

Glass roof constructions Care, service and maintenance of roof glazing/overhead glazing

Overhead glazing is glazing that does not fall within the area of applicability of the EN 13830 product standard, i.e. structures that are inclined by more than 15 degrees from the vertical. The requirements for these roof structures are defined and checked on the basis of the EN 13830 product standard.

Additional requirements are, for example

- Avoidance of the formation of condensation (only conditionally possible)
- Durability of the structural system
- Reduction of deformations for functioning tightness/drainage

Overhead glazing and roof glazing are structures that, due to the installation situation, are subject to different loads than façade structures.

These loads are above all:

- Snow loads and dead weight loads
- Additional wind pressure with steeper roof pitches
- Additional loads due, for example, to sun protection, rooflights, wind deflectors, insurance systems.
- Deformations of the structures due to the occurrence of loads, especially in the case of flat roof pitches and in the transom area
- Temperature differences or temperature increases in the glazing rebate area when exposed to the sun
- More difficult aeration and ventilation of the glazing rebates due to the installation inclination
- More difficult water drainage or temporary accumulation of water with horizontal pressure profiles and flat roof pitches
- Accumulation of dirt, deposits or moss due to lack of cleaning

The lower the roof pitch, the more frequently regular care and maintenance are necessary in order to maintain the functionality and preserve the value of the roof structures.

Information/recommendations regarding the design of flat pitched roofs can be found in this planning folder and also in the ift Professional Information VE-12/1 brochure dated March 2009 – overhead glazing with a low inclination – technical implementation of sophisticated details.

The following points represent the basis for regular care and maintenance, subdivided into the groups:

Appearance

- Cleaning of the surfaces
- Removal of moss and deposits
- Cleaning of gutters or water-carrying components
- Ensuring the drainage of water in the roof area

Functional components

- Sealing profiles
- Checking the contact pressure
Examination for signs of detachment/disintegration
Examination for dirt
Examination for embrittlement
- SG-joints
Checking of the condition as well as the adhesion to the adjacent components
- Drainage/ventilation openings
Checking of the function of drainage or ventilation openings
- Pressure and cover profiles, especially in the transom areas
Exemplary checking of the torque of approx. 4.5 Nm – see processing. If necessary, tightening of the screws to the specified tightening torque – see processing.
- Rooflights and sunblinds
For care and maintenance see the manufacturer's instructions for care and maintenance.

Stability

- Examination of the structural system for corrosion, damage, changes of colour and the function of the insertion elements (the appropriate maintenance intervals must be adhered to for efficient ventilation and smoke evacuation or smoke extraction elements)

Defective parts (profiles, fittings, accessories, glass) may only be replaced by an authorised specialist company. Further information about the maintenance of insertion elements is provided by the 'FRAME⁺ WING operating manual', which is available from the download section at www.raico.de.

We recommend the following care and maintenance intervals:

Roof pitch	2° to 10°	10° to 30°	30° to 75°
Appearance	2x per year	2x per year	1x per year
Function	1x per year	1x per year	every 2 years
Stability	every 2 years	every 2 years	every 3 years

The cleaning of the roof glazing (visual points) can be carried out by the user or suitable personnel. Maintenance work concerning the function and stability is to be carried out by the builder of the roof structure or by appropriately trained and instructed personnel.

Cleaning (appearance) can also be carried out more frequently as required. A check of both the function and stability may also be necessary after unusual events, such as storms, or in case of unfavourable locations (e.g. high accumulation of leaves).

You are urgently recommended to arrange a maintenance contract with the user in particular in the case of roof glazing with roof pitches < 10 degrees. The necessary work is to be defined in the contract and recorded in a maintenance manual after completion of the work.

Cleaning of the materials employed

Anodised or powder-coated aluminium: For the care and maintenance of anodised or powder-coated surfaces, refer to the instructions of the 'Gütegemeinschaft Reinigung von Fassaden e.V. (Façade Cleaning Association)' or contact your refinement company.

Glazing: For the care of glazing, please observe the care instructions of your glass supplier.

Gaskets: Your windows are equipped with maintenance-free sealing profiles. They should be checked annually for perfect fit and sealing function. These gaskets must not be painted over. In order to ensure a long life span of rubber gaskets, the use of conserving care products such as care lotion is recommended. This prevents embrittlement of the material.

For insertion elements of the make RAICO, see the 'FRAME⁺ WING operating manual' in the download area at www.raico.de.

1. General Conditions

All RAICO products have been developed or selected for usage in the construction of façades, windows, and doors. They are meant to be assembled by specialized companies following the acknowledged technical regulations, in particular as applicable to constructing façades, windows, and doors, and also following all directives, norms, regulations and recommendations which are standards within the industry. All RAICO documentation should be considered as non-binding recommendations in regard to the planning, designing, processing, finishing and assembly of these products. They are intended to offer suggestions to the certified specialist, or inform on successful applications. The specialist must always check carefully whether the suggestions and documentations are appropriate also in his particular case, and in every respect.

Scope of delivery and RAICO warranty

Our scope of delivery covers the contents of our known Sales Terms. We assume no liability for damages caused by the use of system accessories, parts, and hardware which are not named in our product documentation as suitable original parts and hardware.

Advisory service by RAICO employees

Our specialists offer free-of-charge advisory services and recommendations. All suggestions, proposals, designs and the like, be it in written or oral form, calculations, drawings, sketches etc. provided by our employees in the course of advice given or by mutual correspondence, are to be considered as non-binding suggestions from our company, and thus result in limiting our liability to deliberate intention and culpable negligence only. This limit also applies to construction designs and tender documents.

Support in cost estimation

Help regarding the estimation of costs is offered to the best of our knowledge and is in any case non-committal. Generally speaking, material prices are calculated only concerning RAICO's product range. Supplements for operating costs, as well as times for manufacture and assembly are calculated according to manufacturer's instructions.

Statics

The statics information published by us, as well as the Chart on the greatest possible window dimensions have been prepared to the best of our knowledge. Construction elements dimensioned according to the correct application of this information and processed expertly are thus sufficiently dimensioned in line with the currently applying industry norms. Supporting structures and enforcements must be defined according to individual static calculations. Our suggestions and proposals regarding statics have to be checked by the processing specialist, by a certified stress analyst, or by the architect before order placement, and be accepted by the orderer.

2. Requirements regarding the processing company

Production facilities

An essential preliminary for the professional processing of RAICO products is the availability of appropriate technical devices and machinery in the company which will process RAICO materials. Facilities must be furnished in such a way that profiles and construction parts will not be damaged during storage, removal or processing. All materials and parts must be stored in a dry place and in a way that they will not be subject to damage caused by external influences. In particular, they must be safely kept away from lime, mortar, dirt, steel chips, grinding sparks, acids, and the like. Concerning the use of solvents, the Data Sheet (MO 17) published by the Berufsgenossenschaft der chemischen Industrie (the German Government Safety Organization of Chemical Industries) is binding.

Instructions and employee training

In order to keep up with newest technical standards it is essential to provide the necessary training - by the study of our documentations on how to process our materials and products, by the study of specialist literature, by visiting seminars etc.

Dimensions, drawings, statics

All measures such as site measuring, cutting measures, glass measures must be determined by the processing company independently. It is necessary to back up details, connections etc. with the help of drawings, and to carry out static calculations for stressed profiles and bracings, and have them checked if applicable.

