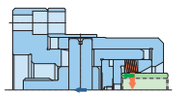
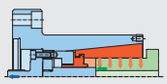
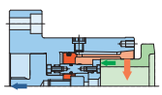
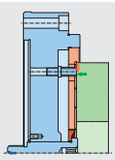
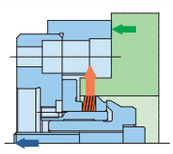
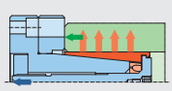
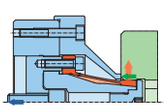
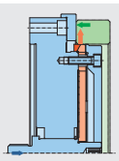
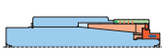
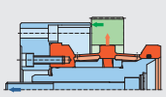
Overview of RINGSPANN Clamping Fixtures

	Complete Clamping Fixtures		Clamping diameter			True running accuracy			Permissible component tolerance					
			small < 50 mm	medium 50 - 200 mm	large 200 - 1600 mm	≤ 0,020 mm	≤ 0,010 mm	≤ 0,005 mm	up to IT 7	up to IT 9	up to IT 10	up to IT 11	up to IT 13	up to IT 15
Precision Clamping Chucks	Bonded Disc Pack Flange Chucks		from 7 mm to 170 mm			●	●		●	●		●		
	Taper Collet Flange Chucks		from 7,2 mm to 73,6 mm			●	●		●	●		●	●	●
	Taper Sleeve Flange Chucks		from 15 mm to 206 mm			●	●		●	●		●	●	
	Flat Element Flange Chucks		from 30 mm to 520 mm			●	●		●	●		●		
Precision Clamping Mandrels	Bonded Disc Pack Flange Mandrels		from 18 mm to 200 mm			●	●		●	●	●	●		
	Taper Collet Flange Mandrels		from 11,9 mm to 132 mm			●	●		●	●	●	●	●	●
	Taper Sleeve Flange Mandrels		from 9 mm to 275 mm			●	●		●	●	●	●	●	
	Flat Element Flange Mandrels		from 41 mm to 560 mm			●	●		●	●	●	●		
	Taper Collet Centre Mandrels		from 11,9 mm to 132 mm			●	●		●	●	●	●	●	●
	Expanding Sleeve Mandrels		from 25 mm to 82,5 mm			●	●	●	●	●	●			

Clamping fixture length		Clamping length		Insertion depth			Pull-back action	Possible component wall thickness		Hand clamping optional possible	Clamping principle	Page
short	long	short	long	very short	short	long		thin	solid			
	●	●			●		●	●	●			8 - 13
	●	●	●	●	●	●	●	●	●			14 - 17
	●	●		●	●	●	●		●	●		18 - 21
●		●		●			●		●	●		22 - 25
	●	●			●		●	●	●	●		26 - 33
	●	●	●		●	●	●	●	●	●		34 - 41
	●	●		●	●		●		●	●*		42 - 45
●		●		●			●		●	●		46 - 49
	●	●	●		●	●	●	●	●	●		50 - 53
	●	●			●	●	●	●	●	●		54 - 55

*Not available in all sizes

Key: Axial actuating force · Radial clamping force · Axial pull-back force

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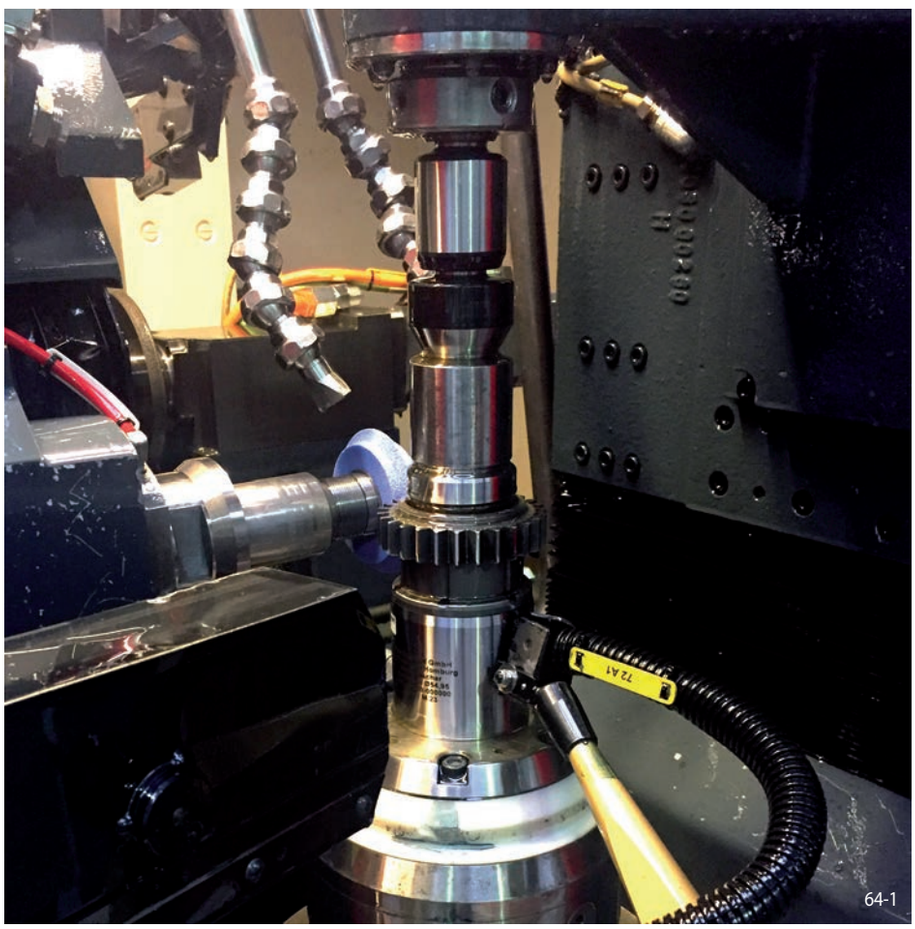
Application examples

