

Operating Instruction Manual

Drills



These operating instructions are part of your product and are intended for all persons who perform work with this tool. They must be read and understood before the initial operation of the tool and must always be stored in an accessible manner.

Always use original spare parts from OERTLI Werkzeuge AG.



Translation of the original instructions

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1. Description

The drills are simple boring tools in one part, tipped design or with reversible knives.

1.1. Appropriate Application

Drills are only suitable for woodworking applications used in axial direction under consideration of suitable operating conditions.

Materials to be machined are:

- Softwoods
- Hardwoods
- Exotic woods
- Particle boards
- MDF (medium density fibreboard)
- Laminated pressed woods
- Composite materials (wood and plastic)

Place and mode of application:

- Woodworking machinery

- exclusively for drilling application (load only in axial direction)
- primarily for CNC-machinery and routers
- Feed systems: Manual feed or Mechanical feed, according to tool inscription
- Max. RPM according to instructions in chapter "Various designs"

1.2. Design variants

All drills are designed only to cut at face and are therefore not suitable for milling operations. According to application they are for clockwise rotation or anti-clockwise rotation. The cutting edge material is according to application either High speed steel (HS) or Tungsten carbide (HW) or Diamond (DP).

Drills may have most different shapes. The most common shapes are described in the following chapters. Besides these shapes all possible special shapes may exist.

1.2.1. Boring bit with roof-shaped center point



| | |
|-----------------------|-------------------------------|
| Application | drilling |
| Shank diameter (C) | 2 to 5 mm |
| Diameter of drill [B] | 2 to 5 mm |
| Number of teeth | 2 |
| Cutting length | 12 to 36 mm |
| End grain cut | with roof-shaped center point |
| Peculiarity | - |
| Max. RPM (n max) | 10'000 1/min |

1.2.2. Twist drills with center point and spurs



| | |
|---------------------------|-----------------------------|
| Application | drilling |
| Shank diameter (C) | 3 to 5 mm |
| Diameter of drill [B] | 3 to 5 mm |
| Number of teeth | 2 |
| Cutting length | 22 to 36 mm |
| End grain cut | with center point and spurs |
| Peculiarity | - |
| Max. RPM (n max) | 10'000 1/min |

1.2.3. Through-hole bits



| | |
|---------------------------|-------------------------------|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 5 to 12 mm |
| Number of teeth | 2 |
| Cutting length | 25 to 40 mm |
| End grain cut | Roof-shaped center point 60° |
| Peculiarity | spiral part is plastic coated |
| Max. RPM (n max) | 10'000 1/min |

1.2.4. Through-hole bit, "LONGLIFE"



| | |
|---------------------------|--|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 5 to 8 mm |
| Number of teeth | 2 |
| Cutting length | 27 to 35 mm |
| End grain cut | Roof-shaped center point with double chamfer |
| Peculiarity | spiral part is plastic coated |
| Max. RPM (n max) | 10'000 1/min |

1.2.5. Dowel drills



| | |
|---------------------------|-----------------------------|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 5 to 16 mm |
| Number of teeth | 2 |
| Cutting length | 27 to 44 mm |
| End grain cut | with center point and spurs |
| Peculiarity | - |
| Max. RPM (n max) | 10'000 1/min |

1.2.6. Spiral boring bits with flat center point



| | |
|---------------------------|-----------------------|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 5 to 10 mm |
| Number of teeth | 2 |
| Cutting length | 27 to 35 mm |
| End grain cut | Negative ground spurs |
| Peculiarity | enlarged chip groove |
| Max. RPM (n max) | 10'000 1/min |

1.2.7. Hinge boring bits, tipped



| | |
|---------------------------|-----------------------------|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 15 to 40 mm |
| Number of teeth | 2 + 2 |
| Cutting length | - |
| End grain cut | with center point and spurs |
| Peculiarity | - |
| Max. RPM (n max) | 7'000 1/min |

1.2.8. Hinge boring bits with reversible knives



| | |
|---------------------------|-----------------------------|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 25 to 40 mm |
| Number of teeth | 2 + 2 |
| Cutting length | - |
| End grain cut | with center point and spurs |
| Peculiarity | adjustable centre point |
| Max. RPM (n max) | 7'000 1/min |

1.2.9. Hinge boring bits with raker knives



| | |
|---------------------------|-----------------------------|
| Application | drilling |
| Shank diameter (C) | 10 mm |
| Diameter of drill [B] | 25 to 40 mm |
| Number of teeth | 2 + 2 |
| Cutting length | - |
| End grain cut | with center point and spurs |
| Peculiarity | adjustable centre point |
| Max. RPM (n max) | 7'000 1/min |

1.2.10. Countersink drills



| | |
|---------------------------|---------------------|
| Application | drilling |
| Shank diameter (C) | 6 to 10 mm |
| Diameter of drill [B] | 10.4 to 25 mm |
| Number of teeth | 3 |
| Cutting length | - |
| End grain cut | for 90° countersink |
| Peculiarity | in HS or HW |
| Max. RPM (n max) | 6'000 1/min |

