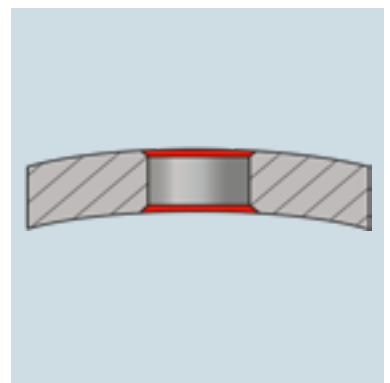
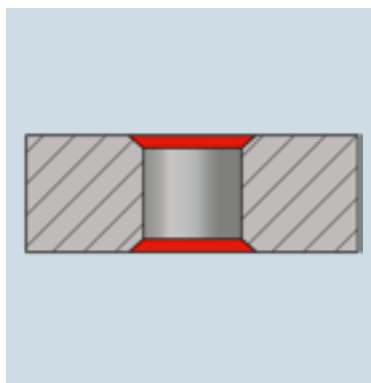


DL2

The deburring tool for bores
from $\varnothing 1.00$ mm up to $\varnothing 2.10$ mm.



DL2 – The deburring tool for small diameters.

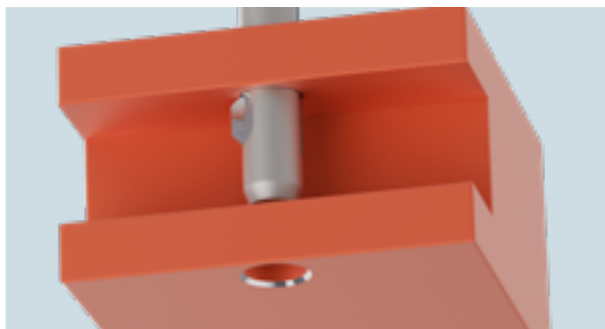


Deburring of bores from Ø1.00 mm up to Ø2.10 mm.

The DL2 tool rounds off the bottom end of the product range. Despite its small dimensions, it meets the high customer requirements for process reliability and deburring quality. DL2 is characterised by its robust design, simple handling and quick blade change.

HEULE deliberately set out to fill the market gap for cost-effective and reliable mechanical deburring tools for smaller diameter bores.

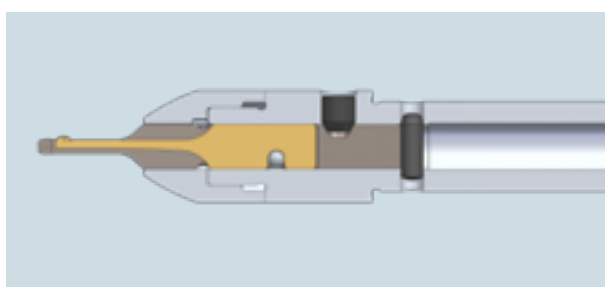
Characteristics and Advantages



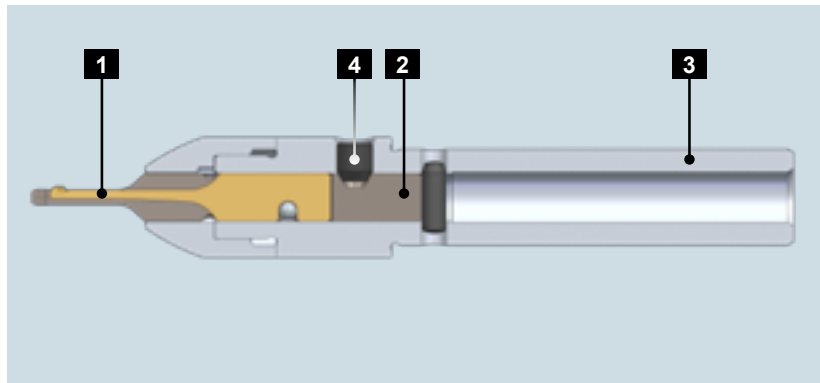
- The DL2 is designed for the machining of even and slightly uneven bore edges. It is extremely reliable in CNC-operation and ensures high efficiency and process reliability.
- Hole diameters starting from Ø1.00 mm can now be mechanically deburred.



- The DL2 was originally developed for the machining of watch cases in cooperation with a renowned Swiss watchmaker.
- After the conclusion of the development phase as well as the successful implementation under series production conditions, the DL2 is now part of HEULE's standard product range.



- The defined cutting process with a ground carbide blade produces a complete, burr-free edge.
- The simple, mechanically controlled deburring tool enables in-house deburring and thus saves the costs and expenses of an external processing.



