

Tool solutions for bent wire parts



Services

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Chapter 1 - Introduction to wire bending with WAFIOS bending tools

Definition of wire tensile strength

Soft wire

■ $R_m \leq 600 \text{ N/mm}^2$

Wire with higher tensile strength

■ $R_m 600 - 1,000 \text{ N/mm}^2$ (e.g. stainless steel)

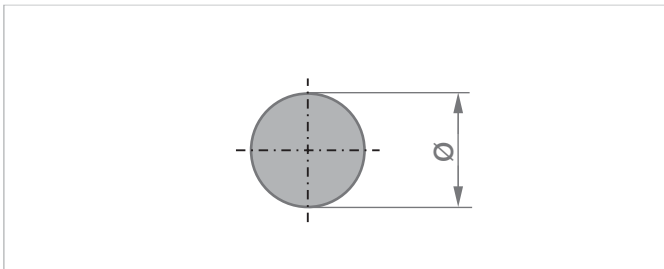
Spring steel wire

■ $R_m \geq 1,000 \text{ N/mm}^2$

Definition of bending parameters

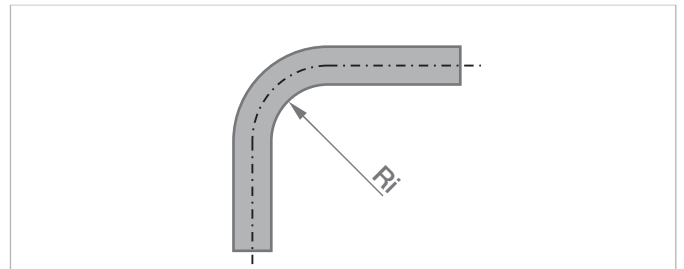
Wire diameter

■ \varnothing alternative D



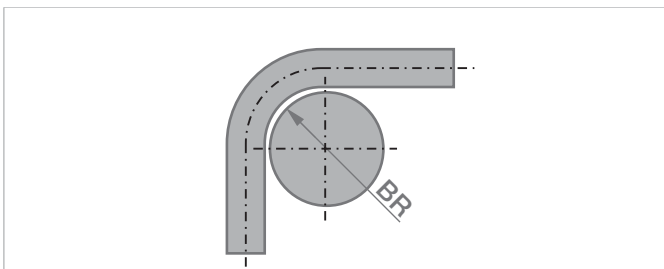
Bending radius of bent part

■ R_i (inner radius)



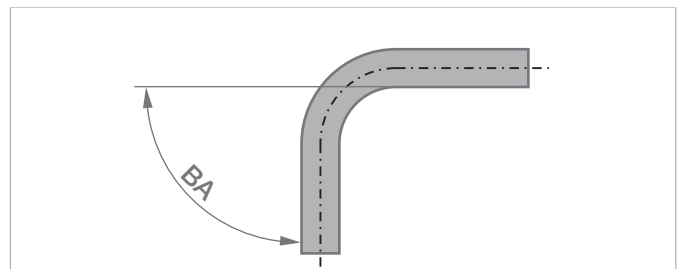
Bending radius of bending tool

■ BR (inner radius)



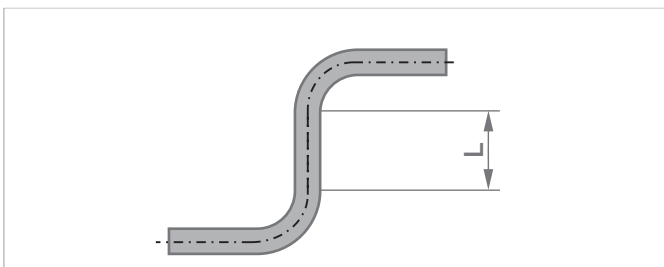
Bending angle

■ BA bending angle



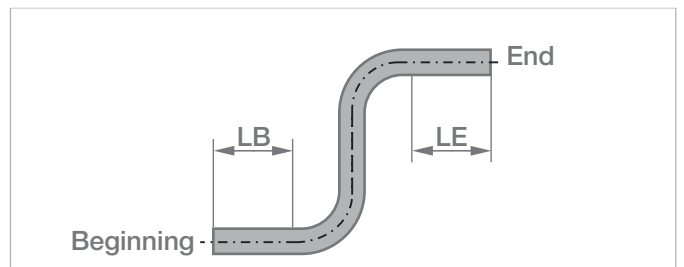
Length

■ Straight length between two bends



Start and end length

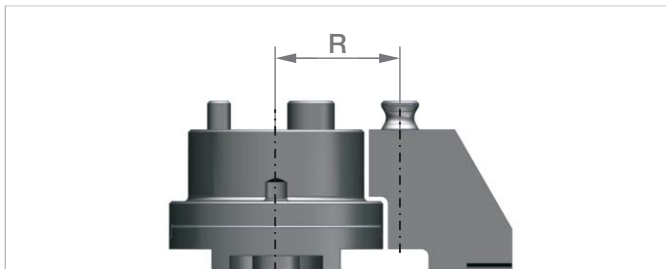
■ Straight length at beginning and/or end of a bent part



Glossary of WAFIOS-specific terms

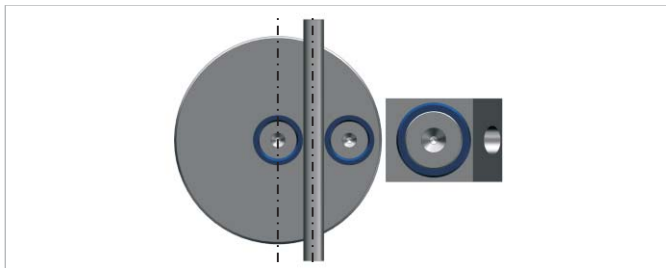
Protruding radius

- R protruding radius (subject to bending pin holder)



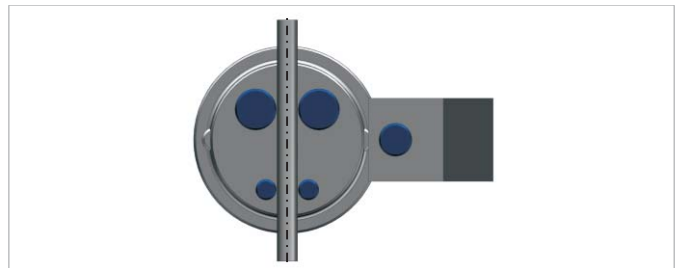
Type 3 bending tool

- Out-of-center bending (B axis required)



