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SOFRASAR
TUNNEL
PRODUCTS

**CONNECTING
ALL
COMPONENTS**

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YOUR EXPERT SOLUTIONS PARTNER

Optimas works in partnership with Civil Engineering companies but also University, Material Research Centers and Laboratory to offer the highest standard of solutions.



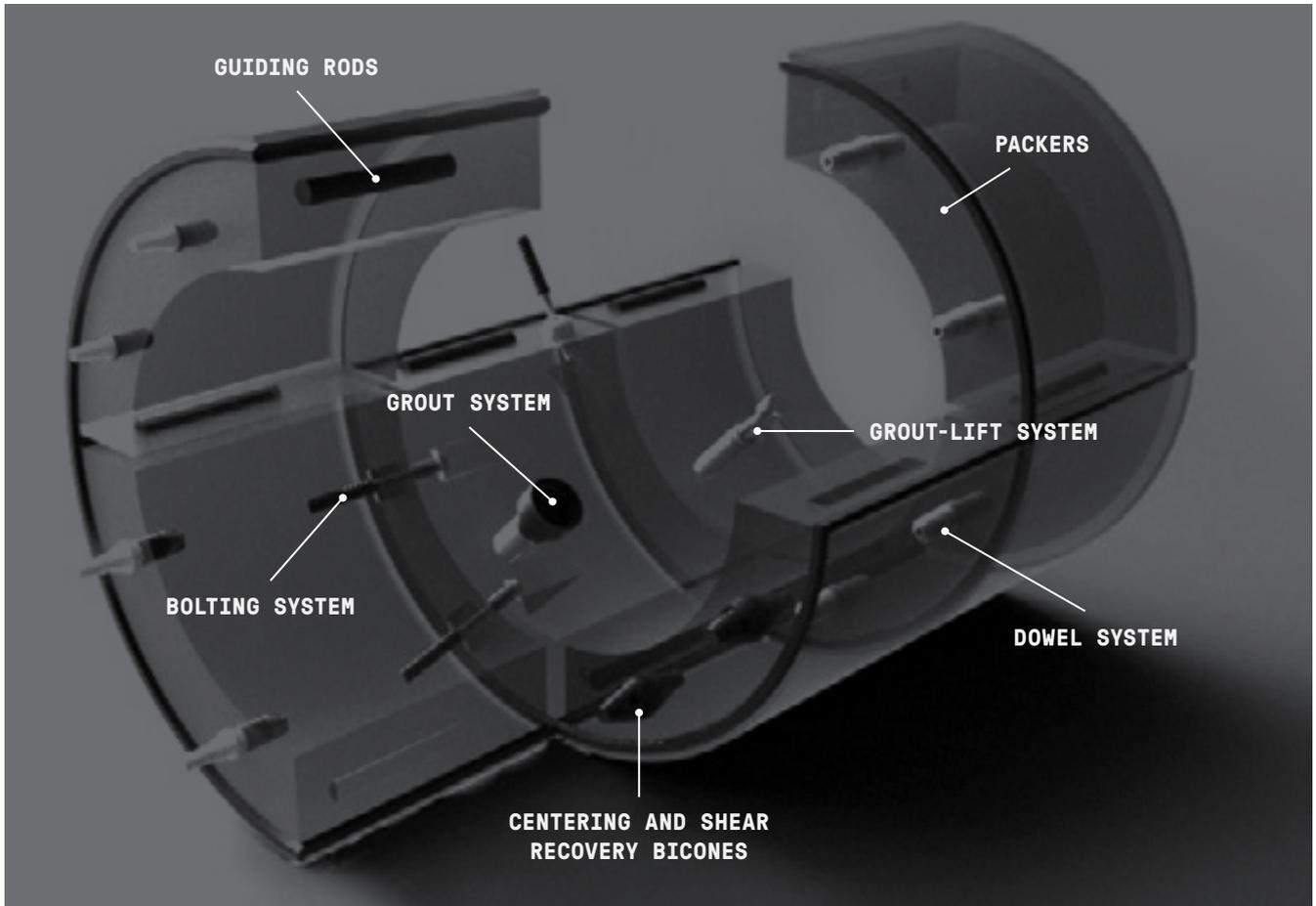
We are in position to offer the following services to our customers:

Development of new products or improvement of existing products to solve specific requests. Our mould technology allows us to customize the products in accordance to your needs. Permanent control of production with quality control under norm.

