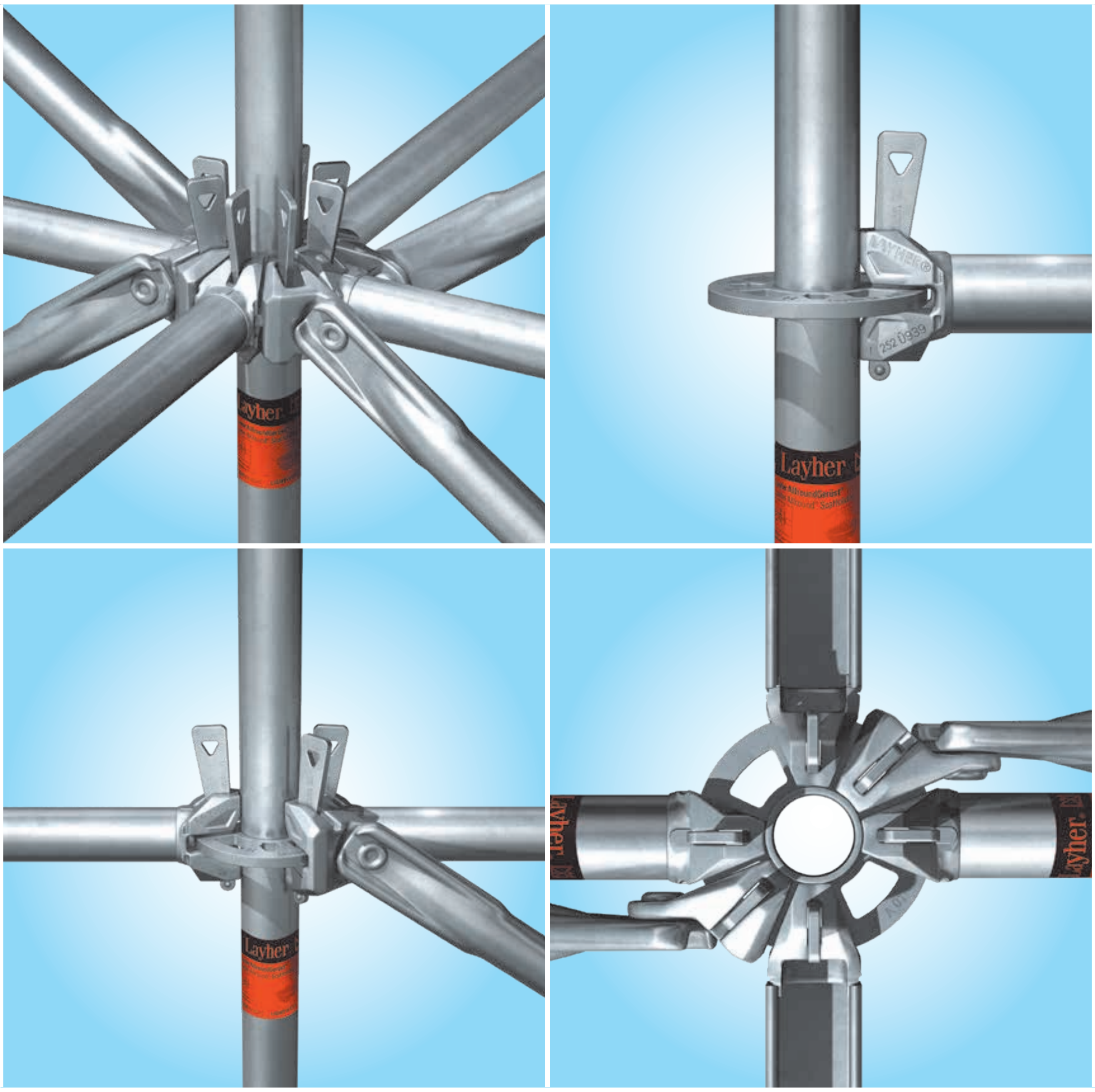
Layher.

More Possibilities. The Scaffolding System.

LAYHER ALLROUND SCAFFOLDING®
TECHNICAL BROCHURE



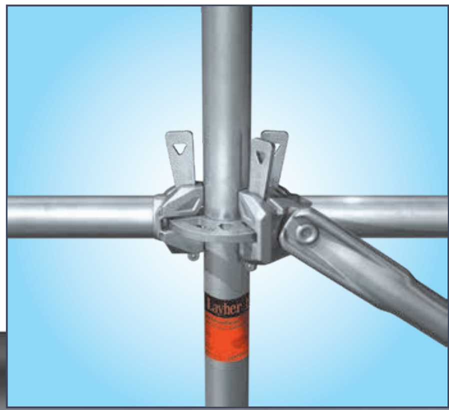
Edition 05.2022
Ref. No. 8116.207

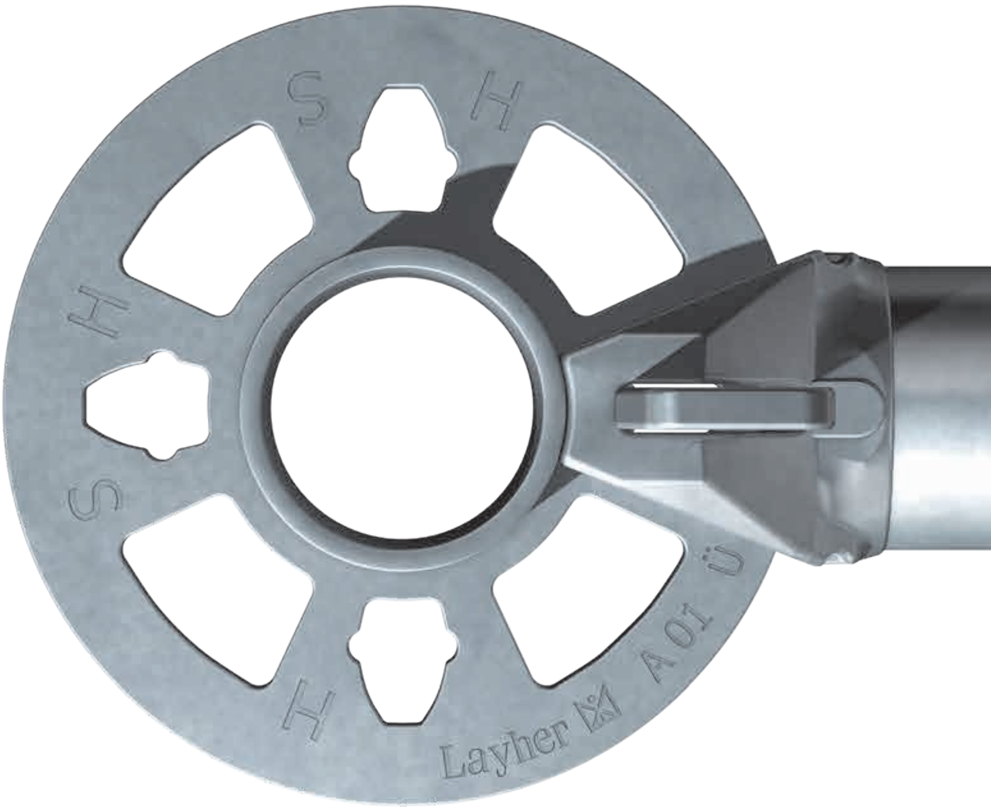
Quality management certified according to DIN EN ISO 9001

Content

THE ORIGINAL ALLROUND SCAFFOLDING – AND ITS INGENIOUS ALLROUND TECHNOLOGY

The original Layher Allround Scaffolding using the principle of *rosette and wedge head* was registered for patent with the German Patent Office for the first time in 1974. An ingenious invention that revolutionised scaffolding technology in every respect!





The Allround Connector is the cutting edge: an ingenious design principle, precision manufacturing by Layher, in-house production checks and external monitoring in line with the provisions in German approval procedures guarantee consistent and dependable quality.

The original Layher Allround Scaffolding offers particularly in structural and engineering scaffolding assembly – in applications with continually new and often unusual challenges – the right solutions. A persuasive variety of uses, rapid assembly and gratifying profitability at all times, not least thanks to an extensive range of series-produced expansion parts: this is the unrestricted versatility of Allround as a modular system.

The proven combination of positive and non-positive connections in rapid and bolt-free system technology with AutoLock function permits connections that are automatically right-angled, obtuse-angled and acute-angled as required, with built-in safety at the same time.
Layher Allround Scaffolding has become a synonym in the marketplace for modular scaffolding.

With Layher Allround Scaffolding – in steel or in aluminium – you are investing in a perfected and complete system with all the approvals required for faster, safer, more profitable and highly flexible scaffolding construction.

DIGITAL SCAFFOLDING PLANNING

SIM | SCAFFOLDING INFORMATION MODELING

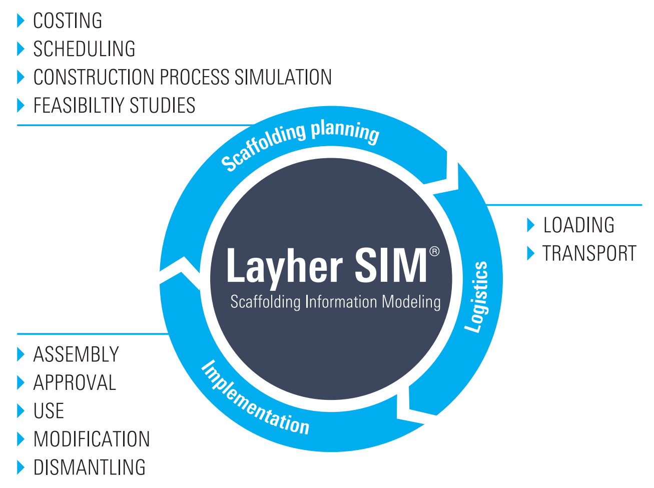
Digitalisation is affecting every industry. That includes scaffolding construction. Rightly so, because nothing else optimises project planning so effectively while opening up for you enormous potential for both transparency and cost savings. Layher therefore asked itself the question of how the BIM concept – Building Information Modeling – originating in civil engineering could be adapted to scaffolding in temporary structures. Because the proven Layher systems permit faster and safer upward access, yet are not part of the actual structure. Furthermore, scaffolding can also be used independently of civil engineering projects, for example as stand-alone structures like temporary bridges. The result is SIM: Scaffolding Information Modeling.

The future in scaffolding construction is digital – and it's name is SIM

Scaffolding Information Modeling – SIM for short – is a process based on 3D models and designed by Layher to meet the specific requirements of scaffolding construction. SIM not only allows you to plan, assemble and manage temporary scaffolding structures more efficiently, but also affords access to BIM at the same time. With the integrated Layher software solution "LayPLAN SUITE", you have a powerful tool for the SIM process: LayPLAN CLASSIC facilitates a start in digital planning by allowing automated planning of predefined scaffolding applications – and if required even with temporary roof structures. For complex scaffolding structures as part of large-scale engineering scaffolding, there is LayPLAN CAD. Detailed information on the modules of LayPLAN SUITE can be found on the following pages.

Planning and scheduling certainty at sites

Dependable 3D planning of scaffolding structures without collisions is just one of many benefits. Added to that are the realistic visualisation of scaffolding, allowing work to be coordinated with other trades or construction sequence simulation, transfer of the scaffolding planning to structural analysis programs, and output of material lists and assembly plans. Transparency at every work step results in a reduction in costs and an increase in safety and profitability. When they work with Layher's scaffolding construction customers, both building contractors and end customers in industry benefit, with SIM, from a high degree of planning certainty, cost control and above all completion of projects on schedule thanks to efficient and undisrupted construction processes. Delays and added costs due to inadequate planning are a thing of the past.



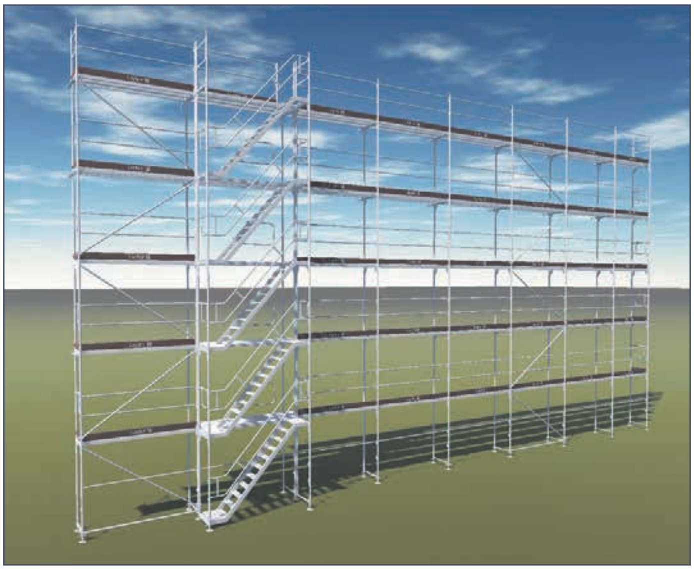
YOUR BENEFITS AT A GLANCE

- Transparency in all work steps and cost control.
- Increase in safety and in profitability for every project.
- Planning and scheduling certainty at every site.
- Your access to BIM.

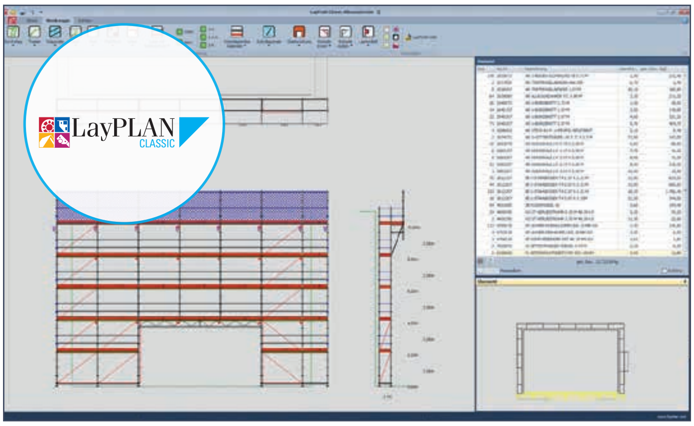
1. LayPLAN CLASSIC for SpeedyScaf and Allround Scaffolding

LayPLAN CLASSIC facilitates a start in digital planning by allowing automated planning of predefined scaffolding applications: whether they're for circular or facade scaffolding made from SpeedyScaf, for birdcage scaffolding and free-standing towers made from Allround Scaffolding, or for structures with temporary roofs.

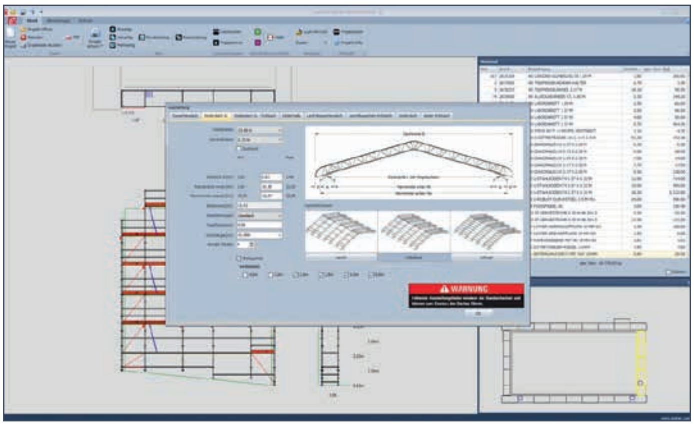
Once the key data has been entered, scaffolding manufacturers receive in seconds a scaffolding-proposal that includes anchoring, bracing and side protection. During the design phase, the overall length, standing heights and areas are continuously calculated and displayed to reflect the latest plan. A materials list can also be easily created at the push of a button: scaffolding erectors benefit from more certainty when planning the commercial and technical details; from optimised use of their stocks; and from full cost transparency at every stage of the project.



3D visualisation in LayPLAN CLASSIC



Facade scaffolding with brick guard level and vehicle access using LayPLAN CLASSIC SpeedyScaf



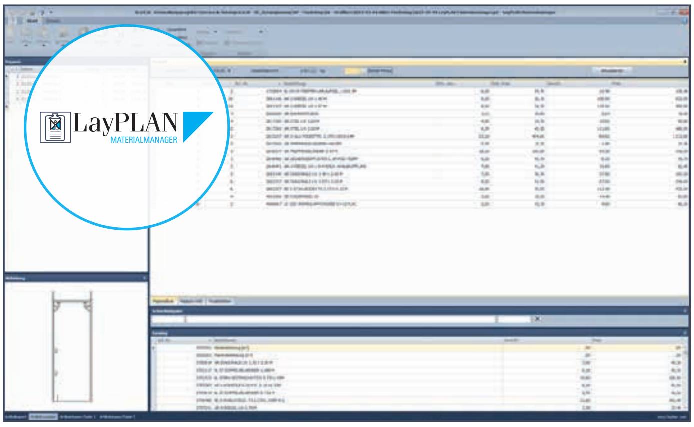
Planning of a weather protection roof with Keder Roof XL on Allround support scaffolding using LayPLAN CLASSIC

THE FUNCTIONS OF LAYPLAN CLASSIC

- Automated planning of standardised scaffolding structures using SpeedyScaf, Allround Scaffolding and Layher weather protection roofs.
- Export function to LayPLAN CAD.
- Automatic 2D drawings.
- 3D visualisation for order acquisition.
- Real-time material list – for transport and assembly.

2. LayPLAN MATERIAL MANAGER for LayPLAN CLASSIC and LayPLAN CAD

The LayPLAN MATERIAL MANAGER allows material lists to be created and edited – for example splitting into different construction sections to permit prices and weights to be considered separately.

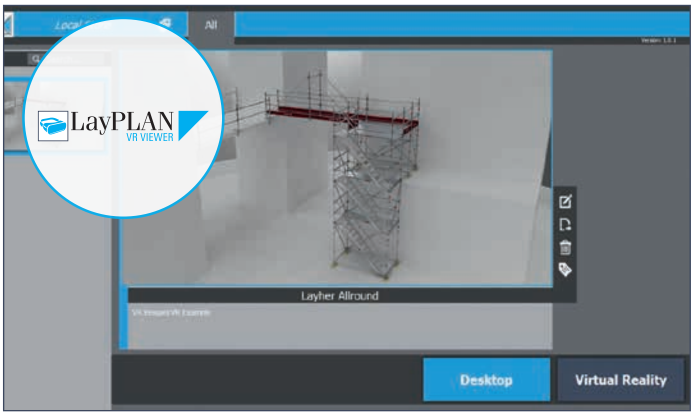


THE FUNCTIONS OF THE LAYPLAN MATERIAL MANAGER

- Automatic creation of material lists from LayPLAN CLASSIC and LayPLAN CAD.
- Manual editing of material lists, for example splitting them into construction sections and applications.
- Detailed information on the scaffolding components including preview image.
- Output as PDF and export in Excel.
- Optional component images on the material lists in the printout – this makes it easier to identify components during loading and assembly.

3. LayPLAN VR VIEWER

The free-of-charge LayPLAN VR Viewer enables virtual tours of scaffolding structures, to convey a realistic spatial impression of the overall situation. Based on the data from LayPLAN CAD, Layher can create for you VR models for display in the LayPLAN VR VIEWER. We'd be happy to assist you on the spot with our specialists and equipment for your VR presentation.



THE FUNCTIONS OF LAYPLAN VR VIEWER

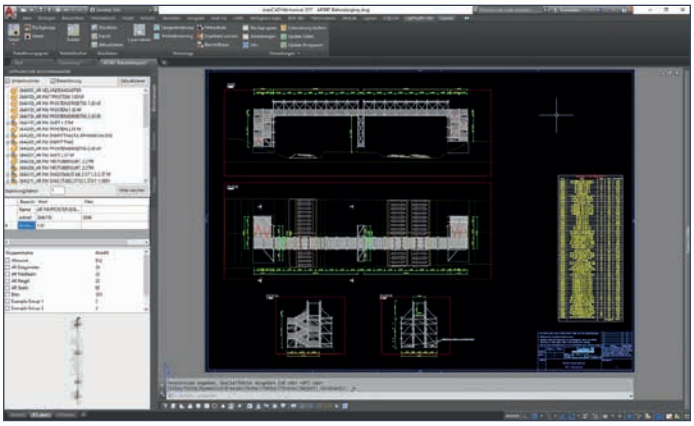
- Virtual tours of scaffolding structures with VR headset (e.g. Oculus Rift).
- Optional display of VR models in Desktop mode.
- Integrated measurement and comment function.
- Conveying of a realistic spatial impression of the overall situation, for order acquisition and for coordination with other trades or for construction sequence simulation.

4. LayPLAN CAD for planning in 3D

For complex scaffolding structures as part of large-scale engineering scaffolding, LayPLAN CAD is available. This is a plug-in for Autodesk AutoCAD. It permits 3-dimensional planning of scaffolding structures of all types.

Professional 3D rendering of the LayPLAN CAD models

Planning of individualised scaffolding structures in LayPLAN CAD



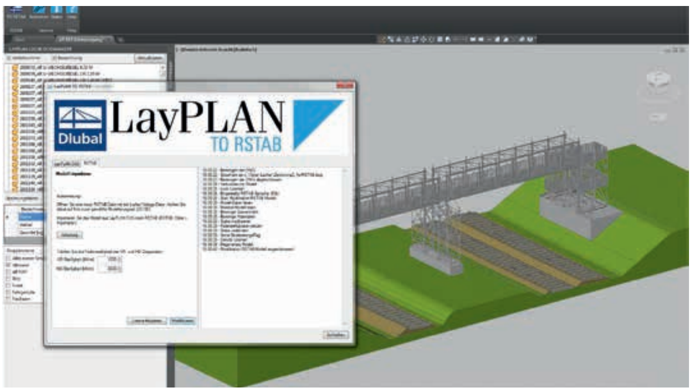
Creation of planning documents with integrated material lists in LayPLAN CAD

THE FUNCTIONS OF LAYPLAN CAD

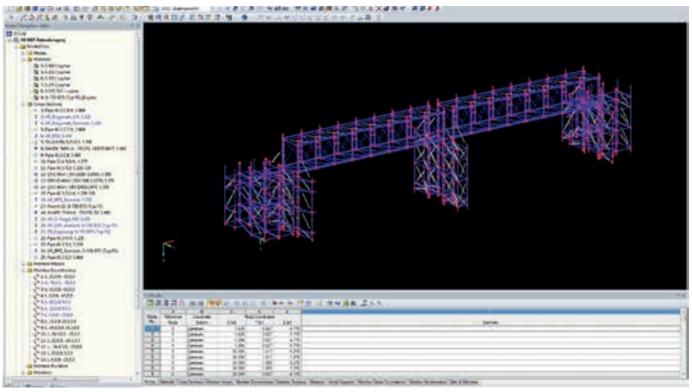
- Scaffolding planning and design in 3D.
- Basic planning can be done in an automated process using the proven LayPLAN CLASSIC – that saves time.
- Dependable visual collision check thanks to realistic rendering as a volume model.
- Extensive component library with a convenient search function – including prefabricated assemblies and template drawings for even faster design.
- Preview image of components and output as 3D models.
- Automatic component identifications.
- Real-time material list for transport and assembly – the required material is guaranteed to be there where it's needed.
- Further editing of the model data in visualisation software (e.g. rendering, VR) for order acquisition and for coordination with other trades or for construction sequence simulation.
- Further editing of the model data in RSTAB for structural strength calculations as part of project-related verifications of stability. Unlike in remodeling which is otherwise necessary, this avoids error sources and saves time when planning. If you are interested, we'd be happy to send you supplementary Layher information for export into RSTAB.
- Available in English, German, French and Spanish.

5. LayPLAN TO RSTAB

For structural strength verification of scaffolding structures, frame analysis programs are generally used. Using the LayPLAN TO RSTAB module, all modeling-relevant information about an Allround Scaffolding structure is imported three-dimensionally into the RSTAB frame analysis program from Dlubal. Automated transmission of the information means that re-entering the model data is not needed. This means that the user will benefit from an enormous time saving, and also avoid a possible source of errors during modeling.



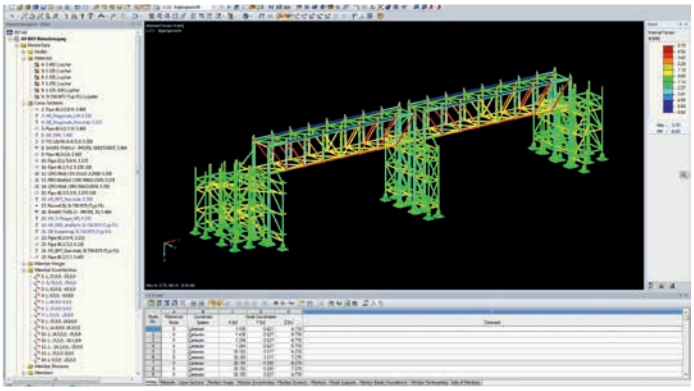
Transmission of model data with the aid of LayPLAN TO RSTAB



Imported RSTAB model, prepared for structural strength computations

THE FUNCTIONS OF LAYPLAN TO RSTAB

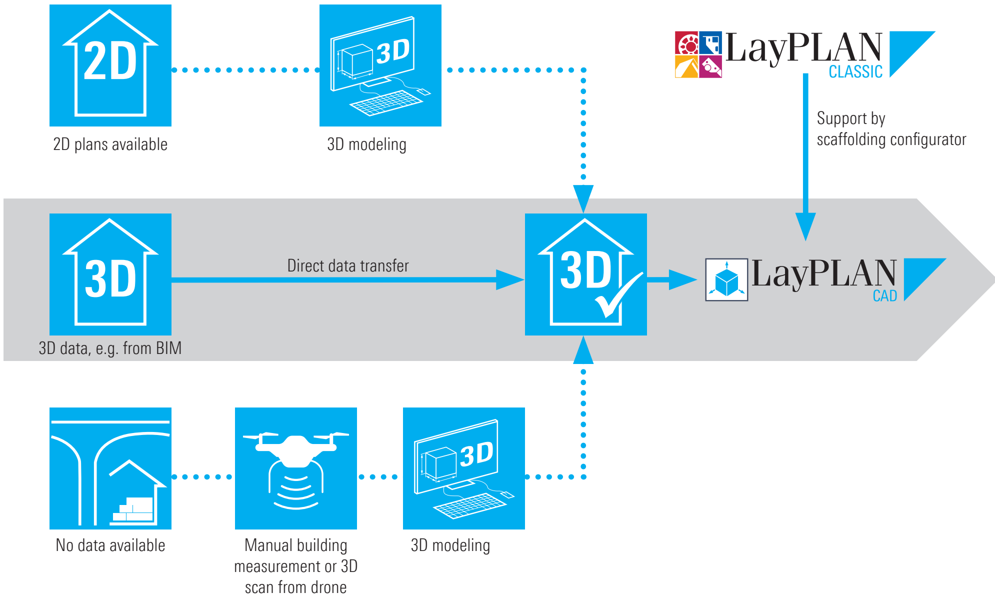
- Time saving thanks to automated 3D model transmission of Allround Scaffolding structures.
- Transmission of all structurally relevant information according to the German approvals (geometry, cross-sections, materials, frame types, eccentricities and non-linear connections).
- Avoidance of possible sources of errors during modeling in the frame analysis program.



Structural strength computations based on definition of nodal supports and loads

PROCESSING OF THE MODEL DATA UP TO 3D USE IN SIM

Digital 3D scaffolding planning affords many advantages over planning in 2D as previously used: from a high degree of detail in planning and in drawings to the visual collision check and to professional visualisation of the scaffolding structure. The basis for scaffolding planning is 3D building model data. It is available as a rule from your customer as part of the BIM process. Alternatively, it is possible to remodel the 3D building model data on the basis of 2D plans or manual building measurements or 3D scans – stationary or using a drone. Once 3D scaffolding planning with LayPLAN CAD is finished, the data can also be used without any problem for downstream processes, for example the creation of part lists or construction sequence simulation.



- Realistic 3D scaffolding planning.
- Visualisation of the design for professional presentation.
- Collision check.
- Data transfer to structural analysis programs.
- Material lists for logistic planning and costing.
- 2D plans for assembly.
- Construction sequence simulation.
- VR model for virtual tour.
- Communication / data exchange with mobile devices.

Further information about SIM in the building trade can be found on film at: **http://yt-sim-en.layher.com**

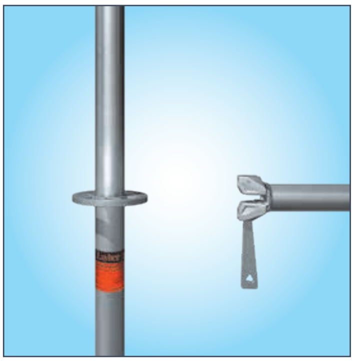
Further information about SIM in industry can be found on film at: **http://yt-sim-ind-en.layher.com**

Further information about LayPLAN SUITE can be found on film at: **qrsoftwareen.layher.com**

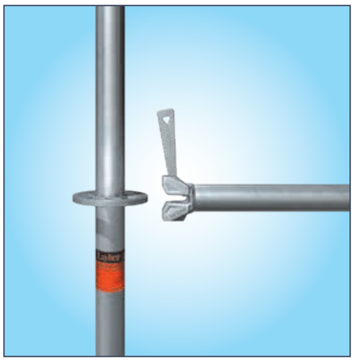
THE ALLROUND POWER CONNECTOR

Whether it's used in industry, chemical plants, power stations, aircraft factories, shipyards, theatres or arenas, on every site and on every structure the "original" does justice to its reputation as an "Allrounder". As work scaffolding and safety scaffolding at the facade, as birdcage, trestle and suspended scaffolding, or as a rolling tower – the right scaffolding at all times and for every job and requirement. For very difficult ground plans and anchoring conditions, for very irregular structures, and for jobs with increased safety requirements.

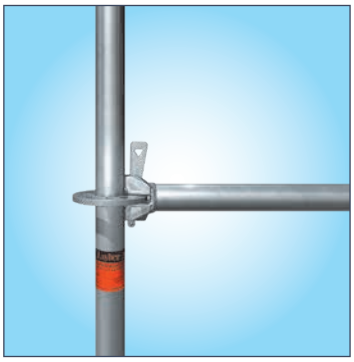
AUTOLOCK – FUNCTION IN THE ALLROUND LEDGER LW



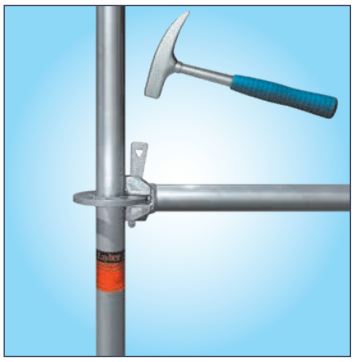
It's this easy: Turning the ledger and slightly tilting it before assembly activates the AutoLock function.



As the wedge head is pushed over the rosette, the wedge drops automatically into the recess and the ledger end is **immediately secured against any possibility of shifting.**
This means: safer 1-man assembly, whatever the height.

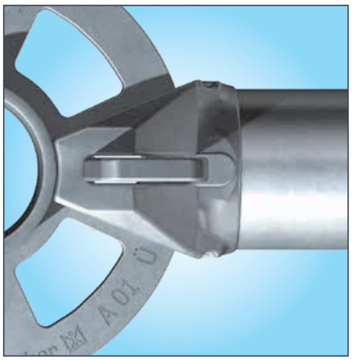


The flat rosette without recesses or bulges prevents it getting clogged with the dirt, of whatever type, that makes assembly difficult.

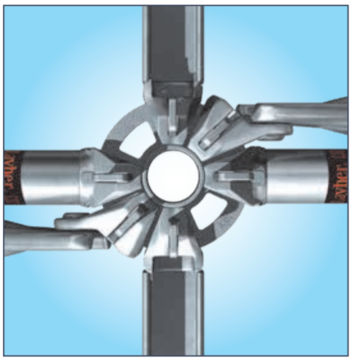


A hammer blow on the wedge transforms the positive connection into a non-positive one.

THE ALLROUND POWER CONNECTOR



The wedge head is precisely matched to the radius of the standard at the front end – so forces are applied to a flat surface and always centrally into the standard.



Built-in assembly speed: the four narrow openings in the rosette automatically centre the ledgers in the correct dimensions and at right angles – the four wide openings permit alignment of ledgers and diagonal braces at the angles required.

