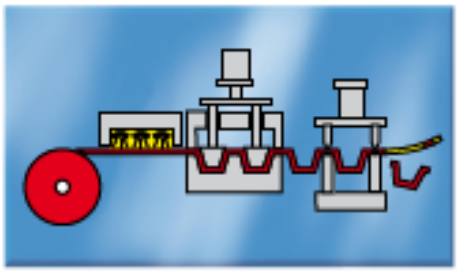


Automatic Pressure Forming Machine

for separate forming and punching

RDKP 54 g
RDKP 72 g

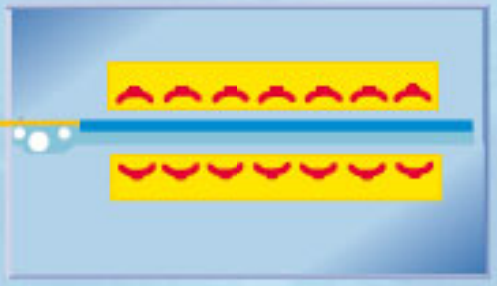
3rd Generation
Thermoformer

Complete Solutions for shortest cycle times

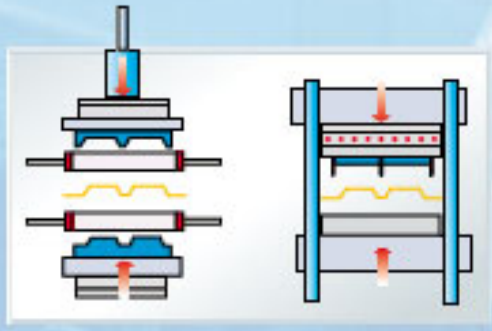
Production methods and expansion levels for separate forming and punching

material roll stand

roll pre-heater for PP processing



radiation heater in forming machine



separate forming and punching with integrated DSB steel rule punch press

Pressure forming, numerous forming methods, high automation level and tool quick-change

The automatic pressure forming machines are the result of consequent optimization of the forming process. Sophisticated shapes can be produced by pressure air and/or vacuum forming due to innovative forming programs and optimized arrangement of all elements involved in the forming process.

High productivity as well as reproducibility of all process parameters are achieved by short cycle times and high automation level (thanks to interlinkage of hole punch unit, steel rule punch press and stacking unit) as well as tried and tested quick-change tool technology.

Computer-aided basic setting and optimization of machine data result in increased performance and optimal product quality.

Materials such as PS, PVC, APET, PE and PP can be processed on RDKP machines, thickness ranging from 0.18 mm to 2.5 mm.

The machines set the standard with regard to mechanical construction, operability and reliability.

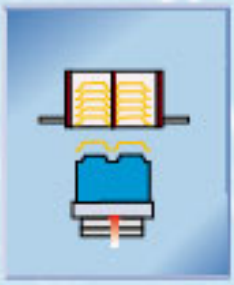
The forming station, a two-pillar construction, features a movable upper and lower table. The required closing force is generated by A.C. servo motors with ball screw and led into the tables by toggle levers. Thanks to this drive technology, table strokes and speeds of the forming station can be variably set. Different forming programs can be realized in combination with the separately driven upper and lower frame.

A new drive technology is employed to realize the service life of the tool table's drive spindle with faster closing movements.

Shorter acceleration phases are possible due to the dynamic behavior of the drives. The time thus saved is used for smoother transitions in shifts in direction.

Direct arrangement of the vacuum and pressure air valves on the forming station allows for fastest filling times of the individual cavities and thus shortest cycle times. Forming air, forming vacuum and demolding air are controlled by a robust and reliable valve technology.

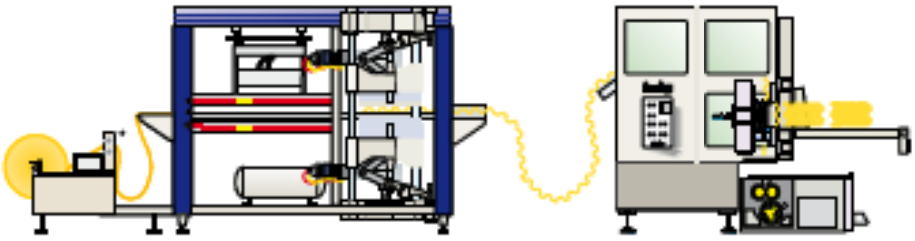
Forming can be carried out alternatively on the upper and lower table using vacuum and/or pressure air. By selecting the desired forming program on the operating panel, all required settings are carried out automatically.



