

Aerospace

SCHUNK Engineering

Hand in hand for tomorrow



SCHUNK Engineering

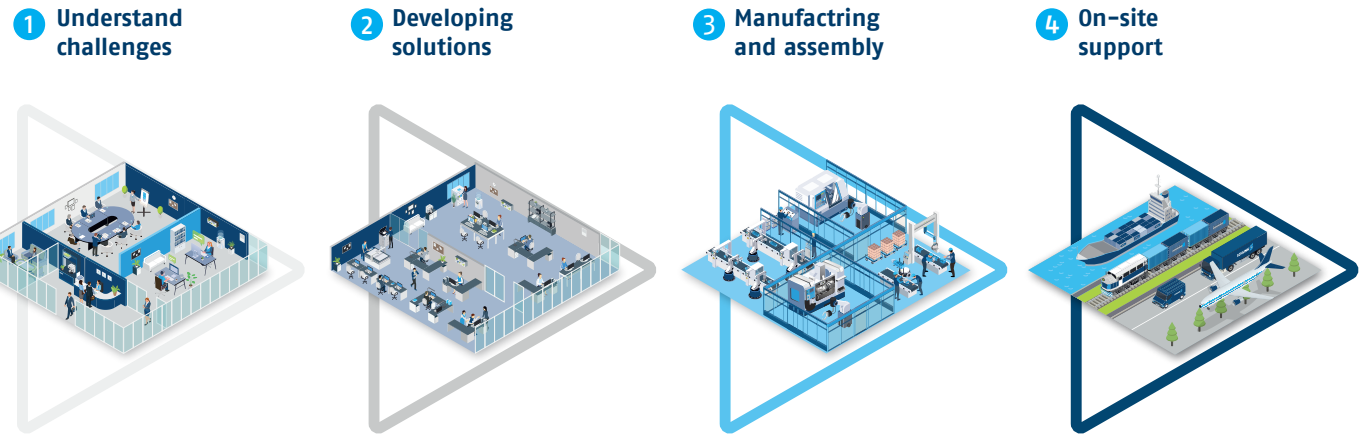
Innovating Partnerships

For the development of customized solutions, we offer a comprehensive range of services: in-depth industry expertise, an engineering process refined over decades, and full design authority over our extensive portfolio of high-quality components.

In the dynamic field of aerospace, there is no room for compromise. SCHUNK Engineering stands for customized solutions that go far beyond standard products. With our in-depth expertise, we develop tailored engineering concepts precisely matched to the requirements of the industry.

- + Maximum precision for your demanding applications
- + Innovative technologies for maximum efficiency
- + Sustainable concepts that relieve people and environment

Four steps to project success



1. Understand challenges –define the requirements

From defining precise requirements through personal dialog to developing a concept with a reliable budget estimate.

2. Developing solutions – from idea to design

We work closely with you to develop customized solutions. This allows you to fully concentrate on your core competencies.

3. Manufacturing and assembly – production and validation

With our high level of manufacturing expertise and an end-to-end digital process chain, we ensure maximum efficiency and precision, worldwide.

4. On-site support – delivery and after-sales

As a trusted partner, we take care of your concerns and support you every step of the way.

Content

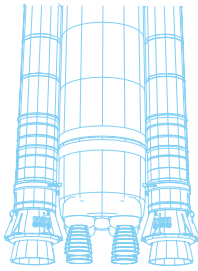
	From page
SCHUNK Engineering	2
Aircraft	4
Engine	4
Landing gear	8
Structural components	16
Helicopter	22
Space	23
Workpiece alignment	24
Process optimization through automation	26
Simulation services	27
Process monitoring and documentation	28



Aircraft
Page 4



Helicopter
Page 24



Space
Page 25

Your contact for your customized solution:

Telefon: +49-7133-103-2555
aerospace@de.schunk.com

Engine

Powerful and innovativ for strictest requirements

The aerospace industry is one of the most demanding industries in the world. Precision, absolute reliability, and innovative manufacturing technologies are essential to meet the highest safety and quality standards. Engine components play a key role, as they must withstand extreme stresses. Continuous innovation in engine parts is also crucial for improving fuel efficiency, reducing emissions, and increasing overall performance.



Clamping of turbine rotors
Chuck jaws for I.D. clamping



Clamping of bladed discs
Hydraulic expansion arbor



Clamping of turbine rotors
Hydraulic expansion toolholder



Clamping of turbine rotors
Hydraulic expansion arbor

You will find solutions for process optimization through automation on page 26.

Clamping of bladed discs

Bladed discs place the highest demands on precision, process reliability, and component protection. SCHUNK develops customized clamping solutions that ensure high run-out accuracy, defined force distribution, and low-vibration machining.

Hydraulic expansion arbor and hydraulic expansion toolholder

- + Run-out accuracy of ≤ 0.01 mm
- + Secure face contact due to integrated axial pullback (optional)
- + Low-deformation with adjustable expansion rate via dosing piston
- + Low-maintenance thanks to hermetically sealed hydraulic expansion technology
- + Vibration damping via floating damping ring and integrated hydro-expansion technology



Hydraulic expansion toolholder



Hydraulic expansion arbor



VERO-S modul

System for quick-change clamping device

- + Positioning via flex taper
- + Consistent pull-down force, even at high rotational speeds
- + Compatible with all common mill/turn centers
- + Set-up time reduction through zero-point clamping station

Clamping of turbine rotors

For turbine rotors, maximum run-out accuracy, and rigidity are the focus at every machining stage. Using rigid, precisely actuated SCHUNK clamping solutions, vibrations are reduced, setup times are shortened, and process reliability is increased.

