GRV Circular Formwork

Anchorless Circular Formwork with GRV Articulated Walers

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Important Notes:

Without exception, all current safety regulations 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 especially safety and anchor details cannot always be considered as conclusive or final. These are subject to the risk assessment carried out by the contractor.

The systems or items shown are not necessarily available in all countries.

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.

Content

GRV Articulated Waler Circular Formwork

For circular structures without ties

Complete circular tank shuttered with GRV without using any ties.

The GRV circular formwork is used for the realisation of circular structures without the use of ties. The external ring tension force as well as the internal compression force are transfered by the closed ring of walers. In this way, significant savings can be achieved as the required alternative solution of watertight tie points is particularly complicated and therefore very expensive.

The GRV articulated waler circular formwork can be used for all radii. By means of the patented articulated connections of the GRV walers, even small radii of 0.60 m can be shuttered.

The main area of application for the GRV circular wall formwork is the construction of circular industrial containers. GRV formwork also offers particularly cost-effective solutions for the construction of arched bridges. The system can be used for a wide range of arched forms – for example, circular, segmental, or basket arches.

Circular formwork with GRV on PERI KGF 240 climbing scaffold.

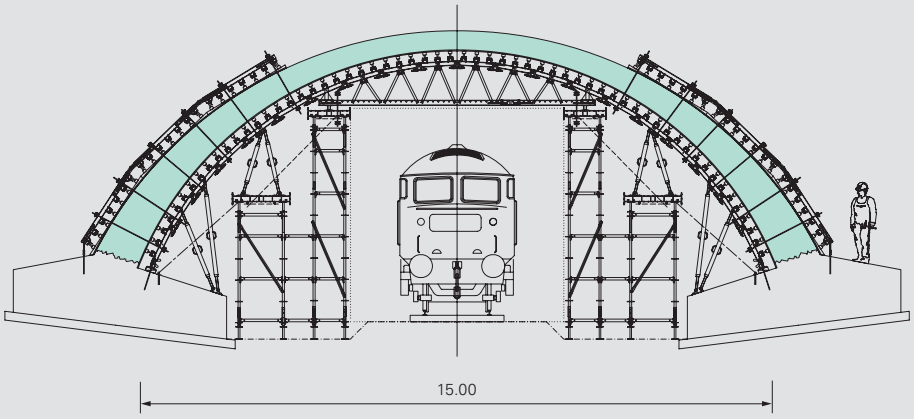
GRV in use as tapering circular column formwork.

Cost-effective customized solutions
Arched bridges with GRV

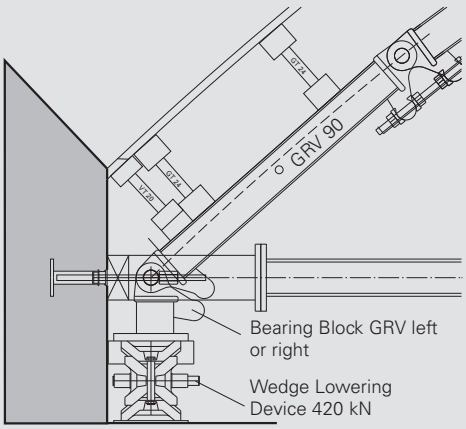
Regardless whether it is for circular, segmental, basket or other arches – the GRV circular formwork is always a particularly economical solution.

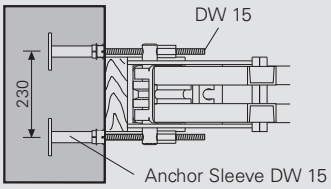
In combination with proven GT 24 lattice girders, spindles and push-pull props, virtually all arched bridges can be shuttered almost entirely with system components. The size of the arch makes no difference as the articulated connections of the walers have an extensive adjustment range.

Ground plan

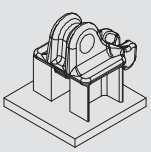


Detailed overview of the bearing section

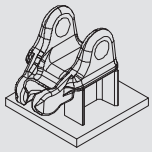




Bearing Block GRV, left



Bearing Block GRV, right



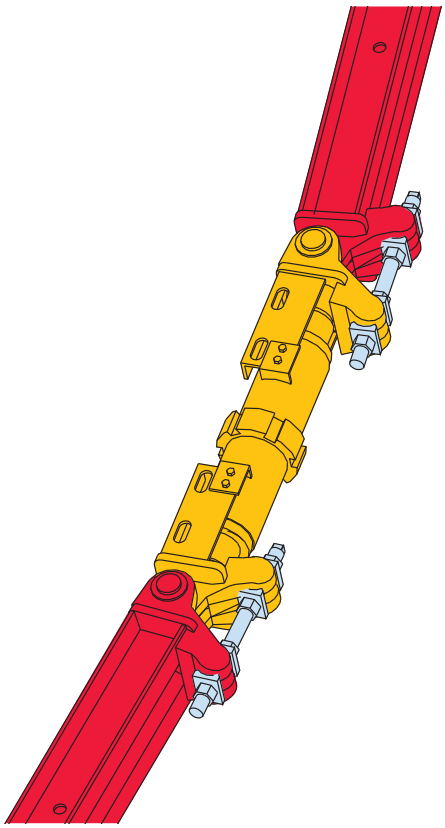
GRV circular formwork and steel walers as self-supporting shoring for arched bridges.

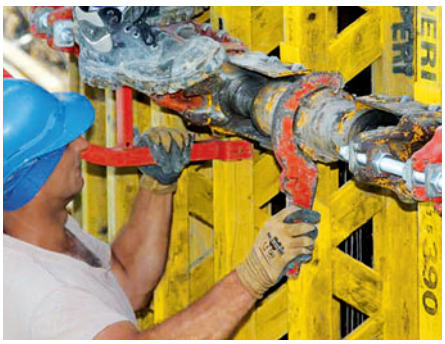
The GSRV Articulated Spindle Waler

Continuously adjustable to suit any radius

For the GRV circular formwork there are four different patented articulated walers which allow the realisation of the smallest pitch circle radius – a minimum of 0.90 m for the articulated waler with a length of 300 mm.

GRV 90
r min = 1.80 m
(approx. 2.10 m concrete radius*)
GRV 75
r min = 1.50 m
(approx. 1.80 m concrete radius*)
GRV 60
r min = 1.20 m
(approx. 1.50 m concrete radius*)
GRV 30
r min = 0.60 m (
approx. 0.90 m concrete radius*)
*with standard formwork assembly

