OERTLI
Excellence in solid wood

Operating Instruction Manual

Tool set mounted on clamping shaft

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

Clamping shafts are tool shafts with a tool spindel. Together with spacing- and clamping elements, single- or several cutters can be assembled to a tool set or to a tool combination. According to design, cutters and spacers will be firmly clamped by an anti-twist protection or by lateral contact surfaces.

Various clamping systems are used for individual cutters which are described in separate operating Manuals.

1.1. Appropriate Application

The clamping shaft serves as an Interface between the drive of the machine and the tool. under consideration of suitable operating conditions.

Tools to be clamped are:

- Tools with bore and according to design variant with or wthout an anti-twist protection
- Tolerance for the bore: nominal diameter **"H7"**

Materials to be cut are:

- Softwood
- Hardwood
- Exotic woods
- Particle boards
- MDF (medium density fibreboard)
- Laminated pressed woods
- Composite materials (Wood and plastic)

Place and mode of application:

- Woodworking machinery, mainly routing machines
- Max. RPM:
  HSK 63, SK 30, SK 40 and cylindrical shank = 18'000 1/min
  HSK-F 85* special, for example for Powermat = 12'000 1/min
  Shanks with chip guidance disc = 10'000 1/min
- Max. tool weight according to chapter "allowable tool weight and tool dimensions"
- Max. tool diameter according to chapter "allowable tool weight and tool dimensions"
- Max. projection length according to chapter "allowable tool weight and tool dimensions"

1.2. Design variants

Various types of clamping sleeves or clamping shafts are available. They are designed for woodworking machines where the tools are in use. The assembly drawing (Fig. 1) shows which holding element is used and which spacers are inserted between the individual cutters. The assembly drawing is essential and is included in all tool kits.

Taking out or inserting spacers allows the tool set to be adjusted for varying wood thicknesses, respectively allows precise micro-adjustments to be made. If a tool set is used for several wood thicknesses, it is shown as such on the assembly drawing.

1.2.1. Connection for spindle drive

The clamping shaft is avaiable for various spindle connections such as:

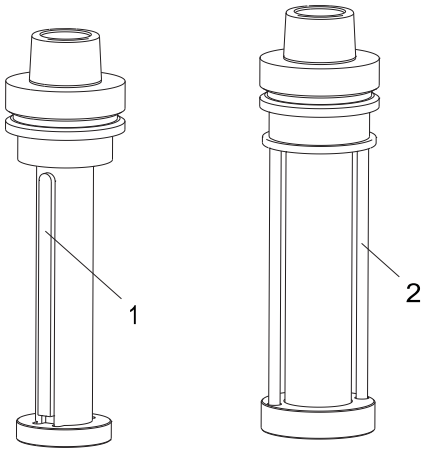
- HSK-F 63 and HSK-E 63 (Hollow Taper Shank)
- HSK-F 85* special, e.g. for Powermat
- SK 30 (Steep Taper Shank)
- SK 40 (Steep Taper Shank)
- Ø 25 mm (Cylindrical Shank)

1.2.2. Tool spindle for tools with bore

According to design, the clamping shaft may take various diameters of bores, such as:

- Ø 25 mm with anti-twist protection type 1
- Ø 30 mm with anti-twist protection type 1
- Ø 35 mm with anti-twist protection type 2
- Ø 40 mm without anti-twist protection

– Ø 50 mm without anti-twist protection



1.2.3. Chip guidance disc

Certain types of clamping shafts may be equipped with a chip guidance disc. It must be programmed on a seperate axis on the CNC-machine according to the tool contour and the operation pathway.

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 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 glovesprotect 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 equiment 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 conections 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 reqiured 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.

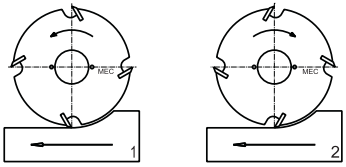
⚠WARNING

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.

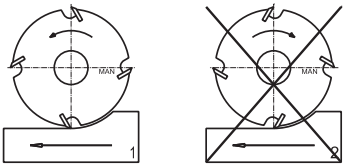
The tool inscription indicates whether your tool is suitable for manual feed or for mechanical feed:



Marking **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.



Marking **MAN**:
=> suitable for manual feed

Operation:
=> only against the feed (1)

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 permissable speed of the clamping adaptor with that of the used tools. The respective **smallest value** is the maximum admissable speed of the corresponding tool combination. Do not exeed 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

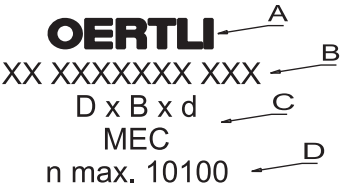
to be operated without checking the strength.
The operating speed must be checked separately for each tool combination. Whether the calculation for the corresponding tool combination has been made, can be seen on the customer drawing. If no customer drawing is available for a tool combination, the operational 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



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

⚠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.

⚠WARNING

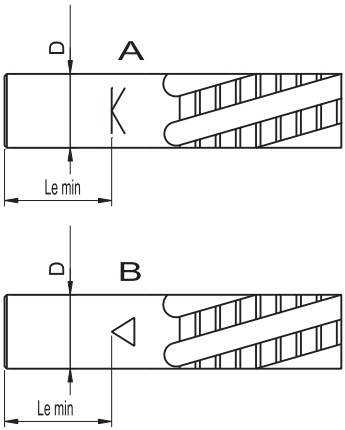
Damage of the tool, the cutting edges and the knife clamping systems as well as the clamping adaptor due to loss of clamping forces.
Cutting injuries, crushing injuries or danger of life due to fly-away parts.

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.

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.

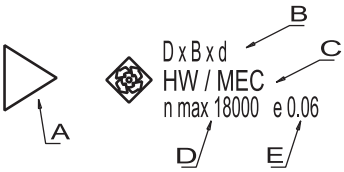
4.4.1. Minimum clamping length according to EN 847-2



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

Shank diameter, D [mm]	Min. clamping length, Le [mm]
D ≤ 10	≥ 20
10 < D < 25	≥ 2.0 * D
D ≥ 25	≥ 1.8 * D

4.4.2. Marking of shank tools



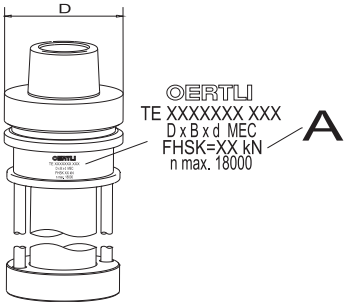
A: Clamping length marking
B: Dimension [mm]
C: Cutting material and MAN/MEC marking
D: Maximum rotation speed [1/min] e.g. n max. 18000
E: Maximum permitted eccentricity (e)

The marking is on the tool shank.

