Window- and door manufacturing
Windows allow an outlook, but they can also give an insight – into the surrounding of a building as well as into its use and quality. At the same time, windows are the showpiece of the owner and the architect. They tell us something about their ideas of style, representation, usability and value. No other architectural detail is so much subject to such variety, the individual will to design, changing tastes and the style of whole periods as the distinguishing element of every facade: the window.

The oldest material in window manufacturing is wood, and this proven material with its natural beauty, its good heat insulation and easy processing still ranks very highly. It was later joined by plastic and aluminium. And this extended range of materials gives rise to new requirements and construction standards that represent the need for safety with regard to static, functionality, durability and efficiency as well as the growing environmental interest for energy saving, a very topical matter.

This situation leads to interesting new perspectives for hand-crafted as well as industrial window manufacturing for new buildings as well as the restoration of historic building fabric. Whoever wants to use them and make progress in the intensifying international competition will need the right planning, the best manufacturing methods and excellent tools. For all this, Leitz is your competent partner who reliably supports its customers.
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61 Evaluated thermal transmittance values of
   Leitz window systems
   Efficient solutions for wood-/alu windows
Today a window as a construction part is not just about construction specifications. International guidelines with which a window has to comply are even more important. Such requirements have been defined concisely in EN 14351-1. The CE sign shows whether the window complies with all the requirement criteria for the use intended. They are in control of the window construction. Leitz knows what is important and gives its customers with the planning and choice of the best tools advisory service and support.
The Leitz window competence
Leitz is in constant contact with:
■ Testing institute
■ CE-distribution point
■ Producers of hinges
■ Producers of piston seals
■ Alu-system houses
■ Producers of glass, etc.

Leitz pushes the window development:
■ The ClimaTrend window system of Leitz
■ RipTec for an improved frame corner joint, etc.

Leitz cooperates with all machine producers worldwide:
■ Coordinated, optimized customer project management
■ Common development of new production- and processing technology, etc.

General bases
■ Careful choice of the wood: wood type, wood quality, tree-rings, symmetric visual gluing and more.
■ Wood humidity in processing 11–13%.
■ For heat- and noise insulated panes, the statically correct wood thickness depending on the dimensions.
■ More than two thirds of the heat transition value depends on the panes in standard sized window. The noise insulation value of the window is around 2 dB lower than of the glass. For noise insulation values above 39 dB, this means that a second insulation is required.
■ Therefore, the thickness of the frame depends on the panes required.
■ Continuous insulation systems, with stop at the wood all the way round if possible, and positioned on the inside far away from the weathering zone.

Constructive wood protection
■ All profiles in the weathered area have to drain off the surface water which occurs both immediately and in a controlled way. Weathered horizontal surfaces need to have a minimum bevel of 15°.
■ All the external edges are to be planned rounded. Standard 3–6 mm, minimum 2 mm.
■ All the internal edges and corners need to be rounded for standardized painting.
■ The ventilation orifice of the glazing rebate upwards and downwards, outside the sealing level, allows for the necessary air circulation in the glazing rebate area.
■ Correct tenon or dowel position for tight and solid corner joint.
■ At the bottom horizontal sash and frame parts, aluminium cover rails are recommended as UV protection.
Features wood windows

**Closure rebate type**
- Euro-rebate
  - Clinging and screwed

- Continuous with positioning tenon drilled and screwed

- Euro groove
  - With positioning groove and screwed

- 4 mm rebate air
  - With millings for each fitting plate and screwed

**Fitting groove**
- Groove position 9 mm.
  - Slave door hinge or a rebated version in the double sash section

- Groove position 13 mm.
  - double sash section

**Glazing bead design**
- Rebated glazing bead
  - for optical tight seating with bevel for punctual mounting

- Smooth glazing bead
  - with shadow gap

- Sash inner profile
  - with gap ring

- Smooth glazing bead
  - without shadow gap
  - Sash with supporting groove

- Glazing bead with gap ring

- Glazing bead clipped

**Glazing type**
- Wet
  - With sealing rebate for rational glazing

- Wet
  - With sealing ribbon for flexible glazing (noise-, fire protection)

- Dry
  - With sealing

**Edge design external**

- Open seam
  - Optimal paint coating through strongly rounded edges in the longitudinal section (standard R6 mm).

- In the corners countered with R3 mm for a 1.5 mm visual seam

- Closed seam
  - Rounded longitudinal edges with countered corner joint

- without edge break longitudinal, with unpainted surface

**Frame overlap and und glazing neck**

- Frame overlap with bevel as indicated

- Frame overlap straight

- Glazing neck with bevel
  - Profile as indicated

- Glazing neck straight (jambs and head)

**Edge design internal**

All internal and external corners of the rebates and grooves in rounded softline-version for an optimum coating of lacquer
Draining

Rail clipped from the top, Draining via the aluminium rail, Optionally without end cap

Rail clipped from the front, Draining behind the rail, Optionally without end cap

Style rail clipped from the front, Draining behind the rail, Appearance of the bead to be selected freely for listed buildings and renovation

Without rain protection rail, Draining via grooved weather bar, For listed buildings and renovation

Without rain protection rail, Draining via milled weather bar, For listed buildings and renovation

Without rain protection rail, Draining via water groove and drilling to the outside

Rail clipped from the top and continuous to external frame, Draining via the rail, Optimised wall joint

Rail grooved, Draining via the rail With end cap, Sealing stop on alu rail and wood with standard rebate dimensions 19, 22, 25 mm with/without thermal separator

Rail clipped from the top, Draining via water gutter and drilling to outside, Sealing stop on pure wood

Additional sealing strip in the sash overlap

Medium 12 mm Sealing stop at the frame (also for rebate as sealing)

Medium 10 mm Sealing stop

Small Wood/Sealing stop

Large Sealing stop

Driving rain sealing

Frame with driving rain sealing
Wood windows IV78, IV90 (IV68, IV106)

