FORKARDT
INTERNATIONAL

SPECIAL WORKHOLDING
AND TOOLHOLDING SYSTEMS

Content

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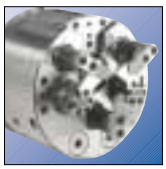
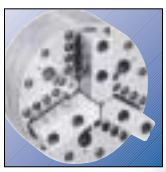




FORKARDT – the world-wide speci toolholding solutions.

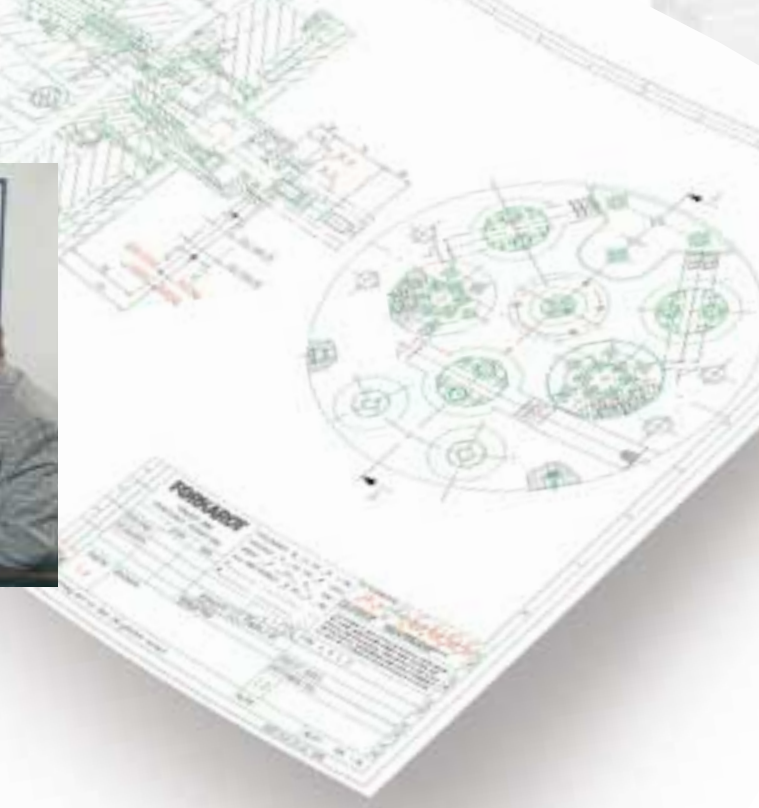
Workpieces of unusual shapes, sizes and weights, which do not allow optimal clamping in standard chucks, require special workholding solutions. Examples include cast and forged parts in automobile manufacture, motors/engines and turbine parts, fittings and many others.

Together we will find the solution

In co-operation with the customer, whose design goals and manufacturing facilities provide the requirements specifications, FORKARDT develops a workholding solution based upon decades of experience and the know-how from thousands of special designs. FORKARDT guarantees a specially designed solution meeting the customer's needs.

Only cost effective solutions are considered perfect

Our customers' success is also ours. To strengthen the competitive capacity of our customers, FORKARDT not only attaches importance to technical perfection, but also keeps the economic goals of the user foremost in mind.



alist for special workholding and

Computer-aided design for functionality from the outset

The FORKARDT group of companies has a highly developed world-wide CAD network which makes it possible to access all the design drawings in the extensive database, from anywhere in the world. For especially demanding workholding and toolholding projects, over 100,000 digitised drawings are available to assist with the speedy development of solutions to our customers latest problems.

Precision chucks for efficient manufacturing

Only the most precisely manufactured special chucks can support high levels of utilisation by the user by providing the highest degree of availability and operational safety. To further ensure high levels of production ability are FORKARDT maintains world wide support, around the clock, through its extensive service network. This brochure presents some examples of the many special workholding and toolholding solutions developed for renowned customers from a wide variety of industrial fields, operating throughout the world.