1.2.11. Machine bits



| | |
|---------------------------|---|
| Application | drilling |
| Shank diameter (C) | 9 to 16 mm |
| Diameter of drill [B] | 10 to 50 mm |
| Number of teeth | 2 + 2 |
| Cutting length | - |
| End grain cut | with center point and spurs |
| Peculiarity | - partially with exchangeable centre point - in HS or HW |
| Max. RPM (n max) | 3'000 1/min |

1.2.12. Plug cutter



| | |
|---------------------------|---------------------------|
| Application | drilling |
| Shank diameter (C) | 13 to 16 mm |
| Diameter of drill [B] | 6 to 20 mm |
| Number of teeth | 2 |
| Cutting length | 35 to 70 mm |
| End grain cut | - |
| Peculiarity | with chip breaker grooves |
| Max. RPM (n max) | 3'000 1/min |

1.2.13. Mortising bits



| | |
|---------------------------|---------------------------|
| Application | drilling |
| Shank diameter (C) | 13 to 16 mm |
| Diameter of drill [B] | 6 to 20 mm |
| Number of teeth | 2 |
| Cutting length | 35 to 70 mm |
| End grain cut | - |
| Peculiarity | with chip breaker grooves |
| Max. RPM (n max) | 3'000 1/min |

1.2.14. Dowel drills



| | |
|---------------------------|-----------------------------|
| Application | drilling |
| Shank diameter (C) | 3 to 16 mm |
| Diameter of drill [B] | 3 to 20 mm |
| Number of teeth | 2 |
| Cutting length | 30 to 140 mm |
| End grain cut | with center point and spurs |
| Peculiarity | in HS or HW |
| Max. RPM (n max) | 4'000 1/min |

1.3. General warranty conditions

The warranty services only include the repair or replacement of defective tools and clamping devices made by OERTLI that are subject to manufacturing or material faults. The warranty period starts with the date of purchase and is specified in the general conditions of business.

2. Security Advice

Our clamping devices and tools correspond to the state of the art and were produced in accordance with EN 847-1 and the subsequent European Standards.

The regulations of the machine manufacturer must be adhered to for safe use of the clamping device or tool. The relevant regulations are provided in the respective operating instructions of the wood processing machine used.

Obtain information regarding the location and function of the safety devices required for your wood processing machine before using the tool.

Work may only be performed by appropriately trained specialist staff familiar with handling wood processing tools and machines as well as the relevant clamping devices.

This tool or clamping device may only be used for the purpose described under "appropriate use" and in compliance with the following safety instructions.

2.1. Signal words

The following Signal words refer to the different levels of danger:

⚠ DANGER

The "DANGER" signal word indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

The "WARNING" signal word indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

The "CAUTION" signal word indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

The "NOTICE" signal word indicates risks that might result in damage to goods.

2.2. General sources of risk

2.2.1. Injuries due to contact with cutting parts

| | |
|----------------|--|
| Source of risk | Contact with cutting parts on the tool. |
| Consequences | Cutting, piercing and crushing injuries. |
| Probability | Contact with the tool always poses a risk of injury. |
| Avoidance | Wear safety gloves that were tested according to EN 388. |
| In emergencies | Perform first aid. Consult a doctor. |

2.2.2. Falling parts

| | |
|----------------|--|
| Source of risk | Damage to persons or goods due to falling parts. |
| Consequences | Crushing, bruises in the foot area and/or damaged tool. |
| Probability | Always during transport or inappropriate storage. |
| Avoidance | Transport in suitable packaging or device. Wear suitable safety shoes. |
| In emergencies | Perform first aid. Contact the supplier/ manufacturer. |

2.2.3. Defective parts or elements

| | |
|----------------|---|
| Source of risk | Worn or wrongly mounted parts that may cause eccentricity or reduce the clamping force. |
| Consequences | Damage to the tool. |

Probability During installation and removal work and after prolonged use or storage.

Avoidance By regular, visual inspection. Only use original parts.

In emergencies Check the tool for damage. Have the tool promptly checked by the manufacturer when damage has occurred.

2.2.4. Fastening torque

Source of risk Tightening screws that have been fastened with too low or too high fastening torque.

Consequences Damage to the tool due to reduced clamping force of the clamping system.

Probability When the tool has not been used for a prolonged time.

Avoidance Fasten all screws using a low-recoil torque wrench. Check tightening screws that have not been loosened for a prolonged period (e.g. after preservation).

In emergencies Immediately deactivate the tool and have it inspected by the manufacturer as required when the tightening screws can no longer be fastened with the fastening torque specified.

2.2.5. Modification of OERTLI products

Source of risk Unauthorised modifications of tools and clamping devices by the user.

Consequences Severe damage to persons and/or goods.

| | |
|----------------|---|
| Probability | Always in case of unauthorised modifications by the user. |
| Avoidance | Only have modifications performed directly by the OERTLI company or with their approval. Always use original spare parts. |
| In emergencies | Perform first aid. Contact the supplier/ manufacturer. |

2.3. Protective equipment required



Protective goggles
Protective goggles protect the eyes against flying particles during wood processing and against possible splashes of liquid during tool cleaning.



