VARIOKIT Engineering Construction Kit
System solutions for bridge, tunnel and civil engineering construction
Important Notes:

Without exception, all current safety regulations must be observed in those countries where our products are used.

The illustrations in this brochure are photographs of real site situations. Safety or formwork anchor details are therefore not to be taken as a definitive guide to the way the equipment is to be used.

Safety instructions and load specifications are to be strictly observed at all times. Separate structural calculations are required for any deviations from the standard design data.

The information contained herein is subject to technical changes in the interests of progress. Errors and typographical mistakes reserved.
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PERI VARIOKIT, the engineering construction kit with rentable, standardised components.

With standardised, rentable PERI system components and construction-compliant connecting means, supporting structures can be cost-effectively erected and adapted geometrically to the respective structure.

High degree of versatility in the applications:

Bridges
- Mobile falsework
- Balanced cantilever traveller + arch cantilever carriage
- Steel composite carriage
- Cantilever bracket
- Parapets
  - Cantilevered parapet carriage
  - Cantilevered parapet track
  - Cantilevered parapet bracket

Tunnels
- Cut-and-cover method
  - Semi-monolithic
  - Separate casting method
- Mined construction method
  - Semi-monolithic
  - Separate casting method

Civil engineering
- General building construction
- Heavy-duty shoring
- Climbing technology

Flexible
Versatile core components with standard connections using bolts.

Load-optimised
Cost-effective use of materials through the static utilisation of the components with project-related adaptations.

Rentable
Economical solutions through the use of standard components taken from the PERI product range.
VARIOKIT for tunnel construction
Project-related designed tunnel formwork carriage consisting of standardised VARIOKIT components. Optionally available additional components such as drive mechanisms and hydraulic equipment for shuttering and striking increase the efficiency.

VARIOKIT for bridge construction
Flexible and cost-effective VARIOKIT formwork carriage solutions for bridge superstructures as well as construction of parapets, perfectly adapted to suit individual jobsite requirements.

VARIOKIT for civil engineering
The clearly defined permissible loads of the standardised components are suitable for all truss applications. Being able to rent the components along with the assembly advantages make VARIOKIT particularly cost-effective with short utilisation times.

Project type
Cut-and-cover, separate casting method
Project
Bypass Tunnel, Tuttlingen, Germany

Project type
Arched cantilever construction and mobile falsework
Project
Opatno Motorway Bridge, Czech Republic

Project type
General building construction
Project
Avala TV Tower, Belgrade, Serbia
Engineering services and materials from one source

The engineering services
PERI not only supplies the required materials. Experienced engineers develop customised formwork solutions. They combine load optimisation, flexibility and functionality for a very wide range of construction site requirements.

Included in the PERI comprehensive solution is all technical documentation such as static calculations, assembly drawings and instructions for use as well as assembly support and continuous support throughout the project.

The materials
VARIOKIT consists mainly of rentable standard components which remain unchanged but nevertheless are highly versatile in their use.

This results in the following benefits:
- small proportion of purchased parts.
- optimal adjustment to project requirements.
- as rentable system equipment at short notice from the rental park.

The three core components:
- Steel Waler SRU
- Climbing Rail RCS
- Heavy-Duty Spindle SLS

The planning of a tunnel with presentation of the moment curves in the system axes (left) as well as the cross-section (right).
Each piece of formwork carries area loads (concrete pressure) via linear loads (waler loads) or individual loads (anchor or prop loads).

Classifying components in load groups allows load-optimized construction of the supporting formwork to take place over several steps.

**Individual components and connections**

Different components such as the Climbing Rail RCS and Heavy-Duty Spindle SLS, as well as the standard ø 21 und ø 26 bolt connections and their use, are type tested.

