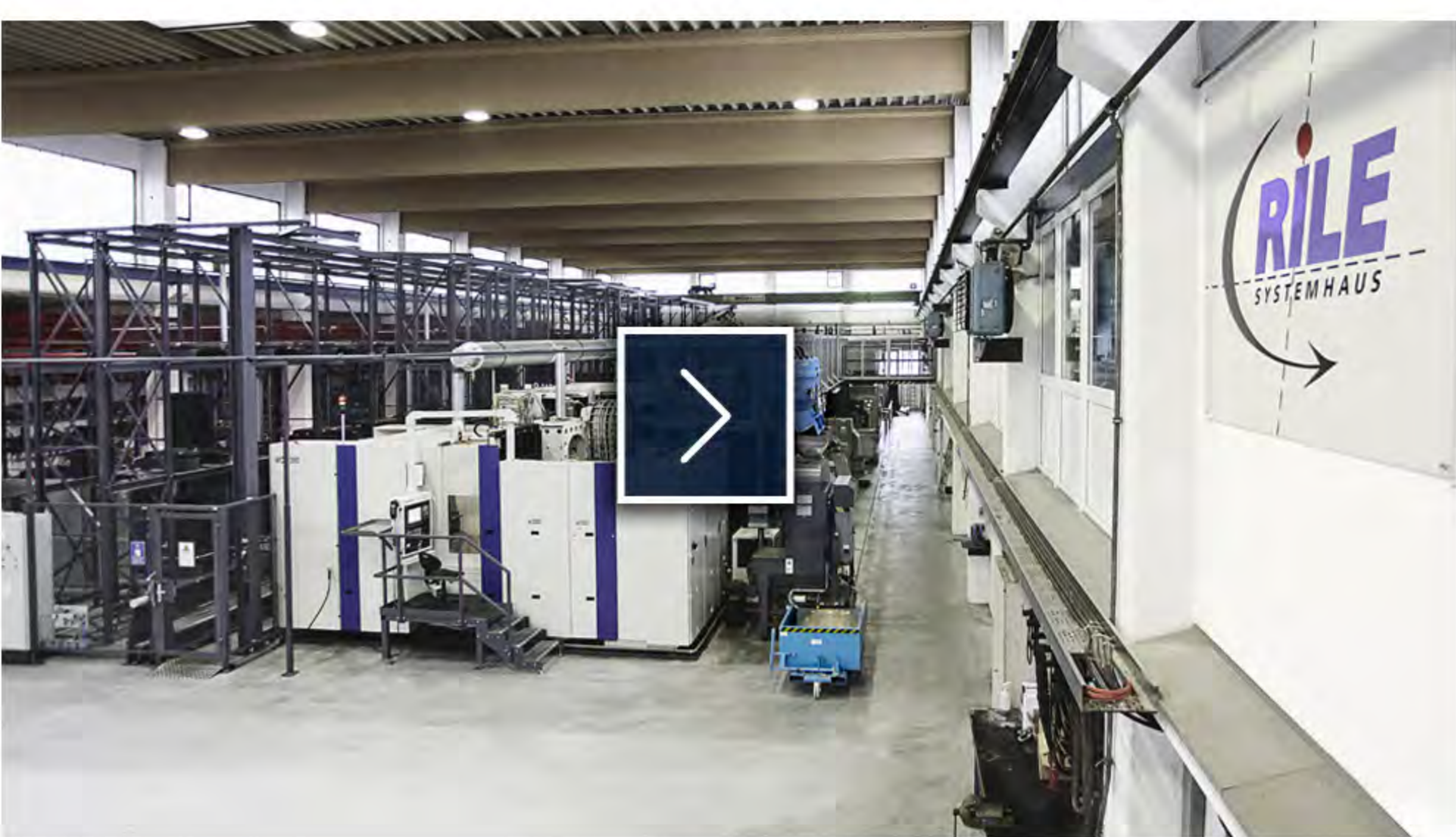




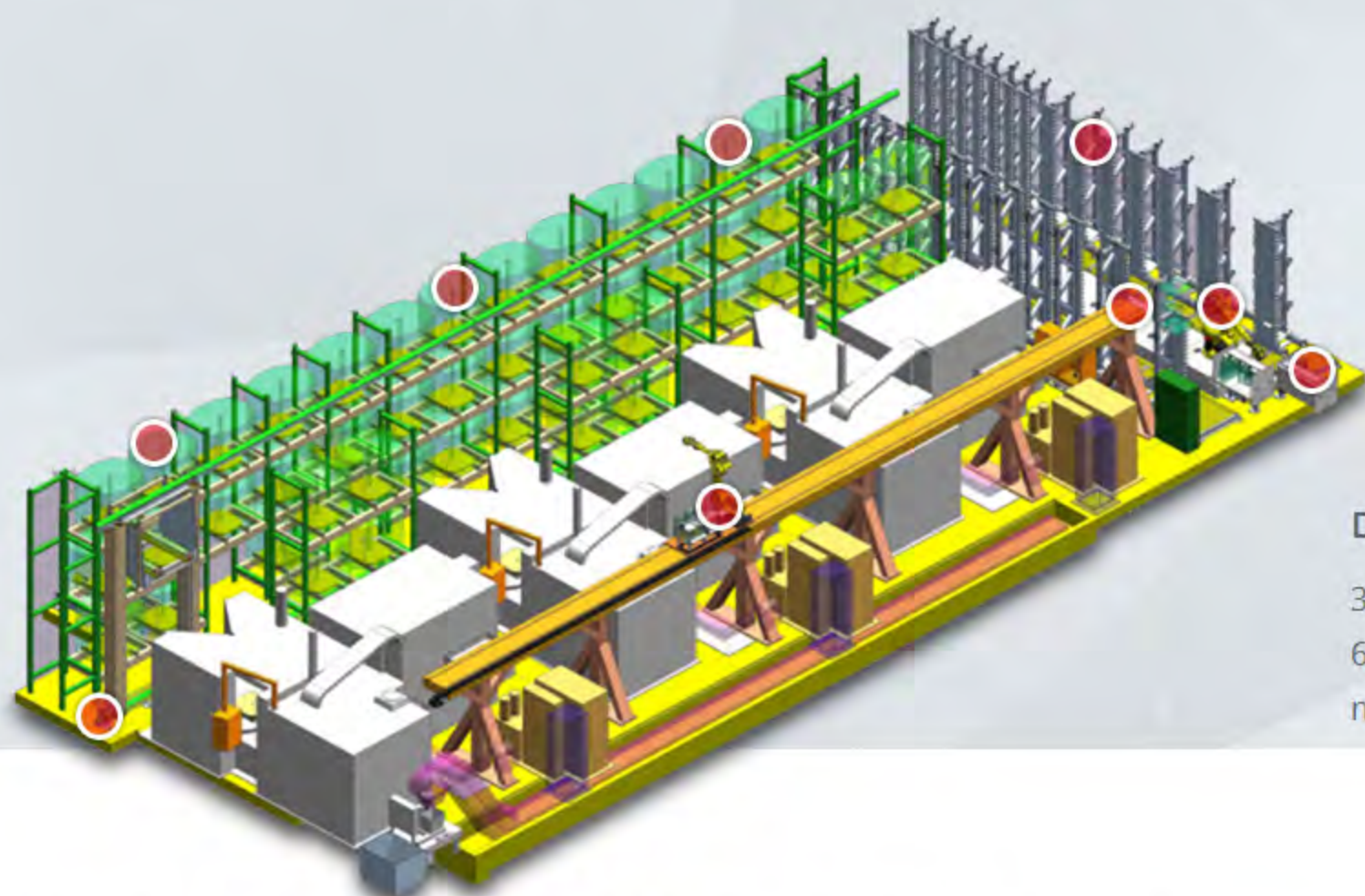
RILE FLEXIBLE MANUFACTURING SYSTEM (FMS)
CAN ALSO BE USED AS INDIVIDUAL MODULES
AUTOMATION OF WORK PIECES (PALLET)S AND TOOLS
REDUCES PRODUCTION LEAD TIMES – INCREASES FLEXIBILITY



RILE FLEXIBLE MANUFACTURING SYSTEM

CAN ALSO BE USED AS INDIVIDUAL MODULES

WORKING AREA (MACHINE)	PALLET SIZE (MACHINE)
X-axis = 1,250 mm	800 mm x 800 mm x 125 mm
Y-axis = 1,000 mm	for work pieces of up to 1,540 mm x 1,250 mm x 1,200 mm
Z-axis = 1,000 mm	other pallet sizes can be used in the RILE FMS at any time



