MAXIMIZE YOUR COMPETITIVENESS WITH PROMOT AUTOMATION
1980  Founding of the company
1981  Erection of the first hall
1984  Use of NC control systems
1985  Extension of Hall 1
1986  Standardisation of gantry components, first module generation
1989  Erection of a second hall
1990  Second generation of standardised gantry components
1991  Full conversion to CAD (ProEngineer)
1992  Development of ‘Prostore’ stores system
1994  Cooperation with WesTech Automation Systems, Chicago, USA
1996  Development of ‘Palmaster’ pallet changer
1997  Extension of Hall 2
1997  Development of ‘Cellmaster’ stacking cell
1999  Third generation of standardised gantry components
2002  Certification to DIN ISO 9001:2000 and VDA 6.4
2002  Erection of an assembly hall
THE COMPANY

General. Promot Automation has been active in the field of automation for machine tools since its founding. We see ourselves as a partner of the industry, with the core task of contributing to the greater competitiveness of our customers by creating efficient automation solutions.

Products. A broad product range has been developed to provide appropriate solutions for the most diverse applications:

- Gantry robots in numerous variants
- Integration of articulated robots
- Numerous gripper solutions
- Variety of workpiece magazines
- Diverse auxiliary stations
- Fully automated high-bay racking
- Interlinking of manufacturing cells
- Software applications for production planning and production data acquisition.

Promot Automation is thus able to offer all-round solutions catering for all aspects of machine tool automation. Promot has implemented parts handling for workpieces from just a few grams up to over 1000 kg in weight, and has in doing so provided automation for machine tools from over 150 different manufacturers.
GANTRY ROBOTS

Linear gantry

Jib-arm gantry

Area gantry
Machine tool automation is based predominantly on gantry robots, integrated loaders and articulated robots, all of which can be offered by Promot.

**Gantry robots.** The task of the gantry robot is to pick up a raw part from the workpiece magazine and at the same time to deposit a finished part (dual gripper), subsequently to supply the raw part to the machine tool for machining, and naturally also to return the finished part.

The machine is loaded from above, either via a loading hatch or through the opened machine door. This maintains free accessibility to the machine tool from the front, which greatly simplifies tool changing, operation and quality assurance.

**Operation.** The linear axes of a gantry robot provide for ease of operation and straightforward program development. A major benefit, also for small batches.

Simple operation is one of the fundamental characteristics of the Promot software. Instructions are displayed in plain text on the hand-held terminal. The positions to be approached by the robot are defined via the hand-held terminal by means of a teach-in function.

**Resetting.** Resetting work is limited to calling a new part program (from the memory), or alternatively ‘teaching-in’ a new part program, and performing any mechanical conversions which may be necessary at the gripper and magazine.
With integrated loaders, the gantry construction is integrated into the machine tool. Access to the machine space is by way of a lateral passage. Thanks to this design, the workpieces can be loaded by the shortest path, thus saving time. A further benefit is an attractive machine appearance, as the design of the gantry construction and the magazine can be matched to that of the basic machine.

When loading heavy workpieces with a crane, the absence of a disturbing gantry construction is a significant advantage of this arrangement. To be able to realize integrated loaders, it is imperative that the design of the gantry loader already be coordinated with the machine tool manufacturer at the development stage.
For certain applications, such as motions in the space, or else where no access from the top is granted, articulated robots are used.

Promot uses robots from proven manufacturers and adds gripper, workpiece magazine, auxiliary stations, safety features and software to form a complete system.
Dual front gripper with NC-swivel drive

Double front gripper in pivot arrangement

45° swivel gripper

Dual shaft gripper in NC-pivot arrangement

Dual shaft gripper in NC-swivel arrangement

NC axis + single shaft gripper

Single parallel gripper

Dual parallel gripper with NC-swivel drive

Gripper yoke with shaft gripper

Double parallel gripper in pivot and swivel arrangement

Basket gripper

V-type gripper
General. The gripper represents the interface to the workpiece and thus deserves particular attention. Wherever possible, Promot uses standardised grippers. Special designs are possible to cater for exceptional applications:
- extremely narrow grippers
- grippers with an especially long stroke

Dual grippers.
To keep part changing times to a minimum, machines are generally equipped with dual grippers, i.e. with two gripper elements, one each for the raw part and the finished part.
The changeover between the two grippers is usually implemented as an NC rotary motion, though pneumatic and hydraulic solutions are equally possible.