**Other publications are available on tunnel and bridge construction.**

**PERI specialist literature**

- Tunnel Formwork
- Bridge Formwork

**Loads from fresh concrete**

- approx. 10 kN
- approx. 30 kN
- approx. 70 kN
- approx. 140 kN
- approx. 200 kN

Perfect adjustment to the structure and load-optimized system solutions for cost-effective supporting formwork.
In cross-project situations, components are used again and again which are standardized. Components which have a mutual function are put together in groups. For example, the assembly group featuring the Heavy Duty Roller, Concrete Pump Connector or components for lifting, lowering or moving.

Fundamental details such as the scaffold tube connector as side protection is taken into consideration just as much as technical working requirements (e.g. Concrete Pump Connector). Also optimal additional components such as the drive mechanism, electrical or hydraulic components are part of the wide range of possibilities provided by the PERI VARIOKIT.

As an option, the tunnel formwork carriage can be equipped with the hydraulic lifting and lowering unit. In addition, the unit allows easy adjustment of the formwork to suit the particular gradient.

RCS climbing rail with hydraulic climbing device.

Simple and effective, the scaffold tube connector on the guardrail post for optimal working safety.

The PERI BPA concrete pump connector is compatible to the TRIO, MAXIMO and VARIO GT 24 wall formwork systems.

If required, the electric drive can be used for moving purposes. It can be retro-fitted on the wheel.
For the complete construction kit, there are only a few type connections with particular advantages:

- Very few different connecting parts, e.g. fitting pins and cotter pins.
- Standardized connection loads according to type of connection.
- Simple and easy on-site assembly.

With the RCS 97 climbing rail connector, RCS climbing rails can be extended without any loss of load-bearing capacity. In addition, SLS heavy-duty spindles can be attached.

SLS heavy-duty spindles are mounted to the RCS climbing rails by means of SLS/RCS spindle adapters.

The RCS scaffold tube adapter Ø 48 connects scaffold tubes Ø 48 with the load-carrying system.

For using the RCS climbing rail as waling for wall formwork, the GT 24 is mounted with the Hook Strap Uni HBU 24-26 U 200.

Frame structures and brackets are constructed with the Climbing Rail Angle Connector RCS. Connecting the SLS heavy-duty spindles or tie yoke is also easily carried out.

The RCS/SRU angle connector can be installed both as an articulated as well as rigid connection.
VARIOKIT for tunnel construction
Cut-and-cover, semi-monolithic construction method

Tunnel formwork carriages are always project-related solutions. VARIOKIT provides an answer with standardized system components.

The advantages of the PERI VARIOKIT formwork carriage:
- Few anchors required in wall areas due to system walers up to UU 200.
- Simple modifications for different cross-sections.
- Optionally available hydraulic support for shuttering and striking as well as lifting and lowering.
- Self-propelled or mobile solutions for moving complete units.

All components can be optimally adapted:
- The HD 200 heavy-duty props allow continuous height adjustment and gridless assembly versions.
- The RCS slab beam can be flexibly adapted.
- The VARIOKIT diagonal strut is continuously usable from 4.0 to 9.0 m.
Circular cross-sections are also just as possible as separate individual formwork carriages for walls and slabs.

The modular PERI VARIOKIT system for a wide range of practical solutions.

The combination of proven systems such as VARIO GT 24 and HD 200 with new elements from RCS or the diagonal strut, results in a cost-effective formwork carriage.
The separate casting method is the simplest variant for the construction of tunnels using the cut-and-cover modus operandi.

Here, the advantages of the VARIOKIT construction kit really come into their own. Through the possibility of being able to rent the system, a mobile transporting unit pays off also if only a few cycles are required. Economical formwork solutions as well as tunnel cross-sections with variable dimensions are the standard applications of the separate casting method. All PERI wal and slab formwork systems can be used here. Mobile solutions are normally realised with VARIOKIT components.

- **Technical processing**
  Well-engineered technical planning allows cost-effective and efficient solutions which are precisely tailored to meet the requirements of the construction site. Regardless whether it is access portals for trucks or single-sided wall formwork with overhead support, such solutions are problem-free with VARIOKIT.