Safety gloves
Safety gloves protect against cutting and piercing injuries while touching, mounting or removing the tool. Only use safety gloves that have been tested according to EN 388 (mechanical risks).



Hearing protection
Hearing protection protects the ears from increased noise exposure during wood processing.



Safety shoes
Safety shoes are used to protect the feet against dropping objects.

Any additional protective equipment that may be required is specified in the operating instructions of the machine manufacturer..

3. Start Up

3.1. Unpacking/Transportation

⚠ WARNING



Very sharp cutting edges pose a risk of cutting and piercing when touching the tool.

Be cautious when unpacking or packing as well as when handling.

Do not touch tools at the cutting edges.

Wear appropriate protective gloves (according to EN 388).

⚠ WARNING



Risk of cutting and crushing by dropping tools.

Only transport and store tools in suitable packaging or devices.

Ensure that the tool is correctly positioned in the holder.

Wear appropriate safety shoes when working with heavy tools.

NOTICE

Damage to the clamping adaptor and to the tool due to strike against foreign material.

Be cautious when unpacking or packing as well as when handling.

Always put tools on soft supports.

Transport clamping adaptors and tools only in a suitable packing.

Always use the original packing for transport.

3.2. Installation/Assembly

NOTICE

Clamping adaptors with steep cone shank require a holding bolt. Without it, the tool is not held in the spindle.
Damage to the clamping adaptor and the tool due to not mounting a holding bolt.

Mount the corresponding holding bolt into the steep cone shank before the tool is put onto the machine.

NOTICE

Damage to the tool, to the cutting edges and to the knife clamping systems as well as to the clamping adaptors due to loss of clamping forces.

All clamping surfaces must be free from dirt, oil, grease and water.

Regularly check all clamping devices for damage and immediately replace damaged devices.

Do not use fibre materials, such as cotton waste for cleaning.

DANGER



Risk of cutting, crushing and mortal danger due to unintentional machine start during tool or cutter exchange.

Disconnect the power supply to the machine.

Ensure that the machine cannot be switched on by third parties during operation.

Mount and secure the clamping adaptors and the tools according to instructions of the machine manufacturer! Consider necessary information from the instruction manual of the woodworking machine in use.

4. Attendance/Operation

WARNING



Danger of injuries or danger of crushing by the rotating tool.

Do not touch the rotating tool.

Do not slow down the tool by lateral pressure against the tool body.

Do not work without necessary safety guard.

4.1. Prior to operation

Check the clamping adaptors and the tools for damage and check the seats of the clamping elements as well as the condition of the cutting edges.

For maintenance work on damaged or dull cutting edges refer to chapter "Maintenance/Cleaning" of the corresponding wood working tool.

For proceeding with respect to preservation and storage, refer to chapter "Preservation/Storage" in this maintenance manual.

WARNING



Tool breakage or cutting edge breakage by overload.

Cutting injuries, crushing injuries or danger of life due to fly-away parts.

Do not re-install neither damaged or modified clamping adaptors and tools nor clamping adaptors and tools with corroded screw connections.

Maintenance work on damaged clamping adaptors and tools to be carried-out only by the manufacturer of clamping adaptors and tools.

Applicable machine parameters such as speed, direction of rotation and feed to be checked and verified with the parameters of the

clamping adaptor and tool.

For compound tools (tipped tools), the rest height or rest thickness of the attached cutting plate is not to be less than 1 mm.

Check screw connections for corrosion after transport or after a longer storage time, respectively a longer unused time. Corroded screws must be replaced. Threaded holes must be checked for correct tolerances and strength.

⚠ WARNING

Due to transport, strong working vibrations or long storage times, alternatively parts not being used for a long time, so called resting-effects may occur due to vibrations and temperature differences on screw connections. As a result, screw clamping forces are considerably lost.

Danger of cutting injuries, crushing injuries or danger of life due to fly-away parts.

Tighten all screws to the required torque before each use.

Protect clamping adaptors and tools with screw connections from vibrations.

Store clamping adaptors and tools at mostly constant temperatures.

4.2. Possible Feed Systems

Single-part tools may be assembled to a tool set or to a tool combination. Tools from such sets or combinations which are not suitable for hand feed will be equipped with a pin in the hub area to avoid using them as single-part tool.



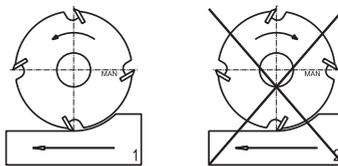
⚠ WARNING

For manual feed exists danger of injuries, danger of crushing or danger of life by tool kick-back.

Manual feed requires working only against the feed.

Do not use individual -with pins secured- tools for manual feed.

The tool inscription indicates whether your tool is suitable for manual feed or for mechanical feed:

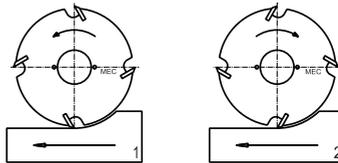


Marking MAN:

=> suitable for manual feed

Operation:

=> only against the feed (1)



Marking MEC:

=> suitable for mechanical feed

Operation:

=> against the feed (1) or with the feed (2)

Ensure that the correct machine parameters have been set before starting work.