- **IV78 ClimaTrend**
  - 13 mm fitting axis
  - 22 mm distance wind-rain lock-out

- **IV68 ClimaTrend**
  - 13 mm fitting axis
  - 22 mm distance wind-rain lock-out

- **IV78 with single groove and Purenit inlay**
- **IV90 (IV106) ClimaTrend**
  - Extension to low-energy window and for use of functional glazing
  - Uw-values see page 60

- **IV78 ClimaTrend**
  - 13 mm fitting axis
  - 32 mm distance wind-rain lock-out
  - Uw-values see page 60

- **IV90 on both sides flush**
- **IV78 window door outward turning**
Sections in the window

**Section A-A**
- Double sash section
- 13 mm fitting groove axis
- Continuous non-active sash, locked horizontally
- Optionally with angle sealing for increased driving rain security
- Optionally with milled cleat and groove for symmetry

**Section B-B**
- Sash enlargement
- With inside sash single groove
- Optional closed seam outside

**Section C-C**
- Enlargement for lateral fixed glazing without rain protection rail

**Section A-A**
- Double sash section
- 9 mm fitting axis and slave door fitting
- Optionally with rebated version and continuous fitting for horizontally locked non-active sash

**Section C-C**
- Enlargement for lateral fixed glazing with rain protection rail (alternatively continuous)
Sections in the window

Section D-D

Fixed glazing in the frame for top and bottom elements with angle fillet

- Rebate change for profile of jambs head
- Rebate change for profile of sill

Section E-E

Element joint with single groove (CNC)

Section E-E

Element joint with tongue/groove coupling (S+T)

Corner solution

Outside corner

Inside corner

Outside corner

Inside corner

Variable rebates inside and outside

Variable grooves inside and outside
Features wood/aluminum windows

<table>
<thead>
<tr>
<th>Closure rebate type</th>
<th>Fitting axis</th>
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<td>Euro-rebate</td>
<td>- Groove position 9 mm. Slave door hinge or a rebated version in the double sash section</td>
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<tr>
<td>Clinging and screwed</td>
<td>- Groove position 13 mm. With corner guide in the double sash section</td>
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<tr>
<td>Medium 12 mm</td>
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<td>Sealing stop (also for constant sealing)</td>
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<td>Medium 10 mm</td>
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<tr>
<td>Sealing stop</td>
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<td>Wood-/sealing stop</td>
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<td>Large</td>
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<td>Sealing stop</td>
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<th>Glazing type</th>
<th>Draining variants</th>
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<td>Via the frame sealing and aluminium profile</td>
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<td></td>
<td>Via the rain protection rail</td>
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<tr>
<td>Wet glazing with sealing rebate</td>
<td>Via the aluminium profile (system without frame sealing)</td>
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<tr>
<td>Wet glazing with sealing ribbon</td>
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<th>Mounting of Alu-system</th>
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<td>Rotating-/clip</td>
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<tr>
<td>bracket screwed</td>
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</tr>
<tr>
<td>Rotating-/clip</td>
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<td>bracket screwed with clip groove</td>
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<td>Connecting clips</td>
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<tr>
<td>Profile 2</td>
<td></td>
</tr>
<tr>
<td>Profile SMART Profiles on the glazing neck. Optionally with profile bend for covered glued seam</td>
<td></td>
</tr>
</tbody>
</table>
### Sash profile types

- In one level with sash for easy assembly. Different glass thicknesses with rebate adjustment
- Different overlapping sash profiles for different glass thicknesses with a constant glass rebate

### Rebate design

- Single rebate only with sealing in the frame
- Double rebate with continuous sash sealing in the rebate

### Alu profile types

- Alu profile and sash stepped design
- Alu profile flush design, sash stepped design
- Alu profile flush design, sash and glass stepped design
- Alu profile and sash flush design

### Alternative variant

- Integral frame profile view
- Integral frame and sash profile view
- Only sash profile visible
- Aluminium-glass view
- Alternative variant e.g. Type Rockframe
Wood-/aluminium windows IV78, IV90 (IV68) with rail draining or frame sealing

**IV78 ClimaTrend**
- 13 mm fitting axis
- Sash outer profile as like as wood window IV78 ClimaTrend
- Uw-values see page 61

**IV68 ClimaTrend**
- Double sash section
- 13 mm fitting axis continuous
- Non-active sash locked horizontally

**IV90 ClimaTrend**
- Double sash section
- 9 mm fitting axis and slave door fitting

**Section A-A**
- Double sash section
- 9 mm fitting axis and slave door fitting

**Section D-D**
- Fixed glazing in the frame for top- or bottom elements with steps or angle fillets

**Section B-B**
- Enlargement with single groove
- Optional with double groove-/tongue construction
- Enlargement for lateral fixed glazing
- Fixed glazing in the frame for top and bottom elements with rebate change
  - Rebate change for profile of jambs head
  - Rebate change for profile of sill
Wood-/aluminium windows IV78, IV90 (IV68)
System without frame sealing

**IV78 ClimaTrend**
- 13 mm fitting axis continuous
- Non-active sash locked horizontally

**IV90 ClimaTrend**
- 13 mm fitting axis

**Section D-D**
- Fixed glazing in the frame for top- or bottom elements with steps or angle fillets

**Section A-A**
- Double sash section
- 13 mm fitting axis continuous
- Non-active sash locked horizontally

**Section A-A**
- Double sash section
- 9 mm fitting axis and slave door fitting

**Section B-B**
- Enlargement with single groove
- Optional with double groove/tongue construction
- Enlargement with inside sash counterprofile

**Section B-B**
- Enlargement for lateral fixed glazing

**Section B-B**
- Fixed glazing in the frame for top and bottom elements with rebate change
  - Rebate change for profile of jambs head
  - Rebate change for profile of sill