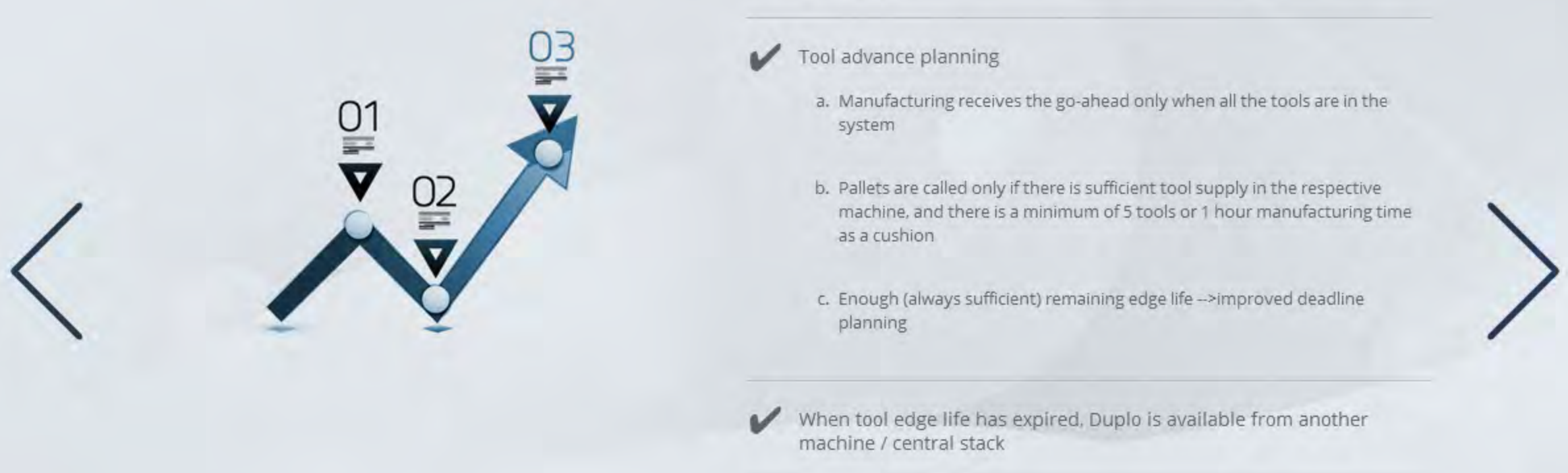
DIMENSIONS FMS
31 m x 17 m x 6 m
62 pallets
more than 2,000 tools

BENEFITS OF THE FLEXIBLE MANUFACTURING SYSTEM



- Increase in customer retention thanks to immediate delivery capability and improved deadline adherence through more optimum forward planning
- Strengthened process discipline thanks to a thought-out process structure
- Reduction in lead time, as the order receives the go-ahead only in the case of tool and part/device/pallet availability
- Reduction in just-in-case stock through order-specific manufacturing
- Improved product quality and lower subsequent processing costs or lower rejection rate thanks to heightened process security
- Cost saving through:
 - a) Manufacturing without setup times
 - b) Unmanned operation / operation with low staffing level possible
 - c) Available machine lead time is increased
 - d) Optimum longer spindle lead time
 - e) Reduction in machine hourly rates / production costs (manufacturing costs)
- Increase in manufacturing flexibility (also thanks to EMS – Extendable Manufacturing System)

BENEFITS THANKS TO CENTRAL TOOL SUPPLY



- ✓ No separate, decentralized tool storage is required (or the storage size is reduced)
- ✓ Tool advance planning
 - a. Manufacturing receives the go-ahead only when all the tools are in the system
 - b. Pallets are called only if there is sufficient tool supply in the respective machine, and there is a minimum of 5 tools or 1 hour manufacturing time as a cushion
 - c. Enough (always sufficient) remaining edge life → improved deadline planning
- ✓ When tool edge life has expired, Duplo is available from another machine / central stack

TOOL AUTOMATION AREAS OF USE

01. Large amount of tools required for manufacturing a (complex) work piece (> 500 work pieces per machining centre)
02. Many tools that are rarely required but used in many machines
03. Manufacturing process split across multiple machines (including turning/milling machines) and many special tools and Duplos are being used
04. Many different parts in a small batch size and high tool requirement due to part complexity
05. Constantly changing, repetitive (make-and-hold) orders with familiar parts
06. Parts with a longer product lifecycle (aerospace/defence) and associated spare part supply
07. Permanent repair orders during ongoing production

EXPERIENCE THE SYSTEM IN DETAIL



Storage and retrieval vehicle



Flexible pallet storage unit



Work piece loading station and central measuring station



EMS master control



Modular autonomous tool magazine



Drawer for tool loading and unloading



Central robot for tool magazine equipping



Tool transfer stations



Shuttle robot with tool bag

Contact person

Your name

Email*

Your email

Phone

Your phone number

COMPANY

Firma

STREET

Street and house number

Postcode / place

Postcode and place

☐ Please give me a return call

☐ Please prepare an offer without engagement

☐ Please make an appointment with your field service

Your inquiry to us ...

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STORAGE AND RETRIEVAL VEHICLE

The storage and retrieval vehicle is responsible for storing and retrieving machine pallets, raw and finished parts (optional) in the pallet storage unit, the equipment stations, and the machine tools.

It is mounted to a rail running parallel to the storage. The storage shelves are located on one or both sides of the rail.

Telescopic forks are attached to the lifting sledge of the storage and retrieval vehicle that are required in order to load and unload the machine, the pallet storage unit, and the equipment station.

The driving sledge is equipped with a coolant pan. The coolant is returned to the machines from the container of the driving sledge using a drain. The storage and retrieval vehicle is a 2-column vehicle consisting of a welded frame that is operated with 3 position-controlled NC axes.