3. Norms

The basis for these Technical Conditions are the following relevant DIN norms (German industrial standards), or DIN EN norms respectively, applying to the construction of façades, windows and doors:

DIN 1055	– Parts 1 to Part 5, load assumptions for buildings.
	– Part 4 A 1 (Additional DIN 1055 Part 4), aerodynamic form co-efficients for building structures
DIN EN 573	– Parts 3 and 4, extruded aluminum sheaths and sheaths made of forgeable aluminum alloys, features and technical delivery terms
DIN 1748	– Parts 3 and 4, extruded aluminum sheaths and sheaths made of forgeable aluminum alloys, design and allowable tolerances
DIN EN 755	– Parts 1 and 2, extruded aluminum sheaths and sheaths made of forgeable aluminum alloys, features and technical delivery terms
DIN 4102	– Parts 5, 13, 18, reaction of building materials and components to fire
DIN 4108	– Parts 1 to 5, heat protection in high-building
DIN EN ISO 10077-1	– Thermo-technical qualities of windows, doors, and joints
DIN 4109	– Sound proofing in high-building
DIN 4113	– Part 1, aluminum constructions under predominantly static stress
DIN EN 12152	– Light curtain-wall façades, joint permeability, requirements and classifications
DIN EN 12153	– Light curtain-wall façades, joint permeability, inspection method
DIN EN 12154	– Curtain-wall façades, tightness to hard rain, laboratory testing under static stress
DIN EN 12179-4	– Light curtain-wall façades, resistance to wind stress
	– Part 4: Laboratory testing
DIN 17611	– Anodized semi-finished goods made of aluminum and forgeable aluminum alloys with layer thicknesses of at least 10 mm, technical delivery terms
DIN 17615	– Parts 1 to 3, precision profiles made of alloys type AlMgSi 0.5
DIN 18055	– Windows, joint permeability, tightness to heavy rain, and mechanical wear. Requirements and testing.
DIN EN 12207	– Windows and doors, air permeability, classification
DIN EN 12208	– Windows and doors, tightness to heavy rain, classi

DIN 18056	– Window walls, dimensioning and construction	DIN V ENV 1630	– Windows, doors, closings-off – burglary inhibition – testing procedures for determining the resistance against manual attempts at burglary
DIN 18073	– Closing-off by rolling elements, sun protection devices and blinds in construction, definition of terms and requirements	DIN V 18103	– Burglary-inhibiting doors, definition of terms, requirements; testing, labeling
DIN 18095	– Parts 1, 2 smoke protection doors	DIN V 18054	– Burglary-inhibiting doors, definition of terms, requirements; testing, labeling
DIN 18201	– Tolerances in construction, definition of terms, basics, application, and inspection	DIN EN 1522	– Windows, doors, closings-off – inhibition of full-penetration shots – requirements and classification
DIN 18202	– Tolerances in high-building, buildings	DIN EN 1523	– Windows, doors, closings-off - inhibition of full-penetration shots – requirements and testing procedures
DIN 18263	– Part 1 and Part 4, locks and hardware, door locking devices with hydraulic absorption	TRLV	– Technical regulations for the usage of glazings with linear supports
DIN EN 1154	– Door locking devices with hydraulic absorption, automatic door closers with linear operation, door closers	TRAV	– Technical regulations for the usage of glazings with anti-fall guards
DIN EN 1155	– Door closers with hydraulic absorption: lockable door closers with and without override		
DIN 18273	– Door handle fittings, doors with protection against fire and smoke		
DIN 18351	– VOB (German Construction Contract Procedures), Part C General technical contractual terms for construction work and façade works		
DIN 18357	– VOB (German Construction Contract Procedures), Contracting rules for award of public works Part C, General technical regulations for construction work, hardware works		
DIN 18358	– VOB (German Construction Contract Procedures), Contracting rules for award of public works Part C, General technical regulations for construction work, rolling shutter works		
DIN 18360	– VOB (German Construction Contract Procedures), Contracting rules for award of public works Part C, General technical regulations for construction work, metal construction work, locksmith works		
DIN 18361	– VOB (German Construction Contract Procedures), Contracting rules for award of public works Part C, General technical regulations for construction work, glazing works		
DIN 18516	– Parts 1, 3, 4, cladding for external walls ventilated at rear		
DIN 18545	– Parts 1 to 3, sealing of glazings with sealing compounds		
DIN 52290	– Parts 1 and 5, assault-inhibiting glazings, definition of terms; testing of features inhibiting full-penetration shots, and classification		
DIN EN 1063	– Assault-inhibiting glazings, definition of terms; testing of feature inhibiting full-penetration shots, and classification		
DIN EN 356	– Assault-inhibiting glazings; testing of features inhibiting assault with cutting and beating tools. Testing of features inhibiting full-penetration throwing, classification.		
DIN V ENV 1627	– Windows, doors, closings-off – burglary inhibition – requirements and classification		
DIN V ENV 1628	– Windows, doors, closings-off – burglary inhibition – testing procedures for determining the resistance against static stress		
DIN V ENV 1629	– Windows, doors, closings-off – burglary inhibition – testing procedures for determining the resistance against dynamic impact		

All our systems and technical products have been developed in accordance with the preliminaries and conditions of the Deutsche Institut für Normung e. V. (DIN, i. e. German Institute for Industrial Norms). In individual cases, deviations from norms valid outside the coverage of DIN standards may occur. Our customers are advised in any case to make comparisons with valid national norms and standards as well.

Quality control

The features and functions of our systems, as described and evaluated in test reports, certificates etc. can only be expected when using original RAICO products. In order to ensure perfect quality, only our original parts should be processed.

Regulations and recommendations

VDI (Association of German Engineers) regulation 2719 – sound protection Chart for determining the exposure categories regarding window glazing – Institut für Fenstertechnik e. V. Rosenheim (Institute for Window Technology), explanatory notes on glazing – Institut des Glaserhandwerks für Verglasungstechnik und Fensterbau (German glazing crafts institute for glazing technology and window construction).

Systems admitted by building inspection authorities must be manufactured according to the admittance declarations (DIBt). Deviations from the admittance declarations must in any case be authorized by the superior building supervision authorities.

4. Materials and products

Materials delivered by us have been manufactured according to applying norms and standards. Materials and products made of materials produced outside our area of influence are to be selected by the processing company at their own accountability.

Aluminium

For the manufacture of aluminum windows, façades, etc. we deliver anodized profiles made of AlMgSi 0.5 F 22 alloy. For specific anodizing procedures, such as single-stage procedures, deviating specific alloys must be used. Specific alloys can be delivered by us only upon prior inquiry and agreement from our side. Extruded aluminum sheaths are delivered in accordance with DIN 17615. We deliver metal sheets and bands in accordance with DIN EN 485, Parts 1 and 2. Various materials and forms of delivery (profiles, metal sheets, bands) are to be adjusted according to the required looks and appearance.

Profiles made of plastic

The qualities of the used molding material corresponds at least to the molding material PVC-U, EDLP, 078-25-28 according to

DIN EN ISO 1163, Parts 1 and 2. Slight flat unevenness caused by production are admissible inasmuch as their correct functioning will not be affected.

Steel

Regarding steel parts necessary for load-bearing construction elements and anchoring constructions, DIN 18800 Part 4 and DIN 18801 apply. All steel parts no longer accessible after assembly must be galvanized. Admitted procedures are hot galvanization and flame spraying galvanization. DIN EN ISO 1461 applies regarding the welding spots of galvanized constructions, and the spots where the corrosion protection of the steel parts is subject to damage during assembly. Parts no longer accessible after assembly must have a surface protection according to DIN 18360 fig. 3.1.8 or higher.

Joining elements

Connecting elements such as screws, bolts, rivets etc. must be sufficiently protected against corrosion. If used together with aluminum they must be made of specific alloys. Aluminum may be used for parts exposed to less static stress.

Under particular climatic or other environmental influences, fixing elements made of stainless steel A4 must be used, especially when visible outside. The processing company has to make sure about their usage at its own accountability.

Hardware

According to our specifications, RAICO hardware and relating components are sufficiently dimensioned and protected against corrosion in regard to the expected exposure and wear. Hardware parts are to be selected by the processing company according to the wear and tear expected under normal conditions. Only hardware as approved and admitted by us is to be used. Movable hardware parts must be maintained.

Thus the wear and tear of movable parts and their susceptibility to corrosion will be reduced. The intervals for cleaning and care depend on the environmental conditions

Glass

The particular guidelines issued by glass manufacturers regarding the processing of insulation glass and special glass apply. Glass manufacturers must produce triplex glass in general, and duplex glass from a glass thickness of 36 mm and higher on the standing edge, to ensure even glass load transfer.

