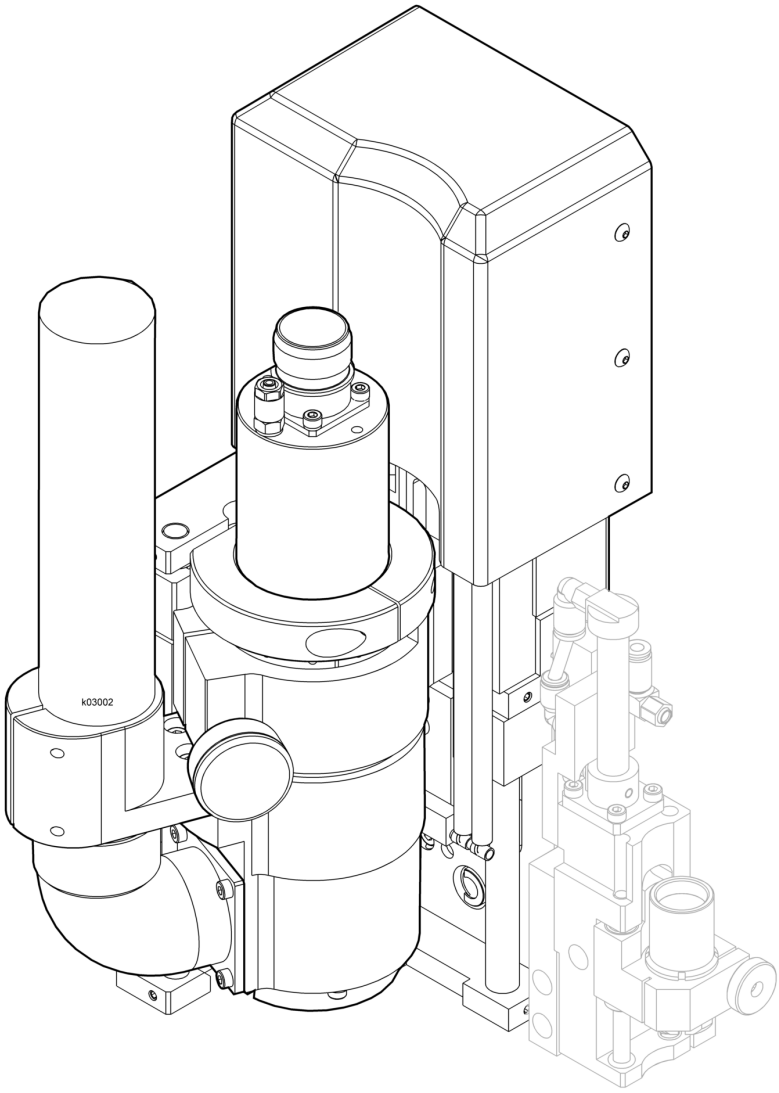
Operating manual

# R45s/HF Motor spindle

Version 006
Menu -




ZÜND
swiss cutting systems

## Contents





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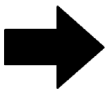
# 1 General

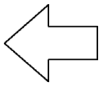
## 1.1 General Information

The R45s module is designed to be used with motor spindles for cutting operations such as drilling and routing. Please observe the supplied documentation concerning the correct operation and maintenance of motor spindles.

## 1.2 Symbols



close, fix, tighten, in



open, release, loosen, out



higher

lower

**Optional accessories**

There are a number of optional accessories available for the machine. Any description relating to an optional accessory is identified in the operating manual by the * symbol.



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# 2 Product description

## 2.1 Module R45s P20

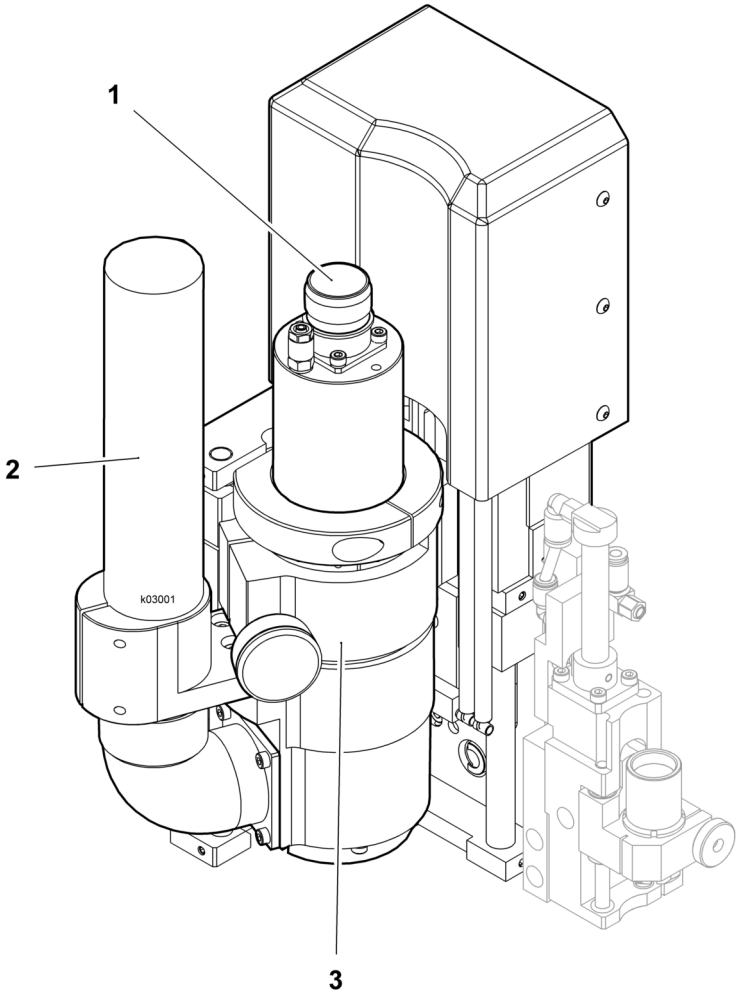


*Fig. 1 R45s Module*

**1** Motor spindle
**2** Suction unit
**3** Motor spindle holder



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## 2.2 HF Motor spindle 4040 DC-S