Hydraulic expansion arbor and hydraulic expansion toolholder

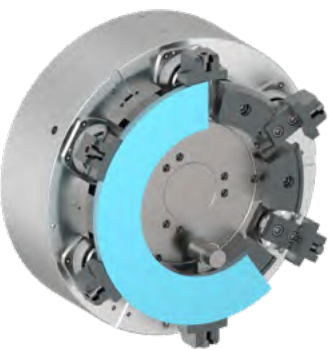
- + With axial pull integrated in the hydraulic expansion arbor
- + Run-out accuracy of ≤ 0.005 mm
- + Secure face contact through additional axial cover
- + With integrated pull stud (optional)
- + Vibration damping thanks to integrated hydraulic expansion technology
- + Low maintenance thanks to hermetically sealed hydraulic expansion technology



Hydraulic expansion arbor



Hydraulic expansion toolholder



Chuck jaws for O.D. clamping – OP10



Chuck jaws for I.D. clamping – OP20

Chuck jaws for I.D. and O.D. clamping

- + With interchangeable clamping inserts
- + High repeat accuracy thanks to the ground mounting at the supporting jaw
- + Workpiece locating with air sensing control
- + Secure face contact thanks to pull-down
- + Lathe chucks SCHUNK ROTA NCS 630/SCHUNK ROTA NCS 500

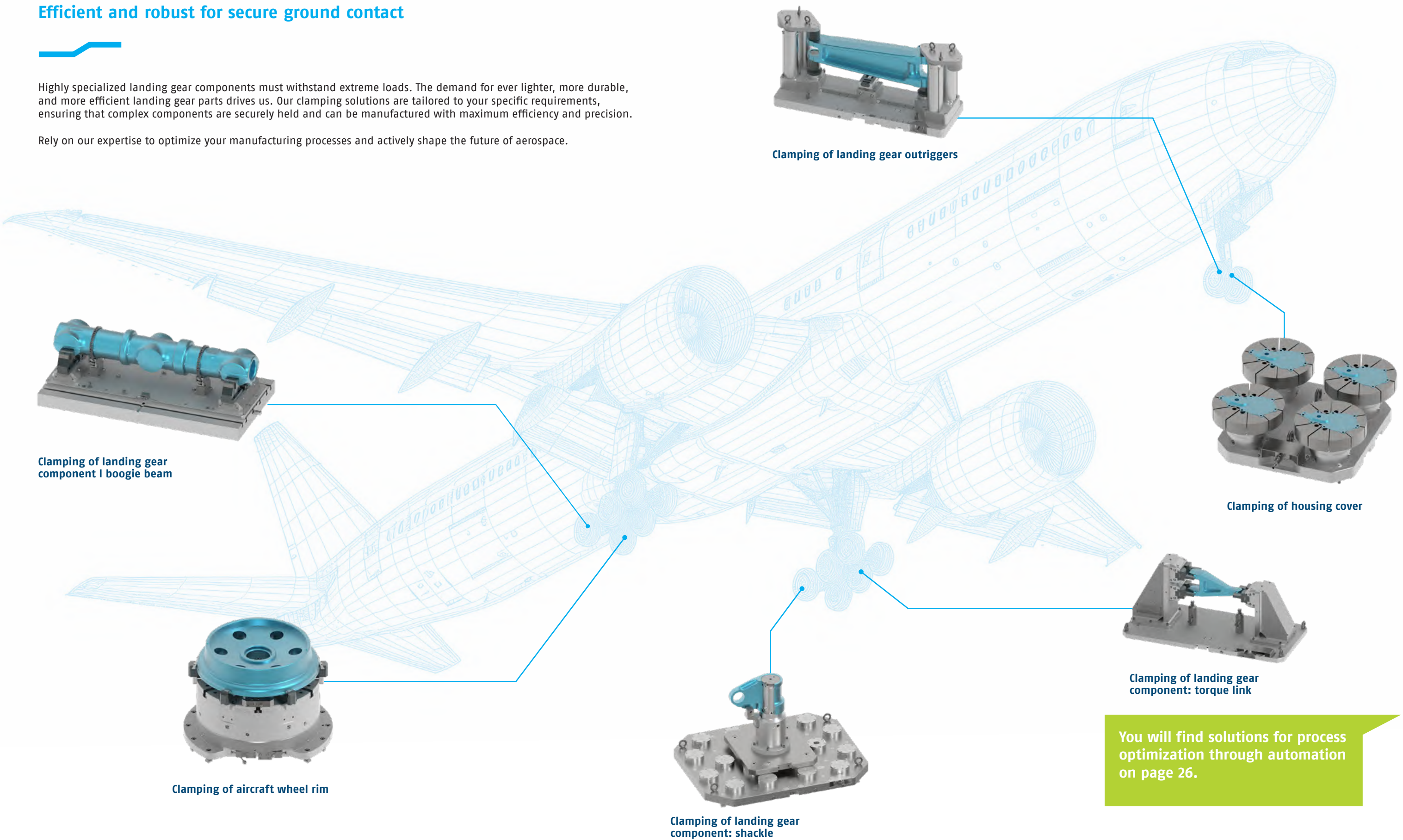
You will find solutions for process optimization through automation on page 26.

Landing gear

Efficient and robust for secure ground contact

Highly specialized landing gear components must withstand extreme loads. The demand for ever lighter, more durable, and more efficient landing gear parts drives us. Our clamping solutions are tailored to your specific requirements, ensuring that complex components are securely held and can be manufactured with maximum efficiency and precision.

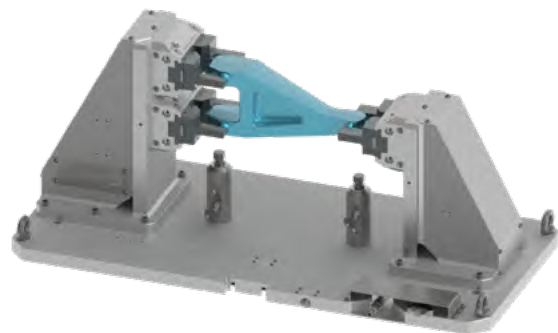
Rely on our expertise to optimize your manufacturing processes and actively shape the future of aerospace.



You will find solutions for process optimization through automation on page 26.

Clamping of landing gear components: torque link

Landing gear components demand tight tolerances, surface protection, and high process stability – often with complex geometries. With application-optimized clamping solutions from SCHUNK, forces are precisely applied and high rigidity is ensured, minimizing distortion, reducing setup times, and guaranteeing reproducible quality across all machining stages.



Clamping forces block TANDEM KSP 160

Raw part clamping – torque link, small – OP10

- + With additional loading aid for easy handling
- + Optimal accessibility from two sides
- + Central control of every clamping device
- + Based on a VERO-S quick-change pallet system to reduce setup times during fixture changes.

