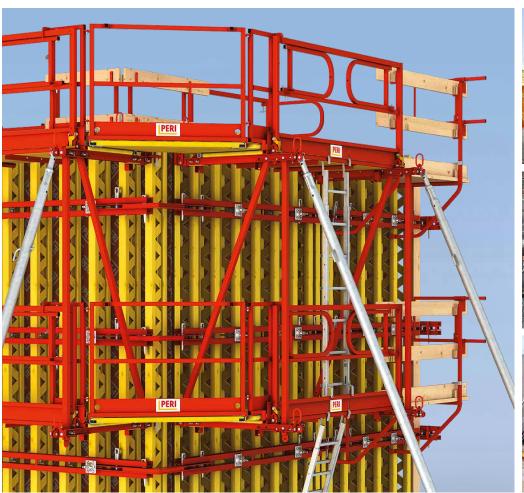


VARIO GT 24

The variable Girder Wall Formwork System with the proven Lattice Girder GT 24

Product Brochure – Issue 11/2017









PERI AG

Formwork Scaffolding Engineering

Rudolf-Diesel-Strasse 19 89264 Weissenhorn Germany Tel. +49 (0)7309.950-0 Fax +49 (0)7309.951-0 info@peri.com www.peri.com

Important Notes

All current safety regulations and guidelines must be observed in those countries where our products are used.

The photos shown in this brochure feature construction sites in progress. For this reason, safety and anchor details in particular cannot always be considered as conclusive or final. These are subject to the risk assessment carried out by the contractor.

In addition, computer graphics are used which are to be understood as system representations. For ensuring a better understanding, these and the detailed illustrations shown have been partially reduced to certain aspects. The safety installations which have possibly not been shown in these detailed descriptions must nevertheless be available.

The systems or items shown might not be available in every country.

Safety instructions and load specifications are to be strictly observed at all times. Separate structural calculations are required in case of changes and deviations.

The information contained herein is subject to technical changes in the interests of progress. Errors and typographical mistakes reserved.



Content

General

- 2 The variable girder wall formwork system
- 6 Complicated geometries with standard system components
- 8 The GT 24 lattice girder
- The standard system components of a VARIO GT 24 panel

Standard Applications

- 12 VARIO GT 24 standard panels
- 14 Continuously adjustable panel connections
- 16 Fillers, stopend formwork and panel width extension units
- 18 External corners, internal corners and shafts
- 20 Push-pull prop connector, crane lifting units
- 22 Working and Concreting Scaffold
- 24 Panel extensions

Special applications

- 26 Architectural concrete
- 30 Bridge construction
- 34 Water-retaining structures
- 38 Single-sided walls

General

The variable girder wall formwork system

VARIO GT 24 is the proven girder wall formwork system complete with the continuously adjustable elongated hole couplings.

Regardless whether it is industrial or residential construction, bridge abutments or retaining walls, every layout and any height up to 18 m can be formed with PERI VARIO.

The 30 cm increments of the GT 24 girder allow easy adjustment to suit the required height.

Pre-assembled, ready-to-use platforms provide site personnel with a very high level of safety, as well as large time savings particularly with multiple

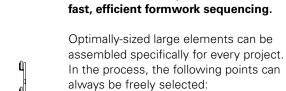








Extended VARIO GT 24 panels being used to shutter administration building.



The VARIO GT 24 girder wall formwork

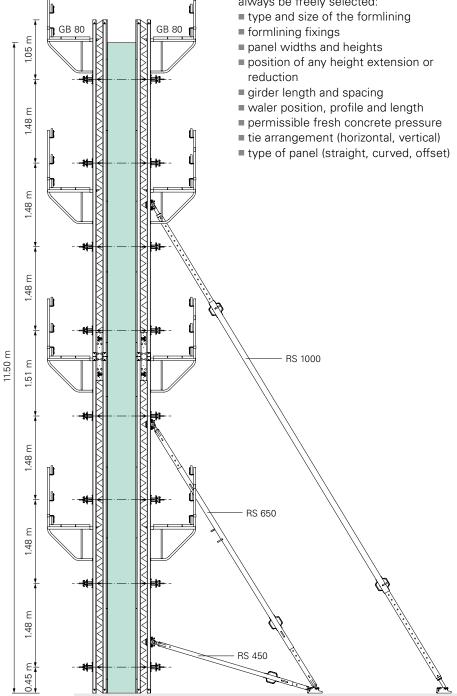
system offers many advantages. This

includes simple planning, minimum

on-site material requirements and



VARIO GT 24 being used to build a sewage treatment facility with tapered walls.



General

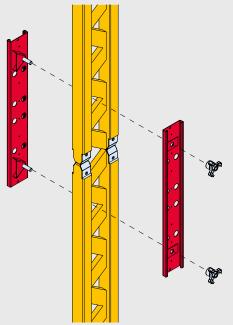
The variable girder wall formwork system



The formwork is extended with the VARIO Extension Splice 24.

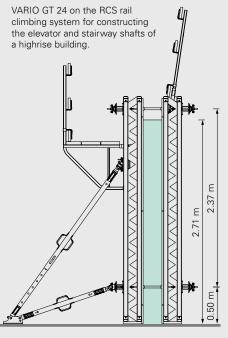
Quickly and easily fitted through the latticework of the GT 24, without having to drill girders.

The flexurall rigid connection automatically aligns the girders. The splice consists of just two components which are quickly connected using triple wingnuts.

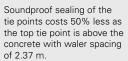


VARIO GT 24 formwork specially adapted to the requirements with defined formlining joint formation and tie point positioning.





VARIO panels, with concreting scaffold and push-pull props, are shifted as a complete unit.





