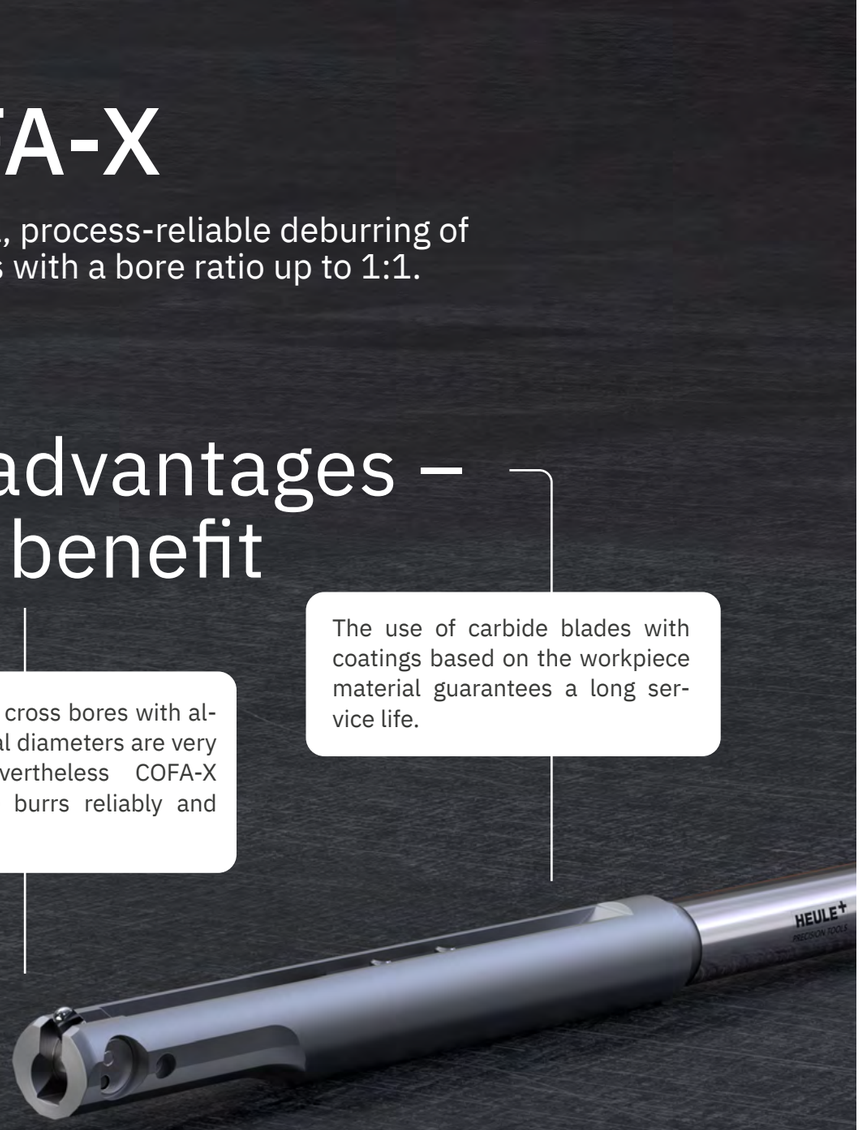
COFA-X

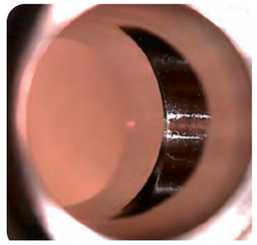
Mechanical, process-reliable deburring of cross bores with a bore ratio up to 1:1.

The advantages – Your benefit

The edges of cross bores with almost identical diameters are very uneven. Nevertheless COFA-X removes the burrs reliably and completely.

The use of carbide blades with coatings based on the workpiece material guarantees a long service life.





The defined cutting process ensures a fully broken edge. The edge is burr-free.

The simple, mechanical operating principle massively increases process reliability with regard to deburring and reduces process costs at the same time.

THE RANGE

The reliable and economical deburring of cross bores is a major challenge. COFA-X solves this problem by combining its strengths with the capabilities of a modern CNC machine. The field of application for COFA-X starts from a bore diameter of 5.0 mm.

COFA-X does not have a standardised product range. Every COFA-X tool is manufactured as part of our INDIVIDUAL range of solutions designed specifically for the application. For a quote, please send us the data and information about your application using the checklist. We will be happy to help you.