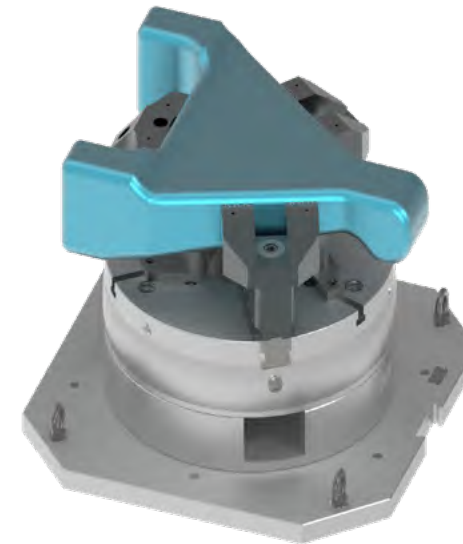


Clamping force block TANDEM KSP 250

Finish machining – OP20

Precisely positioned finishing, along with an optimized outer contour for maximum lateral accessibility and optimal chip flow:

- + With pendulum jaws that optimally adapt to the workpiece geometry
- + Based on a VERO-S quick-change pallet system to reduce setup time during exchange of the fixture



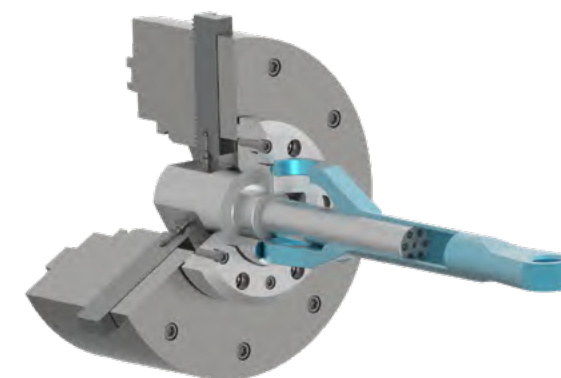
Manual 3-jaw chuck ROTA-S plus 630 with quick-change jaws

Raw part clamping – torque link, big – OP10

- + One fixed jaw and two pendulum jaws for a repeatable reference and adaptation to the workpiece geometry
- + Based on a VERO-S quick-change pallet system to reduce setup time during fixture changes

I.D. clamping

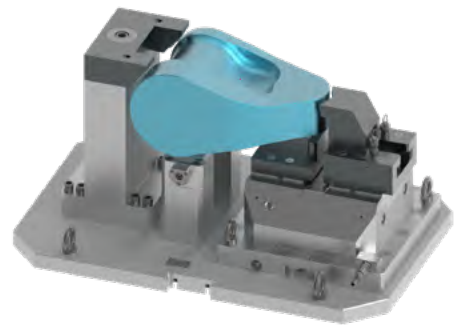
- + Face-side adapted for the ROTA THW lathe chuck
- + Run-out accuracy of ≤ 0.005 mm, centered on the chuck face using an intermediate flange
- + Actuation via SCHUNK chuck jaws Monoblock
- + Vibration damping via integrated hydraulic expansion technology
- + Low-maintenance thanks to hermetically sealed hydraulic expansion technology



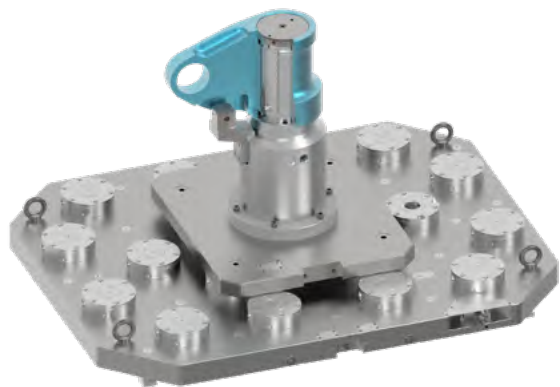
Hydraulic expansion arbor

Clamping of landing gear components: shackle

Shackles are characterized by tight tolerances and the need for process-reliable, form-locked force transmission – often with complex geometries. SCHUNK clamping solutions with defined support points and contour-adapted clamping surfaces minimize distortion, reduce setup times, and ensure reproducible machining processes.