ISO 9001:2008 - ISO 14001 - OHSAS 18001.

We adapt to specific project requirements everywhere in the world.

OUR APPLICATIONS



Note:

The pull-out and shear resistance in this product catalog are given in accordance to our trial protocol with a specific speed during the tests. These reports are available for validation before each order.

DOWEL SYSTEMS



Alignment & fixation dowels between rings.

Fixating the rings through thermoplastic dowels will enable a quick and secure installation in tight global tolerances, while providing stability of the rings as a result of ground or injection pressure.



SOF-FIX FD

Pull-out resistance: 40 kN

Shear resistance: 60 kN

Recommended for tunnel up to \varnothing 4m

Axis:

- \varnothing 50 mm
- Length: 178 mm
- Polyamide

Socket:

- \varnothing 55 mm
- Length: 92 mm
- Polyamide



BERLIN

Pull-out resistance:

48 to 60 kN

Shear resistance: 100 kN

Recommended for tunnel \varnothing 3m up to 5m

With centering cone

Axis:

- \varnothing 18.5 mm
- Length: 180/70 mm
- Steel AF55C35

Socket:

- \varnothing 35 mm
- Length: 110 mm
- Polyamide



SOF-FIX AXIS

Pull-out resistance:

10 to 15 kN

Shear resistance: 50 to 60 kN

Recommended for tunnel $\varnothing \leq 6$ m

Installation in concrete reservation without socket

Axis:

- \varnothing 60 mm
- Length: 180 mm
- Polyamide



SOF-FIX SYSTEM

TP axis:

Pull-out resistance: 50 kN

Shear resistance: 62 kN

ZUB axis:

Pull-out resistance: 65 kN

Shear resistance: 90 kN

Recommended for tunnel $4\text{m} < \varnothing < 7\text{m}$

Axis:

- \varnothing 60 mm
- Length: 186 mm
- Polyamide + plastic insert
- Polyamide + steel rod

Socket:

- Polyamide



SOF-FIX ANIX 60

Pull-out resistance: 60 kN
(With 3 mm elongation)

Ultimate resistance: 100 kN

Minimum shear resistance:
160 kN

Recommended for tunnel
 $4\text{m} < \varnothing < 7\text{m}$

Axis:

- \varnothing 59 - 68 - 88 mm
- Length: 215 mm
- Polyamide + steel

Socket:

- Polyamide



SOF-FIX ANIX 80

Pull-out resistance: 80 kN
(with 4 mm elongation)

Ultimate resistance: 130 kN

Minimum shear resistance:
160 kN

Recommended for tunnel
 $6\text{m} < \varnothing < 9\text{m}$

Axis:

- \varnothing 59 - 68 - 88 mm
- Length: 247 mm
- Polyamide + steel insert M16

Socket:

- Polyamide



SOF-FIX ANIX 110

Pull-out resistance: 110 kN
(with 5 mm elongation)

Ultimate resistance: 160 kN

Minimum shear resistance:
160 kN

Recommended for tunnel $\varnothing > 10\text{m}$

Axis:

- \varnothing 75 - 100 mm
- Length: 278 mm
- Polyamide + steel insert M16

Socket:

- Polyamide



SOF CLIP

TP axis:

Pull-out resistance: 40 kN

ZUB axis:

Shear resistance: 100 kN

Recommended
for tunnel $\varnothing < 10\text{m}$

Axis:

- \varnothing 70 mm
- Length: 270 mm
- Polyamide

**SMALL
PARTS.
BIG
IMPACT.**



BOLTING SYSTEMS



Bolting systems for the assembly of concrete segment, rail fixings and belt conveyers.

