Gear clamping with the HAINBUCH system:

- O.D. clamping
- I.D. clamping
Content

Who is HAINBUCH? 

Main gear clamping possibilities

I.D. clamping  

O.D. clamping - with adaptations for quick change from O.D. to I.D.  

Solutions

Gear clamping examples
Tradition is good. Combined with innovation it is even better. For 60 years we have been constantly developing new clamping solutions focusing on your wants and needs. Set-up times and cost savings, flexibility, productivity, energy efficiency, and security – all are desired from clamping solutions. Our products deliver these essentials. Included are CE certification, and formal commitments to minimize environmental impact as well as exemplary corporate and social conduct. This is us and what we owe to you.

**HAINBUCH – as flexible as your requirements!**

Key advantages
- HAINBUCH designs, develops and produces different clamping tools that are simple and better
- Third-generation family business
- The company was founded in 1951
- More than 500 employees worldwide
- 3 national locations
- 8 international subsidiaries [China, France, Great Britain, Italy, Sweden, Slovakia, Thailand, USA]
- Nearly 40 agencies worldwide
I.D. clamping

Segmented clamping bushings
- Vibration dampening due to vulcanized segmented clamping bushings
- Work piece stabilization through axial draw force applied against the work piece end-stop
- Extremely high clamping force even at the smallest clamping Ø
- Clamping range from Ø 8 – 120 mm with only 8 mandrel sizes
- All mandrels prepared for pneumatic part sensing

Key advantages
- Concentric precision < 0.01 mm
- Large clamping range due to vulcanized clamping elements
- Standard end-stop for machining to size
- Standard segmented clamping bushing for in-house machining available
- Typical HAINBUCH features, such as parallel clamping, optimal power conversion, extreme stiffness and high holding power, as well as little wear and tear

Insert segmented clamping bushing [MANDO T211]

Mandrel | Place on segmented clamping bushing | Screw in draw bolt | Place the end-stop in position | Clamping device set-up

Insert segmented clamping bushing [MANDO T212]

Mandrel | Place on segmented clamping bushing | Attach coupling ring | Place the end-stop in position | Clamping device set-up
Standard segmented mandrels at a glance

<table>
<thead>
<tr>
<th>MANDO T211</th>
<th>MANDO T212</th>
<th>Special segmented mandrels</th>
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</thead>
<tbody>
<tr>
<td>Description</td>
<td>With draw bolt</td>
<td>Without draw bolt</td>
</tr>
<tr>
<td>Sizes</td>
<td>0, 1, 2, 3, 4</td>
<td>XXS, XS, S, 0, 1, 2, 3, 4</td>
</tr>
<tr>
<td>Clamping range of all sizes [mm]</td>
<td>20 – 120</td>
<td>8 – 100</td>
</tr>
<tr>
<td>Advantages</td>
<td>Form-compensating segmented clamping bushing on request</td>
<td>Clamping without draw bolt, ideal for blind bores</td>
</tr>
</tbody>
</table>

MANDO T211 in detail

**Designation**

1. Spindle flange suitable for all standard mandrel sizes
2. Torsional safety
3. Integrated ejector pins for forced opening of the clamping bushing
4. Torsional safety for segmented clamping bushing
5. Standard end-stop for machining to size
6. Draw bolt [with safeguard against spinning out of segmented clamping bushing at empty clamping]
7. Segmented clamping bushing made of case-hardened steel [60 HRC]

MANDO T212 in detail

**Designation**

1. Spindle flange suitable for all standard mandrel sizes
2. Torsional safety
3. Trimming sleeve for SAD segmented clamping bushings
4. Torsional safety for segmented clamping bushing
5. Installation aid, recommended for vertical machines from mandrel size 2 on
6. Segmented clamping bushing made of case-hardened steel [60 HRC]
7. Coupling ring for fast changing of the segmented clamping bushing
8. High stiffness through one-piece crown coupling
The HAINBUCH modular system

Clamping device

Rotating

- TOPlus chuck
- SPANNTOP chuck
- TOROK manual chuck

Stationary

- MANOK plus manual stationary chuck
- HYDROK hydraulic stationary chuck

Clamping element

- Circumferential clamping
- 3 different versions: For raw material, precision machining and for in-house machining
- An abundance of profile clamping possibilities
- Coolant-resistant rubber-metal connection, prevents chips in the chuck
- In stock

