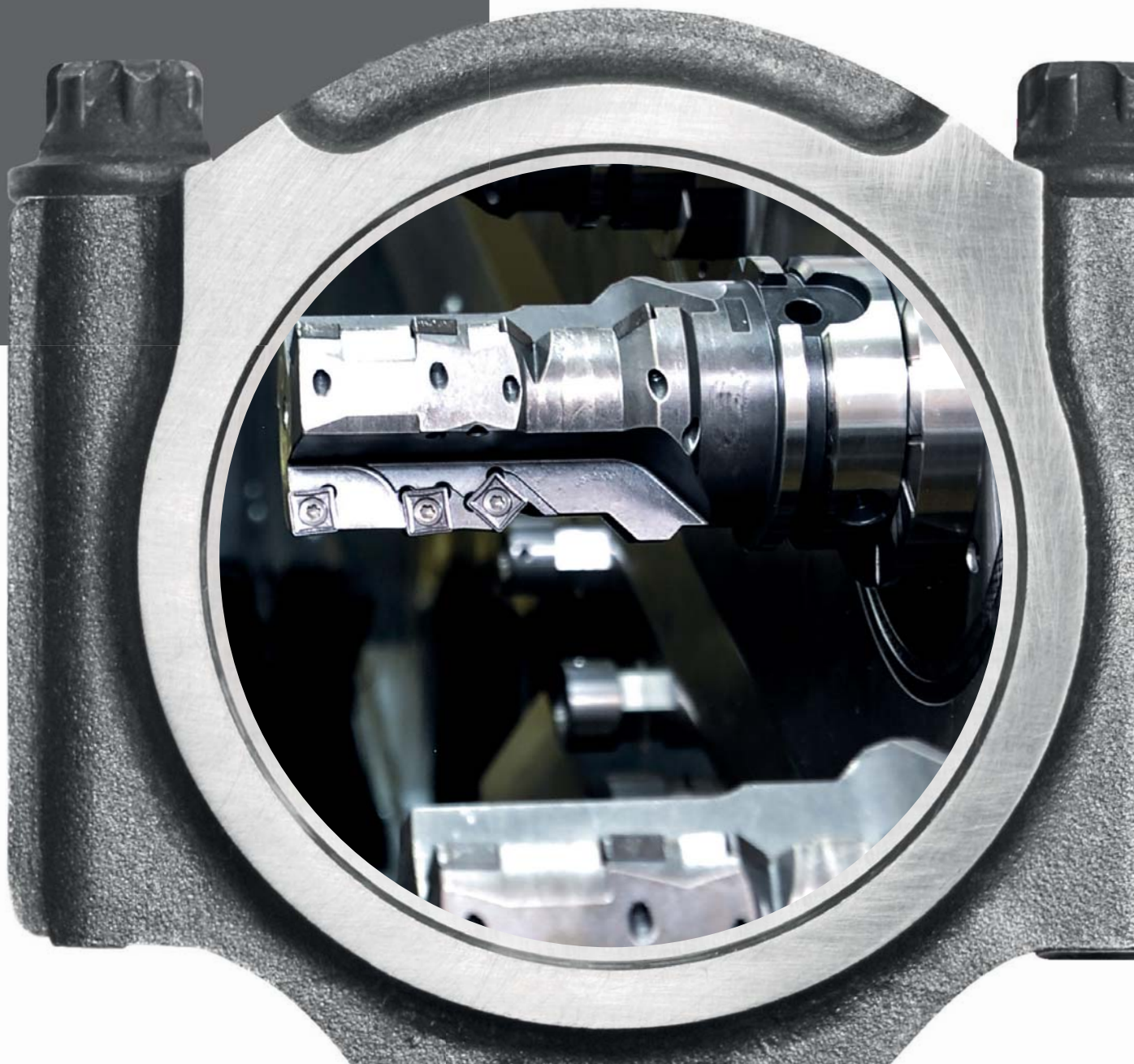


AX 400

High speed and flexibility
in con rod machining.

