# SOLO

The counterboring and spotfacing tool for any machine. Forwards and backwards. Interrupted cutting possible.

## The advantages – Your benefit

SOLO enables automatic spotfacing and counterboring on both the front and back of the bore without turning the workpiece.

Versatile use thanks to modular design: The control unit and shank are standard, while the blade housing, blade control and blade are customised to the customer's application.


The optimum processing result with maximum cost-effectiveness is guaranteed.

SOLO achieves maximum process reliability and performance thanks to its design optimised for the customer's specific application and its reliability-oriented, simple construction.



## THE RANGE

| **Bore Ø range** mm | **Counterbore Ø max.** mm | **Workpiece material** | **Series** |
|---|---|---|---|
| Ø6.0–Ø25.0 | ≈ 1.9 x bore Ø | Aluminium | SOLO |
| Ø6.0–Ø25.0 | ≈ 1.9 x bore Ø | Steel, titanium, Inconel | SOLO2 |
| Ø25.0–Ø 45.0 | ≈ 1.9 x bore Ø | | SOLO25 |

SOLO does not have a standardised product range. Each SOLO tool is designed specifically for the application as part of our INDIVIDUAL range, with one of the three control unit types being used in each case.

Is SOLO an option for you? **We would be happy to examine the feasibility** of SOLO in your application and give you a quote so that you can assess the economic viability. Please send us full application information.

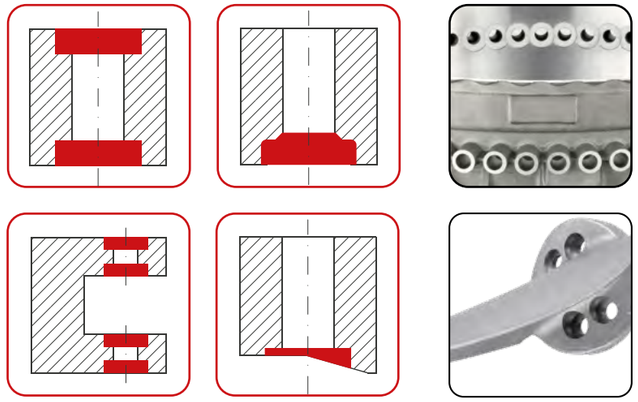
## CHECKLIST FOR FEASIBILITY CHECK

- Bore Ø including tolerance
- Counterbore Ø or chamfer Ø with tolerance
- Bore depth
- Counterbore depth + form and position tolerances if necessary
- Chamfer angle with tolerance
- Workpiece 3D model (STEP, DXF)

- Material
- Interfering edges / distances
- Machine (type, internal coolant, external coolant, compressed air)
- Shank type

- Production volume per year
- Batch size
- Current solution
- Special requirements

## FIELD OF APPLICATION



# OPERATING PRINCIPLE

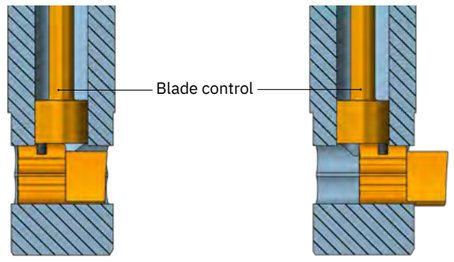
Two versions of the SOLO have been developed to fulfil the requirements of different workpiece materials requiring different cutting speeds. These are SOLO and SOLO2. The two tool systems are visually identical, have however a distinct internal configuration difference.

Centrifugal force caused by rotation of the tool causes two guided weights inside the control unit to slide outwards. The linear motion of the sliding weights is converted into rotary motion with a rack and pinion systems. the pinion is mounted onto the end of the blade control shaft, which rotate as the weights slide back and forth. this rotary motion of the blade control shaft is utilised to either extend or retract the blade.

The distance travelled by the weights is exactly calculated to cause the blade control shaft to rotate by 180°. The centrifugal/outward movement of the weights therefore causes the blade to extend with the SOLO and to rectract with the SOLO2.