- **Wall formwork**
  The wall formwork is comprised of components such as waling, girders, accessories and anchoring systems which are available in the PERI VARIOKIT standard programme. At the same time, it offers considerable design possibilities and can also be constructed to handle high concrete pressures. This allows fast concreting with high form stability.

- **Minimum of anchors**
  The number of anchors can be clearly reduced through the use of the DW 20 and 26 tie systems which results in a substantial cost benefit.

- **Slab formwork**
  A project-related slab formwork carriage usually consists of one VARIOKIT load-carrying system and the formwork level. VARIO GT 24 girder wall formwork is frequently used for the formwork level.
HD 200 heavy-duty props installed in the trailing slab formwork carriage accommodate the loads of this road tunnel constructed using the separate casting method.

Clearly visible are the 2 separate concreting cycles, the wall on the left and the slab on the right. Both sets of formworks are designed as mobile units.
As a general rule, a formwork carriage for mining tunnels must fulfill very high requirements regarding wet concrete pressure and dimensional accuracy.

With shorter tunnels (up to approx. 40 sections) as well as for widened areas etc., formwork carriages which have been assembled using rentable system components are used.

It is particularly with the use of these standard components that the advantages are clearly demonstrated through the short operating times or very few sections. Rentable components also for high loads, hydraulic control element and electric drive units, make the standard carriage very easy to use. In addition, the time required for assembly and dismantling as well as moving are about the same with both versions.

Technically demanding solutions and easy handling are not mutually exclusive. As a result, constructions can be realized with VARIOKIT which optimally fulfill the boundary conditions of the construction site.

For mining tunnels, access portals are an important prerequisite for the use.

The PERI UP scaffold system offers all possibilities - from a simple stair tower through to a complete sealing carriage.
Optional VARIOKIT accessories such as hydraulic winches, electric drive units, lifting and lowering units and hydraulic cylinders for operating the wall and slab formwork elements are available in the VARIOKIT construction kit and, if necessary, are planned according to project requirements.

High permissible concrete pressure
A mining tunnel formwork carriage safely accommodate wet concrete pressures of up to 120 kN/m².

This tunnel formwork carriage can fold itself to suit the passage dimension of the standard cross-section, move laterally along the correct axis (with the help of the lifting and lowering unit) and subsequently move forward. After this, it is moved sideways again and brought into the concreting position.
VARIOKIT for tunnel construction
Mining, separate casting method

The extremely high loads carried by a tunnel formwork carriage during mining operations present a special challenge for PERI VARIOKIT.

In order to effectively manage the forces and, at the same time, provide construction site traffic an access portal, the VARIOKIT with anchoring components combination is supplemented with the SB brace frame system. For smaller tunnel lengths (< 40 cycles) with short section lengths (< 20 m) and tight construction schedules (< 12 months), solutions using rentable parts are considerably more cost-effective than complete project solutions with special steel components.

For tunnels constructed using mining techniques, the formwork is always designed whilst considering ancillary conditions which are, in part, not compatible:

- Large loads resulting from the fresh concrete pressure and dead weight.
- Low individual weights due to tight space conditions during assembly and operations.
- Minimum of material costs from high proportion of rental parts and small quantities.
- Few operating elements and optimally adapted to suit construction progress.
- Simple operation of large units.

Best concrete results from the 2nd cycle (wall area) form the exit for the arched formwork carriage.

The experience gained from brace frame anchoring can also be used in the 2nd cycle.

System components for the carriage and the movable formwork suspension allow flexible utilization.

The first section with the bottom slab and starter has already been concreted.
The formwork carriage for the 3rd cycle (arched section) also corresponds to project requirements.

Through the possibility of installing only those parts in the component levels which are required in each case for transferring in part large forces, load optimization can be achieved.

The transportation carriage from the RCS system moves the formwork and support unit to the next cycle.
The VARIOKIT parapet track is used for the construction and refurbishment of parapets at the edge of bridges and between the superstructures.