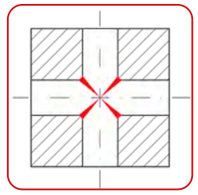
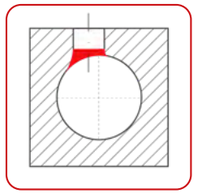
CHECKLIST FOR FEASIBILITY CHECK

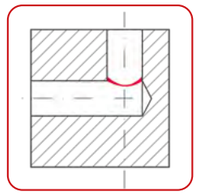
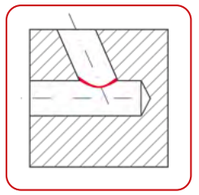
- Main bore diameter including tolerance
- Cross bore diameter including tolerance
- Bore depth
- Workpiece 3D model (STEP, DXF)

- Material
- Penetration angle
- Eccentricity
- Cycle time
- Machine (type, external cooling, compressed air)

- Production volume per year
- Current solution
- Special requirements

FIELD OF APPLICATION

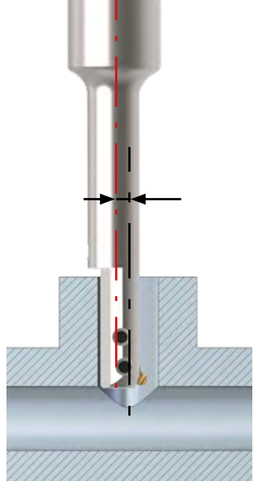



OPERATING PRINCIPLE

Tool function: COFA-X works the same way as the COFA tool system. The difference is the pre-tensioned spring and the relieved front of the tool body. The relief is necessary in order to move the blade, which can only move in one direction due to the pretension, eccentrically into the bore. Eccentricity, in turn, requires the capabilities of a CNC machine.

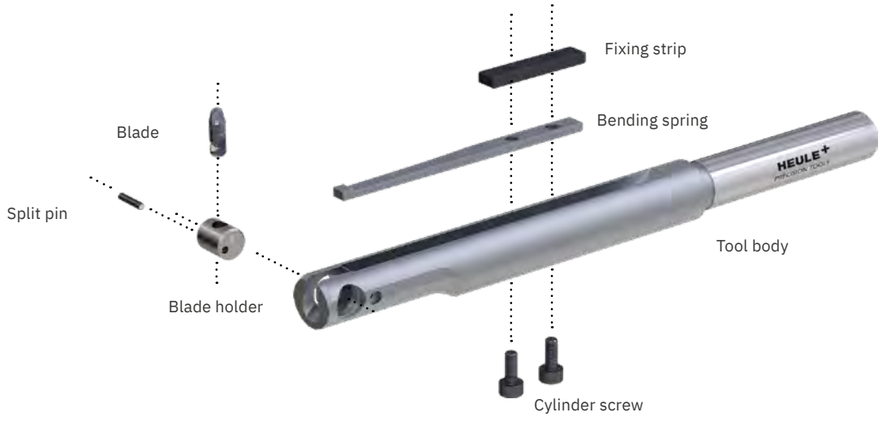
Blade function: The blades are designed either for forward or reverse machining only and are always pre-tensioned by the spring. The spring returns the blade to its neutral position. The blade position varies according to the machining direction.



Neutral position of blade for machining in reverse

Neutral position of blade for forward machining

TOOL DESIGN



COFA-X CUTTING DATA

	Description	Tensile strength RM (MPa)	Hardness (HB)	Hardn. (HRC)	Spring	Cutting speed (VC)	Working feed (FZ)
P0	Low-carbon steel, long-chipping, C <0.25%	<530	<125	–	S	20–30	0.05–0.15
P1	Low-carbon steel, short-chipping, C <0.25%	<530	<125	–	S	20–30	0.05–0.15
P2	Steel with carbon content C >0.25%	>530	<220	<25	S	20–30	0.05–0.15
P3	Alloy steel and tool steel, C >0.25%	600–850	<330	<35	S	20–30	0.05–0.15
P4	Alloy steel and tool steel, C >0.25%	850–1400	340–450	35–48	Z	10–20	0.05–0.1
P5	Ferritic, martensitic and stainless PH steel	600–900	<330	<35	Z	10–20	0.05–0.1
P6	High-strength ferritic, martensitic and PH stainless steel	900–1350	350–450	35–48	Z1	10–20	0.05–0.1
M1	Austenitic stainless steel	<600	130–200	–	Z1	20–30	0.05–0.15
M2	High-strength austenitic stainless steel	600–800	150–230	<25	Z1	10–20	0.05–0.1
M3	Duplex stainless steel	<800	135–275	<30	Z1	10–20	0.05–0.1
K1	Cast iron	125–500	120–290	<32	S	20–30	0.05–0.15
K2	Ductile cast iron with up to medium strength	<600	130–260	<28	S	20–30	0.05–0.15
K3	High-strength cast iron and bainitic cast iron	>600	180–350	<43	S	20–30	0.05–0.15
N1	Wrought aluminium alloys	–	–	–	H	20–40	0.1–0.2
N2	Aluminium alloys with low Si content	–	–	–	H	20–40	0.1–0.2
N3	Aluminium alloys with high Si content	–	–	–	H	20–40	0.1–0.2
N4	Copper, brass and zinc base	–	–	–	H	20–40	0.1–0.2
S1	Iron-based heat-resistant alloys	500–1200	160–260	25–48	Z1	10–20	0.05–0.1
S2	Cobalt-based heat-resistant alloys	1000–1450	250–450	25–48	Z1	10–20	0.05–0.1
S3	Nickel-based heat-resistant alloys	600–1700	160–450	<48	Z1	10–20	0.05–0.1
S4	Titanium and titanium alloys	900–1600	300–400	33–48	Z1	10–20	0.05–0.1