Sealing compounds for glazing and sealing

Used sealing compounds must be resistant to influences of age and climate, and have to be malleable or permanently elastic, depending on the applied load. They must be suitable to their intended purpose, in line with DIN 18545 according to all applying individual requirements.

Sealing profiles

The sealing profiles which are used must be non-hardening and abrasion-proof, and must keep their elastic qualities including their reset force to a large extent within the existing temperature range. The shore hardness must remain the same with only little tolerances. Sealing profiles have to be resistant to normal atmospheric influences.

Assembly of various materials

When assembling various materials, it must be ensured that neither corrosion nor other unfavorable influences occur. In particular it must be ensured that no disturbing sounds will be caused by changes in length as a result of temperature influences.

5. Construction features

System profiles

We only deliver profile systems which have been tested, admitted and certified, if necessary, by an acknowledged test institute or by the DIBt. The processing company will itself select the profile systems to be used, considering the expected requirements. Profile dimensions regarding frame, wing, mullion and transom are to be determined according to statics for profiles and hardware. For blind frames and sashes, hollow profiles are to be used in general.

Corner connectors and T-connectors

The production of corner connectors, T-connectors, butt joints and angle couplings for construction elements, by welding, screwing and bonding, bonding with off-center pins, pressing and bonding, must be done in accordance with the valid regulations. For an adhesive a cold-hardening two-component glue is to be used. The joints must feature sufficient firmness, stiffness and tightness throughout the complete profile's cross-section.

System drainage

The drainage of the system must be provided for. Penetrating water must be drained off in any case. Please refer to the drainage cross section as shown in RAICO's processing guidelines. All openings and joints in the frame (such as screw holes, notches of the corner connectors, and the like) must be made tight, particularly regarding the lower horizontal zone. Water tightness at miter joints, joints and crossings of the construction must be ensured.

Assembly of the components

Where the construction makes joints necessary, additional polytuft brushes, or EPDM/chloroprene sealings respectively, must be used for soundless moving and gliding. Where directly joined or screwed profiles and components have been used, functional sealing bands or interlayers are to be used in order to avoid permeability, sound emission caused by expansion, and contact erosion.

Static requirements

All components must absorb the affecting forces and transfer them to the supporting structure of the building. DIN 18056 on window walls, dimensions and processing applies.

Wind loads

Wind loads must be considered according to DIN 1055, Part 4 with the addition on increased suction coefficients (at the building edges), if no exceeding loads are indicated.

Superficial loads

If the load of a person leaning out affects the transom (when the window wing is open), the additional vertical load which is then required must be considered as well. In case of ceiling-high infills the horizontal superficial loads (caused by persons pressing against the mullion or transom from the inside) must be accounted for.

Special loads

Additional loads, such as sun protection devices, scaffolds, etc. must be considered in the static calculations.

Our standard products and systems are not to be used in maritime environments, swimming pools and spas without prior modifications.

Bending

The determined flection of mullion and transom must be in accordance with the requirements as defined in DIN 18056. Additional requirements, in particular when using specific insulation

glass panes, must be considered when calculating the admissible deflection.

Protection against heat and humidity

According to DIN 4108 on heat protection in high-building, building components are among light external walls when featuring weights of up to 300 kg/m². The resulting influences on the room climate must be particularly considered, above all regarding the type and location of heating and air conditioning, heat storage, wall surfaces, and the respective solar radiation. The builder's requirements are to be tuned to the economical and technical possibilities in window construction. In particular, DIN 4108 applies here. Drainage measures must be agreed. The applicable insulation and avoidance of thermal bridges must be considered when external wall claddings, carriers, supports, panels and other fillings are used.

Rear-ventilated wall claddings

Wall claddings and socle wainscotings ventilated from the rear must be done in a fashion that little quantities of water having penetrated the ventilation gap are led to the outside in a controlled manner. Inasmuch as is required, anti-drumming devices have to be built in. The openings for entering and escaping ventilation air must be distributed evenly over the width, their total resulting in a sufficient cross section. In any case, a rear-ventilated façade requires a perfectly insulated and airtight wall.

Sound proofing

For bigger sheet surfaces, claddings, cover profiles and window sills, anti-drumming materials must be used. VDI guideline 2719 on the sound protection of windows and DIN 4109 on sound protection in high-building are the basics. If higher requirements than those defined in sound-protection category 2 are demanded, particular requirements must be considered and agreed.

Sun protection

Sun protection devices and the resulting construction design must be agreed between the processing company and the builder.

Protection against fire and smoke

Due to building regulations and obligations by local authorities differing regionally, protective measures against fire and smoke must be taken from the tender documentation, or agreed with the orderer.

Movement and deformation of building and building components

Building components must not absorb loads from the structure. Snow loads, differences in temperature, as well as lowering and shrinking must be considered. Expansion joints must be done accounting for differences in temperature from – 20° to + 60° Centigrade with light surfaces of natural color; with colored and dark surfaces from -20° to +80° Centigrade.

6. Production

Accuracy grade, surface qualities and deformation risks have to be checked before cutting. For the manufacture and processing of our constructions we provide multiple processing guidelines, tools, and auxiliary means to the processing company, which serve as a help to reach the required quality standards. General basic processing instructions will not be mentioned here.

Processing

The focus must be on the angular accuracy during cutting and assembly in particular. With steel profiles or heat-insulated profiles, fitting pieces should be used for precise cutting. The effect caused by released internal stress, deflection and the like in the

profiles must be checked not only before and after cutting, but also after milling and stamping. The cutting edges must be deburred carefully. Especially the burs from the workpiece must be removed wherever they inhibit correct functioning or result in possible accident hazards.

During production, the following issues must be carefully observed:

- a) Accuracy of fit, flush corner connections and joints
- b) Dimensional accuracy of profiles and components
- c) Build-in of sealings and tightness, fitting accuracy of corners and joints
- d) Drainage (dimensioning and distribution)
- e) Sealing of all profile joints, notches, and screwing
- f) Fitting accuracy of the wing bearing
- g) Damages to the surface
- h) Hardware must be mounted according to the newest state-of-the-art technology and to our specific instructions in such a way that the smooth-running motion (by lubrication), correct fit of the hardware, and tightness of the component will all be ensured.
- i) Lubrication of all moving parts (lock bars, scissors, handles, etc.)

Function test

RAICO components, being high-quality items with long life cycles, should fulfill, among others, the following requirements:

Tightness against heavy rain

A window's tightness against water penetration is defined according to DIN EN 12208, and is categorized by four exposure groups. The exposure group to be chosen depends on the geographical location, a normal or excessive wind load, the form of the building, the position of the building and its height. If not agreed otherwise, DIN EN 12208 applies.

Hardware function

Ensuring the easy operation of all hardware. Faultless functioning of the safety devices, or the faulty-operation blockers respectively.

Surface treatment of aluminum

All component surfaces have to be protected against influences normally expected. The processing company decides at its own accountability on the suitable individual surface treatment. It will also make sure that specific features of the construction, such as the combination with metals of higher value within the electrochemical series (Cu, Sn, Pb etc.), will be considered, as well as specific emissions caused by the individual location including the effect of sea water. We do not give any warranty for profiles hardware and components which have been anodized or color-coated outside our area of influence; in particular this applies to combinations of heat-insulated profiles.

Anodic oxidation

The surface treatment of components made of aluminum must be carried out in accordance with DIN 17611. The look of the surface in regard to shine, structure, color shade, and evenness, and the required surface treatment (E0 – E6) are to be taken from the tender documentation or agreed individually.

For color shading only procedures are admissible which create oxidation layers that are color-fast and light resistant without exception. For judging varieties in appearance and color, an evaluation by means of average or limit samples must be agreed.

