As a rule, models with cooling lubricant circuits are already fully assembled ex works. In this case the connection of the cooling lubricant circuits has already taken place and is therefore no longer necessary. As a matter of principle, the procedure for connecting the supply lines is as follows:

(1) Feed the IEC power cables for the power supply through the opening in the connection panel as described in *section 9.2.1 'Electrical connection'*.

(2) Plug the IEC power cables into the 230 V sockets labelled 'Cooling 1' and 'Cooling 2'.

(3) Insert the hosepipes for Cooling 1 and Cooling 2 into the quick-release connectors (10) or (11) respectively.

9.3 Software installation

The DC5 Dental Milling System is delivered with a pre-installed operating system and pre-installed application software. An installation is not required.

NOTE!

The software for the DC5 is subject to constant improvement and development. Therefore, check regularly whether new program versions are available for your system.

See *section 10 'Operation'*

9.3.1 System settings for Unicode-incompatible programs

As a rule all required system settings have been made prior to delivery. The following steps should be only carried out or checked if faults and errors occur in the program execution.

See also *section 11 'Troubleshooting'*.

NOTE!

Changes to the system settings!

Incorrect settings in the operating system can lead to the software of the DC5 Dental Milling System no longer working correctly.

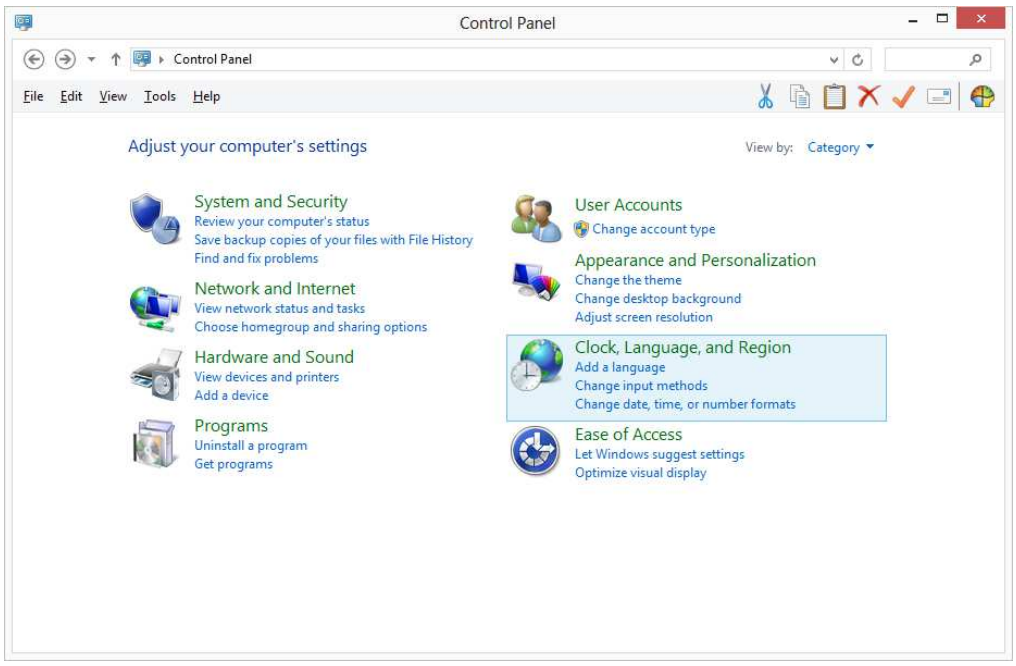
Changes to the system settings should only be carried out by trained and authorised personnel or technical personnel from Dental Concept Systems GmbH.

The software of the DC5 is not Unicode-compatible. For this reason the locale for Unicode-incompatible programs must be set to 'German (Germany)' in the Windows Region and Language settings.

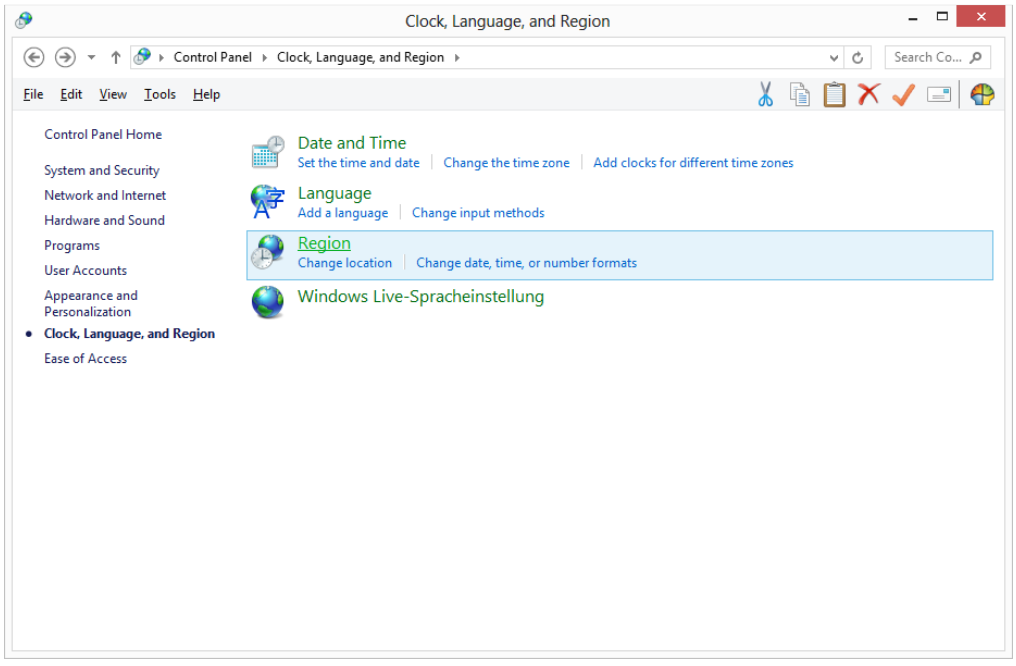
To do this, proceed as follows:

– Tap the Windows Start button and open the Control Panel.

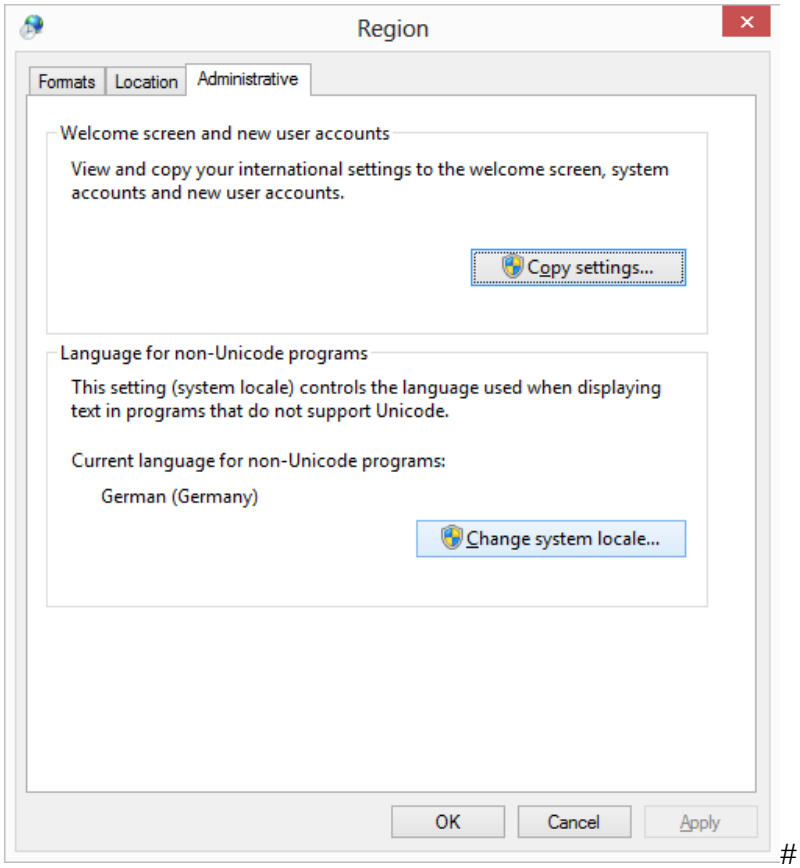
– Now tap the entry ‘Clock, Language and Region’ in the Control Panel:



– Now tap on ‘Region and Language’:

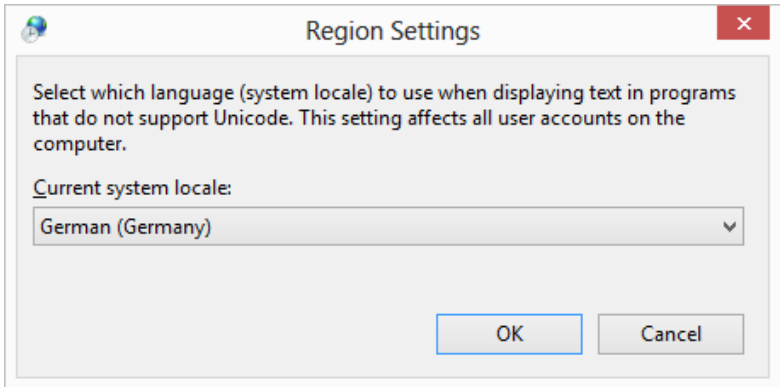


– Now tap the ‘Administrative’ tab in the ‘Region and Language’ dialogue box and then tap the ‘Change system locale’ button:



#

– Now select the setting ‘German (Germany)’ and confirm your selection with ‘OK’:



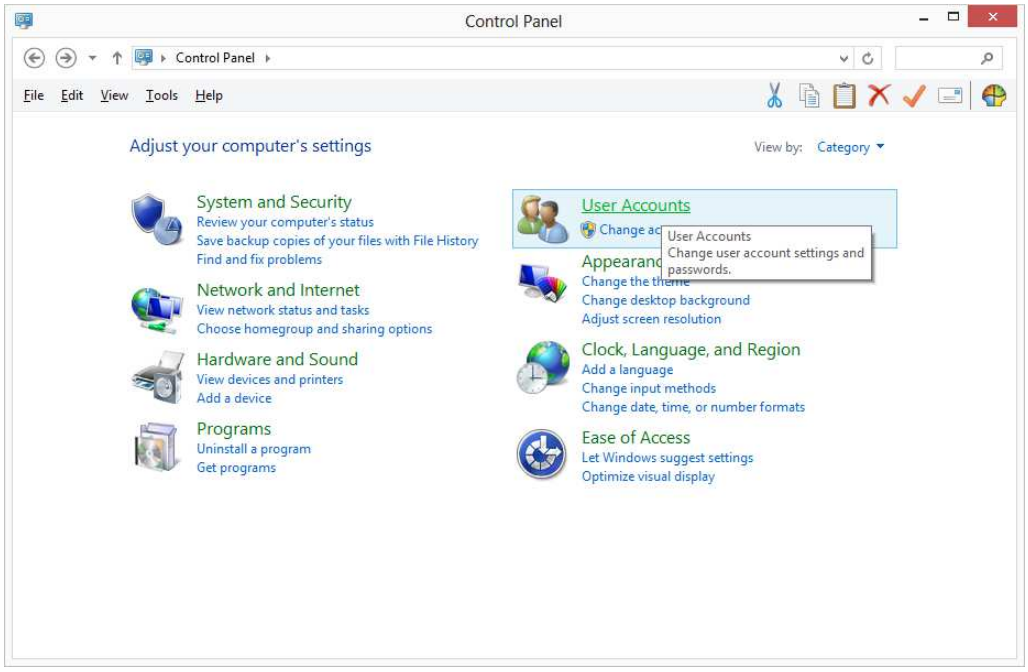
9.3.2 User accounts administration

For trouble-free operation of the DC5 software the user accounts administration in Windows must be deactivated.

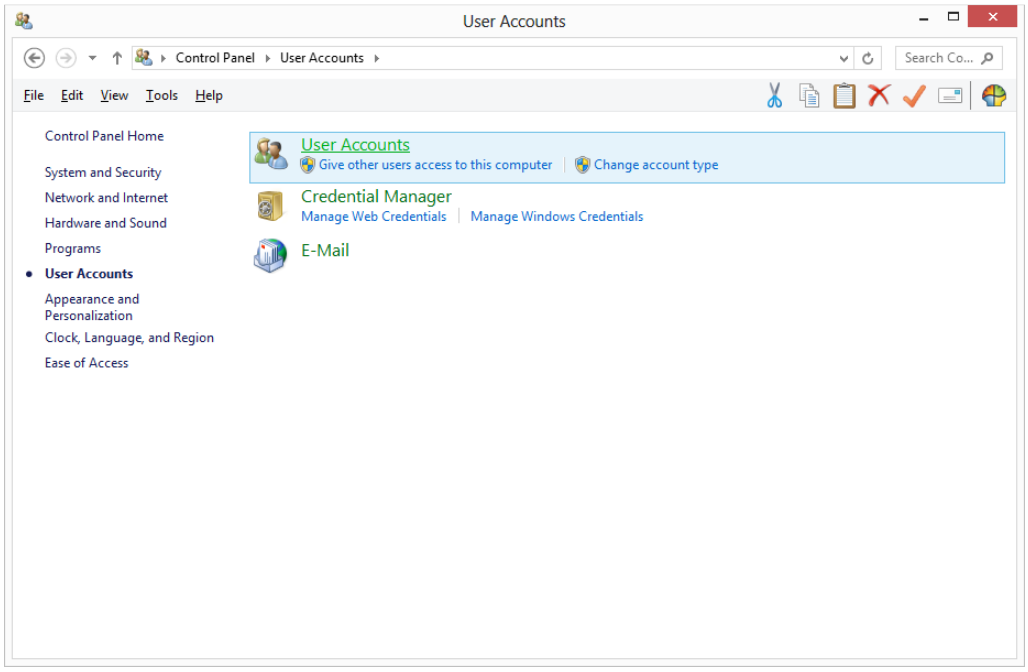
To do this, proceed as follows:

– Tap the Windows Start button and open the Control Panel.

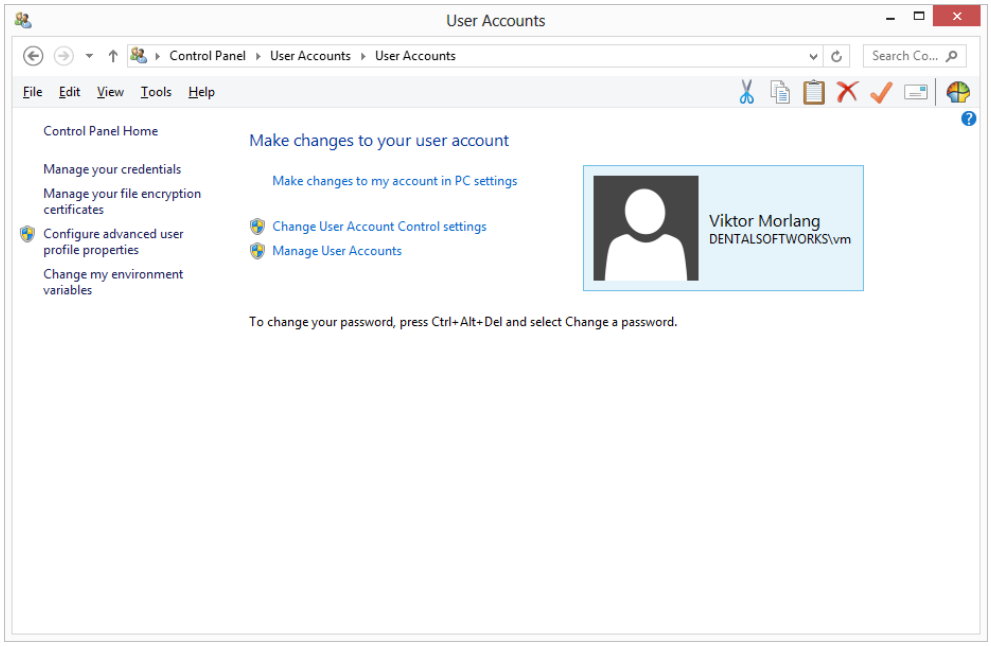
– Now tap the entry ‘User Accounts and Family Safety’ in the Control Panel.



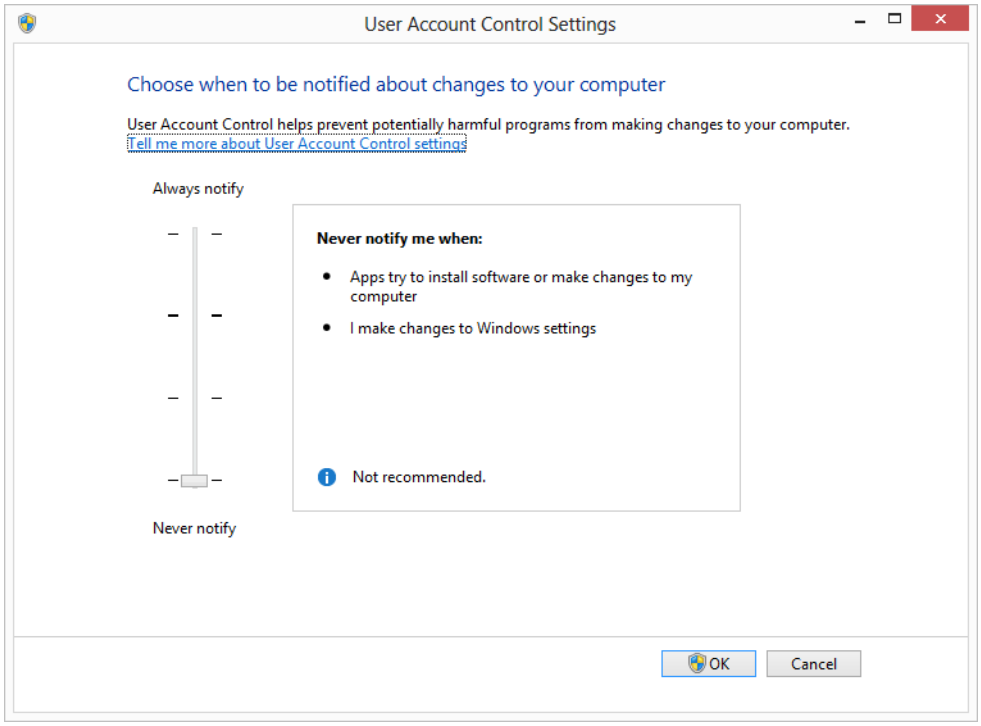
– Now tap the entry ‘User Accounts’:



– Now, under ‘Make changes to your user account’, select the lowest entry ‘Change User Account Control settings’.



In the ‘User Account Control Settings’ dialogue, you must now move the slider on the left-hand side right to the bottom. The user account control is now set to ‘Never notify’.



9.3.3 Network settings

NOTE!

Changes to the network settings!

The DC5's internal controller communicates with the computer via the TCP/IP protocol.

In the Windows operating system of the DC5 computer this network appears under the network settings as 'Unidentified network'.

The settings of this network may not be changed, otherwise the computer and the controller can no longer communicate.

If the settings should have been overwritten, the following settings are to be made for the TCP/IP protocol:

– IP address: 192.168.0.100

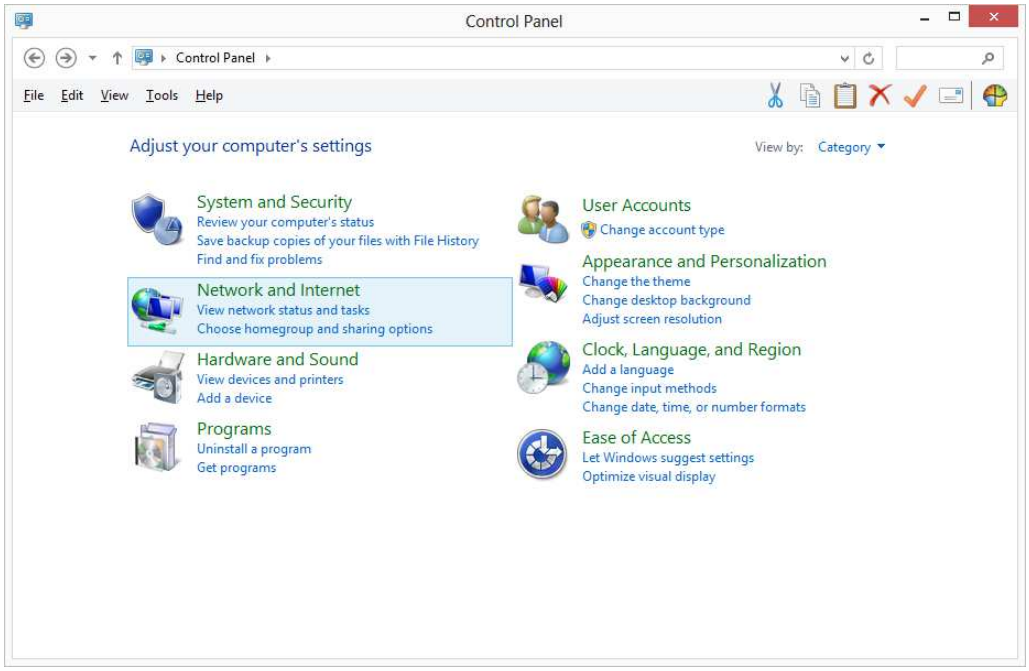
– Subnet mask: 255.255.255.0

– The fields for standard gateway and DNS server addresses remain empty.

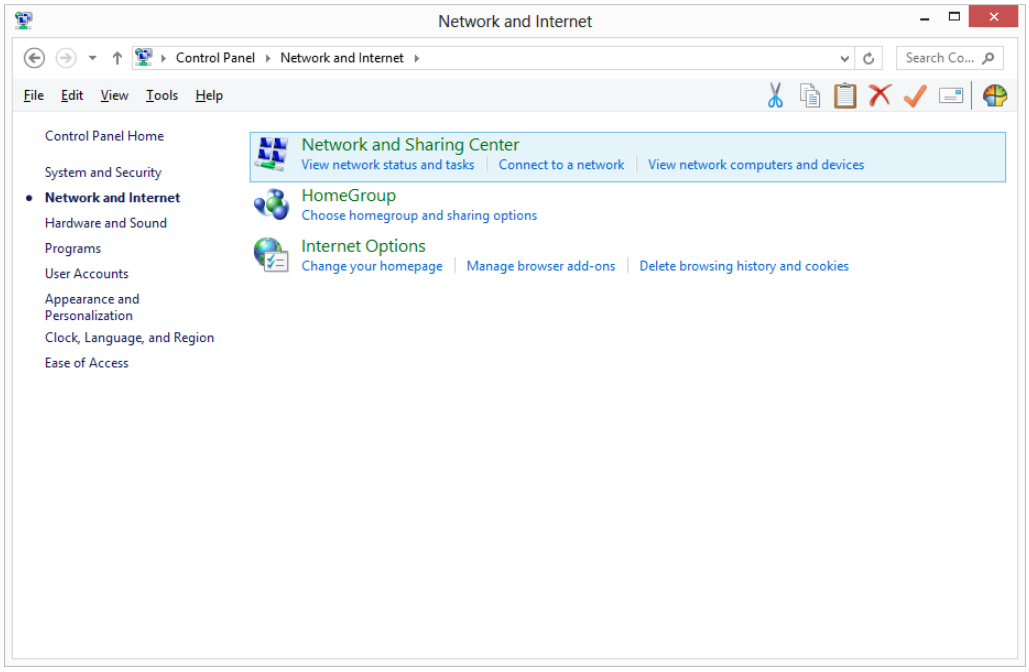
The DC5 Dental Milling System requires certain network settings. Proceed as follows to set up the network:

– Tap the Windows Start button and open the Control Panel.

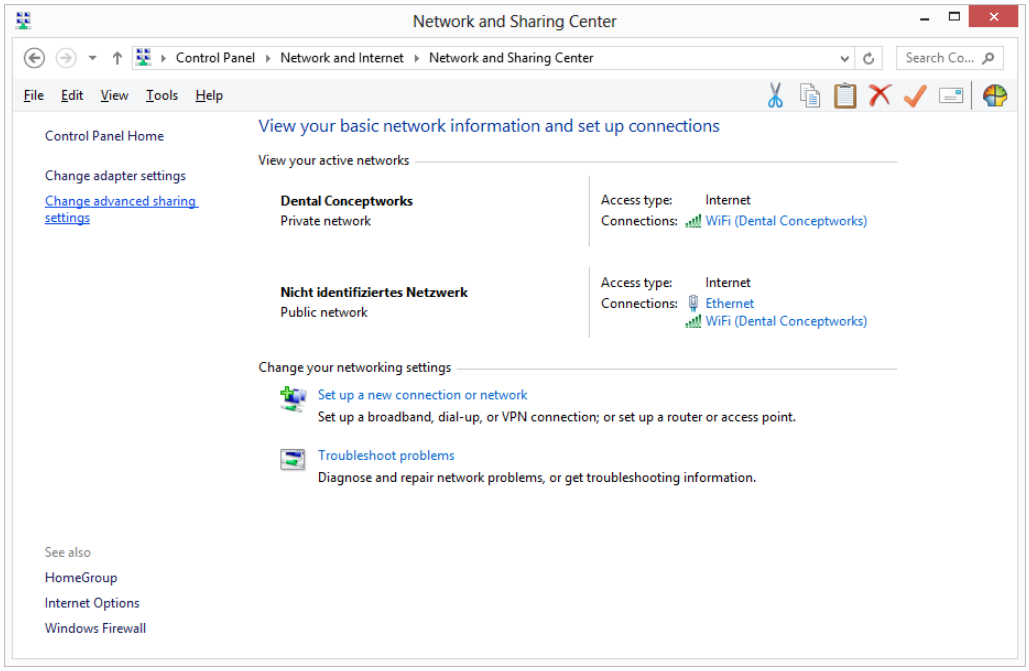
– Now tap the entry 'Network and Internet' in the Control Panel.



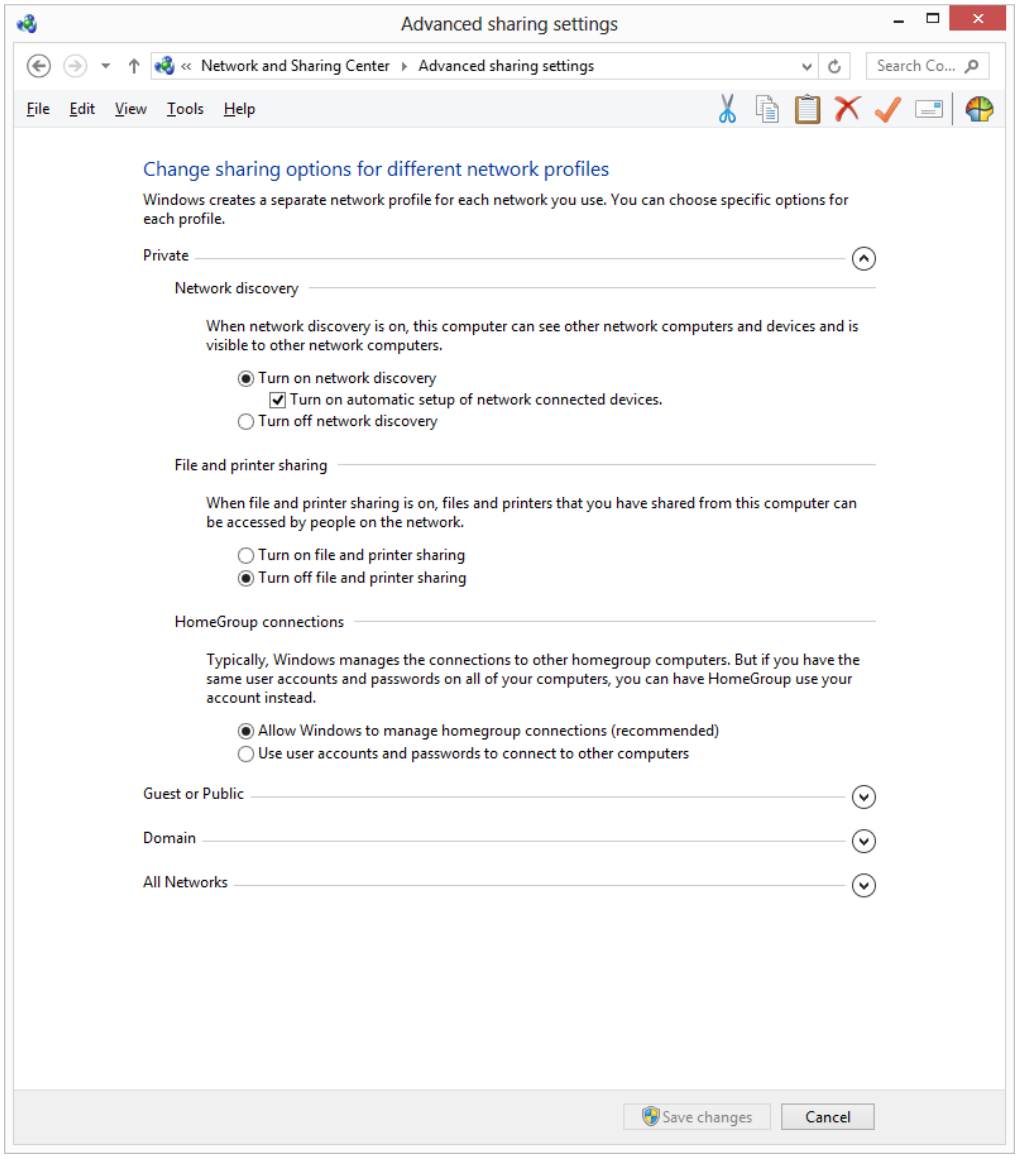
– Tap on ‘Network and Sharing Centre’:



– Select the entry ‘Change advanced sharing settings’ on the left:



– Now change the settings as indicated:



– Tap ‘Save changes’ to confirm the settings.

9.3.4 Folder for milling data

In order to exchange the milling data between a CAM computer and the milling machine via a network connection, you must create and share a folder for the data exchange.

As a rule the folder on the DC5 is:

C:\dc5_hmi\Cam-Out

This folder can be changed at any time. See also *section 10 'Operation'* regarding this.

Before a folder can be used for data exchange, it must be shared. Proceed as follows to share it:

– Start Windows Explorer. To do this, tap the symbol for the Windows Explorer in the Windows taskbar at the bottom of the Windows desktop:

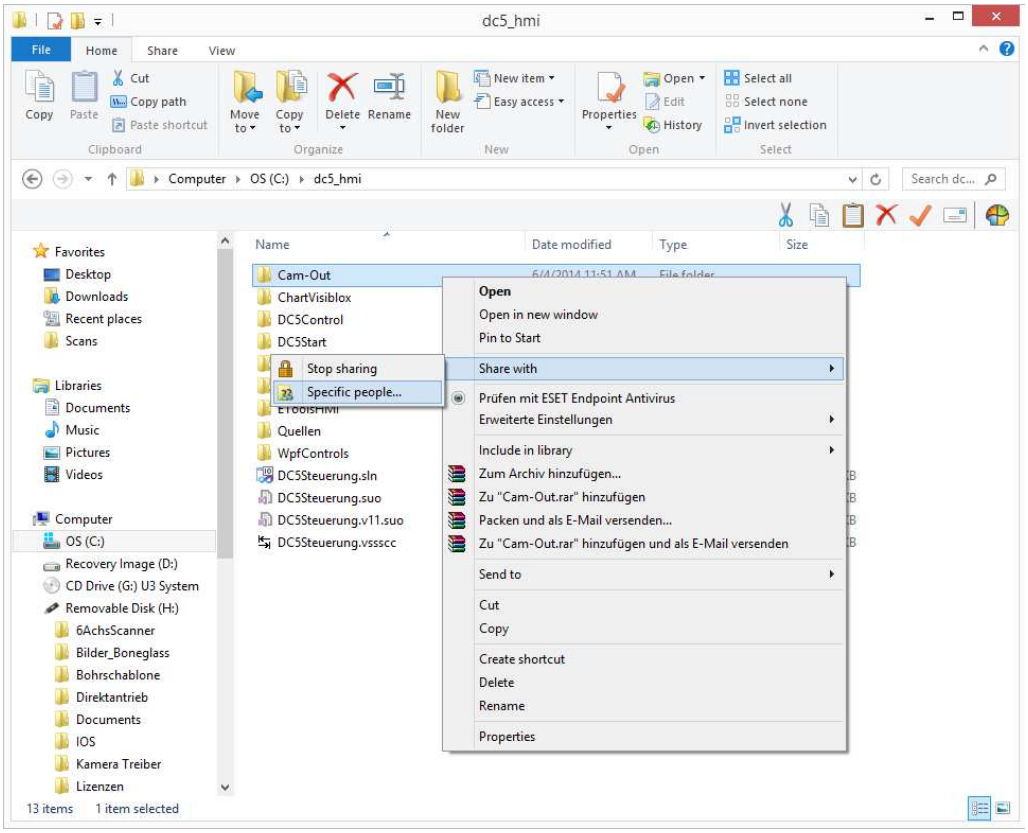
Alternatively you can also open Windows Explorer by right-clicking on the Windows Start button. In the pop-up menu, select 'Open Windows Explorer'.

NOTE!

