FINN·POWER

SOLUTIONS FOR AUTOMATED BENDING

FINN-POWER EB

Automated Bending Cell adds to the productivity of your sheet metal working process

In many cases the press brake, the standard technical solution for the bending of sheet metal components, is not only the typical but also the most conventional manufacturing method.

Yet, there are many manufacturing situations where an automated bending cell offers benefits far superior in terms of
• total manufacturing cost
• component quality
• automation level.

FINN-POWER's new EB bending cell is your optimal solution for bending
• large components
• from thin sheets
• in long series
• automatically.

With FINN-POWER EB the machine operation cycle is fully automatic and includes the following stages: loading, rotation during the bending sequence, bending and unloading.

Operation

The machine is operated by a CNC and a PLC (Programmable Logic Controller). The CNC and the PLC exchange information and synchronism through digital profibus. The machine's main functions as well as all the axes involved in the bending are controlled by the CNC. An on-board PC and a colour display are included in the standard configuration of the machine to create an ergonomic machine interface.

Bending generally starts from the outside edge of the sheet and continues towards the inside of the sheet, working one side after another in sequence. The sheet is loaded automatically onto the working table by a robot where a manipulator pushes it against the positioning pins. The manipulator holds the work piece firmly during all the manipulation phases.

The bending tool holds the required portion of sheet in position during the bending action. Two blades manipulate the portion protruding from between the counterblade and the upper tool, upwards or downwards according to the nature of the bend (positive or negative) and the required angle, CNC programmable. The ready-bent component is automatically exited and the next flat work piece loaded.

BendTerm software for machine programming

BendTerm is a Windows® based application which is run in the on-board PC, connected to the numerical control.

The parametric program of a part can be made and edited in the programming module. The programs are stored on the hard disk of the PC from which they can be called to the numerical control.

Programming and editing can be performed while the machine is operating. During the running of individual programs the machine operates independent of BendTerm.

There are many manufacturing situations where
FINN-POWER EB provides superior cost efficiency in bending.
Analyse your manufacturing tasks together with
FINN-POWER – the latest technology offers the best in productivity.

INGENIOUS BASIC PRINCIPLE
– ROBUST, CAREFULLY ENGINEERED CONSTRUCTION
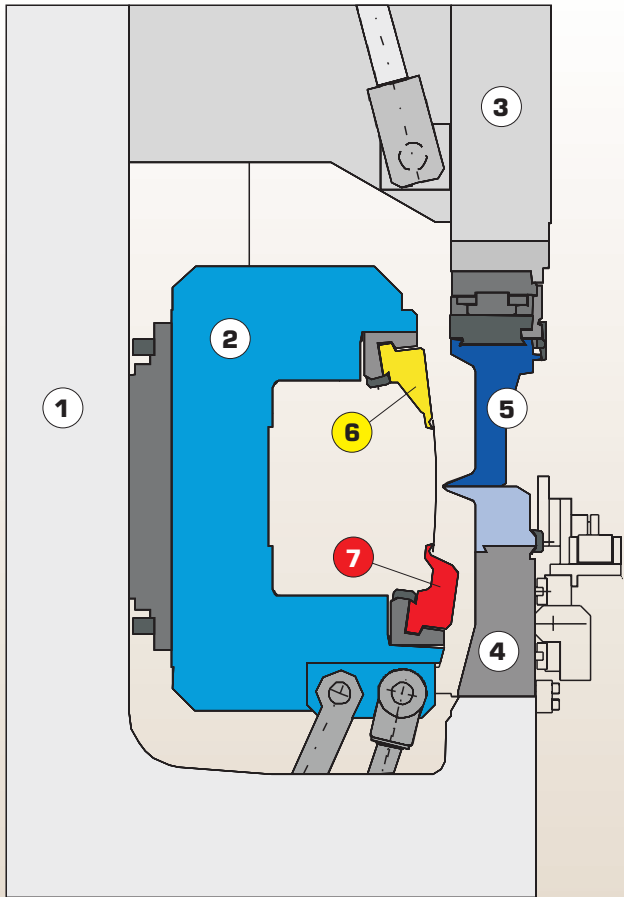
The bending principle of the FINN-POWER EB bending cell is simple and based on the following main components:

Two frames: the stationary main frame 1 of the machine and a C-frame 2 with hydraulically actuated swinging movement upwards or downwards.