General

Complicated geometries with standard system components

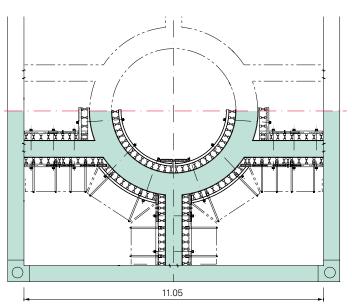




VARIO GT 24 being used to construct a circular tank. Timber wedges between girders and steel walers produce the circular shape.



Multi-storey building in Paris with VARIO GT 24 and CB 240 climbing formwork systems.



Even for this complicated layout, over 90% of the formwork consists of standard system components.

The stringent French safety standards for high-rise construction were taken into account during the formwork planning. They included fine wire mesh panels for all safety handrails, and end handrail swing frames for the outside climbing units, in order to maximise the protection against falling, even during climbing.

General

The GT 24 lattice girder

As the main component in slab and wall formwork, the formwork girder significantly determines the profitability of the formwork. Thereby, it is not the initial investment costs but the durability and handling costs which are the decisive factors.

Therefore, successful contractors use the GT 24 lattice girder from PERI:

- light and manageable for slabs
- strong for wall formwork
- cost-effective for customized formwork solutions



More information is available in the GT 24 brochure.

The GT 24 from PERI offers:

- long service life
- shorter forming times

Designed by timber specialists to ensure a long service life

The patented girder nodes with mini-finger joints has virtully no "water cavities" which could trap moisture. The latticework design ensures excellent air circulation even when the girders are stacked.





The GT 24 in comparison	VT 20	GT 24	Diff.%
Permissible reaction force	22 kN	28 kN*	+ 27%
Permissible bending moment	5 kNm	7 kNm*	+ 40%
Flexural stiffness	460 kNm²	887 kNm²	+ 86%
Weight	5.3 kg/m	5.9 kg/m	±0%

* When supported at the nodes.



High load-bearing capacity with low weight

Perm. Q on the compression struts $\begin{array}{lll} Q_{\text{D}} = & 14 \text{ kN} \\ \text{Perm. bending moment} & M = & 7 \text{ kNm} \\ I_{\text{U}} = 8.064 \text{ cm}^4 \end{array}$

Steel end caps with through-rivets

- Robust end protection
- Prevents end being sawn off accidentally
- Can be used to replace the rubbing board on VARIO panels if required

6 x 8 cm thick chord

For easy screwing and nailing. The girder chord is prevented from splitting as the full depth of the chord is finger-jointed to the struts and tied at each girder connection.

PERI Design Tables are available for slab and wall formwork operations. The girder is monitored according to the requirements of DIN EN 13377.



The GT 24 lattice girder – the girder that reduces your shuttering costs!

General

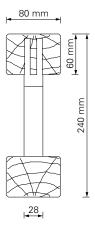
The standard system components of a VARIO GT 24 panel

The GT 24 formwork girder

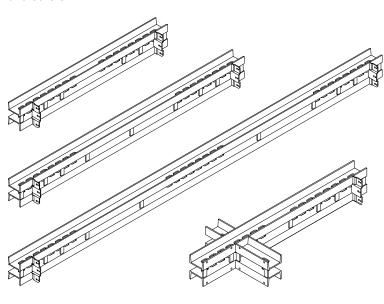
forms the main element of the VARIO GT 24 wall formwork. Available in lengths from 90 cm to 17.80 m, in 30 cm increments.



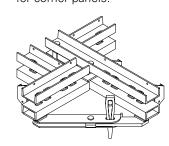
Cross-section

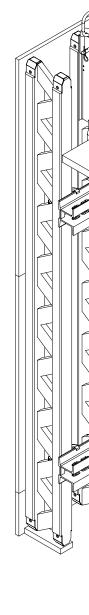


Available in standard lengths as well as any special sizes and forms. Profile cross-sections of the U 100 to U 140 and others.

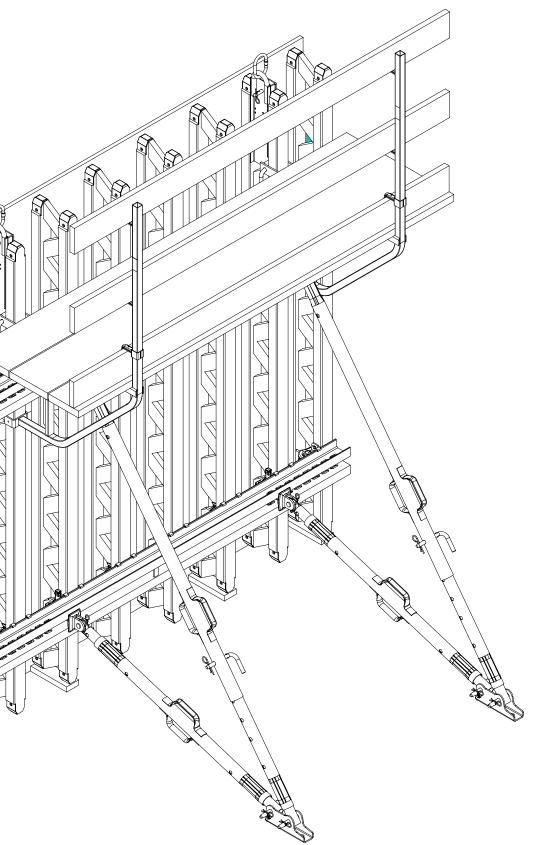


VARIO Steel Waler and Internal Corner Waler IRZ for corner panels.









Formlining

PERI formlining sheets come in a range of sizes, thicknesses and grades to ensure that the most appropriate formlining is available to meet individual site requirements.



Connecting components Hook Strap HB 24

for connecting the GT 24 to SRZ and SRU walers on the girder nodes.



Hook Strap Uni HBU

for connecting the GT 24 to SRZ and SRU walers outside of the girder nodes.