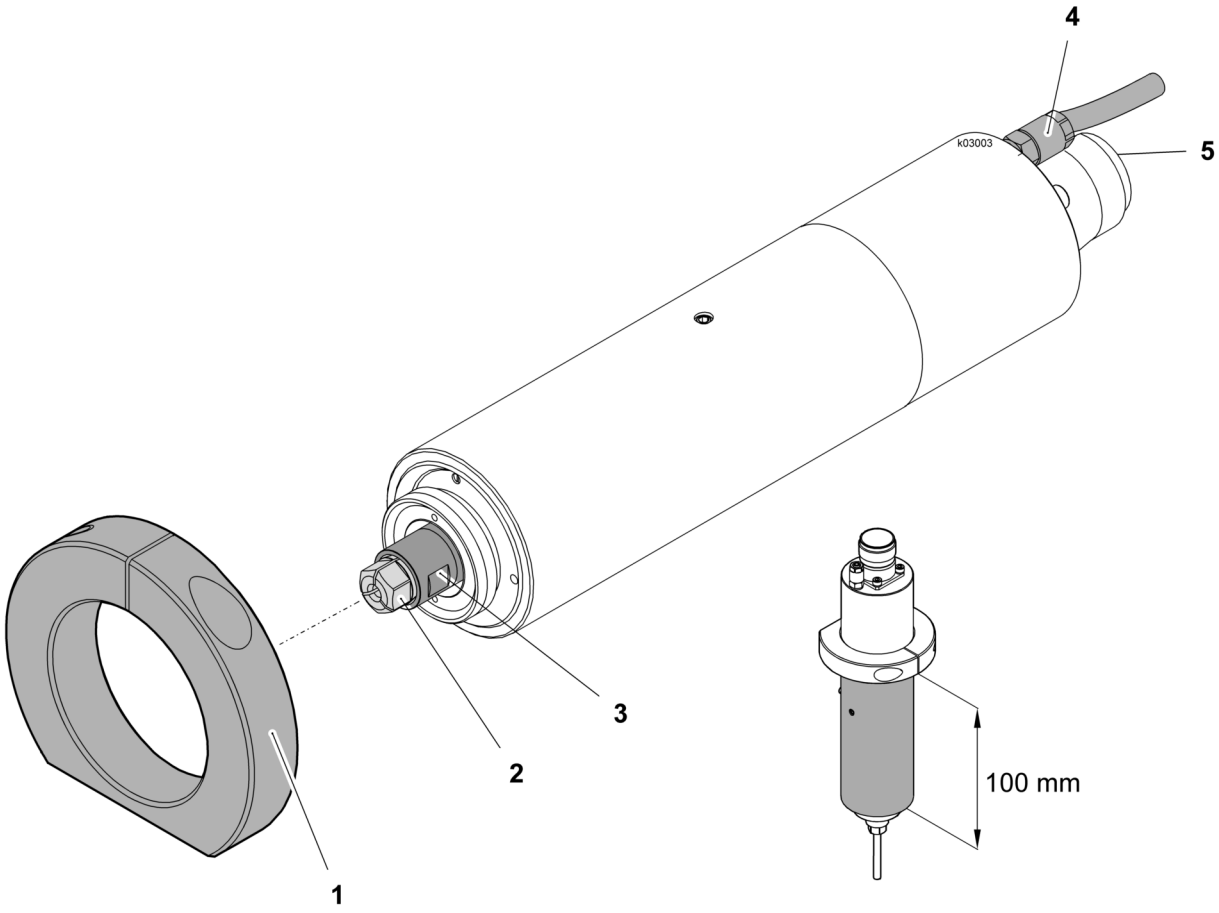


*Fig. 2 Motor spindle 4040 DC-S*

**1** Clamping ring
**2** Collet
**3** Chuck
**4** Sealing air connector
**5** Electrical connection



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## 2.3 HF Motor spindle 4040 DC

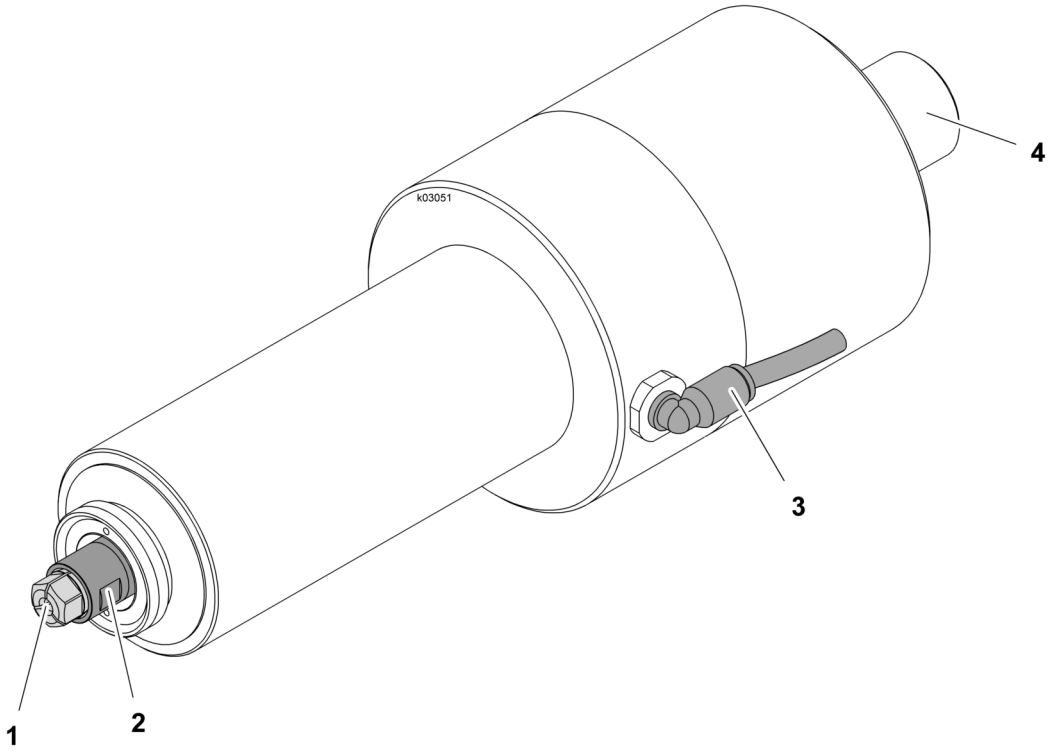


*Fig. 3 Motor spindle 4040 DC*

| | | | |
|---|---|---|---|
| **1** | Collet | **3** | Sealing air connector |
| **2** | Chuck | **4** | Electrical connection |