Please observe:

The E0 procedure is only applicable in case that there are no demands whatsoever regarding an even, decorative surface. The E6 procedure may only be applied under the condition that the factory-packed aluminum can be transported within an assuredly short time from the manufacturing factory to the anodizing workshop. The profiles must not be exposed to humidity and/or affected by human sweat, or subjected to lack of packaging during transport, storage, inappropriate handling and the like. If these preliminaries are not observed, RAICO cannot accept any warranty claims.

Coating

Color coating procedures of the surface of aluminum components are not standardized. Due to the various possible procedures, details are to be taken from the tender documentation, or agreed with the orderer and RAICO (in case we deliver surface-coated profiles). Regarding high-gloss colors undesirable effects may be more clearly visible than in case of standard coating. This cannot be influenced by RAICO. At offshore locations and in indoor swimming pools with brine water or sea water, filiform corrosion may occur. In these cases the usage of pre-anodized profiles is recommended. Please inquire for more details.

Protective measures during completion time

According to VOB (Contracting Rules for Award of Public Works), the building owner is liable to all damages regarding his services until buy-off through the building owner. For temporarily protecting the components during completion time, in particular against mechanical damage or damaging effects of plaster, mortar, cement, color and the like, adhesive tapes, plastic foils and suitable protective paint can be used which can be removed later without leaving traces.

7. Transport and assembly

During transport and storage, appropriate protective measures are to be taken in order to avoid damages. Assembly of the components is to be done only after having finished all plastering work. On demand of the building owner and for a certain compensation to be agreed on, the components must be protected against possible damage with the help of protective bands or foils in case later plastering work is carried out.

Fastening

Build-in and bracing must be carried out according to DIN 18056 and DIN 18360. It must be ensured that the bracing safely transfers forces from the building component to the structure. The fixing elements must be adjusted to the building shell, supporting the adjoining profiles in such a way that they will be protected against torsion and bending. In case the firmness in the bracing spots seem doubtful, the orderer must be informed without delay according to VOB/B § 4, Paragraph 3 (German Construction Contract Procedures). If components with moving wings, mullions and transoms are used, the blind frames must be mounted in such a way that the forces emanating from bands, bearings, mullions and transoms will be transferred to the structure. Each side of the window wall must be joined to the structure at least at two points. The maximum distance of the bracing spots is 80 cm. The necessary assembly clearance, caused by thermal expansion of the building components, necessary sealing joints, and dimensional changes of the adjacent components has to be controlled by means of expansion joints. If required, gliding elements for expansion compensation which are soundproof, airtight and watertight must be used. During mounting and plastering, door frames should be planned, also considering heat insulation and moisture barriers.

Sealing

If not defined otherwise in the tender documentation, the parts of the building which serve as brick partitions (such as windows, window walls, doors, etc.) must be sealed in the joints of the building structure and the components by suitable sealing materials. The joints must be tight and sealed according to DIN 18360 and DIN 18540. Bigger hollow spaces at joining walls or joints in the construction have to be rear-ventilated by using water-repellent bands to fill the joints, with pore blocking. Only bands are allowable which can change their volume elastically due to their structure. Exterior joints and joining walls are sealed by means of permanent sealing agents or EPDM foils to be glued or clamped. For proper processing, sealing joints must be clean, dry and greaseless. The sealing joints must be dimensioned according to the instructions given by the manufacturers producing sealing agents.

Glazing

The glazing of window panes, panels, fillings and the like is to be carried out according to DIN 18361 (glazing work). Glass manufacturers' guidelines on glazing procedures must be observed. The company in charge of window construction, if not carrying out the glazing itself, upon order receipt must agree on the precise manner and execution of glazing works with the glazing company before placing the order on glass. The glazing contractor has to be informed on the selected system type, or way of mounting. The guidelines issued by the German Institute of Glazing Crafts referring to glazing technology and window construction, and the processing guidelines issued by the sub-suppliers of glass panels and insulation glass must be considered.

Wet glazing

For wet glazing the 'Chart for determining the exposure categories of window glazing', published by the German Institute for Window Technology must be considered.

Dry glazing

For dry glazing with duplex sealing profiles, the rebate must generally be equipped with a ventilation system and a controlled drainage system towards the outside. Materials used for the sealing profiles will be selected according to expected exposure. When processing the sealing profiles it is important that the tolerances and dimensions of the rebate width without sealing, of the sealing itself, and of the filling elements (e. g. the glass pane) will be adjusted to each other, ensuring that the adding tolerance values will not exceed the maximum allowances, and that they will remain water-tight (please see processing guidelines). Principally, however, the guidelines on glazing are to be considered.

Pressure glazing

For pressure glazing the specific processing guidelines issued by glass manufacturers and system producers must be followed.

Usage of blocks

With glass panes, panels, fillings and the like, blocks made of plastic or impregnated water-proofed hardwood featuring a minimum length of 10 cm must be used in an expert way dependent on the type of wing and rebate, to ensure that the wings will not touch and scrape. When single-sheet glazing and insulation glass are used, the guidelines on the use of blocks with even glass panes must be observed (as issued by the German Institute of Glazing Crafts for Glazing Technology and Window Construction).

Controlled drainage

Rain water and leak water penetrating from other building components must be collected right above the metal construction,

and drained off in a controlled manner. Water caused by rain, condensation and leak caught in the construction itself must be collected and drained off in a controlled manner within the lower horizontal of each zone, whether applying to glazing zones or wings with differing varieties of opening.

When collecting this water, the maximum level the water will rise inside the collecting chamber must be taken into account, also considering external pressure. The rising level should be at least 10 mm and must be increased according to the expected maximum external pressure. Collected water must be drained off in a controlled manner to the outside, preventing it to penetrate the building structure.

Cleaning

Assembled components must be cleaned before buyoff, dirt and soil caused by mounting must be removed. Only allowable cleaning detergents may be used. Additional cleaning procedures have been defined in Explanatory Note A 5 on cleaning aluminum in construction (issued by the German Aluminum Center).

Protective measures

To ensure faultless functioning and long life-cycles of hardware parts, suitable lubricants and grease have to be applied to moving hardware elements.

Final inspection

Before delivery of the building components to the orderer, the following functions must be checked:

- a) the evenness of joints between frame and window sash, and the even circumferential wing bearing
- b) the easy motion and correct functioning of all hardware parts
- c) the operation blockers
- d) the correct and faultless fit of the wing seals
- e) the openings for ventilation and drainage of the rebate.

§ 1 Validity of the General Terms of Sale

1. Our Terms of Sale shall apply exclusively. They shall apply even where we unreservedly effect delivery to the Customer whilst aware of the Customer's conflicting provisions or provisions at variance with our Terms of Sale. Customer's diverging General Terms of Business are hereby strictly opposed. These shall only form part of the Contract when their validity for each individual contract has been explicitly confirmed in writing by us. We will not accept any differing terms and conditions notwithstanding that we may not have expressly rejected them nor by means of our referring to correspondence with the contractual partner in which reference is made to the contractual partner's terms and conditions. Conclusion of the Contract shall not fail due to conflicting General Terms of Business. Each provision within these Terms and Conditions shall be valid on its own. Our Terms of Sale shall only apply to entrepreneurs pursuant to § 14, Section 1 of the German Civil Code (BGB) and to legal entities under public law or to special public funds. 2. Where colliding General Terms of Business tally with one another, the concurring resolutions shall apply. Beyond this, those sections of our Terms of Sale shall be deemed accepted where no provision in the Customer's General Terms of Business collides with them. On the other hand, those provisions in the Customer's General Terms of Business not fully concurring with the contractual substance of our General Terms of Business shall not form part of the Contract. In all other cases *ius dispositivum* shall apply. 3. These Terms of Sale shall apply in their current version also for all future contracts on the delivery of goods and on subsequent deliveries between the Parties in this business relationship without there being a need for repeated inclusion of, or reference to, these Terms of Sale after the initial agreement. 4. In the case of written documents appended with a translation into a foreign language relating to a Contract for which German is the official language, the translation shall only serve as information. The German wording alone shall be conclusive in determining the subject of the Contract. 5. All agreements concluded between ourselves and the Customer for the purpose of implementing this Contract must be set down in writing within this Contract. Additional agreements, subsequent changes to the Contract and provisions of guarantees, in particular assurances of characteristics or the assumption of procurement risks by non-authorised persons, must all be made in writing.