A range of assembly systems of bolts and sockets that support tensile stress from 70 to 400 kN.

Our inserts are available in various grades of plastic and steel: plastic; polyamide or polypropylene; steel; stainless steel; either 316L or a different grade.



WHAT'S NEW!

DIVISIBLE SOCKETS

- Easy installation in the mould
- Protection of the socket from dust and water penetration
- Time saving



T19 - T25 - T28 SYSTEM

Pull-out resistance:
80 kN to 400 kN

- Bolt:**
- T19: \varnothing 19.5 mm
 - T25: \varnothing 25 mm
 - T28: \varnothing 28.5 mm
 - Steel AF65C45
 - Steel ASTM A307, A325
 - Steel per project requirements

- Socket:**
- T19 Length: 100mm
 - T25 Length: 80 to 160 mm
 - T28 Length: 120 to 175mm
 - Polyamide



T20 SYSTEM

Pull-out resistance:
45 kN to 95 kN

- Recommended for
tunnel $\varnothing < 6m$
- Bolt:**
- T20: \varnothing 22.5 mm
 - Steel E295 or C45

- Socket:**
- T20: \varnothing 35 mm
 - Length: 135 mm
 - Polypropylene
- Rail fixation
Conveyor belt



BERLIN SYSTEM

Pull-out resistance:

90 kN

Bolt:

- \varnothing 18.5 mm
- Steel AF55 C35 cold rolled

Socket:

- \varnothing 45 mm
- Length: 110 mm
- Polyamide



BALL JOINT SYSTEM

- Centering during approach
- Diminution of plays
- Control of the shear recovering
- Available for T25 & T28 bolting system



STAINLESS STEEL BOLTING SYSTEM

We can provide a large range of steel products :

- Inox Cl. 50
- A2, A4
- DUPLEX
- Yield 250 to 350 MPa
- Ultimate resistance 500 to 700 MPa

GROUT – LIFT SOCKETS



A large range of grout and concrete segment handling sockets providing a tightness cap up to 40 bars and a breaking tensile stress up to 600 kN.

All grout sockets are available with opened or closed ends to meet specific project requirements.



WHAT'S NEW!

DIVISIBLE GROUT-LIFT SOCKETS

- Easy installation in the mould
- Protection of the socket from dust and water penetration
- Time saving
- Variable positioning in the mould



TYPE I

Pull-out resistance:

250 kN in concrete

- \varnothing 54.7 mm
- Length: 180 mm

- Insert assembly can be equipped with screw cap and non return valve.
- Extensions can be added to fit the segment thickness requirements.
- Screw caps available for pressure resistance up to 12 bar.



TYPE III

- \varnothing 90.5 mm
- Length: 130 mm + extension tube

- Insert assembly can be equipped with screw cap and non return valve.
- Extensions can be added to fit the segment thickness requirements.
- Screw caps available for pressure resistance up to 40 bar.



TYPE IV

Pull-out resistance:

400 kN in concrete

- \varnothing 90.5 mm
- Length: 190 mm + extension tube

- Insert assembly can be equipped with screw cap and non return valve.
- Extensions can be added to fit the segment thickness requirements.
- Screw caps available for pressure resistance up to 40 bar.



TYPE V

- \varnothing 126 mm
- Length: 119 mm
+ extension tube
- Insert assembly can be equipped with screw cap and non return valve.
- Extensions can be added to fit the segment thickness requirements.
- Screw caps available for pressure resistance up to 40 bar.



TYPE ZU

Pull-out resistance:

110 kN in concrete

- \varnothing 54.7 mm
- Length: 100mm or 140 mm
+ extension tube
- Insert assembly can be equipped with screw cap and non return valve.
- Extensions can be added to fit the segment thickness requirements.
- Screw caps available for pressure resistance up to 12 bar.

CENTERING DOWELS AND SHEAR DOWELS



Centering systems and shear dowels for a quick and simple installation of concrete segments, enabling optimum control of the shearing stress up to 500 kN.

We offer a large range of dimensions and thermoplastic quality to find the most appropriate deflexion curves for your application.