Quality management certified to ISO 9001

Approval for the Allround modular system in steel: Z-8.22-64, Z-8.22-939, Z-8.22-949

Approval for the Allround Connector in aluminium: Z-8.22-64.1

Certificate for the Allround modular system in steel

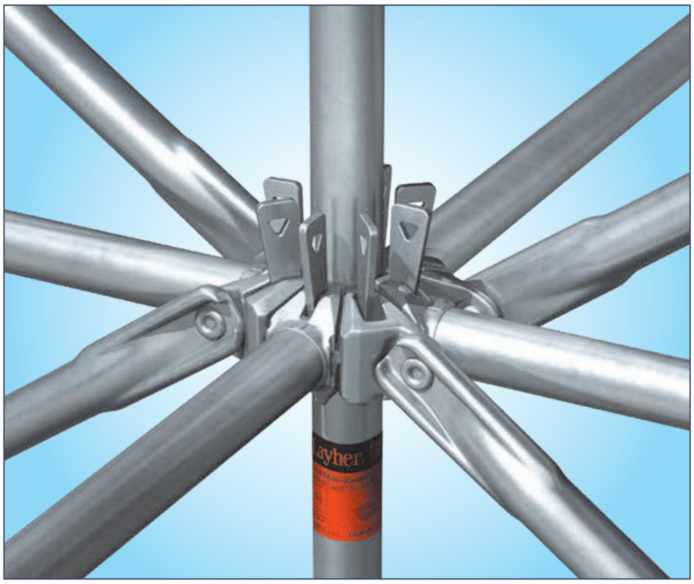
Certificate for the Allround modular system in steel

Certificate for the Allround modular system in steel

Certificate for the Allround modular system in steel

Approval for the Allround modular system in steel and aluminium

AN INGENIOUS DESIGN PRINCIPLE



Up to eight connections can be made in the structurally ideal Allround connector, on one level and at various angles. How the system is assembled is self-explanatory.

Approval for the Allround modular system in steel

Certificate for the Allround modular system in steel and aluminium

Certificate for the Allround modular system in steel and aluminium

Certificate for the Allround modular system in steel and aluminium

Certificate for the Allround modular system in steel

Further approvals and certificates worldwide.

In various countries, the listed approvals or certificates are also accepted.

GUARANTEED WITH GERMAN APPROVAL

SAFER. CERTIFIED. TESTED.

Z-8.22-939: THE ALLROUND LIGHTWEIGHT IN HIGH-TENSILE STEEL

Z-8.22-64: THE ALLROUND MODULAR SYSTEM IN STEEL (VARIANT K2000+ AND EARLIER VARIANTS [VARIANT I AND VARIANT II])

Z-8.22-949: THE MODULAR SYSTEM ALLROUND LWV IN STEEL (COMMON USE OF THE VERSIONS OF VARIANTS I TO LW)

The Layher Allround LW connector was developed by optimisation of the K2000+ variant and of the Allround connector registered for patent in 1974 and proven ever since.

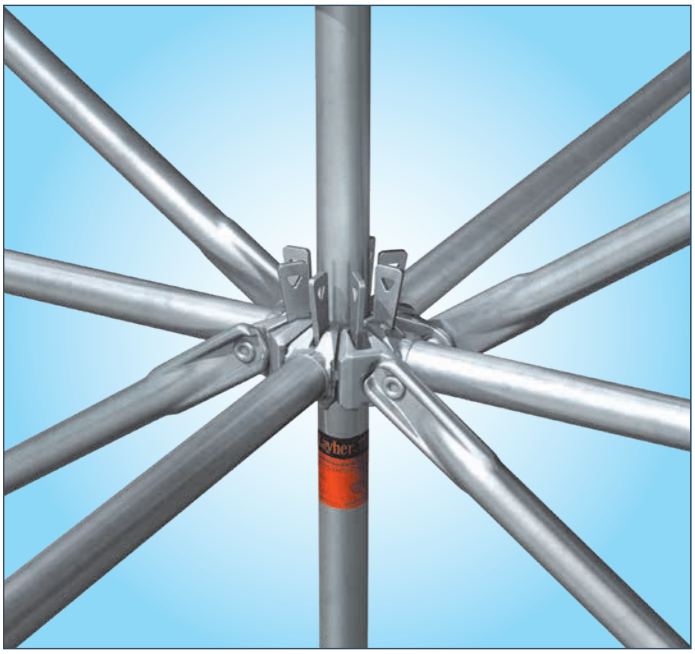
The Layher Allround LW connector offers, in comparison with the previous connector variant,

- substantially higher loading capacities
- e. g. bending moment of ledger connection: + 18.8%

This means: even more possibilities.

- Common use with the Allround material of previous designs is generally assured and regulated by german approval.

That means: existing Allround material can remain in use without any restriction.



Layher Allround Scaffolding has, in addition to German approval, further approvals and certificates worldwide.

The Allround connector is the cutting edge: superb design, high-quality material and precision manufacturing by Layher ensure high stability, dependable quality and greater safety.

The contents of this document refer exclusively to original Layher scaffolding components. Layher has compiled the contents, in particular the information, illustrations, data, calculations, notes and recommendations contained therein, with the greatest possible care. Nevertheless, Layher disclaims all liability for the correctness, completeness and up-to-dateness of the contents. Except in cases of wilful intent by Layher, liability is excluded to the extent permitted by law. This applies in particular to obvious errors, spelling mistakes, miscalculations and printing errors. The contents are used at the user's own risk. Unless stated otherwise in the tables and lists, the load values (permissible loads, load classes, design resistances) quoted in this brochure are based on Layher's in-house calculations. They have been prepared to the best of our knowledge and belief by structural engineers qualified to do so.

The specifications of the following technical rulebooks provide the foundation for these calculations:
- DIN EN 12810-1:2004-03
- DIN EN 12811-1:2004-03 in conjunction with the "Application guideline for work scaffolding in accordance with DIN EN 12811-1"
- Eurocode 3: Design of steel structures
- Eurocode 9: Design of aluminium structures
  (with exception of aluminium Allround Scaffolding components which were dimensioned on the basis of the "DIBt approval principles for the dimensioning of aluminium components in scaffolding construction", issued in May 1996)

along with the issues of the German Layher approvals applicable at the time of going to press.

The scaffolding structures, detailed solutions and intended uses shown are only to be understood as non-binding examples. The user of the scaffolding components must make and document his own structural calculations for each scaffolding structure, taking into account the design, local conditions and local requirements. The user is responsible for checking the country-specific requirements, rules and regulations that apply at the place of use. If Layher offers type-tested structural calculations for certain scaffolding structures or scaffolding components, their applicability must be checked for each respective case.

GERMAN APPROVALS FOR THE STANDARD ASSEMBLY

SAFER. CERTIFIED. TESTED.

Z-8.22-939 / Z-8.22-64 / Z-8.22-949

- **Approvals for the standard assembly as facade scaffolding.**

The German approvals for Allround Scaffolding cover the connector and assembly as facade scaffolding. No vertical diagonal braces are required in the standard assembly for facade scaffolding according to the approval.

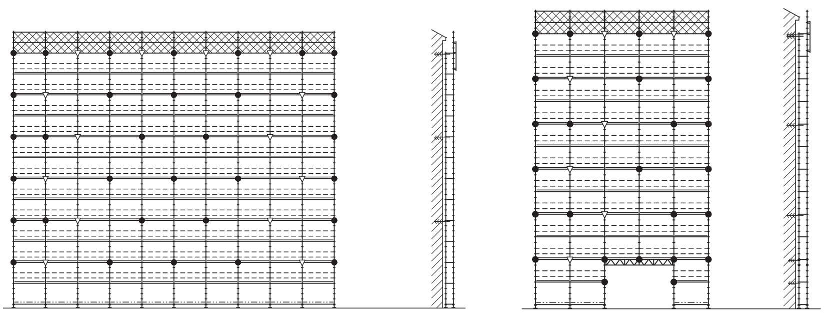
- **At the facade too the Allround Scaffolding offers the proven Allround advantages:**

- Low tendency to clogging
- "Automatic" right-angled assembly
- Flexibility
- High loading capacity
- Decks can be removed or installed at any point and at any time

- **Allround Scaffolding as an intelligent and economical solution.**

Particularly irregular facades and structures with curving ground plan can be enclosed economically and safely using Allround Scaffolding.

This is where Allround Scaffolding with its persuasive adaptability offers an intelligent and economical solution.



ALLROUND CONNECTORS MADE OF ALUMINIUM

SAFER. CERTIFIED. TESTED.

Z-8.22-64.1

Possible applications in which the specific advantages of Layher Allround Scaffolding made of aluminium can be used to particular advantage in terms of both profitability and design include

- rolling towers
- suspended scaffolding
- as scenery in theatres
- in the trade fair and events field

And in addition,
- faster assembly
- less physical strain on the erectors
- low weight

are specific reasons for using the Layher Allround Scaffolding in aluminium.

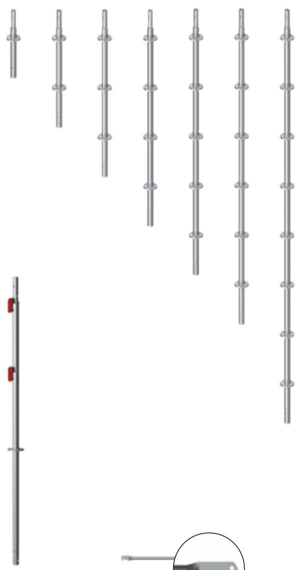
Examples of typical applications:
- A setup area not sufficiently firm to sustain the weight of a steel scaffolding structure.
- Historic natural stone masonry – starting to crumble due to environmental influences – has to be repaired and is no longer able to support steel scaffolding.
- In boilers, power stations etc. with manhole feeding where low weight is particularly important for ease of handling.

All these are scenarios where use of Layher Allround Scaffolding of aluminium is appropriate.

ALLROUND SCAFFOLDING – COMPONENTS

Three basic elements – standard, ledger, diagonal brace – in practically-minded dimensions, together with application-oriented expansion parts, make up the Allround system. All parts are made at Layher's own certified production facility, out of steel – hot-dip galvanized – or aluminium, depending on the function. Proven, high quality thanks to continuous monitoring, starting at goods reception and continuing during every phase of manufacture. Short delivery times from plentiful stocks, and reliable availability thanks to the special transporters in the company's own large vehicle fleet, as well as additional stocks held for you in a tight-knit network of delivery warehouses.

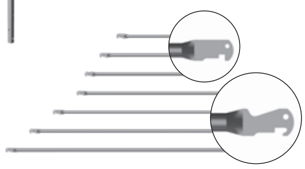
VERTICAL SUPPORT ELEMENTS IN STEEL



Standard LW, steel
with integrated spigot
Length 0.50 m – 4.00 m
Weight 2.7 kg – 18.1 kg
Ref. No. 2617.xxx

Standard LW, steel
without spigot
Length 0.50 m – 3.00 m
Weight 2.5 kg – 13.7 kg
Ref. No. 2619.xxx

Allround ARGS standard LW
Length 2.00 m
Weight 8.0 kg
Ref. No. 2602.065



ARGS guardrail
Length 0.73 m – 3.07 m
Weight 1.4 kg – 5.5 kg
Ref. No. 2602.xxx

HORIZONTAL SUPPORT ELEMENTS, SIDE PROTECTION

Allround O-ledger LW, steel
with AutoLock function
Length 0.25 m – 4.14 m
Weight 1.4 kg – 13.4 kg
Ref. No. 2601.xxx

U-ledger LW T14, steel
Length 0.45 m – 1.40 m
Weight 2.1 kg – 5.4 kg
Ref. No. 2618.xxx

U-ledger reinforced LW T14, steel
Length 1.40 m – 3.07 m
Weight 8.9 kg, 19.0 kg
Ref. No. 2618.xxx

U-ledger, steel deck / steel deck
Length 0.32 m – 0.96 m
Weight 3.1 kg – 5.5 kg
Ref. No. 2614.xxx

U-ledger, steel deck / O-ledger
Length 0.32 m – 0.96 m
Weight 3.3 kg – 6.5 kg
Ref. No. 2614.xxx

U-ledger, aluminium
Length 0.73 m
Weight 1.5 kg
Ref. No. 3203.073

U-ledger reinforced, aluminium
Length 1.09 m – 1.40 m
Weight 3.7 kg, 4.5 kg
Ref. No. 3203.109, 3203.140

U-bridging ledger, aluminium
Length 1.57 m, 2.07 m
Weight 4.3 kg, 5.5 kg
Ref. No. 3207.157, 3207.207

O-ledger reinforced LW, steel
Length 1.09 m – 3.07 m
Weight 5.9 kg – 17.0 kg
Ref. No. 2672.xxx

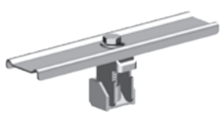
U-lift-off preventer T8
Length 0.39 m – 1.29 m
Weight 0.6 kg – 2.1 kg
Ref. No. 2635.xxx

U-lift-off preventer T9
Length 1.40 m – 3.07 m
Weight 5.3 kg – 11.9 kg
Ref. No. 2658.xxx

U-toe board, wood
for decks with U-suspension,
for longitudinal and end sides
Length 0.73 m – 4.14 m
Weight 1.5 kg – 7.5 kg
Ref. No. 2640.xxx

U-toe board, aluminium
for longitudinal and end sides,
lightweight and durable
Length 0.73 m – 3.07 m
Weight 1.5 kg – 5.7 kg
Ref. No. 2651.xxx

U-steel toe board
Length 0.73 m – 3.07 m
Weight 1.8 kg – 6.3 kg
Ref. No. 2644.xxx



Universal U-lift-off preventer
universally usable in any U-section
(steel and aluminium), WS 19 and WS 22
Length 0.28 m
Weight 1.0 kg
Ref. No. 2635.xxx

DIAGONAL BRACING

Diagonal brace LW, steel
for bay heights from 0.50 m – 2.00 m
for bay lengths from 0.73 m – 4.14 m
Weight 3.9 kg – 4.5 kg
Ref. No. 2683.xxx, 2682.xxx,
2681.xxx, 2680.xxx

Diagonal brace, aluminium
for bay lengths from 0.73 m – 3.07 m
Length 2.12 m – 3.58 m
Weight 3.9 kg – 5.3 kg
Ref. No. 3204.xxx

O-ledger LW, horizontal-diagonal, steel
Length 1.54 m – 4.34 m
Weight 5.5 kg – 14.5 kg
Ref. No. 2678.xxx

SCAFFOLDING DECKS, ACCESS DECKS

U-steel deck LW, 0.32 m wide
Length 0.73 m – 3.07 m
Weight 5.6 kg – 19.3 kg
Ref. No. 3883.xxx

U-steel deck T4, 0.32 m wide
Length 0.73 m – 4.14 m
Weight 6.0 kg – 29.8 kg
Ref. No. 3812. xxx / 3802.xxx

U-steel deck, 0.19 m wide
as equalising deck,
length 0.73 m – 3.07 m
Weight 5.1 kg – 15.3 kg
Ref. No. 3801.xxx

U-Xtra-N deck, 0.61 m wide
Length 0.73 m – 3.07 m
Weight 7.0 kg – 23.5 kg
Ref. No. 3866.xxx

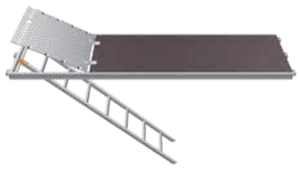
U-Robust deck, 0.61 m wide
Length 0.73 m – 3.07 m
Weight 7.2 kg – 24.2 kg
Ref. No. 3835.xxx

U-Xtra-N deck, 0.32 m wide
Length 1.57 m – 3.07 m
Weight 8.5 kg – 15.2 kg
Ref. No. 3877.xxx

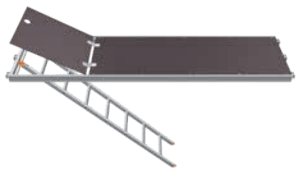
U-Stalu deck T9, 0.61 m wide
Length 0.73 m – 3.07 m
Weight 6.6 kg – 21.0 kg
Ref. No. 3867.xxx

U-Stalu deck T9, 0.32 m wide
Length 1.57 m – 3.07 m
Weight 7.4 kg – 13.3 kg
Ref. No. 3856.xxx

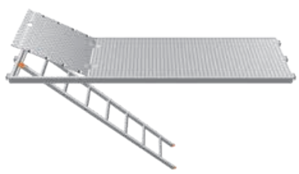
U-Stalu deck T9, 0.19 m wide
Length 1.57 m – 3.07 m
Weight 5.6 kg – 10.2 kg
Ref. No. 3857.xxx



U-Xtra-N access deck, 0.61 m wide, with integrated access ladder
Length 2.57 m – 3.07 m
Weight 25.4 kg – 29.5 kg
Ref. No. 3869.xxx

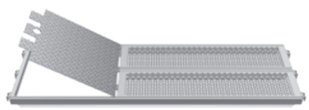


U-Robust access deck, 0.61 m wide, with integrated access ladder
Length 2.57 m – 3.07 m
Weight 24.0 kg – 27.4 kg
Ref. No. 3838.xxx

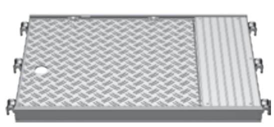


U-aluminium access deck, 0.61 m wide, with integrated access ladder
Length 2.57 m – 3.07 m
Weight 24.0 kg – 28.0 kg
Ref. No. 3852.xxx

U-access deck, aluminium, 0.61 m wide
side-opening hatch, without ladder
Length 2.07 m
Weight 17.6 kg
Ref. No. 3875.207



U-access steel deck, 0.64 m wide
access hatch of aluminium
Length 2.07 m, 2.57 m
Weight 28.9 kg, 38.0 kg
Ref. No. 3813.207, 3813.257



U-access deck, aluminium, 0.61 m wide
without ladder
Length 1.00 m
Weight 10.0 kg
Ref. No. 3851.100

Access ladder, 7-rung, T15 / T19, steel
for access deck
Length 2.15 m
Weight 7.6 kg
Ref. No. 4008.007 / 4009.007

Steel plank 0.20 m
hot-dip-galvanized
Length 1.00 m – 2.50 m
Weight 4.8 kg – 11.8 kg
Ref. No. 3878.xxx

Steel plank 0.30 m
hot-dip-galvanized
Length 1.00 m – 2.50 m
Weight 6.5 kg – 15.3 kg
Ref. No. 3880.xxx

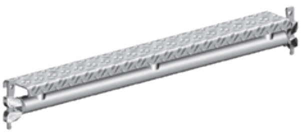
Locking screw, long (red), steel galvanized, for securing steel planks on steel decks, 50 pcs.
Length 0.08 m, WS 19 / 22
Weight 4.0 kg, 3.9 kg
Ref. No. 3800.009, 3800.010

Locking screw, short (blue), steel galvanized, for securing steel cover plates on steel decks, 50 pcs.
Length 0.04 m, WS 19 / 22
Weight 2.3 kg
Ref. No. 3800.011, 3800.012

Steel cover plate 320, 0.32 m
use up to load class 6 with a max. opening width of 20 cm
For bay lengths from 0.73 m – 2.00 m
Weight 2.6 kg – 12.0 kg
Ref. No. 3881.xxx

Cover plate 320 with hooks, 0.32 m
for bay lengths from of 1.57 m – 3.07 m
Weight 4.5 kg – 12.3 kg
Ref. No. 3882.xxx

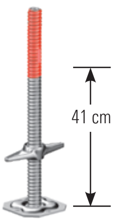
Telescoping U-system deck
closes openings between 40 and 255 mm, infinitely adjustable
Length 0.73 m – 3.07 m
Weight 5.2 kg – 22.3 kg
Ref. No. 3881.xxx



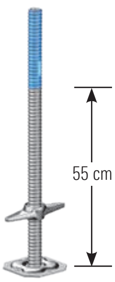
U-cover ledger 110 LW, 0.11 m wide
Length 0.73 m – 2.57 m
Weight 5.2 kg – 17.6 kg
Ref. No. 2675.xxx

Locking pin, plastic, dia. 11 mm
once-only use, 100 pcs.
Length 0.08 m
Weight 0.1 kg
Ref. No. 3800.006

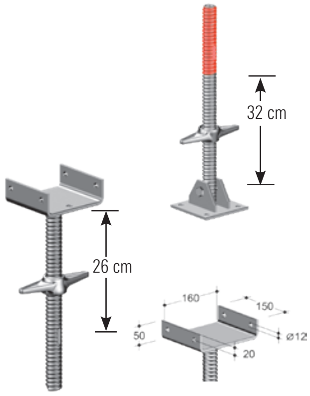
SCAFFOLDING SPINDLES



Base plate 60
(max. spindle travel 41 cm)
Length 0.56 m
Weight 3.6 kg
Ref. No. 4001.060



Base plate 80, reinforced
(max. spindle travel 55 cm)
Length 0.73 m
Weight 4.9 kg
Ref. No. 4002.080



Swiveling base plate 60, reinforced
(max. spindle travel 32 cm),
ensure sufficient structural strength
Length 0.58 m, Weight 6.1 kg
Ref. No. 4003.000

Head jack 45, solid, 16 cm
(max. spindle travel 26 cm)
Fork width 16 cm
Length 0.45 m
Weight 6.6 kg
Ref. No. 5314.045

Wedge spindle swivel coupler
Weight 1.8 kg
Ref. No. 4735.000

Base collar
Length 0.24 m
Weight 1.4 kg
Ref. No. 2602.000

BRACKETS

U-bracket LW, 0.28 m wide
for U-deck 0.19 m wide
U-lift-off preventer provided by customer
Length 0.28 m
Weight 3.4 kg
Ref. No. 2632.019

U-bracket LW, 0.39 m wide
for U-deck 0.32 m wide
Length 0.39 m
Weight 3.9 kg
Ref. No. 2632.039

U-bracket LW, 0.73 m wide
for 2 U-decks 0.32 m or
1 U-deck 0.61 m wide
Length 0.73 m
Weight 6.4 kg
Ref. No. 2632.073

Bracket brace
Length 2.05 m
Weight 8.8 kg
Ref. No. 2631.205

LATTICE BEAMS

O-lattice beam LW, with 4 wedge heads, steel
Length 2.07 m – 7.71 m
Weight 22.2 kg – 71.0 kg
Ref. No. 2674.xxx

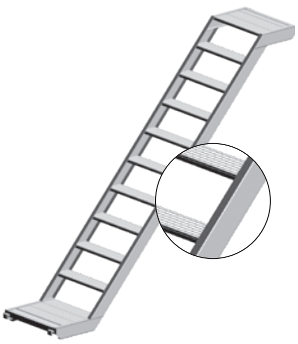
U-lattice beam LW, with 4 wedge heads, steel
Length 2.07 m – 6.14 m
Weight 21.4 kg – 60.5 kg
Ref. No. 2673.xxx

U-lattice beam, with 4 wedge heads
aluminium
Length 1.57 m – 5.14 m
Weight 8.6 kg – 30.2 kg
Ref. No. 3206.xxx

Spigot for U-section /
Spigot for U-section reinforced
for lattice beam, incl. 2 bolts
also for U-bridging ledger
Weight 2.1 kg
Ref. No. 2656.001 / 2656.002

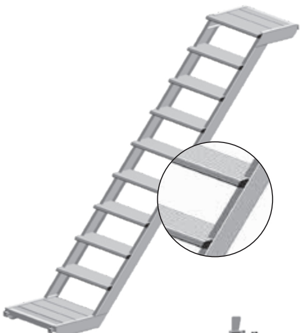
Spigot for O-lattice beam
with half-coupler, for lattice beam
and ledger
Weight 1.8 kg, WS 19 / 22
Ref. No. 4706.019, 4706.022

STAIR ACCESS

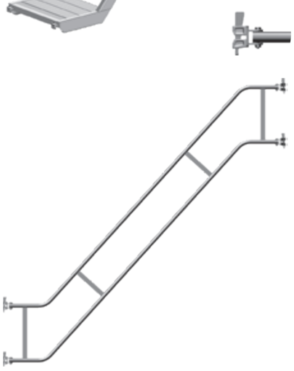


U-platform stair, 2.00 m high,
0.64 m wide / 0.94 m wide
aluminium
Stair class A as per EN 12811-1
for 2.57 m and 3.07 m bay lengths
Weight 21.9 kg – 40.1 kg
Ref. No. 1753.xxx

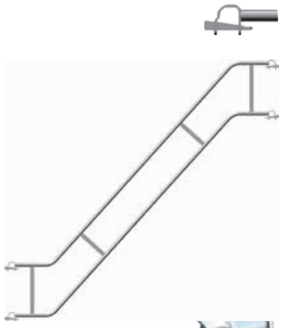
U-platform stair, 1.50 m high
0.64 m wide / 0.94 m wide
aluminium
Stair class A as per EN 12811-1
for 2.57 m bay length
Weight 21.5 kg, 36.6 kg
Ref. No. 1753.251, 1753.252



U-comfort stair, 2.00 m high
0.64 m wide
aluminium
Stair class B as per EN 12811-1
for 2.57 m and 3.07 m bay length
Weight 27.0 kg, 32.0 kg
Ref. No. 1755.257, 1755.307



Stair guardrail, 2.00 m high
with swiveling wedge heads
for 2.57 m and 3.07 m bay length
Weight 18.1 kg, 20.1 kg
Ref. No. 2638.258, 2638.308



Stair guardrail, 2.00 m high
with U-forks, steel galvanized
for 2.57 m and 3.07 m bay length
Weight 18.1 kg, 20.1 kg
Ref. No. 2638.257, 2638.307

Stair guardrail adapter
Weight 0.7 kg
Ref. No. 2637.000

COUPLERS

Wedge head coupler, rigid
WS 19 / 22
Weight 1.1 kg, 1.1 kg
Ref. No. 2628.019, 2628.022

Wedge head coupler, swiveling
WS 19 / 22
Weight 1.5 kg, 1.5 kg
Ref. No. 2629.019, 2629.022

Wedge head coupler LW, double
Weight 1.2 kg
Ref. No. 2629.000

Rosette, clampable
WS 19 / 22
Length 0.12 m, 0.12 m
Weight 1.1 kg, 1.2 kg
Ref. No. 2602.019, 2602.022

Rosette with thread, clampable
WS 19 / 22
Length 0.12 m, 0.12 m
Weight 1.7 kg, 1.7 kg
Ref. No. 2602.119, 2602.122

ANCHORING

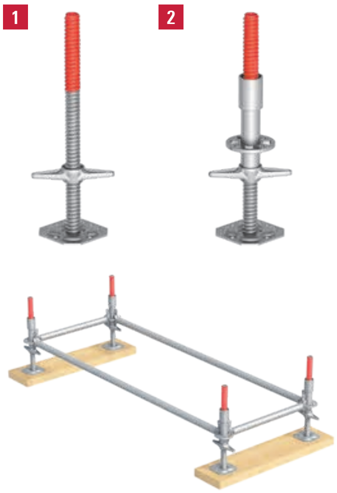
Allround wall tie, 0.80 m
Length 0.80 m
Weight 3.3 kg
Ref. No. 2639.080

For further information and scaffolding components please refer to our Layher Allround Scaffolding price list. WS = Wrench size

THE ASSEMBLY

The Allround wedge head system provides positive connection to every joint between standards, ledgers and diagonal braces as soon as they are assembled. This fundamental safety stays with the assemblers and users of the scaffolding all the way up. The required non-positive connection is achieved with the specified hammer blow using a hammer of at least 500 g until the blow bounces.

LAYING OUT THE SCAFFOLDING



1 Position spindles in the configuration dimension. Use load-distributing bases if the ground is not sufficiently firm.

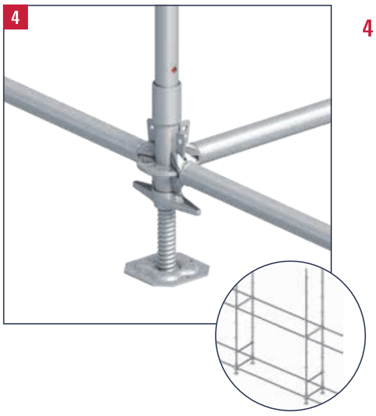
Permissible loads and maximum spindle extension lengths must be complied with (see loading tables for base plates).

2 Push the base collar onto the base plate.

3 Connect the base collars in the longitudinal and transverse directions by ledgers in the selected configuration dimension.

For **right-angled** connections use the **small holes** of the rosette.

Then align the scaffolding base level horizontally, starting at the highest ground point, by adjusting the spindle nuts.

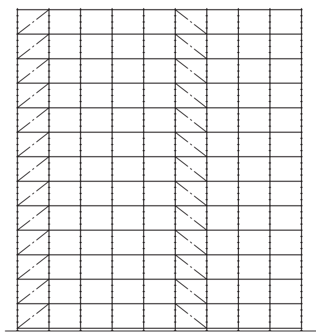


4 Attach standards and connect them at a maximum height of 2.0 m using a transversal ledger and scaffolding decks. In scaffolding levels without decks, longitudinal ledgers must be installed. Depending on static requirements, for example in some facade scaffolding assembly variants, install a further transversal ledger 0.5 m above the bottom transom.

5 We recommend in common applications that the standard lengths be selected such that the joints are on one deck level or on one braced ledger level. Diverging arrangements of the joints must be structurally verified. Note: When the AGS System is used, there is a different arrangement of standard joints. For facade scaffolding in the regular version, no longitudinal ledgers are required in deck levels with scaffolding decks.

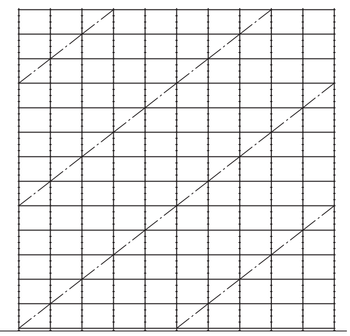
6 Install diagonal braces according to the static requirements. Diagonal braces are not required in the standard assembly according to the German approval. If diagonal braces are required, they can be installed in tower form **6a** or continuously **6b**.

6a



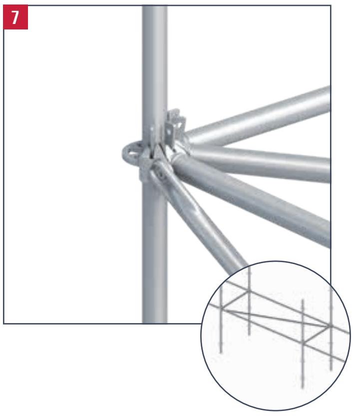
Diagonal braces unidirectional in tower form.

6b



Diagonal braces continuous

The illustrations show the usual diagonal bracing arrangement: one diagonal brace for every 5 scaffolding bays; anchoring not shown.



7 All wedge connections must be knocked in with a hammer of at least 500 g until the blow bounces.

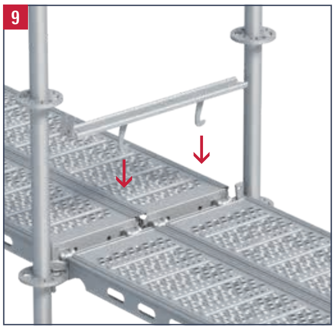
If no scaffolding decks are installed, longitudinal ledgers must be installed, and in every 5th bay, ledgers as horizontal-diagonal bracing. This also applies for plank decking.

8 Assembly is continued by repeating the steps **4, 5, 6** and **7.**

Insert scaffolding decks as bracing every 2.0 m apart in the upward direction as building work progresses.

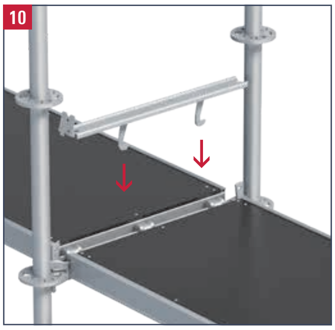
THE SCAFFOLDING DECK

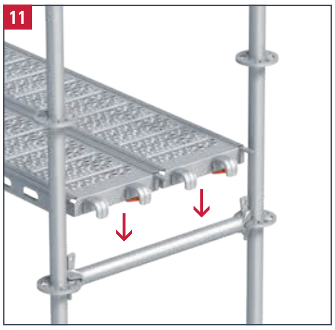
In the Layher system, choose from decks made of steel, aluminium or an aluminium frame with glass-fibre-reinforced plastic or plywood board depending on the type of application and load class, but also in accordance with your working requirements. Common to all Layher decks is their horizontally bracing effect inside the scaffolding.


9

U-scaffolding decks

9 / 10 Suspend decks in U-ledger and secure them with U-lift-off preventer. Select the deck depending on load and bay width.


10


11

O-scaffolding decks

11 Place decks onto the O-ledger with the lift-off preventer swung back. Swing the lift-off preventer forwards.
Select the scaffolding decks depending on load and bay width.