An upper tool 3 with hydraulically actuated vertical movement CNC controlled (parameter H1) and a fixed lower tool 4 for holding the work piece in position during bending.

Upper tool segments 5, which determine bend length.

Upper 6 and lower 7 blades, which transfer the bending force onto the sheet.

Key components in the material management of the cell are the very fast suction cup robot which loads the flat component, and the manipulator, which places it against numerically controlled positioning pins, rotates the work piece and, once all sides have been bent, transfers it onto the unloading conveyor. Thus the entire bending process can be automated, and the bending of components automatically continues as long as programmed.
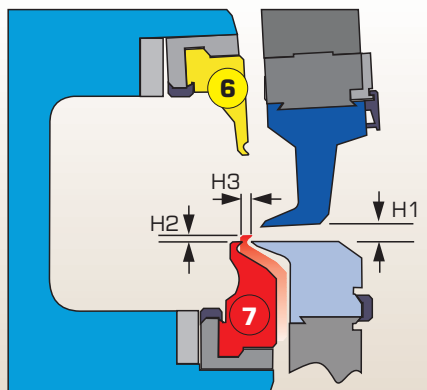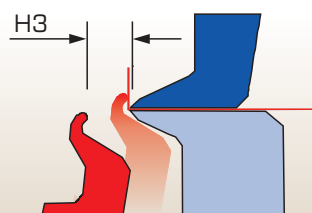
Axis interpolation

A fundamental characteristic of the EB bending technology is the movement of the blade. The contact line of the blade and the material being bent remains constant. This is achieved by numerically controlled interpolation of the two axes that operate blade movement.
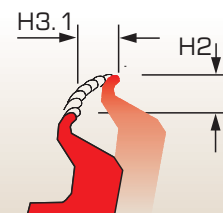
This solution eliminates scratching of the material; thus even sensitive materials can be bent while high surface quality is retained.
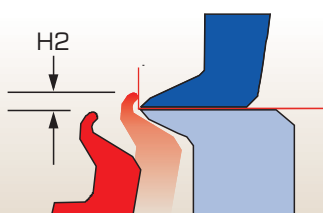
H3
Horizontal movement CNC processed

H2
Vertical movement

H3/1 = H3 + H2.
The result is a curve movement due to the interpolation of two axes.

A RANGE OF OPTIONAL EQUIPMENT AND FEATURES TO MEET YOUR SPECIFIC MANUFACTURING REQUIREMENTS

Additional short blades (ASP)

The additional short blade construction consists of two numerically controlled carriages installed within the C frame structure. Short blades (length 500 mm, standard manufactured for each carriage, can reach up to 900 mm with alternative equipment) are mounted onto the carriages and allow, for example, the bending of small wings. The option can be automatically activated and deactivated during the bending cycle. The bending can be performed either upward or downward, therefore positive and negative bending can be achieved even with the ASP.
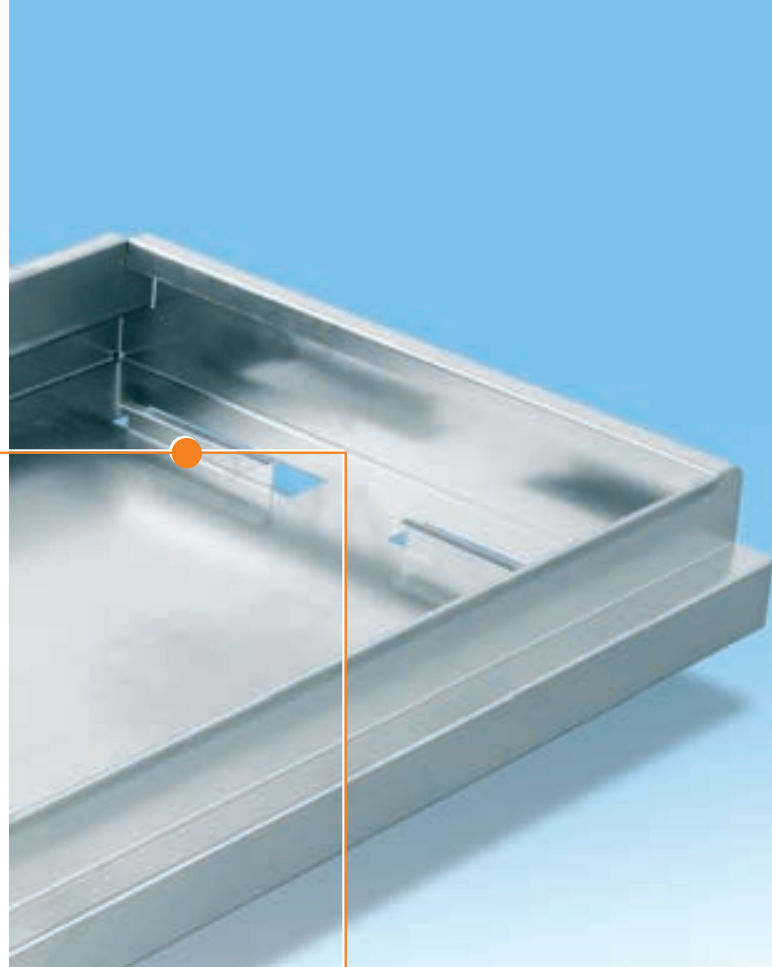
Integrated engraving unit (IEU)