CENTERING & SHEAR RECOVERY BICONE

- Contributes to a better stress distribution next to the niches and allows the reduction of the steel structure.
- Available for linings of various thickness
- Shear resistance from 40 kN to 400 kN

500
 ø 100 mm F = 500 kN
420
 ø 80 mm F = 420 kN
400
 ø 120 mm F = 400 kN

375
 ø 100 mm F = 375 kN
180
 ø 120 mm F = 180 kN

150s
 ø 100 mm F = 150 kN
150
 ø 80 mm F = 150 kN
250
 ø 120 mm F = 250 kN



BICONE SC

70 × 144 mm
 With or without steel insert



BICONE SOF-CLIP

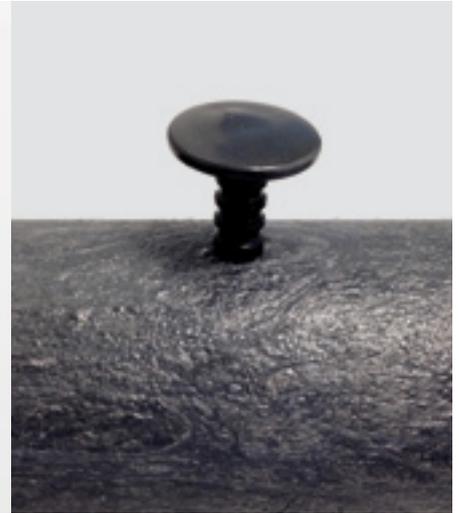
60 × 65 mm



BICONE WITH TIE-RODS

To minimize the lost of the cylinder pressure of the TBM on the last segments and to avoid the opening between two segments, these are equipped with tie-rods. The tie-rods M27 are maintained between the segments through special bicones equipped with sleeves M27.

GUIDING RODS



WHAT'S NEW! PLASTIC STUD

- \varnothing 30 - 35 - 40 - 50 - 60 - 80 mm
- Length : Variable
- Polyethylene Polypropylène recycled
- Easy installation due to clipping system
- Positioning of the guiding rods immediately after release from segment
- No glue needed



GUIDING ROD

- \varnothing 30 - 35 - 40 - 50 - 60 - 80 mm
- Length : Variable
- Polyethylene Polypropylène recycled

MISCELLANEOUS ACCESSORIES



PLASTIC CASTED AXIS

- Assure connection between tunnel lining and internal wall
- Designed to facilitate tunnel lining and divider wall vertical movement



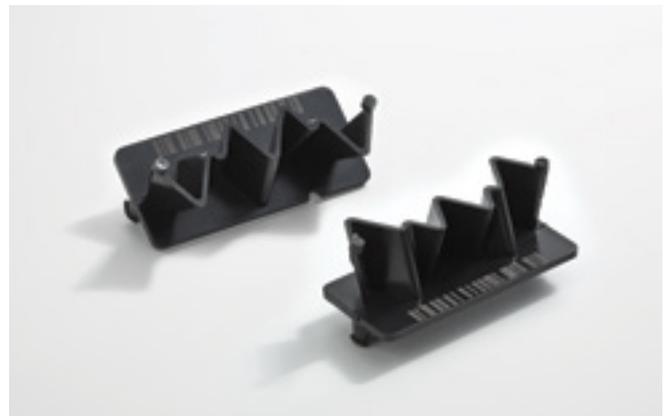
PACKERS

- Bituminous base with polyester reinforcement grid:
Control of crushing and creeping
Elastomeric SBR sheet from recycled material,
thicknesses: 3, 4, 5 mm
- Reduction of voids



WATERTIGHTNESS O-RING & INFLATABLE SEALS

- Application O-Ring assure an optimal watertightness between excavation and segments.
- Pillar/shutter solution: fast, economical, and shrink free.
- Reinforcement Hose system allows an immediate transfer of stress and is universally compatible to various arch profiles.