TSS Torx Screw

for assembling the formlining.



Standard Applications

VARIO GT 24 standard panels

VARIO GT 24 standard elements complete with platforms.

6.00 m

VARIO standard panels are pre-assembled rentable formwork panels which are fitted with 21 mm formlining.

The ready-to-use wall formwork is assembled using tried and tested VARIO system components. The panels are supplied complete with lifting eyes and rubbing board.

Permissible fresh concrete pressure:

60 kN/m² with tie spacings 55/140/55 or 50 kN/m² with tie spacings 62.5/125/62.5 according to DIN 18202, Table 3, Line 7.

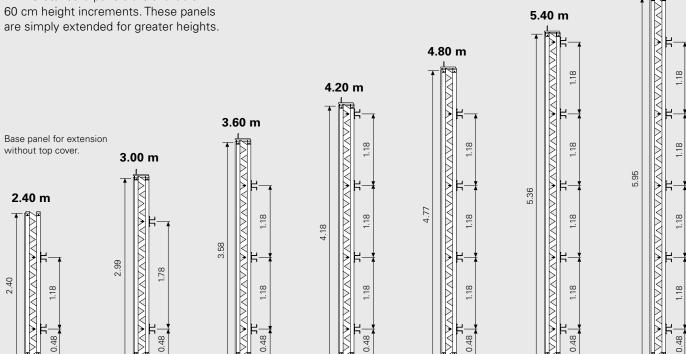
Integrated crane lifting unit as well as top cover board for protecting against concrete splashes.





Height increments

VARIO standard panels are available in

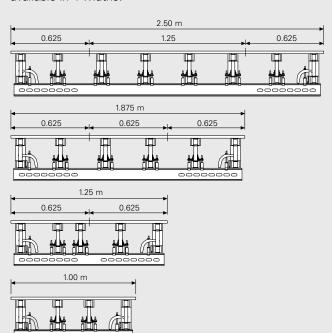


VARIO standard panels for 9 m high tunnel walls.



Width increments

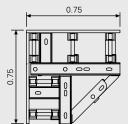
VARIO standard panels are available in 4 widths:



VARIO standard internal corners

The consistent leg length of 75 cm allows this design to be used as a left-hand or right-hand corner.





The VARIO standard internal corner is available in 5 heights: 2.40, 3.00, 3.60, 4.80 and 6.00 m.

Standard Applications

Continuously adjustable panel connections

The rows of slots in the PERI steel walers and couplings allow continuous tightening of panel joints of even roughly erected panels.

VARIO Coupling VKZ

With the VARIO coupling, the panels are simultaneously aligned.

The multi-functional VARIO coupling with the wedge:

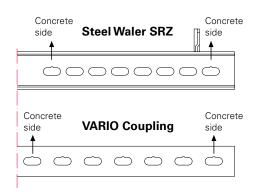
- continuously tightens until joint is grout-tight
- aligns panels
- supports plywood fillers
- extends the width of panels
- fixes stopend formwork
- stabilises internal corners
- is continuously adjustable on both sides

Important:

PERI steel walers and couplings have notches in the elongated holes. These must always point towards the concrete side. As a result, the tolerances are equal to zero and the panel joints are optimally aligned.

Standard joint

The continuous adjustment possibility ensures extremely tight panel joints.



Filler joint

Any gap up to 1.25 m wide can be filled.

PERION (Sp. 100) PERION (Sp. 100) PERION (Sp. 100)

Internal corner

The same VARIO coupling as for the straight joint.



Oblique joint

Any angle can be shuttered with the articulated coupling.



Practical tip

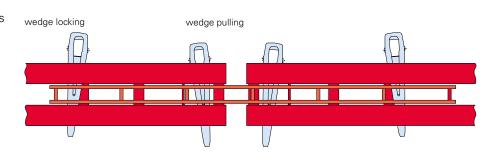
Whether a wedge is locking or pulling is evident from its inclination:

Wedge tip points to the element joint

= wedge pulls

Wedge tip points away from the element joint

= wedge pushes





Neat and precise panel joints are always specifically required where special architectural requirements are placed on the concrete surface.

VARIO Coupling Concrete Finish VKSWith the VARIO Coupling VKS and the
Alignment Clamp VRS, it is easy and
quick to carry out.

The Coupling VKS allows offsets up to 5 mm to be compensated. At the same time, the Coupling VKS can be used as a "standard panel connection".



Handling

- Centrally position the Coupling VKS on the element joint in the steel waler.
- The smaller side of the trapezoidalshaped cut-outs point to the plywood. (Fig. 1)
- Position the Wedges KZ in the same way as with coupling VKZ.
- With element offsets, mount Alignment Clamp VRS on Panel ① which is positioned more rear.
- Release pulling wedge on Panel ②.
- Use counter wedge to slightly open the formlining joint on Panel ②. (Fig. 2)
- Loosen pulling and counter wedges on Panel ①.
- Eliminate panel offset by tensioning the Alignment Clamp VRS.
- Release pulling wedge on Panel ②.
- Tightly close joint on Panel ② with counter wedge.
- Counter with pulling wedge on Panel ②. (Fig. 3)

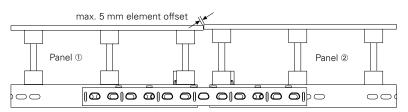
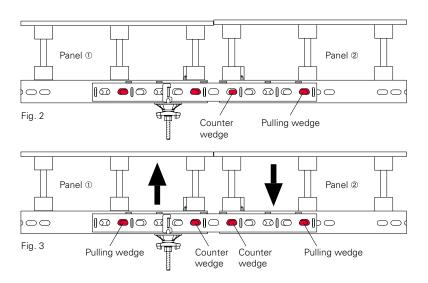