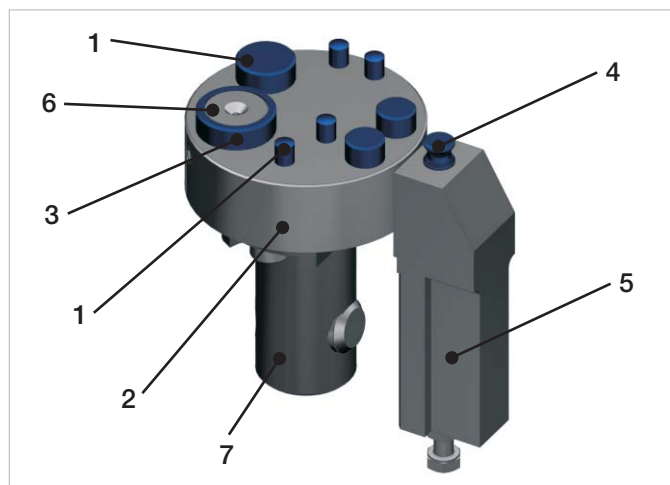
Type 5 bending tool

- Over-center bending (no B axis required)



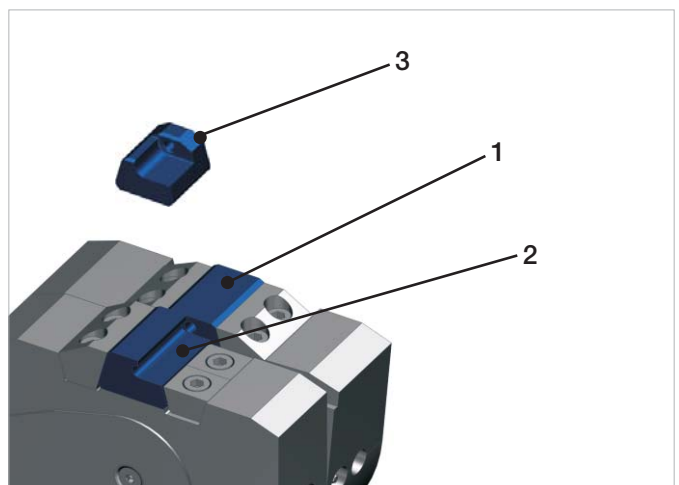
Glossary of selected bending tool components

- 1 Bending mandrel
- 2 Bending mandrel holder
- 3 Bending roller
- 4 Bending pin
- 5 Bending pin holder
- 6 Roller bolt
- 7 Tool support



Glossary of selected work tool components

- 1 Counter cutting tool
- 2 Cutting tool
- 3 Cutting tool with hole (for short end lengths)



Chapter 2 - Standard bending tool basics

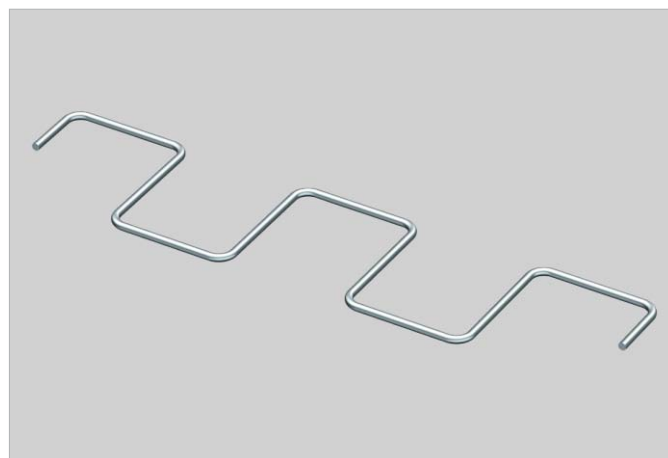
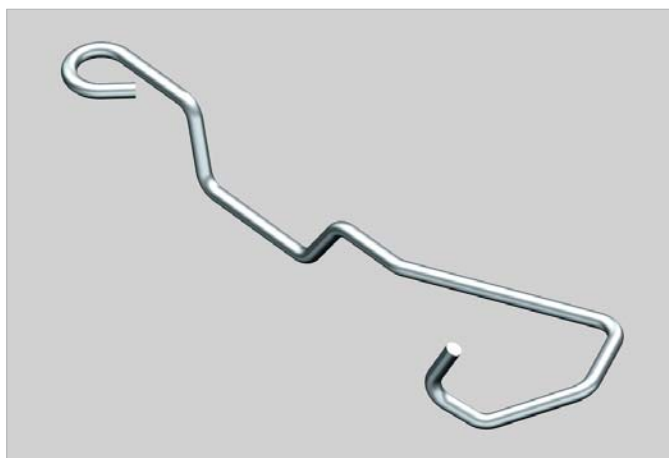
Type 5 - Standard-4-pin bending tool



Type 5 - Standard-4-pin bending tool

- With two bending radii ($BR=0.5xD$ and $BR=D$)
- Simple structure
- Bending mandrels made of carbide
- Bending mandrels are exchangeable
- Right/left bending
- Combination with a second bending pin holder is possible, increased speed

Bent parts



Very well suited for ...

- 180° bends
- Soft wire ($R_m \leq 600N/mm^2$). Smallest $BR=0.5xD$
- Loops
- Right/left bending
- Up to two bending radii

Limited suitability for ...

- Coiling operations (alternative: roller bending tool, see p.8)
- Stainless steel wire and spring steel wire. BR subject to tensile strength. (Alternative: 4-pin bending tool with bending mandrels in accordance with tensile strength, or milled bending tool, see p.7). When processing stainless steel, we recommend coated bending pins
- Very short ($L < 1.5xD$) lengths (alternative: milled bending tool, see p.7)
- Wire display items (alternative: 4-pin bending tool with bending roller, see p.5 or roller bending tool, see p.8)

Type 5 - 4-pin bending tool with bending roller



Type 5 - 4-pin bending tool with bending roller

- With two bending radii ($BR=0.5xD$ and $BR=D$)
- Simple structure
- Bending mandrels made of carbide
- Bending mandrels and bending roller are exchangeable
- Right/left bending
- Combination with a second bending pin holder is possible, increased speed
- Bending pin holder with bending roller for bending wire display items or bent parts with high demands on surface quality

Bent parts



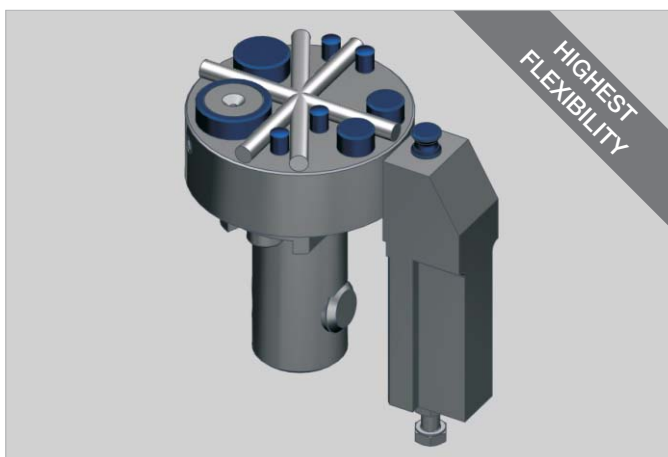
Very well suited for ...

