

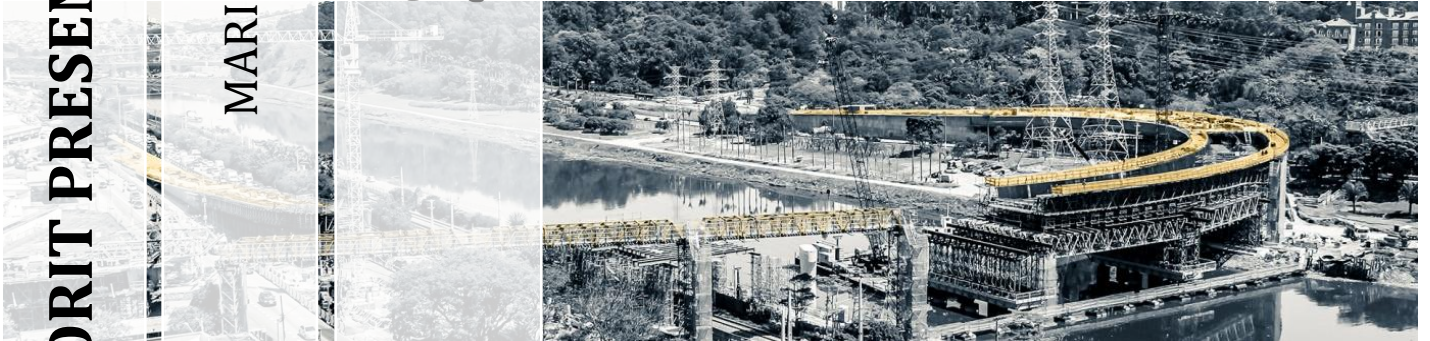
# DIORIT PRESENTATION

MARIO VRDOLJAK

# 2018



BUILDING SOLUTIONS TOGETHER



DIORIT D.O.O.  
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Bosnia and Herzegovina  
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## ABOUT US

DIORIT Company established in 2011 and started its journey with a very strong and challenging motto "building solutions together". We are dedicated to provide high standard quality solutions mainly for high-tech Construction industry. We are not confined to domestic market therefore we have completed very successful projects outside Bosnia and Herzegovina with our daughter company in another country in the Balkan region. Our continuous dedication to quality and customer satisfaction are the main drivers of this achievement.

Through our regional offices Diorit provides services in the sector of prestressed structures, prestressing works, various system solutions for a variety of technical engineering purposes, including threaded bar anchors for mining and tunnelling, reinforcement connections, form ties, tie rods, soil nails, micropiles, rock and soil anchors for geotechnical applications, rock drilling tools as well as meshes for slope support project.

We have our footprints in numerous projects not only in domestic market, also in all countries in the Balkan region. Products manufactured by Diorit suppliers have been used many years without any problems.

Regarding Diorit product quality approach, everyone from the lowest level of employees up to the highest level are committed to excellence. Customer satisfaction with the high quality production implementation and service is the highest priority for Diorit. To achieve this goal, we see our customers, suppliers and employees as our business partners and indispensable building blocks of our company.

The backbone of the company makes a dynamic team of people with proven experience in large-scale projects, engineering and sales.

- In the past 6-7 years Diorit is recognized from our partners like very serious company.
- Diorit has been recognized as a company that can be trusted both by old domestic companies and by large foreign companies operating in the Balkan region.
- Let's just mention some of which we have achieved very serious cooperation in the construction of bridges, tunnels, slope protection, harbor construction, and various hydro engineering projects:
- Euro-asphalt doo- Sarajevo, Strabag-Belgrade, Vektor-integra doo- Sarajevo, Integral-inženjering doo- Banja Luka, China road and Bridge Corporation - Podgorica, China Shandong International- Belgrade, Geosonda doo- Belgrade, Ferbild doo- Institute doo- Belgrade, Aqua Mont doo- Belgrade, Maxpro doo- Zemun, Boksita Jajce Mines dd-Jajce, Hyca doo- Belgrade, Fidija – Podgorica etc..

## SAS THREAD BAR SYSTEM



### SOLUTIONS FOR INDIVIDUAL CHALLENGES IN TECHNICAL ENGINEERING

Our SAS systems feature high quality thread bars of various grades, up to prestressing steel quality, in a range of diameters from 12 to 75 mm. We provide various system solutions for a variety of technical engineering purposes, including thread bar anchors for mining and tunnelling, reinforcement connections, form ties, tie rods, soil nails, micropiles, rock and soil anchors for geotechnical applications as well as prestressing tendons for post-tensioning.

Our SAS thread bar systems are used for connections, formwork and anchorages and have been installed in large-scale construction projects worldwide. Whether for building, underground, bridge or road construction, tunnelling or mining, we can supply the steel you need to get the job done. In the technical engineering sector, our SAS system products have made us the leading global supplier of hot-rolled thread bars.

Providing individualized solutions for specific customer requirements is a challenge we gladly accept.

#### **Geotechnical system**

SAS thread bar system for soil and foundation engineering and harbour construction



SAS thread bar systems have been successfully used for decades as micropiles, soil nails, rock and soil anchors, and tension ties in special geotechnical works and harbour construction.

The broad product range includes various systems featuring a variety of steel grades such as SAS 500/550, SAS 550/620, SAS 555/700, SAS 670/800, SAS 950/1050 and SAS 838/1035 as well as different types of corrosion protection systems: Galvanized, standard corrosion protection by means of a cement grout envelope, or durable double corrosion protection.

Our SAS systems can thus be used for a wide range of applications and be flexibly tailored to satisfy individual customer requirements and environmental conditions.

Numerous national and European approvals are proof of the reliability and efficiency of our thread bar systems in geotechnical engineering.

Our customers have already successfully installed our SAS micropiles, soil nails, rock and soil anchors, and tension ties in various projects worldwide, e.g. the new Gateway Bridge in Brisbane, Australia, Dubai Dry Dock, Al Salam Street in Abu Dhabi and Koge Harbour in Denmark.

On Balkan region we are using that kind of bar on slope support project like Mrtvica 1 , Mrtvica 2 on Serbian koridor 10 , Monte negro Highway Bar-Boljare , Port „ Kostolac“-Serbia, ZGP-Sarajevo – Bosna Bridge etc..

## SAS post – tensioning system

for bridge and structural engineering



SAS post-tensioning bars are an integral part of modern post-tensioning solutions in bridge construction, structural engineering and the upgrading of structures.

SAS bar post-tensioning systems comprise post-tensioning thread bars and smooth bars of the grades **SAS 950/1050** and **SAS 835/1035**, as well as tested and approved anchorage elements specially developed for the systems.