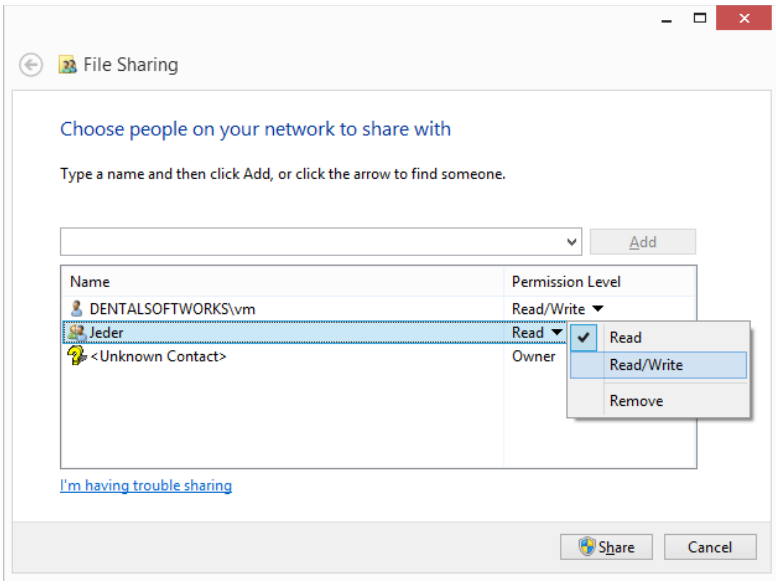
Clicking with the right mouse button corresponds to the following gesture in systems with touchscreen control:

Tap the object that you wish to click with the right mouse button. Keep your finger pressed until a circle appears around the selected object. Now release your finger from the touchscreen. The so-called pop-up menu appears that is called up by clicking with the right mouse button.

– In Windows Explorer, open the folder 'C:\dc5 _hmi'
– Click with the right mouse button on the sub-folder 'Cam-Out' (see above).
– Now select in the pop-up menu 'Share with' → 'Certain persons':



– In the ‘File sharing’ dialogue, add the person ‘Everyone’ to the list of people to share with. Change the access rights by tapping the arrow to the right of the entry under ‘Permission level’ to ‘Write/Read’:



It may be necessary to specify the path in the settings for the control software. See *section 10.8.1 ‘User interface’* regarding this.

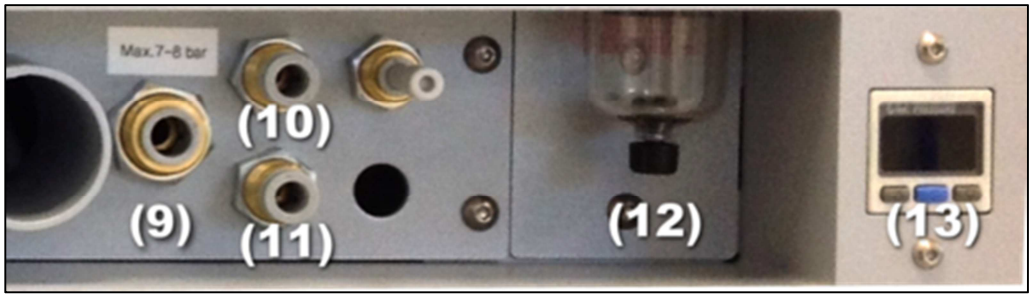
– In systems with automation, share the folder ‘C:\DC5 _Automation\DC5_Import’ in the same way.

9.4 Initial commissioning

9.4.1 Starting the DC5 Dental Milling System.

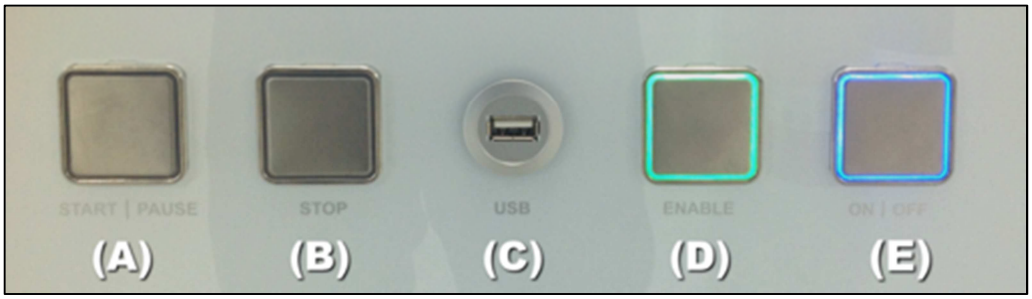
The DC5 is now ready for the first start:

(1) Switch on the compressed air if necessary and check the pressure on the pressure gauge (13):



(2) Switch the DC5 on at the main switch (1) on the rear side of the milling machine.

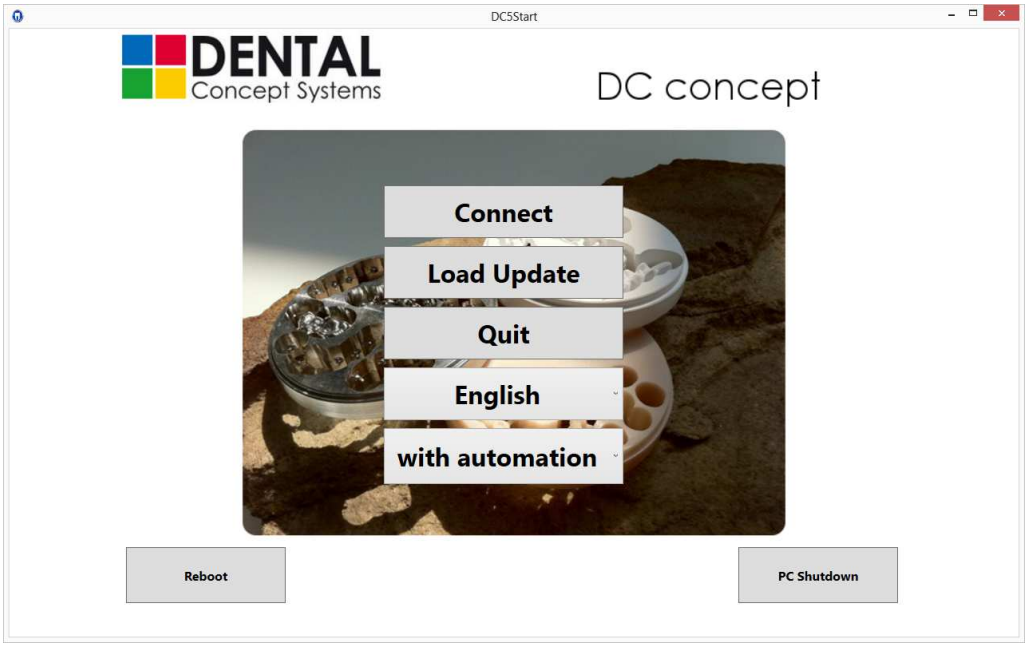
(3) Now press the ‘ON|OFF’ button (E) on the front side of the miller. The button surround now lights up blue and the DC5’s computer boots up the Microsoft Windows 7 operating system:



(4) After Windows 7 has started, the ‘DC5 Start’ application is usually started automatically.

If this is not the case, tap the desktop symbol ‘DC5 Start’ on the touchscreen twice in succession (‘double-click’).

(5) After the program start the ‘DC5 Start’ application displays the following dialogue box:



(6) Check whether the text on the lowest button in the dialogue box corresponds to the equipment of your milling machine:

- ‘Without automation’ = DC5 without automation
- ‘With automation’ = DC5 with automation

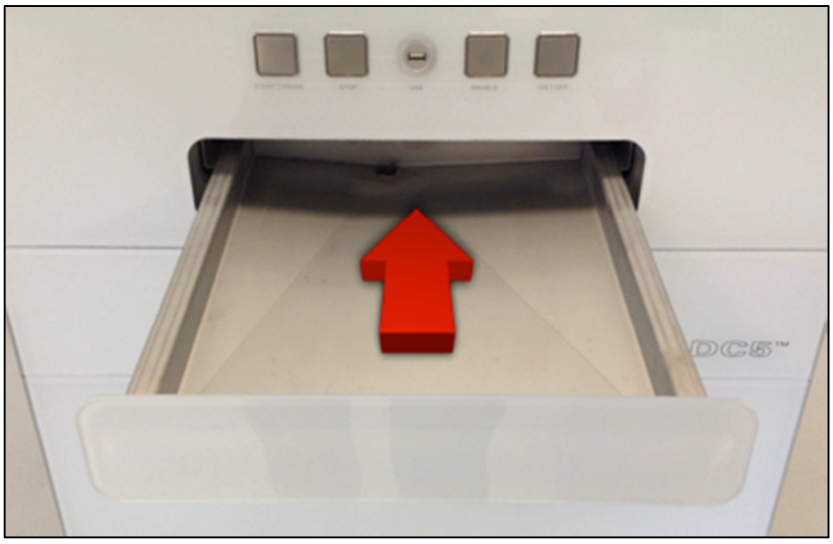
Click on the small arrow at the right edge of the button if the display is not correct and you wish to change it.

NOTE!

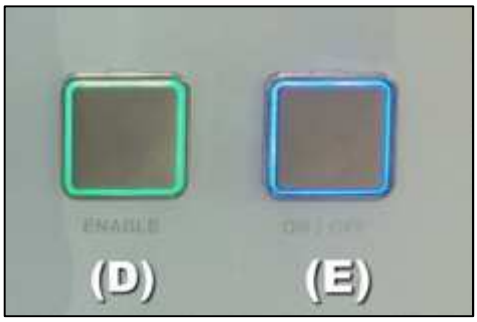
Make absolutely sure that the correct configuration of your DC5, 'With automation' or 'Without automation', is selected.

(7) Close the front door.

(8) The inserted drain tub must be completely closed and latched.



(9) Press the 'Enable' button (D) on the front side of the milling machine. The button surround lights up green.



(10) Now tap the 'Connect' button in the dialogue box of the DC5 software. The control

software is started.

NOTE!

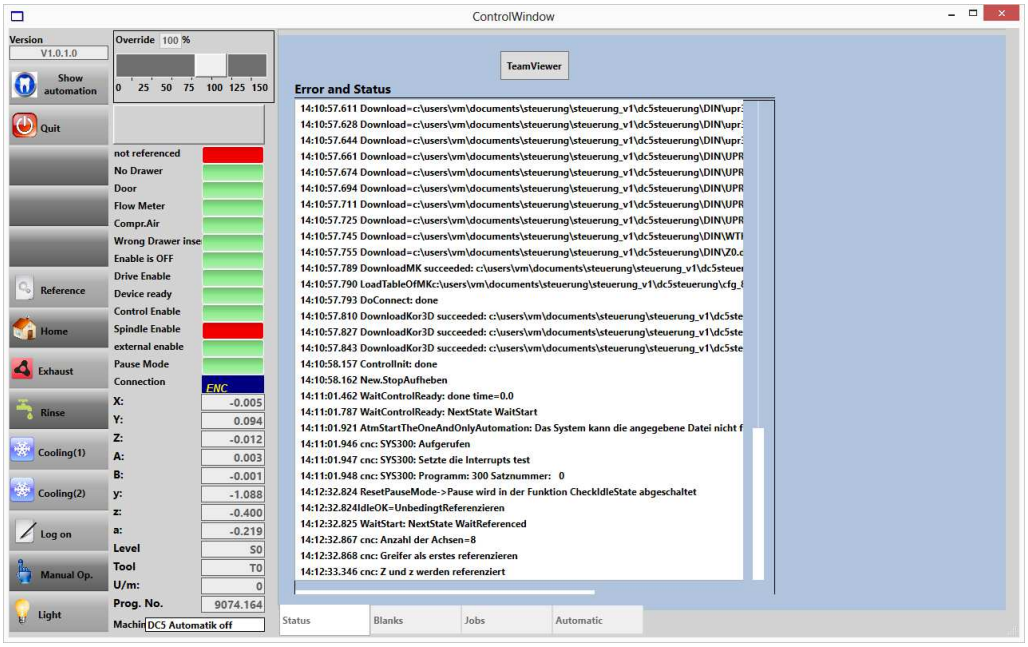
The basic control software is essentially the same when milling with and without automation.

However, the control software of the machines with automation has some additional functions. In addition there is an extra software module via which the management and automatic changing of the blanks is controlled.

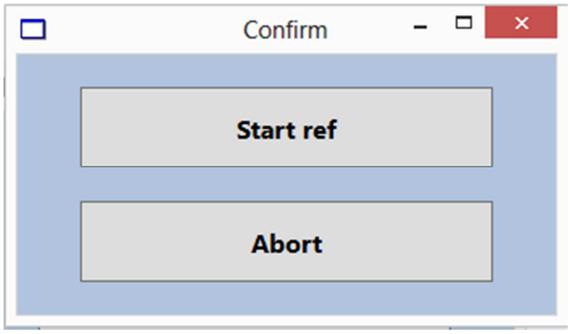
With regard to the starting sequence, this gives rise to some differences with regard to the software user interface and the elements displayed.

DC5 without automation

(11) The user interface of the main program is displayed. Various status messages are displayed in the ‘Error and Status’ window.



If the system start was completed without error, a dialogue box appears at the end of the initialisation. In this dialogue box you are requested to start the referencing of the DC5.



NOTE!

During referencing, defined positions are driven to on the individual axes. This is required in order to synchronise and adjust the axes. The DC5 is only ready for milling after successful referencing.

If the dialogue box is **not** displayed at the end of the initialisation, please check the messages displayed in the 'Error and Status' field and check the following points:

- compressed air is connected,
- sufficient pressure,
- front door is completely closed,
- 'Enable' button on the front side of the milling machine has been pressed (button surround lights up green),
- drain tub is completely closed and latched.

See also *section 11 'Troubleshooting'*.

(12) Now tap the 'Start ref button. The referencing of the axes is started.

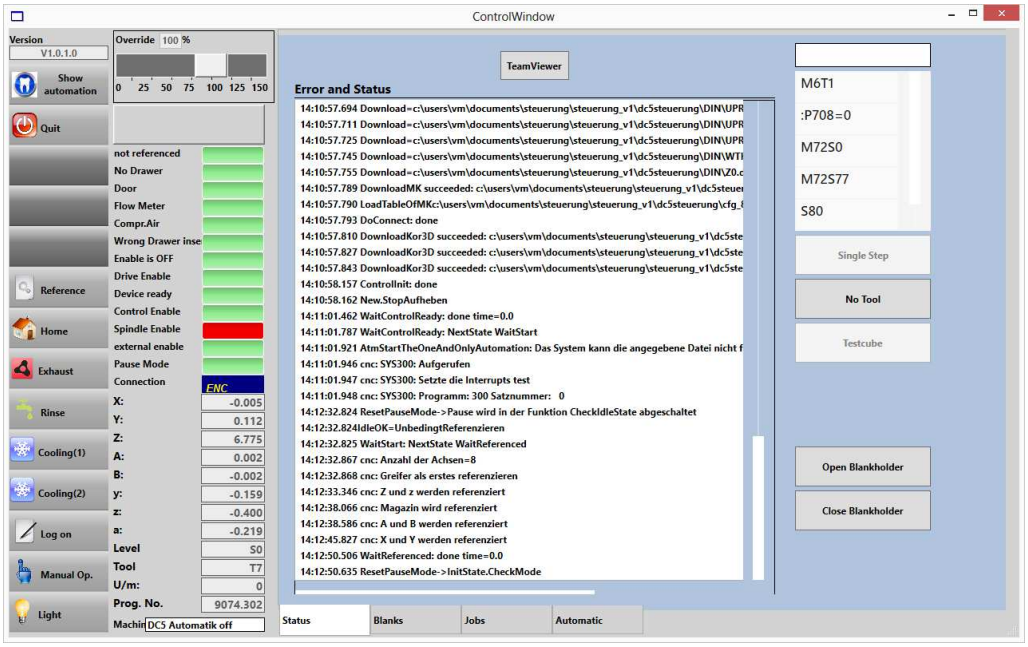
NOTE!

You can close the dialogue box by tapping the 'Cancel' button. In this case the DC5 will not be referenced. Milling is not possible. However, you can carry out the referencing of the DC5 manually at any time.

See *section 10 'Operation'.*

(13) As soon as referencing has been successfully completed, all status displays should light up green with the exception of the spindle enable.

See also *section 10 'Operation'.*



Additional display elements are now shown on the right-hand side of the program interface.

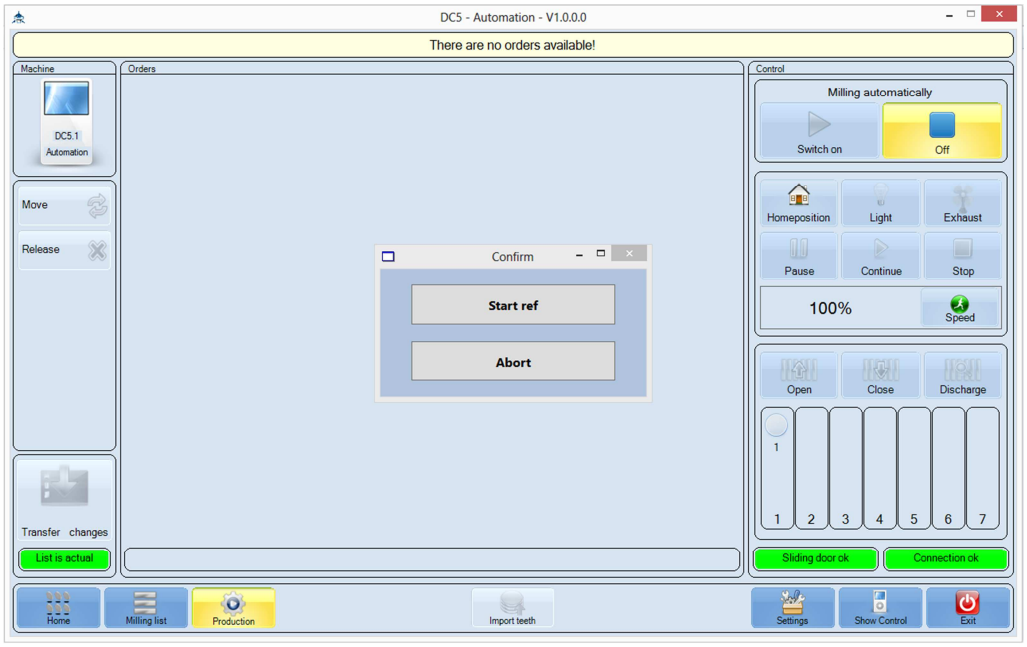
NOTE!

The spindle is secured against impacts during transport with a foam insert.

Open the front door and remove the foam insert.

DC5 with automation

(11) The user interface of the ‘Automation’ module is shown. After completion of the initialisation a dialogue box is displayed requesting you to reference the DC5.



If the dialogue box is **not** displayed at the end of the initialisation, please check the messages displayed in the ‘Error and Status’ field and check the following points:

- compressed air is connected,
- sufficient pressure,
- front door is completely closed,
- ‘Enable’ button on the front side of the milling machine has been pressed (button surround lights up green),
- drain tub is completely closed and latched.

See also *section 11 ‘Troubleshooting’.*

Now tap the ‘Start ref’ button. The referencing of the axes is started.

NOTE!

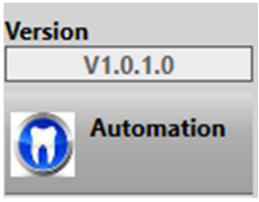
You can close the dialogue box by tapping the ‘Cancel’ button. In this case the DC5 will not be referenced. Milling is not possible. However, you can carry out the referencing of the DC5 manually at any time.

See section 10 ‘Operation’.

During referencing the display switches from ‘Automation’ to the standard control software screen.

See from *point (13) ‘DC5 without automation’*

In order to switch back to ‘Automation’ after referencing, please tap the ‘Show Automation’ button at the top left in the program window. See also *section 10 ‘Operation’.*



Referencing is now complete.

9.4.2 Loading the tool magazines

HINWEIS!

The length of the used tools should not be longer than 57 mm.

The length above the shaft should be 22 mm up to 25 mm. This is the part where the tool is clamped by the chuck.

Take care that these tolerances are fulfilled. Otherwise the contact pressure can be wrong and the tool will not be clamped correctly.

Each tool magazine in the DC5 can accept up to 10 tools. Several tool magazines with different tools can be used.

The positions in the tool magazines are numbered. Please pay attention to different and clear numbering if you use several tool magazines.

Tool magazines with different numbering (10s, 20s, 30s) are available as accessories.

The actual management of the tool magazines takes place via the ‘DS-concept CAM’ CAM software. The software can manage up to 100 tools.

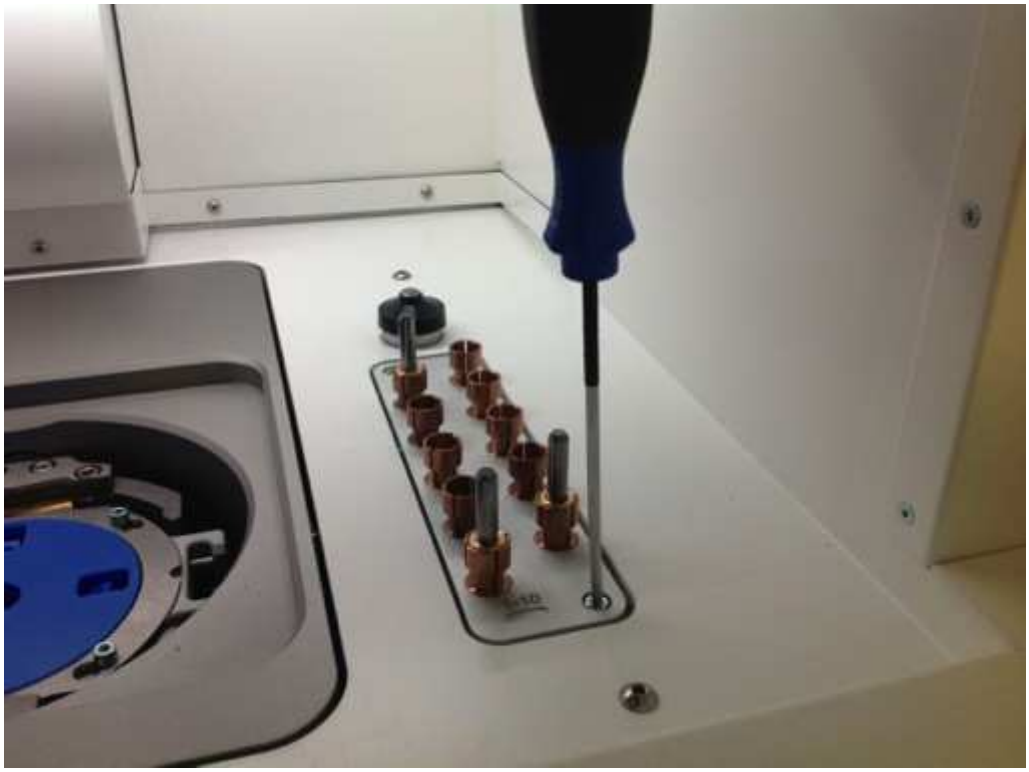
NOTE!

Always load the tool magazines in accordance with the tool management of the ‘DS-concept CAM’ CAM software.

Always make sure when changing the tool magazine that the tool magazine receptacle is free from milling swarf.

Proceed as follows to change a tool magazine:

Undo the two hex socket head screws of the tool magazine currently installed using the hex key provided:



– Now lift the tool magazine out of the receptacle and clean it with a brush:

– Insert the new tool magazine and tighten the screws handtight using the hex key provided.

NOTE!

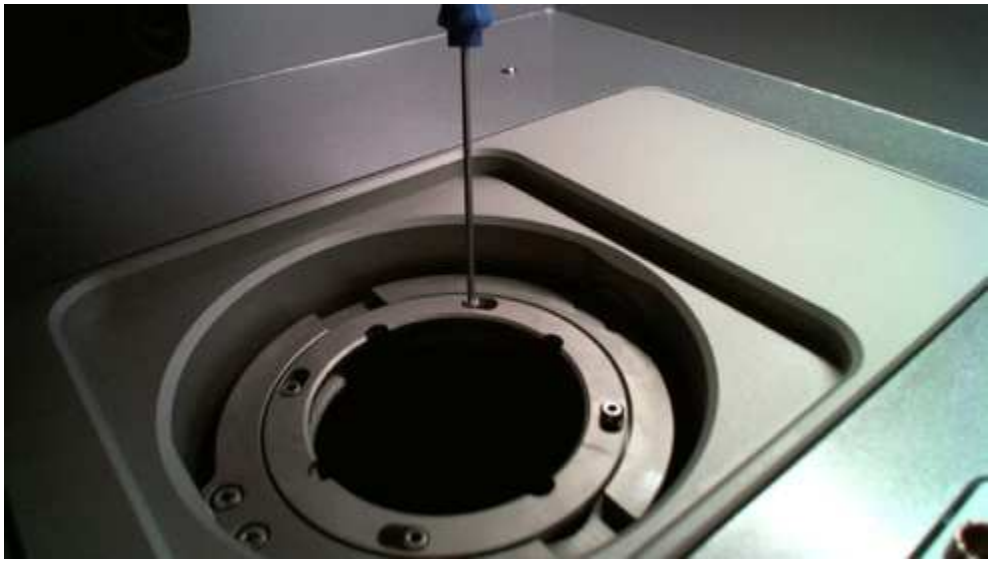
Always clean the support surfaces of the tool magazine with a brush before inserting a new tool magazine.

9.4.3 Loading the holder (without automation)

– Undo the screws using the hex key provided until the clamping ring can be easily turned and lifted.

– Now place a blank in the holder and set the clamping ring on the holder again with a light turning movement.

– Now tighten the screws handtight, step by step and diagonally.



9.4.4 Loading the holder (with automation)

In the case of milling machines with automation the blanks are placed into special holders. These holders can be arranged in the magazine of the milling machine or can also be inserted manually into the pneumatic holders.

Proceed as follows to place a blank into a holder:

– First of all, undo the screws on the holder using the hex key provided until the clamping ring can be easily turned and lifted.

– Now place a blank in the holder and set the clamping ring on the holder again with a light turning movement.

  Make sure the clamping ring is aligned correctly.

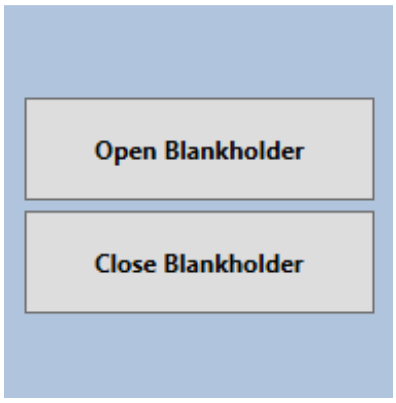
– Now tighten the screws handtight, step by step and diagonally.

During the milling operation the loaded holders are arranged in the magazine (see section 9.4.5 ‘Loading the magazine (automation)’). The holder can also be inserted manually into the pneumatic holder receptacle. This is necessary, for example, if the milling cutter has to be measured.

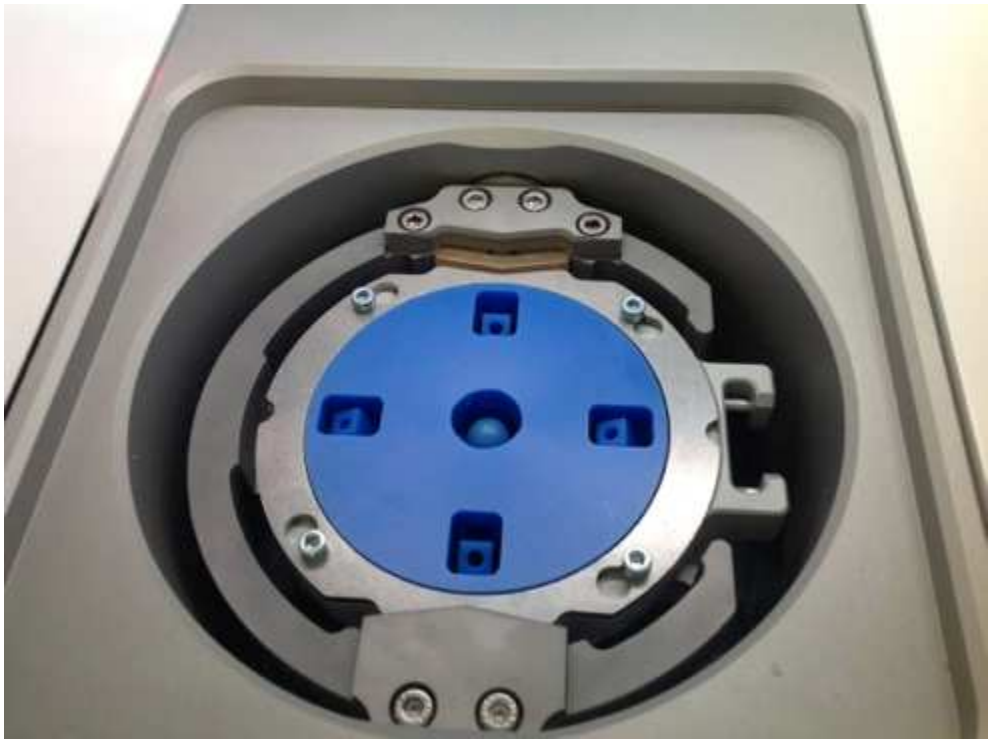
Proceed as follows to manually insert the holder:

– Tap the ‘DC 5.1 Automation’ button at the top left in the program window if the ‘Automation’ module is displayed:

– Tap the ‘Open blank holder’ button at the bottom left in the program window in order to open the pneumatic lock of the holder receptacle:

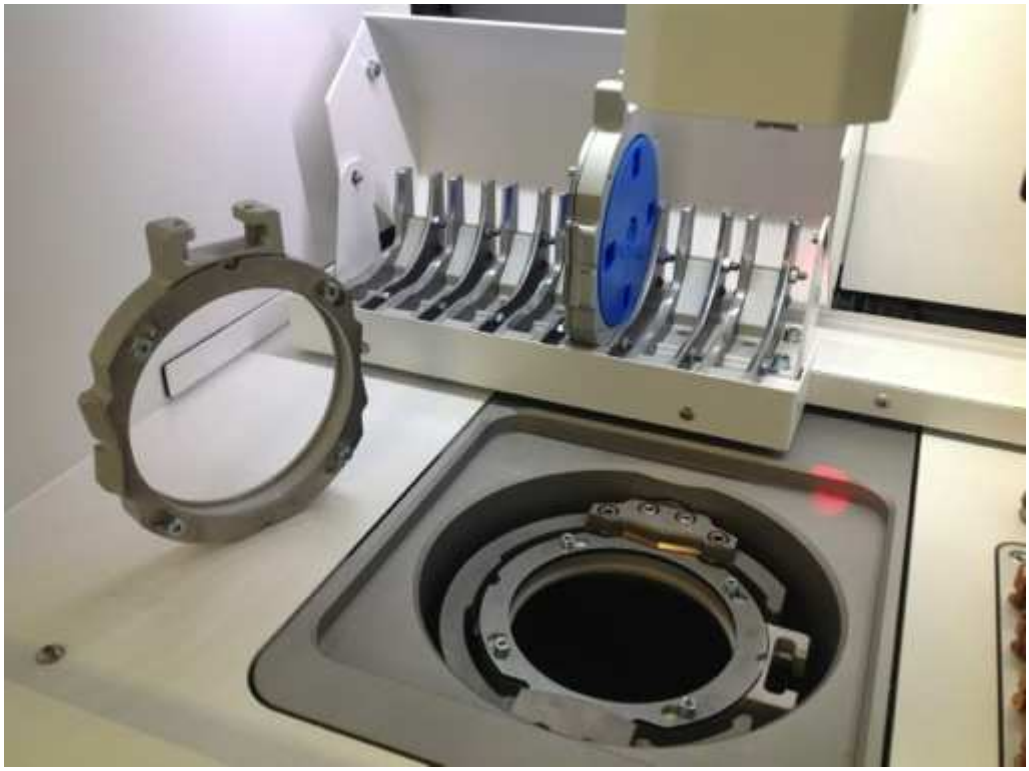


– Now insert the holder with the clamped blank. Make sure that the clamping ring is facing upwards and that the receptacle for the gripper is pointing to the right:



– Tap the ‘Close blank holder’ button to lock the holder receptacle:

9.4.5 Loading the magazine (automation)



The holders with the inserted blanks can now be inserted into the magazine. In normal milling operation the magazine should always be loaded via the ‘Automation’ program module.

NOTE!

The allocation of the holders to a certain magazine position takes place via the automation module of the control software.

(See section 10 ‘Operation’).

9.4.6 Testing the magazine manually

NOTE!

For a functional check in the manual mode you need to be logged in. Otherwise some of the needed functions are not available.

The enhanced manual mode is reserved for authorized personnel of Dental Concept Systems!

NOTE!

In manual operation the operator takes control of the machine.

Inappropriate and incorrect operation can lead to damage to the machine!

The milling machine may only be operated by trained and instructed personnel or by specialists from Dental Concept Systems GmbH!

Dental Concept Systems accepts no liability for damage caused by improper manual operation!

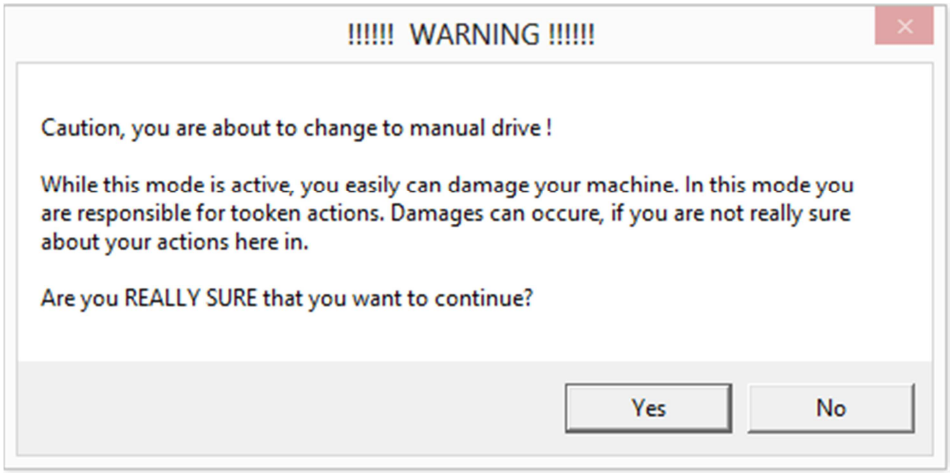
Proceed as follows to open the magazine:

– Close the front door and press the ‘Enable’ button on the front side of the milling machine. The red lighting in the machining compartment now lights up white.