4.4.3. Marking of HSK shank tools

Attention: The subsequent chapter only applies to tools delivered after December 2016.

HSK arbors with an increased clamping force that deviates from the following table will carry additional information concerning the minimum clamping force of the machine tool spindle (A).



The following guidelines are to be assumed when no information is provided on the HSK arbor:

Clamping force (A) for HSK arbor with Form E:

Nominal size (D)	40	50	63	80	100
Clamping force [kN]	6.8	11	18	28	45

Clamping force (A) for HSK arbor with Form F:

Nominal size (D)	50	63	80	85*	100
Clamping force [kN]	6.8	11	18	28	28

⚠WARNING

Insufficient clamping force can result in failure or an unstable condition of the HSK interface.
Cutting and crushing injuries as well as mortal danger due to flying parts.

Clean the HSK holder before each use.

Check the clamping force as required by using a clamping force measuring device.

*Special HSK arbor with extended flat contact area (from 80 to 85 mm), e.g. for Powerlock systems.

Additional clamping forces for HSK arbor with **special modifications** and without marking on the HSK arbor must be discussed with the respective tool supplier before these arbors are used.

The clamping force at the spindle can be determined by using a clamping force measuring device.

4.4.4. 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 ≥ 12 mm and "h8" for d < 12 mm
- Test mandrel accuracy = 0.002 mm
- Surface roughness max. Ra = 0.4 µm
- Hardened

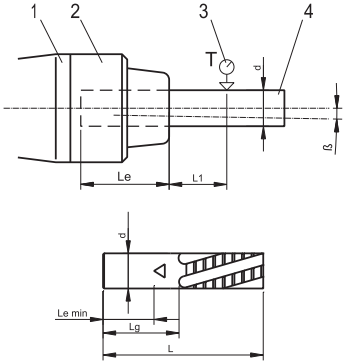
A measuring gauge is required to determine the eccentricity. It has to comply with the following requirements:

- 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-Le)/2) + 10 [in mm]
Lg: Shaft length of the tool
d: Test mandrel diameter
Le: Clamping length of the test mandrel / tool
L: Total tool length
T: Concentricity error at the test point
β: Angular error

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

The eccentricity measured (em) 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. Allowable tool weight and tool dimensions

Since October 2013 each CNC clamping device has to be calculated in accordance to the european security standard EN 847-2 for his rupture strength. For a corresponding tool combination (tool set) this calculation can lead to a reduction of the maximum rotational speed.

⚠WARNING

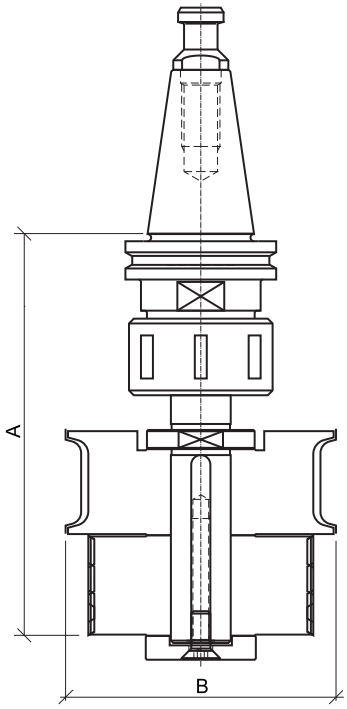
Rupture of tool or clamping device due to overload.
Injury or death due to stray components in operation.

Consider the given parameters regarding max. allowable weight, projection length and tool diameter of the corresponding clamping device. Compare these given parameters with the maximum given figures of the woodworking machine in use.
Under no circumstances, do not exceed any of these given parameters without permission of the corresponding supplier.

In the following chapters, tool systems are described which are normally used in practice.

If you intend to set-up your own tool combinations and you are unable to assign them to one of the following tool systems, you are not allowed to use them! In such cases, please contact OERTLI Werkzeuge AG.

Pictures for the tool systems show one and all HSK shaft connections.The terms of reference are valid also for steep taper shafts SK 40 and as noted also for SK 30 with the exception for PowerLock shafts (type 6 to 10).