Clamping force block TANDEM



Hydraulic expansion arbor

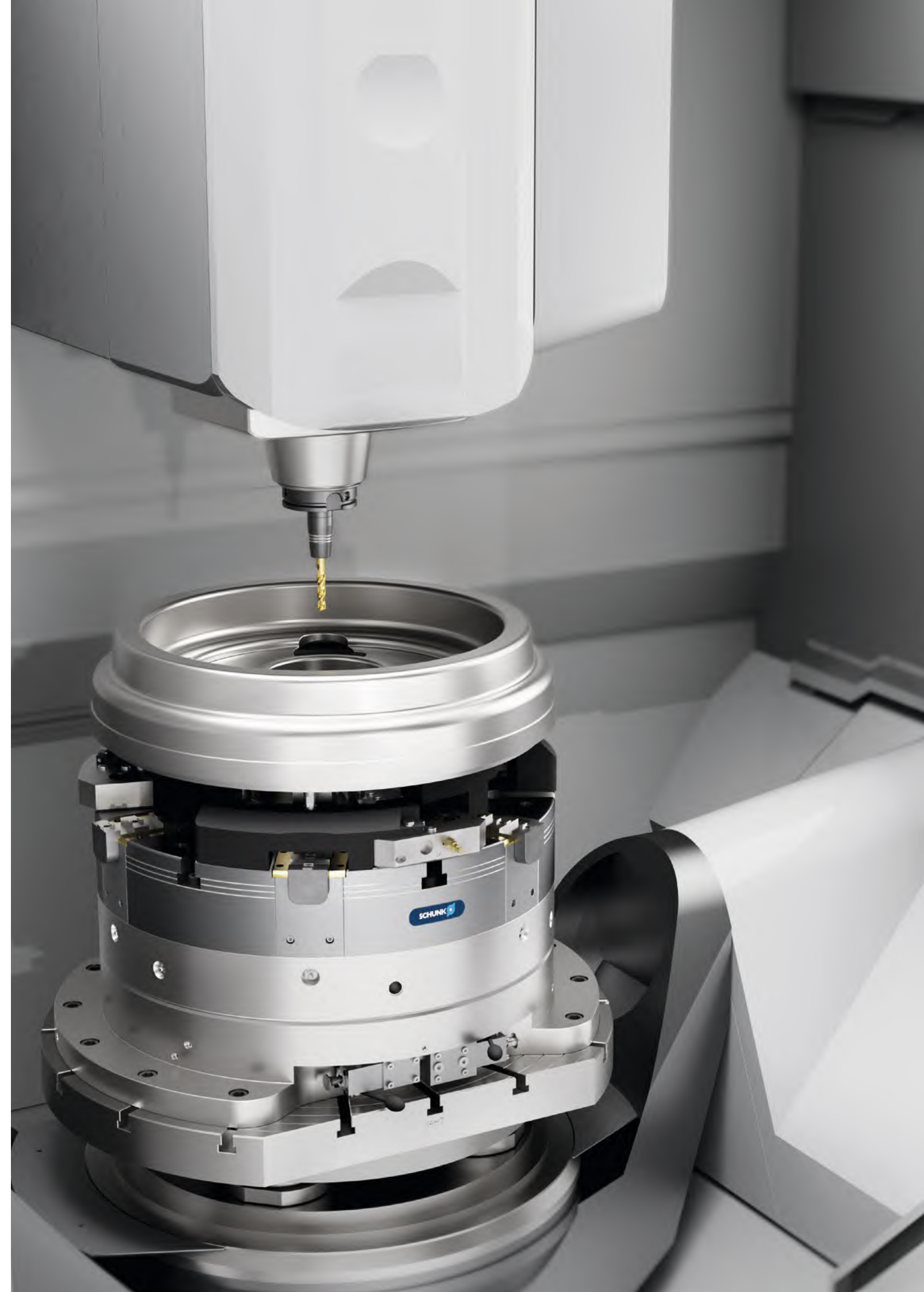
Raw parts clamping – OP10

Precision wedge hook for highest quality requirements allow clamping with high clamping forces in confined spaces:

- + External fixed jaw for defined reference
- + Movable chuck jaw used as a pendulum jaw for compensating raw material fluctuations
- + Based on a VERO-S quick-change pallet system to reduce setup times during fixture change

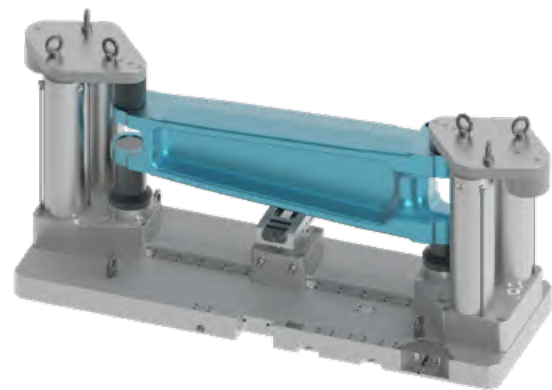
Finish machining – OP20

- + Transmission of high torques for heavy machining
- + Compatible with VERO-S quick-change system
- + Orientation via ball plunger
- + Vibration damping thanks to integrated hydraulic expansion technology
- + Low-maintenance thanks to hermetically sealed hydraulic expansion technology



Clamping other landing gear parts

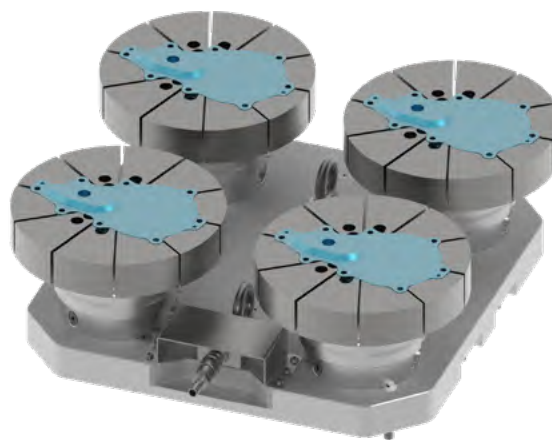
Beyond torque links and shackles, SCHUNK offers clamping solutions for additional landing gear components. The emphasis is on robust, precisely designed systems with contour-adapted support, high 5-axis compatibility, reduced setup times through quick-change pallet technology, and dependable process stability throughout all machining stages.



Hydraulic expansion arbor and VERO-S

Clamping of landing gear outriggers

- + OP20 Bearbeitung auf einer 5- Achs Fräsmaschine
- + Optimale Zugänglichkeit von zwei Seiten
- + Fast exchange of hydraulic expansion arbors via VERO-S quick-change pallet system
- + Compensating mounting with compensation clamping pins SPA-X and SPA-XY
- + Based on a VERO-S quick-change pallet system to reduce setup time during fixture change



VERO-S fixture membrane with active pull-down

Clamping of housing cover

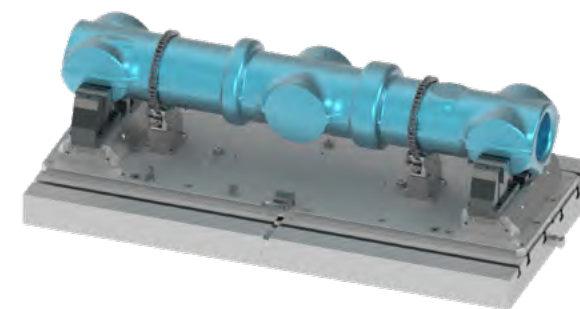
- + Clamping of flexible irregular outer contours
- + Deformation-free clamping of particularly delicate or thin-walled workpieces



ROTA NCR-A 630 lathe chuck with pendulum jaws

Clamping of rims

- + Compensating 6-jaw chuck with pendulum jaws for clamping of delicate, deformationsensitive components
- + Sealed and low-maintenance lathe chuck for clamping
- + Workpiece-specific chuck jaws and workpiece stops
- + Maximum process reliability due to air system monitoring for automated workpiece handling



Clamping force block TANDEM KSP3 315

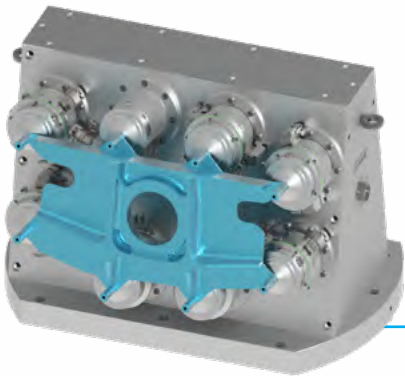
Clamping of landing gear component: boogie beam

- + OP10 machining on a 5-axis milling machine
- + 5-axis chuck jaws with pull-down effect for secure reference support
- + Including hardened grip chuck jaw inserts for secure raw parts clamping

Structural components

Smart and efficient, delivering high strength at low weight

In the field of structural components, opposites meet. Components must combine low weight with exceptionally high strength to ensure stability and safety under extreme conditions. Advances in materials science now enable the development of innovative solutions that are not only more powerful, but also lighter and more efficient.