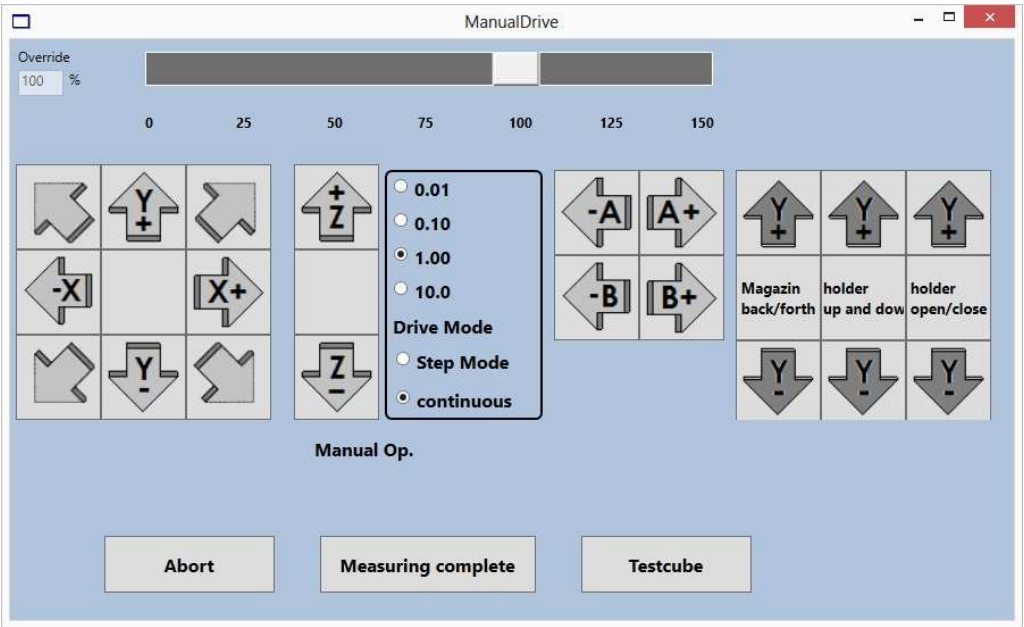
– Tap the ‘Home’ button to place the spindle and gripper in a safe position:

– Now tap the ‘Manual operation’ button. A warning message appears informing you of the possible consequences of improper operation of the milling machine in manual mode:

– Confirm the ‘Warning’ dialogue with ‘Yes’ in order to open the ‘Manual mode’ dialogue box:



– Now press the ‘Y-’ button in the ‘Manual mode’ dialogue box in the right-hand program window to move the magazine to the front. Keep the button pressed until the magazine has driven right to the front and the cover has fully opened:



– You can now place holders into the magazine.

– To do this, open the front door of the milling machine. The lighting in the machining compartment now lights up red.

NOTE!

Tap the ‘Light’ button twice to switch the lighting in the machining compartment back to white.

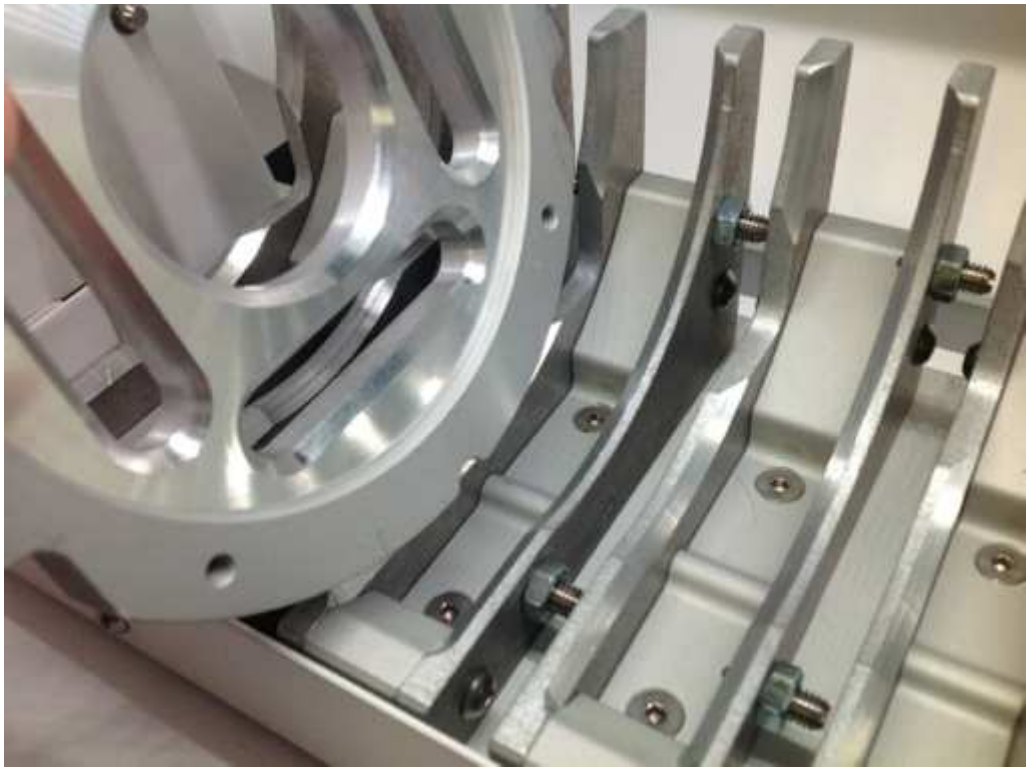
– Now place the holder in the magazine.

NOTE!

Make absolutely sure that the holder is correctly aligned and correctly seated in the magazine.

The clamping ring must point to the left and the receptacle for the gripper must point upwards!

Otherwise there is a danger of the milling machine being damaged.



– Now close the front door and press the ‘Enable’ button on the front side of the milling machine.
– Press and hold the ‘Y+’ button in the ‘Manual mode’ dialogue box until the magazine is fully closed and has driven back to the parking position.

NOTE!

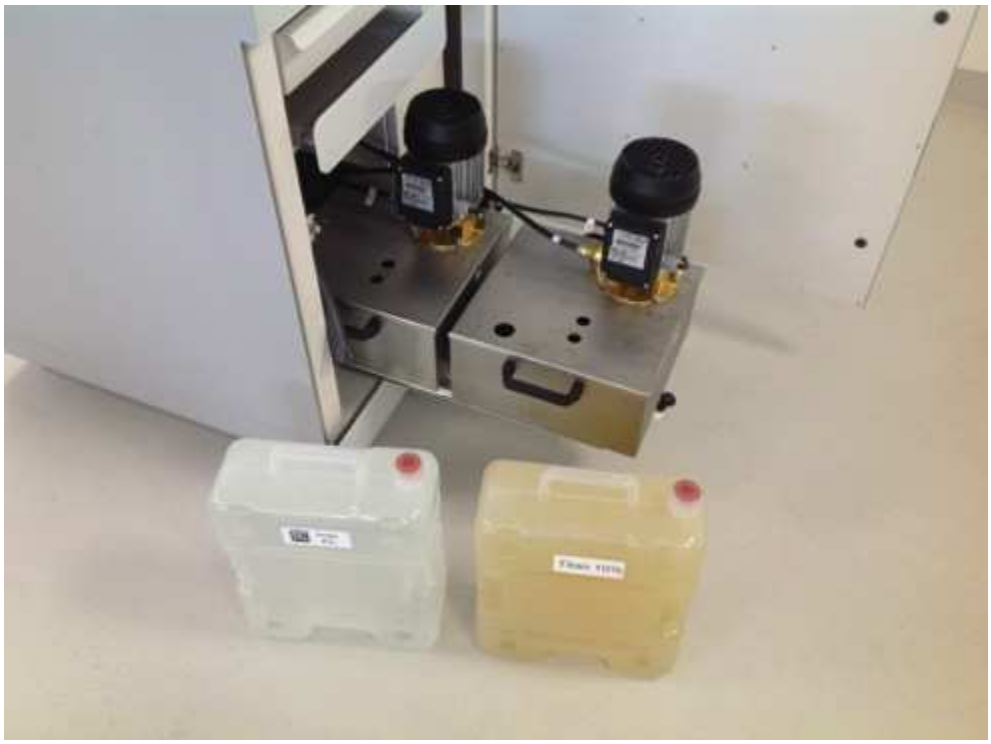
The loading of the magazine in manual mode described here serves only to demonstrate the loading of the magazine and the functional test of the magazine.

In milling operation the magazine is loaded via the ‘Automation’ program module. This is important, because before the magazine is closed the individual magazine positions are scanned with a light barrier and compared with the list of milling jobs to be machined.

The loading of the magazine via the ‘Automation’ program module is described in greater detail in section 10 ‘Operation’.

9.4.7 Filling with cooling lubricant

In the case of milling machines with an integrated cooling lubricant circuit, the machine must be filled with cooling lubricant after installation.



The DC5 can be operated with two independent cooling lubricant circuits. Depending on which coolant circuit you activate, the associated drain tub must first be inserted.

The drain tubs for the two cooling lubricants differ by the position of the drain connector and a small metal flag at the rear end of the drain tub. The controller uses the metal flag to detect whether the correct drain tub is inserted.

The drain tubs are labelled according to the associated cooling lubricant circuit.

NOTE!

Make sure that the correct drain tub is inserted and that it is correctly latched on insertion.

You can activate a cooling lubricant circuit only after inserting the associated drain tub.

Proceed as follows to change the drain tub:

– Press gently on the front panel of the inserted drain tub and release it again. The latch releases itself and the tub jumps slightly forwards.
– Now pull the drain tub forwards.

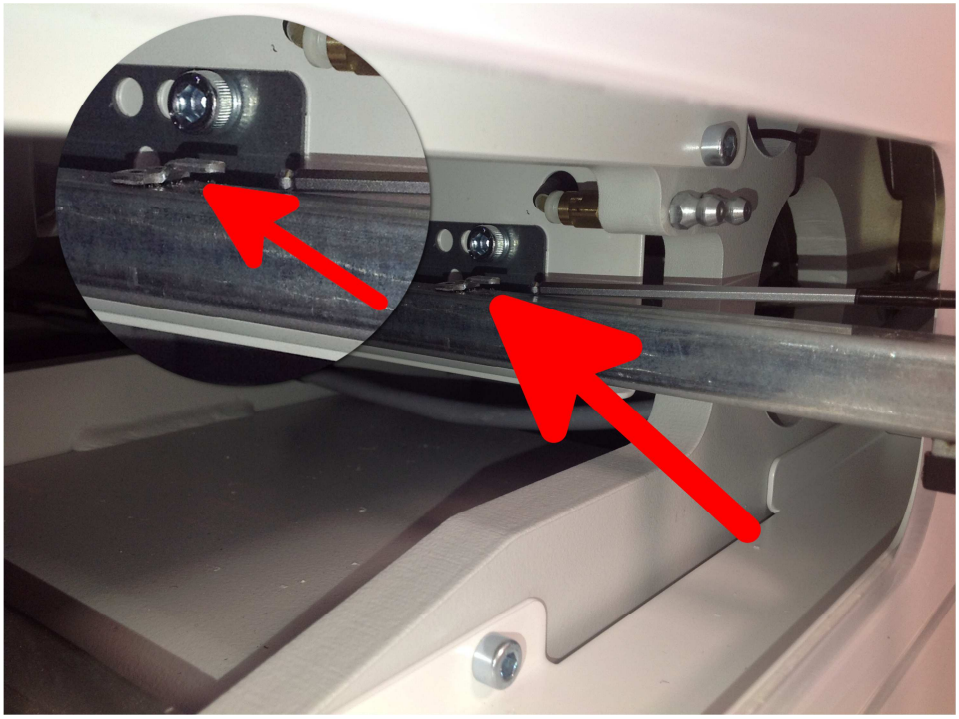
– Press on the plastic catches at the left and right with which the drain tub is fixed to the slide rails of the tub holder and lift the tub slightly:

– Now carefully remove the drain tub from the tub holder in a forward direction.

– In the lower cabinet below the drawer there is a receptacle for the unused drain tub:

– Now carefully place the drain tub to be inserted on the sliding rails of the tub holder.

Make sure that the tub slides under the lugs on the sliding rails at the rear end:



– There are small lugs on the sliding rails on the left and right with which you can pull the sliding rails to the front if they should be pushed into the tub holder when inserting the drain tub:

– Now press on the plastic catches on the sliding rails whilst at the same time pressing

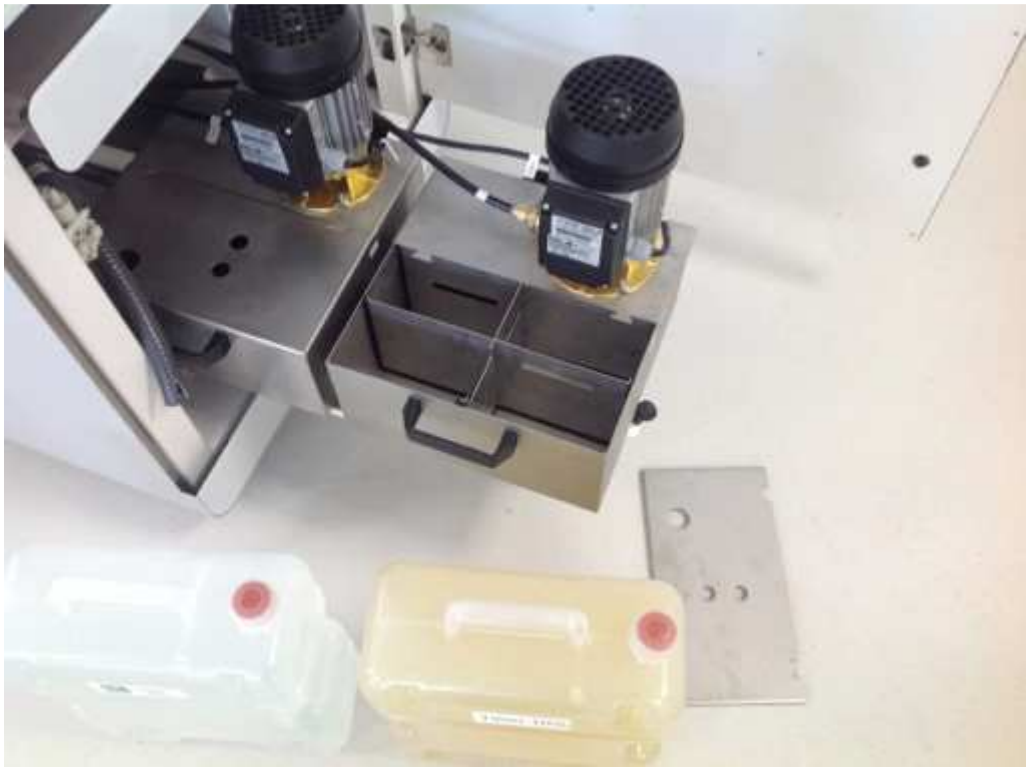
the drain tub downwards until the plastic catches engage in the openings on the left and right on the drain tub:

– Now push the drain tub into the tub receptacle of the milling machine until you feel slight resistance.
– Now press briefly and firmly on the front panel of the drain tub to latch it.
– The status display ‘No tub’ lights up green if the tub is inserted correctly:

To fill up with cooling lubricant, proceed as follows:

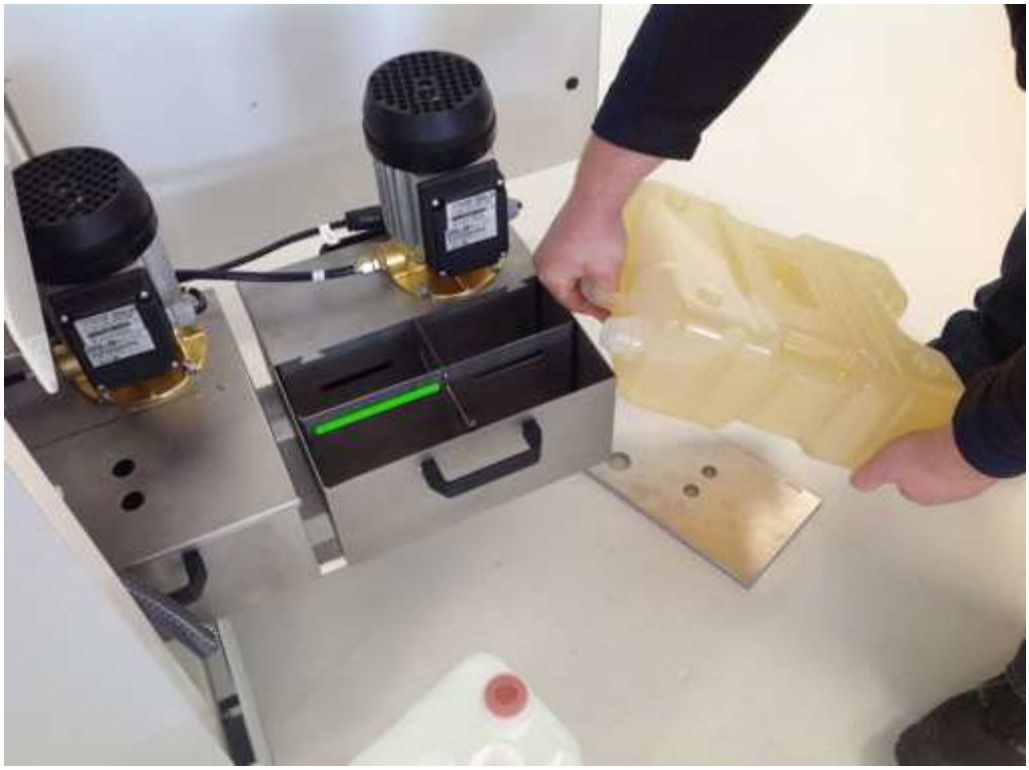
– The cooling lubricant tanks and pumps are attached to a slide, which can be unlocked and pulled forwards out of the lower cabinet. Open the door of the lower frame, pull on the latch and pull the locking knob of the slide upwards.

– Pull the slide forwards. The pumps and cooling lubricant tanks are now freely accessible:

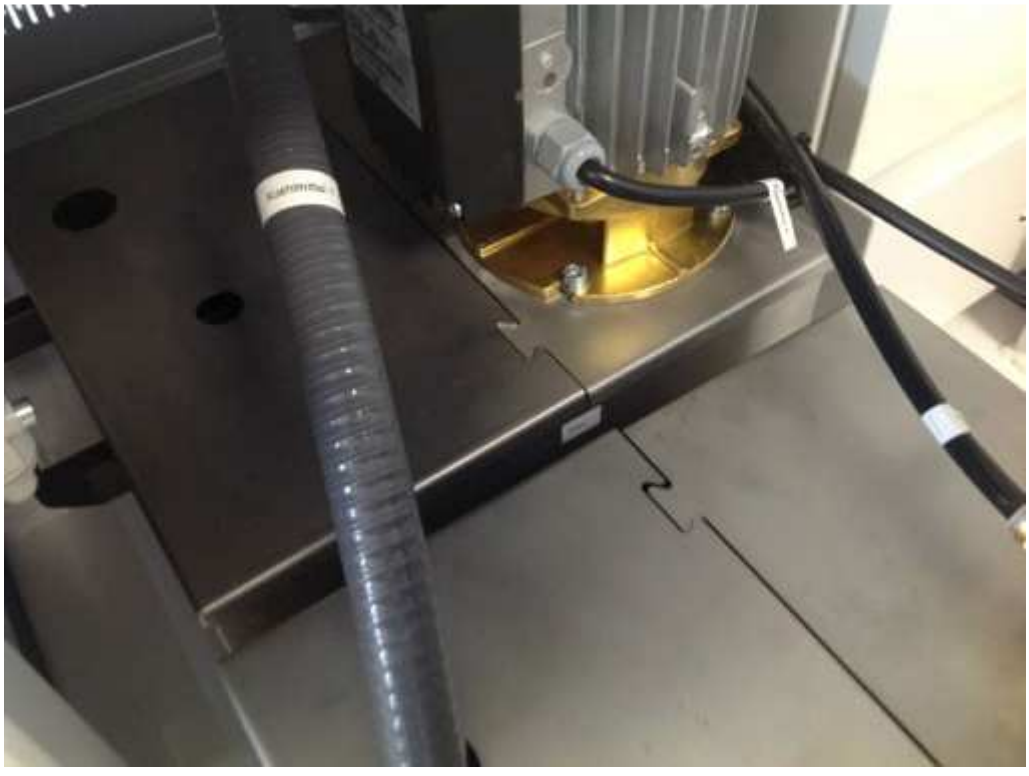


– Pull the return flow hose out of the cover of the tank to be filled and lift off the cover.

– Now open the container with the cooling lubricant and pour cooling lubricant into the tank until this is filled to about 3 cm under the rim:



– Fit the cover onto the tank and insert the return flow hose into the rear large opening in the cover:



NOTE!

Make sure that you insert the hose labelled ‘Coolant 1’ in the front tank and the hose labelled ‘Coolant 2’ in the rear tank.

– Position the spindle centrally above the drain tub using the ‘X+, X-, Y+, Y-, Z+ and Z-‘ buttons.
– Now, in the program window of the control software, tap the ‘Coolant 1’ button to start the pump for the front tank (metal) and the ‘Coolant 2’ button to start the pump for the rear tank (ceramic):

NOTE!

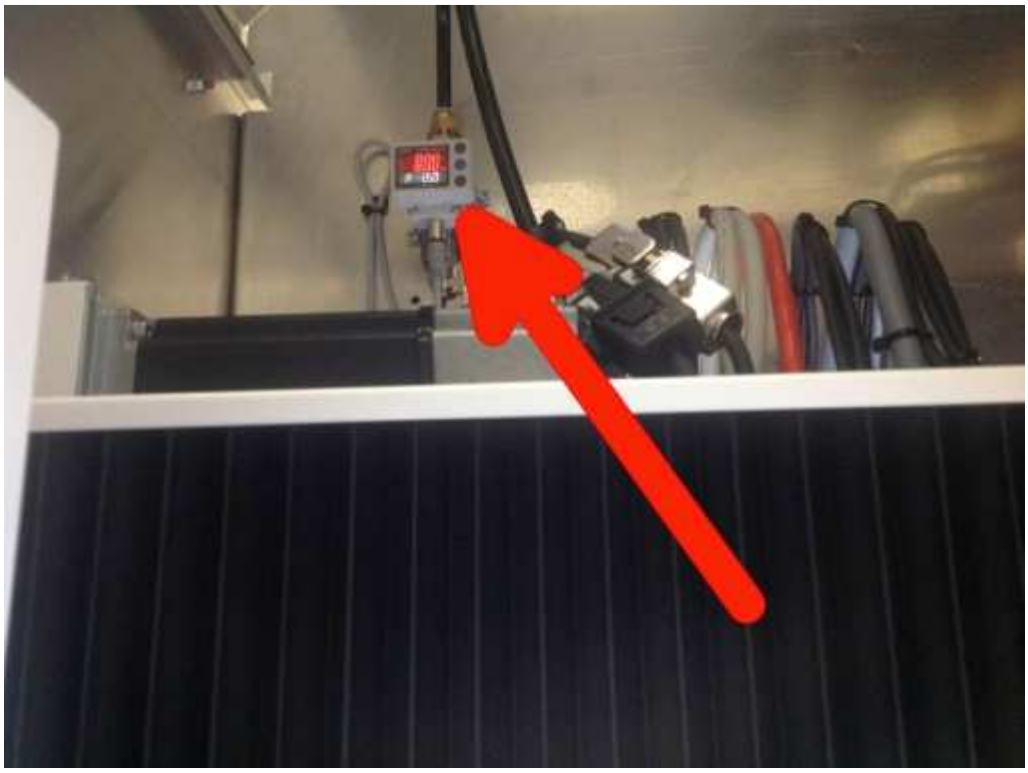
The software reports the error ‘Incorrect tub inserted’ if you attempt to start a cooling lubricant circuit and the drain tub for the other cooling lubricant circuit is inserted.

In addition the status display ‘Incorrect tub’ lights up red.

Exchange the drain tub as described above.

– The pump starts and cooling lubricant is pumped into the circuit. The filter cartridges are fastened in the rear of the lower cabinet. These are not yet filled on delivery and must be filled with cooling lubricant first.
– Pour in more cooling lubricant until the level in the tank no longer falls and remains stable.
– The control valves for regulating the flow rate of the cooling lubricant are located on the left-hand side in the lower cabinet. Set the flow rate to a value of 2.3 - 2.5 l/min.

– You can read the flow rate on the flow meter. This is located at the top left on the back wall of the machine and is visible from the front door:

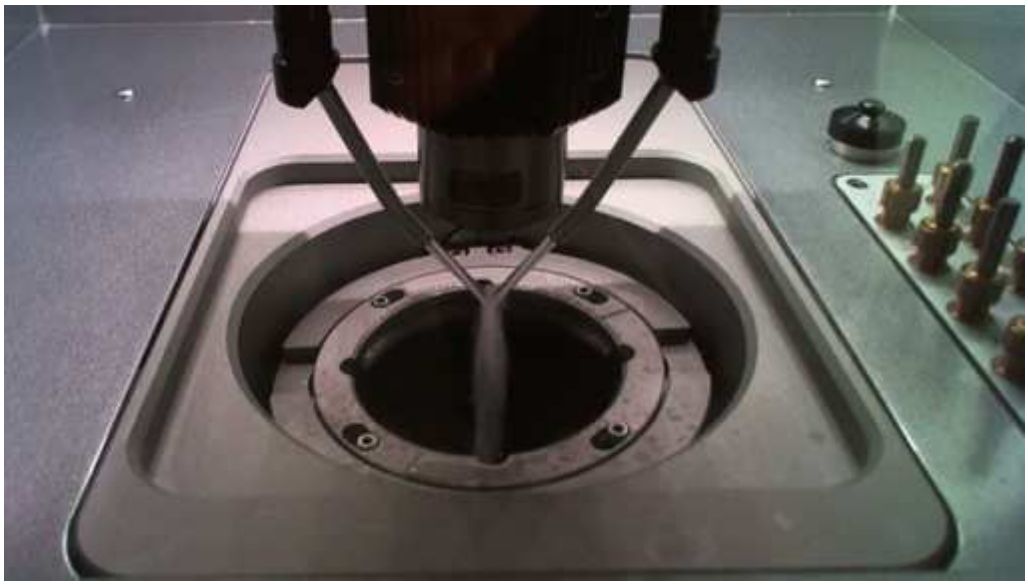


NOTE!

The flow meter monitors the flow rate of the cooling lubricant.

The milling process is interrupted automatically if the flow rate falls below a lower limit value during the operation of the milling machine.

– Let the pump of the cooling lubricant circuit run for a few minutes.
– Align the outlet nozzles at the left and right next to the spindle so that the coolant strikes the tool below the collet chuck:



– Now repeat the filling procedure for the rear tank and cooling lubricant circuit 2.

NOTE!

The rear tank is easier to fill from the rear side of the machine.

To do this, open the rear lower door using the square key provided.

Both cooling lubricant circuits are equipped with filter cartridges.

To change the filters, see *section 12.2 'Regular maintenance work'.*

9.4.8 Testing

Finally, carry out the following function test:

(1) Test the safety deactivation of the front door:

- Close the front door and press the 'Enable' button on the front side of the milling machine.
- Wait until the red lighting in the machining compartment lights up white.
- Open the front door.

The lighting in the machining compartment must now light up red.

The 'Door' status display lights up red.

The surround of the 'Enable' button on the front side of the milling machine no longer lights.

The 'No enable' status display in the program window lights up red.

(2) Test the 'Stop' button on the front side of the milling machine:

- Close the front door and press the 'Enable' button on the front side of the milling machine.
- Tap the 'Mill test cubes' button on the right-hand side of the program interface of the control software.
- Tap the 'Mill all cubes' button or any desired cube position in the 'TestCube' dialogue box (see section 9.5.1 'Milling test cubes').
- Once the milling data have been loaded, press the 'Start' button on the front side of the milling machine.
- Wait until the milling machine has started, then press the 'Stop' button on the front side of the milling machine.

The milling process must be interrupted immediately and the spindle must be stopped.

The lighting in the machining compartment lights up red.

- Open the front panel and then tap the ‘Abort’ button at the top left of the program window of the control software.

- Delete the complete milling job by tapping the ‘Stop Job’ button:

(3) In case of milling machines with cooling lubricant circuits:

- Close the front door.
- Press the ‘Enable’ button on the front side of the miller.
- Wait until the lighting in the machining compartment lights up white.
- Now press lightly against the front panel of the inserted drain tub, so that it jumps out of the latch.

The ‘No tub’ status display must light up red.

(4) In case of milling machines with extraction:

- Tap the ‘Extraction’ button in the program window of the control software.
  The extraction starts up.
- Tap the ‘Extraction’ button in the program window of the control software again.
  The extraction switches off.

(5) Test the ‘On | Off’ button

- Tap the ‘Exit’ button on the left-hand side of the program window to exit from the program.

- The program window of the ‘DC5 Start’ application appears.
- Tap the ‘Switch machine off’ button at the bottom right.

- The operating system is shut down and the computer switches itself off.
- Now press the ‘ON|OFF’ pushbutton on the front side of the panel.

The blue lighting of the button surround goes out. The machine is switched off.

(6) Test the main switch:

- Switch the main switch off. The light in the main switch goes out.
- Now press the ‘ON|OFF’ button on the front side of the milling machine.

The milling machine must NOT start up.

9.5 Calibration

9.5.1 Milling test cubes

The calibration of the miller should be checked after installation and repeated if necessary.

Before recalibrating the miller, you should first check the calibration. The calibration is checked by milling test cubes. Milling files are already stored for this.

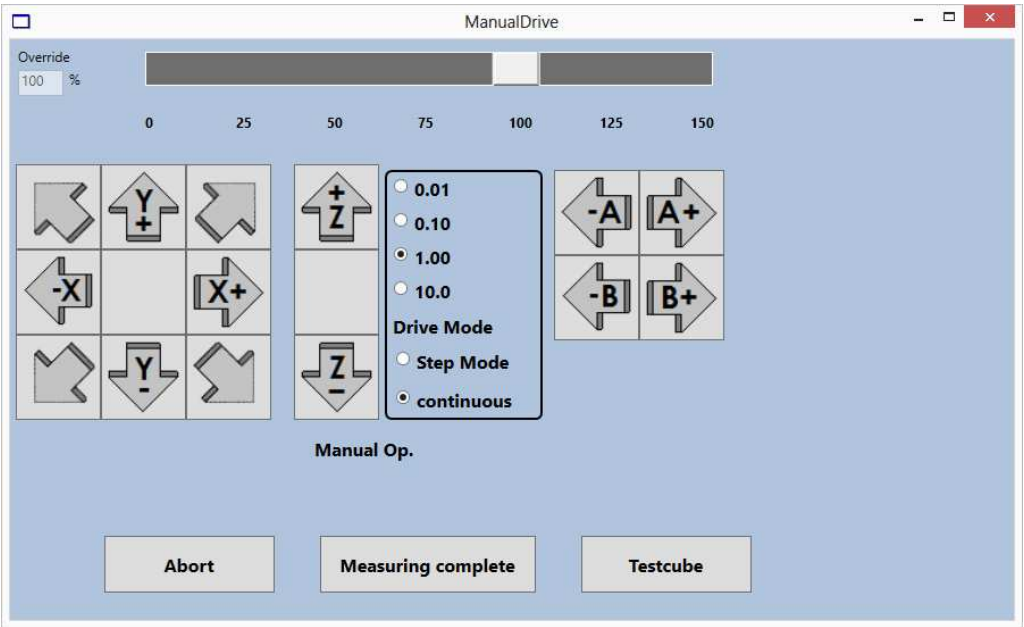
The milling of test cubes is identical for milling machines with and without automation.

In the case of milling machines with automation you must switch to the standard display.

– Tap the ‘DC 5.1 Automation’ button at the top left in the program window if the ‘Automation’ module is displayed:

– Tab the button ‘manual mode’ to open the dialogue ‘manual drive’:

– A warning message will be shown. Tab the button ‘Yes’ to proceed.
– Now tab on the button ‘Testcube’



– The ‘TestCube’ dialogue box opens and a blank is shown with the available test cube positions.

  Various options are available to you with regard to milling test cubes. Tap the ‘All cubes’ button if you wish to mill test cubes at all of the positions shown. Alternatively, tap the respective position that you wish to mill.

  You can only ever select and mill one position at a time. If you wish to check several positions, you must repeat the procedure for each further position.

NOTE!

Be sure to observe the specifications with regard to the tools employed and their positions in the tool magazine!

Mill the test cubes from a wax blank with a thickness of 18 mm!