Optionally fixed glazing with clipped glazing bead
Features entrance doors

**Rebate design**
- Single rebate stepped design
  - Continuous stop of the sash overlap sealing
  - Frame sealing 3-sided
- Single rebate stepped design
  - Rebated
  - Continuous stop of the sash overlap sealing
  - Frame sealing covered 3-sided
- Single rebate flush design
  - Continuous stop of the sash sealing
  - Door opener in frame or sash
- Double rebate stepped design
  - Rebate sealing continuous in the sash
  - Optionally without door overlap – bottom
- Double rebate flush design
  - Continuous stop of the sash overlap sealing
  - Second sealing 3-sided

**Hardware**
- Fitting groove 16
- Fitting groove 20
- Locking system milled

**Opening type**
- Inward turning
- Outward turning

**Door hinges**
- Milled shifted
- Drilled shifted
- Flush e.g. Tectus
- Milled flush outward turning
- Mounted outward turning

**Sealing positioning**
- In sash overlap
- In frame overlap covered
- In frame overlap
- In frame overlap covered by rebated sash
Door design

- Frame door with sash inner overlap
- Frame door with beads mounted on both sides
- Pre-manufactured door with openings (glass)

Bottom rails

- For internal stop at the sash overlap
- For rebate sealing stop
- For rebate sealing and stop at the sash overlap

Angle-rail

Bottom flush rail

With wiper-/drop down sealing bottom
Entrance doors IV78, IV90 (IV68)

Entrance door rebated variant

Section A-A

Double sash section

Section D-D

Fixed glazing
Variant glazing bead plain

Section D-D

Fixed glazing
Variant glazing bead rebated

Entrance door single rebate
Frame and sash sealing, sash sealing stop continuous and bottom rail for simple mounting

Section B-B

Enlargement entrance door

Section C-C

Enlargement fixed element

Entrance door double rebate flush

Section D-D

Fixed glazing
Variant glazing bead plain
Wood-/aluminium entrance doors IV78, IV90 (IV68)

Wood-/aluminium entrance door single rebate
Stepped design, inward turning
Wood thickness frame and sash equal

Wood-/aluminium entrance door single rebate
Stepped design, inward turning
Wood thickness unequal, standard aluminium

Wood-/aluminium entrance door single rebate
Flush design, inward turning

Wood-/aluminium entrance door double rebate
Flush design, inward turning

Wood-/aluminium entrance door single rebate
Flush design, outward turning

Wood-/aluminium entrance door double rebate
Flush design, outward turning
Features lifting-sliding door

**Sliding rail top**
- Sliding rail top standard in frame
- Sliding rail top in frame
- Sliding rail top in sash
- Sliding rail top in sash

- Sliding door rail continuous in sash
- Lateral ventilation

**Sliding rail bottom**
- Sliding rail bottom 10 mm large caster
- Sliding rail bottom 5 mm large caster
- Sliding rail bottom 10 mm small caster
- Sliding rail bottom 5 mm small caster

**Scheme C**
- Scheme C version with strip
- Scheme C milled
- Bottom rail aluminium composite or GFRP
- Bottom rail massive wood
Lifting-sliding doors

Possible schemes

- Scheme A, G, C, F, K
- Scheme E, L

Wood-/aluminium lifting-sliding door
With fixed glazing in blind frame
Floor depth glazing with stepless discharge

- Wood lifting-sliding door with fixed glazing frame
- Wood-/aluminium lifting-sliding door
In contrast to a zero-energy house, low-energy- and passive houses are equipped with a heating system and a modern ventilation system with heat recovery.

The characteristic values for an ultralow-energy house are between 15 and 40 kWh and the value for a low-energy house is 40 and 70 kWh/m² per year. There is no specific value defined for windows, but the general rule is, the better the heat insulation of the windows, the better the energy balance of the whole building project. Usually the value is between 0.8 and 1.0 Uw/m²K, without any particular glass value specified.
Passive-house windows

A passive-house is a building which can have convenient indoor climate by minimum energy input. For this the house has an extreme insulation of the building shell. A controlled ventilation system provides permanent fresh air, avoids mold build-up and minimizes energy loss through heat recovery. The passive-house standard of maximum 15 kWh/m² per year today not only is realized in the new construction, but also in the renovation.

The Passive House Institute awards certificates for passive-house windows for window constructions designed for these buildings.

For the calculation a heat transition value for glass of Ug 0.7 W/m²K is taken as a basis. The value of the complete window either may not exceed the maximum value of Uw W/m²K or reach U_{\text{wett}} of maximum 0.85 W/m²K in the thermal-bridgefree mounting. This situation requires to improve the thermal properties of the frame construction.

The passive-house-qualified system constructions of Leitz are designed accordingly and a customer-specific certification through authorized testing institutes is still just a matter of form.
International window systems

Outward opening
Glazing bead inside or outside with single rebate and sash sealing
Typical for Scandinavia

Stormproof Casement
Typical for Great Britain

Flush Casement
Typical for Great Britain

Flush Casement, PC Combi 500
Typical for Great Britain
Aluminium Clad Flush Casement
Typical for Great Britain

Box Sash Window
Typical for Great Britain

VisioneClima wood window
Typical for Italy

VisioneClima wood-/aluminium window
Typical for Italy
International window systems

**EcoTrend** wood window
Typical for Belgium

**EsThermo** wood window
Typical for Spain

**Idéale Standard** wood window
Typical for France

**YuBaDiTan** wood window
Typical for China
Outward opening
Double rebate and sash sealing
Typical for China

Wood-/aluminium window door
Outward turning with window milling
Typical for China

Horizontal pivoted wood window
12 mm rebate air (e.g. Hautau)
U-shaped sealing on same level

Horizontal pivoted wood-/aluminium window
12 mm rebate air (e.g. Hautau)
U-shaped sealing on same level
International window systems

