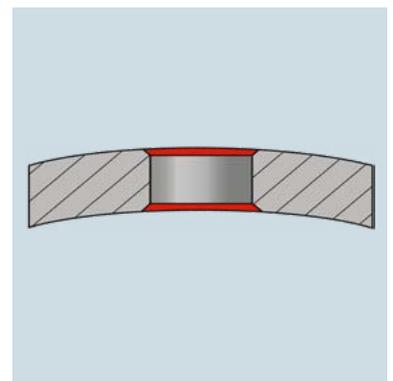
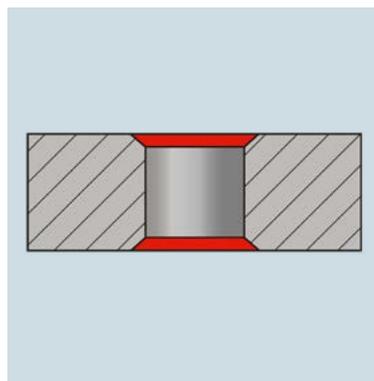


DL2

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.

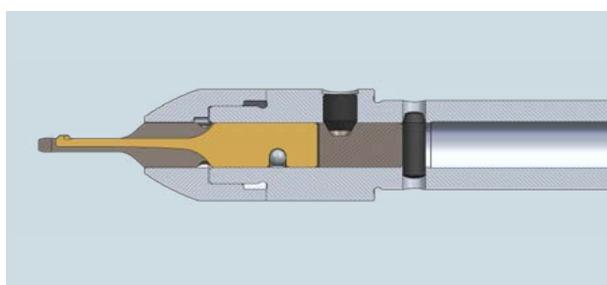
Characteristics and Advantages



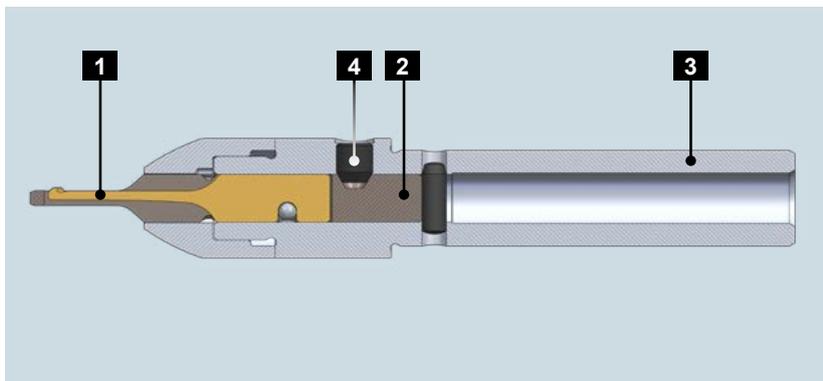
- The DL2 is designed for the machining of even and slightly uneven bore edges. It is extremely reliable in CNC-operation and ensures high efficiency and process reliability.
- Hole diameters starting from Ø1.00 mm can now be mechanically deburred.



- 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.

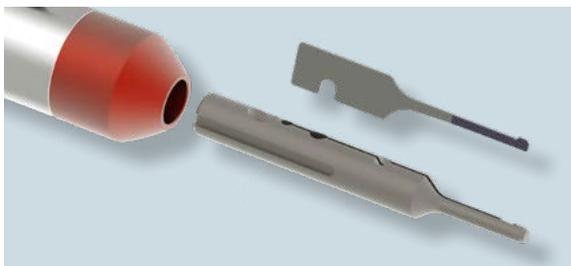


Fig. 1: The blade housing gives maximum guidance and stability to the blade.

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.

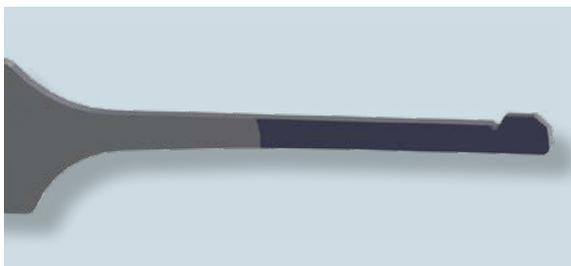


Fig. 2: The blade and the spring form a single unit. This solution allows simple handling despite the miniature dimensions.

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**.