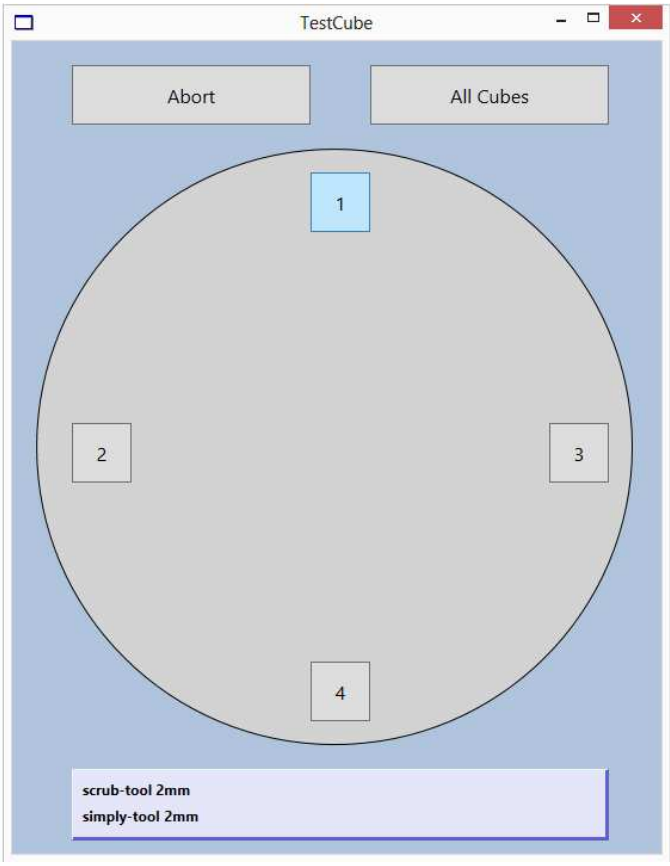
CAUTION

Danger due to fine dust!

Lung damage and difficulty in breathing are possible.

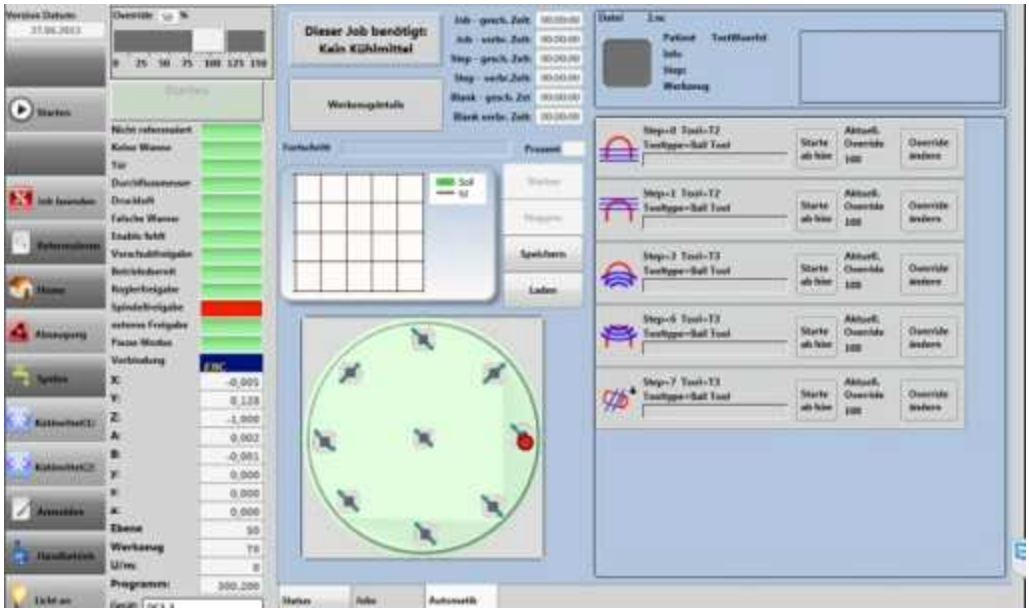
Mill only with extraction connected and switched on!

Regularly check and clean the extraction system; exchange the filter.



– Now tap the ‘Mill all cubes’ button or one of the test cube positions displayed.

  The stored file with the milling data is now loaded and the milling steps are displayed in the program window:



Before you can start the milling process, you must place a blank in the holder and insert the tools displayed in the TestCube dialogue box in the tool magazine.

To insert the 18 mm thick wax blank, proceed as described in *sections 9.4.3 'Loading the holder (without automation)'* and *9.4.4 'Loading the holder (with automation)'.*

– Now close the front door and press the 'Enable' button on the front side of the milling machine.
– Press the 'Start' button on the front side of the milling machine to start the milling process.
– Wait until the milling process is complete and then remove the wax blank.

The test cubes should meet the following criteria:

- Smooth side walls with no step.
- Central and continuous bore.
- Dimensions: 10 mm x 10 mm x 10 mm

If these criteria are not met, carry out a calibration of the miller.

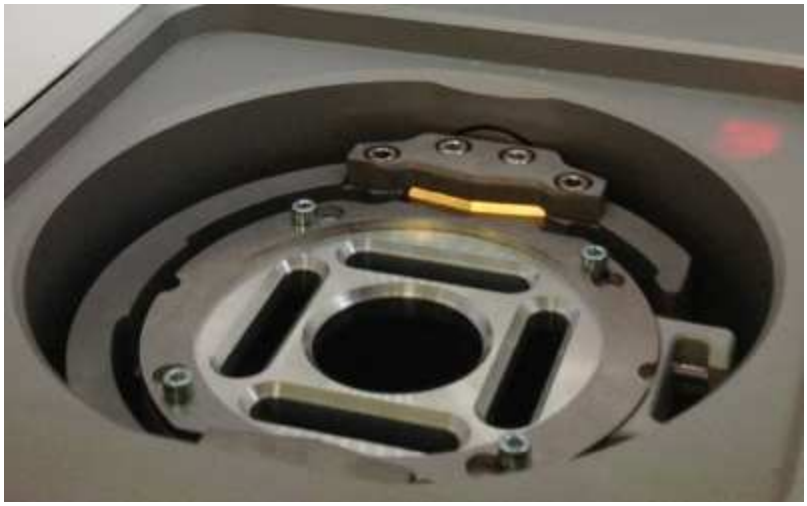
See *section 9.5.2 'Calibration'.*

9.5.2 Calibration

For the calibration of the milling machine you require a measuring blank and a measuring probe. The calibration of the DC5 takes place fully automatically.

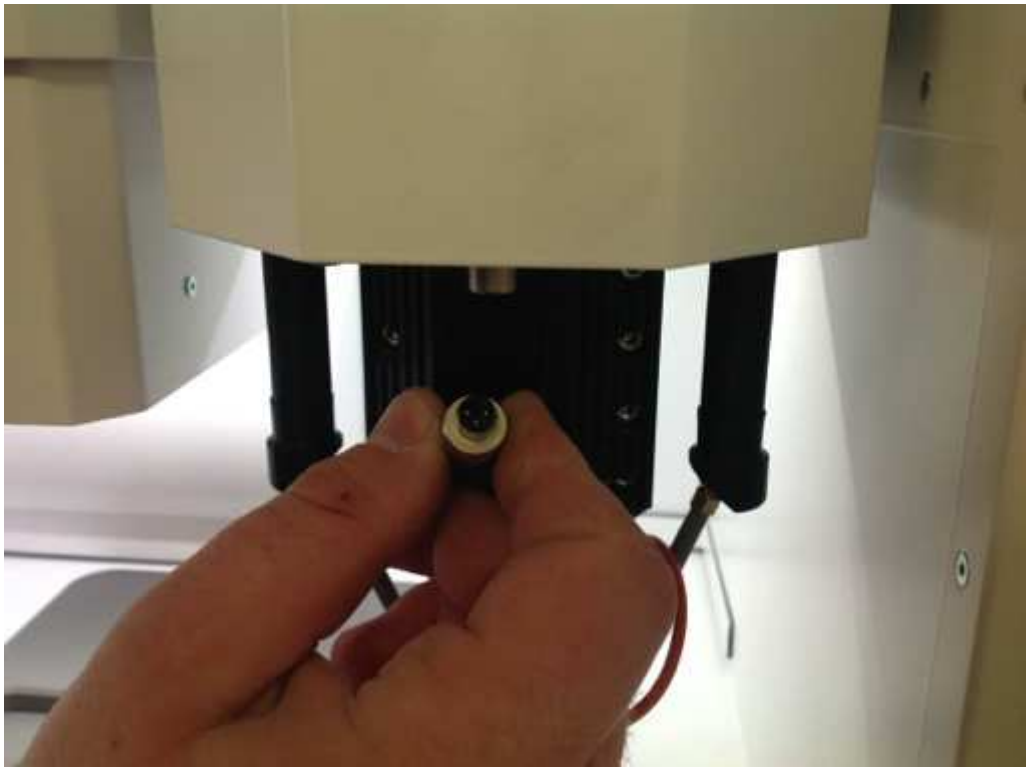
Proceed as follows to carry out the calibration:

Insert the measuring blank as described in *sections 9.4.3 'Loading the holder (without automation)'* and *9.4.4 'Loading the holder (with automation)'.* Insert the measuring blank so that the slots are approximately parallel to the front side of the milling machine:



– Open the front cover.
– Press the button at the bottom left on the spindle holder. This button is for manually opening the collet chuck. Keep the button pressed and insert the measuring probe into the collet chuck up to the stop ring.
– Release the button to close the collet chuck.

– Now remove the protective cap from the connection socket for the measuring probe. The socket is located centrally under the spindle holder.



– Now insert the plug of the measuring probe cable into the socket.

NOTE!

Make sure that the plug is correctly orientated!

The plug must be easy to insert into the socket and carefully screwed tight.

Do not use force to insert the plug.

The measuring probe is a high-precision polished measuring tool.

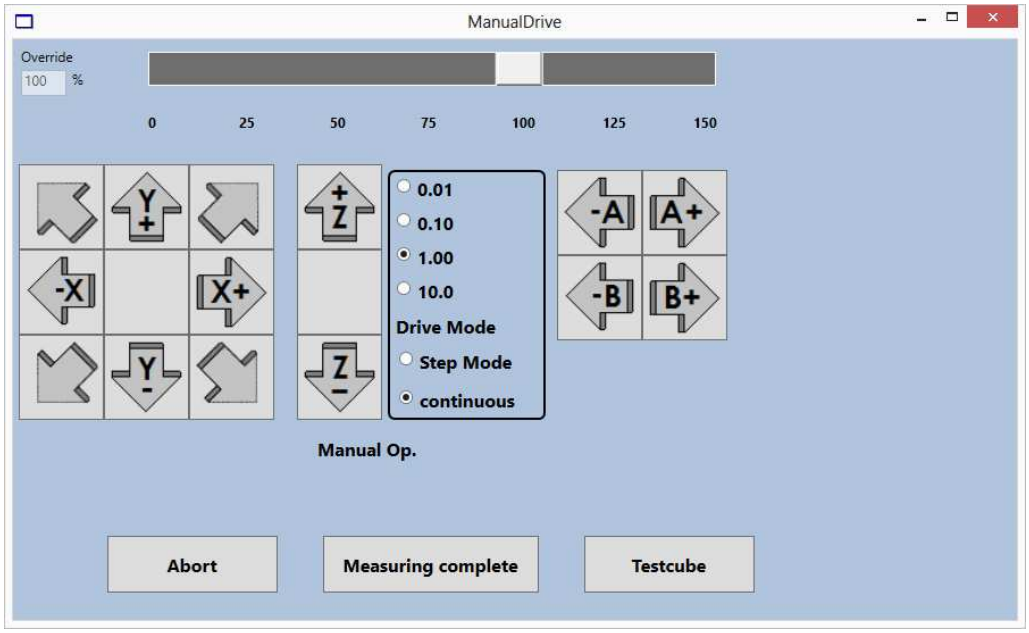
Treat the measuring probe with extreme care!

– Close the front door and press the ‘Enable’ button on the front side of the milling machine.

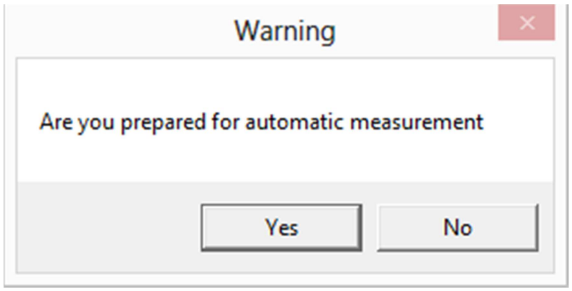
– Now tap the ‘Manual mode’ button.

– Confirm the warning message with ‘Yes’.

– Tap the ‘Complete calibration’ button in the ‘Manual mode’ dialogue box.

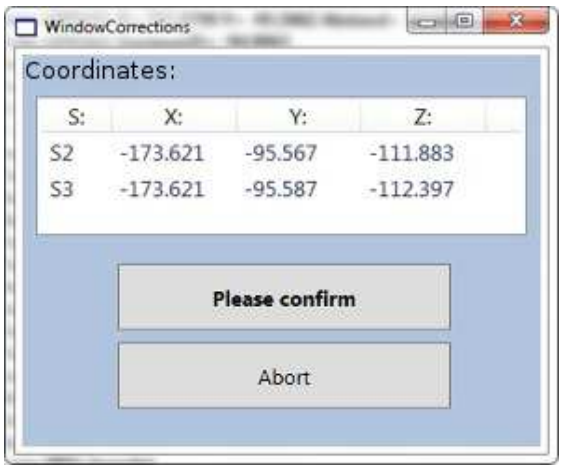


– Confirm the question whether measuring blank and measuring probe are inserted with ‘Yes’.



– The calibration starts.

– Once the calibration is completed a dialogue is displayed showing the result of the calibration. Tap the ‘Please confirm’ button to adopt the calibration data and to end the calibration procedure:



– Check the calibration by milling one or more test cubes again. *See section 9.5.1 ‘Milling test cubes’.*

9.5.3 Tool positions

The collet chuck must be positioned and opened centrally above the tools when changing the tool.

The coordinates of the tool positions are stored in the control software and must be readjusted if the collet chuck does not open centrally above the tools.

NOTE!

Incorrectly adjusted tool positions will lead to a collision between collet chuck and tool.

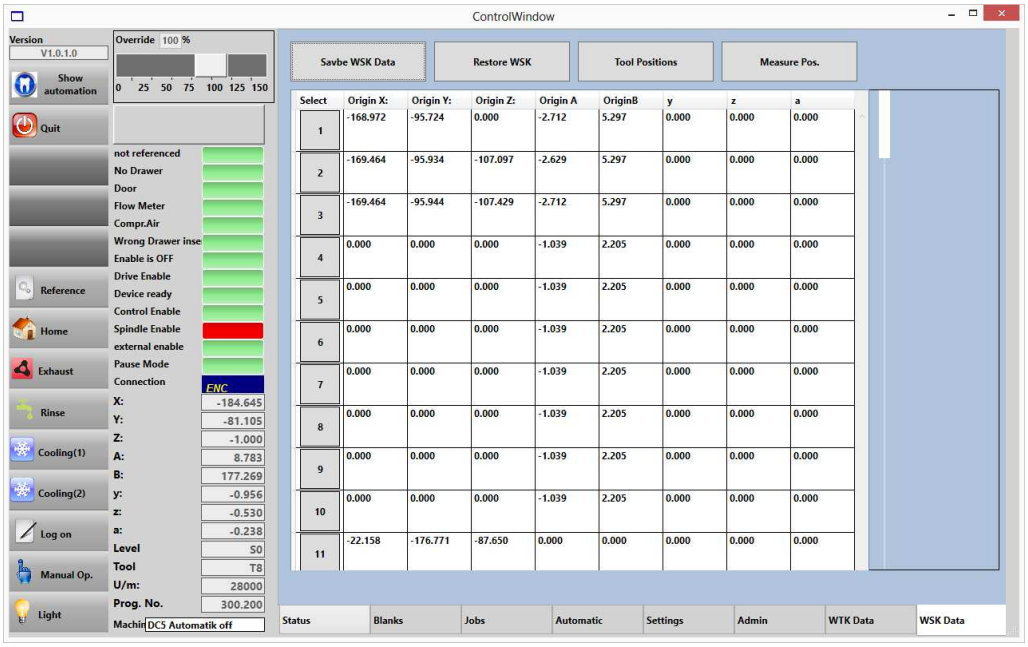
A collision between the collet chuck and the tools or other parts of the milling machine can lead to damage to the collet chuck and spindle.

In that case stop all milling work and inform Dental Concept Systems GmbH immediately!

The tool positions can only be adjusted after logging on. Proceed as follows:

– Tap the ‘Logon’ button and enter the password (see *section 9.5.1 ‘Milling test cubes’*). Confirm the entry by tapping the ‘Please confirm’ button. Further program options are available after logging on.

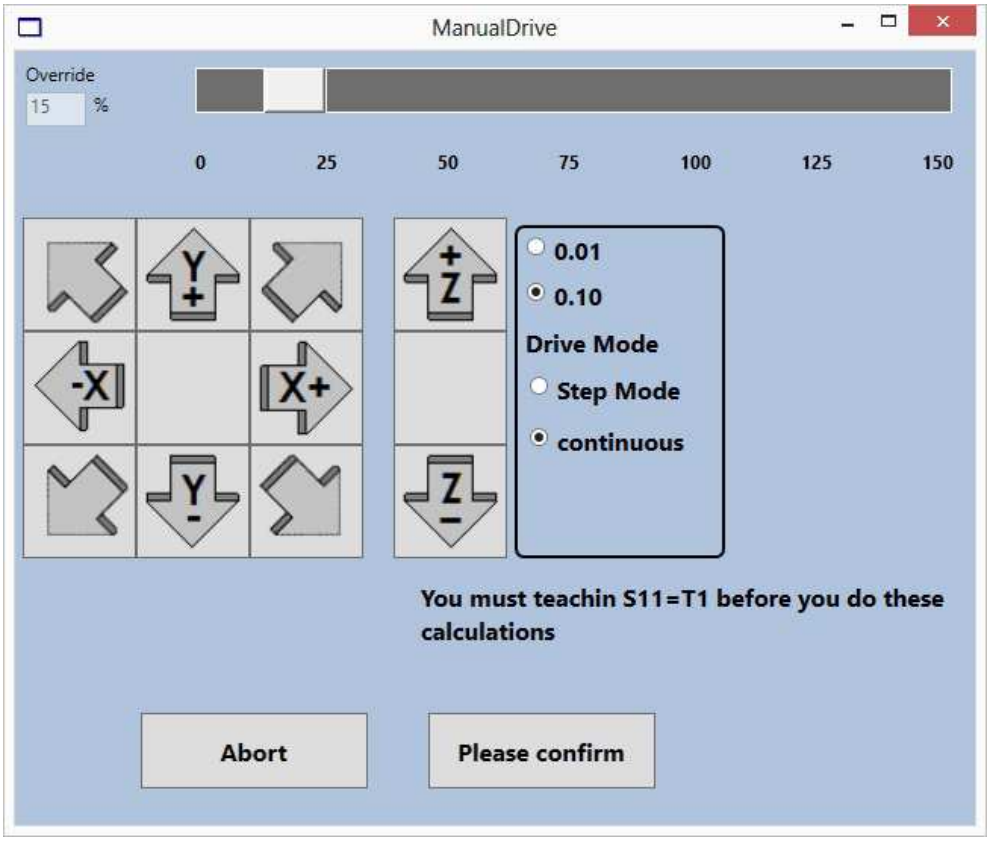
– Tap on the ‘WSK data’ button in the lower area of the program window. The window with the currently set tool positions is opened:



– The tool positions do not need to be adjusted separately. It is sufficient to correct the tool located in position ‘1’ in the tool magazine. Due to the known geometry, all further positions can be calculated from the position of this tool.

– Pull the tool in position ‘1’ of the tool magazine out of the holder and clamp it in the collet chuck. Proceed in the same way as described in *section 9.5.2 ‘Calibration’* for the measuring probe. Press and hold the button on the left under the spindle holder. The collet chuck is opened. Now insert a tool into the opened collet chuck and push the tool into the collet chuck up to the stop ring. Now release the button so that the collet chuck closes and clamps the tool.

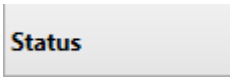
– Now tap the ‘Tool positions’ button in the control software. The ‘ManualDrive’ dialogue for manual movement of the axes is displayed:



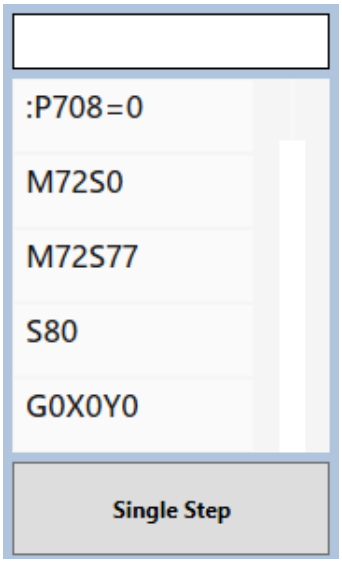
– Now move the spindle with the clamped tool exactly over the tool receptacle at position ‘1’ in the tool magazine using the ‘X+, X-, Y+ and Y-’ buttons.
– Now carefully move the spindle downwards with the ‘Z+’ and ‘Z-’ buttons in order to lower the clamped tool into the holder in position ‘1’ in the tool magazine. Proceed with extreme caution! Lower the spindle until the receptacle in the holder is pressed slightly downwards.
– Change the step size for the motor feed from ‘continuous’ to ‘0.01’ and move the spindle upwards until the tool just no longer presses the receptacle downwards.
– Tap the ‘Please confirm’ button to save the tool position.
– Now remove the tool from the collet chuck (see above) and replace it in position ‘1’ in the tool magazine.

Now test the tool change:

– Tap the ‘Status’ button at the bottom of the program window:



– In the input box above the ‘Single command’ button, enter the command ‘M6Tx’ (e.g. ‘M6T4’ for the tool at position 4):



Replace ‘x’ by the number of the tool that you wish to use.

NOTE!

Below the editing field is a list with the single commands last executed.

Select an entry from the list and then tap ‘Single command’ to execute the command.

– Now tap the ‘Single command’ button to pick up the tool ‘x’.

Check the tool change for different positions. If necessary, adjust tool position ‘1’ again as described above.

NOTE!

The movement speed of the axes is limited to 15% of the standard speed when adjusting the tool positions (‘ManualDrive’ dialog).

Coarsely position the spindle with the clamped tool using the ‘Manual’ mode button and only switch to the ‘WSK data’ display in order to adjust the tool position precisely as described above.

9.5.4 Tool measurement

The length of the clamped tool is measured before and after each milling step in order to detect any wear or breakage of the tool.

NOTE!

The length measurement must take place exactly centrally on the precision switch. Otherwise the measurement results may be incorrect.

If the length measurement does not take place exactly in the centre of the precision switch, the measurement position must be readjusted.

The adjustment of the measurement position is done in a similar way to the adjustment of the positions of the tools in the tool magazine as described in *section 9.5.3 'Tool positions'*.

Proceed as in *section 9.5.3 'Tool positions'*:

– Tap the 'Logon' button and enter the password.

– Tap the 'WSK data' button to switch to the display with the tool positions.

– Now tap the 'Measure pos.' button at the top of the program window.

– Insert the measuring probe as described in *section 9.5.2 'Calibration'*.

– Now position the measuring probe centrally above the precision switch and move the spindle downwards until it just touches the switch. It doesn't matter whether the measuring probe slightly presses the switch downwards. Make sure only that the measuring probe contacts the switch in the centre.

NOTE!

Move the spindle only very carefully downwards and make sure that the measuring probe presses the precision switch only slightly downwards.

Excess pressure on the precision switch and measuring probe can damage them!

10 Operation

10.1 Requirements

NOTE!

Training by the technical personnel from Dental Concept Systems GmbH is necessary before the DC5 Dental Milling System can be operated.

NOTE!

Do not make any changes to the device settings of the milling machine without first consulting and obtaining the permission of the technical personnel from Dental Concept Systems GmbH.

10.2 Requirements of the operating personnel

Persons may work on the DC5 Dental Milling System or put it into operation only if:

– they have been trained and instructed in the handling of the DC5 Dental Milling System and all associated tasks and

– they have completely read the operating manual and understood all safety instructions.

Apprentices and personnel undergoing training may only operate the DC5 Dental Milling System under the supervision of a trained and experienced person.

NOTE!

Reading the operating manual is a prerequisite for operating the milling machine.

All safety instructions in the operating manual must have been read and understood.

Maintenance work may be carried out only by authorised and trained technical personnel.

The protective devices of the DC5 Dental Milling System offer sufficient protection against crushing and cutting injuries. Crushing and cutting injuries can be caused by:

– tools
– rotating spindle
– pneumatically moved components
– electrically moved components

For that reason, always operate the milling machine only with fully intact protective devices. Do not disable any protective devices and do not attempt to bypass them!

DANGER

Risk of fire when milling titanium without cooling lubricant!

Titanium must be always be milled with a cooling lubricant!

Milling without a cooling lubricant produces a great deal of heat. Red-hot swarf and tools can start a fire!

WARNING

Danger due to rotating and moving sharp and sharp-edged machine parts!

There is the danger of severe crushing or cuts if the milling machine is operated with the front cover open.

Never bypass the protective devices of the milling machine.

The milling machine may only be operated with intact protective devices!

WARNING

Danger due to pneumatically moved machine parts!

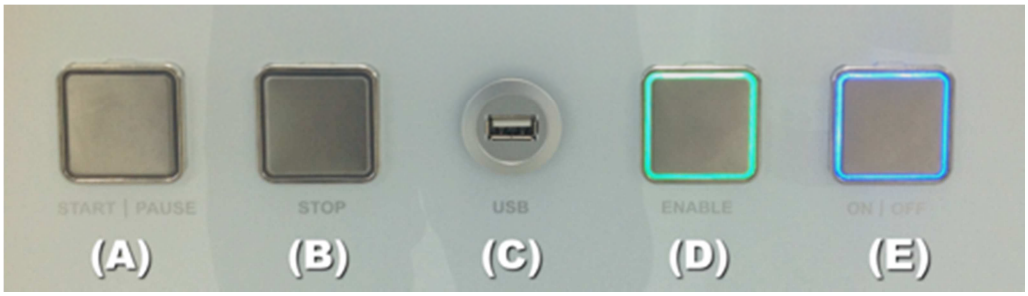
There is the danger of serious crushing and cutting injuries in case of faults in the pneumatic changing and locking system.

In case of malfunctions and collisions of the changing and locking system, turn the compressed air off immediately and inform Dental Concept Systems GmbH.

10.3 Overviews and protective measures

10.3.1 Overview of operating elements and displays

The DC5 Dental Milling System is operated by means of the integrated Windows 7 computer and the touchscreen as well as the buttons on the front side.



- START | PAUSE (A): Starts the milling process or interrupts the currently running milling process.
- STOP (B): Stops the currently running milling process.
- USB socket (C): Can be used for the transfer of milling files or for the connection of a keyboard or mouse.
- ENABLE (D): Enables the system for milling or for the manual movement of the axes.
- ON | OFF (E): On/Off switch. Switches the system on or off.

The basic control software is the same for all milling machines. Systems with the ‘Automation’ option are equipped with an additional software module via which the essential control functions can be executed. In addition, the holders and blanks are managed and automatically changed and the magazine is loaded and unloaded by means of this module.

You can switch between the ‘Automation’ software module and the program screen of the control software as you like.

The individual milling jobs are always executed via the control software, even in the case of systems with automation.

10.3.2 Summary of modes of operation and protective measures

Depending on the equipment level the following modes of operation are possible:

- Milling without automation: milling of any number of milling jobs. The milling jobs must be assigned to the clamped blank. The number of milling jobs is limited only by the available space on a blank. The changing of the blank takes place manually.
- Milling with automation (optional): milling of any number of milling jobs. The milling jobs can be distributed to different blanks or holders. The changing of the holders takes place automatically and is controlled by the ‘Automation’ software module.
- Manual mode: enables the free movement of the axes. The manual mode is started via the program screen of the control software.

Isolating protective devices

Both the milling process and the movement of individual axes can only be started if the following conditions are satisfied:

– Compressed air must be connected and must have a pressure of 7-8 bar.

– The inserted drain tray must be completely closed.

– The front door must be completely closed.

– The controller must be enabled by pressing the ‘Enable’ button (D) on the front side (see *section 10.3.1 ‘Overview of control elements and displays’*).

– When milling with cooling lubricant the flow rate is continuously monitored. If the flow rate falls below a lower limit value, the milling process is automatically interrupted and the spindle is removed from the material and stopped.

Protective measures for stability

– The milling machine is provided with four adjustable feet with which the miller is secured on the floor against rolling away (see *section 9.1 ‘Assembly’*).

Other protective devices

– Malfunctions and control interruptions are indicated by the changing of the colour of the lighting in the machining compartment to red.

– As soon as the system is enabled for milling or the movement of the shafts in manual mode, the colour of the lighting changes to white.

– The individual machining steps are indicated by different colours.

10.3.3 Requirements for stability

– Make sure that the floor is level and free from vibrations and has a sufficient load capacity (see *section 8.1.1 'Dimensions and weight'* and *section 8.1.3 'Foundations and floor'*)

10.3.4 Overview of components that must be transported regularly

– Up to 99 tools can be managed by the 'DC5 Dental Milling System'. Each tool magazine contains up to 10 tools. The tools must be manually exchanged. Take care during transport that you don't come into contact with the sharp cutting edges of the tools.

– Never place the tool magazines down such that they are resting on the tool tips. The tools can be broken off or damaged. When storing the tool magazines, lay them on the side or use the locating pins provided, which you can insert in the holes intended for them.

– Always place the tool magazines down on a secure surface. The tool magazines are made of solid metal and can be damaged or cause injuries if they fall down.

CAUTION

Danger due to sharp tools and falling tool magazines

There is the danger of being crushed or cut when transporting and storing tools and tool magazines.

Do not hold the loaded tool magazines by the cutting edges of the tools.

Make sure you set the tool magazines down only on a stable and secure surface.

– In the case of milling machines without automation you must insert the blanks into the holder. In the case of milling machines with automation the blanks must first be inserted into a holder and then into the pneumatic holder receptacle or the magazine.

– Blanks made of CoCr and titanium in particular are quite heavy. Ensure that the blanks and your hands are dry and hold the blanks firmly in your hands when transporting them.
– Always set the blanks and holders down only on a stable and secure surface.

CAUTION

Danger due to falling blanks and holders

There is the danger of being crushed when transporting and storing blanks and holders.

Always hold the blanks and holders with dry hands.

Always dry blanks and holders after milling with cooling lubricant before transporting them.

Make sure you set the blanks and holders down only on a stable and secure surface.

10.3.5 Overview of the operator's workplaces

– Make sure there is sufficient space in front of the milling machine. Note that the operator stands in front of the milling machine and must open the front door to top up cooling lubricants or to change the fine dust filters. The area in front of the miller should not be smaller than 1.50 m x 1.50 in the ideal case.

10.4 Before each start-up

Each time before starting up, carry out the following tasks in the given order before putting the DC5 Dental Milling Machine into operation.

(1) In the case of milling machines with cooling lubricants, inspect the filter cartridges and cooling lubricant tank for dirt and clean them if necessary. Check the cooling lubricant and top up if necessary (see *section 12 'Maintenance'*).

(2) In the case of milling machines with an integrated extraction module, replace the fine dust bag if necessary (see *section 12 'Maintenance'*).

(3) Inspect the machining compartment and remove any objects.

(4) Connect and turn on the compressed air.

(5) In case of central extraction, connect and/or switch on the extraction.

10.5 Before each restart

After storage or a standstill of the machine lasting longer than 3 months, carry out the following tasks in the given order before putting the DC5 Dental Milling System into operation again.

(1) Check the lubrication of the axes (see *section 12 'Maintenance'*).

(2) In the case of milling machines with cooling lubricants, check the cooling lubricant circuit for leaks. Dismount and clean filter cartridge housings. Replace filter cartridges. Empty and clean the cooling lubricant tank. Fill up with cooling lubricant (see *section 12 'Maintenance'*).

(3) In the case of milling machines with an integrated extraction module, replace the fine dust bag (see *section 12 'Maintenance'*).

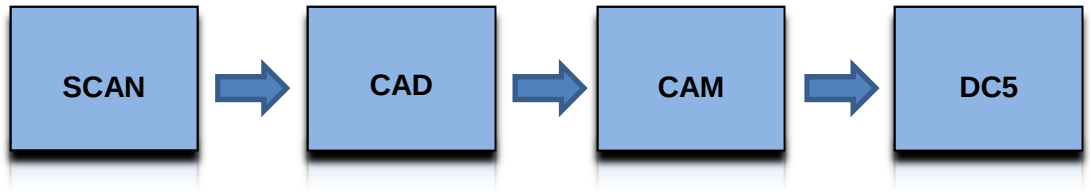
Proceed further as described in *section 10.4 'Before each start-up'.*

10.6 Creation of data for the DC5 Dental Milling System

The DC5 Dental Milling System processes milling files in the so-called NC (numerical control) format. For this you require CAM software (= Computer Aided Manufacturing), which contains a so-called post-processor for the DC5. The post-processor prepares the milling paths calculated by the CAM software in accordance with the geometry and the kinematics of the DC5, so that they can be machined on the DC5.

The 'DC5 CAM V3' CAM software, which is compatible with all variants of the DC5 Dental Milling System, must be acquired separately (see *section 2.4.3 'Software'*).

The creation of milling data thereby essentially follows the flow chart below:



10.7 Switching on the machine

Switch the machine on in accordance with the steps described in detail in *section 9.4.1 'Starting the DC5 Dental Milling System'.*

(1) Switch the machine on at the main switch.

(2) Turn on the compressed air if necessary.

(3) Press the 'ON|OFF' button on the front side of the miller. The button surround lights up blue and the integrated Windows 7 computer boots up and automatically starts the 'DC5 Start' program.