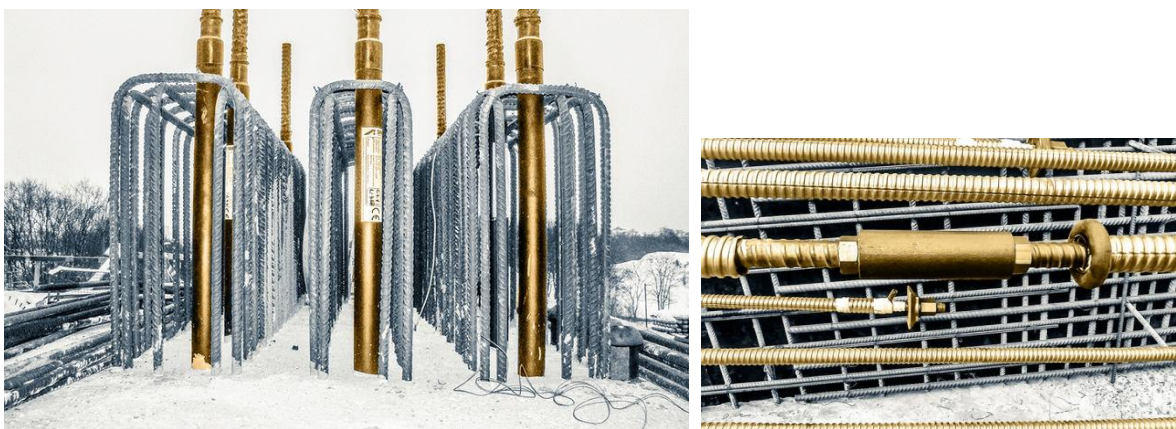
SAS bar post-tensioning systems have been successfully installed for many years in transversely post-tensioned bridges and pylon heads. They are used worldwide in hall and stadium construction to tie back steel structures and rope systems and as auxiliary construction tools in bridge construction for attaching launching noses and form travellers.

To improve and ensure a functioning infrastructure that meets the needs of a growing economy and population, existing structures will have to be upgraded in the years to come. SAS post-tensioning bar tendons have already been successfully employed for strengthening existing bridges, thus providing eco-efficient, long-lasting and future-oriented solutions.

Modern wind power plants require simple, quick and cost-efficient construction systems. SAS post-tensioning bar tendons installed in the base and shaft help optimize the construction progress, thus promoting the move towards renewable energy resources. The European Technical Approval ETA-05/0122 offers designers a tested system that takes all project-specific conditions into account, e.g. post-tensioning anchorages, load transfer to concrete and corrosion protection.

Our customers have already installed our bar post-tensioning systems in various projects, e.g. Capital Gate Tower in Abu Dhabi (UAE), weir in Mont Saint Michel (F) and Johannesburg soccer stadium (South Africa).

On Balkan region we use that kind of bars for bulding bridge Bosna in Bosnia and Herzegovina , Babina bridge – Zenica Bypass –Bosna and Herzegovina , Kostolac port- Serbia etc..



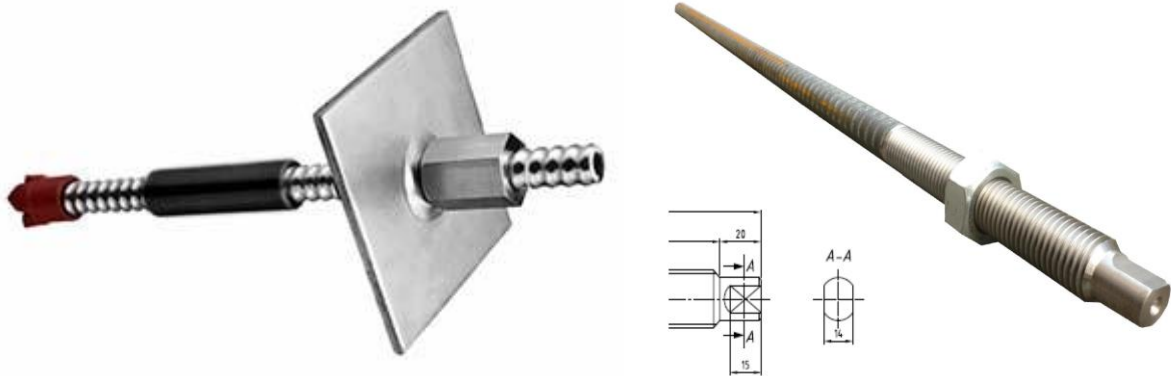
**SAS – ANP – DIORIT anchor system for tunnelling and mining application**



Anchor systems are used in various ways in mining and tunnelling constructions and serve to optimize traffic routes or mine raw materials. Dependent on the construction system used, geology of the surrounding rock and hydrological conditions underground, we offer a variety of anchor systems to meet specific project requirements.

SAS anchor systems are available using thread bars in the grades SAS 450/700, SAS 500/550 (with DIBT approval), SAS 650/800, SAS 670/800 and as smooth bars, grade E 360/690-830. The wide range of steel grades ensures technic and economic optimized construction systems.

ANP – Diorit can provide different type of SN anchors from standard rebars and SDA anchors for tunnelling construction..



SDA anchors consist of three main components: the nail head, the steel tendon – including sleeve and single-use drill bit – and the grout body. The steel tendon is a hollow steel bar with coldrolled round thread and can therefore be cut or joined at any desired point.

We can offer SDA bars from R32 mm – 210 kN to R51 mm – 800 kN ultimate load.

SN anchors from rebar we can offer in different diameters and steel quality B500 , B670/800.