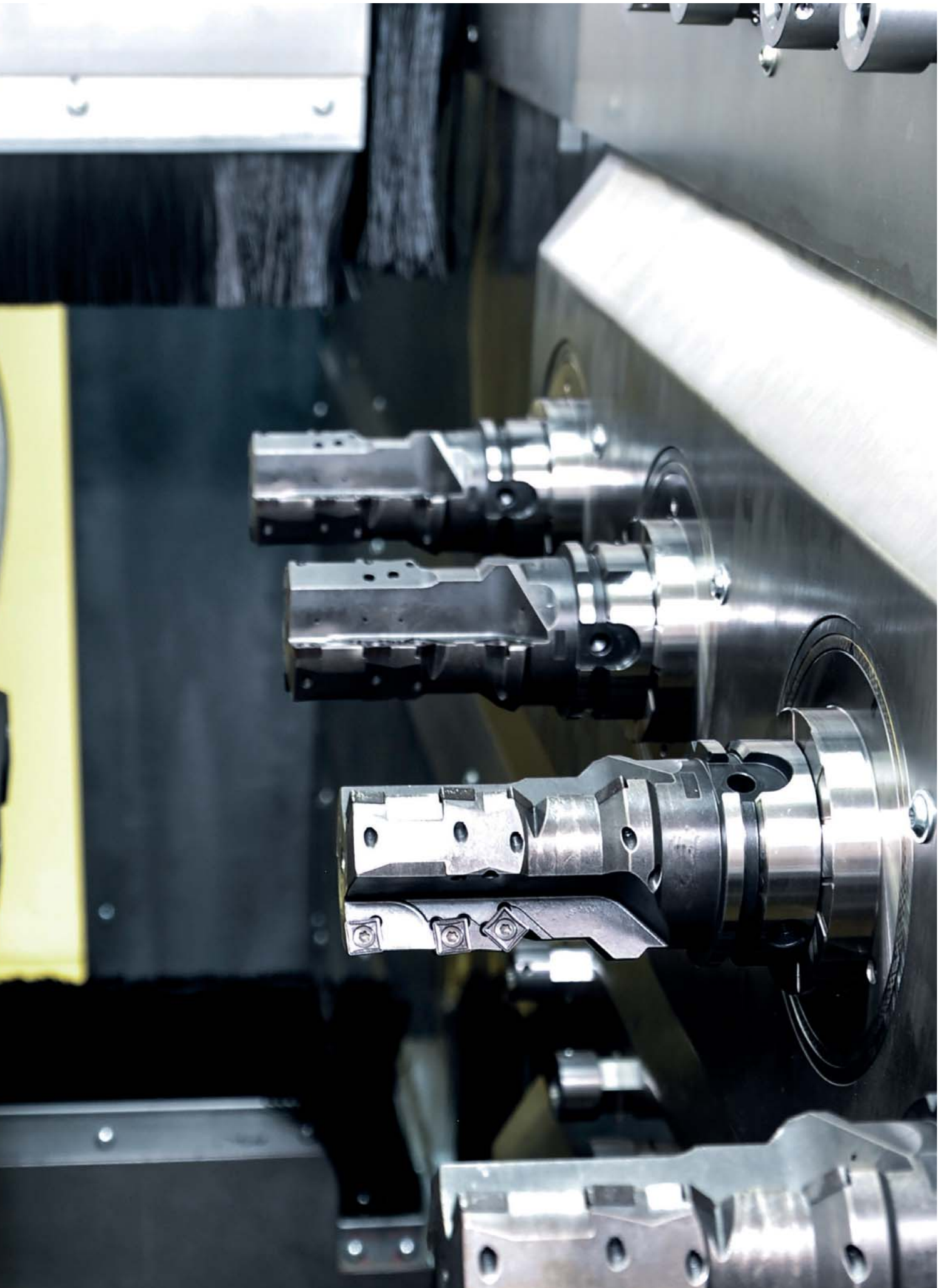


AX 400

**Minimum non-productive times,
maximum production.**

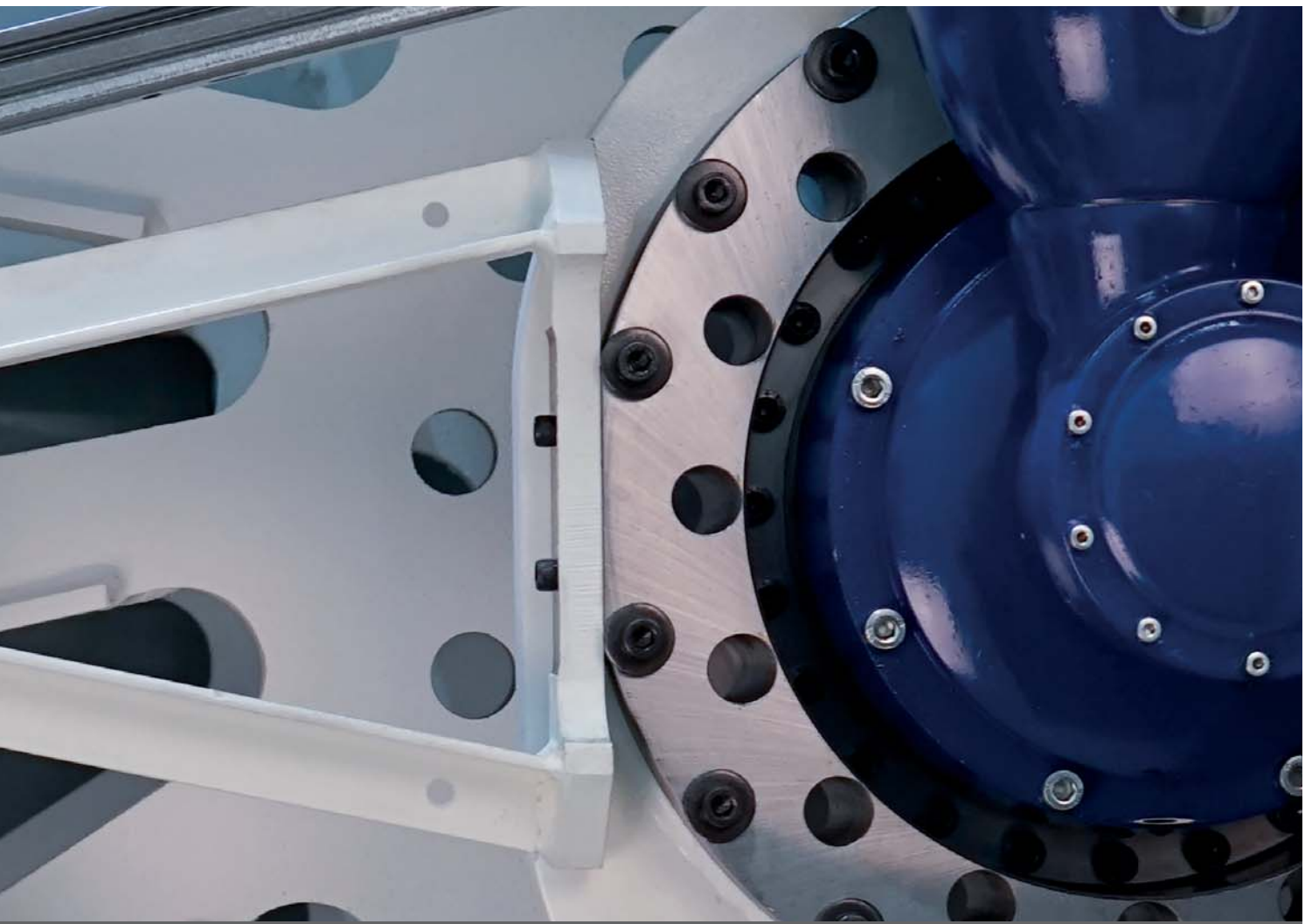
Extremely short chip-to-chip time: The short travels guarantee an extremely low positioning time. Together with the main time parallel component loading and unloading as well as the quick tool change, this means unique peak values for a machine with the flexibility of a machining center and the high output of a special purpose machine.