The cutting data listed are guidelines! They depend on the amount of the unevenness of the bore edges (e.g. high slope > low cutting value).
For materials that are difficult to machine or uneven bore edges, we recommend applying cutting speeds that are at the lower end of the range.

Operating instructions

> Blade change
> Spring change

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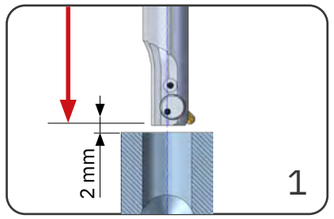
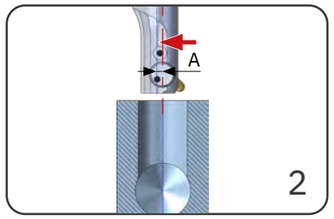
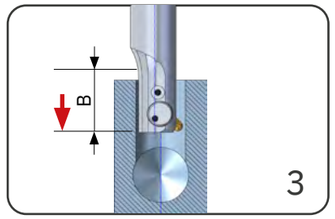
COFA-X PROCESS STEPS



- Spindle stop
- Approach by rapidly traversing with offset 0 spindle orientation[2] (=M19).



- Offset value **A** (value depends on the tool, see customer drawing)



- Rapid feed to max. **B** (value depends on the tool, see customer drawing)

Example

```
M5
G0 X0 Y0 M19
G0 Z+27.0[1]
```

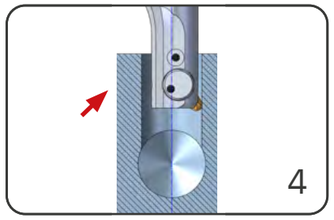
```
G0 Y+1.12
```

```
G0 Z+10.0[3]
```

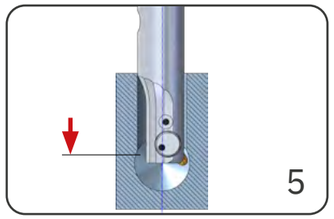
[1] 27.0=50.0/2+2.0

[2] Spindle orientation: The position of the cutting edge must be aligned in advance so that it can be moved in the offset direction.

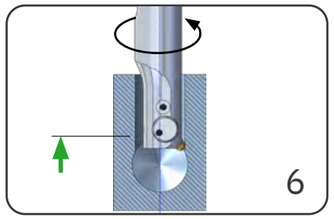
[3] 10.0=50.0/2-15.0(=B)



- Offset value 0 (centre of bore axis, bore edge is lightly touched)



- Rapid feed to the starting position



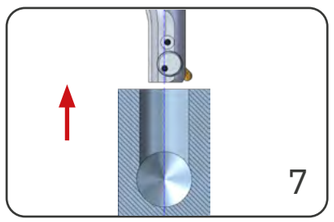
- Spindle rotation anti-clockwise
- External coolant on
- Working feed

```
G1 Y+0.0 Z+11.12
```

```
G0 Z+0.0
```

```
S800 M4
M8
G1 Z+7.0[3] F80
```

[4] 7.0=5.0+2.0

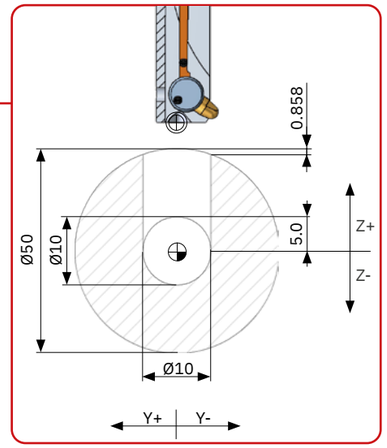


- Spindle stop!
- Rapid feed out of the workpiece

```
M5
G0 Z+27.0
```

Important:
COFA-X works in the **anti-clockwise direction**, meaning the spindle must be programmed to rotate anti-clockwise.