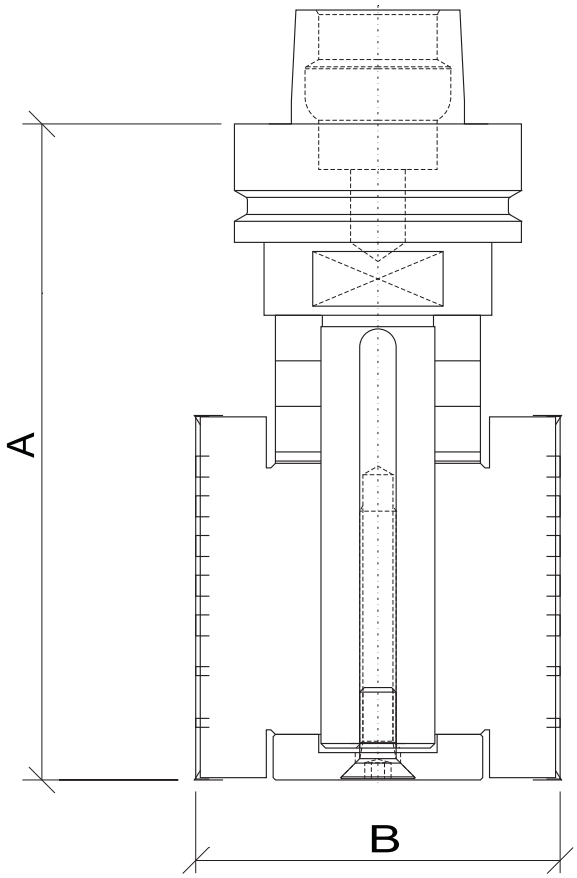


A: Projection length
B: Tool diameter

4.5.1. Guide figures for clamping shafts, Type 1

Description: **Single cutter on clamping shaft**

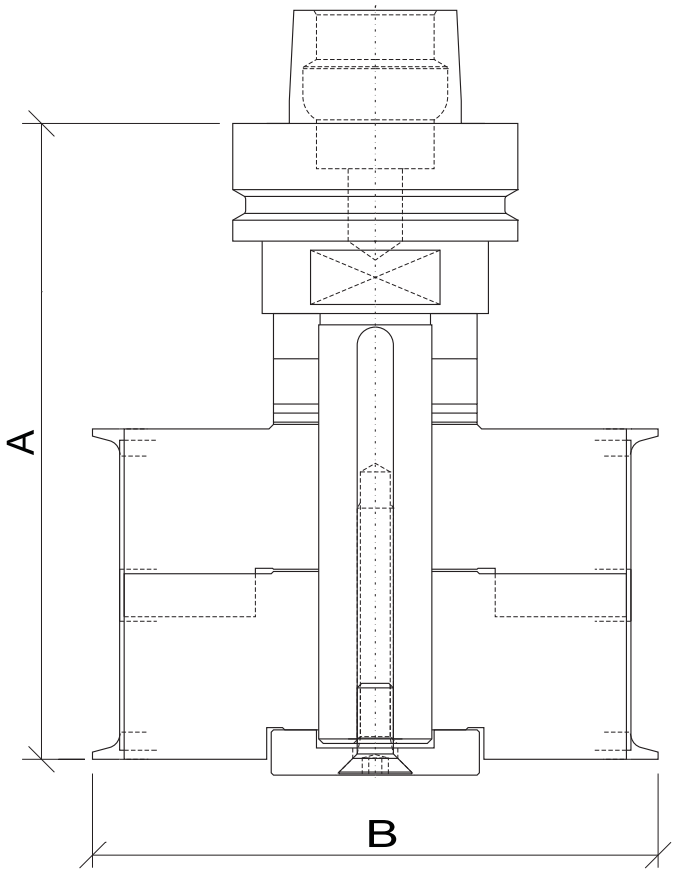
Spindle diameter	25 + 30 + 35 mm
Max. tool weight 1 (incl. clamping devices)	4000 g for HSK 63 + SK 40
Max. tool weight 2 (incl. clamping devices)	2600 g for SK 30
Max. tool diameter (B) for steel	80 mm
Max. tool diameter (B) for aluminum	80 mm
Max. RPM	18'000 1/min
Max. projection length (A)	140 mm
Min. clamping force of the spindle	HSK-F 63 = 11 kN / HSK-E 63 = 18 kN



4.5.2. Guide figures for clamping shafts, Type 2

Description: **Single cutter, respectively tool set on clamping shaft**

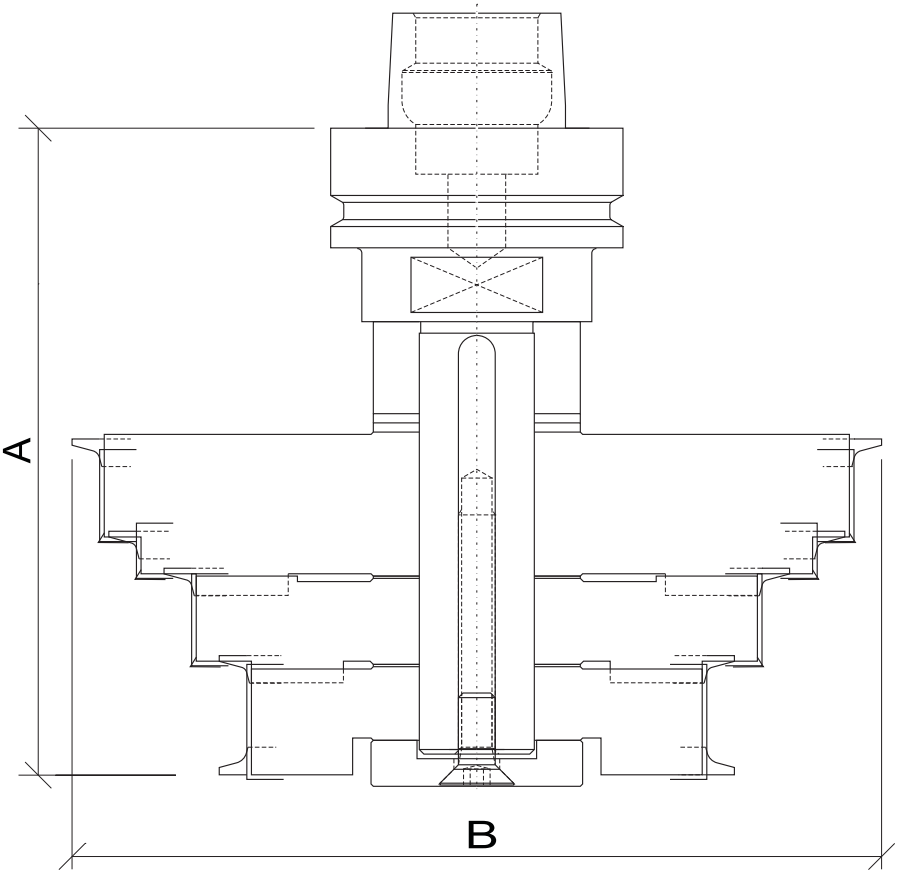
Spindle diameter	25 + 30 + 35 mm
Max. tool weight 1 (incl. clamping devices)	5000 g for HSK 63 + SK 40
Max. tool weight 2 (incl. clamping devices)	3100 g for SK 30
Max. tool diameter (B) for steel	125 mm
Max. tool diameter (B) for aluminum	120 mm
Max. RPM	12'000 1/min
Max. projection length (A)	180 mm
Min. clamping force of the spindle	HSK-F 63 = 11 kN / HSK-E 63 = 18 kN



4.5.3. Guide figures for clamping shafts, Type 3

Description: **Single cutter, respectively tool set on clamping shaft**

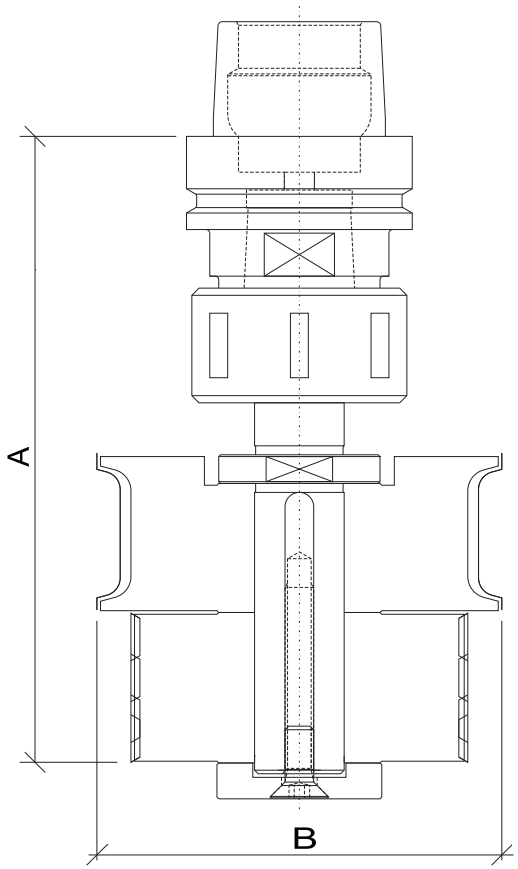
Spindle diameter	25 + 30 + 35 mm
Max. tool weight 1 (incl. clamping devices)	6500 g for HSK 63 + SK 40
Max. tool weight 2 (incl. clamping devices)	4000 g for SK 30
Max. tool diameter (B) for steel	180 mm
Max. tool diameter (B) for aluminum	160 mm
Max. RPM	9'000 1/min
Max. projection length (A)	180 mm
Min. clamping force of the spindle	HSK-F 63 = 11 kN / HSK-E 63 = 18 kN