**SOLO – higher cutting speed requirements – the blade is *retracted* when the spindle is stopped.**
The blade is extended to working position when the spindle rotation speed exceeds 1900 rpm. The blade is retracted back into the blade housing by stopping the spindle.

**SOLO2 – lower cutting speed requirements – the blade is *extended* when the spindle is stopped.**
The blade remains in its extended working position up to a spindle speed of 1500 rpm. To retract the blade for entry into or exit from the bore, the spindle speed is increased to above 1900 rpm.




Blade housing with retracted blade

Blade housing with extended blade. The rotary motion of the pinion causes the blade control to extend or retract the blade.

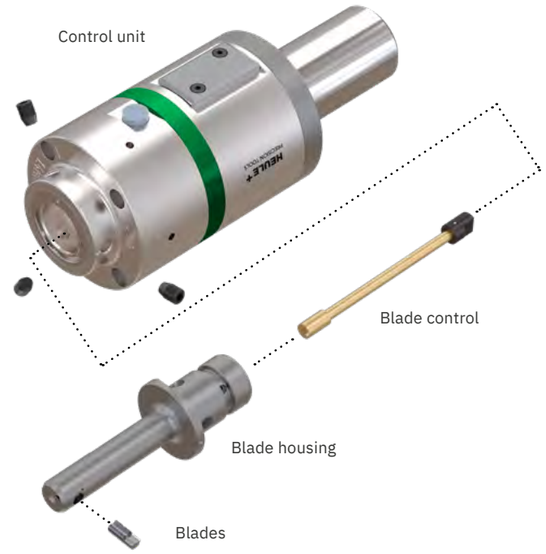
# OVERVIEW DISTINGUISHING FEATURES

| | SOLO | SOLO2 | SOLO25 |
|---|---|---|---|
| Colour of centre ring | black | green | no colour |
| Blade position when spindle stops | retracted | extended | extended |
| Extension speed | 1900 rpm | 0 = spindle stop | 0 = spindle stop |
| Retraction speed | 0 = spindle stop | 1900 rpm | 2200 rpm |
| Machining speed | > 1900 rpm | 0–1500 rpm | 0–1500 rpm |





# TOOL DESIGN




SOLO is characterised by its simplicity and user-friendliness. The blade can be replaced in the machine by hand.

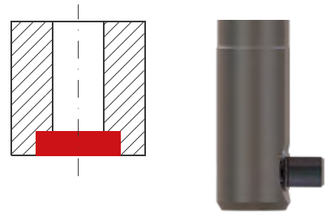
Resistant to dirt and chips: The radially extending and retracting blade is guided through the blade housing, ensuring high process reliability. This prevents chips from becoming trapped.

The components that are subject to wear are very easy to replace during routine maintenance.

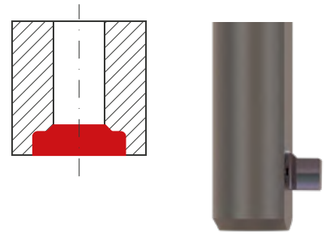
## Blades

The design of the blade and the blade housing are customised for the specific application.

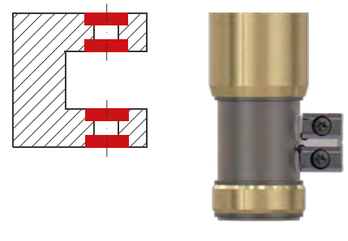
The use of bronze guide bushings is recommended for applications with high radial forces during machining, such as when cutting radiuses, chamfers, or when the cut is interrupted. Guide bushings can also be useful to reduce any marking on the surface of the bore caused by the blade housing, especially when machining softer materials.