The integrated engraving unit is a roll forming tool mounted on one of the carriages of the ASP. It is used for making a groove in the sheet to facilitate subsequent bending.
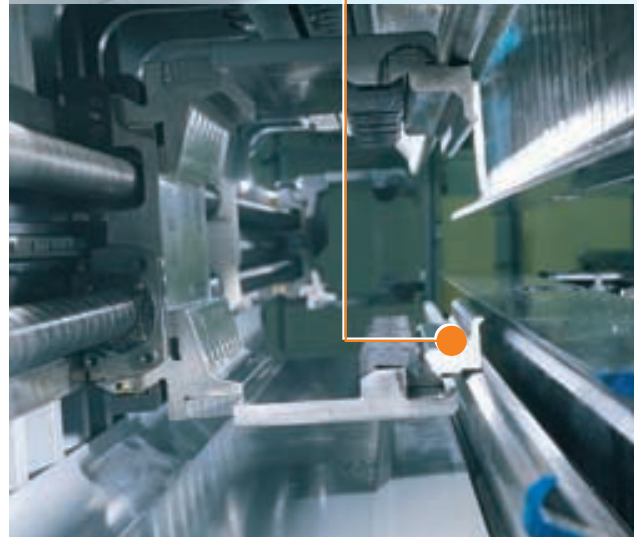
Hydraulic bending die (HBD)

Hydraulic dies can be mounted onto the ASP carriage for bending component the sides of which are not parallel or for bending portions of the sheet that would not be reached in other ways. The option is always a custom-made solution.

A RANGE OF OPTIONAL EQUIPMENT AND FEATURES TO MEET YOUR SPECIFIC MANUFACTURING REQUIREMENTS

Automatic tool change (ATC)

Automatic Tool Change can be chosen in order to decrease the number of tools required and to shorten set-up times. With it the length of the upper tool can be automatically adjusted.