4.3. Allowable range of spindle RPM

⚠ WARNING

Tool breakage due to overload. Cutting injuries, crushing injuries or danger of life by fly-away parts.

Some clamping adaptors are allowed to be used only for one direction of rotation. Check a possibly pretended direction of rotation of the clamping adaptor with that of the tool as well as with that of the machine.

For shank type tools and tools with bore, for example on clamping bushes:

Check the maximum permissible speed of the clamping adaptor with that of the used tools. The respective **smallest value** is the maximum admissible speed of the corresponding tool combination. Do not exceed the **smallest maximum speed** of all participating clamping adaptors and tools.

For tools with bore, for example on CNC-clamping shafts:

Tools with bore on CNC-clamping shafts with for example HSK- or Steep Taper Cones are not allowed to be operated without checking the strength.

The operating speed must be checked separately for each tool combination. Whether the calculation for the corresponding tool combination has been made, can be seen on the customer drawing. If no customer drawing is available for a tool combination, the operational stability has to be checked.

WARNING

For manual feed exists danger of injuries, danger of crushing or danger of life by kick-back of the workpiece, if the allowed range of speed falls short of.

Do not fall short of the allowed range of speed for manual feed.



4.3.1. Marking of tools and tool sets

OERTLI ← A
 XX XXXXXXXX XXX ← B
 D x B x d ← C
 MEC
 n max. 10100 ← D

- A: Brand name / manufacturer
- B: Item / tool number
- C: Dimension [mm] and MAN/MEC marking
- D: Maximum rotation speed or permitted rotation speed [1/min] e.g. n max. 10100

Markings of tools are on the tool body and markings of tool sets are on the clamping device.

4.4. Clamping of Shank Tools

In order that the forces arising by the cutting process are transmitted safely, highest requirements are to be met by the clamping adaptors and its applications.

WARNING



Damage of the tool, the cutting edges and the knife clamping systems as well as the clamping adaptor due to loss of clamping forces.

Cutting injuries, crushing injuries or danger of life due to fly-away parts.

Damaged clamping parts, such as screws, collets, holding bolts and clamping nuts must be replaced.

Compare the effective diameter of the tool shank with the given tolerances of the clamping adaptor. Do not mount shank tools with shank diameters outside allowable tolerances into clamping adaptors.

WARNING

Tool rupture due to overload or imbalance.

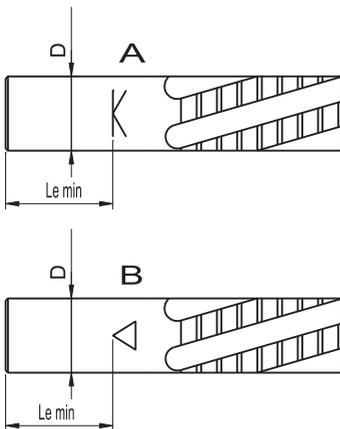
Cutting injuries, crushing injuries or danger of life due to fly-away parts.

Compare the given parameters of the clamping adaptor regarding clamping length with the identification mark on the shank tool. Use the **larger value** as minimum clamping length.

Measure the clamping eccentricity (em) of your clamping adaptor and compare the value with the inscription on the tool (e). Use the clamping adaptor only, if "em ≤ e". Consider thereby the procedure in chapter "Measuring the clamping eccentricity".

Clamping adaptors with a value "em > 0.1" should not be used anymore. As required, recondition the clamping adaptor by the supplier.

4.4.1. Minimum clamping length according to EN 847-2



- A: Old marking
B: New marking according to EN 847-2

| Shank diameter, D [mm] | Min. clamping length, Le [mm] |
|------------------------|-------------------------------|
| $D \leq 10$ | ≥ 20 |
| $10 < D < 25$ | $\geq 2.0 * D$ |
| $D \geq 25$ | $\geq 1.8 * D$ |

4.4.2. Marking of shank tools



- A: Clamping length marking
B: Dimension [mm]
C: Cutting material and MAN/MEC marking
D: Maximum rotation speed [1/min] e.g. n max. 18000
E: Maximum permitted eccentricity (e)

The marking is on the tool shank.

4.4.3. Measuring of clamping eccentricity

The clamping eccentricity can be determined by using a test mandrel. It has to comply with the following requirements:

- Test mandrel diameter tolerance "h7" for $d \geq 12$ mm and "h8" for $d < 12$ mm
- Test mandrel accuracy = 0.002 mm
- Surface roughness max. $R_a = 0.4 \mu\text{m}$
- Hardened

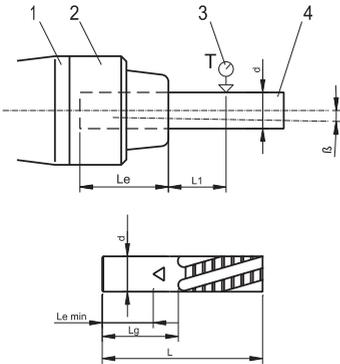
A measuring gauge is required to determine the eccentricity. It has to comply with the following requirements:

- Measuring gauge resolution = 0.001 mm
- Measuring gauge accuracy = 0.006 mm

The diameter (d) of the test mandrel is the shaft diameter of the clamping device.