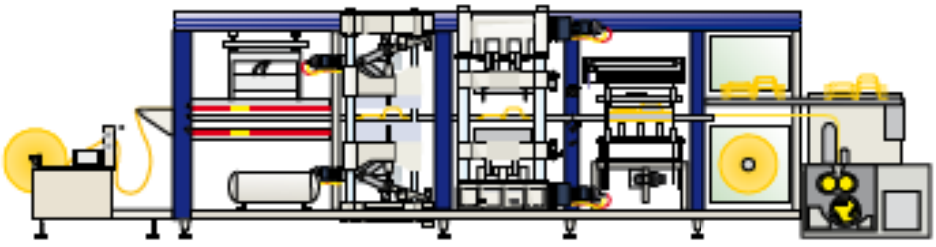
stacking station

skeletal granulator

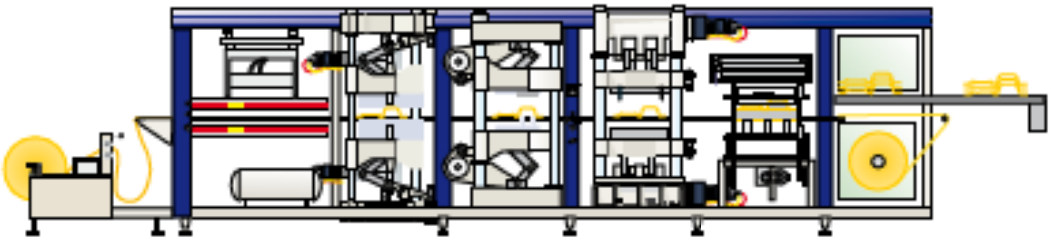
granulate suction



RDKP automatic pressure forming machine with STAL 80 punch and die press



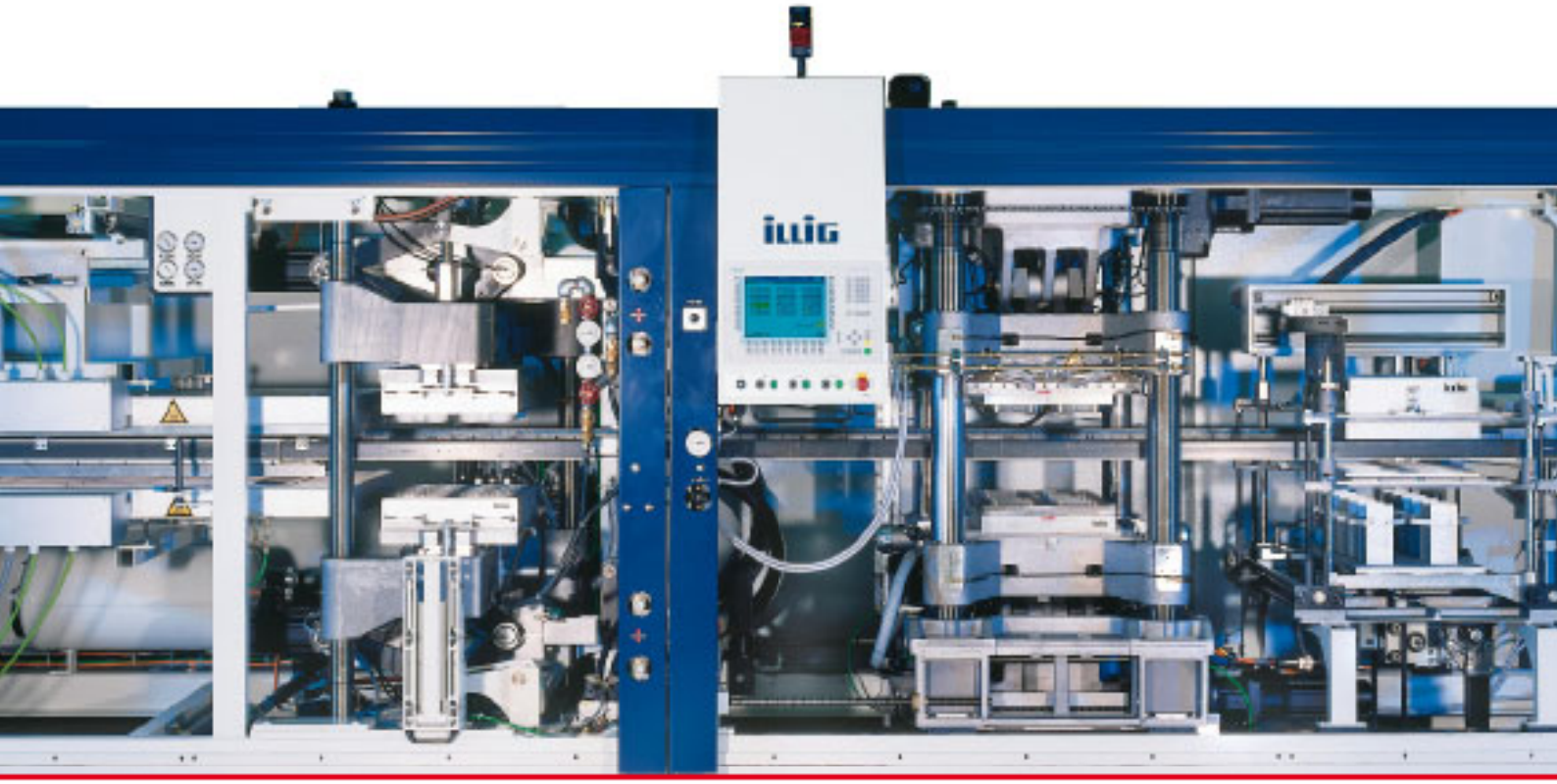
RDKP automatic pressure forming machine with steel rule punch press and skeletal granulator



RDKP automatic pressure forming machine with hole punch press and steel rule punch press

The drive unit of the forming station can be manually height-adjusted in RDKP 54g, in RDKP 72g by motor. This way the tool block can be descended below the material transport during tool change.

Moreover, the height adjustment is employed to set the required closing force and to offset minor tool height tolerances.



preventive maintenance
guided service
longer lifetime
guided quick-change of sizing parts
higher output
higher productivity and availability

servo-driven material transport drive
vacuum values
pressure values
distances, times
control of complete forming process
control of essential parameters in the thermoforming process