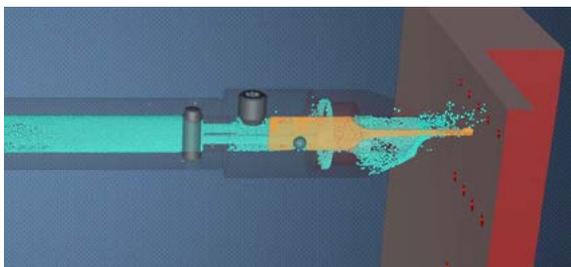
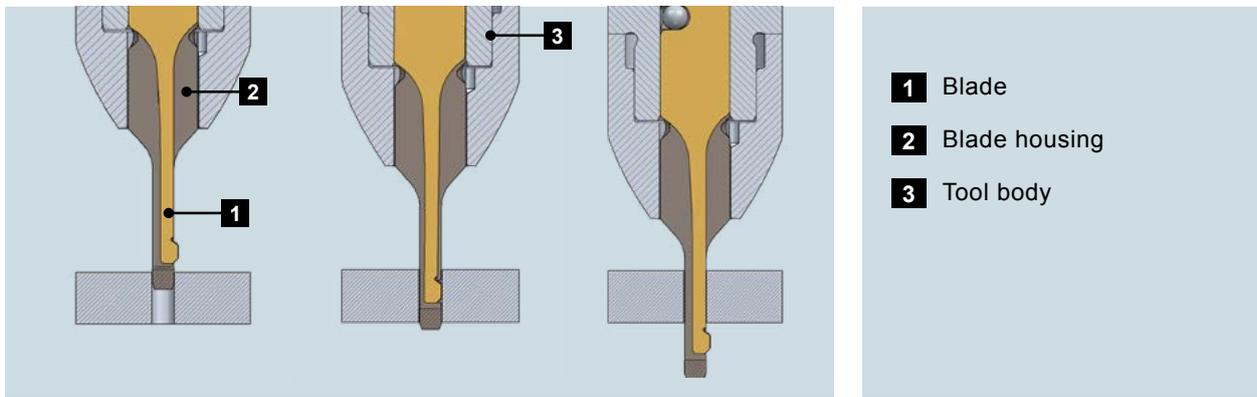


Fig. 3: With internal cooling, the carbide blade is cooled effectively in every stage of the deburring process which is important for reliable series production.

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.

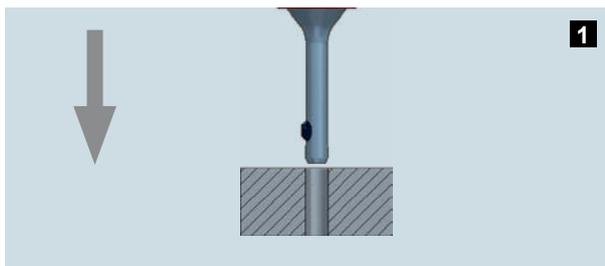
Operating principle of the DL2 tool



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

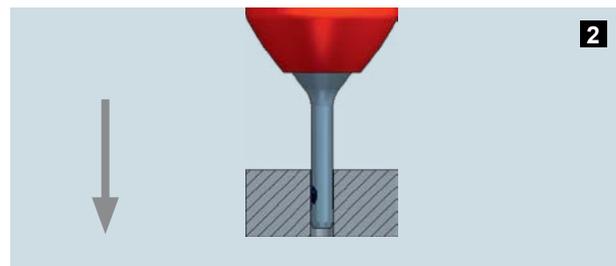
desired deburring at the work feed rate. As soon as deburring is complete, the blade retracts into the blade housing automatically. The specially designed sliding section prevents damage to the drilled holes. When exiting the hole, the spring-loaded blade automatically returns to its original position.

Process steps description



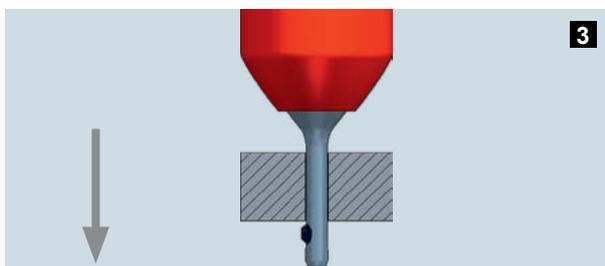
The carbide blade is aligned and retained by its own spring section and the blade housing. The blade is positioned in rapid feed above the edge of the hole.