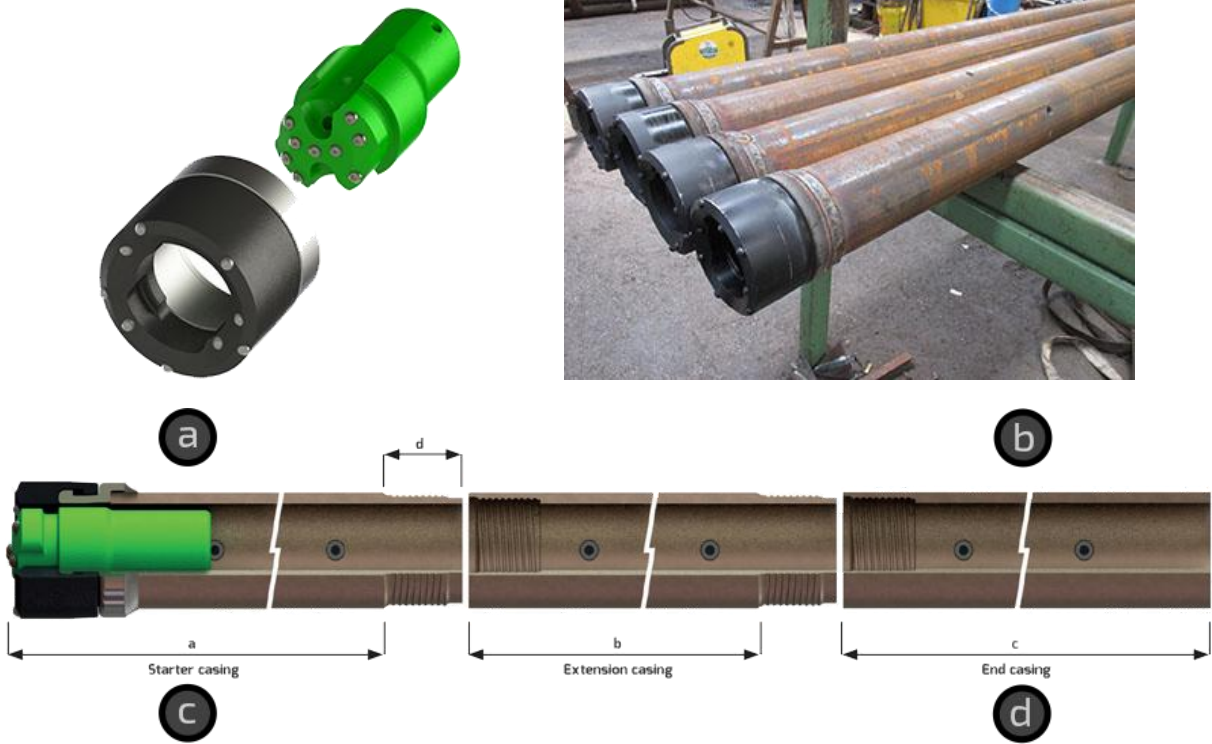
# FOREPOLING SYSTEMS

Forepoling Ring Bits and Casings are designed for drilling injection casings for tunnel construction in weak ground conditions.

Ring bit systems are designed for both top and DTH hammers.

Ring bit systems can be delivered with or without the casings.

System is available from 76 to 216 mm casings and for all major DTH shanks and top hammer threads. Threaded casings are available with 2-3 start trapezoidal threads and 10mm entrance.



- a) Casing shoe and ring bit are integrated with strong shoulders
- c) Heavy duty ring bit protects the pilot gauge buttons

- b) Ring bit welded to starter casing in factory
- d) Optional one way valves for grouting installed in factory (3-10bar)

<b>System</b> product code	Casing OD mm	inch	Wall mm	Ring bit ID mm	Ring bit OD mm	Pilot bit OD mm	Lenght a/b/c m	Lenght d mm
F76-8-47	76,1	3"	7,1	47	89	59	2,95 / 3 / 3	80
F89-8-60	88,9	3 1/2"	6,3 / 7,1 / 8	60	105	71	2,95 / 3 / 3	80
F102-8-68	101,6	4"	7,1 / 8	68	118	80	2,95 / 3 / 3	80
F114-10-76	114,3	4 1/2"	6,3 / 7,1 / 8 / 10	76	130	89	2,95 / 3 / 3	100
F140-10-102	139,7	5 1/2"	7,1 / 8 / 10	102	156	116	2,95 / 3 / 3	100
F159-10-120	159	6 1/4"	8 / 10	120	175	136	2,95 / 3 / 3	100
F168-10-128	168,3	6 5/8"	8 / 10	128	184	145	2,95 / 3 / 3	100
F216-12.7-171	215,9	8 1/2"	8 / 10 / 12.7	171	237	186	2,95 / 3 / 3	100



## **SAS – reinforcing system**

for reinforced concrete and road construction



SAS reinforcing systems are widely used throughout the world in structural engineering as well as building and road construction.

The systems consist of hot-rolled SAS thread bars and accessories and are available in the grades SAS 500/550, SAS 550/620 and SAS 555/700. The optimally suited and versatile accessories are used to couple bars and minimize anchorage lengths by means of special reinforcement end anchorages that can also be installed in difficult application conditions.

The thread bars of our SAS reinforcing systems have been tried and proven for decades and now play an indispensable role in modern reinforced concrete construction.

They have been successfully installed in numerous reinforced concrete structures, e.g. in the ADAC building in Munich (FRG), Berlin Government Building (FRG), ballastless track (track supporting slabs) of the Nürnberg & Erfurt ICE high speed tracks (FRG) and in the Rheinfeldern hydroelectric power station (FRG).

## **SAS high strength reinforcing system**

for high rise buildings



SAS 670/800 high-strength reinforcement is an innovative product far surpassing conventional reinforcement and is primarily used in the construction of high-rise buildings.

High-strength reinforcement systems feature an increased yield and ultimate strength. The increased yield strength enables the construction of slender yet stable structural elements thus helping save resources and costs – convincing advantages for our customers who have since successfully installed our SAS 670/800 high-strength reinforcement in numerous building projects such as the Frankfurt Opera Tower (FRG), Dancing Towers in Hamburg (FRG) and World Trade Center in New York (USA). Many other buildings are currently under design or construction.



## **SAS – formwork system**

for connections and anchorage in civil and structural engineering



SAS form ties and SAS formwork accessories are used worldwide by well-known leading formwork companies and building contractors to connect and anchor concrete formworks and scaffolding in civil and structural engineering projects.

SAS form ties have been installed e.g. in the Panama Canal, World Trade Center and Berlin Government Buildings.

Although, form ties make up only a relatively minor part of the overall formwork system costs, they are of essential importance technically. They absorb and transfer all forces acting onto the formworks and working platforms. Therefore, maximum quality and reliability must be absolutely ensured.

Whether hot-rolled of the grades SAS 900/1100 FA, SAS 900/1050 FC and SAS 850/950 FB or cold-rolled of the grade SAS 850 FS, SAS form ties can be used for a wide variety of solutions in formwork engineering.

Our accessories meet equally high quality standards. As a rule, they are tested up to the bars' ultimate load.

## **SAS tie rods systems**

SAS MarineTie rod systems for harbour construction and hydraulic engineering



In harbour construction and hydraulic engineering SAS thread bars are used as tie rods (horizontal tensile elements in combination with an anchor wall) or grouted tieback anchors, e.g. for tie-back sheet piling walls. Optimally fitted with temporary or permanent corrosion protection systems as well as appropriate accessories, SAS thread bar systems for harbour construction and hydraulic engineering are suitable for use in diverse environmental conditions.

SAS LokTie rod systems for wood and steel construction

The SAS LokTie rod system with high-strength thread bars for bracing composite structures in commercial and industrial buildings is the modern alternative to bolted tension cables, welded tie rods and tie rods with fine threads. It is a modern bracing system, easy to handle at job sites, featuring a high load-bearing capacity with a low dead load. It has been granted a German National Approval by the German Institute of Construction Engineering (Z-14.4-565).

## ANP SYSTEM



### COMPANY PORTRAIT

Since its founding in July 2009 **ANP - SYSTEMS GmbH** has been THE manufacturer in the field of post-tensioning and anchoring systems. The company operates internationally and is an innovative and reliable partner, both in Austria and around the world.

The products and services offered cover the wide spectrum of **geotechnical applications as well as applications in bridge-, structural- and civil-engineering through to underground mining**. Also leading the market in geotechnical products, the company specialises in the use of sophisticated **tensioning and anchoring systems**.

**Well-qualified employees, many years of experience, technical know-how and efficient customer support** make ANP - SYSTEMS GmbH a competent partner and assure the **highest quality, punctuality and economic efficiency**.

### ANCHORS

Anchors are always used in situations in which high tensile forces must be transferred into the ground. Typical applications include, for example, anchoring of excavation sheeting or retaining walls, slope and rock stabilisation or anchorings for bridge abutments or wind turbine masts.

