1 Ordering details

1.1 Catalogue Tools

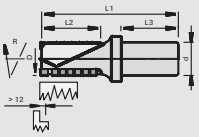
By indicating the Ident-No. the tool is described unequivocally.

The additional indication of Class-No., dimensions, sense of rotation and cutting material increases the information content and avoids wrong deliveries if the Ident-No. is false.

Please see one example each for shank-type tools and tools with bore.

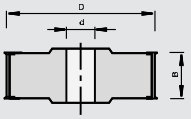
1.1.1 Shank-Type Tools

description: LEUCODIA shank-type cutter
Class-No.: 229022
Ident-No.: 181475
dimensions: 25 x 38/120 x 25 (D X L2/L1 x d)
sense of rotation: R (right-hand rotation)
no. of teeth: Z3+3
cutting material: DP (polycrystalline diamond)



1.1.2 Tools with Bore

description: chamfering cutterhead
Class-No.: 120255
Ident-No.: 167048
dimensions: 125 x 50 x 30 (D x B x d)
double keyway: DKW 12 x 5
no. of teeth: Z4+4 (main cutting edge knives+spurs)
cutting material: HW (tungsten carbide)



1.2 Special Tools

The quick processing of inquiries and orders requires detailled information.

1.2.1 Tool Data

- tool design (one-part tool, compound tool or composed tool)
- diameter x cutting width x bore (tools with bore)
- diameter x effective length x shank dimension (shank-type tools)
- no. of teeth
- profile depth
- sense of rotation
- operating speed (RPM)
- feed rate
- dimensions of keyways
- cutting material type

1.2.2 Type of feed

- manual feed (MAN)

- mechanical feed (MEC)

1.2.3 Sense of rotation

- right-hand rotation[R]

- left-hand rotation[L]

1.2.4 Workpiece

- workpiece material: solid woods, wood-based panels, composite materials, plastics, NF metals etc.

- surface texture of the workpiece material: veneered, plastic-laminated, melamine-faced, lacquered etc.

In the case of lack of clarity with regard to the workpiece material samples of the material to be machined can be sent.

1.2.5 Machine data

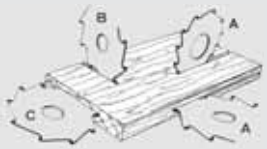
- brand and type
- range of RPM
- installed capacity
- max. tool dimensions
- interface
- type of feed etc.

1.2.6 Position of the workpiece with regard to the tool

- reference surface and reference edge of the workpiece (i.e. machine cutting table surface)
- feed direction

1.2.7 Grain direction

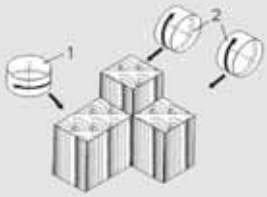
Grooving in grain-oriented materials



A along the grain
B across the grain
C end-grain cutting

Application with and across the grain

(1)
- position of workpiece is horizontal relative to the spindle
- direction of feed is across the grain
- position of the spindle is parallel to the grain
- peripheral edge cuts parallel to the grain
- end or side (flank) edge cuts vertical relative to the grain
- no preliminary cleavage



In rebating and grooving work the flank or side edges will make the separating cut

(2)
- position of workpiece is vertical relative to the spindle
- direction of feed is across the grain
- peripheral edge cuts through end grain
- flank or side edge cuts parallel to the grain
- no preliminary cleavage

In jointing, rebating and grooving work the peripheral edges will do the principal cutting.

1.2.8 Mode of application

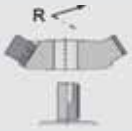
against feed
with feed

1.2.9 Profile details

Profile drawings must clearly show whether the workpiece or the tool is shown.
Please state bearing side, sense of rotation, dimensions and application conditions on workpiece samples or drawings.

1.2.10 Information for chamfering, rabbeting and profiling tools

If no special information is available chamfering, rabbeting and profiling tools are always delivered as follows:
clockwise rotation and large diameter resp. top side spur.