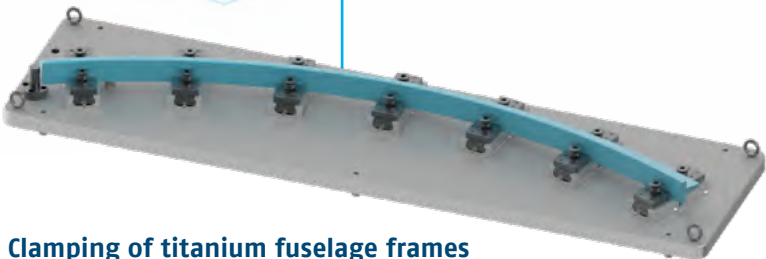
Clamping of titan pintel plate
VERO-S



Clamping of wing panels
VERO-S



Clamping of wing panels
KONTEC vises solutions



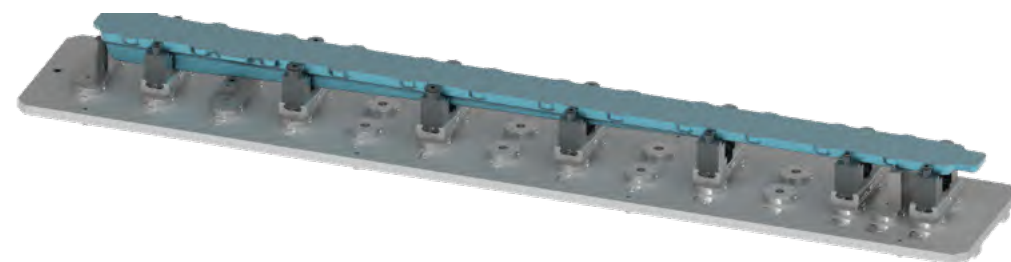
Clamping of titanium fuselage frames
KONTEC vises solutions

You will find solutions for process optimization through automation on page 26.

Clamping of structural components

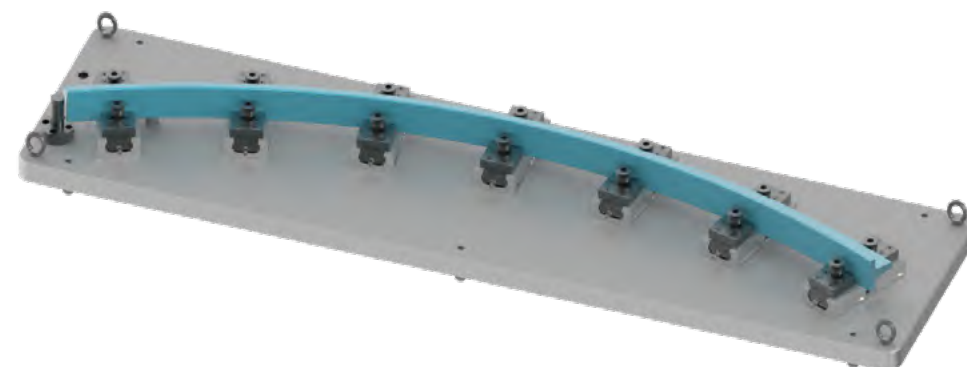
Deformation-free clamping with KONTEC KSC3 125

High precision and high clamping forces



KONTEC KSC3 125

- + Centric clamping vise KSC3 for aligning and positioning the workpiece
- + Floating KSC3 vise for deformation-free clamping
- + Low-maintenance and long-lasting clamping solution thanks to encapsulated spindle for low-maintenance and long-lasting clamping center
- + With customized chuck jaws with pull-down and round grip jaws that adapt effortlessly to the workpiece contour
- + Based on a VERO-S quick-change pallet system to reduce setup time during fixture change



KONTEC KSC3 125

Deformation-free clamping with VERO-S Aviation 2D + 3D clamping units

With a machining volume of 98%, a large number of residual stresses are released on the workpiece side



VERO-S Aviation

- + Flexible clamping system for setup of different parts on different machines
- + Reduction of lead time and costs through fewer operations and reduced setup effort
- + Workpiece tensions can be relieved during machining
- + Completion in two operations instead of four
- + Precision-shaped parts directly from the machine table, reducing costs for final straightening



VERO-S Aviation

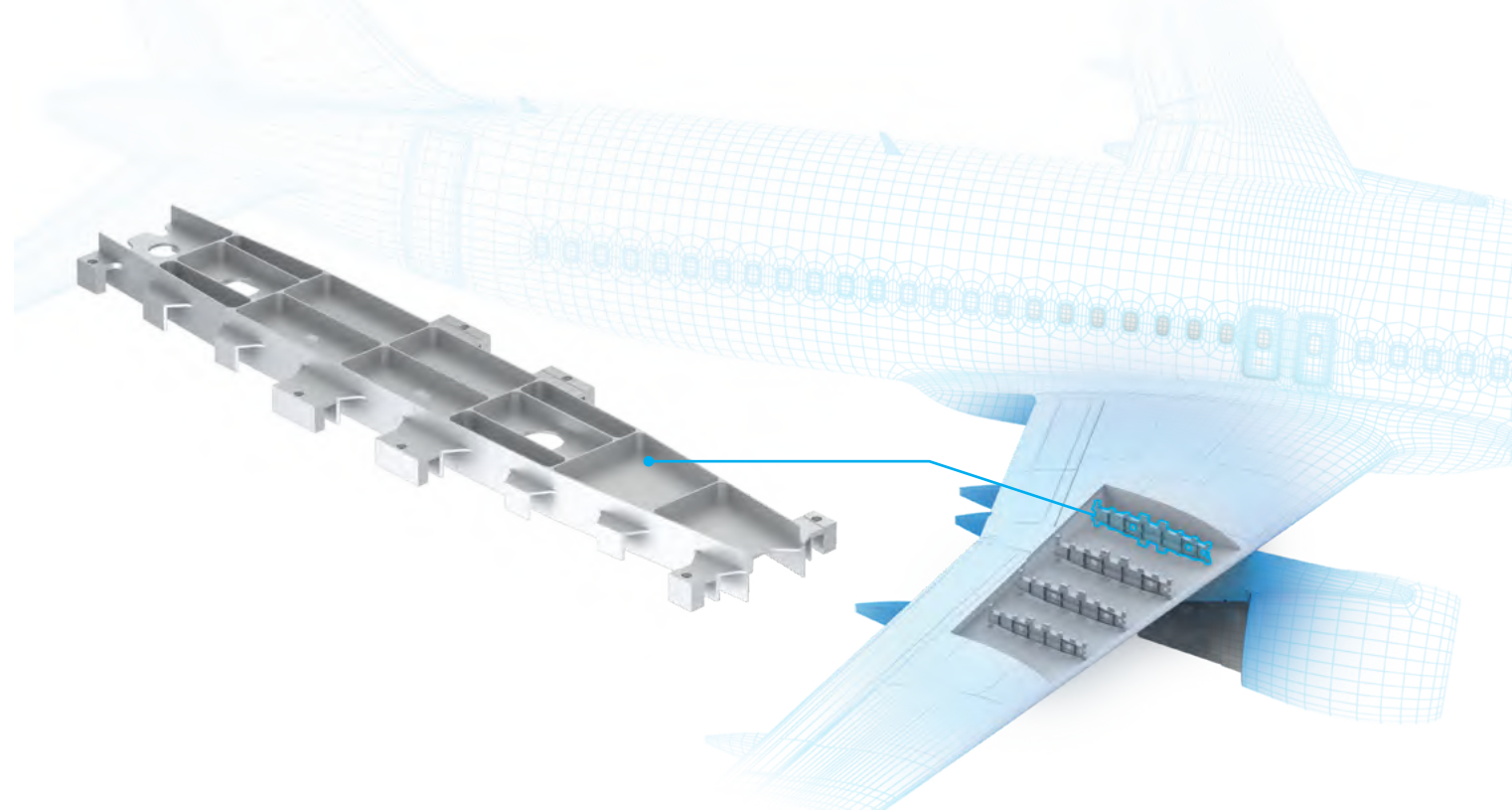
You will find more information about VERO-S Aviation on page 20.