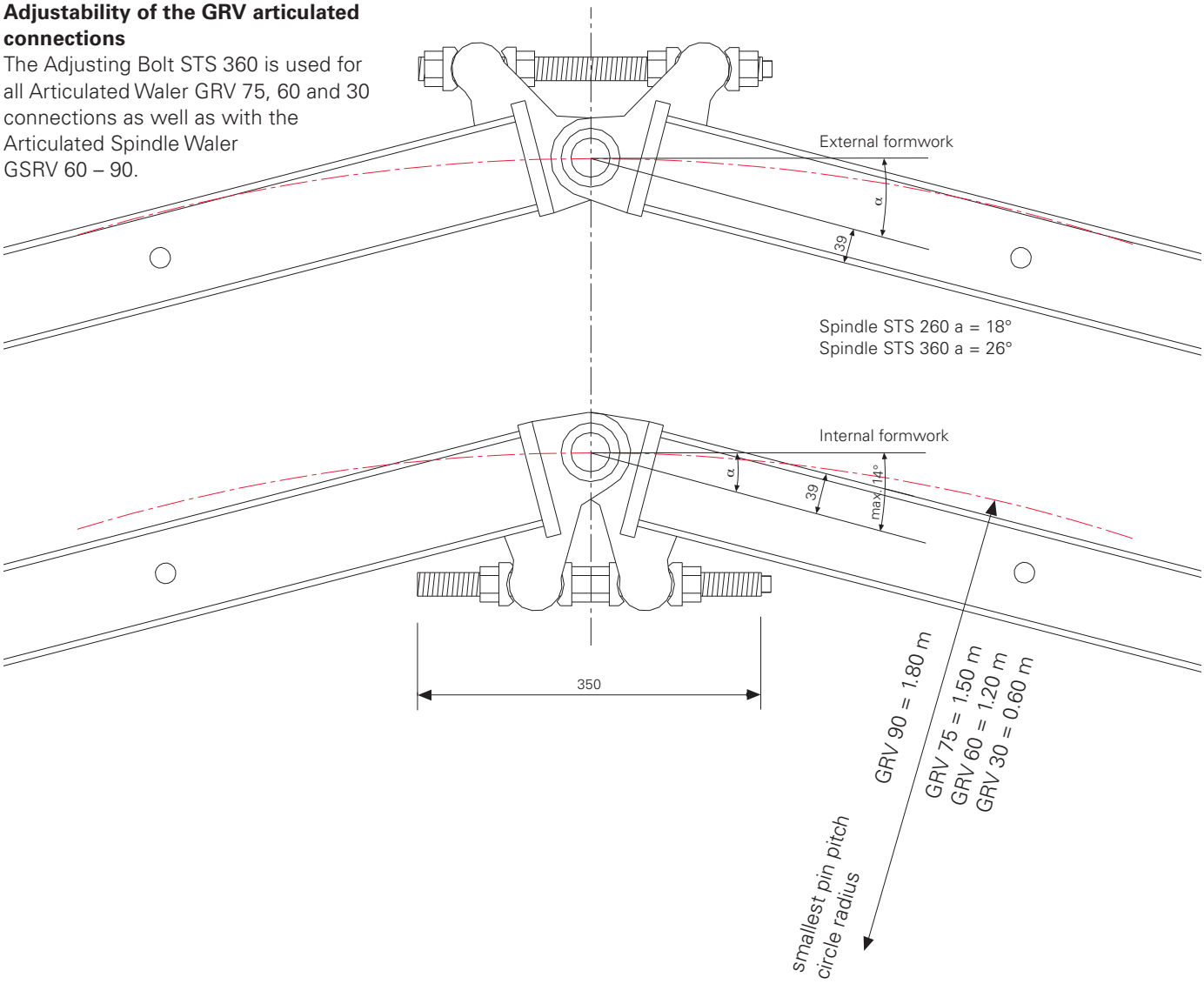




Adjusting the Articulated Spindle Waler GSRV with the Hook Spanner.

The GRV circular formwork can also be used for larger radii. It is especially cost-effective when several identical circular structures are to be concreted one after the other.

Adjustability of the GRV articulated connections
The Adjusting Bolt STS 360 is used for all Articulated Waler GRV 75, 60 and 30 connections as well as with the Articulated Spindle Waler GSRV 60 – 90.



GRV: smallest pin pitch radii [m]				
	inside		outside	
	Nut M24 DIN EN ISO 4032 Item no. 022250	Nut M24 DIN EN ISO4035	Nut M24 DIN EN ISO 4032 Item no. 022250	Adjusting Bolt
GRV 90	2.20	1.72	1.58	STS 360
GRV 75	1.85	1.44	1.35	STS 360
GRV 60	1.35	1.10	0.91	STS 360
GRV 30	1.30 – 1.15			STS 260
GRV 30	0.75	0.60	STS 260, shortened	
For an inner circle, a minimum of 13 GRV walers has to be used otherwise the angle α would be less than 14°.				

The PERI assembly service

Efficient and cost-effective pre-assembly

Even if the basic assembly of the GRV formwork elements is usually carried out on the construction site, prefabrication by the PERI assembly service team is still an economical alternative.

One of our wide range of services is the preparation of complete formwork elements in our plant – tailored to match the requirements of the structure as well as the individual construction planning. Our specialists have the required space at their disposal along with the necessary machines and equipment as well as extensive experience in formwork assembly This results in ready-to-use formwork elements – precisonmade and delivered just-in-time to the site. There are numerous advantages for the contractor: no production facilities or assembly areas and machines are necessary, and no personnel have to be asigned for these activities on the construction site. One very important aspect is also quality assurance as the need to "improvise" due to lack of equipment and missing materials is avoided.

Assembly of GRV panels with segment boards.

Even complicated cross sections for sewage treatment plants are no problem with PERI GRV.

The GRV articulated waler is continuously adjustable and thus allows the realisation of virtually all circular structures.

Note:
Pre-assembled GRV panels must not exceed the permissible transportation width.

Mark out the required pin pitch circle radius on a template and drill four holes each with Ø of 40 mm using the appropriate spacing for the size of articulated waler selected (900 mm, 750 mm, 600 mm or 300 mm) centrally on the circular arc. (Fig. 1)

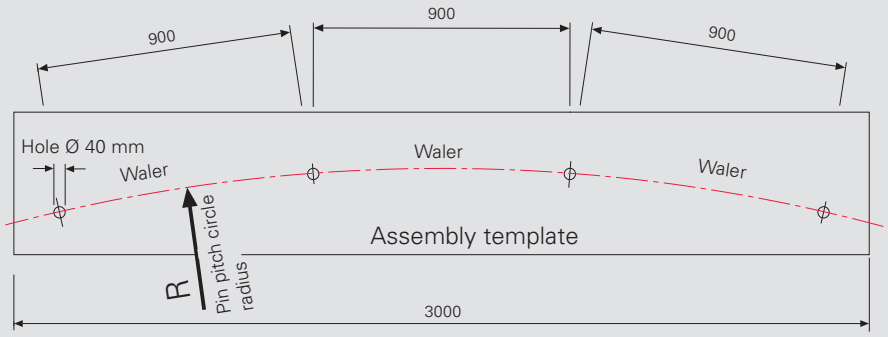


Fig. 1

Lay the three articulated walers on the template and connect with two pins. The two outside walers are only roughly aligned with the drilled hole. (Fig. 2)

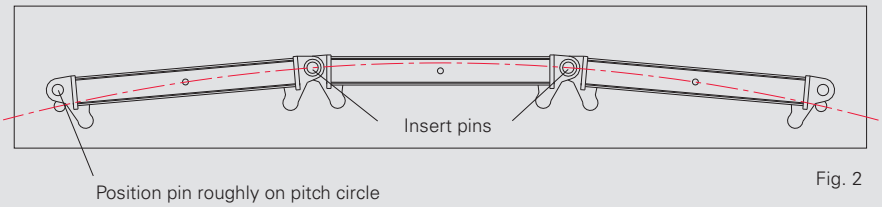


Fig. 2

Insert adjusting bolts with M24 nuts loosely fitted, then tighten the two nuts on the inside waler. Now use the two remaining nuts to line up the outside walers with the drilled holes (visual check). (Fig. 3)

