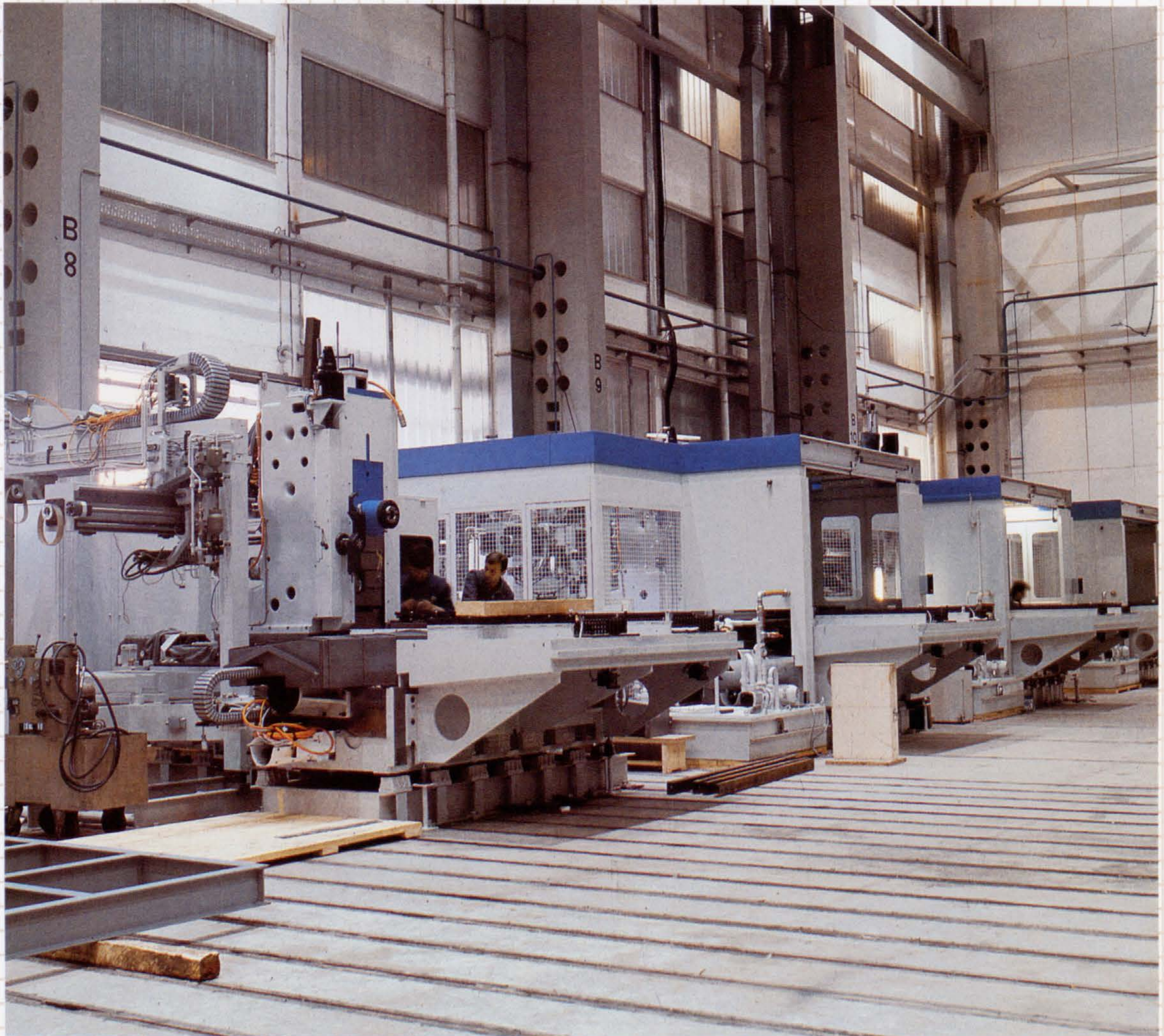




**TECHNOLOGICAL
EQUIPMENT**

MACHINE CONSTRUCTION

Due to the thirty-year development and experience in the field of design and construction of special-purpose machine tools we rank among the most successful producers of special-purpose technological equipment. At the beginning of '60 s, we designed and constructed in TAM the first transfer line for complete machining of cylinder heads, which constituted the first solution of this kind in Yugoslavia.



Adaptable Machining Systems

From the production of non-flexible automatic machine tools we switched over to the production of adaptable machining systems featuring the following advantages:

- reduction of waiting times and thus greater utilization of machine tools
- machining of different workpieces simultaneously
- in case of damage of a part of the system the machining is not interrupted, but only the number of workpieces reduced
- reduction of manual work and high productivity even with minor series.

In designing the machining systems we keep to the principle of graduality. The Fig. 1 shows an adaptable machining system with two machines SAMO. In general use are systems with four or more multi-operational machines (Fig. 2)

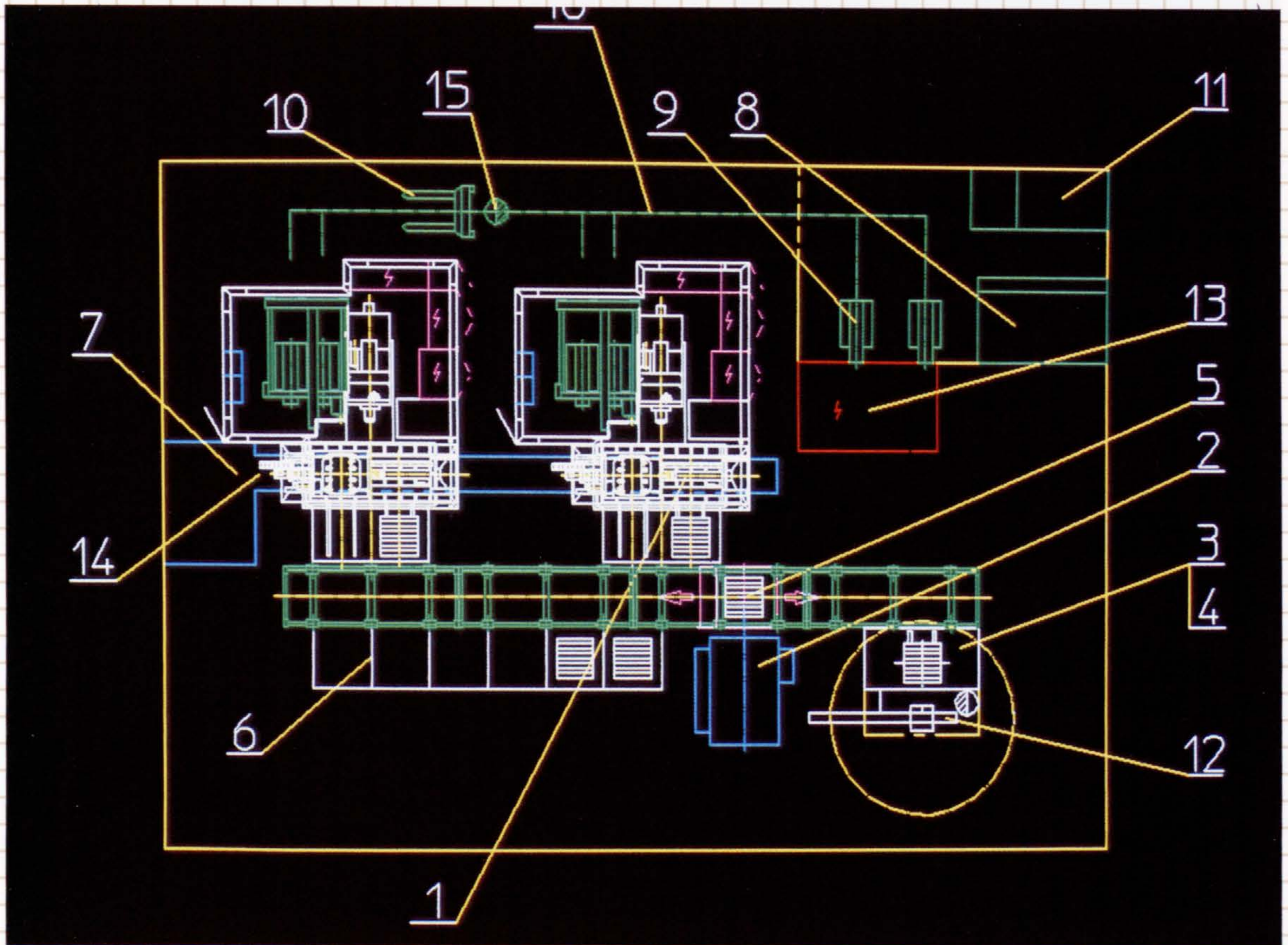


Fig. 1

1. SAMO
2. Chip removal plant
3. Clamping point
4. Unclamping point
5. Conveying system
6. Pallet magazine
7. Chip conveyor + cleaning plant
8. Tool magazine

9. Tool cassette
10. Cassette conveying vehicle
11. Adjusting — measuring the tools
12. Manipulator
13. System control
14. Chip conveyor
15. Operator
16. Conveying path for tool cassettes