IMPORTANT: The DL2 tool cuts counter-clockwise.

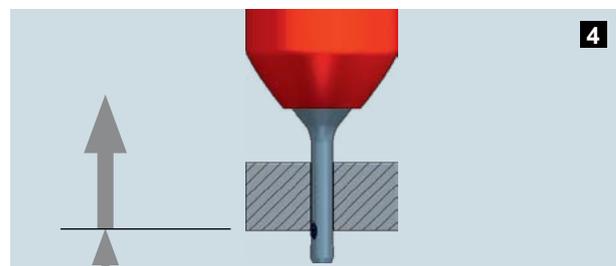


The specially ground forward and backward deburring blade deburrs the edge when moving forward. As soon as the required deburring size is reached, the blade retracts into the tool body.

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

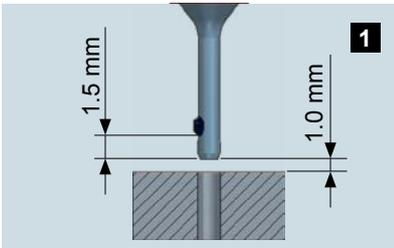


The blade passes through the hole on a specially designed sliding surface without damaging the hole. It is essential to position the tool taking into account the height of the burr on the underside of the workpiece.

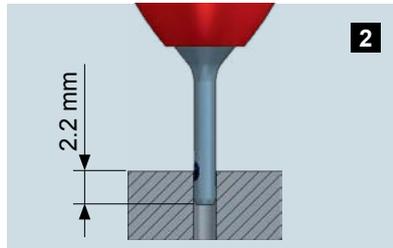


Deburring is carried out backwards in working feed, without a spindle stop or a change in the direction of rotation. Afterwards the tool can be retracted back through the hole in rapid feed to the starting position.

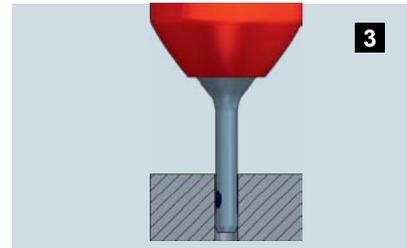
Programming information



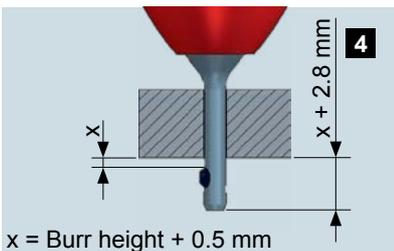
The DL2 tool must be used in **counter-clockwise rotation**. During the entire machining process, neither a change in the direction of rotation nor a stopping of the spindle is necessary. The tool cutting edge is positioned in rapid feed above the front of the hole to be deburred.



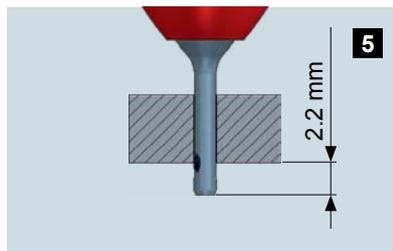
At working feed, the edge is deburred on the front edge of the hole until the blade has fully retracted.



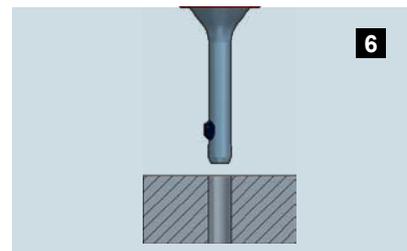
In rapid / increased feed, the tool passes through the workpiece without damaging the surface.



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.

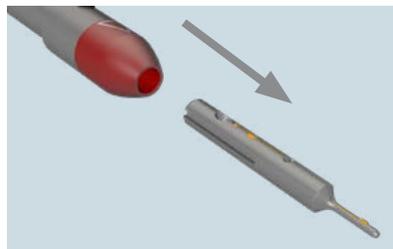


Move out of the workpiece in rapid feed and move to the next hole.