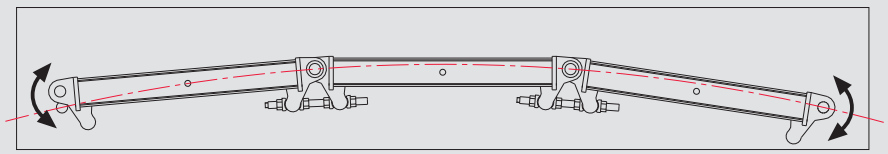


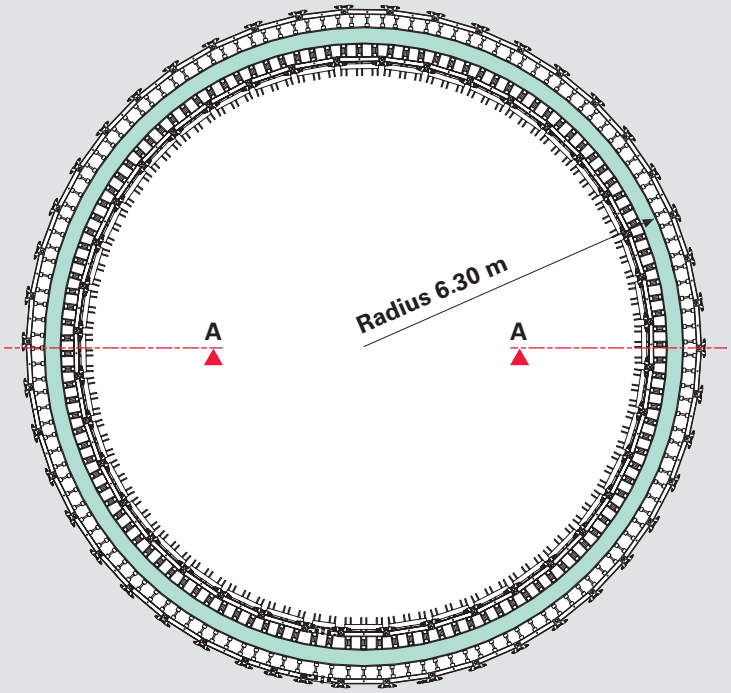
Fig. 3

This procedure eliminates the clearance of the waler pins, with the inside formwork in compression and the outside formwork in tension. The girders can now be fitted as required.

GRV Circular Formwork
Example of use

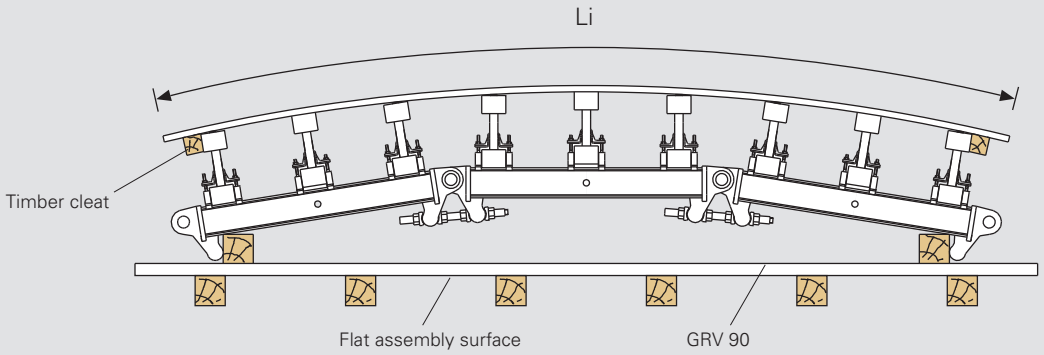
Circular tank with haunch

Inside radius: 6.00 m
Wall thickness: 0.30 m
Concreting height: 5.00 m

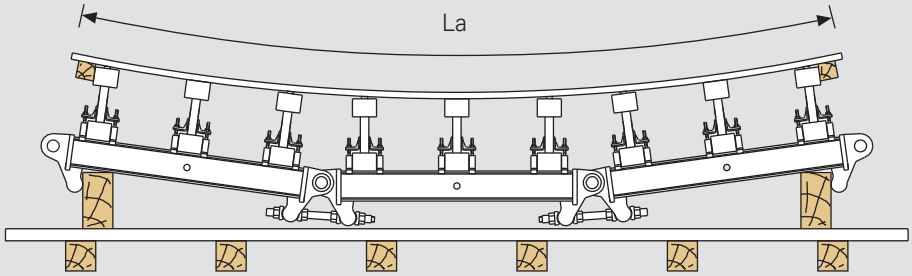


Panel assembly

Inside panel

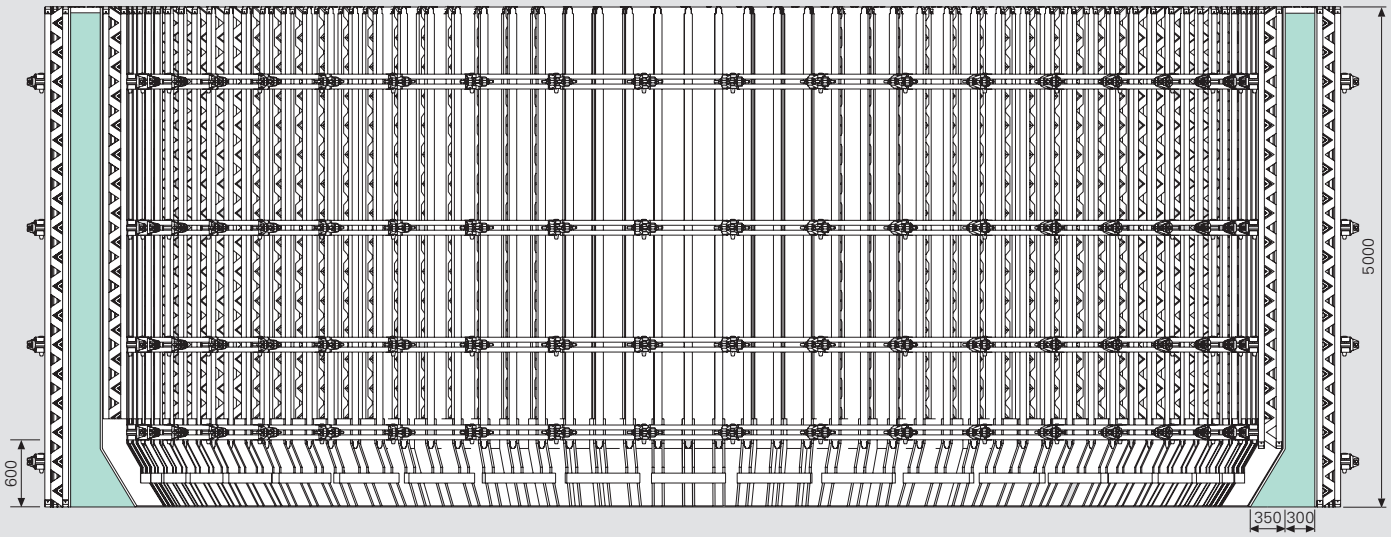


Outside panel



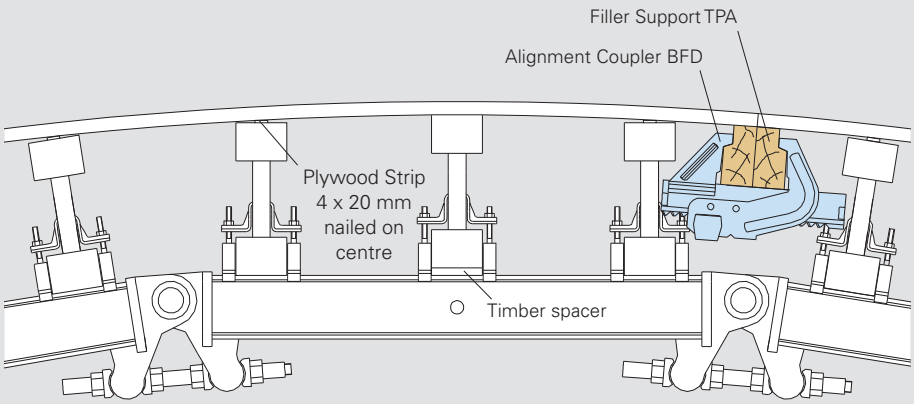
The formlining joint of the panel is aligned radially with the centre line of the pin between the girders.