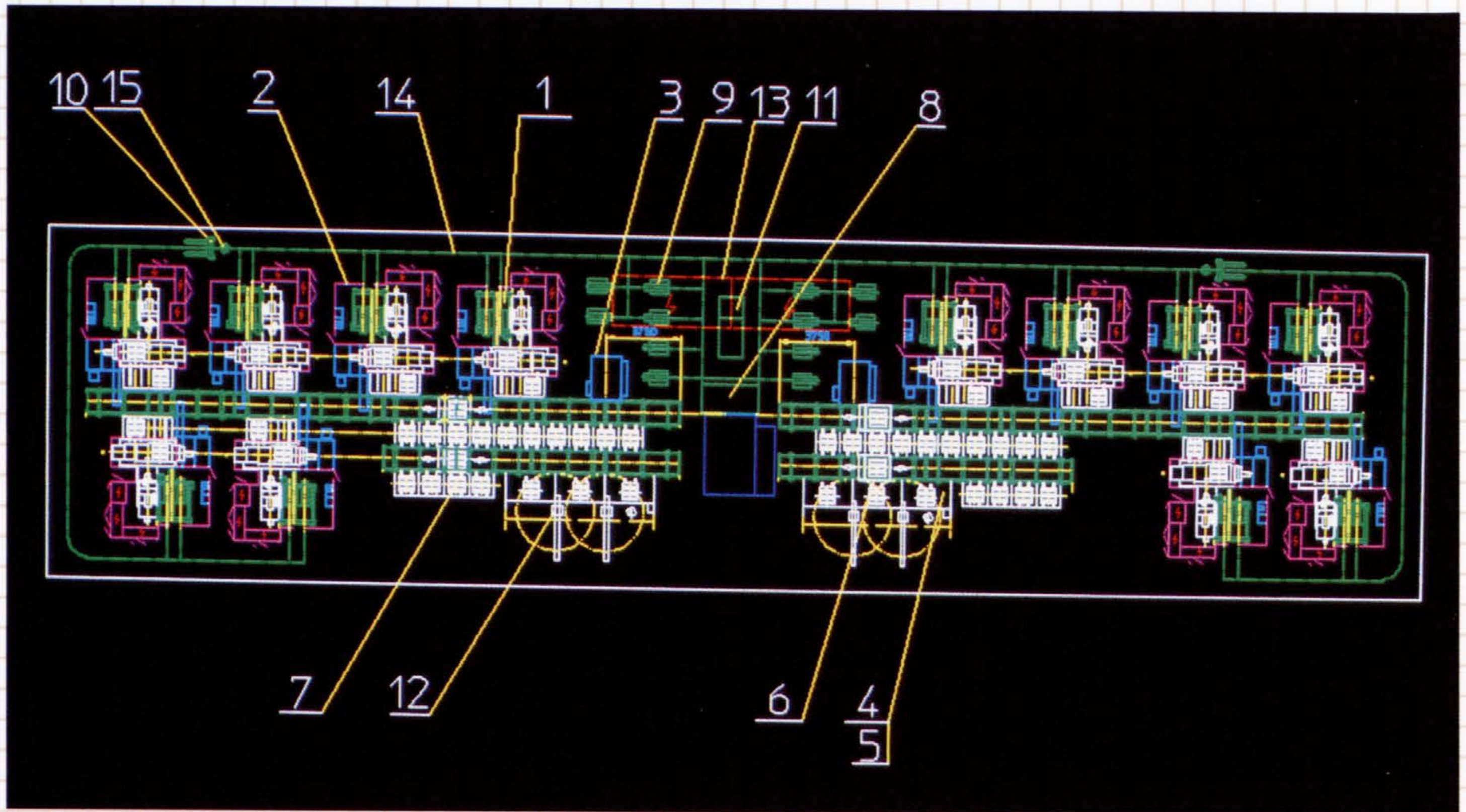
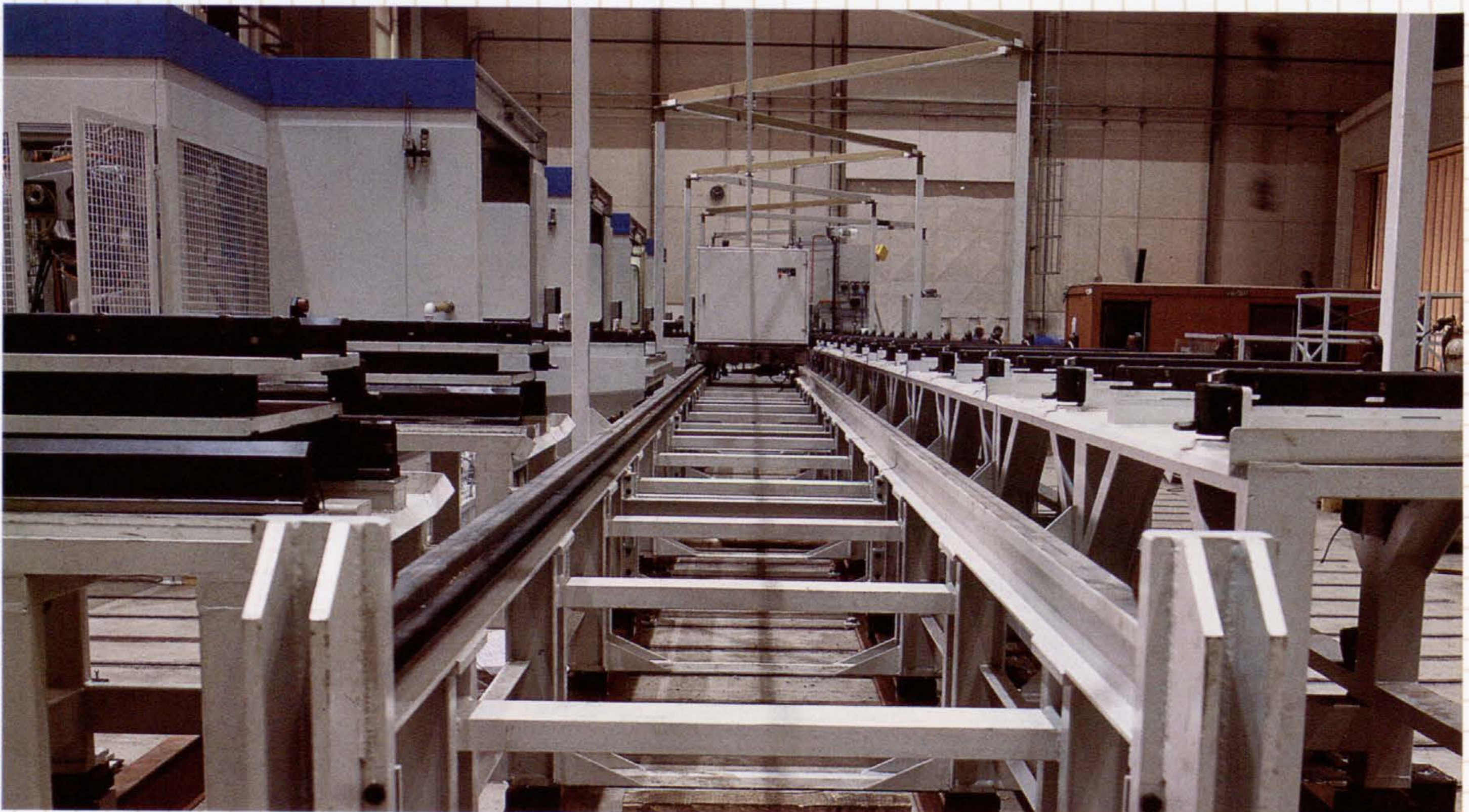


Fig. 2

- 1. SAMO 1
- 2. Guard rail of pallet magazine
- 3. Chip removal plant
- 4. Clamping point
- 5. Unclamping point
- 6. Conveying system
- 7. Pallet magazine
- 8. Tool magazine

- 9. Tool cassette
- 10. Cassette conveying vehicle
- 11. Adjusting — measuring the tools
- 12. Manipulator
- 13. System control
- 14. Operator
- 16. Conveying path for tool cassettes



The production systems are set up acc. to the modular design principle from type- or specific modules. The modules are functionally rounded off units and have the ability of integration in higher structures without modifications. Within the system we can adapt the layout and the number of machines, scope of computer-aided operation, level of flexibility and scope of equipment.

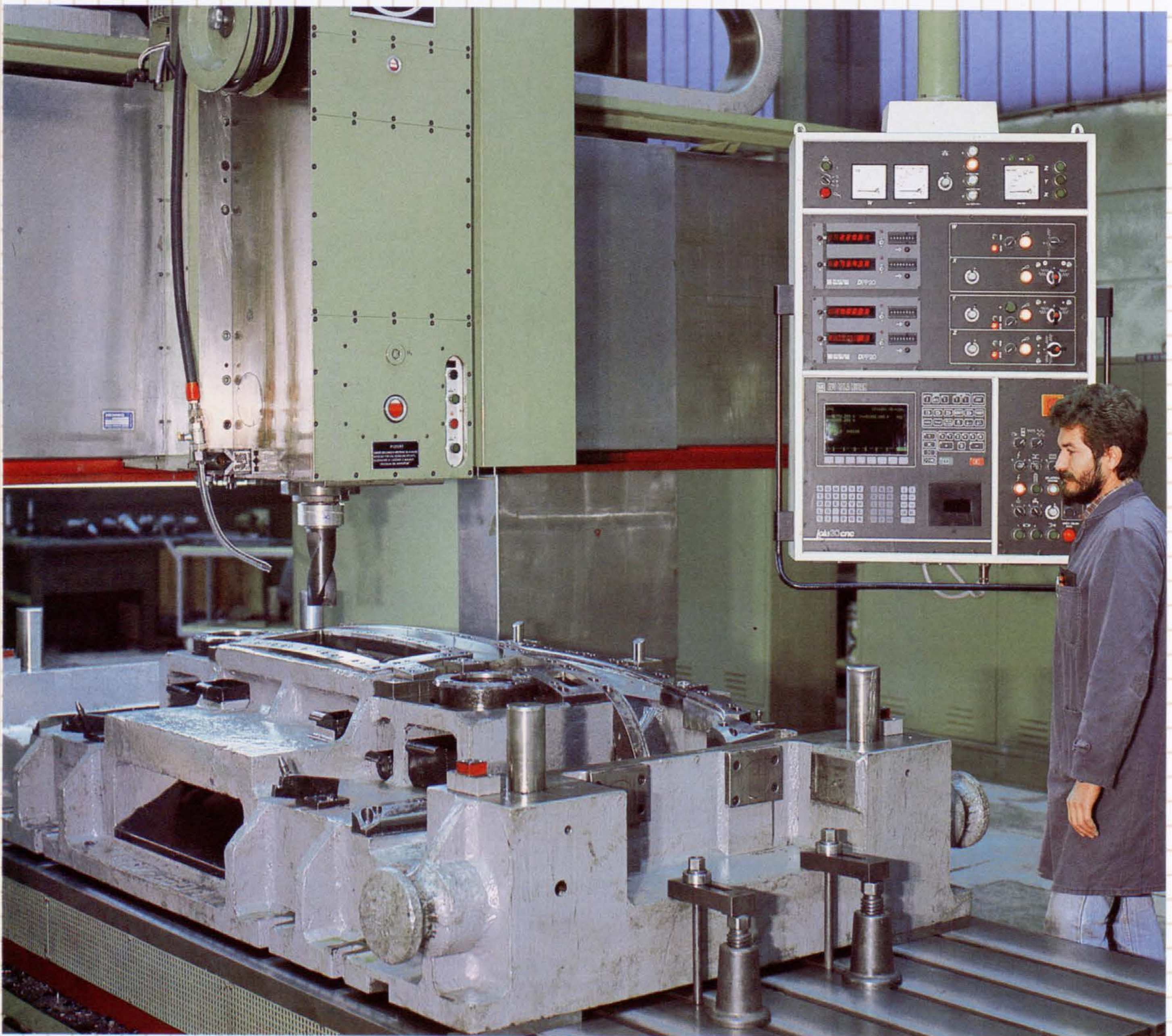


TECHNICAL DATA

	SAMO 1	SAMO 2			
Working range acc. DIN 66217			Accuracy		
X-axis:	800 mm	1250 mm	X, Y and Z axis are measured directly with linear scales		
Y-axis:	500 mm	800 mm	Uncertainty-of-position factor T_p acc. to VDI/DGQ 3441	0.017 mm	0.017 mm
Z-axis:	500 mm	800 mm	Scatter-of-position acc. to VDI/DGQ 3441	0.007 mm	0.007 mm
Spindle head in lower position (Y axis) working spindle axis up to worktable surface (palette)	130 mm	130 mm	Feed rates		
Workpiece turning range	Ø900 mm	Ø1250 mm	— working range		
Working spindle			Feed range X, Y, Z is infinitely variable	5...3500 mm/min	5...3500 mm/min
Low bearing dia.	Ø80/100/110 mm	Ø100/110 mm	Feed power rate (100 % ED)	15,000 N	15,000 N
Main spindle cone DIN 69871	A 50	A 50	— Rapid traverse rate		
Rev/min — infinitely variable	20-3900 rev/min	20-3900 rev/min	in X, Y and Z axis	12,000 mm/min	12,000 mm/min
Option	(40-7800) rev/min	(40-7800) rev/min	in B axis	10 rev/min	10 rev/min
Working spindle power	21 kW	21 kW	Rotary table — palette		
Working spindle torque	790 Nm	790 Nm	Palette clamping surface	500 × 630 mm	800 × 800 mm 800 × 1000 mm
Tool supply system			Version acc. to	DIN 55201, version 2	
Two cassettes with 24 tools each, dia.	Ø100 mm	Ø100 mm	Perm. table load	800 daN	2500 daN
Max. tool dia.	Ø270 mm	Ø270 mm	Repeatability (4 × 90 deg.)	±0.002 deg	±0.002 deg
Perm. tool weight	25 daN	25 daN	Accuracy over all positions	±0.003 deg	±0.003 deg
Perm. tool length (from spindle nose)	450 mm	450 mm			

TOOL SHOP

The setting up of TAM tool shop goes back to 1947 when the firm TAM was established. The tool shop has since achieved a high level not only in terms of technology, but also in production output, and is as such able to appear on the market as a major Yugoslav manufacturer of tools.



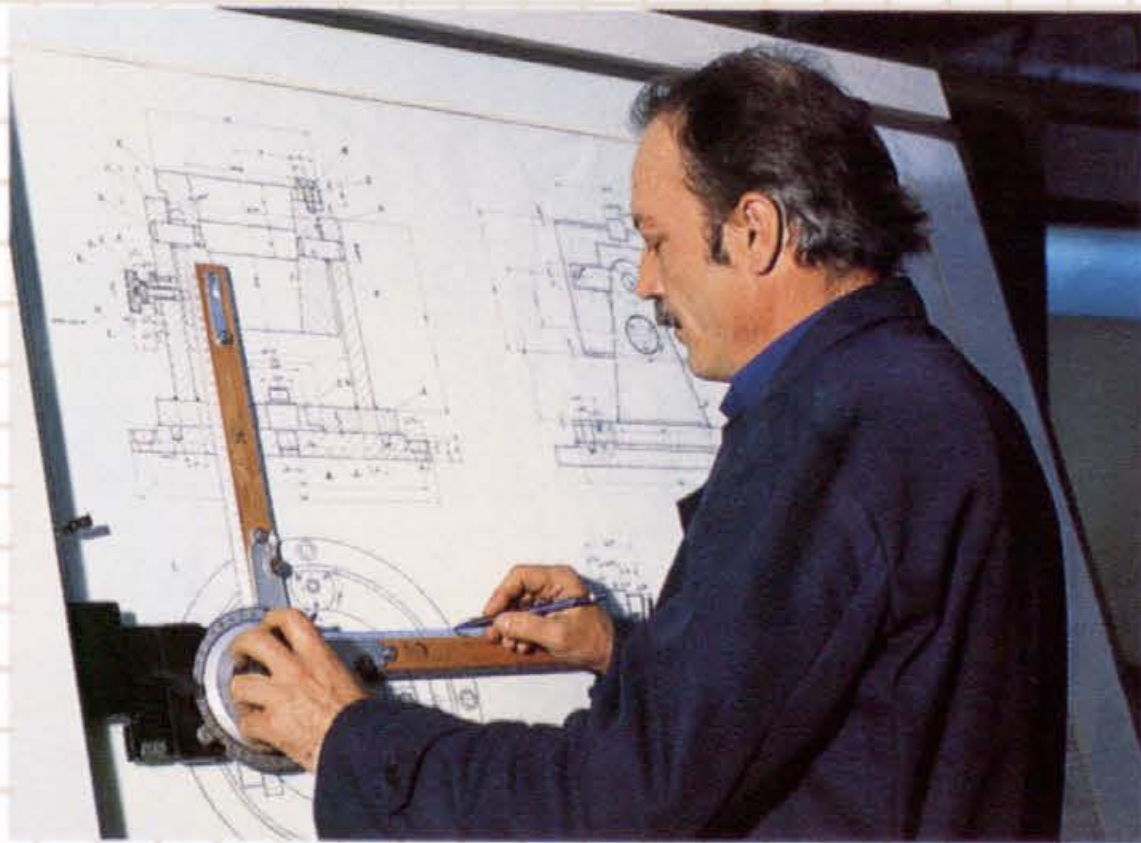
The tool production programme encompasses all kinds of multi-purpose tools required in the manufacture of trucks ranging from light to heavy-duty categories. Moreover, the TAM tool-shop can also produce any other tools that cover the above mentioned programme as regards the requirements, quality and size.