THE 3-PART SIDE PROTECTION.


12a

12a Install ledgers 0.5 m above the deck level as an intermediate rail and 1.0 m above the deck level as a guardrail.

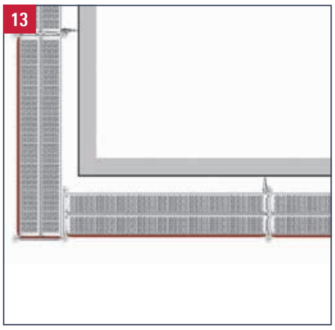
Install toe boards on the longitudinal side and at the ends of the deck level.


12b

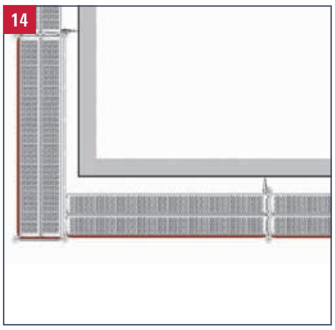
12b Whenever the AGS Sytem is used, Allround AGS standards LW 2.0 m **12c** and swiveling AGS guardrails **12d** are used too. The standard joint of the AGS standards is at 1.0 m height between the scaffolding levels. The AGS system permits safer and faster assembly of the guardrails from the secured level underneath.


12c

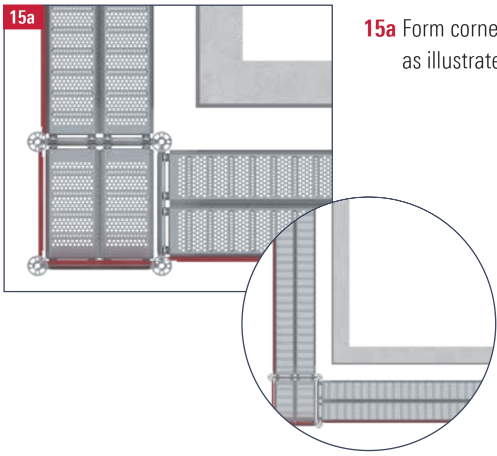

12d


13

13 / 14 Insert longitudinal and end toe boards behind the wedges.

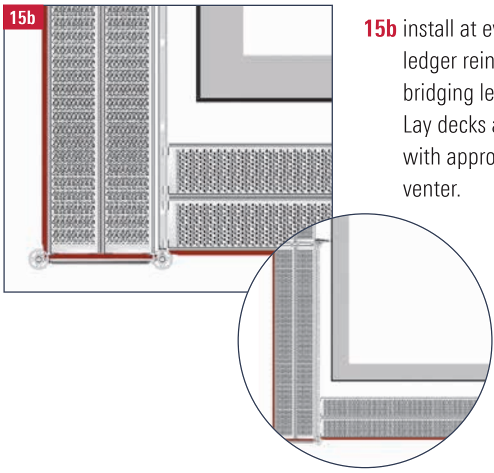

14

THE PRACTICAL CORNER DESIGN



15a Form corner using 4 standards as illustrated,

or



15b install at every deck level ledger reinforced, LW or bridging ledger as shown. Lay decks and secure them with appropriate lift-off preventer.

CANTILEVERS

Bracket cantilever

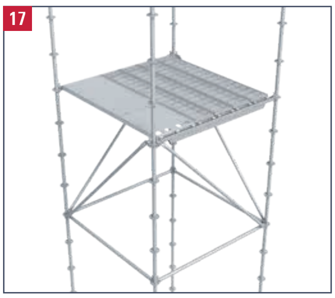
18 0.3 m bracket cantilever using Allround bracket and scaffolding decks.

19 0.7 m bracket cantilever using Allround bracket, bracket brace and scaffolding decks.

Allround scaffolding cantilever

20 Support cantilevers 0.5 m below the deck level with bracket braces or Allround diagonal braces. Safeguard scaffolding decks on cantilever structures from being inadvertently lifted out using appropriate lift-off preventer.

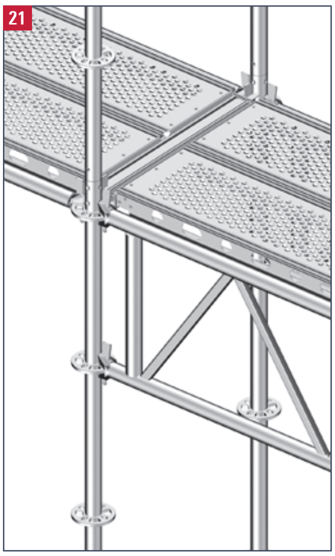
TOWER AND BIRDCAGE SCAFFOLDING



16/17 Use of ledgers reinforced, LW, bridging ledgers and lattice beams.

ALLROUND BRIDGING

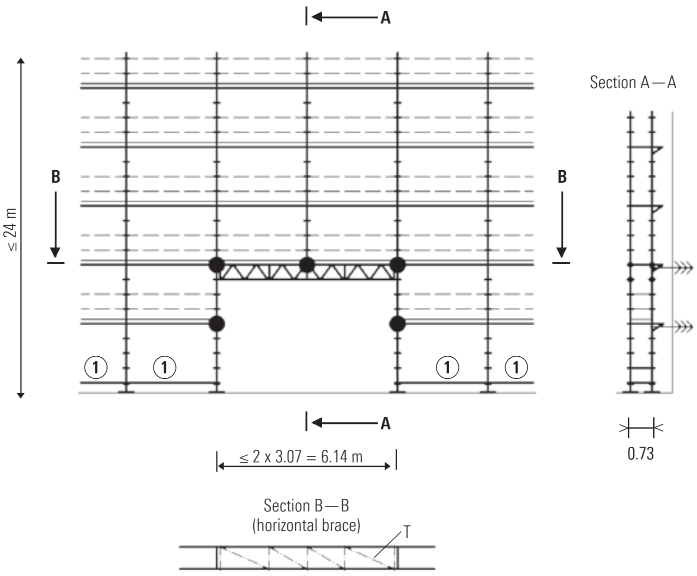
Bridging of spans of up to 4.14 m can be achieved with steel decks of 4.14 m length together with 4.14 m long guardrails and toe boards. Bridging of gate entrances, building projections, balconies or openings using Allround lattice beams (see bridging variant A) or with vertical diagonal braces (see bridging variant B).



21 Allround lattice beam: Connect the wedge heads of the lattice beams to the rosettes of the vertical standards. For bridging variant A.

BRIDGING ARRANGEMENTS FOR FACADE SCAFFOLDING

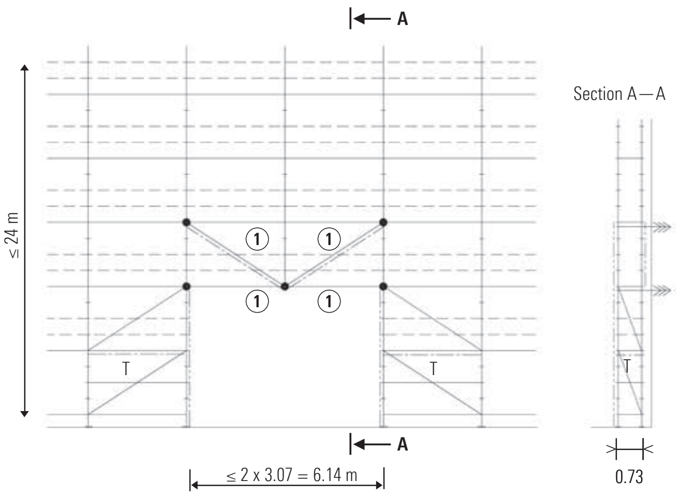
Bridging variant A
for load class 3, scaffolding width 0.73 m
up to 24 m high



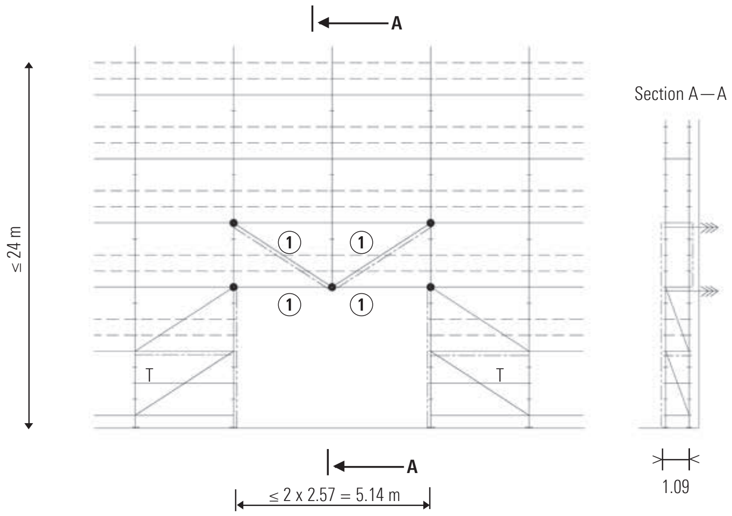
- Anchoring point for bridging

T Scaffolding tube dia. 48.3 mm as per EN 39
① Ledgers inside and outside

Bridging variant B1
for load class 3, scaffolding width 0.73 m
up to 24 m high



Bridging variant B2
for load class 4, scaffolding width 1.09 m
up to 24 m high,
with diagonal braces K2000+ or diagonal braces LW



- Anchoring point for bridging

T Scaffolding tube dia. 48.3 mm as per EN 39 as horizontal diagonal brace
① Ledgers inside and outside
Position of the vertical diagonal braces:
——— outside
– – – – inside

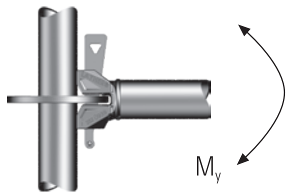
DESIGN RESISTANCES PER GERMAN APPROVAL

DESIGN RESISTANCES IN ALLROUND LEDGER CONNECTION

DESIGN RESISTANCES OF DIAGONAL BRACES TO NORMAL FORCE

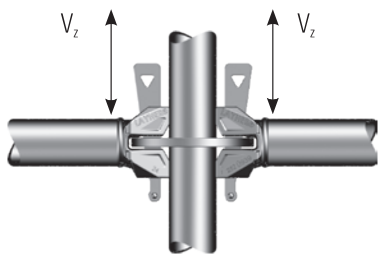
Z-8.22-939: LIGHTWEIGHT

Bending moment



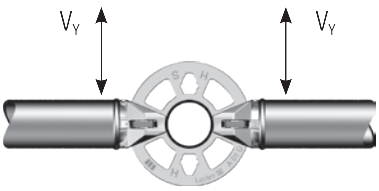
Bending moment
$M_{y,Rd} = \pm 120.0$ kNcm

Vertical shear force

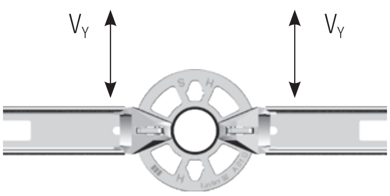


Vertical shear force single connection
$V_{z,Rd} = \pm 31.7$ kN
Vertical shear force per rosette
$\sum V_{z,Rd} = \pm 117.0$ kN

Horizontal shear force

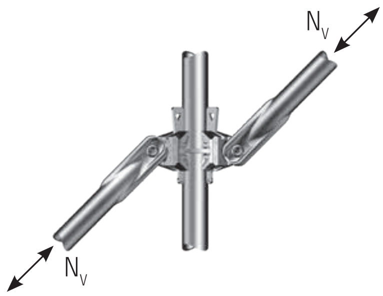


O-ledger: $V_{y,Rd} = \pm 16.6$ kN

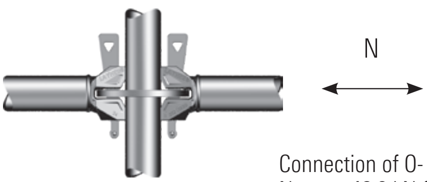


U-ledger: $V_{y,Rd} = \pm 16.6$ kN

Normal force, diagonal brace



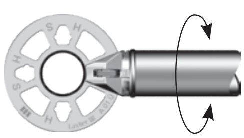
Normal force



Connection of O- and U-ledgers:
$N_{Rd} = \pm 42.3$ kN for connection in small hole

$N_{Rd} = \pm 35.1$ kN for connection in large hole

Torsional moment



$M_{T,Rd} = \pm 52.5$ kNcm

Design resistances of vertical diagonal braces LW for bay height 2.0 m									
Bay length [m]	0.73	1.036	1.09	1.40	1.57	2.07	2.57	3.07	4.14
Compression $N_{V,Rd}$ [kN]	-18.6	-19.9	-20.1	-18.6	-17.6	-14.4	-11.7	-9.5	-6.0
Tension $N_{V,Rd}$ [kN]	+20.9	+24.2	+24.7	+25.6	+26.3	+28.5	+30.9	+32.2	+29.7

Design resistances of vertical diagonal braces LW for bay height 1.5 m						
Bay length [m]	0.73	1.09	1.57	2.07	2.57	3.07
Compression $N_{V,Rd}$ [kN]	-19.4	-21.3	-22.5	-17.8	-13.9	-10.8
Tension $N_{V,Rd}$ [kN]	+23.0	+25.6	+28.3	+31.6	+31.3	+29.9

Design resistances of vertical diagonal braces LW for bay height 1.0 m						
Bay length [m]	0.73	1.09	1.57	2.07	2.57	3.07
Compression $N_{V,Rd}$ [kN]	-21.0	-23.2	-18.7	-17.1	-15.9	-12.1
Tension $N_{V,Rd}$ [kN]	+25.3	+28.2	+32.2	+30.0	+28.7	+28.1

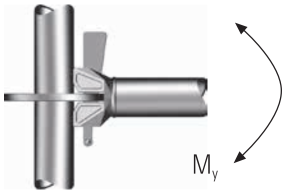
Design resistances of vertical diagonal braces LW for bay height 0.5 m						
Bay length [m]	0.73	1.09	1.57	2.07	2.57	3.07
Compression $N_{V,Rd}$ [kN]	-21.1	-17.2	-16.1	-15.7	-15.5	-13.0
Tension $N_{V,Rd}$ [kN]	+30.4	+30.1	+28.2	+27.4	+27.1	+26.9

Permissible forces and moments are obtained by dividing the design resistance by 1.5 (= γ_F). The index R_d stands for design resistance.

Z-8.22-64: K2000+

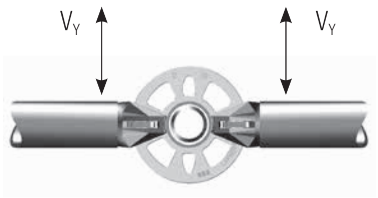
Variant K2000+ is a former generation of Allround Scaffolding

Bending moment

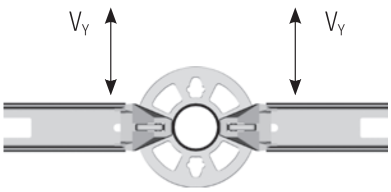


Bending moment
$M_{y,\,Rd} = \pm\ 101.0$ kNcm

Horizontal shear force

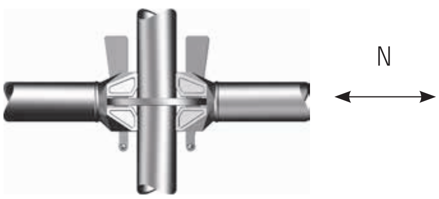


O-ledger $V_{y,\,Rd} = \pm\ 10.0$ kN



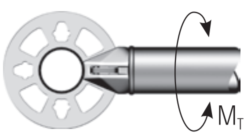
U-ledger: $V_{y,\,Rd} = \pm\ 5.9$ kN

Normal force



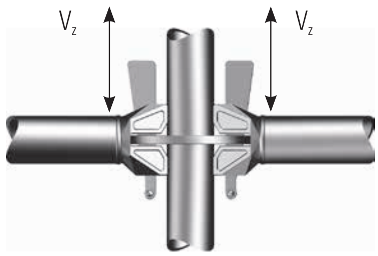
Connection of O- and U-ledgers:
$N_{Rd} = \pm\ 31.0$ kN for connection in large and small hole

Torsional moment



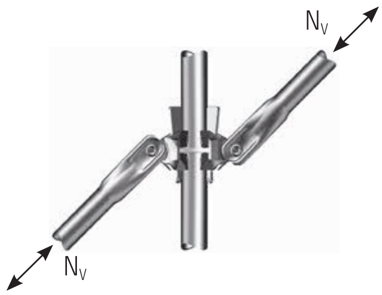
$M_{T,\,Rd} = \pm\ 52.5$ kNcm

Vertical shear force



Vertical shear force single connection
$V_{z,\,Rd} = \pm\ 26.4$ kN
Vertical shear force per rosette
$\sum V_{z,\,Rd} = \pm\ 105.6$ kN

Normal force, diagonal brace



Design resistances of vertical diagonal braces K2000+ for bay height 2.0 m									
Bay length [m]	0.73	1.036	1.09	1.40	1.57	2.07	2.57	3.07	4.14
Compression $N_{V,Rd}$ [kN]	-16.6	-17.9	-17.7	-16.3	-15.4	-12.8	-10.5	-8.5	-5.4
Tension $N_{V,Rd}$ [kN]	+18.0	+20.8	+21.2	+22.0	+22.6	+24.5	+26.7	+27.6	+25.5

Design resistances of vertical diagonal braces K2000+ for bay height 1.5 m						
Bay length [m]	0.73	1.09	1.57	2.07	2.57	3.07
Compression $N_{V,Rd}$ [kN]	-17.8	-20.4	-19.3	-15.5	-12.3	-9.7
Tension $N_{V,Rd}$ [kN]	+19.8	+22.0	+24.4	+27.3	+26.8	+25.6

Design resistances of vertical diagonal braces K2000+ for bay height 1.0 m						
Bay length [m]	0.73	1.09	1.57	2.07	2.57	3.07
Compression $N_{V,Rd}$ [kN]	-20.0	-23.1	-18.7	-17.1	-14.0	-10.8
Tension $N_{V,Rd}$ [kN]	+21.7	+24.3	+27.6	+25.7	+24.6	+24.1

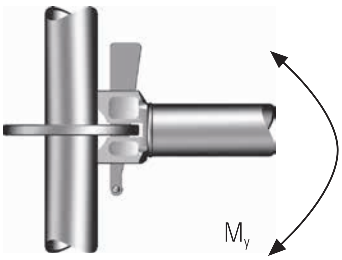
Design resistances of vertical diagonal braces K2000+ for bay height 0.5 m						
Bay length [m]	0.73	1.09	1.57	2.07	2.57	3.07
Compression $N_{V,Rd}$ [kN]	-21.1	-17.2	-16.1	-15.7	-15.2	-11.5
Tension $N_{V,Rd}$ [kN]	+26.2	+25.8	+24.1	+23.5	+23.2	+23.1

Permissible forces and moments are obtained by dividing the design resistance by 1.5 (= γ_F). The index R_d stands for design resistance.

Z-8.22-64: Variant II

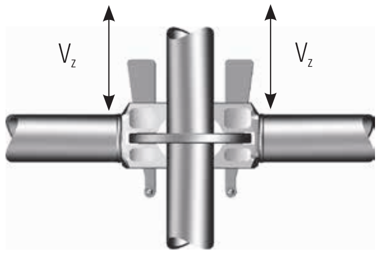
Variant II is a former generation of Allround Scaffolding

Bending moment



Bending moment
$M_{y,\,Rd} = \pm$ 68.0 kNcm

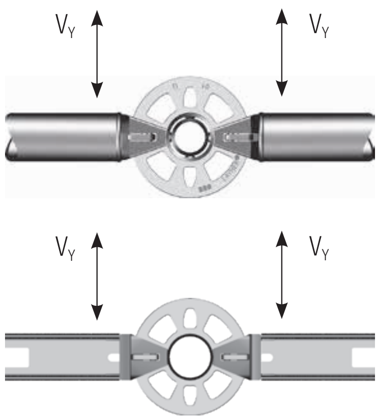
Vertical shear force



Vertical shear force single connection
$V_{z,\,Rd} = \pm$ 17.4 kN

Vertical shear force per rosette
$\sum V_{z,\,Rd} = \pm$ 69.5 kN

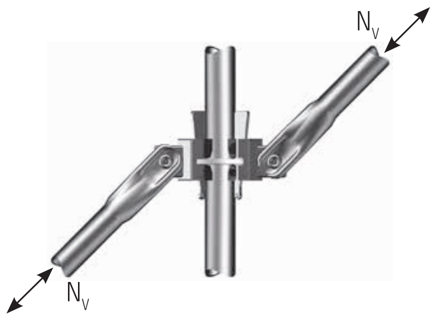
Horizontal shear force



O-ledger: $V_{y,\,Rd} = \pm$ 6.7 kN

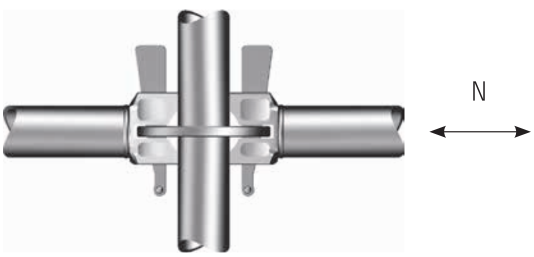
U-ledger: $V_{y,\,Rd} = \pm$ 5.9 kN

Normal force, diagonal brace



Design resistances of vertical diagonal braces, Variant II for bay height 2.0 m								
Bay length [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07	4.14
Compression $N_{V,Rd}$ [kN]	-8.4							-5.3
Tension $N_{V,Rd}$ [kN]	+8.4							

Normal force



Connection of O- and U-ledgers:
$N_{Rd} = \pm$ 22.7 kN for connection in large and small hole

Permissible forces and the permissible moment are obtained by dividing the design resistance by 1.5 (= γ_F). The index R_d stands for design resistance.

COMMON USE

COMPONENTS OF DIFFERENT ALLROUND SCAFFOLDING GENERATIONS

The components of different generations of Allround Scaffolding may be used together without restriction.
This is regulated in the German general building authority approvals Z-8.22-64 and Z-8.22-949.

In accordance with these approvals, the following regulations apply for the structural analysis of scaffolding structures containing components from different Allround Scaffolding generations:

Combination Allround Scaffolding components	Design resistances		Stiffnesses	
	Ledger connections	Vertical diagonal braces	Ledger connections [3]	Vertical diagonal braces
Variant II + K2000+	as Variant II	as Variant II [1]	as K2000+	as (Variant II and K2000+) [4]
LW + Variant II + K2000+ and LW + Variant II	as Variant II	as Variant II [2]	as Variant II	
LW + K2000+	as K2000+		as K2000+	

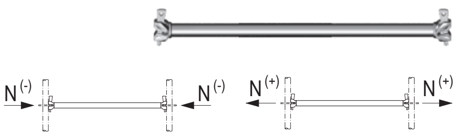
[1] If vertical diagonal braces K2000+ are used with standards of Variant II, the values approved for them in accordance with Z-8.22-64 may be used alternatively.
[2] If only vertical diagonal braces LW and / or K2000+ are used, the values approved for them may be used alternatively, see [1] and Z-8.22-949
[3] The ledger connections may – as in all Allround Scaffolding structures – also assumed to be articulated.
[4] Note: Vertical diagonal braces Variant II and vertical diagonal braces K2000+ have the same stiffnesses.

The use of Allround Scaffolding components of the first generation, Variant I, is also permissible together with Allround Scaffolding components of Variant II, K2000+ and LW without restriction. Regulations regarding the stiffnesses and design resistances of the ledger connections and diagonal braces can be found in the above approvals.

LOADING TABLES FOR ALLROUND STEEL

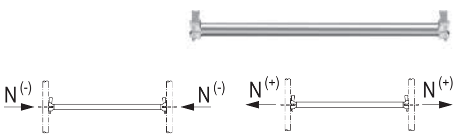
ALL SPECIFIED LOADS ARE SAFE WORKING LOADS.

O-ledger LW



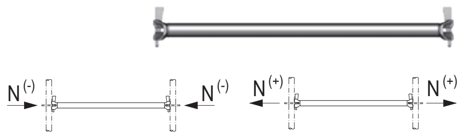
Permissible normal force O-ledger LW				
Ledger length [m]	Compression N(-) [kN]		Tension N(+) [kN]	
	Connection in small hole	Connection in large hole	Connection in small hole	Connection in large hole
≤ 1.57	-28.2	-23.4	+28.2	+23.4
2.07	-27.3	-23.4		
2.57	-18.1			
3.07	-12.9			

O-ledger Variant II



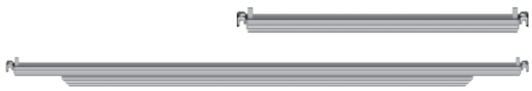
Permissible normal force O-ledger Variant II		
Ledger length [m]	Compression N(-) [kN]	Tension N(+) [kN]
≤ 2.57	-15.1	+15.1
3.07	-13.8	

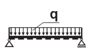
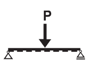
O-ledger K2000+



Permissible normal force O-ledger K2000+		
Ledger length [m]	Compression N(-) [kN]	Tension N(+) [kN]
≤ 2.07	-20.7	+20.7
2.57	-19.1	
3.07	-13.8	

U-interchangeable ledger LW / U-interchangeable ledger LW reinforced



Permissible load of U-interchangeable ledger LW / U-interchangeable ledger LW reinforced							
Ledger type	U-LW		U-LW-V				
Length [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
 Uniformly distributed line load (q) [kN/m]	33.3	14.4	23.3	14.6	10.6	6.8	4.7
 Concentrated load (P) in bay centre [kN]	11.3	7.5	18.3	16.2	12.2	9.8	8.2

O-ledger LW
on LW standards

Permissible load of O-ledger LW							
Ledger length (system dimension) [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Uniformly distributed line load (q) [kN/m]	29.2	14.1	8.8	7.0	4.1	2.7	1.9
Concentrated load (P) in bay centre [kN]	10.1	7.1	5.7	5.1	4.0	3.3	2.7

O-ledger LW
on K2000+ standards

Permissible load of O-ledger LW							
Ledger length (system dimension) [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Uniformly distributed line load (q) [kN/m]	29.2	14.1	8.8	7.0	4.1	2.3	1.5
Concentrated load (P) in bay centre [kN]	10.1	7.1	5.7	5.1	4.0	3.3	2.7

O-ledger K2000+
on K2000+ standards

Permissible load of O-ledger K2000+							
Ledger length (system dimension) [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Uniformly distributed line load (q) [kN/m]	22.1	10.4	6.5	5.3	3.1	2.1	1.5
Concentrated load (P) in bay centre [kN]	7.4	5.2	4.2	3.8	3.0	2.4	2.1

O-ledger Variant II
on standards Variant II

Permissible load of O-ledger Variant II							
Ledger length (system dimension) [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Uniformly distributed line load (q) [kN/m]	22.1	8.8	4.6	3.5	1.8	1.1	0.7
Concentrated load (P) in bay centre [kN]	7.4	5.2	4.1	3.5	2.4	1.8	1.4

U- and O-bridging ledgers
on standards LW, K2000+ and Variant II

Permissible load of U- / O-bridging ledgers								
Ledger type [m]	U 1.57	U 2.07	U 2.57	U 3.07	O 1.57	O 2.07	O 2.57	O 3.07
Uniformly distributed line load (q) [kN/m]	15.2	8.7	5.1	3.6	14.5	8.6	5.4	3.6
Concentrated load (P) in bay centre [kN]	8.0	6.9	5.3	5.2	10.6	6.9	4.6	3.6

O- and U-bridging ledgers are available in Variant K2000+ and Variant II

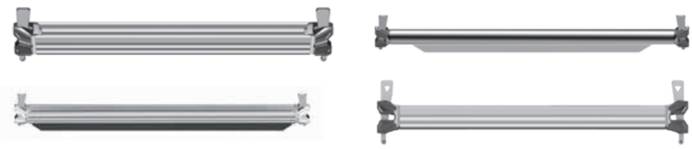
Diagonal braces, H = 2,0 m

Permissible load of vertical diagonal braces LW, H = 2.,0 m							
Bay length [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Compression force [kN]	-12.4	-13.4	-12.4	-11.7	-9.6	-7.8	-6.3
Tension force [kN]	+13.9	+16.5	+17.1	+17.5	+19.0	+20.6	+21.5

Permissible load of vertical diagonal braces K2000+, H = 2.0 m							
Bay length [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Compression force [kN]	-11.1	-11.8	-10.9	-10.3	-8.5	-7.0	-5.7
Tension force [kN]	+12.0	+14.1	+14.7	+15.1	+16.3	+17.8	+18.4

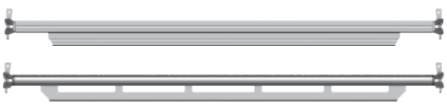
Permissible load of vertical diagonal braces Variant II = 2.0 m							
Bay length [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Tension / compression force [kN]	±5.6	±5.6	±5.6	±5.6	±5.6	±5.6	±5.6

U-ledger / U-ledger reinforced / O-ledger reinforced / U-ledger LW
on standards LW, K2000+ and Variant II



Permissible load of U-ledger (U), reinforced ledger (V), O-ledger (O)							
Ledger type	U/U-LW	U-V	U-V	O-V	O-V	U-LW	U-LW
Length [m]	0.73	1.09	1.40	1.09	1.29	1.09	1.40
Uniformly distributed line load (q) [kN/m]	19.0	17.3	10.4	21.8	15.6	17.5	10.8
Concentrated load (P) in bay centre [kN]	6.1	8.8	6.8	11.0	9.3	8.6	6.4

U-ledger reinforced LW / O-ledger reinforced LW
on standards LW and K2000+



Permissible load of U- / O-ledger LW reinforced										
Ledger type	U-LW-V					O-LW-V				
Length [m]	1.40	1.57	2.07	2.57	3.07	1.09	1.40	1.57	2.07	2.57	3.07
Uniformly distributed line load (q) [kN/m]	19.8	17.7	13.0	8.4	5.0	21.4	17.1	16.1	11.1	8.5	6.0
Concentrated load (P) in bay centre [kN]	19.2	17.1	12.9	10.4	8.7	19.6	19.4	17.3	13.2	10.7	9.0

ALLROUND O-LATTICE BEAM LW

Permissible load of Allround O-lattice beam LW							
Beam length [m]	2.07	2.57	3.07	4.14	5.14	6.14	7.71
Bracing of top chord	A	B	C	D	E	F	G
Uniformly distributed line load (q) [kN/m]	21.6 A1	11.3 B1	5.5 C1	8.5	3.6 E1	3.4 F1	1.3 G1
	21.6 A2	17.7 B2	14.1 C2		7.7 E2	6.2 F2	4.5 G2
Concentrated load (P) in bay centre [kN]	26.9 A1	14.2 B1	8.3 C1	25.8	13.6 E1	10.3 F1	5.1 G1
	35.3 A2	37.2 B2	[13.9[1] / 32.4[2]] C2		27.3 E2	21.7 F2	17.1 G2
Two concentrated loads (P_1) in the one-third points [kN]	–	–	–	–	–	–	3.9 G1
							12.8 G2

ALLROUND O-LATTICE BEAMS K2000+ AND VARIANT II

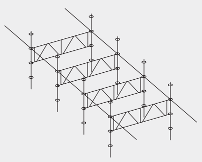
Permissible load of Allround O-lattice beams K2000+ and Variant II							
Beam length [m]	2.07	2.57	3.07	4.14	5.14	6.14	7.71
Bracing of top chord	A1	B	C	D	E	F	G
Uniformly distributed line load (q) [kN/m]	16.7	11.0 B1	5.5 C1	7.3	3.6 E1	3.4 F1	1.3 G1
		12.7 B2	10.1 C2		5.5 E2	4.5 F2	3.3 G2
Concentrated load (P) in bay centre [kN]	25.4	14.2 B1	8.3 C1	25.8	13.6 E1	10.3 F1	5.1 G1
		26.7 B2	[11.2[1] / 23.3[2]] C2		23.4 E2	18.8 F2	14.8 G2
Two concentrated loads (P_1) in the one-third points [kN]	–	–	–	–	–	–	3.9 G1
							11.1 G2

[1] Concentrated load exactly in the centre of the lattice beam (= between the two central posts)
[2] Concentrated load above one of the central posts

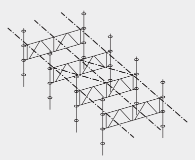
BRACING OF THE LATTICE BEAMS WITH TUBES AND COUPLERS

Lattice beam 2.07 m

A1: No bracing

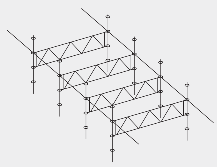


A2 : In the centre, at post* or at top chord**

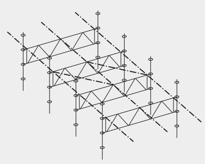


Lattice beam 2.57 m

B1: No bracing

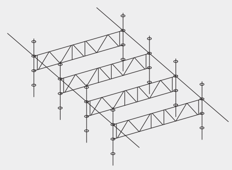


B2: In the centre, at top chord**

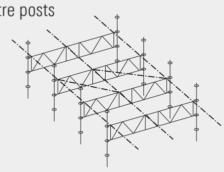


Lattice beam 3.07 m

C1: No bracing

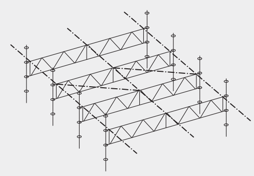


C2: At one of the centre posts* or at top chord** between the centre posts



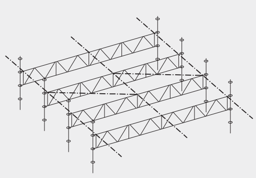
Lattice beam 4.14 m

D: In the centre: at post* or at top chord**

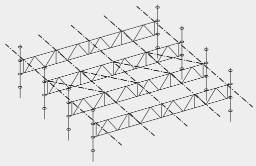


Lattice beam 5.14 m

E1: In the centre, at post* or at top chord**

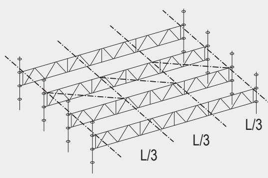


E2 : at the posts*

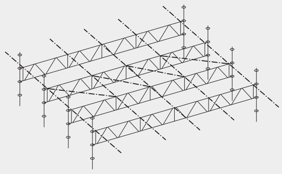


Lattice beam 6.14 m

F1: At top chord** in the one-third points

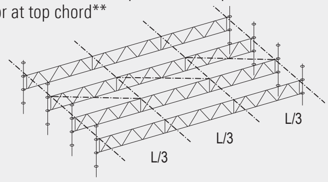


F2: at the posts*

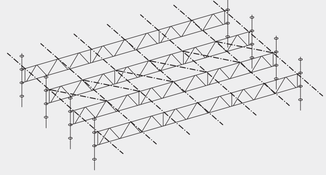


Lattice beam 7.71 m

G1: In the one-third points: at the posts* or at top chord**



G2: In 6 intervals each of 1.285 m, at the top chord** and at the posts*



* Bracing at the posts means: longitudinal tubes at the posts, connected directly underneath the top chord. The horizontally / diagonally running tubes are connected to the longitudinal tubes.