- Stainless steel wire ($BR \geq 1xD$)
- Bent parts with high demands on surface quality
- 180° bends
- Soft wire ($R_m \leq 600N/mm^2$). Smallest $BR=0.5xD$
- Loops
- Right/left bending
- Up to two bending radii

Limited suitability for ...

- Wire display items with very high demands on surface quality as well as flatness (alternative: roller bending tool, see p.8)
- Coiling operations (alternative: roller bending tool, see p.8)
- Spring steel wire. Bending radii subject to tensile strength. (Alternative: 4-pin bending tool with bending mandrels in accordance with tensile strength, or milled bending tool, see p.7)
- Short start and intermediate lengths (alternative: milled bending tool, see p.7)

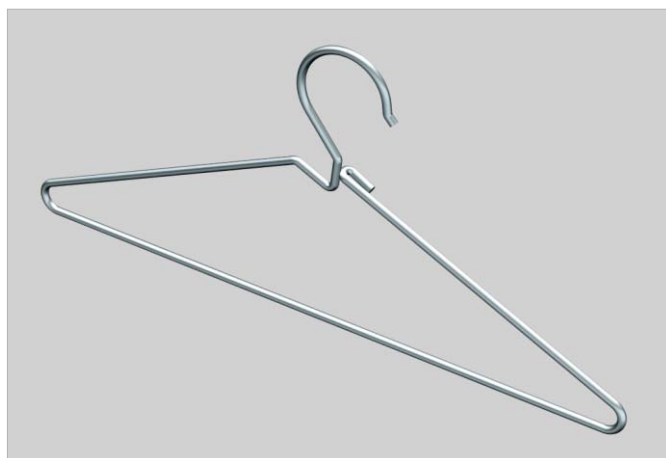
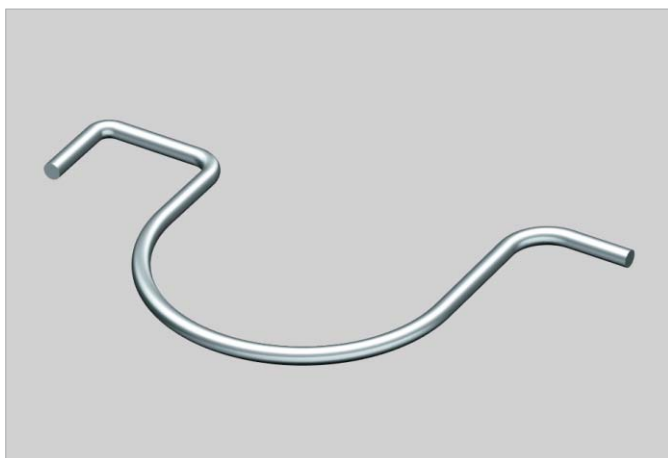
Type 5 - Standard multi-radii bending tool



Type 5 - Standard multi-radii bending tool

- With four bending radii (BR=0.5xD; BR=D; BR=1.5xD; BR=2xD)
- Force-fitted bending mandrels and bending roller
- Bending mandrels and bending roller are exchangeable
- Right/left bending

Bent parts



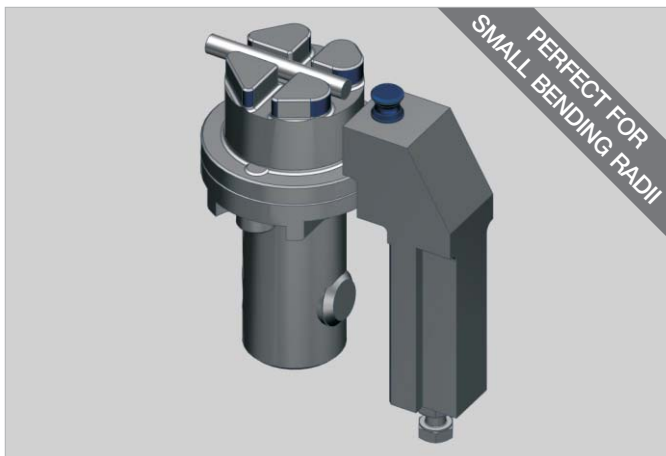
Very well suited for ...

- Simple coiling operations
- 180° bends
- Soft wire ($R_m \leq 600 \text{ N/mm}^2$)
- Loops
- Right/left bending
- Up to two bending radii

Limited suitability for ...

- Complex coiling operations (alternative: roller bending tool, see p.8)
- Spring steel wire. Bending radii subject to tensile strength (alternative: milled bending tool, see p.7)
- Stainless steel wire (BR $\geq 1 \times D$)
- Very short ($L < 1.5 \times D$) lengths (alternative: milled bending tool, see p.7)
- Wire display items with very high demands (alternative: roller bending tool, see p.8)

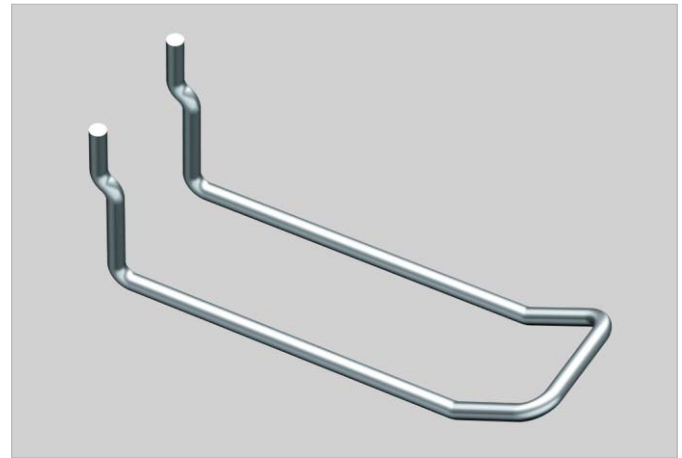
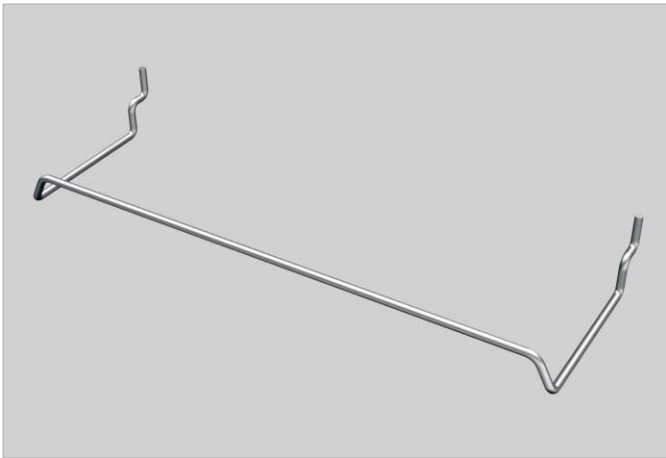
Type 5 - Milled bending tool



Type 5 - Milled bending tool

- With up to eight different bending radii
- Bending radii smaller than $0.5xD$ are possible
- Bending mandrel holder milled from one piece
- Right/left bending

Bent parts



Very well suited for ...