Thanks to the high level of workmanship developed within our plant we are able to guarantee on-time manufacture of top quality up-to-date products. In addition we can offer the customer our complete KNOW-HOW.

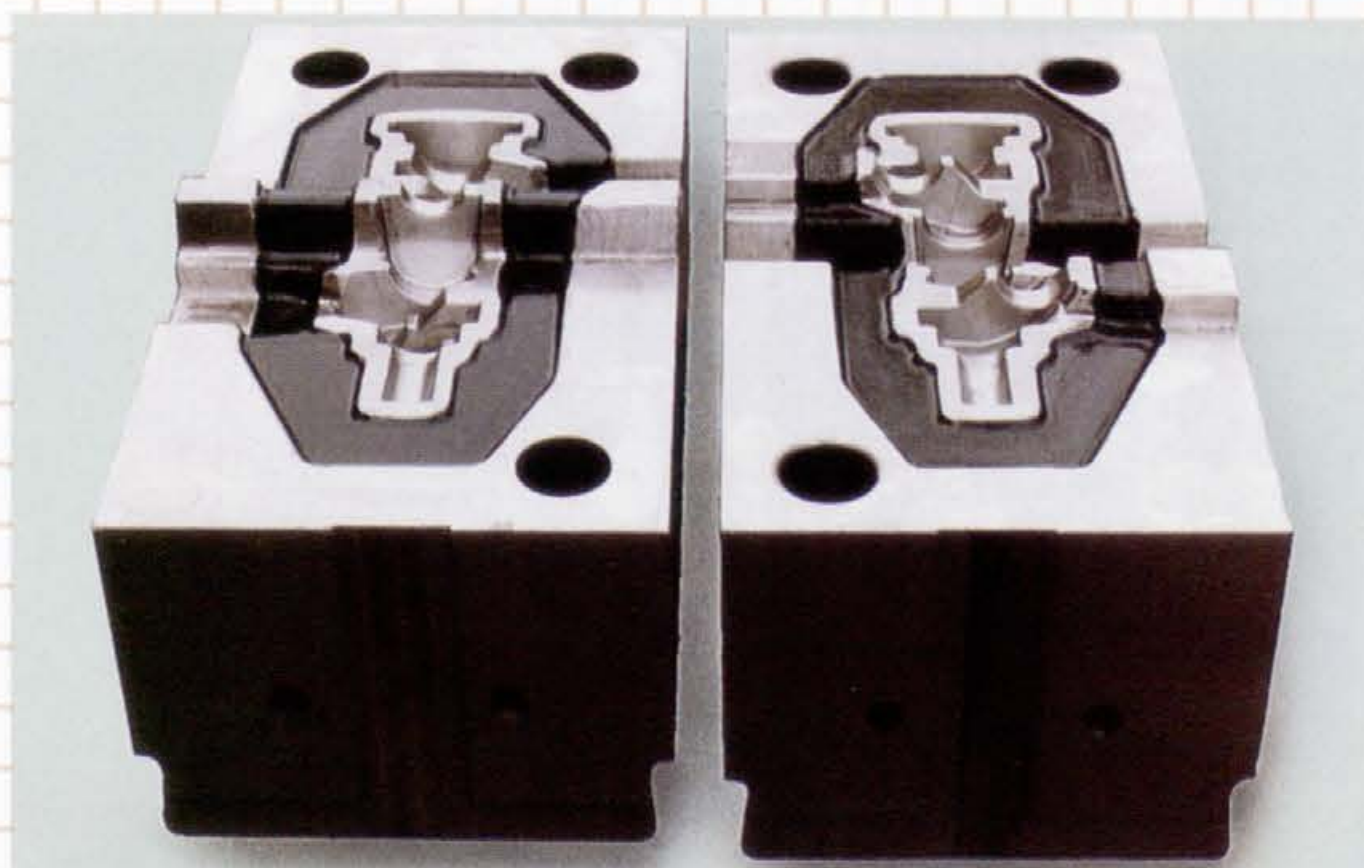
Thus the manufacture of tools is based either on the design supplied by the customer, our own design or the documentation complete with all technological solutions.

Tools are produced by the equipment consisting of complex machinery, which is constantly supplemented by up-to-date machines. This enables permanent pursuit of technological development and a high level of machining.

Controlling by modern measuring devices and machines ensures continuous high quality.



Forging Tools



Production Programme:

- Hot forging dies
- Cold hammer dies
- Hot pressing dies
- Cold pressing dies
- Tools for forgings cutting

Cutting-off Tools



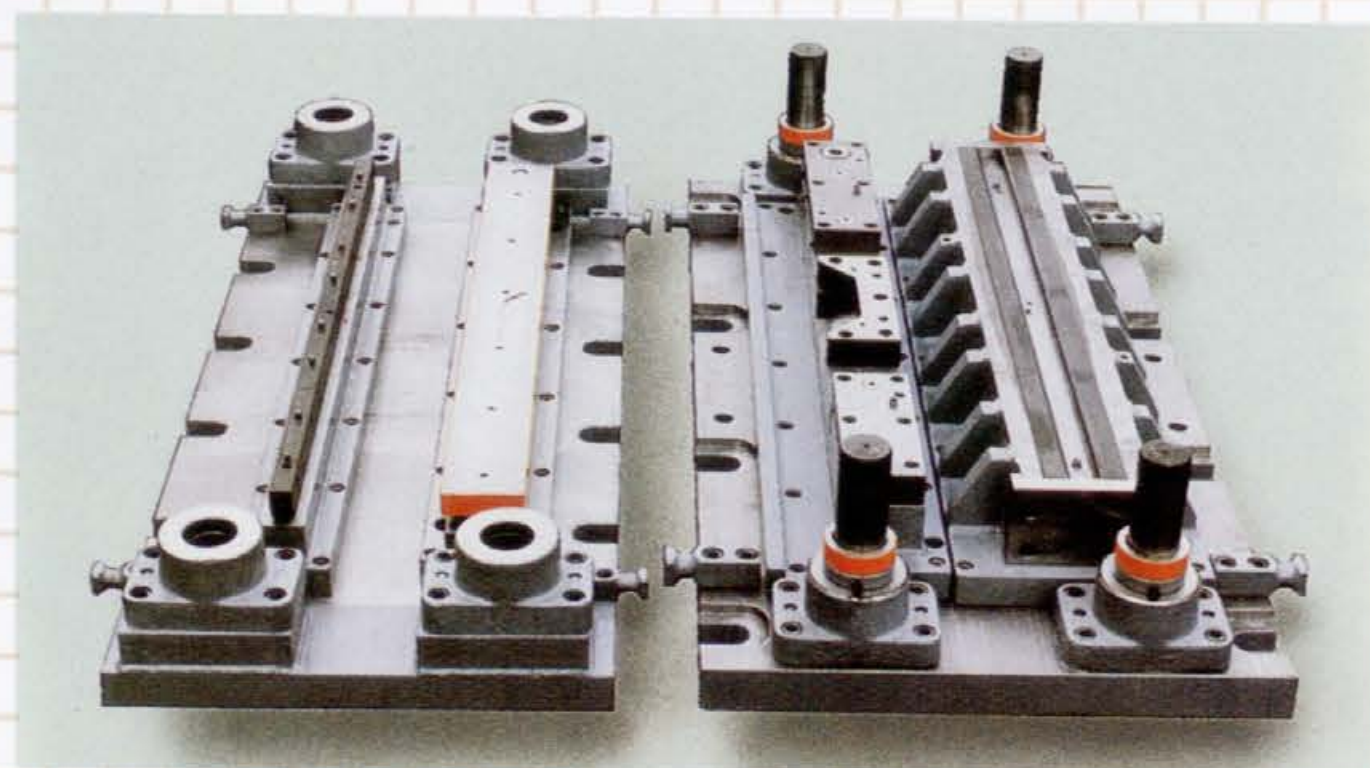
Production Programme:

- Milling tools — made of high speed steel & hard metal
- Reamers — made of high speed steel & hard metal
- Twist drills
- Deephole drilling tools
- Countersinking tools
- Turning tools
- Tools for gear production
- Threading rolls
- Taps
- Broaching tools
- Thread milling cutters
- Hard metal plates tool holders

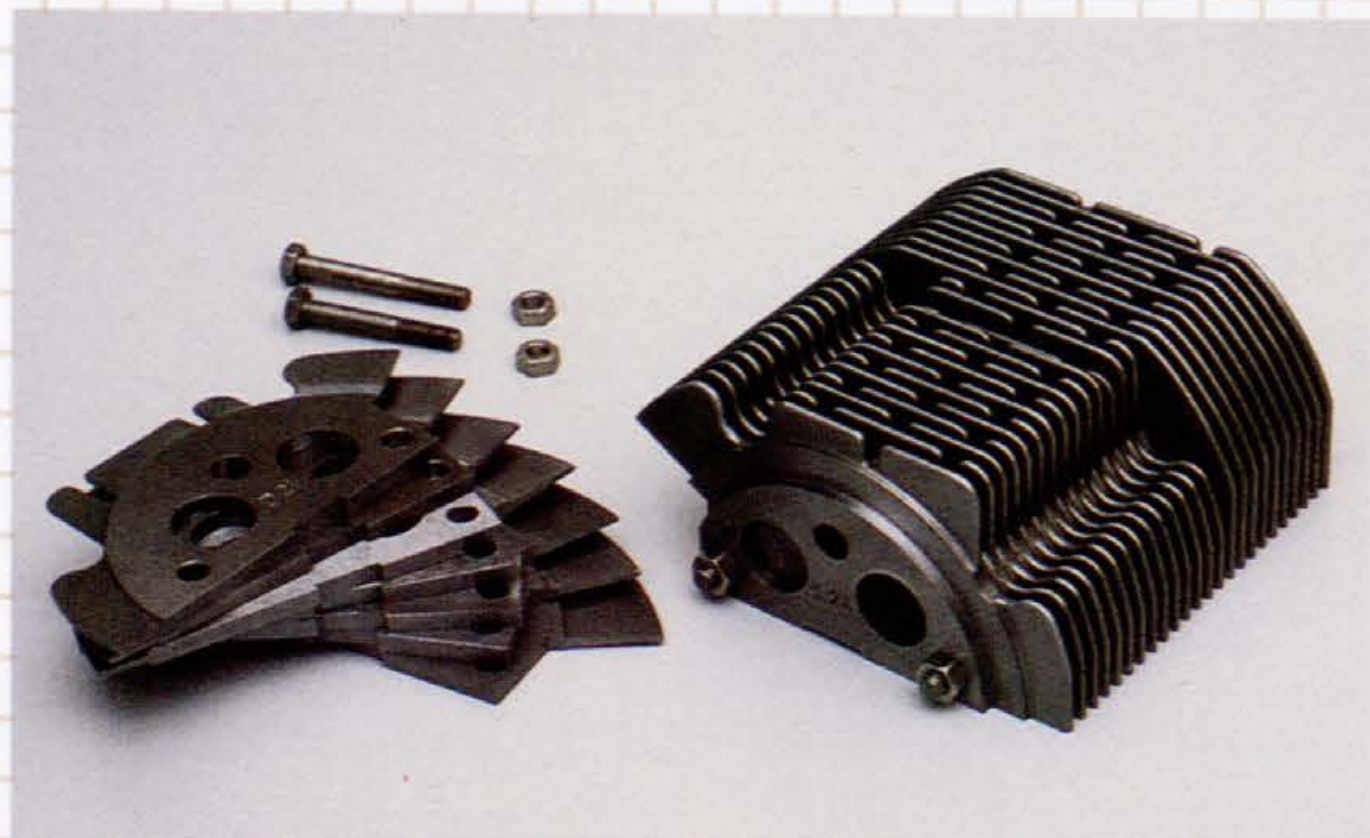
Tools for Sheet Metal Forming

Production Programme:

- Drawing tools
- Cutting tools
- Bending tools
- Multi-stage tools
- Devices for spot welding of sheet metal assemblies
- Cold extrusion tools



Casting Tools for Metals and Plastic



Production Programme:

- Gravity casting
- Die casting
- Tools for the manufacture of foundry cores and tools for shell-molding
- Tools for injection molding of plastic

Fixtures



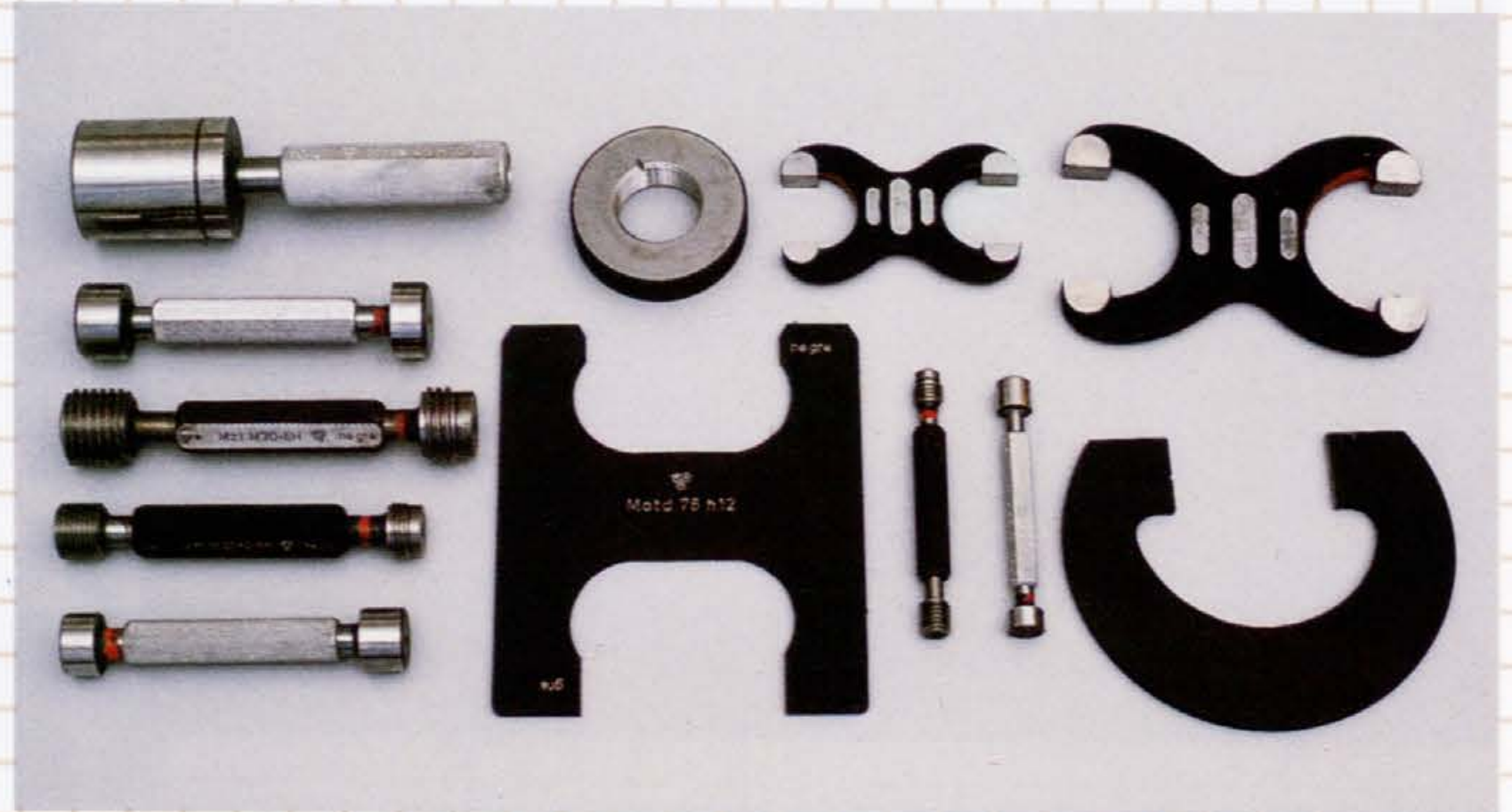
Production Programme:

- Grinding fixtures
- Milling fixtures
- Turning fixtures
- Assembly equipment
- Welding jig
- Drilling units
- Milling units
- Clamping tools
- Clamping systems for CNC machines

Controlling and Measuring Tools

Production Programme:

- Ring gauges and monitor sockets
- Plug gauges
- External gauges
- Setting gauges
- Measuring devices and accessories



Gears



Production Programme:

- Spur gears with straight gearing
- Spur gears with helical gearing
- Straight bevel gears
- Worm gears
- Gear couplings
- Spur gears with internal gearing

Machines and Tools Maintenance

Simultaneously with the development of vehicle production we were also engaged in other activities, one of the main being the maintenance of the machines.

Due to diverse machinery in the production of vehicles we are qualified to reconstruct all kinds of machine tools. Besides, we are equipped with most up-to-date gauges and measuring instruments.

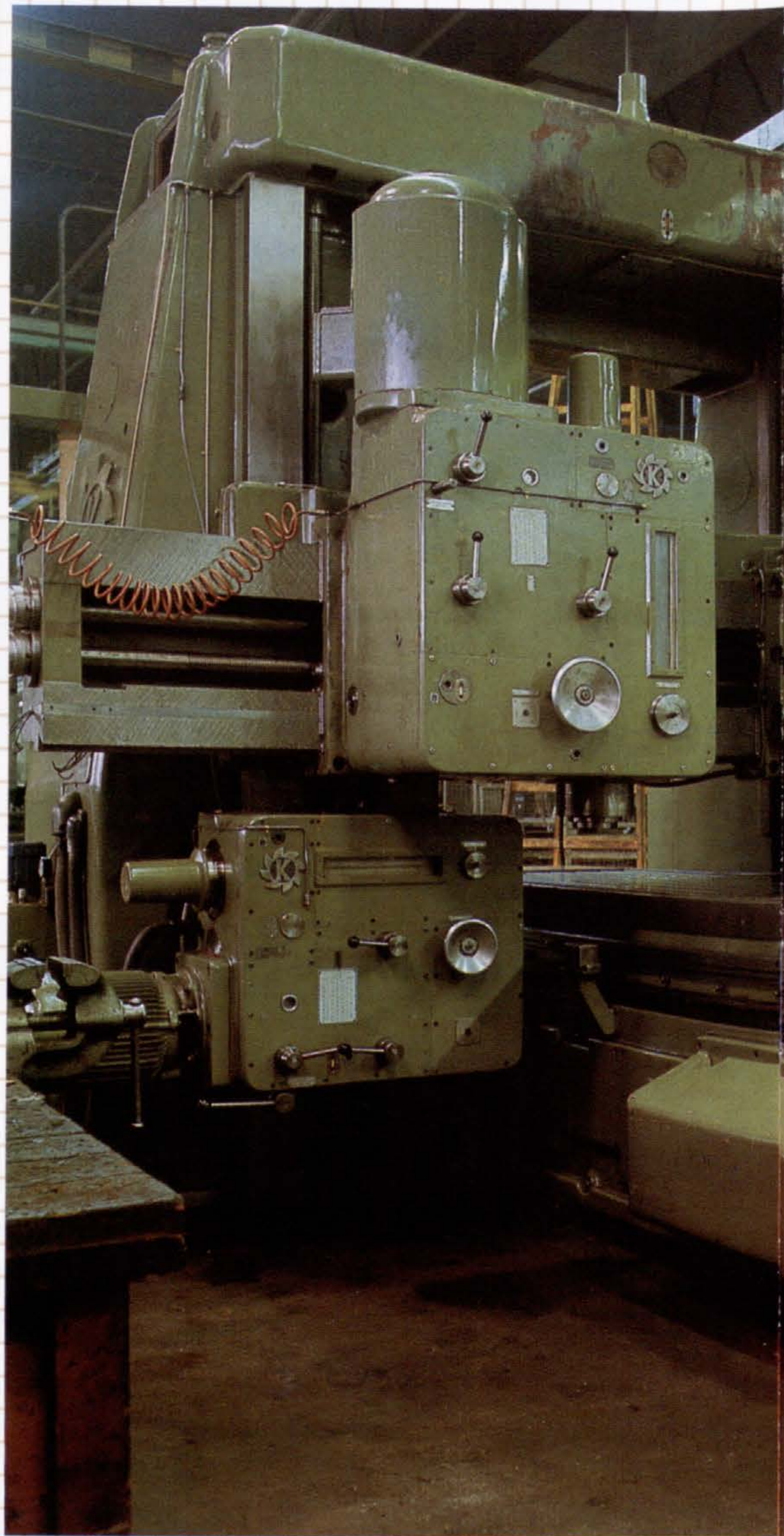
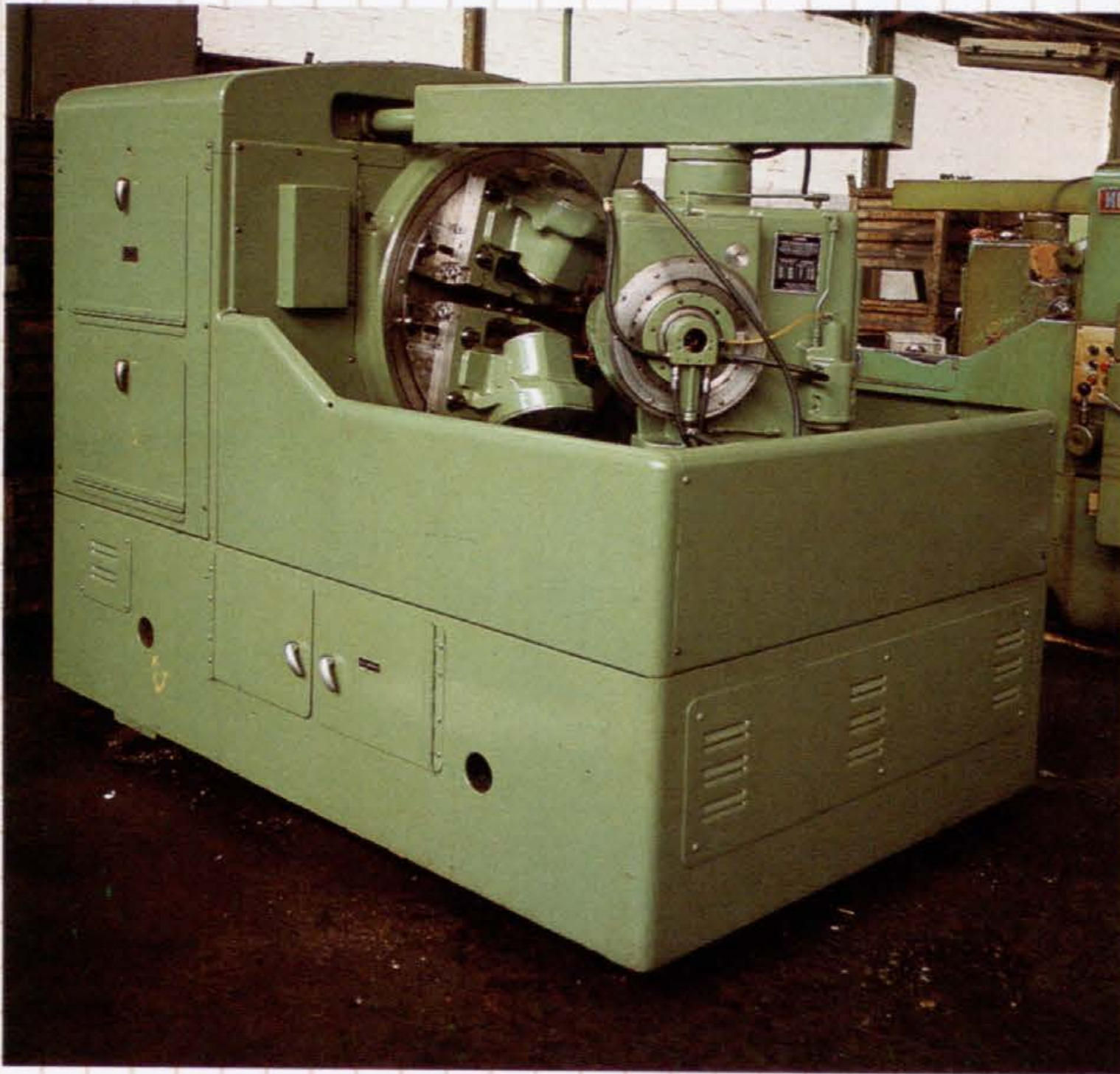
We reconstruct:

- NC and CNC machines- if required, we can replace even the type of electronics
- grinding-, milling- and shaping machines for cylindrical and bevel gears

- special-purpose machines
- grinding machines, also thread grinding machines
- milling machines
- lathes and automatic lathes
- presses and forging machines

We manufacture:

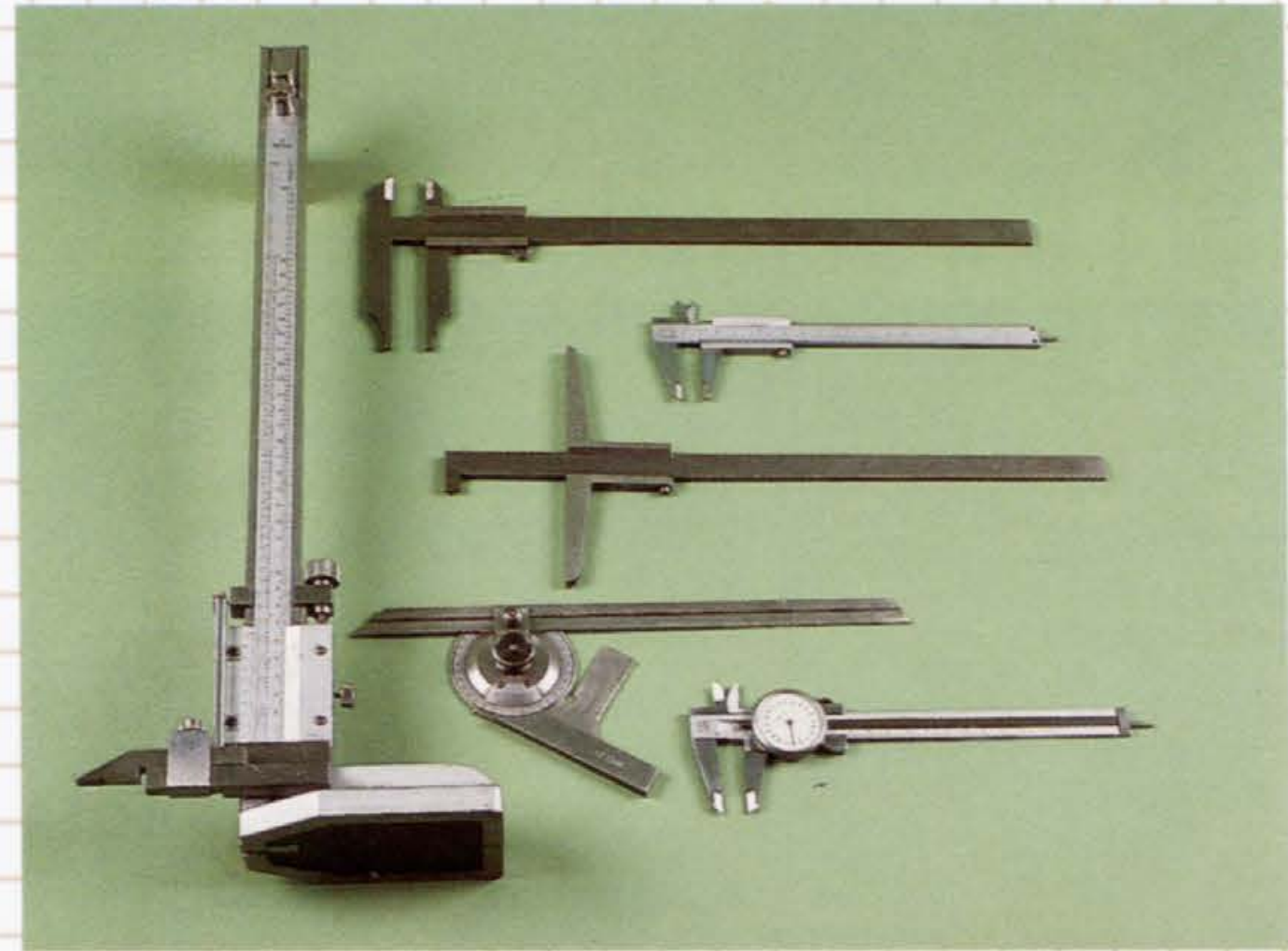
- spare parts for machine tools, also work spindles



We recondition also all kinds of measuring tools, e. g.

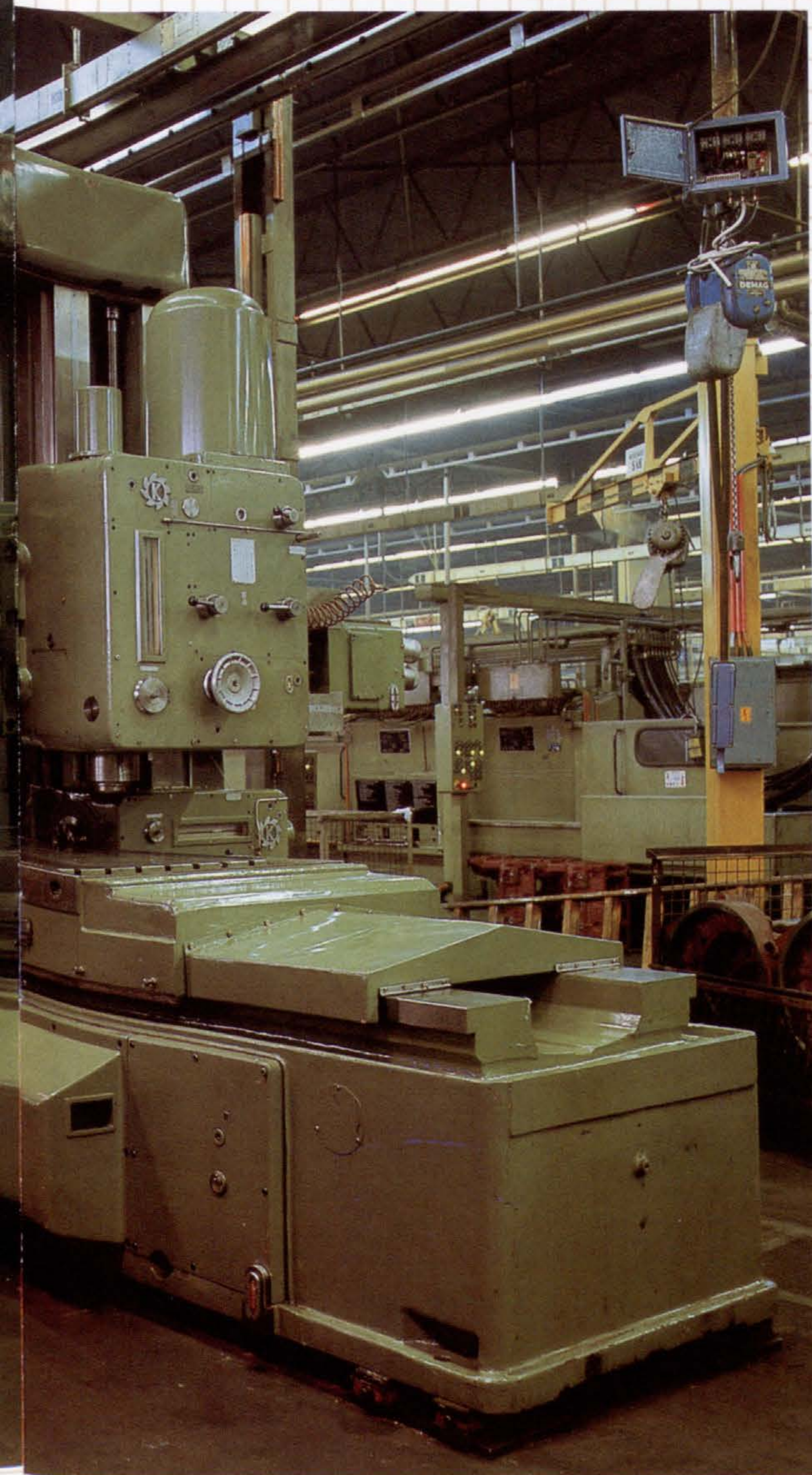
- micrometers
- dial gauges
- passimeters, etc.

For all measuring tools a certificate is issued upon reconditioning. We can also carry out the inspection for measuring tools alone and issue the certificate upon it.



We sharpen the cutting tools:

- broaches
- milling cutters, also gear cutters and gear shaping cutters
- twist drills and reamers
- circular saws
- and others.