Blade for back spotfacing



Blade for back counterboring



Bronze guide bushing

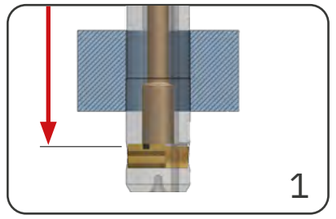
Blade holder with inserts for front and back spotfacing

## Operating instructions

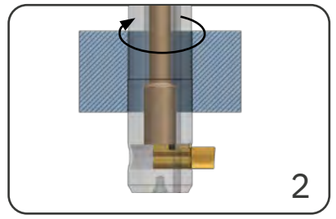
> Blade change
> Changing the control bolt
> Maintenance manual

heule.com > Service > Media & download centre

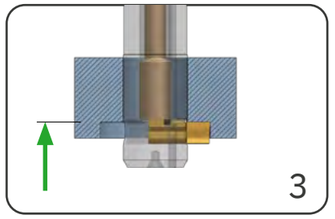
# SOLO PROCESS STEPS




- Spindle stop! Blade is retracted
- Rapid feed through the work-piece




- Spindle rotation clockwise
- Spindle speed (>1900 rpm) – Blade extends
- Dwell time min. 1 sec.
- External/internal coolant on

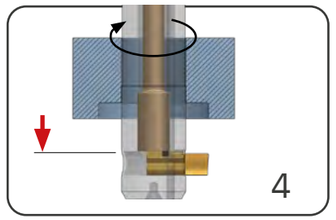



- Working feed to counterbore depth

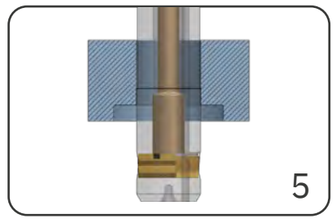
| Example | | | |
|---|---|---|---|
| | M5<br>G0 Z-32.0[1)] | S2729 M3<br>G4 X2<br>M8 (M88) | G1 Z-22.0[2)] F136 |

[1)] 32.0=30.0+2.0 (safety)

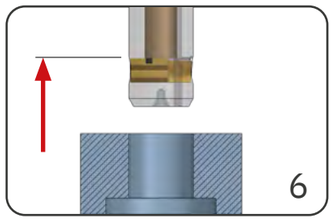
[2)] 22.0=30.0-8.0




- Rapid feed out of the workpiece
- External/internal coolant off




- Spindle stop! Blade retracts
- Dwell time at least 1 sec.




- Rapid feed out of the workpiece

| | | |
|---|---|---|
| G0 Z-32.0[3)]<br>M9 (M89) | M5<br>G4 X2 | G0 Z+13.3[4)] |

[3)] 32.0=30.0+2.0 (safety)

[4)] 13.3=11.3+2.0 (safety)

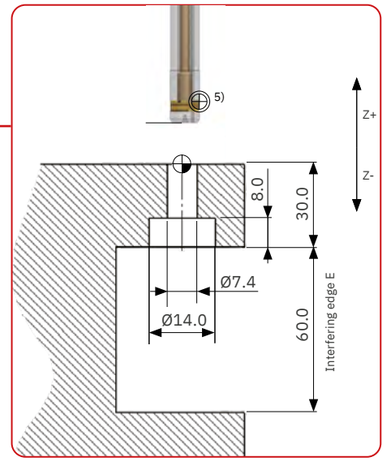
**Note for commissioning the SOLO after extended idle period**

A manual function check must be carried out after the tool has been idle for an extended period. Non-use can lead to the coolant and dirt drying out and the blade and blade control sticking together. This adhesive effect can lead to malfunction. To free them, the blade control and blade must be manipulated manually on the tool before it is put back into operation.