- 1** Blade
- 2** Blade housing
- 3** Tool body with coolant sleeve
- 4** Clamping screw

The DL2 has a very simple but robust construction. The design consists of only four component parts. The advantages of this design can best be seen when changing the blade. The blade can easily be changed without tweezers or magnifying glass despite the extremely small dimensions.

The tool body and the blade housing form the heart of this micro-tool. The coolant sleeve guides the coolant into the blade housing and guarantees the permanent flushing of the cutting edge, which is important especially with the smaller tool.

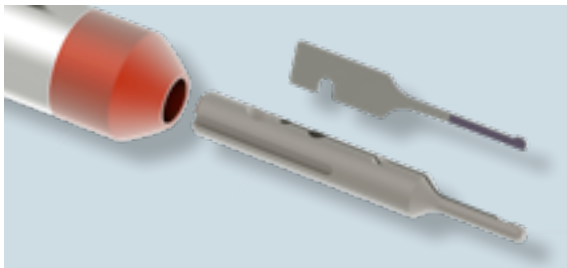


Fig. 1: The blade housing gives maximum guidance and stability to the blade.

Smart tool concept

HEULE is taking a new approach with the DL2 tool. The blade positioning and blade assembly are very different from the existing HEULE tool concepts. The designers of the DL2 tool utilised the available space to ensure a design offering optimal stability. For example, we abandoned the use of a traditional spring in the tool design.



Fig. 2: The blade and the spring form a single unit. This solution allows simple handling despite the miniature dimensions.

The blade is also the spring

In order to guarantee the guiding and the cutting forces of the blade, the spring and the carbide blade have been combined into a single unit. This combination guarantees the required spring tension. The DL2 tool must be used in **counter-clockwise rotation**.

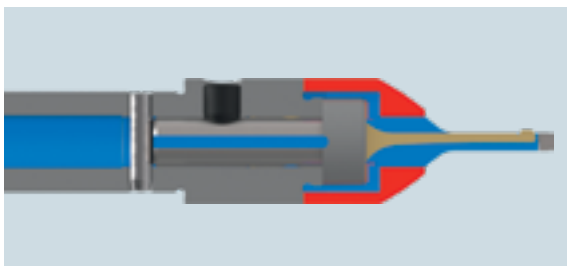
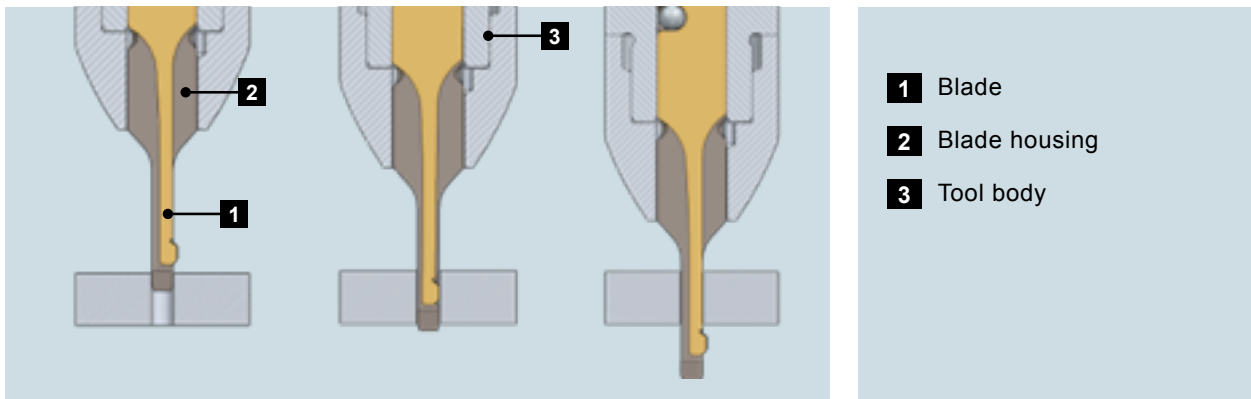


Fig. 3: With internal cooling, the carbide blade is cooled effectively in every stage of the deburring process which is important for reliable series production.

Internal blade cooling

The technical challenge of deburring tools of this size is the blade cooling. With the DL2, the coolant supply is provided through the tool so that it is guided directly to the cutting edge of the carbide blade. This is an important aspect for the function and process safety during high-volume production.