Crankshaft chucks for all machi

Photo: Courtesy, VW in Salzgitter

- *Crankshaft chuck machining system for automobile crankshafts.*

  Three different chucks are used successively to machine main bearings and pin bearings.

The special geometry of cast and forged automobile crankshafts places the highest demands on the dry machining of pin bearings wherever they are located. Accordingly, FORKARDT has developed a clamping and chucking system which not only guarantees the required precision, but also the highest degree of flexibility. The result is economic production through substantially shortened set-up times, low maintenance and consistent high precision.

Photo: Courtesy, VW in Salzgitter

Technical specifications		Main bearing chuck	Pin bearing chuck 1 + 4	Pin bearing chuck 2 + 3
Diameter	mm	255	420	420
Max. operating force	daN	8,000	6,000	6,000
Max. clamping force	daN	12,000	11,000	11,000
Max. rpm	min^{-1}	3,000	1,200	1,200
Repeatability	mm	0.03	0.03	0.03

ning operations.

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An interchargeable set of spaces is a quick and cost effective way of providing for fast set-up for different types/sizes of crankshafts. More costly automatic change over systems are also available. All chucks in this series are sealed and greased for life to prevent the ingress of dirt, swarf and coolant thus ensuring the high degree of operational reliability and availability required by the automobile industry.

Highlights of the FORKARDT crankshaft chuck technology

- Maximum functional reliability, minimum maintenance.
- Crankshaft chuck set-up on centreline by simple adjustment of the chuck body.
- Minimised set-up times to other crankshaft versions due to the simple configuration of the exchange parts.
- Smooth chuck surfaces to assist optimum drop of chips.
- Precise repeatability with ground jaws of < 0.03 mm.

Special design for heavy vehicle crankshafts for secure workholding and accurate machining.

Technical specifications		3KWD 420
Max. clamoing force at 50 bar	daN	9,000
Max. rpm	min^{-1}	560

Special chuck for heavy vehicle crankshaft machining

These crankshafts are centred between the chuck and the tailstock centre. The axial position of the shaft at the flange is effectively fixed whilst the movable chuck centre reverses. The correct angular position is achieved at the first crank web. Final clamping is made by the clamping jaws at a main bearing. Once half of the shaft is machined, the shaft is turned to have the second half finished. The clamping chuck can be used for 4 to 6 cylinder crankshafts, if equipped with the corresponding exchange parts.