# APPLICATION AND PROGRAMMING EXAMPLE




**Cylindrical counterbore on the back of the bore**

**Application data**

| | |
|---|---|
| Material: | Aluminium |
| Counterbore Ø: | 14.0 mm |
| Counterbore depth: | 8.0 mm |
| Bore Ø: | 7.4 mm |

**Tool and blade selection**

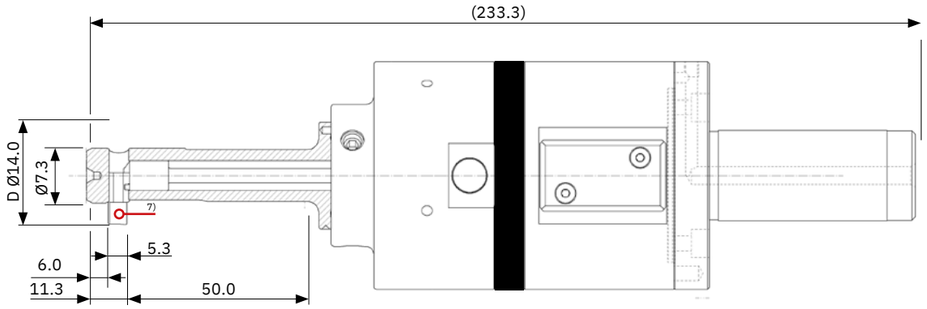
| | |
|---|---|
| Tool: | see below |
| Blade: | backward cutting only |

**Cutting data**

| | |
|---|---|
| Cutting speed Vc: | 120 m/min. |
| Working feed fz: | 0.05 mm/rev |

[5)] We recommend programming the zero point of the tool to the cutting edge of the blade.

# TOOL FOR APPLICATION [6)]




[6)] All SOLO tools are customised. The dimensions of this tool must not be used to program your own application. The applicable values can be found in your own tool drawing.

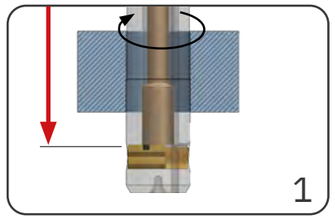
[7)] Attention: Blade position when spindle stops is RETRACTED. Minimum spindle speed for machining is >1900 rpm, as the activation speed is 1900 rpm.

# COUNTERBORING TOLERANCE

| | | |
|---|---|---|
| Tolérance du Ø de perçage en mm | +0.1<br>0 | +0.2<br>0 |
| Tolérance du Ø de lamage en mm | ±0.2 | ±0.3 |

Please note the recommended value for the tolerance of the bore diameter. The larger the tolerance, the more the quality can be affected (damage to the bore, pressing, counterbore diameter becomes smaller).

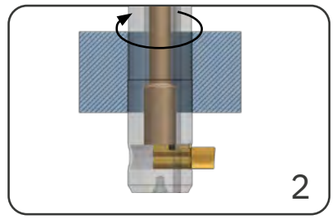
# PROCESS STEPS SOLO2 / SOLO25




- Activation speed (>1900 rpm) – Blade retracts
- Dwell time min. 1 sec.
- Rapid feed through the workpiece

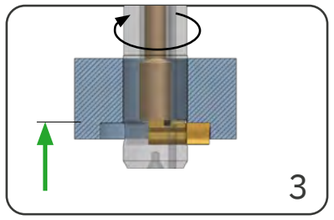
Example
S1900 M3
G4 X2
G0 Z-32.0[1)]

[1)] 32.0=30.0+2.0 (safety)




- Spindle stop! Blade extends
- Dwell time min. 1 sec.
- External/internal coolant on
- Spindle speed (max. 1500 rpm)

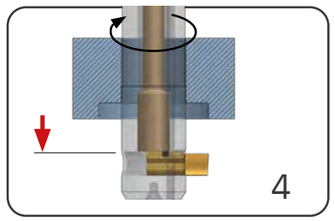
M5 G4 X2
M8 (M88)
S227 M3




- Working feed to counterbore depth

G1 Z-22.0[2)] F7

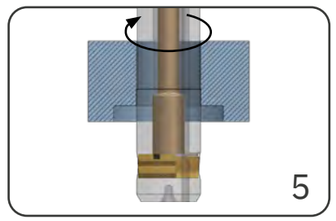
[2)] 22.0=30.0-8.0




- Rapid feed out of the workpiece
- Spindle stop! Blade remains extended
- External/internal coolant off

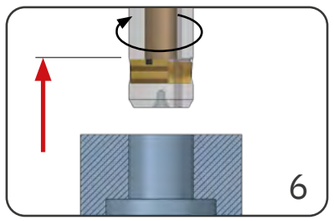
G0 Z-32.0[3)]
M5
M9 (M89)

[3)] 32.0=30.0+2.0 (safety)




- Activation speed (>1900 rpm) – Blade retracts
- Dwell time min. 1 sec.