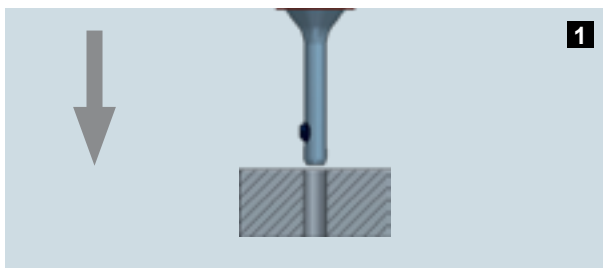
Operating principle of the DL2 tool



Due to its size, the DL2 blade has been integrated into the spring, to form a single unit. Due to the rigid alignment of the blade, the operating principle is different from that of other HEULE tool systems. The blade has been designed in such a way that it is able to accommodate the limited space available and still retain its function. The blade produces the

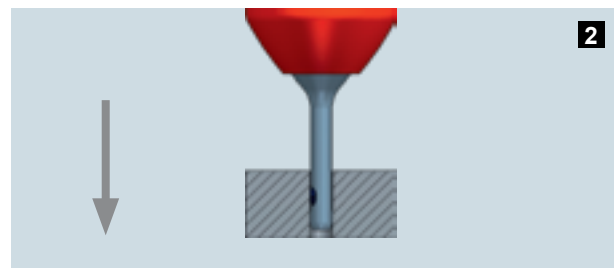
desired deburring at the work feed rate. As soon as deburring is complete, the blade retracts into the blade housing automatically. The specially designed sliding section prevents damage to the drilled holes. When exiting the hole, the spring-loaded blade automatically returns to its original position.

Process steps description



The carbide blade is aligned and retained by its own spring section and the blade housing. The blade is positioned in rapid feed above the edge of the hole.

IMPORTANT: The DL2 tool cuts counter-clockwise.

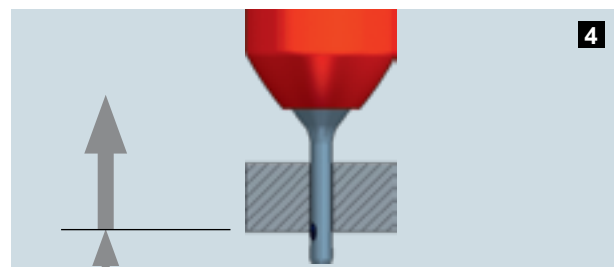


The specially ground forward and backward deburring blade deburrs the edge when moving forward. As soon as the required deburring size is reached, the blade retracts into the tool body.

IMPORTANT: Entry burrs must be observed when programming the tool approach.

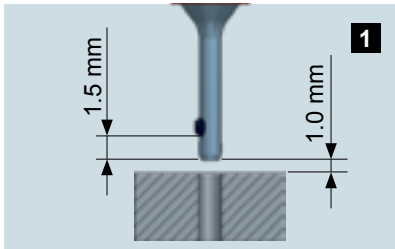


The blade passes through the hole on a specially designed sliding surface without damaging the hole. It is essential to position the tool taking into account the height of the burr on the underside of the workpiece.

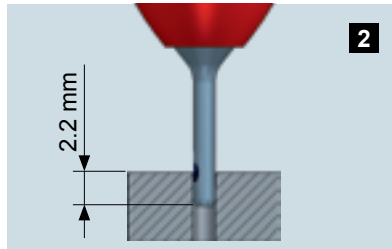


Deburring is carried out backwards in working feed, without a spindle stop or a change in the direction of rotation. Afterwards the tool can be retracted back through the hole in rapid feed to the starting position.

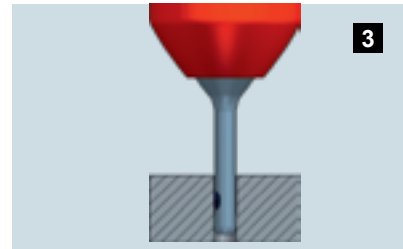
Programming information



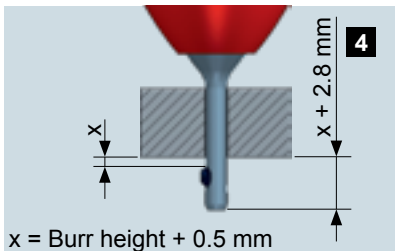
The DL2 tool must be used in **counter-clockwise rotation**. During the entire machining process, neither a change in the direction of rotation nor a stopping of the spindle is necessary. The tool cutting edge is positioned in rapid feed above the front of the hole to be deburred.