RINGSPANN®

Gear wheel for car motorsport gears



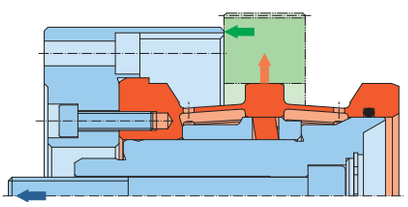
Component
Gear wheel

Type of machine
Grinding machine

Machining
Grinding the gearing

Task
- Clamping with true running accuracy max. 5 µm
- Additional clearance
- Clamping with pull-back action
- Freedom from leakage of the clamping principle
- Hand clamping

Our solution
Expanding Sleeve Mandrel

Clamping principle


In the manufacturing of customer-specific gear wheels for international motorsports, the highest geometrical accuracy requirements apply. These are significantly higher than the standard quality requirements in normal automotive engineering. Automobile manufacturers for gear wheels expect a high gearing quality of 5 or 4 in accordance with DIN 3961. Volker Schlautmann, head of the RINGSPANN clamping fixture division has therefore come up with a new (and now patented) Expanding Sleeve Mandrel: The HDDS. This innovative inner clamping system is a highly precise and economically attractive alternative to hydraulic expanding clamping tools. It earns plaudits for its true running accuracy of ≤ 5 µm and can take workpieces with bores of up to tolerance class IT10. The HDDS significantly reduces the costs for the necessary feeding and positioning technology in fully automated operation.

The man from RINGSPANN presented, with the new Expanding Sleeve Mandrel, to the parent plant of a Swiss specialist for gear wheel. A suitable workpiece had been selected there: A precision spur wheel for the special gear of a sports.

A Höfner Helix 400 grinding centre was used for the machining. Its installation space accommodates a hydraulic base mounting, which the HDDS was clamped into vertically enabling it to be centrically aligned. The gearing engineers then manually clamped a neutral control workpiece in place so as to check the axial run-out accuracy and true running accuracy of the Expanding Sleeve Mandrel with a tactile measuring device accurate to the µm. The result left the audience astonished: The measuring device showed ≤ 2 µm for the axial run-out and ≤ 3 µm for the true running – amazing accuracies for a mechanical clamping system without additional alignment effort! What precision could then be expected when grinding the gearing?

To find out, a tailstock was mounted. However, its travel distance turned out to have been dimensioned too short to reach RINGSPANN's Expanding Sleeve Mandrel. A spacer had to be used to bridge the gap, although it could not be aligned. Despite this improvisation, the spur wheel blank was now clamped on with the HDDS and the grinding process started.

Surprise on the measuring device

The finished spur wheel was removed from the HDDS and tactile measurements performed on it in a coordinate measuring system. The geometrical accuracy of the involute gearing (the term denotes the force-optimized shaping of the tooth flanks) was well within the tolerance limits. Despite the additional bridging element between the tailstock and the workpiece, only about two thirds of the permissible tolerance was exhausted.

Spurred on by the excellent results achieved until then, the gearing engineers started a further test run, but this time without the tailstock. The new Expanding Sleeve Mandrel then showed its real strength. When grinding without the tailstock since just half of the permitted tolerance had been exhausted. A gearing quality of grade 4 could even be achieved, and without the clamping fixture being realigned!