The prestressing force applied to the anchor head using hydraulic equipment is introduced through the freely extensible prestressing tendon and the grout body into a load-bearing soil layer. The created anchoring force then acts actively on the anchored building component and the anchor does not require a displacement of the anchored component in order to become effective.

### STRAND ANCHORS



Strand anchors consist of three main components: the anchor head, a steel tendon - divided into the bond section and free length - and the grout body.

The steel tendon is constructed from a number of 7-wire prestressing strands.

#### Features:

- Nationally approved system with internal and external quality control

- Can be closely matched to the required loads by selecting the number of strands, strand cross-section and steel grade
- Longer anchor lengths can be produced without joints
- Relatively low dead weight and small diameter
- Ease of installation thanks to high anchor flexibility
- Efficient to transport due to low space requirement for transport and storage (anchors are supplied coiled up)

**Types available:**  
**Temporary anchors**

- Temporary anchors (service life up to 2 years)
- Temporary anchors for extended short-term use (service life 2-7 years)
- Temporary anchors with removable free length

**Permanent anchors** (service life up to 100 years)  
in the steel grades (see tables for loads)

- ST 1570/1770 0.60" (140 mm<sup>2</sup>)
- ST 1570/1770 0.62" (150 mm<sup>2</sup>)
- ST 1670/1860 0.60" (140 mm<sup>2</sup>)
- ST 1670/1860 0.62" (150 mm<sup>2</sup>)

**BAR ANCHORS**

Bar anchors consist of three main components: the anchor head, a steel tendon - divided into the bond section and free length - and the grout body.

The steel tendon is a round steel bar with coarse, hot rolled thread ribs and can therefore be cut or joined at any desired point.



**Features:**

- Nationally approved system with internal and external quality control
- Well suited to transport and assembly conditions as delivered in parts with couplers
- Simple tensioning, post-tensioning and releasing by means of screw anchoring

- Simple to adapt to required length on site, e.g. with varying geological conditions (can be shortened by cutting or lengthened with a coupler)
- Excellent bond between anchor rod and cement mortar thanks to threaded ribs
- Can be closely matched to the required loads thanks to wide range of cross-sections and steel grades

**Types available:**  
**Temporary anchors**

- Temporary anchors (service life up to 2 years)
- Temporary anchors for extended short-term use (service life 2-7 years)
- Removable temporary anchors

**Permanent anchors** (service life up to 100 years)  
 in the steel grades below (see tables for diameters and loads)

- S 670/800
- S 950/1050

**NAILS**

The principle of soil nailing consists in installing reinforcements in the form of bars (soil nails) into the natural soil in order to increase the tensile and shear strength of the ground. This creates a monolithic compound structure whose load-bearing behaviour is similar to that of a gravity retaining wall loaded by external forces.

Typical uses include securing terraces or slope cuts and excavations and the stabilising of existing slopes and dams. The use as rock nails is a special application.

**HOLLOW-BAR NAILS - SELF DRILLING ANCHORS**

Hollow-bar nails consist of three main components: the nail head, the steel tendon – including sleeve and single-use drill bit – and the grout body. The steel tendon is a hollow steel bar with coldrolled round thread and can therefore be cut or joined at any desired point.



## Features

- Nationally approved system with internal and external quality control
- Well suited to transport and assembly conditions thanks to delivery in parts with couplers
- A wide selection of drill bits allows use in a wide range of soil types
- Simple to adapt to required length on site, e.g. with varying geological conditions by using partial sections with couplers
- Excellent bond between SHS-bar and cement mortar thanks to threaded ribs
- Can be closely matched to the required loads thanks to wide range of cross-sections
- Facilitates rapid building progress since drilling, installation and injection of the nail are carried out in a single operation

## Types available: Temporary nails

### Permanent nails

- Temporary nails (service life up to 2 years)
- Semi-permanent nails, untreated, allowing for a soil-dependent corrosion rate (service life up to 50 years)
- Semi-permanent nails, hot-dip galvanised, allowing for a soil-dependent corrosion rate (service life up to 50 years)

tendon	ultimate load	yield load 0.2%	design load
Ø	$F_{pk}$	$F_{p0.2}$	$R_d = F_{p0.2} / 1.15$
[mm]	[kN]	[kN]	[kN]
H 0210-32	210	170	148
H 0250-32	250	190	165
H 0280-32	280	230	200
H 0360-32	360	280	243
H 0400-32	400	330	287
H 0420-38	420	350	304
H 0500-38	500	400	348
H 0630-51	630	530	461
H 0800-51	800	630	548

## MICROPILES

Micropiles are deep foundation elements with a small diameter of up to 300 mm, by means of which loads from the superstructure are transferred to lower-lying, load-bearing soil layers through skin friction.

Micropiles can transfer tensile, compression and alternating loads. Typical applications are the foundation or strengthening of existing foundations of structures (e.g. buildings, bridges, retaining walls, masts etc.) or uplift restraint for structures in groundwater.

## HOLLOW-BAR PILES



Hollow-bar piles consist of three main components: the pile head, the steel tendon or compression member - including coupler and single-use drill bit - and the grout body.

The steel tendon or compression member is a hollow steel bar with a coarse, cold rolled round or trapezoidal thread and can therefore be cut or joined at any desired point.

### Features:

- National approval pending
- Well suited to transport and assembly conditions as delivered in parts with couplers
- A wide selection of drill bits allows use in a wide range of soil types
- Simple to adapt to required length on site, e.g. with varying geological conditions by using partial sections with couplers
- Excellent bond between SHS-bar and cement mortar thanks to threaded ribs
- Can be closely matched to the required loads thanks to wide range of cross-sections
- Facilitates rapid building progress since drilling, installation and injection of the pile are carried out in a single operation

### Types available:

#### Temporary piles

- Temporary piles (service life up to 2 years)

#### Semipermanent piles (service life up to 50 years)

- Semipermanent piles, untreated, allowing for a soil-dependent rusting rate
- Semipermanent piles, hot-dip galvanised, allowing for a soil-dependent rusting rate



tendon Ø [mm]	ultimateload $F_{pk}$ [kN]	Yieldload $F_{p0.2}$ [kN]	designload $R_d = F_{p0.2} /$ [kN]
H 0420-38	420	350	304
H 0500-38	500	400	348
H 0630-51	630	530	461
H 0800-51	800	630	548
H 1000-64	1000	750	696
H 1200-64	1200	900	826
H 1400-76	1400	1075	939
H 1600-76	1600	1200	1043
H 1800-76	1800	1500	1217
H 2400-108	2400	1850	1548

## TRUMER SCHUTZBAUTEN



- **COMPANY PROFILE;**

- Since 1991, Trumer Schutzbauten GmbH has offered mitigation products for natural hazards. Our product spectrum covers the following areas:

- **Rockfall catchment fences**



- Rock fall protection barriers serve as a secondary form of defence in possible deposition zones of rock fall, such as collapsed cliffs.
- TRUMER offers ideal solutions in such cases for standard applications as well as for challenging territories.
- This well-thought-out construction of the complete supporting structure, its modular system design and the unique characteristics of the OMEGA-Net provide the ideal onsite adaptability of the TRUMER barrier for the given topographical conditions. Many of these well-thought-out TRUMER "extras" ultimately lead to simplified application planning, as well as considerable overall savings on time and effort for installation.