- Very small bending radii
- Spring steel wire
- Right/left bending
- Up to two bending radii
- Very short lengths between bends

Limited suitability for ...

- Large bending angles $BA > \sim 100^\circ$. BA~BR (alternative: 4-pin or multi-radii bending tool, see p.4 or p.6)
- Wire display items (alternative: milled bending tool with bending pin holder and bending roller or roller bending tool, see p.8)
- More than four bending radii (alternative: milled special tool, our Tool Center team will gladly advise you)

Not suitable for ...

- Very large bending angles $BA > 120^\circ$. BA~BR (alternative: milled, tear-shaped bending tool, see p.11, 4-pin or multi-radii bending tool, see p.4 or p.6)
- Loops (alternative: 4-pin or multi-radii bending tool, see p.4 or p.6)
- Coiling operations (alternative: roller bending tool, see p.8)

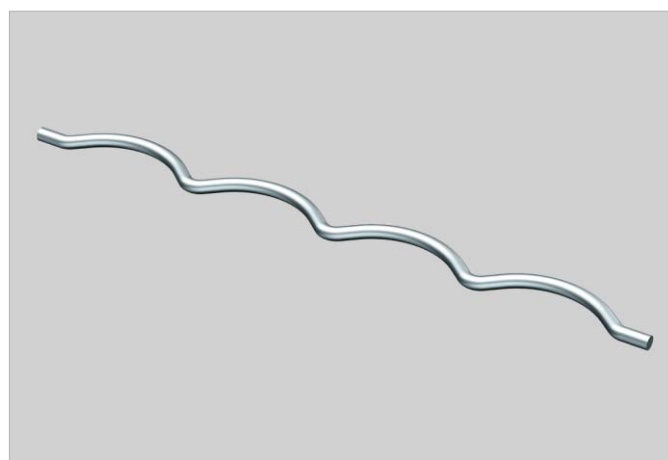
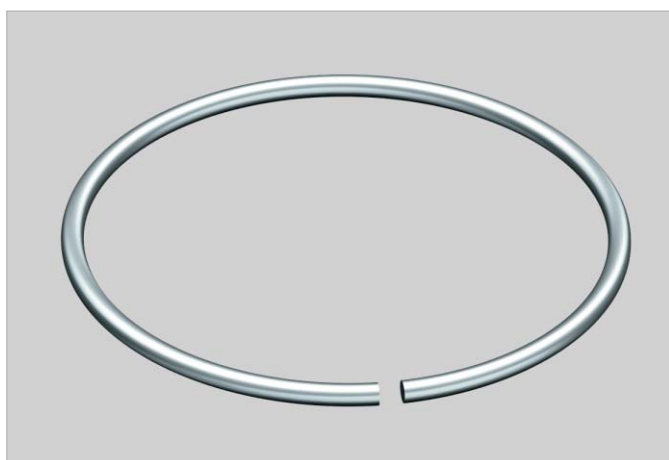
Type 5 - Roller bending tool



Type 5 - Roller bending tool

- Specially mounted bending rollers for precise free-form bending operations
- Can be combined with bending groove for bending small bending radii
- Right/left bending

Bent parts



Very well suited for ...

- Complex coiling operations starting at $BR \geq 5xD$
- Wire display items with highest demands on surface quality and flatness
- Up to two bending radii
- Large bending radii
- Spring steel wire (for small bending radii, bending tools with coated bending pin)
- Aluminum wire

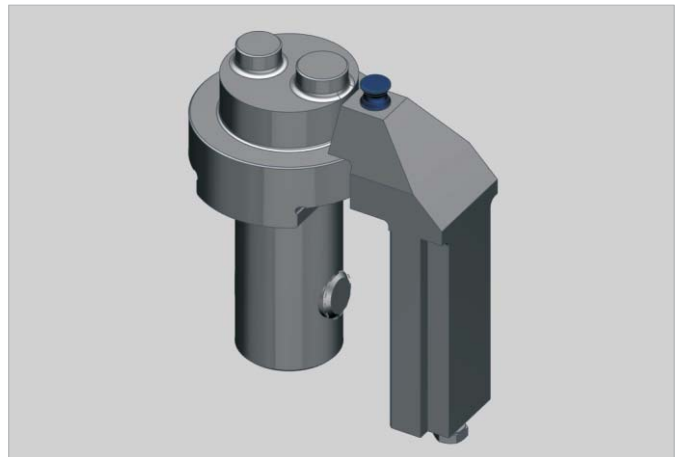
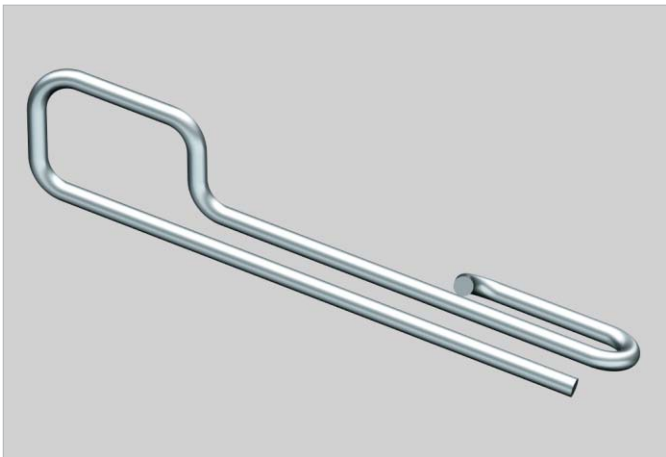
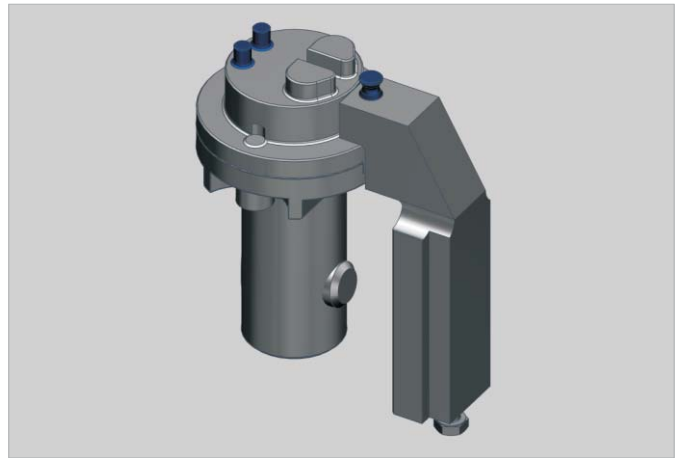
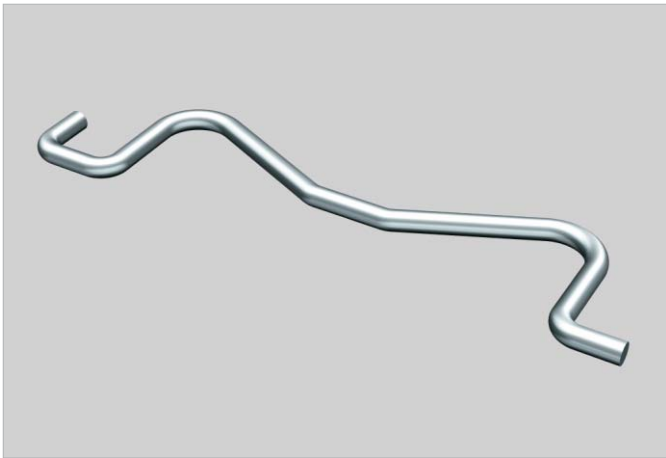
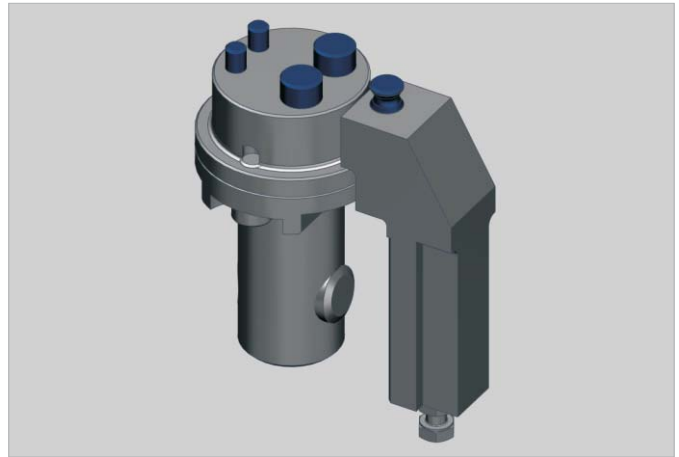
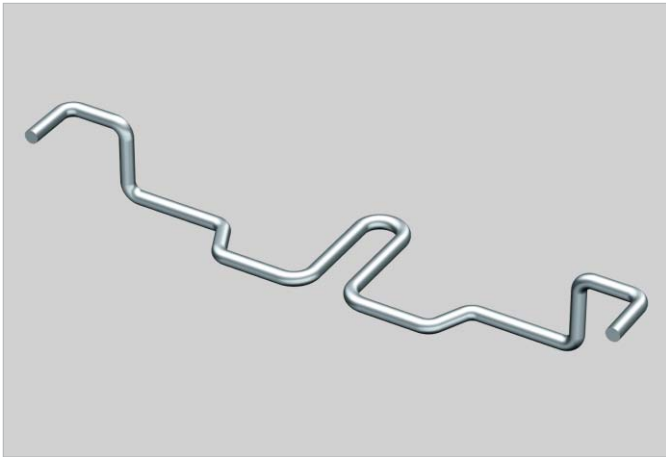
Limited suitability for ...