(4) Check whether the text on the lowest button in the dialogue box corresponds to the equipment of your milling machine:

- 'Without automation' = DC5 without automation
- 'With automation' = DC5 with automation

(5) Remove any items that may be in the machining compartment and close the front door.

(6) Make sure that the drain tub is completely closed.

(7) Press the ‘Enable’ button on the front side of the milling machine. The button surround lights up green.

(8) Now tap the ‘Connect’ button. The control program is started.

(9) If the start-up routine proceeds without error, the ‘Reference’ dialogue box is displayed. Now tap the ‘Reference’ button to reference the individual axes.

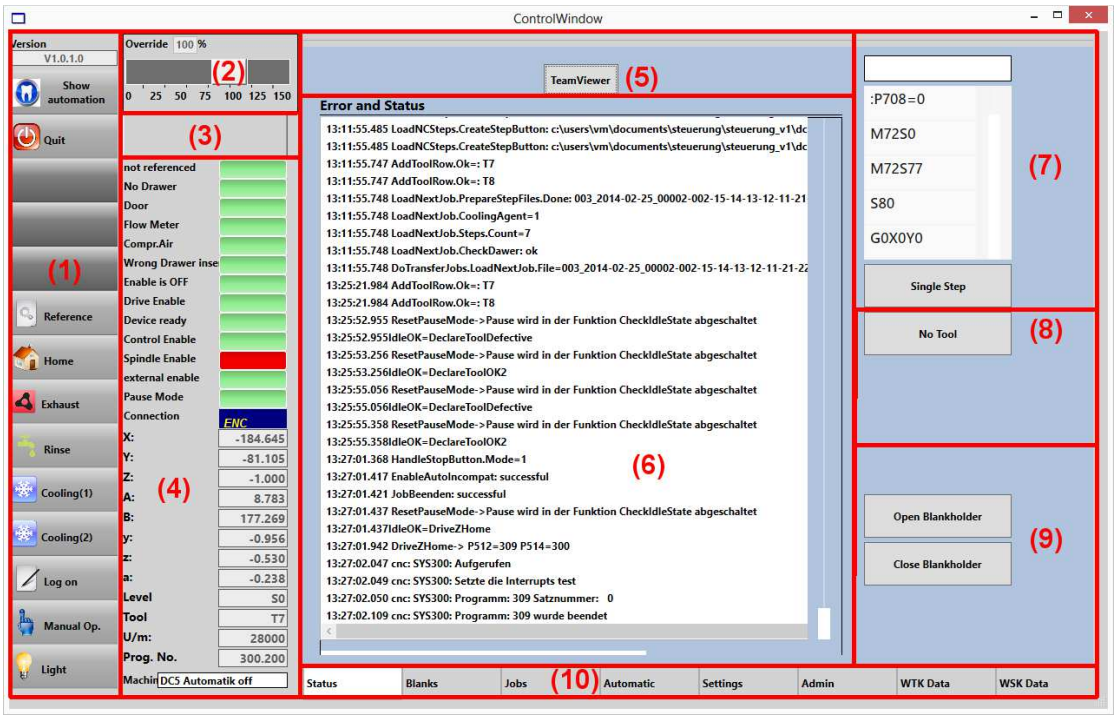
The milling machine is now ready for operation.

10.8 DC5 Dental Milling System without automation

10.8.1 Operating interface

The individual milling jobs are processed by the control software in milling machines both with and without automation. This basic module is identical in all variants of the DC5.

After the start-up and referencing have been completed, the program interface of the control software is displayed:



(1) Commands

Following the program start, or if no milling job is loaded, the following commands are available.

‘Show Automation’	Button to switch to the ‘Automation’ software module (optional).
‘Exit’	Terminates the control program and switches to the ‘DC5 Start’ program.
‘Reference’	Starts the referencing of the axes.
‘Home’	Drives all axes to the safe home position.
‘Exhaust’	Manual switching on and off of the extraction.
‘Rinse’	Blows out the cooling lubricant lines with compressed air.
‘Coolant (1)’	Manual switching on and off of the first circuit.
‘Coolant (2)’	Manual switching on and off of the second circuit.
‘Log on’	Logon dialogue for displaying further program functions.
‘Manual mode’	Opens the ‘Manual mode’ dialogue box.
‘Light on’	Switches the lighting in the machining compartment on and off.

(2) Override:

The feeding speed can be manually increased or decreased during milling using the ‘Override’ sliding control.

(3) Messages:

Displays important messages such as readiness to start.

(4) Status displays:

The status displays provide information about the readiness for operation of the miller. Red illuminated status fields indicate that there is a malfunction and that the milling machine is not ready for operation. The machine is ready for operation when all status displays (with the exception of ‘Feed enable’) light up green.

‘Not referenced’	Lights up red if the axes have not yet been referenced. Close the front door and press the ‘Enable’ button on the front side of the milling machine (button surround lights up green). Then tap the ‘Reference’ button (see (1)).
‘No drawer’	Lights up red if no drain tub is inserted or if the drain tub is not closed correctly.

	Insert a drain tub and close it.
‘Door’	Lights up red if the door is opened. In addition, the colour of the lighting in the machining compartment changes to red. Close the door and press the ‘Enable’ button on the front side of the milling machine. The button surround lights up green.
‘Flow meter’	Lights up red if the flow rate of the activated cooling lubricant circuit is too low. The flow rate should be about 2.3-2.5 l/min. Set the flow rate with the regulating valves in the lower cabinet and check the cooling lubricant quantity. Top up the cooling lubricant if necessary.
‘Compressed air’	Lights up red if no compressed air is connected or if the pressure is too low. The milling machine is not ready for operation. Check the connected compressed air.
‘Incorrect drawer’	Lights up red if a cooling lubricant circuit is activated and the wrong tub has been inserted.
‘No enable’	Lights up red if the ‘Enable’ button on the front side of the milling machine has not been pressed or is not activated. If ‘Enable’ is activated the button surround lights up green. The ‘Enable’ button can only be activated if all malfunctions have been rectified and all requirements are met.
‘Drive enable’	Lights up green if all safety and check queries were without error.
‘Device ready’	Lights up green when the machine is ready for operation. Loaded milling jobs can be milled.
‘Control enable’	Lights up green when the controller is ready for operation and has been enabled.
‘Spindle enable’	Lights up green as soon as a milling job is processed and the spindle has been enabled.
‘External enable’	Must light up green after the software starts.
‘Pause mode’	Lights up red if the ‘Start|Pause’ button on the front side of the milling machine is pressed during milling. After actuation of the button the milling process is interrupted directly. The spindle and tool are driven out of the material. When pause is activated the front door can be opened. Malfunctions or potential sources of problems can be eliminated (e.g. milled-off material residues that could lead to the blockage of an axis). To resume the milling procedure, close the front door and resume the milling procedure by pressing the ‘Start|Pause’ button again.

‘Connection’	The lettering ‘ENC’ in yellow on a blue background must be visible in the status display.
‘X’, ‘Y’, ‘Z’	Specify the coordinates of the translatory axes X, Y and Z.
‘A’, ‘B’	Specify the coordinates of the rotary axes A and B.
‘Level ‘	Current level.
‘Tool’	Number of the currently clamped tool.
‘Rpm’	Current rotary speed of the spindle
‘Program’	Current program line.
‘Device’	Designation of the connected milling machine.

(5) Teamviewer:

The Teamviewer remote maintenance software is pre-installed on all milling machines.

Contact the Support Dept. of Dental Concept Systems GmbH and tap the ‘Teamviewer’ button when requested to do so.

Tell Support the ID shown in the Client module as well as the password.

With this data the Dental Concept Systems GmbH Support Dept. can directly access the computer of the DC5.

(6) Error and status:

All error and status messages are displayed in the ‘Error and status’ field. These messages contain important information regarding errors and malfunctions and serve amongst other things to identify the causes of errors. All entries are stored as so-called log files and can be found in the directory ‘C:\dc5 _hmi \DC5Steuerung \log files’.

Under certain circumstances you may be requested by the Dental Concept Systems GmbH Support Dept. in the event of an error to send one or more log files by email.

(7) Individual commands:

The DC5 control software enables the direct entry of single commands in NC format.

Enter the command to be executed in the text box and then tap the 'Single command' button to execute the command.

The commands executed last are shown in the list below the text box. Tap the command that you wish to execute again and execute it by tapping the 'Single command' button.

NOTE!

The execution of single commands requires precise knowledge of the milling machine and the NC code.

Single commands should be executed only by trained and authorised personnel.

Incorrect operation can lead to damage to the milling machine.

Dental Concept Systems GmbH accepts no liability whatsoever for unauthorised or incorrect execution of single commands!

(8) No tool:

Using the 'No tool' button the predefined single command to deposit an inserted tool in its associated position in the tool magazine is called up and executed.

NOTE!

Execute the 'No tool' command only if you are sure that the tool magazine has not been changed and that the position in which the tool is to be deposited is not already occupied!

The deposition of a tool in a tool position that is already occupied can lead to damage to the tool and to the milling machine.

Dental Concept Systems accepts no liability for damage caused by the negligent deposition of tools in positions that are already occupied!

(9) Open blank holder / Close blank holder:

Milling machines with automation have a pneumatically locking holder receptacle. This is opened with the ‘Open blank holder’ button and closed with the ‘Close blank holder’ button. For manual insertion of the holders see also *section 9.4.4 ‘Loading the holders (automation)’*.

(10) Page selection:

As standard the ‘Status’ page is displayed. Further options and setting possibilities of the control software and/or the DC5 are displayed by tapping further page selection buttons. Some buttons are only available after logging on.

NOTE!

Do not make any changes to the settings of the control software unless expressly requested to do so by the technical personnel from Dental Concept Systems GmbH.

Otherwise there is a risk of the milling machine no longer functioning correctly and possibly being damaged.

Dental Concept System GmbH accepts no liability whatsoever for damage caused by unauthorised changes to the settings of the control software!

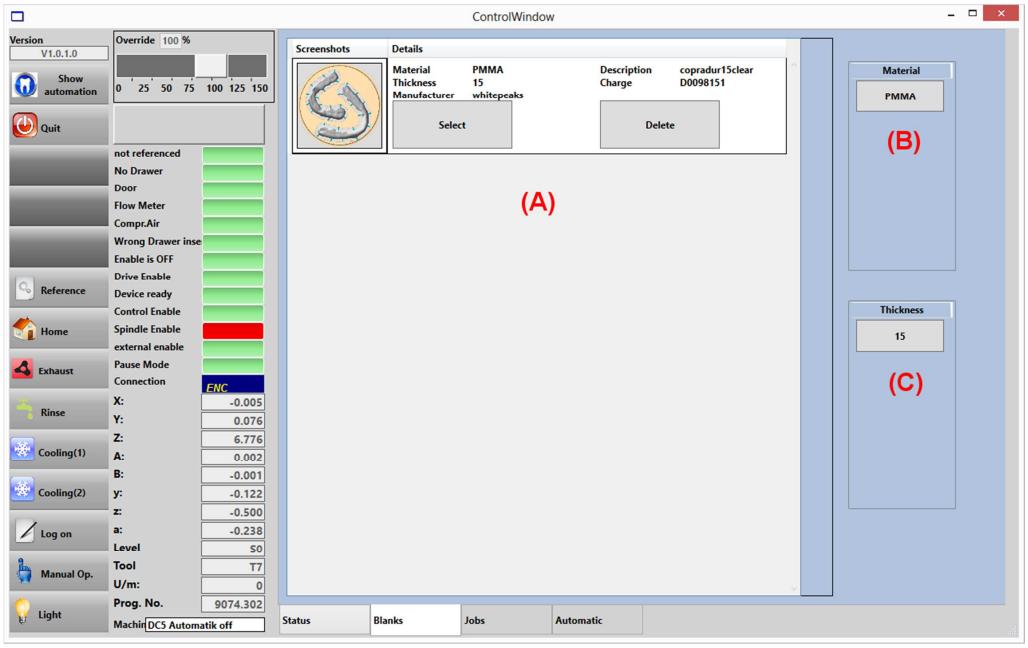
‘Status’:

The ‘Status’ display appears directly after the program is started. The display contains essential information on errors and the status of the milling machine. In addition it contains operating elements for calibration, etc. (see also above).

Tap the ‘Status’ button to call up the operating elements and ‘Status’ display.

Blanks **‘Blanks’:**

Tap the ‘Blanks’ button to switch to the ‘Blanks’ page. The blank data transmitted to the milling machine are displayed on this page. The blank data contain all open milling jobs for a certain blank.



Field (A)

Blanks	List of the transmitted blanks.

Field (B)

Material	Specification of the material of a marked blank in the list (A)

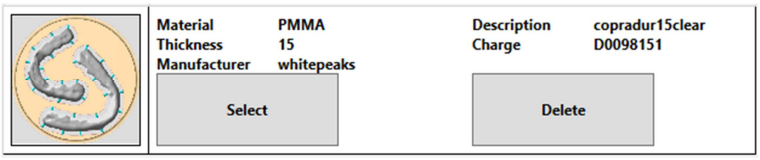
Field (C)

Thickness	Specification of the thickness of a marked blank in the list (A)

Each blank corresponds to an entry in the list (A) in the centre of the program window. Any number of blank data can be displayed. The number of entries corresponds to the number of blank data transmitted from the CAM to the milling machine.

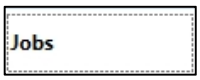
Each list entry contains a graphic illustration of the associated blank as well as specifications of material, thickness, manufacturer, designation and batch. If you tap on an entry in the list, then the material and thickness are shown in the fields (B) and (C) respectively on the right-hand side of the display.

Adjacent to each entry are two buttons: ‘Select’ and ‘Delete’.



Tap the ‘Display’ button to load the open milling jobs for the blank. The display switches automatically to the ‘Jobs’ page.

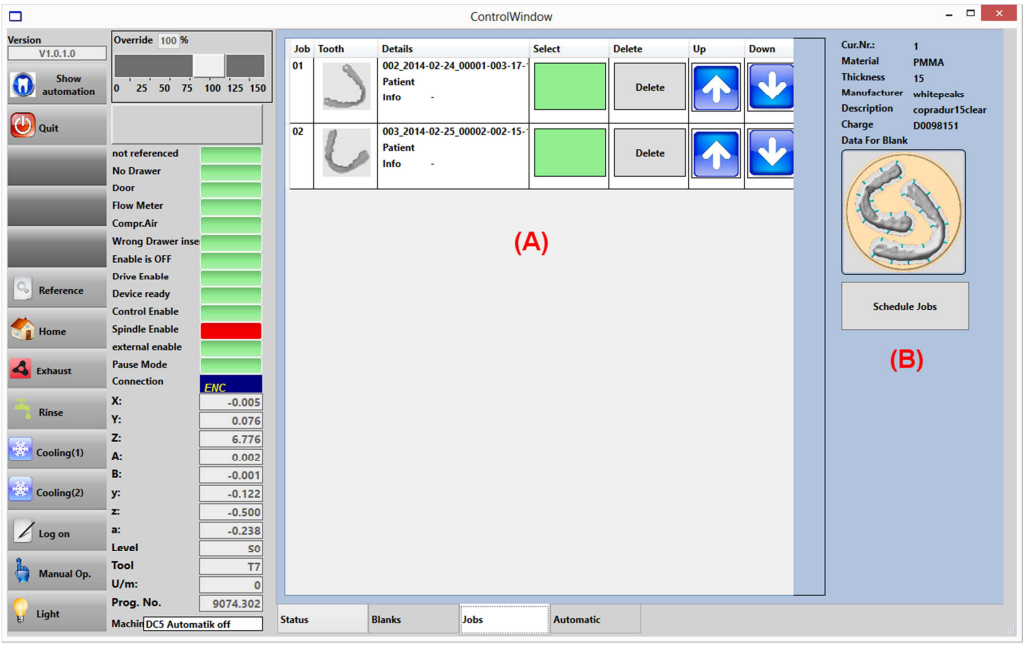
Tap the ‘Delete’ button to delete the data of a blank and all associated milling jobs. The data will be completely deleted. The data cannot be restored; they must be transmitted by the CAM software to the milling machine again.



‘Jobs’:

Tap the ‘Jobs’ button to switch to the ‘Jobs’ page. The ‘Jobs’ page contains all open milling jobs for the blank selected on the ‘Blanks’ page.

The ‘Jobs’ page is called automatically if you tap the ‘Display’ button in the list entry for a blank on the ‘Blanks’ page.



Field (A)

Jobs	List of the open jobs for a loaded blank.

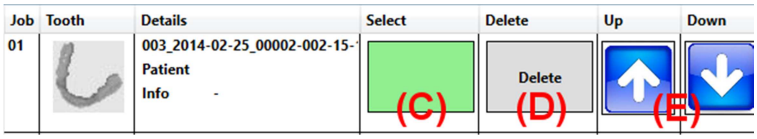
Field (B)

Blank details	List of the open jobs for a loaded blank.

‘Mill jobs’	Detailed information for the blank and the ‘Mill jobs’ button with which the milling procedure is started.

Each milling job corresponds to an entry in the list (A) in the centre of the program window. If you tap on an entry, several data as well as a graphic illustration of the associated blank are displayed on the right-hand side of the program window (B).

Each individual list entry contains a graphic illustration of the work to be milled, detailed information about the project and various buttons.



Tap the ‘Select’ button (C) to deselect a milling job. Only selected jobs are milled. A job is selected if the associated switch is green. Deselected milling jobs can be activated at any time and then milled.

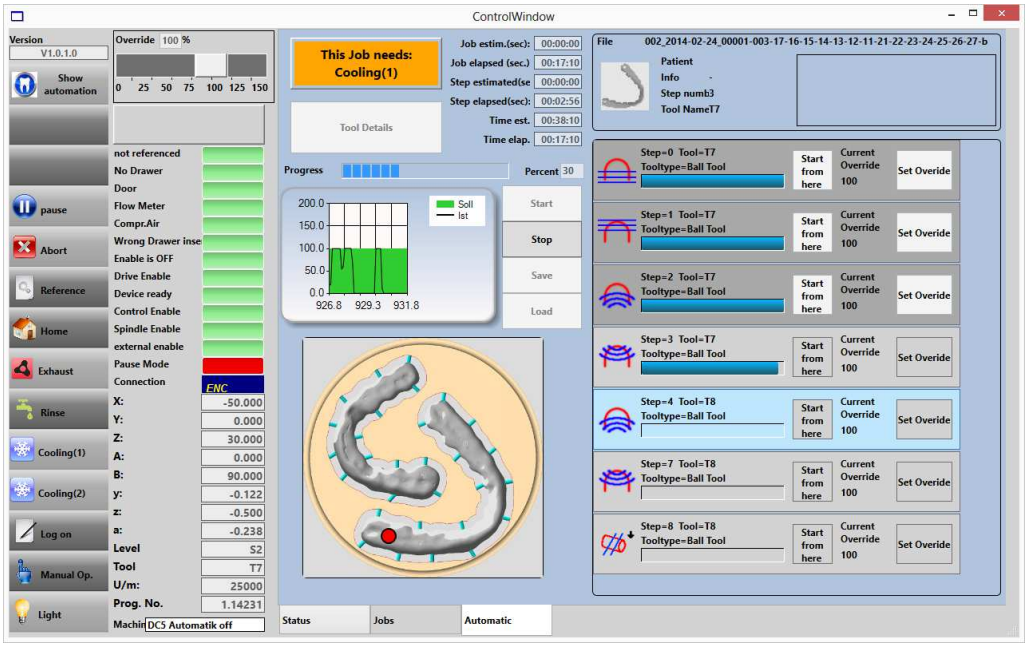
Tap the ‘Delete’ button (D) to cancel a milling job. All milling data are deleted.

Using the ‘Earlier’ and ‘Later’ buttons (E) you can change the position of the milling job in the list. The position in the list corresponds to the order in which the jobs are machined.

The milling of the jobs is started by the ‘Mill jobs’ button. The page switches automatically to the ‘Automatic’ screen.

Automatic **‘Automatic’:**

Tap the ‘Automatic’ button to switch the page to ‘Automatic’.



The ‘Automatic’ page is active as soon as a milling job is machined.

On this page the operator is provided with information on the job currently being machined. Operating elements can be used to intervene in the current milling process.

For milling without automatic, see also *section 10.8.3 ‘Milling’.*

If you are logged on (‘Logon’ button), further pages are available to you:

- ‘Settings’
- ‘Service’
- ‘WTK data’
- ‘WSK data’

These additional pages contain important specifications and settings. Usually you do not need to make changes here unless you are explicitly requested to do so by the Support Dept.

NOTE!

The ‘Settings’, ‘Service’, ‘WTK data’ and ‘WSK data’ pages are reserved for authorised and trained personnel.

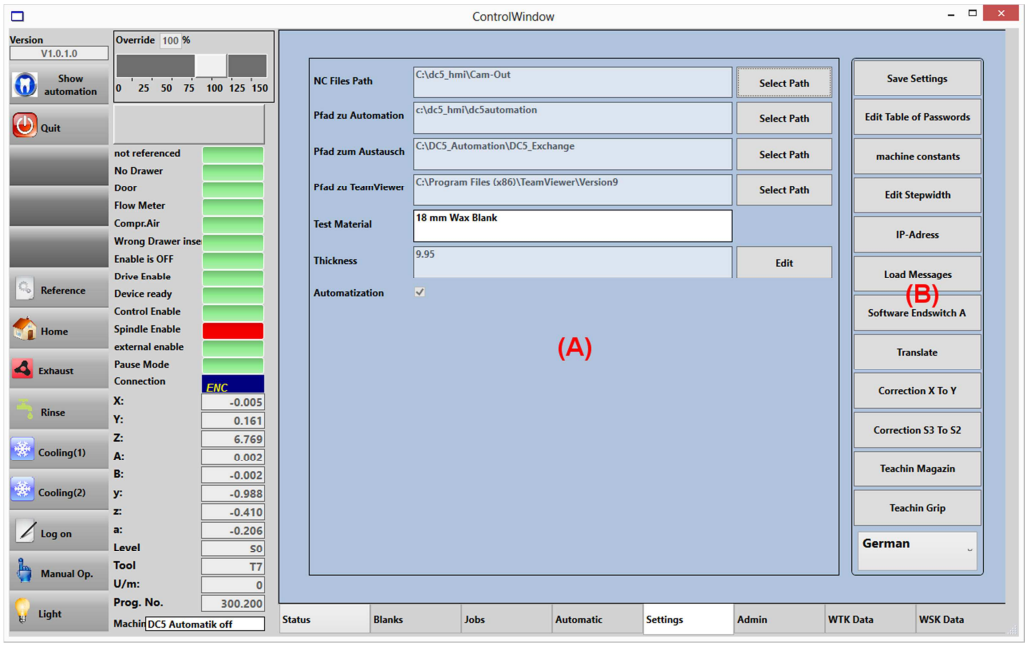
Only make changes here if you are requested to do so by the technical personnel from Dental Concept Systems.

Incorrect entries can lead to the milling machine no longer correctly functioning and may result in damage to the milling machine!

Dental Concept Systems GmbH accepts no liability for damage caused by incorrect and unauthorised changing of settings!

Settings **‘Settings’:**

Tap the ‘Settings’ button in order to switch the page to the ‘Settings’ page.



Field (A)

Paths00	Enables the entry of the paths to NC files, data for automation and data exchange as well as the specification of the path to the ‘TeamViewer’ remote maintenance software.
Test cubes	Specifications for the milling of test cubes.

Thickness	Thickness of the blank to be used for milling test cubes.

Field (B)

‘Save Settings’	Saves the settings.
‘Edit Table of Passwords’	Opens the password management.
‘Machine constants’	Opens the machine constants management.
‘Edit Stepwidth’	Opens the dialogue box for setting the step size.
‘IP Adress’	Opens the display of the IP and MAC address.
‘Software Endswitch A’	Activates/deactivates software switch A.
‘Translate’	Translation module.
‘Correction X to Y’	Calibration.
‘Correction S3 to S2’	Calibration.
‘Teachin Magazine’	Entry of the blank positions in the magazine.
‘Teachin Grip’	Entry of the clamping device of the gripper mechanism.
‘German’	Language settings.

Set the paths in section (A). Tap the respective ‘Select path’ button to the right of the path specification that you wish to change.

The ‘Folder search’ dialogue box opens.

Now select a folder or create a new folder using the ‘Create new folder’ button.

Tap the ‘OK’ button to confirm the entry and save the folder.

The specified path to the selected folder now appears in the respective text box.

You should not actuate the buttons in field (B) without being requested to do so by technical personnel from the Support Dept. of Dental Concept Systems GmbH. The only exception to this is the ‘German’ button (or ‘English’, if English is selected as the language).

Save the changed settings by tapping the ‘Save settings’ button.

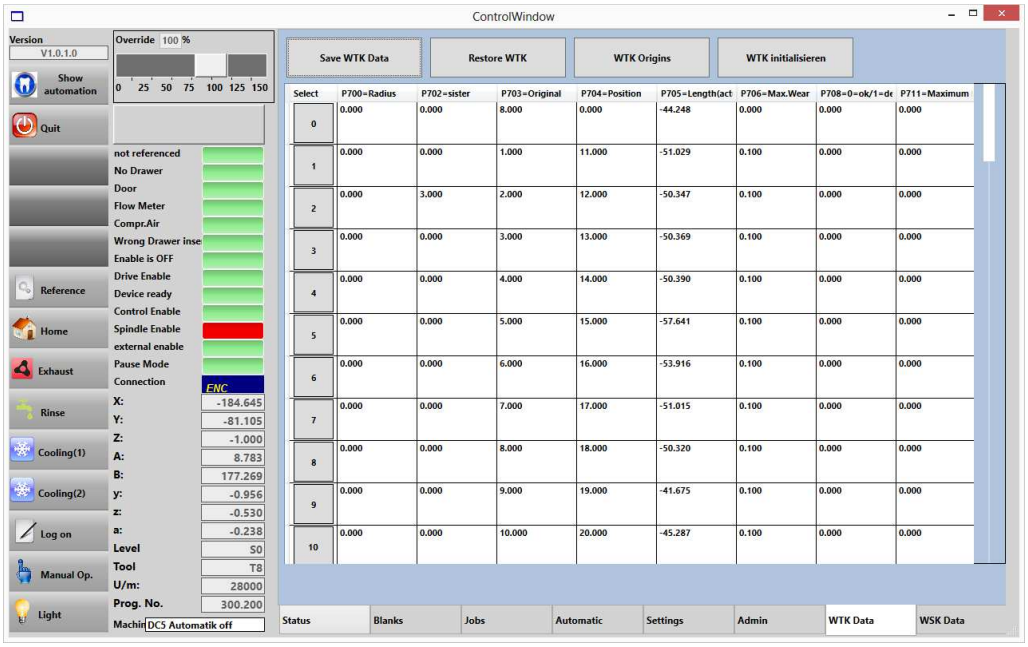
‘Admin’:

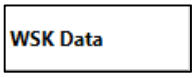
Tap the ‘Admin’ button to switch to the ‘Admin’ page.

The ‘Service’ page contains various buttons and displays for checking the functions of the DC5.

WTK Data **'WTK data':**

Tap the 'WTK data' button to switch to the 'WTK data' page. The 'WTK data' page contains tool specifications. Do not make any changes here.



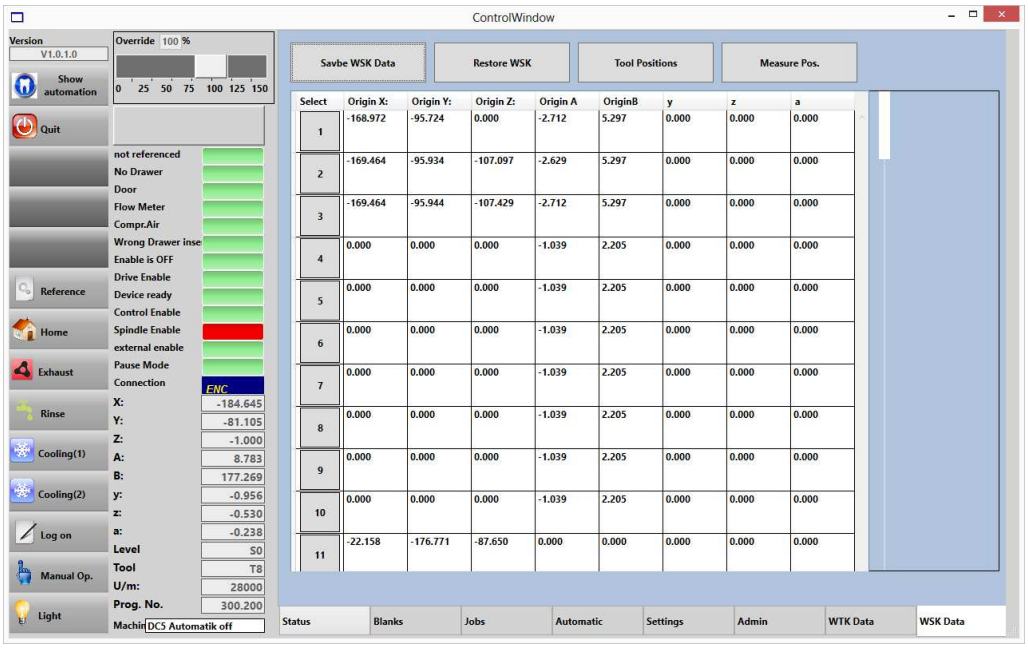


‘WSK data’:

Tap the ‘WSK data’ button to switch to the ‘WSK data’ page.

The tool positions and the measuring position are set on the WSK data page.

See *section 9.5.3 ‘Tool positions’* and *section 9.5.4 ‘Tool measurement’* regarding this.



10.8.2 Milling jobs

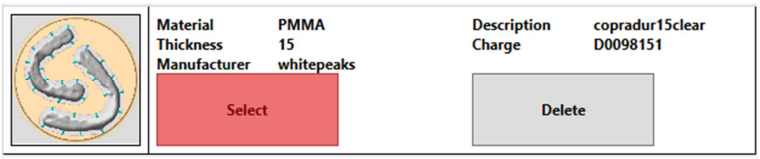
After setting up the computer, the NC files to be milled are automatically copied by the CAM software into the folder for the NC data on the DC5. The folder is usually called: ‘C:\dc5 _hmi\Cam Out’ (see *section 9.3.4 Folder for milling data’*).

Alternatively you also can transfer the data to the milling machine using a USB flash drive. Use the USB port on the front side of the DC5 for this. As soon as you plug a USB flash drive into the USB port, Windows identifies it as an additional storage medium. Now use Windows Explorer to copy NC files from the flash drive into the folder for NC data on the computer in the DC5.

The folder for NC data is monitored by the control software. Incoming milling jobs are automatically added to the list on the ‘Blanks’ page as new entries (see *section 10.8.1 ‘Operating interface’*).

Proceed as follows if you wish to mill the milling jobs for a blank:

(1) On the ‘Blanks’ page, tap the ‘Display’ button for the blank whose open milling jobs you wish to mill.



(2) The display automatically switches to the ‘Jobs’ page and all open milling jobs for the selected blank are displayed.

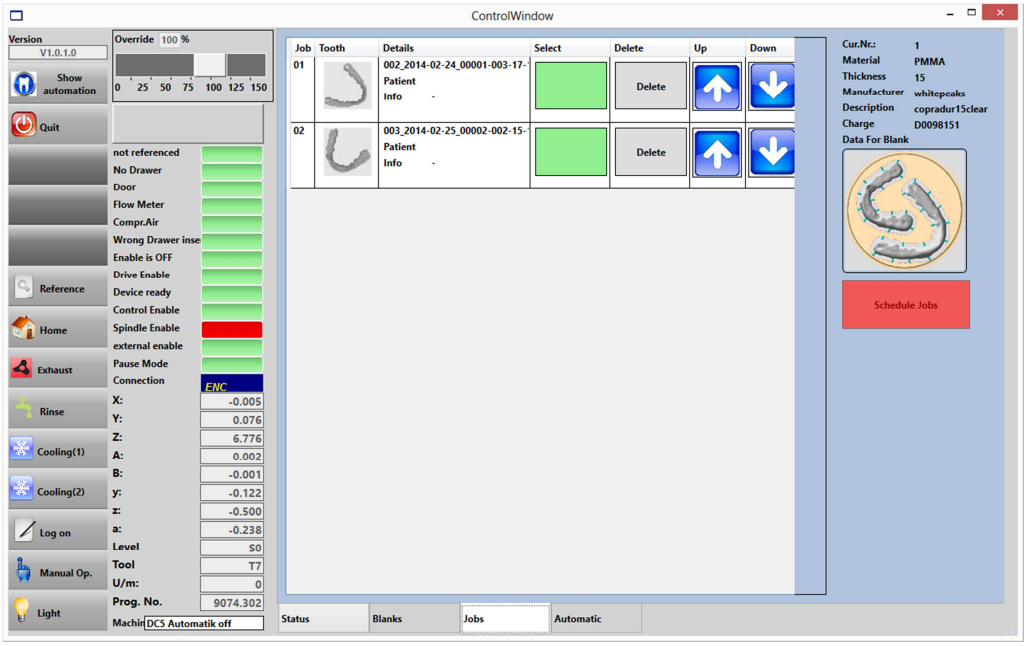
(3) As described in section 10.8.1 ‘Operating interface’, you can change the order in which the jobs are milled using the ‘Earlier’ or ‘Later’ buttons.

The jobs are milled according to the position in the list. Jobs nearer the top are milled first, jobs nearer the bottom later.