Horizontal pivoted wood window
Sealing level stepped

Horizontal pivoted wood-/aluminium window
Sealing level stepped

Horizontal pivoted wood round window

Horizontal pivoted wood-/aluminium round window
Inward turning with single rebate

Wood window
Double rebate frame sealing
Typical for Switzerland and Germany

Type Trilux Deux Switzerland
Inward turning with double rebate
Frame sealing and sash overlap sealing

Wood-/aluminium window with sash profile
Typical for Switzerland and Germany
International window systems

Wood-/aluminium window
Aluminium rail from frame overlap
Typical for Switzerland and Germany

Wood-/aluminium window
Aluminium rail from wood window frame

Wood-/aluminium window
Typical for Switzerland and Germany

Type WBS
Stepped glazing window
Inward turning with single rebate
Frame- and sash overlap sealing
Wood window Integral

Wood-aluminium window Integral

Low-energy wood window (two-parted)

Wood window (two-parted)
Typical for Switzerland
International window systems

**Type Pollux**
Glued glass window, inward turning with single rebate for extremely slim design, frame- and sash overlap sealing

**Countersash window EV/EV**
Inward turning with rain protection rail and frame sealing
Typical for Central Europe

**Countersash window EV/IV**
Inward turning with rain protection rail and sash sealing
Typical for Central Europe

**Countersash window Vienna II EV/EV**
Typical for Central Europe
Coupled window wood EV/IV
Inward turning with rain protection rail, double rebate and frame sealing
Typical for Central Europe

Wood-/aluminium compound window
Typical for Central Europe
Those who want to be one step ahead of a growing international competition – from the planning phase onwards – can rely on Leitz. Being a competent partner, we serve any project with tailor-made, profitable solutions for the production of modern window and door systems. After assessing their capability, Leitz’s clients get their personal, profitable powerpack in cooperation with machine and software-developers.

For example, if there’s a need for high flexibility, tool sets will be split. Is productivity of most crucial priority, complete tool sets are the most effective solution.

Leitz is on the forefront of market Trends. Constantly in contact with the top and most popular testing institutes, fittings and seal manufacturers and through experience, know what is necessary for window construction. Using CAD, Leitz design their own construction from the know-how developed. The company is keen on passing this know-how to the next generation.

Feel free to ask, our application engineers will advice how to achieve the best for you from your window project.
Identification number
- Each part with an unique serial number
  (Set Id.No., SET-Toolset, Serial-No., Direction of rotation, Maximum rpm of the tool set)

Tool drawing incl. information
- Basic data
- Profile dimensions and spindle position
- Reference points for programming

Operation parameters
- Tool weight
- Recommended production cycles and feed rate
- Recommended RPM

Spare part list
- Part list
- List of all spare parts/knives

Layout of the toolchanger
- Identification number of the various toolsets
- The tools are especially designed according to the available space in the tool-changer

Example operation parameter (reference values)
Specified operation parameters are indicative and independent of the machine, only based on the tool limits and applies to softwood.

Max. RPM: 12,700 1/min
Operating RPM: 10,600 1/min
Feed rate
lengthwise: 15 m/min (against feed)
Feed rate cross: 7 m/min (with feed)
Feed rate arches: 7 m/min (against feed)

Reduction feed rate:
Hardwood: -20%

Total weight: 7.5 kg
Profile generation based on cross section drawing
- Profile list incl. unique names for machine software

Corresponding tools for each profile
- Profile name as in production sequence drawing
- Required tool list per profile

Corresponding tools to the production sequence
- Tool ID No.
- Spindle position: axial, radial
- Dimensions:
  - Spindle/Profile
  - Tool underneath the table/clamping system
- Generation of the production sequence according to the tool layout
- Description of each profile incl. reference point and all relevant profile positions
- Collision detection: Check, whether all profiles are produced completely and in the right way

Outline
- 3D model generation for simulation (collision detection, design of dust hoods)

Profile generation based on cross section drawing

Corresponding tools to the production sequence – CNC-technique

Layout of the toolchanger

Corresponding tools for each profile

Corresponding tools to the production sequence – through-feed machines

Outline
Machinery and machining concepts

Serial manufacturing and manufacturing per frame
In serial manufacturing, all of the parts with the same profile and a similar length are arranged according to manufacturing groups during work preparation in order to produce these as efficiently as possible without having to adjust the machines. This method is ideal for manufacturing on double-sided machine layouts with a high output of parts.

In manufacturing by frame, the processing of the parts is done as per order. All frames and corresponding sash frames are processed one by one in the most varied dimensions and polygonal forms on the machine. Ideal for the use of one-sided angle systems or CNC processing centres for flexible manufacturing.

Single-, double- or multiple part manufacturing in cross-grained wood processing
The single-part manufacture is done mainly on double-sided cross-machines. The part is mounted on conveying chains and processed at both face sides. If a high performance is required, several identical parts are mounted directly behind one another. High part output!

In double-part manufacture, two parts of an element with an identical size and the same end profile are mounted on one-sided machines and then conveyed one by one to the longitudinal machine. This procedure has proven very valuable in connection with manufacture frame by frame. The parts output can be increased while maintaining flexibility!

Frame manufacture and individual part manufacture
In frame manufacture, the glued frame or sash is machined on the outside. In individual parts manufacture, all end grain counter profiles, optionally including slot and tenon profiles, as well as all longitudinal millings, holes and orifices are machined at the individual part. This is followed directly by assembly. Outside profiling does not take place. Less space and machine usage is required, and end grain coating can be carried out before the assembly.

Manufacture with complete tool sets or profile splitting
A complete toolset manufactures a pre-defined profile ready processed on a cutting position. This method corresponds to the most frequent machine manufacturing procedure, from the table moulder to large-scale window manufacturing machines. Their advantage lies in absolutely consistent manufacturing with the clear allocation of knives as per profile. Profile changes, such as different wood thicknesses, do however require the refitting of the respective machine.

