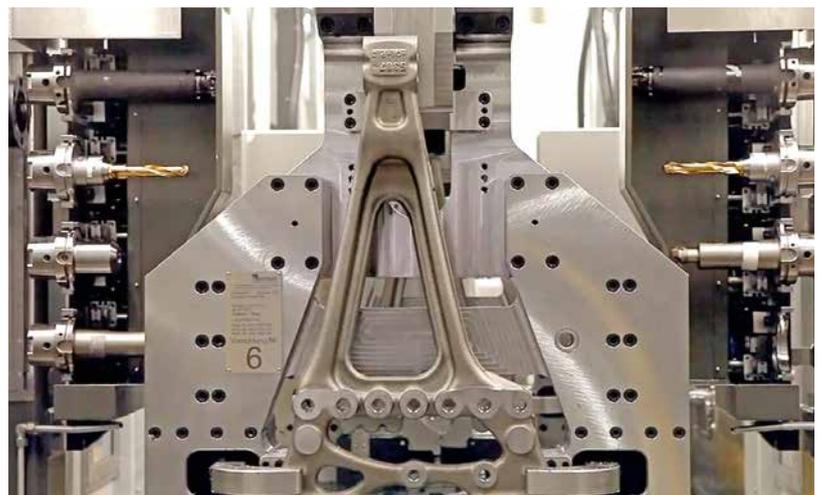
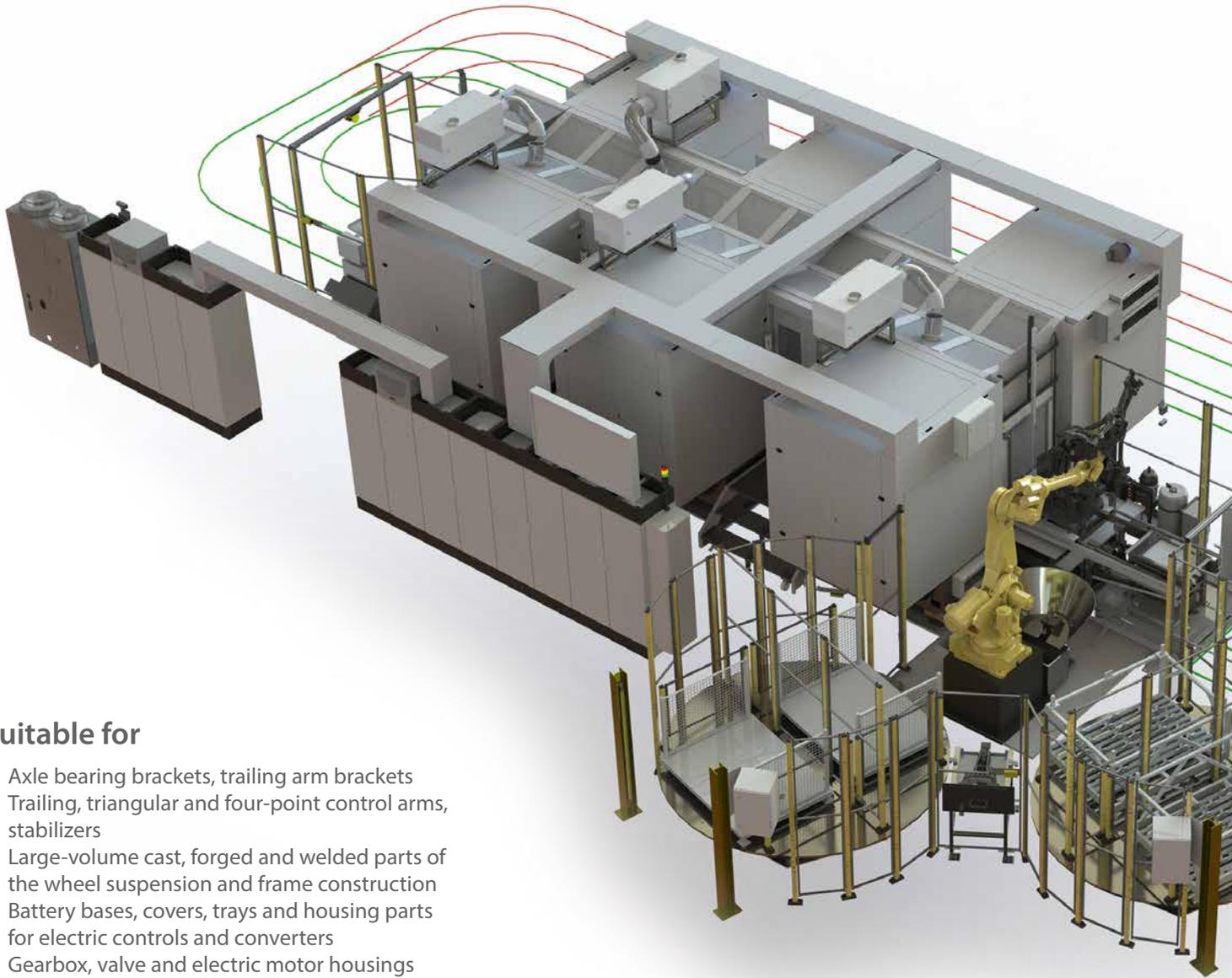