## 2.4 HF Motor spindle 4041 DC-S

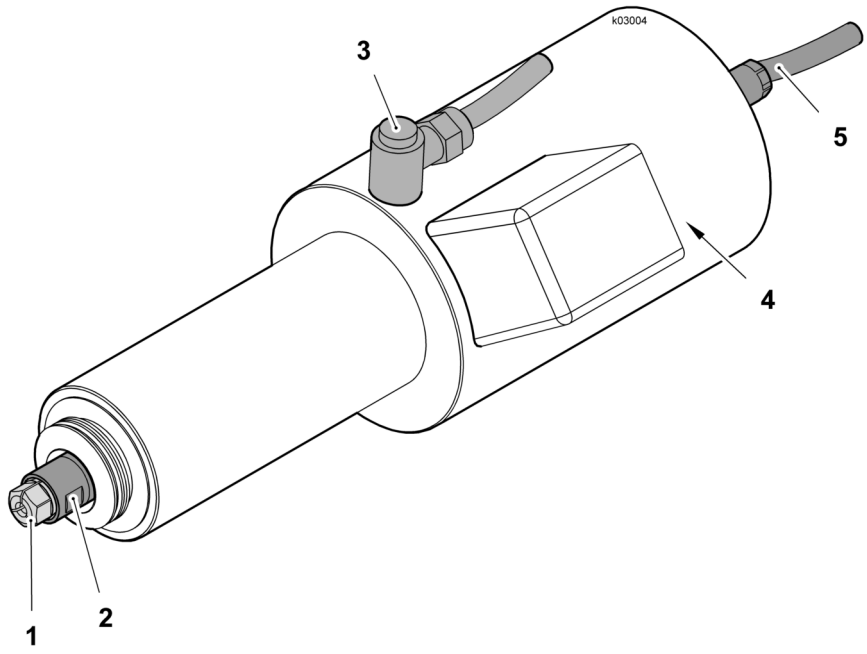


*Fig. 4 Motor spindle 4041 DC-S*



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1 Collet
2 Chuck
3 Sealing air connector
4 Electrical connection
5 Compressed air connection for tool changing

## 2.5 Converter unit

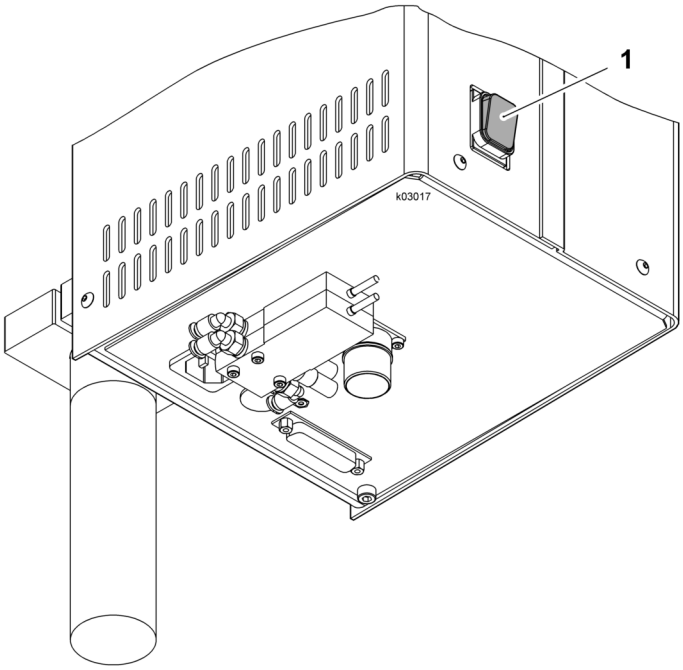


*Fig. 5 Converter unit*

1 On/Off switch



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## 2.6 Maintenance unit

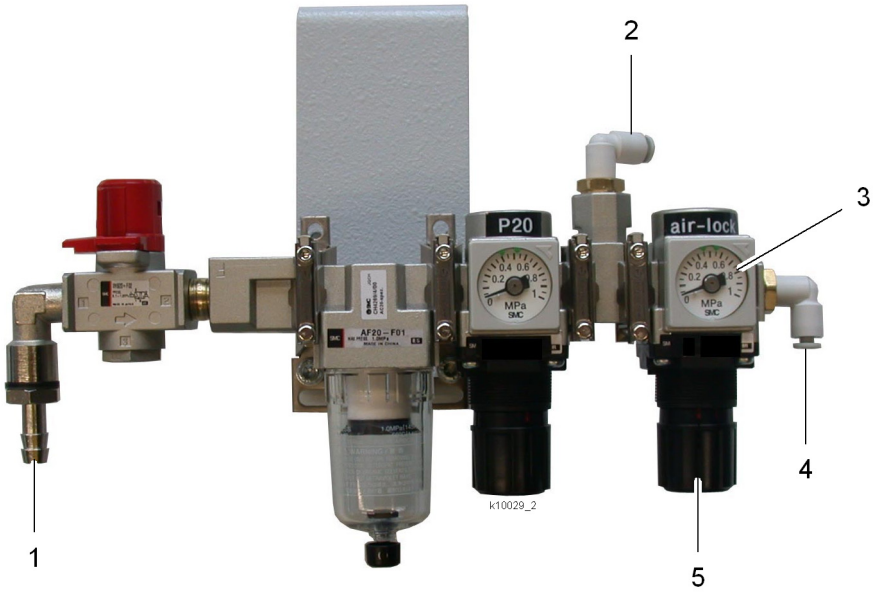


*Fig. 6 Maintenance unit*

**1** Air inlet
**2** Air outlet (Pen 20)
**3** Sealing air pressure gauge
**4** Sealing air outlet
**5** Sealing air pressure adjusting wheel

### Sealing air pressure setting

The pressure setting of the sealing air depends on the table size:

| Table size | Air pressure (Mpa) |
|---|---|
| S-800, M-800, M-1200, M1600, L-800, L-1200, L-1600, XL-800, XL-1200, XL-1600, LH-1600, L-2500 | 0.17 |
| XL-2500, XL-3000, L-3000 | 0.21 |
| 2XL-3000, 3XL-3000 | 0.25 |



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## 2.7 Technical information

| Description | Measure-ment | Unit |
|---|---|---|
| Motor type | BLDC | |
| Operating voltage | 45 | Volt |
| Torque | 17 | Ncm |
| Peak power | 1000 | Watt |
| Max. speed | 50000 | rpm |
| Max. current | 16.0 | A |
| Weight | 3.5* / 1.6 | kg |
| Direction of rotation | left | |
| Protection class/type | III / IP 54 | |
| Sealing air pressure | 1 | bar |
| Sealing air consumption | 20 - 40 | l/min |
| Pneumatic tool change * | 7 - 8 | bar |
| Collets | 1.5 - 6.35 | mm |



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# 3 Safety requirements

## Important !

These safety requirements and information are simple model-specific enhancements to the Safety requirements section of the Cutter Operating Manual.

Your safety – as the operator, service engineer or otherwise – is the primary concern. Certain situations, problems or faults which might occur with this equipment can pose safety risks if you are not familiar with preventative measures for these dangers.