Fig. 1

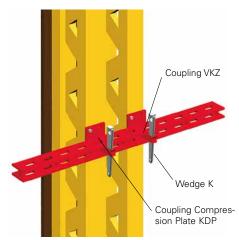


Standard Applications

Fillers, stopend formwork and panel width extensions units

Infill areas

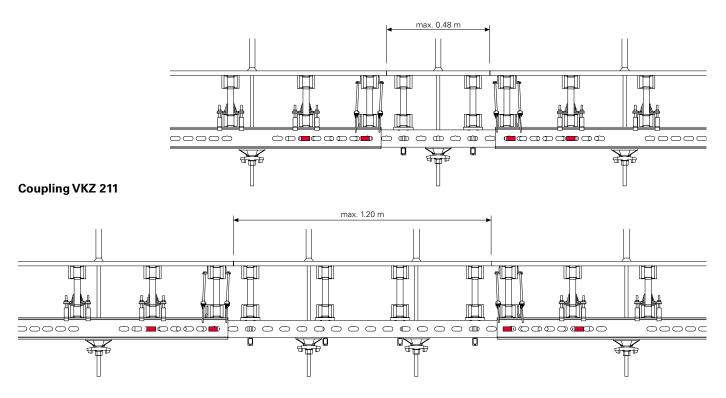
VARIO GT 24 infill areas are shuttered using the Couplings VKZ 147 and VKZ 211.





Continuous infill area width with Couplings VKZ.

Coupling VKZ 147



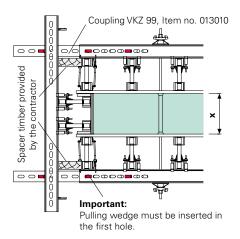


Stopend Formwork

VARIO offers 2 possibilities for realising stopend formwork: either the Coupling VKZ or Bulkhead Tie is used.

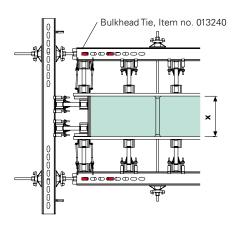
Coupling VKZ

perm. tension force 50 kN.



Bulkhead Tie

perm. tension force 30 kN.





Complete stopend formwork with bulkhead tie.

Panel width extensions



Panel width extensions are also realised using VARIO with system components.

Standard Applications

External corners, internal corners and shafts

Depending on the application, external and internal corners can be formed in various alternative ways.

- With VARIO Corner Panels
- With Cross Walers & Shaft Corners
- With Special Walers

VARIO Corner Panel

With this solution, especially for thin walls and low utilisation, the fillers consist of standard components.

External:

Panel w = 2.50 m1 panel with extension.

Internal:

Corner Panel w = 1.25 / 0.50 m and Panel w = 1.25 m with filler element.



Internal Corner

VARIO Internal Corner with filler element.



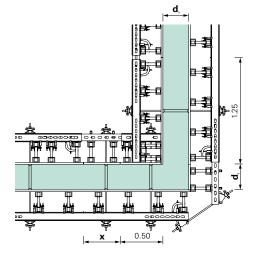
External Corner

Ensure that it is tightened when the correct angle is achieved. The continuous adjustment possibility facilitates this process.



The waler on the panel width extension unit must project 2 cm to enable firm pre-tensioning of the corner.

Details of the VARIO Corner





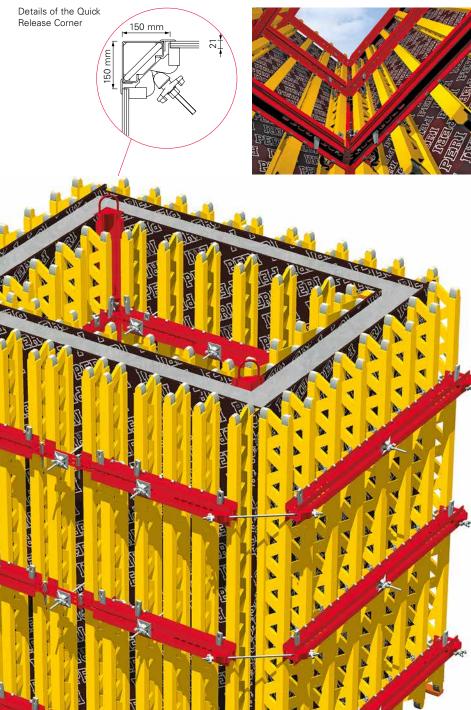
Shafts

In particular, small shafts can be realised extremely cost-effectively with customised Cross Walers and the quick-release Shaft Corner SSE.

Practical tip

Small lift shaft with Cross Walers and Quick Release Corner SSE.

The shaft corner should be stripped at the very latest one day after concreting.



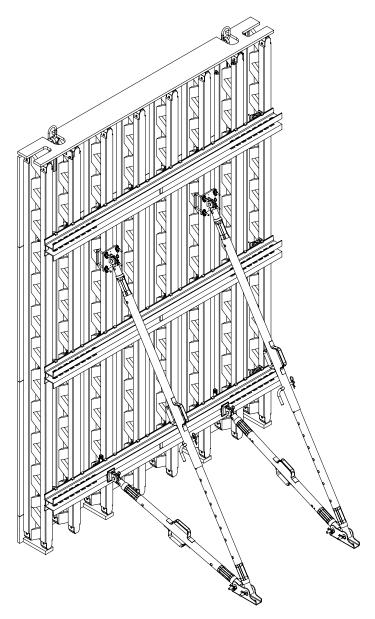
Standard Applications

Push-pull prop connector, crane lifting units

Push-Pull Prop Connector

Connecting the push-props and kickers to the VARIO panel is carried out using the Girder Headpiece or Wedge Headpiece. Fixing to the slab takes place using Base Plates and PERI Anchor Bolts14/20 x 130.