4.5.4. Guide figures for clamping shafts, Type 4

Description: **Single cutter, respectively tool set on clamping shaft with cylindrical shank in clamping chuck.**

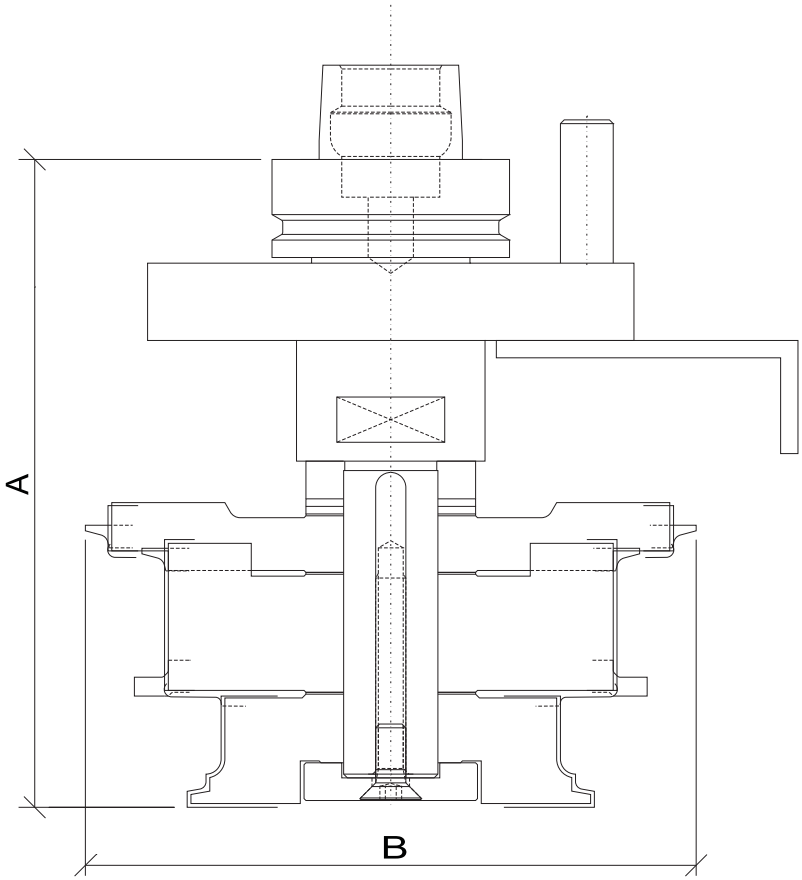
Spindle diameter	25 + 30 + 35 mm
Max. tool weight 1 (incl. clamping devices)	6000 g for HSK 63 + SK 40
Max. tool weight 2 (incl. clamping devices)	4000 g for SK 30
Max. tool diameter (B) for steel	110 mm
Max. tool diameter (B) for aluminum	130 mm
Max. RPM	9'000 1/min
Max. projection length (A)	165 mm
Min. clamping force of the spindle	HSK-F 63 = 11 kN / HSK-E 63 = 18 kN



4.5.5. Guide figures for clamping shafts, Type 5

Description: **Single cutter, respectively tool set on clamping shaft with chip guidance disc**

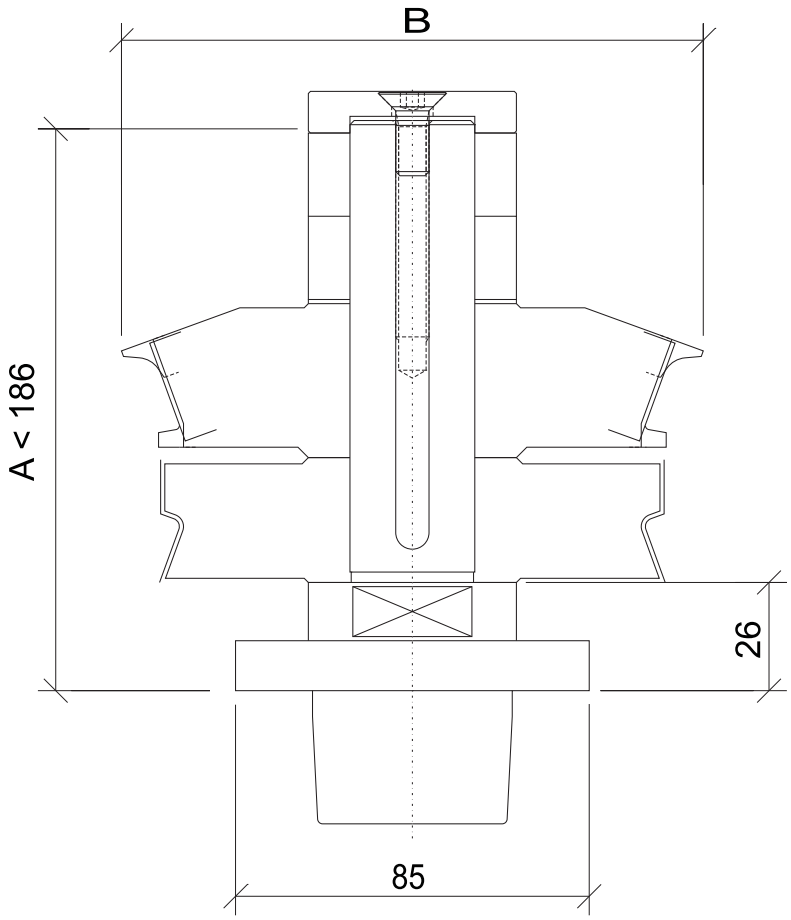
Spindle diameter	25 + 30 + 35 mm
Max. tool weight 1 (incl. clamping devices)	6500 g for HSK 63 + SK 40
Max. tool weight 2 (incl. clamping devices)	**SK 30 not allowed**
Max. tool diameter (B) for steel	160 mm
Max. tool diameter (B) for aluminum	145 mm
Max. RPM	10'000 1/min
Max. projection length (A)	180 mm
Min. clamping force of the spindle	HSK-F 63 = 11 kN / HSK-E 63 = 18 kN



4.5.6. Guide figures for clamping shafts, Type 6

Description: **Single cutter, respectively tool set on clamping shaft with PowerLock clamping**