Four-axis horizontal Transfer production line TFA-3-2



Highly productive production of truck axle bearing brackets or trailing arm brackets using three machining stations - with simultaneous machining of the workpiece on both sides
... without reclamping

Automated four-sided machining of the trailing arm bracket of the truck wheel suspension



Suitable for

- Axle bearing brackets, trailing arm brackets
- Trailing, triangular and four-point control arms, stabilizers
- Large-volume cast, forged and welded parts of the wheel suspension and frame construction
- Battery bases, covers, trays and housing parts for electric controls and converters
- Gearbox, valve and electric motor housings

Task

- Plan milling of surfaces on the front and rear sides
- Machining of through holes
- Thread cutting
- Deburring and countersinking of holes
- Machining of contours

Special feature

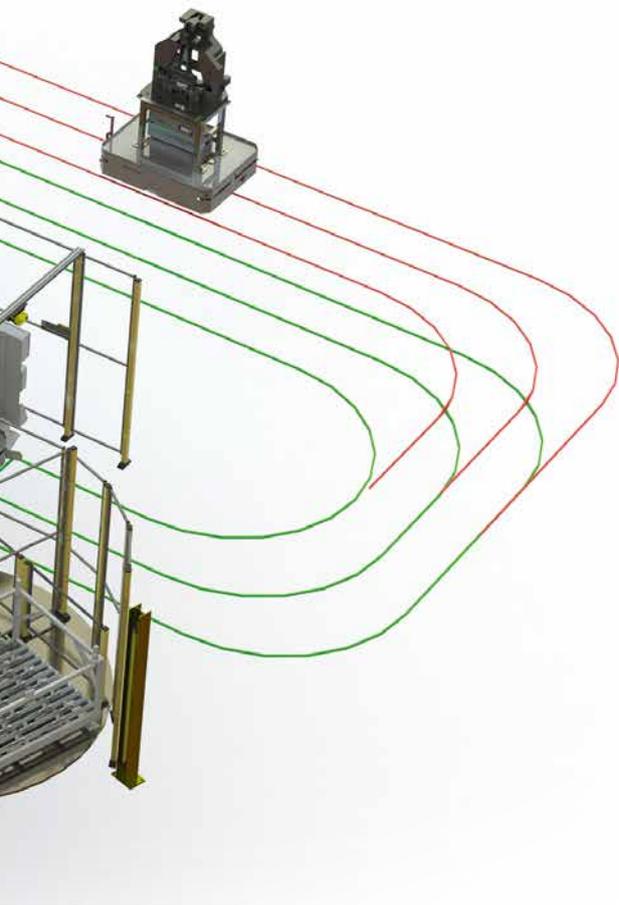
- The complete machining process takes place in one machine
- Very short workpiece transport paths
- The workpiece is machined in just one clamping operation

The heart of the four-axis horizontal transfer production system is the simultaneous processing of 3 workpieces in 3 processing stations - each with alternating tools on both sides.

All sides of the workpiece are processed in one system to save time.