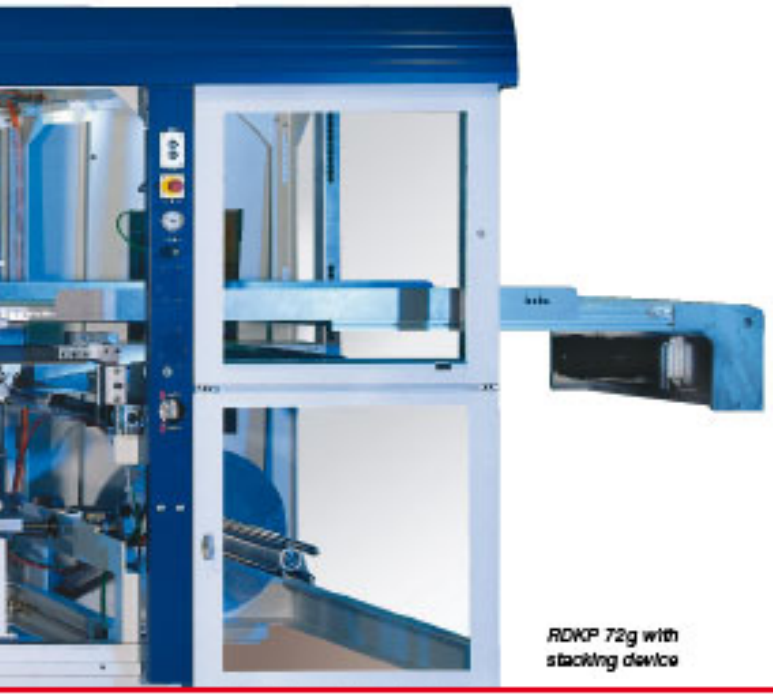
infinitely variable control of demolding air
short forming air distances
sufficient forming air supply
strokes and speeds can be separately set
vacuum and/or pressure forming
reproducibility of thermoforming process

Increase in cycle speeds and improvement of product quality with 3rd generation thermoformer

In order to secure long-term success for the processor, the machine must satisfy a broad range of customer demands. Some of the essential prerequisites are: flexible machine concept, simple machine operability as well as reproducibility of all elements involved in the process.

During the past few years machine lines were improved comprehensively in the thermoforming sector.

It is possible for the first time to benefit to the full extent from the cost advantages resulting from the increase in output in combination with energy savings.



RDKP 72g with stacking device

RDKP 54g 3rd generation thermoformer

simpler format parts
shorter cycle times with constantforming/cooling time
computer-aided cycle speed optimization
guided start-up process forming, punching, stacking
innovative forming air supply
cost reduction process optimization

customer training
application technology
integrated tool design
testing of machine and tools
integrated line concept
system technology

industrial PC
Profibus interfaces
monitoring of limit values
diagnostic aid
few setting parameters
simple machine operation

A fresh impetus has been given especially to the production of thermoformed packs since the new machine generation meets latest demands by the food industry.

Substantially faster cycle speeds are achieved with 3rd generation thermoformers. Product quality is clearly improved due to an optimized and considerably accelerated forming process. This way new application ranges can be opened up.

optimization product quality

3rd generation optimization of sequencing and performance

3rd Generation thermoforming – optimization strategy

3rd generation thermoformers feature an optimization strategy based on an innovative, functional program structure suitable for systematic improvement of performance, product quality and production reliability.

Setting data and process times established by the computer-aided basic setting can be optimized to such an extent that controlled overlapping of machine sequencing sections is possible.

Without changing the thermoforming process, the resulting intersections have an optimal effect on cycle time, however, without adversely affecting the product quality.

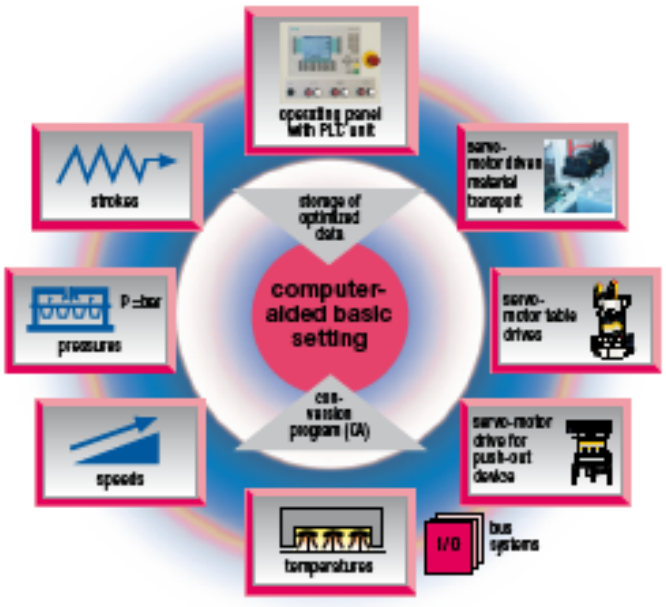
The complexity of the process with respect to forming, punching and stacking calls for a new type of control technology where several individual drives are controlled and optimized.

Newly developed menus provide selective operator guidance through the individual optimization phases. This means the parameters relevant for performance are provided automatically to the operator for process optimization subject to the forming program of the machine.

Consequences of the measures taken are displayed on the screen. The operator benefits from the selective display of required information and auxiliary functions in accordance with principles of professional industrial design.

The screen is easy to understand and thanks to a clear and simple menu structure operating mistakes can be avoided. Easy and comfortable navigation through the individual menus via screen. The dialogue system also includes an electronic help function included in the operating system.

RDKP 72g operating panel



easy operation, computer-aided basic setting of machine data and computer-aided conversion due to digitalized machine

Control of essential parameters in the thermoforming process

Realization of the requirements calls for a new control concept where all relevant forming, punching and stacking movements are calculated, controlled and optimized.

Separate optimization of all process parameters is thus possible as well as their precise allocation to the individual forming phases. Start and ending points as well as absolute values for pressure and/or vacuum can be precisely determined and documented, thus they are available for repeat orders.