To be un

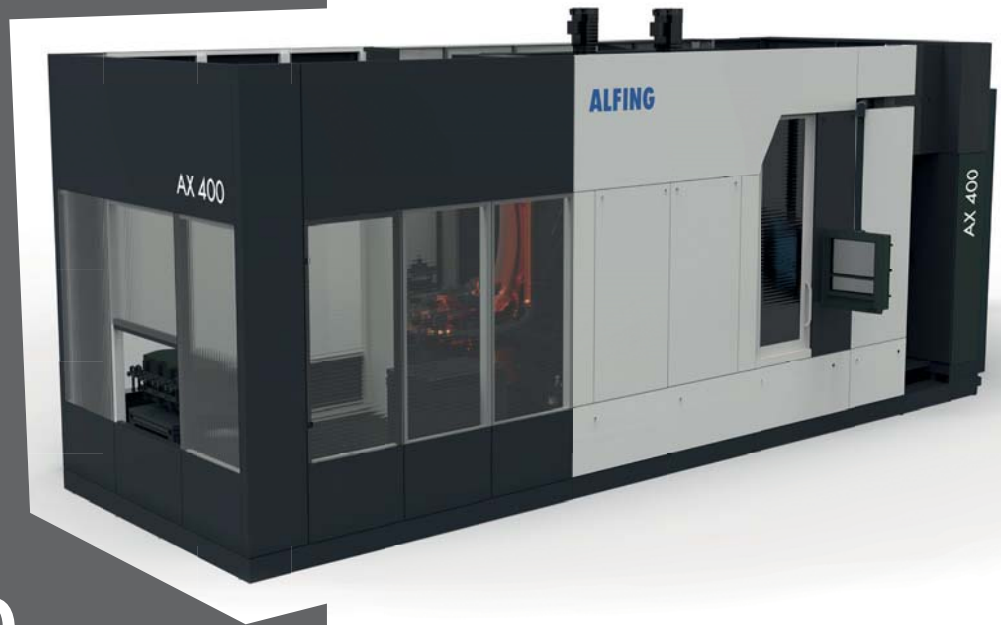


compromising

means to create a customer-oriented concept leaving the limits of existing technologies behind. As a result, this uncompromising attitude is the foundation of a new, highly specialized and modular generation of con rod machines.

High production volume. Consequent flexibility. Individual scalability. Low change-over times. Highest precision.





AX 400

The AX 400 for rough machining of con rods.