Driverless transport trolleys on induction loops



Equipment

- 3 machining stations with 2 milling spindles each (= 6 milling spindles)
- 3 tool axes + B-axis, optional A-axis

Tool spindle

- Tool holder: HSK 100
- Internal coolant supply up to 120 bar possible
- Tool magazine: 4 tools per spindle, expandable
- Torque: 250 Nm / 3000 min⁻¹
- Power: 34.2 kW

Periphery

- Loading and unloading with robots
- Automated guided vehicle system
- Integration of customer supplies (e.g. measuring station, deburring station, ...)

Machine dimensions

- Transfer production line: 1400 mm x 6500 mm
- With driverless transport system, loading and unloading: 22000 mm x 14100 mm

Processing area

- Tool path: X: 707 mm
Y: 700 mm
Z: 490 mm



Cleaning before changing tools



Processing on both sides – simultaneously at three processing stations

The machine concept: Quality, quantity, reliability

Loading and unloading

A Fanuc robot programmed by HK-CON is used for loading and unloading. Fanuc robot is used for loading and unloading. A comparable robot from the manufacturers Yaskawa, Stäubli, KUKA and ABB can also be used. There are no limits to customer requirements here.

The machine is loaded and the finished workpiece unloaded with the aid of just one robot - in combination with the integration of an automated guided vehicle system: this moves the machined storage rack back to the loading periphery fully automatically.

This means that the loading and unloading areas coincide. A 6-axis robot from Fanuc with a reach of 2655 mm and a load capacity of 165 kg is used to load the clamping device and unload the trolleys of the automated guided vehicle system, which was also integrated into the process by HK-CON in terms of software.

The Fanuc Robot R-2000iC/165F is structurally integrated into the overall concept of the transfer production system. The programming of the movement sequences for loading and unloading, including feeding into separate deburring and measuring units, is also part of HK-CON's expertise!



Fanuc robots for loading and unloading

Turntables – for effective loading

The raw parts, which are sorted into charging pallets, are transported to the robot room via a turntable. This has two functions

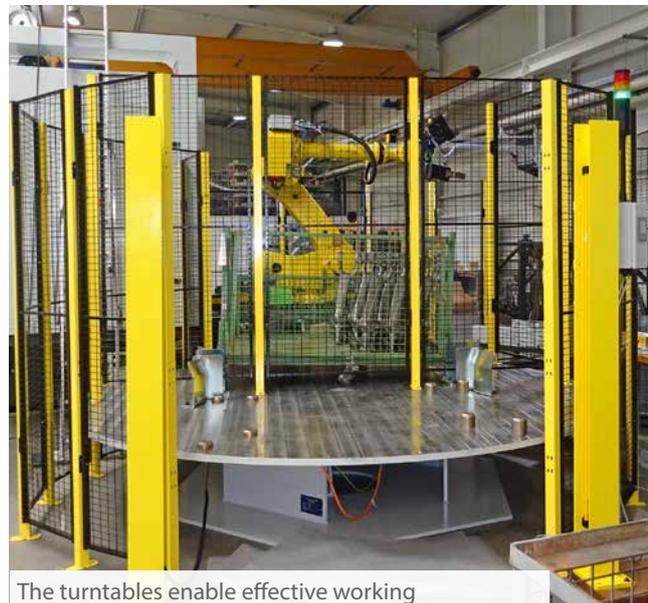
- The robot loads the system from a pallet
- A second pallet serves as a parts store for stockpiling

The pallets are lifted onto the turntable using a forklift truck.

Protective devices

On the one hand, the turntable creates a safe boundary between the robot room and its surroundings. The fence elements provide protection against unwanted access to the robot room.

Furthermore, the system has a system-specific safety concept, which has been checked by an independent company and confirmed by a risk assessment and the declaration of conformity.



The turntables enable effective working

Clamping device and lifting transport unit

The robot removes the workpiece from its work area and places it in the machine's clamping device. In this 0. station, the clamping device is tilted slightly backwards to ensure that the workpiece can be safely inserted and positioned.



Protected behind bars



The system has six turning spindles

Three processing units

The horizontal transfer production system has a total of three processing stations in which the workpiece is processed on both sides at the same time. The workpiece is transported between the processing stations via the lifting transport unit. This connects the three processing stations with each other, whereby the entire "clamping device + semi-finished product" assembly is lifted, moved and lowered to the next station. The special feature here is that the workpieces remain permanently clamped during the entire machining process.