**This chapter**

- defines the intended use of the module,
- contains special safety information and requirements that are specific to this module,
- Provides information on the protective equipment required for work and maintenance

Special operational and situation-specific safety requirements are listed in the relevant processing steps in subsequent sections of this manual.

## 3.1 Proper use

Proper use of the module is essential for its safe operation.

The equipment delivered with the module determines its possible uses.

The module is essentially designed to be mounted on HF motor spindle 4041 and HF motor spindle 4040 DC-S. Proper use is therefore limited to cutting operations such as drilling and routing of solid materials with a suitable tool.

Any other use which does not meet this description shall be classed as improper use. The user bears sole liability for any damage arising as a result of improper use.

The module is deemed to be used properly under the following conditions:

- compliance with applicable national safety regulations
- the safety instructions listed in this operating manual are complied with
- compliance with the conditions of use and the specified operating materials

## 3.2 Examples of improper use

- use of unsuitable tools
- use of tool shanks not manufactured according to DIN-ISO standards
- improper or non-intended use
- use of the tool at non-permitted speeds
- incorrect clamping of tools in the collet
- insufficient collet holding force (due to wear or dirt)
- incompatible tool shaft and collet sizes
- infrequent cleaning of collet
- non-observance of maintenance instructions
- non-adherence to safety requirements
- failure to react to signs of wear and damage

## 3.3 Dangers caused by improper use

- snapping of tool shanks



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– tool unintentionally slipping out of the collet
– breakage or cracking of tool

## 3.4 Protective equipment

When operating, cleaning or servicing the machine, wear close-fitting clothing and appropriate personal protective equipment.

Personal protective equipment comprises:

- work clothes,
- protective eyewear,
- protective gloves where injury is possible due to:
  – burns
  – pointed or sharp-edged objects

**Important !**

You are personally responsible for:

– using the required personal protective equipment
– cleaning and maintaining the equipment on a regular basis
– replacing damaged and unusable elements of the protective equipment in good time



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## 3.5 Safety signs

Important safety signs are attached to the machine. Failure to observe these signs could result in death or serious injury.

### Warning !

**Safety risks due to missing or illegible safety signs.**

- Check all safety signs on a regular basis for legibility and completeness.
- Replace missing or illegible safety signs with new original signs immediately.

#### Meaning of safety signs

The symbols on the safety signs

– have specific meanings

– are located wherever specific behaviour is forbidden because it could lead to a hazard

#### Prohibition signs

These symbols

– are round and blue in colour

– stipulate the wearing of personal protective gear to protect against danger

Wear eye protection



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# 4 Operation

## 4.1 General

**Attention !**

**Risk of damage to the motor spindle**

The motor spindle overheats if the sealing air and/or suction unit is/are switched off.

- Never operate the motor spindle without sealing air/suction.

## 4.2 Inserting the routing spindle

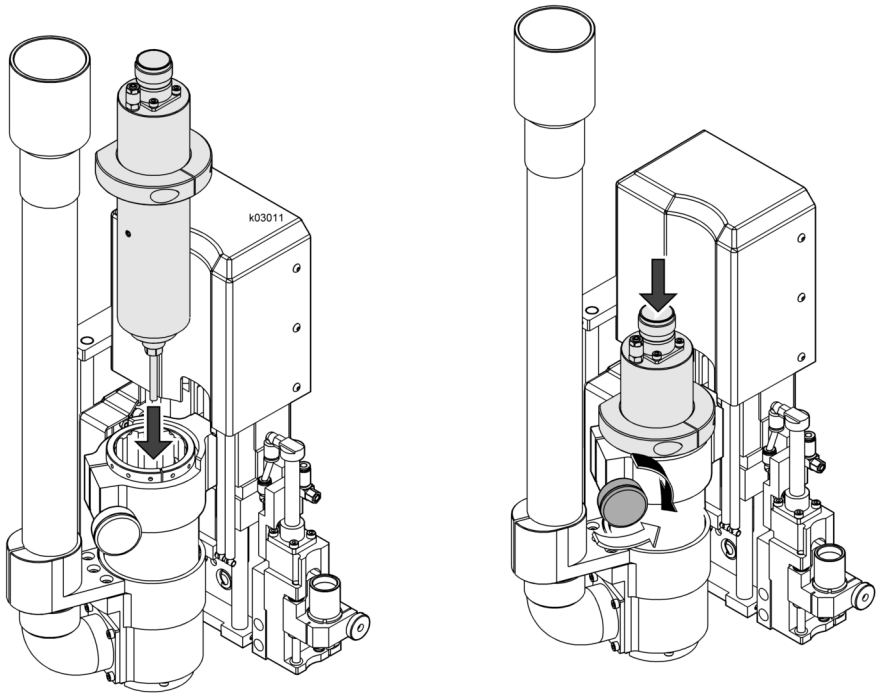


*Fig. 7 Inserting the spindle*

**Attention !**

**Risk of damage to the routing tool**

When mounting the spindle, make absolutely sure that the routing tool does not touch the tool holder.

- Guide the spindle into the module holder until the clamping ring lies fully on the motor spindle holder.
- Clamp the spindle by turning the fixing screw clockwise.

## 4.3 Suction unit

**Attention !**

**Risk of damage to spindle**

The air aspirated by the suction unit serves - among other things - to cool the motor spindle. If suction is not activated during operation, the motor spindle may overheat.

Activate the suction unit during operation.



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The guarantee does not cover faults due to the motor spindle being operated without the suction unit.

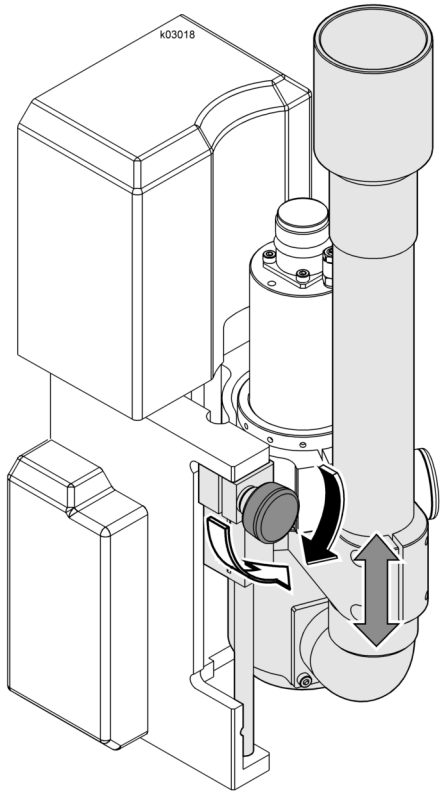


*Fig. 8 Adjusting the height of the suction unit*

- Undo the fixing screw and adjust the height of the suction unit.