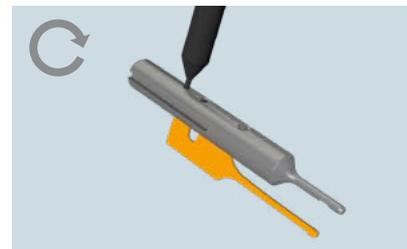
Blade change



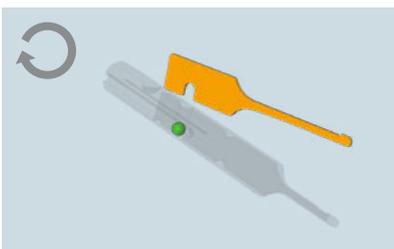
Loosen the clamping screw with the supplied Torx wrench.



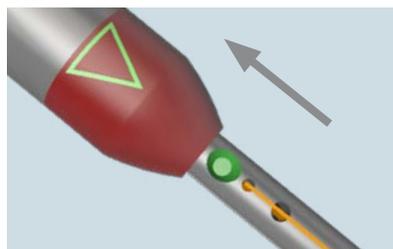
Carefully pull the blade housing out of the main body.



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 $\text{\O}1.00$ mm to $\text{\O}2.10$ mm. The deburring capacity is maximal 0.20 mm. The deburring result is directly

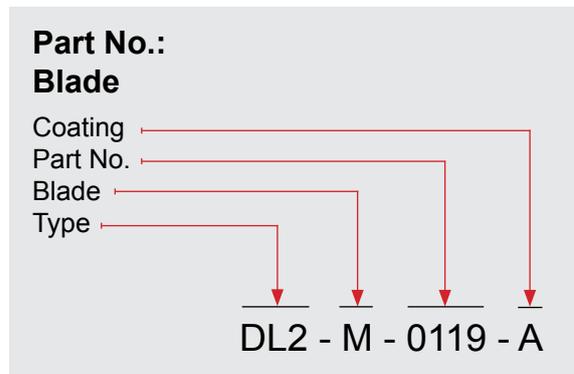
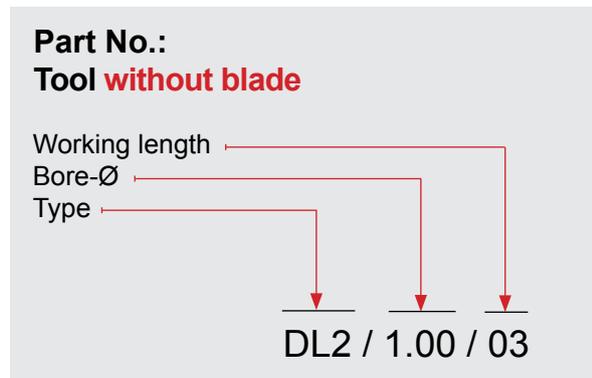
influenced by many factors, such as coolant, feed rate, clamping situation etc.



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
$\text{\O}1.00 - \text{\O}2.10$ 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.



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-Ø of 1.00 mm. Simple but reliable handling during blade change was a central focus for the developers.

Tool size

The tool size is defined by the bore-Ø. Tool-Ø and theoretical deburring-Ø are defined in the tables on the following pages. If a tool is used in a larger hole than the tool size indicates, the deburring size is reduced accordingly.

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.

Blade type

The tool is supplied without a blade as standard. The blade must be ordered separately. Customised working lengths are possible upon request. Available options are backward cutting only or a single tool offering forward and backward cutting.