- Productive as a special purpose machine, flexible as a machining center.
- Machining of up to 4 con rods simultaneously
- Extremely short chip-to-chip time thanks to main time-parallel tool change
- Main time-parallel loading and unloading of components
- Loading robot integrated in machine control, thereby simple operation without any robot knowledge
- Ergonomic loading station for quick and fool-proof tool change, no access into working area required
- Flexible due to integrated tool magazine
- Quick change-over possibility: fixture change by robot, tool change by loading station



ROUGH MACHINING

- *Rough bore crank and pin end*
- *Machining of bolt seat, bolt holes and thread*
- *Finish machining pin end for bush insertion*

ROTARY INDEX TABLE ASSEMBLY MACHINE



The rotary index table assembly machine for fracture splitting and assembly of con rods.

- Cycle times < 9 seconds, even with single-track concept
- Use of latest laser technology
- Worldwide first machine for fracture splitting of con rods made of highly ductile materials: use of cooling by nitrogen
- Highly efficient nut runner technology
- Position-oriented bush assembly
- Integration of further operations such as measuring, calibrating and outbreak control
- Recording and evaluation of all important parameters
- High operator convenience



FRACTURE SPLITTING AND ASSEMBLY

- Laser scribing
- Fracture splitting
- Torquing
- Bush insertion



AT 200

The AT 200 for semi-finish machining of con rods.

- Up to 4 fixtures can be mounted simultaneously for short change-over times
- Up to 2 turret heads with each 4, 6 or 8 tools
- Extremely short chip-to-chip time
- No chip problems at the tool interface thanks to the use of the tool turret
- High thermal stability
- High operator convenience
- Very good accessibility for maintenance and tool change
- Low space requirement in floor space and height
- Very versatile: as variant with Y-stroke 630 mm a highly productive and process-safe alternative compared to a machining center



SEMI-FINISH MACHINING

- *Semi-finish bore crank end*
- *Tee-pee machining*
- *Drill oil hole*
- *Mill lock notch*
- *Face milling*



AF 400

The AF 400 machine for finish machining of con rods.

- Highest precision due to optimized servo axis arrangement
- No protruding masses thanks to compact axis arrangement
- Oval and trumpet form bores with freely programmable geometry
- Simple, scalable production increase
- Hydrostatic spindles with highest precision, stiffness and damping
- Optional with more cost-efficient spindles with roller bearings
- Up to 4 fixtures can be mounted simultaneously for short change-over times
- Directly driven, NC-programmable main spindles
- High thermal stability
- High ease of operation
- Very good accessibility for maintenance and tool change
- Low space requirement in floor space and height



FINISH MACHINING

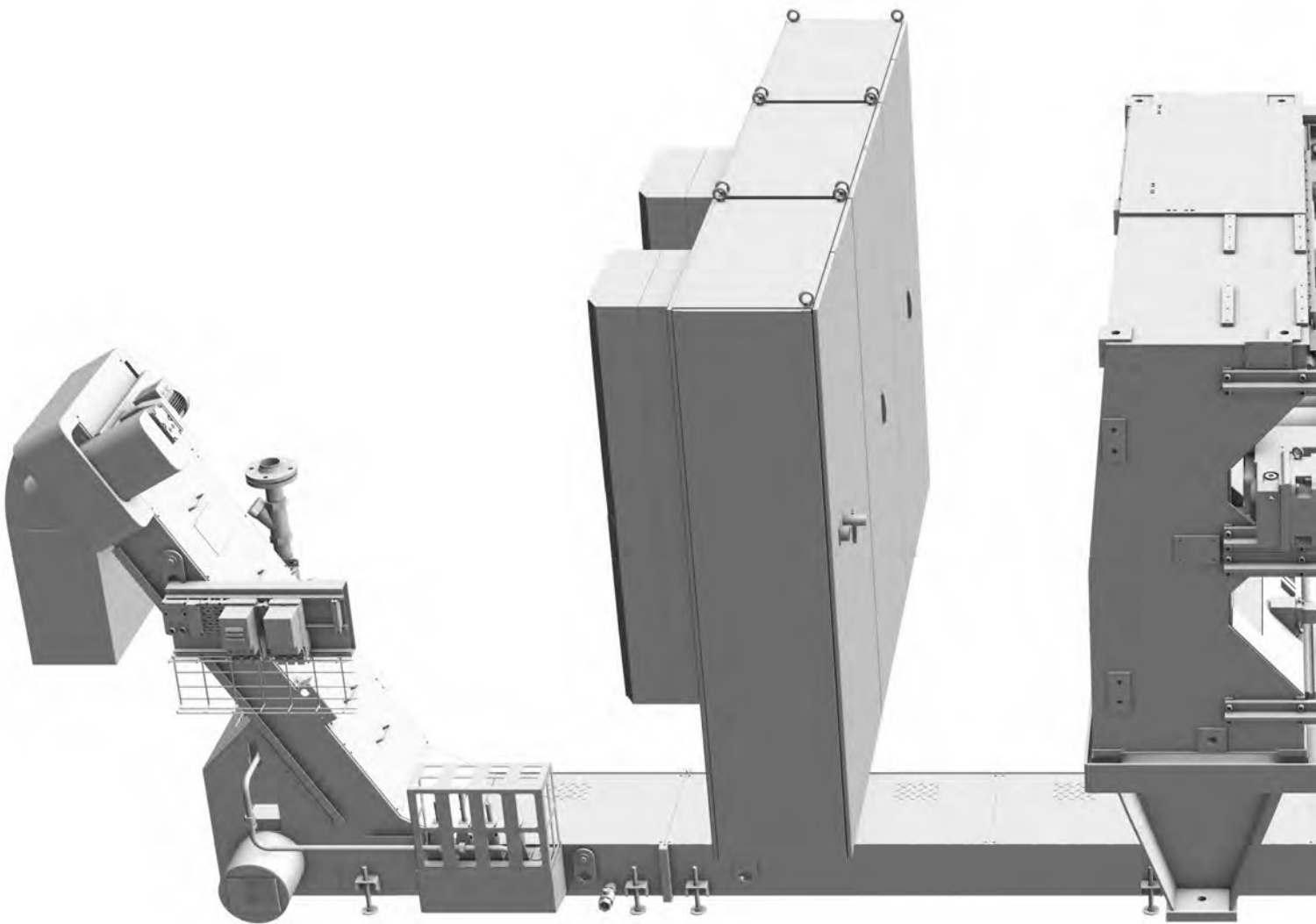
- Fine bore crank and pin end
- NC-controlled form and oval boring
- Roller burnish pin end