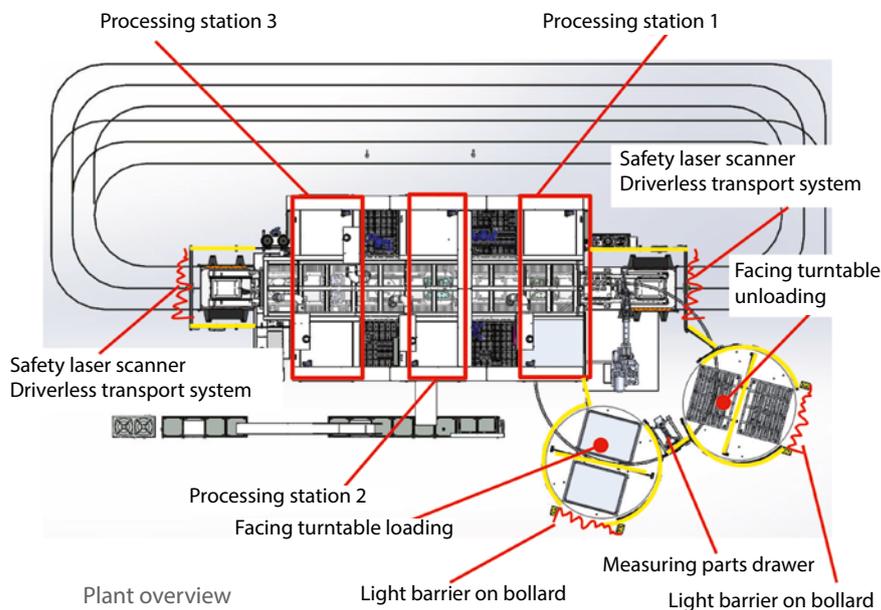
Zero-point alignment

Zero-point alignment takes place at each station via the zero-point clamping system. This ensures that the position of the workpiece does not shift during the machining process.

Lifting transport unit

In simple terms, the lifting transport unit consists of two parallel bars that run through the processing machine along the longitudinal axis of the machine from station 0 (loading station) to station 6 (turning back and cleaning). The lifting transport unit also functions as an unloading device by lifting the "clamping device + finished workpiece" assembly out of the machine onto the carriage of the automated guided vehicle.