The following equation applies regarding the eccentricity measured (em):

$$e_m = \frac{T}{2}$$



- 1: Drive spindle / clamping device shaft
- 2: Clamping device
- 3: Test point
- 4: Test mandrel

L1: $((L-L_e)/2) + 10$ [in mm]

Lg: Shaft length of the tool

d: Test mandrel diameter

L_e: Clamping length of the test mandrel / tool

L: Total tool length

T: Concentricity error at the test point

β: Angular error

The information regarding L_e is provided in the chapter "Minimum clamping length according to EN 847-2".

The eccentricity measured (e_m) must be smaller or equal to the permitted eccentricity (e).

$$e_m \leq e$$

The permitted eccentricity (e) is specified on the tool.

4.5. Application parameters

⚠ WARNING

Tool breakage due to overload. Cutting injuries, crushing injuries or danger of life by fly-away parts.

Make sure that operating vibrations are as small as possible.

As required, adjust feed rate, speed and cutting depth.

Improve clamping stability of the work-piece.

⚠ WARNING

Rupture of tool or clamping device due to overload. Injury or death due to stray components in operation.

Boring chucks are only suitable for boring operations and therefore use boring chucks only in an uniaxial direction.

Never use a boring chuck for milling work.

4.6. Reasons for a possible knife -, resp. tool rupture

The following reasons may lead to a knife rupture:

- Grinding cracks or change of the cutting geometry due to improper sharpening
- Jerking movements of the work-piece
- Jam of the tool by a waste piece (especially by cut-out work)
- Overheating by friction due to too small

feed rate or too small cutting depth as well as due to dull cutting edges

- Too high feed rate
- Too large cutting depth
- Insufficient clamping of the tool
- Vibrations of the machine

NOTICE

High advance during processing may cause damage to the tool.

Check all processing data and adapt or reduce the values as required before each use of the tool.

5. Maintenance/Cleaning

Clamping adaptor quality and tool quality as well as work safety are only guaranteed, if the clamping adaptor and the tool is checked and cleaned before used.

Required tightening torques to be exactly maintained when screws are tightened (use proper torque wrench). Only by this manner sufficient clamping is guaranteed.

⚠ WARNING

Tool- or knife rupture due to imbalance of not mounted reversible- or inserted knives.

Cutting injuries, crushing injuries or danger of life by fly-away parts.

Do not mount unsymmetrically reversible knives and inserted knives.

Always use the same screws and clamping parts per cutting system.

⚠ WARNING

Tool- or knife rupture due to corroded screw connections.

Cutting injuries, crushing injuries or danger of life by fly-away parts.

Damaged or corroded screws and clamping parts must be replaced. In addition corresponding threaded

holes must be checked for accuracy and strength.

⚠ WARNING

Tool- or knife rupture due to overload from worn -or damaged knife cutting edges.

Cutting and crushing injuries as well as mortal danger during operation due to flying parts.

Use only original spare parts from OERTLI Werkzeuge AG.

For reversible knives or inserted knives:

- Do not re-sharpen, but replace in time
- Do consider thereby the instruction manual for changing knives for the corresponding knife system

For compound tools and single-part tools such as saw blades, diamond tipped cutters or tungsten carbide tipped cutters, solid tungsten carbide spiral cutters:

- Re-sharpen or replace
- Do consider thereby the corresponding information in chapter "Maintenance work"

Dull or damaged cutting edges must be sharpened or replaced, if:

- the wear-out part of the cutting edges are greater than 0.2 mm (consider especially the main wear-out parts!)
- Break-outs on the cutting edge are visible
- Burns on the wood are visible
- the surface on the work piece does not comply anymore with the desired requirements
- the power requirement of the machine increases considerably (more than 10%)

5.1. Maintenance Work

5.1.1. Instructions for knife change for hinge boring bits

(see Fig. 1, 2 and 3)

Knife change for raker and reversible knife:

1. Clean tool first.
2. Loosen screws (1A) with suitable key only so far until the raker knife (2A) can be removed from the knife seat.
3. Completely remove screw (1B) with a suitable key in order the reversible knife (2B) can also be removed.
4. Clean knife seat and all parts to go with it. Make sure that all clamping surfaces are free from dirt, oil, grease and water.
5. Before mounting the raker knife (2A), make sure that the marking (8) of the clamping wedges (3) are lined-up parallel to the mounting notch of the raker knife.
6. Mount precisely reversed or new knife into the knife seat (see Fig. 1 and 2). Make sure that the stop edge of the knife leans onto the stop surface of the knife seat.
7. Press slightly the knife against the stop face and laterally against the center point (see Fig. 1 and 2).
8. In case more than two screws per knife seat are to be tightened, the clamping screws must be tightened with the required torque from center to outside.
9. Tighten screws with a suitable torque wrench to the required torque of 2 Nm for the raker knives (2A) and 3 Nm for the reversible knives (2B).
10. Check on the hinge boring bit that for the raker knives, the screw (1A) and the clamping wedge (3) are approx. flush with the tool body.