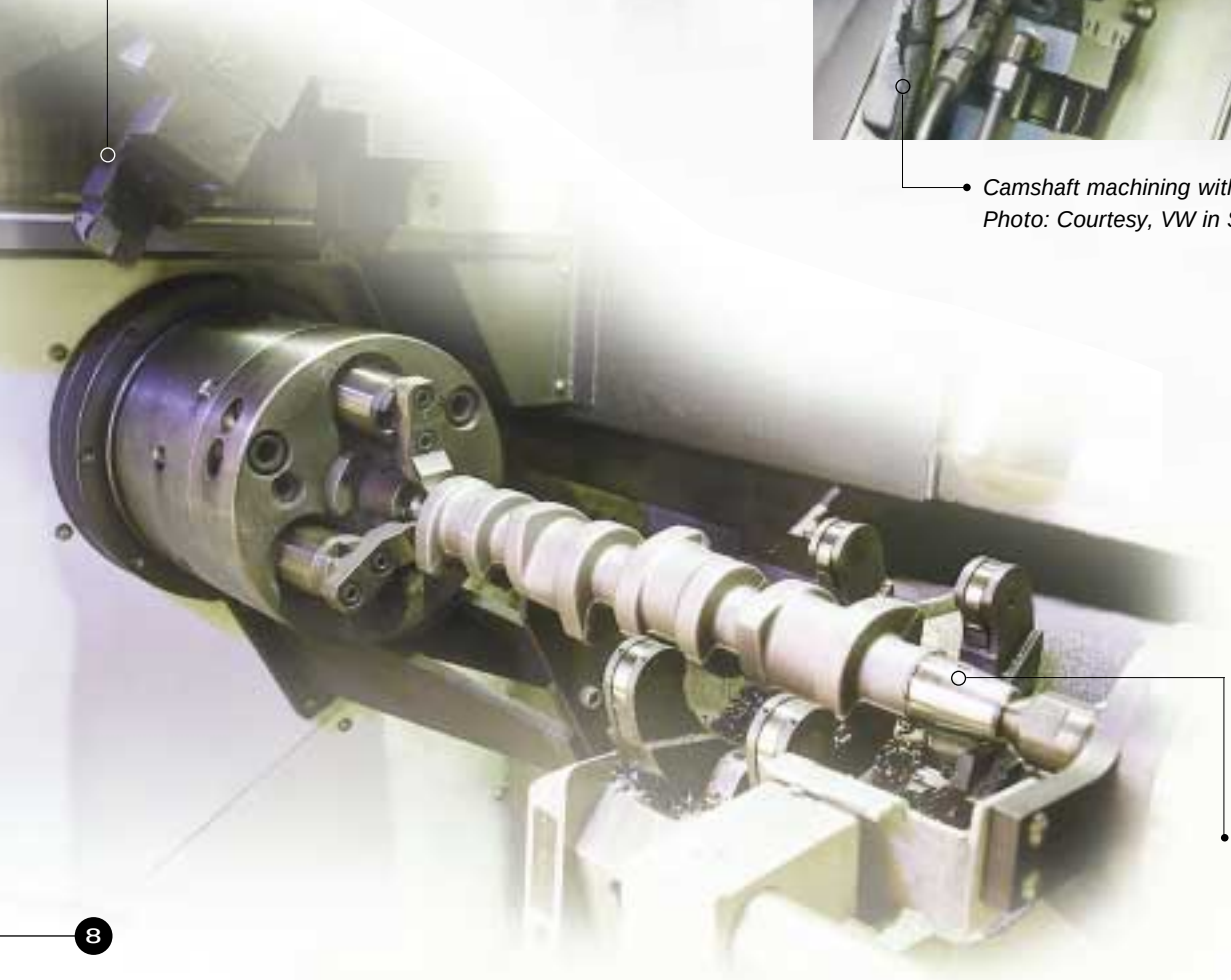
Camshaft chucks for production

FORKARDT has developed a clamping system intended for turning, milling and boring of camshafts, placing emphasis on the economic production of large batch sizes.

The production line starts with the positioning of the workpieces -cast or forged camshafts- to allow turning. Here the camshaft is simply pushed by the tailstock onto the centering insert of the clamping chuck.

The clamping process is compensated on the pre-turned diameter. Moveable steady rests support the camshaft during bearing journal machining. Hermetically sealed FORKARDT chucks, such as these, have been proven for both dry and wet machining methods.

Camshaft machining with steady rest. Photo: Courtesy, VW in Salzgitter



Partially machined camshaft with steady rests. Photo: Courtesy, VW in Salzgitter

line stations.

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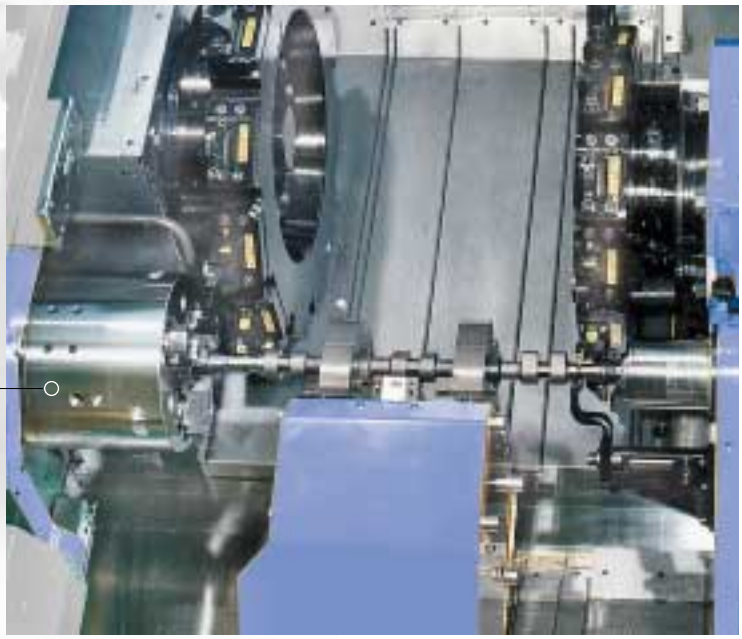
2-jaw chucks are used in the production lines for milling and boring the camshaft grease channels. Integrated turning centres guarantee precise workpiece centering. Compensating clamping permits the clamping of unmachined workpiece surfaces.