Section A-A

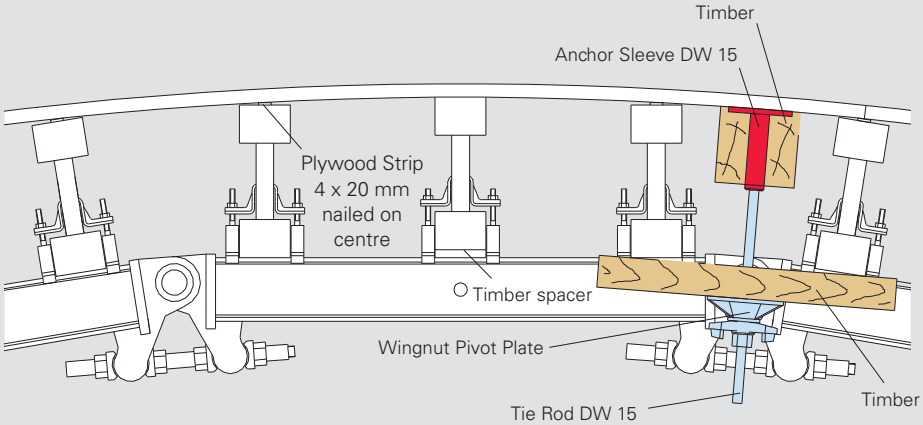


Formlining joint variations

1. Formlining joint between the girders
With TRIO Alignment Coupler BFD and filler support.



2. Formlining joint on the girders
With a clamping device and the Anchor Sleeve DW 15, Item no. 026280.



GRV Circular Formwork

Planing aid for circular containers

This table serves to determine the pin pitch circle radius and number of articulated walers required. The exact values can be determined on a full-scale plan or by means of CAD.

1. Determination of pin pitch circle radius R		**inside**		**outside**
Inside concrete radius Ri	**[m]**		**Outside concrete radius Ra**	**[m]**
Formlining thickness	**[m] -**		**Formlining thickness**	**[m] +**
Open formwork	**[m] -**		**Open formwork**	**[m] +**
PERI girder	**[m] -**	**0,240**	**PERI girder**	**[m] +** **0,240**
Packing timber as required	**[m] -**		**Packing timber as required**	**[m] +**
up to pin centre line	**[m] -**	**0,039**	**up to pin centre line**	**[m] +** **0,039**
Inside pin pitch circle radius	**[m]**	.....	**Outside pin pitch circle radius**	**[m]** .....

2. Number of articulated walers N	**inside**	**outside**
No. of GRVs Ni = pin pitch circle radius x	6.988 **GRV 90** = ...	**No. of GRVs Na =** pin pitch circle radius x 6.974 **GRV 90** = ...
	8.385 **GRV 75** = ...	8.369 **GRV 75** = ...
	10.482 **GRV 60** = ...	10.462 **GRV 60** = ...

GRV 75, 60, 30 as well as Articulated Spindle Waler GSRV 65 – 90 are used to close the circumference.

Total requirements	**GRV 90**	**GRV 75**	**GRV 60**	Spindle Waler	**Recommendation:** Spindle Waler per ring
..... **Inside rings x Ni Pieces**					up to Ø 10 m 1 piece
..... **Outside rings x Na Pieces**					up to Ø 20 m 2 pieces
Total Pieces					up to Ø 30 m 3 pieces

3. Number of girders N	**inside**	**outside**
Ni x 3 or 2 =	..... **Pieces** ..... **Length**	**Na x 3 or 2 =** ..... **Pieces** ..... **Length**

Check this quantity against the number of walers / ring actually chosen

4. Determine length of formlining L		**inside**		**outside**
Internal circumference	**Ui = 2 x ri x π =**	..... **[m]**	**External circumference**	**Ua = 2 x ra x π =** ..... **[m]**
Li/waler section	**= $\frac{Ui}{Ni}$ =** ..... **=**	..... **[m]**	**La/waler section**	**= $\frac{Ua}{Na}$ =** ..... **=** ..... **[m]**
Li/panel width for	..... **Waler =**	..... **[m]**	**La/panel width for**	..... **Waler =** ..... **[m]**

With a closed formwork ring, the GRV circular formwork accommodates a maximum compression or tension force of 300 kN.

For calculating the actual waler tension force:

$$\mathbf{Z_{Ring} = r \times P_b \times h}$$

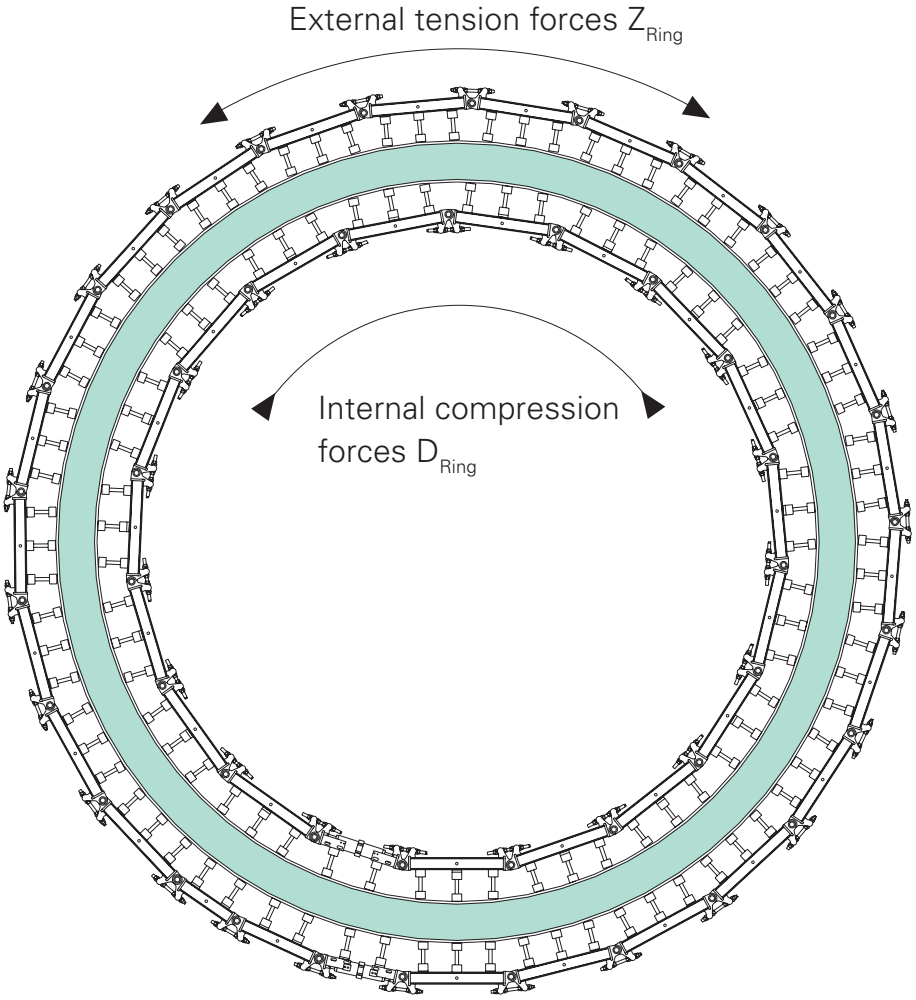
where:
r = outside radius [m]
P_b = fresh concrete pressure [kN/m²]
h = height of load carried by the waler [m]