- **Debris flow barriers**





- Mud and debris flow protection
- **EXTREMELY RESILIENT, HIGH RETENTION AND COMPLETELY RELIABLE**
- The change in climate is always creating new tasks for geologists, geo-engineers, planners, engineers, which apply and need to be dealt with today and for future generations. The increase in the event of heavy rainfall already leads to the accumulation of destructive landslides and debris flow. Mud flows, which gutter and come crashing down, create a particular challenge.
- These large masses which move out of control, and need to be stopped at high flowing speeds; disproportionately strain bearing structures, anchoring and net-technology.
- Flexible TRUMER barriers provide a particular method of a triple protection against sliding earth and masses of debris. TRUMER barriers stop, drain and compress the rubble. The simple assembly in the channelling enables a reliable and cost-effective layout of individual measures or protective cascades, which particularly confine the high effect of mud flows.
- **avalanche protection systems**



- *Well-thought-out assistance, to help nature help itself, against masses of self-compacting snow*
- TRUMER Avalanche protection systems already hold back instable masses of snow in high risk areas! These preventive protection measures are implied through the combination of well-thoughtout applied supporting structures with the unique characteristic of the TRUMER OMEGA-Net, guaranteeing the highest level of safety, without distinctly affecting the landscape's appearance.
- TRUMER avalanche protection systems are measured according to the Swiss guidelines for "avalanche support in breakout areas" and are represented particularly in scenic sensitive areas as an aesthetic solution to conventional constructions.

- rock and slope stabilization products



- Slope and rock face stabilisation
- ISOTROPIC RESILIENT SAFETY FOR SLOPES, CLIFFS AND INDIVIDUAL BLOCKS
- *Fits like a glove, maximal bearing pressure in both horizontal and vertical directions, stabilising and safeguarding.*
- In the area of cliff and slope safety, solutions with nets and meshwork offer nature the possibility to win back stabilised areas with re-vegetation. With this type of protection, nets and meshes correspond to the static calculations either through punctiform slabs or fixed through horizontal and vertical running ropes. Independent to onsite topographical situations, TRUMER offers proven solutions, which fit the technical challenge, as well as the typically tightly calculated budget, which these types of project invoices tend to have



We can offer next type of mesh;

- Omega-Net:  
Rope diameter: 4.5; 6; 7.5; 9 and 10.5 mm  
Mesh size: approx. from 90 to 250 mm
- High Performance Netting (HPN) 50/50/4.6:  
Wire diameter: 4.6 mm  
Mesh size: 50 x 50 mm
- Rectangular netting e.g. 50/50/2.5; 60/60/3.1:  
Wire diameter: approx. from 2.0 to 3.8 mm  
Mesh size: approx. from 30 x 30 to 70 x 70 mm
- Hexagonal netting e.g. 50/70/2.5; 60/80/2.7:  
Drahtstärken: approx. from 2.2 to 3.0 mm  
Mesh size: approx. from 50 x 70 to 80 x 100 mm

- In addition, Trumer Schutzbauten also offers custom design and production of specialized solutions to meet the needs of individual clients and difficult sites. This includes, for example, securing individual blocks or outcrops or protection from high-velocity debris.
- "Safety by Competence" is the core philosophy of Trumer Schutzbauten as we offer our clients solutions based on decades of experience -both from testing and practical application- protecting life, urban areas and infrastructure from natural and anthropogenic induced hazards.

"Safety without Compromise" is the promise we make to our clients that every system developed by Trumer Schutzbauten has the highest level of safety, achieved by an intensive research and development program based on practical experience and realistic conditions.

- **Flexible barriers to protect against landslides**



- *Intelligently stopping, dispersing and compressing*
- Scientific studies prove the increase of extreme events in habituated areas and prognosis a further growth for future decades. The protection of mankind and nature from these dangerous landslides is essential in these affected regions. TRUMER encounters this challenge through the consequential development of flexible barriers, offering the highest technical protection level without affecting the onsite quality of life.
- TRUMER protection barriers use the particular flexibility and extreme resistibility of the TRUMER OMEGA-Net; in order to embrace the impacting landslide and to act similar to a filter press to drain and compress it.

ZERTIFIKAT | CERTIFICATE | CERTIFICADO | CERTIFICADO | CERTIFICADO



# CERTIFICATE

The Certification Body  
of TÜV SÜD Landesgesellschaft Österreich GmbH  
certifies that



**TRUMER Schutzbauten GmbH**  
5110 Oberndorf, Maria-Bühel Straße 7  
5431 Kuchl, Weißenbach 106  
5162 Obertrum am See, Handelsstraße 6  
Versuchsgelände: 8790 Eisenerz, Erzberg 1  
90763 Fürth, Frommüllerstraße 71

has established and applies  
a Quality Management System for

**Development, sales and production of rockfall- and  
avalanche protection as well as rock and slope stabilisation**

An audit was performed, Report No. 1531202  
Proof has been furnished that the requirements  
according to

**ISO 9001 : 2008**  
are fulfilled. The certificate is valid until 2018-09-14  
Certificate Registration No. Q1530914



Wels, 2016-05-13



Certification Body  
of TÜV SÜD Landesgesellschaft Österreich GmbH  
Campus 21 Europaring 4040/1, A-2345 Businesspark Wien Süd, Austria



## EC CERTIFICATE

of  
**Factory Production Control (FPC)**

No.: 0408-CPD-TA0173

In compliance with Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products (the Construction Products Directive or CPD), as later amended, it has been stated that the construction product

Harmonised Standard	Execution Class	Declaration Method
EN1090-1:2009+A1:2011	Load steel components up to EXC 2 acc. EN 1090-2	3 as acc. Tab. A.1 of EN 1090-1

placed on the market by  
**Trumer Schutzbauten GmbH**  
Maria Bühelstraße 7  
5110 Oberndorf bei Salzburg, Austria

and produced in the factory  
**Trumer Schutzbauten GmbH**  
Handelsstraße 6  
5162 Obertrum am See, Austria

is submitted by the manufacturer to the initial type-testing of the product, a factory production control and to the further testing of samples taken at the factory in accordance with a prescribed test plan and that the notified body No. 0408 - TÜV AUSTRIA SERVICES GmbH - has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

**Confirmation** This certificate attests that all provisions concerning the attestation of factory production control described in Annex ZA of the standard  
**EN 1090-1:2009+A1:2011**  
were applied.


**Valid From** 29.08.2012 (First Day of Issue)  
**Next Surveillance** 28.08.2013

**Validity Period** This certificate remains valid as long as the conditions laid down in the harmonised standard in reference to the manufacturing conditions in the factory or the FPC itself are not modified significantly. The welding certificate No.: 0408-CPD-TA0173/1 has been issued in association with this certificate.