Hermetically sealed chucks fitted in a milling and boring line.
Photo: Courtesy, VW in Salzgitter

Highlights of the FORKARDT clamping technology: camshaft chucks

- Maximum functional reliability with minimum maintenance
- Easy chuck set-up on the centre line by simple chuck body adjustment
- Shortest possible set-up times due to the simple configuration of the exchange parts
- Smooth chuck surfaces to assist optimum chip clearance
- Precise repeatability with ground jaws of 0.015 - 0.03 mm



Camshaft machining of the bearing seats.
Photo: Courtesy, VW in Salzgitter

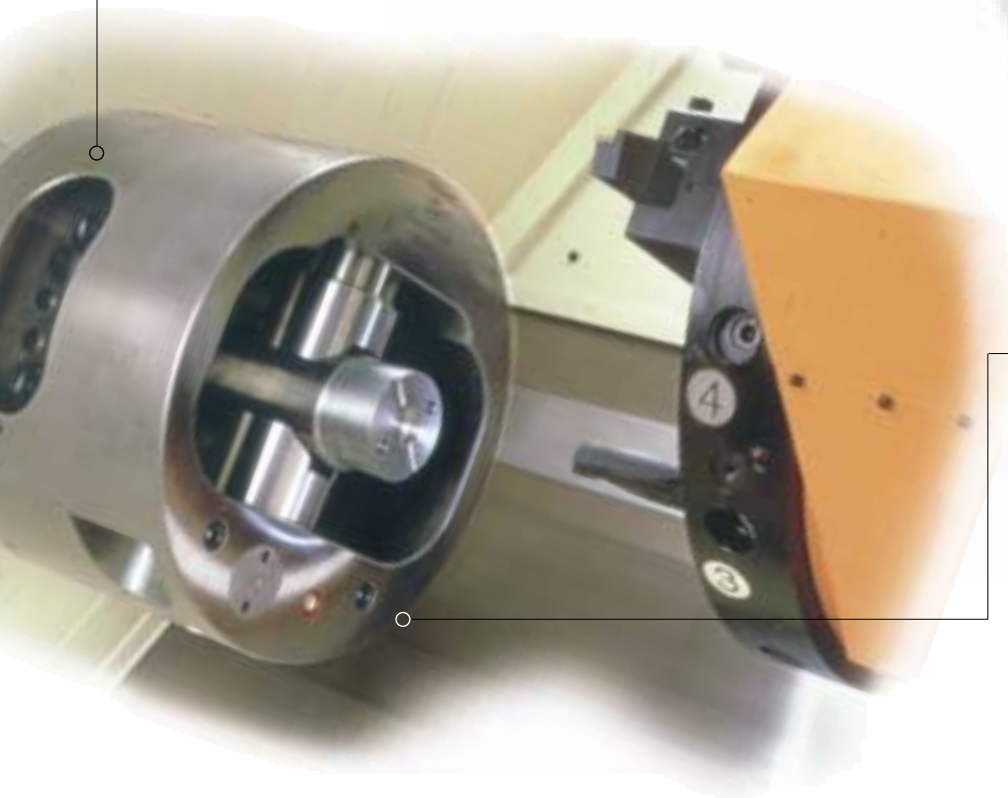
Technical specifications		Turning operation	Drilling and milling operation
Diameter	mm	210	208
Max. operating force	daN	5,000	2,000
Max. clamping force	daN	7,500	2,000
Max. rpm	min^{-1}	4,000	
Repeatability	mm	0.03	0.015

Indexing chucks for complete ma
in one gripping position.