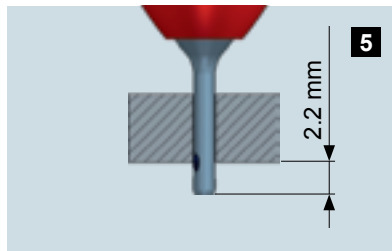
At working feed, the edge is deburred on the front edge of the hole until the blade has fully retracted.



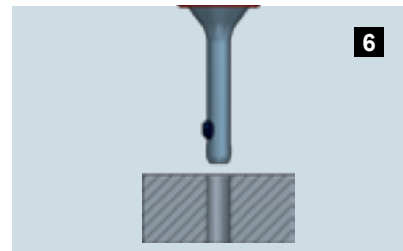
In rapid / increased feed, the tool passes through the workpiece without damaging the surface.



Position the blade 0.5 mm deeper than the existing burr to safely reach the new starting position.



In working feed, the hole on the underside of the workpiece is deburred. The blade should travel 0.5mm further than the deburring size.

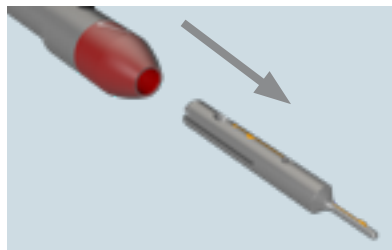


Move out of the workpiece in rapid feed and move to the next hole.

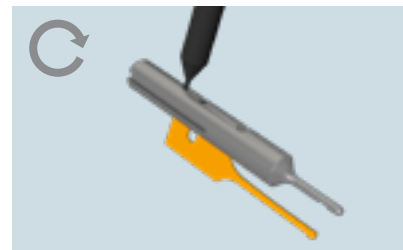
Blade change



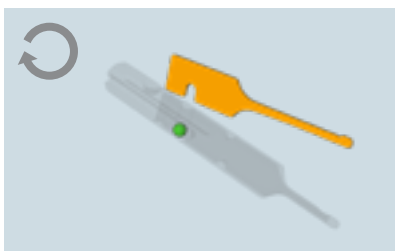
Loosen the clamping screw with the supplied Torx wrench.



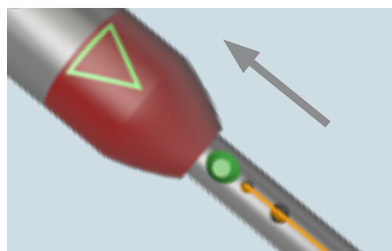
Carefully pull the blade housing out of the main body.



Insert a small pointed instrument through the hole on the underside of the blade housing. This lifts the blade out of its housing enabling easy removal.



Insert the new blade from above, paying attention to the positioning ball.



Slide the blade housing back into the tool body. The arrow on the coolant sleeve is aligned with the bore of the clamping screw.



To complete the blade change, tighten the clamping screw using the Torx wrench.

DL2 Range Summary

The range includes tools for use with bores from $\text{Ø}1.00$ mm to $\text{Ø}2.10$ mm. The deburring capacity is maximal 0.20 mm. The deburring result is directly

influenced by many factors, such as coolant, feed rate, clamping situation etc.

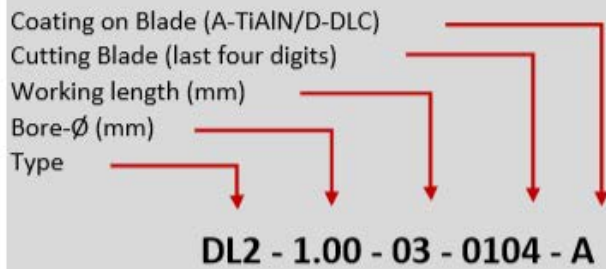


Fig. 1: A selection of DL2 tools from left to right: DL2/1.00/03, DL2/1.30/04, DL2/1.60/06, DL2/2.00/10.

Bore	Max. Deburring Capacity ¹	Tool Series
$\text{Ø}1.00 - \text{Ø}2.10$ mm	0.15 - 0.20 mm	DL2

¹) The achievable deburring capacity varies slightly depending on material, cutting data or application. The indicated dimension is the theoretically possible maximum.

PART No:
Tool with Blade



Tool type:

The DL2 tool type completes the HEULE product range by enabling deburring of small diameter holes. With the DL2 range, mechanical deburring is possible from a bore dia. Ø1.0mm. Simple but reliable handling during blade change was a central focus for the developers.