Profile splitting in contrast means that the required cuttings in a part are distributed over several processing steps. The respective tool sets and parts are positioned by electronic axes when going through the processing steps.

Modern control technology enables the flexible manufacture of profiles without tool refitting.

This ensures the production of a varied profile range without cost-intensive refitting times. However, it requires a corresponding machine technology with several vertical and horizontal spindles arranged behind each other. Professional planning and the clever use of the tools give a competitive edge. For this, Leitz supports its customers with competent Know-how.

Support of the frame parts

Support of the sash parts

CNC machining centres

Complete profiling
Mit dem richtigen Maschinen- und Werkzeugkonzept sind zum Beispiel ohne Umrüstaufwand folgende Produktionen möglich:

- Holzfenster, Holz/Alu-Fenster und Haustüren
- IV-, Verbund- und Kasten-Fenster
- Hebe-Schiebe-Elemente, Niedrigenergie- und Passivhausfenster
- Zusatzelemente wie Blindstock, Fensterläden u.a.m.

Die Erzeugnisse können darüber hinaus noch in folgenden Ausführungen variiert werden:

- Holzdicke
- Einfach- oder Doppelfalz
- Falzbreiten für unterschiedliche Gläser bei Holz/Alu-Fenstern
- Bevelled oder profi led version für Blind frames and sashes for wood windows

Furthermore the following features can be varied:

- Wood thickness
- Single- or double rebate
- Rebate widths for different glass thicknesses for wood/alu windows
- Bevelled or profi led version for blind frames and sashes for wood windows
- Wall joints for aluminium, window sill, renovation rebate, foam grooves
- Sash overlap sealing

Profile splitting on through-feed machines

Profile splitting on CNC machining centres
Leitz tooling systems

ProfilCut Q Premium

Multifunctional profile tool system for perfect surfaces. With uniform clamping system for profiled and turnblade knives. With a cutting speed of 120 meters per second, the premium system is faster than any comparable tool, both in productivity and surface quality. Its accelerated process performance saves time and money.

Limited production expenditures due to
■ longer tool life by Marathon „high power“ coating,
■ reduced maintenance,
■ less machine down time,
■ economy by combining standard straight and profiled throwaway knives.

Machined surfaces to finish quality by
■ extra-sharp cutting edges by polished face,
■ innovative coating-technology for longer performance and cut quality,
■ balanced to prevent vibration, therefore an enhanced cut quality surface finish.

Short set-up times combined with user friendliness due to
■ automatic knife adjustment without setting gauges,
■ changing the knives while the tools is in the machine possible,
■ lightweight construction of the tool body,
■ clamping screws are dust-protected,
■ perfect repetition accuracy, after every knife change,
■ noise reducing design.

ProfilCut Q

Leitz provides a ProfilCut Q version specifically for spindle moulders and angular systems. This version allows for cutting speeds up to 90 meters per second and has the same advantages including finish quality and ease of use.

High performance coating Marathon

The Marathon MC coated ProfilCut Q knives increases performance times significantly with a more consistent, excellent cut quality. Consequently, the use of resources are optimised and the tool-performance enhanced. Optional Marathon TDC is available when machining hardwood, abrasive materials and for large batch production to optimize setup and down-times.

Marathon MC – excellent surface quality, especially in softwood

Marathon TDC – the expert for hardwood and abrasive materials
ProFix Plus

The high-performance profile tooling system – for window- and door production and also for furniture production, stair production, interior construction and timber construction. Its profile knives can be repeatedly sharpened and determined to the system are absolutely profile- and diameter constant. This makes ProFix a guarantor for maximal efficiency and easy handling. Of course, ProFix also scores referring to finish quality and performance times. This is ensured by the tungsten carbide edges of the profile tooling systems, its geometry and variants of cutting material are perfectly adjusted to the respectively used working materials and machining processes. Even in a third performance dimension ProFix is impressing: with flexibility. Tipping the tool body with changing knives, allows a profile change that couldn’t be easier and quicker.

ProFix F

The complete ProFix system family is flexible. However, ProFix takes these strenghts to a peak. As the F in its name stands for absolute flexibility. ProFix allows its users any positioning in the tool body. Machine set-ups for profile changes are reduced to a minimum due to a special profile structure proceeding from a constant zero diameter. For frequently changing profiles, the ProFix F is the profile tooling system of choice. Also on 4-side moulding machines, ProFix is the ideal solution.

ProFix C

The specialist of the ProFix system family for cutting across the grain. Of course, also ProFix C have all these features making the profile tooling system so efficient. Large chip- and shear angles and gullets optimized for large slotting depths predestine ProFix C for cutting across the grain – mainly for the production of slot-tenon and counter joints for wooden windows and -front doors.
Combination ProFix & ProfilCut Q

As ProFix and ProfilCut Q can be combined, the flexibility and efficiency for window- and door manufacturing are increased in the appropriate areas. These advantages of the Leitz profile tool systems allow for a tailored and efficient solution for every customer requirement to a degree that is absolutely unique.
New coated router cutters: Efficiency from the beginning.

- Reduction in operations due to roughing-finishing in one pass.
- Increased productivity through higher feed speed.
- Increased tool life due to the special coating.
- Increased profitability through the reduction in the machining costs.

New solid tungsten carbide spiral drills: Fast, clean cutting, accurate.

- 30 to 50 % higher feed rates.
- Precise dowel location and fit due to the cut and geometric qualities.
- No chipping on the workpiece at the bore entry.
- Low power consumption through optimal chip ejection.
- Precise plunging on bevelled faces.
Leitz Powerpack

Leitz RipTec-technology for planing and cross grain cutting

Even with pre-splitting woods, twisted fibres or knots, a Leitz innovation generates an optimized surface. The RipTec pre-cutting technology reduces the rejection rate to almost zero. By applying this technique, the feed speed can be increased and therefore improved productivity. Compared to a smooth profile, the ripple profile with its small glue gaps provides a high level of adhesion and gives a significantly more stable corner joint. In addition, these tools can be resharpened up to 20 times giving excellent value and tool life.