Application examples

RINGSPANN®

Gear wheel for car motorsport gears

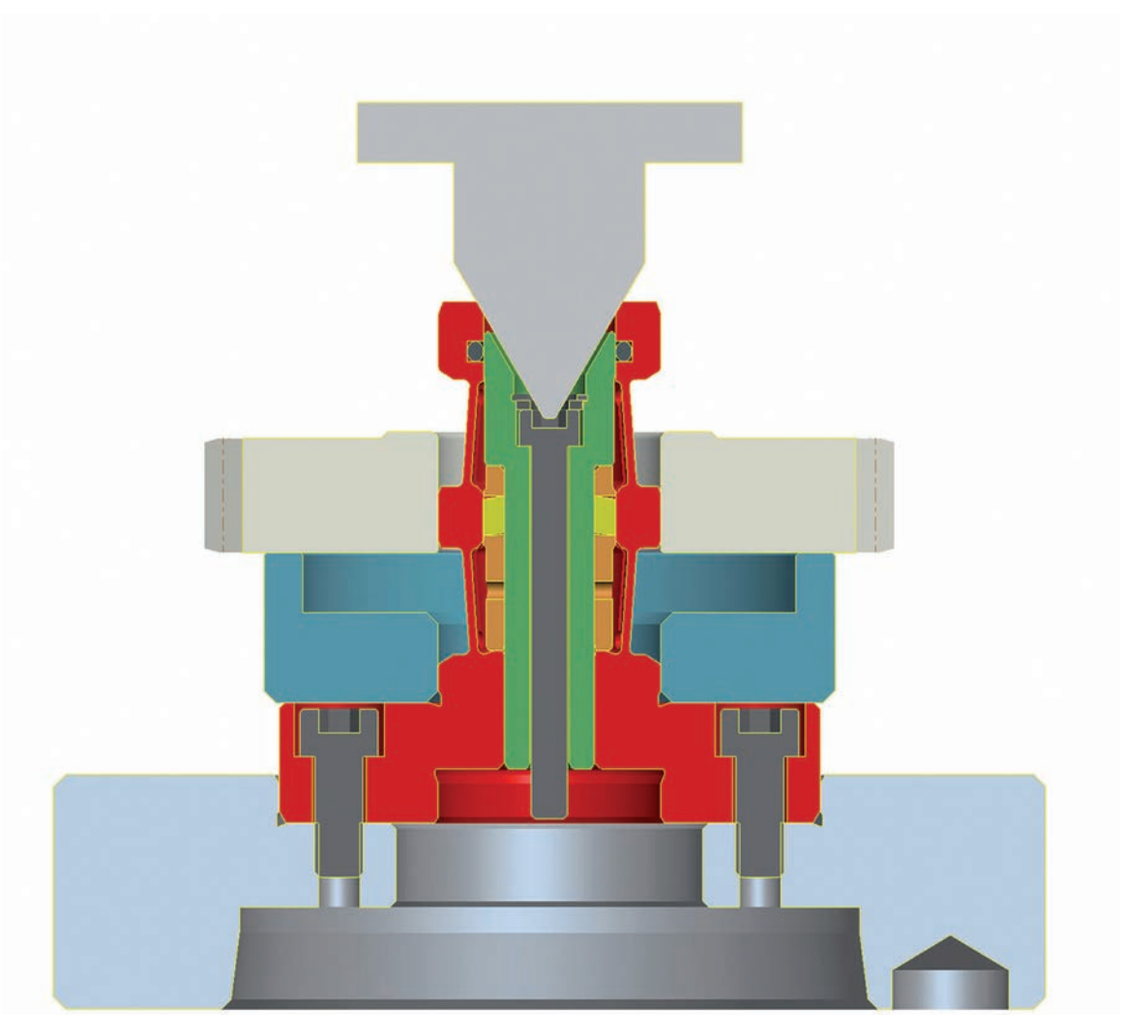
Higher accuracy at lower costs

With its new Expanding Sleeve Mandrel, RINGSPANN offers a very economical alternative to hydraulic expansion clamping tools. "Apart from the high accuracies achievable with the HDDS, the absolute expansion of our new Expanding Sleeve Mandrel is also up to four times greater. This does not only mean a higher degree of flexibility, but is particularly of great importance for the simple implementation of fully automated manufacturing concepts," Volker Schlautmann says. It is important to mention here that, for pure reasons of physics, hydraulic expanding clamping mandrels have quite a small expansion rate. This requires a high precision from the handling systems used for feeding, which can usually only be achieved with considerable additional investments in measuring and control technology. This problem disappears with the new Expanding Sleeve Mandrel.

Clamping without risk of leakage

A further advantage of the new HDD: Unlike hydraulic clamping systems, it is not subject to a risk of leakage. This offers the user a greater process reliability, since a leak on a hydraulic extension clamping tool always goes hand in hand with malfunctioning, disassembly and repair by the manufacturer. Only the clamping discs – also quality RINGSPANN products – of the Expanding Sleeve Mandrel are subject to minimal wear. These can be exchanged very easily; and the HDDS does not even need to be taken from the machine spindle.

Finally, it should be mentioned that the new inner clamping system from RINGSPANN can also be easily used for workpieces with very short clamping lengths. The Expanding Sleeve Mandrel performs a pull-back action, where the workpiece is pressed against a backstop and aligned – also ensuring an accurate centering and clamping of workpieces with short clamping lengths. Even bores interrupted by a groove for example can be reliably and precisely taken by the HDDS from RINGSPANN without any supplementary aids.