2.1 Tools

One-piece tools (solid tungsten carbide tool / solid steel tool)

Tools without combined or removable parts; the body and the cutting parts are made from one piece.

Composite tools (tipped tools)

Tools with cutting parts (cutting tips) which are tightly connected with the body by means of welding, soft-soldering, hard-soldering, non-detachable bonding, etc.

Complex tools

Tools consisting of a body and one or more cutting parts (exchangeable inserts, knives) which can be changed by means of unlockable clamping elements. The cutting parts can be made in one-piece or compound design.

Tool set

Single tools which are mounted on a tool carrier and meant to work like one tool.

Tool combination

Unit consisting of multiple loose tools which can be combined with each other in diverse order or can be varied axially in different positions.

2.2 Tool bodies

2.3 Types of feed (according to EN 847)

Tool bodies are made from such materials that they can withstand the forces and strains to be expected during use. For this purpose steel- and aluminum materials are used. For shank-type tools supplemental materials are available.

2.3.1 Manual feed (MAN)

Manual feed means manually holding and guiding workpieces or machine elements with tools. Manual feed also includes using a removable feed device that is not interlocked with the tool as well as as a manual push-slide.

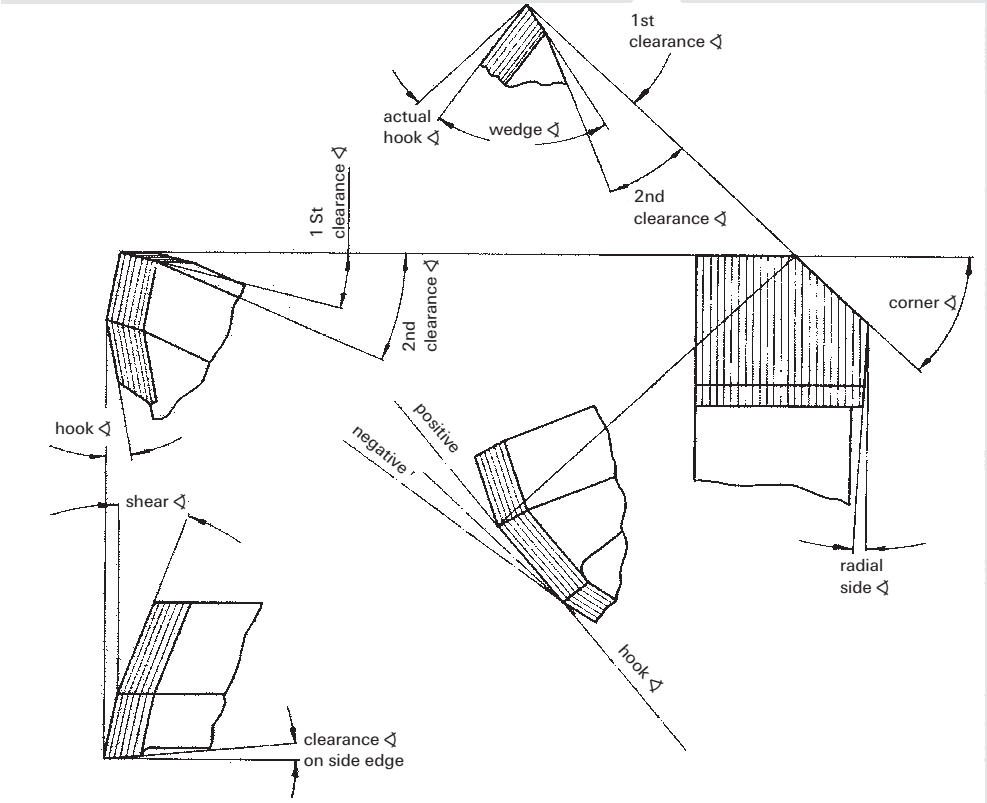
2.3.2 Mechanical feed (MEC)

Feed mechanism for the workpiece or the tool, integrated in the machine and by means of which the workpiece or machine element with tool is mechanically clamped and guided during operation.