Pusher.
To be able to simulate the pushing action of the human hand, chuck part grippers for raw parts are fitted with a spherically seated clamping star, which is actuated either pneumatically or by spring pressure.

Gripper change.
If the full range of parts to be machined cannot be handled with a single gripper, the necessary gripper change can be performed either manually or automatically. A standardised quick-release coupling permits fast gripper changing.
AUXILIARY STATIONS

Blow-off box

SPC drawer

Centrifuging station

Deburring station

Cleaning station

Marking station

Revolving station for chuck parts

Revolving station for shaft parts

Alignment station

Greasing station

SPC drawer with NOK conveyor

Up righting station
Auxiliary stations. A variety of auxiliary stations can be integrated between the magazine and the individual machine tools. This relieves the operator of certain work processes and thus greatly enhances the productive value of the automation.

**Auxiliary stations with ‘productive value’**
- Measuring
- Marking
- Cleaning (washing / blowing off / centrifuging / extraction)
- Deburring
- Preservation
- ‘Simple’ assembly tasks

**Auxiliary stations for quality assurance**
- Measuring part removal (and reloading)
  - SPC drawer (SPC...Statistic Process Control)
  - SPC conveyor
- NOK part removal

**Auxiliary stations for the handling sequence**
- Revolving station
- Alignment station
- Up righting station
- Workpiece buffer
Indexed workpiece magazine
Promot WS-Uni

Workpiece Magazine Promot WS-ST with stacking pallets

Accumulating conveyor

Plate conveyor with prism support

Shaft magazine with prism support

Shaft magazine with roll support
**Time saving at magazine loading**

*Belt magazines* are used for raw and finished parts. This magazine type is generally loaded/unloaded manually. The idea is to concentrate the time spent on magazine loading and thus to establish periods of autonomous machine tool operation, whereby personnel can be kept available for other tasks.

A distinction is made between the two basic forms ‘accumulating parts transport’ and ‘fixed-index parts transport’.

The Indexed workpiece magazine *Promot WS Uni* is able to handle both shaft parts and chuck parts. The pallets are characterised by a high degree of variability and simple resetting (sheet-metal construction and prism supports), and is thus ideally suited for small batch sizes.

In the case of longer shaft-like workpieces, the space requirements exceed the capacities of typical belt magazines. For such applications, special *shaft magazines* are used.
**Pallet magazines.** Another form of magazine is a pallet switcher. The decisive factor is whether the workpieces are loaded/unloaded manually to/from the (stationary) pallets of the magazine, or whether pre-loaded pallets are to be lifted to/from the switching unit.

The pallet switcher positions the pallet exactly under the traversing axis of the gantry loader by way of an NC axis. This permits the use of a whole range of grid dimensions on the pallet.

**Typical forms:**

- Multi deck magazine
- Pallet shuttle
- Through-feed magazine
The fully automated high-bay racking system ‘Prostore’ offers facilities for the space-saving storage of workpieces (raw and finished parts), fixtures and tools. In such cases, the storage management software Promot Prosys is adapted individually to the system interfaces and the specific application.

Integration of the high-bay racking and the machine tool assigns special importance to the automation, and above all to the software. All the magazines, robots and machine tools must be able to communicate with each other. As Promot supplies not only the machine tool automation, but also the magazine equipment and the software, no additional interfaces are necessary.
**Stacking cells.** The Promot Cellmaster is a workpiece magazine operating with stacks of containers. These containers, in which the workpieces are stored, may be wire baskets, plastic boxes or metal pallets. The stacks are loaded/unloaded either manually or automatically, and then transferred from one manufacturing process to the next.

**Function principle.** The Cellmaster supplies the individual containers to the robot such that the workpieces can be removed. The uppermost container is taken from the raw parts stack and positioned centrally under the gantry arm/gripper. Finished parts are returned to the same container. The container is then deposited on the finished parts stack.

In its standard version, the Cellmaster provides 3 stacking locations.
- Raw parts stack in processing
- Finished parts stack in processing
- Buffer stack, to permit stack changing parallel to machining
Increase of machine utilization

**Stacking cells.** The basic idea when using Cellmasters is to create individual machining cells with the objective of uncoupling the process sequences, thus significantly increasing the utilisation of the machine and the output of finished parts.

- Uncoupling of individual operations
- Individual scheduling of the operations
- Individual optimisation of the operations
- One-point manual loading/unloading of the containers
- Manual stack transport from operation to operation
- Facility to create ordered buffers between the operations
Variants.