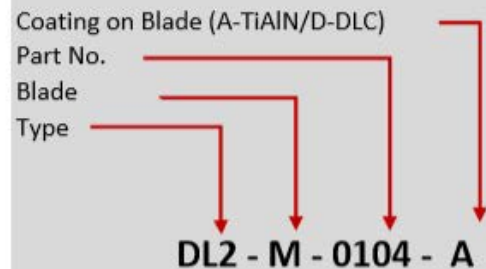
Tool size:

The tool size is defined by the bore-dia. Ø. Tool-Ø and theoretical deburring-Ø are defined in the tables on the page 8. If the tool is used in a larger hole than the tool size indicates, the deburring size is reduced accordingly. Customised working lengths may be possible upon requests.

Spring:

The DL2 does not have a separate spring as is common with other HEULE tool systems. To save space the spring and blade have been designed as a single unit. This guarantees easy handling and the available space in the tool is optimally utilised.

PART No:
Spare Blade



Blade Type:

By Adding the last four digits of the blade order number and coating preference. The tools can be supplied with a blade as standard. Spare blades can be ordered separately. Available options are backward cutting only (BCO) or front & back cutting (F&B)

Coatings:

All DL2 blades are made of carbide. The two available coatings are:

- A: TiAlN for most common materials -Std
- D: DLC (Diamond); Special for Alum.

Order example DL2-1.60-06-0173-A

Requirements: *Deburr bore, backward cutting only (bco), deburred with 0.10mm*

Bore-Ø material: 1.60mm Stainless Steel

Selection:

Tool: **DL2-1.60-06-0173-A**

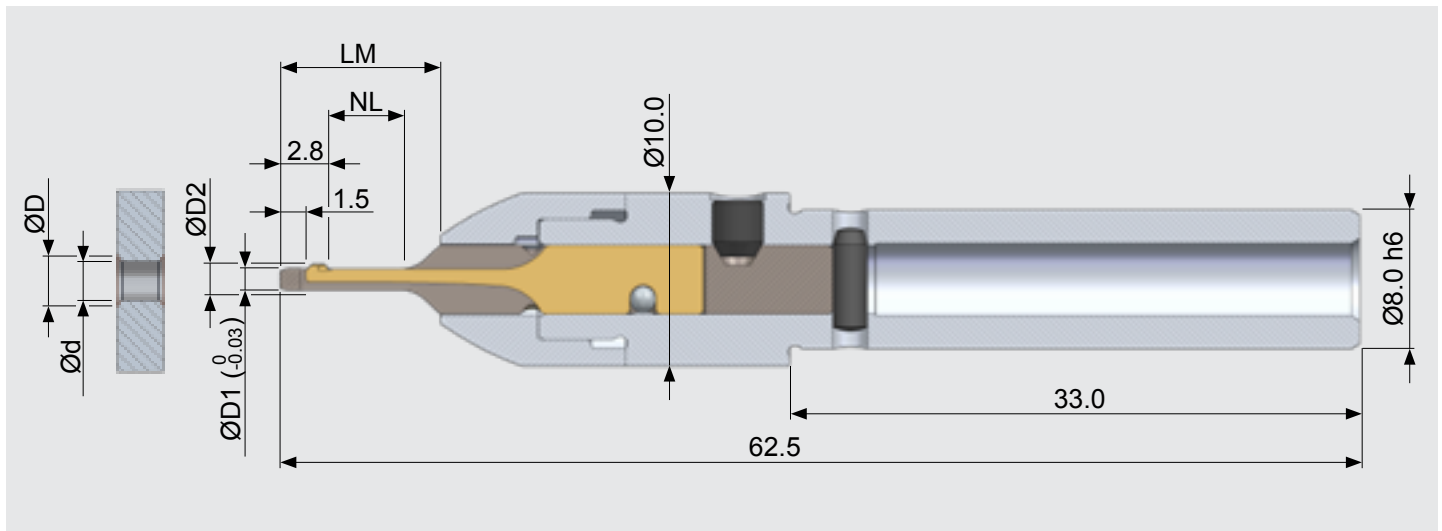
Extra Blade: **DL2-M-0173-A**

Recommendations:

The blade should only be used for the corresponding diameters.