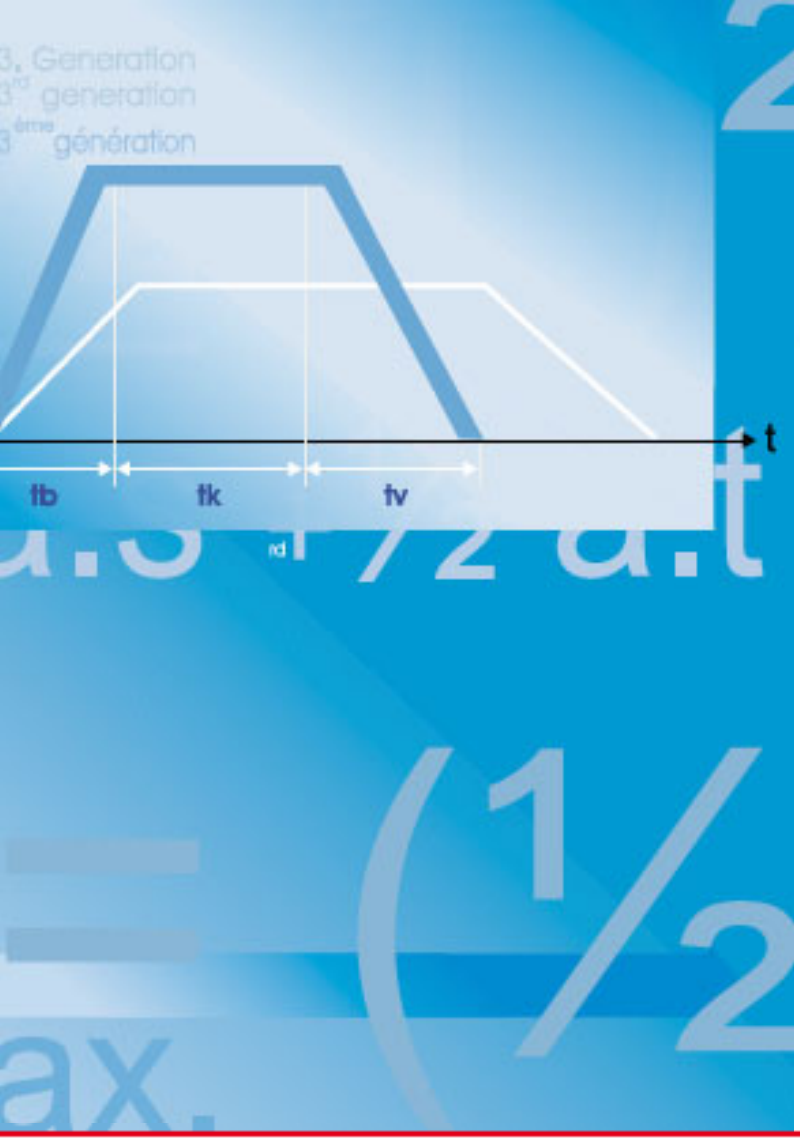
Absolutely exact and flat sealing rims are the prerequisite for a long shelf life of the content of the packs. This is achieved by cooled downholders and clamping frames.

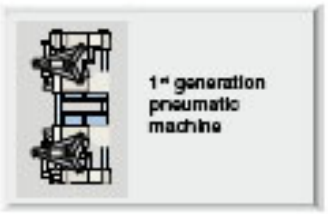
On occasion of cycle time optimization, the basic machine was extended by the following elements:

- material transport with pneumatic chain tightening system
- upper and lower clamping frame system with cascade control
- highly dynamic valves for build-up and release of forming pressure
- infinitely variable demolding air control
- optimized drive technology and sequencing for forming, punching and stacking station

Requirements with respect to formed parts can be systematically improved by integrated optimization of machine and tooling. At the same time demands with respect to machine specifications were put into practice, such as:

- control of all parameters relevant to the thermoforming process
- reproducibility of thermoforming process
- reduction of energy consumption
- short tool changing times
- guided service and preventive maintenance
- higher availability and productivity

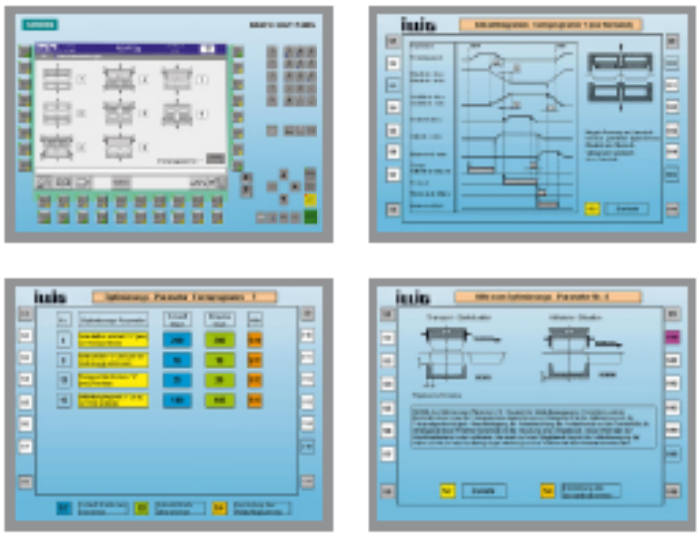




development levels

Reproducible forming of sealing rim, stacking edge and thickness distribution of the side wall thanks to interaction of all parameters relevant to the process.

Reduced changing times of tools and format parts, simplified operation and higher availability are further benefits featured by ILLIG 3rd generation thermoformers. Rectangular trays, e.g., can be produced at a speed of 55 cycles/min due to the above-mentioned features.



menu pages for operator guidance for 3rd generation process optimization

Expansion levels for utmost modularity and flexibility

The modular design provides a variety of combination options for all different process engineering technologies for forming, punching and stacking of products. The modular elements can be completed by a skeletal granulator for form a complete line.

In addition, an empty stand can be employed to accommodate devices for positioning of fleece inserts, for pack decoration or bar code printing.