The first panel must always be secured with 2 push-pull props.





Connecting to the GT 24 girder by means of the Girder Headpiece, Item no. 028050.



Connecting to Steel Waler SRZ with the Wedge Headpiece, Item no. 028060 and Wedge K, Item no. 024250.



Crane Lifting Unit

PERI VARIO offers three possibilities for lifting panels with the crane.

1. The Crane Splice 24

as easily assembled and dismantled lifting unit.

- **2. The Crane Lifting Eye 24, right / left** as permanently mounted lifting unit.
- **3. The Crane Lifting Unit 2 t / GT 24** for very heavy formwork units.

Important:

In general, two crane lifting units are used per moving unit. The Instructions for Use contain important information and must be followed at all times.

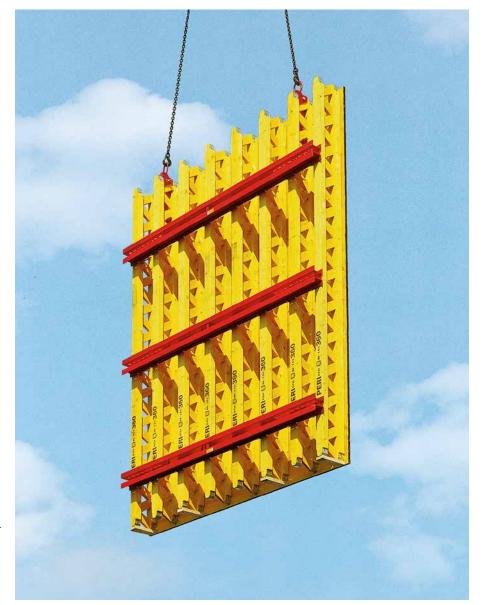


Instructions for Use for the Crane Splice 24.

Customized, ready-to-use VARIO GT 24 element.



Instructions for Use for the Crane Lifting Unit 2t/GT 24.





Crane Splice 24

Permissible load-bearing capacity 700 kg with a crane sling angle of max. 15°.



Crane Lifting Eye 24, right/left

Permissible load-bearing capacity 700 kg with a crane sling angle of max. 15°.

Standard Applications

Working and Concreting Scaffold

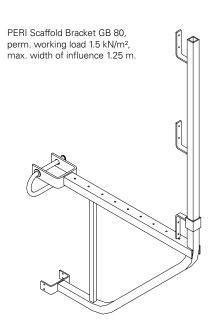
Scaffold Bracket GB 80

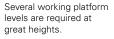
The Scaffold Bracket GB 80 is used for the assembly of an 80 cm wide working scaffold. Scaffold components supplied by the contractor must comply with local valid safety regulations (for Germany DIN 4420). Timber components must conform at least to S10 or MS10 classification according to DIN 4074 as well as being clearly marked (BGR 169). Cross-section of guardrail boards: 3 cm x 15 cm.

Secure planking and guardrails with nails or screws.

A correctly assembled concreting platform complete with PERI End Guardrail Frame 55, Item no. 065066.

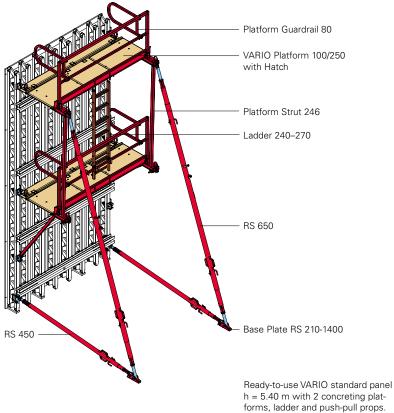






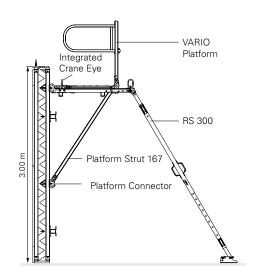






VARIO Platform System

Pre-assembled concreting/working platforms in different widths.
Complete with guardrails, end handrail frame, push-pull prop connections and crane eye. With or without access hatch.



Standard Applications

Panel extensions

Heights up to 8.00 m

The standard method of extension is to use the VARIO Extension Splice 24.

The flexurally stiff connection also automatically aligns the panels. The splice consists of only two components and is connected in no time with two quick action wingnuts.

Static values for the Extension Splice 24

 $M_{perm.} = 1.73 \text{ kNm}$

 $Q_{perm.} = 0 \text{ kN}$

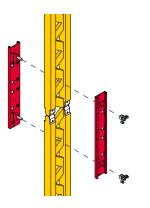
or

 $\begin{array}{ll} M_{\text{perm.}} & = 0 \text{ kNm} \\ O_{\text{perm.}} & = 5 \text{ kN} \end{array}$

60 cm high timber extension simply realised with the Extension Splice 24.

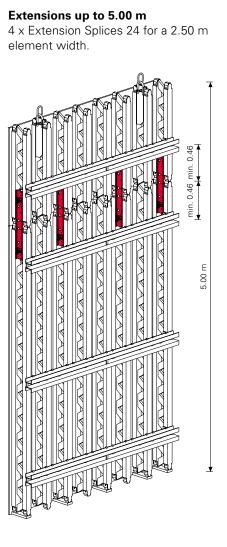


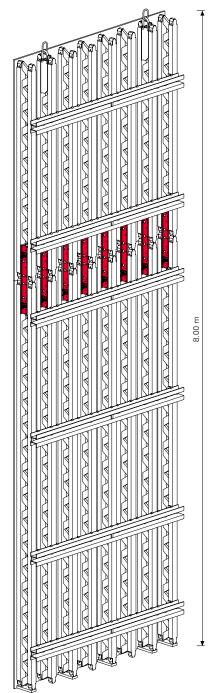
Assembly of the Extension Splice 24 takes place through the lattice work of the GT 24 without having to drill the girders.