This special indexing chuck developed by FORKARDT is intended for machining workpieces with several machining axes. When clamped with conventional chucking equipment, each machining surface requires repositioning and re-gripping of the component, which drastically increases non-productive times and can introduce significant errors.

FORKARDT indexing chucks allow all machining steps with just one gripping operation. Without unclamping, the workpiece is pivoted with high precision into its individual processing position. Usually, the machine spindle does not even need to stop.

For decades, FORKARDT indexing chucks have been used successfully for the mass production of small parts such as constant velocity pivot joints and fittings of many types. Other versions have also been developed for the production of heavy castings and forgings, such as large valve fittings and pump housings. Clamping cams or fixing bores can also be supplied where appropriate, to facilitate the gripping of difficult workpieces in the indexing chuck. Typically, exchanging standard workholding equipment for indexing chucks results in a considerable reduction of processing times, combined with improved production accuracy and consistency.



Hydraulic indexing chuck for complete machining processes on a CNC lathe.

achining processes

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Hydraulic indexing chuck for the complete machining of threaded sleeves.

Hydraulic indexing chuck for the complete machining of a constant velocity pivot joint.

Large batch production using hydraulic indexing chucks within a multi-spindle machining application.

High speed power chucks.

To meet the ever increasing demands for higher productivity, higher accuracy and reduced costs, FORKARDT offers a high speed clamping concept which helps to achieve these targets far more effectively than was previously possible – the LDH three jaw chucks for operation at speeds of up to 11,000 r.p.m.

Until recently, advanced users were not able to take full advantage of the capabilities offered by the leading machine tool and tooling suppliers, largely because suitable chucks for the max. turning speed range were not available. The new FORKARDT range of LDH chucks offers users a clear productivity advantage due to substantially reduced machining times.

Advantages of the LDH technology:

- Integra centrifugal force compensation with the lever jaw system.
- High intrinsic stability resulting from the fully enclosed chuck body.
- Hermetic seals ensure permanent lubrication without maintenance.
- Finely balanced precision production guarantees a high degree of active safety.
- High precision mounting of the weight optimised top jaws, in conjunction with precision balancing, combine for completely vibration-free concentric run – even at 11,000 r.p.m.

Technical specifications		3 LDH 175	3 LDH 160
Diameter	Ø mm	175	?
Max. operating force	kN	15	?
Max. clamping force	kN	35	?
Max. rpm	min^{-1}	11.000	?
Weight	kg	13	?

Chucking products for grinding processes.

The range of FORKARDT 3 KCHP chucks is primarily designed for use with cylindrical grinding machines to hold larger workpieces. Hermetically sealed, these chucks cannot be effected by the ingress of grinding residue. The oil filling ensures up to a one year operation of the chuck without maintenance.

The 3 KFHP is a power operated lever chuck, operated by a power clamping cylinder. The levers convert the axial piston movement into a radial jaw stroke. The patented ball positioning system allows the jaw to be changed without regrinding the clamping position whilst maintaining a concentricity precision of ≤ 0.005 mm. It is also simple to convert the chuck from centric clamping to floating clamping of the workpieces between centres (automatic turning centre). Furthermore the flat design of the chuck reduces the space requirement for the spindle bearing to free the maximum of space in the machining compartment.

Special features

- Maximum repeatability of concentricity within ≤ 2.5 µm.
- Chuck adjustment capability.
- Maximum production availability resulting from low maintenance and short jaw change times.
- Large jaw stroke.
- Longevity and consistent high accuracy.