§ 2 Offers/Quotes

1. Offers made by us shall be subject to change. These represent an invitation to the Customer to place a binding offer for the conclusion of a Contract (order) and are therefore not yet binding for us at this stage. We are entitled to accept orders within a period of 4 weeks. During such time the Customer is legally bound to honour his order offer. 2. Contracts shall not be binding for us unless we accept the order by means of written order confirmation. We shall not be required to oppose a potential Customer's written order relating to an offer of this kind should the Contract fail to be concluded. 3. Delivery dates are estimates only and are without obligation unless we have expressly agreed to their being binding. Descriptions and photographs of our goods and products in catalogues, leaflets, circulars, advertisements and price lists, insofar as these are not part of our quotation are always only approximate and shall only become subject of the Contract when this is expressly indicated and laid down in the Contract. Drawings, illustrations, dimensions, weights or other performance data shall only be binding where this is expressly agreed in writing. 4. We reserve the right to make changes at any time to the subject of the Contract prompted by technical progress, rationalisation or design requirements insofar as these changes are within those that are customary in the trade and are reasonable to the Customer. We also reserve the right to make those changes to colour, weight etc. that are customary in the trade. 5. Should a change to the subject of the Contract not fall within those customary in the trade and should it also not be reasonable to the Customer, the Customer shall be entitled to cancel the Contract – a right which he can exercise in writing within 2 weeks of receiving relevant notification from us. Cancellation at a later date shall be excluded due to the relevant amendment to the Contract having taken effect by then.

§ 3 Offer Charges, Offer Documentation and Copyrights

1. As a rule, the initial processing of an offer is free-of-charge. Further offers and planning work shall only be free-of-charge when the delivery contract becomes valid and remains so. 2. We reserve ownership and copyrights on illustrations, drawings, designs, sketches, calculations and other documents; access to these may not be given to third parties without our written consent. These may neither be copied nor reproduced in any other manner without our consent and on request they must be returned to us once the order has been carried out. 3. Those moulds, samples and dies produced by us in order to fulfil the Contract shall remain our property. Furthermore, we shall not be obliged to surrender these to the Customer even if the price for these has been indicated separately in the Contract or invoice, in the absence of explicit contractual agreements to the contrary. We shall be entitled to the copyrights for the said moulds, samples and dies. 4. With goods manufactured to the Customer's drawings, specimens or other specifications, the Customer shall assume liability where patents and other copyrights of third parties are violated. The Customer shall undertake to release us from any such claims to this effect.

§ 4 Prices

1. Unless agreed otherwise, all prices shall be net "ex works" plus statutory VAT valid at the invoice issue date. Additional costs such as packaging, freight, forwarding expenses, customs, assembly, insurance and bank charges shall be charged separately. 2. In the absence of any other agreement to the contrary, we shall be bound to the prices agreed for a period of 30 days. Should costs then change (in particular due to wage settlements or changes in the cost of materials) once the commitment period has come to an end but prior to delivery, we shall be entitled to alter the agreed prices respectively. On request we shall provide proof of this change in costs. 3. With repeat orders prices shall be agreed upon afresh. Should no such agreement materialise, we shall be entitled to set the prices unilaterally at our discretion. 4. Where value added tax is not included in our invoice – particularly because notification by the Customer suggests an "intracommunity" delivery pursuant to § 4 No. 1 b in conjunction with § 6 a of the German VAT law (UStG) – and because we shall be subject to subsequent VAT (§ 6 a, IV of the German VAT law - UStG) – the Customer shall be obliged to pay us the sum we shall be charged in this context. This obligation shall stand regardless of whether we are subsequently required to pay value added tax, turnover tax on imports or any comparable taxes domestically or abroad. 5. If on any given delivery date, which is at least four months after the date on which the contract was concluded, any changes should occur to the basis on which prices have been established (e.g. an increase in the price charged for raw materials, materials, wages, transportation or storage), we shall reserve the right to adapt our prices accordingly after informing the purchaser of this change, whereby the individual cost elements and their increase shall be given a fair weighting in determining any new prices. In the event that individual cost elements should increase whilst others decrease, this shall also be taken into consideration when determining the new price.

§ 5 Lead Time, Delivery Periods, Delays, Neglect of Duty and Acts of God

1. In the absence of any contractual agreements to the contrary, agreed delivery deadlines shall be deemed as observed when, by this time, the delivery item left our works, was handed over to the forwarding agent at our works or was indicated ready for dispatch to the Customer. 2. Where fulfilment of the order depends on documents and permits being furnished or essential questions being clarified by the Customer, any delivery deadline consented to or agreed upon by us shall only remain binding once the Customer has clarified the said question or furnished the said documents or permits by the start of the 10th week prior to the delivery deadline. What documents and clarifications are to be furnished in the context of this stipulation shall depend on the separate provisions of both Parties to the Contract or shall result from the nature of the Contract. 3. In the absence of agreements to the contrary, delivery periods shall commence once the order confirmation has been sent. 4. Delivery periods shall, however, not commence until the Customer has furnished the required documents and permits and has clarified those questions essential for the implementation of the Contract. What documents and permits are to be furnished and what questions are to be clarified by the Customer shall be determined by the individual contractual agreements made by the Parties or by the nature of the Contract itself. 5. Observance of the delivery period shall depend on the Customer fulfilling his agreed advance payment obligations. Beyond this, the delivery period shall likewise commence on fulfilment of those contractual obligations of the Customer which are laid down

separately with reference to this provision in each individual contract or which result from the nature of the Contract. Furthermore, the delivery period shall only commence subsequent to the full and faultless fulfilment of all those contractual obligations of the Customer which are essential and necessary for the performance of our obligation. 6. Should we accept a request for a change to the contractual services expressed by the Customer subsequent to concluding the Contract, those delivery periods and deadlines agreed upon shall become non-binding. We shall make every effort to indicate to the Customer new delivery, commissioning and acceptance deadlines for the goods he has ordered as swiftly as possible. We shall, however, be entitled to give priority consideration to other obligations when finding new deadlines in this context. 7. In the event of delays in delivery as laid down in the above-mentioned provisions, a new delivery and/or assembly date shall only be binding subject to written consent by us or an authorised member of our staff. The same shall apply in cases where the date has become non-binding due to legal regulations. 8. Delivery periods shall extend appropriately or the delivery date shall be postponed by a reasonable period due to circumstances prompted by industrial action, in particular strikes or lock-outs, or due to the advent of unforeseen hindrances beyond our volition such as breakdowns, energy or raw material shortages, traffic disruption, energy supply problems, measures taken on the part of the authorities, sovereign interventions or orders in so far as those hindrances are proven to have a significant influence on the completion or delivery of the items. This shall also apply where such circumstances have effected upstream suppliers. The same shall apply for hindrances caused by Acts of God. Likewise, we cannot be held responsible for the circumstances described above where they occur during an already existent delay. Should the disruption last for over 3 months, each Party to the Contract shall be entitled to withdraw from that hitherto unfulfilled section of the Contract in writing within a period of 2 weeks without recourse to claims for compensation. Should withdrawal arise, the outlay for work already carried out incl. material must be reimbursed. At the request of either Party to the Contract, the respective other Party must declare whether he wishes to adhere to the Contract once the 3-month delay period has expired. We shall be obliged to notify the Customer in writing of any delay at the earliest possible convenience. The same shall apply when the delay ceases to apply. 9. We always reserve the right to honour our delivery obligations subject to the correct and timely delivery of our own supplies. 10. In the event of us being responsible for a transgression or failure to observe the delivery periods, the Customer shall be entitled to cancel the Contract in accordance with legal provisions, subsequent to his setting us a deadline of at least 2 weeks in writing and this deadline also expiring without being met. He may cancel without setting any deadline where the conditions laid down in § 323, Section 2 of the German Civil Code (BGB) are met. Declarations of cancellation or refusal and the fixing of final deadlines can only be made in writing. 11. In the event of neglect of duty on our part however, we shall only be obliged to compensate for damages where premeditation or gross negligence can be ascribed to us or one of our vicarious agents employed. This shall not apply in the case of a firm deal. Legal provisions concerning the burden of proof shall remain unaffected by this.