DETAILED INFORMATION



CONTROL UNIT OF THE STORAGE AND RETRIEVAL VEHICLE

In the event of failures or in case of maintenance work, the machine operator can use the control unit of the storage and retrieval vehicle in order to release and manoeuvre the storage and retrieval vehicle.



2-COLUM STORAGE AND RETRIEVAL VEHICLE

Lifting capacity: 1,850kg, including pallets, device, and work piece

Driving velocity in loaded condition

X-axis	2.0m / sec.
Y-lifting	0.5m / sec.
Z-axis	0.5m / sec.



PALLET TRANSFER FROM STORAGE AND RETRIEVAL VEHICLE TO CNC MACHINING CENTRE

Depending on the type of machine tool, you will be provided with an individually adapted transfer unit.

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FLEXIBLE PALLET STORAGE UNIT

The flexible pallet storage unit is a shelving system that is used in order to store the machine pallets, as well as the raw and finished parts (optional) required for manufacture.

The shelf is a steel structure consisting of vertical and horizontal beams. In order to position the machine pallets, pallet-specific cross beams are attached between the horizontal beams. The storage shelf is attached to the floor by means of expanding type foundation bolts.

DIMENSIONS:

- dimensions (LxWxH) approx. 25x5x6m
- 55 machine pallet locations are present in the shelf; can be adapted modularly at any time
- max weight 1,850kg in this version



DETAILED INFORMATION



SHELF PALLET LOCATION

Below the machine pallet locations, there are collection pans for dripping coolant. The coolant is guided from the pans via a pipeline and can thus be directed into a collection tank and/or returned to the machine.



PALLET TRANSFER

Into the shelf with extracted telescopic fork

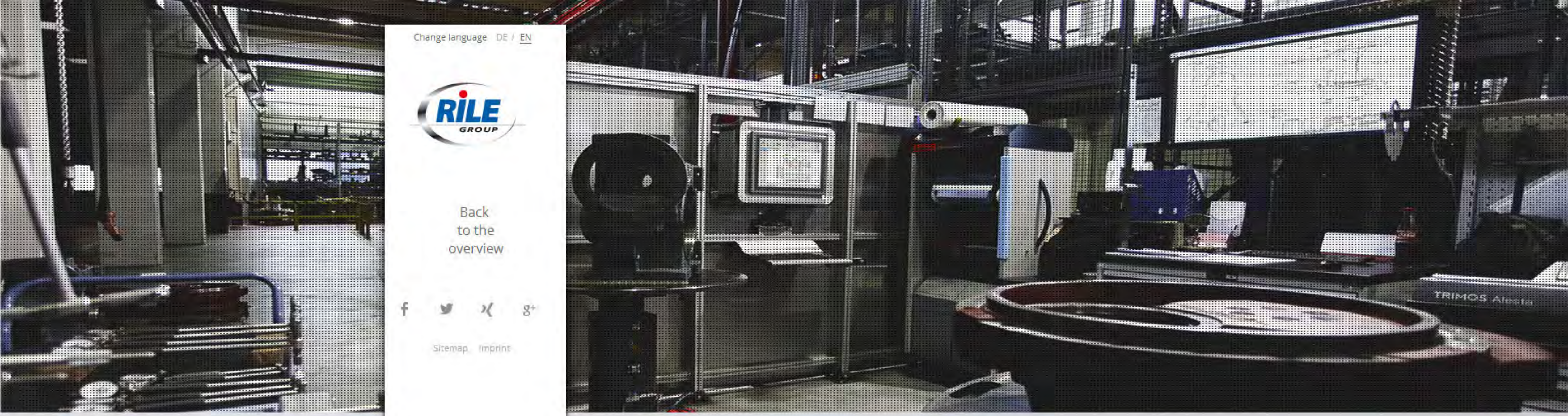
- stroke: 1,600mm (can be extended upon customer's request) load-bearing capacity: 2,000kg
- telescopic forks with reduced deflection for more accurate transfer of the pallets



LIFTING UNIT

In the machine equipment station in extracted condition

- in order to lift off the pallet at the equipment station of the machine
- in order to retract the telescopic forks