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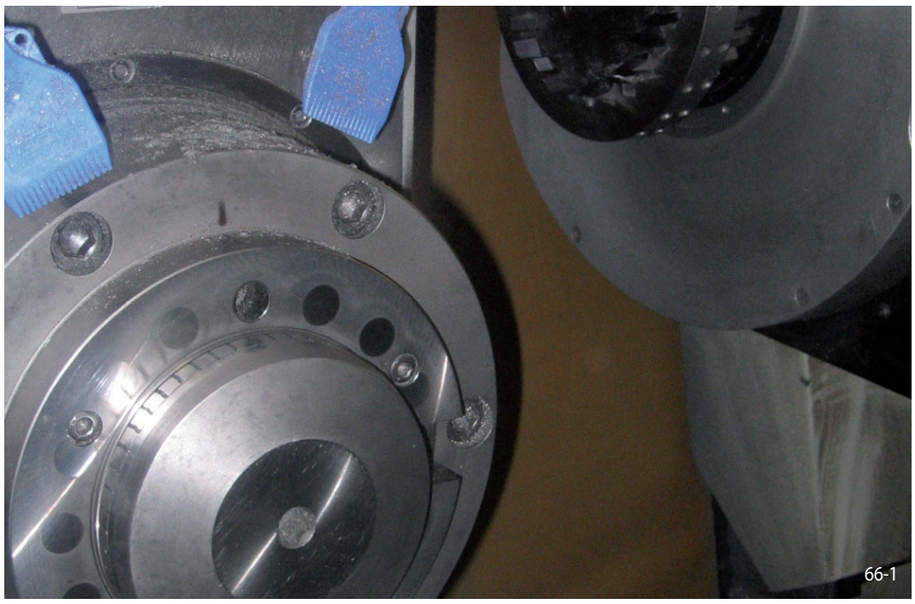
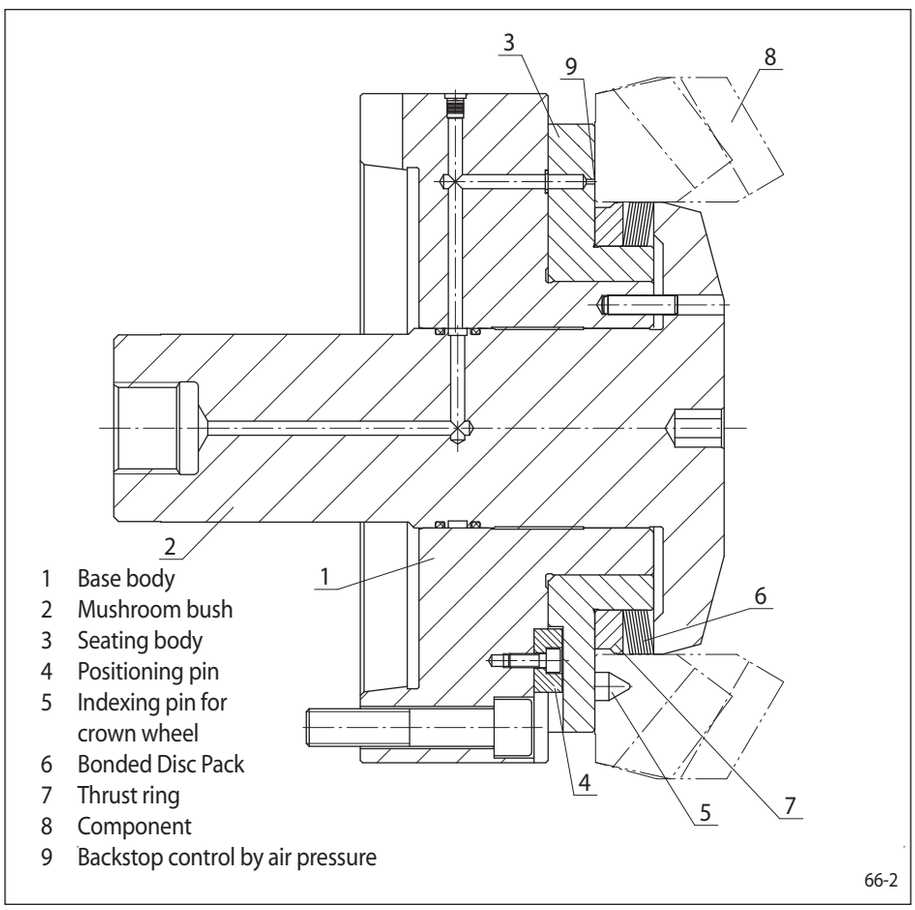
Application examples

RINGSPANN®

Truck crown wheel





1 Base body
2 Mushroom bush
3 Seating body
4 Positioning pin
5 Indexing pin for crown wheel
6 Bonded Disc Pack
7 Thrust ring
8 Component
9 Backstop control by air pressure

Component

Truck crown wheel

Type of machine

Tooth milling machine

Machining

Tooth milling

Task

- Clamping of blank crown gear in the central bore hole
- Automatic loading
- 3 shift serial production
- Quick change to a different clamping diameter

Our solution

- Bonded Disc Pack Flange Mandrel with interchangeable clamping sets and backstop control
- Power activated

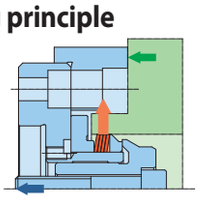
Customer benefit

- High clamping precision
- Easy loading due to special loading chamfer on mushroom bush and additional clearance
- Backstop control by air pressure
- Long service life of Bonded Disc Pack
- Interchangeable clamping sets for short set-up time

Brief description

The Bonded Disc Pack Flange Mandrel is equipped with an automatic component feed unit. In order to ensure collision-free loading, the mushroom bush (2) is designed with an insertion chamfer. The additional clearance of approx. 0,2 mm further facilitates loading. During the clamping process, the crown wheel (8) is aligned, pressed against the contact surface and clamped. Radial and axial runout amount to 0,01 mm. Exact flush alignment is monitored by an air-system control unit (9). By changing the replaceable clamping sets consisting of a mushroom bush (2), a seating body (3), a thrust ring (7) and a Bonded Disc Pack (6), the clamping system can be reconfigured quickly for processing of other crown wheel types.