- 180° bends (alternative: 4-pin bending tool with bending roller, see p.5)
- Loops (alternative: 4-pin bending tool with bending roller, see p.5)
- Small bending radii (alternative: combined tool with bending groove, p.13)

Chapter 3 - Bent parts with according tool solution

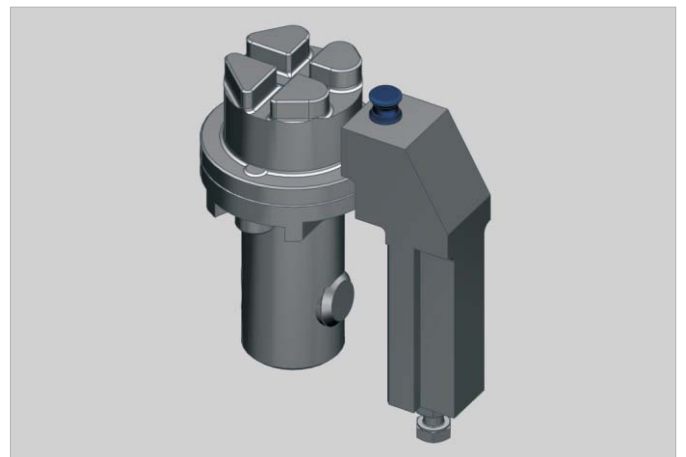
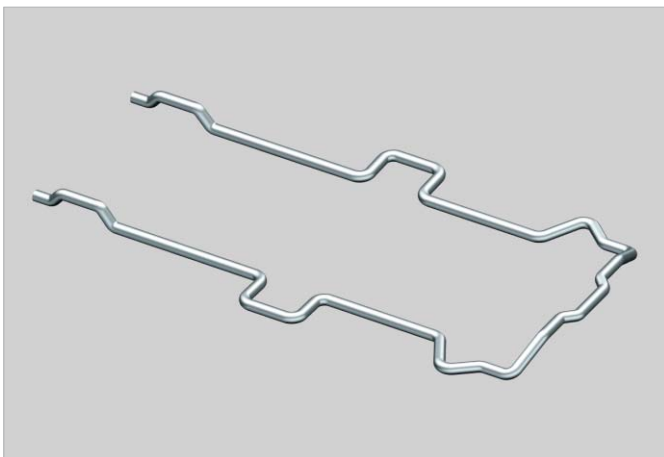
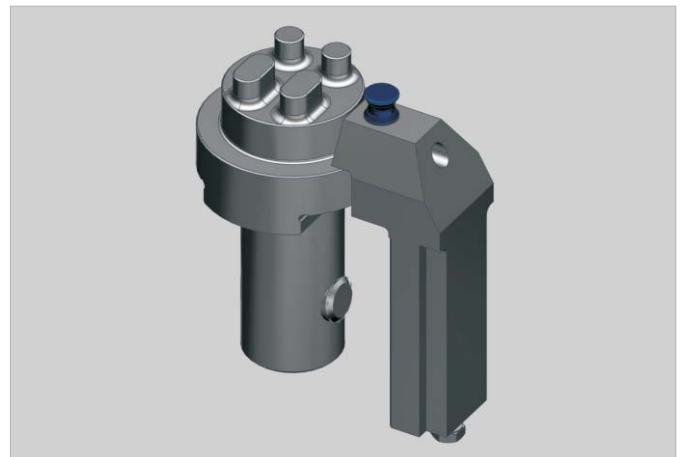
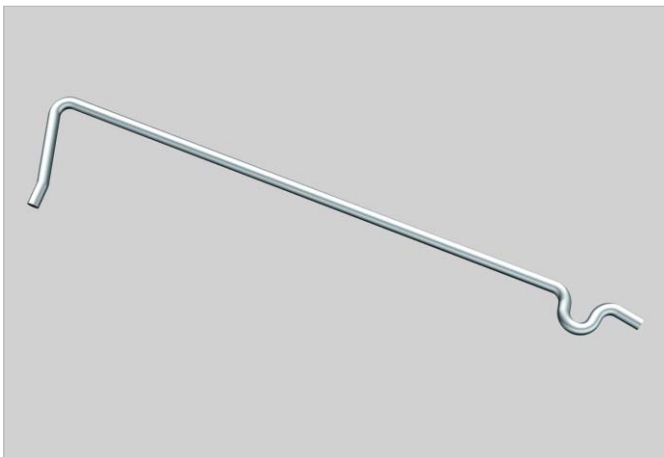
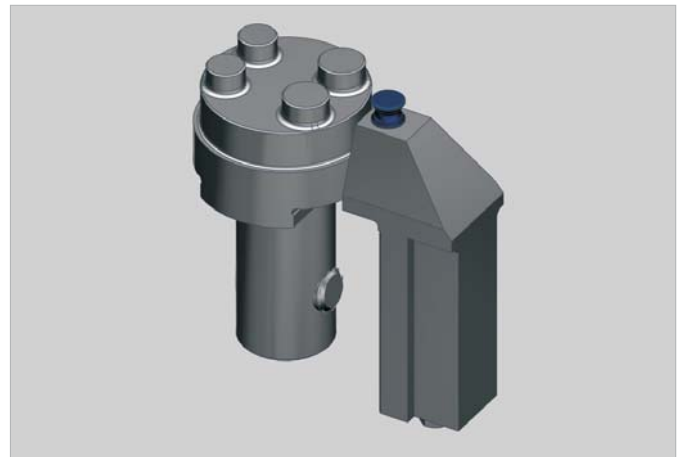
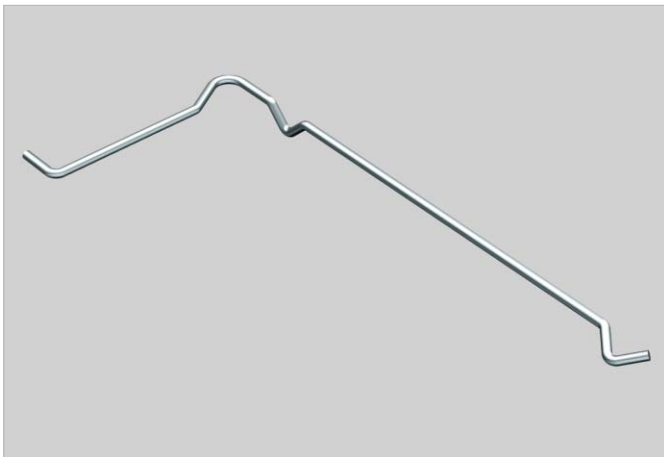
Your requirements