Different Cellmaster variants may be used, depending on parts flow, cycle time, buffer requirements, space conditions, etc.

- Standard Cellmaster (with 3 cells)
- Cellmaster with front access
- Multiple Cellmaster (e.g. with 6 cells)

- Through-feed Cellmaster
- Cellmaster for AGV’s (automated guided vehicles)
- Cellmaster with infeed and delivery conveyors
Interlinking machine tools. For mass production, it is generally necessary to link individual process sequences. The most appropriate form of concatenation differs from case to case and is dependent on factors such as:

- Range of workpieces
- Batch size
- Available space
- Existing logistics
- Manufacturing philosophy
- Project objectives

Gantry interlinked machines. With gantry interlinking, the workpiece is transferred between the individual stations using gantry robots (transfer principle). Several machine tools, auxiliary stations and workpiece magazines are loaded/unloaded by a gantry robot. Depending on the number of machines and the available cycle times, the handling tasks are performed by one, two or more independent gantry systems.

Gantry interlinking is the least flexible form of machine tool interlinking and is a suitable choice for applications with:

- less frequent resetting
- similar cycle times for the individual machines
- very stable processes.

Buffer magazines may be incorporated to achieve a partial uncoupling of the process steps.

**Gantry interlinked machines**

A ... Machine tool 1  
B ... Machine tool 2  
C ... Machine tool 3  
D ... Auxiliary station (centrifuging)  
E ... Raw parts magazine  
F ... Finished parts magazine
**In-line integration.** With in-line integration, the workpieces are supplied to the machine tools by (accumulating) conveyor systems. Robots, gantry robots or integrated loader systems load and unload the individual machine tools.

This form of machine tool interlinking is chosen especially for applications where several machines are to be linked over longer distances.
Manufacturing cells. With interlinking manufacturing cells, the workpieces are transferred manually from one operation to the next in container stacks. The basic idea of manufacturing cells is to create individual machining cells with the objective of uncoupling the process sequences, thus significantly increasing the flexibility, utilisation of machine tools and the output of finished parts.

- Uncoupling of individual operations
- Individual scheduling of the operations
- Individual optimisation of the operations
- One-point manual loading/unloading of the containers

Increase of flexibility and machine utilisation

- Manual stack transport from operation to operation
- Facility to create ordered buffers between the operations
- Relatively simple capacity enhancement by duplicating the bottleneck machine

**Manufacturing Cells**
- A... Cell 1 - OP 10, Part 1
- B... Cell 2 - OP 20, Part 1
- C... Cell 3 - OP 30, Part 1
- D... Cell 4 - OP 40, Part 1
- E... Cell 5 - OP 10, Part 2
- F... Cell 6 - OP 20, Part 2
- G... Cell 7 - OP 30, Part 2
**Mixed forms.** Combinations of gantry interlinking, In-line integration and manufacturing cells may be chosen to make optimum use of the benefits of the individual systems, and to minimise the influence of any disadvantages for a particular application.
**Hardware.** The control systems offered as standard are first of all CNC control systems and drives from the Sinumerik/Simodrive product family from Siemens. At the same time, the Promot control system 960M is available as an economical and convenient alternative solution. Signal exchange between the machine and robot control systems is implemented via either Profibus or I/O interfaces.

**Software.** The system software is a modular package of proven, standardised subprograms, which may be adapted to suit individual customer requirements in exceptional cases.

**Visual teach-in.** Normally, the new parameter set for a new workpiece is created using the ‘visual teach-in’ function, whereby the gantry loader automatically completes a predefined sequence of motions. The operator is subsequently asked to optimise the individual teach-in points visually and to confirm the final input. The visual teach-in function is intended above all for small batch sizes and for workpieces for which no previous data is available.

**Parameter programs.** For mass production with recurring and very similar workpiece dimensions, it is possible to create parameter programs. In this case, the operator must enter the relevant parameters (e.g. workpiece diameter and length) directly. The software then calculates the necessary processing sequence automatically.
Computer-Integrated Automation (CIA). The logical further development of the automation solution for manufacturing is to gather the production data for statistical evaluation.