VERO-S Aviation

The modular system for efficient workpiece direct clamping of structural parts

The aerospace industry is and remains a growth market – including for machining. Structural components are particularly cost- and setup-intensive, as they place high demands on clamping. This is due to the residual stresses released during machining. To relieve the parts repeatedly, numerous adjustments, modifications, or complete re-setups of the clamping are necessary.

The SCHUNK VERO-S quick-change pallet system is considered the ultimate in efficient workpiece clamping. To allow users to benefit from its setup cost efficiency even with structural components, the revolutionary SCHUNK VERO-S Aviation clamping system was developed. It enables a drastic reduction of setups through controlled flexibility.



Advantages of SCHUNK VERO-S Aviation clamping system

- Optimal workpiece accessibility allows up to 98% of the machining volume to be achieved with significantly fewer setups
- Repeatable clamping from machining through deburring to measuring and assembly
- Reduction of lead time and costs through fewer operations and less setup effort
- Geometry-accurate parts directly from the machine table, minimizing costs for final straightening
- Flexible clamping system for setting up different parts on different machines



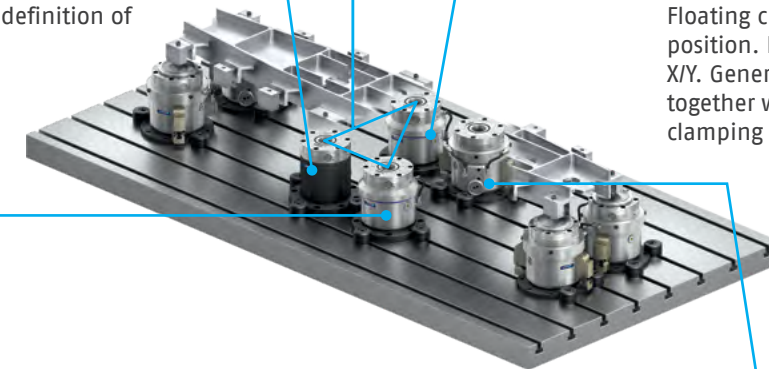
2D CLAMPING UNIT CU-0: A VERSION

Rigid clamping unit. For definition of workpiece zero point.



2D CLAMPING UNIT CU-XY: C VERSION

Floating clamping unit. Without force in position. Release of degrees of freedom in X/Y. Generation of 3-point bearing in Z together with the rigid and compensating clamping unit.



2D Clamping Unit CU-X: B version

Compensating clamping unit. For definition of the workpiece position. Pitch errors with the rigid clamping unit are compensated.



3D clamping unit CU-XYZ: D version

Without force in position or location for release of all degrees of freedom. Pitch and positional deviations to all other clamping units are compensated.

Comparison: Resulting residual stress in the component with and without VERO-S Aviation



Tension in the component is reduced with VERO-S Aviation without any further set-up effort or loss of the workpiece's zero point.

Without VERO-S Aviation, the part is deformed during unclamping, which usually leads to cost-intensive rework.

Helicopter

Precise and reliable to meet the highest safety standards

Helicopter components feature complex geometries, safety-critical requirements, and high dynamic loads. SCHUNK provides precise handling and clamping solutions, ensuring run-out and dimensional accuracy as well as process-reliable machining throughout all production stages.



Clamping of blade holders Hydraulic expansion toolholder

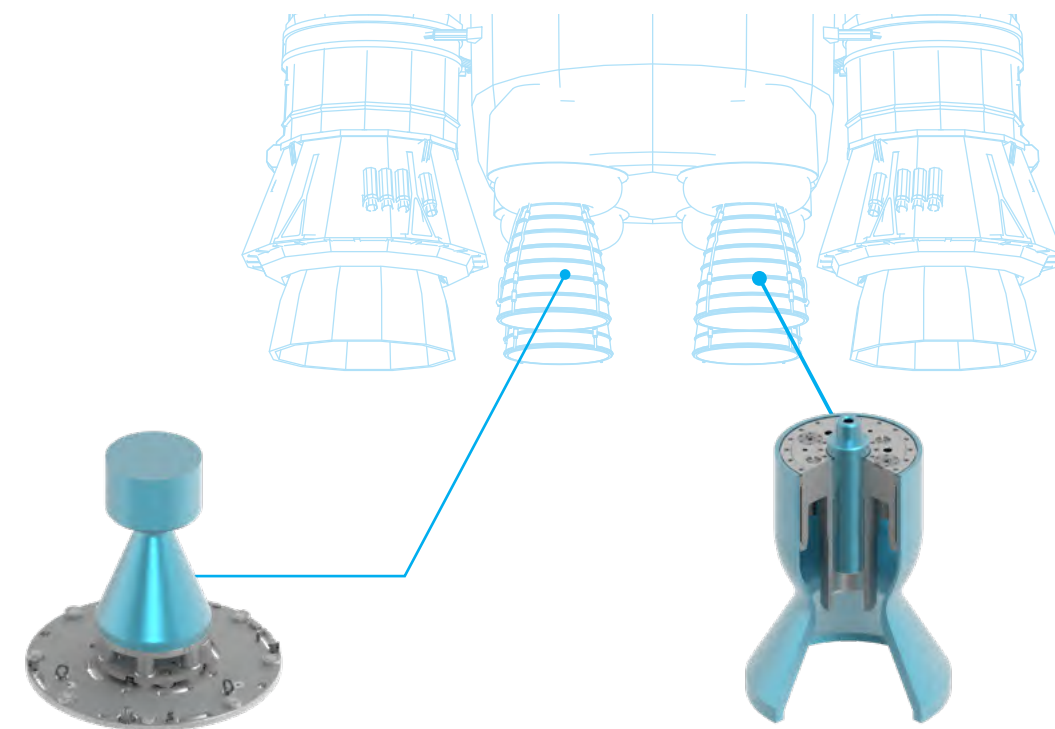
- + Delivers high torques for heavy duty machining
- + Short clamping length thanks to clamping via a one-sided slotted intermediate sleeve
- + Compatible with VERO-S quick-change system
- + Workpiece orientation via sword pins
- + Vibrations damping thanks to integrated hydraulic expansion technology
- + Low-maintenance thanks to hermetically sealed hydraulic expansion technology