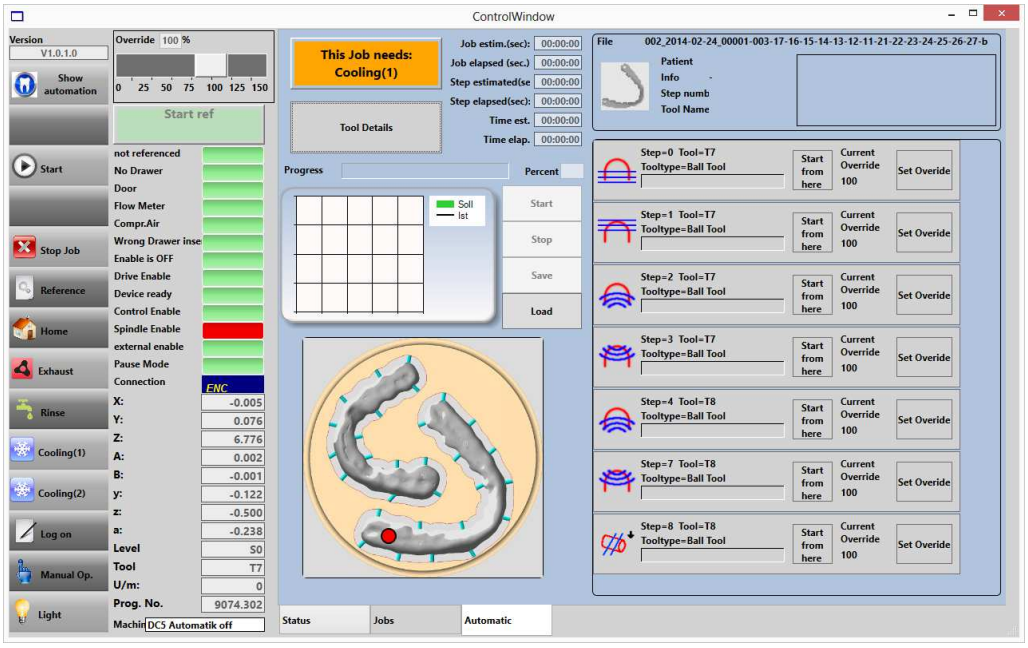
Deactivate jobs that you do not wish to mill or wish to mill at a later time by tapping the green ‘Select’ button. The button has a grey colour if the job is deactivated.

If you wish to permanently remove a job, tap the ‘Delete’ button.

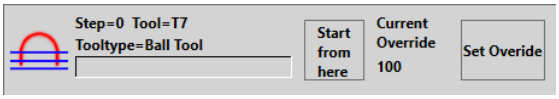
(4) Now tap the ‘Mill jobs’ button on the right in the program window to start the milling process.



The page switches automatically to the ‘Automatic’ page.



The first job in the list on the ‘Jobs’ page is loaded and the individual milling steps of the loaded job are displayed on the ‘Automatic’ page.



Each individual milling step corresponds to an entry in the list. An individual milling step contains details of the tool number and the type of tool.

Not all milling steps can be displayed at once if the number of milling steps is very large. In this case, use the scroll bar at the right-hand side of the list to scroll the display with the entries up or down.

If you tap the ‘Start from here’ button, all previous milling steps are skipped and the machining starts directly with the selected milling step.

The ‘Start from here’ option enables you to resume an interrupted job at a certain point. A repetition of milling steps already executed is not necessary.

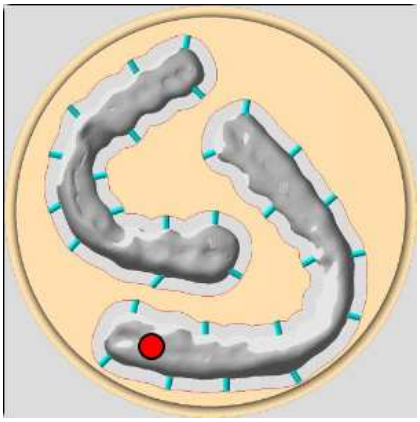
NOTE!

Use the ‘Start from here’ button only if all previous milling steps have already been executed (e.g. if you have to restart a job due to an error).

Do not omit milling steps that have not yet been executed!

The omission of milling steps that have not yet been executed can result in tool breakages and damage to the milling machine!

Apart from the individual milling steps on the ‘Automatic’ page, a graphic illustration of the loaded blank and the associated jobs is also displayed. The red dot marks the job that is currently loaded and being milled.



If the use of cooling lubricant is required, then this is indicated by the text

‘This job requires: Coolant (1)’ or ‘This job requires: Coolant (2)’ on an orange background.

If no cooling lubricant is required, then this is indicated by the text

‘This job requires: No coolant’ on a grey background.

(5) If cooling lubricant is required, check that the correct tub is inserted.

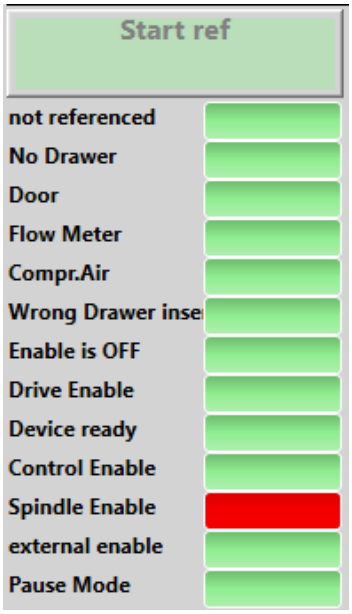
(6) Insert a blank (see *section 9.4.3 ‘Loading the holder (without automation)’*). Make sure that the material and thickness of the blank are correctly selected.

(7) Check that the correct tool magazine is inserted and that all tools are present.

(8) Now close the front door.

(9) Press the ‘Enable’ button on the front side of the DC5. The button surround lights up green.

(10) As soon as the DC5 is ready for milling, all status displays light up green (with the exception of the 'Spindle enable' display – the spindle is enabled when the milling process starts). The message box (see section 10.8.1 'Operating interface') above the status displays flashes green and the 'Start' text is displayed.

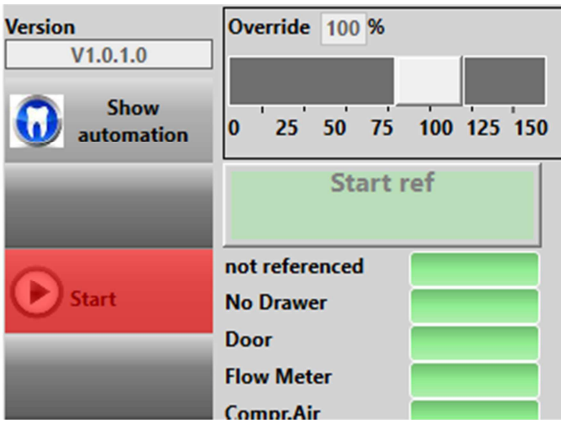


In addition to the command buttons already described in section 10.8.1 'Operating interface', further buttons are available after loading a job.

Before the start or in the case of a stopped job, these are:

'Start'	Starts the loaded job.
'Quit job'	The job is deleted from the processing. Resumption is possible by selecting the job again on the 'Jobs' page.

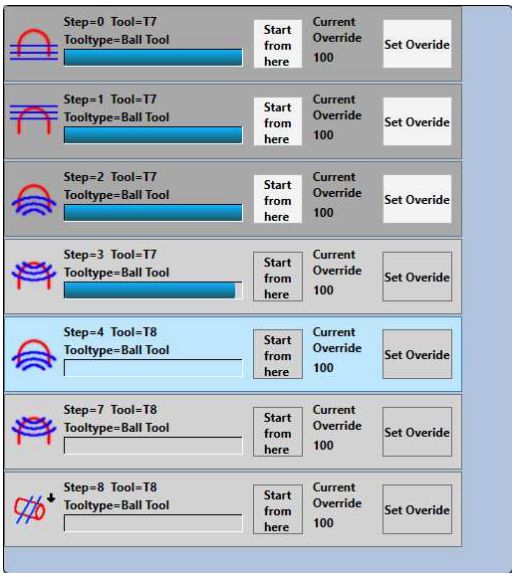
(11) Now press the 'Start|Pause' button on the front side of the DC5 or the 'Start' switch in the control software.



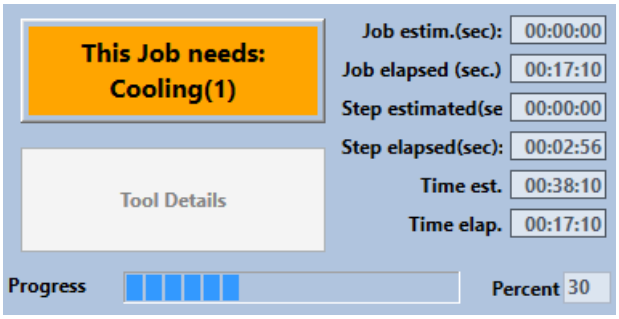
The milling process is started and the colour of the lighting in the machining compartment changes.

Different colours are assigned to the individual milling steps. The colour of the lighting changes with each new milling step. The lighting is switched off once the milling process is completed.

For each individual milling step a progress bar is displayed informing you how many percent of the respective milling step have already been completed.



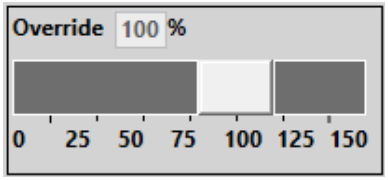
Information on the status of the complete machining is provided by a progress bar in the top left area of the ‘Automatic’ page.



(12) As described in section 10.8.1 ‘Operating elements’, the feeding speed can be changed during milling.

In particular in the case of narrow and complicated works with fast changes of direction or when testing new milling strategies, it is very useful to set the feeding speed to a low value at first and to increase it slowly. This way you have more control over the milling process and can carefully determine the optimum feeding speed.

The set value is displayed under ‘Current. Override’ in percent. The value 100 corresponds to the value specified in the milling strategy.



NOTE!

Increase the feeding speed only with extreme caution!

As a rule the feeding speed set in the milling strategy should not be exceeded.

Reduce the feeding speed manually if you are testing new milling strategies or milling very narrow works.

10.8.3 Interrupting or cancelling jobs

Jobs currently being machined can be interrupted, resumed or completely deleted at any time.

As already described in section 10.8.2 ‘Milling jobs’, further command buttons are available after loading a job. The following buttons are available after a job has been started:

‘Pause’	Interrupts the loaded job.
‘Continue’	Displayed when a job is interrupted. Resumes the interrupted job at the point of the interruption.
‘Cancel’	Aborts the job. If restarted, the job starts with the first milling step. Already executed milling steps can be skipped using the ‘Start from here’ button.

In order to interrupt a running job and to resume it at the point of interruption later on, the following options are available to you:

– Tap the ‘Pause’ button in the control software.

– Press the ‘Start|Pause’ button on the front side of the DC5.

– Open the front door.

In order to resume an interrupted job, proceed as follows:

– Close the front door.

– Press the ‘Enable’ button on the front side of the DC5.

– Now tap the ‘Continue’ button in the control software or press the ‘Start|Pause’ button on the front side of the DC5.

The job is resumed at the precise point of the interruption. This also applies if the current job was interrupted within a milling step.

In order to cancel a running job, the following options are available to you:

– Tap the ‘Cancel’ button in the control software.

– Press the Stop button on the front side of the DC5. The button surround lights up red.

The resumption of a cancelled job is also possible. Resumption within a milling step is not possible. The job is either completely repeated or it can be resumed from the associated milling step using the ‘Start from here’ button. In this case the complete milling step is repeated.

In order to resume a cancelled job, proceed as follows:

– Close the front door.

– Press the ‘Enable’ button on the front side of the DC5.

– Optional: Tap the ‘Start from here’ button for the milling step at which you wish to resume the milling process,

  Confirm the safety question.

– Tap the ‘Start’ button in the control software or press the ‘Start|Pause’ button on the front side of the DC5.

If a job is to be completely deleted, the ‘Quit job’ button in the control software must be pressed after cancelling the job (Fig. 27, field ‘1’).

The job is removed from the processing and can be deleted on the ‘JOBS’ page. Complete blanks are deleted on the ‘BLANKS’ page (see section 4.2.2.1 ‘Loading and milling jobs’, figs. 35 and 36).

Jobs are interrupted and can be resumed:

– Tap the ‘Pause’ button in the control software.

– Press the ‘Start|Pause’ button on the front side of the DC5.

– Open the front door.

Jobs are cancelled and must be restarted:

– Tap the ‘Cancel’ button in the control software.

– Press the ‘Stop’ button on the front side of the DC5.

(*Skipping of milling steps using the ‘Start from here’ button in the respective milling step*).

10.8.4 Error messages

Errors and malfunctions during milling can lead to an interruption of the milling process. If an error or a malfunction occurs, this is indicated by the control software in the form of a message. In addition, the lighting in the machining compartment lights up red in the event of an interruption. As a rule the errors can be quickly rectified and the milling process can be resumed.

The most frequent error messages during milling are:

'Tool defective'

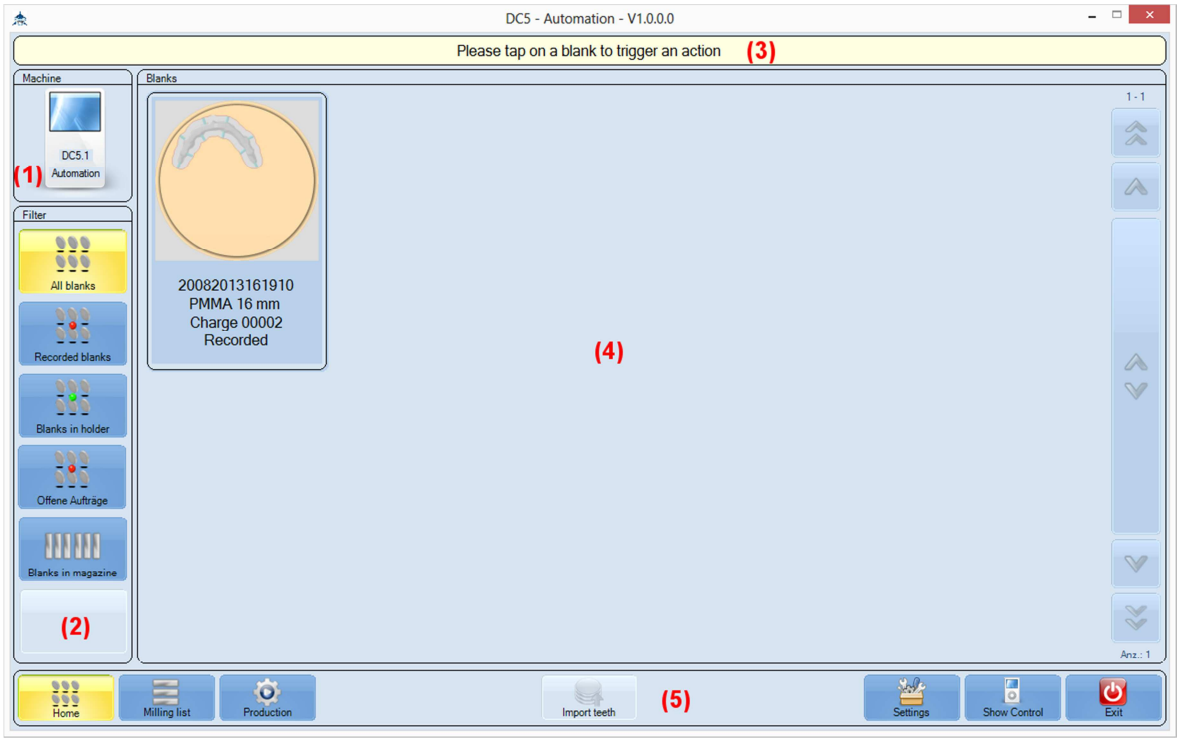
'Coolant active'

For this and further malfunctions, see also section 11.2 'Troubleshooting'.

10.9 DC5 Dental Milling System with automation

Jobs are processed in systems with automation in the same way as in systems without automation. However, there is an additional module that takes over the management of the blanks and holders and forwards the jobs to the control software.

10.9.1 Operating interface



(1) Machine:

Tap the ‘DC5.1 Automation’ symbol in order to access the standard window of the control software.

(2) Blank and holder management:

‘All blanks’	Displays all blanks.
‘Blanks without holder’	Displays blanks that have not yet been assigned to a holder.
‘Blanks in holder’	Displays blanks that have been assigned to a holder.
‘Open jobs’	Displays all open jobs.
‘Blanks in magazine’	Displays blanks that have been assigned to a holder and are located in the magazine.

(3) Information/notes:

Status line with information showing which actions are available to the operator.

(4) Blanks and jobs:

Window with a list of the blanks and jobs. The window changes depending on which window was selected under (2) blanks and holder management.

Tap on a list entry to process it.

See also *section 10.9.2 'Milling', section 10.9.3 'Cancelling jobs', section 10.9.4 'Removing blanks from a holder'* and *section 10.9.5 'Removing holders from the magazine'.*

(5) Control bar:

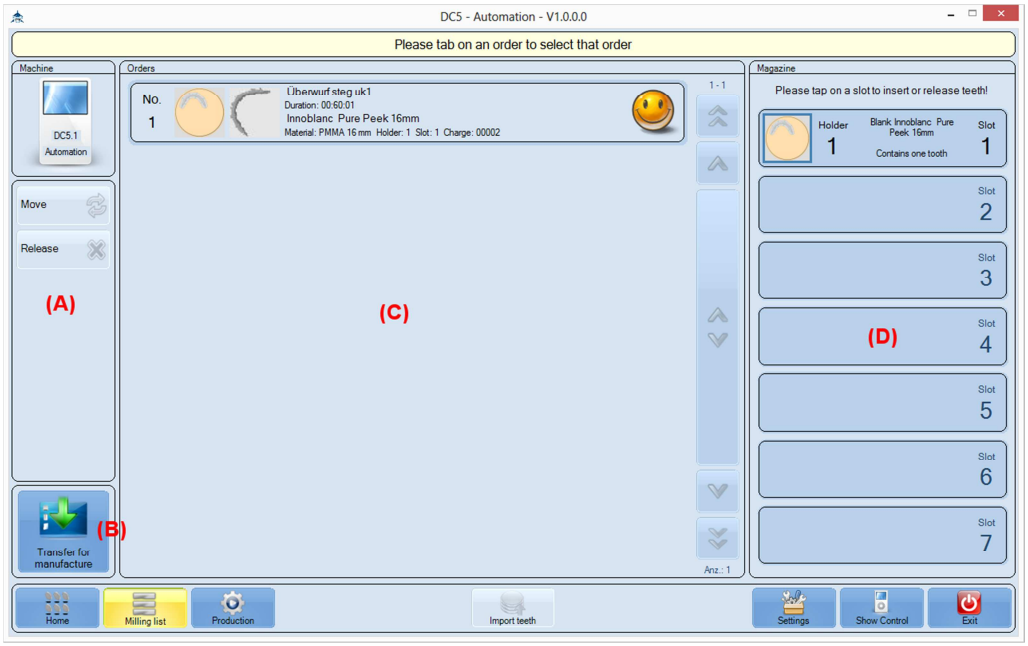
Switches between the various pages and contains buttons for importing milling jobs, switching over the control and exiting from the program.

'Home':

Tap the 'Blanks' button to switch to the 'Blanks' page (see above).

'Milling list':

Tap the 'Milling list' button to switch to the 'Milling list' page.



Field (A)

'Move'	Enables the shifting of the selected job in the job list (C). The position in the list corresponds to the priority of the job.
'Release'	Enables the removal or cancellation of jobs (see *section 10.9.3 'Cancelling jobs'*).

Field (B)

‘Transfer for manufacture’	Transfers the milling list to production for milling.

Field (C)

‘Orders’	View of all available jobs. The respective entry must be tapped to select it.

Buttons in Field (D)

‘Magazin’	View of the holders that are assigned to a certain position in the magazine.

Jobs can be edited on the ‘Orders’ page. It is possible to arrange jobs in order of priority, to deactivate them or to cancel them.

The milling jobs are displayed in the list field (C). Using the ‘Move’ and ‘Release’ buttons (A) you can change the position of the jobs or remove them. To cancel jobs, see also *section 10.9.3 ‘Cancelling jobs’.* Jobs further up in the list (C) are milled first, jobs lower down later.

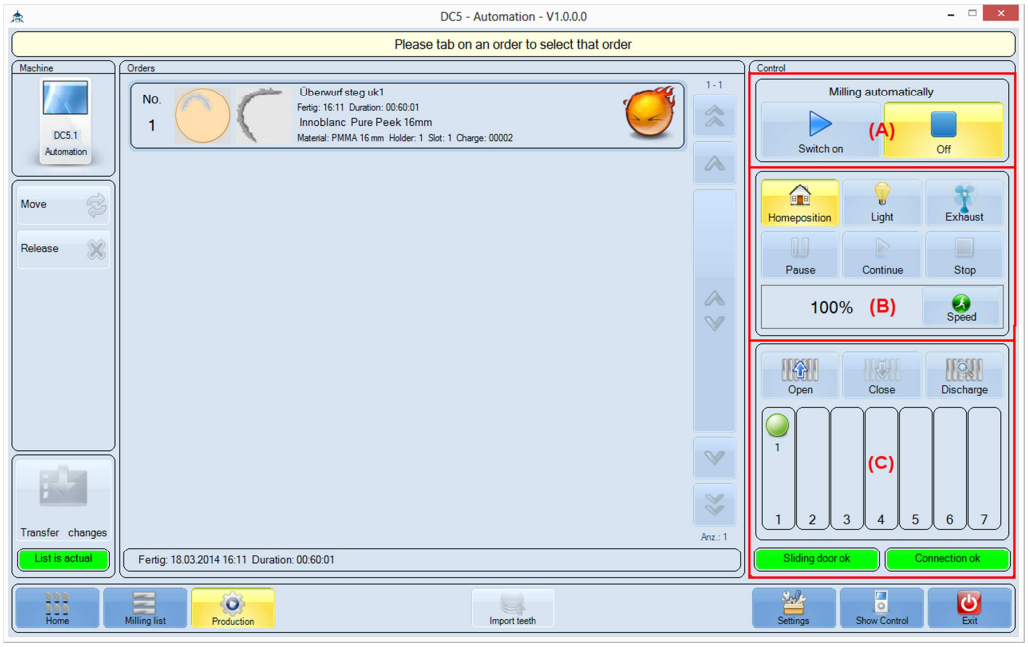
Field (D) shows the holders that are in the magazine.

Each holder and thus each blank in the magazine has its own jobs. You can compile and mill the milling list from the jobs of the blanks located in the magazine. Tap one of the entries in the list (D). The magazine has a total of 7 positions. The number of the entry in the list (D) corresponds to the position in the magazine.

The ‘Transfer to production’ button transfers the job list to the production (see *section 10.9.2 ‘Milling’* regarding this).

'Production':

Tap the 'Production' button to switch to the 'Production' page.



Field (A):

'Switch on'	Loads the first job and starts the milling process.
'Switch off'	Stops the automatic mode.

Field (B):

'Home position'	Drives the axes to the safe start position. The start position must be driven to before the magazine can be opened and the holders placed inside it can be read.
'Light'	Switches the light on or off.
'Exhaust'	Starts/stops the external vaccum.
'Pause'	Interrupts the current milling process.
'Continue'	Resumes the milling process at the point of the interruption.
'Stop'	Stops the current milling process.
'Speed'	Changes the feeding speed.

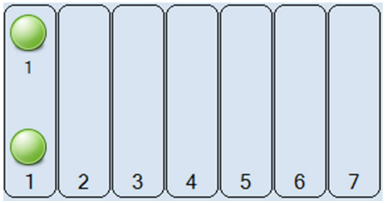
Field (C):

'Open'	Opens the magazine. Holders can be removed or inserted.

‘Close’	Closes the magazine and starts the reading of the holder position in the magazine. See *below.*
‘Discharge'	Removes a holder from the pneumatic holder receptacle and places it in the magazine.
‘Continue’	Resumes the milling process at the point of the interruption.

The display in field (C) represents the positions in the magazine. The green circles indicate the positions in the magazine to which a job is assigned (above) and whether the holder has also actually been inserted into the magazine (below).

Milling is possible only if a both an upper and a lower green circle are displayed.



The inserted holders are read automatically on closing the magazine.

As soon as all holders are inserted and identified, the milling process can be started with the ‘Start’ button in field (A).

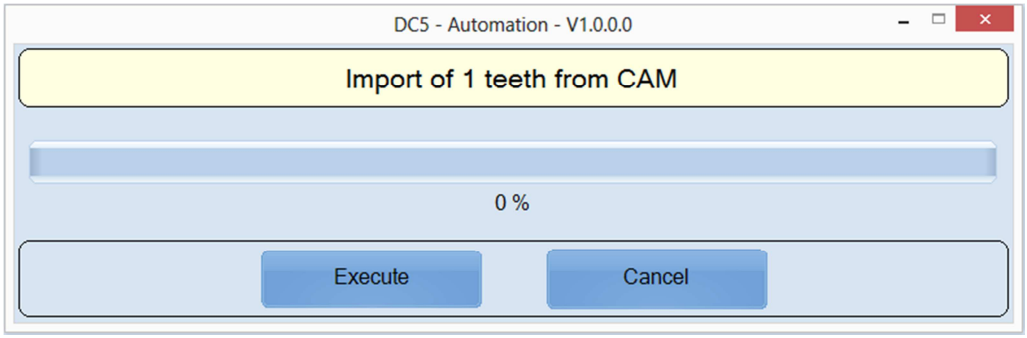
See also *section 10.9.2 ‘Milling’* for the reading of holders and milling with automation.

‘Import’:

The Import button flashes as soon as milling jobs have been transferred from the CAM to the DC5.

– Tap the button to start the import.

– A dialogue box is displayed in which you are requested to import the data:



Tap the ‘Execute’ button to import the data.

Loaded blank data are shown on the ‘Blanks’ page. See also *section 10.9.2 ‘Milling’* for the import of CAM data.

'Settings':

Tap the 'Settings' button to switch to the 'Settings' page.

Field (A):

'Common'	Displays the general settings.
'Folders'	Displays the settings for the definition of the paths.

Field (B) – 'General settings':

'Languages'	Language settings. At present German or English.

Field (C) – 'General settings':

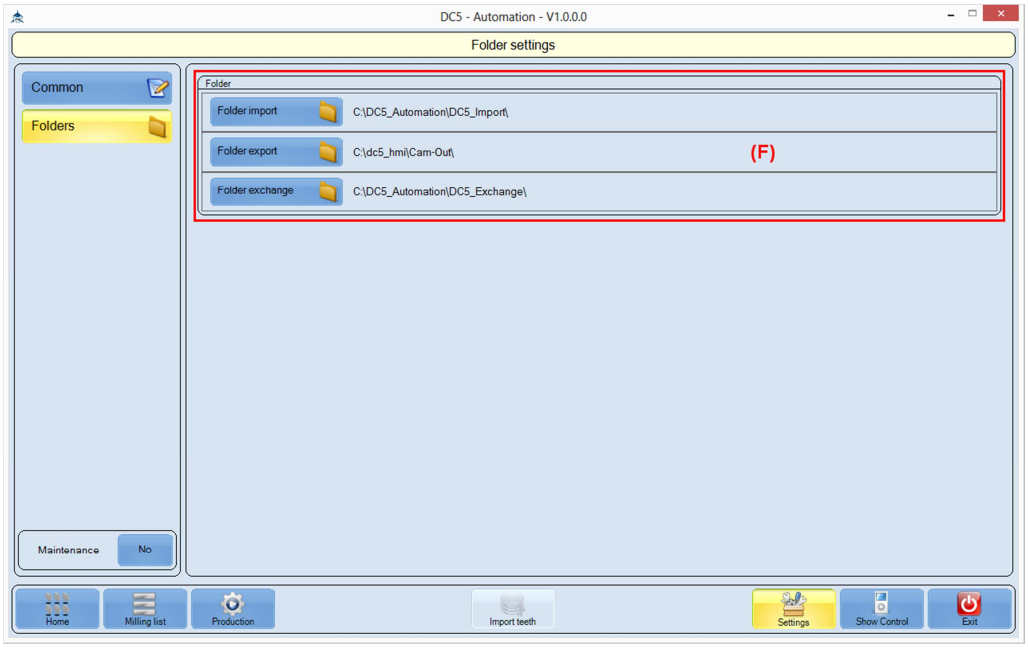
'Performe feedback automatically'	Switches automatic feedback signals on.
'Take over all orders automatically to milling list'	Switches the 'Take over all orders automatically to milling list' option on.
'Select alternatives by context menu'	Switches the 'Select alternatives by context menu' option on.

Field (D) – 'General settings':

'Use large blank symbols'	Switches the display of large blank symbols on.

Field (E) – ‘General settings’:

‘Use large holder symbols’	Switches the display of large holder symbols on.



Field (F) – ‘Folder settings’

‘Folder import’	Path to the import folder of the automation module.
‘Folder export’	Path to the export folder.
‘Folder exchange’	Path to the exchange folder.

‘Show Control’:

Tap the ‘Show Control’ button to switch to the desktop.

‘Exit’:

Tap the ‘Exit’ button to exit from the software.

10.9.2 Milling

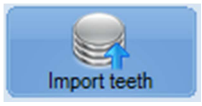
NOTE!

Do not delete jobs via the control software (see *section 10.8 'Dental milling system without automation'*) when milling with automation!

Use exclusively the functions of the 'Automation' software module for the cancellation of jobs.

Milling jobs transferred from the CAM to the milling machine are identified automatically after setting up the software (see *section 9.3 'Software installation'*).

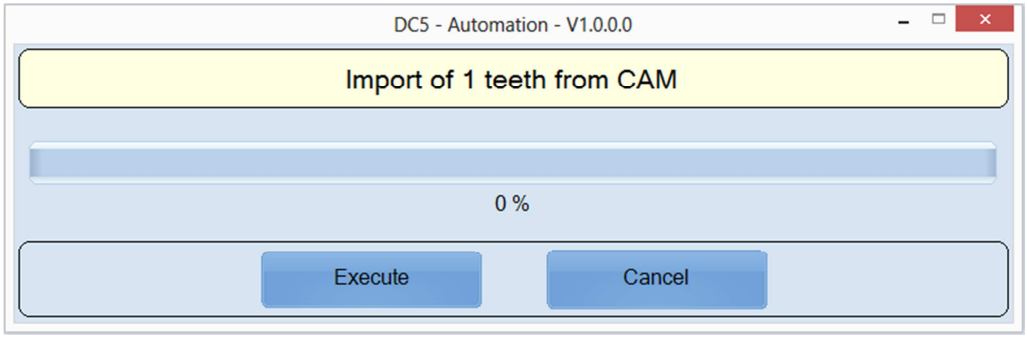
The 'Import' button flashes periodically as soon as new milling jobs arrive:



Proceed as follows to import and mill milling jobs:

– Tap the 'Import' button to import the new milling jobs.

– Confirm the import of the data in the import dialogue and tap the 'Execute' button:

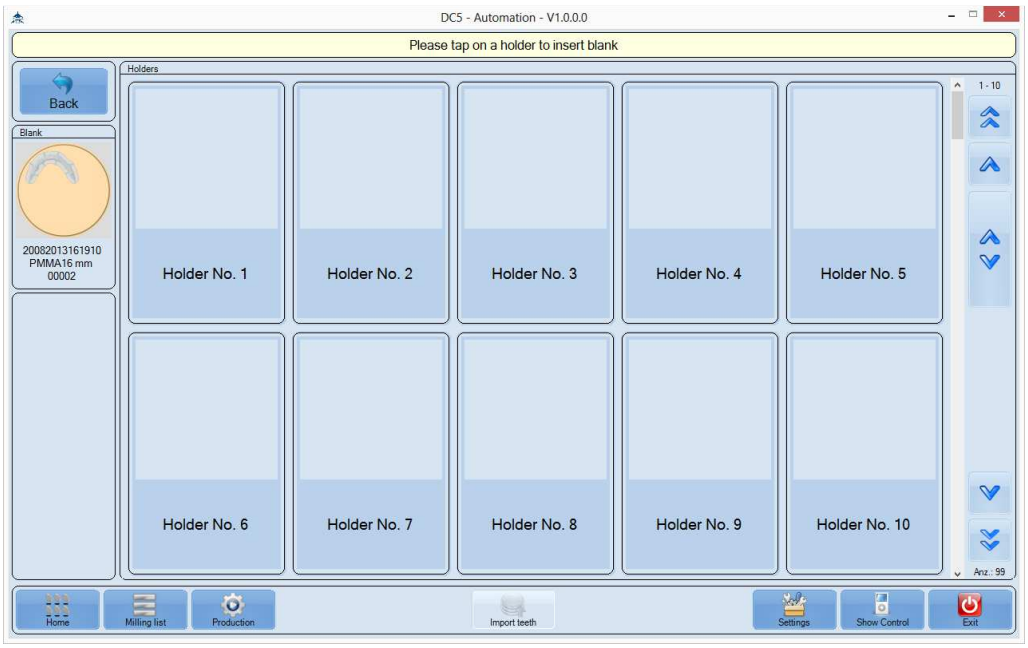


– The milling jobs are imported and displayed as blank symbols on the 'Blanks' page:

– Blanks that are not yet assigned to a holder are displayed in the display modes ‘All blanks’ or ‘Blanks without holders’.

  In the case of blanks that are already assigned to a holder, proceed by selecting the appropriate display mode: ‘All blanks’ or ‘Blanks in holders’.

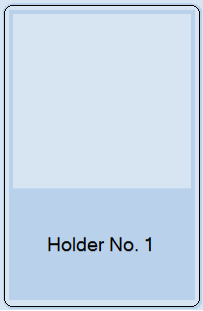
– Tap the blank that you wish to machine. The display switches automatically to the ‘Holder selection’ page:



The blank is displayed in the left-hand area of the program window.