## Important !

The optimum height of the suction unit depends on the material and the size of the routed end-product. Carry out a test run to obtain the desired effect.



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## 4.4 Menu function

### General

| Description | Menu | Setting/Function |
|---|---|---|
| TZ MODULE | ESC 118 | |
| POS UP | 1181 | Distance of tool from Z zero point in PEN UP mode |
| POS DOWN | 1182 | Tool depth in PEN DOWN mode going from the Z zero point |
| Z-OFFSET | 1183 | Correction value added to or subtracted from the zero point. |
| Z-INIT | 1184 | Start Z-axis initialisation process |
| Z-INIT AUTO | 1185 | - |
| Z-LOWER | 1186 | Lowering speed in the Z-axis |
| Z-LIFT | 1187 | Lifting speed in the Z-axis |
| MODE | 1188 | Position |
| PRESSURE | 1189 | - |

### Motor spindle operation

**Important !**

The motor spindle can be operated both via the control unit and via the menu.

| Designation | Menu | Setting/Function |
|---|---|---|
| ROTATIONAL SPEED | ESC 2213 | For setting the speed of the motor spindle |
| ROUTER ON/OFF | ESC 1155 | For turning the motor spindle and suction unit on/off |
| SUCTION ON/OFF | ESC 1156 | For turning the dust extractor on/off |



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## 4.5 Control unit

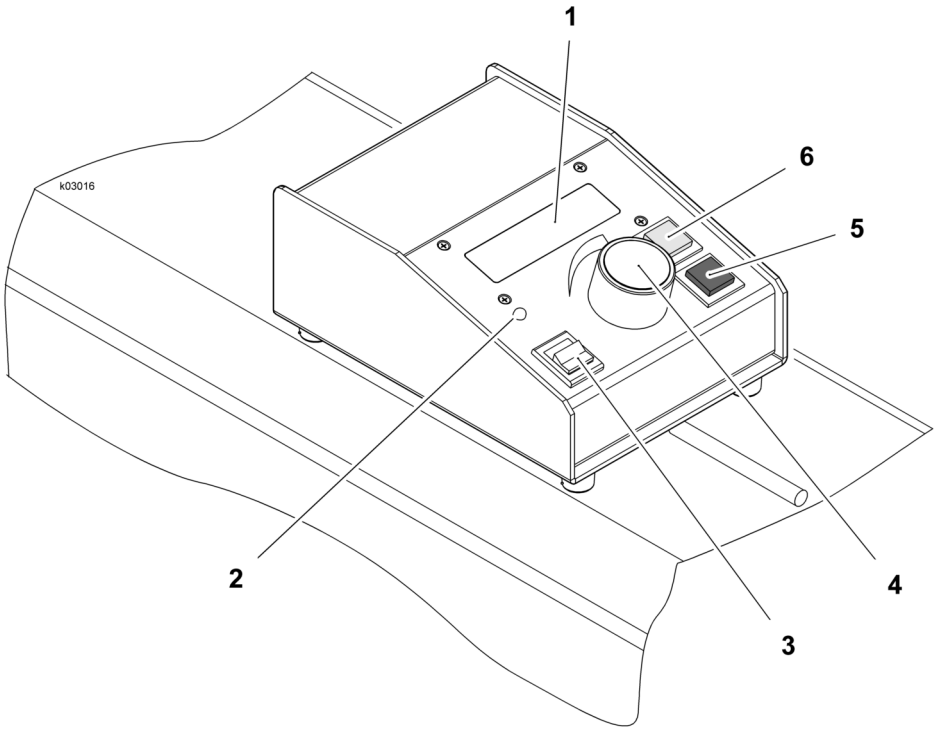


*Fig. 9 Control unit*

| | | | |
|---|---|---|---|
| **1** | Status display | **4** | Rotary knob for speed setting |
| **2** | Collet open/closed LED | **5** | Motor spindle off switch |
| **3** | Collet open/close switch | **6** | Motor spindle on switch |

1 When the converter unit is switched on, the status display tells you the current status and the current speed setting of the motor spindle.

2 The collet open/closed LED lights up green when the collet is closed.

3 Use the collet open/close switch to operate the pneumatic collet of motor spindle 4041 DC-S.

### Important !

Make sure that the switch is always in the "closed" position when operating with motor spindle 4040 DC-S.

4 Use the rotary knob to adjust the speed of the motor spindle. After approximately 30 seconds the value will be saved, and becomes available immediately following a restart.

5 Press this key to turn the motor spindle off. The suction unit is switched off automatically.

6 Press this key to turn the motor spindle on. The suction unit is switched on automatically

## 4.6 Initialising the Z-axis

Ensure that

– the routing spindle is clamped in the module as described in the manual



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– the router is properly chucked
– the spindle is turned off

### Procedure

## Important !

There are two ways of setting the zero point:

– Define the material surface as the zero point and then set the routing depth (POS DOWN) in the menu.
– Define the cutting support as the zero point (POS DOWN = 0). Make sure that POSITION UP is higher than the material thickness.

## Important !

Adjust the suction unit according to the router height.

• Activate function Z-INIT (1184).

Operating the travel keys moves the Z-axis up/down until the router touches the material surface or cutting support. Simultaneously pressing the SHIFT key increases the lifting/lowering speed.

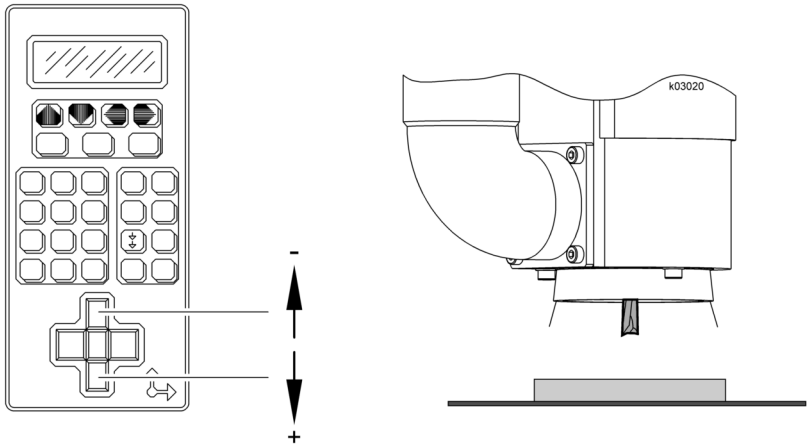


*Fig. 10 Moving the module*

⇨ Carefully approach the surface and confirm by pressing <ENT>.
✓ The value is automatically saved After initialisation, the POS DOWN (1182) is automatically set to "0".

### Tool positions

After initialisation, 3 tool positions are possible.