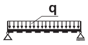
** Bracing at the top chord means: longitudinal tubes connected to the top chord. The horizontally / diagonally running tubes are connected to the longitudinal tubes.

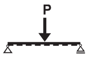
Horizontally / diagonally running tubes in at least every 5th bay.

The sketches illustrate the principle. Support scaffolding including its bracing and side protection is not illustrated.

ALLROUND U-LATTICE BEAM LW, K2000+

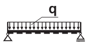
Permissible loads when the lattice beams are completely covered with U-decks secured with lift-off preventer

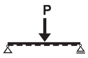




Permissible load of Allround U-lattice beams LW and K2000+												
Beam type	Allround U-lattice beams LW						Allround U-lattice beams K2000+					
Beam length [m]	2.07	2.57	3.07	4.14	5.14	6.14	2.07	2.57	3.07	4.14	5.14	6.14
Uniformly distributed line load (q) [kN/m]	20.0	16.5	13.7	10.1	7.8	6.1	17.3	12.5	10.2	7.3	5.2	4.3
Concentrated load (P) in bay centre [kN]	33.9	37.2	15.8[1] / 32.4[2]	34.7	28.4	23.4	25.1	26.6	8.2[1] / 19.5[2]	16.2	15.9	10.9

Permissible loads when the lattice beams are braced with tubes and couplers or when the lattice beams are not braced





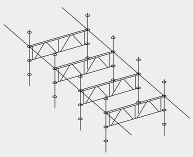
Permissible load of Allround U-lattice beams LW and K2000+												
Beam type	Allround U-lattice beams LW						Allround U-lattice beams K2000+					
Beam length [m]	2.07	2.57	3.07	4.14	5.14	6.14	2.07	2.57	3.07	4.14	5.14	6.14
Bracing of top chord	A	B	C	D	E	F	A	B	C	D	E	F
Uniformly distributed line load (q) [kN/m]	20.0	14.9	7.6 [C1] 13.7 [C2]	10.7	5.0 [E1] 7.8 [E2]	2.5 [F1] 6.1 [F2]	17.3	12.5	7.5 [C1] 10.2 [C2]	7.3	4.6 [E1] 5.2 [E2]	2.4 [F1] 4.3 [F2]
Concentrated load (P) in bay centre [kN]	33.9	19.2	(11.7[1,2]) [C1] (15.8[1] / 32.4[2]) [C2]	33.8	18.9 [E1] 28.4 [E2]	11.4 [F1] 23.4 [F2]	25.1	17.9	(8.2[1] / 11.3[2]) [C1] (8.2[1] / 19.5[2]) [C2]	16.2	15.9 [E1. E2]	10.9 [F1. F2]

[1] Concentrated load exactly in the centre of the lattice beam (= between the two central posts)
[2] Concentrated load above one of the central posts

BRACING OF THE LATTICE BEAMS WITH TUBES AND COUPLERS

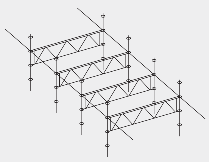
Lattice beam 2.07 m

A: No bracing



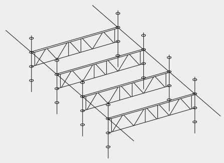
Lattice beam 2.57 m

B: No bracing

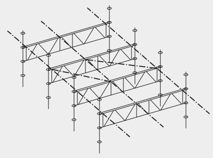


Lattice beam 3.07 m

C1: No bracing

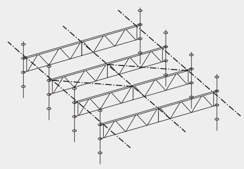


C2: At one of the centre posts*



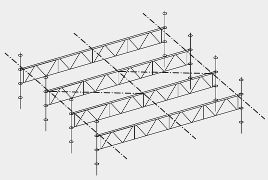
Lattice beam 4.14 m

D: In the centre, at the post*

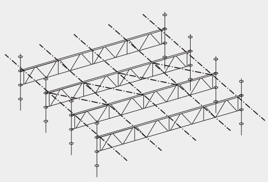


Lattice beam 5.14 m

E1: In the centre, at the post*

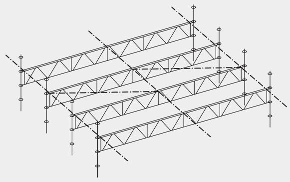


E2 : At all posts*

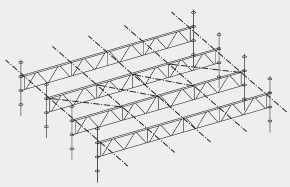


Lattice beam 6.14 m

F1: In the centre, at the post*



F2: At all posts*

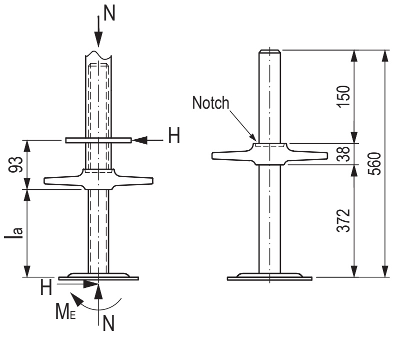


* Bracing at the posts means: longitudinal tubes at the posts, connected directly underneath the top chord. The horizontally / diagonally running tubes are connected to the longitudinal tubes.

Horizontally / diagonally running tubes in at least every 5th bay.

The sketches illustrate the principle. Support scaffolding including its bracing and side protection is not illustrated.

BASE PLATE 60 LOADING TABLE



Equivalent section properties
of the thread

$A = 3.84\ cm^2$
$W_{el} = 2.61\ cm^3$
$W_{pl} = 3.26\ cm^3$
$I = 3.74\ cm^4$

Material: EN 10219-S235JRH
→ Rolled thread: $f_{y,k}$ = 280.0 N/mm²

Permissible load of base plate 60

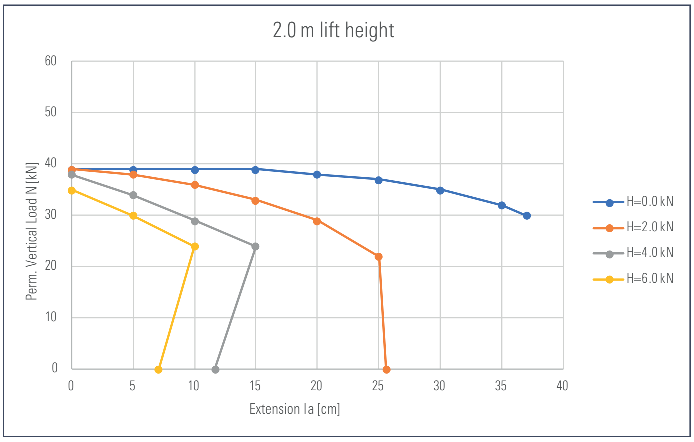
Extension l_a [cm]	Permissible vertical load N [kN] in case of a simultaneously acting horizontal load H [kN] for different lift heights																					Perm. horizontal load H [kN], when N = 0 kN
	H = 0.0			H = 1.0			H = 2.0			H = 3.0			H = 4.0			H = 5.0			H = 6.0			
	Level [m]																					
	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	
0	39[1]	53	59	39[1]	51	58	39[1]	50	57	39[1]	49	55	38	47	54	36	45	52	35	43	51	26.3
5	39[1]	52	58	39[1]	50	56	38	47	54	36	44	51	34	42	49	32	39	46	30	37	42	7.8
10	39[1]	51	57	38	47	52	36	43	46	33	40	40	29	36	33	26	31	25	24	23	16	4.6
15	39[1]	49	54	36	44	46	33	39	37	29	30	27	24	20	16	–	–	–	–	–	–	3.2
20	38	47	49	34	40	39	29	29	27	–	17	15	–	–	–	–	–	–	–	–	–	2.5
25	37	44	44	31	33	32	22	20	19	–	–	–	–	–	–	–	–	–	–	–	–	2.0
30	35	38	39	27	26	26	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7
35	32	33	34	21	20	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5
37	30	31	31	17	18	18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.4

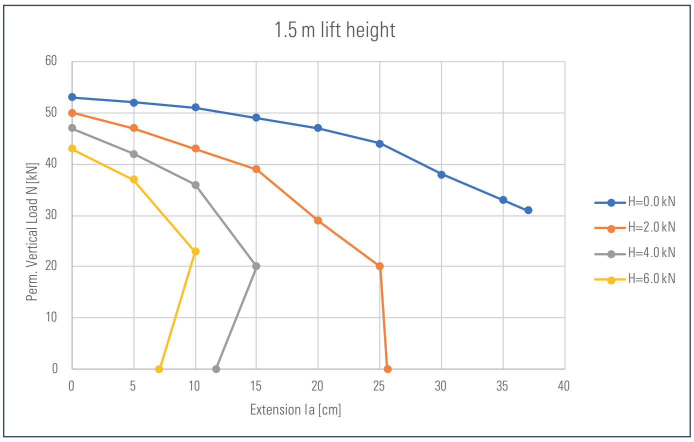
The permissible vertical loads are calculated by application of the calculation model according to DIN EN 12811-1, para. 10.2.3.2. To consider the bending stiffness of the Allround standard, the effects from second-order theory and the maximum load-bearing capacity of the standards, birdcage scaffolding with modular dimension 2.57 x 2.57 m and different lift heights was considered.

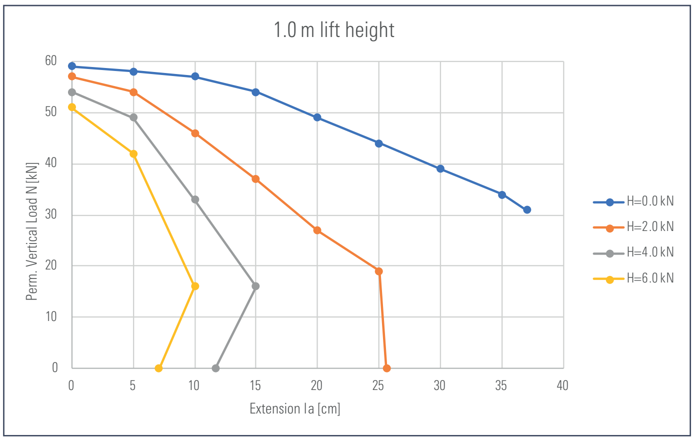
(–) With this combination of spindle extension and horizontal load, the load-bearing capacity of the spindle is exceeded.

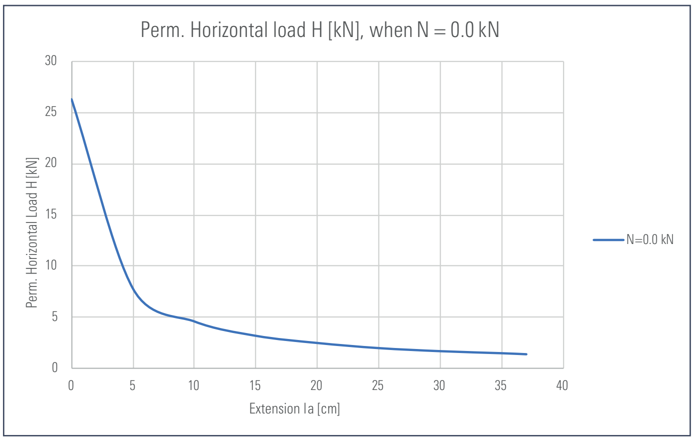
[1] Here the permissible vertical load of the standard at 2.0 m lift height is reached (39 kN)

GRAPHIC DISPLAY OF TABLE VALUES

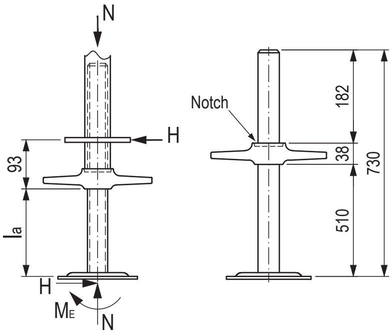








BASE PLATE 80 REINFORCED LOADING TABLE



Permissible load of base plate 80 reinforced

Extension l_a [cm]	Permissible vertical load N [kN] in case of a simultaneously acting horizontal load H [kN] for different lift heights																					Perm. horizontal load H [kN], when N = 0 kN
	H = 0.0			H = 1.0			H = 2.0			H = 3.0			H = 4.0			H = 5.0			H = 6.0			
	Level [m]																					
	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	
0	39[1]	54[2]	69	39[1]	54[2]	68	39[1]	53	67	39[1]	53	66	38	52	64	38	51	63	38	50	61	30.0
5	39[1]	54[2]	68	39[1]	53	66	38	52	64	38	50	62	37	49	59	35	47	56	34	44	53	8.9
10	39[1]	53	67	38	52	64	38	49	57	36	47	50	34	43	43	31	40	36	28	34	25	5.2
15	39[1]	53	65	38	50	55	36	46	46	33	40	36	29	29	25	–	–	–	–	–	–	3.7
20	38	51	60	37	47	48	33	38	36	28	26	23	–	–	–	–	–	–	–	–	–	2.8
25	38	50	55	35	41	41	30	28	27	–	–	–	–	–	–	–	–	–	–	–	–	2.3
30	37	47	50	33	35	35	7	20	19	–	–	–	–	–	–	–	–	–	–	–	–	2.0
35	36	42	45	28	29	29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7
40	34	38	40	23	24	24	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5
45	32	33	35	13	16	19	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.3
51	27	28	29	5	6	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.2

The permissible vertical loads are calculated by application of the calculation model according to DIN EN 12811-1, para. 10.2.3.2. To consider the bending stiffness of the Allround standard, the effects from second-order theory and the maximum load-bearing capacity of the standards, birdcage scaffolding with modular dimension 2.57 x 2.57 m and different lift heights was considered.

(–) With this combination of spindle extension and horizontal load, the load-bearing capacity of the spindle is exceeded.

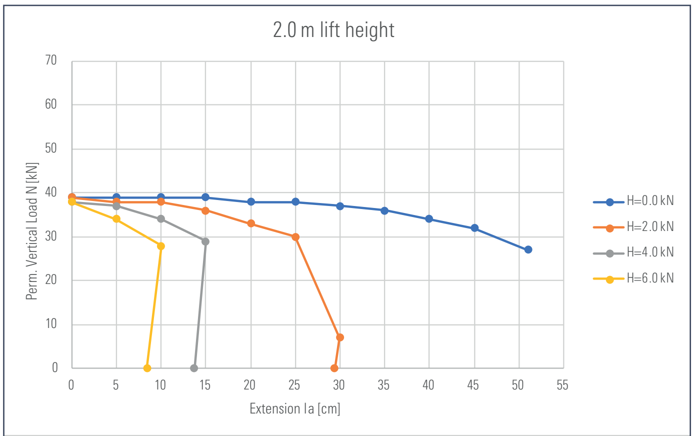
[1] Here the permissible vertical load of the standard at 2.0 m lift height is reached (39 kN)
[2] Here the permissible vertical load of the standard at 1.5 m lift height is reached (54 kN)

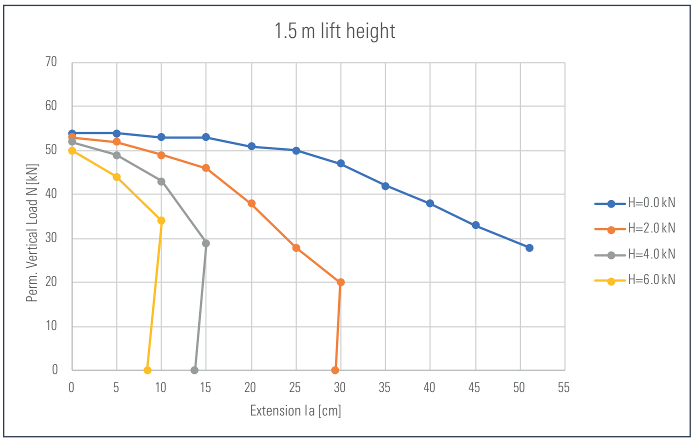
Equivalent section properties of the thread

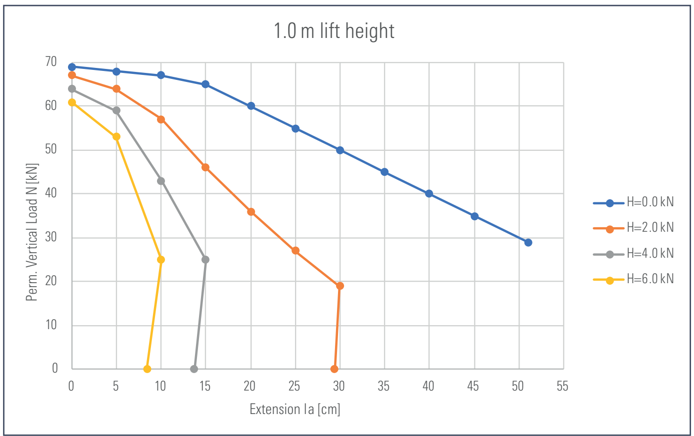
A = 4.71 cm²
W_{el} = 2.97 cm³
W_{pl} = 3.71 cm³
I = 4.29 cm⁴

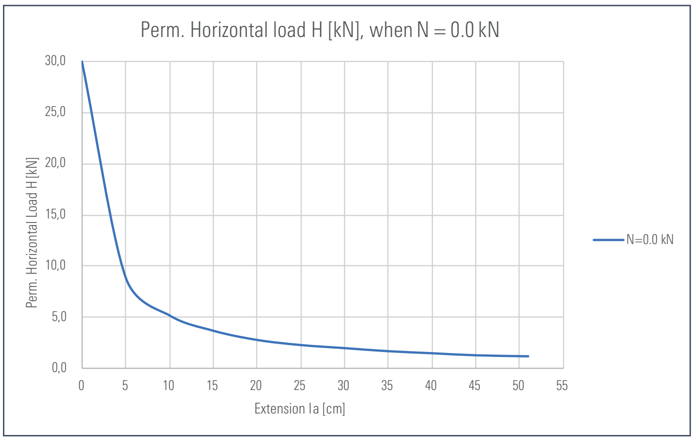
Material: EN 10219-S235JRH
→ Rolled thread: $f_{y,k}$ = 280.0 N/mm²

GRAPHIC DISPLAY OF TABLE VALUES

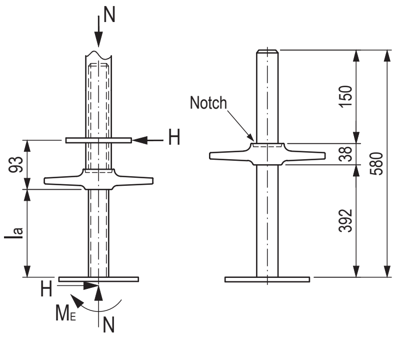








BASE PLATE 60 SOLID LOADING TABLE



Equivalent section properties
of the thread
$A = 8.80\ cm^2$
$W_{el} = 3.84\ cm^3$
$W_{pl} = 4.79\ cm^3$
$I = 6.51\ cm^4$

Material: EN 10025-2-S355J2
→ Rolled thread: $f_{y,k} = 360.0\ N/mm^2$

Permissible load of base plate 60 solid

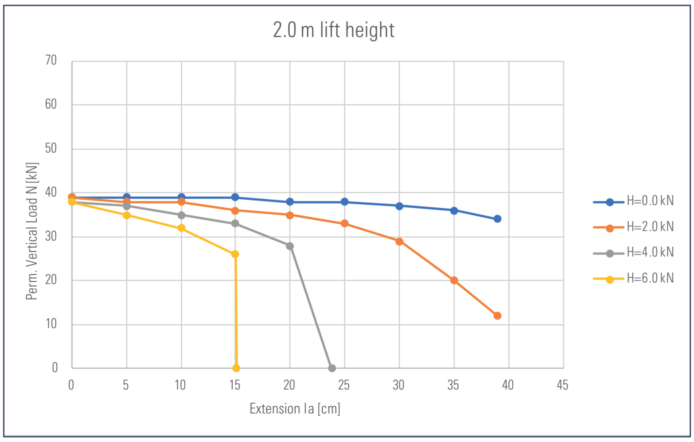
Extension l_a [cm]	Permissible vertical load N [kN] in case of a simultaneously acting horizontal load H [kN] for different lift heights																					Perm. horizontal load H [kN], when N = 0 kN
	H = 0.0			H = 1.0			H = 2.0			H = 3.0			H = 4.0			H = 5.0			H = 6.0			
	Level [m]																					
	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	
0	39[1]	54[2]	69	39[1]	54[2]	68	39[1]	53	67	39[1]	53	65	38	52	64	38	51	62	38	50	61	43.6
5	39[1]	54[2]	68	39[1]	53	66	38	52	64	38	50	61	37	48	59	36	47	56	35	45	53	14.1
10	39[1]	53	67	38	52	64	38	49	61	36	47	57	35	45	53	33	42	49	32	40	44	8.4
15	39[1]	53	66	38	50	61	36	47	57	35	43	52	33	41	46	29	38	40	26	34	31	6.0
20	38	51	64	37	48	58	35	44	52	31	41	46	28	36	39	–	–	29	–	–	–	4.7
25	38	50	61	36	45	54	33	41	47	28	37	39	–	–	–	–	–	–	–	–	–	3.8
30	37	48	57	34	43	50	29	38	41	11	15	27	–	–	–	–	–	–	–	–	–	3.2
35	36	45	53	30	40	44	20	27	31	–	–	–	–	–	–	–	–	–	–	–	–	2.8
39	34	42	48	27	35	36	12	13	18	–	–	–	–	–	–	–	–	–	–	–	–	2.5

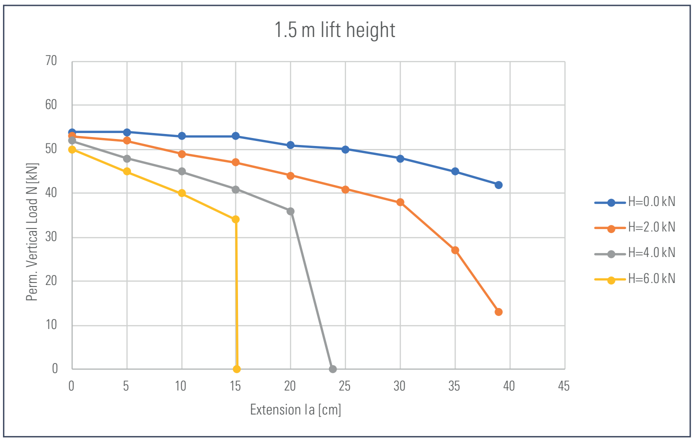
The permissible vertical loads are calculated by application of the calculation model according to DIN EN 12811-1, para. 10.2.3.2. To consider the bending stiffness of the Allround standard, the effects from second-order theory and the maximum load-bearing capacity of the standards, birdcage scaffolding with modular dimension 2.57 x 2.57 m and different lift heights was considered.

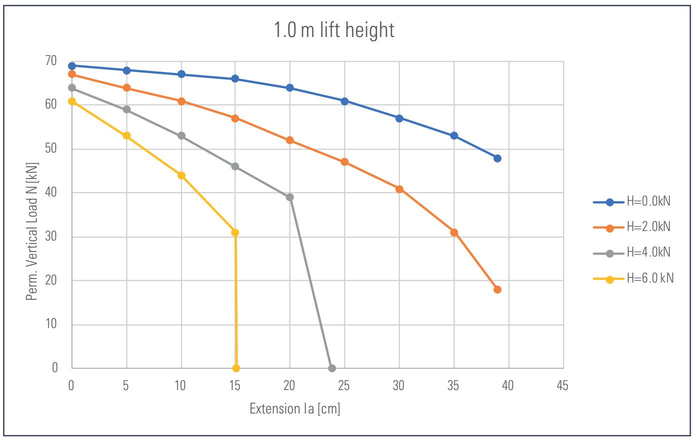
(–) With this combination of spindle extension and horizontal load, the load-bearing capacity of the spindle is exceeded.

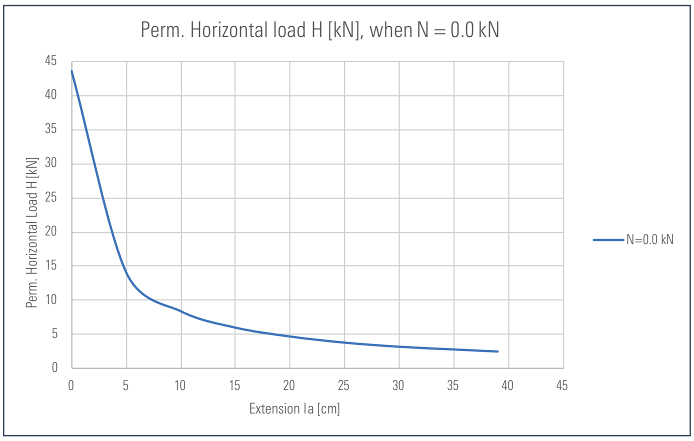
[1] Here the permissible vertical load of the standard at 2.0 m lift height is reached (39 kN)
[2] Here the permissible vertical load of the standard at 1.5 m lift height is reached (54 kN)

GRAPHIC DISPLAY OF TABLE VALUES

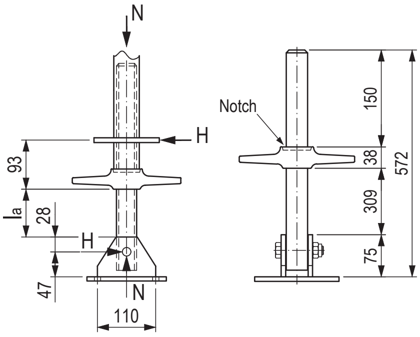








BASE PLATE 60 SWIVELING, REINFORCED LOADING TABLE



Equivalent section properties of the thread

A $= 4.71$ cm²
$W_{el} = 2.97$ cm³
$W_{pl} = 3.71$ cm³
I $= 4.29$ cm⁴

Material: EN 10219-S235JRH
→ Rolled thread: $f_{y,k} = 280.0$ N/mm²

Permissible load of base plate 60 swiveling, reinforced

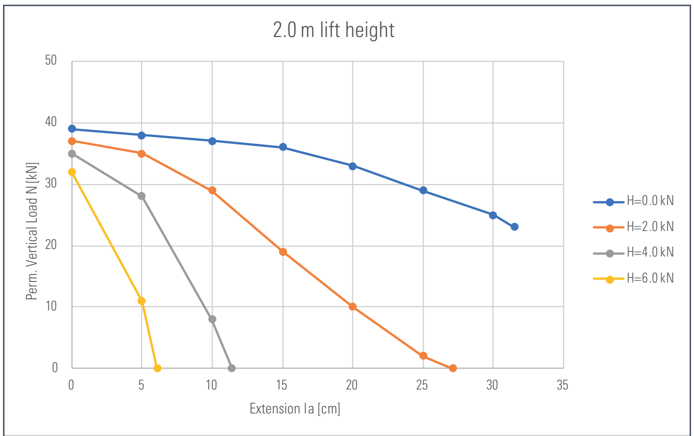
Extension l_a [cm]	Permissible vertical load N [kN] in case of a simultaneously acting horizontal load H [kN] for different lift heights																					Perm. horizontal load H [kN], when N = 0 kN
	H = 0.0			H = 1.0			H = 2.0			H = 3.0			H = 4.0			H = 5.0			H = 6.0			
	Level [m]																					
	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	2.0	1.5	1.0	
0	39[1]	44[3]	44[3]	38	44[3]	44[3]	37	44	44	36	44	44	35	44	44	34	44	44	32	38	44	14.3
5	38	44[3]	44[3]	37	44[3]	44[3]	35	44	44	33	39	41	28	30	33	21	22	23	11	11	12	6.7
10	37	44[3]	44[3]	35	43	44[3]	29	32	35	20	21	23	8	8	8	–	–	–	–	–	–	4.3
15	36	44[3]	44[3]	29	34	37	19	20	22	5	5	6	–	–	–	–	–	–	–	–	–	3.2
20	33	39	43	23	25	28	10	10	11	–	–	–	–	–	–	–	–	–	–	–	–	2.5
25	29	32	36	17	19	20	2	2	3	–	–	–	–	–	–	–	–	–	–	–	–	2.1
30	25	27	30	12	13	14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.8
31.5	23	26	29	11	12	13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7

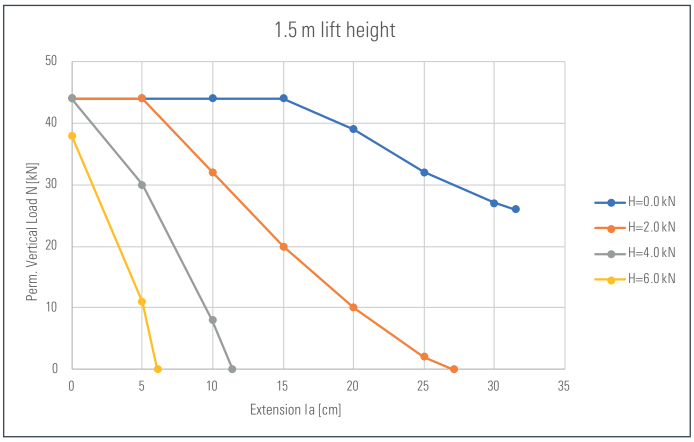
The permissible vertical loads are calculated by application of the calculation model according to DIN EN 12811-1, para. 10.2.3.2. To consider the bending stiffness of the Allround standard, the effects from second-order theory and the maximum load-bearing capacity of the standards, birdcage scaffolding with modular dimension 2.57 x 2.57 m and different lift heights was considered.