Example:
Radius r = 11 m
Fresh concrete pressure P_b = 30 kN/m²
Loading height h = 90 cm

Z_{Ring} = 11 m x 30 kN/m² x 0.90 m

Z_{Ring} = 297 kN < 300 kN permissible

The external ring tension force (Z_{Ring}), is critical as the inner compression force (D_{Ring}) is always smaller.

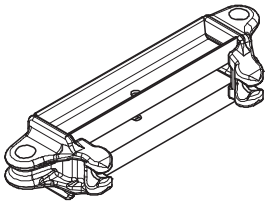


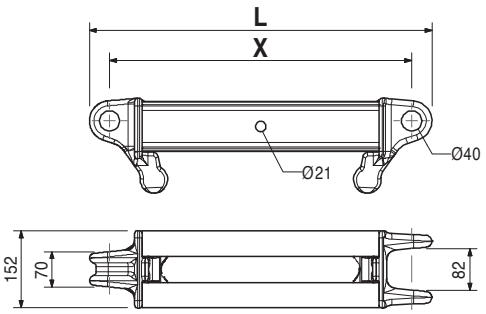
Item no.	Weight kg	
		Articulated Walers GRV
021140	17.600	**Articulated Waler GRV 30**
021130	23.900	**Articulated Waler GRV 60**
021120	27.100	**Articulated Waler GRV 75**
021110	30.200	**Articulated Waler GRV 90**

For tie-less forming of circular structures with closed formwork ring. Continuously adjustable to suit all radii.

L	X
380	300
680	600
830	750
980	900

Technical Data
Permissible compressive and tension force 300 kN.

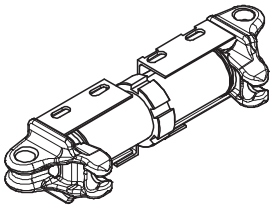


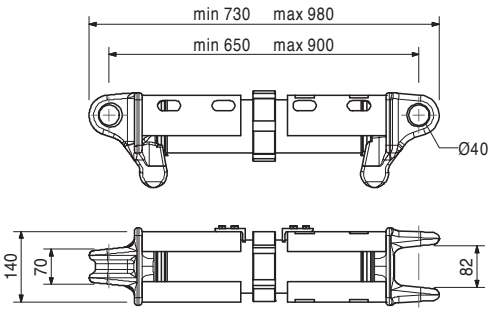


021150	49.200	**Articulated Spindle Waler GSRV 65 – 90**

For forming circular structures without ties by means of a completely closed circular formwork construction. For compensations, adjustable from 65 to 90 cm.

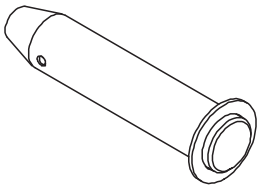
Technical Data
Permissible compressive and tension force 300 kN.

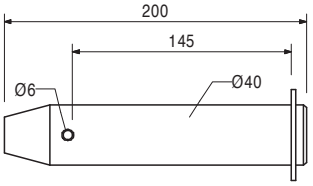




022210	1.900	**Pin for GRB, galv.**

For connecting the Articulated Waler GRV and Articulated Adjustable Waler GSRV 65 – 90.

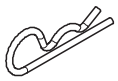




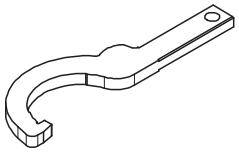
Accessories

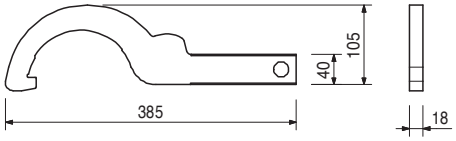
022230	0.033	**Cotter Pin 5/1, galv.**

Item no.	Weight kg	
022230	0.033	**Cotter Pin 5/1, galv.**

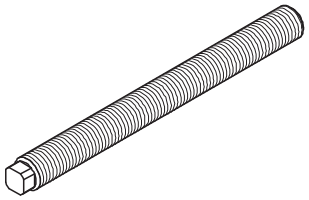


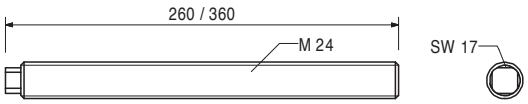
021160	2.450	**Hook Spanner HKS for GRV** For adjusting the Articulated Adjustable Waler GSRV 65 – 90.





		Adjusting Bolts STS
021240	0.907	**Adjusting Bolt STS 260, galv.**
021250	1.260	**Adjusting Bolt STS 360, galv.**
		For adjusting Articulated Waler GRV and Articulated Adjustable Waler GSRV 65 – 90.

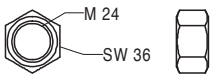




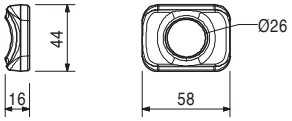
Accessories

022250	0.100	**Nut ISO 4032 M24-8, galv.**
021260	0.178	**Half Round Washer HRS, galv.**

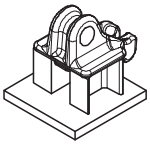
022250	0.100	**Nut ISO 4032 M24-8, galv.**

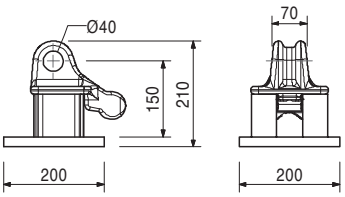


021260	0.178	**Half Round Washer HRS, galv.**

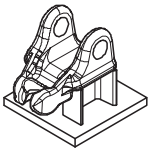


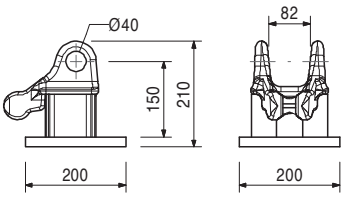
Item no.	Weight kg	
021270	15.000	**GRV Bearing Block, left** For using the Articulated Waler GRV for special applications.



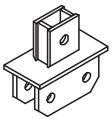


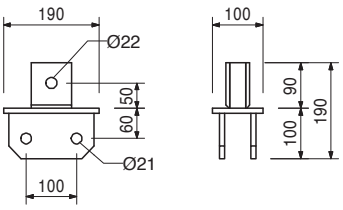
021280	15.100	**GRV Bearing Block, right** For using the Articulated Waler GRV for special applications.





021290	4.880	**GRV Spindle Connector** For using the Articulated Waler GRV for special applications.