Adaptation clamping device

- Quick change-over from O.D. to I.D. clamping without indicating due to CENTREX interface
- Concentricity < 0.005mm between chuck taper and mandrel taper
- 5 different mandrel sizes
- Clamping range Ø12 – 100mm
- Available with and without draw bolt
- In stock

- Approximately double the clamping Ø can be realized
- Drilling and milling between the jaws
- Installation and removal with tapered bolts – without changing fixture
- Loading plug for in-house machining of the soft jaws

Jaw adapter – clamping in front of the chuck
Mandrel adaptions
Changing over from O.D. clamping to I.D. clamping, without changing the clamping device? No problem! With MANDO Adapt, just place the mandrel in the mounted clamping device. In this process the mandrel engages in the coupling of the clamping device via a sophisticated mechanism, where the clamping head usually engages. A great time-savings solution, not to mention that MANDO Adapt is very attractive with extreme rigidity and precision. Concentricity of 0.005 mm between chuck taper and mandrel taper, and for stationary clamping devices repeatability of 0.003 mm can be achieved. And best of all, this can all be accomplished without indicating.

The MANDO Adapt is available in 3 variants:
- T211 – Clamping with pull-back effect and draw bolt
- T212 – Clamping with pull-back effect without draw bolt
- T812 – Clamping without pull-back effect without draw bolt

Ingeniously simple and effective, genuine HAINBUCH!

Key advantages
- Extremely fast conversion without disassembling the base clamping device [2 min.]
- Vibration dampening due to vulcanized segmented clamping bushings
- Extremely high clamping force even at the smallest clamping Ø
- Large span range due to vulcanized clamping elements
- Standard end-stop for machining to size
- Standard segmented clamping bushing for in-house machining available
- Typical HAINBUCH features, such as parallel clamping, optimal power conversion, extreme stiffness and high holding power, as well as little wear and tear
MANDO Adapt at a glance

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<tr>
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<th>MANDO Adapt T211</th>
<th>MANDO Adapt T212</th>
<th>MANDO Adapt T812</th>
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<tbody>
<tr>
<td>Description</td>
<td>Mandrel-clamping-device with draw bolt</td>
<td>Mandrel-clamping-device without draw bolt</td>
<td>Mandrel-clamping-device without draw bolt</td>
</tr>
<tr>
<td>Sizes</td>
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<td>XS, S, 0, 1, 2, 3, 4</td>
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<tr>
<td>Clamping range of all sizes [mm]</td>
<td>20 – 120</td>
<td>13 – 100</td>
<td>13 – 100</td>
</tr>
<tr>
<td>Variants</td>
<td>SE [hexagonal], RD [round]</td>
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<td>RD [round]</td>
</tr>
<tr>
<td>Actuation</td>
<td>Draw</td>
<td>Draw</td>
<td>Pressure</td>
</tr>
<tr>
<td>Advantages</td>
<td>Form-compensating segmented clamping bushings on request</td>
<td>Clamping without draw bolt, ideal for blind bores</td>
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<tr>
<td></td>
<td>Clamping range from Ø 20 – 120 mm with only 5 mandrel sizes</td>
<td>Clamping range from Ø 13 – 100 mm with only 7 mandrel sizes</td>
<td>Clamping range from Ø 13 – 100 mm with only 7 mandrel sizes</td>
</tr>
<tr>
<td></td>
<td>Work piece stabilization through axial draw force applied against the work piece end-stop</td>
<td>Work piece stabilization through axial draw force applied against the work piece end-stop</td>
<td>Pure radial clamping, no pull-back against the work piece end-stop. Ideal for pick-off from the main spindle</td>
</tr>
</tbody>
</table>

Change-over to mandrel adaptation T211 [2 min.]

Remove clamping head
Insert MANDO Adapt T211
Install segmented clamping bushing
Screw in draw bolt
Clamping device set-up

Change-over to mandrel adaptation T212 [2 min.]

Insert MANDO Adapt T212
Install segmented clamping bushing
Attach coupling ring
Place on trimming sleeve/end-stop
Clamping device set-up
MANDO Adapt T211 SE in detail

**Designation**

1. CENTREX system for ultra precise usage without adjustment
2. Coupling: Mandrel locks automatically when the draw bolt is assembled
3. Mounting screws for fast change
4. Integrated forced release of the clamping bushing
5. Torsional safety for segmented clamping bushing
6. Standard end-stop for machining to size
7. Draw bolt
8. Segmented clamping bushing made of case-hardened steel [60 HRC]