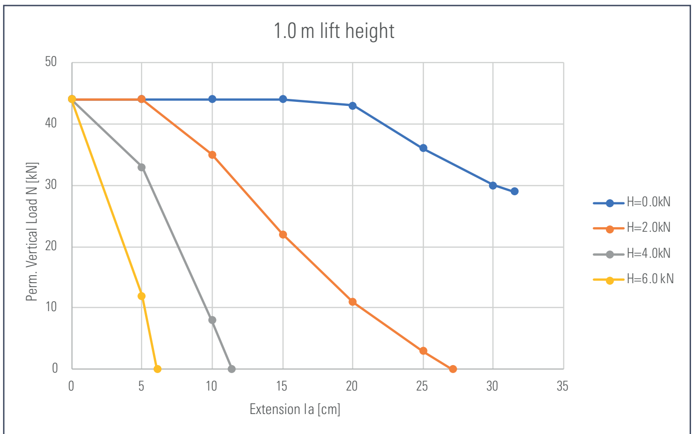
(–) With this combination of spindle extension and horizontal load, the load-bearing capacity of the spindle is exceeded.

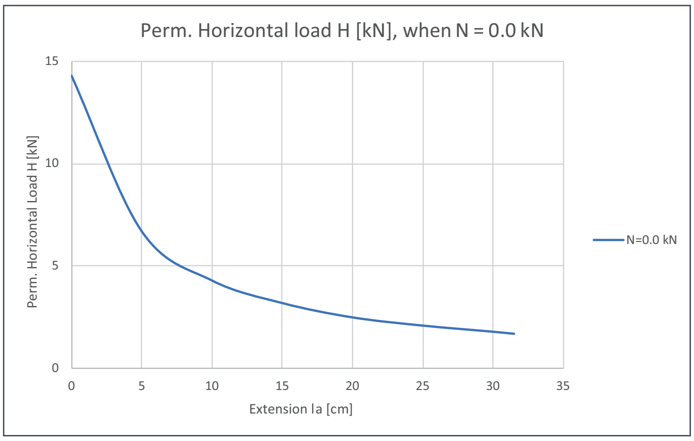
[1] Here the permissible vertical load of the standard at 2.0 m lift height is reached (39 kN)
[3] Here the load-bearing capacity of the M16 bolt is reached (interaction of bending and shear, permissible vertical load is 44 kN)

GRAPHIC DISPLAY OF TABLE VALUES

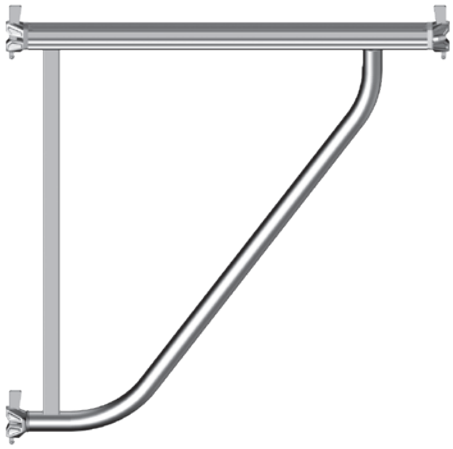






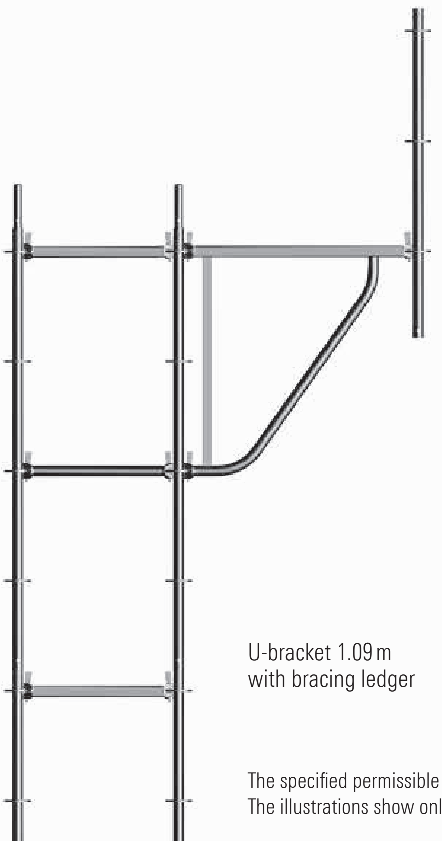


ALLROUND BRACKETS



Permissible load of Allround brackets, K2000+ and LW, U- and O-versions										
Bay length w [m]	Bracket 0.39 m			Bracket 0.73 m				Bracket 1.09 m with bracing ledger		
				without support			with support			
	perm. concentrated load on spigot [kN]	perm. uniformly distributed load on bracket deck [kN/m²]	Load class*	perm. concentrated load on spigot [kN]	perm. uniformly distributed load on bracket deck [kN/m²]	Load class	Load class*	perm. concentrated load [kN]	perm. uniformly distributed load on bracket deck [kN/m²]	Load class
2.07		6.7	5		3.4		6		4.2	
2.57	2.6	5.2	4	2.2	2.6	3	5	5.2	3.3	3
3.07		4.3	4		2.1		4		2.7	

Please note: The concentrated loads quoted and the uniformly distributed load on the bracket deck must **not act simultaneously!**
The load classes quoted apply to the use of steel decks as bracket deck.
The permissible loads quoted apply for decks double-sided.
*) Nominal load only, not a partial area load



U-bracket 1.09 m
with bracing ledger

The specified permissible loads apply for the U-version and the O-version of the brackets.
The illustrations show only the U-version of the brackets.

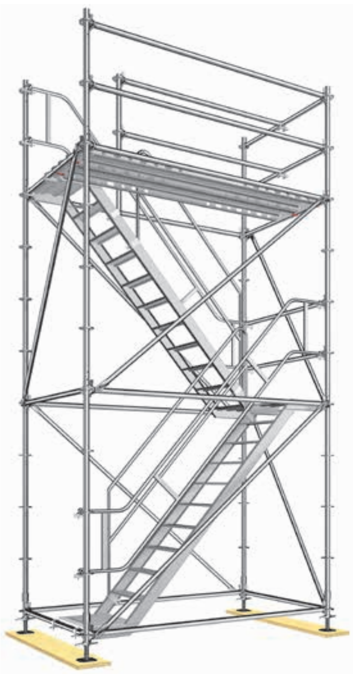
PLATFORM STAIR / COMFORT STAIR

INFORMATION ON APPLICATIONS

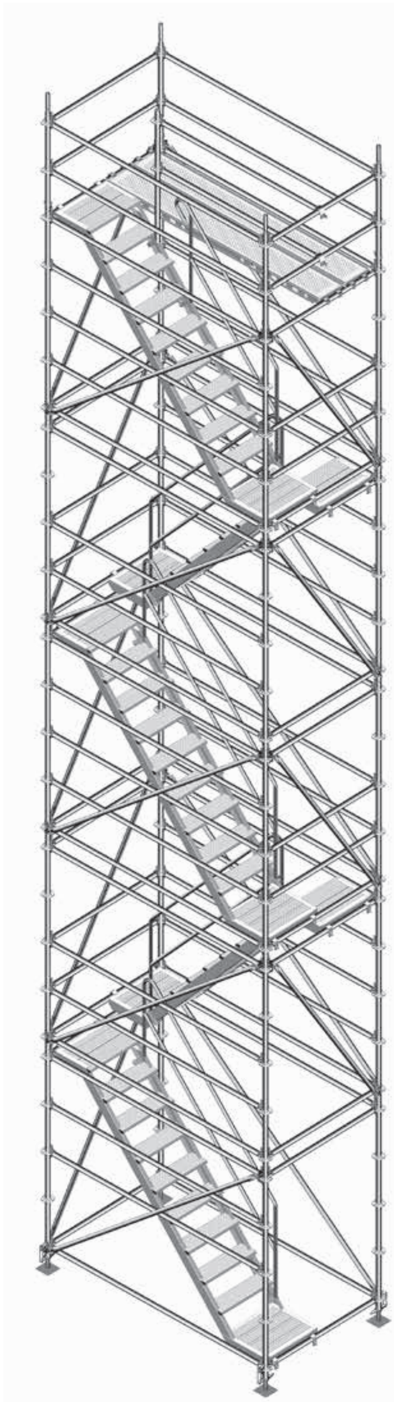
The platform stair / comfort stair of aluminium ensure safer ascent and descent at the scaffolding.
Scaffolding users always have one hand free and can carry tools or work materials without any problem.
The platform stair / comfort stair is available for the bay lengths 2.57 m and 3.07 m, in U- and O-versions, and in the widths 0.64 m and 0.94 m.
Stairs with width 0.64 m fit into 0.73 m wide scaffolding bays, and stairs with width 0.94 m into 1.09 m wide bays.
With the platform stair / comfort stair, accesses of different types can be provided with different features, for example:

- 4-standard stairtower: either integrated into the scaffolding or as a separate access anchored to the building
- Unidirectional or alternating stair access
- Stair access "classic" with stair height of 2.0 m or modular stairtower with module / stair height of 2.21 m, consisting of modules that can be preassembled and moved by crane

Stair access attached to the scaffolding, unidirectional



Stair access, alternating



End module

Stair module

Stair module

Stair module

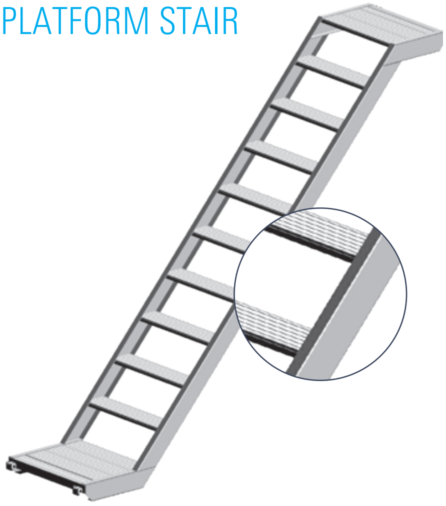
Stair module
with red. side protection

Basis

Module stairtower, alternating

To compensate for height differences in the ground, a variety of initial stairs in the heights 1.0 m, 1.20 m and 1.70 m are available.
Matching outer, inner and continuous guardrails round off the range for aluminium platform stairs / comfort stairs.

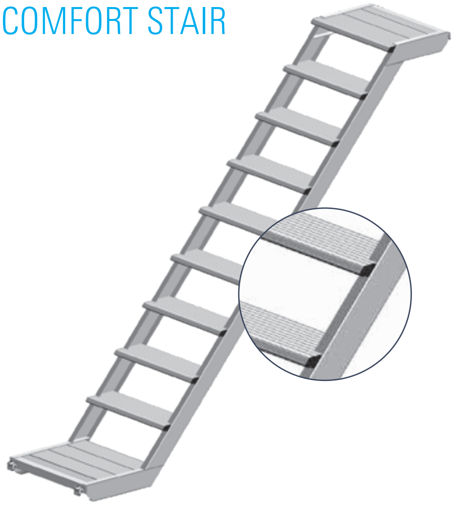
PLATFORM STAIR



The proven platform stair conforms to stair class A as per EN 12811-1.

- 10 risers with a stair height of 2.0 m

COMFORT STAIR



The comfort stair conforms to stair class B as per EN 12811-1. The comfort stair is based on the platform stair, but has a more comfortable step dimension plus a reinforced and hence stiffer step section and stringer section. All these characteristics enable much more pleasant ascent and descent, meaning the comfort stair is particularly suitable when greater heights have to be accessed.

- 9 risers with a stair height of 2.0 m

LOADING TABLE

Stairs	Permissible area load on the entire area of the stair (on all steps and landings) [kN/m²]
All stairs of width 0.64 m	2.5*
All stairs of width 0.94 m	2.0*

* The requirement of EN 12811-1: $q_{perm} = 1.0\ kN/m^2$ is met.

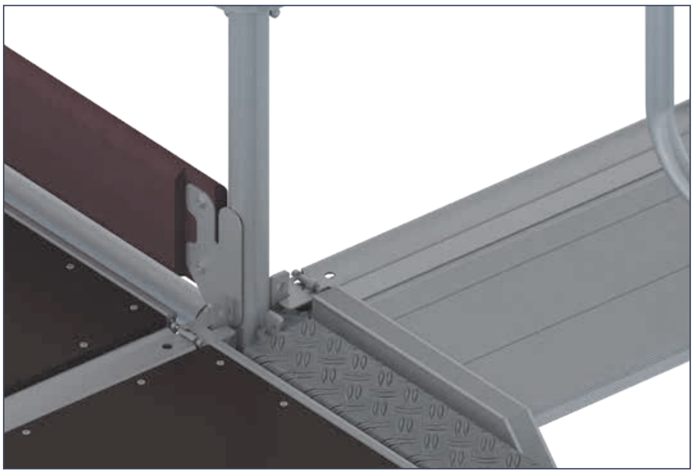
The steps and landings of the platform stair and of the comfort stair were verified for a permissible concentrated load of 1.5 kN according to the requirements of EN 12811-1, 6.2.4 in addition to the permissible area load. Verification of the fatigue strength of the welded-on stair steps of aluminium was made in accordance with the stipulations of EN 12810-1, 8.5.1 by tests as per EN 12810-2, Annex C.

TRANSITION TO SCAFFOLDING

Transition from the stair to the scaffolding can be provided with the aid of the cover ledger 110 LW, 0.11 m or the telescoping U-system deck.
The construction depends on the width of the scaffolding bay and on the width of the scaffolding decks used.

Example: Transition to 0.73 m wide scaffolding with cover ledger 110 LW, 0.11 m and 0.61 m wide scaffolding deck (Xtra-N deck, Robust deck, Stalu deck)

General view of transition



Detailed view

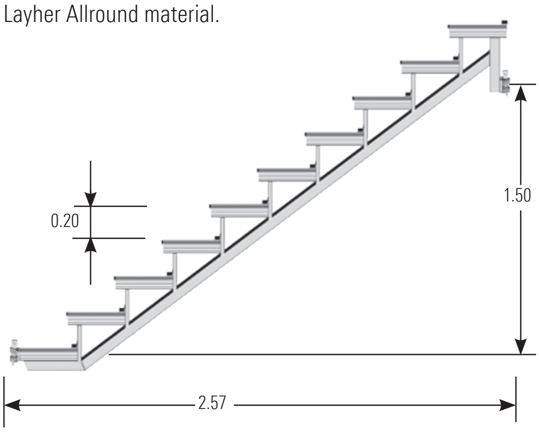
STAIR STRINGERS

STAIR STRINGER 200

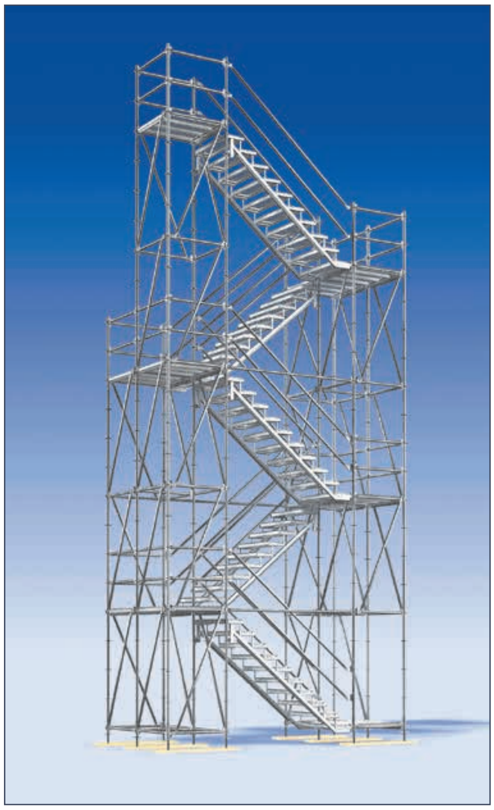
Rectangular tube 60 x 50 x 2.0 mm
Material: EN 10219-S235JRH

Live load of the stair stringer 200	
Length of steps [m]	Steel deck, one-sided perm. p [kN/m²]
1.09	2.7
1.29	2.2
1.40	2.0
1.57	1.7
2.07	1.3
2.57	1.0

With the Allround construction stairtower 200, 12-standard, each stair is assembled from 2 separate U-stair stringers 200, and 32 cm wide steel decks used as steps.
Separate stringers and decks permit variable stair widths (1.09 m, 1.57 m, 2.07 m, 2.57 m). Weight and volume of the parts are kept low and the stair can be constructed completely from standard Layher Allround material.

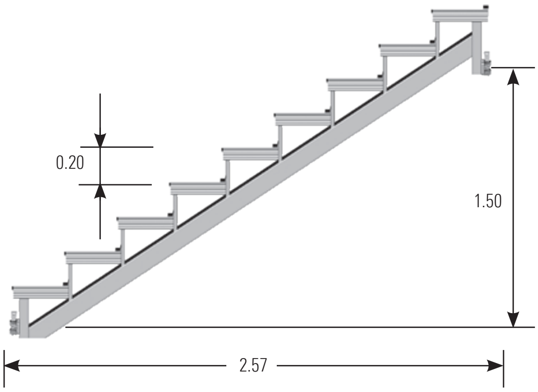


Stair dimensions: Riser r = 20.0 cm; going g = 24.1 cm; overlap = 7.9 cm



STAIR STRINGER 500

The stairtower 500 is intended for temporary stair structures with higher live loads. It is preferably used as a construction stairtower, e.g. for access to the site or as a road crossing not open to the public during construction work, but also at buildings as an additional escape stairtower. The stair steps are 32 cm wide steel decks. Under certain circumstances, the stairtower 500 can also be used for public access during construction work or as a mandatory escape stairtower.



Stair dimensions: Riser r = 20.0 cm; goinig g = 27.5 cm; overlap = 4.5 cm.

Manufacture until 2012
Rectangular tube 100 x 50 x 3.6 mm
Material: EN 10219-S235JRH

Live load of the stair stringer 500		
Length of steps [m]	perm. p on the steel decks [kN/m²]	
	Steel deck, one-sided	Steel deck, double-sided
1.09	11.7	5.6
1.40	9.0	4.3
1.57	7.9	3.8
2.07	5.9	2.8
2.57	4.7	2.2

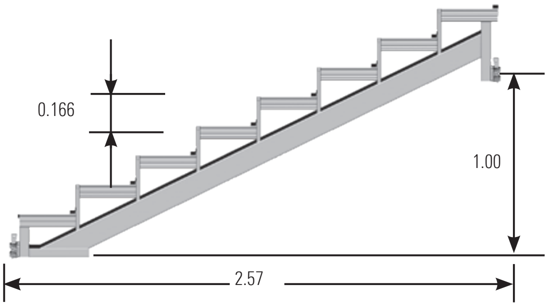
Manufacture starting 2012
Rectangular tube 100 x 50 x 2.5 mm
Material: EN 10219-S355JRH

Live load of the stair stringer 500		
Length of steps [m]	perm. p on the steel decks [kN/m²]	
	Steel deck, one-sided	Steel deck, double-sided
1.09	12.8	6.1
1.40	9.8	4.7
1.57	8.7	4.2
2.07	6.5	3.1
2.57	5.2	2.4

Basis for dimensioning: EN 1993-1-1
Partial factors used:
γ_{M0} = 1.0 in accordance with the recommendation of DIN EN 1993-1-1 and the stipulation in DIN EN 1993-1-1NA for cross-section verifications in which the internal forces were not determined according to second-order theory.
γ_G = 1.35 as per DIN EN 1990
γ_F = 1.5

STAIR STRINGER 750

The stairtower 750 with child-safety guardrail is intended, in view of its riser dimensions, for both temporary and permanent stair structures in public areas. Typical applications are as road-crossings during building work, as stairs inside buildings for the duration of the construction work, as a mandatory escape stairtower or as a construction stairtower. The stair steps are 32 cm wide steel decks. For the events field, the stairtower 750 has a high load-bearing capacity, allowing it to be used for accessing stands and stages.



Stair dimensions: Riser r = 16.6 cm; goinig g = 31.0 cm; overlap = 1.0 cm.

Manufacture until 2012
Rectangular tube 120 x 50 x 4.0 mm
Material: EN 10219-S235JRH

Live load of the stair stringer 750		
Length of steps [m]	perm. p on the steel decks [kN/m²]	
	Steel deck, one-sided	Steel deck, double-sided
1.09	17.5	8.4
1.40	13.4	6.5
1.57	11.9	5.7
2.07	8.9	4.3
2.57	7.1	3.4

Manufacture starting 2012
Rectangular tube 120 x 50 x 3.0 mm
Material: EN 10219-S355JRH

Live load of the stair stringer 750		
Length of steps [m]	perm. p on the steel decks [kN/m²]	
	Steel deck, one-sided	Steel deck, double-sided
1.09	20.5	9.9
1.40	15.7	7.6
1.57	14.0	6.8
2.07	10.5	5.0
2.57	7.5*/8.4**	4.0

* Steel decks of earlier design ** Steel decks LW

Basis for dimensioning: EN 1993-1-1
Partial factors used:

γ_{M0} = 1.0 in accordance with the recommendation of DIN EN 1993-1-1 and the stipulation in DIN EN 1993-1-1NA for cross-section verifications in which the internal forces were not determined according to second-order theory.

γ_G = 1.35 as per DIN EN 1990

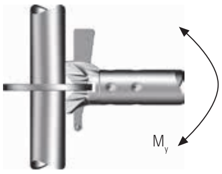
γ_F = 1.5

CONNECTION VALUES AS PER GERMAN APPROVAL

DESIGN RESISTANCES IN ALLROUND LEDGER AND DIAGONAL BRACE CONNECTION

Z-8.22-64.1: ALLROUND ALUMINIUM

Bending moment

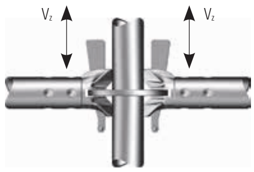


a) If normal force Nst [kN] in the standard $\leq$ is 45 kN: $M_{y,\,Rd} = \pm 60$ kNcm

b) If normal force Nst [kN] in the standard $>$ is 45 kN:

$$M_{y,\,Rd} = \pm\left[\frac{60 \times (63 - Nst)}{18}\right] \text{ [kNcm]}$$

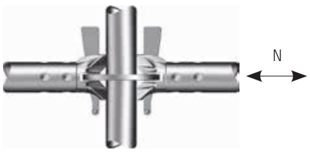
Vertical shear force



a) Vertical shear force single connection $V_{Z,\,Rd} = \pm 18.1$ kN

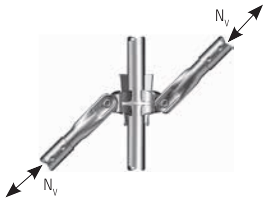
b) Vertical shear force per rosette $\sum V_{Z,\,Rd} = 46.4$ kN

Normal force



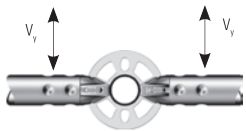
$N_{Rd} = \pm 18.5$ kN

Normal force, diagonal brace



$N_{V,\,Rd} = \pm 9.0$ kN

Horizontal shear force



$V_{y,\,Rd} = \pm 6.0$ kN

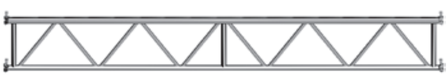
LOADING TABLES FOR ALLROUND ALUMINIUM

ALL SPECIFIED LOADS ARE SAFE WORKING LOADS.

Inner standard 2.0 m lift height							
Bay width [m]	0.73		1.09	1.57	2.07	2.57	3.07
Diagonal bracing	A	B	A, B	A, B	A, B	B	B
Permissible vertical load V_I [kN]	15.5	13.7	14.7	14.6	14.4	14.2	14.0

Outer standard 2.0 m lift height							
Bay width [m]	0.73		1.09	1.57	2.07	2.57	3.07
Diagonal bracing	A	B	B	B	B	B	B
Permissible vertical load V_A [kN]	13.5	11.5	12.5	12.5	12.1	11.9	11.7

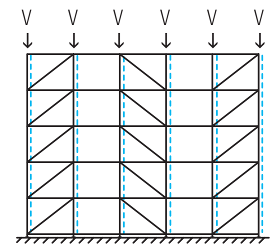
Permissible load of aluminium U-ledger (U), U-ledger reinforced (U-V)			
Ledger type and length [m]	0.73 (U)	1.09 (U-V)	1.40 (U-V)
Uniformly distributed line load (q) [kN/m]	17.8	10.7	8.4
Concentrated load (P) in bay centre [kN]	5.9	7.2	5.7



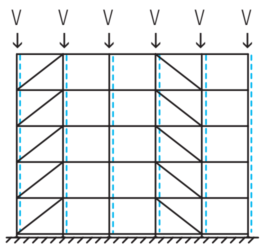
Permissible load of Alu-U-lattice beam				
Bay width [m]	2.57	3.07	4.14	5.14
Uniformly distributed line load (q) [kN/m]*	7.7	6.0	4.1	3.2
Concentrated load (P) in bay centre [kN]*	6.7	11.4	8.9	8.0

Permissible load of Alu ledger							
Bay width [m]	0.73	1.09	1.40	1.57	2.07	2.57	3.07
Uniformly distributed line load (q) [kN/m]	18.7	7.4	3.9	2.9	1.5	0.9	0.6
Concentrated load (P) in bay centre [kN]	6.3	4.5	3.4	2.9	2.0	1.5	1.2

Permissible load of aluminium Allround standards

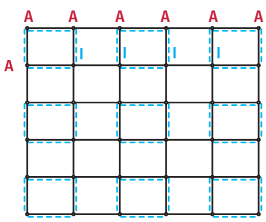


Diagonal bracing A:
1 diagonal brace for 2 bays

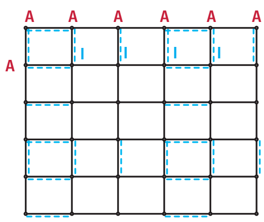


Diagonal bracing B:
1 diagonal brace for 3 bays

Front View



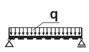
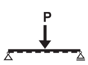
A = Outer standard I = Inner standard



Top view

A = Outer standard I = Inner standard

* Completely covered with scaffolding decks

Permissible load of Alu U-bridging ledger		
Bay width [m]	1.57	2.07
 Uniformly distributed line load (q) [kN/m]*	6.9	3.7
 Concentrated load (P) in bay centre [kN]*	6.2	2.3

SCAFFOLDING DECKS

LOAD CLASSES AND USE IN PROTECTIVE SCAFFOLD[1] AND ROOF EDGE PROTECTION SCAFFOLD[2] ACCORDING TO GERMAN APPROVAL

Steel decks

Load class EN 12811-1		U- and O-steel decks 0.32 m wide (without web holes, T4/T9, LW) Ref. No. 3802, 3812, 3883, 3844, 3861, 3862, 3890								Steel decks 0.19 m wide, Ref. No. 3801, 3863				Steel access deck, Art. No. 3813	
		0.73	1.09	1.40	1.57	2.07	2.57	3.07	4.14	1.57	2.07	2.57	3.07	2.07	2.57
perm. q [kN/m²]	up to and including T4/T9	37.6	25.3	19.7	17.5	11.4	7.5	5.0	2.0	17.7	11.4	7.5	5.0	–	–
	LW					13.3	9.3	6.5							
1		•	•	•	•	•	•	•	•	•	•	•	•	•	•
2		•	•	•	•	•	•	•	•	•	•	•	•	•	•
3		•	•	•	•	•	•	•	•	•	•	•	•	•	•
4		•	•	•	•	•	•	•	–	•	•	•	•	•	•
5		•	•	•	•	•	•	–	–	•	•	•	–	–	–
6		•	•	•	•	•	–	–	–	•	•	–	–	–	–
Protective scaffold and roof edge protection scaffold		•	•	•	•	•	•	•	•	•	•	•	•	•	•

Robust decks, Xtra-N decks

Load class EN 12811-1	Robust deck 0.61 m wide, Ref. No. 3835, 3870 Xtra-N deck, 0.61 m wide, Ref. No. 3866						Robust deck 0.32 m wide, Ref. No. 3836 Xtra-N deck, 0.32 m wide, Ref. No. 3877				Robust access decks, Ref. No. 3838, 3858, 3859, 3872, Xtra-N access deck, Ref. No. 3869	
	0.73	1.09	1.57	2.07	2.57	3.07	1.57	2.07	2.57	3.07	2.57	3.07
1	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•
4	–	–	–	–	–	–	•	•	•	–	–	–
5	–	–	–	–	–	–	•	•	–	–	–	–
6	–	–	–	–	–	–	•	–	–	–	–	–
Protective scaffold and roof edge protection scaffold	•	•	•	•	•	•	•	•	•	•	•	•

Stalu decks

Load class EN 12811-1	Stalu decks 0.61 m wide, Ref. No. 3850, 3867, 3888, 3898				Stalu deck 0.32 m wide, Ref. No. 3856					Stalu deck 0.19 m wide, Ref. No. 3857			
	1.57	2.07	2.57	3.07	1.57	2.07	2.57	3.07	4.14	1.57	2.07	2.57	3.07
1	•	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•	•
4	•	•	•	•	•	•	•	•	–	•	•	•	•
5	•	•	•	–	•	•	•	–	–	•	•	•	–
6	•	•	–	–	•	•	–	–	–	•	•	–	–
Protective scaffold and roof edge protection scaffold	•	•	•	•	•	•	•	•	•	•	•	•	•

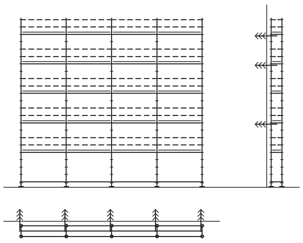
Alu decks

Load class EN 12811-1	Alu deck 0.32 m wide, Ref. No. 3803						Alu deck 0.19 m wide, Ref. No. 3824			Alu access decks, Ref. No. see below				
										3851, 3852, 3875, 3871, 3874				3851.100, 3871.100
	0.73	1.09	1.57	2.07	2.57	3.07	1.57	2.07	2.57	1.57	2.07	2.57	2.57	1.00
1	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4	•	•	•	•	•	–	•	•	•	–	–	–	–	–
5	•	•	•	•	–	–	•	•	–	–	–	–	–	–
6	•	•	•	–	–	–	•	–	–	–	–	–	–	–
Protective scaffold and roof edge protection scaffold	•	•	•	•	•	•	•	•	•	•	•	•	•	•

1 Protective scaffold: scaffolding arresting the fall of a person
2 Roof edge protection scaffold: scaffolding, including a protective wall, arresting the fall of a person sliding down a sloping surface

• Approved for use in the load class/approved for use in the protective scaffold and roof edge protection scaffold.
Suitability for use in protective scaffold and roof edge protection scaffold has been verified by drop tests as per EN 12810-2, Annex B.
(–) not approved for this load class.

USE AS FACADE SCAFFOLDING



No vertical diagonal braces are required in the standard assembly according to the German approval. Assembly variants diverging from the standard version must be verified by structural analysis. Vertical diagonal braces may be required here depending on the height of the scaffolding, on the anchoring configuration, from the presence of cladding, on the load and on the scaffolding width. Experience suggests that assembly variants other than the standard version can be implemented with vertical diagonal braces in every 5th bay.
In scaffolding levels without decks, O-horizontal diagonal braces must be installed in every 5th bay and longitudinal ledgers on the inside and outside. This also applies for scaffolding levels with wooden planks.