Space

Smart and efficient for maximum strength, minimum weight

Space components require extreme precision, absolute reliability, and documented process stability under the strictest standards. SCHUNK's specialized handling and clamping solutions protect sensitive surfaces, maintain tight tolerances, and ensure reproducible quality across all production stages – providing mission-ready components from structures to propulsion systems.

Clamping of nozzle bells



Raw parts – machining VERO-S

- + Based on a VERO-S quick-change pallet system to reduce setup times during fixture change
- + Positioning via patented flexible taper for achieving a run-out accuracy of 0.01 mm
- + Rotational speed up to 200 RPM
- + With visual safety device for maximum operating safety
- + Form-fit, self-retaining locking, even if pressure drops the full pull-down force is maintained

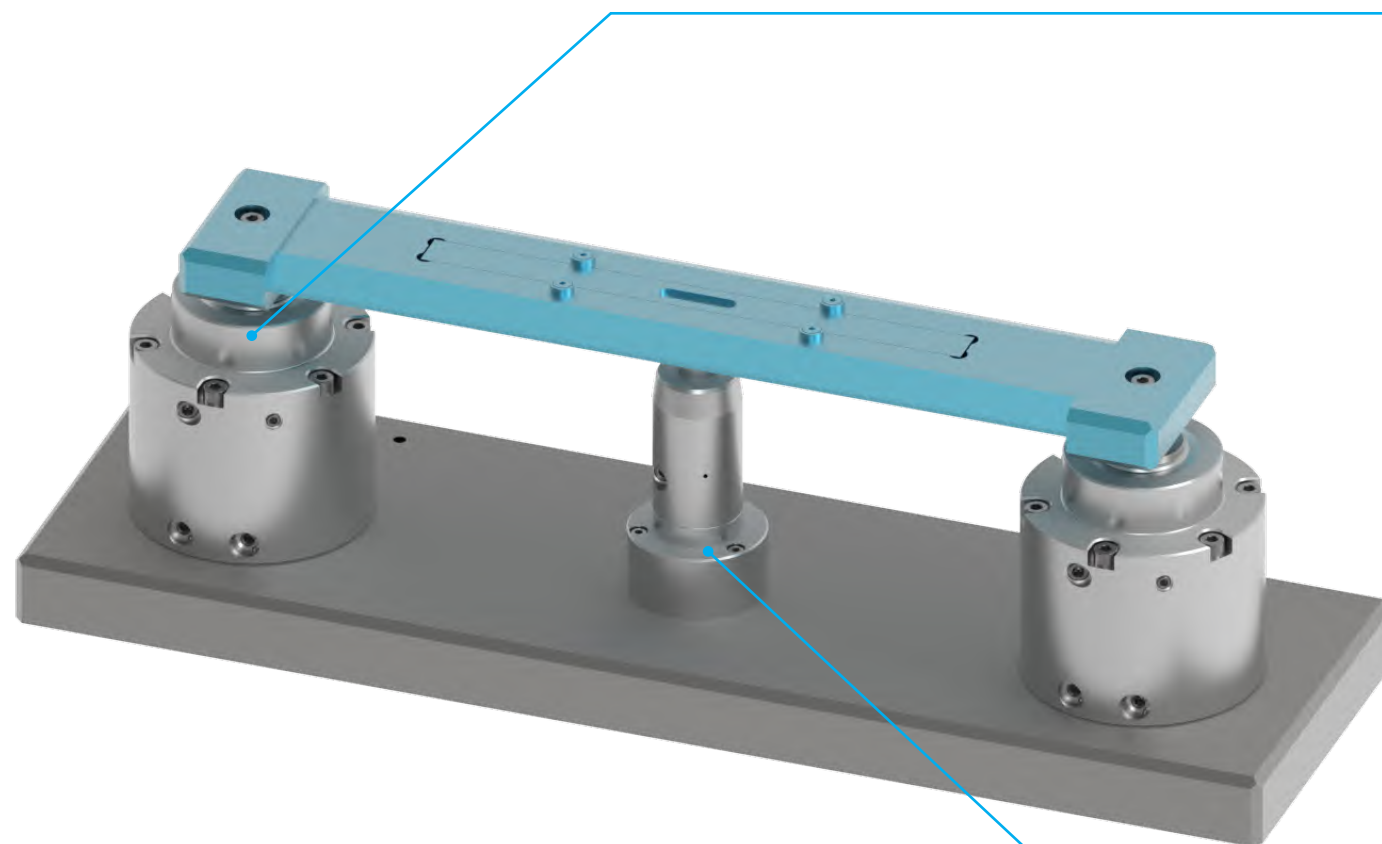
Finish machining – hydraulic expansion toolholder

- + A combination of a hydraulic expansion arbor and a toolholder
- + Run-out accuracy of ≤ 0.005 mm
- + I.D. and O.D. clamping in one clamping device (shaft clamping via hydraulic expansion toolholder and workpiece clamping via hydraulic expansion arbor)
- + Controlled clamping allows low-deformation clamping
- + Vibration damping thanks to integrated hydraulic expansion technology
- + Low-deformation thanks to hermetically sealed hydraulic expansion technology

Workpiece alignment

Precision in motion

Workpiece alignment enables precise axial adjustments. From exact position control and vibration reduction to preventing workpiece deformation – our alignment solutions set the benchmark in fine-tuning.



Micro adjustment and spring adjuster can be used in combination.



Micro adjuster

Micro-precise positioning

The micro adjuster allows precise adjustment of your workpieces.