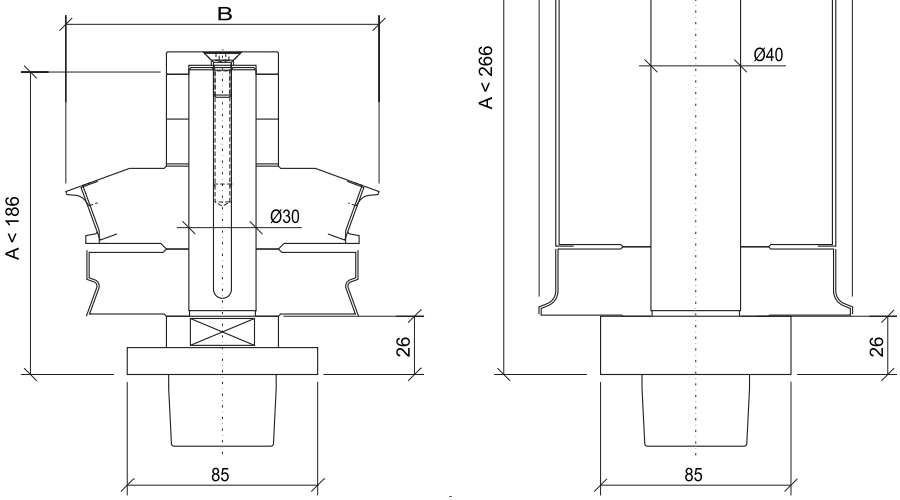
Spindle diameter	25 mm
Max. tool weight (incl. clamping devices)	6000 g
Max. tool diameter (B) for steel	143 mm
Max. tool diameter (B) for aluminum	120 mm
Max. RPM	10'000 1/min
Max. projection length (A)	186 mm
Min. clamping force of the spindle	HSK-F 85* = 28 kN



4.5.7. Guide figures for clamping shafts, Type 7

Description: **Single cutter, respectively tool set on clamping shaft with PowerLock clamping**

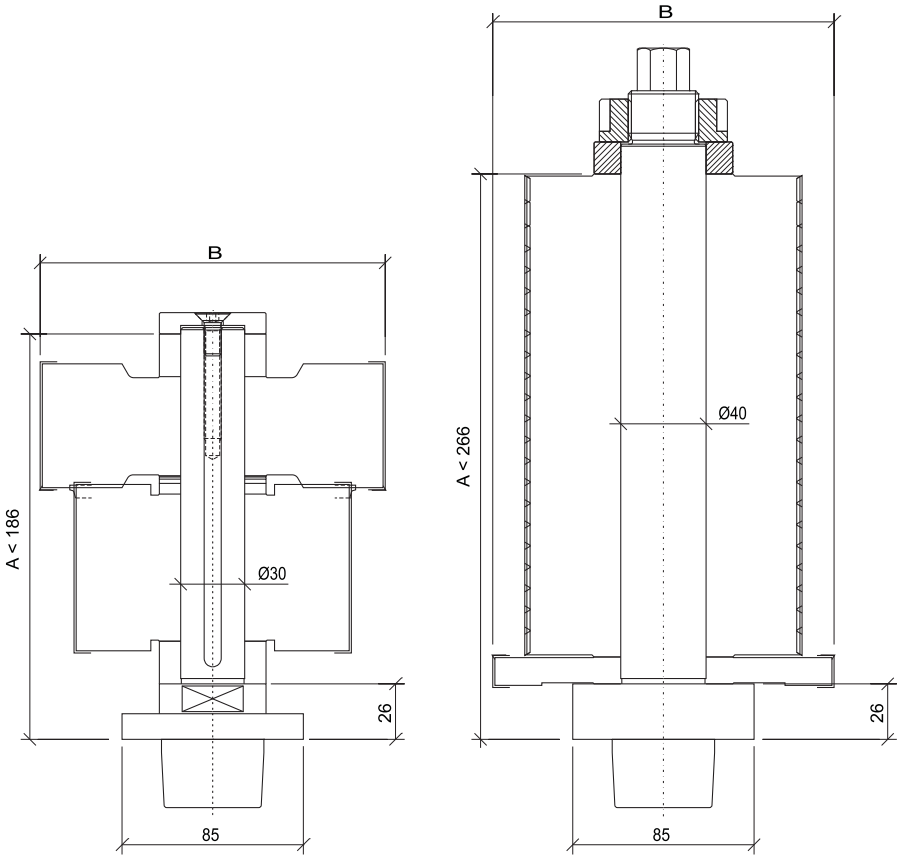
Spindle diameter	30 + 40 mm
Max. tool weight (incl. clamping devices)	8000 g
Max. tool diameter (B) for steel	143 mm
Max. tool diameter (B) for aluminum	120 mm
Max. RPM	12'000 1/min
Max. projection length (A)	186 / 266 mm
Min. clamping force of the spindle	HSK-F 85* = 28 kN



4.5.8. Guide figures for clamping shafts, Type 8

Description: **Single cutter, respectively tool set on clamping shaft with PowerLock clamping**

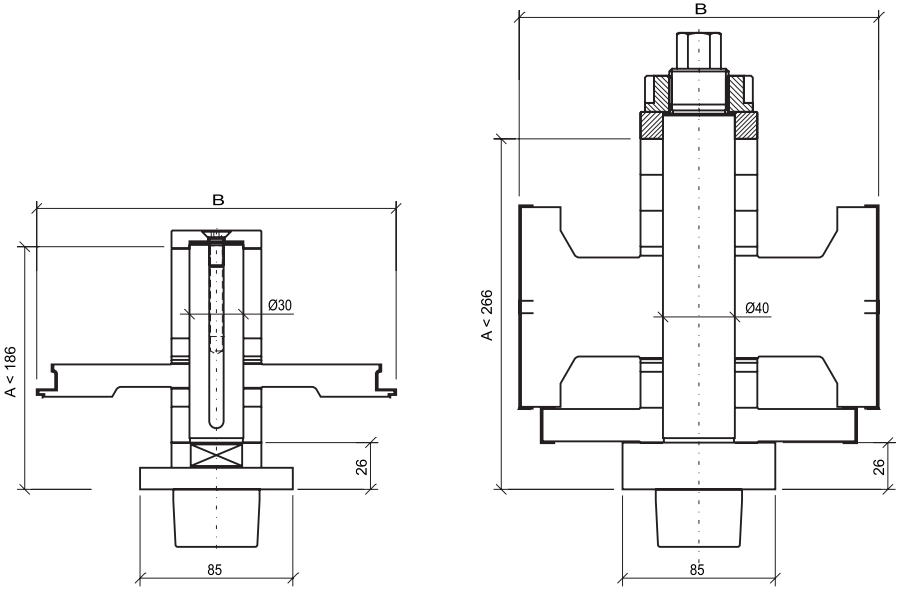
Spindle diameter	30 + 40 mm
Max. tool weight (incl. clamping devices)	9000 g
Max. tool diameter (B) for steel	170 mm
Max. tool diameter (B) for aluminum	145 mm
Max. RPM	10'000 1/min
Max. projection length (A)	186 / 266 mm
Min. clamping force of the spindle	HSK-F 85* = 28 kN