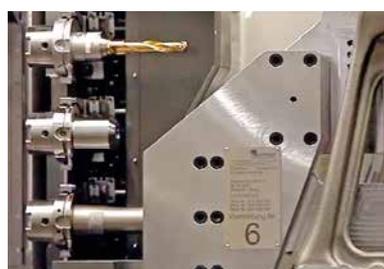
— = Axelent security fence



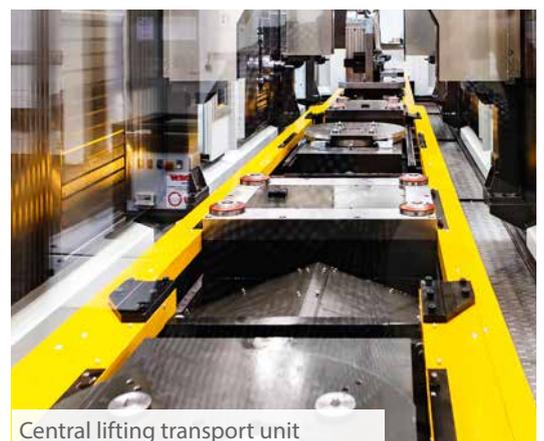
Plant overview



Tightly synchronized transport

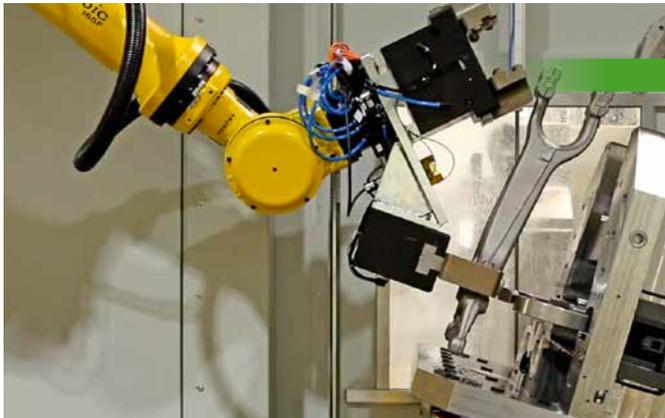


Tool change, 4 times per spindle



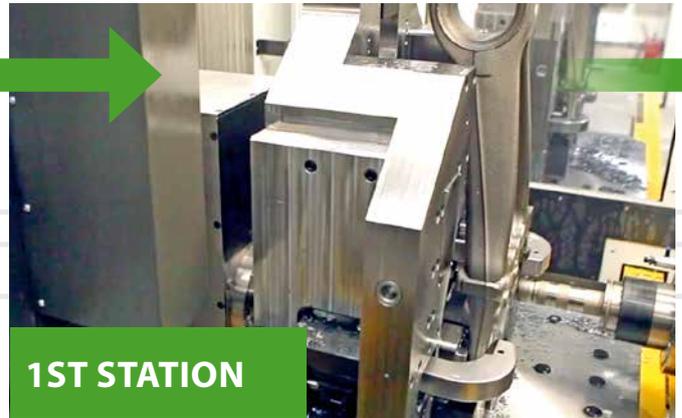
Central lifting transport unit

Eight stations: Fully automated processing of the workpieces



0TH STATION

The robot inserts the blank into the clamping device.



1ST STATION

Processing station 1: The workpiece is machined from both sides: The flat surfaces are first pre-roughed and then finished.



The finished workpiece is removed.

The cycle closes

A trolley of the driverless transport system brings the finished workpiece back to the robot room by means of induction loops on the hall floor.

The robot equipped with a double gripper, which also loaded the system with the blank shortly beforehand, removes the machined workpiece from the clamping device on the transport trolley and places it in the measuring device.

There, the workpiece is checked for compliance with all dimensional tolerances. The robot then sorts the finished workpiece into a mesh box for finished part storage. This is also located on a turntable, which enables effective and time-saving removal.



Driverless transportation.



7TH STATION

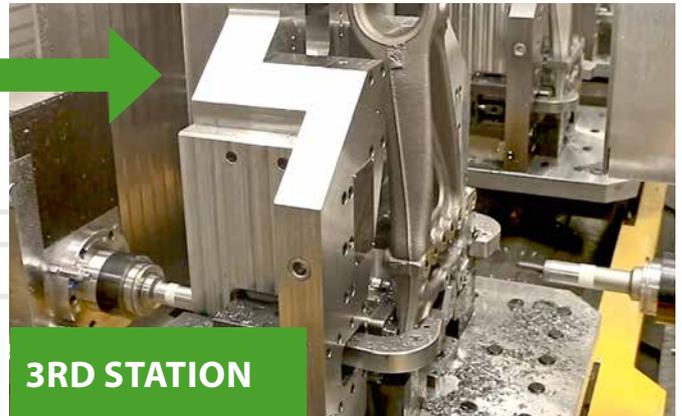
The lifting transport unit unloads the finished part onto the trolley of the automated guided vehicle system.





2ND STATION

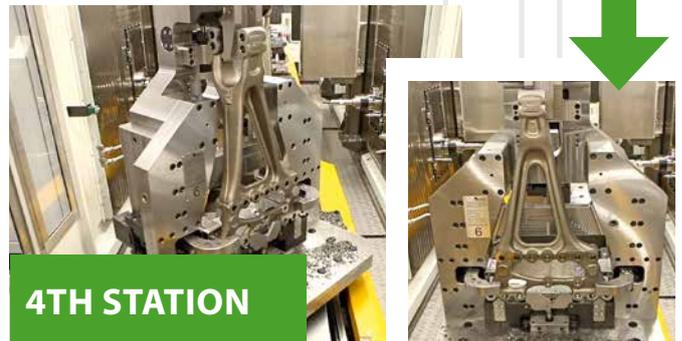
This station is an intermediate station during transportation – (no processing).



3RD STATION

Processing station 2: Simultaneous processing on both sides.