The individual holders are displayed as symbols in the centre of the program window. Holders that are already occupied can be identified by a graphic with the clamped blank in the (light blue) field above the holder name.

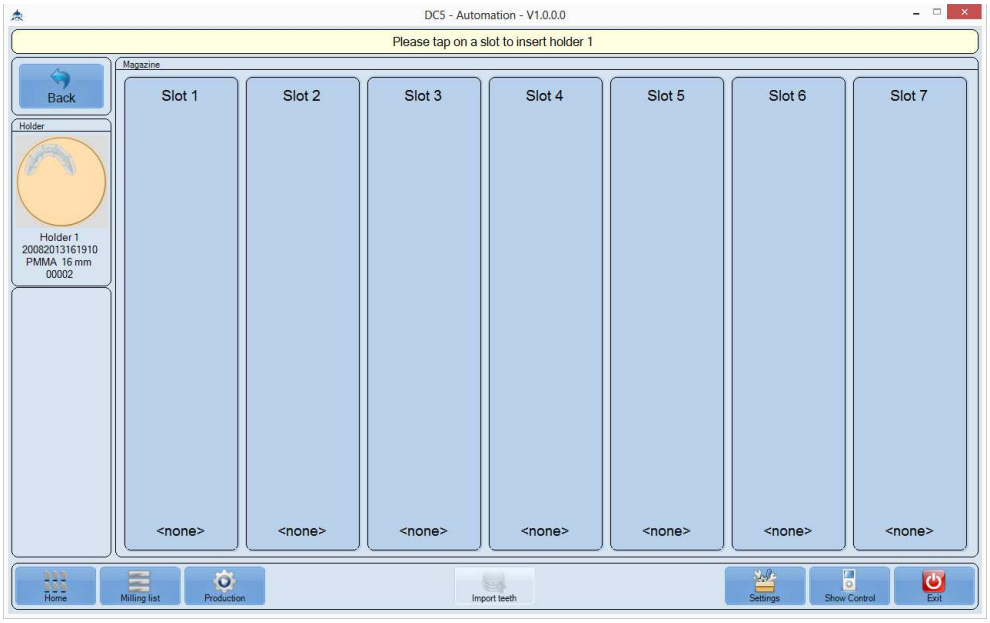
– Now tap the symbol of the holder in which you wish to clamp the blank (e.g. ‘Holder No. 1’):



If you wish to use a holder that is already occupied, you must first remove the blank that is clamped in this holder (see *section 10.9.5 ‘Removing holders from the magazine’* for instructions).

Tap the ‘Back’ button if you wish to go back by one level.

– The blank is now assigned to a holder and the display switches automatically to a view of the magazine with the seven available magazine positions:

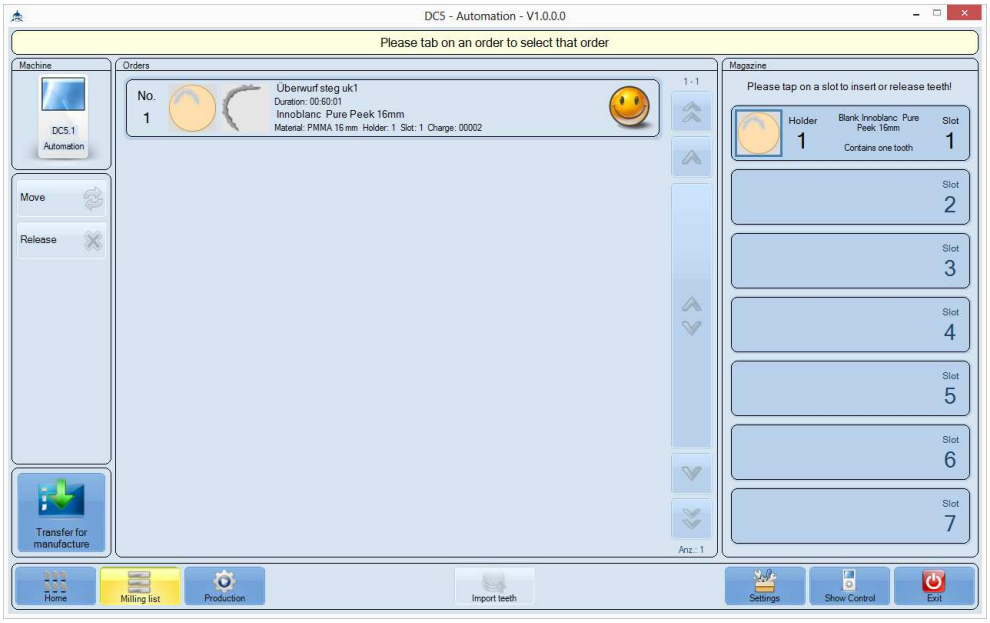


Occupied positions are marked by a graphic and the designation of the holder in the text field <none>.

Here, too, you can of course use a position in the magazine that is already occupied by another holder (see *section 10.9.5 ‘Removing holders from magazine’*). Tap the ‘Back’ button to go back by one level.

– Tap the position in the magazine into which you wish to insert the holder.

– The holder is now assigned to a position in the magazine and the display switches automatically to the ‘Milling list’ page:



As already described in section 10.9.1 ‘Operating interface’, you can place jobs in the processing list in order of their priority in this window. The position in the list corresponds to the order in which the jobs are machined.

Jobs can be removed from the milling list or removed completely.

If you wish to process a job, first tap the corresponding entry in the jobs list. Selected jobs have a blue background:

– Tap the ‘Shift’ or ‘Release’ button respectively if you wish to move the job in the milling list or if you wish to remove or cancel the job.

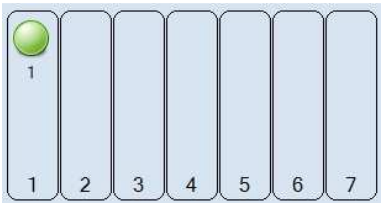
  For cancellation see *section 10.9.3 ‘Cancelling jobs’.*

  As described in *section 10.9.1 ‘Operating interface’*, you can add milling jobs of holders or blanks to further magazine positions in the milling list in the ‘Magazine’ field.

– Tap the ‘Transfer for manufacture’ button if you have finished editing the milling list and wish to mill the jobs:

The ‘Control’ display elements are now shown on the right-hand side of the program window:

At magazine position 1 a green circle symbolises that jobs exist for the holder in this position:



Milling cannot take place yet, because the holder has not yet been inserted or read.

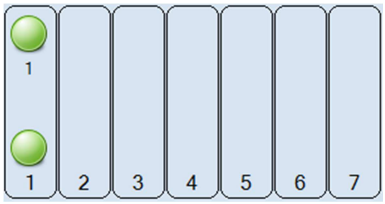
– Tap the ‘Start position’ button to place the spindle and gripper in a safe position in which the magazine can be opened:

– Now tap the ‘Open’ button:

The magazine drives forward and the cover opens automatically. If you have not already done so, place the holder with the blank into the correct position in the magazine (see *section 9.4.5 ‘Loading the magazine (automation)’*).

– Tap the ‘Close’ button. The gripper system first scans the individual magazine positions with a light barrier. Subsequently, the magazine drives back and the cover is automatically closed.

Magazine positions in which a holder was found are now marked by a further green circle:



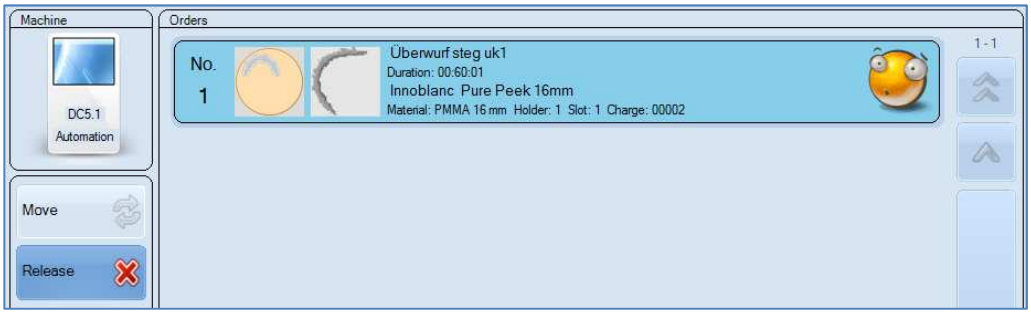
– Tap the ‘Switch on’ button to start the processing of the milling jobs.

10.9.3 Cancellation of jobs

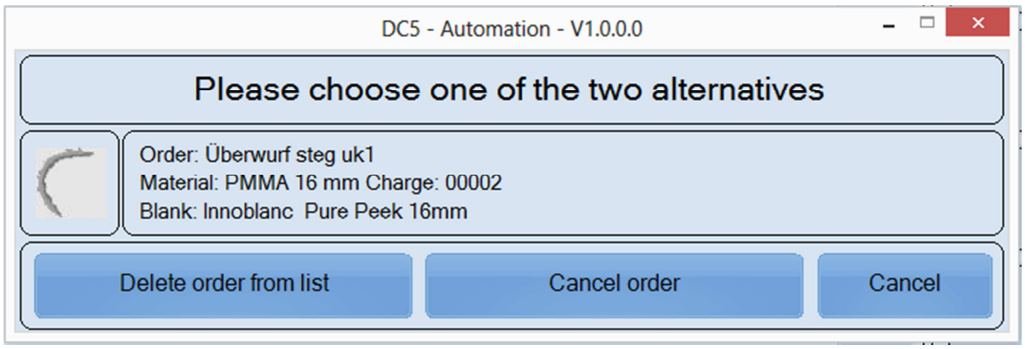
You can shift or cancel jobs at any time. To cancel jobs on the ‘Milling list’ page, proceed as follows:

– Switch to the ‘Milling list’ page.

– First of all, in the job list (see *section 10.9.1 ‘Operating interface’, ‘Milling list’ page, list (D)*), mark the job that you wish to edit and then tap the ‘Release’ button to remove the job from the milling list:



– After you have tapped the ‘Release’ button, an input dialogue box appears:



– Tap the ‘Delete order from list’ button if you wish to process the job later, but not cancel it.

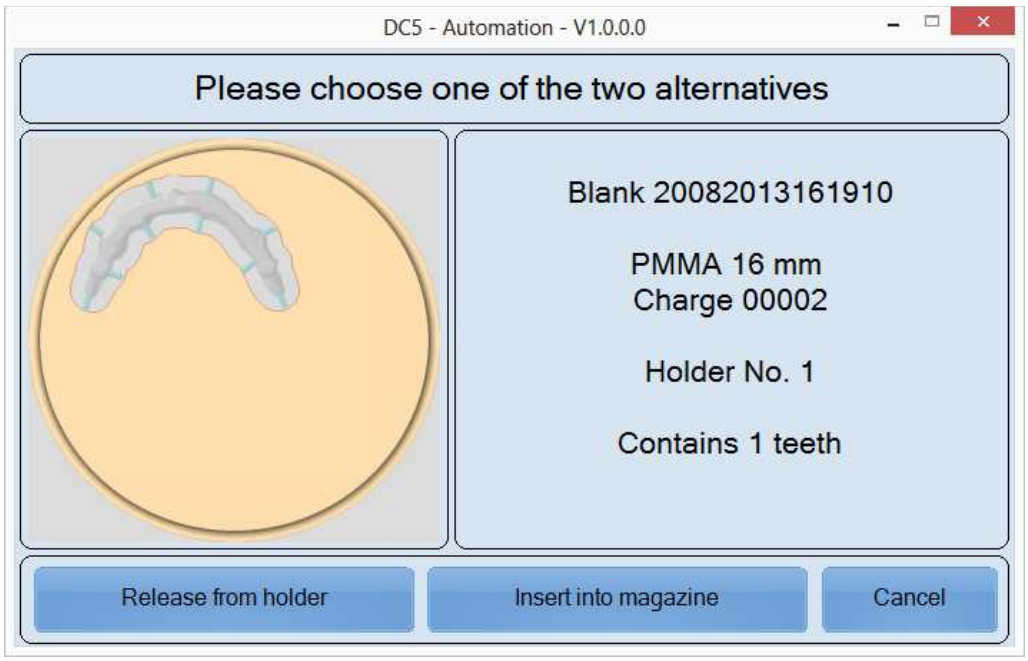
– Tap the ‘Cancel order’ button if the job is to be cancelled.

10.9.4 Removing blanks from a holder

Proceed as follows to remove blanks from holders:

- Tap, for example, the ‘Blanks in holders’ button on the ‘Blanks’ page to display all blanks that are already assigned to a holder:

– Now tap the symbol with the holder from which you wish to remove the blank. A dialogue box opens:



– Tap ‘Release from holder’ to remove the blank from the holder and release the holder for use with a new blank.

  Using the ‘Insert into magazine’ button you can also assign the holder to a position in the magazine.

  The blank is now displayed on the ‘Blanks’ page under ‘Blanks without holders’.

10.9.5 Removing holders from the magazine

Proceed as follows to remove holders from the magazine:

- Tap, for example, the ‘Holders in magazine’ button on the ‘Blanks’ page to display all holders that are already assigned to a position in the magazine:

– Now tap the symbol for the position in the magazine from which you wish to remove a holder. A dialogue box opens:

– Tap ‘Release from magazine’ to remove the holder from the magazine and release the position in the magazine for another holder.

  Using the ‘Add to milling list’ button you can add open jobs assigned to the holder or the blank to the milling list.

  The holder is now displayed on the ‘Blanks’ page under ‘Blanks in holders’.

10.10 Manual mode

All axes in the DC5 Dental Milling System can also be moved in manual mode. This is required, for example, for service purposes or for the adjustment of the DC5.

In manual mode there is a danger of the spindle or the gripper system colliding with other components of the DC5 and damaging the machine.

The milling machine can only be operated in manual mode after logging on and entering a password.

In manual mode the operator takes full control of the machine. The operator is thus responsible for all damage resulting from collisions and negligent operation.

NOTE!

In manual mode the operator takes full control of the machine.

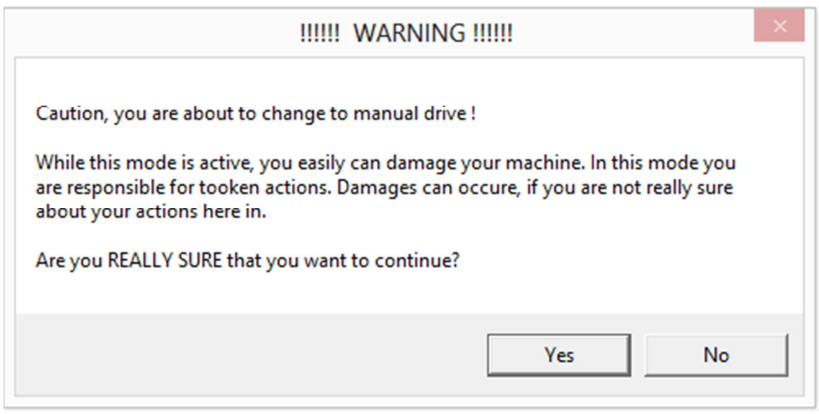
The machine operator is solely responsible for damage due to collisions and negligent operation.

Dental Concept Systems accepts no liability whatsoever for damage occurring during manual operation!

In order to operate the DC5 in manual mode, you must first log on. See *section 9.5.1 'Milling test cubes'* for details.

– Tap the 'Manual mode' button:

A dialogue box opens, informing you of the consequences of incorrect operation of the milling machine in manual mode:

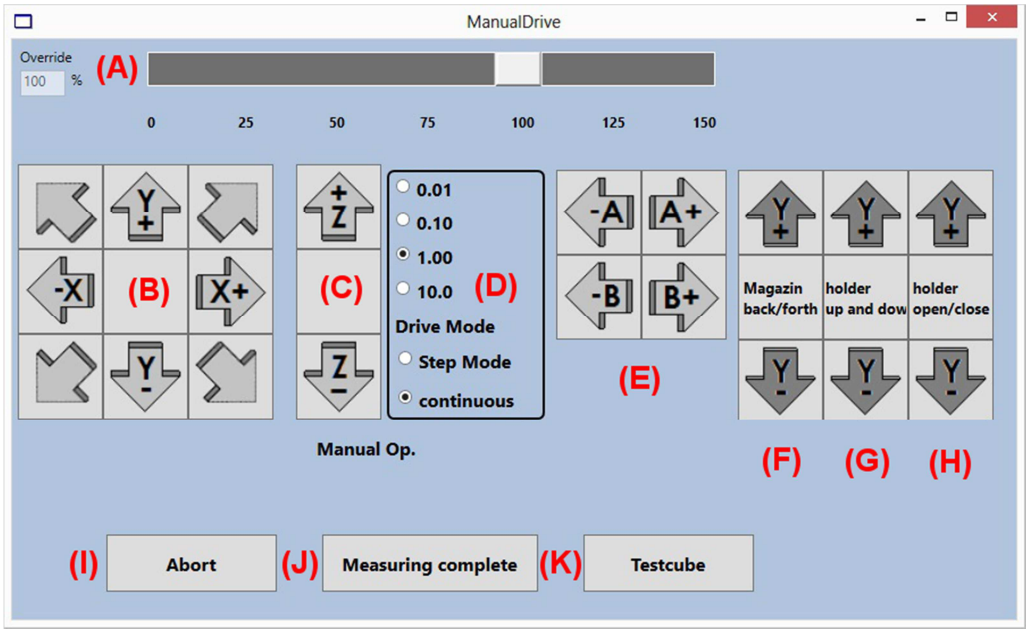


– Tap the ‘Yes’ button to open the dialogue box for manual operation:

NOTE!

Only tap the ‘Yes’ button if you are fully aware of the consequences of incorrect operation in manual mode.

Collisions can result in serious damage to the machine!



(A) Override:

Changes the speed with which the axes are moved. Tap the slider of the slide control and keep it pressed. Now move the slider to the left or right. The value 100 corresponds to the preset speed. Lower values correspond to a slower speed, higher values to a faster speed.

(B) Translations in X and Y direction:

Tap the buttons to move the spindle to the left, to the right, forwards or backwards. The arrows on the buttons show the direction in which the spindle is moved.

(C) Translation in Z direction / spindle up and down:

Tap these buttons to move the spindle upwards or downwards.

(D) Step by step / Continuous movement mode:

The axes can be moved continuously or step by step.

In the ‘continuous’ mode the movement continues as long as the button is pressed.

In the step by step mode the movement takes place only once, by precisely the set step size, when the button is tapped. A further step is only executed when the button is tapped again. Available step sizes (in mm): 0.01, 0.1, 1.00 and 10.00.

(E) Rotations around the A and B axes:

Tap these buttons to rotate the holder in the A or B direction.

(F) Magazine forwards/backwards (optional):

This option is only available in systems with automation.

Tap one of the buttons to move the magazine towards the front or towards the rear. The opening or closing of the magazine takes place automatically and synchronously with the movement of the magazine.

(G) Gripper up and down (optional):

This option is only available in systems with automation. Tap one of the buttons to move the gripper upwards or downwards.

(H) Open and close gripper (optional):

This option is only available in systems with automation. Tap one of the buttons to open or close the gripper.

(I) Abort:

Close dialogue.

(J) Measurement complete:

Starts the calibration process.

(K) Testcubes:

Starts the process of milling testcubes.

NOTE!

The buttons (F) – (H) are available after the user has logged in (password needed).

The usage of these buttons is provided for authorized service personnel of Dental Concept Systems GmbH.

11 Fault finding

NOTE!

Inform Dental Concept Systems GmbH immediately in case of malfunctions (for service address see *section 11.1 'Service address'*).

Disconnect the machine from the power supply.

Only authorised technical personnel may rectify the malfunction and if necessary open the machine!

CAUTION

Troubleshooting may only be carried out by authorised technical personnel.

DANGER

Fatal or serious injuries due to electric shock!

Disconnect the machine from the power supply before opening it.

Unplug the mains plug.

WARNING

Danger due to whipping of hosepipes,

danger due to parts being flung and

danger due to the escape of compressed air!

Serious injuries possible.

Disconnect the machine from the compressed air supply!

WARNING

Danger due to moving machine parts when the machine is running!

There is the danger of severe crushing and other injuries if the milling machine is operated with the front cover open.

Work may only be carried out by authorised technical personnel.

WARNING

Danger due to exposed electrical connections!

There is a danger of fatal and serious injuries due to electric shock.

Troubleshooting and repairs may only be carried out by authorised technical personnel.

Work is to be carried out only when the power supply is interrupted!

11.1 Service address

Inform Dental Concept Systems GmbH of any malfunctions:

Dental Concept Systems GmbH
Buchbrunnenweg 26
D- 89081 Ulm
Germany

Phone: +49 (0)731 – 9 642 603 - 0
Fax: +49 (0)731 – 9 642 603 – 17

info@dental-concept-systems.com

11.2 Troubleshooting

NOTE!

In case of malfunctions, first check all fundamental prerequisites for the operation of the DC5 before taking any further action.

General malfunctions and error messages

Malfunction / error message	Possible cause(s)
Is power being supplied?	Switch on the *main switch.* Check the mains plug for tightness. Plug in the mains plug.
Is the compressed air supply correctly connected?	Connect the compressed air supply correctly. See *section 9.2.2 'Pneumatic connection'.*
Is the operating pressure sufficient?	Check the operating pressure. See section *9.2.2 'Pneumatic connection'.*

Possible malfunctions and sources of error during operation:

Malfunction / error message	Possible cause(s)	Remedial action
ON|OFF button does not react	Main switch is switched off.	Switch on the main switch.
'Reference' dialogue box does not appear	Insufficient pneumatic pressure. Front door not closed. Drain tub not closed. 'Enable' button not pressed.	Check the pressure. Close the front door. Close the drain tub. Press the 'Enable' button.
Status and error display: 'Short-circuit/overcurrent in motor phases or earth fault in the output stage' Crackling noises audible	Undefined status in one or more axes (note the Node ID in the status and error display)	Exit from the control software. Switch the machine off. Tilt both rotary axes (A and B) a little. Switch the machine on. Start the control software.
Status and error display: Contouring error		Proceed as described above for 'Short-circuit/overcurrent in motor phases or earth fault in the output stage'. If the error persists: Contact Dental Concept Systems.
Tool defective	Tool breakage or excessive wear	See *section 11.2.1 'Tool defective'.*

Malfunction / error message	Possible cause(s)	Remedial action
Coolant active	Too little cooling lubricant. Control valves closed. Filter/filter mats clogged.	Top up the cooling lubricant. Open control valves. Replace filter cartridges and mats. See *section 11.2.2 'Coolant must flow'.*
Milling process does not start	'Enable' button not pressed.	Press the 'Enable' button.
No tub	Tub not closed. Metal flag on the tub does not trigger the proximity switch.	Close the tub. Clean the metal flag and proximity switch. Bend metal flag slightly downwards. See *section 11.2.3 'No tub'.*
Milling machine stops during milling	Limit angles for A and B axes exceeded.	Adjust limit values in CAM software. A: min. -30°; max. +30° B: min. -30°; max. +30°
No progress bar	Cyclic block line missing from NC file	CAM – insert cyclic block line: P2000=#StepPercent P2001=#GlobalPercent
Blank cannot be clamped	Holder receptacle dirty	Clean the holder receptacle.
Integrated extraction module does not start. 'Filter full' LED lights up.	Signal Suction power malfunction or filter exchange	The extraction module does not switch on if a suction power malfunction has occurred with a duration of 60 sec or 2 x 30 sec. Exchange the filter. Remove the blockage. See *section 5.3 'Extraction (optional)'* and *section 12.2.3 'Replacing the filter of the integrated extraction module'.*

Malfunction / error message	Possible cause(s)	Remedial action
Automation		
Pneumatic lock of the holder does not close.	Insufficient pneumatic pressure. Holder dirty.	Adjust the pressure. Clean the holder.
Holders in magazine are not read in.	Gripper bent. Light barrier wrongly adjusted.	Contact Dental Concept Systems.
Holder in gripper	Undefined status.	If necessary, remove the holder with the blank from the gripper by manual operation. Press the reset button.

11.2.1 'Tool defective'

Tools are subjected to strong stresses during milling and thus to normal wear (consumable material).

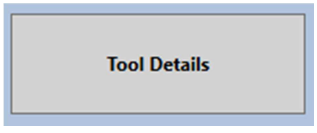
For this reason tools must be renewed regularly. The service life depends on various factors such as material, feeding speed, feeding depth, rotary speed of the spindle and also the milling strategy.

Occasionally the tool may break during milling. Breakage and normal wear of the tool lead to a change in its length. The control software measures the length of a tool before and after each milling step. The measurement results are compared with stored limit values. In this way excessive wear or a tool breakage can be reliably identified. If the control software detects an impermissible change in length, then the tool is marked as defective and is no longer used.

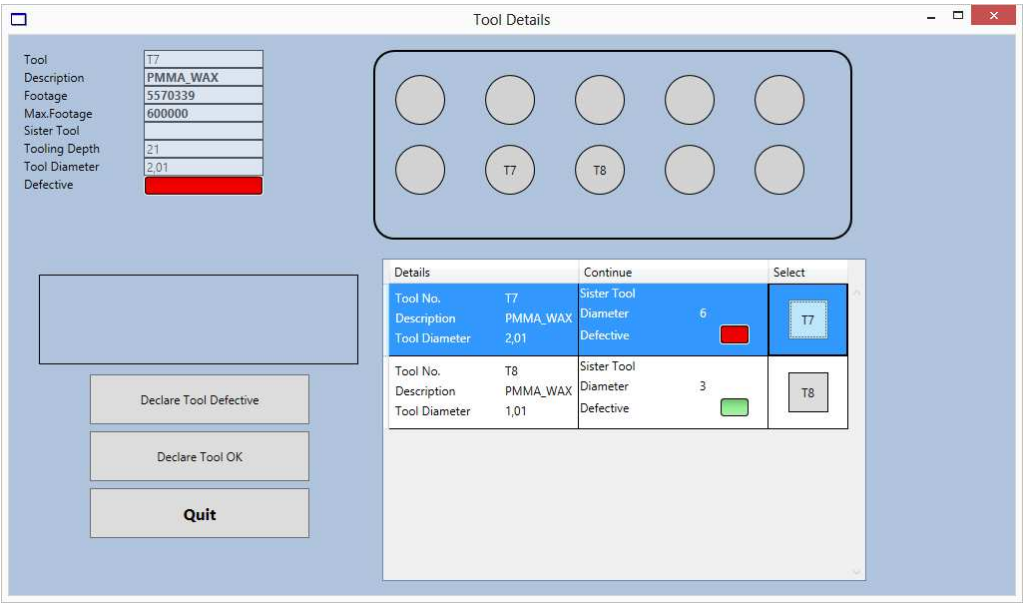
– The milling process is interrupted.
– The lighting in the machining compartment lights up red.
– The 'Tool details' field is coloured red.

Proceed as follows to rectify the fault:

– Tap the 'Tool details' field.



– The 'Tool Details' dialogue box is displayed:



This dialogue box shows all the tools that are used for the machining of the job.

Tools for which an excessively large change in length has been measured are marked by a red field in the ‘Continue’ column.

– Open the front door and exchange the defective tool.
– Tap the button in the ‘Select’ column in the list entry for the defective tool. The button is labelled with the letter ‘T’ followed by the tool number (e.g. ‘T7’ for the tool in position 7)
– Now tap the ‘Mark tool as OK’ button at the left.
– Tap the ‘Exit’ button. The dialog box closes.
– Close the front door.
– Press the ‘Enable’ button on the front side of the DC5.
– Now tap the ‘Start’ switch or press the ‘Start|Pause’ button on the front side of the DC5.

The milling process is resumed.

Using the CAM software you can define so-called sister or spare tools. These tools have the same geometry. If sister tools have been defined, these are automatically used by the control software after detection of a change in length.

The job is automatically resumed using the sister tool. An intervention is not necessary.

HINWEIS!

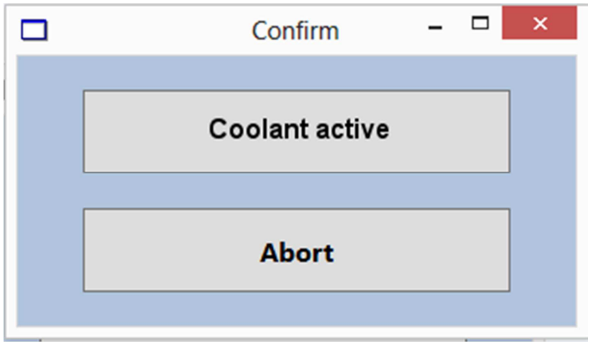
Define sister tools if you mill overnight and the milling machine is not supervised.

If a tool breaks it is automatically replaced by the sister tool and the milling process resumes.

11.2.2 'Coolant should flow'

When milling and grinding with cooling lubricant the flow rate of the cooling lubricant is continuously measured. If the flow rate falls below a critical value, the control software stops the milling process in order to protect the material and tools against overheating and to avoid damage.

In case the flow rate is too low, the milling process stops, the lighting in the machining compartment turns red and a dialog box is opened in which the cooling lubricant circuit can be restarted.



You must determine and rectify the cause of the insufficient flow rate before restarting the cooling lubricant circuit with the 'Coolant active' button.

Check the following points:

– **Flow rate set too low:**

  The flow rate is adjusted by the control valves in the lower cabinet. The flow rate should be set to a value of 2.3 - 2.5 l/min.

  Solution:

  Open the valves to increase the flow rate (see *section 9.4.6 'Filling with cooling lubricant'*).

– **Cooling lubricant amount:**

  If there is insufficient cooling lubricant in the tank, the tank will be pumped empty before cooling lubricant runs back into the tank. The flow rate drops abruptly and falls

below the critical limit value.

Solution:

Top up the cooling lubricant until the tank is well filled (see *section 9.4.6 'Filling with cooling lubricant'*).

– **Lines clogged:**

If swarf gets into the lines and valves, it can clog them. PMMA in particular swells up enormously when milling with cooling lubricant and clogs lines.

Solution:

Clean the cooling lubricant tank regularly and clean the milling machine.

In the event of a blockage the lines and valves must be cleaned and flushed through.

Use the filter mats offered by Dental Concept Systems (see *section 2.4.4 'Accessories'*).

– **Clogged filters:**

If the filters are clogged the flow rate drops dramatically.

Solution:

Make sure that clogged filters are replaced in good time.

– **Vacuum in the cooling lubricant circuit:**

If there is too little cooling lubricant in the circuit and the tank is pumped empty, a vacuum can be created in the cooling lubricant circuit.

Despite filling the tank with cooling lubricant, the flow rate does not increase to the normal value in this case.

Solution:

Pull the lines off the pump and filters and then push them on again. The pressure and flow rate return to normal.

11.2.3 'No tub'

In some cases the 'No tub' status display lights up red even though the drain tub is correctly inserted and closed.

At the rear end of each drain tub is a metal flag. The position of the metal flag differs in the two cooling lubricant circuits 1 and 2 (see *section 9.4.6 'Filling with cooling lubricant'*). Two proximity switches are located at the rear of the tub drawer compartment. If the drain tub is now closed, the metal flag at the rear of the drain tub triggers one of the two proximity switches. Depending on which proximity switch is triggered, the drain tub inserted is for cooling lubricant circuit 1 or 2.

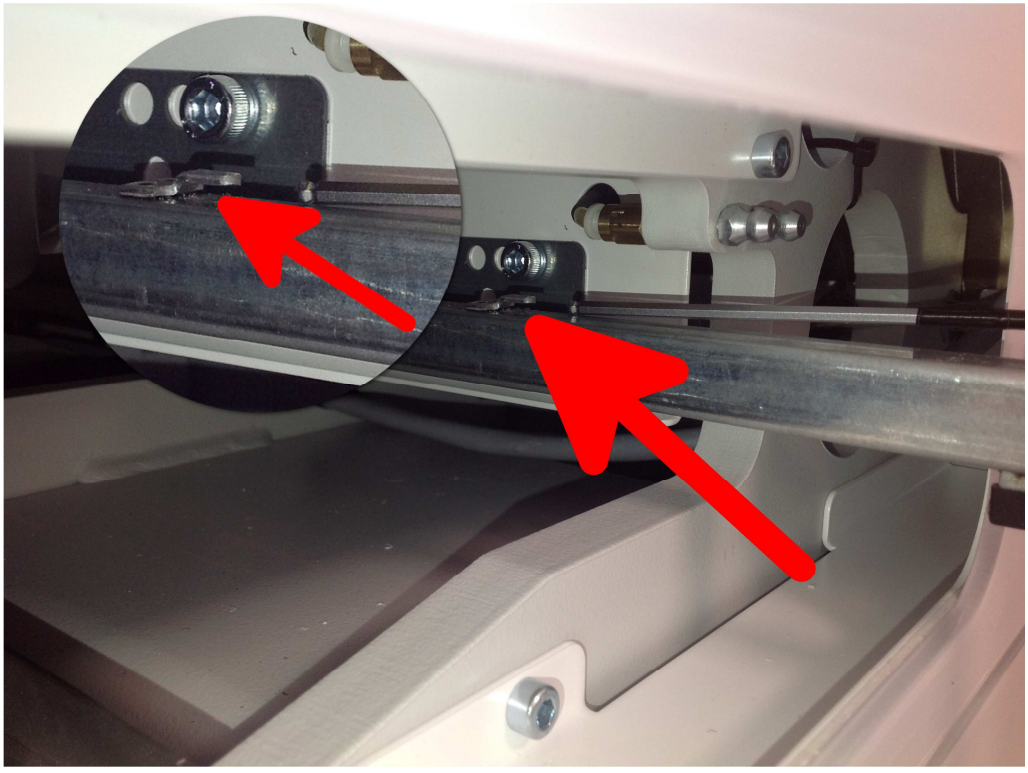
If the ‘No tub’ status display lights steadily red, the associated proximity switch has not been triggered. There may be various reasons for this:

– **The drain tub is not seated correctly on the sliding rail in the drawer compartment.**

On the sliding rail is a lug into which the drain tub is hooked when inserted. If the lug is bent too far downwards the drain tub cannot be inserted correctly and lies on top of the lug. This increases the distance to the proximity switch and the switch is not triggered.