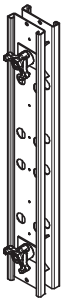


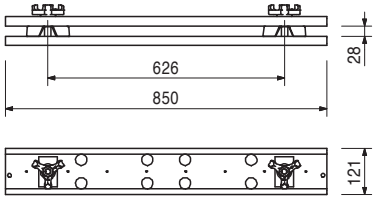


Item no.	Weight kg
024480	7.040

Extension Splice 24-2
For extending GT 24 girders and VARIO GT 24 panels up to max. height of 8.00 m.

Complete with
2 pc. 030190 Three Wingnut DW 15, galv.
Note
Permissible load: see PERI Design Tables.

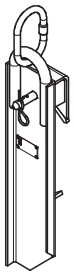


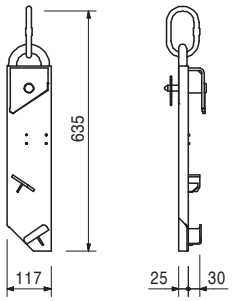


070760	4.650

Crane Splice GT 24
For transporting elements by crane with the GT 24 girder.

Complete with
1 pc. 018050 Pin Ø 16 x 65/86, galv.
2 pc. 018060 Cotter Pin 4/1, galv.
Note
Follow Instructions for Use!
Technical Data
Permissible load-bearing capacity 700 kg with crane sling angle ≤ 15°.

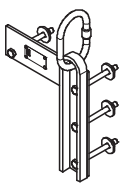


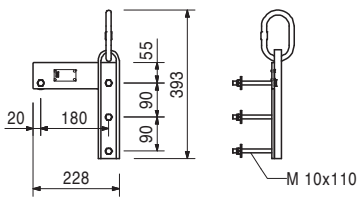


021990	2.780
021980	2.780

Crane Eyes 24
Crane Eye 24, right
Crane Eye 24, left
For transporting elements by crane with the GT 24 girder. Mounted securely to the element.

Complete with
4 pc. 710138 Bolt ISO 4014 M10 x 110-8.8, galv.
4 pc. 780356 Nut ISO 7042 M10-8, galv.
4 pc. 710139 Washer R11 DIN 440, galv.
Note
Illustration shows Crane Eye 24, left.
Follow Instructions for Use!
Technical Data
Permissible load-bearing capacity 700 kg with crane sling angle ≤ 15°.

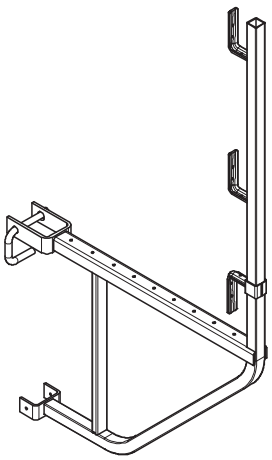


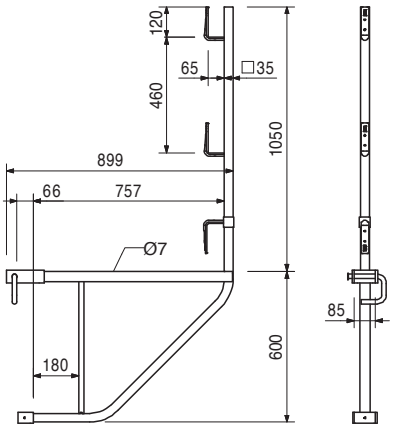


Item no.	Weight kg
027110	11.000

Scaffold Bracket GB 80
For assembly of a working and concreting scaffold with GT 24 girder.

Technical Data
Permissible load 150 kg/m². Maximum width of influence 1.25 m.

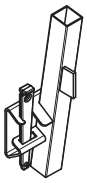


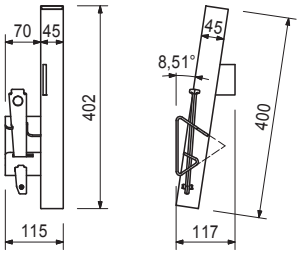


112159	2.120

Handrail Post Holder VARIO
For assembling a guardrail with GT 24 Girder.

Complete with
1 pc. 024250 Wedge K, galv.
1 pc. 780800 Sleeve ISO 8752 8 x 20, galv.





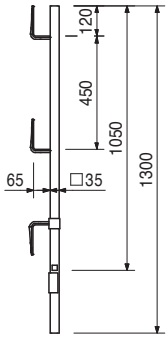
Accessories

116292	4.730

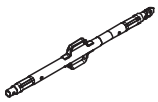
Guardrail Post HSGP-2

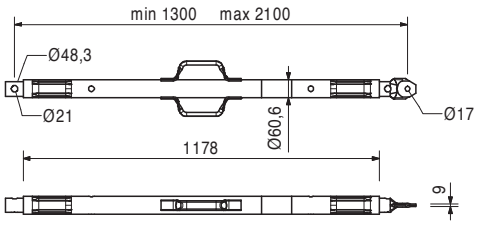
116292	4.730

Guardrail Post HSGP-2
As guardrail for different systems.

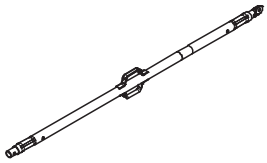


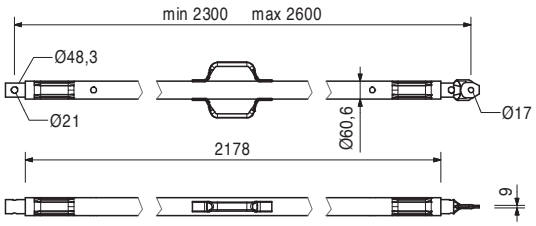
Item no.	Weight kg		
117466	10.600	**Push-Pull Prop RS 210, galv.** Extension length l = 1.30 – 2.10 m. For aligning PERI formwork systems and precast concrete elements.	**Note** Permissible load see PERI Design Tables.



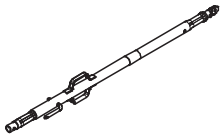


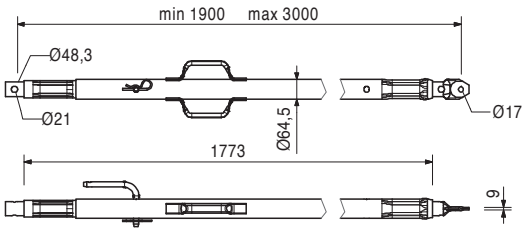
118238	12.200	**Push-Pull Prop RS 260, galv.** Extension length l = 2.30 – 2.60 m. For aligning PERI formwork systems and precast concrete elements.	**Note** Permissible load see PERI Design Tables.



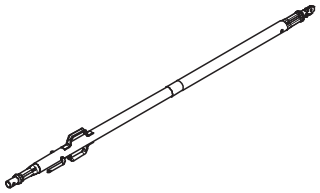


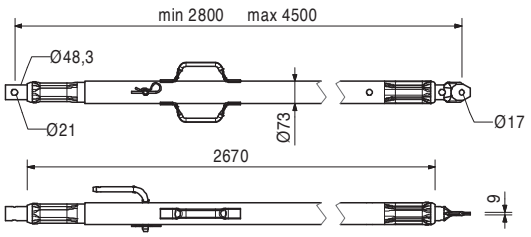
117467	15.500	**Push-Pull Prop RS 300, galv.** Extension length l = 1.90 – 3.00 m. For aligning PERI formwork systems and precast concrete elements.	**Note** Permissible load see PERI Design Tables.