Extensions up to 8.00 m

8 x Extension Splices 24 for a 2.50 m element width.



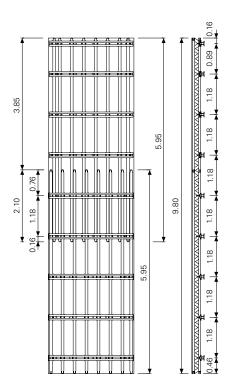


11.00 m high bridge abutment with butted girders and additional overlapping girders for stiffening.



Heights up to 9.80 m

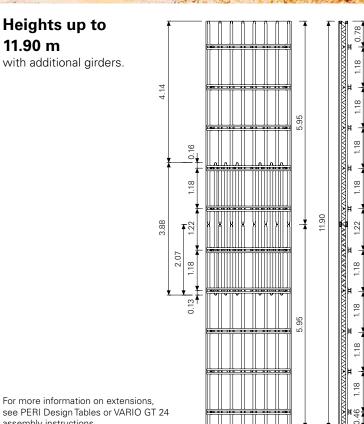
with overlapping girders.



Heights up to 11.90 m

assembly instructions.

with additional girders.



Special Applications

Architectural concrete | Perfect concrete surfaces with VARIO

Achieving a first-class architectural concrete finish is primarily a question of selecting the most suitable formwork and formlining. Other factors such as the accuracy of the formwork assembly, shuttering work, concrete release agent, concrete and its placing all significantly influence the result. Through the free choice of girder lengths and spacings, tie positions and formlining, the VARIO GT 24 girder wall formwork offers the highest possible degree of flexibility for the realisation of architectural concrete structures.





Attractive looking concrete finish with rough vertical board finish.

43.50 m high tower with architectural concrete with a board finish for an industrial plant.



Exemplary fairfaced concrete with rough horizontal board finish.



Church steeple in Feldmoching near Munich. VARIO GT 24 on KGF 240 climbing formwork.

Consecretion Hall, Neubiberg, Germany. VARIO with an orderly tie pattern. Formlining screwed on from the rear.



Special Applications

Architectural concrete | Perfect concrete surfaces with VARIO

Due to the freely configurable waler and tie spacings, numerous possibilities for realising neat joint and tie arrangements can be executed.



An orderly pattern of ties spaced at 0.75 x 1.18 m and smooth, architectural concrete are the result (Secondary School in Kletow).

2.50 x 3.60 m panel

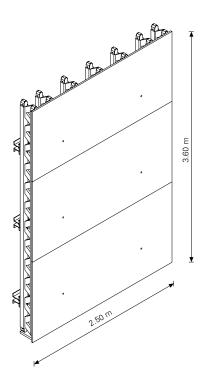
with tie spacings of $1.25 \times 1.18 \text{ m}$. 2 ties horizontally, 3 ties vertically.

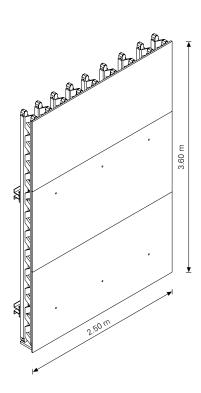
2.50 x 3.60 m panel

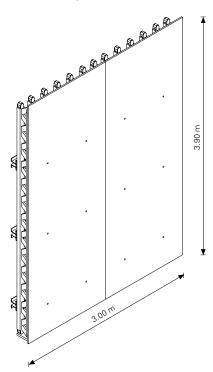
with tie spacings of $0.88 \times 1.78 \text{ m}$. 3 ties horizontally, 2 ties vertically.

3.00 x 3.90 m panel

Architectural concrete with an orderly pattern of joints and tie spacings of 0.75×1.18 m. 4 ties horizontally, 3 ties vertically.





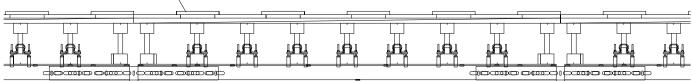


The rough surface finish ensures that the massive tunnel portals blend into the volcanic rock landscape. The unusual washboard structure was created by using extra battens on the formlining.

> Portal of a tunnel structure on Hawaii, shuttered with VARIO GT 24 on KGF 240 climbing scaffold.

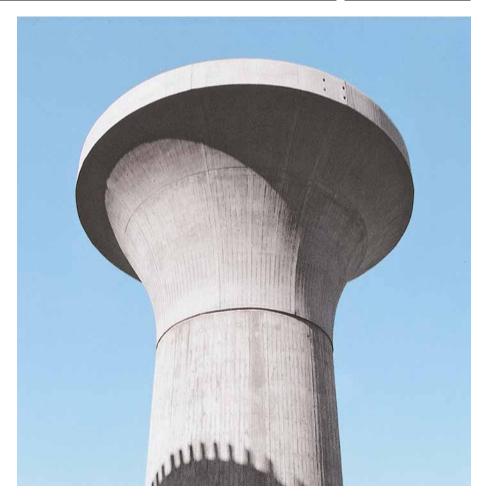


Forming boards provided by the contractor



High-quality architectural concrete with vertical board finish.

The panels were pre-assembled at PERI's Weissenhorn factory.



The BAB 4 motorway bridge over the Triebischbach valley was constructed with 49 m high circular piers featuring trumpet-shaped pier heads.

Special Applications

Bridge construction | VARIO on climbing scaffold and working platforms

Further information: Climbing Scaffold CB product brochure.

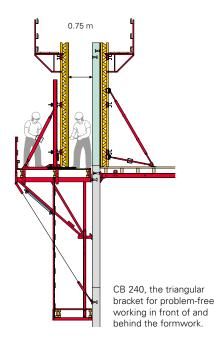
Type-tested safety with KGF 240, KG 180 and CB 240, CB 160 systems.