**Remarks** This certificate has been issued in an English and a German version.

Wels, 07.02.2013  
Date & Place of Issue

Dipl.-Ing. Gerald WITTMANN  
Certification Office



TÜV AUSTRIA SERVICES GMBH, Krugerstraße 16, A-1015 Wien, www.tuv.at

ZERTIFIKAT | CERTIFICATE | CERTIFICADO | CERTIFICADO | CERTIFICADO



## ZERTIFIKAT

Certificate

Die Zertifizierungsstelle der TÜV AUSTRIA SERVICES GMBH bescheinigt, dass die  
The certification body of TÜV AUSTRIA SERVICES GMBH certifies that  
Firma

**Trumer Schutzbauten GmbH**

in / of  
**Maria Bühelstraße 7, 5110 Oberndorf, Austria  
Produktionsstätte / factory:  
Handelsstraße 6, 5162 Obertrum am See, Austria**

die Schweißtechnischen Qualitätsanforderungen in Übereinstimmung mit der  
have met all necessary quality requirements for welding according to

**ÖNORM EN ISO 3834-3**  
erfüllt.

Die Betriebsüberprüfung erfolgte am: **29.08.2012**  
Date of audit:

Dieses Zertifikat gilt für folgende Anwendungsbereiche:  
This certificate is valid for the following products or service ranges:

**Entwicklung, Vertrieb und Produktion von Steinschlag- und  
Lawinschutzsystemen sowie Fels- und Hangsicherungen /  
Development, sales and production of rockfall- and avalanche protection  
as well as rock and slope stabilisation**

Gültigkeit bis: **28.08.2015**  
Date of expiry:

Zertifikat Nr.: DG/12/S/174/AXM  
Certificate No.:

TÜV AUSTRIA SERVICES GMBH  
Zertifizierungsstelle  
1015 Wien, Krugerstrasse 16, Austria  
Wels, am 07.02.2013




Dipl.-Ing. Gerald WITTMANN  
Zertifizierungsbeauftragter  
Certification responsible



Bei Nichterfüllung der in der Anlage genannten Bedingungen wird dieses Zertifikat ungültig!  
Failure to meet all these necessary requirements as defined in the annex to this certificate will spoil this document!  
2012-DG-WEL-EX-000199-Trumer Schutzbauten-Zertifikat und Checkliste EN ISO 3834

ZERTIFIKAT | CERTIFICATE | CERTIFICADO | CERTIFICADO | CERTIFICADO



## WELDING CERTIFICATE

No.: 0408-CPR-TA0173/1

**Manufacturer** Trumer Schutzbauten GmbH  
Handelsstraße 6  
5162 Obertrum am See, Austria

**Factories** Trumer Schutzbauten GmbH  
Handelsstraße 6  
5162 Obertrum am See, Austria

**Standard** EN 1090-1:2009+A1:2011  
EN 1090-2:2008+A1:2011

**Execution Classes** Up to EXC 2

**Welding Processes** 135 – Metal Active Gas Welding  
(According to ISO 4063)

**Parent Metals** S235, S275, S355 (material group 1.1 and 1.2) according to  
EN 1090-2, table 2 and 3

**Responsible Welding  
Coordinator** Mr. Markus Bichler, born: 08.07.1975, IWT

**Deputies** Mr. Daniel Jäger, born: 18.07.1980, operations manager


**Confirmation** It is confirmed that all procedures for the execution and  
supervision of welding work are available.

**Remarks** This welding certificate is only valid within the scope of and  
in connection with FPC Certificate No.: 0408-CPD-TA0173.  
This certificate has been issued in an English and a German  
version.

**Valid From** 29.08.2012 (First Day of Issue)  
**Next Surveillance** 28.08.2018

Wels, 19.11.2015

Dipl.-Ing. Gerald WITTMANN  
Certification Representative



TÜV AUSTRIA SERVICES GMBH, Krugerstraße 16, A-1015 Wien, www.tuv.at

## **OVM leads the chinese prestression industry**



OVM is a leading product supplier and specialist contractor in China and world wide in the field of Post-tensioning and other specialized construction techniques. OVM Systems have successfully worked on challenging projects including bridges, buildings, tunnels, harbors, dams and nuclear power plants. OVM designs its systems and fabricates them in its own Chinese factory allowing it to apply a stringent quality control system on its products throughout the manufacturing process. In doing so, OVM established itself as a leading Post-tensioning provider with a strong reputation for high quality, reliability, professionalism.

With over 40 years of experience in the field, OVM has developed into one of the leading Product Suppliers and Specialist Contractors in China. OVM's proprietary systems have been integrated into a variety of different projects, ranging from bridges to nuclear power plants. At the strategic level OVM perpetually invests in R&D to remain at the forefront of the industry and to continually offer more efficient and effective solutions to clients internationally. Product lineup includes Post-tensioning Systems, Cable Systems, Construction Solutions, Bearings & Expansion Joints, and Monitoring Systems. The entire product offering is certified as compliant to ISO9001-2008 and meet requirement standards specified by international organizations including:- ETAG 013, AASHTO LRFD, BS, ASTM, JIS, etc.

### **Post tensioning system**



With more than 50 years of experience in the field, OVM has evolved into a leading product supplier and specialist contractor worldwide in the field of Post-tensioning and other specialized construction techniques. OVM technology and products have been applied and integrated into a multitude of projects including: buildings, bridges, highways, high-speed railways, dams, nuclear power plants-receiving worldwide acknowledgement.

OVM invests from its annual turnover into technical R&D to remain at the forefront of the industry. The company owns a national technology center and a postdoctoral research workstation and maintains

close relationships with numerous universities and institutions across China; this effort has led to OVM registering many technical patents.

The company focuses on developing top of the line Post-tensioning technology while building renowned brand in the field of civil engineering. As the largest supplier in China, OVM carries a large selection of Post-tensioning systems which include, but are not limited to: Post tensioning systems, Cable systems (MS & PWS Cables), and Construction solutions (incremental launching, turning, and heavy lifting)

OVM product excellence is certified by the ISO9001-2008, Quality Management System by BSI, and CQC. Additionally, our products satisfy all major standards such as AASHTO, ASTM, BS, EN, ETA, FIP, GB, JIS, and PTI. Moreover, OVM conducts extensive testing with international independent testing organizations to further improve its products at the technical level.

### **Post-tensioning – bridges**



Post-Tensioning (PT) is a dynamic technology that allows for the cost-effective construction of high-quality bridges. PT is adaptable in that it can be implemented in a wide variety of conditions and lengths. Post-tensioned bridges have a high degree of intrinsic durability, can be constructed relatively swiftly, are at a lesser risk of cracking, have lesser structural depth, and feature low maintenance costs. Additionally, these bridges can be built without touching the geography below- permitting longer spans (~300 ft.), and shallower girders. Better ductility, seismic performance, and aesthetics are common benefits gained from utilizing post-tensioning.