2.4 Information with regard to the tables and charts

The working parameters for machining of wood and wood-composites are significantly co-determined by a multitude of individual factors (i.e. structure and composition of the workpiece material, machine parameters). In specific application cases there may be differences from the indications given in the tables and diagrams.

2.5 Angles and cutting edge geometries



Diameter D [mm]

Cutting width B [mm]

Hook angle [°]

Wedge angle [°]

Shear angle [°]

Corner angle [°]

3 Formulas, standard values and further information

cutting diameter D[mm]	$D = (1000 \times 60 \times v_c) / (n \times \pi)$
RPM n [min^{-1}]	$n = v_c \times 1000 \times 60 / (\pi \times D)$
depth of knife marks t [mm]	$t = f_z^2 / (4 \times D)$
medium chip thickness h_m [mm]	$h_m = f_z \times \sqrt{(a_e/D)}$
cutting speed v_c [m/s^{-1}]	$v_c = \pi \times D \times n / (1000 \times 60)$
depth of cut a_e [mm]	
feedrate v_f [m/min^{-1}]	$v_f = f_z \times n \times z / 1000$
feedrate per tooth f_z [mm]	$f_z = v_f \times 1000 / (n \times z)$
number of teeth z	$z = (v_f \times 1000) / (f_z \times n)$

For safety reasons (noise emission, danger of kickback) the range of cutting speeds for tools with manual feed (MAN) lies between 40 - 70 m/s.

4 Cutting materials

4.1 General information

For woodworking the following cutting materials are used:

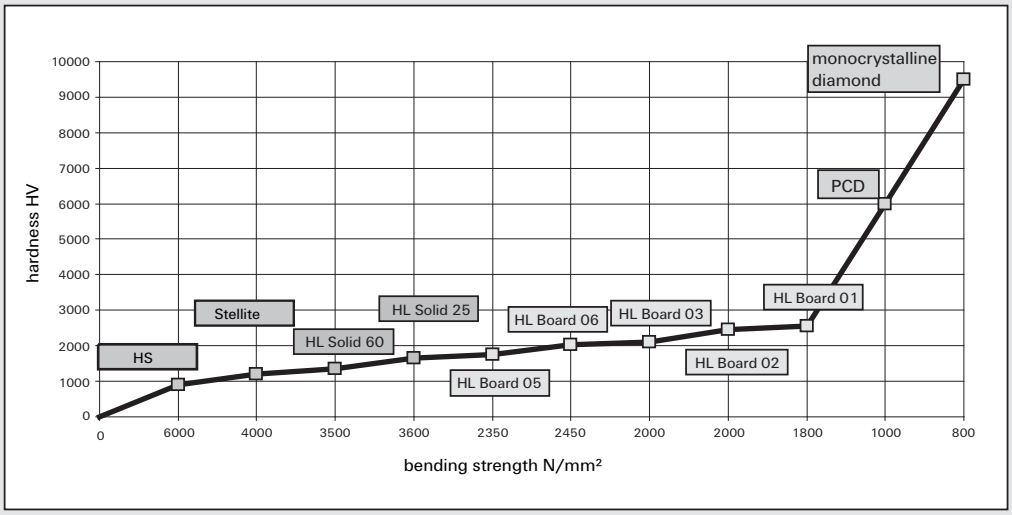
SP alloyed steel
HL high-alloyed steel
HS high-speed steel
HW uncoated tungsten carbide
HC coated tungsten carbide
ST casting alloy on cobalt basis
DP polycrystalline diamond
DM monocrystalline diamond

The multitude of materials to be machined and the various kinds of applications make different demands on the cutting edge and thus on the cutting edge material and the cutting edge geometry.

Whereas soft woods require a small hook angle, particle boards require a cutting edge which is extremely wear-resistant.

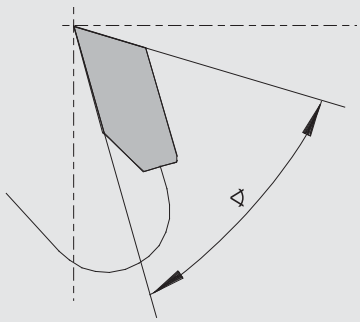
The optimum cutting material would thus be tough and hard.