The KGF 240 and CB 240 carriages allow the formwork to be moved 0.75 m on the platform without a crane. The formwork is moved together with the scaffold vertically in one crane lift. This saves time.

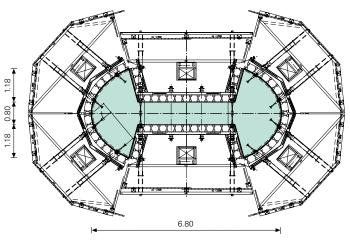
The KGF 240 and CB 240 provide a high level of safety due to the obstruction-free surface of the platform. The brackets are positioned below the platform which means there are no tripping hazards.

The platform lining can be pre-assembled and can be used immediately when moving from one site to the next. This results in considerable assembly time savings.





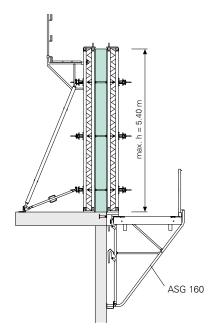


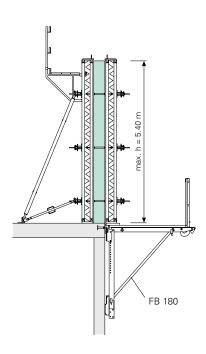


Motorway viaduct in France. Sophisticated pier geometry with an extraordinary concrete finish. Formed with VARIO GT 24 and SKS climbing brackets.

On ASG 160









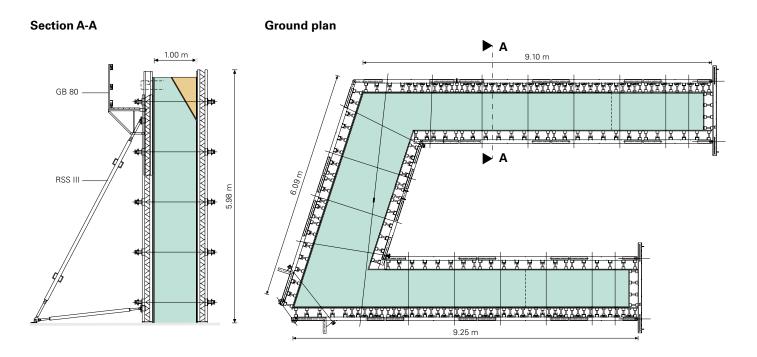
Further information: Folding Platform FB 180 product brochure.

Special Applications

Bridge construction | Abutments and piers

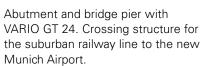


Bridge over the Danube, BAB 8 motorway near Leipheim.



Bridge over the Danube, BAB 8 motorway near Leipheim.



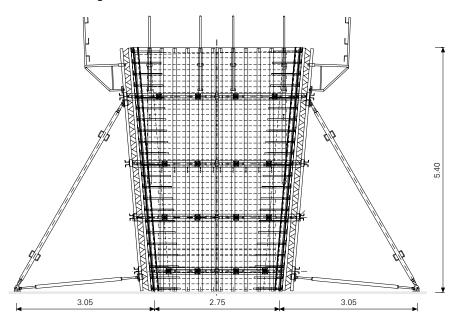




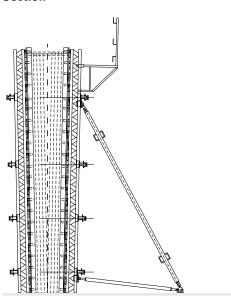
Sides of hollow piers on the banks of the river, climbed with VARIO GT 24 on PERI KG 240 climbing scaffold. Adapting to the arch-shaped ends was achieved with VARIO standard components and forming boards.

Example of a bridge pier tapered towards the top.

View of the longitudinal side



Section



Special Applications

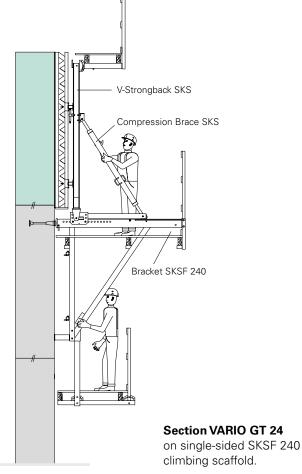
Water-retaining structures

Single-sided forming without formwork ties

When constructing locks, dams, cooling towers and walls requiring single-sided shuttering, VARIO GT 24 is frequently used with KG and CB, or SKS, climbing scaffold systems.



Magdeburg Waterway Intersection. The intersection for three transort routes: rail – road – waterway. As part of this major transportation project, a number of key structures had to be realised. The photo shows the Rothensee lock facility. It was formed with VARIO GT 24 on KG climbing scaffold and single-sided SKS climbing scaffold.

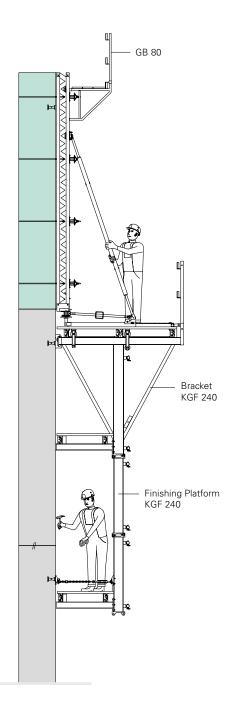


Front of the weir pier. VARIO in combination with GRV circular formwork system on KGF 240 climbing scaffold.

VARIO GT 24 – tied formwork

Section VARIO GT 24,

tied girder wall formwork on KGF 240 climbing scaffold.