S1900 M3
G4 X2




- Rapid feed out of the workpiece

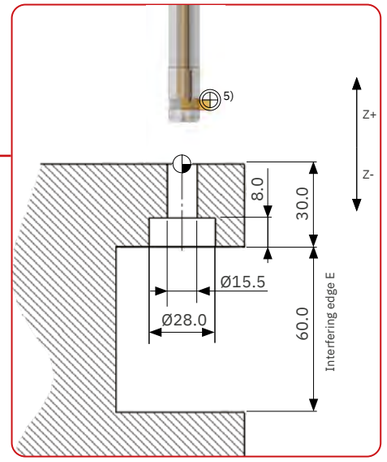
G0 Z+13.3[4)]

[4)] 13.3=11.3+2.0 (safety)

**Note for commissioning the SOLO after extended idle period**

A manual function check must be carried out after the tool has been idle for an extended period. Non-use can lead to the coolant and dirt drying out and the blade and blade control sticking together. This adhesive effect can lead to malfunction. To free them, the blade control and blade must be manipulated manually on the tool before it is put back into operation.

# APPLICATION AND PROGRAMMING EXAMPLE




**Cylindrical counterbore on the back of the bore**

**Application data**

| | |
|---|---|
| Material: | X5CrNi1810 |
| Counterbore diameter: | 28.0 mm |
| Counterbore depth: | 8.0 mm |
| Bore diameter: | 15.5 mm |

**Tool and blade selection**

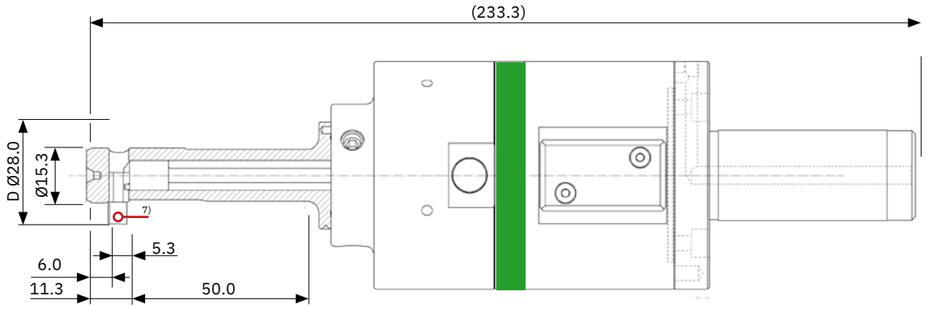
Tool: see below
Blade: backward cutting only

**Cutting data**

| | |
|---|---|
| Cutting speed Vc: | 20 m/min. |
| Working feed fz: | 0.03 mm/rev |

[5)] We recommend programming the zero point of the tool to the cutting edge of the blade.

# TOOL FOR APPLICATION [6)]




[6)] All SOLO tools are customised. The dimensions of this tool must not be used to program your own application. The applicable values can only be found in your own tool drawing.

[7)] Blade EXTENDED at standstill. Max. machining speed 1500 rpm, as the retraction speed is 1900 rpm.

# COUNTERBORING TOLERANCE

| | | |
|---|---|---|
| Tolérance du Ø de perçage en mm | +0.1<br>0 | +0.2<br>0 |
| Tolérance du Ø de lamage en mm | ±0.2 | ±0.3 |

Please note the recommended value for the tolerance of the bore diameter. The larger the tolerance, the more the quality can be affected (damage to the bore, pressing, counterbore diameter becomes smaller).