4.5.9. Guide figures for clamping shafts, Type 9

Description: **Single cutter, respectively tool set on clamping shaft with PowerLock clamping**

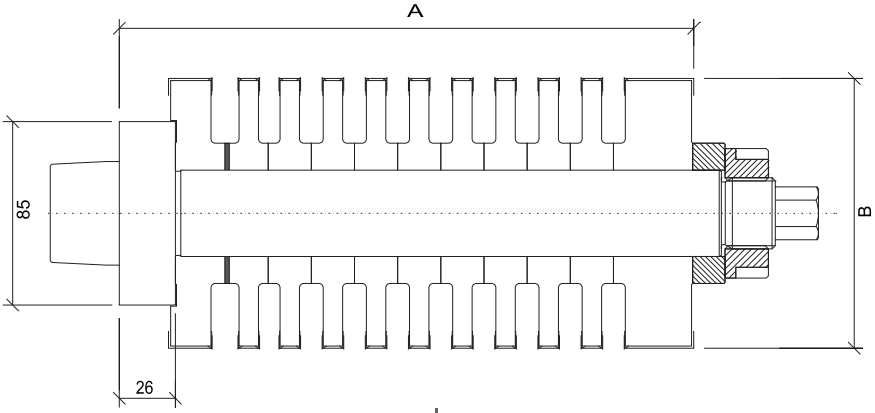
Spindle diameter	30 + 40 mm
Max. tool weight (incl. clamping devices)	11000 g
Max. tool diameter (B) for steel	210 mm
Max. tool diameter (B) for aluminum	180 mm
Max. RPM	8'000 1/min
Max. projection length (A)	186 / 266 mm
Min. clamping force of the spindle	HSK-F 85* = 28 kN



4.5.10. Guide figures for clamping shafts, Type 10

Description: **Single cutter, respectively tool set on clamping shaft with PowerLock clamping**

Spindle diameter	40 + 50 mm
Max. tool weight (incl. clamping devices)	12000 g
Max. tool diameter (B) for steel	**not allowed**
Max. tool diameter (B) for aluminum	125 mm
Max. RPM	8'000 1/min
Max. projection length (A)	336 mm
Min. clamping force of the spindle	HSK-F 85* = 28 kN



4.6. 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.

4.7. 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. Disassembly and assembly of tools on clamping shafts

(see Fig.1 and Fig.2)

Consider unconditionally all given terms and restrictions from chapter "Attendance/Operation".

As an example is thereafter the disassembly and assembly for a clamping shaft with anti-twist protection type 1 (double key way) described. The same procedure applies basically also for a clamping shaft with anti-twist protection type 2. But with a PowerLock clamping however with the following differences:

- no anti-twist protection
- no treatment with screw securing paste (e.g. LOCTITE)
- Tightening torque for the nut = 80 Nm

1. Prepare all drawings belonging to the tool set (part of the delivery). Identification is via the drawing no. at the right bottom corner as shown on the picture. In Fig. 1 is the drawing no. TE 1511199 101 01 A. The tool set is marked with the part number. For the example in Fig. 1, the tool set is therefore marked with "TE1511199101".
2. Clean tool set carefully before dismantling. Put cleaned set into a corresponding tool instalation device.
3. Loosen with an Allen key the screw (1) - secured with e.g. LOCTITE- and remove it completely together with the cover (3).
4. Now all spacing elements (4, 5) and all cutters can be removed from the tool shaft (2).
5. Make sure that no components get lost or get mixed-up with other tool sets.
6. Clean carefully all components before assembly of the tool set. Specifically, all remains of screw lockings on the screw (1) and on the corresponding tapped hole must be completely removed with a solvent. Make sure that all clamping- and mounting surfaces are free from dirt, oil, grease and water.
7. Assemble spacing elements and cutters, as shown on the assembly drawing, onto the corresponding tool shaft (2). Part no. (N2) is engraved into the tool shaft. Make sure when assembling (see Fig.2), that the keys (B) of the tool shaft (C) engage into the keyways (A) of the spacing elements, respectively of the cutters.
8. Individual cutters are identified by their inscription. To the cutter (6) shown on the assembly drawing belongs the part no. (N6). This number is engraved on the cutter and provides therefore the reference to the drawing.The spacing elements are engraved with the width in millimeters. The widths of the spacing elements (B4, B5) are described on the assembly drawing and belong to the spacers (4), respectively to the shims (5).
9. Place the cover (3) with the part no. (N3) onto the spindle end of the tool shaft. Make sure that the machined notches of the cover engage into the keyway of the tool shaft.
10. After all cutters, all spacing elements and the cover are assembled (verify with the assembly drawing), treat the screw with screw securing paste (e.g. LOCTITE) and screw it into the provided tapped hole of the tool shaft. Tighten the screw to the required torque of 15 Nm.
11. Wait approx. 45 min. after assemly the tool shaft before taking it into operation, in order the screw securing can reach the operational strength. Consider thereby the corresponding instruction manual for screw security.