### **Post-tensioning – buildings**



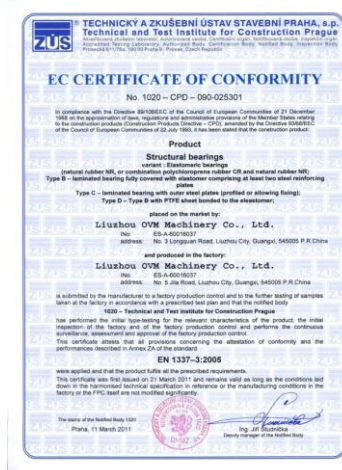
Post-Tensioning is a solution that may be integrated into different types of buildings, ranging from residential apartments to hotels. PT in buildings leads to greater design flexibility and requires less reinforcing steel than conventional methods to attain same levels of strength. Post-tensioned concrete drastically reduces floor-to-floor heights when compared to structural steel, therefore reducing facade, HVAC, electrical, plumbing, and vertical transport system expenses- hence leading to significant savings. Integrally, post-tensioned buildings have superior structural integrity when compared to precast concrete structures, have better crack control, have an overall lower building mass, and have a faster floor construction cycles – all without sacrificing building aesthetics.

## OVM's multi-strand cable system

OVM's multi-strand cable system consists of multiple high-strength PE sheathed, galvanized, or epoxy-coated strands placed parallel to one another, compact anchorages at both ends, outer HDPE pipes, dampers, monitoring system, and other accessories. The system is designed to meet and fulfill FIB, CIP, and PTI requirements.

### Advantages of OVM Cable Stay Systems:

- Excellent fatigue resistance.
- Proven anchor reliability. Static load tests have satisfied a minimum of 096 GUTS, even under low-service stress conditions, the system maintains reliable anchoring.
- Enhanced system fatigue performance, as there aren't any rigid points of contact along the cable's full length (with the exception of wedges in the anchor plate) hence avoiding fretting fatigue.
- Water tight performance, meeting FIB, CIP, and PTI requirements.
- Excellent corrosion protection system- stable and durable fillers are placed inside anchorages to provide protection against corrosion on anchoring and tensile elements. Individual strands are protected by multiple barriers. Outer HDPE Pipes serve to protect internal tensile elements and resist UV radiation.
- Easy installation. Capable of individual strand stressing and de-stressing, as well as integral cable stressing and adjustment.
- Individual strands are inspect-able and replaceable. Cables could be replaced with minimal interference to bridge traffic and without heavy equipment.
- Cable force and condition can be easily monitored during construction process and throughout its service life.

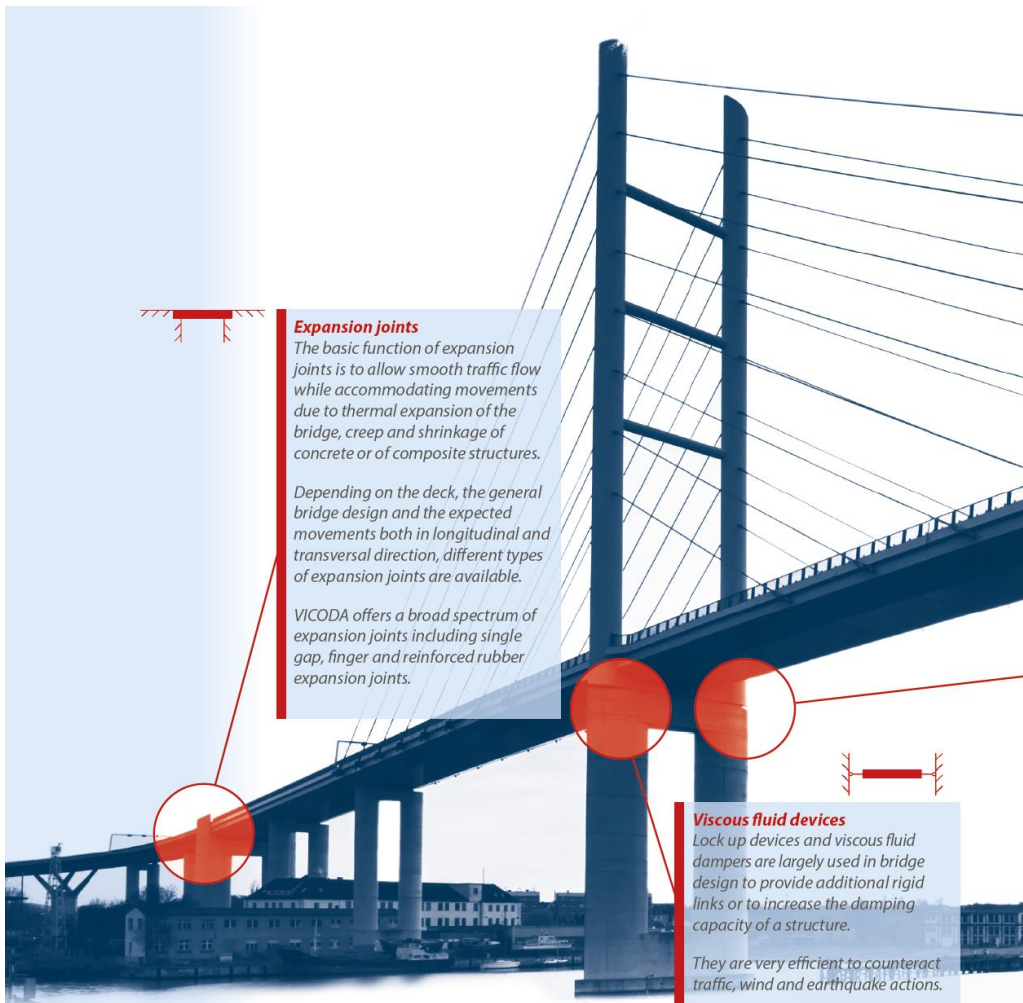


# BEARINGS AND EXPANSION JOINTS - VICODA GERMANY

## TECHNICAL INTRODUCTION

Although bridges at first sight seem to be fixed and motionless, they are in fact flexible structures. Their movement is due to various phenomena like temperature expansion,

traffic loads, concrete creep or shrinkage, wind or earthquakes. The forces induced by the movement are adding to the dead and live loads of the bridge.





Any bridge needs to be designed in a way that it can move within predefined limits and that the sum of the acting forces does not overstress the mechanical structure.

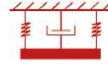
Structural bearings, expansion joints, tuned mass dampers and viscous fluid devices are special products that support these design requirements.

### **Tuned mass dampers**

*Tuned mass dampers (TMDs) are special vibration control devices designed to minimize unwanted vibrations due to traffic, wind or earthquakes.*

*With TMDs dynamic loads can be significantly reduced thus allowing to simplify the overall structural layout.*

*Through this bridges can be designed in a more slender, cost effective and safer way.*



### **Structural bearings**

*Bridge bearings are designed to transmit forces from the bridge superstructure (deck) to the substructure (piers, abutments and foundations) within the limits of the design requirements regarding forces, displacements and rotations.*

*In line with the definition given by the European Standard EN 1337 "Structural bearings are elements allowing rotation between two members of a structure and*

*transmitting the loads defined in the relevant requirements as well as preventing displacements (fixed bearings), allowing displacements in only one direction (guided bearings) or in all directions of a plane (free bearings) as required".*

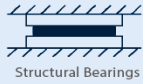
*In order to meet these requirements VICODA has designed a wide range of elastomeric bearings, pot bearings, spherical bearings and shear keys.*



# PRODUCT RANGE

VICODA has developed a wide range of structural bearings, expansion joints, tuned mass dampers and viscous fluid devices for the bridge construction industry. With these products all typical design require-

ments can be met. In order to define the right product for every application, VICODA's technical experts are available to give all necessary assistance.