Leitz Integral technology for cutting along grain

The combination of a RipTec cutting edge and a finishing edge in one tool provides the best combination for performance and profitability. The arrangement of the cutting edges is paramount to this integral technology, where the first knife enables the pre-cutting and the second knife achieves the finish. This innovation prolongs the tool life of the finishing knife edge up to 30 percent, a significant cost saving in any application area.

Hybrid technology; Perfection by Leitz

At Leitz, true Hybrid technology means the combination of two tooling systems to achieve the optimization of a production process. The combination of a TC-tooling system with diamond knives reduces the cost of processing composite materials i.e. glued joints as well as abrasive coatings considerably. The diamond knife acts as a protective knife for the HW knife by machining the abrasive area of the workpiece allowing the HW knife to machine the softer material therefore extending the tool life. For the customer this means consistent quality during a long product life cycle. A reduction of rework and scrap, as well as reduced set-up times. These factors can significantly decrease production costs.
Aluminium alloyed tools: Lower mass for more performance.

- Balanced and optimized finish quality.
- Reduced stress and wear on the machine bearings.
- Quiet running through optimized tool body design.
- Accurate tool mounting with Leitz ShrinkFit.
- Easy handling.
- Steel Heli-Coil inserts for thread security.
- No tool body corrosion.

Leitz Chip Technology: Less set-up time

For the application on CNC-machines, Leitz provides intelligent tools with an integrated memory chip. This provides the machine control centre with essential geometry and technology data such as tool length, diameter as well as RPM and direction of rotation. The risk of false manual input is reduced as the microchip in the tool automatically updates the machine. E.g. for resetting the tools for different window types. Through intelligent Leitz tools, the incorrect use of the tool is eliminated therefore high working and process safety is achieved. Automatic radius offset correction after sharpening prevents producing an incorrect profile, thus reducing scrap costs and therefore improving profitability.

Hard coated alloyed tools for the most demanding of conditions.

- Reduction of tool body wear especially during the machining of abrasive work pieces.
Adaptors

**Machine with cyl. Spindles**

**Clamping sleeve with end ring and safety device against twisting**
Clamping sleeves with end ring for constant clamping and zero-height with anti-twist protection for left and right hand run. Clamping is done with clamping screws which also secure the individual tools against twisting. Highly accurate axial and radial run out.

**Hydro-Duo clamping element**
For clearance-free clamping of single tools, as well as cuttersets on window machines with heave spindles. Elimination of the fitting tolerances between tool and machine spindle. Closed two-way clamping system via pressure piston mechanism with a central screw in the dust-protected area. Most accurate axial and radial run out for an optimized cutting quality with longer life-time.
Machine with HSK arbours

Clamping arbour HSK
For the clamping of tools with bore for use on planning- and profiling machines with HSK interfaces.

Hydro clamping arbour HSK
For the clearance-free clamping of single tools, as well as cuttersets on planning and profiling machines with HSK interfaces. Elimination of the tolerances between the tool and clamping arbour. Closed clamping system via pressure piston mechanism with a central screw in the dust-protected area for the disassembly of the tools. Highly accurate axial and radial run out.

Shrinkage clamping arbour HSK for boring tools and shrinkage clamping chuck for shank tools
The tools are mounted on arbours through a special playfree mounting system – demounting the tools in the factory is possible. By this process the fitting tolerance is reduced to zero – this optimizes considerably the remaining unbalance and the concentricity of the tools. Furthermore the toolset obtains a rigidity as if it would be of one piece. By means of this technology considerably higher RPMs and therefore higher feed rates on constant finish quality of the workpiece can be achieved.

Mounting of shank tools into a ThermoGrip shrinkage clamping chuck
By the help of this clamping technology very high running accuracies, balancing qualities and dynamic rigidities of the tools are reached. By this these tools are best suitable for high RPMs, i.e. also for HSC machining. The shrinkage clamping technology of Leitz offers maximum stability, accuracy and thus optimum finish quality on the workpiece together with maximum tool lifetime and minimum interference contour.

Pre-planing tool HeliPlan on clamping arbour HSK
Toolset ProfiCut Q Premium on clamping arbour HSK
Toolset on shrinking clamping arbour HSK
Shank tool in ThermoGrip shrinkage clamping arbour
Corner joints

Slot and tenon joint
The proven slot and tenon connection is the standard on all through-feed machines (lines) and it’s getting more importance on CNC machines – especially in combination with a single-part production. After milling the outer profiles, the slots and tenons are milled. The dimension of the slot and tenon pitch is essential. If this connection is produced on modern CNC machines several limits have to be considered: max. diameter, max. length, max. weight, ...

Counter dowel joint
The counter dowel joint is established in window industry, especially for the production on CNC machining centres. The dowel arrangements and dimensions have to be observed in order to design stable corner joints. Small tool diameters are possible for this type of connection which means less space and weight of the tools. Disadvantage is the use of many dowels (drilling operations, gluing, putting in the dowels). A significant improvement of the bonding, the tightness and the stability of the corner joint is obtained through Rip-Tec by Leitz on cutting cross grain.

Mechanical joint
A further development of the counter dowel joint is the screwed, mechanical connection. This system reduces the number of dowels. In addition a screw is inserted. A second small screw is used next to the main one, which is responsible for the rigidity of the corner joint. It eliminates a loose glazing bead. The sash is mounted around the glass on a special assembling table.
Leitz PlugTec corner joint

The Leitz PlugTec corner joint combines the advantages of established slot-tenon with counter-dowel joints in one system – increased stability with cost-effective production.

Tenons are milled and rounded on the window parts. Slots on the counter-piece result in an exact, stable and form-fitting joint. Product tests at the ift Rosenheim testing institute in Germany confirm highest loading capacity and durability.