§ 6 On-Demand Delivery

1. We can dispatch orders as part deliveries insofar as these remain within those customary in the trade and are reasonable to the Customer. These part deliveries must each be paid for separately in accordance with our terms of payment. Once we have effected part delivery, the Customer shall be entitled to assert his rights arising from § 5, Nos. 10 and 11 of these General Terms of Business, also in terms of the entire Contract, should the conditions laid down therein prevail and the Customer have no interest in part delivery. 2. Should delivery on demand be agreed upon, we shall be entitled to cancel the Contract and/or claim for damages instead of demanding payment where the Customer delays in demanding delivery and we have set an appropriate deadline to no avail. Claims for damages shall not be permitted should the Customer not be responsible for the delay. Our claim for compensation due to delay pursuant to § 280, Section 1, Section 2 of the German Civil Code BGB in conjunction with § 286 of the German Civil Code (BGB) shall remain unaffected by this. Alternatively in this case, we shall be entitled to demand the agreed purchase price for preparation of the entire delivery. 3. Goods ordered for delivery on demand must be requested in full within no more than 3 months subsequent to order confirmation where no other deadline has been agreed.

§ 7 Passing of Risk and Transport

1. In the absence of other separate agreements to the contrary, delivery shall be effected ex works at 87772 Pfaffenhausen. This shall also apply for part deliveries. 2. Where the goods are sent to the Customer at his request or as agreed, the risk of accidental loss/destruction and accidental deterioration shall pass (insofar as this is legally permitted) to the Customer as soon as the goods leave our works – also in the case of part deliveries. This shall apply regardless of whether the goods are dispatched from the place of fulfilment or from another location and regardless of who bears the freight costs or who transported the goods to the Customer or to a forwarding agent. 3. Where those goods to be dispatched to the Customer or collected by the Customer pursuant to the above provision are surrendered to the forwarding agent or the Customer at the works, the risk shall then pass to the Customer to the extent described above. 4. In the absence of other agreements to the contrary, we shall determine the means of transport and the transport route chosen here without there being any onus on us to select the fastest and cheapest option here. Where the Customer so wishes we shall insure the consignment against damage incurred during transit, storage and assembly on behalf and at the cost of the Customer. Where the Customer's place of business is both place of performance and place of effect as a result of an explicit agreement, we shall be entitled to insure the consignment against damage incurred during transit, storage and assembly on behalf and at the cost of the Customer. 5. Where the goods are transported by third parties and where the goods remain uninsured, particularly at the explicit request of the Customer, these goods shall be transported at the Customer's own risk. 6. Insofar as we bear the transport risk pursuant to the above provisions, the Customer shall be obliged to facilitate the settlement of claims with insurance companies for us to the best of his endeavours. More specifically, the Customer must satisfy himself of the condition of the consignment immediately on its arrival and must have any possible damage in transit assessed forthwith by the relevant body (station of arrival, delivery post office, forwarding agent) and must relay this information to us without delay. Where the insurance company effects reduced payment to us due to insufficient involvement of the Customer in assessing the damage and in settling the claim, we shall be entitled to charge the Customer the insurance company's shortfall in payment. 7. Where the goods are ready for dispatch and where their dispatch or acceptance is delayed for reasons for which we are not responsible, the risk shall pass to the Customer on receipt of notification announcing the goods' readiness for dispatch. The same shall apply where the goods are not called up for delivery within the set period in the case of delivery on call.

§ 8 Acceptance

1. The Customer must take acceptance of delivered items – even those which are defective. Where he refuses to do so indicating the alleged defects, he shall not be entitled to derive claims for damages from his inability to use the said goods. He shall also bear the risk of further deterioration in this respect. His rights in the event of defects shall remain unaffected by this. Acceptance of the delivered items shall not be subject here to an acceptance of goods pursuant to § 640 of the German Civil Code - BGB). 2. Where delivered items are taken into operation without any reservations, this shall be deemed as an acceptance regardless of whether consignments or other services, in particular assembly, are yet to be effected by us. 3. In case of our exceptional voluntary agreement given in advance and in writing without implying any acceptance of a statutory duty, to partially or completely accept goods returned to us, the following applies: Only goods returned in a faultless technical and optical condition coming in their original packing, in complete packing units, and without any missing items, will be accepted by us. The original Bill of Delivery must be included in the return shipment, which has to be sent by the purchaser to us free of postage and handling. After corresponding receipt of the goods, the customer then receives a goods credit note less the costs of putting back into storage, which depend on the value of the goods returned. In the case of a goods value of < 300 € the fee for putting back into storage is 30 %, 20 % for a goods value of > 300 € to < 600 €, 15 % for a goods value > 600 € to < 1,000 €, 10 % for a goods value of > 1,000 €. However, returned goods are only accepted by us in any case and are offset against a credit note, if a

maximum of 6 months has passed between the date of the delivery note of the original delivery and the date of the return of goods. However, we will in any case only accept goods returns and issue a goods credit note if the period between the date of the delivery note and the date of the goods return does not exceed 6 months. Hazardous items and goods with a limited shelf life are excluded from returns.

§ 9 Terms of Payment

1. Our invoices are payable with a 2 % discount within 10 days of the invoice date or 30 days net, departing from the net value of the goods (as per payment received date). 2. We shall only accept means of payment going beyond cash or transfers to those accounts indicated on the invoices for the sake of fulfilling the Contract – this shall particularly apply in the case of bills of exchange or cheques. All payments must be effected free of charge to us. Bank, discount and collection charges shall be borne by the Customer. Payment by bill of exchange shall be subject to prior agreement. Discount on payments by bill of exchange shall not be granted. The surrender of bills of exchange and cheques as such shall not be considered as settlement of outstanding accounts. 3. In the event of culpable default on payment subsequent to the due date we can, without the need for any reminders, demand interest of 8 percentage points above the current base interest rate from the Customer as a contractual penalty. Where we are in a position to prove greater delay-related damage, we shall be entitled to assert this claim. As soon as those pre-conditions required to lodge a claim for compensation prevail, our claims shall be regulated in accordance with § 11 of these General Terms of Business. 4. The Customer shall neither be entitled to withhold any payments nor to set off any payment obligations in the event of counter claims being disputed, not recognised by us or not legally enforceable. 5. Where the Customer defaults on payment for more than 10 days, where bills of exchange or cheques are not honoured punctually or where a substantial deterioration of the purchaser's financial circumstances should come to our attention (regardless of whether this occurred prior or subsequent to conclusion of the Contract), we shall have the option of demanding either a) advance payment on all those services not yet provided (including bills receivable) or b) the provision of collateral in respect of these claims. For such time as these claims remain unfulfilled we shall not be obliged to effect further deliveries arising from current contracts. 6. Each part delivery shall be considered a separate transaction. 7. Part payments are subject to special written agreement.