Use as facade scaffolding

Load class EN 12811-1	Nominal load q_1 [kN/m²]	Partial area load q_2		Concentrated load F_1 [kN]	Application	Scaffolding width b [m]	Scaffolding bay length [m]	Support ledger	Deck type
		[kN/m²]	Partial area A_c [1] [m²]						
1	0.75	Not required		1.5	Inspection purposes, Working with light tools, without building material storage.	0.73	3.07	U-ledger LW, O-ledger LW, U-ledger, O-ledger	All scaffolding decks
2	1.5	Not required		1.5	Inspection work, work with materials that are consumed immediately, e.g. painting, stone cleaning, grouting, plastering etc.	0.73	3.07	U-ledger LW, O-ledger LW, U-ledger, O-ledger	All scaffolding decks
3	2.0	Not required		1.5					
4	3.0	5.0	0.4 x A [2]	3.0	Bricklaying, attachment of prefabricated concrete parts, plastering etc.	1.09	3.07	U-ledger LW, O-ledger LW, U-ledger reinforced	Steel decks, Stalu decks
						1.40	3.07	U-ledger LW, U-ledger LW reinforced, O-ledger LW reinforced	
						1.40	2.57	U-ledger LW, U-ledger reinforced, O-ledger LW reinforced	Steel decks, Stalu decks, Robust decks (0.32 m wide), aluminium decks (0.32 m wide), Xtra-N decks (0.32 m wide)
						1.09	2.07	O-ledger LW, O-ledger, U-ledger LW	
						1.09	2.57	U-ledger LW, O-ledger LW, O-ledger reinforced, U-ledger reinforced	
						1.57	3.07	U-ledger LW reinforced, U-bridging ledger, O-bridging ledger, O-ledger LW reinforced	Steel decks, Stalu decks
5	4.5	7.5	0.4 x A [2]	3.0		1.09	2.07	O-ledger LW, U-ledger reinforced, U-ledger LW	Steel decks, Stalu decks, Robust decks (0.32 m wide), Aluminium decks (0.32 m wide), Xtra-N decks (0.32 m wide)
						1.40	2.07	U-ledger LW reinforced, O-ledger LW reinforced	
						1.40	1.57	U-ledger, reinforced	
						1.57	2.07	U-ledger LW reinforced, U-bridging ledger, O-bridging ledger, O-ledger LW reinforced	
						1.57	2.57	U-ledger LW reinforced, U-bridging ledger, O-bridging ledger, O-ledger LW reinforced	Steel decks, Stalu decks
						2.07	2.07	U-ledger LW reinforced	
6	6.0	10.0	0.5 x A [2]	3.0	Heavy bricklaying or natural stonework. Storage of a large quantity of building materials or components	1.09	1.57	O-ledger LW, U-ledger reinforced, U-ledger LW	Steel decks and Stalu decks up to scaffolding bay length 2.07 m, Xtra-N decks (0.32 m wide) and Robust decks (0.32 m wide) up to scaffolding bay length 1.57 m
						1.09	2.07	U-ledger reinforced, U-ledger LW, O-ledger LW reinforced	
						1.40	2.07	U-ledger LW reinforced, O-ledger LW reinforced	
						1.57	1.57	U-ledger LW reinforced, U-bridging ledger, O-ledger LW reinforced	
						1.57	2.07	U-ledger LW reinforced	

[1]) A_C = partial area
[2]) A = platform area of a scaffolding bay

Permissible span in [m] for scaffolding decks made of wooden planks or boards (according to Tab. 2, DIN 4420-3:2006)

Load class EN 12811-1	Board or plank width [mm]	Board or plank thickness [mm]				
		30	35	40	45	50
1, 2, 3	200	1.25	1.50	1.75	2.25	2.50
	240 and 280	1.25	1.75	2.25	2.50	2.75
4	200	1.25	1.50	1.75	2.25	2.50
	240 and 280	1.25	1.75	2.00	2.25	2.50
5	200, 240, 280	1.25	1.25	1.50	1.75	2.00
6	200, 240, 280	1.00	1.25	1.25	1.50	1.75

Select the Layher scaffolding decks in accordance with the required load class (see previous page).

For the use of wooden planks and boards in safety decking, arresting the fall of persons or objects, the information according to Tab. 2 DIN 4420-1:2004 applies.

LAYHER MODULAR ACCESS SYSTEM AGS

SAFER. CERTIFIED. TYPE-APPROVED

ADVANTAGES, ASSEMBLY UND USE

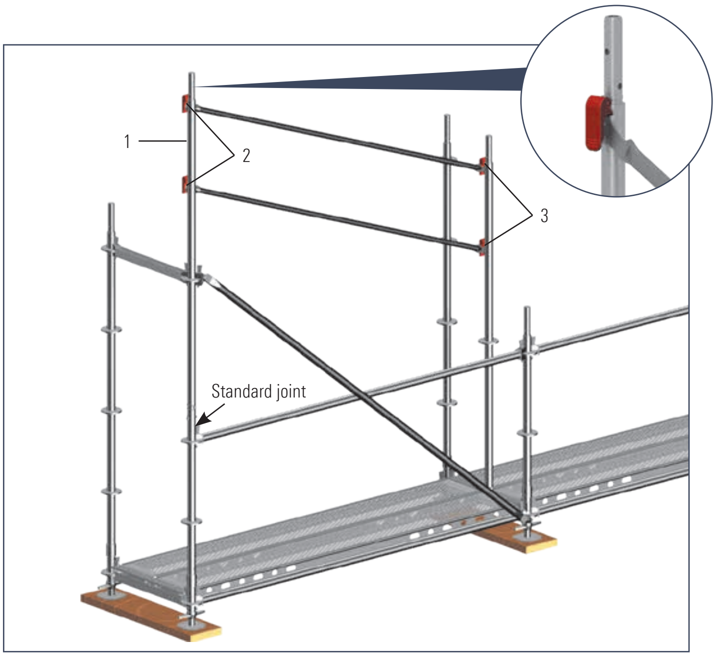
The Layher Modular Access System AGS

- is the ideal solution for safer scaffolding at facades
- combines AGS components and Allround components, creating scaffolding with system-integrated technical fall protection
- does not require any work steps for repeated repositioning of the guardrails, as AGS standards and guardrails form part of the assembled scaffolding

Easy assembly

1. Fit first AGS standard LW 2.00 m.
2. Insert AGS guardrails into the AGS safety locks of the fitted AGS standard, with the AGS safety locks being closed.
3. Insert the other ends of the AGS guardrails into the AGS safety locks of the next AGS standard to be fitted. Close the AGS safety locks.
4. Then swing up the AGS standard and place it onto the already installed standard 1.00 m.

The standard joint of the AGS standards is always 1 metre above the deck level.



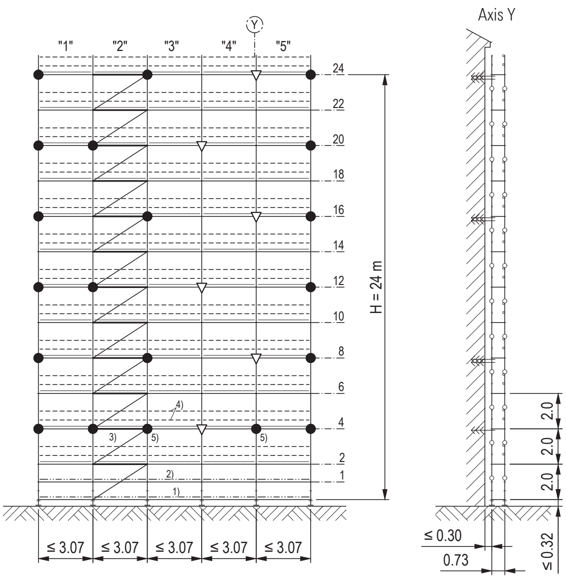
TYPE APPROVAL TP-21-012

The type approval describes a standard set of system configurations of the Layher Modular Access System AGS. These are assembly variants

- with width of 0.73 m or 1.09 m
- with bay lengths ≤ 3.07 m
- with scaffolding height 24 m above ground surface
- with or without inner console brackets
- with or without cladding with tarpaulins
- for live loads from 0.73 kN/m² to 3.00 kN/m² (load class 1 – 4)
- with AGS outside and Allround inside or with AGS outside and inside

The outside plane of the scaffolding is braced by vertical bracing consisting of Allround diagonal braces and ledgers.

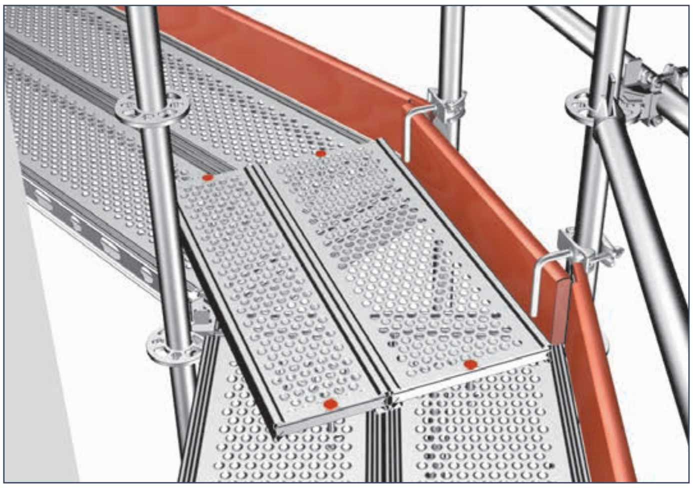
The use of AGS components of the standard set together with the other Allround components is regulated in the Layher approval Z-8.22-949.



Example: Assembly variant TY-AGS-03

LAYHER STEEL PLANK

The steel plank is used for closing larger openings in the deck level.



LOAD CLASSES AND PERMISSIBLE AREA LOADS

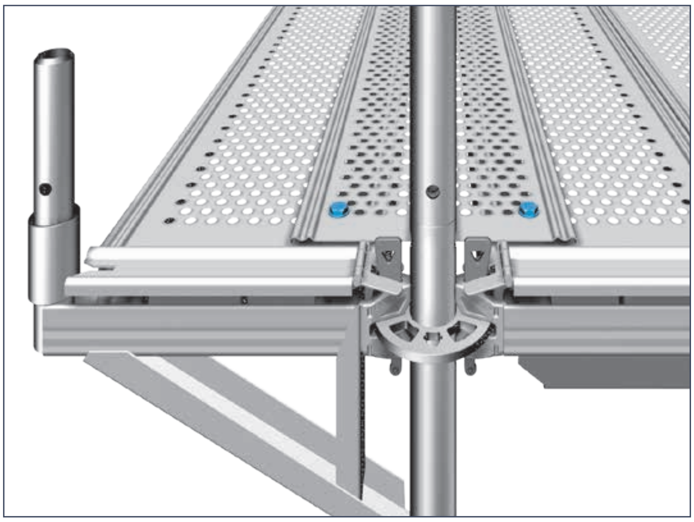
Steel plank		Load class as per EN 12811-1	Permissible area load (on the entire area of the steel plank) [kN/m²]
Width [cm]	Length [m]		
20	1.0	6	10.0
	1.5		
	2.0	5	7.5
	2.5	3	2.0
30	1.0	6	10.0
	1.5		
	2.0	5	7.5
	2.5	3	2.0

If at least 2 steel planks are adjacent to one another, they may also be used in protective scaffold and roof edge protection scaffold.
This has been verified by drop tests as per EN 12810-2, Annex B.

Compared with the wooden plank, the steel plank is durable, non-inflammable, non-slip and also lower-weight.
Steel planks are available in the widths 20 cm and 30 cm.
The support length must be at least 10 cm at every support.

Securing against shifting and lifting out is achieved from above	
using long locking screws (red), one per support	with plastic locking pins, two per support
	

CLOSING OF OPENINGS IN DECK LEVELS



STEEL COVER PLATE 320

For closing openings between steel decks or aluminium decks, U or O versions, the steel cover plate 320 is used. The steel cover plate 320 is secured with short locking screws (blue) against slipping and lifting off. The width of the cover plate 320 is 32 cm.

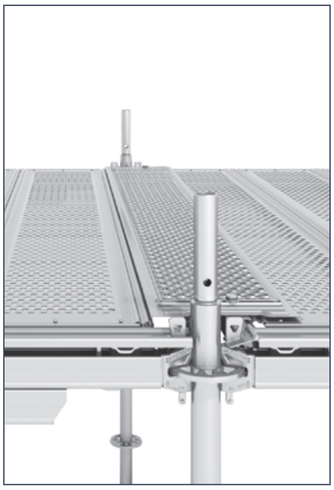
According to German approval
Largest permissible opening width: 22 cm
Load class 6 as per EN 12811-1
Permissible area load: 10 kN/m²
(on the entire area of the opening sheet)
Load transfer in transverse direction

COVER PLATE 320, WITH HOOKS

The cover plate 320 with hooks was designed for closing openings between unperforated U-scaffolding decks (Robust decks, Xtra-N decks, Stalu decks). Securing is achieved with the built-in Allround lift-off preventer. The width of the cover plate with hooks is 32 cm.

According to German approval

Largest permissible opening width: 22 cm
Load class 6 as per EN 12811-1
Permissible area load: 10 kN/m^2 (on the entire area of the cover plate)
Load transfer in transverse direction

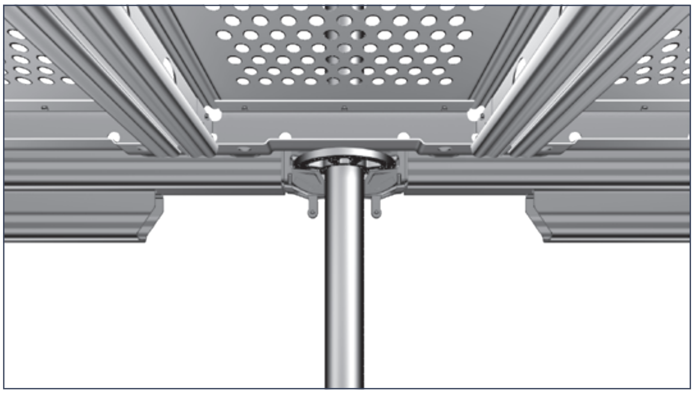


TELESCOPING U-SYSTEM DECK

The telescoping U-system deck permits the closing of 40 mm to 255 mm wide openings. Infinite adjustment to the opening dimension in question. Fixing by two integrated screws workable from above. Precisely fitting decking over the rosette even with the system ledger installed. Braces the decks in the scaffolding bay, securing them against inadvertent shifting. Load transfer in longitudinal direction.

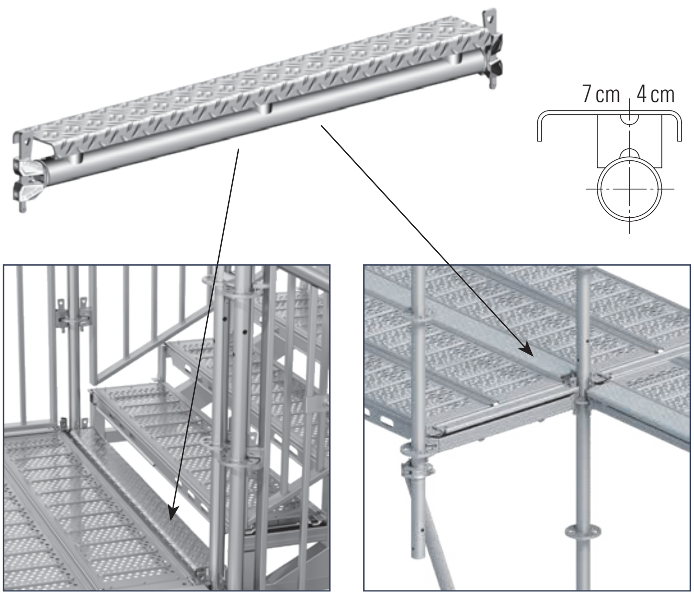
According to German approval

Length of telescoping system deck [m]	Load class according to EN 12811-1	Permissible area load (on the entire area of the system deck) [kN/m^2]
≤ 2.07	6	10.0
2.57	5	7.5
3.07	4	5.0



U-STEEL DECK

The cap of the 32 cm wide U-steel deck is optimised in its shape to permit precisely fitting decking over the rosette.
For load classes and permissible area loads see table of scaffolding decks.



O- / U-COVER LEDGER 110 LW 0.11 M WIDE

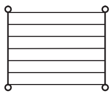
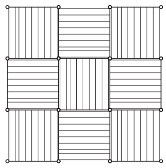
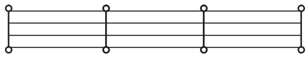
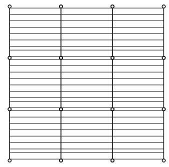
The 0.11 m wide cover ledger is used to close the opening between two scaffolding bays or between scaffolding bay and projection. The 0.11 m wide cover ledger is also needed at the start and end of a stair for connection to the stair landing.

According to German approval (both tables)

Load class and permissible area load of cover ledger LW 0.11 m		
Length of cover ledger LW [m]	Load class according to EN 12811-1	Permissible area load (on the entire area of the cover ledger) [kN/m^2]
≤ 3.07	6	10.0

Load class and permissible area load of cover ledger K2000+ 0.11 m		
Length of cover ledger K2000+ [m]	Load class according to EN 12811-1	Permissible area load (on the entire area of the cover ledger) [kN/m^2]
≤ 2.07	6	10.0
2.57	5	7.5
3.07	4	5.0

TYPES OF DECK LEVELS IN ALLROUND SCAFFOLDING

Decks on the ledger on one side*		Decks on the ledger on both sides*	
Tower scaffolding	Birdcage scaffolding: Decks alternating	Facade scaffolding	Birdcage scaffolding: Decks unidirectional
			

* Ledger = support ledger on which the decks are laid

LOAD CLASSES OF DECK LEVELS IN ALLROUND SCAFFOLDING

Load classes for deck levels in Allround Scaffolding																											
Ledger connection to standard/type	Ledger type	Ledger length [m]	perm. line load of ledger [kN/m]	Steel decks on the ledger on one side												Steel decks on the ledger on both sides											
				permissible load class with deck length [m]												permissible load class with deck length [m]											
				1.57			2.07			2.57			3.07			1.57			2.07			2.57			3.07		
				NL	6 m²	PL	NL	6 m²	PL	NL	6 m²	PL	NL	6 m²	PL	NL	6 m²	PL	NL	6 m²	PL	NL	6 m²	PL	NL	6 m²	PL
Allround standards LW, K2000+ or Variant II	O ledger K2000+	0.73	22.07	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^+
		1.09	10.44	6	6	6	6	6	6	6	6	5	5^+	5^+	4^+	6	6	5	5	5	4	4	4	4	4	4	–
		1.40	6.54	6	6	6	6	6	5	5	5	4	4	4	4	4	4	4	3	3	–	3	3	–	2	3	–
		1.57	5.26	6	6	5	5	5	4	4	4	4	4	4	–	4	4	–	3	3	–	2	2	–	2	2	–
		2.07	3.12	4	4	4	3	3	–	3	3	–	2	2	–	2	2	–	1	1	–	1	1	–	1	1	–
		2.57	2.06	3	3	–	2	2	–	1	1	–	1	1	–	1	1	–	1	1	–	–	–	–	–	–	–
		3.07	1.46	2	2	–	1	1	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Allround standards K2000+ or Variant II	O-ledger LW	0.73	29.24	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}
		1.09	14.09	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	5	5	5	5	4	4	4
		1.40	8.76	6	6	6	6	6	6	6	6	5	5	5	4^+	5	5	5	4	4	4	4	4	–	3	3	–
		1.57	7.03	6	6	6	6	6	5	5	5	5	4	4	4	4	4	4	4	4	–	3	3	–	3	3	–
		2.07	4.09	5	5	5	4	4	4	3	3	–	3	3	–	3	3	–	2	2	–	1	1	–	1	1	–
		2.57	2.33	3	3	–	3	3	–	2	2	–	1	1	–	1	1	–	1	1	–	–	–	–	–	–	–
		3.07	1.48	2	2	–	1	1	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Allround standards LW	O-ledger LW	0.73	29.24	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}
		1.09	14.09	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	5	5	5	5	4	4	4
		1.40	8.76	6	6	6	6	6	6	6	6	5	5	5	4^+	5	5	5	4	4	4	4	4	–	3	3	–
		1.57	7.03	6	6	6	6	6	5	5	5	5	4	4	4	4	4	4	4	4	–	3	3	–	3	3	–
		2.07	4.09	5	5	5	4	4	4	3	3	–	3	3	–	3	3	–	2	2	–	1	1	–	1	1	–
		2.57	2.65	4	4	–	3	3	–	2	2	–	2	2	–	1	2	–	1	1	–	1	1	–	–	–	–
		3.07	1.85	3	3	–	2	2	–	1	1	–	1	1	–	1	1	–	–	–	–	–	–	–	–	–	–
Allround standards LW, K2000+ or Variant II	O-ledger reinforced	1.09	21.82	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^+
	O-bridging ledger	1.57	14.46	6	6	6	6	6	6	6	6	5	5^+	5^+	4^{++}	6	6	6	6	6	5	5	5	5	5	5	4
		2.07	8.63	6	6	6	6	6	6	6	6	5	5	5	4^+	5	5	5	4	4	4	4	4	–	3	4	–
		2.57	5.37	6	6	5	5	5	5	4	4	4	4	4	4	4	4	–	3	3	–	2	3	–	2	2	–
		3.07	3.53	4	4	4	4	4	–	3	3	–	3	3	–	3	3	–	1	2	–	1	1	–	1	1	–
	U-ledger	0.73	19.01	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5	5^+	5^+	4^+
	U-ledger, reinforced	1.09	17.34	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^+	6	6	6	6	6	6	6	6	5	5	5^+	4^+
		1.40	10.42	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^+	6	6	5	5	5	4	4	4	4	4	4	–
	U-bridging ledger	1.57	15.16	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	5	5	5	5	5	5	4
		2.07	8.65	6	6	6	6	6	6	6	6	5	5	5	4^+	5	5	5	4	4	4	4	4	–	3	4	–
		2.57	5.12	6	6	5	5	5	4	4	4	4	4	4	–	4	4	–	3	3	–	2	3	–	1	2	–
		3.07	3.59	4	4	4	4	4	–	3	3	–	3	3	–	3	3	–	2	2	–	1	1	–	1	1	–
Allround standards LW or K2000+ or Variant II	U-ledger LW	1.09	17.55	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5	5	5	4^+
		1.40	10.84	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^+	6	6	5	5	5	5	4	4	4	4	4	4
	U-ledger LW reinforced	1.40	19.80	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5	5^+	5^+	4^+
		1.57	17.70	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5	5	5^+	4^+
		2.07	13.00	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	5	5	5	4	4	5	4
		2.57	8.40	6	6	6	6	6	6	6	6	5	5	5	4^+	5	5	5	4	4	4	4	4	–	3	4	–
		3.07	5.00	6	6	5	5	5	4	4	4	4	4	4	–	3	4	–	3	3	–	2	3	–	1	2	–
	O-ledger LW reinforced	1.09	21.40	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5	5^+	5^+	4^+
		1.40	17.10	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	6	6	6	5	5	5	4^+
		1.57	16.10	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^{++}	6	6	6	6	6	5	6	6	5	5	5	4^+
		2.07	11.10	6	6	6	6	6	6	6	6	5^+	5^+	5^+	4^+	6	6	5	5	5	5	4	5	4	4	4	4
		2.57	8.50	6	6	6	6	6	6	6	6	5	5	5	4	5	5	5	4	4	4	4	4	–	3	4	–
		3.07	6.00	6	6	5	5	5	5	4	5	4	4	4	4	4	4	4	3	4	–	3	3	–	2	3	–

APPLICATION OF THE TABLE FOR LOAD CLASSES OF DECK LEVELS IN ALLROUND SCAFFOLDING

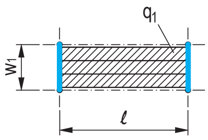
Designation	**Explanation**	**Sketch or example**

NL

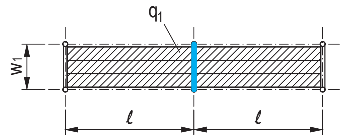
Nominal load q_1 as per EN 12811-1, Table 3 evenly distributed over the entire area:

Load class	Associated nominal load q_1 [kN/m²]
1	0.75
2	1.50
3	2.00
4	3.00
5	4.50
6	6.00

Steel decks on one side:



Steel decks on both sides:

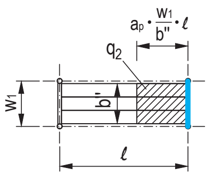


TL

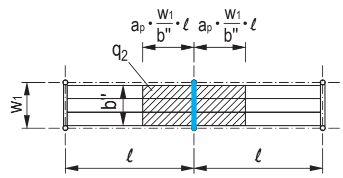
Partial area load q_2 as per EN 12811-1, Table 3 acting on 40% or 50% of the platform area of each scaffolding bay:

Load class	Associated partial area load q_2 [kN/m²]	Partial area factor a_p	Meaning
1	–	–	no partial area load specified
2	–	–	
3	–	–	
4	5.00	0.4	q_2 acts on 40% of the deck area of each scaffolding bay
5	7.50	0.4	
6	10.00	0.5	q_2 acts on 50% of the deck area of each scaffolding bay

Steel decks on one side:



Steel decks on both sides:



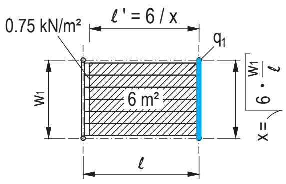
w_1, ℓ = axis dimensions of upright
b" = entire deck width in scaffolding bay

6 m²

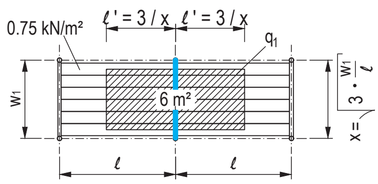
Limiting of the nominal load to an area of 6 m² as per EN 12811-1, 6.2.2.6: The load on the supporting components of a birdcage scaffolding may be calculated by assuming that the nominal load q_1 acts on an area of 6 m² in combination with a load of 0.75 kN/m² over the remaining area.

The load area of 6 m² is arranged such that it has for the ledger the least favourable effect.

Steel decks on one side:



Steel decks on both sides:



+

The load-bearing capacity of the steel decks matches the load class indicated in front of the symbol "+". The load-bearing capacity of the ledger is one load class higher.

+ +

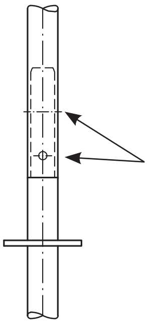
The load-bearing capacity of the steel decks matches the load class indicated in front of the symbol "+ +". The load-bearing capacity of the ledger is two load classes higher.

NL	
5+	The steel decks can support the nominal load of load class 5 (4.5 kN/m²). The load-bearing capacity of the ledger matches the nominal load of load class 6 (6.0 kN/m²).

6 m²	
5+	The steel decks can support the nominal load of the load class 5 (4.5 kN/m²) on an area of 6 m² plus 0.75 kN/m² on the remaining area. The load-bearing capacity of the ledger matches the nominal load of load class 6 (6.0 kN/m²) on an area of 6 m² plus 0.75 kN/m² on the remaining area.

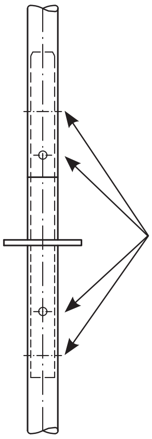
PL	
4++	The steel decks can support the partial area load of load class 4 (5.0 kN/m² on 40% of the deck area of each scaffolding bay). The load-bearing capacity of the ledger matches the partial area load of load class 6 (10.0 kN/m² on 50% of the deck area of each scaffolding bay).

TRANSFER OF TENSION OF STANDARD JOINT



Fasteners: Hinged pins or special bolts M12-8.8 with nut

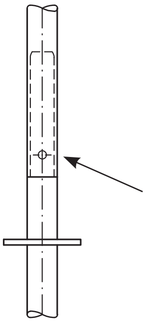
Permissible tension force of Allround Standard LW with integrated spigot [kN]			
Standard below	Number of fasteners	Standard above	
		Allround LW	Allround K2000+ or Variant II
Allround LW with integrally cast spigot	1	36.4	29.5
	2	69.3	59.0



Fasteners: Hinged pins or special bolts M12-8.8 with nut

Permissible tension force of Allround Standard LW with bolt-in spigot [kN]			
Standard below, without spigot	Number of fasteners above / below	Standard above	
		Allround LW	Allround K2000+ or Variant II
Allround LW	1 / 1	29.5	
	2 / 2	56.1	
Allround K2000+ or Variant II	1 / 1	32.6	29.5
	2 / 2	56.1	56.1

Permissible tension force of Allround Standard Aluminium with bolt-in spigot [kN]		
Standard below, without spigot	Number of fasteners above / below	Standard above: Allround Aluminium
Allround Aluminium	2 / 2	42.2



Fastener: Hinged pin or special bolt M12-8.8 with nut or locking pin red, dia 11 mm

Permissible tension force of Allround Standard with pressed-in spigot, K2000+ and Variant II:
6.7 kN

SUSPENDED SCAFFOLDING WITH LAYHER LATTICE BEAM 450 STEEL

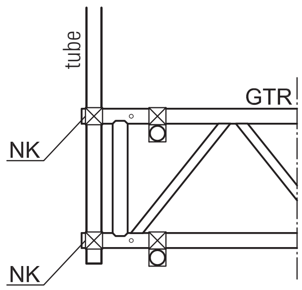
Load class 3 EN 12811-1 (q_1 = 2.0 kN/m² over 6 m², remaining area with 0.75 kN/m²)
Deck: Steel deck; aluminium deck; Stalu deck; Robust deck, wooden planks d = 4.5 cm

Suspended scaffolding with Layher lattice beam 450 steel			
		Maximum suspension force[1] in [kN]	
Span a of lattice beams [m]	Top chord bracing interval b [m]	Single-bay beam	Multiple-bay beam
4.0	2.0	9.6	20.2
6.0	1.5	13.4	27.9

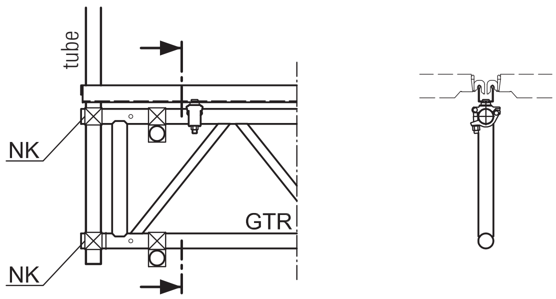
1 The values are working loads.

Remarks:
Decks must be secured against lift-off.
The suspended scaffolding must be secured to prevent swinging.