Solution:

Bend the lug slightly upwards using a screwdriver or a similar tool.



– **Dirt on the metal flag and/or proximity switch**

Cooling lubricant residues and dirt form a film on metal flags and proximity switches. This film prevents the metal flags from triggering the respective proximity switch.

Solution:

Remove the drain tub from the drawer compartment and clean the metal flag.

Reach into drawer compartment and carefully clean the proximity switches with a cloth. The proximity switch has a cylindrical shape. Wipe the top surface of the cylinder with the cloth.

If the actions described above do not help, the metal flag must be bent downwards a

little in order to reduce the distance to the proximity switch. Bend the metal flag downwards with the utmost caution to avoid it breaking off. It may be necessary to correct the position of the proximity switches. The proximity switches are fitted with an external thread. Release the lock nut slightly and screw the respective proximity switch upwards a little. Lightly tighten the lock nut again.

12 Maintenance

The DC5 Dental Milling System is very easy to maintain. However, you should clean and service the machine on a regular basis. Regular cleaning and maintenance prolong the service life and the operational reliability of the system.

The maintenance of the DC5 should be carried out only by authorised technical personnel. Have the DC5 Dental Milling System serviced regularly by Dental Concept Systems.

NOTE!

Clean the DC5 Dental Milling System regularly in order to prolong its service life and operational reliability.

Have the machine serviced regularly by Dental Concept Systems.

The DC5 contains components such as pneumatics hoses, seals or sight glasses made of rubber or plastic that can be damaged by aggressive cleaning agents. Also, do not use aggressive cleaning agents for the cleaning of painted components.

Observe the manufacturers' instructions without fail!

NOTE!

Do not use any cleaning agents that attack plastics, rubber or paint!

CAUTION

Have the machine serviced once per year by authorised technical personnel from Dental Concept Systems.

Inform Dental Concept Systems immediately if you notice defective electrical cables or connections.

Defective cables must be replaced immediately!

WARNING

Uncontrolled start-up of the machine!

There is a danger of serious injuries and being crushed.

WARNING

Danger due to pneumatic energy!

There is a danger of serious injuries and being crushed.

– Have all maintenance work carried out on time and carefully.
– Only carry out maintenance work that is described in this operating manual. Other maintenance work may be carried out exclusively by

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D- 89081 Ulm
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info@dental-concept-systems.com

- Always switch the compressed air supply and the *MAIN SWITCH* off before commencing with maintenance work if no energy supply is required for this maintenance work. Check the pressure gauge to make sure that there is no longer any pressure.
  Secure the *MAIN SWITCH* against being inadvertently switched on.
- Exercise particular caution when carrying out maintenance work that requires an energy supply with dismounted and/or inactive protective devices.
- Secure the installation area of DC5 against access by third parties during all maintenance work. This applies in particular if you have to leave the installation area for a short or longer period.
- Remove safety devices only if this is unavoidable for the respective maintenance work.
- After completion of the maintenance work, install all safety devices properly and check that they are fully functional.

12.1 Inspection and maintenance plan

Have the DC5 Dental Milling System serviced once per year by authorised technical personnel from Dental Concept Systems GmbH.

Carry out the maintenance work described in this operating manual on a regular basis.

CAUTION

The DC5 Dental Milling System may be serviced exclusively by authorised technical personnel from Dental Concept Systems GmbH.

Inspection interval: annually.

12.2 Regular maintenance work

12.2.1 Cleanliness

Make sure that the machining compartment is always clean. Swarf and dust also settle on holder receptacles, tool magazines and other components and can lead to malfunctions (see *section 11.2 'Troubleshooting'*).

Therefore cleanse the machining compartment of coarse milling swarf several times a day if possible – in particular in the case of high frequency of use of the machine.

Above all, you should briefly clean the machining compartment when changing from dry to wet milling or from wet to dry milling.

NOTE!

Do not switch the extraction system on if the machining compartment is still very wet!

Do not switch the extraction system and either of the cooling lubricant circuits on at the same time!

Proceed as follows:

Dry milling:

– Open the front door to the machining compartment.

– Tap the 'Extraction' button on the 'Status' page of the control software to start the extraction system.

– Brush swarf and dust into the drain tub with the extraction running.

– In particular, clean the holder receptacle and tool magazine (remove the tool magazine if necessary. See *section 9.4.2 'Loading the tool magazines'*).

Wet milling:

– Position the spindle centrally over the drain tub if necessary using the 'Manual mode' button and switch on the respective cooling lubricant circuit with the 'Coolant (1)' or 'Coolant (2)' button. Brush coarse swarf into the drain tub with the coolant running. If necessary you can also move the spindle with the outlet nozzles over the holder or holder receptacle and rinse off milling swarf in this way.

– Subsequently, mop up any surplus cooling lubricant with a moist cloth.

– Rinse loose parts (e.g. clamping ring holder) under running water and subsequently

dry them with a clean cloth.

– Remove the drain tub and dispose of coarse dirt from the filter mat and drain tub. Rinse the filter mat and drain tub under running water and subsequently dry the tub with a clean cloth.

12.2.2 Cleaning the collet chuck

During operation, so-called sealing air flows through the spindle and collet chuck. This prevents the fine dust that results in particular when milling zircon from collecting in the spindle and collet chuck.

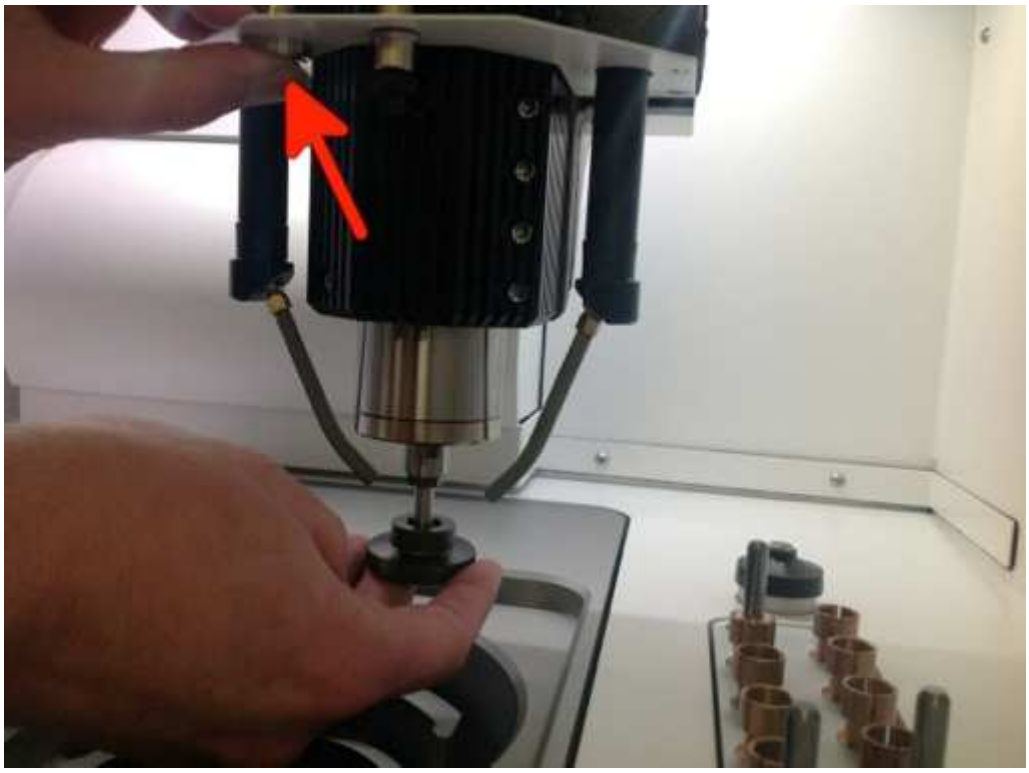
You should clean the collet chuck regularly, in particular when zircon is frequently milled. For this purpose a cleaning set consisting of spanners to loosen the collet chuck and brushes for cleaning the collet chuck and collet chuck holder are included with the DC5 Dental Milling System.

You must remove the collet chuck from its holder in order to clean it with brush provided with the cleaning set.

Proceed as follows:

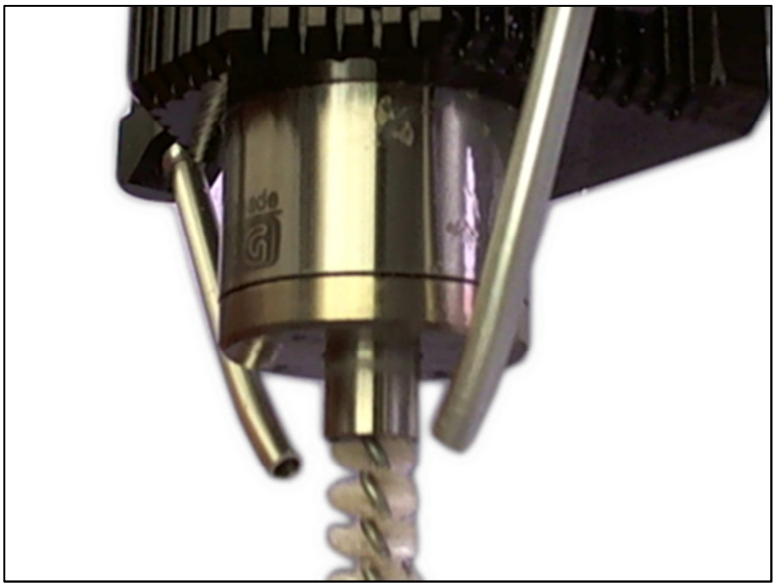
– Press and hold the button for opening the collet chuck and remove any tool that may be clamped in the chuck.

– Now insert the tool for releasing the collet chuck into the receptacle as far as the stop. Keep the button for opening the collet chuck pressed while doing this.



– Release the button to close the collet chuck.
– Now place the spanner provided with the cleaning set into the recess intended for it above the collet chuck:

– Hold the spindle in position with the wrench and carefully unscrew the collet chuck using the collet chuck release tool.
– Clean the collet chuck carefully.
– Carefully clean out the collet chuck with the brush provided with the cleaning set:



Proceed in the reverse order to refit the collet chuck.

NOTE!

Overtightening will destroy the collet chuck and the collet chuck holder!

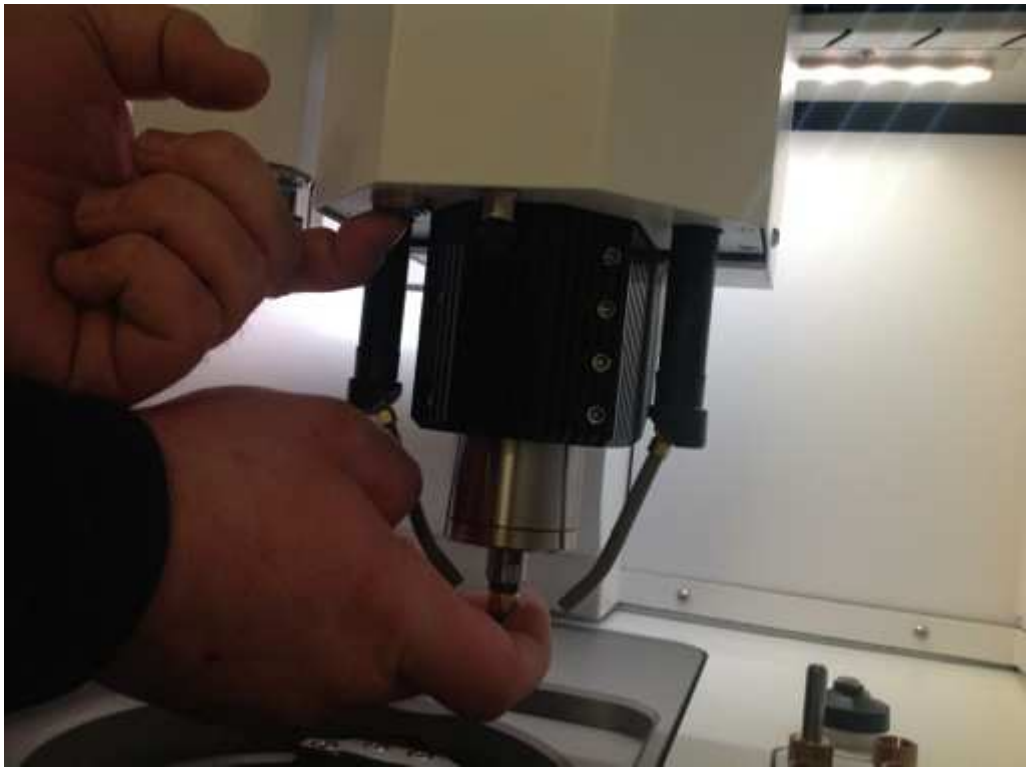
Only ever tighten the collet chuck handtight!

– Tighten the collet chuck only barely handtight using the tool provided!

  When doing this, hold the spindle still with the spanner provided as described above.

– Finally, insert a tool to check the function of the collet chuck.

  To do this, press and hold the button for opening the collet chuck and carefully insert the tool up to the stop ring:



12.2.3 Changing the filter of the integrated extraction module

If your machine is equipped with an integrated extraction module, you must exchange the filter bag regularly in order to maintain the suction power.

NOTE!

Check regularly whether the filter bag in the integrated extraction module need to be exchanged.

Also, observe the instructions in the operating manual for the V7000 extraction module from Zubler Gerätebau GmbH!

If a filter exchange should be necessary, the ‘Filter change’ LED on the control panel of the extraction module lights up (see *section 5.3 ‘Extraction’*).

In case of a suction malfunction lasting 60 sec or 2 x 30 sec, the extraction module no longer switches on in order to avoid an overload.

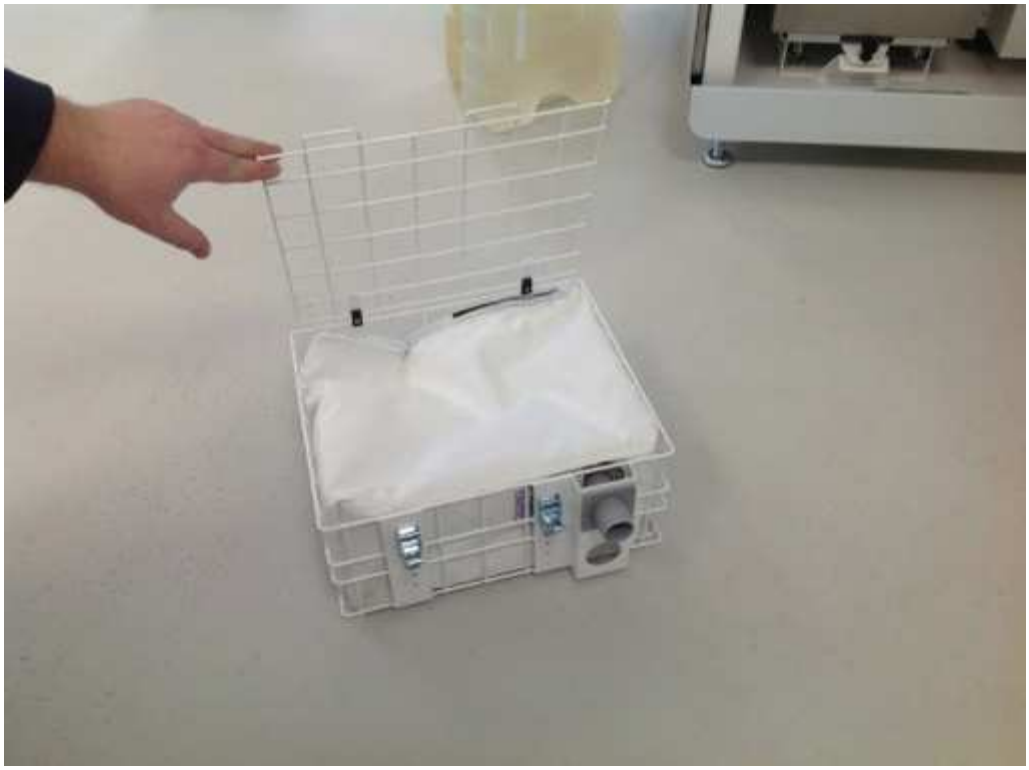
Proceed as follows to exchange the filter:

– Open the door of the lower cabinet:

– Flip up the silver lock on the flap on the front side and turn it by 180° so that you can see the underside of the lock:

– Hinge the flap down and pull out the filter cage together with the filter:

– Open the catches on the filter cage, open the flap on the cage and remove the full filter bag:



– Now insert a new filter:

– Close the filter cage and put it back into the extraction module.

– Close the flap on the front side of the extraction module and turn the silver lock by 180° back into the initial position in order to lock the flap:

12.2.4 Cooling lubricant

Always make sure that there is sufficient cooling lubricant in the tanks.

NOTE!

Use only the original cooling lubricants from Dental Concept Systems.

If you use concentrate and not a ready-to-use mixture, dilute the concentrate with distilled water observing the specified mixing ratio!

The filter cartridges must be exchanged and the cooling lubricant tanks cleaned at regular intervals.

Cleaning the cooling lubricant tank:

– Pull the locking knob upward and pull the slide with the cooling lubricant tanks forwards:

– Pull the return flow pipe out of the tank and remove the cover:

– Pull the pipes out of the quick-release couplings on the pump and disconnect the screw connector for the supply of power:

– Lift the pump off the tank together with the cover.
– You can now lift the tank out of the slide.
– Carefully pour the cooling lubricant into a container and remove the step insert.
– Clean and rinse the step insert and the tank and subsequently place the step insert into the tank again.

  To reassemble, proceed in the reverse order and fill the collected cooling lubricant into the tank again.

  Fill the tank with cooling lubricant, proceeding as described in *section 9.4.6 'Filling with cooling lubricant'.*

Exchanging the filter cartridges:

In order to clean the filter cartridges of the cooling lubricant circuits, proceed as follows:

– Open the rear door of the lower cabinet using the square key provided.

The filters are now freely accessible.

– Guide the plastic wrench provided over the filter cartridge housing from underneath. Make sure that the wrench comes to rest with its pins over the protuberances of the transparent filter housing:

– Now turn the wrench in the clockwise direction to loosen the transparent filter housing. After loosening the filter housing you can unscrew it by hand and carefully remove it in a downward direction.

– Remove the dirty cartridge and insert a new cartridge:

– Make sure when inserting the cartridge that the cartridge is placed precisely on the spigot at the base of transparent filter housing:

– Now place the transparent filter housing onto the thread of the filter from underneath, holding the filter housing as straight as possible.

  Make sure that the cartridge is positioned precisely over the spigot in the blue filter head and carefully tighten the transparent filter housing with the hand.

– Now tighten the transparent filter housing firmly in an anticlockwise direction using the plastic wrench.

12.2.5 Lubricating the axes

The axes of the DC5 Dental Milling System must be lubricated regularly.

NOTE!

Use only lubricating grease from Dental Concept Systems!

A high-pressure grease gun is available as an accessory.

Grease the axes once per year.

The axes have an easily accessible grease nipple. Apply the high-pressure grease gun, which is available as an accessory, to the nipple and press a little grease into the line.

The milling machine need not be dismantled for the lubrication.

12.3 Spare parts, wearing parts and consumables

NOTE!

Use exclusively original spare parts and accessories from Dental Concept Systems!

Spare parts, wearing parts and consumables can be obtained from:

Dental Concept Systems GmbH
Buchbrunnenweg 26
D- 89081 Ulm
Germany

Phone: +49 (0)731 – 9 642 603 - 0
Fax: +49 (0)731 – 9 642 603 – 17

info@dental-concept-systems.com

13 Repairs

With the exception of replacing the spindle, repair work may only be carried out by authorised technical personnel from Dental Concept Systems.

The replacement of the spindle may only be carried out by personnel who have been specially trained for this work by Dental Concept Systems.

CAUTION

The DC5 Dental Milling System may be repaired exclusively by authorised technical personnel from Dental Concept Systems GmbH.

The spindle may only be replaced by specially trained personnel!

WARNING

Danger when opening the machine housing!

There is a danger of fatal and very serious injuries due to electric shock.

Do not open the machine housing!

Repair work may only be carried out by authorised technical personnel from Dental Concept Systems!

WARNING

Uncontrolled start-up of the machine!

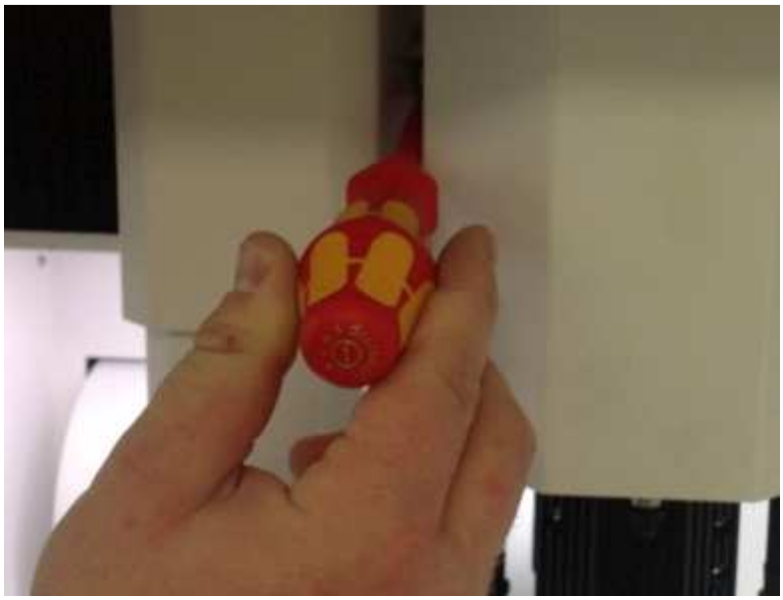
There is a danger of serious injuries and being crushed.

WARNING

Danger due to pneumatic energy!

There is a danger of serious injuries and being crushed.

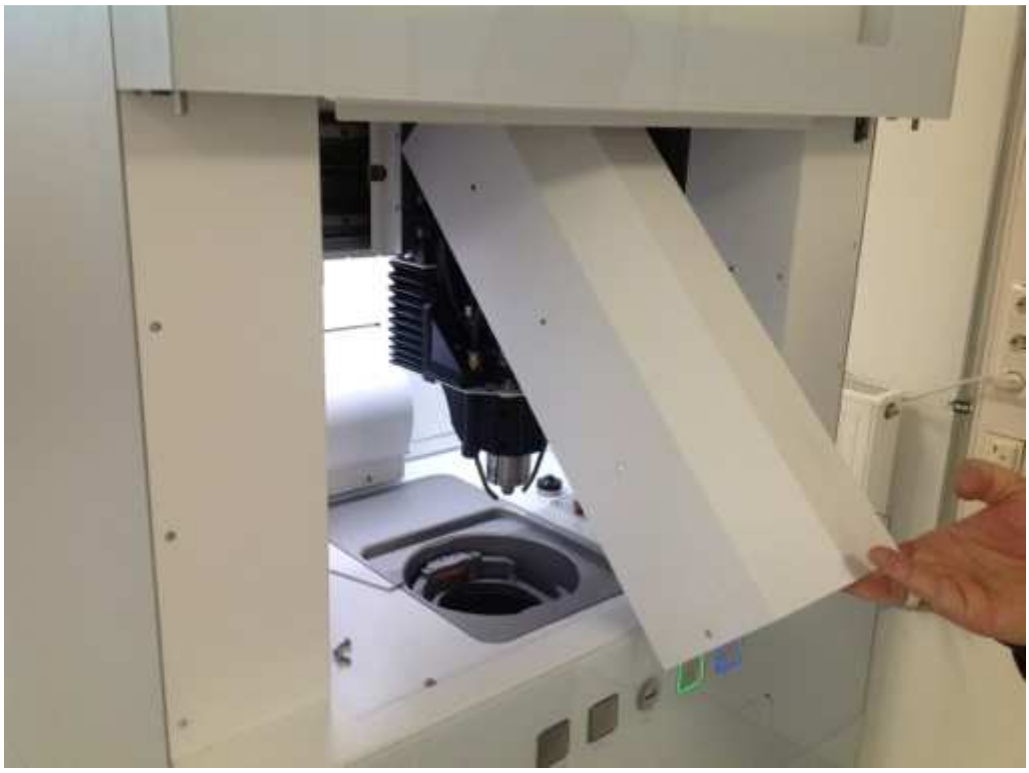
– Always switch off the compressed air supply and the *MAIN SWITCH* before commencing with the replacement of the spindle and unplug the mains plug. Check the pressure gauge to make sure that there is no longer any pressure.
– Open the front cover
– In systems with automation, loosen the screw between the gripper system and the spindle:



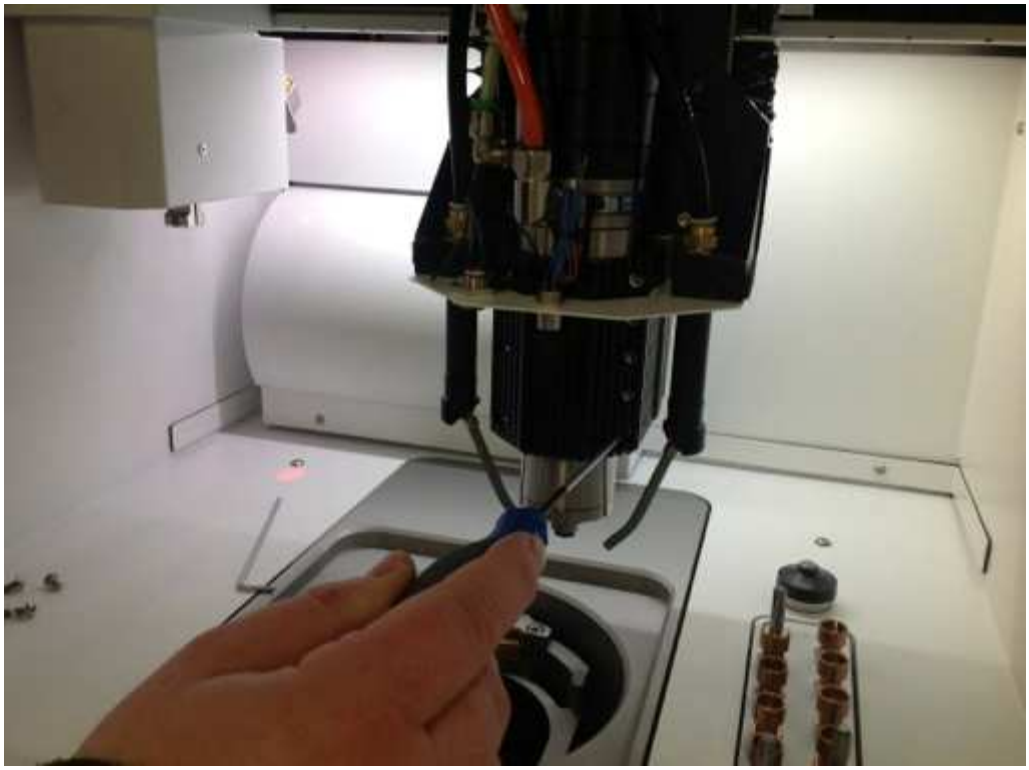
– Push the gripper system to the left. You now have free access to the screws on the left-hand side of the spindle cover:

– Undo the screws on the left and right-hand sides of the spindle cover. Use a hex key to undo the screws:

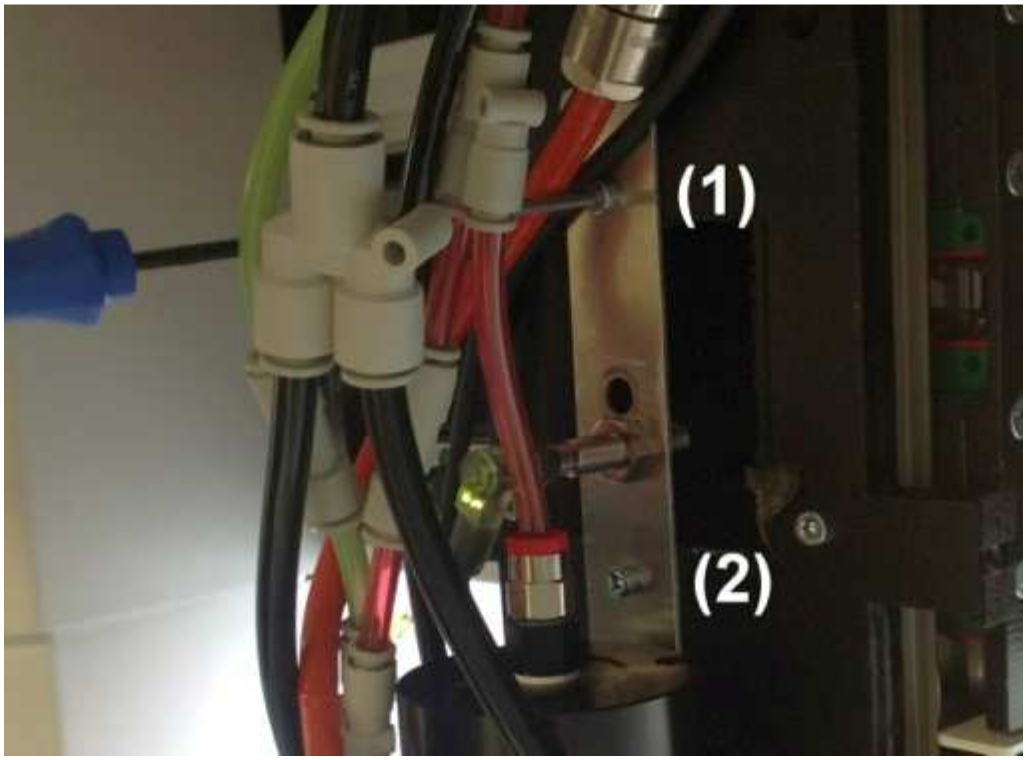
– Now carefully lift off the spindle cover. First pull the housing downwards and then tilt it forwards out of the machining compartment:



– Now undo the screws on the right-hand side of the spindle cooler using a hex key. The spindle cooler also serves as a holder for the spindle:



– Now undo the screws (1) and (2) on the plate with the proximity switch above the spindle and carefully pull out the plate.



– Pull all the pipes out of the quick-release couplings on the spindle. The pipes are coloured coded in order to avoid mistakes when inserting them again.
– Undo the screw connector of the control cable above the spindle and pull it off.

  Do not undo the control cable on the spindle!

– You can now carefully pull the spindle out of the cooler in an upward direction.
– Now insert the new spindle from above into the cooler and push it down into the cooler as far as the stop.
– Tighten the hex socket head screws on the cooler step by step and firmly handtight.
– Attach the plate with the proximity switch again using the screws (1) and (2).
– Connect the control cable and tighten the screw fastener handtight.
– Insert all pipes into the quick-release couplings again, observing the colour coding of the pipes:

– Now mount the cover of the spindle and the gripper system.
– Following the assembly, check the tool positions and measuring position and carry out a calibration of the milling machine (see *section 9.5. 'Calibration'*).

14 Dismantling and disposal

NOTE!

The DC5 Dental Milling System may only be disposed of by authorised technical personnel!

Comply with applicable guidelines for the protection of the environment when disposing of the machine.

Cooling lubricants must not be poured down the drain; they must be disposed of as special waste.

CAUTION

The dismantling and disposal of the DC5 may only be carried out by authorised technical personnel.

DANGER

Fatal or serious injuries due to electric shock!

Disconnect the machine from the electricity supply before commencing with dismantling.

DANGER

Danger due to whipping of hosepipes,

danger due to parts being flung and

danger due to the escape of compressed air!

Serious personal injuries possible.

Disconnect the machine from the compressed air supply!

DANGER

Fatal or serious injuries due to electric shock!

Disconnect the machine from the electricity supply before commencing with dismantling.

CAUTION

Poor stability of the machine!

Impact and crushing hazards are possible if the DC5 is not stable.

Serious injuries and crushing are possible if the DC5 Dental Milling System falls over.

Make sure that

- the stability of the system is ensured.

14.1 Final shutdown

CAUTION

Risk of crushing, knocking and cutting fingers and hands due to moving parts.
Before disposal of the machine, remove the mains plug and the IEC socket so that unauthorised persons cannot put the machine into operation again.

14.2 Dismantling

(1) Empty the cooling lubricant circuits if applicable and dispose of the cooling lubricants properly.

(2) Remove the filter bags from the extraction module if applicable and dispose of them properly.

(3) Dismantle all attachments and recycle them or dispose of them properly.

14.3 Disposal

NOTE!

The DC5 Dental Milling System does not contain any hazardous materials. The individual components must be disposed of properly by the user.

– In Germany, dispose of electrical and electronic devices in accordance with the Electrical and Electronic Device Law (ElektroG).
– Outside Germany, dispose of electrical and electronic devices according to national laws.
– Dispose of seals as special waste.

15 Supplier documentation

15.1 Spindle

See appendix: original operating manual for the spindle, IBAG.

15.2 V7000 extraction module (optional)

See appendix: original operating manual for the V7000 extraction system, Zubler-Gerätebau.

15.3 Cooling lubricant pumps

See appendix: original operating manual for the pump, Speck.