The system consists of two side transfer units each one supporting a set of narrow tool segments. The tools dimension adjustment is first made by side transfer units, which load or unload from the central part of the upper tool the narrow segment and afterwards move the end tool segment to the further position.
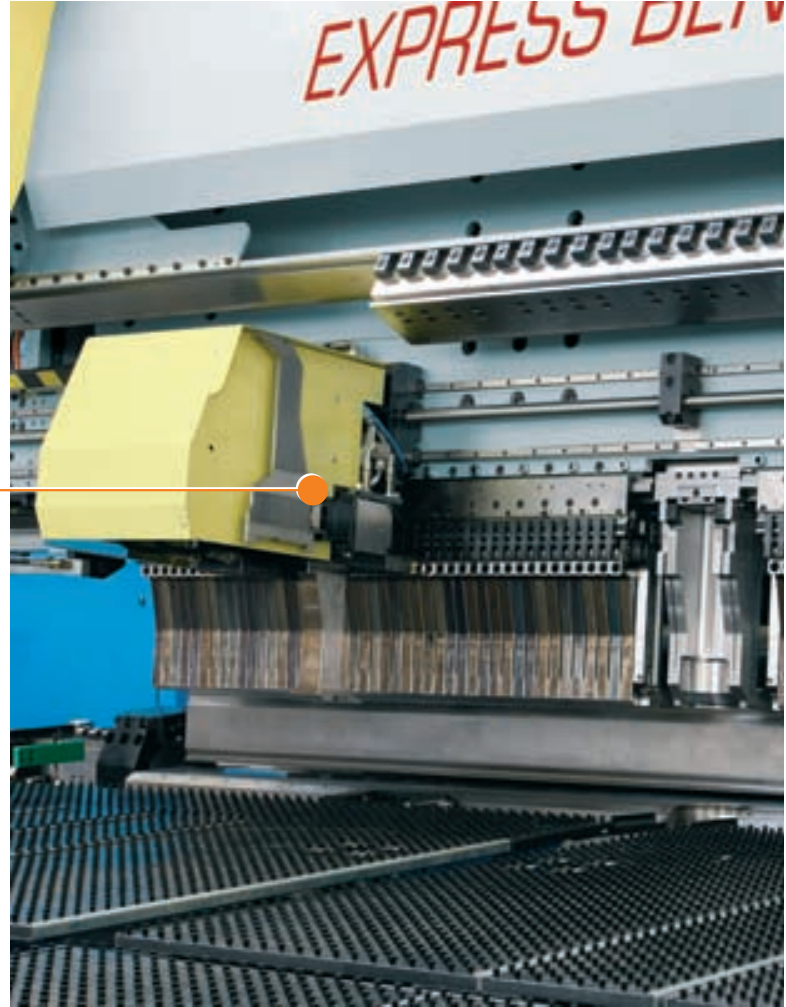
Additional upper tool (AUT)

The AUT mechanism allows the changes of upper tool mechanism by lowering an additional tool below the standard upper tool segments. It is often required for making bends that are "hidden", i.e. when the bending point to reach is "shadowed" by the previously bent profile, and negative. Further, the possibility of using special tools provides additional versatility, like big radius bend, tube profiles, wide inward bending, and holding of the sheet while pressing with the blades.
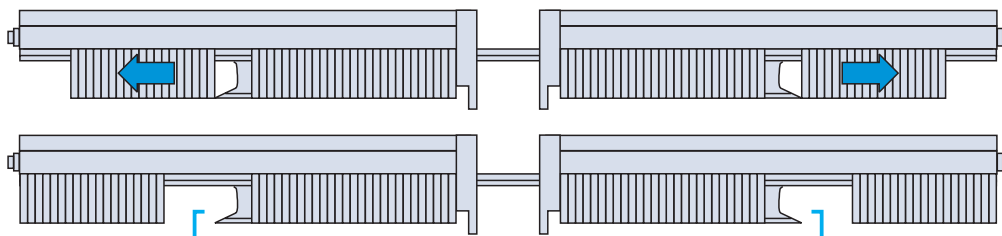
Reversed bending sequence (CLL)

In the standard bending cycle short sides are bent first and long ones afterwards. This sequence can be reversed with the CLL option, which forms two gaps in the upper tool, either symmetrical or asymmetrical to accommodate the bent edges of the longer sides.

Hydraulic tool clamping (HTC)

Changing upper tool dimensions is facilitated and made faster by the hydraulic tool clamping option. In order to change the upper tool dimension the operator simply needs to unlock the hydraulic clamp and press a clip to be able to move the segment into desired position.

Control cabin cooler

Acceptable ambient temperature for the standard bending cell is $+15°\dots +30°$ C. For operation in warmer temperatures a control cabinet cooler is required.

BendCam

BendCam is a graphic programming system for automatic bending technology. The program can be used for designing and programming a large variety of components. Component geometry data can also be given in many commonly used formats (.dxf, .iges, .dwg or .mi). A flat pattern description is bent into a 3D part simulation model.

Machine program is made mainly by using a mouse to point the location of positioning pins and the bending sequence of edges. The program can be simulated step by step in order to check whether the tooling profile is compatible with the work piece. After testing the program is converted into a machine program by using material factors.

FP Profiler software

FP Profiler is a Windows® based application, which is run in a PC connected to the numerical control via serial connection. The bending program is quickly generated by using a library of available profiles as support, or simply by realising also new profiles by writing simple "SCRIPTS". The standard or generated, profilers have to be modified in length and angle, then added to one of the four side panel.