MANDO Adapt T212 SE in detail

**Designation**

1. CENTREX system for ultra precise usage without adjustment
2. Coupling: Mandrel is locked via separate key
3. Mounting screws for fast change
4. Trimming sleeve for machinable [SAD] segmented clamping bushings
5. High stiffness through one-piece crown coupling with integrated driver for segmented clamping bushing
6. Segmented clamping bushing made of case-hardened steel [60 HRC]
7. Coupling ring for fast change of segmented clamping bushing

MANDO Adapt T812 RD in detail

**Designation**

1. Bayonet locking mechanism
2. CENTREX system for ultra precise usage without adjustment
3. Mounting screws for fast change
4. Coupling ring for fast change of segmented clamping bushing
5. Standard end-stop with integrated coupling guide for in-house machining
6. Segmented clamping bushing made of case-hardened steel [60 HRC]
Transmission manufacturers have particularly high standards for the individual components. For example, the concentric precision of the individual gears is a decisive factor effecting final transmission noise level. This is certainly also the reason why transmission manufacturers around the world use HAINBUCH clamping systems.

Our clamping systems are convincing due to the pull-back effect against the fixed end-stop. This effect, pulling the part flush against its face makes it possible to virtually eliminate chatter. The fact that HAINBUCH clamping devices provide concentricity well below 0.01 mm in addition to large opening strokes [often necessary to enable automatic loading] are additional substantial advantages.

**Gear wheel power honing**

**Requirement:**
- Excellent concentricity
- Large loading stroke
- Large clamping range

**Solution:** Mandrel
- Excellent rigidity
- Highly conformable, due to rubber vulcanized clamping bushings
- Vibration dampening
- Large radial stroke for automatic loading

**Output shaft gear cutting**

**Requirement:**
- Compensating clamping on shaft journal
- Centering between centers

**Solution:** SPANNTOP chuck
- Floating clamping element
- Rigid center integrated in chuck body

**Gear wheel gear shaping**

**Requirement:**
- Conventional collets with long slots
- High torque transmission losses
- Uneven centering

**Solution:**
- Multiple centering mandrel
- 5 gear wheels
- Vulcanized segmented clamping bushings
- Each gear wheel is centered independently therefore large bore tolerances can be compensated
- Concentricity < 0.02 mm

**Rear axle shaft gear cutting**

**Requirement:**
- Long cutter over-stroke
- Low-interference profile

**Solution:** Collet chuck
- Vulcanized draw-in collet
- Optimum chip shielding
- Chip removal through open chuck body

**Gear wheel gear cutting**

**Requirement:**
- High transfer of force with small clamping diameter

**Solution:** Mandrel
- Clamping with pull-back effect
- Hard wear-resistant segments
- Excellent rigidity and concentricity

**Gear wheel power honing**

**Requirement:**
- Excellent concentricity
- Large loading stroke
- Large clamping range

**Solution:**
- Mandrel with counter fixture
- Excellent rigidity
- Highly elastic, because of rubber vulcanization on clamping bushings
- Vibration dampening
- Large radial stroke for automatic loading
Since there are special requirements regarding interference and precision in gear machining, HAINBUCH has always worked closely together with machine builders. Numerous world-class gear manufacturers have adopted devices that exploit the vulcanized segmented clamping elements from HAINBUCH. These companies have enjoyed a multitude of benefits including superior precision, rigidity, vibration damping, durability, simplicity and flexibility.

You too can benefit from our experience!

**Gear rings**

**gear cutting**

**Requirement:**
- Complicated mandrel with jaws guided in T-grooves
- Gear rings were deformed
- Required: multiple clamping which simulates the installed condition of the part

**Solution: Mandrel**
- 23 gear rings clamped at once
- Over 100 t radial clamping force
- All rings expanded to defined dimension and machined to a uniform size

**Gear shaft**

**gear cutting**

**Requirement:**
- Excellent concentricity
- Large loading stroke
- Large clamping range

**Solution: SPANNTOP chuck**
- Excellent rigidity
- Vibration damping through pull-back effect, positive face location of the part
- Large radial stroke for automatic loading

**Gear wheel**

**power honing**

**Requirement:**
- Multiple part clamping
- Gears must be independently centered
- High vibration damping

**Solution: Double segment mandrel**
- Vibration damping due to vulcanized rubber in-between clamping segments
- 2 independently working clamping bushings
- Slim design

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Gearing solutions

**Work piece**
- Gear

**Clamping requirement**
- 5x clamping of gear blanks

**Machining**
- Gear hobbing

**Challenge**
- High throughput
- Maximum machine productivity
- Secure centering and clamping in spite of open blank tolerances