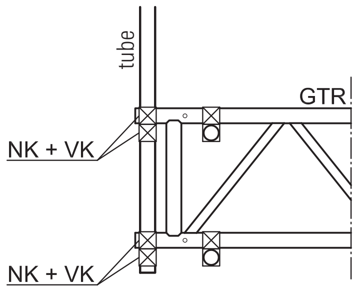
Detail A — Version: Wooden planks



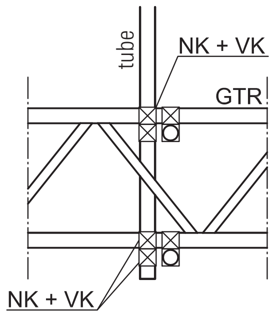
Detail A1 — Version: Aluminium U-profile with half-couplers for decks



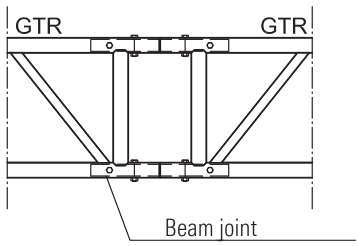
Detail B



Detail C

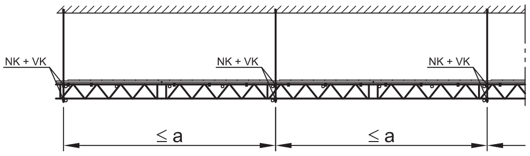


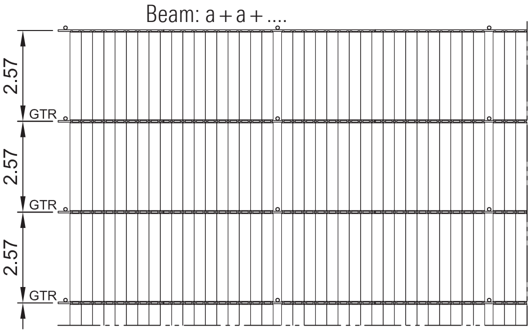
Detail of beam joint



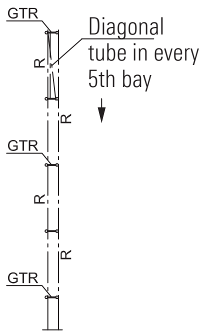
GTR = Lattice beam
NK = Double coupler
VK = Supplementary coupler

Multiple-bay beam

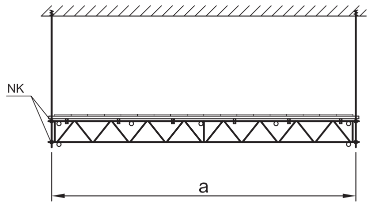


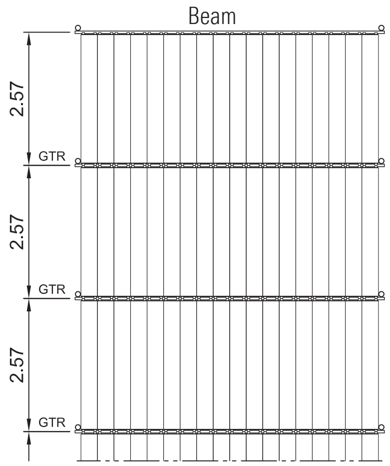


View A

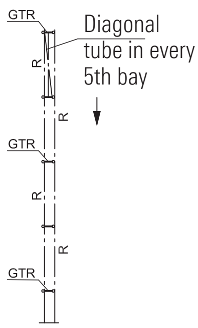


Single-bay beam

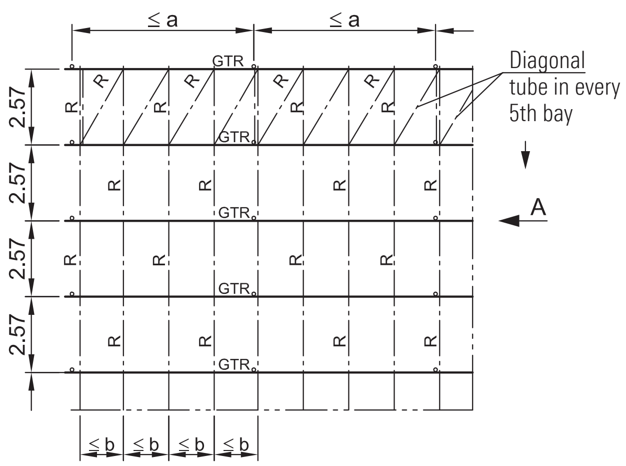




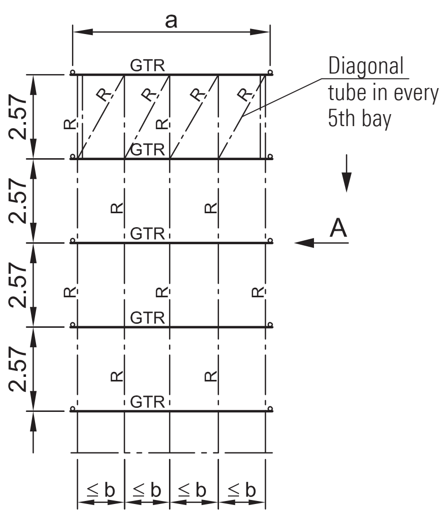
View A



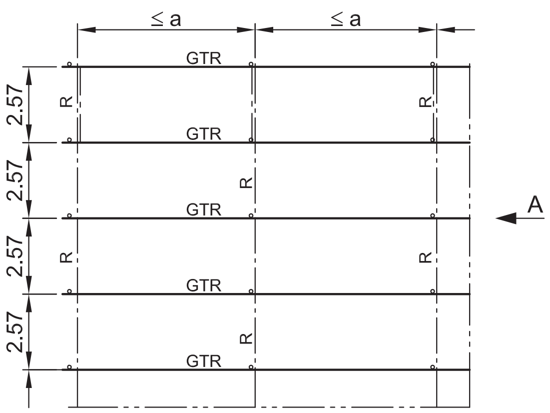
Bracing of top chord



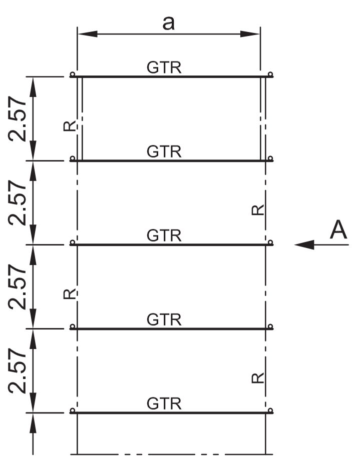
Bracing of top chord



Bracing of bottom chord



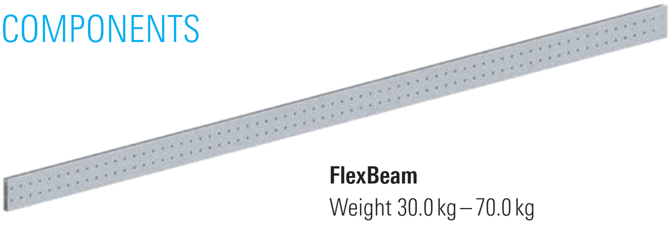
Bracing of bottom chord



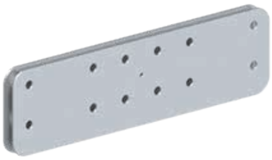
GTR = Lattice beam
NK = Double coupler
R = Tube
VK = Supplementary coupler

ALUMINIUM FLEXBEAM

COMPONENTS



FlexBeam
Weight 30.0 kg – 70.0 kg
Ref. No. 2657.300, 2657.400, 2657.500, 2657.600, 2657.700



FlexBeam beam connector
Weight 16.4 kg
Ref. No. 2657.010

FlexBeam standard connector
Weight 6.6 kg
Ref. No. 2657.080

FlexBeam tie rod adapter
Weight 5.7 kg
Ref. No. 2657.050

FlexBeam standard adapter male
Weight 1.7 kg
Ref. No. 2657.060

FlexBeam standard adapter female
Weight 2.9 kg
Ref. No. 2657.070

FlexBeam suspension shoe
Weight 9.3 kg
Ref. No. 2657.040

FlexBeam anchor plate
Weight 12.0 kg
Ref. No. 2657.030

FlexBeam anchor plate tube
Weight 1.3 kg
Ref. No. 2657.020

FlexBeam timber beam support
Weight 3.4 kg
Ref. No. 2657.090

FlexBeam lift-off preventer
Weight 3.3 kg
Ref. No. 2657.100

FlexBeam lift-off preventer lock
Weight 8.1 kg, 50 pcs.
Ref. No. 2657.110

FlexBeam lift-off preventer bolt
Weight 2.8 kg, 20 pcs.
Ref. No. 2657.120

FlexBeam rosette adapter
Weight 2.7 kg
Ref. No. 2657.130

Bolt, dia. **20 x 113 mm**
Weight 3.0 kg, 10 pcs.
Ref. No. 2646.280

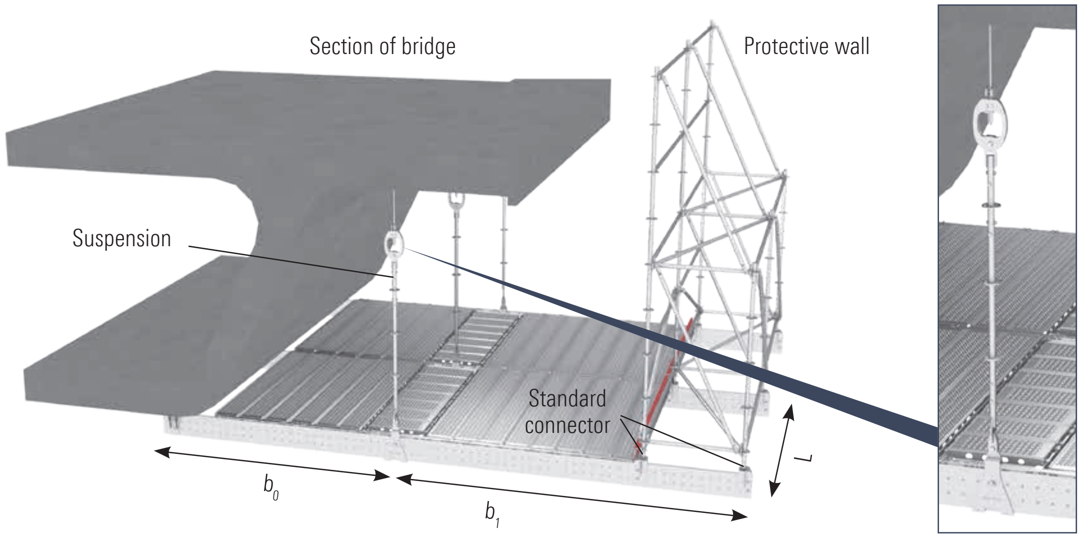
Securing pin, dia. **4 mm**
Weight 1.5 kg, 50 pcs.
Ref. No. 5905.001

FlexBeam end beam adapter
Weight 11.8 kg
Ref. No. 2657.015

BRIDGE REPAIR AS EXAMPLE OF APPLICATION

The aluminium FlexBeam has a high load capacity but low height. This means that standing and suspended surface scaffolding can be assembled even more economically. Extension using standard Allround components in the system dimension – for example side protection – is possible. Interchangeable U-ledgers also ensure high flexibility when positioning the suspension shoe.

For further information please refer to the Instructions for Assembly and Use.



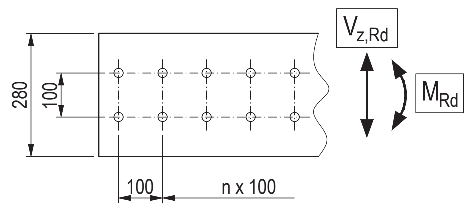
The table values b_1 were calculated on the assumption of a four metre high and fully covered protective wall with a one-metre projection beyond the bridge structure. For the protective wall the working wind load w was assumed, calculated with a velocity pressure of 0.2 kN/m².
$w = 1.3 \times 0.2\ kN/m^2 = 0.26\ kN/m^2$

The distance b_0 should be at least 2.0 m.

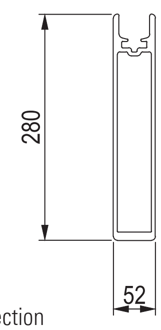
Maximum projection b_1 (Distance of suspension from protective wall, see image above)			
Beam spacing L	perm. area load p		
	2.0 kN/m²	3.0 kN/m²	4.0 kN/m²
2.07 m	3.4 m	2.9 m	2.5 m
2.57 m	3.0 m	2.6 m	2.2 m

THE DESIGN RESISTANCES OF THE FLEXBEAM AND THE SUSPENSION ARE:

FlexBeam



Detail of holes



Cross-section

Design values of the resistance to bending moment and shear force

$M_{Rd} = \pm 51.2\ kNm\ (\pm 34.1\ kNm)$
$V_{z,Rd} = \pm 191.2\ kN\ (\pm 127.5\ kN)$

Suspension

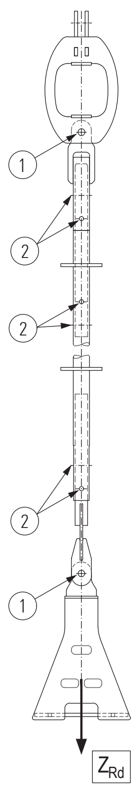
1. 1 x bolt dia. 20 – 8.8
   with securing pin

2. 2 x special bolt M12-8.8
   with nut
   or
   2 x hinged pin, pin dia. 12 – 8.8

Design value of the resistance to tension force of suspension

Allround Standard LW with integrated spigot:
$Z_{Rd} = 89.2\ kN\ (59.5\ kN)$

Allround Standard LW / K2000+ / Variant II with bolt-in spigot:
$Z_{Rd} = 84.2\ kN\ (56.1\ kN)$



Values in brackets are permissible forces or the permissible bending moment ($\gamma_F = 1.5$)

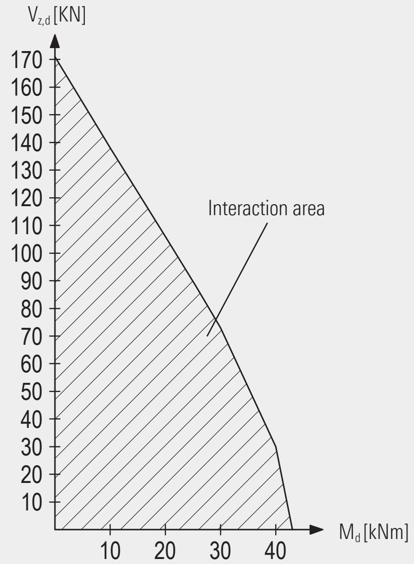
TRANSFERABLE COMBINATIONS OF INTERNAL MOMENT AND SHEAR FORCE IN THE BEAM JOINT

The joint of the FlexBeam is made using the FlexBeam beam connector and fasteners (bolt dia. 20-8.8 with securing pin). Bending moment and shear force are transferred the joint. We recommend the version with six fasteners per side. If lower moments and shear forces have to be transferred in individual cases, the version with six fasteners per side can also be sufficient.

FlexBeam joint with 12 bolts (6 bolts per side)

Transferable combinations of bending moment and shear force
All combinations of bending moment and shear force in the respective interaction area can be transferred.

Design values for bending moment and shear force



Bending moment and shear force due to working loads (actually effective loads)

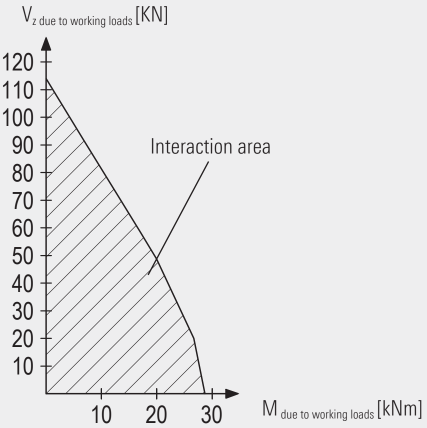
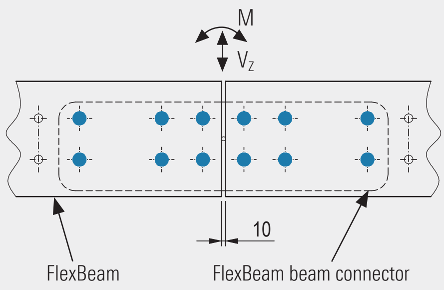


Illustration of joint



M_d* [kNm]	0	10.0	20.0	25.0	30.0	40.0	43.0
$V_{z,d}$ * [kN]	171.0	138.0	106.0	88.5	73.0	30.0	0

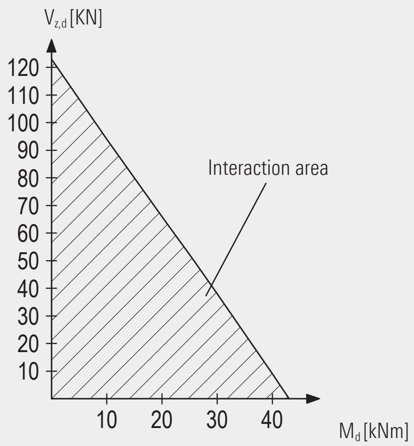
$M_{due\ to\ working\ loads}$* [kNm]	0	6.7	13.3	16.7	20.0	26.7	28.7
$V_{z,\ due\ to\ working\ loads}$* [kN]	114.0	92.0	70.7	59.0	48.7	20.0	0

* Selected value pairs at the limit of the interaction area

FlexBeam joint with 8 bolts (4 bolts per side)

Transferable combinations of bending moment and shear force
All combinations of bending moment and shear force in the respective interaction area can be transferred.

Design values for bending moment and shear force



Bending moment and shear force due to working loads (actually effective loads)

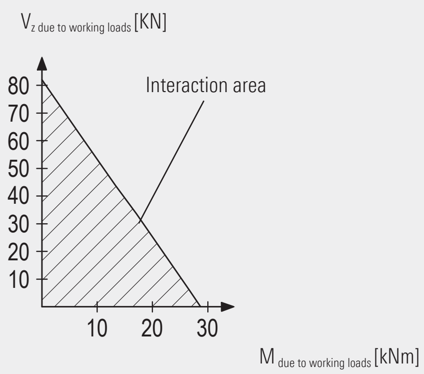
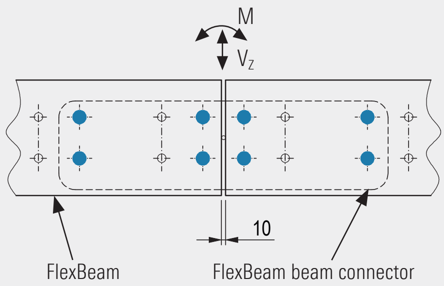


Illustration of joint



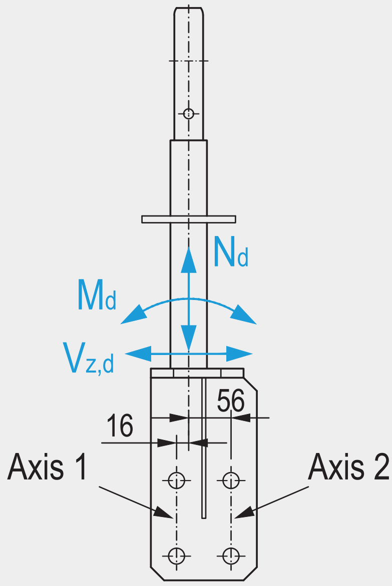
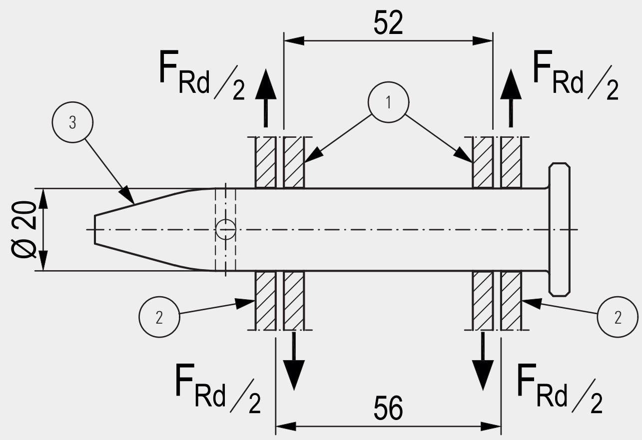
M_d* [kNm]	0	10.0	20.0	25.0	30.0	40.0	43.0
$V_{z,d}$ * [kN]	123.0	94.0	66.0	51.6	38.0	9.0	0

$M_{due\ to\ working\ loads}$* [kNm]	0	6.7	13.3	16.7	20.0	26.7	28.7
$V_{z,\ due\ to\ working\ loads}$* [kN]	82.0	62.7	44.0	34.4	25.3	6.0	0

* Selected value pairs at the limit of the interaction area

BOLT CONNECTION BETWEEN FLEXBEAM AND STANDARD CONNECTOR

The FlexBeam standard connector allows Allround standards to be connected to the FlexBeam, e.g. for the protective wall. Bolts dia. 20-8.8 with securing pin are used as fasteners. Either two bolts in axis 1 or two bolts in axis 2 are installed.

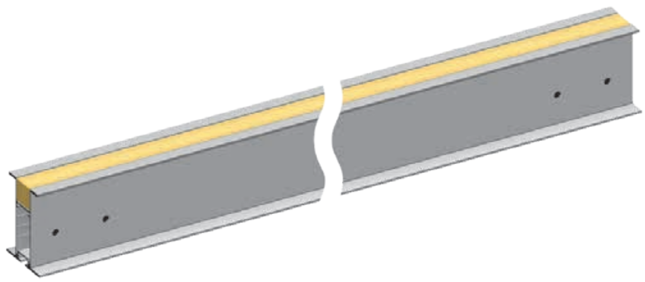
FlexBeam standard connector	Bolt dia. 20-8.8
 	 1 FlexBeam 2 FlexBeam standard connector 3 Bolt dia. 20−8.8 with securing pin Design shear/bearing resistance per bolt: F_{Rd} = 68.2 kN (45.5 kN)* * The value in brackets is the permissible shear/bearing force per bolt ($\gamma_F = 1.5$).

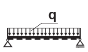
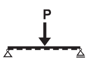
The bolt connection must be verified for the specific project for the respective combination of internal forces and moment (M_d, N_d, $V_{z,d}$).

ALUMINIUM SECTION BEAM WITH SQUARED TIMBER

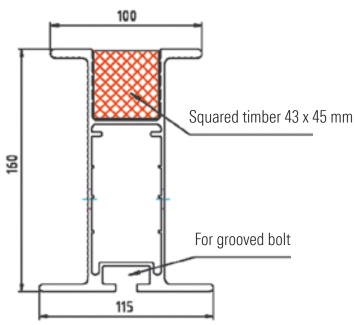
The aluminium section beam with wood is a lightweight aluminium beam with low overall height for birdcage scaffolding, walkways and bridging.

Specifications:
Double-web beam of aluminium, 160 mm high. 1 flange 115 mm wide, with T-groove for connections with grooved bolts.
1 flange 100 mm wide, with replaceable squared timber insert, for nailed or bolted connections.



	Permissible load of aluminium section beam with squared timber						
	Span l [m]	3.0	4.0	5.0	6.0	7.0	8.0
	Uniformly distributed line load q [kN/m]	12.0	6.7	4.3	3.0	2.2	1.7
	Deflection [cm]	2.5	4.4	6.8	9.8	13.4	17.5
	Concentrated load P in bay centre [kN]	17.9	13.4	10.7	9.0	7.7	6.7
	Deflection [cm]	2.0	2.5	5.5	7.9	10.7	14.0

Note: The permissible loads were calculated considerring a safety factor of $\gamma_F = 1.5$, deflections were calculated considering $\gamma_F = 1.0$.



ALLROUND FW SYSTEM

COMPONENTS

FW chord
Weight 10.5 kg – 17.4 kg
Ref. No. 2646.157, 2646.207, 2646.257

FW post
Weight 8.8 kg – 16.2 kg
Ref. No. 2646.100, 2646.150, 2646.200

FW post, extended
Weight 19.0 kg
Ref. No. 2646.250

FW post, one-sided
Weight 6.4 kg – 13.8 kg
Ref. No. 2646.105, 2646.155, 2646.205

FW post, one-sided, extended
Weight 16.6 kg
Ref. No. 2646.255

FW end fitting with turnbuckle
Weight 3.8 kg
Ref. No. 2646.202

FW end fitting
Weight 1.0 kg
Ref. No. 2646.203

FW diagonal rod
Weight 1.4 kg – 3.3 kg
Ref. No. 2646.xxx

Bolt, dia. 20 mm
Weight 1.6 kg, 10 pcs.
Ref. No. 2646.220

Securing pin dia. 4 mm
Weight 1.5 kg, 50 pcs.
Ref. No. 5905.001

Allround FW System lock nut, dia. 20 mm
Weight 1.5 kg, 10 pcs.
Ref. No. 2646.230

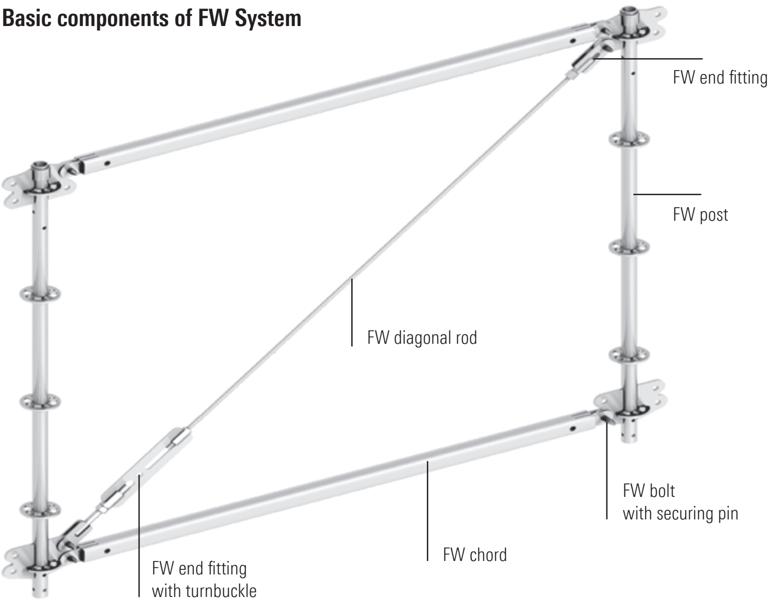
FW guardrail adapter
Weight 1.2 kg
Ref. No. 2646.001

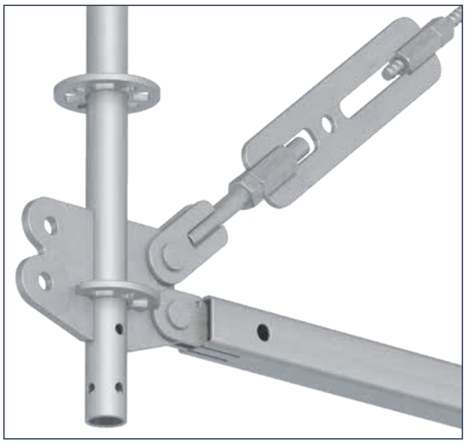
EXAMPLE OF APPLICATION OF ALLROUND FW SYSTEM

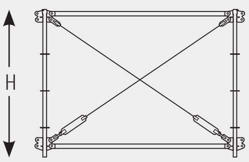
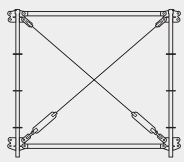
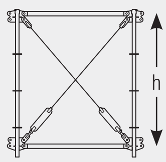
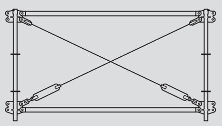
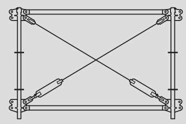
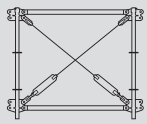
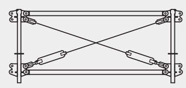
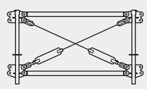
Thanks to the modular design of the FW System and its integration into Allround Scaffolding, the scaffolding structures can be optimally adapted to building conditions. For example, vertical attachment to the open ends of the FW post is possible using Allround standards and FW post. In the transverse direction, the FW System is braced using standard Allround components. That permits the construction of bridging and support beams. With a few expansion parts, the FW System can also be used as a supporting structure for roofs.

For further information please refer to the Instructions for Assembly and Use.

Basic components of FW System



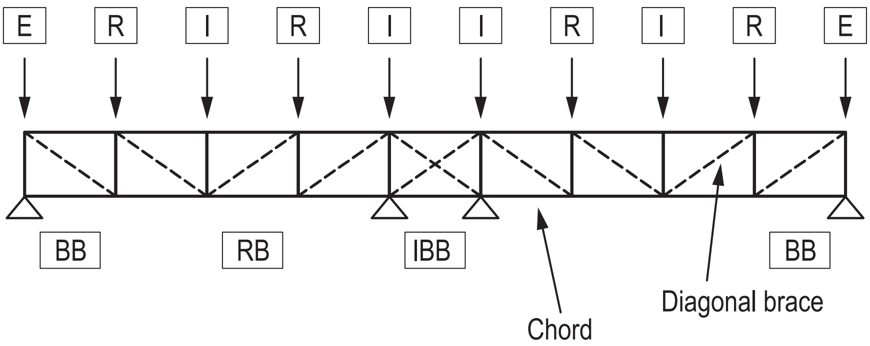


Post / chord combination possibilities				
System height H of post	Length of chord			Static height h
	2.57 m	2.07 m	1.57 m	
2.0 m				1.8 m
1.5 m				1.3 m
1.0 m	From a structural viewpoint has no point			0.8 m

Design resistances of top and bottom chords N_{Rd} [kN]				
	Bay length L			
	1.09 m	1.57 m	2.07 m	2.57 m
Compression	-123.4			-95.5
Tension	123.4 (bolt connection)			

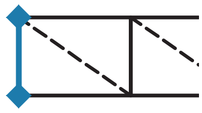
Design resistances to tension of diagonal brace Z_{Rd} [kN]				
System height H	Bay length L [m]			
	1.09 m	1.57 m	2.07 m	2.57 m
	123.4 (bolt connection)			
	Derived design shear resistance $V_{Z,Rd}$ [kN]			
2.0 m	105.6	93.0	81.0	70.8
1.5 m	94.6	78.7	65.6	55.7
1.0 m	73.0	56.0	44.5	36.7

STATIC SYSTEM – PURE FRAMEWORK



Notes:
The design resistances of the standards specified in the following were ascertained for the system in the plane of the framework. They take into account the eccentric connection of the diagonal braces to the corner plates.

E - End support standard



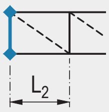
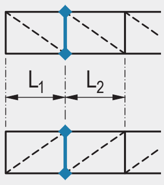
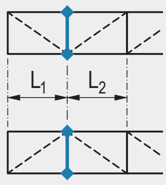
I - Intermediate support standard

R - Inner standard / Regular standard

BB - Bearing bay

RB - Regular bay

IBB - Intermediate-bearing bay

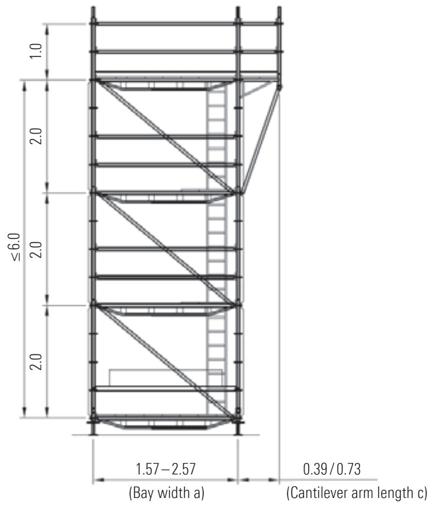
Design resistances of post N_{Rd} [kN] in the plane of the framework						
Design resistances of end support standard (E), regular standard (R) and intermediate support standard (I)						
		End support standard E	Regular standard R		Intermediate support standard I	
						
System height H of posts	Bay length L_2		Bay length L_1			
			$L_1 = 1.09$ m	$L_1 = 1.57$ m	$L_1 = 2.07$ m	$L_1 = 2.57$ m
		E	R / I	R / I	R / I	R / I
2.0 m	$L_2 = 1.09$ m	35.0	46.0 / 61.7	40.0 / 44.0	34.0 / 34.0	29.5 / 27.0
	$L_2 = 1.57$ m	45.5		59.0 / 61.7	43.5 / 43.0	35.0 / 33.0
	$L_2 = 2.07$ m	58.0			61.7 / 61.7	43.0 / 44.0
	$L_2 = 2.57$ m	42.0				56.0 / 61.7
1.5 m	$L_2 = 1.09$ m	28.0	31.0 / 99.0	30.0 / 58.0	29.0 / 39.0	28.0 / 28.0
	$L_2 = 1.57$ m	39.0		43.0 / 99.0	41.0 / 57.0	39.0 / 39.0
	$L_2 = 2.07$ m	58.0			70.0 / 99.0	58.0 / 58.0
	$L_2 = 2.57$ m	99.0				99.0 / 99.0
1.0 m	$L_2 = 1.09$ m	48.0	55.0 / 144.2	48.0 / 48.0	38.0 / 26.0	23.0 / 18.0
	$L_2 = 1.57$ m	144.2		144.2 / 144.2	46.0 / 46.0	25.0 / 25.0
	$L_2 = 2.07$ m	46.0			53.0 / 144.2	27.0 / 46.0

Design resistances of posts perpendicular to the plane of the framework N_{Rd} [kN]	
H = 2.00 m	51.8
H = 1.50 m	81.3
H = 1.00 m	126.6

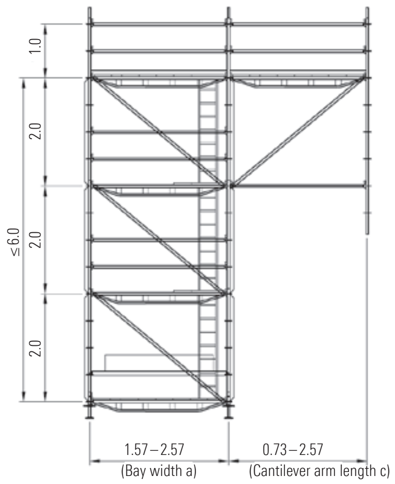
Design resistances of posts perpendicular to the plane of the framework N_{Rd} [kN]	
h = 1.80 m	61.6
h = 1.30 m	98.1
h = 0.80 m	144.2

FREE-STANDING TOWERS

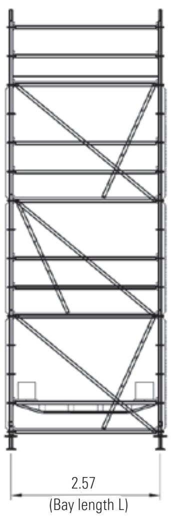
Version with bracket (B)
Side view



Version with Allround (A)
Side view



Version with bracket (B)
Version with Allround (A)
Front view



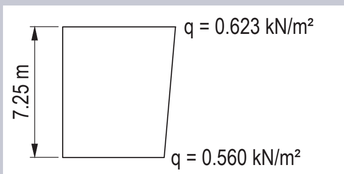
Free-standing towers Platform height: 2.25 m	Bay length L: 2.57 m				
		Outdoors		Indoors	
Bay width a [m]	Cantilever arm length c [m]	Ballast total [kg]	Max. load to a standard [kN]	Ballast total [kg]	Max. load to a standard [kN]
1.57	0.39 (B)	370	6.4	–	5.2
	0.73 (B)	490	8.2	45	6.9
2.07	0.39 (B)	100	6.4	–	6.0
	0.73 (B)	190	8.1	–	7.5
2.57	0.00	–	5.5	–	5.4
	0.39 (B)	–	6.9	–	6.9
	0.73 (B)	–	8.3	–	8.3
Platform height: 4.25 m	**Bay length L: 2.57 m**				
1.57	0.39 (B)	1400	10.4	–	6.2
	0.73 (B)	1515	12.2	–	7.8
	0.73 (A)	1595	12.8	95	8.4
2.07	0.39 (B)	745	9.2	–	6.9
	0.73 (B)	835	10.9	–	8.4
	0.73 (A)	895	11.4	–	8.8
	1.09 (A)	1050	13.5	115	10.8
	1.57 (A)	1340	16.8	780	15.1
2.57	0.00	275	7.4	–	6.4
	0.39 (B)	330	8.9	–	7.7
	0.73 (B)	405	10.4	–	9.2
	0.73 (A)	450	10.9	–	9.5
	1.09 (A)	580	12.8	–	11.1
	1.57 (A)	810	15.8	360	14.5
	2.07 (A)	1330	19.8	1090	19.5
	2.57 (A)	2230	25.1	2025	24.6