FP Profiler can be installed on the machine PC, as an off-line programming station. The FP Profiler, which is an easy operator-machine interface, generates readable and modifiable programs with the BendTerm to be used in the CNC of the EB.
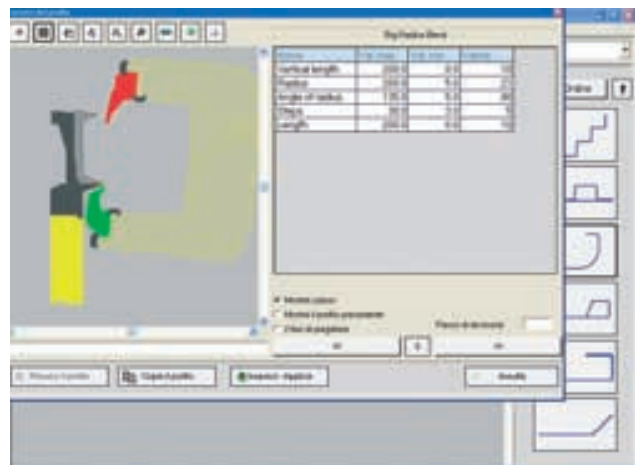
MATERIAL MANAGEMENT OPTIONS

Flexible, modular solutions for automated material management are a traditional FINN-POWER strength. The EB bending cell can be upgraded by *using a range of options which prolong unmanned operation for added productivity and eliminate tedious work stages.*

SGR & NTR

FINN-POWER's SGR stacking robot provides the material management link from a punching /shearing cell, from a laser cutting machine (cell) or from the NTW storage. Its primary function is to load components either direct or with a buffering function. It can also stack components on a separate pallet and load the bending cell from a pallet brought from NTW or from outside the system.
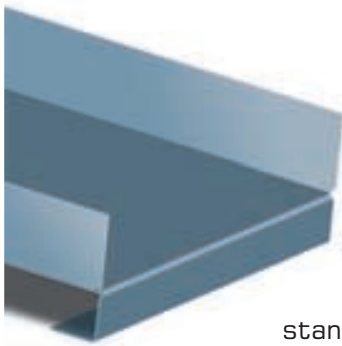
Negative last bend (LBN)

If the last bend made is negative (i.e. downwards), the standard unloading conveyor placed in the middle of the machine cannot be used. With the LBN option, such components are unloaded by a carriage that pushes them laterally out, without taking the part to the centre of the machine table.

Unloading and stacking system (USS)

The innovative idea of the USS option is to use the loading device for both loading the blank sheet and stacking the bent parts.

The USS loader picks up the components either from the standard loading table or from the NTR or SGR centring table and takes them to the machine for the bending. Meanwhile, the previously bent part is unloaded and centred on the TUT table. The loader picks up the part from the TUT table and stacks it as desired. The stacking area available is four EUR pallets. There are several stacking addresses that can be combined to optimize area and product storage.

Nonmagnetic material separation (NMS)

With plastic coated sheets and under conditions where static electricity may be a problem, the NMS option eliminates it. The suction cup rows closest to the edges of the sheet operate at first to lift the edges for better sheet separation. Blowing compressed air between the sheets and additional steel brushes finally contribute to the separation. The option is for stand-alone machines only.

Alt set-up

This option provides automatic adjustment of the loading unit and the positioning bars on the loading table. It shortens set-up times and facilitates the loading of a new stack.

1. Bending cell
2. Unloading roll table
3. Buffer
4. Safety fencing
5. Sheet pusher

Tilting unloading table (TUT)