The chart shows the hardness and bending strength of the most popular cutting materials.



This suggests that an increase of hardness is inevitably linked with a decrease of the bending strength. With other words: „Hard cutting materials need a large wedge angle."

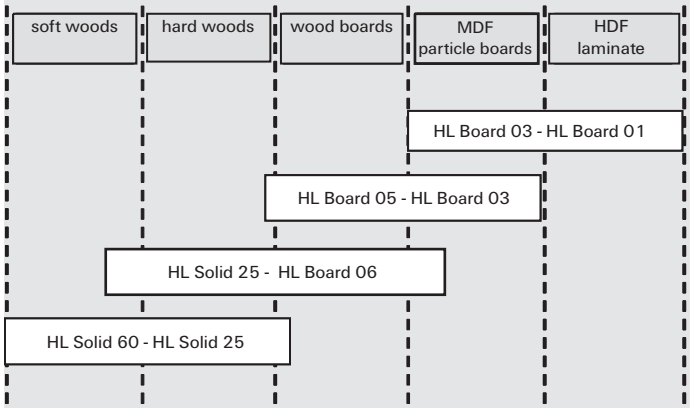
DP: ∢ = 60° - 70°
HW: ∢ = 45° - 55°
ST: ∢ = 40° - 50°
HS: ∢ = 35° - 45°



4.2 Range of application of the different cutting materials

4.2.1 Tungsten carbide cutting materials (HW, HC)

Tungsten carbide grades are destined for the use in soft woods, hard woods and laminated timbers as well as in wood-based panels.



The spectrum of tungsten carbide grades ranges from HL Board 01 to HL Solid 60. HL Board grades are hard and wear-resistant. HL Solid grades are tougher and can have a smaller wedge angle.

4.2.2 Diamond cutting materials (DP)

Diamond cutting materials have a wide range of application (from hard woods to laminate overlays).

The applied diamond grades are exclusively made by well-known manufacturers of cutting materials who guarantee a constant high quality.

Mainly the following grades are applied:

	Fine	Medium	Coarse
Advantages	l high wear resistance l excellent surface quality l excellent sharpness of cutting edges, long edge lives	l excellent wear resistance l high sharpness of cutting edges l moderate impact resistance	l extremely high wear resistance l slightly lesser impact resistance and toughness
Application area	l for moderately abrasive materials	l universally applicable	l for extremely abrasive materials

4.2.3 Monocrystalline diamond (DM)

Because of its high brittleness and hardness monocrystalline diamond is applied in the case of homogeneous and extremely abrasive workpiece materials. Application areas are for example the machining of laminate overlays and transparent plastics.

4.2.4 Casting alloy on cobalt basis (ST, Stellite)

Stellite is the ideal cutting material for the machining of humid woods.

4.2.5 High speed steel (HS)

High speed steel is chosen for the machining of soft and hard woods.

For special applications further cutting materials (e.g. CVD) and coatings (e.g. Topcoat) are available.

5 Workpiece materials

Overview

Solid woods	Soft woods	
	Hard woods	
	Exotic woods	
	Veneers	
Wood-based materials	Laminated woods	Plywood etc.
	Particle materials	Particle boards
	Fiber boards	MDF etc.
	Laminates	HPL, CPL, Trespa, Multiplex etc.
	Wood wool	Heraklith etc.
Plastics	Thermoplastic	PA, PE, PMMA etc.
	Thermosets	Pertinax®, Restitex® etc.
	Fiber-reinforced plastics	CFRP, GRP etc.
	Polymer bound plastics	Corian®, Varicor®, Noblan®, Kerrock® etc.
Composite materials	Solid wood laminated with	HDF, MDF, veneer
	Panels laminated with	HPL, cork etc.
	Gypsum boards	
	Gypsum plaster boards	
	Cement bonded boards	
	Mineral wool boards	
	Plastics with metals (Alucobond® etc.)	
NF-Metals	Pure aluminum	
	Al-Mg-Cu	
	Al-Si alloys	

® different trade marks