AX 400

Schematic representation of machine
and its basic components.

1 SPINDLE HEADS

*Maintenance-parallel tool change:
two multiple boring heads
arranged above each other,
alternately acting, move on
the X-axis.*



CLAMPING FIXTURE

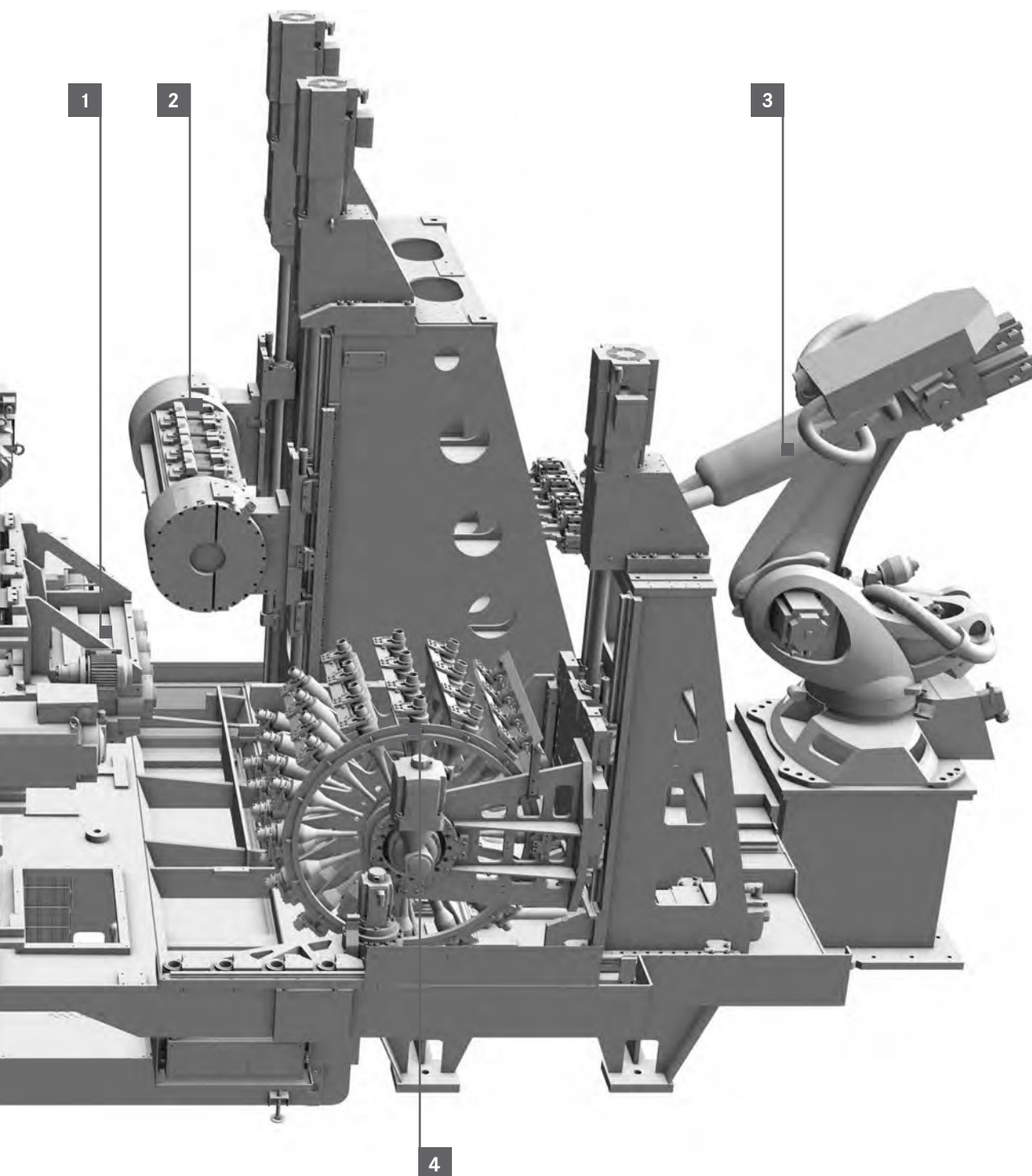
2

The clamping fixture with twofold bearing swiveling around the A-axis moves in Y- and Z-axis.

ROBOT

3

Maintime-parallel loading and unloading: the fully synchronized robot is integrated part of the machine axes and follows the Y- and the Z-axis.



TOOL MAGAZINE

4