Customer benefit / focus of development

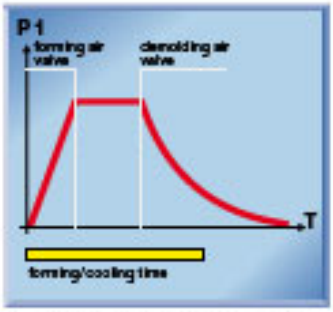
Higher productivity and availability

At ILLIG synergetic effects between customer benefit and development of thermoformers have resulted in considerably higher outputs.

Substantially higher cycle speeds are achieved in an optimized and accelerated forming process with machines featuring forming areas within tested limits.

Different process steps are carried out during the actual forming process (forming table movements, build-up of forming pressure, punching, stacking, etc.). The quality of the formed part is subject to the precision of these process steps.

Acceleration of the individual process steps can be used to extend the cooling time or to further increase the performance of the line.



schematic drawing: build-up and/or release of forming pressure

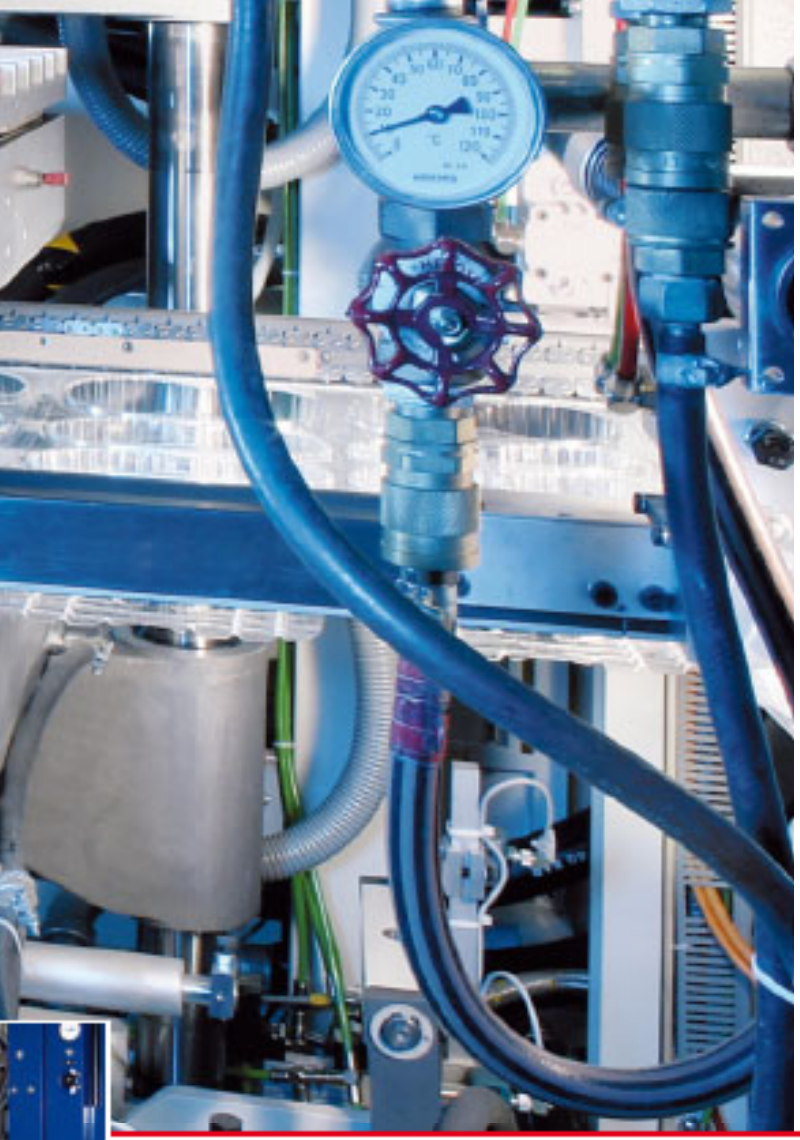
Servo-driven material transport system for exact positioning during high speeds

Width and index length of the material transport is set by means of the computer-aided basic setting via operating panel. The servo-mechanical positioning drive reduces index length tolerances to +/– 0.2 mm. In the area of the forming station the material transport is moved apart pneumatically by the spreading device. The material is stretched thus webbing is prevented during forming which is especially beneficial for PP processing.

The pneumatic chain tensioning system is supplied with adjustable pressure and keeps the transport chains separately under optimal tension. This way the play between the individual chain links and the tolerances occurring in an expanding chain can be offset.

Benefit:

- Checking of chain tension and readjustment are no longer required.
- Higher transport accuracy and longer service life of chains since chain tension is always optimally set and is identical on both chains.
- Moreover, wear and tear is reduced due to integrated cooling chanels.



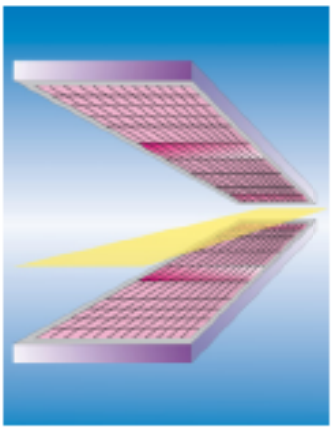
RDKP 72g forming station

ILLIG heating technology provides optimum conditions for thermoforming

Upper and lower heater are included in the basic equipment. The individual rows of heater elements can be controlled by pilots. Rows of heater elements which are not needed are switched off automatically subject to index length and material width.

Four rows of heater elements on the feed side can be switched off to make optimal adjustments to the index length with respect to the temperature influences of forming tool and clamping frame cooling and the effective length of upper and lower heater.

Moreover, the heater length can be adjusted exactly to the index length by using water cooled heater covers.