Their main components are:
- multifunctional rails
- roller unit
- anchoring

The interaction of these 3 parts leads to the fact that load cases such as moving, vertical and horizontal concrete loads and the dead weight are likewise transferred like loads from working operations and wind without any additional fixings to the superstructure. Through the anchoring to the underside of the bridge and the low structural height, the parapet to be formed is freely accessible. Working operations can be carried out on and under the bridge during moving traffic.

Through the flexible adaptation of the parapet track, outer and middle parapets can be realised without any problems.

Free access from the top side of the bridge without disruptions through the overhead load-carrying construction.
GS-certified safety for the GKB work cage.

The geometry of the suspension anchor allows fast lateral and perpendicular self-adjustments of the roller unit.

The track units roll self-centering over the roller units and rails along the bridge gradient.

Optimal and flexible adjustment to the bridge geometry for the construction of the middle parapet.

Assembly on the bridge superstructure takes place with the GKB work cage while the assembly fitter is secured by means of personal protective equipment against falling.

Safe access possibilities to the platforms are provided via the leading and finishing platforms.

Striking procedure
The parapet track is moved as a complete unit. The rollers to be freed up are dismantled from the finishing platform and re-mounted in the moving direction at the front from the leading platform. In accordance with the size of the parapet, anchor spacings of 100, 125 and 150 cm can be realised by combining the 100 and 150 cm rail lengths. This leads to optimal utilisation of the formwork carriage and a reduction in the number of anchor points.

Cross-section
Safety during concreting and operations is guaranteed at all times through separate concreting and working platforms.

Concreting platform
Working platform
For meeting the requirements of modern bridge construction, the PERI parapet carriage provides an economical and efficient solution. Thanks to the VARIOKIT construction kit, it can be optimally adapted to the construction site requirements.

The advantages of the VARIOKIT parapet carriage:
- Less deformations under load.
- Variable spacings between the individual sections.

Moving the formwork carriage is carried out cost-effectively and according to project requirements by means of steel profiles. As a rule, no anchorage is required for the structure and the horizontal force is transferred with friction.

The few different components actually required can be clearly seen here:
- Steel Walers SRU
- Climbing Rails RCS
- Heavy-Duty Spindles SLS
- Accessories such as scaffold tubes and couplers
All required adjustment work takes place from the working platform. At the same time, there is an option of using a second working platform.

The different versions can be adapted to the structure and allow:
- keeping the clearance profile free
- construction of special geometries
- working areas for inspection work on the structure’s web.

Projects with special requirements such as this bridge show the high degree of variability of the PERI VARIOKIT parapet carriage. Here, 5.00 m had to be spanned without support on the pedestrian and cycle lanes.

Short cantilever overhangs, interruptions through transversal steel girders in the area of the cantilever and limited clearance profiles are the decision criteria for the PERI VARIOKIT parapet carriage.
The lightweight PERI parapet bracket can be installed by hand and rounds off the range of parapet solutions. For the new construction of short bridge superstructures as well as refurbishment, the parapet bracket is a rational and economical solution. Special attention during the development was focused on the weight reduction of individual components. The heaviest part weighs only 18 kg and thus allows assembly by hand.

Apart from the weight reduction, particular importance was placed on completely separating the formwork support from the platform. Due to this separation, closed through to watertight enclosures can be realised. Adjusting to the parapet geometry and operations safely takes place from the closed platform.

For the construction crew this means:
After the initial assembly, access by means of an elevating work platform or scaffolding is not necessary.

Due to separating the formwork support and platform, re-installation of the platform after the demolition work for concreting is not required. The formwork support is simply positioned on the platform.
The mounting shoe of the bracket allows 2 versions of anchoring:
- New bridge construction with the high load-bearing and proven PERI Anchor Sleeve M24
- Bridge refurbishment with various commercially available bonded tie systems together with official approval.

Easy and fast assembly by hand. The bracket suspension head with anchoring details.

The VGK parapet bracket has been designed for horizontal and vertical use. The consoles can be mounted to the underside of the cantilever as well as the abutment walls by simply re-bolting.

Horizontal use in the area of the cantilever.  
Vertical use in the area of the abutment.