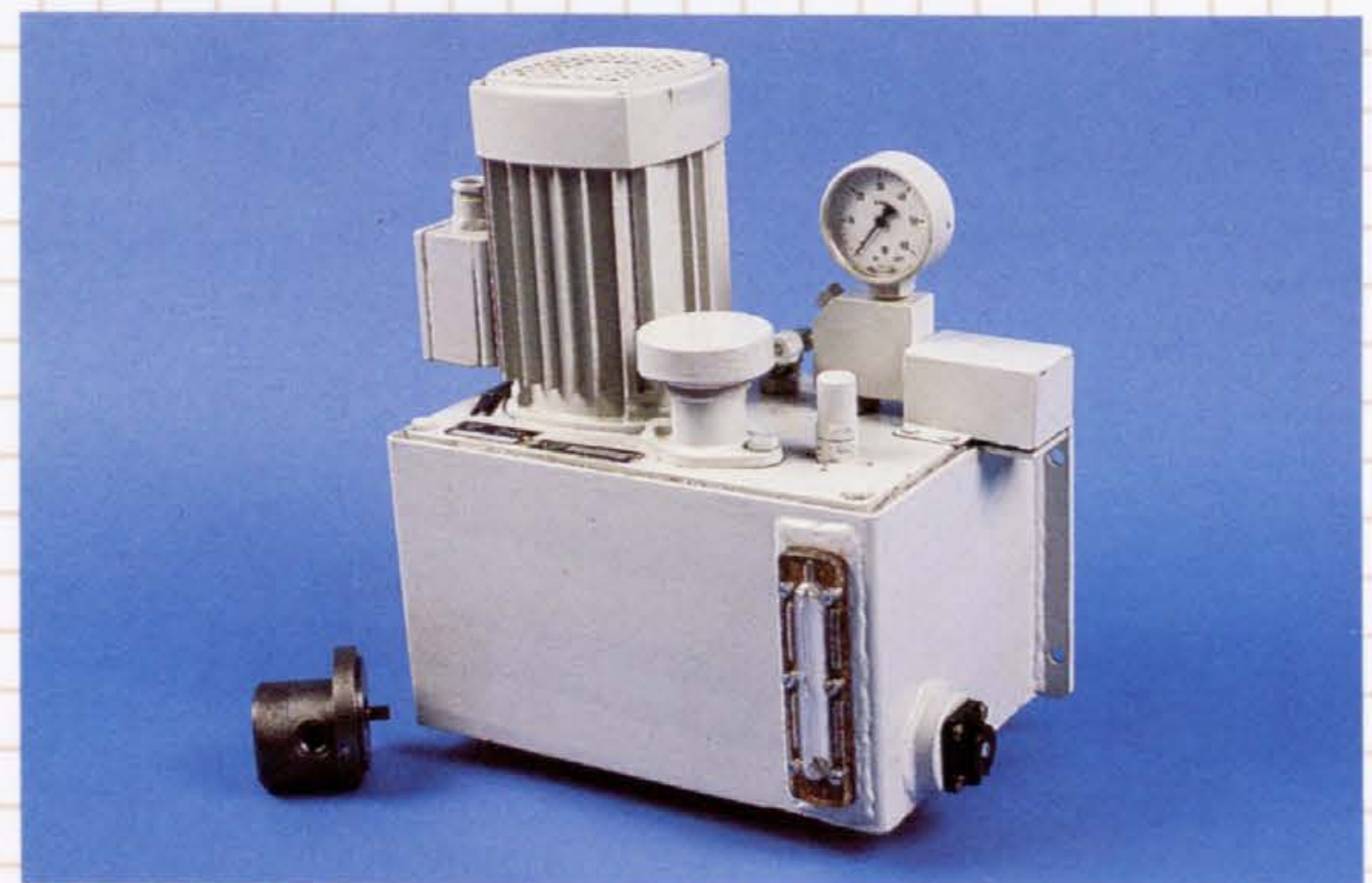
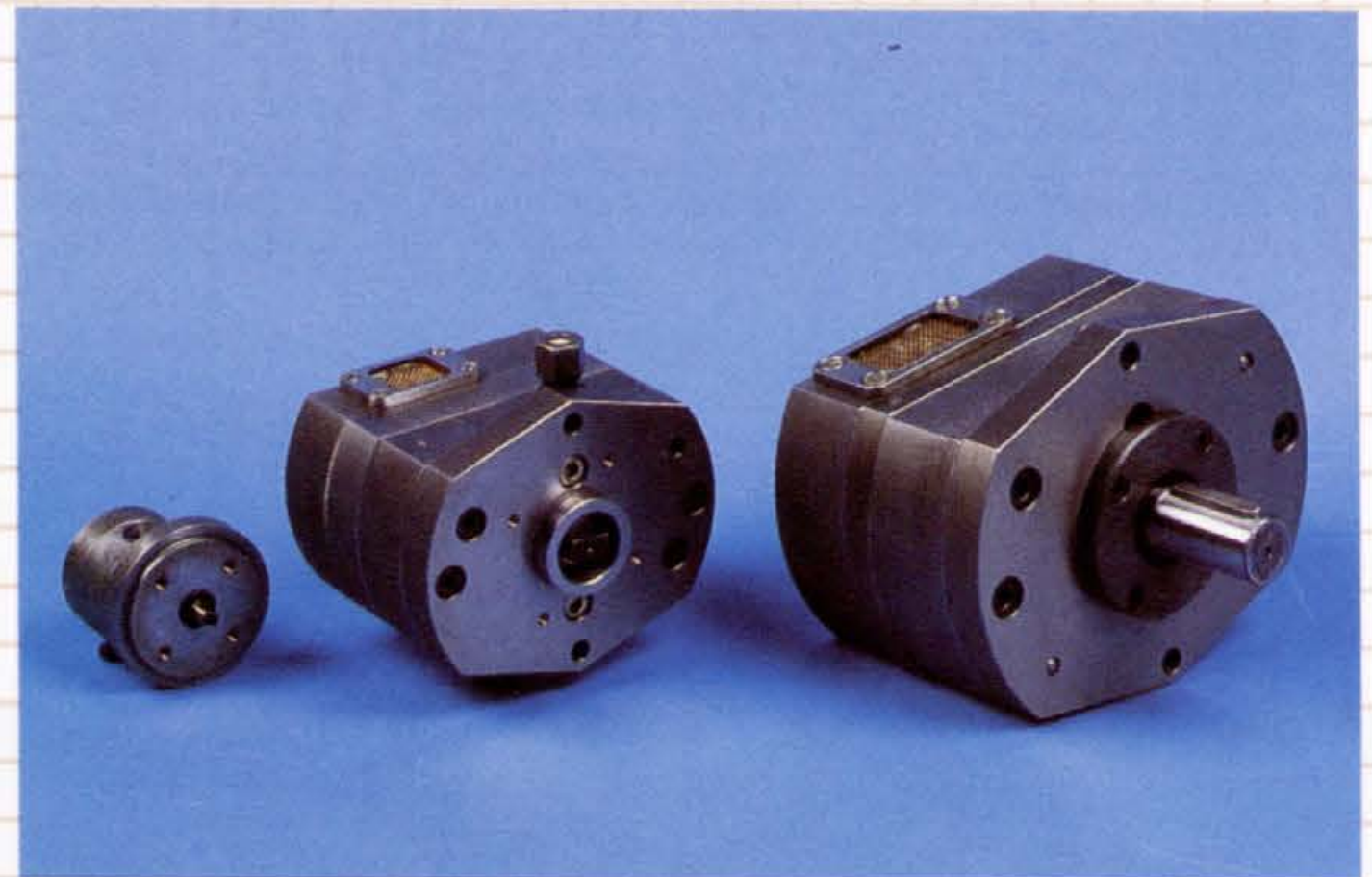
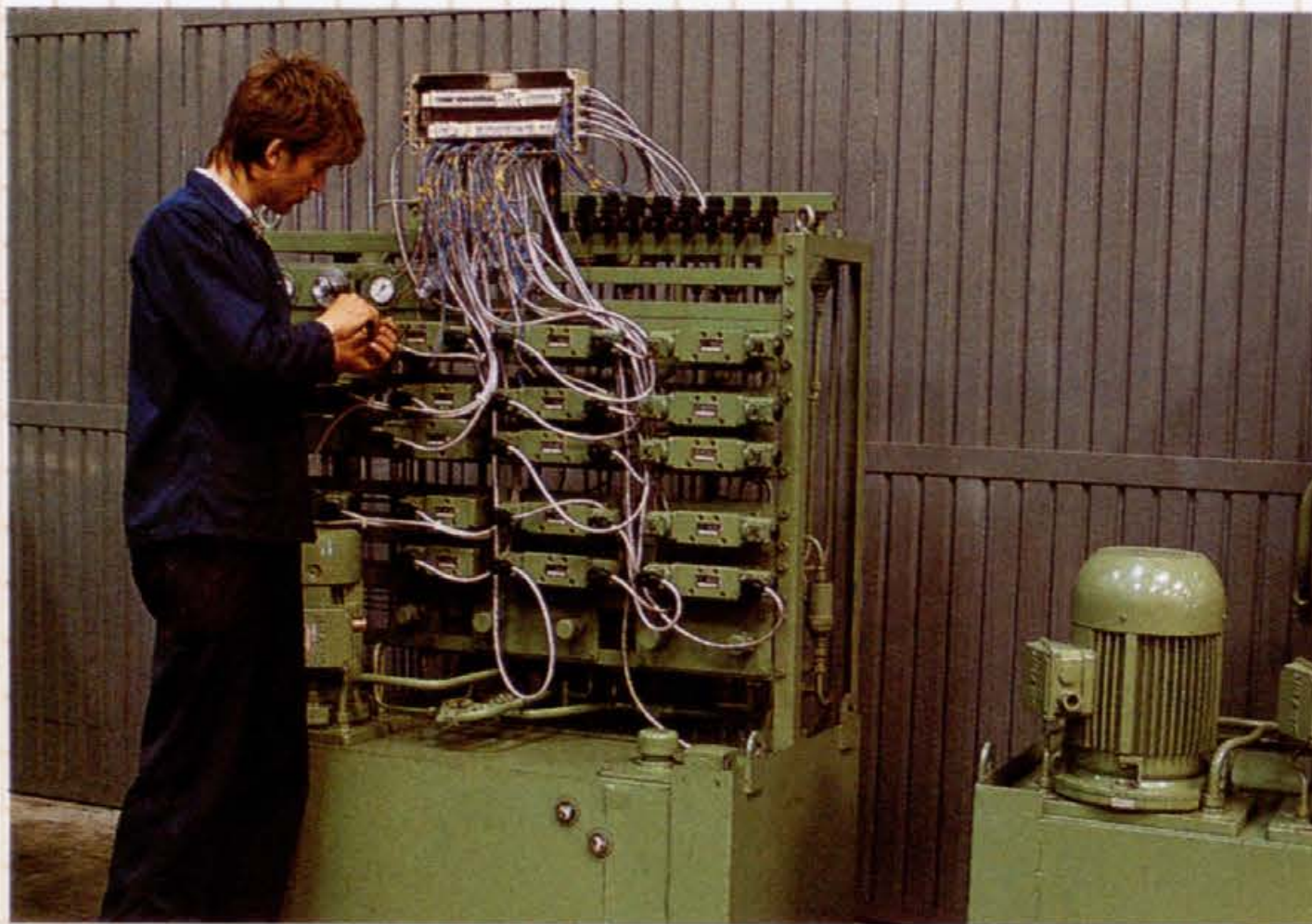


Hydraulics and Pneumatics

TAM's specialized workshop for hydraulics and pneumatics and the hydraulic-pneumatic design department boast a 30 years tradition and are based on our own knowledge, experience and equipment. Much of our experience was gained at the construction of outfit, diesel engines and vehicles as well as at repairing the hydraulic and pneumatic equipment.

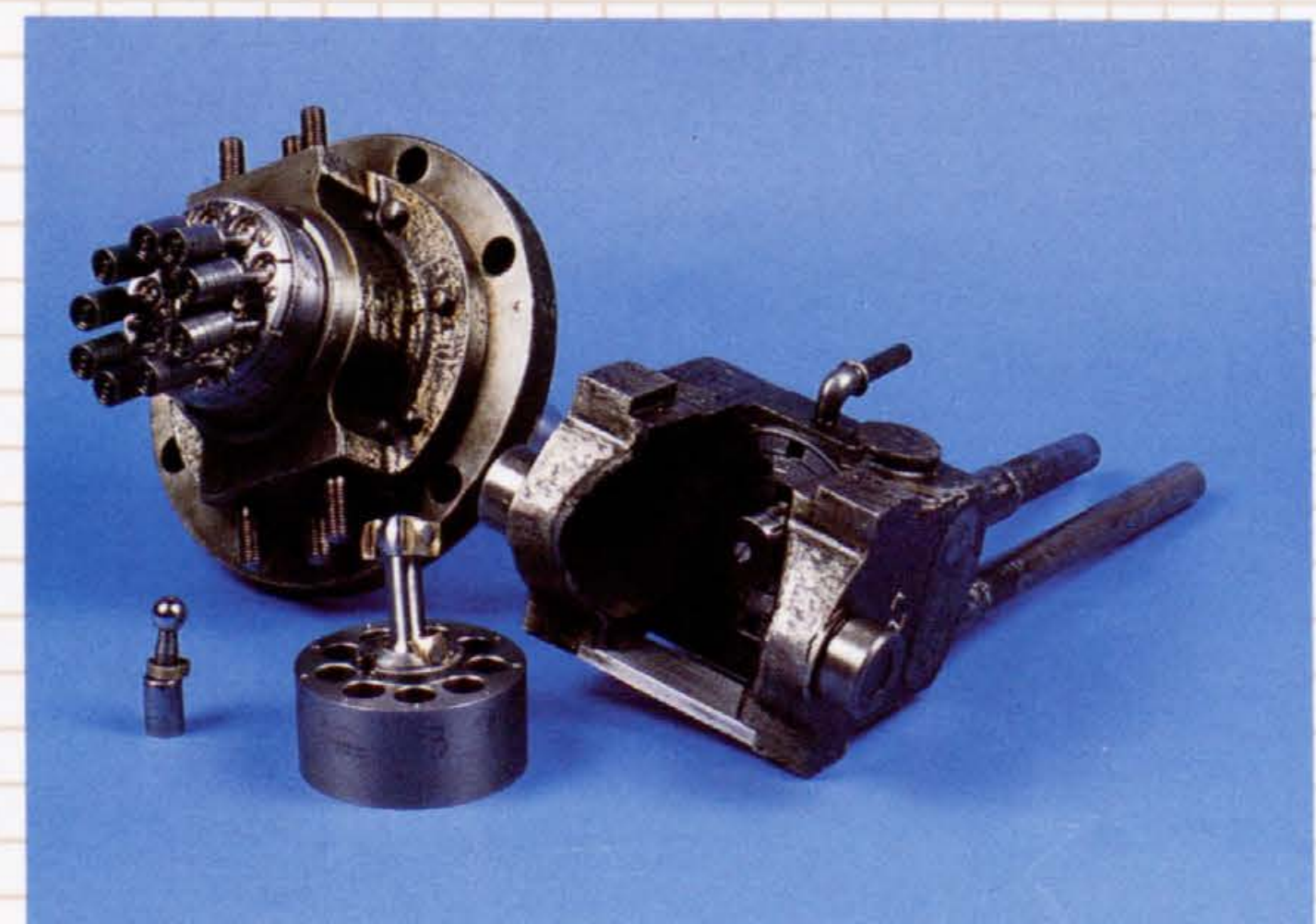
We build our own special-purpose machine tools, jigs and fixtures, hoisting devices, measuring and controlling instruments with hydraulic and pneumatic drives as well as lubricating and cooling technique. We have developed various hydraulic components, from pumps, control and other valves to cylinders which are adapted to specific characteristics of machine tools. We have designed and manufactured a number of components with non-standard features that are normally not offered by professional manufacturers of hydraulic and pneumatic systems. We also repair defective hydraulic and pneumatic equipment. The hydraulic and pneumatic drives manufactured acc. to our documentation or by ourselves for the vehicles and superstructures have proved very successful in operation. Thanks to our inventiveness and our own know-how we manage to solve urgent problems brought about by the production processes in TAM and outside TAM.