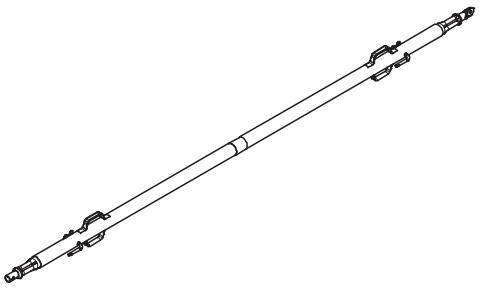


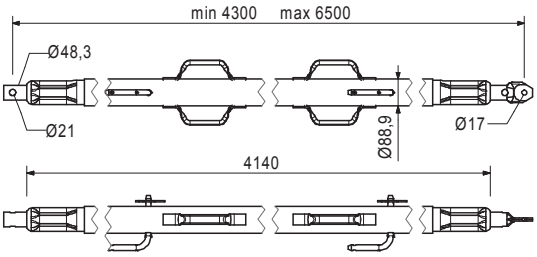
117468	23.000	**Push-Pull Prop RS 450, galv.** Extension length l = 2.80 – 4.50 m. For aligning PERI formwork systems and precast concrete elements.	**Note** Permissible load see PERI Design Tables.



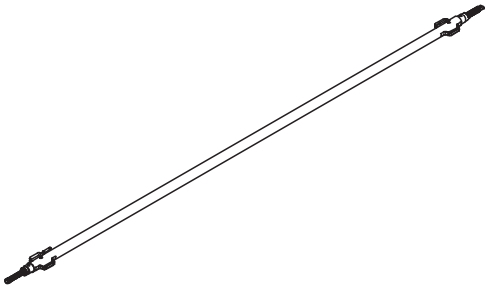


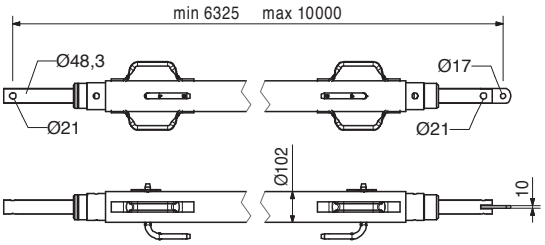
Item no.	Weight kg		
117469	40.000	**Push-Pull Prop RS 650, galv.** Extension length l = 4.30 – 6.50 m. For aligning PERI formwork systems and precast concrete elements.	**Note** Permissible load see PERI Design Tables.



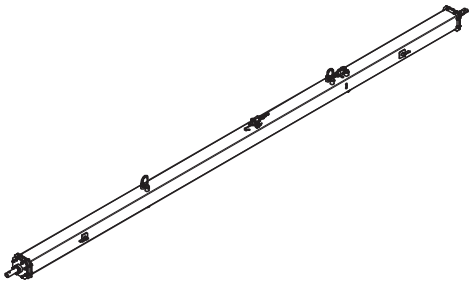


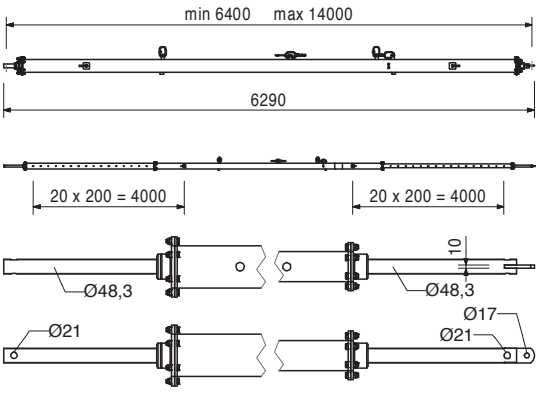
028990	115.000	**Push-Pull Prop RS 1000, galv.** Extension length l = 6.40 – 10.00 m. For aligning PERI formwork systems.	**Note** Permissible load see PERI Design Tables.



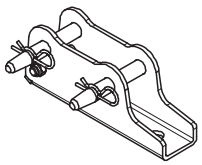


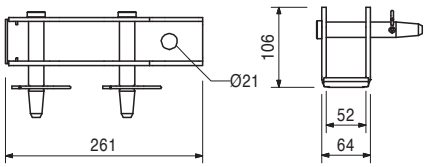
103800	271.000	**Push-Pull Prop RS 1400, galv.** Extension length l = 6.40 – 14.00 m. For aligning PERI formwork systems.	**Note** Permissible load see PERI Design Tables. Chain can be operated from bottom.





Item no.	Weight kg		
117343	3.250	**Base Plate-2 for RS 210 – 1400, galv.** For assembly of Push-Pull Props RS 210, 260, 300, 450, 650, 1000 and 1400.	**Complete with** 2 pc. 105400 Pin Ø 20 x 140, galv. 2 pc. 018060 Cotter Pin 4/1, galv.

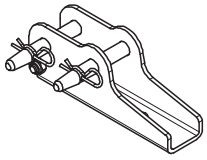


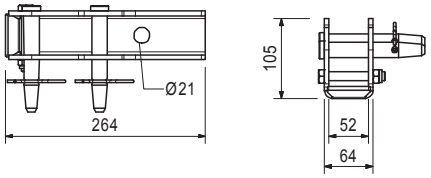


Accessories

124777	0.210	**Anchor Bolt PERI 14/20 x 130**

126666	3.070	**Base Plate-3 for RS 210 - 1400** For assembly of Push-Pull Props RS 210, 260, 300, 450, 650, 1000 and 1400.	**Complete with** 2 pc. 105400 Pin Ø 20 x 140, galv. 2 pc. 018060 Cotter Pin 4/1, galv. 1 pc. 113063 Bolt ISO 4014 M12 x 80-8.8, galv. 1 pc. 113064 Hex Nut ISO7042-M12-8-G, galv.

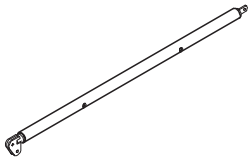


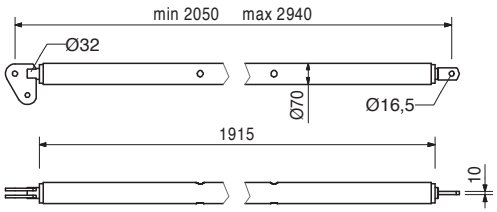


Accessories

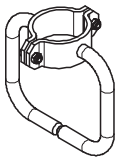
124777	0.210	**Anchor Bolt PERI 14/20 x 130**

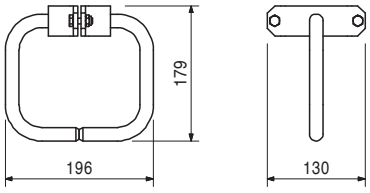
028010	17.900	**Push-Pull Prop RSS I** Extension length l = 2.05 – 2.94 m. For aligning PERI formwork systems.	**Note** Permissible load see PERI Design Tables.