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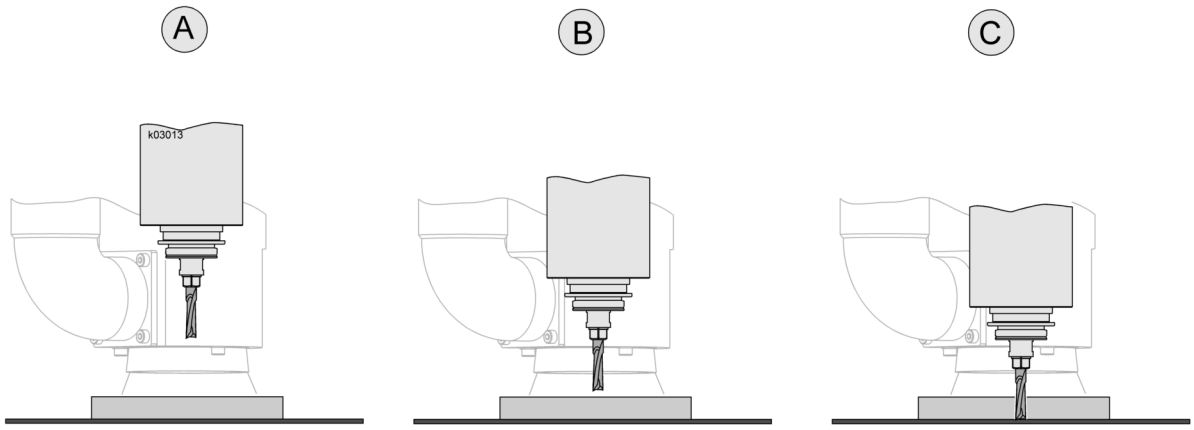


*Fig. 11 Tool positions*

| Pos. | Function | Description | Key |
|---|---|---|---|
| A | Park Position | moves to the highest position on the Z axis | Shift +  |
| B | PU (Pen Up) | Z zero point - Preset POS UP |  |
| C | PD (Pen Down) | Zero point + POS DOWN + any Z-OFFSET |  |



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## 4.7 Performing a test cut

### Attention !

**Risk of injury due to chips**

Although the working area is protected by the action of the suction unit, chips may pose a hazard in view of the high speed at which the router operates.

- Always use your personal protective equipment when routing.

**Procedure**

- Set the routing depth (1184).
- Set the routing speed (1111) - Adjust the routing speed to the material being cut.
- Set acceleration (1121) to "1".
- Set the lowering speed (1186) - Adjust the lowering speed to the material being cut.
- Switch on the spindle and suction unit (1155).
- Adjust the speed of the routing converter according to the tool or the material being cut.
- Lower the tool and make a test cut using the travel keys.
- Lift the spindle and check the cutting depth.
- If necessary, correct the routing depth with the POS DOWN (1182) or OFFSET (1183) functions.

### Important !

If the routing depth is correctly set, the router leaves a slight trace in the routing support.

### Important !

To improve quality, routing can be carried out in several stages. (Multipass).



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# 5 4040 DC-S / 4040 DC

## Warning !

**Revolving parts can be dangerous.**

- Only change the tool or the collet with the motor spindle completely at rest.
- Before working on the motor spindle, safeguard the machine against being switched on accidentally (turn off the converter unit).

## Attention !

**Risk of damage to the motor spindle.**

Use only the supplied original tool to clamp/unclamp the tool and collet.

- If the clamping nut is not firmly tightened, the router may come loose.
- If the clamping nut is secured too tightly, the clamping nut or the shank may be damaged.
- Use only appropriate tools (follow the manufacturer's instructions).
- Do not operate the spindle without the collet or tool having been inserted.

## 5.1 Changing the collet on the 4040 DC-S / 4040 DC

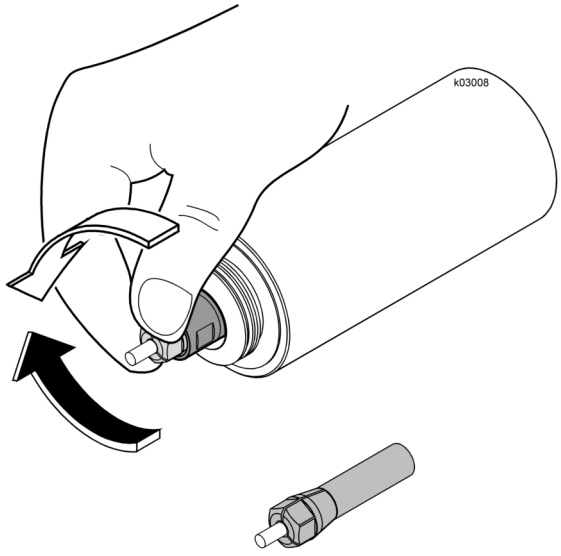


*Fig. 12 Removing the collet*

⇨ Use the SW 13 open-ended spanner and the SW 10 double-ended ring spanner to remove the collet.



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## 5.2 Tool changing

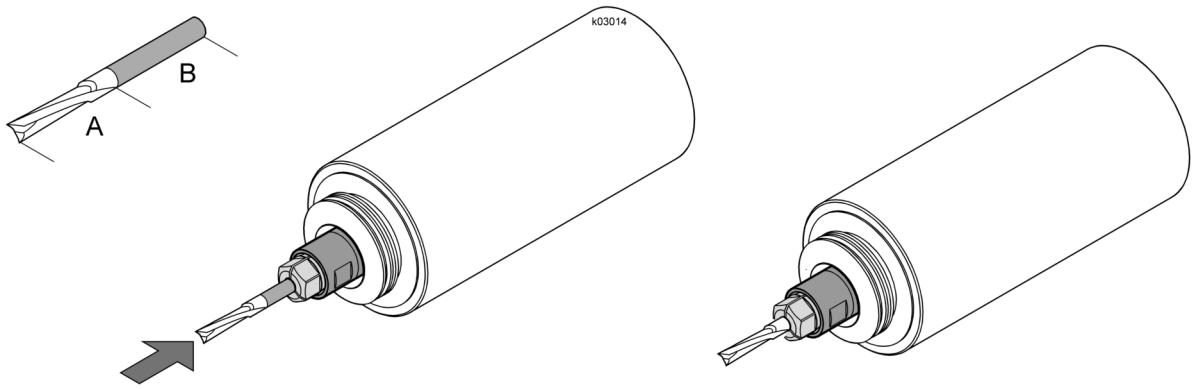


*Fig. 13 Tool changing*

### Important !

Make sure the tool diameter always corresponds to the collet diameter.

⇨ Push the tool, according to the shank length (B) and any instructions of the tool manufacturer, into the collet to such an extent that the tool body (A) does not touch the collet.