Basis for dimensioning of free-standing towers:
The assembly variants for outdoor use were calculated assuming the velocity pressure as per EN 12810-1, Fig. 3, reduced by a factor of 0.7 to take into account a time from the erection to the dismantling of ≤ 2 years:

$q_{(H=0)} = 0.800\,kN/m^2 \times 0.7 = 0.560\,kN/m^2$

$q_{(H=7.25)} = 0.891\,kN/m^2 \times 0.7 = 0.623\,kN/m^2$

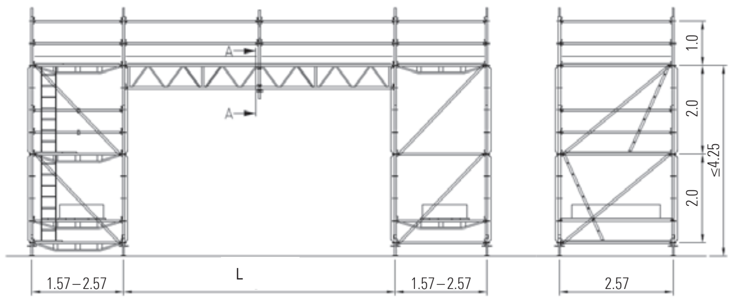
In Germany this covers: Wind zone 3, inland, time from the erection to the dismantling ≤ 2 years



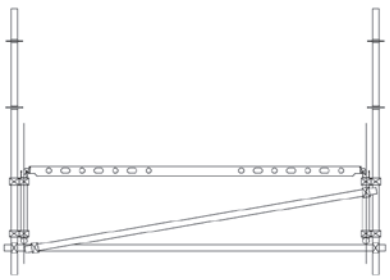
Free-standing towers					
Platform height: 6.25 m	Bay length L: 2.57 m				
		Outdoors		Indoors	
Bay width a [m]	Cantilever arm length c [m]	Ballast total [kg]	Max. load to a standard [kN]	Ballast total [kg]	Max. load to a standard [kN]
1.57	0.39 (B)	2980	17.7	–	7.2
	0.73 (B)	3095	18.6	–	8.8
	0.73 (A)	3175	19.2	70	9.4
2.07	0.39 (B)	1880	13.8	–	7.9
	0.73 (B)	1970	15.3	–	9.4
	0.73 (A)	2030	15.8	–	9.8
	1.09 (A)	2190	17.9	40	11.7
	1.57 (A)	2480	21.1	715	16.1
2.57	0.00	1150	11.1	–	7.5
	0.39 (B)	1200	12.5	–	8.8
	0.73 (B)	1270	14.1	–	10.3
	0.73 (A)	1320	14.6	–	10.7
	1.09 (A)	1445	16.4	–	12.3
	1.57 (A)	1680	19.4	265	15.4
	2.07 (A)	1985	22.9	1000	20.1
	2.57 (A)	2395	27.0	1950	25.7

BRIDGING

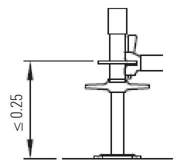
Front and side view



Section A-A (bracing with tube and coupler)



Detail of base point



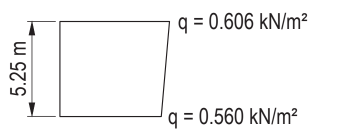
Bridging					
Platform height: 4.25 m					
		Outdoors		Indoors	
Bay width a [m]	Bay length L [m]	Ballast total [kg]	Max. load to a standard [kN]	Ballast total [kg]	Max. load to a standard [kN]
1.57	4.14 (2 x 2.07)	820	10.4	–	10.8
	5.14 (2 x 2.57)	930	11.9	–	12.6
	6.14 (2 x 3.07)	1040	13.1	–	14.2
	7.71 (3 x 2.57)	1200	13.8	–	11.3
2.07	4.14 (2 x 2.07)	920	10.9	–	11.8
	5.14 (2 x 2.57)	1030	12.3	–	13.6
	6.14 (2 x 3.07)	1140	13.4	–	15.2
	7.71 (3 x 2.57)	1290	13.9	–	11.9
2.57	4.14 (2 x 2.07)	1020	11.8	–	12.8
	5.14 (2 x 2.57)	1140	13.2	–	14.6
	6.14 (2 x 3.07)	1240	14.3	–	16.3
	7.71 (3 x 2.57)	1400	14.7	–	12.5

Basis for dimensioning of bridging:
The assembly variants for outdoor use were calculated assuming the velocity pressure as per EN 12810-1, Fig. 3, reduced by a factor of 0.7 to take into account a time from the erection to the dismantling of ≤ 2 years:

$q_{(H=0)} = 0.800\,kN/m^2 \times 0.7 = 0.560\,kN/m^2$

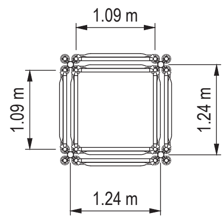
$q_{(H=5.25)} = 0.866\,kN/m^2 \times 0.7 = 0.606\,kN/m^2$

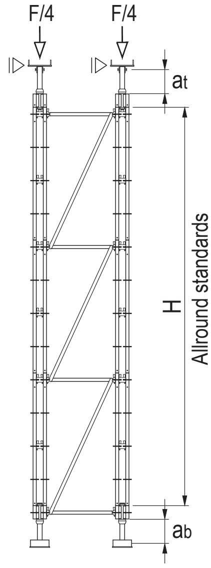
In Germany this covers: Wind zone 3, inland, time from the erection to the dismantling ≤ 2 years



HEAVY-DUTY TOWER

Permissible vertical load F [kN] per Allround heavy-duty tower 1.09 x 1.09 m, laterally held at the top				
Tower height [m]	Characteristic velocity pressure q (q_p) [kN/m²]			
	0 (no wind)	0.5 (0,71)	0.8 (1,14)	1.2 (1,71)
2	602.0	593.6	588.8	582.4
4	564.4	548.8	544.0	536.0
6	564.4	555.6	540.4	481.2
8	554.8	518.4	452.0	363.6
10	535.2	436.8	352.8	240.8
12	518.0	398.8	290.0	145.6
16	504.0	298.0	144.8	–
20	492.4	201.6	–	–





Double wedge head coupler spacing: 50 cm or 100 cm
Spindle extension of head jack and base plate: $a_t \leq 25$ cm, $a_b \leq 25$ cm

The permissible loads apply for any combined execution of the heavy-duty tower with Allround scaffolding components LW / Variant K2000+ / Variant II.

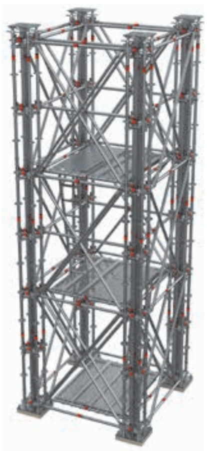
The calculations were made with the velocity pressures q, covering any time from the erection to the dismantling. For a time from the erection to the dismantling of up to two years, the velocity pressure may be reduced by the factor 0.7, such that the specified permissible vertical loads apply for the higher velocity pressures q_p in brackets.

HEAVY-DUTY TOWER XL

In some construction projects, industrial applications and structural safeguarding measures, shoring with particularly high load-bearing capacity is needed, as very high loads have to be transmitted at particular points. That relates for example to projects in bridge construction, plant repair and structural safeguarding measures for structures and plants after accidental events.

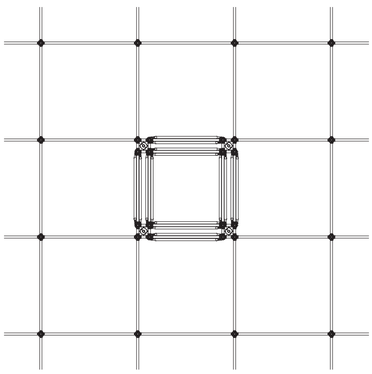
The heavy-duty tower XL is ideal for this and also a convincing alternative to the otherwise used heavy shoring structures made from structural steel. The Heavy-Duty Tower XL:

- Can carry a working load of up to 200 tonnes (= 2000 kN), depending on the conditions of use
- Is modular in structure, based on standard Allround Scaffolding components and the reliable connection technology using wedge head and half-couplers
- Can be installed and dismantled without a crane, thanks to modular components of relatively low weight and simple connection technology
- Offers safety during assembly thanks to integrable access decks and scaffolding decks
- Is fully integrated into the Layher system dimensions and thus fits accurately into Allround birdcage scaffolding
- Must be structurally verified for the specific project


Heavy-Duty Tower XL


Project example: Inclined support


Centred load application at the top


Integration of the Heavy-Duty Tower XL into Allround birdcage scaffolding

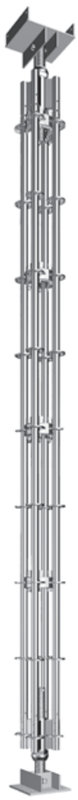
HEAVY-DUTY SUPPORT

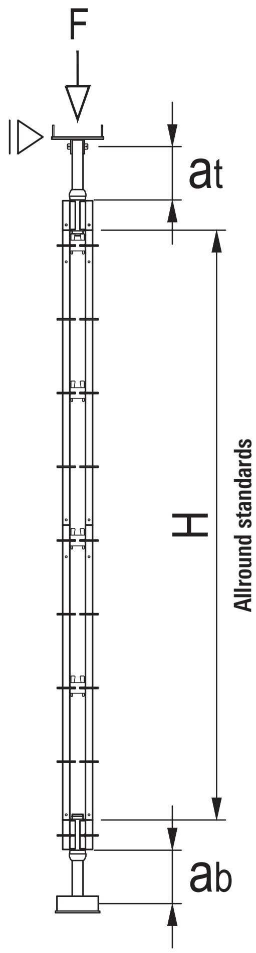
The heavy-duty support has been verified for vertically upright and angled alignments. The permissible load on the head jack has been determined for various wind loads (velocity pressures), spindle extensions and double wedge head coupler spacings.

The permissible loads apply for any application versions of the heavy-duty support with Allround Scaffolding components LW / Variant K2000+ / Variant II.

The structural analysis was made with the velocity pressures q, covering any time from the erection to the dismantling. For a time from the erection to the dismantling of up to two years, the velocity pressure may be reduced by the factor 0.7, so that the specified permissible loads apply for the higher velocity pressures q_p given in brackets.

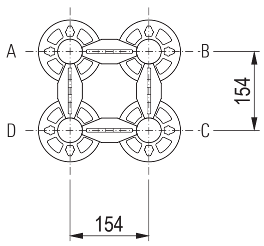
Support height H = 2.0 m:
2.0 m standards are to be used.
Support height H = 3.0 m:
Either standards 3.0 m or staggered standards can be used. Staggered arrangement: [A and C]: 1 m + 2 m; [B and D]: 2 m + 1 m
Support height H = 4.0 m:
Either standards 4.0 m or staggered standard can be used. Staggered arrangement: [A and C]: 2 m + 2 m; [B and D]: 1 m + 2 m + 1 m





In standard arrangements with staggered joints, the joints of the diagonally opposite standards [A and C] and [B and D] are at the same height.

The joints between the Allround standards and the joints between Allround standards and the head part / base piece must be secured using hinged pins.



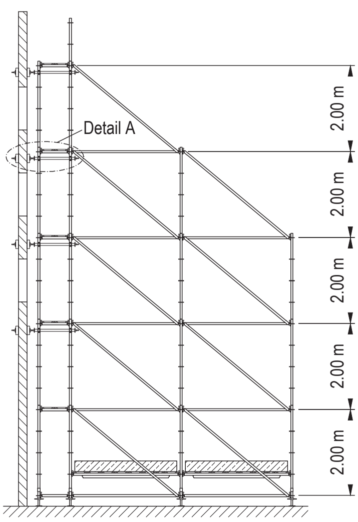
Vertical heavy-duty support					
Characteristic velocity pressure q (q_p) [kN/m²]	Spindle extension bottom / top a_b / a_t [cm]	Spacing between the double wedge head couplers [cm]	Permissible vertical load on the head jack F [kN] Support height H = 2.0 m	Support height H = 3.0 m	Support height H = 4.0 m
0 (no wind)	5 / 5	50	178.5	162.9	143.3
		100	170.0	137.0	98.9
	20 / 20	50	165.6	151.6	133.4
		100	158.8	135.8	97.1
	35 / 35	50	152.2	139.8	123.5
		100	146.9	134.3	95.1
0.5 (0.71)	5 / 5	50	177.3	159.6	136.2
		100	168.7	132.1	93.2
	20 / 20	50	164.1	148.1	128.1
		100	157.2	131.1	91.6
	35 / 35	50	150.3	136.0	118.1
		100	145.0	129.6	89.6
0.8 (1.14)	5 / 5	50	176.6	157.7	132.1
		100	167.9	129.1	89.8
	20 / 20	50	163.2	146.0	125.0
		100	156.2	128.2	88.3
	35 / 35	50	149.2	133.8	114.9
		100	143.8	126.8	86.7
1.2 (1.71)	5 / 5	50	175.7	155.1	126.8
		100	166.8	125.2	85.2
	20 / 20	50	162.0	143.2	120.9
		100	154.9	124.3	83.8
	35 / 35	50	147.7	130.8	110.7
		100	142.3	123.0	82.4

Heavy-duty support angled (0 ° ≤ α < 90 °)					
Characteristic velocity pressure q (q_p) [kN/m²]	Spindle extension bottom / top a_b / a_t [cm]	Spacing between the double wedge head couplers [cm]	Permissible compression force on the head jack, acting in the support axis F [kN]		
			Support height H = 2.0 m	Support height H = 3.0 m	Support height H = 4.0 m
0 (no wind)	5 / 5	50	176.8	157.5	127.4
		100	168.2	126.8	87.6
	20 / 20	50	159.9	146.8	123.9
		100	156.2	125.7	86.1
	35 / 35	50	148.7	132.9	113.6
		100	143.6	124.1	84.5
0,5 (0,71)	5 / 5	50	175.8	154.5	121.6
		100	167.0	122.1	82.1
	20 / 20	50	161.7	142.2	117.9
		100	154.8	121.2	80.8
	35 / 35	50	147.1	129.6	108.9
		100	141.9	119.8	79.4
0,8 (1,14)	5 / 5	50	175.1	152.7	118.2
		100	166.3	119.4	78.9
	20 / 20	50	160.9	140.4	114.8
		100	153.9	118.5	77.7
	35 / 35	50	146.2	127.6	104.3
		100	140.9	117.3	76.4
1,2 (1,71)	5 / 5	50	174.2	150.4	113.9
		100	165.3	115.7	74.4
	20 / 20	50	159.8	137.9	110.8
		100	152.8	114.9	73.4
	35 / 35	50	144.9	125.0	95.5
		100	139.6	113.8	72.3

SUPPORT SCAFFOLDING

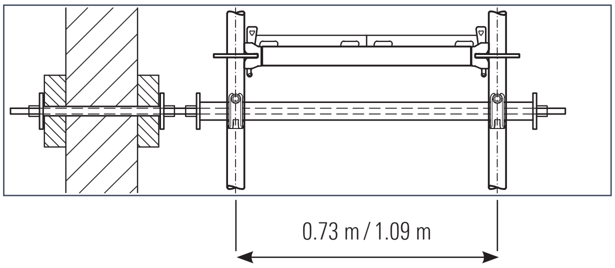
SUPPORTING A FREE-STANDING FACADE WITH ALLROUND SCAFFOLDING

A free-standing wall or facade can be supported very effectively with Allround Scaffolding, e.g. when renovating historic buildings. The support scaffolding must sustain the wind loads on the facade. This requires a static calculation for the specific project. The scaffolding must be connected to the facade, as shown.



Connection of the scaffolding to the free-standing facade

Example of support scaffolding for a free-standing facade



To ensure the positional **stability** of support scaffolding, it has to be ballasted in accordance with the static calculation.

The support scaffolding must always use Allround standards with bolt-in spigots or bolted LW standards!

The required weight of the ballast depends on:

- the height of the wall
- the space available on the ground for widening the scaffolding
- the wind load

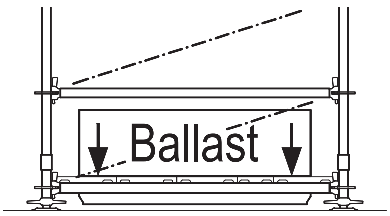
The structural design of the level(s) for laying the ballast depends on:

- the load-bearing capacity of the decks, deck ledger or lattice beams on which the ballast is placed

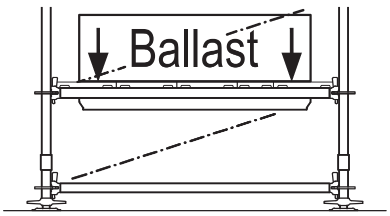
Notes on ballasting with positioned ballast weights:

- Do not place the ballast at the level of the base collars, as this does not allow any tension forces to be transferred (see Fig. below)
- Ballast is usually made of solid materials such as concrete or steel
- Static calculation required

WRONG

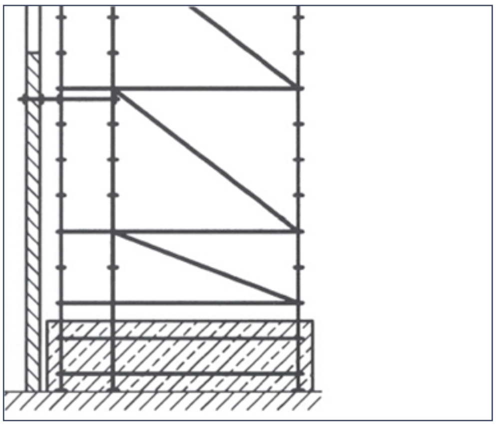


RIGHT



BALLASTING WITH CONCRETE FOUNDATION

Sometimes it is not possible to make support scaffolding sufficiently stable using placed ballast weights. The load capacity of the ground area, and the permissible load of the Allround standards and of the scaffolding deck area for positioning of the ballast weights would be exceeded.
This can happen in particular when only a limited setup area is available for the scaffolding or if the scaffolding width has to be limited for other reasons.
In these cases the scaffolding standards can be embedded in a concrete foundation.
Support scaffolding with concrete foundation must of course also be verified by static calculation.



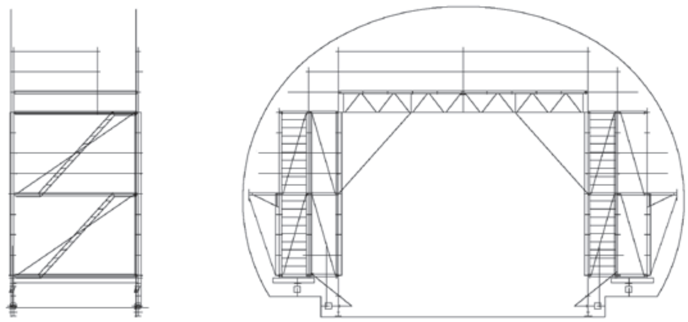
Example: Casting the scaffolding standards in a concrete foundation

LAYHER ALLROUND SCAFFOLDING® IN USE

MORE POSSIBILITIES

Layher Allround Scaffolding ensures shorter assembly times, optimises costs, increases safety when enclosing churches, monuments and all kinds of towers – scaffolding on and in boilers, storage tanks and pipelines, scaffolding over workplaces and traffic routes, around machines and / or under bridges – construction scaffolding or rolling tunnel structures: There is no job that can't be done more quickly, economically and safely with the Layher Allround system.

The building industry puts high demands for load-bearing capacity and design variation in scaffolding. This is where Allround Scaffolding is setting the standards: one system, as bricklayers' scaffolding, work scaffolding or protective scaffold with bay widths of 0.73 m, 1.09 m or 1.40 m, with selectable lift heights and live loads up to load class 6, depending on the bay width. Or assembled as scaffolding for formwork or support: with Allround Scaffolding you're prepared for anything.



Mobile tunnel scaffolding

BIRDCAGE SCAFFOLDING

REPAIR – RENOVATION

Building repair is an ongoing task. With Allround Scaffolding you can get on with any job. Concrete repair work on major structures, and the renovation of historic structures of all types, such as half-timbered houses, churches, castles and museums, including the restoration of artistically and historically valuable ceilings, or internal or external scaffolding for asbestos clearance.

ENGINEERING SCAFFOLDING

SCAFFOLDING FOR DEMANDING BUILDING SHAPES, SUCH AS STEEPLES AND DOMES.

For scaffolding around and inside churches in particular, Allround Scaffolding offers impressive flexibility plus simpler and safer handling. With its particular benefits, such as rapid assembly without bolts, positive and non-positive connections, dimensional accuracy and stiffness, you can rapidly create safer workplaces for roofers, masons, carpenters, plasterers, plumbers, painters and glaziers – both indoors and outdoors – even at extreme heights.

INDUSTRIAL SCAFFOLDING

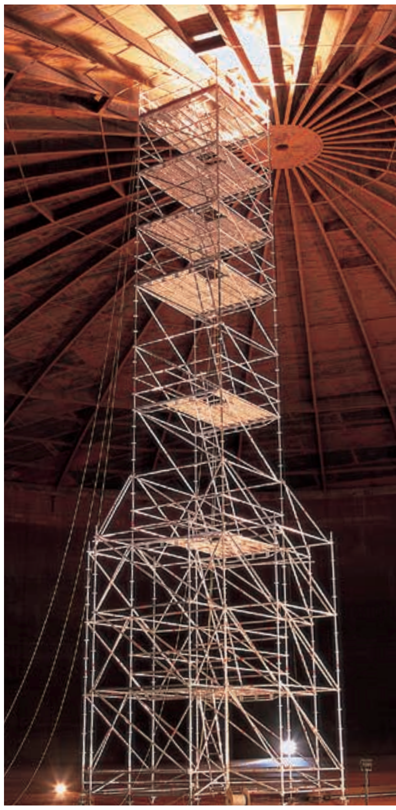
SAFE WORKPLACES AND ASSEMBLY PLACES

Industrial scaffolding is used for a wide range of applications, for example tall machinery and plant has to be serviced and repaired, equipment and systems have to be assembled, electrical units have to be replaced.

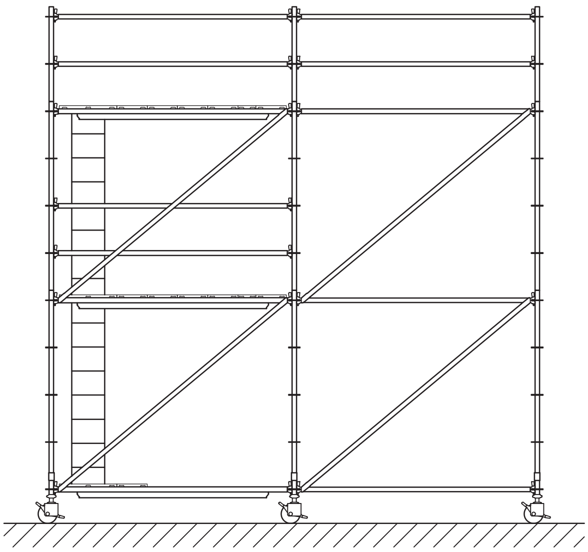
Using the Allround System, safer places for work and assembly can be created in a very short time in any industrial facility and in any company, whatever its size and whatever the industry. Here today, there tomorrow – wherever it’s used, it permits faster work thanks to a secure footing at height.

AS A BASIC SYSTEM FOR VERSATILE USE

STAIRTOWERS – ROLLING TOWERS – CLADDING WITH PROTECT

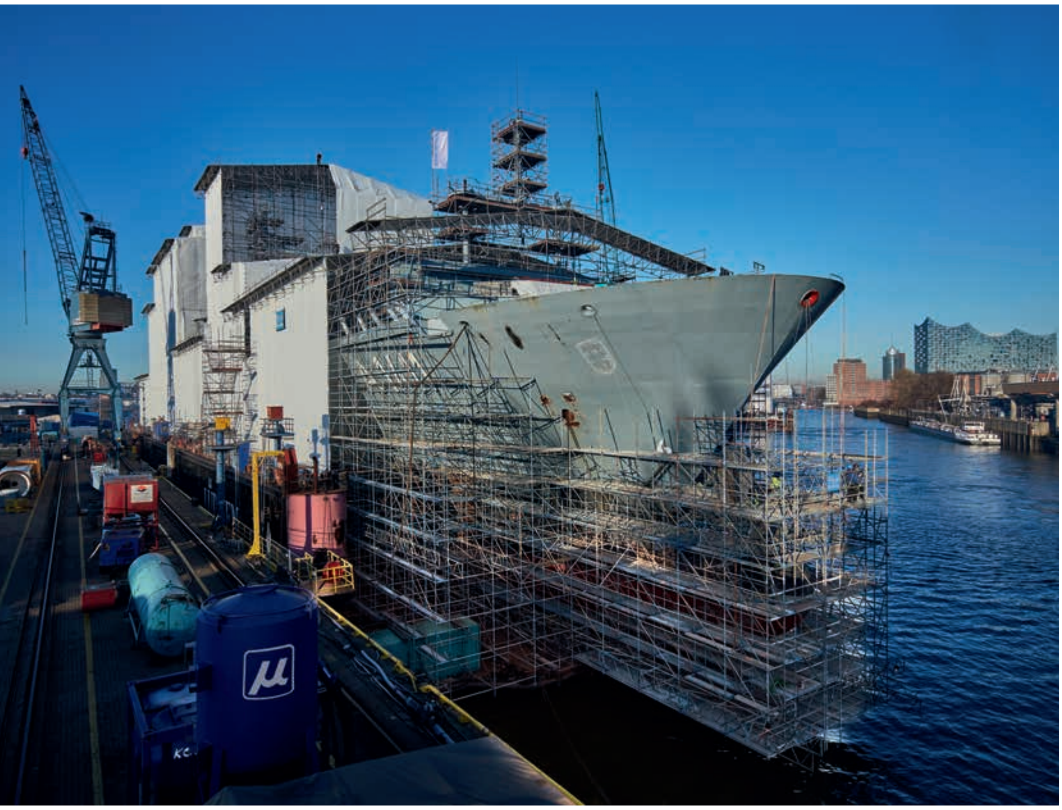


The great variability of Allround Scaffolding means that a wide range of applications can be handled using a small number of additional parts. By using stair stringers and appropriate guardrails, stairtowers ranging from construction stairtowers to stairs in areas open to the public can be built. Rolling towers with a range of ground plans and heights are possible. Together with the Protect system, waterproof enclosures covering entire facades, e.g. for asbestos clearance, can be realised.



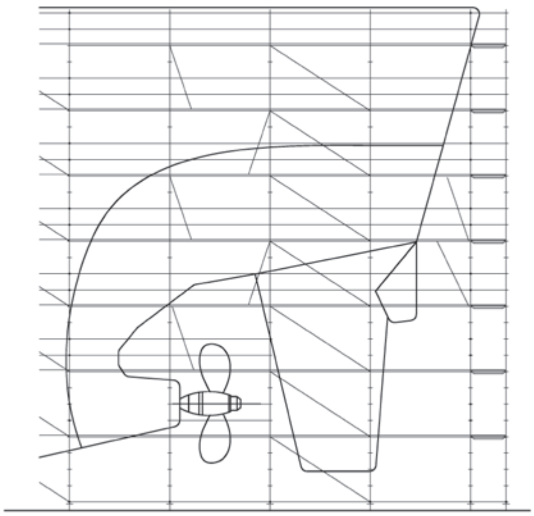
SHIPYARDS AND THE OFFSHORE SECTOR

SHORT INSTALLATION TIMES – FOR VERY FAST REPAIRS



In addition to Layher Allround Scaffolding, we offer Layher application technology, including technical consultation with qualified, trained contact partners. At your headquarters, at your building site, in your nearest Layher branch, or in the central technical office. Or highly experienced supervisors who help you to fully exploit the profitable possibilities of the Allround system.

One particular focus of the Allround Scaffolding is the construction of racks in shipyards and in the offshore sector. Enclosing the difficult shapes on and inside a ship, above and below deck, on and underneath offshore platforms, are no problem for the Allround Scaffolding, any more than the fast assembly and dismantling times that are required. For maintenance on drilling rigs, offshore or in the repair yard, the Allround Scaffolding is nowadays indispensable due to its versatility and adaptability.



OPTIMUM SCAFFOLDING FOR AIRCRAFT

SAFETY – RELIABILITY – ECONOMY

Safety and service are vital when it comes to aircraft. This not only applies to the flight itself, but also to maintenance and therefore to the maintenance equipment. Whether for mobile maintenance units or special structures, Layher Allround Scaffolding is the right choice wherever more reliability and safer work at exactly the right height is critical.

Flexibility due to

- variable working heights
- selectable bay lengths and widths
- perfect adjustment to the contours of the aircraft

Reliability and improved safety thanks to

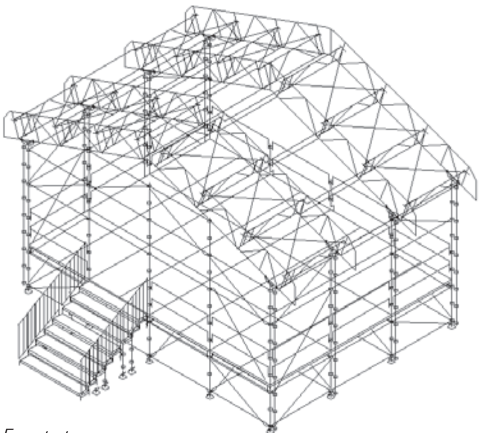
- bolt-free connection technology
- short assembly and dismantling times
- non-slip decks, comfortable stairs, suitable castor wheels and other components from a well-thought-out and mature system

STANDS. PODIUMS. EVENT STRUCTURES. FOR INDOORS AND OUTDOORS

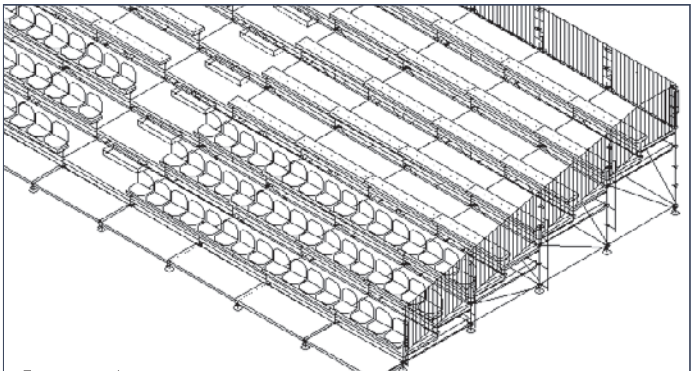
FOR EVERY OCCASION IN THE EVENTS SECTOR

Using the Layher Allround system, you can safely, inexpensively and quickly assemble mobile stands, podiums and event structures of widely varying types for indoors and outdoors, for any occasion, in variable sizes.

Matching roof structures are available as the Keder Roof XL, cassette roof or Allround FW System roof – in mono-pitch or double-pitch design, made from standard Layher material.



Event stage



Event stand

Layher is your dependable partner with more than 75 years of experience. "Made by Layher" always means "Made in Germany" too – and that goes for the entire product range. Superb quality – and all from one source.

Proximity to the customer is a central factor behind Layher's success – geographically speaking too. Wherever our customers need us, we will be there – with our advice, assistance and solutions.

- **SpeedyScaf**
- **Allround Scaffolding**
- **System-free Accessories**
- **Protective Systems**
- **Shoring**
- **Event Systems**
- **Rolling Towers**
- **Ladders**
- **Software**

Headquarters in Eibensbach

Plant 2 in Gueglingen

Layher®

More Possibilities. The Scaffolding System.

Wilhelm Layher GmbH & Co KG
Scaffolding Grandstands Ladders

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Edition 05.2022
Ref. No. 8116.207