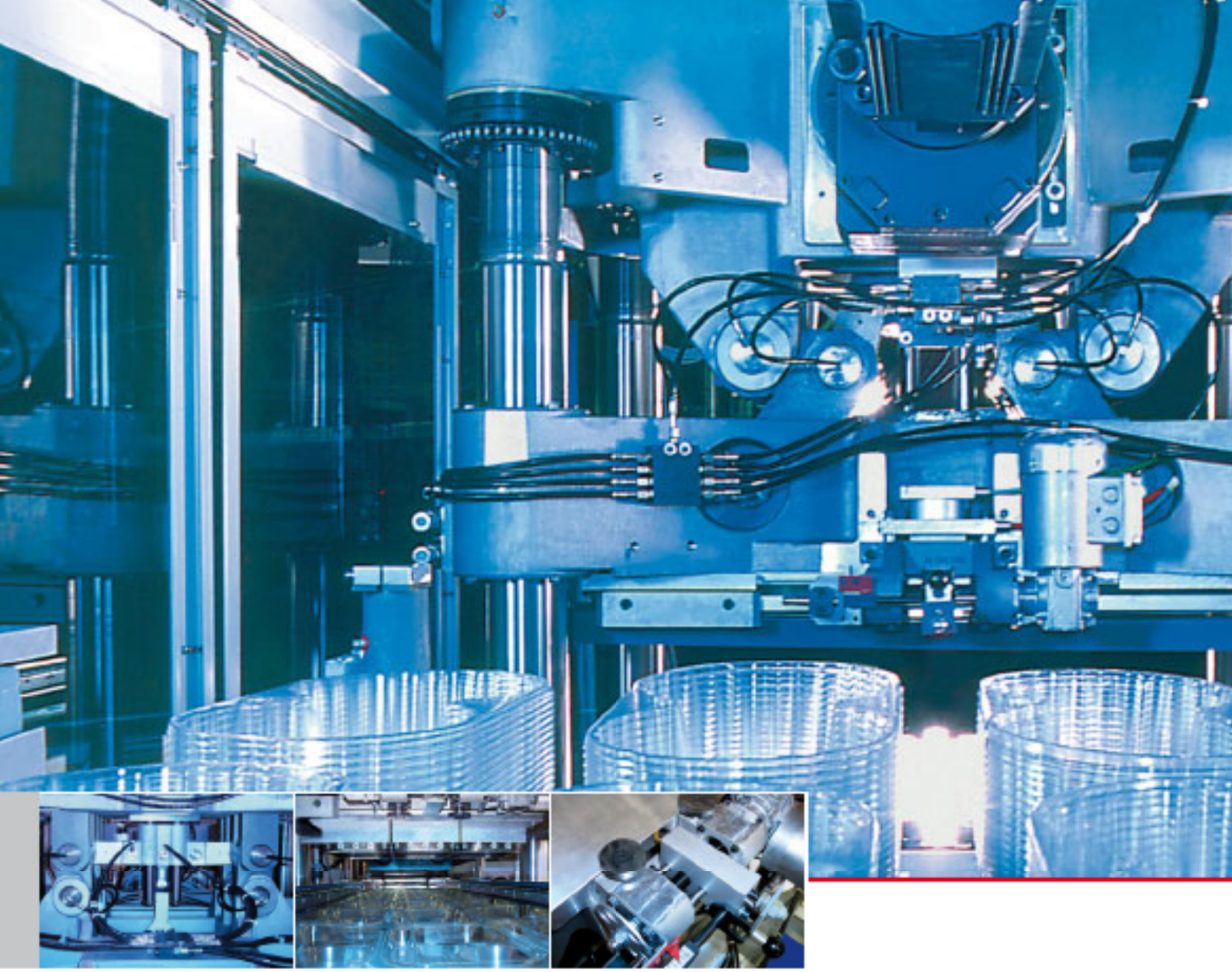


the upper and lower heater is equipped with longitudinal row control, the effective heating length can be adapted to the index length by switching off the cross rows of heater elements on the feed side

The control establishes a heating profile via computer-aided basic setting subject to the rows of heater elements. It is possible, e.g., to increase or decrease the temperature level as a whole to achieve higher cycle speeds.

Excessive sagging due to material overheating is detected by a light barrier, upper and lower heater move back and the machine stops. This way it is not possible that the material can fall into the lower heater.

All thermoforming possibilities can be optimally used with this optimized heater equipment.



Steel rule punch press (option)

A steel rule punch press is offered with movable upper and lower table for product punching. The station starts working automatically in the automatic mode, as soon as the first parts have been transported into the punch press.

The whole station can be moved in longitudinal direction by means of servo drive. The correct position is determined by the computer-aided basic setting and stored. Precision correction is possible during operation.

The toggle lever drive – an essential element of the steel rule punch press – is very rigid thanks to its mechanical force transmission. In the dynamic phase of the closing and opening movement there is central force transmission to the double toggle lever joint which prevents development of transverse forces on the pillar guidings of the forming tables.

The table speed is reduced due to the sinusoidal closing movement and the force in the punching area increases intensely. The resulting movement profile of the double toggle levers thus allows maximum force transmission during actual punching. The system is at its highest point of performance in this condition.

The high rigidity of the punching station is achieved by one-piece guide pillars and sufficient dimensioning.

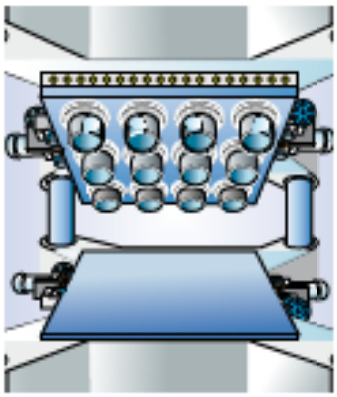
The steel rule cutter is positioned by means of motor-driven adjustment devices allowing movements of the steel rule cutter in all degrees of freedom on the punching table. The selected positions can be changed during operation and stored after being optimized.