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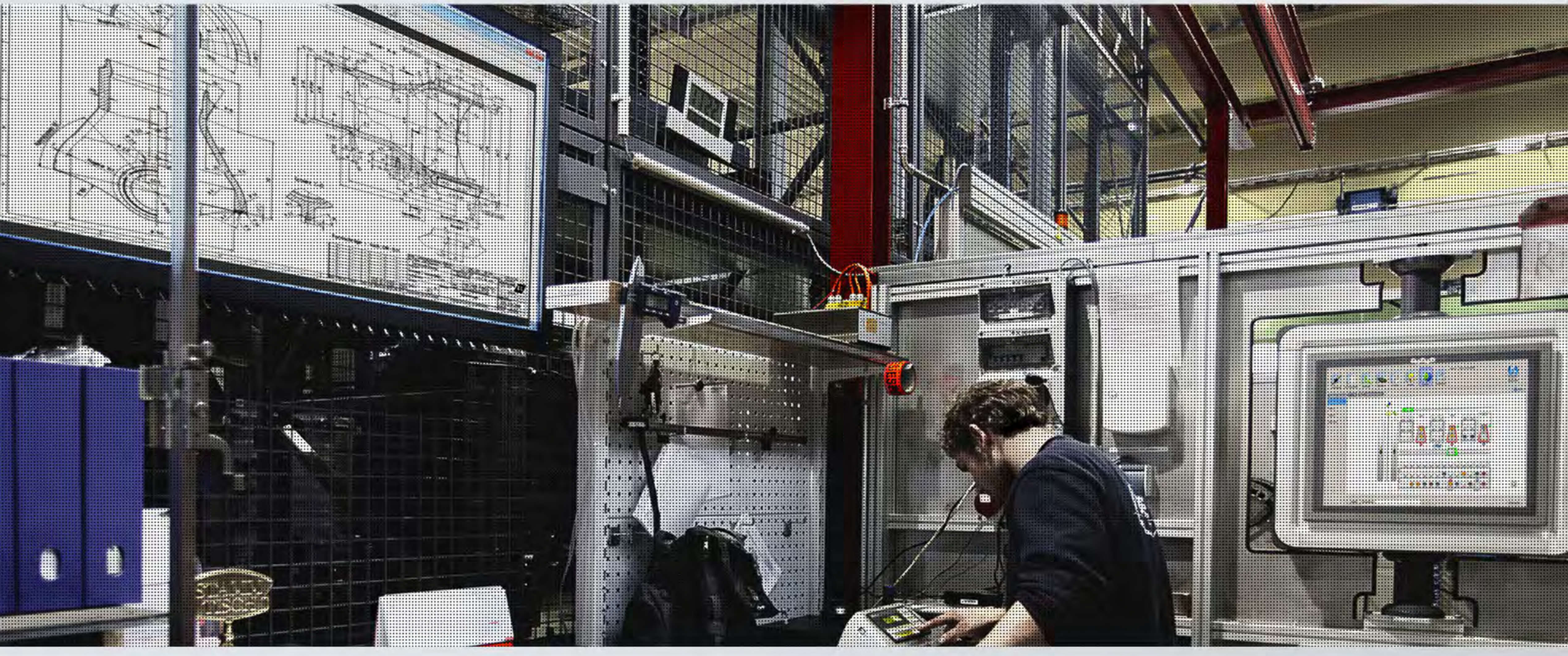
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WORK PIECE LOADING STATION AND CENTRAL MEASURING STATION FOR PALLET LOADING

The machine pallets are loaded with the work pieces and the work pieces are unloaded from the machine pallets at two work piece loading stations that can be arranged individually as required by the customer. At the customer's request, the work piece loading stations can also be used for loading and unloading raw parts. In this, the parts are stored to the shelving system.

In order to rule out the presence of no longer up-to-date shop drawings, the current drawings and test schedules are always digitalised at the work piece loading station and are updated automatically.

At the central measuring station, the current shop drawing, as well as the test schedule and further documents accompanying the work can be retrieved clearly on a large screen in each case. Height-adjustable measuring tables are used to perform and document accompanying measurements and tests.



DETAILED INFORMATION



WORK PIECE LOADING STATION

The machine pallet is indexed on the work piece loading station and can be rotated by 360 degrees either manually or electrically. Thanks to the ground-level design, the pallet is freely accessible and an ergonomic way of working is guaranteed.



ANTI-COLLISION DEVICE DUE TO SWIVEL-MOUNTED FRAME

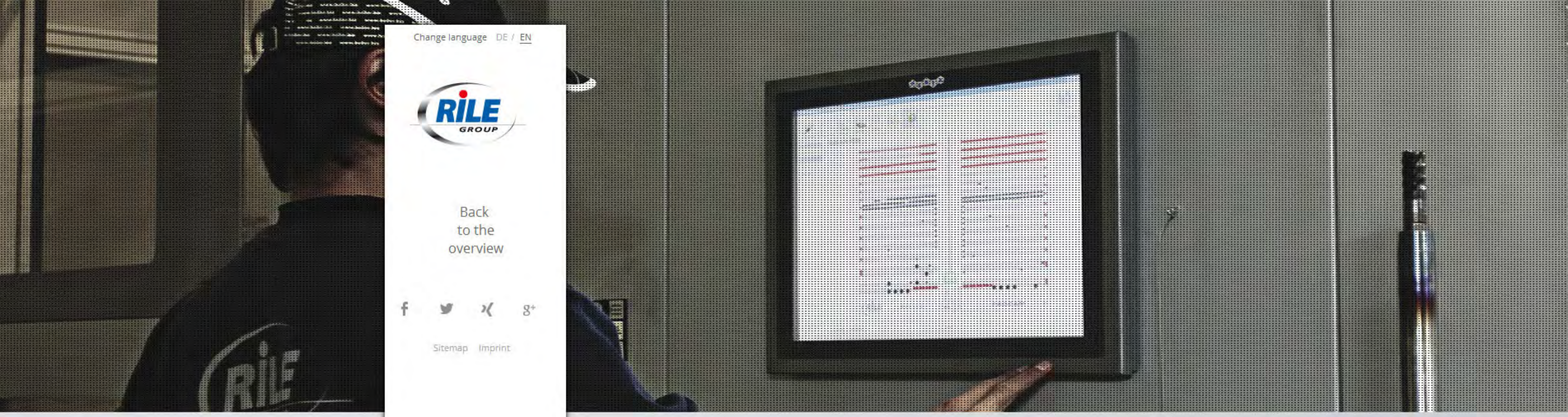
This is intended to control the maximum admissible pallet height and width. If the pallet storage unit is loaded with too large a component, the system will switch to failure.