Our solution



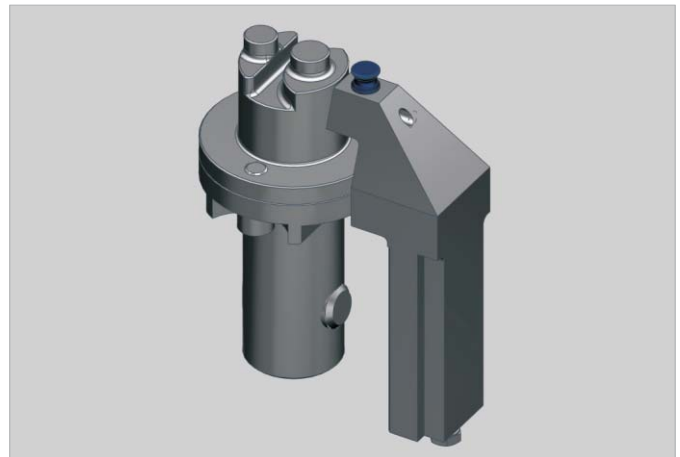
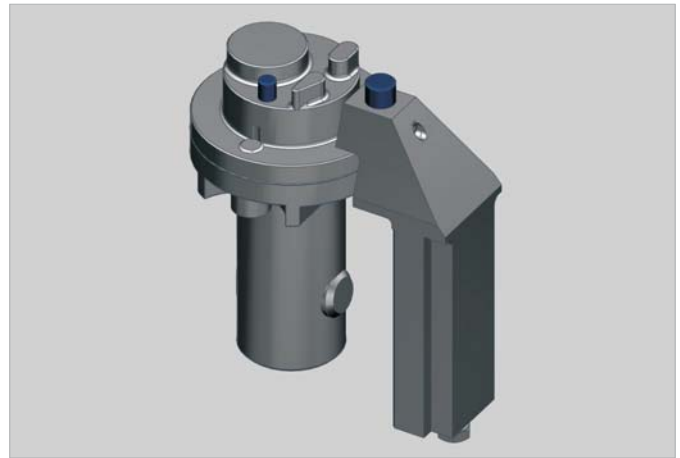
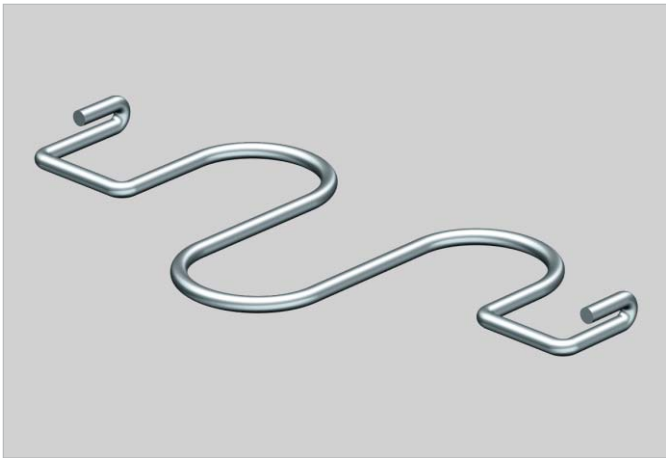
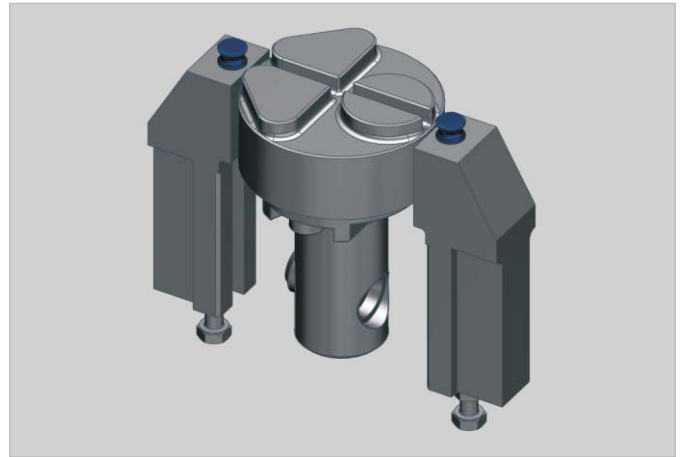
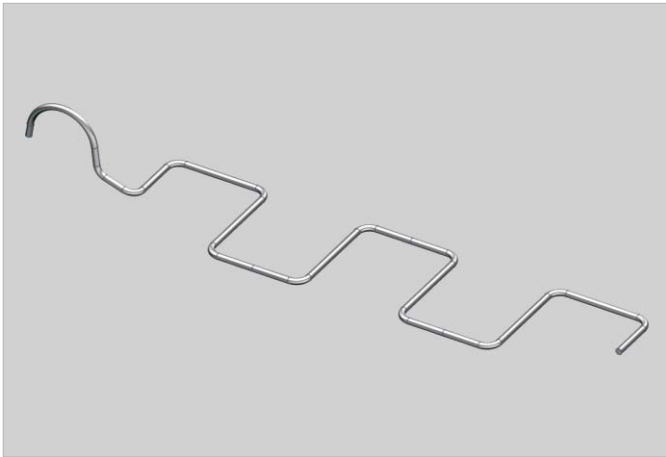
Your requirements