§ 10 Retention of Title

1. We shall retain title of ownership on the delivered items until such time as the Customer has paid all claims arising from his business relationship with us (extended retention of title to ownership). Thus, this retention of title on the delivered items also safeguards claims lodged against the Customer arising from contracts not relating to the delivered items. The Customer shall secure ownership by way of security for us. 2. Where the extended retention of title to ownership has not become part of the Contract due to the Customer having conflicting General Terms of Business, delivery based upon ordinary retention of title can be used as an alternative. 3. The Customer may only sell the delivered items in ordinary business transactions where he is not in default of payment and where he has not suspended payments. In such cases resale shall not be permitted. 4. On concluding the purchase contract with us the Customer shall, by way of collateral, already assign to us the claims he would be entitled to against his buyer on the basis of the sale or any other legal reason with respect to the subject of the Contract along with all secondary rights, at an amount corresponding to the percentage value of the subject of our Contract. The Customer shall be entitled to collect the claim as long as he does not default on his payments to us or has not suspended payments generally. 5. The Customer must immediately inform us in writing of any attachments, seizures or other dispositions by third parties on the item subject to retention of title and enclose all relevant documents (fiat fieri etc.). Where a third party is unable to reimburse us the judicial and extra-judicial costs of an action pursuant to § 771 of the German Code of Civil Procedure (ZPO), the Customer shall be held liable to cover this shortfall incurred by us. 6. We can demand that the Customer makes notification of the assignment to his buyers and that he furnishes us with all information and documents necessary to collect the assigned claims. 7. Where those Customer's claims - arising from resale of the goods subject to our retention of title or from the resale of goods of which we are co-owners - are incorporated into a current account, the Customer must immediately assign his payment claim to us to the value of the current and recognised balance - i.e. to the amount of our claims against the Customer. 8. The Customer shall be obliged, for as long as title is retained, to treat the goods with care and to keep them in proper condition. Any necessary repairs must be performed immediately by us - with the exception of emergencies - at the Customer's cost. We shall bear the cost of these repairs where we are obliged to provide services in lieu or remedy defects as part of the provisions laid down in these General Terms of Business relating to warranties. 9. We shall be entitled, at the Customer's cost, to sufficiently insure - to reinstatement value - those goods subject to retention of title against theft and damage of all kinds, in particular fire or water damage where the Customer fails to prove he has taken insurance cover of this kind. 10. Where the realisable value of that collateral to which we are entitled shall exceed by more than 15 % the claims to be safeguarded arising from this business relationship, we shall be obliged, upon the Customer's request, to release the collateral in this respect. The choice of collateral to be released shall fall to us. 11. The processing and transformation of the delivered items by the Customer shall always be performed for us. Where the delivered items are processed along with items not belonging to us we shall acquire co-ownership of the new item corresponding to the value of the delivered item in relation to the other items processed at the time of processing. The items arising from processing shall be subject to the same provisions as the items delivered subject to retention of title. 12. Where the goods subject to retention of title are connected to a plot of land of which the goods form an essential part, the Customer shall be obliged to allow us to view this plot of land and have access to it and shall be obliged to assign to us his claims in respect of the owners of the land or to grant other collateral securities of equal value should he be the owner of the land himself. Should a substantial deterioration of the financial circumstances of the Customer occur we shall be entitled, with the consent of the owner of the land or the landlord, to step into the legal position of the Customer vis-à-vis the former. 13. The assertion of our claims arising from ownership by way of security shall not mean cancellation of the Contract.

§ 11 Delay of the Customer

1. Where the Customer fails to accept the goods on the agreed delivery deadline or once the delivery period has come to an end, due to circumstances for which he is responsible, we can demand compensation for the additional expenses we have incurred as a result. 2. In the event of default by the Customer we shall be entitled, regardless of the possibility of asserting a greater claim for actual damage, to demand interest on the sum for which the Customer is in default at 8 percentage points above the current base interest rate. 3. Where we are entitled to claim damages instead of performance we can, regardless of the possibility of asserting a greater claim for actual damage, demand 15 % of our price as damages provided the Customer fails to prove that there was no damage caused at all or damage is considerably lower than the lumpsum compensation.

§ 12 Claims for Defects

1. Where defective goods exist for which we are responsible we shall be entitled to either remedy the defect or to effect subsequent deliveries. Any replaced component shall transfer to our ownership. 2. The assertion of claims for defects by the commercial Customer shall be dependent on the latter having fulfilled his due obligations in terms of examining the goods and giving notice of any defects pursuant to § 377 of the German Commercial Code (HGB). Any notification of defects must be made in writing detailing the specific defect involved. 3. We can refuse to remedy the defects for such time as the Customer has failed to fulfil all his payment obligations, with the exception of a sum corresponding to the price reduction on the defective goods. In this case, the Customer shall only be obliged to effect advance payment where we have confirmed our liability for defects within the ambit of these General Terms of Business to him in writing. 4. We must be given the opportunity to inspect the notified defects on the spot. This inspection must be performed by us without delay where the Customer is interested in immediate settlement of the matter. Claims for defects shall not be permitted where merely insignificant deviations from the properties of the goods or where merely an insignificant impairment of the serviceability of the goods shall prevail. 5. We can demand from the Customer

those additional costs incurred for the purpose of subsequent fulfilment of obligations - in particular transport costs, tolls, work and material costs - where the outlay is increased as a result of transferring the goods to be delivered to location other than the delivery address, unless transfer occurs in accordance with the usage set out in the Contract. 6. Claims under the right of recourse on the part of the Customer in the case of the purchase of consumer goods (§ 478 of the German Civil Code - BGB) shall be excluded in this respect when relating to agreements made by the Customer with his buyer going beyond the legal claims for defects of that buyer. The Customer must inform us in good time of any claims for defects lodged by his buyer so that we are in a position to meet the claims of the buyer instead of the Customer if we so wish. 7. Where our contractual obligations also include assembly of the items to be delivered, an acceptance certificate must be produced once assembly has been completed to be signed by the Customer. This must record any defects the Customer has become aware of or that have become apparent by this time. Where these defects are not recorded our services shall be deemed accepted free from defects in this respect. 8. Services rendered in lieu and remedied defects shall be subject to the same warranty provisions governing the item originally delivered. 9. Claims for defects shall become statute-barred 1 year after the passing of the risk unless we are found to have caused the defect due to gross negligence or with pre-meditation or to have concealed the defect with an intent to deceive. This shall apply for any guarantees issued by us or binding to us in the absence of other agreements to the contrary. The statutory time-limits for claims lodged under the right of recourse pursuant to § 478 of the German Civil Code (BGB) shall remain unaffected by this. The same shall apply for longer statutory time limitations, for the construction of buildings or for the delivery of goods used for a building in accordance with their normal purpose that have caused the building's defectiveness. These time limitations shall also apply for consequential damage where the claims are not asserted here based upon an illegal act. Where a defective delivery shall make defect remediation necessary, the time limitation shall only be suspended for such time as defects have been remedied and shall not be reinstated again. 10. Before the Customer can assert any further claims or rights (cancellation, price reductions, compensation or reimbursement of expenses) we shall have the opportunity to be set an appropriate deadline in which to remedy the defect where we have not issued any guarantee worded to the contrary. Where we fail to remedy the defect despite at least two attempts, where we refuse to remedy the defect or where this remediation is not possible or not reasonable to the Customer, the Customer shall be entitled to cancel the Contract or to lower (reduce) remuneration. § 13 of these terms shall apply for the assertion of claims for compensation or reimbursement of expenses. 11. The following shall also apply in the event of claims based upon deficiencies in title: In the absence of provisions to the contrary we shall merely be obliged to effect delivery in the country of the delivery address unaffected by third party rights. In the event of us being responsible for violating third party copyrights we shall be entitled to either acquire at our own expense a right of exploitation sufficient for the agreed or precluded use and make this over to the Customer, to change the delivered goods in such a way as to ensure the copyright is not violated or to exchange the delivered goods insofar as the agreed and precluded use is not compromised. Where we are unable to do this, where we refuse to remedy the defect or where this fails, the Customer shall be entitled to lodge legal claims and assert his rights. § 13 of these terms shall apply for the assertion of claims for compensation or reimbursement of expenses. 12. Where the Customer chooses to cancel the Contract on the basis of deficiencies in title or a quality defect subsequent to a failure to remedy these, he shall also forfeit his right to claim for compensation for the defect. Where the Customer chooses to claim damages subsequent to a failure to remedy defects, the goods shall remain at the Customer's premises insofar as this is reasonable to him. Compensation shall be limited to the difference between the price to the Customer and the value of the defective goods. This shall not apply where we have caused the contractual violation with an intent to deceive. 13. Where a selection of samples is sent out to the Customer for inspection, we shall only be responsible for ensuring the delivery is effected in accordance with the sample selection taking any adjustments into account. 14. Where the Customer receives erroneous assembly instructions, we shall merely be obliged to deliver assembly instructions free from errors and indeed only at all when the error in the assembly instructions is at variance with proper assembly.