DL2 tool

Ø1.00 mm to Ø2.10 mm (.040" - .080")



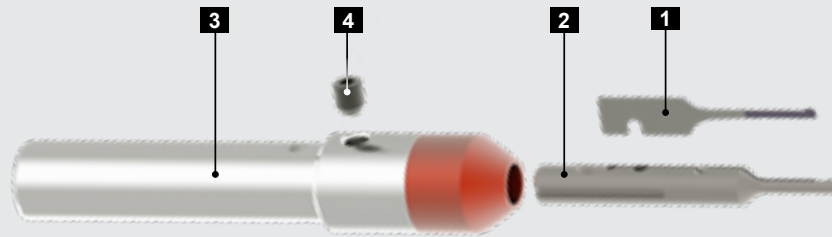
Tool table

(mm - inch)						Tool with blade F&B	Tool with blade BCO
Bore-Ø d	Debur-Ømax D	Working Length Max NL	Length blade housing LM	Tool-Ø D1	Max-Ø D2	Part No.	Part No.
1.00 .039"	1.20 .047"	3.00 .118"	8.30 .327"	0.95 .037"	1.35 .053"	DL2-1.00-03-0104-A	DL2-1.00-03-0101-A
1.05 .041"	1.25 .049"	3.00 .118"	8.30 .327"	1.00 .039"	1.40 .055"	DL2-1.05-03-0110-A	DL2-1.05-03-0107-A
1.10 .043"	1.30 .051"	4.00 .157"	9.30 .366"	1.05 .041"	1.55 .061"	DL2-1.10-04-0116-A	DL2-1.10-04-0113-A
1.15 .045"	1.35 .053"	4.00 .157"	9.30 .366"	1.10 .043"	1.60 .063"	DL2-1.15-04-0122-A	DL2-1.15-04-0119-A
1.20 .047"	1.40 .055"	4.00 .157"	9.30 .366"	1.15 .045"	1.65 .065"	DL2-1.20-04-0128-A	DL2-1.20-04-0125-A
1.25 .049"	1.45 .057"	4.00 .157"	9.30 .366"	1.20 .047"	1.70 .067"	DL2-1.25-04-0134-A	DL2-1.25-04-0131-A
1.30 .051"	1.50 .059"	4.00 .157"	9.30 .366"	1.25 .049"	1.75 .069"	DL2-1.30-04-0140-A	DL2-1.30-04-0137-A
1.35 .053"	1.55 .061"	4.00 .157"	9.30 .366"	1.30 .051"	1.80 .071"	DL2-1.35-04-0146-A	DL2-1.35-04-0143-A
1.40 .055"	1.60 .063"	5.00 .197"	10.30 .406"	1.35 .053"	1.85 .073"	DL2-1.40-05-0152-A	DL2-1.40-05-0149-A
1.45 .057"	1.65 .065"	5.00 .197"	10.30 .406"	1.40 .055"	1.90 .075"	DL2-1.45-05-0158-A	DL2-1.45-05-0155-A
1.50 .059"	1.70 .067"	6.00 .236"	11.30 .445"	1.45 .057"	1.95 .077"	DL2-1.50-06-0164-A	DL2-1.50-06-0161-A
1.55 .061"	1.75 .069"	6.00 .236"	11.30 .445"	1.50 .059"	2.00 .079"	DL2-1.55-06-0170-A	DL2-1.55-06-0167-A
1.60 .063"	1.80 .071"	6.00 .236"	11.30 .445"	1.55 .061"	2.05 .081"	DL2-1.60-06-0176-A	DL2-1.60-06-0173-A
1.65 .065"	1.85 .073"	7.00 .276"	12.30 .484"	1.60 .063"	2.10 .083"	DL2-1.65-07-0182-A	DL2-1.65-07-0179-A
1.70 .067"	1.90 .075"	7.00 .276"	12.30 .484"	1.65 .065"	2.15 .085"	DL2-1.70-07-0188-A	DL2-1.70-07-0185-A
1.75 .069"	1.95 .077"	8.00 .315"	13.30 .524"	1.70 .067"	2.20 .087"	DL2-1.75-08-0194-A	DL2-1.75-08-0191-A
1.80 .071"	2.00 .079"	8.00 .315"	13.30 .524"	1.75 .069"	2.25 .089"	DL2-1.80-08-0200-A	DL2-1.80-08-0197-A
1.85 .073"	2.05 .081"	9.00 .354"	13.30 .524"	1.80 .071"	2.30 .091"	DL2-1.85-09-0206-A	DL2-1.85-09-0203-A
1.90 .075"	2.10 .083"	9.00 .354"	13.30 .524"	1.85 .073"	2.35 .093"	DL2-1.90-09-0212-A	DL2-1.90-09-0209-A
1.95 .077"	2.15 .085"	10.00 .394"	13.30 .524"	1.90 .075"	2.40 .094"	DL2-1.95-10-0218-A	DL2-1.95-10-0215-A
2.00 .079"	2.20 .087"	10.00 .394"	13.30 .524"	1.95 .077"	2.45 .096"	DL2-2.00-10-0224-A	DL2-2.00-10-0221-A
2.05 .081"	2.25 .089"	10.00 .394"	13.30 .524"	2.00 .079"	2.50 .098"	DL2-2.05-10-0230-A	DL2-2.05-10-0227-A
2.10 .083"	2.30 .091"	10.00 .394"	13.30 .524"	2.05 .081"	2.55 .100"	DL2-2.10-10-0236-A	DL2-2.10-10-0233-A

*Standard items are in bold

ORDERING INFORMATION

The tools are sold with blade. Extra blades can be ordered separately.