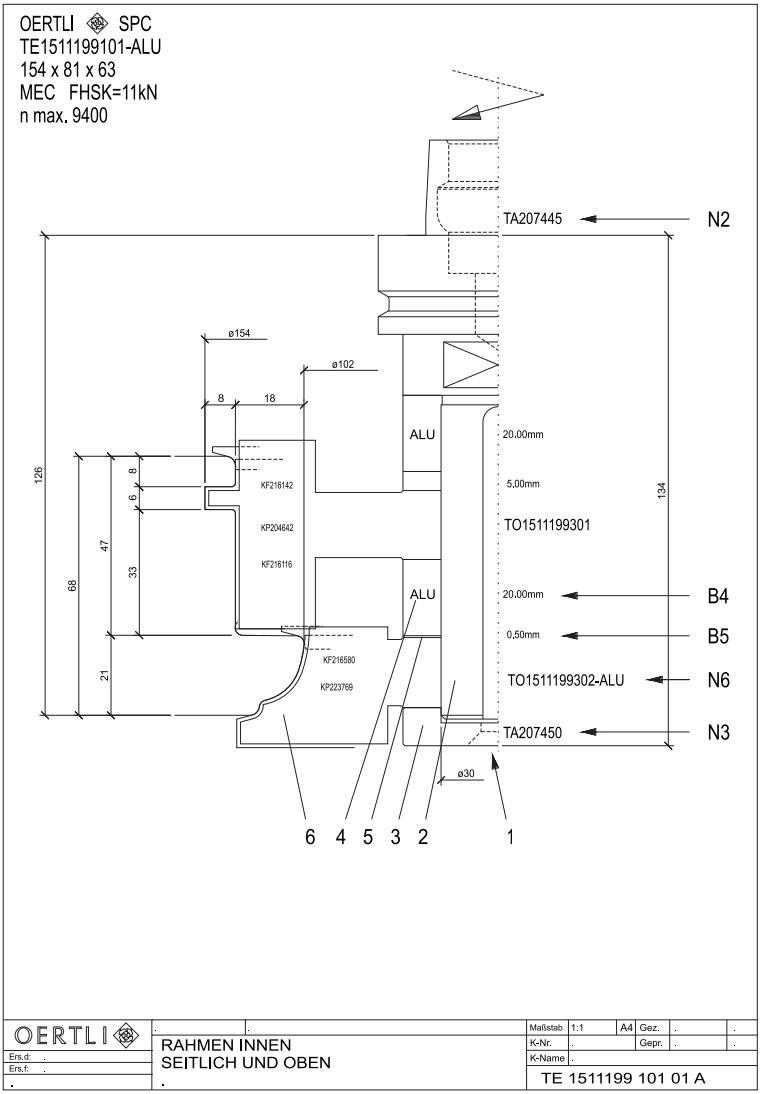

OERTLI SPC
TE1511199101-ALU
154 x 81 x 63
MEC FHSK=11kN
n max. 9400
TA207445
N2
ø154
ø102
8
18
ALU
20.00mm
5,00mm
TO1511199301
134
126
8
6
47
33
68
21
KP216142
KP204642
KP216116
ALU
20.00mm
B4
0,50mm
B5
KP216580
KP223769
TO1511199302-ALU
N6
TA207450
N3
ø30
6 4 5 3 2 1
OERTLI
Ers.d:
Ers.f:
RAHMEN INNEN
SEITLICH UND OBEN
Maßstab 1:1
A4
Gez.
K-Nr.
Gepr.
K-Name
TE 1511199 101 01 A

Fig. 1

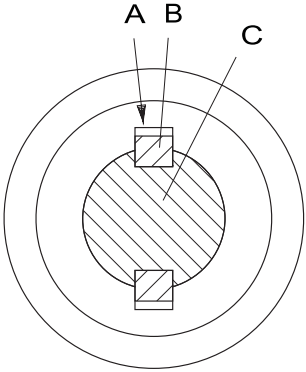


Fig. 2

5.1.2. 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.

Clamping shafts with anti-twist protection:

Screws M8 with Hexagonal Socket Head **5 mm = 15 Nm**. Treat with screw securing paste (e.g. LOCTITE).

Screw M8 with Torx T45 (1x in the center) = **20 Nm**; also be treated with screm securing paste (e.g. LOCTITE).

Screw M8 with Torx T45 (3x) = **20 Nm**; also be treated with screm securing paste (e.g. LOCTITE).

Clamping shafts for PowerLock:

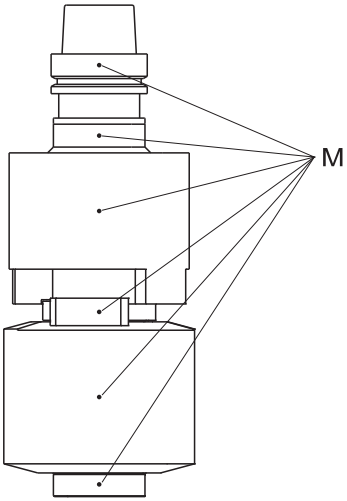
Nut M33 x 1.5 with key size **50 mm = 80 Nm**

Holding bolts for Steep Taper Shanks:

Holding bolt **M10 = 20 Nm**
Holding bolt **M12 = 24 Nm**
Holding bolt **M16 = 30 Nm**

5.1.3. Balance quality of CNC tools

All components of an installation must be positioned so that all their markers (M) are arranged along a single line in order to ensure that the CNC tools are appropriately balanced.



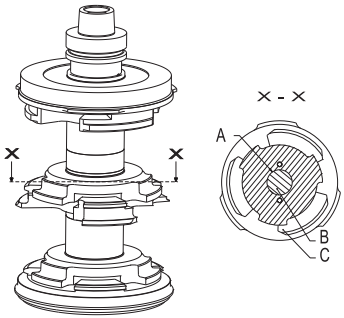
NOTICE

Imbalance of the tool set may result from faulty installation of individual components.
Imbalance may cause damage to the tool and result in bad processing surfaces.

Ensure during each installation that all markers on the tool set are arranged along a single line.

5.1.4. Tools with 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.



A: Stable connection
B: Clamping device (shaft)
C: Bore cutter

The individual bore cutter may only be resolved from the clamping device by OERTLI Werkzeuge AG.

Tools with SP-Technik or HPC/HPC+ are labeled accordingly.

Example SP-Technik:

OERTLI
XX XXXXXXX XXX
D x B x d
MEC
SP-Technik n.max. 11800 A

A: Tool with SP-Technik and maximum rotation speed [1/min] e.g. n max. 18000

5.1.5. 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 predamaged 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 flyaway 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.

5.1.6. 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.

⚠WARNING

Material weaknesses and expansion may result when the temperatures of the clamping system are too high. This may cause damage to the clamping system.
Cutting and crushing injuries as well as mortal danger due to flying parts.

Ensure that the tools and clamping devices are not heated above 60 °C.

⚠WARNING

The use of cleaning agents that are unsuitablefor the basic aluminium body poses a risk of corrosion.
Corrosion may lead to failure of the tool elements.
Risk of injuries and mortal danger during the operation due to flying parts.

Only use suitable, water-soluble, special cleaning agents based on solvents that are suitable for aluminium.

Adhere to the concentration (mixing ratio), temperature and cleaning time recommended by the cleaning agent manufacturer.

Tools with a basic body made of aluminium must be mechanically cleaned.

NOTICE

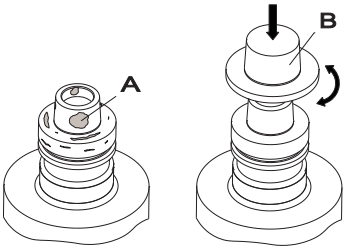
Danger of rupture of knives.

Do not clean mechanically knives of diamond.

5.1.7. Cleaning the receiving cone

Clamping devices with a cone require some specific cleaning work.

Check the tool interface daily for contamination and damage. The cone of the clamping device can be cleaned with a cleaning tool.



A: HSK cone with impurities (e.g. shavings, dust or rust)
B: Cleaning tool

Cleaning instructions:

1. Put the cleaning tool (B) over the cone.
2. Rotate the cleaning tool with slight pressure on the cone.
3. Remove cleaning tool.
4. Check whether the contamination has been removed.
5. If necessary, clean again.

⚠WARNING

Danger of unstable tool in operation due to pollution. Injury or death due to stray components in operation.

Clean regularly the bearing surfaces on the tool cone.