A steel rule die heating to reduce cutting forces is optionally available. Reduced cutting forces increase the usable length of cutting lines.

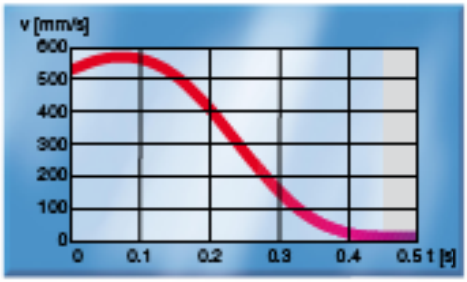
RDKP 72g steel rule punch press

Practical experience shows that the life of steel rule cutting tools (achievable number of cuts up to disposal) predominantly depends on setting during tool installation.

Optimum service life of expensive steel rule cutting tools and smooth breaking out and stacking at the same time can only be achieved by professional handling of the punching force (correct setting).



steel rule punch press with adjustment of cutter in "Y" axis and floating cutter



dynamic phase of opening and closing movement

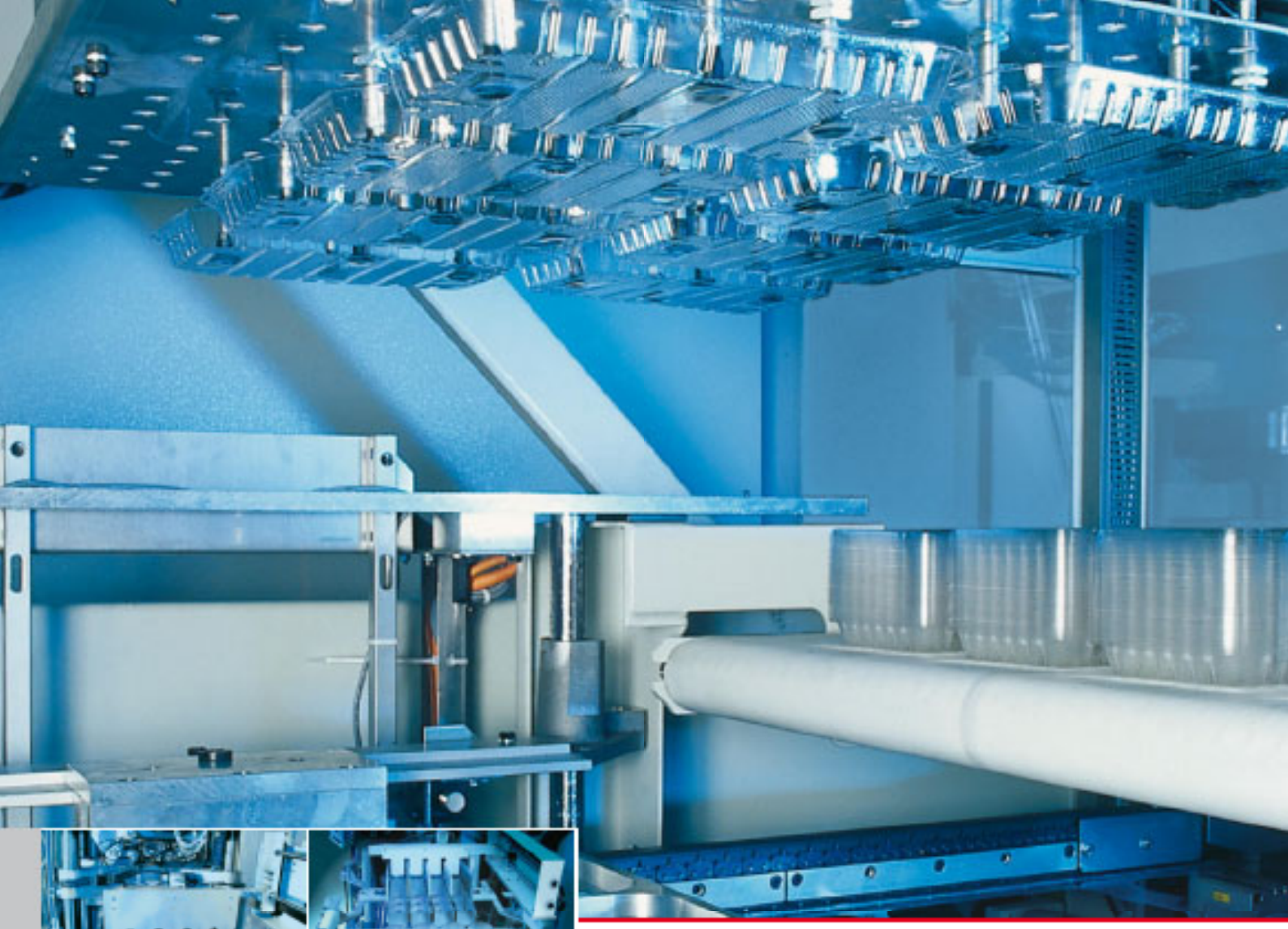
Adjustment of cutter, height adjustment, floating cutter

Production tolerances on the part result from the fact that heated material is formed by pre-stretcher and pressure air and punched by means of steel rule cutting dies in a separate working step.

In order to limit this tolerance range, the punching tools are designed as so-called "floating cutters".

Cutting contours are supported in a freely movable way within the holding plate so the centering aids can center the cutting dies (shaped in the forming contour) shortly before punching.