Spare parts

Pos.	Description	Part No.
1	Blade	see below
2	Blade housing	see table page 10
3	Tool body	see table page 10
4	Fixing screw	GH-H-S-1125
	Torx wrench	GH-H-S-2021

Blade

Bore-Ø	Deburr-Ø max.	Part No. forward and backward cutting		Part No. backward cutting only	
		Coating A	Coating D	Coating A	Coating D
1.00	1.20	DL2-M-0104-A	DL2-M-0104-D	DL2-M-0101-A*	DL2-M-0101-D*
1.05	1.25	DL2-M-0110-A	DL2-M-0110-D	DL2-M-0107-A*	DL2-M-0107-D*
1.10	1.30	DL2-M-0116-A	DL2-M-0116-D	DL2-M-0113-A*	DL2-M-0113-D*
1.15	1.35	DL2-M-0122-A	DL2-M-0122-D	DL2-M-0119-A*	DL2-M-0119-D*
1.20	1.40	DL2-M-0128-A	DL2-M-0128-D	DL2-M-0125-A*	DL2-M-0125-D*
1.25	1.45	DL2-M-0134-A	DL2-M-0134-D	DL2-M-0131-A*	DL2-M-0131-D*
1.30	1.50	DL2-M-0140-A	DL2-M-0140-D	DL2-M-0137-A*	DL2-M-0137-D*
1.35	1.55	DL2-M-0146-A	DL2-M-0146-D	DL2-M-0143-A	DL2-M-0143-D
1.40	1.60	DL2-M-0152-A	DL2-M-0152-D	DL2-M-0149-A*	DL2-M-0149-D*
1.45	1.65	DL2-M-0158-A	DL2-M-0158-D	DL2-M-0155-A	DL2-M-0155-D
1.50	1.70	DL2-M-0164-A	DL2-M-0164-D	DL2-M-0161-A*	DL2-M-0161-D*
1.55	1.75	DL2-M-0170-A	DL2-M-0170-D	DL2-M-0167-A	DL2-M-0167-D
1.60	1.80	DL2-M-0176-A	DL2-M-0176-D	DL2-M-0173-A*	DL2-M-0173-D*
1.65	1.85	DL2-M-0182-A	DL2-M-0182-D	DL2-M-0179-A	DL2-M-0179-D
1.70	1.90	DL2-M-0188-A	DL2-M-0188-D	DL2-M-0185-A*	DL2-M-0185-D*
1.75	1.95	DL2-M-0194-A	DL2-M-0194-D	DL2-M-0191-A	DL2-M-0191-D
1.80	2.00	DL2-M-0200-A	DL2-M-0200-D	DL2-M-0197-A*	DL2-M-0197-D*
1.85	2.05	DL2-M-0206-A	DL2-M-0206-D	DL2-M-0203-A	DL2-M-0203-D
1.90	2.10	DL2-M-0212-A	DL2-M-0212-D	DL2-M-0209-A*	DL2-M-0209-D*
1.95	2.15	DL2-M-0218-A	DL2-M-0218-D	DL2-M-0215-A	DL2-M-0215-D
2.00	2.20	DL2-M-0224-A	DL2-M-0224-D	DL2-M-0221-A*	DL2-M-0221-D*
2.05	2.25	DL2-M-0230-A	DL2-M-0230-D	DL2-M-0227-A	DL2-M-0227-D
2.10	2.30	DL2-M-0236-A	DL2-M-0236-D	DL2-M-0233-A*	DL2-M-0233-D*

*Standard items / Please enquire about stock or delivery times for all non-standard items.

ORDERING INFORMATION

The blades are specific for the individual deburring diameters and therefore are not interchangeable with blades for other diameters.