Our solution



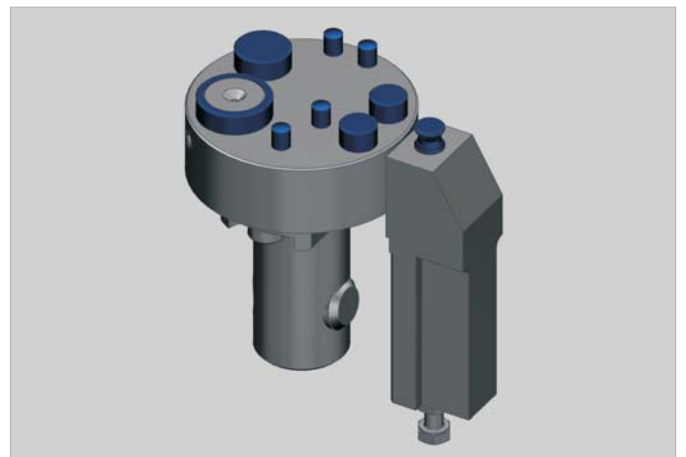
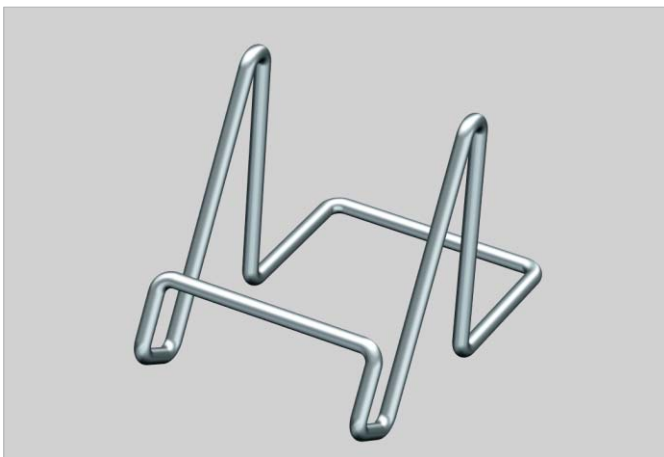
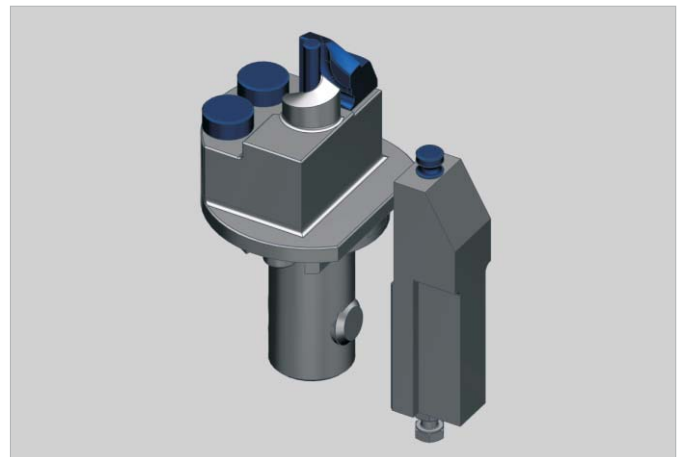
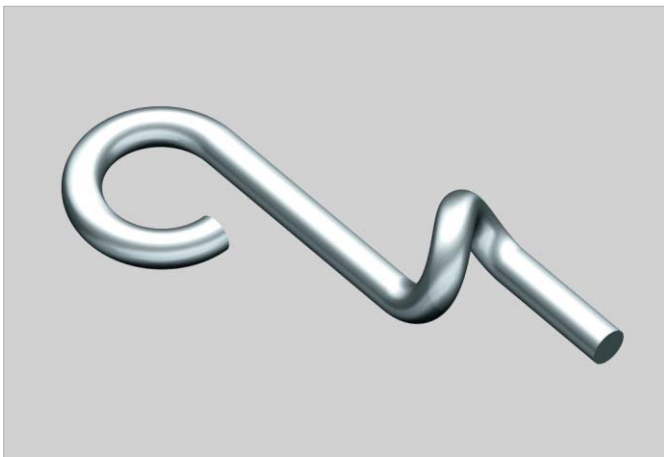
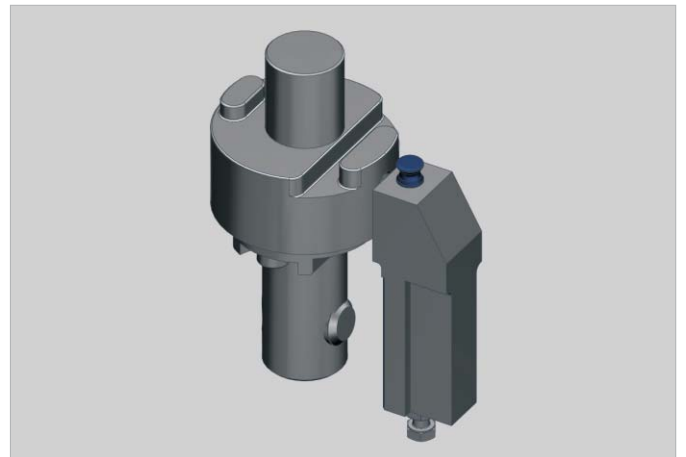
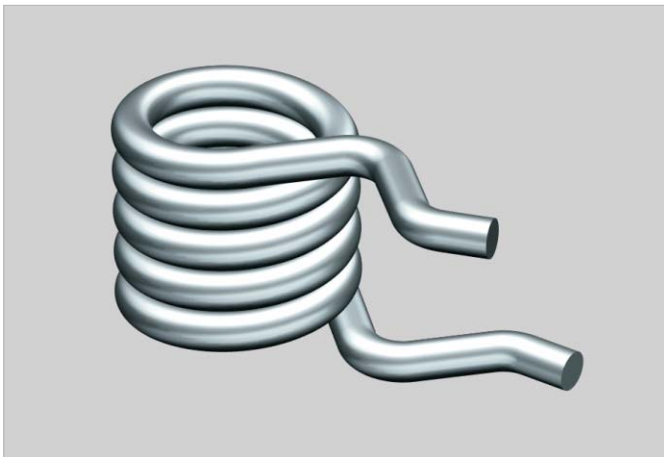
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Our solution