Power station on the River Isar near the town of Plattling-Pielwachs. Pier formwork with VARIO GT 24 in combination with GRV circular formwork. The concrete surface was realised in the form of architectural concrete with a vertical board finish. PERI VARIO GT 24's versatility and easy adaptability makes it a particularly cost-effective shuttering system in this area.

Rear side of the weir pier. The VARIO GT 24 could be easily adapted to suit the inclined rear wall requirements.

Special Applications

Water-retaining structures | Circular structures with VARIO

VARIO GT 24 – for shuttering circular structures

The VARIO articulated couplings connect the straight steel walers in a polygonal arrangement. It can be moved continuously to the right or to the left via the wedges. This results in a flush and neat panel joint.

In general, two design versions is standard.

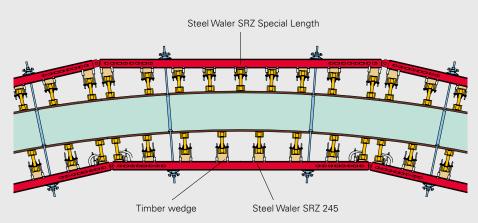


Silo, h = 72 m, \emptyset = 20 m for power station in Oppeln, Poland. Shuttered with circular VARIO girder formwork on KGF climbing scaffold.



More information on PERI circular formwork: RUNDFLEX and GRV product brochures.







Version 1Spacer timber inserted between
GT 24 girders and SRZ steel walers.

The haunched transition to the ground slab was preassembled with the VARIO wall formwork panels to form a single unit for lifting.



Version 2Segment profile timbers between the formlining and girders.



 $7.50~\mathrm{m}$ hight circular formwork with segment profile timbers on the GT 24 girders.

Special Applications

Single-sided walls | With VARIO and Brace Frame SB

For concreting against rock faces, existing walls or sheet piling, VARIO GT 24 with SB Brace Frames is used.

PERI brace frames

allow single-sided concreting up to a max. height of 8.75 m (see PERI Design Tables).

PERI Brace Frames SB-A0, A, B, C are sized for loading on a lorry or in a container.

PERI brace frames

can be connected to all PERI wall formwork systems with standard system components.



Max. concreting height of 8.75 m, Brace Frame SB-A0, A, B and C with VARIO GT 24 wall formwork.

The PERIV-Tie Holder

For easy and accurate installation of anchors when using brace frames.

The V-Tie Holder and the Leading Anchor Coupler allow accurate assembly of the Tension Anchor under 45°.



Anchor system is easily fixed to the reinforcement with wire and pliers.

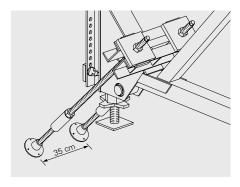
The advantages of the anchoring system with the Leading Anchor Coupler and V-Tie Holder are:

- less on-site material requirements
- no need to cut the tie rods to size
- tie rods are recoverable



The Leading Anchor Coupler is removed using the Single-Ended Spanner SW 70.

The tension forces arising at the brace frame's anchor point determine the choice of anchor system.



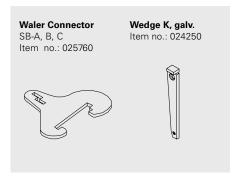
Example: DW 20 anchor system Perm. tension force according to DIN 18216 2 x 150 kN = 300 kN.



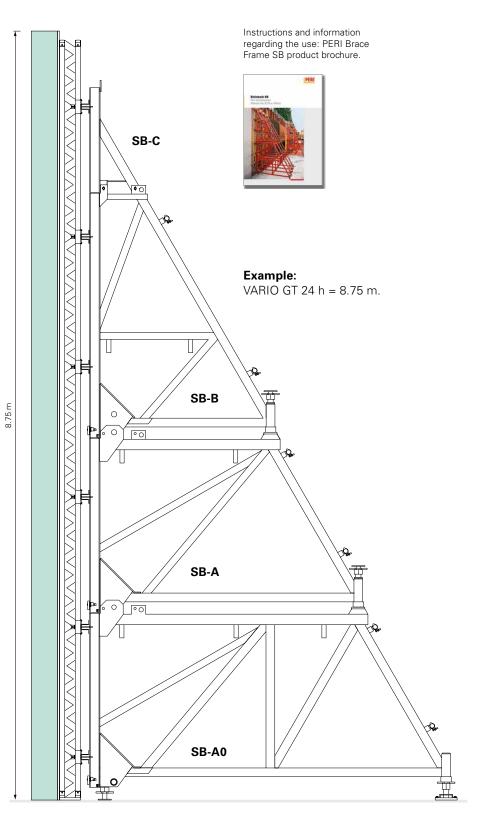
When using PERI brace frames, the following must be taken into consideration:

- 1. The structural members (e.g. foundations or ground slabs) must be able to carry the tension and compression forces arising. Check the design of the members and position of the anchors when planning.
- 2. The "other side" of the single-sided formwork (existing walls, planking, rocks etc.) must obviously be able to withstand the fresh concrete pressure acting upon it.
- 3. DW tie rods installed for anchoring purposes must not be welded or bent. We recommend the use of PERI V-Tie Holders.

The following connecting parts are required for connecting VARIO GT 24 to Brace Frames SB-A0, A, B and C:







Notices

PERI

The optimal System for every Project and every Requirement



Wall Formwork



Column Formwork



Slab Formwork



Climbing Systems



Bridge Formwork



Tunnel Formwork



Shoring Systems



Construction Scaffold



Facade Scaffold



Industrial Scaffold



Access



Protection Scaffold



Safety Systems



System-Independent Accessories



Services



PERI AG

PERI AG
Formwork Scaffolding Engineering
Rudolf-Diesel-Strasse 19
89264 Weissenhorn
Germany
Tel. +49 (0)7309.950-0
Fax +49 (0)7309.951-0
info@peri.com
www.peri.com