Tool magazine with 16 x 4 tools.

UNCOMPRO- MISINGLY PRODUCTIVE

Two spindle rows with alternately acting main spindles arranged above each other enable a maintime-parallel tool change.

MAIN SPINDLES

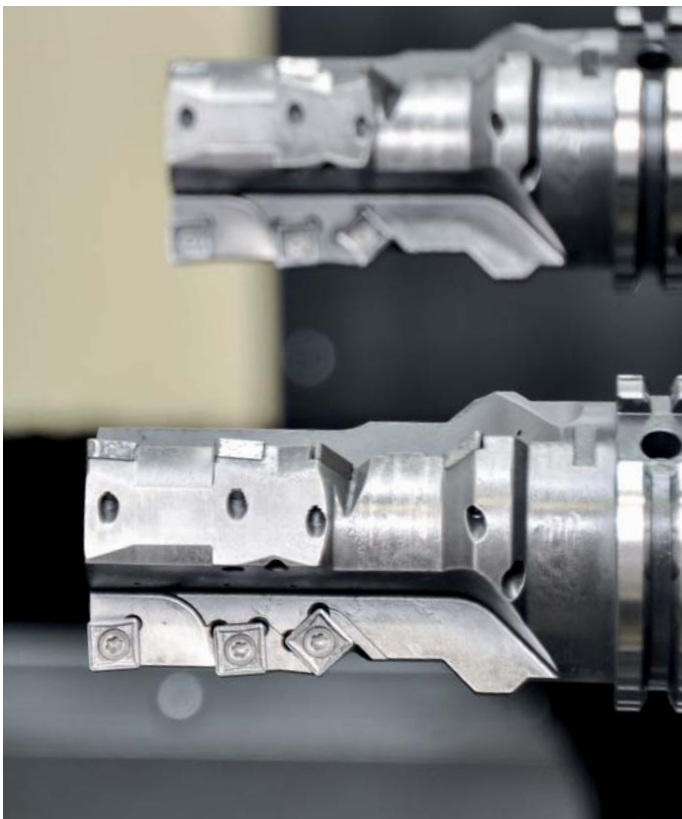
During the machining process of the one spindle row, tools are changed at the second row. Thanks to this minimum number of cost-intensive spindles the maximum cost / benefit is achieved.

EXTREMELY SHORT CHIP-TO-CHIP TIME

Short travels guarantee an extremely short positioning time and thus a drastic reduction of non-productive times.