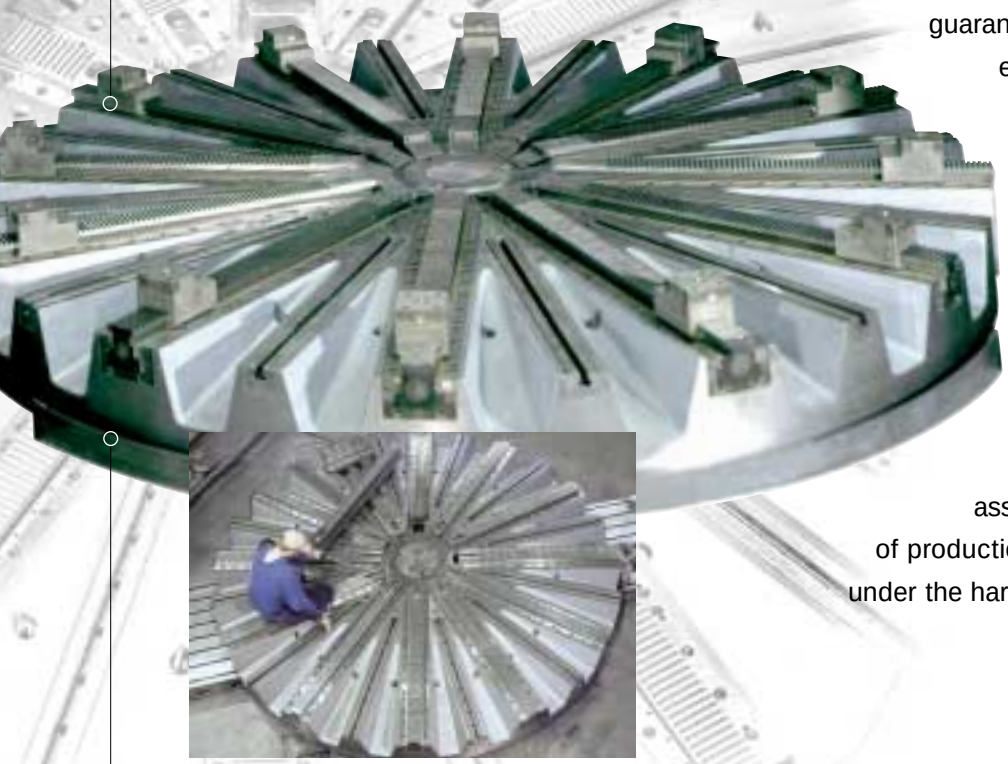
Chuck type		3 KCHP 130-22	3 KCHP 160-30	3 KCHP 200-40
Max. operating force	daN	500	800	1000
Min. clamping force	daN	50	50	50
Max. clamping force	daN	1250	2250	2500
Permissible rpm	min^{-1}	2500	2250	2000
Weight	kg	3.1	5.1	7.8
Moment of inertia	kgm^2	0.0068	0.016	0.038

Clamping solutions for thin walled rings.

Extreme size and the deformation of workpieces create a formidable technical production challenge when premachining and finishing internal and external rings for large bearings. Know-how and experience from the FORKARDT's range of special chucks are the perfect solutions to this type of problem.

Features of the FORKARDT technology:

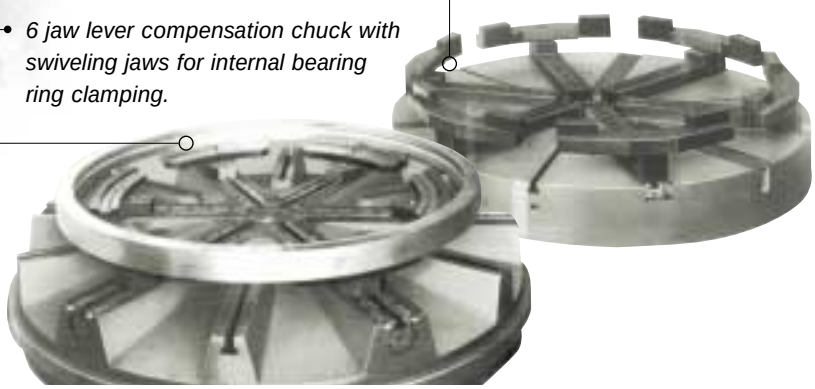
- Easily adjusted compensation mechanics in the chuck centre guarantee evenly controlled contact of the 12 jaws even on non-concentric workpieces, while centring the workpiece centre on the turning axis.
- The centrifugal force comensation system guarantees constant gripping forces even at high rotational speeds. This dynamic process creates rotational speed independent clamping forces which are precisely reproducable.
- Sealing strips on the base jaws and the central lubrication of all moving chuck components assure a reliability and a high degree of production availability the chuck, even under the harshest of production conditions.



12 WAZK 4000
The largest 12 jaw power chuck in the world - 4000 mm dia.

6 jaw chuck for the external clamping of large rings.

6 jaw lever compensation chuck with swiveling jaws for internal bearing ring clamping.



Technical highlights	12 WAZK 4000
Diameter	4.000 mm
Number of jaws	12
Jaw stroke	100 mm
Compensating stroke	±8 mm
Clamping force	60-600 kN
Max. rpm	70 U/min

Expanding mandrels for very large components.

A venture into new dimensions.
Whenever and wherever in the technical world production tasks require innovative individual solutions with maximum precision and reliability, FORKARDT is renowned world-wide for it's experience of delivering solutions which work.

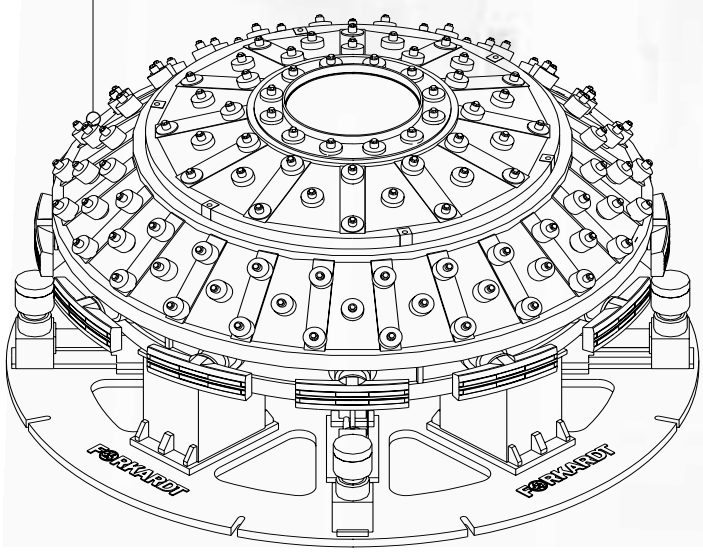
An outstanding result in overcoming such a challenges is the range of FORKARDT expanding mandrels for the production of thin walled booster housing segments for the European Ariane 5 rocket. These unrivalled expanding mandrels with their unusually large dimensions and functions are equipped with 24 individually and synchronously controlled clamping jaws. Especially in Space technology, success depends on a large number of perfectly functioning individual components. Reworking of parts is, therefore, absolutely unacceptable. Everything must be "right first time". Production risks have to be eliminated from the very beginning.

By the development of future oriented technologies FORKARDT contributes to the production of reliable large components.

Highlights of this application FORKARDT technology:

- Clamping diameter: 3 m (loft); height: 3.8 m (12.5 ft).
- Clamping mode: centred, form retaining, program controlled changeover from centric to circular.
- 24 hydraulically operated clamping jaws.
- 24 vibration dampers.
- 4 retractable hydrostatically compensating support units.

Clamping system for machining complex conical forms.



Workholding and toolholding solutions are our business

- For more information visit our website at:

www.forkardt.com

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