⇨ Fix the tool by tightening the collet with the supplied implement.



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# 6 4041 DC-S *

## Warning !

**Revolving parts can be dangerous.**

- Only change the tool or the collet with the motor spindle completely at rest.
- Before working on the motor spindle, safeguard the machine against being switched on accidentally (turn off the converter unit).

## Attention !

**Risk of damage to the motor spindle.**

Use only the supplied original tool to clamp/unclamp the tool and collet.

- If the clamping nut is not firmly tightened, the router may come loose.
- If the clamping nut is secured too tightly, the clamping nut or the shank may be damaged.
- Use only appropriate tools (follow the manufacturer's instructions).
- Do not operate the spindle without the collet or tool having been inserted.

## 6.1 Changing the collet on the 4040 DC-S

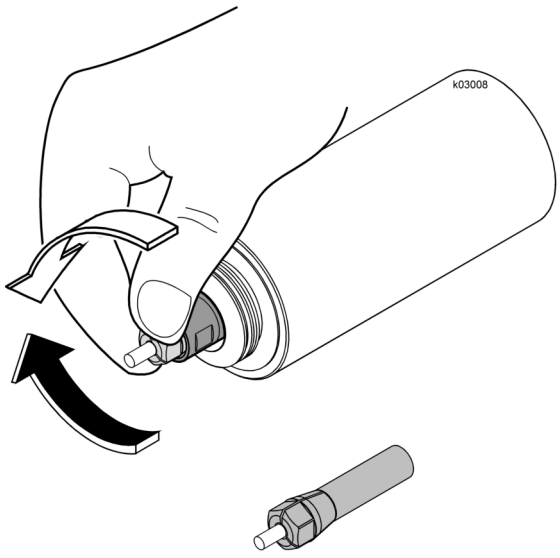
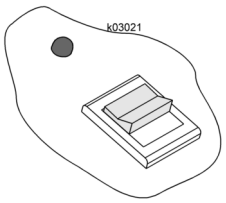



*Fig. 14 Changing the collet*




- Operate the compressed air feed on the control unit to open the collet.

The green LED on the control unit goes out.

- Once the collet has opened, turn it by hand in the direction shown by the arrow until the collet can be removed by hand.
- Push the new collet, with a tool or test pin inserted, into the collet holder.
- Screw the collet, with the tool or a suitable test pin inserted, into the holder by hand as far as it will go.



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### Attention !

**Risk of damage to the motor spindle.**

- To set the correct clamping distance, loosen the collet by approximately 1/4 of a turn.

## 6.2 Changing the tool on the 4041 DC-S

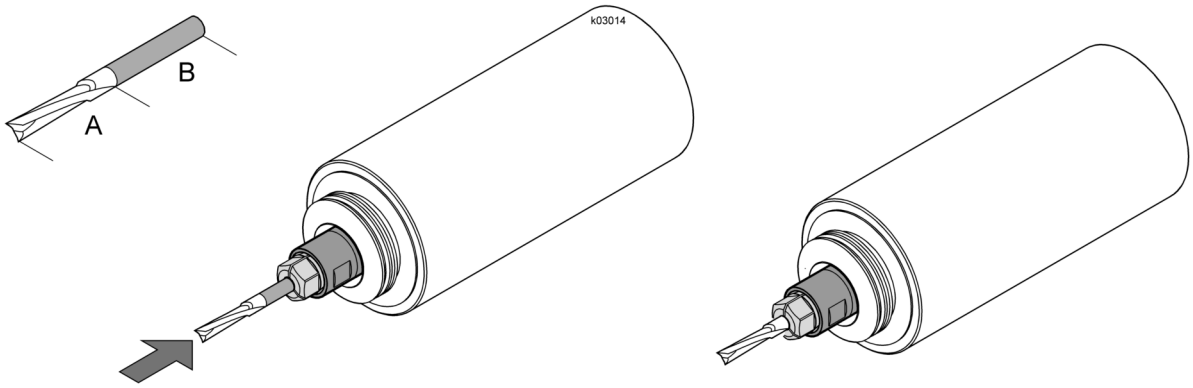
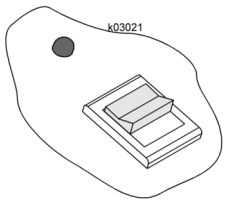



*Fig. 15 Changing the tool*

### Important !

Make sure the tool diameter always corresponds to the collet diameter.




- Operate the compressed air feed on the control unit to open the collet.

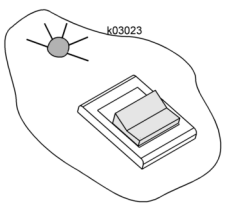
The green LED on the control unit goes out.

- Once the collet has opened, remove the previously used tool.

### Important !

Only use the SW 10 double-ended ring spanner and SW 10 ratchet spanner if the collet is stuck fast.

- Push the tool, according to the shank length (B) and any instructions of the tool manufacturer, into the collet to such an extent that the tool body (A) does not touch the collet.
- Close the collet with the collet open/close switch.




The green LED on the control unit lights up as soon as the collet is closed.



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# 7 Sealing air monitor

Available with frequency converter version V30/Control unit version V20 or higher

The motor spindle is supplied with sealing air for protection against dust and for cooling. If the sealing air is omitted, the motor will be damaged.

The sealing air pressure is monitored with a pressure sensor.