**HAINBUCH solution**
- Multi-centering mandrel

**Workholding technology**
- Bulk clamping of 5 gears
- Individual centering thanks to spring assemblies + axial clamping
- Increased opening stroke for ease of loading

**Results / customer benefits**
- Secure and rigid clamping in spite of open bore tolerances
- Virtually wear-free technology, no downtime
- Process reliability due to the closed design

**SAVINGS**
- Machining of 5 gears in series as compared to single part clamping ➔ **savings: approx. 12 sec./piece**
- Increased rigidity due to bulk clamping design ➔ **approx. 25 % in tool costs**
## Work piece
Gears for wind turbines

## Clamping requirement
I.D. clamping

## Machining
Gear hobbing and grinding of large gears

### Challenge
- Clamp Ø 200 mm – 420 mm bores, gear Ø up to 1000 mm
- Minimize set-up time
- Cover clamping range with a few basic mandrels

### HAINBUCH solution
Segmented mandrels, type 213

### Workholding technology
- Segmented mandrels, type 213, easy set-up
- CENTREX machine adapter for repeatable assembly
- Only 4 mandrel sizes for the complete clamping range
- Draw bolt with pilot area for easy loading
- Mandrels with pull-back effect

### Results / customer benefits
- Mandrel change-over accuracy < 0.005 mm
- Achieved concentricity of all mandrel sizes < 0.02 mm
- Set-up time for mandrel change-over is 15 min.
- Minimized tool wear thanks to extremely rigid clamping

### SAVINGS
- Minimized set-up time ➔ savings: approx. 70 % in set-up time
- Reduced tool wear ➔ savings: approx. 20 % in tool costs
Gearing solutions

<table>
<thead>
<tr>
<th>Work piece</th>
<th>Thin-walled gear</th>
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<tr>
<td>Clamping requirement</td>
<td>I.D. clamping</td>
</tr>
<tr>
<td>Machining</td>
<td>Gear hobbing</td>
</tr>
</tbody>
</table>

**Challenge**
- Hob extremely thin-walled gears – in small unit quantities
- Machine an entire family of parts [16 work pieces] with two basic mandrels and work piece-specific change parts
- Machine: EMAG VSC 400 WF
  [WF = Walzfräsen, German term for hobbing]
  with standard clamping cylinder

**HAINBUCH solution**
- DKS special mandrel with centroteX quick-change system

**Workholding technology**
- Two clamping positions. Large type 212 bushing, small type 213 bushing
- Actuation of the rear clamping position via a drawtube
- Actuation of the front clamping unit via springs – allowing for use of the standard cylinder
- Air check confirmation
- Bayonet locking mechanism

**Results / customer benefits**
- High flexibility with just two basic mandrels
- Quick change-over from this mandrel to an additional mandrel [type 213] with clamping repeatability < 0.01 mm
- Secure tolerance-independent clamping on two different clamping diameters with pull-back effect on end-stop

**SAVINGS**
- Reduced tool wear → **savings: 20 % in tool costs**
- Improved dimensional accuracy by clamping on both reference surfaces → **savings: 30 % less of the tolerance band**
Work piece  Cylindrical gear  
Clamping requirement  I.D. clamping  
Machining  Gear cutting  

Challenge  
- Extremely high pressure angle in the machined area due to cutter shape  
- Conventional clamping device susceptible to vibration  
- Clamping diameter with open tolerance  
- Automatic loading  

HAINBUCH solution  Mandrel type 213  

Workholding technology  
- Mandrel with optimized design and pull-back effect for increased clamping rigidity  
- Vulcanized segmented clamping bushing for vibration-dampening effect  
- Large span and load strokes are possible to accommodate automatic loading  
- User friendly set-up due to quick-change interface  

Results / customer benefits  
- Extremely rigid clamping in spite of slender design  
- Excellent vibration dampening due to high clamping area  
- Significantly increased tool life  

SAVINGS  
- Reduced tool wear  savings: approx. 30 % of tool costs  
- Reduced set-up time  savings: approx. 30 min. of set-up time
What is Your GREEN LIGHT Strategy?

A 60 year track record of providing the best clamping solutions in the industry has earned HAINBUCH a reputation as problem solvers. Let us bring our experience to your team to help create your GREEN LIGHT STRATEGY.

Attain better operational efficiencies through:

- Faster change-over times
- Improved part quality
- Shorter cycle times
- Improved tool life

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