STIFF AND PRECISE

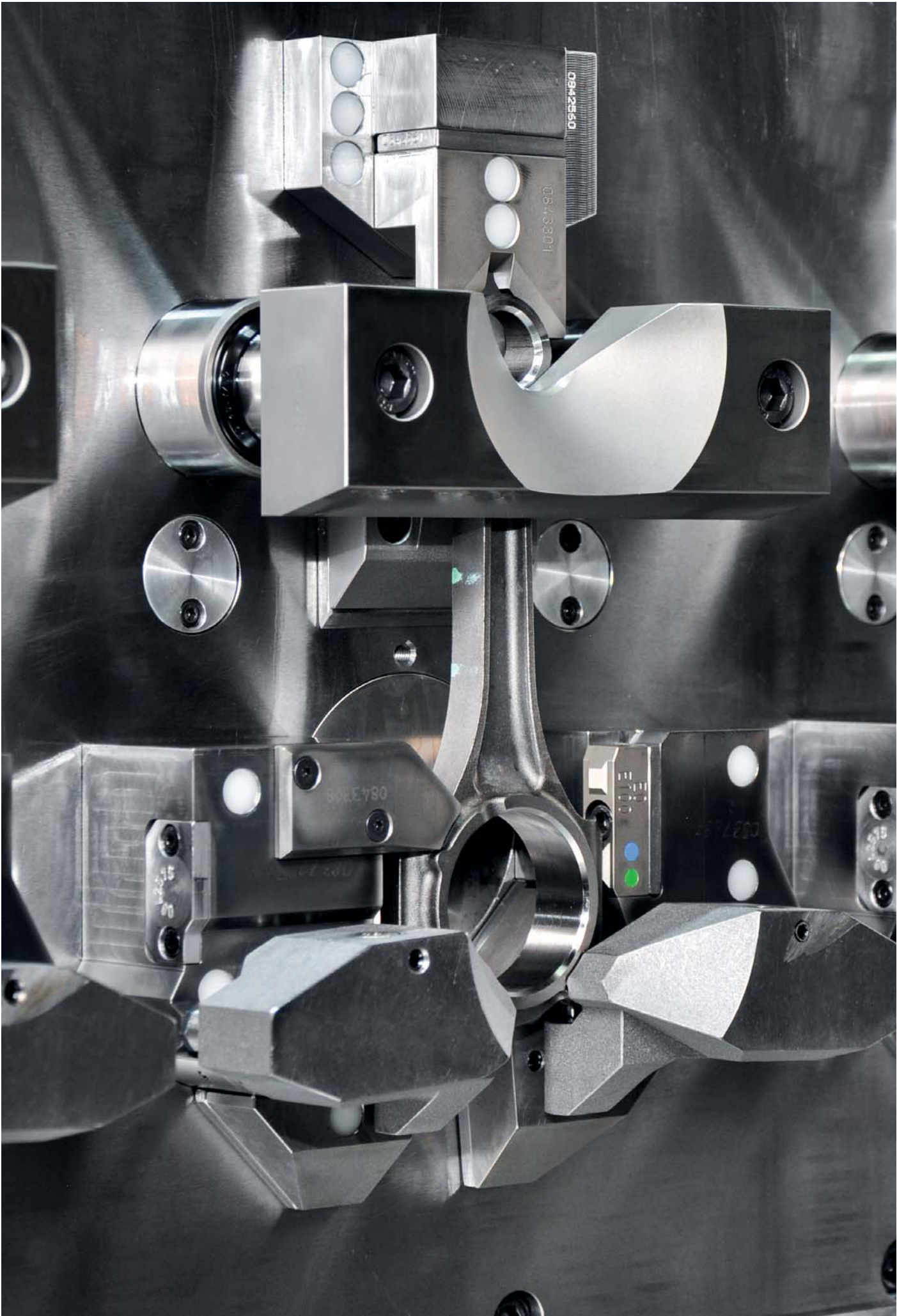
Usual projecting quills as used in other machine concepts are deliberately not used in the AX 400. The result is highest rigidity and precision.



SPINDLE HEADS

Maintime-parallel tool change: two alternately acting main spindles arranged above each other move on the X-axis.





UNCOMPRO- MISINGLY FLEXIBLE

The clamping fixture can be changed over to new or different component types in very short time. This is possible due to a combination of semi-automatic clamping plate change as well as exchange of tool and NC program.

BASIC FIXTURE

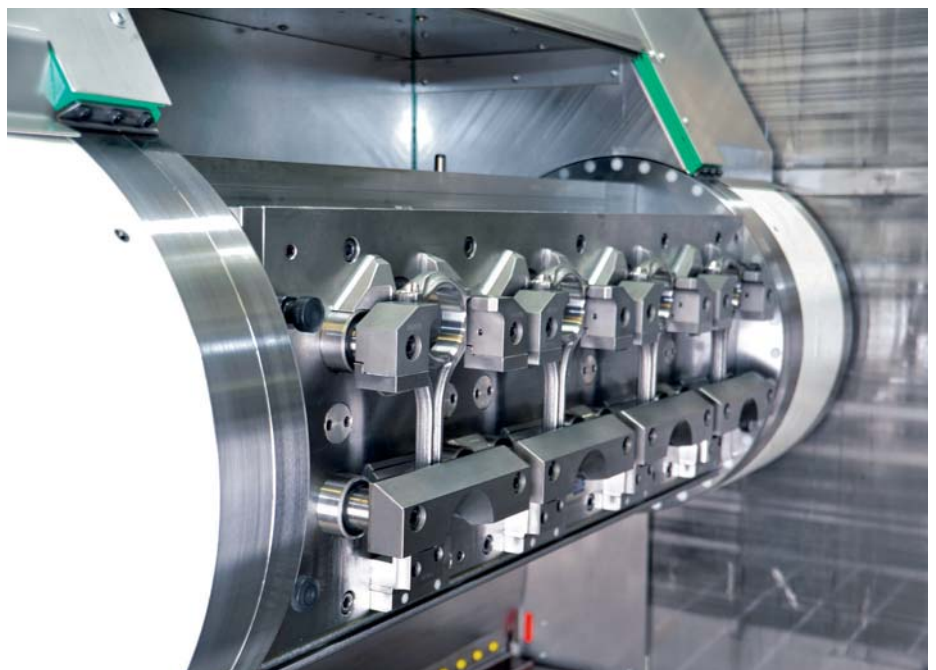
The basic fixture comprises the clamping cylinders as well as the clamped/unclamped control. The clamping cylinder itself is integrated in the basic fixture, being reflected in a lower weight and lower cost. Clamping sequence and clamping pressure can be freely programmed in the NC program.