MARKING PLATES

- Length:** 90 mm
Width: 40 mm
Total Height: 38 mm
Pin Diameter: 10 mm

- Pin Height:** 10 mm
Distance pin to pin: 78 mm
Material: PEHD Black
 Possible with RFID card for easy identification



FASTENING ANCHORS - CONCRETE SCREWBOLT

Type SOF-FS:

- \varnothing 6 to 20 mm
- Length: 30 to 200 mm
- Capacity: 5 to 125kN



SOCKET T10 - 100

Length: 100 mm

Diameter: 10 mm

External Diameter: 28 mm

Material: Polypropylen +
Glassfiber

Accessories: 2 caps included



SOCKET M16

Length: 100 mm

Diameter: M16

External diameter: 20 mm

Material: Polypropylen
+ Glassfiber

Pull-out Resistance: 40 kN

LONG SIZE ANCHORAGES



MACHINING



ROLLING



LENGTH UP TO 5.00M SIZE FROM M12 TO M90

TABLE OF RESISTANCE

SOFRASAR BOLTING AND PLASTIC DOWEL SYSTEMS

ROLLED THREAD BOLTING SYSTEM	SOCKET PULL-OUT RESISTANCE	BOLT (Steel AF65C45 corresponding to ASTM A307) Or different upon request		
		Tensile Yield Strength (400 Mpa = 58'000 PSI)	Ultimate Tensile Strength (700 Mpa = 101'000 PSI)	
T19 × 100	>150 kN	65 kN	110 kN	Steel S275JR
T20	100 kN	120 kN	200 kN	Socket Polypropylène
T25 × 80	>110 kN	151 kN	265 kN	
T25 × 105	>140 kN	151 kN	265 kN	
T25 × 120	>180 kN	151 kN	265 kN	
T25 × 140	>220 kN	151 kN	265 kN	
T25 × 160	>260 kN	151 kN	265 kN	
T28 × 120	>250 kN	196 kN	343 kN	
T28 × 140	>310 kN*	196 kN	343 kN	
T28 × 160	>360 kN	196 kN	343 kN	
T28 × 175	400 kN	352 kN	441 kN	Steel 9.8

* Resistance estimated by calculation on basis of T28 × 160 socket.

BALLJOINT	MATERIAL	SHEAR RESISTANCE
	POM	100 kN
	PEHD	80 kN

BERLIN SYSTEM	SOCKET POLYAMIDE	BOLT (Steel AF55C35)	
		Tensile Yield Strength (315 Mpa = 45'000 PSI)	Ultimate Tensile Strength (540 Mpa = 78'000 PSI)
Berlin Bolt	>90 kN	80 kN	137 kN
Berlin dowel System (2 Sockets)	≥48 kN	59 kN	101 kN

CENTERING DOWELS AND SHEAR DOWELS	DESIGNATION SOF-SHEAR	150	150 S	180	250	375	400	420	500
		SHEAR RESISTANCE	150 kN	150 kN	180 kN	250 kN	375 kN	400 kN	420 kN

PLASTIC DOWEL SYSTEM	DRIVE-IN EFFORT	PULL-OUT RESISTANCE	MAXIMUM SHEAR RESISTANCE	MAXIMUM DISTORTION
SOF-CLIP	63 kN	42 kN	100 kN	50 to 70 mm
SOF-FIX ZUB	26 kN	65 kN	90 kN	20 mm
SOF-FIX TP	26 kN	50 kN	60 kN	50 mm
SOF-FIX FD		40 kN	60 kN	
SOF-FIX ANIX 60	Possible with hammer	60 kN with 3 mm (Ultimate 100 kN)	160 kN	30 mm
SOF-FIX ANIX 80	Possible with hammer	80 kN with 4 mm (Ultimate 130 kN)	160 kN	30 mm
SOF-FIX ANIX 110	Possible with hammer	110 kN with 5 mm (Ultimate 160 kN)	160 kN	40 mm
SOF-FIX (without socket)		10 kN	50 kN (up to 60 kN)	50 mm



**MORE
THAN
PRODUCTS,
WE
SUPPLY
SOLUTIONS.**



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ABOVE AND BEYOND .

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