Change of the spur knife:

1. Clean the tool first.
2. In order the spur knife (5) can be removed from the knife seat, the screw (4) must be completely removed using a suitable key.
3. Clean knife seat and all parts to go with it. Make sure that all clamping surfaces are free from dirt, oil, grease and water.
4. Mount precisely reversed or new spur knife into the knife seat (see Fig. 1). Make sure that the head of the screw engages into the notch provided for by the spur knife.
5. Re-mount screw (4) with suitable torque key and tighten it to the required torque of 2 Nm for the variant with raker knife (2A) and 3 Nm for the variant with reversible knives (2B).

Change of the center point:

1. Clean tool first.
2. In order to change the center point, it may be necessary -depending on the situation- to remove first the raker knives, respectively the reversible knives (see knife change for raker knives and reversible knives).
3. Loosen screw (6) with a suitable key only so far until the center point (7) can be removed from the connecting bore (see Fig. 1 and 3).
4. Put new center point into the connecting bore of the tool.
5. Adjust center point to the desired position.
6. Make sure that the clamping surface of the center point is aligned to the screw (see Fig. 3).
7. Tighten screw (6) with a suitable torque wrench to the required torque of 2 Nm for the variant with raker knives (2A) and 4 Nm for the variant with reversible knives (2B).

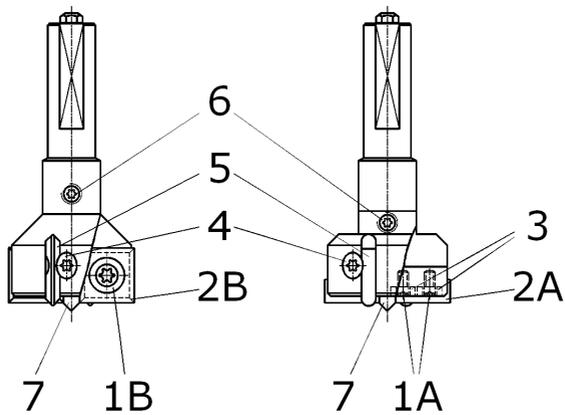


Fig. 1

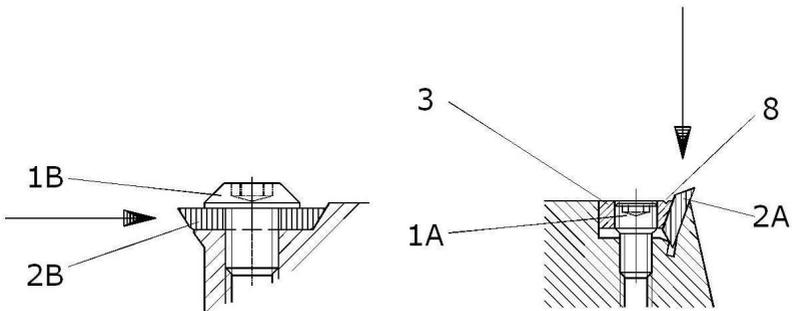


Fig. 2

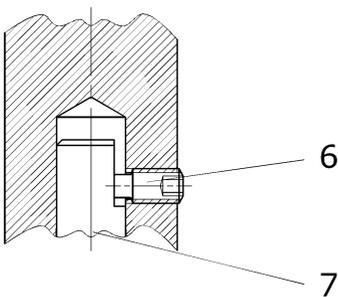


Fig. 3

5.1.2. Re-sharpening of cutting edges

An unqualified re-sharpening of a tool may

lead to break-outs on cutting edges or even to rupture of the tool! Therefore we basically recommend to carry-out all sharpening work by OERTLI Werkzeuge AG or by an authorized service station.

5.1.3. Sharpening instructions

Only qualified personal is allowed to carry-out sharpening work. After sharpening, the tool must comply to all valid regulations and standards.

This is especially true for:

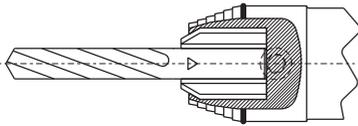
- Projection of knives
- Rest thickness of knives
- Chip gullet width

- Rest imbalance
- Tool inscription

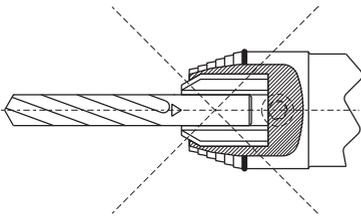
Inform yourself by the tool manufacturer about sharpening services in your neighbourhood.

5.1.4. Optimum clamping length of shank tools

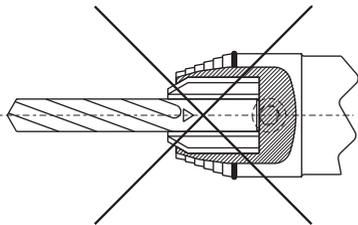
When clamping the shank tool be sure that the free shaft length is as short as possible.



Optimal clamping length



Minimum clamping length (not optimal)



Too deep clamping length (not permitted)

5.1.5. Tightening torques

⚠ WARNING

Insufficient clamping, screw breakage or damage due to overload. Risk of injuries and mortal danger during operation due to flying parts.

Use a recoil-free torque spanner.

Do not mount tools or clamping devices in a heated or undercooled state.