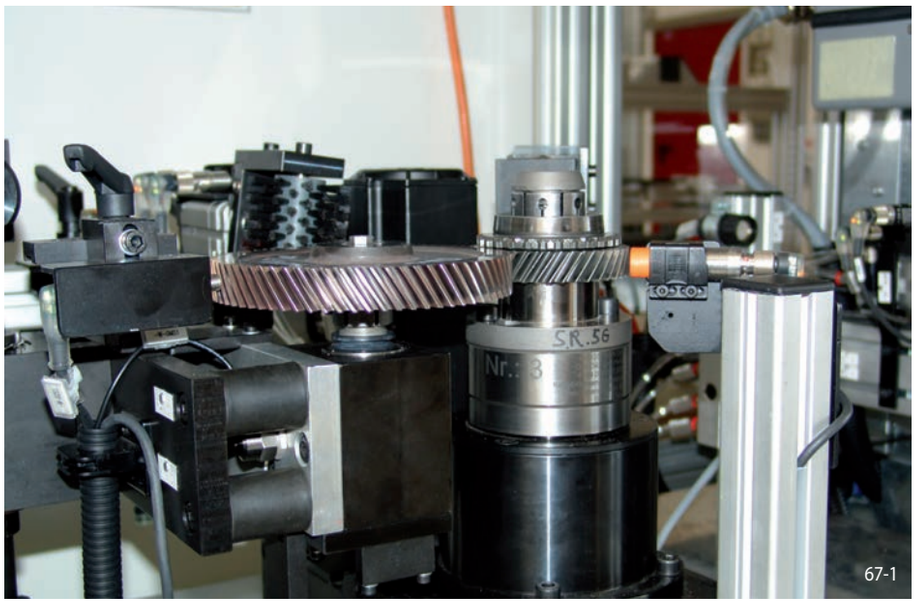
Clamping principle



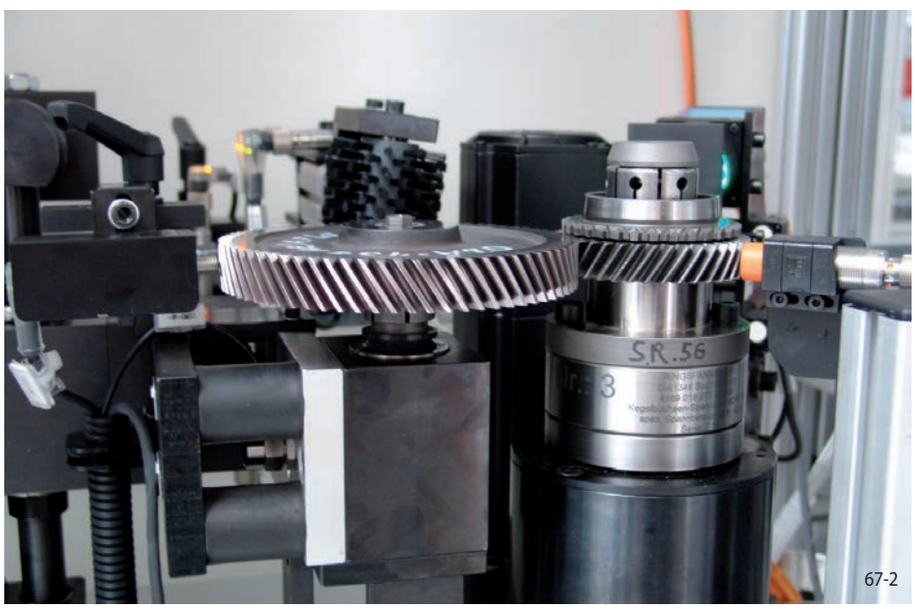
Application examples

RINGSPANN®

Gear wheel



67-1



67-2

Component
Gear wheel

Type of machine
Testing machine

Machining
Inspection of gear tooth performance

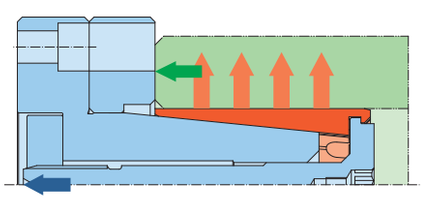
Task
- Clamping of gear wheels during automatic operation
- Transmission of torque during testing
- High true running accuracy

Our solution
- Taper Collet Flange Mandrel
- Power activated

Customer benefit
- Additional clearance (1,2 mm expansion)
- True running accuracy ≤ 0,01 mm

Brief description
The Taper Collet Flange Mandrel is integrated within a fully automated testing machine. Loading and unloading are effected by a robot. The entire gear wheel is pressed against the master wheel, which drives it. The resulting noise is measured and evaluated. At the same time, geometric scanning and inspection are performed by a laser.