One quality assurance requirement which is sure to become a decisive factor in competition in the future is the facility to retrace the processes performed for each individual workpiece:

- Analyses of causes for NOK parts
- Limiting of the costs incurred through product recalls
- Statistical evaluation and optimisation of production

Promot Prosys. With the software package Prosys, Promot has developed and installed a tool which provides precisely these functions:

- QA function: Documentation of the whole manufacturing history of each individual workpiece
- PPS function: Facility to specify a defined batch run through the interlinking of manufacturing cells
- PDA function: Machine utilisation data, etc. are made available at the press of a button.
Significant importance is to be attached not only to the products themselves, but also to project management.

To satisfy this requirement accordingly, a tailored ERP system has been installed to mirror all customer-relevant processes throughout the whole life cycle of a plant – from the first sales discussions, through design, costing, project coordination, scheduling and commissioning, and on to after-sales service and maintenance.

This system of defined, computer-assisted processes forms the basis for optimum project management.
Service on site. Our installation and service teams are on the road throughout Western Europe and can be on site in next to no time, should this become necessary.

Teleservice. A team of experts can be contacted via a telephone hotline. A description of the service work or software required is often able to solve the question in this way. If, on the other hand, a service visit is necessary, appropriate preparations can already be coordinated in advance.

For systems fitted with the ‘remote maintenance’ option, access to the control system and software is possible via telephone and an installed modem, if requested by the customer.

Spare parts. The majority of the parts and components installed in Promot systems are kept in stock and can be prepared for dispatch at short notice.
The benefit. The whole purpose of an investment in automation is to reduce the manufacturing costs per part, while at the same time enhancing part quality.

- Increased production per unit of time
  - Additional machine utilisation during breaks
  - Production also during allowance times
  - Constantly fast parts changing
- Increased production time
  - Production beyond shift end without personnel
  - Production in an unmanned shift
- Lower overall investment
  - Higher productivity enables the manufacturing of the same number of workpieces with fewer machine tools!
- Reduction of labour time per workpiece

Additional benefits:

- Improved quality
  - Elimination of thermal expansion problems through continuous production
  - Constantly identical machine loading, elimination of human errors
- More reliable production planning
- Ergonomic benefits for handling heavy workpieces
- Greatly reduced workpiece change times for very heavy workpieces

Cost structure per workpiece:
Our customer base includes not only users from the automobile sector and from among small and medium-size industrial enterprises, but also machine dealers and the machine manufacturers themselves.

Here you will find a brief selection of customers from our list of references ...

**Machine tools automated by Promot**

**Turning machines**
- Hessapp
- Hestika
- Heyligensteadt
- Hitachi Seiki
- Hyundai
- IMT
- Index
- KIA
- Kummer
- Leadwell
- Magdeburg
- Max Müller
- Mazak
- Miyano
- Monforts
- Mori Seiki
- Nakamura
- Niles

**Grinding machines**
- Hegenscheidt
- Herminghausen
- J unker
- Karstens
- Kellenberger
- König & Bauer
- Kopp
- Liddöppling
- Lizzini
- Mägerle
- Mikrosa
- Morara
- Nova

**Machining centres**
- Haas
- Heckert
- Heckler & Koch
- Heller
- Hermle
- Hitachi Seiki
- Hübner Hille
- Ikehara
- Leadwell
- Maho
- Makino
- Matsura

**Gear-cutting machines**
- Höfler
- Huth Modul
- Kapp
- Klingelnberg
- Köpfen
- Liebherr

**Special machines**
- Inda
- Krause Maffei
- Krause
- Krautinger
- Leisritz
- Linsinger

**End customer:**
- Audi
- BBS
- BMW
- Caterpillar
- Daewoo Automotive
- DaimlerChrysler
- Dana
- Delphi
- Fiat
- Ford
- General Motors
- Getrag
- Harley Davidson
- Iveco
- John Deere
- KHD
- MAN
- Mannesmann
- Miba
- Magna
- MTU
- Opel
- Saab-Scania
- Skoda
- Renault
- Volkswagen
- Volvo
- ZF

**REFERENCES**
- Alzmetall
- Anger
- AXA
- Bridgeport
- Burkhard & Weber
- Chiron
- Daewoo
- Emco
- Ernault
- EX-Cel-O
- Fanup

**Decima**
- Lorenz
- Oerlikon
- Pfaudler
- Reishauer
- Richardon
- Samputensili

**Dörr**
- Rausch
- RMG
- Roll
- Schenk
- Schlick

**Elba**
- Sema
- Sulzer Metco
- TBT
- Unima
- Unior
- USF
- Zippel