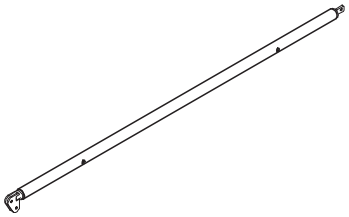


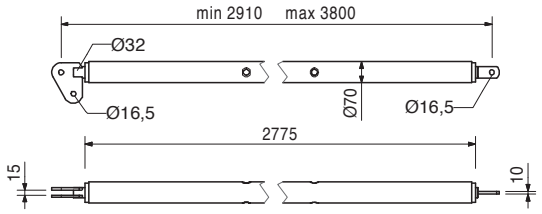
113397	1.600	**Spindle Handle RSS / AV** Spindle Handle for screwing on Push-Pull-Props RSS I, RSS II, RSS III and Kickers AV 210 and AV 190 complete with 2 bolts and nuts M8.	



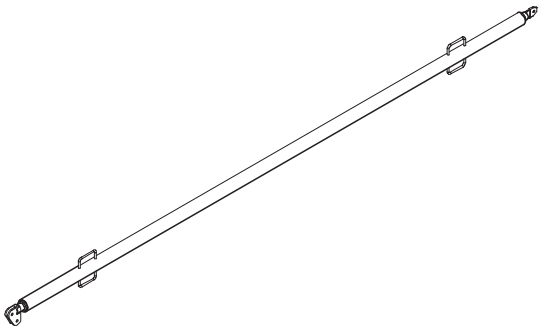


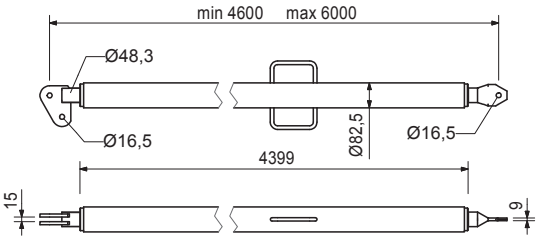
Item no.	Weight kg		
028020	22.000	**Push-Pull Prop RSS II** Extension length l = 2.91 – 3.80 m. For aligning PERI formwork systems.	**Note** Permissible load see PERI Design Tables.



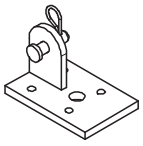


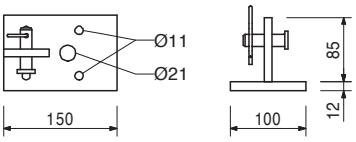
028030	38.400	**Push-Pull Prop RSS III** Extension length l = 4.60 – 6.00 m. For aligning PERI formwork systems.	**Note** Permissible load see PERI Design Tables.





106000	1.820	**Base Plate-2 for RSS, galv.** For assembly of RSS Push-Pull Props.	**Complete with** 1 pc. 027170 Pin Ø 16 x 42, galv. 1 pc. 018060 Cotter Pin 4/1, galv.





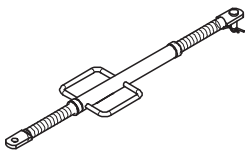
Accessories

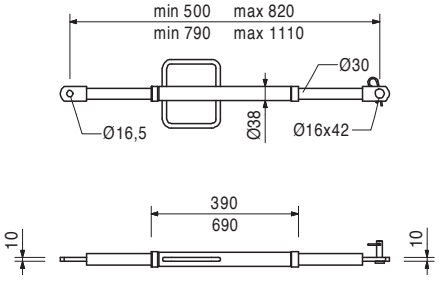
124777	0.210	**Anchor Bolt PERI 14/20 x 130**

Item no.	Weight kg		min. L	max. L
		Kickers AV		
057087	3.720	**Kicker AV 82**	500	820
057088	4.410	**Kicker AV 111**	790	1110

For aligning PERI formwork systems.

Complete with
1 pc. 027170 Pin Ø 16 x 42, galv.
1 pc. 018060 Cotter Pin 4/1, galv.
Note
Permissible load see PERI Design Tables.

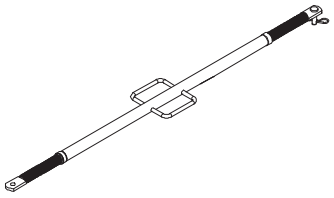


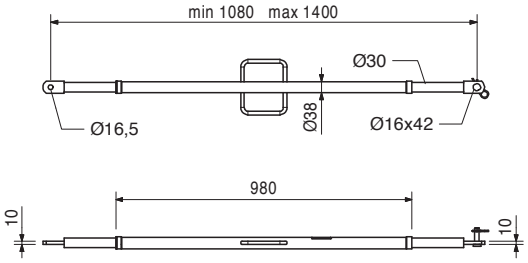


028110	5.180	**Kicker AV 140**

Extension length l = 1.08 – 1.40 m.
For aligning PERI formwork systems.

Complete with
1 pc. 027170 Pin Ø 16 x 42, galv.
1 pc. 018060 Cotter Pin 4/1, galv.
Note
Permissible load see PERI Design Tables.

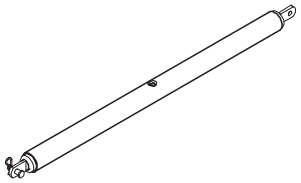


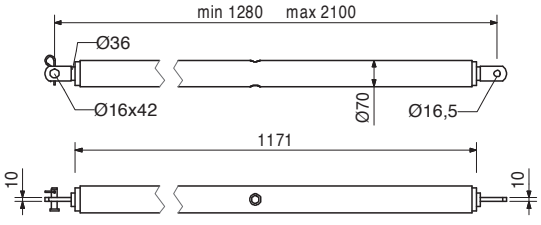


108135	12.900	**Kicker AV 210**

Extension length l = 1.28 – 2.10 m.
For aligning PERI formwork systems.

Complete with
1 pc. 027170 Pin Ø 16 x 42, galv.
1 pc. 018060 Cotter Pin 4/1, galv.
Note
Permissible load see PERI Design Tables.



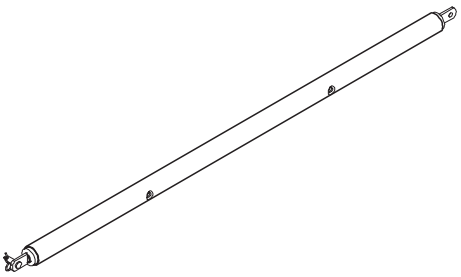


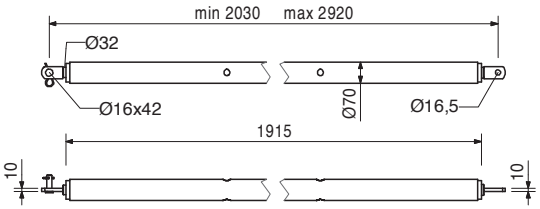
Item no.	Weight kg
028120	17.000

Kicker AV RSS III
Extension length l = 2.03 – 2.92 m.
For aligning PERI formwork systems.

Complete with
1 pc. 027170 Pin Ø 16 x 42, galv.
1 pc. 018060 Cotter Pin 4/1, galv.

Note
Permissible load see PERI Design Tables.

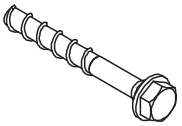


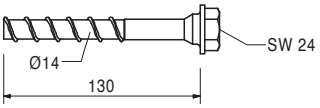


124777	0.210

Anchor Bolt PERI 14/20 x 130
For temporary fixation to reinforced concrete structures.

Note
See PERI data sheet!
Drilling Ø 14 mm.





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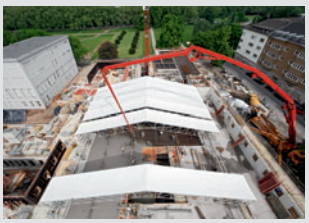

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