Definition of coatings:

D: for aluminium alloys

A: steel, titanium, Inconel / for increased requirements

Spare parts

	Blade housing	Tool body
Bore-Ø	Part No.	Part No.
1.00	DL2-N-0102*	DL2-G-0103*
1.05	DL2-N-0112*	DL2-G-0103*
1.10	DL2-N-0123*	DL2-G-0104*
1.15	DL2-N-0133*	DL2-G-0104*
1.20	DL2-N-0143*	DL2-G-0104*
1.25	DL2-N-0153*	DL2-G-0104*
1.30	DL2-N-0163*	DL2-G-0104*
1.35	DL2-N-0174	DL2-G-0104*
1.40	DL2-N-0184*	DL2-G-0105*
1.45	DL2-N-0194	DL2-G-0105*
1.50	DL2-N-0205*	DL2-G-0106*
1.55	DL2-N-0215	DL2-G-0106*
1.60	DL2-N-0225*	DL2-G-0106*
1.65	DL2-N-0236	DL2-G-0107*
1.70	DL2-N-0246*	DL2-G-0107*
1.75	DL2-N-0257	DL2-G-0108*
1.80	DL2-N-0267*	DL2-G-0108*
1.85	DL2-N-0278	DL2-G-0109*
1.90	DL2-N-0288*	DL2-G-0109*
1.95	DL2-N-0299	DL2-G-0110*
2.00	DL2-N-0309*	DL2-G-0110*
2.05	DL2-N-0319	DL2-G-0110*
2.10	DL2-N-0329*	DL2-G-0110*

*Standard items / Please enquire about stock or delivery times for all non-standard items.

ORDERING INFORMATION

The blade housing and tool body must be paired according to the table.
Failure to do so may result in a collision between the work piece and the tool.

DL2 tool

1.00 to 2.00 mm (.040" - .080")

Cutting data DL2

Material	Hardness BHN	IPR mm/rev	SFM MPM
Carbon Steels	120-334	.0002 - .0006 .005-.015	66-165 20-50
Free Machining Alloys	120-334	.0002 - .0006 .005-.015	100-165 30-50
High Alloy Steel	120-334	.0002 - .0006 .005-.015	50-130 15-40
Stainless Steel	120-334	.0002 - .0006 .005-.015	50-100 15-30
Grey Cast iron	120-334	.0002 - .0006 .005-.015	130-165 40-50
Nodular Cast Iron	120-334	.0002 - .0006 .005-.015	100-165 30-50
Aluminum Alloys	120-334	.0002 - .0006 .005-.015	200-265 60-80
Nickel-based Alloys	120-334	.0002 - .0006 .005-.015	32-50 10-15
Titanium	120-334	.0002 - .0006 .005-.015	32-50 10-15
Copper-Brass-Bronze	120-334	.0002 - .0006 .005-.015	100-200 30-60

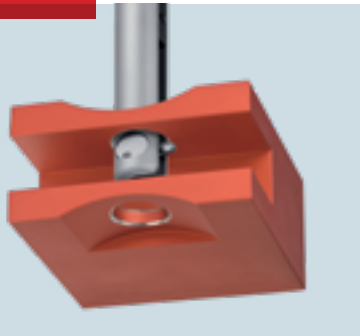
NOTE: All listed cutting data are standard values only. In case of hard-to-machine materials or uneven bore edges, we recommend applying cutting speeds that are at the lower end of the range.



Efficient and reliable.
Our solutions reduce your production costs.

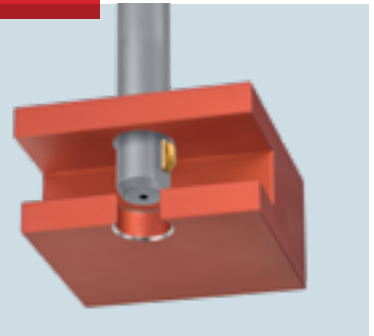
Deburring

- COFA
- DL2
- X-BORES



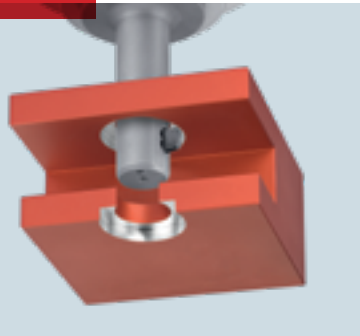
Chamfering

- SNAP
- DEFA



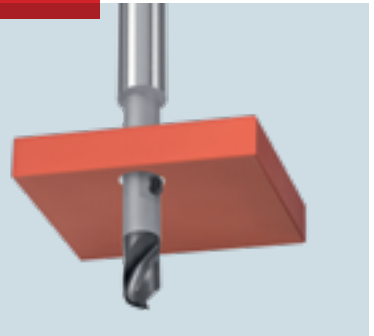
Countersinking

- BSF
- SOLO
- GH-K



Drilling

- VEX



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