Check and regularly clean the inner cone of the spindle according to specifications of the spindle or machine manufacturer.

Replace the clamping device immediately if defects appear such as dents, impressions or cracks.

5.1.8. Measurement

NOTICE

Danger of rupture of knives.

Knives of diamond to be measured only optical.

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 exeption 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 dryed 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.

7. Accessories

Tool installation device as necessary for the taper cone of the tool shaft

Holding bolt as required for the steep taper cone of the tool shaft

8. Contacts/Addresses

Switzerland
OERTLI Werkzeuge AG
Hofstrasse 1
CH-8181 Höri bei Bülach
Phone: +41 44 863 75 11
Fax: +41 44 863 75 12
E-Mail: info@oertli.ch
Website: www.oertli.ch

Benelux
OERTLI Gereedschappenfabriek B.V.
Elftweg 4
NL-4940 AB Raamsdonksveer
Phone: +31 162 51 48 80
Fax: +31 162 51 77 87
E-Mail: oertli@oertli.nl
Website: www.oertli.nl

Austria
OERTLI Werkzeuge GmbH
Industriepark Runa
AT-6800 Feldkirch
Phone: +43 5522 75787 0
Fax: +43 5522 75787 3
E-Mail: info@oertli.at
Website: www.oertli.at

Germany
OERTLI Werkzeug- und Maschinenhandels-GmbH
Schillerstrasse 119
DE-73486 Adelmannsfelden
Phone: +49 7963 841 900
Fax: +49 7963 841 909
E-Mail: info@oertli-werkzeuge.de
Website: www.oertli-werkzeuge.de

Estonia
Kaur Trade OÜ
Rehepapi tee 23
EE-61709 Soinaste küla
Phone: +372 7 307 250
Fax: +372 7 367 241
E-Mail: info@kaurtrade.ee
Website: www.kaurtrade.ee

China
AKE Precicion Tooling (TaiCang) Co., Ltd.
1st Floor, Building 2,
Hongliang Industry Park
1st Outer Ring Road
CN-215400 TaiCang, JiangSu Province
Phone: +86 512 53 18 51 51
Fax: +86 512 53 18 50 50
E-Mail: info@aketools.com

Italy
OERTLI Italia S.r.l.
Via Caporalino 21/a
IT-25060-Cellatica-Brescia
Phone: +39 30 277 2801
Fax: +39 30 277 1192
E-Mail: oertli@hotmail.it
Website: www.oertli.it

Sweden
Kvarnstrands Verktyg AB
Storgatan 11
SE-57450 Ekenässjön
Phone: +46 38 33 47 00
Fax: +46 383 383 30027
E-Mail: info@kvarnstrands.com
Website: www.kvarnstrands.com

Hungary
OERTLI Magyarország Kft.
Marton Lajos u.2.
HU-8790 Zalaszentgrót
Phone: +36 83 560 005
Fax: +36 83 560 006
E-Mail: oertlikft@t-online.hu
Website: www.oertli.hu

Russia
AKE RUS
Polustrovsky pr. 28 G
28-Zh, office 18
RU-195197 St. Petersburg
Phone: +7 812 347 84 90
Fax: +7 812 347 84 94
E-Mail: info@ake.de

United Kingdom and Ireland
OERTLI Tooling UK Ltd.
7 Warren Park Way Enderby
Leicester
UK-LE19 4SA
Phone: +44 116 286 34 09
Fax: +44 116 286 75 45
E-Mail: info@oertli.co.uk
Website: www.oertli.co.uk

France
OERTLI France
Résidence Jean Le Bon
13 avenue Albert Camus
FR-21000 Dijon
Phone: +33 3 8055 1662
Fax: +33 3 8055 1691
E-Mail: info@oertli-outils.fr
Website: www.oertli-outils.fr

Poland
AKE Polska Sp. z o.o.
ul. Witosa 7
PL-98-400 Wieruszów
Phone: +48 62 7832 200
Fax: +48 62 7832 201
E-Mail: ake@ake.pl
Website: www.ake.pl

Romania
SORIN MIHAI s.r.l.
Str. De Mijloc 183
RO-500064 Brasov
Phone: +40 268 472 159
Fax: +40 268 472 193
E-Mail: office@sorinmihai.ro

Slovenia
KTP d.o.o.
Kolodvorska cesta 28a
SI-6230 Postojna
Phone: +386 590 72140
Fax: +386 590 72149
E-Mail: info@ktp.si

Latvia and Lithuania
B.R.A.N.G.S. Ltd.
Brivibas 22
LV-5001 Ogre
Phone: +371 293 734 13
Fax: +371 650 227 31
E-Mail: a.spulis@oertli.com

Australia
Fenestration Solutions Australia Pty Ltd
1/11 Ashley Park Dve
Chelsea Heights
VIC Australia, 3196
Phone: +61 3 9773 3966
Fax: +61 3 9773 3988
E-Mail: sales@fsa.aus.com.au
Website: www.fsa-aus.com.au

Czech Republic
OERTLI Partner Czech Republic
Sluneční 2417
CZ-75661 Rožnov pod Radhoštěm
Phone: +420 608 750 788
E-Mail: hastry22@gmail.com

USA
KYOCERA UNIMERCO Tooling Inc.
6620 State Road
Saline, MI 48176
Phone: +1 734 944 4433
Fax: +1 734 429 5177
E-Mail: ummi@kyocera-unimerco.com
Website: www.kyocera-unimerco.us

Spain
Preziss Diamant
Poligono Industrial, Les Pedreres Nave A-1
ES-08390 Montgat
Phone: 0034/93 469 03 51
Fax: 0034/93 469 22 79
E-Mail: preziss@preziss.com
Website: www.preziss.com

9. Glossary

9.1. Technical terms

Deflector
Protruding 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.

Resharpening
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 bluntened 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 fort 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.

9.2. Item numbering structure

An OERTLI item number has the following structure:

9.2.1. 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

9.2.2. B - number part

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

9.2.3. 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.

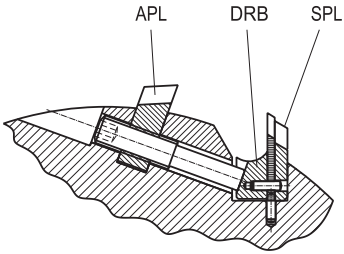
Examples:
KP171300 = H8 (hard metal quality)
KP171300**H6C02** = H6 with coating

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
KP171300**SPL** = Support plate
KP171300**DRB** = Profiled pressure jaw
KP171300**APL** = Deflector

Shortened standard cutters:

Standard cutters that were individually shortened have the following suffix:

L + shortened length in millimetres

Example:
TA469720**L195** (shortened to 195 mm)

9.3. 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)

9.4. 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

9.5. Unit

9.5.1. Table of units

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