§ 13 Compensation/Reimbursement of Expenses

1. The purchaser's legal right of rescission - with the exception of cases that fall within §12 and §13 - shall be neither excluded nor limited. Likewise it is not intended to exclude or limit any legal or contractual rights or claims to which we may be entitled. 2. We shall be liable without limit for intentional harm and gross negligence (including that of our legal representatives or agents) and for injury to life, limb or health. We shall also have unlimited liability in providing guarantees if a defect that is covered by a guarantee triggers liability. There shall also be no limit to our liability in relation to offences relating to the creation of a hazard, particularly in accordance with the German Product Liability Act (Produkthaftungsgesetz). This shall not affect any liability under the recourse principles under §478 et seq. of the German Civil Code (BGB).

3. In the case of any other culpable breach of significant contractual duties (cardinal duties, subclause 8) our remaining liability shall be limited to foreseeable damage as is usual for this type of contract. 4. All other forms of liability shall be excluded from this contract regardless of their legal grounds, in particular claims resulting from a breach of any main or ancillary duties under the contract, illegal acts and any other tortious acts. 5. The same exclusions, limitations and exceptions shall apply in respect of claims based on fault at the time the contract was concluded. 6. §13 shall apply analogously in the case of any reimbursement of expenses (with the exception of any reimbursement of expenses in accordance with §439 II or §635 II of the German Civil Code (BGB)). 7. Any exclusion or limitation of our liability shall also apply to our legal representatives and agents. 8. No reversal of the burden of proof is intended. Cardinal duties are significant duties, i.e. such duties which characterise the contract and on which the contractual partner can rely; these are therefore the significant rights and duties which are the prerequisites for contractual performance and which are indispensable in order to fulfil the contractual purpose. 9. Statutory limitation of claims between the Supplier and the Customer shall be governed by § 12, Section 9 insofar as claims relating to product liability pursuant to § 823 et seq. of the German Civil Code (BGB) or the Product Liability Law are not affected by this. This statutory limitation shall also particularly apply in the case of consequential damage. 10. We shall assume no liability for damage caused by unsuitable or improper use, defective commissioning or assembly carried out by the Customer himself, natural wear and tear, defective or negligent treatment - in particular through excessive use, unsuitable operating resources, replacement materials, defective construction work, unsuitable ground for building, chemical, electrochemical or electrical influences and improper modifications or maintenance performed without our approval. 11. We shall not be responsible for issuing any special public permits required or for the observance of any pollution protection laws. This shall not apply where the observance of these laws or the provision of special public permits have been agreed upon by us on an individual contractual basis.

§ 14 Court of Jurisdiction and Place of Fulfilment

1. The place of fulfilment for all contractual obligations shall be 87772 Pfaffenhausen. 2. Where the Customer is a merchant, a legal entity under public law or a special public fund, we shall be entitled to make the court of jurisdiction for all litigation arising from this contractual relationship alternatively Memmingen, the Customer's place of business or - in the case of foreign deliveries - the capital of the country where the Customer has his place of business. The same shall apply where the domicile or place of habitual residence of the Customer at the time the action commences is not known. This shall also apply for litigation arising from bills of exchange and cheques. 3. Legal relationships between the Customer and ourselves shall be subject only to the law of the Federal Republic of Germany excluding the UN convention on the international sale of goods.

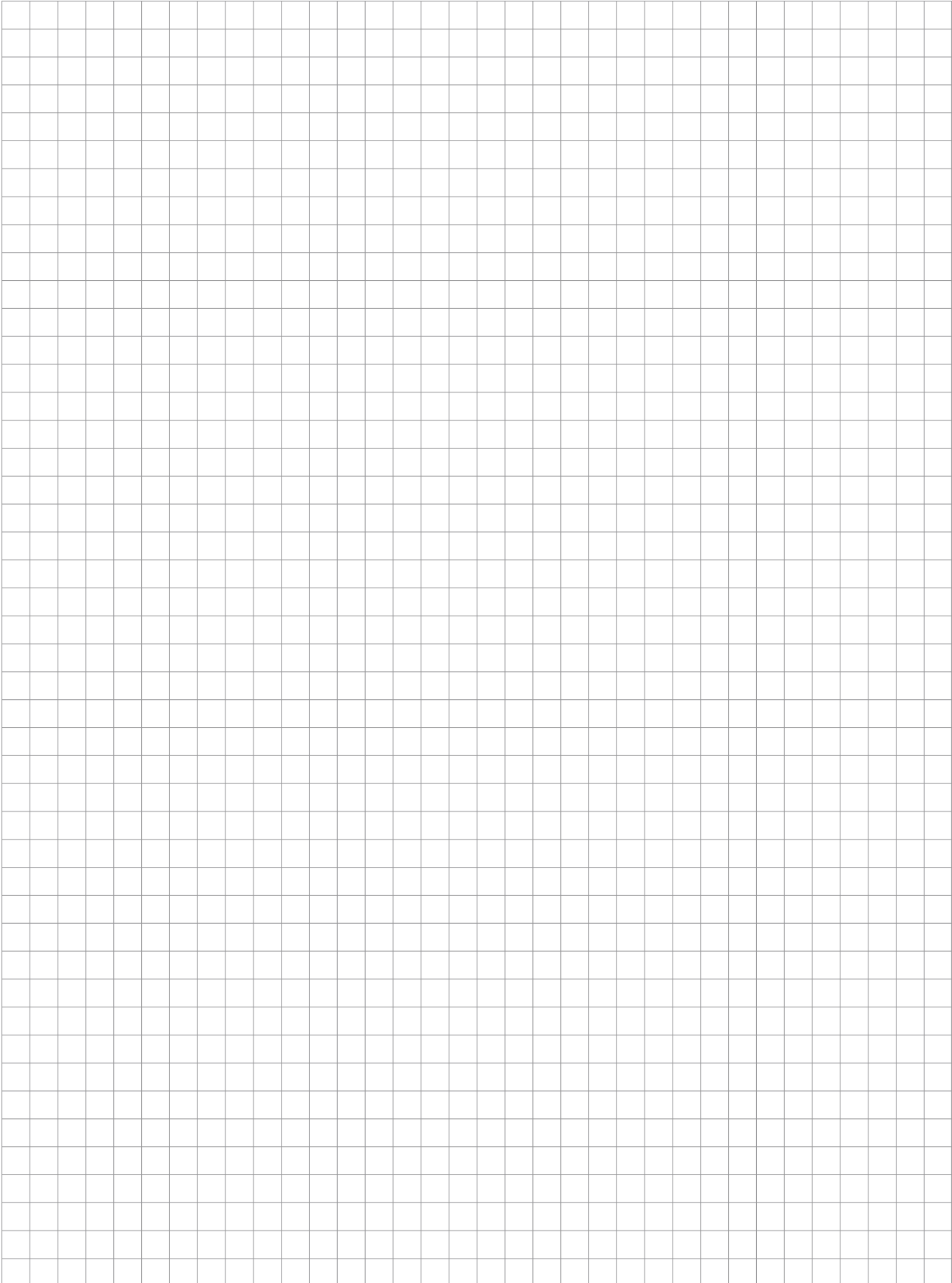
§ 15 Others

1. We process your personal data for the execution of your order and to provide you with the latest news about our range of products. You may object to the processing and use of your data for advertising purposes at any time (e-mail to marketing@raico.de).

(Dated march 2017)



Technical Information





Technical Information

Pictures and diagrams, measurements, and technical data in this planning manual have been used for illustrating purposes, and are thus not binding. We reserve the right to make changes to reflect technical advancements.

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