### Sealing air monitor

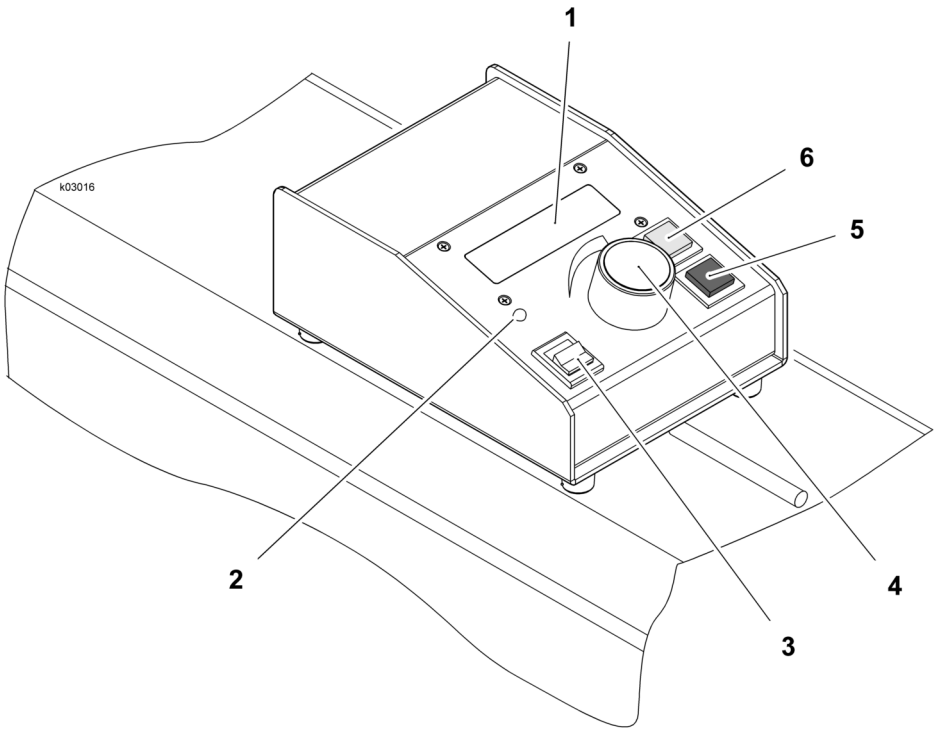


*Fig. 16 Control unit*

| | | | |
|---|---|---|---|
| 1 | Status display | 4 | Rotary knob for speed setting |
| 2 | Collet open/closed LED | 5 | Motor spindle off switch |
| 3 | Collet open/close switch | 6 | Motor spindle on switch |

### Sealing air pressure too low or not present

If the sealing air monitor is actuated (drop in pressure or no pressure at all), the motor spindle is switched off.

The message *Low Pressure* appears on the status display of the control unit.

⇨ The press the "Motor spindle ON" key.

✓ The current air pressure is displayed. Proceed according the "Causes/ troubleshooting" table.

⇨ Press he "Motor spindle OFF" key.

✓ Sealing air, suction unit and vacuum are switched off.



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### Set air pressure (available with control unit version V30)

Adjustment of the air pressure takes place - with motor spindle switched on - at the maintenance unit, while the air pressure is checked at the status display of the control unit.

⇨ Press and hold the "Motor spindle OFF" key for 5 sec.

✓ The current pressure is shown on the status display of the control unit.

⇨ Set the sealing air pressure at the maintenance unit according to the table (Ch. 2.6).

⇨ Press the "Motor spindle OFF" key in order to leave this mode.

### Cause/Troubleshooting

| Symptom | Cause | Troubleshooting |
|---|---|---|
| No air pressure | Stopcock closed | Stopcock open |
| | Air hose not connected | Check connection of the air hose at the following points:<br>• Air outlet maintenance unit<br>• Routing converter air inlet<br>• Routing converter air outlet<br>• Motor spindle air connection |
| | Valve not switched | Contact service dept. |
| | Defective pressure sensor | Contact service dept. |
| | Defective air hose | Check air hose for breaks<br>Contact service dept. |
| Air pressure too low (< 0.13 Mpa) | Pressure regulator set incorrectly | Maintenance unit, check pressure display.<br>Set the pressure at the pressure regulator according to the table (Ch. 2.6) |
| | Air supply defect | Check building line connection, increase air pressure |
| | Air hose defect | Check air hose for leakage<br>Contact service dept. |



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# 8 Cleaning and maintenance

## 8.1 General

- Regularly remove all material residue from the spindle and module.
- Make sure that plug connectors and contacts are free from dust and dirt.
- Clean the panelling with a plastic cleaner.

## 8.2 Steps for maintenance

| Interval | Activity |
|---|---|
| Daily | Clean spindle |
| | Check suction unit for dirt and clean as necessary |
| Daily | Guide |
| | Clean and oil Z-axis guides |

## 8.3 Cleaning the spindle

**Attention !**

**Risk of damage to the motor spindle**

- Never clean the motor spindle with ultrasound, steam jet, compressed air etc.
- Never use cleaning products (cleaning spray, grease solvent etc.)

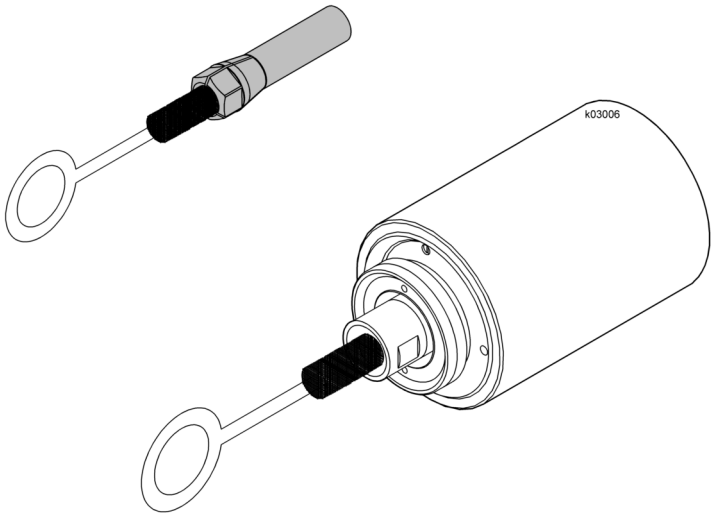


*Fig. 17 Cleaning the spindle*

- Clean the collet holder and collet with a brush or paintbrush. Lightly oil the thread of the collet.
- Fit the cleaned collet, with the tool or test pin inserted, back in the spindle.



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## 8.4 Cleaning the Z-axis guide

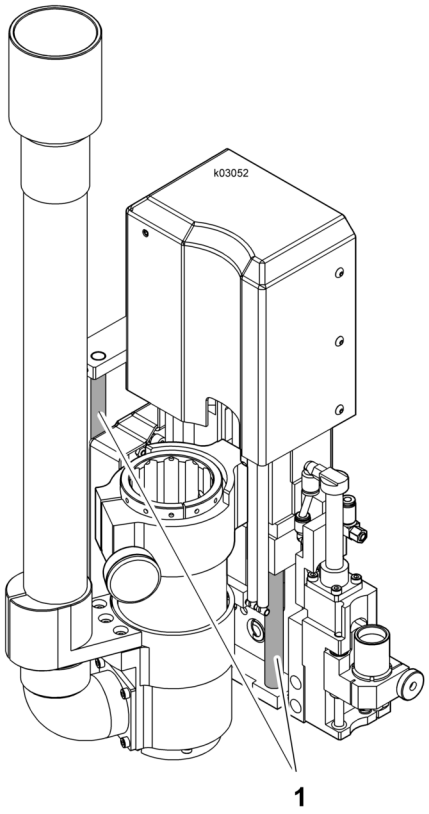


*Fig. 18 Cleaning the guide*

- Clean the guides with a soft cloth impregnated with oil (Fig. , 1)



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