Instead of the standard table, a tilting unloading table can be used. This table is designed to allow the bent panels to be unloaded towards the operator side and grant a small buffering function (2-3 relatively small pieces). After the ready-bent component reaches the TUT table, a roll mechanism transfers the part to the end of the table, a location from which it is brought by conveyor belts to the operator side of the table.
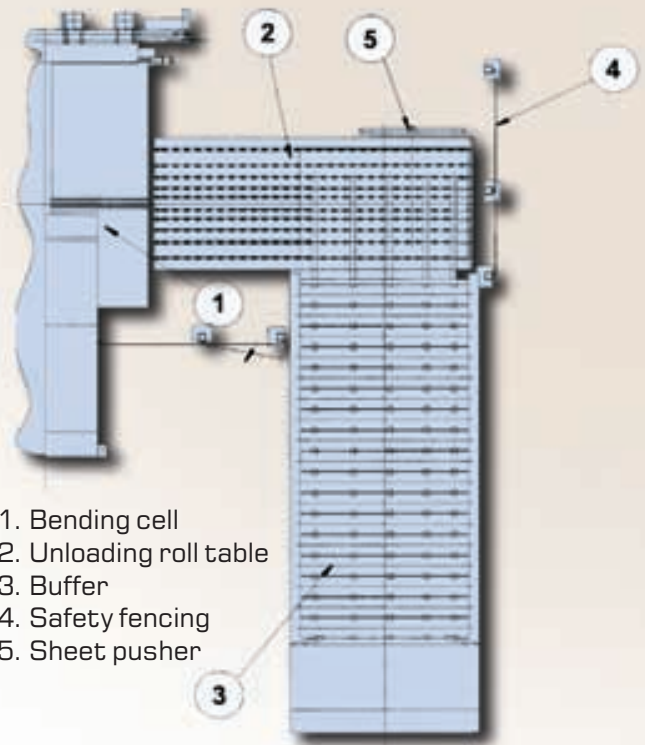
Buffer storages

FINN-POWER EB can be equipped with a buffer system for bent components to prolong periods of unmanned operation. The components are temporarily stored in vertical position on a buffer which is installed at right angles to the unloading conveyor.