MEASURING TABLE

Height-adjustable measuring table for an ergonomic way of working

360° swivel-mounted



EMS MASTER CONTROL

CONTROL STATION SOFTWARE FOR STANDALONE NC MACHINES AND CHAINED SYSTEMS

The master control ensures the superordinate communication within the RILE FMS.

THE EMS CREATES CONNECTIONS WITH THE FOLLOWING OPTIONS:

- integration and control of transport systems for automated tool and work piece management
- communication with NC machines, even with different CNC control units
- communication with other customer software possible, e.g. inter-site tool management
- control system completely based on PC hardware and MS Windows compatible
- industrial-suited Siemens hardware with mirrored hard drives for ideal data security, optionally a virtual server is possible
- server/client technology for a theoretically unlimited number of EMS clients in the network
- operation also optimised for touch screens
- remote diagnostics contained in standard version

ADVANTAGES:

- all functions are available at all stations
- user administration, in order to grant or deny access to functions for certain people
- Hardware-independent: in the event of hardware failure, system administration from another client
- optimised fully automatic operation
- raw material processing
- multi-side processing
- automatic position indicators for the tools
- predictive tool planning, including loading and unloading lists
- automatic supply of the machines with NC programmes
- sending/receiving NC programmes manually is further possible

FURTHER OPTIONS:

- incorporation of presetting devices, paternoster, tool identification systems, operating data analysis according to VDV3423/OEE (Overall Equipment Effectiveness), device management, TPM



DETAILED INFORMATION



MAIN FUNCTIONS

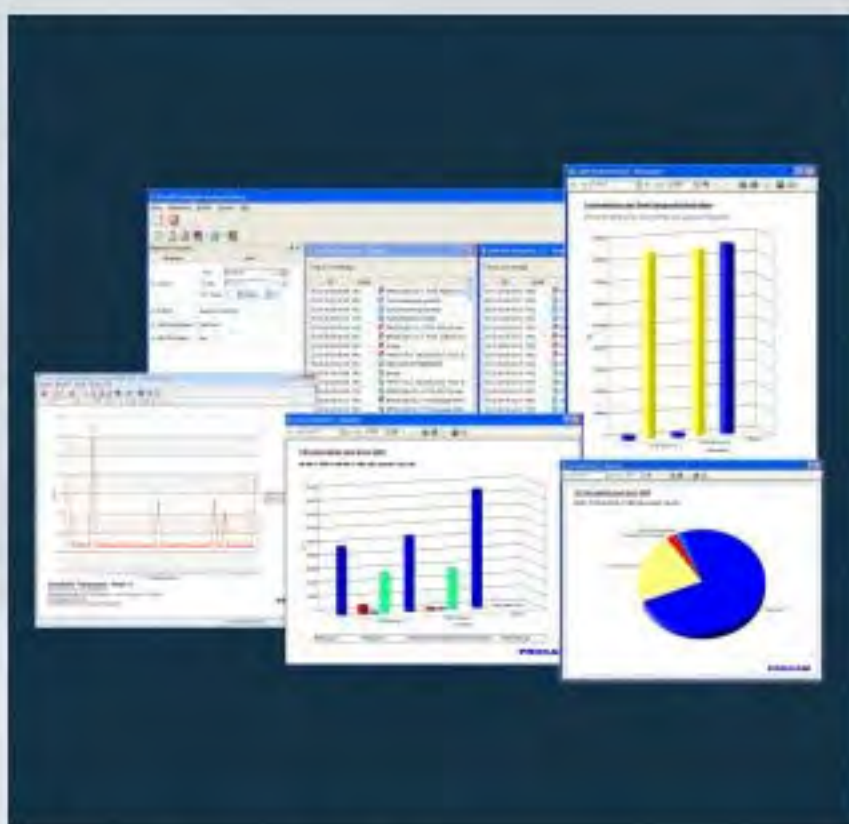
All required functions in order to control a flexible manufacturing system with one software:

- tool management
- NC programme management
- job management
- pallet management
- trolley management



SYSTEM INFORMATION

- graphic system overview
- all machine conditions and pallet conditions at one glance
- manual transports are possible by simply selecting the source and destination pallets in the graph
- indication of all pending alarms and messages of the connected machines



ANALYSIS TOOLS

Using the BDE/MDE analysis tool, all production data can be analysed comfortably and published directly in the form of a customer report.