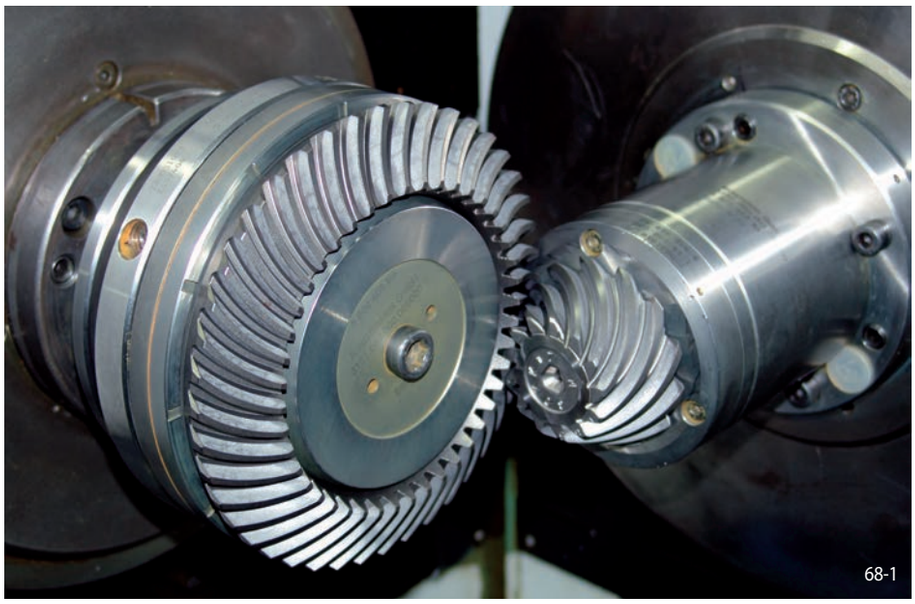
Clamping principle

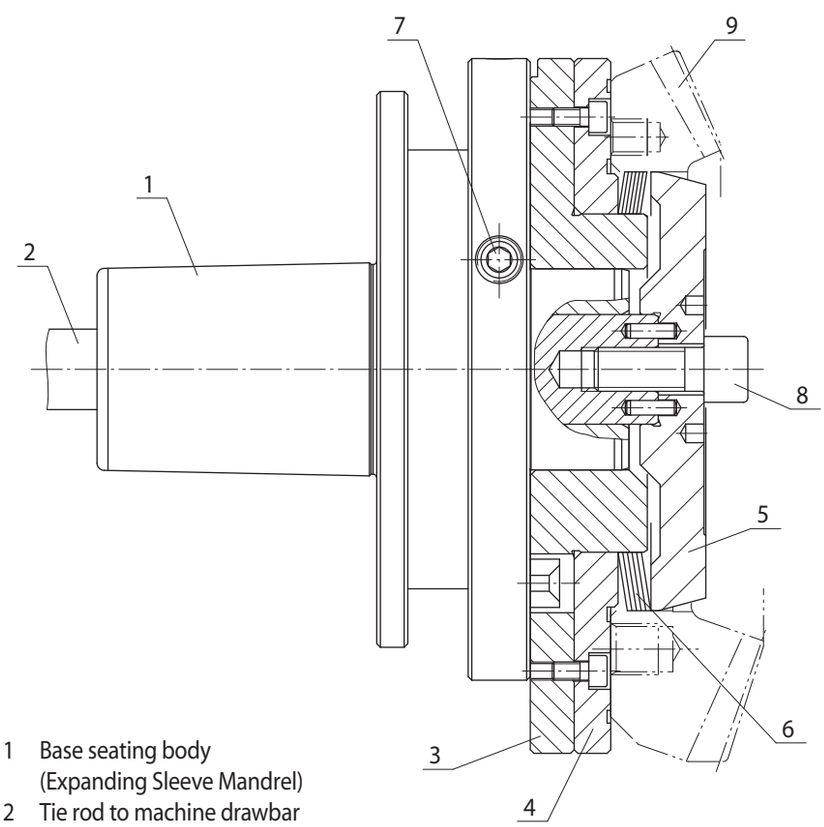


Application examples

RINGSPANN®

Crown wheel





1 Base seating body (Expanding Sleeve Mandrel)
2 Tie rod to machine drawbar
3 Seating body flange
4 Backstop ring
5 Mushroom cover
6 Bonded Disc Pack
7 Radial clamping screw
8 Screw
9 Component

68-2

Component
Crown wheel

Type of machine
Lapping and testing machine

Machining
Lapping and testing of gear teeth

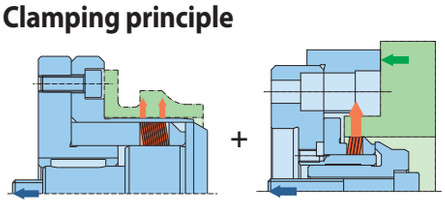
Task
Clamping of crown wheels with possibility of quick change to different clamping diameters

Our solution
- Expanding Sleeve Mandrel as base seating body
- Bonded Disc Pack Flange Mandrel as interchangeable clamping sets
- Power activated

Customer benefit
- Quick change to different clamping diameters without loss of accuracy
- No precise positioning action necessary as the base seating body remains on the spindle
- One Clamping Fixture for different crown wheels

Brief description
The base seating body (1), configured as an Expanding Sleeve Mandrel, remains permanently in the lapping and testing machine. The Expanding Sleeve Mandrel (1) centres and clamps the various replaceable clamping sets consisting of a base body flange (3), a backstop ring (4), a Bonded Disc Pack (6) and a mushroom cover (5). The force required to clamp the crown wheel (9) is provided by the machine tie rod (2). The mushroom cover (5) engages the Bonded Disc Pack (6), which centres the crown wheel (9), aligns it through pull-back action and clamps it. Axial and radial runout are less than 0,006 mm. The entire replaceable clamping set can be removed for replacement by loosening the radial clamping bolt (7) on the Expanding Sleeve Mandrel (1) and the central bolt on the mushroom cover. The operation can be complted in just a few minutes. Thus this system is also suitable for the economically efficient production of small lots.