Using two clamping screws, the membrane inside the device is smoothly actuated via hydro-expansion technology, causing the plunger to extend and accurately position the workpiece. Then the plunger is hydraulically clamped via a clamping screw.

Technical information

- + Micron-precise adjustment within 0.001 mm
- + Hysteresis-free system
- + Hermetically sealed hydraulic expansion technology
- + Manual actuation

Spring adjuster

Secure support

SCHUNK spring adjusters support longer workpieces during clamping, preventing deformation and minimizing vibrations.

The integrated spring ensures precise, stepless adjustment of the pin to the workpiece. Following this, the pin is hydraulically clamped via a clamping screw.

Technical information

- + Integration into existing systems
- + Low height
- + Manual actuation



Optimizing processes through automation

In the aerospace sector, automation is key for reliably and economically producing safety-critical components in larger quantities. It ensures certifiable quality, reduces cycle times, and makes production capacities predictable – even for parts with high variant diversity.

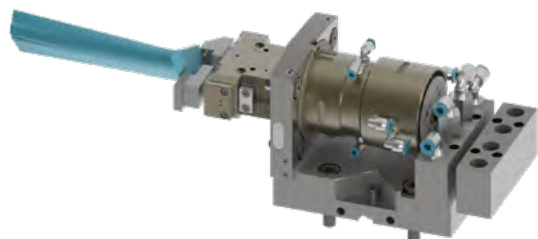
SCHUNK combines precise handling, process-reliable machining, and seamless data collection into a scalable production flow; compliance is ensured, and competitiveness is sustainably strengthened.

Handling of turbine blades



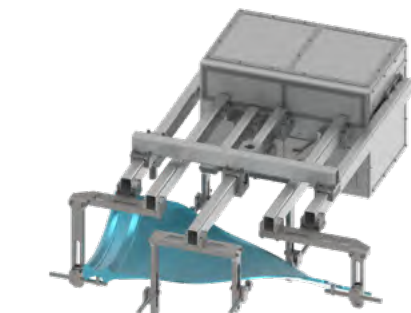
Loading and unloading of machine tools

- + Gripper fingers are specifically designed to fit the customer's workpiece
- + Functional example: Plastic gripper fingers that enable X-ray quality inspection of components while they are being held



Deburring process

- + The customer component is held securely, with tolerance differences between the raw part and the machining tool automatically compensated
- + Reduced machining time and improved quality thanks to compensation of raw part tolerances



Repositioning turbine blades during the hardening process

- + Customer component is taken out of or loaded into the hardening furnace (>1,000 °C)
- + Key challenge: Ensuring thermal insulation to cope with the extreme process temperatures

Simulations services

Perfection for your custom applications

To optimize your machining and handling processes, we can simulate tool, workpiece, and gripper clamping – including automated handovers between process steps. We offer precise design of the clamping and gripping system tailored to your production process, coordinated with planned automation. Additional simulation options can be implemented following technical assessment.

Possible results

- + Reduction of workpiece deformation *Arstückverformung* for delicate or highly precise workpieces
- + Applying a targeted deformation to the workpiece
- + Clamping system deformation under machining forces
- + Modal analysis

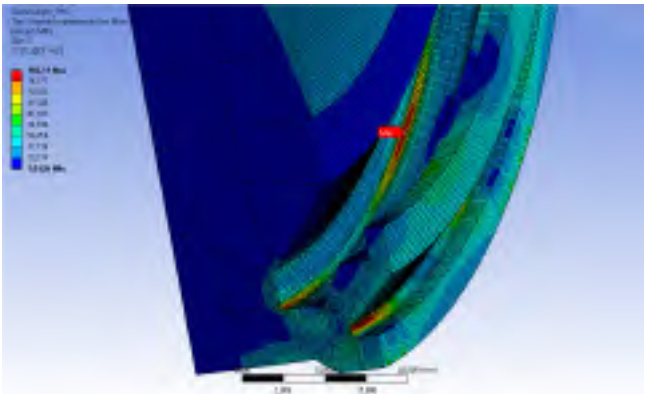
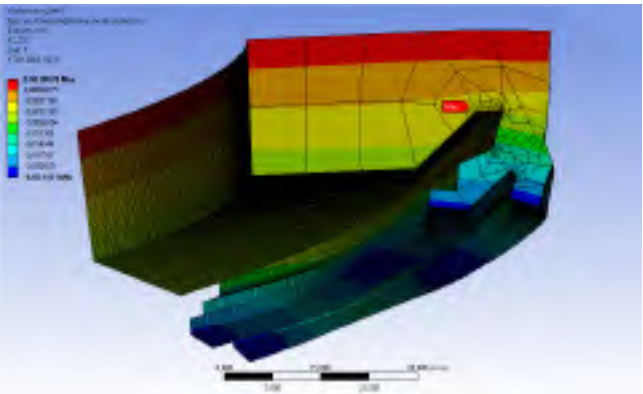
Scope of services

Conducting a feasibility analysis that provides insights into key parameters:

- + Stress on machine components
- + Clamping forces
- + Service life of clamping tools

Your added value

- + Process-reliability
- + Tailored design of the clamping solution
- + Longer service life of the clamping device
- + Faster time to market



Process monitoring and documentation

iTENDO² and iTENDO² seismo: real-time data for tool and machine

Aerospace manufacturing demands verifiable, highly stable processes for challenging materials like titanium, superalloys, and CFRP. Tight tolerances, documented quality, and maximum process reliability are essential for certification and series production.

iTENDO² and iTENDO² seismo provide the necessary process transparency in real time. Together, both systems create a seamless database for process monitoring, documentation, and data-based interface optimization.

iTENDO²



The smart way to optimal processes

iTENDO² measures vibrations directly in the tool mounting in real time, and ensures a reproducible quality. This ensures you get the most out of automation.

Your added value

- + Increase in productivity
- + Cost reduction
- + Quality stability
- + Flexibility
- + Competitiveness

iTENDO² seismo



Flexibility thanks to intelligent real-time sensor-based process

iTENDO² Seismo, an externally mountable sensor, extends the measurement chain on the machine or component – perfect for rapid testing and validation.

Your added value

- + Faster process validation
- + Flexible positioning (magnetically/screwed)
- + 100% compatible: with all iTENDO² packages



SCHUNK SE & Co. KG
Spanntechnik
Greiftechnik
Automatisierungstechnik

Bahnhofstr. 106 - 134
D-74348 Lauffen/Neckar
Tel. +49-7133-103-0
info@de.schunk.com
schunk.com

Follow us