- long-term analyses of NC programmes (trend identifications, comparisons between machines)
- runtime comparisons (how long do NC programmes run in planning in comparison with in reality)
- alarm duration analyses (how long do which alarms pend at the machines)
- Re-chucking analyses (how long does it take the operator to re-chuck)
- VDI 3423 analysis
- OEE analysis



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MODULAR AUTONOMOUS TOOL MAGAZINE

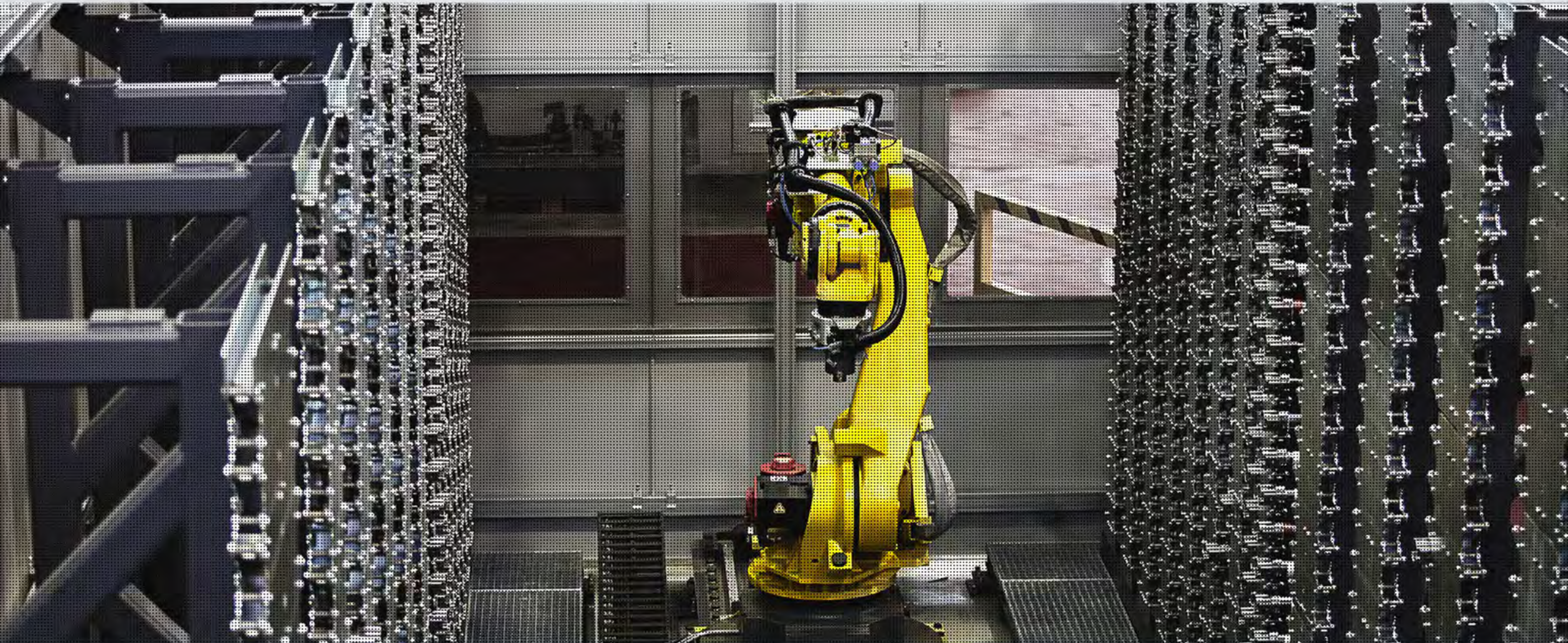
The modular autonomous tool magazine is a central tool storage unit that is used to supply the machine tools connected within the RILE FMS with tools. The number of tools stored in the tool magazine can be configured in a customisable manner.

After having loaded the tools into the modular autonomous tool magazine via the tool drawer, the tool data is checked. Therefore the robot will move to a defined position where the tool chip write- and read station is located, after having removed the tool from the drawer.

Here, the tool data contained on the chip at the tool is read out and transferred automatically to the master control. This way, the tool is defined in the tool management system of the overall system and stored with all required data.

The tools can be stored either by means of a fixed location ID code or by using envelope curves.