The innovative joint geometry of Leitz PlugTec allows a form-fitting and cost-effective production in one clamping position during profiling the single parts – without additional required joining elements. By avoiding dowel hole bores, the reduction in material consumption and the possibility of small tool diameters result in efficient production on CNC machines.

No matter whether the application calls for slim wood/aluminum windows with extremely small wood widths or ClimaTrend wooden windows, Leitz PlugTec is suitable for most window and door systems.
Leitz offers flexible tooling concepts for planning and separating raw beads. At the same time glazing beads, sash bars, cleat and covering beads can be produced. These concepts are fixed together with machine manufactures.

**Pre- and finish planing, bead production**

**Planing, finish jointing, raw bead separation**
- Square dressing
- Seven raw-beads are separated from the frame inside and sash outside profile.
- High quality glazing beads are produced as the raw beads are separated from the top lamella of the timber.
- The deep rebates of the profiles are pre-cutted.

**Glazing bead profiling**
- Special rebated glazing beads are produced out of the raw beads.
- Due to this special rebate the bead fits optically tight into the sash.

**Spindle 1 on bottom**
Jointing with surfacing

**Spindle 2 right hand**
Jointing right hand and square bead, changing tool: profiling bead variants

**Spindle 3 left hand**
Jointing and rounding, changing tool: profiling bead variants

**Spindle 4 on top**
Pre-planing thickness, machine pulse: profiling bead

**Spindle 5 on top**
Finish planing thickness, machine pulse: separating raw bead

**Spindle 6 on bottom**
Finish planing thickness, machine pulse: profiling beads
Arched and curved beads

CNC machining centers are ideally suited for the production of arched and curved beads. It is recommended to use RH and LH tools to mill with the grain to achieve perfect quality and avoid breakouts.
Planerhead HeliPlan for pre planing
Aluminium tool body with spiral, staggered single cutting edges, mounted on the tool body periphery

Special advantages:
- Minimum breakout.
- Noise reduction (up to 10 dB(A)).
- The staggered cut reduces both the cutting force and feed pressure.
- Turnblade knives have four cutting edges (four lives).

Planing cutterhead VariPlan Plus for pre- and finish planing
Resharpenable and diameter constant tool system with turnblade planer knives. Special advantages:
- Version with resharpenable turnblade knife Microfinish for optimal surface quality
- Integral-variant possible: pre and finish planing in the same tool
- Operational safety through form fitting knife clamping
- Fast knife change through self positioning knife clamping
- Knife clamping in the dust-protected area
- Resharpenable and diameter constant turnblade planer knife for more efficiency

Planing cutterhead VariPlan Plus with turnblade planer knives
Planing cutterhead VariPlan Plus combined with ProFix
Profile tooling systems for bead production

ProFix
The profile tool system for industrial applications. Lowest operating costs for high volumes. Can be resharpened with constant profile and constant diameter.

ProfilCut Q Premium and ProfilCut Q
Multi-functional profile tool system for a perfect finish. Standardised clamping system for profile and turnblade knives. For small and medium series production.
Tips for manufacturing

Table side of parts
The same table side of the sashes and frames on the outside during processing has the following advantages:
- For fixed glazing elements, parts with one-sided frame and sash profile on the other side can be milled (same wood thickness).
- Best table side for transoms, mullions and sash bars.
- Accurate radius transition to the weathered area.

Same slot- and tenon parting in frame and sash for element construction
With the same wood thickness in the sash and frame combinations of movable and fixed glazing can be manufactured, depending on the static limit values of the frame construction. Varying frame and sash inner profiles within the window elements can be connected with each other, if the slot and tenon parting is the same (sash and frame). This leads to fewer parts to be produced, a slimmer look, less capillary holes through joints and lower manufacturing costs.

With rebate change on CNC controlled machines with slot and tenon or counterprofile
The rebate change cutting, i.e. the profile transition from frame-inner profile to sash-inner profile in the section of mullions makes the element construction through the omission of the filling bead even more economical.
Sash with double tenon
- The same sash and tenon parting in frame and sash for the element construction is standard today (see section element construction).
- Breather hole $\leq 22$ mm. Rail rebate is bored or plunged, respectively proceeds horizontally for slot and tenon.
- Straight joint in the sash inside and outside vertically.
- Stable thickness of the tenon.
- Suitable for stable double groove – tongue doubling in the sash.

Sash with 2.5-times tenon
- Element parts are countered and doweled respectively produced with own tools for sash slot and tenon with frame pitch.
- Breather hole is possible for rail rebate $\leq 22$ mm vertically through slot and tenon.
- Straight joint proceeds vertically on the outside as in the frame. Watch the milled stop bead.
- More glueing space.
- Sash inner profile doubled with inlay.

Block dimension
To achieve a constant accuracy in fittings for slot and tenon tools sets, Leitz has been using the block dimension adjustment for years. The external flanks are used as reference values here. The spurs screwed flush to these surfaces make an accurate cut from the first to the last tenon without wear. A perfect slot and tenon connection is therefore ensured permanently before and after a change of the knives.
Roundings in the cross-grained wood area

The open seams in the corner joint are the sign for quality in cross-grained wood processing. This is taken into account by differentiating between separating main- and rounding knives with a special shear cut. Thus a very good surface is obtained. This can be improved massively by using modern machinery. The processing cross-section is limited to the width of the wood through dedicated rounding aggregates horizontally, on top and bottom. Therefore the rounders do not mill the whole tenon length as normally usually.

The horizontal rounders must be controllable axially and also rotatable for the manufacture of inclined windows, depending on the machine concept.

Increase of effectiveness and quality through the right pre-cutting and corrugation technology

In the manufacture of windows and doors, pre-chipping technology improves product quality and efficiency. The usual stepped pre-cutting of the profile can lead to tears at the rebate edge. The low allowance that is still available for the final cut is frequently not sufficient to avoid these tears. It is therefore important to choose the right strategy in the field of prechipping here. For this purpose, Leitz recommends tools and procedures with bevelled pre-cutting. This leads to a clean rebate edge which is free of tears.