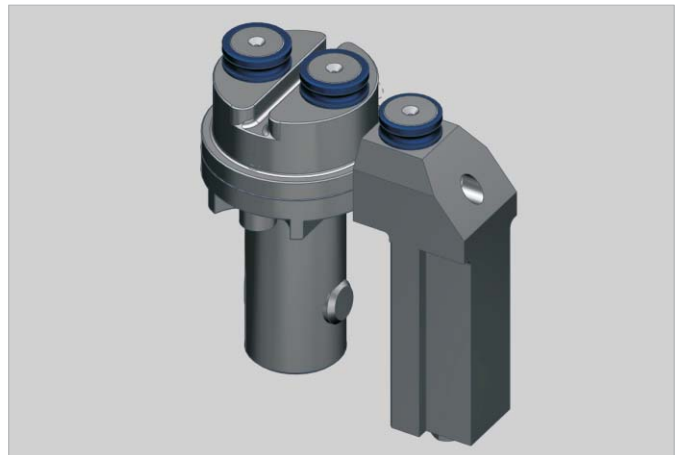
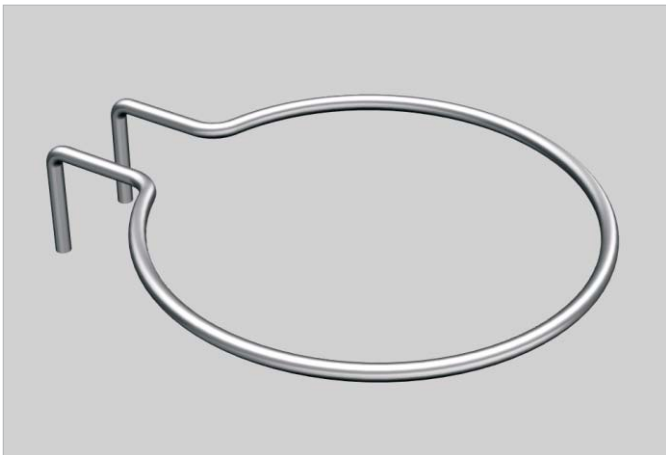
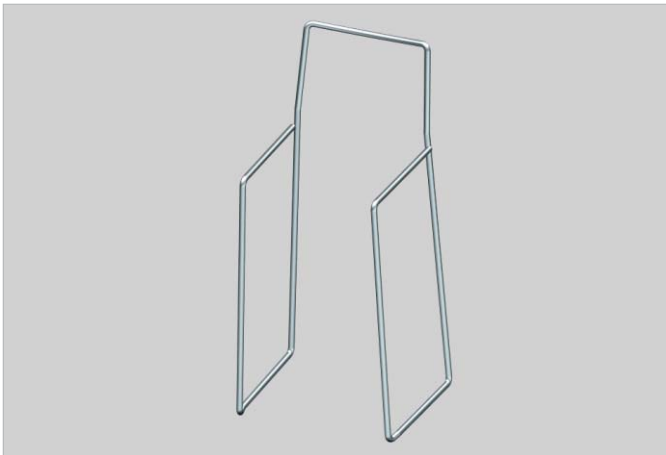
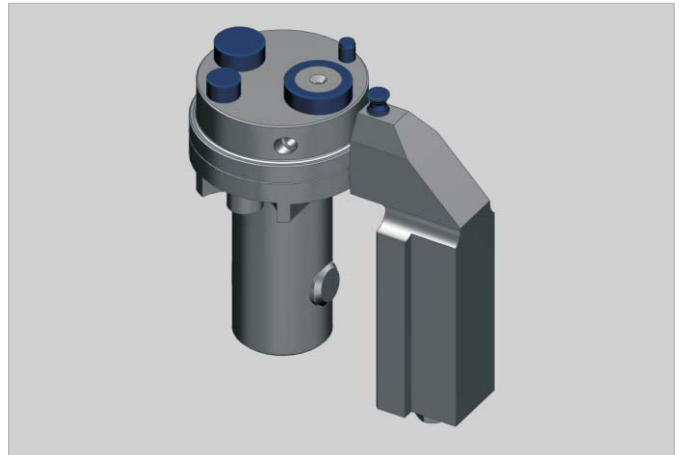
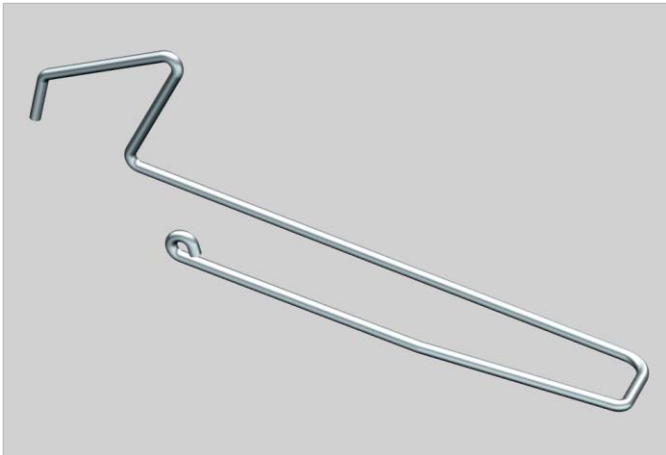
Your requirements

Our solution



Your requirements

Our solution



Chapter 4 - Technical advice and sales

Contact partners in the Tool Center

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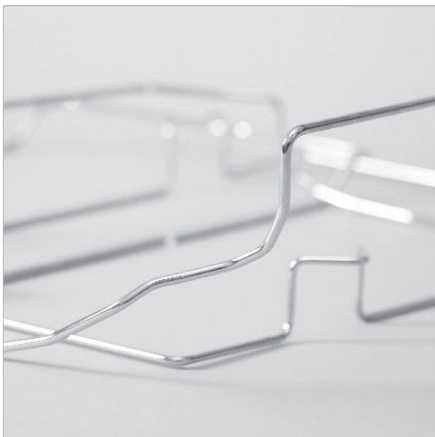
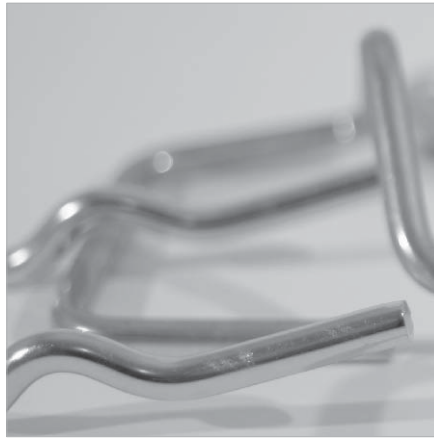
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