The modular autonomous tool magazine can also be used in standalone operation at an individual machine tool.



DETAILED INFORMATION



DRAWER

Used for loading and unloading the tool magazine. Since the tool position is retrieved automatically when inserting the tool into the drawer, improper insertion is eliminated.



WRITE AND READ HEAD

On the one hand, the head serves for reading out tool data when loading the tools into the system, on the other hand, the tools are identified with the current data at the point when they are unloaded from the system.



TOOL TOWER

- approx. 50 tool stations per tower.
- max tool size:
 - full diameter: Ø 280mm
 - bridge tools max Ø 550mm
 - length: 600mm
- max. tool weight 35kg
- HSK shape A nominal size 100 according to DIN 69893-1
- at the customer's request, other tool types, weights, and geometries possible thanks to the modular design of the tool racks



CENTRAL ROBOT

The central robot ensures that the tools in the modular autonomous tool machine are loaded and unloaded.



TRANSFER STATION

The transfer station is intended to transfer the tools from the central robot of the tool magazine to the shuttle robot.
- 5 transfer stations



SAFETY LIGHT GRID

Allows for harmlessly opening the RILE tool drawers even when the robot is approaching the transfer station.



DRAWER FOR TOOL LOADING AND UNLOADING AT THE MODULAR AUTONOMOUS TOOL MAGAZINE

2 drawers with 5 storage areas in each case are used in order to load the tools into the modular autonomous tool magazine and/or to unload the tools from the same. The tool data is taken from the tool data chip and transferred to the master control.

Additionally, it is also possible to load and unload tools directly at the tool magazine of the machine; however, The tool data is also collected by the tool management function of the master computer automatically at this point.

ADVANTAGES:

- 2 drawers allow for parallel loading and unloading by the employee and the robot

DETAILED INFORMATION



EXTERNAL TOOL READ-HEAD OUTSIDE OF THE TOOL MAGAZINE

On the one hand, the tool read-head is intended to read out the tool data in order to provide the operator with information. On the other hand, this station can also be used in order to write data onto the tools.



TOOL MANAGEMENT

- tool management for an unlimited number of virtual and real tools
- shows the current positions and status data of all tools
- can additionally manage manual and automatic tool storage units
- saves the date of creation and the most recent spindle use for all tools
- flexible browsing for spindle time, usage in programmes or jobs



INSERTION MONITORING

Improper insertion can be ruled out by automatically retrieving the tool position when the tool is inserted into the drawers.



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SHUTTLE ROBOT WITH TOOL BAG

The shuttle robot provides the individual machine tools with tools from the central tool magazine. It also transports the tools no longer required by the machine tool back into the central tool magazine. It is also possible to transfer tools from one machine to another.

In order to optimise the motion routes and in order to increase the cycle time, the shuttle robot is equipped with a tool bag (buffer storage unit) containing 5 tool stations.



DETAILED INFORMATION



SHUTTLE ROBOT

- type Fanuc Robot R-1000iA 100F on the 7th axis
- velocity: 2m/sec
- at the customer's request, other robot manufacturers are available too



TOOL BAG WITH 5 STORAGE AREAS

Tool storage positions in the bag are equipped with a clamping unit. This clamping unit serves as transport locking device against falling, but particularly in order to guarantee transportation in correct position. This way, it is ensured that the transfer accuracy of 0.8 to 1.0mm is guaranteed.



SHUTTLE ROBOT ABOVE THE FLOOR

The shuttle robot is located on a 7th axis at a height of 3.5m. Therefore, the machines are accessible at all times. Thus, the revolving tool sluice of the machine tool, as well as the medium supply, and the chip disposal unit are accessible without any limitations.



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TOOL TRANSFER STATIONS

The RILE FMS contains the following transfer stations:

1. in the modular autonomous tool magazine
2. at the respective tool magazine of the machine tool

The shuttle robot with tool bag is responsible for transporting the tools to and from the central tool magazine and to and from the machines. The machine is loaded by the shuttle robot as follows: the tools are collected from the transfer station in the modular autonomous tool magazine. Then, the tools are loaded to and unloaded from the drawer system at the respective machine tool.

The drawer is then used to transport the tools into the machine. From there, the tools are placed into the tool magazine of the machine tool by its loading unit.

The tools are unloaded in reverse order.



DETAILED INFORMATION



TRANSFER STATION MODULAR AUTONOMOUS TOOL MAGAZINE

The shuttle robot can take the tools from the central tool magazines at 5 transfer stations and it can return the tools to the central tool magazines at these 5 transfer stations.

(Interface between central robot and shuttle robot)



TOOL TRANSFER MACHINE TOOL

The shuttle robot can use two tool stations in the drawer of the machine tool in order to provide the machine tool with tools.

The employee may, at any time, manually equip the tool magazine of the machine tool directly using the revolving sluice of the machine's tool magazine.