This process is supported by the movement profile of the table drives since the speed is reduced in the decisive phase and thus there is sufficient time for centering. The benefits provided by heated dies are fully maintained in floating cutters, too.



Process optimization by different stacking system variants

Last but not least the properties of the product are subject to quality and reliability of the different production steps. ILLIG therefore offers a reliable range of stacking systems and downstream equipment for RDKP adjusted to:

- automation level
- output
- further processing

Safe and reliable product stacking is assured at any speed by employing the predominantly used servo drive technology suitable for synchronization and precision adjustment of the stacking movements.

Admissible depths of draw are considered in the layout of the stacking station. Positive or negative parts can be stacked. The stacking station starts in the automatic mode as soon as the first punched cycle output has been transported in.

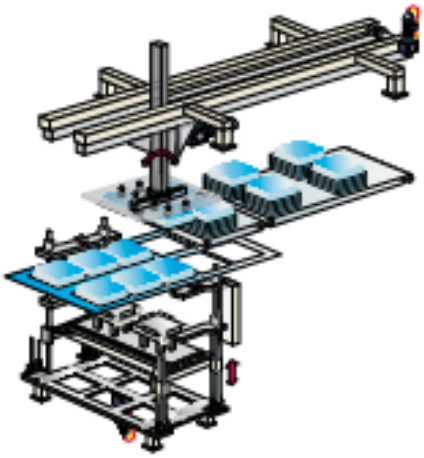
Clamping mask and stacking chute are moved together simultaneously by a pneumatic cylinder and fix the skeletal. The formed parts are held in the skeletal by means of holding studs. The format-dependent break-out unit removes the parts from the skeletal and positions them in the stacking chute.

When the set number of parts has been reached in the stacking cage, the formed stacks are moved to a buffer sheet and/or a conveyor (in case of optional equipment) by servo motor.

In the pre-setting program the stacking station is automatically precisely positioned. Precision correction during operation is possible.

Optionally, the clamping mask can be driven by servo motor resulting in reproducible synchronous stacking movements regardless of part weight. Reliable stacking movements and thus optimal stacking due to synchronized movements.

The setting parameters of the servo-driven stacking movements can be programmed and stored in the teach-in method.



stacking station with handling system, stacks of counted cups are formed on a conveyor

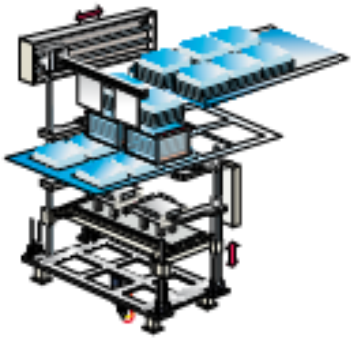
stacking station with handling system
- *machine output not limited*
- *ergonomic part removal*
- *long discharge conveyor as storage range*

The push-out time of formed parts must be extended for high cycle speeds. For this purpose a fixed stacking cage is used in addition to the movable one.

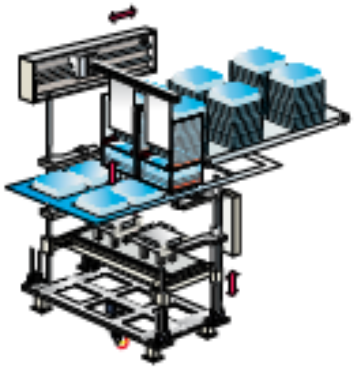
Storage in the movable stacking cage is possible in combination with the servo-driven clamping mask, this way parts can be pushed out regardless of machine cycles.

Handling system

The handling system is operated via the operating panel of the forming machine. Integration of the control ensures exact synchronization of the movements of the entire stacking system. A/B/C stacking is possible. Moreover, parts formed in W-configuration can be stacked. Change of format parts by means of the quick-change technology allows shorteet conversion times. Conventional stacking format parts can be used.



stacking station with counting device and servo-driven pushing-out device, parts pushed on storage sheet and/or conveyor



version with divided stacking cage for higher cycle speeds

In the stacking station the products are separated from the web by a break-out plug and transferred to the suction plate of the handling system. This works with two linear units and positions the formed parts on a conveyor.

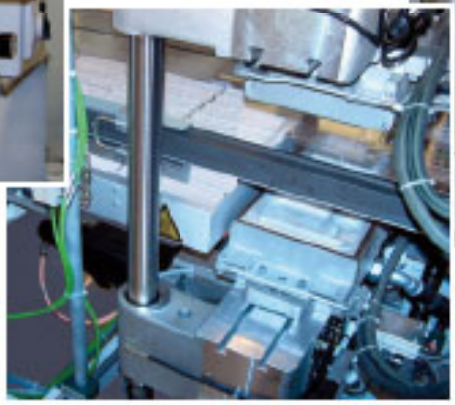
Optionally, a divided conveyor is available for easier product removal if the operator takes care of more than one machines.

Control of shuttle stacking in stacking station

Stacking studs in multi-layer tools can be designed differently und arranged in different ways. In the stacking station the product rows are then pushed on top of each other and stacked in one row.

The parts are kept at a distance from each other due to the fact that the position of the stacking studs is changing from part to part. This way the parts will not get jammed in the stack and can be easily destacked.

ILLIG Maschinenbau GmbH & Co. KG
Robert-Bosch-Strasse 10
74081 Heilbronn/Germany
Telefon: +49(0)7131/505-0
Telefax: +49(0)7131/505-303
e-mail: info@illig.de
Internet: www.illig.de



ILLIG SYSTEMS

for Thermoforming and Packaging Technology

Sheet processing machines
Automatic roll-fed thermoformers for forming/punching tools
Automatic roll-fed thermoformers, separate forming and punching
Skin and blister packaging machines
Form, fill and seal lines
Produced Tooling

01.20.09/2006 - e - Subject to change.