FOR EXAMPLE...
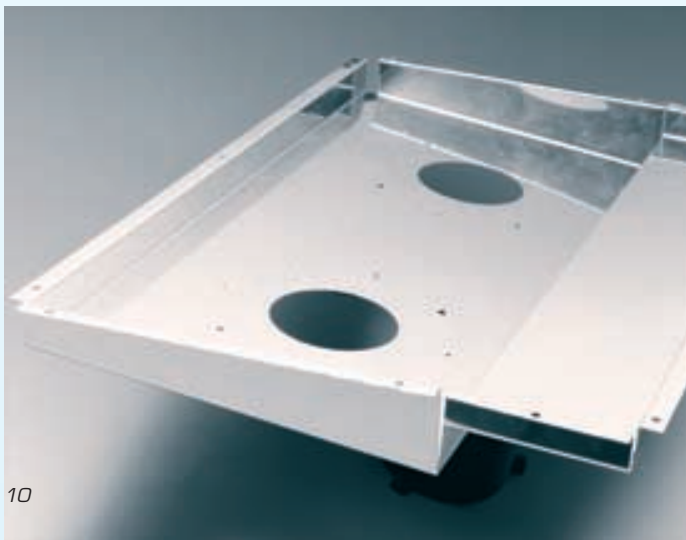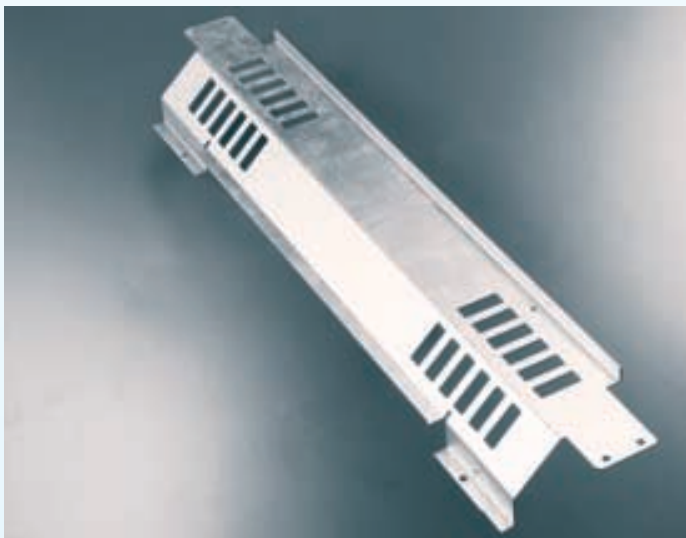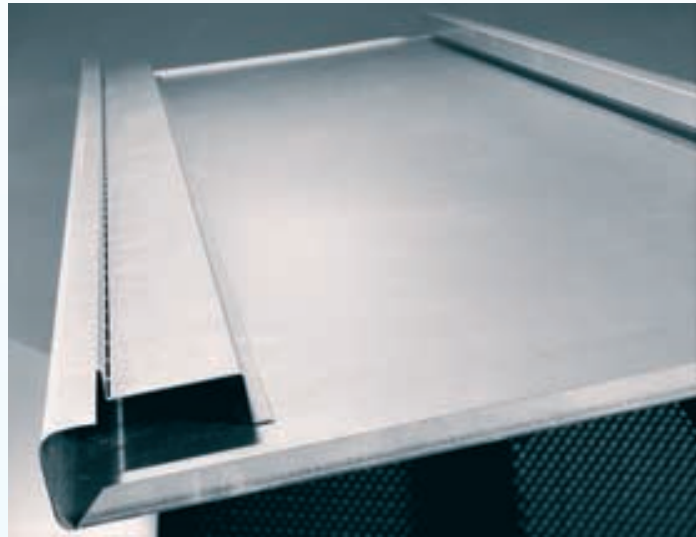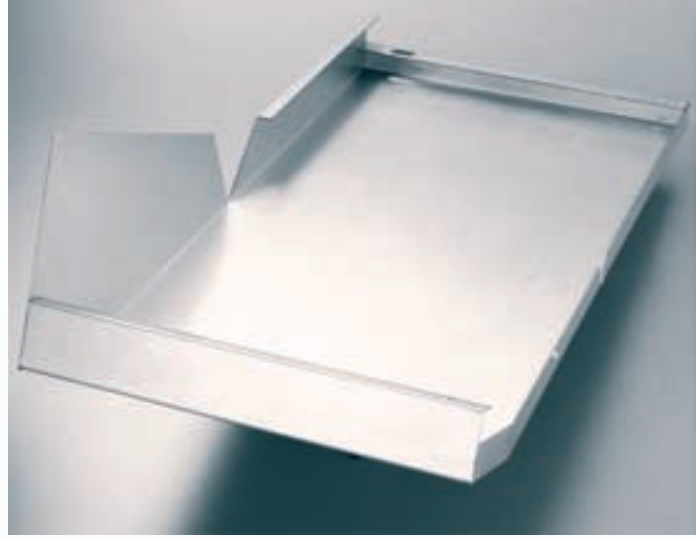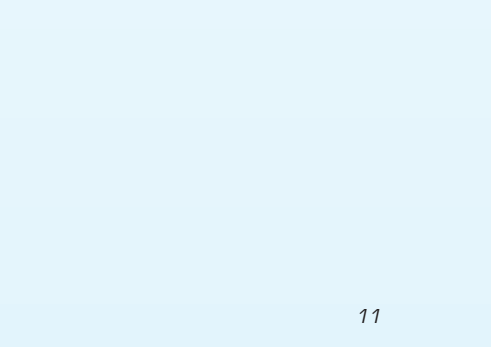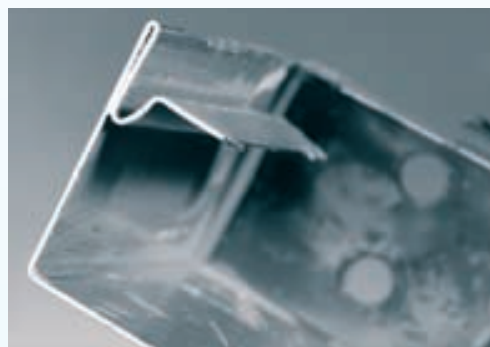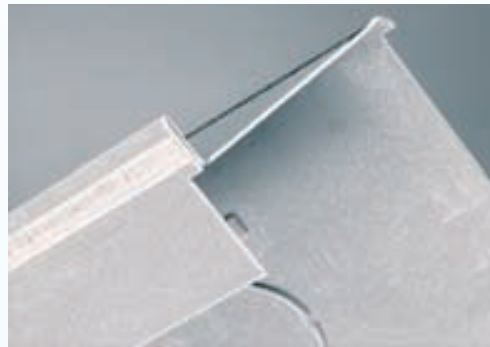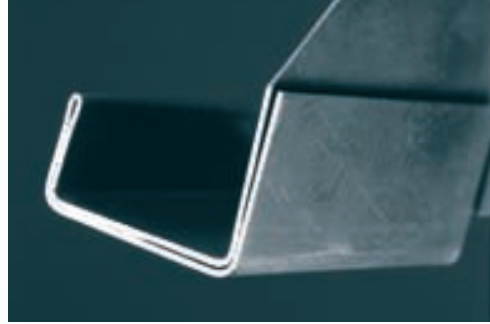
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