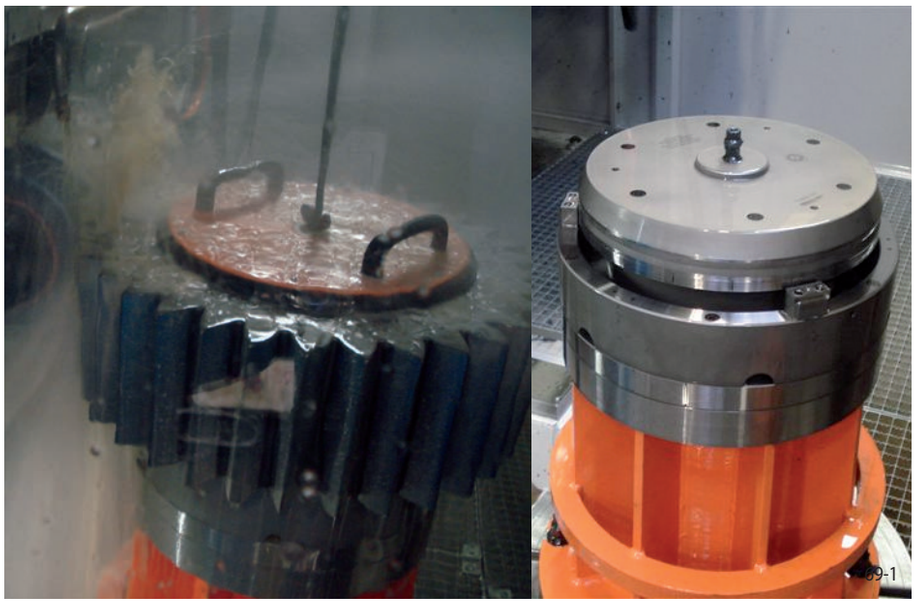
Clamping principle

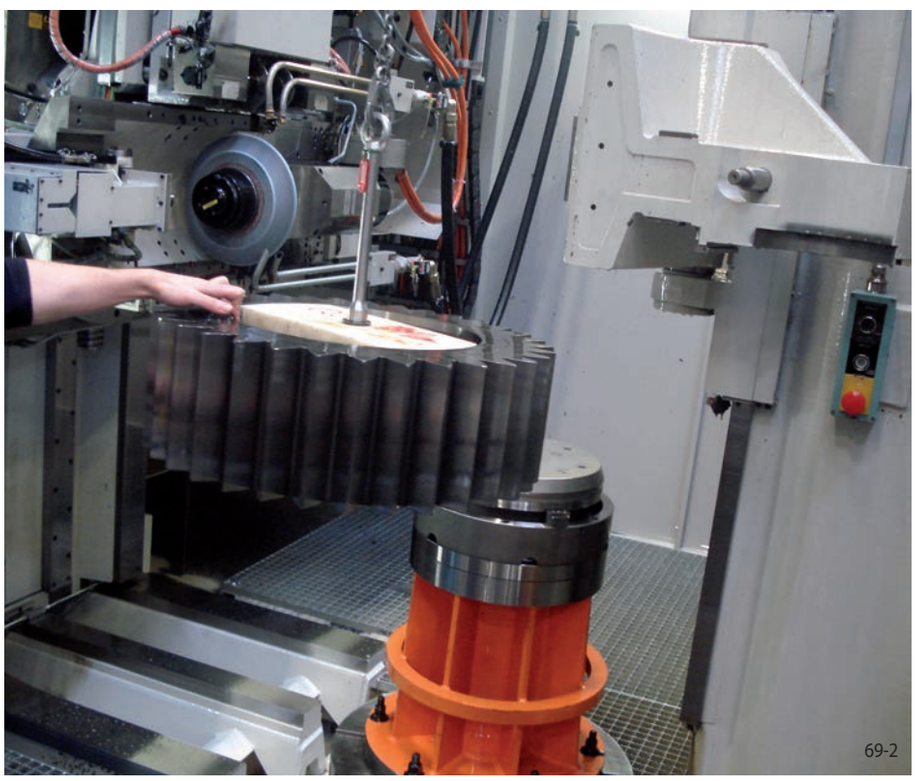


Application examples

RINGSPANN®

Gear wheel for a wind turbine transmission





Component
Gear wheel for a wind turbine transmission

Type of machine
Grinding machine

Machining
Grinding of tooth flank

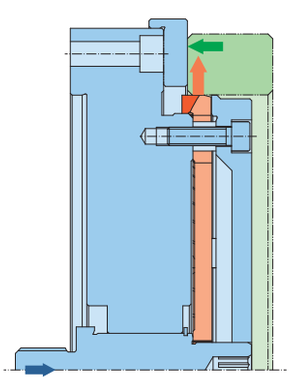
Task
- Central component alignment, max. weight 1 000 kg
- Clamping for machining torque transmission

Our solution
- Flat Element Flange Mandrel
- Power activated

Customer benefit
- Centering accuracy ≤ 0,01 mm in spite of heavy component weight
- True running accuracy ≤ 0,02 mm
- Poweractuating with actuating force reduction
- Cover with pre-centring

Brief description
The Clamping Fixture is actuated when pressure is applied. Because the minimal programmable actuating force of the machine is greater than the maximum permissible force for the Flat Element, an actuating force limiter is positioned between the power clamping device of the machine and the thrust bolt of the Flat Element Flange Mandrel. This consists of two telescope sleeves with disc springs positioned in between. The Flat Element Flange Mandrel exerts a very high radial force which securely centres and clamps the gear wheel in spite of its substantial weight. The cover is equipped with an insertion groove, in order to facilitate the loading of heavy components.