# CUTTING DATA SOLO / SOLO2 / SOLO25

| | Description | Tensile str. RM (MPa)* | Hardness (HB) | Hardn. (HRC) | Cutting speed (Vc) | Working feed (fz) |
|---|---|---|---|---|---|---|
| P0 | Low-carbon steel, long-chipping, C <0.25% | <530 | <125 | – | 50–90 | 0.03–0.1 |
| P1 | Low-carbon steel, short-chipping, C <0.25% | <530 | <125 | – | 50–90 | 0.03–0.1 |
| P2 | Steel with carbon content C >0.25% | >530 | <220 | <25 | 50–90 | 0.03–0.1 |
| P3 | Alloy steel and tool steel, C >0.25% | 600–850 | <330 | <35 | 50–90 | 0.03–0.08 |
| P4 | Alloy steel and tool steel, C >0.25% | 850–1400 | 340–450 | 35–48 | 30–50 | 0.02–0.05 |
| P5 | Ferritic, martensitic and stainless PH steel | 600–900 | <330 | <35 | 40–80 | 0.03–0.08 |
| P6 | High-strength ferritic, martensitic and PH stainless steel | 900–1350 | 350–450 | 35–48 | 30–50 | 0.02–0.05 |
| M1 | Austenitic stainless steel | <600 | 130–200 | – | 30–50 | 0.03–0.08 |
| M2 | High-strength austenitic stainless steel | 600–800 | 150–230 | <25 | 15–25 | 0.02–0.05 |
| M3 | Duplex stainless steel | <800 | 135–275 | <30 | 30–50 | 0.02–0.05 |
| K1 | Cast iron | 125–500 | 120–290 | <32 | 50–110 | 0.03–0.1 |
| K2 | Ductile cast iron with up to medium strength | <600 | 130–260 | <28 | 50–90 | 0.03–0.08 |
| K3 | High-strength cast iron and bainitic cast iron | >600 | 180–350 | <43 | 50–90 | 0.03–0.08 |
| N1 | Wrought aluminium alloys | – | – | – | 100–200 | 0.03–0.12 |
| N2 | Aluminium alloys with low Si content | – | – | – | 100–200 | 0.03–0.12 |
| N3 | Aluminium alloys with high Si content | – | – | – | 100–200 | 0.03–0.12 |
| N4 | Copper, brass and zinc base | – | – | – | 50–90 | 0.03–0.08 |
| S1 | Iron-based heat-resistant alloys | 500–1200 | 160–260 | 25–48 | 15–25 | 0.02–0.05 |
| S2 | Cobalt-based heat-resistant alloys | 1000–1450 | 250–450 | 25–48 | 15–25 | 0.02–0.05 |
| S3 | Nickel-based heat-resistant alloys | 600–1700 | 160–450 | <48 | 15–25 | 0.02–0.05 |
| S4 | Titanium and titanium alloys | 900–1600 | 300–400 | 33–48 | 15–25 | 0.02–0.05 |

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





# MAINTENANCE INTERVAL / SERVICES

**Periodic maintenance interval after 18 months or 200,000 cycles**

Any service or maintenance which requires the removal of sealed screws may only be carried out by personnel certified or authorised by HEULE Werkzeug AG.

HEULE Werkzeug AG offers technical support and services for all products.

Professional maintenance and timely service cycles guarantee process reliability.

# MANDATORY MAINTENANCE / SAFETY

Maintenance is mandatory once the maintenance interval has been reached. In addition to the work that must be carried out by persons authorised by HEULE, the following three processes can be carried out independently by the customer:

- Blade change
- Replacing the blade control
- Replacing the blade housing

**IMPORTANT**: The control unit may only be opened by certified and authorised personnel.
HEULE Werkzeug AG accepts no liability if it has been opened by unauthorised persons.

**SAFETY NOTE**

If these guidelines are not adhered to, there is **considerable risk of injury** during operation of the tool.