In cooperation with our experts for automotive electrical equipment and electronics we can offer up-to-date and thought-out solutions — in the field of documentation and manufacture — of even the most intricate problems concerning the control systems in the industry of today.

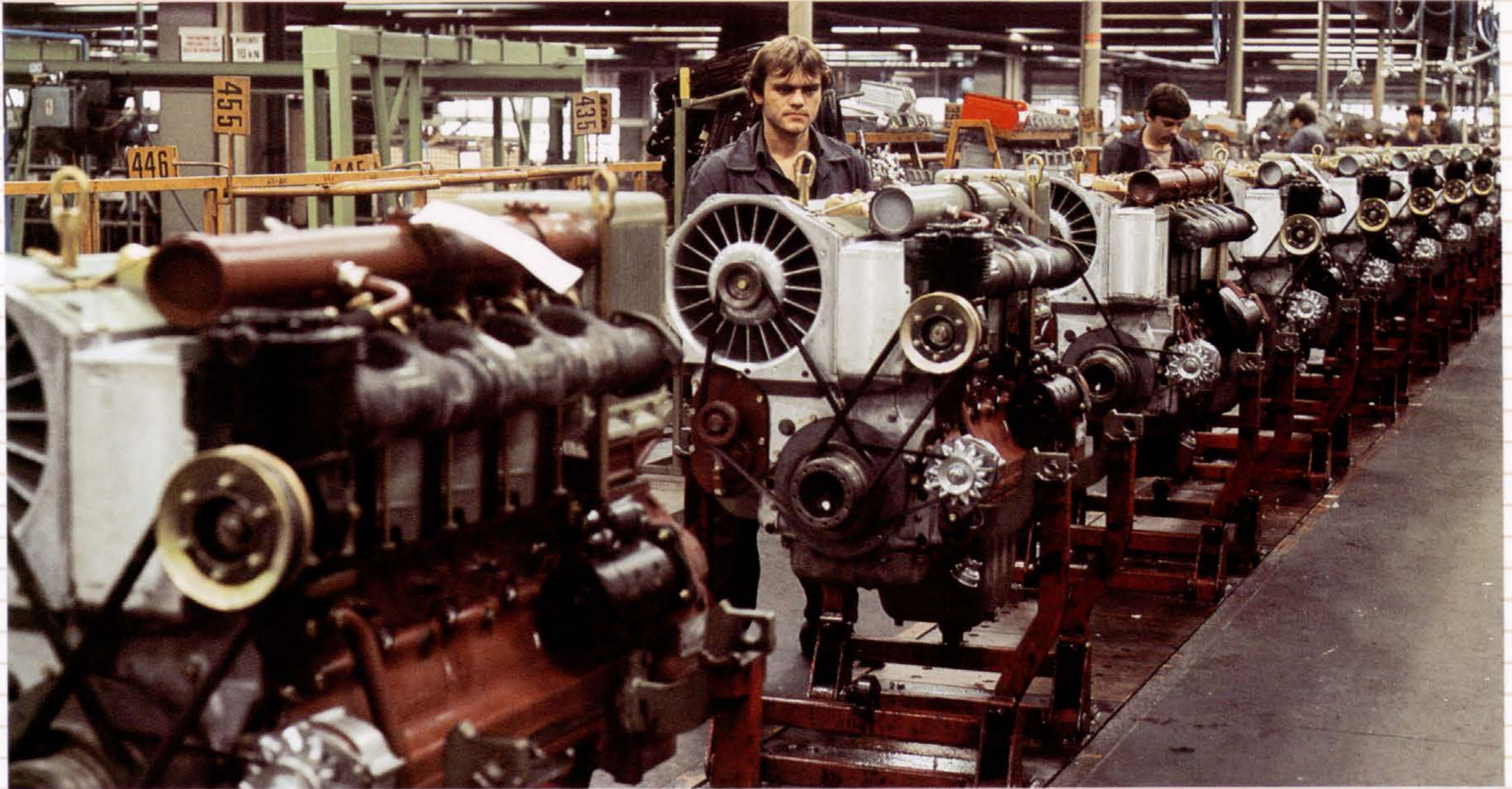


We offer:

- elaboration of design documentation for hydraulic and pneumatic drives, central lubricating and cooling systems of machines
- elaboration of design documentation for all kinds of hydraulic and pneumatic components, particularly those showing special non-standard features
- manufacture and starting of hydraulic and pneumatic components and systems
- repairing, reconditioning and testing diverse complex systems in the field of hydraulics and pneumatics.



Conveying Systems

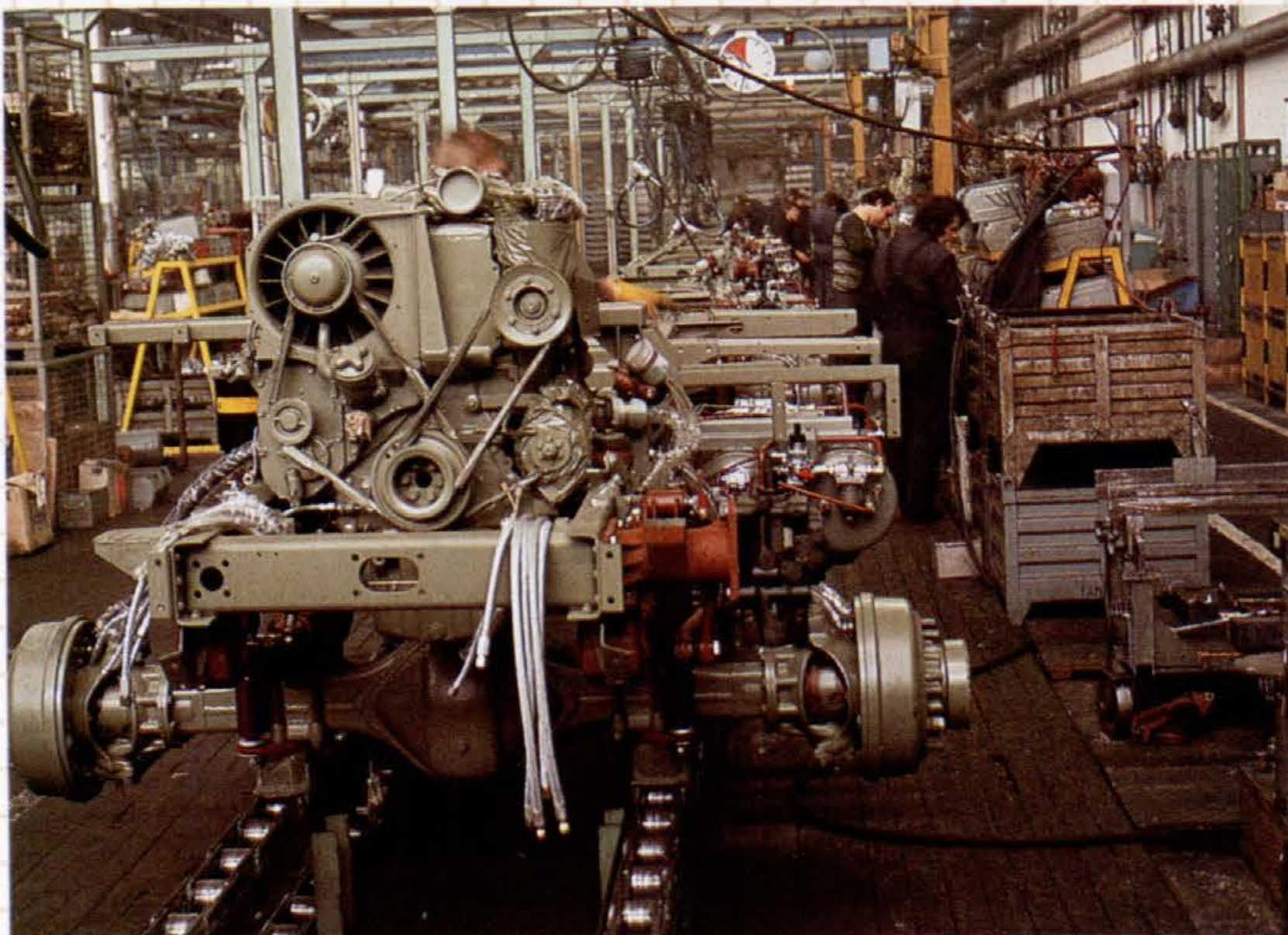


We offer you our knowledge and experience gained in designing and constructing the industrial plants for our own requirements in the field of conveying systems and degreasing plants.

We offer the following equipment belonging to the conveying systems:

- conveyor belts for assembly of engines and vehicles
- conveyors
- floor conveyors with special-purpose trolleys
- chip conveyors
- bridge and monorail cranes with a capacity up to 50 kN

- plane-parallel scissors lift with a capacity of up to 100 kN
- wall cranes with a capacity of up to 5 kN
- manipulator with a capacity of up to 1.6 kN
- roller conveyors
- trailers for heavy loads