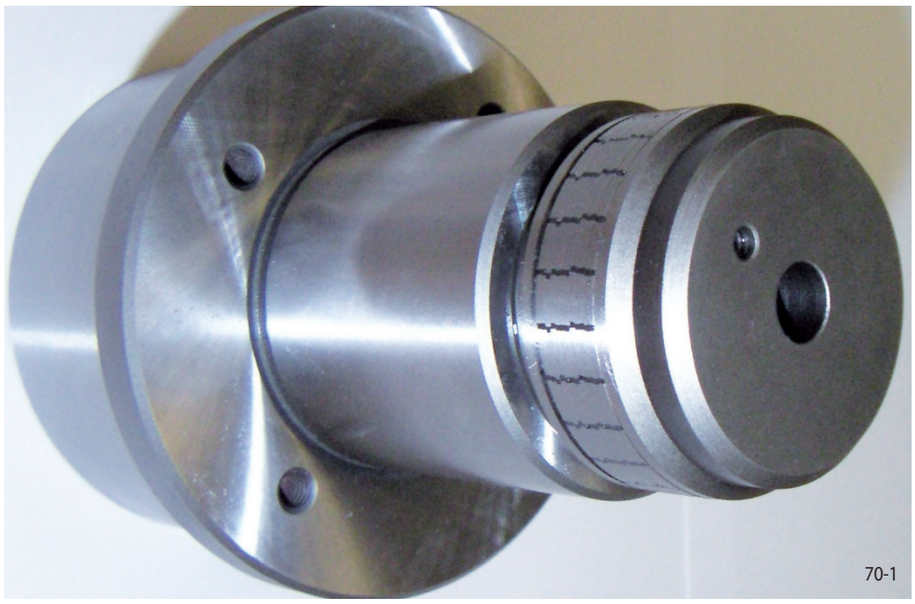
Clamping principle

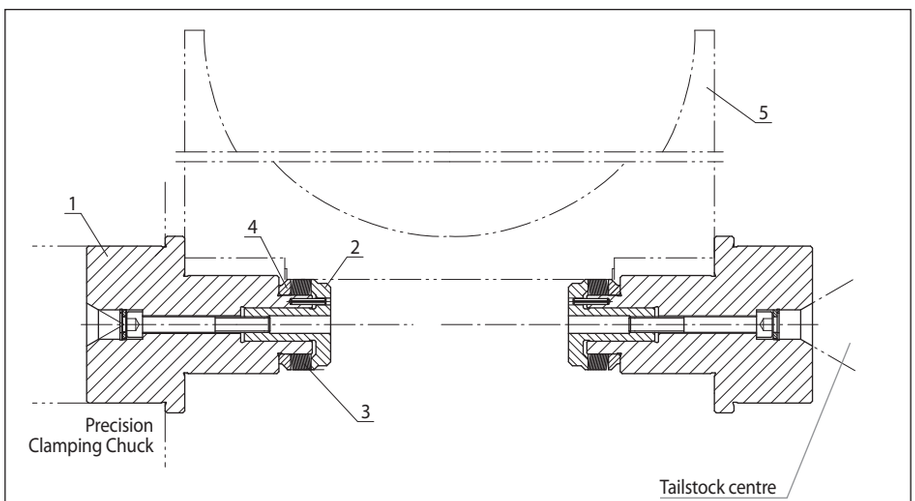


Application examples

RINGSPANN®

Forming roller for profile rolling mills





1 Seating body
2 Mushroom bush
3 Bonded Disc Pack
4 Thrust ring
5 Component (roller)

70-2

Component
Forming roller for profile rolling mills

Type of machine
Lathe

Machining
Contour machining

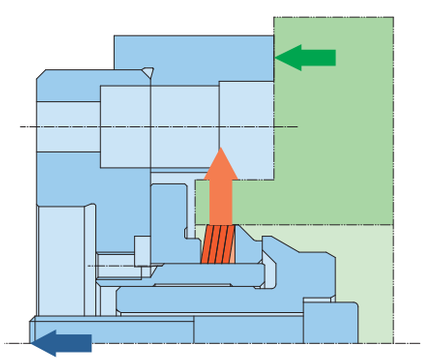
Task
Rework or remanufacturing of form roller

Our solution
- Bonded Disc Pack Clamping Mandrel
- Manually activated

Customer benefit
- Very short set-up time
- High true running accuracy
- Application independent of component length
- Long service life

Brief description
Mounting in the tolerance bores on both sides of the of the form roller (5). The Bonded Disc Pack Clamping Mandrel on the left transmits the torque required for processing. It is held by a precision base chuck. The Bonded Disc Pack Clamping Mandrel on the right is centred with a tailstock pin.

Clamping principle



Notes / sketches

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