APPLICATION AND PROGRAMMING EXAMPLE



Application data

Material:	St50-1 (P3)
Bore Ø:	Ø10.0 mm
Workpiece:	Ø50.0 mm
Machining:	rear bore edge only

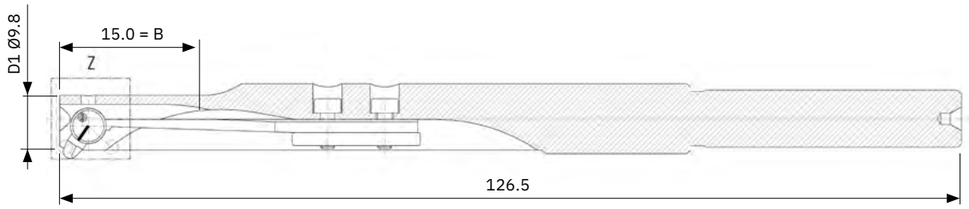
Tool and blade selection

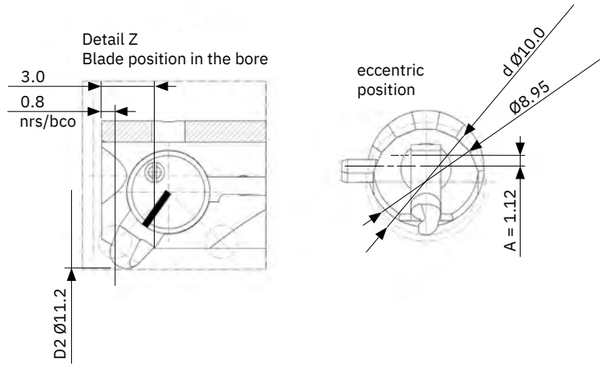
Tool:	COFA-X
Blade:	backward cutting only left-hand cutting

Cutting data

Cutting speed V_c:	20–30 m/min.
Tool working feed:	0.05–0.15 mm/rev

TOOL FOR APPLICATION EXAMPLE





Attention!
Each COFA-X is application-specific, i.e. specifically designed for the individual deburring task. When programming, do not use the values from the programming/tool example above, but use the values from your own tool drawing.

COFA-X

COFA-X FAQ

Question	Causes	Remedy
No or incomplete deburring	Incorrect direction of rotation – standard COFA-X blades are left-hand cutting (M4)	Observe direction of rotation and correct to left-hand cutting (M4)
	Bore diameter too large	Drill bore according to specifications – COFA-X requires a bore tolerance of +0.1/0.
	Bending spring too soft	Install a harder bending spring if the tool concept permits (modular)
	Blade worn, worn out	Change blade
	Cutting speed too high	Reduce cutting speed
	Working feed rate too high	Reduce working feed rate
	Incorrect starting position for deburring	Check traverse ranges
	Burr height	Reduce the burr height by drilling until burr-free or reduce the service life of the drill
Vibration, chatter marks	Cutting speed too high	Reduce cutting speed
	Working feed rate too high	Reduce working feed rate
Deburring too small	Burr height	Reduce the burr height by drilling until burr-free or reduce the service life of the drill
	Bending spring too soft	Install a harder bending spring if the tool concept permits (modular)
	Cutting parameters too high	Reduce the cutting parameters according to the specifications or carry out the deburring process twice
Deburring too large	Bending spring too hard	Install a softer bending spring if the tool concept allows it (modular)
Secondary burr	Bending spring too hard	Install a softer bending spring if the tool concept allows it (modular)
Short service life	Poorly clamped workpiece or tool (vibration)	Ensure that workpiece and tool are more firmly clamped
	Burr height	Reduce the burr height by drilling without burrs or reduce the service life of the drill
Blade or spring breakage	Tool and blade incorrectly positioned in the tool holder	Mount the tool correctly in the tool holder (Weldon)

Question	Causes	Remedy
Blade or spring breakage (continued)	Blade coordinates programmed incorrectly – blade orientation does not match the machining edge	Correct the programming, check traverse ranges
	Cutting parameters too high	Reduce cutting parameters according to specifications
Converting standard COFA to COFA-X	Conversion not possible	The standard COFA is designed for the bore diameter and therefore does not allow an offset value.
Inserting a standard COFA blade into a COFA-X tool	Standard COFA blades do not work in a COFA-X.	Standard COFA cutting geometry does not match the preloaded position of the blade (30° blade, left-hand cutting)
Possible use of COFA-X in a standard lathe	Spindle orientation (tool blade orientated to the alignment of the X-axis) and eccentric entry into the bore required	COFA-X requires the application-specific blade to be aligned with the bore edge as well as an offset in the X-axis for entry or exit - similar to a turning tool for the undercut