The fastening screws must be tightened in a sequence from the middle towards the outside applying the appropriate torque, when more than two screws per clamping unit have to be fastened.

Hinge boring bit with raker knives:

Screws M3 and M4 with Torx T8 for center point, spurs and raker knives = 2 Nm

Hinge boring bit with reversible knives:

Screws M3.5 with Torx T15 for spurs and reversible knives = 3 Nm

Screw M6 with Torx T15 for center point = 4 Nm

5.1.6. Behaviour after a tool collision

⚠ DANGER



After a tool collision or after high working vibrations, the strength of the brittle cutting edge material and the hardened clamping adaptor is not guaranteed anymore. High vibrations or a collision of the tool act like blows on the cutting edges. For very high loads due to high cutting speeds in woodworking, such pre-damaged tools and clamping adaptors may lead to tool rupture. Ruptured tool parts act like bullets at high working speeds! Danger of cutting injuries, danger of crushing or danger of life due to fly-away ruptured tool parts!

Do not re-use damaged tools or deformed tools and clamping adaptors.

Repair work and maintenance work on tools and clamping adaptors to be carried-out only by the tool manufacturer.

Tool and clamping adaptor to be checked for micro-damages. In addition, verify the tool connection of the machine.

5.1.7. Cleaning

NOTICE

To achieve highest precision and best performance, it is important to clean tools and clamping adaptors regularly as required according to application.

Damage of the tool, the cutting edge and the knife clamping system as well as the clamping adaptor due to loss of the clamping force.

All surfaces used for clamping must be free from dirt, oil, grease and water.

Rinse and dry tools after cleaning with a solvent.

Do not use fibrous materials, such as cotton waste, for cleaning.

6. Preservation/Storage/Disposal

6.1. Preservation/Storage

If the tool or clamping adaptor is not being used for a longer period of time (> 6 months), it should be prepared for storage as follow:

- With the exception of fix screwed Hydro-clamping components, tool sets or tool combinations must be first dismantled into single tools.
- Clean well the single tools and clamping adaptors such as for example bushes, shafts, collets and chucks. For details, please refer to chapter "Cleaning" of the corresponding maintenance manual.
- For tools with inserted knives or reversible knives, all knife clamping systems must be dismantled and cleaned. Please refer to chapter "Cleaning" of the corresponding maintenance manual.
- Make sure that all clamping- and contact

surfaces are free from dirt, oil, grease and water.

- For tools with inserted knives or reversible knives, the knives can now be re-mounted. Please refer therefore to chapter "Maintenance work" in the corresponding operating manual.
- Treat the dried single tools and clamping adaptors with a customary available preservation oil.
- Single tools and clamping adaptors may now be re-assembled.
- Store the conserved tools and clamping adaptors in a room, which is not exposed to large temperature fluctuations (20°C +/- 10°C).

NOTICE



Danger of corrosion by storing unconserved tools and clamping adaptors.

Always conserve tools and clamping adaptors, if not in use.

Do not put into operation tools and clamping adaptors with corroded screw connentions. Corroded screws must be replaced.

Threaded holes must be checked for accuracy as well as for strength.

6.2. Disposal

Dispose of tools and clamping devices in accordance with the local and national environmental regulations in your country.

Please take note of the disposal instructions of the cleaning agent manufacturer when disposing of the cleaning agent.

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8. Glossary**8.1. Technical terms****Deflector**

Protuding safety component that limits the clamping thickness.

Bore cutter (also bore tool)

A tool with a bore in the centre that is used to fasten the tool to the clamping device.

Pressure jaw

A clamping element that creates contact pressure to fasten a cutter to a tool.

Clamping eccentricity

Radial inaccuracy that results when a tool is clamped.

One-piece tools

Solid tools that are completely made of the same material.

Cutting circle diameter

Diameter range of the cutting edge and therefore largest outer diameter of the cutter.

Up-cut milling

During up-cut milling, the cutting movement of the tool proceeds against the relative advance movement of the work piece. The tool edge always enters the work piece by scraping and pressing.

Climb milling

Only suitable for mechanical advance. During climb milling, the cutting movement of the tool proceeds in the same direction as the relative advance movement of the work piece. The tool edge enters the work piece by cutting.

Helicoil

A Helicoil (brand name) is a wire thread insert for internal threads.

Cutter seat

Area in the support body that holds the cutters, which are fastened inside it by clamping elements.

Mean chip thickness

The mean chip thickness is the average thickness of a chip.

Resharpener

Sharpening the cutting edges of pre-used, blunt cutters.

Residual imbalance

Permitted imbalance range of the tool after balancing.

Recoil (also tool recoil)

Uncontrolled flinging away of the work piece or of work piece parts against the advance direction.

Shaft cutter

Single-part or compound tools that have cutters immediately next to the shaft (clamping area).

Grinding cracks

Grinding cracks are small micro-cracks that may occur during sharpening of cutters.

Cutter overhang

This is the radial distance between cutting edge and the circumference of the cutter body.

Cutter exchange

Replacement of blunted cutters with new cutters without complete removal of the tool.