The advantages are:

- An improved tool geometry ensures a long lifetime of the rounders.
- Pre-scoring of the tenons in the parapet area, therefore fewer tears.
- Central access to all cross-grained wood roundings in one aggregate.

Bevelled pre-cutting

Rebated cutting
5-axis-technology in window production
The 5-axis-technology is becoming more and more important in the window industry. This technology allows optimum cutting conditions matched to the profiles and reduces the amount of tools and aggregates.

Significant improvement in production quality with increased life time
- Homogeneous cutting speed
- No flank friction during rebating
- Optimal cutting geometry, less tear-outs
- Smaller profile depths/diameter, higher RPM, higher feed rate
- Less power consumption and cutting forces

Face milling of visible profiles
Through the use of panel raising tools visible cutter marks are avoided. Due to the optimum cutting conditions by 5-axis-technology also the tool life can be significantly increased.
### Evaluated thermal transmittance values of Leitz window systems

#### Efficient solutions for wooden windows

<table>
<thead>
<tr>
<th>IV68 wooden window</th>
<th>IV78 wooden window</th>
<th>IV90 wooden window</th>
<th>Low-energy window</th>
<th>Low-energy window</th>
<th>Passive-house window</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClimaTrend</td>
<td>ClimaTrend</td>
<td></td>
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<td></td>
<td>&quot;Leitz VariTherm H&quot;</td>
</tr>
</tbody>
</table>

#### Glass thickness

- **24 mm Ar**
  - Ug: 1.10 W/m²K
  - Ug top: 1.42 W/m²K
  - Ug bottom: 1.64 W/m²K
  - Uw value: 1.33 W/m²K

- **36 mm Ar**
  - Ug: 0.70 W/m²K
  - Ug top: 1.07 W/m²K
  - Ug bottom: 1.31 W/m²K
  - Uw value: 0.86 W/m²K

- **40 mm Ar**
  - Ug: 0.60 W/m²K
  - Ug top: 0.99 W/m²K
  - Ug bottom: 1.27 W/m²K
  - Uw value: 0.99 W/m²K

- **44 mm Ar**
  - Ug: 0.60 W/m²K
  - Ug top: 0.99 W/m²K
  - Ug bottom: 1.27 W/m²K
  - Uw value: 0.99 W/m²K

- **48 mm Ar**
  - Ug: 0.50 W/m²K
  - Ug top: 0.81 W/m²K
  - Ug bottom: 1.09 W/m²K
  - Uw value: 0.81 W/m²K

- **48 mm Ar**
  - Ug: 0.50 W/m²K
  - Ug top: 0.81 W/m²K
  - Ug bottom: 1.09 W/m²K
  - Uw value: 0.81 W/m²K

- **50 mm Ar**
  - Ug: 0.50 W/m²K
  - Ug top: 0.81 W/m²K
  - Ug bottom: 1.09 W/m²K
  - Uw value: 0.81 W/m²K

#### Glass thickness

- **24 mm Ar**
  - Ug: 1.00 W/m²K
  - Ug top: 1.28 W/m²K
  - Ug bottom: 1.51 W/m²K
  - Uw value: 1.19 W/m²K

- **36 mm Ar**
  - Ug: 0.60 W/m²K
  - Ug top: 1.14 W/m²K
  - Ug bottom: 1.33 W/m²K
  - Uw value: 0.87 W/m²K

- **40 mm Ar**
  - Ug: 0.50 W/m²K
  - Ug top: 1.02 W/m²K
  - Ug bottom: 1.17 W/m²K
  - Uw value: 0.76 W/m²K

- **44 mm Ar**
  - Ug: 0.50 W/m²K
  - Ug top: 0.99 W/m²K
  - Ug bottom: 1.09 W/m²K
  - Uw value: 0.74 W/m²K

- **48 mm Ar**
  - Ug: 0.50 W/m²K
  - Ug top: 1.02 W/m²K
  - Ug bottom: 1.17 W/m²K
  - Uw value: 0.76 W/m²K

#### Glass thickness

- **40 mm Ar**
  - Ug: 0.60 W/m²K
  - Ug top: 1.28 W/m²K
  - Ug bottom: 1.51 W/m²K
  - Uw value: 0.87 W/m²K

Calculation basis: pinewood (Lamda-value 0.13), spacer Thermix

**OPTIMUM VALUE** – calculation basis: spruce (Lamda-value 0.11), spacer Swisspace V

<table>
<thead>
<tr>
<th>Glass thickness 24 mm Ar</th>
<th>Glass thickness 40 mm Ar</th>
<th>Glass thickness 44 mm Ar</th>
<th>Glass thickness 48 mm Ar</th>
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Evaluated thermal transmittance values of Leitz window systems
Efficient solutions for wood-/alu windows

IV68 wood-/alu window

Uw value

Glass thickness
24 mm Ar

Ug: 1,10 W/m²K
Uf top: 1,42 W/m²K
Uf bottom: 1,42 W/m²K
Uw value: 1,31 W/m²K

Glass thickness
40 mm Ar

Ug: 0,70 W/m²K
Uf top: 1,27 W/m²K
Uf bottom: 1,27 W/m²K
Uw value: 1,00 W/m²K

Optimum value – calculation basis: spruce (Lamda-value 0,11), spacer Swisspace V

Glass thickness
40 mm Ar

Ug: 0,60 W/m²K
Uf top: 1,14 W/m²K
Uf bottom: 1,14 W/m²K
Uw value: 0,87 W/m²K

Glass thickness
48 mm Ar

Ug: 0,50 W/m²K
Uf top: 1,11 W/m²K
Uf bottom: 1,11 W/m²K
Uw value: 0,68 W/m²K

There is no liability on our side for the correctness of the calculated values.