Coatings

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

D: for aluminium alloys

A: steel, titanium, Inconel / for increased requirements

Order example DL2/1.60/06

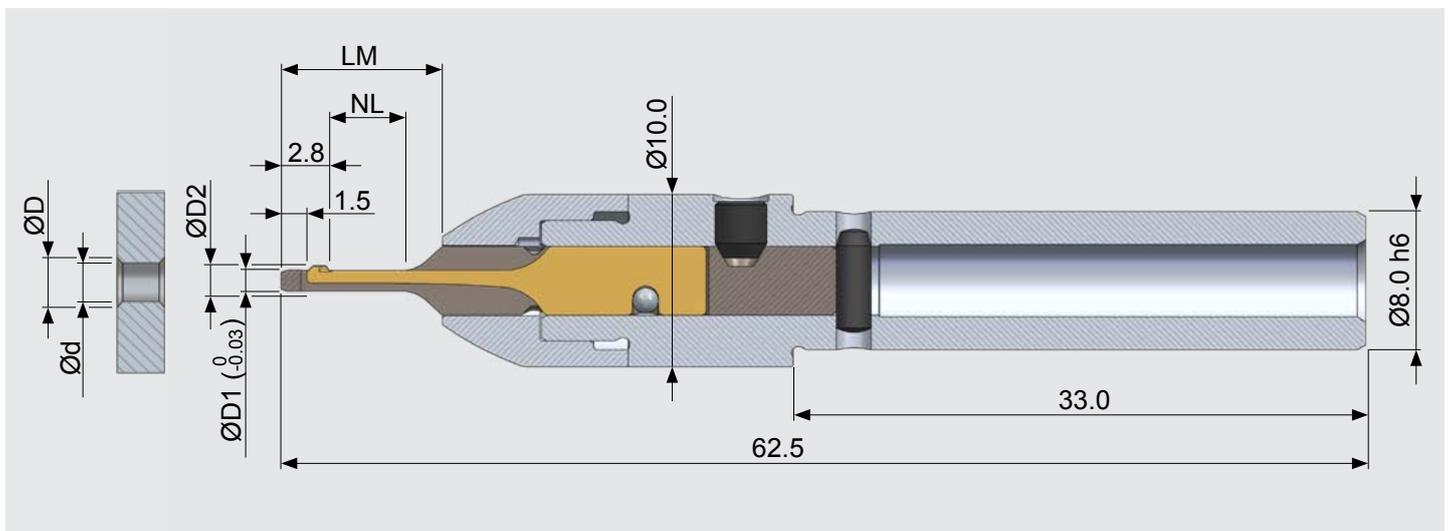
<i>Requirements:</i>	<i>Deburr bore, backward cutting only, deburred with 0.10 mm</i>
Bore-Ø:	1.60 mm
Material:	Stainless steel
<i>Selection:</i>	
Tool:	DL2/1.60/06
Blade:	DL2-M-0173-A

Recommendation

The blade should only be used for the corresponding diameter.

DL2 tool

Ø1.00 mm to Ø2.10 mm



Tool table

Bore-Ø d	Deburr-Ø max. D	Working length ¹ max. NL	Length blade housing LM	Tool-Ø D1	Max. Ø ² D2	Tool without blade
						Part No.
1.00	1.20	3.00	8.30	0.95	1.35	DL2/1.00/03*
1.05	1.25	3.00	8.30	1.00	1.40	DL2/1.05/03*
1.10	1.30	4.00	9.30	1.05	1.55	DL2/1.10/04*
1.15	1.35	4.00	9.30	1.10	1.60	DL2/1.15/04*
1.20	1.40	4.00	9.30	1.15	1.65	DL2/1.20/04*
1.25	1.45	4.00	9.30	1.20	1.70	DL2/1.25/04*
1.30	1.50	4.00	9.30	1.25	1.75	DL2/1.30/04*
1.35	1.55	4.00	9.30	1.30	1.80	DL2/1.35/04
1.40	1.60	5.00	10.30	1.35	1.85	DL2/1.40/05*
1.45	1.65	5.00	10.30	1.40	1.90	DL2/1.45/05
1.50	1.70	6.00	11.30	1.45	1.95	DL2/1.50/06*
1.55	1.75	6.00	11.30	1.50	2.00	DL2/1.55/06
1.60	1.80	6.00	11.30	1.55	2.05	DL2/1.60/06*
1.65	1.85	7.00	12.30	1.60	2.10	DL2/1.65/07
1.70	1.90	7.00	12.30	1.65	2.15	DL2/1.70/07*
1.75	1.95	8.00	13.30	1.70	2.20	DL2/1.75/08
1.80	2.00	8.00	13.30	1.75	2.25	DL2/1.80/08*
1.85	2.05	9.00	13.30	1.80	2.30	DL2/1.85/09
1.90	2.10	9.00	13.30	1.85	2.35	DL2/1.90/09*
1.95	2.15	10.00	13.30	1.90	2.40	DL2/1.95/10
2.00	2.20	10.00	13.30	1.95	2.45	DL2/2.00/10*
2.05	2.25	10.00	13.30	2.00	2.50	DL2/2.05/10
2.10	2.30	10.00	13.30	2.05	2.55	DL2/2.10/10*