- Inserting the through holes
- After tool change: cutting the required threads
- At the same time, the holes are deburred on the opposite side



4TH STATION

Intermediate station equipped with a B-axis. The workpiece is rotated by 90° here. This enables the following station to processing of the narrow sides is possible.



6TH STATION

The workpiece is turned back by 90° using the „station's own“ B-axis by 90°.



5TH STATION

Processing station 3: The through-holes in the narrow sides are made from both sides.

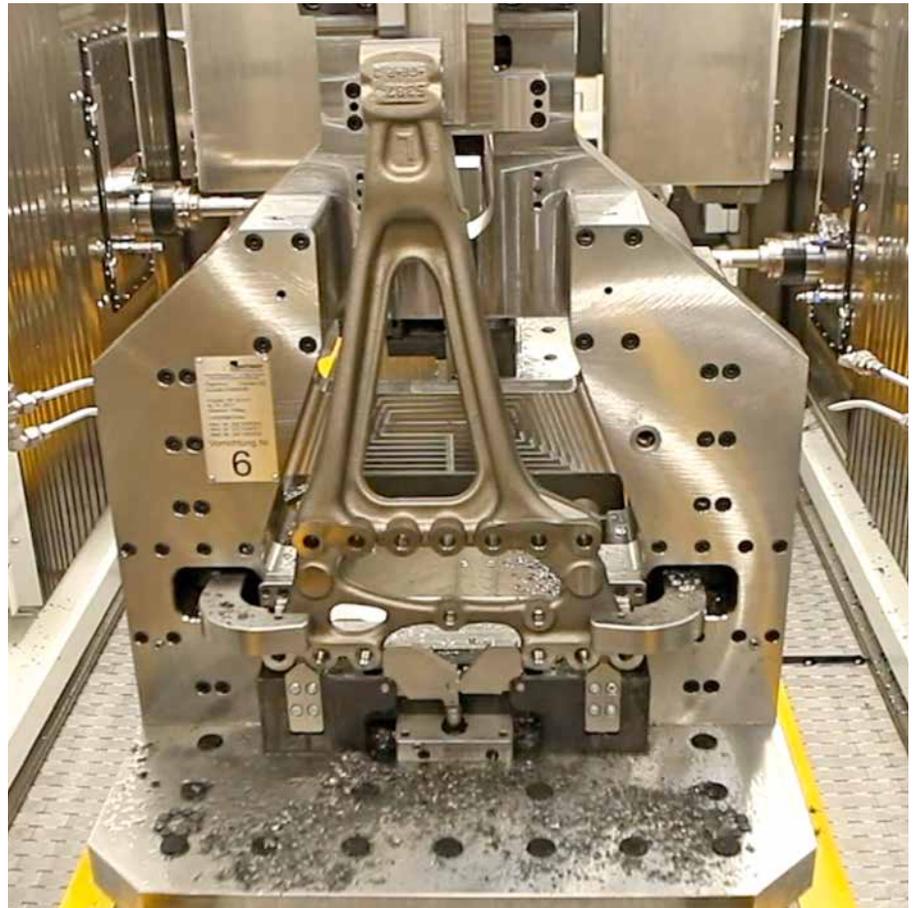


Experience the TFA-3-2 transfer production system on YouTube



Highlights

- Operation of the entire transfer production system by just one worker.
- Six machining operations with one control unit.
- Radio pressure monitoring of the clamping pressure with isplay output.
- RFID chips: unique identification of all nine pallets in use. This enables the control system to automatically compensate for the zero offset of each individual pallet.
- All tools are equipped with tool breakage monitoring. Effective tool breakage monitoring also includes the automatic retraction program after a tool breakage. This also applies to the taps.
- Reading in the tool data via RFO.
- Light curtain with "cut-out": The trolleys of the driverless transport system pass through a light curtain when leaving and entering the transfer production system. The contours of the trolley are digitally stored. This ensures that no human driver can enter the loading and unloading area of the machine through the light curtain.
- The lifting transport unit is an impressive development from HK-CON. The cylinder used to lift the seven pallets being processed can lift 19,500 kg - including clamping device and workpiece. The mechanics behind it are solidly constructed. As a transfer system, the transfer production machine therefore has a real "powerhouse under the cladding".



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