Cutting speed

This is the speed at which the tool cutting edge moves in the cutting direction through the material to be processed. The cutting speed is specified in metres per second.

SP-Technik or HPC/HPC+

Tools with SP-Technik or HPC/HPC+ are connected free of clearance on the clamping device. They form a functional unit which can be operated at much higher process parameters.

Chip breaker

This is a clamping element that is used between the pressure jaw and the cutter. A chip breaker ensures optimal chip breakage during the milling process.

Chip gap width

Tangential distance from the cutter edge to the deflector or circumference of the support body.

Clamping screw

The clamping screw (fastening element) produces the retaining force required by the pressure jaw to retain the cutter.

Service life

The service life is the duration that a tool can work without interruption until considerable signs of wear occur and the tool has to be replaced.

Support body

Basic body that carries the cutters.

Compound tools

Tipped tools that consist of a support body and firmly attached (not removable) cutters.

Precutter

Cutter part that can cut at the circumference as well as the front edge. It extends past the main cutter in a radial and possibly also in an axial direction.

Advance speed

Speed in meters per minute at which the tool processes the wood.

Exchangeable cutters

These are removable cutters that can be exchanged for new ones once they have reached the end of their service life.

Reversible cutters

These are cutters that can be reversed and can therefore be used several times.

Tool quality

Quality level of the tool.

Tool set

This is a combination of several individual tools that are jointly clamped onto one shaft or one bushing.

Tooth feed

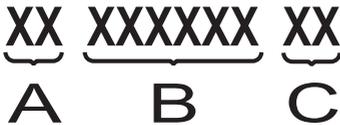
Distance between two subsequent cutting surfaces in the advance direction.

Composite tool

Tool consisting of a support body, cutting edges and fastening elements that together form a unit.

8.2. Item numbering structure

An OERTLI item number has the following structure:



8.2.1. A - prefix

The prefix always has two characters and includes the following abbreviations:

TA = Standard parts
TB = Standard parts
TE = Tool set (special tools)
TO = Individual tool (special tools)
TV = Various special parts

KC = Profile knife
KP = Profile knife

KX = Profile knife
KW = WIN knife
KG = Straight knife
KN = Groove knife
KF = Format knife
KR = Serrated knife

Example:

TA469720 = Standard part

8.2.2. B - number part

This is a 6 or 10 digit number between the prefix and the suffix and accurately identifies the item.

8.2.3. C - suffix

This suffix may contain the following information:

Cutter quality:

H8 = Standard hard-metal quality
H6 = Hard hard-metal quality
C01 = Coating Type 1
C02 = Coating Type 2
HS = High-alloy high-speed steel
HW = Hard metal
DP = Diamond

Only the H8 hard metal quality is an exception, as it is used as standard by the OERTLI company. Item numbers for hard metal quality H8 do not have a suffix.

Examples:

KP171300 = H8 (hard metal quality)
KP171300H6C02 = H6 with coating

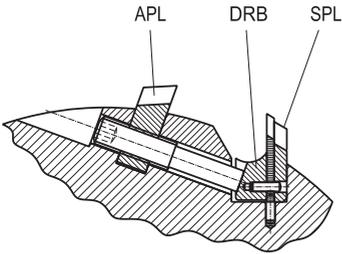
Profiled clamping parts:

Individual clamping parts carry their own marking when they are used in clamping systems for profiled clamping parts. This allows for easier identification of the individual clamping parts.

Description types:

APL = Deflector
PI/PA = Protect
SPL = Support plate
DRB = Profiled pressure jaw

Example:



KP171300 = Cutter
 KP171300SPL = Support plate
 KP171300DRB = Profiled pressure jaw
 KP171300APL = Deflector

Shortened standard cutters:

Standard cutters that were individually shortened have the following suffix:

L + shortened length in millimetres

Example:
 TA469720L195 (shortened to 195 mm)

8.3. Drawing numbers

The drawing numbers of the OERTLI company are structured like the following example:

TE 1511199 001 01 A
 A B C D E

- A: Drawing type (prefix)
- B: Project number
- C: Running number
- D: Version number
- E: Change index (alphabetically increasing)

8.4. Symbols



Use of damaged tools prohibited



Warning of rotating tool



Warning of cutting injuries



Warning of recoil



Warning of caustic substances



Read the operating instructions



Wear safety gloves



Wear protective goggles



Wear hearing protection



Wear safety shoes

8.5. Unit

8.5.1. Table of units

| Parameter | Unity | Translation |
|-----------|-------|--------------------|
| Length | [mm] | x 0.03937 = [inch] |

| Parameter | Unity | Translation |
|----------------|---------|------------------------|
| Length | [m] | x 39.370 = [inch] |
| Weight | [g] | x 0.035 = [oz] |
| Weight | [kg] | x 2.2046 = [lb] |
| Force | [N] | x 0.22481 = [lbf] |
| Force | [kN] | x 101.9716 = [kp] |
| Torque | [Nm] | x 0.738 = [lbf ft] |
| Pressure | [bar] | x 14.504 = [PSI] |
| Temperature | [°C] | (°C x 1.8) + 32 = [°F] |
| Rotation speed | [1/min] | --- |
| Density | [kg/m³] | --- |