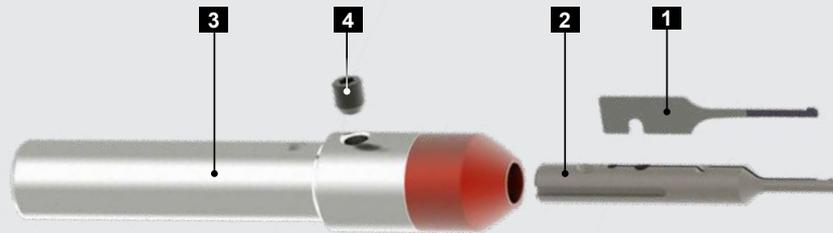
¹⁾ Customised working lengths are available upon request.

²⁾ Pay attention to interfering edges or surfaces!

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

ORDERING INFORMATION

The tools are **without blade**. The blades for the tool need to 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.

Technical Data and Settings

Cutting data DL2

Material	Condition	Tensile strength	Hardness	Cutting speed	Feed
		(N/mm ²)	HB		
Unalloyed steel		<500	<150	30-50	0.005-0.015
Cast steel		500 - 850	150 - 250	30-50	0.005-0.015
Grey cast iron		<500	<150	40-60	0.005-0.015
Ductile cast iron		300 - 800	90 - 240	30-50	0.005-0.015
Low alloy steel	annealed	<850	<250	30-50	0.005-0.015
	tempered	850 - 1000	250 - 300	25-45	0.005-0.015
	tempered	>1000 - 1200	>300 - 350	20-40	0.005-0.015
High alloy steel	annealed	<850	<250	20-40	0.005-0.015
	tempered	850 - 1100	250 - 320	15-25	0.005-0.015
Stainless steel	ferritic	450 - 650	130 - 190	20-40	0.005-0.015
	austenitic	650 - 900	190 - 270	15-30	0.005-0.015
	martensitic	500 - 700	150 - 200	15-25	0.005-0.015
Special alloy (Inconel, titanium)		<1200	<350	10-15	0.005-0.015
Wrought or cast aluminium alloys				60-80	0.005-0.015
Copper alloy	Brass			50-60	0.005-0.015
	Bronze short-chipping			40-50	0.005-0.015
	Bronze long-chipping			30-40	0.005-0.015

WARNING NOTICE

All listed cutting data are standard values only! The cutting values depend on the amount of slope of the uneven bore edge (i.e. high slope ► low cutting value). The feed also depends on the sloping ratio. In case of hard to machine materials or uneven bore edges, we recommend to apply cutting speeds that are at the lower end of the range for uneven bore edges.

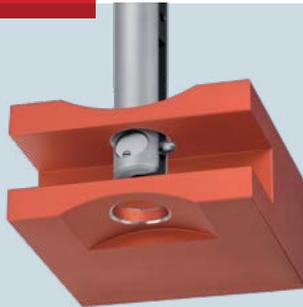


Efficient and reliable.

Our solutions reduce your production costs.

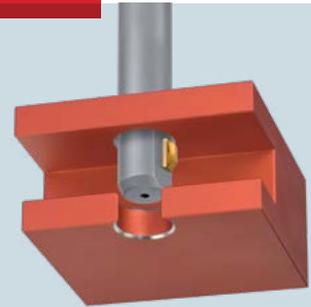
Deburring

- COFA
- DL2
- X-BORES



Chamfering

- SNAP
- DEFA



Countersinking

- BSF
- SOLO
- GH-K



Drilling

- VEX



HEULE+
PRECISION TOOLS

Headquarters: HEULE Werkzeug AG, Balgach / Switzerland, Tel. +41 71 7263838, info@heule.com, www.heule.com

Subsidiaries: HEULE Tool Corp., Loveland/OH, USA, Tel. +1 513 860 9900, info@heuletool.com, www.heuletool.com
HEULE Precision Tools (Wuxi) Co. Ltd., Wuxi / China, Tel. +86 510 8202 2404, china@heule.cn, www.heule.cn
HEULE Korea Co. Ltd., Gyeonggi-do / South Korea, Tel. +82 31 8005-8392, info@heule.co.kr, www.heule.co.kr
HEULE Germany GmbH, Wangen/Allgäu, Tel. +49 7522 99990-60, info@heule.de, www.heule.de

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