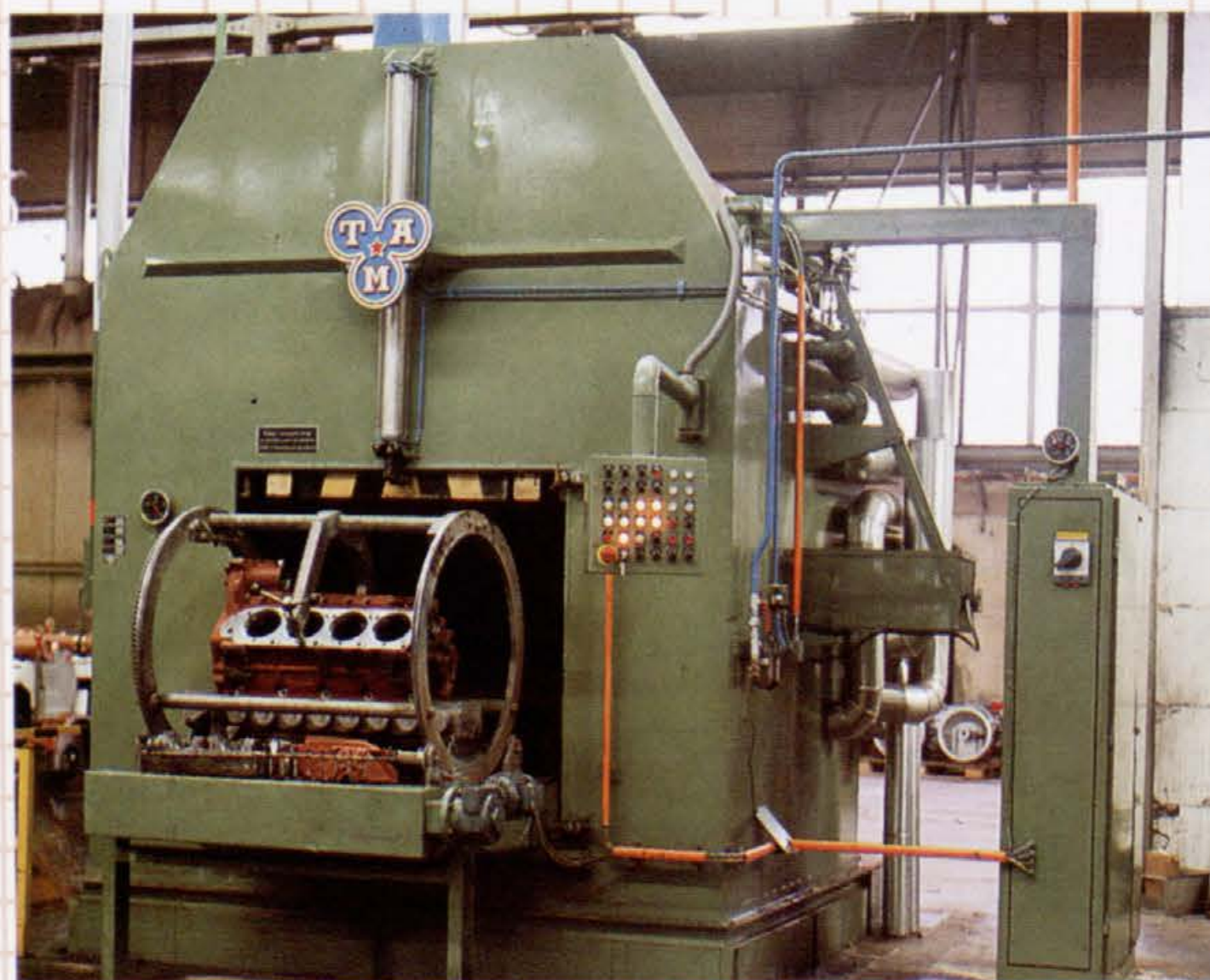
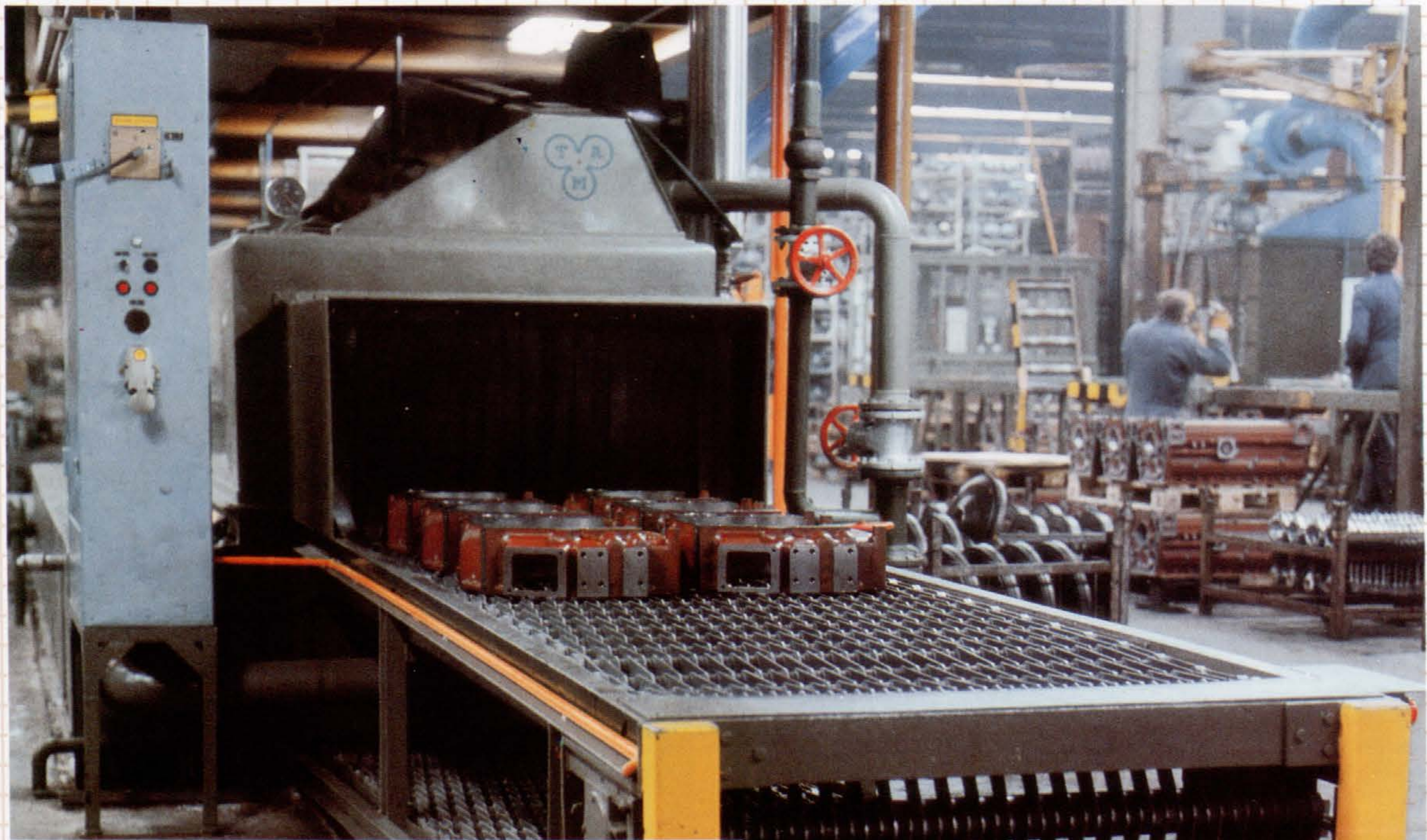
Metal Parts Degreasing- and Washing Plants

The metal parts degreasing and washing plants are used for:

- washing and degreasing of metal elements with warm washing agents (60—80° C)
- washing at workroom temperature.

The washing liquid can be heated by vapour, hot water or electric current. Washing at workroom temperature is a more recent method and is ecologically more favourable (without phosphates). The special- purpose washing machines (for crankcase, crankshaft, cylinder head ets.) are integrated in the machining line.

We manufacture chamber- and tunnel-type washing machines, the latter operating in cycle- or continuous mode. The largest tunnel-type washing machine has an opening of 2400 x 600 mm and a length of 17.3 m.



Electrical Equipment

More than thirty years of experience acquired in the execution of several thousand electric projects are a guarantee that we are a reliable partner in the implementation of standard relay- or CNC electrical equipment for machine tools, conveying- and industrial plants and equipment for automation of production.

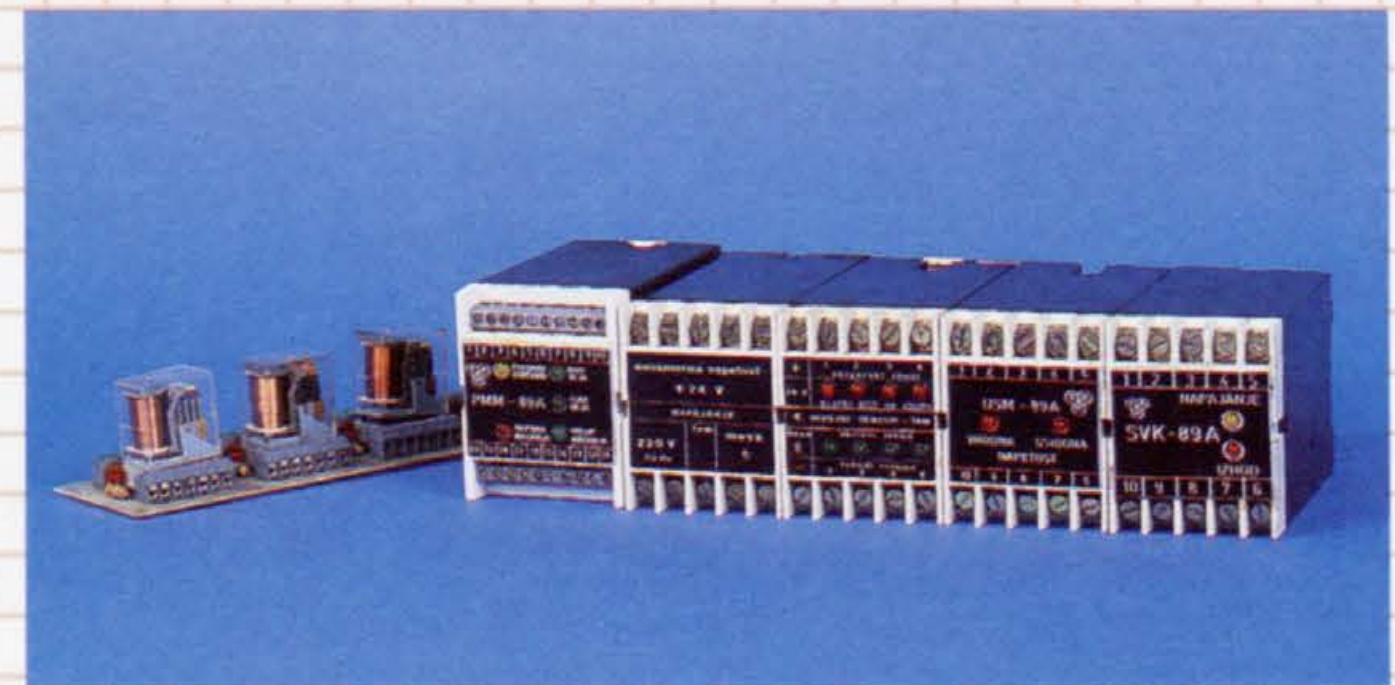
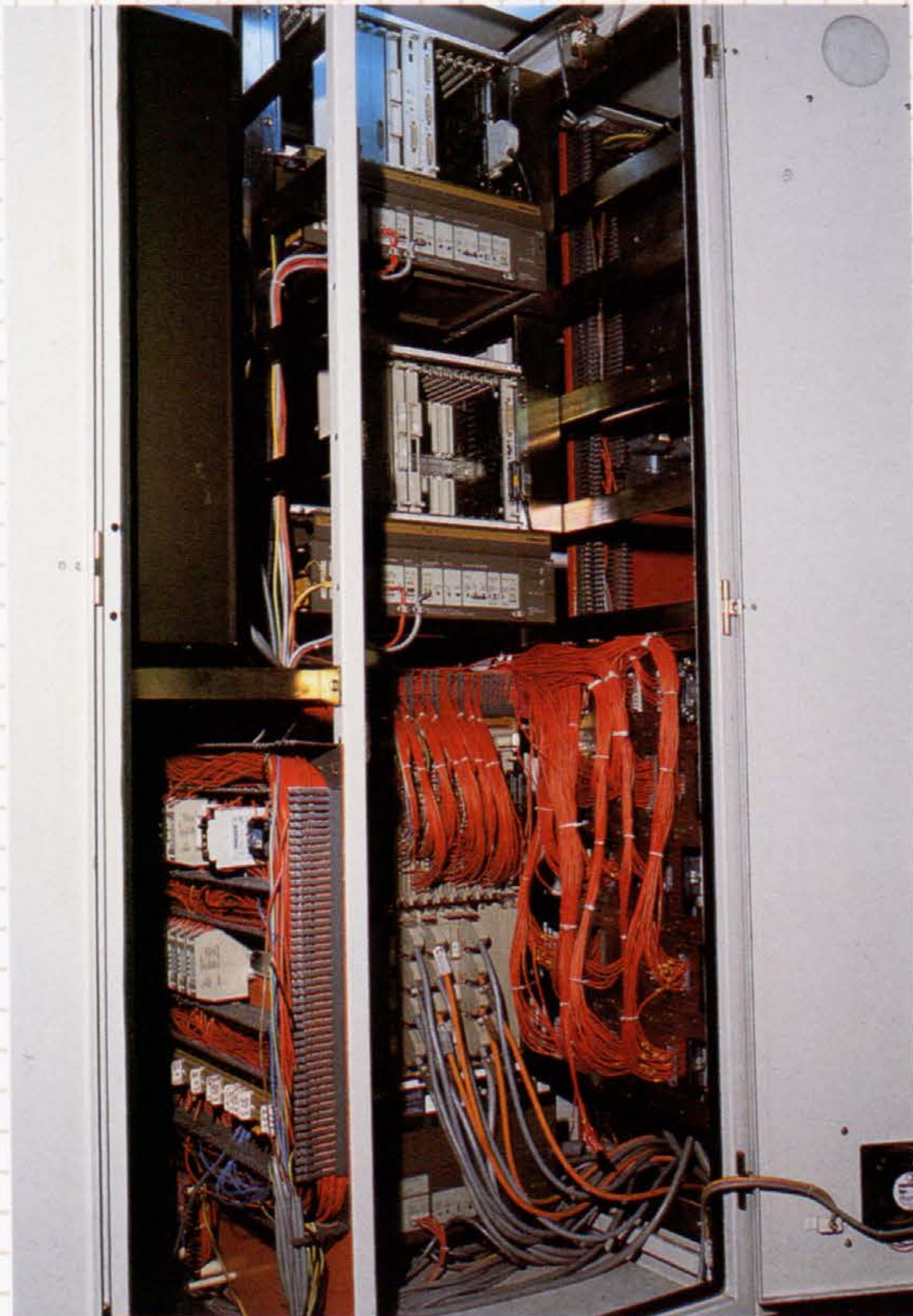
We offer the following services:

- consulting
- designing
- development of modules
- manufacturing, starting and testing the equipment
- maintenance.

On hand of your draft project or a project that is prepared in cooperation with you and by means of the CAD system we can elaborate the most extensive and complex projects.

Up-to-date fitting methods ensure efficient, precise, aesthetic and reliable installation of electrical equipment.

We can develop software for diverse PLC and CNC systems of different manufacturers e. g. ISKRA, ILR, FESTO, OMRON, SIEMENS etc.



We design and construct various special-purpose electronic modules for the control of lubricating units, power supply modules, brakes of induction motors, two-hand trip guards etc.

We perform maintenance of electrical equipment produced by different foreign and home manufacturers, e. g. ISKRA, ENERGOINVEST, SIEMENS, BOSCH, HEIDENHAIN, INDRAMAT, and installed in diverse machine tools and generating plants.

The entire range of activities is covered by a few expert teams in the design-, assembly- and maintenance departments. Our experts have acquired the necessary technical knowledge by attending numerous training courses at home and abroad.

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