PART SEATED CONTROL

With its four monitoring circuits, the part seated control can be performed for each con rod. By monitoring every clamping position individually, fault sources can be identified quickly and reliably.

MINIMUM CHANGE-OVER TIME

The clamping plate change is semi-automatic. At change-over to a new component type, only the fastening screws of the clamping plate must be manually untightened; subsequently, the corresponding clamping plate can be exchanged by the loading robot.



CLAMPING FIXTURE

The clamping fixture with twofold bearing, swiveling around the A-axis, moves in Y- and Z-axis.

UNCOMPRO- MISINGLY COMFORT- ABLE

In the future-orientated control concept of the AX 400, all robot functions are integrated in the machine control.

ROBOT

Maintime-parallel loading and unloading: The fully synchronized robot is part of the machine axes and follows the Y- and the Z-axis.

INTEGRATED ROBOT CONTROL

Whereas in usual systems the operation of robot and machine is realized with 2 separate controls, the robot control of the AX 400 is integrated in the machine control. From the NC operating panel, the machine operator can control all robot functions and read all relevant information.



MAINTIME-PARALLEL LOADING AND UNLOADING

Machine and robot operate completely synchronously: during the machining process of the machine, the robot automatically follows the movements of the clamping fixture in the Y- and Z-axis. Loading and unloading thus is parallel to the main time.

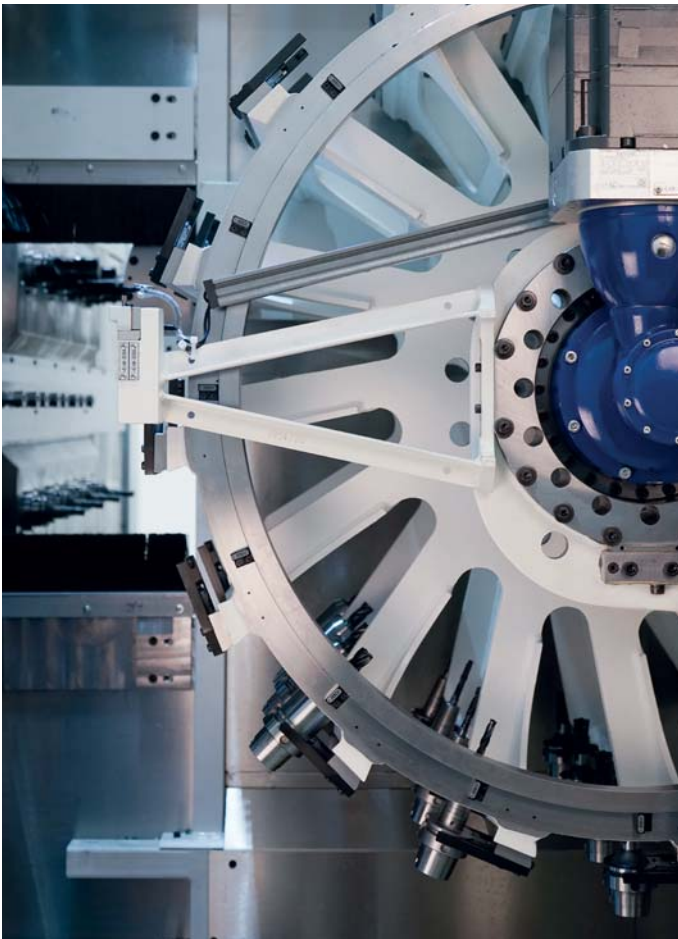
SIMPLE CONFIGURATION

In JOG operation, the movement sequences of the robot can be programmed in Cartesian coordinates (X, Y, Z) as well as individually for any axis which considerably facilitates robot setup.



UNCOMPRO- MISINGLY EFFICIENT

The tool magazine of the AX 400 consists of a drum-type magazine with in all 16 x 4 tool seats. The capacity is designed to make available several tool sets for component machining, depending on the process.



MINIMUM CHANGE-OVER TIME

The tool magazine with a capacity of 16 x 4 tools can be completely re-equipped in less than 10 minutes.



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