Structural Bearings



Expansion Joints



Tuned Mass Dampers



Viscous Fluid Devices



Services

## Structural Bearings

Type	Design		Max vertical load V [MN]
<b>Standard elastomeric bearings</b>	Free, movable in all horizontal directions 5 different layouts depending on anchoring system	→ VS-EB 1, 2, 3, 4, 5	15
<b>Restrained elastomeric bearings</b>	Fixed, with both horizontal directions restrained Movable, with 1 horizontal direction restrained	→ VS-RBF → VS-RBU	15
<b>Sliding elastomeric bearings</b>	Movable, with 1 horizontal direction restrained Free, movable in all horizontal directions	→ VS-SBU → VS-SBM	15
<b>Pot bearings</b>	Fixed, with both horizontal directions restrained Movable, with 1 horizontal direction restrained Free, movable in all horizontal directions	→ VS-P → VS-PU → VS-PM	50
<b>Spherical bearings</b>	Fixed, with both horizontal directions restrained Movable, with 1 horizontal direction restrained Free, movable in all horizontal directions	→ VS-S → VS-SU → VS-SM	50
<b>Shear keys</b>	Fixed, with both horizontal directions restrained Movable, with 1 horizontal direction restrained	→ VS-K → VS-KU	No vertical load allowed

## Expansion Joints

Type		Movements [mm]			Noise reduction	Service life [years]
		Longitudinal	Transversal	Vertical		
<b>Single gap expansion joints</b>	→ VS-JS	80	120	10	No	50
<b>Single gap expansion joints with noise reduction</b>	→ VS-JSR	120	120	10	Yes	50
<b>Finger expansion joints</b>	→ VS-F	Up to 400	No design limits	10	Yes	50
<b>Reinforced rubber expansion joints</b>	→ VS-Flex	Up to 320	Up to 320	20	No	20

## Viscous Fluid Devices

Type		Behaviour with slow movements (thermal, creep, shrinkage)	Behaviour with dynamic actions (vehicle braking, wind, earthquakes)	Max axial load [MN]	Max stroke [mm]	Service life [years]
<b>Viscous fluid dampers</b>	→ VS-VD	Allow movement with negligible reaction force	Reduce dynamic force by damping energy (up to 75%)	5	1000	50
<b>Lock up devices (STUs)</b>	→ VS-STU	Allow movement with negligible reaction force	Transmit dynamic force as a rigid link	7	1000	50

## Tuned Mass Dampers

Type	Design	Service life [years]
<b>TMD</b>	Special products to reduce unwanted vibrations and structural-borne noise due to wind, earthquakes, traffic loads or induced by other causes  Different layouts are available to act in horizontal and/or vertical direction  Adaptable to all kinds of structures	50

## Services

Available engineering services
■ Structural engineering
■ Vibration measurements
■ Special product design
■ Installation
■ Repair and maintenance
■ Monitoring systems

**Rock drilling tools**



**Diorit** can provide diferent type of rock drilling tools with advanced european tehcnology for open air and underground mining,tunneling and onther civil engineering. Diorit drilling tools is widely used throughout non ferous mine and tunnel construczion worldwide. With outstanding quality and resonable prices , our tools have effectively reduced the cost and reised the productivity for the customer and won a good reputation among them.

**TOP HAMMER DRILLING TOOLS**



**DTH DRILLING TOOLS**



**Replacement spare part for tunnel drilling machine**

Atlas copco drifter spare parts –replacement

			
<i>Piston Guide Rear</i>	<i>Seal Housing</i>	<i>Bushing (3115 1881 00)</i>	<i>Return Accumulator</i>
			
<i>Stop Ring</i>	<i>Side Bolt</i>	<i>Diaphragm 3115 2472 00</i>	<i>Diaphragm 3115 1926 02</i>
			
<i>Atlas Copco Front Head</i>	<i>Shaft</i>	<i>Atlas Copco HD Front Head</i>	<i>Bushing</i>
			
<i>Driver</i>	<i>Flushing Head</i>	<i>Rotation Chuck</i>	<i>Gear</i>
			
<i>Piston</i>	<i>Valve Piston</i>	<i>Guide</i>	<i>Accumulator</i>

Sandvik drifter spare parts –replacement

			
<i>Driver</i>	<i>Rear Cylinder</i>	<i>Seal Housing HL 1000</i>	<i>Rotation Bushing Assy</i>
			
<i>Piston</i>	<i>Housing</i>	<i>Distributor</i>	<i>Driver HL 1500</i>
			
<i>Rear Bushing</i>	<i>Stop Ring HL 1500</i>	<i>Bushing Bearing</i>	<i>Retainer HL 1500</i>
			
<i>Bushing</i>	<i>Gear Wheel</i>	<i>Axle HL 1000</i>	<i>Hydromotors Gear</i>



Machine replacement spare parts





## References

Diorit has proven as a regional firm that has successfully participated in a number of infrastructure projects in the region as a contractor, or as a supplier of equipment or materials needed to build it. We will only mention some:

**Hydroelectric plant tunnel Ribnica - Kakanj –BiH - Dzekos d.o.o.-** company from Sarajevo (Diorit supply underground drilling rig and loader for excavating material from the tunnel and drilling tools );

**Hydroelectric power plant Arilje – Serbia –Geosonda – Belgrade** (Diorit supply geotechnical strand anchors)

**Vektor-integra d.o.o.- Sarajevo, Slope support project Mrtvica 1, 2 - Serbia - Corridor 10,** (Diorit supply strand anchors, Gewi® bars and self drilling anchors)

**Rehabilitation of the slope - Grdelica - Corridor 10,** (Main contractor Trace – Bulgaria, subcontractor Hyca-CZ – Diorit supply self drilling anchors )

**Maxpro d.o.o.- Zemun - tunnel Predejane - Corridor 10-Serbia** (Diorit supply strand anchors)

**Euro-asphalt - Corridor Vc-overpasses on the Svilaj-Odzak section,** (Post tensioning works)

**Euro-asphalt – Post tensioning works on the "Ričice" roadway - Zenica bypass – BiH**

**Strabag - "Trebiljevo" bridge –** Post-tensioning works -Crna Gora

**Fidija - "Bijelo Polje" Bridge –** Post – tensioning works - Montenegro.

**Geosonda- Belgrade - Basin of the Pljevlje mine –** (Diorit supply self drilling anchors) Montenegro

**Aqua-mont - Belgrade -** Construction of the port "Kostolac", (Diorit supply strand anchors and Gewi® bars 950/1050)

**Boksita Jajce mine –Jajce – BiH -** Delivery of underground machine for mining operations

**Euro-asphalt of Sarajevo -** Tunnel Ričice and tunnel Pečuj - delivery SDA anchors

**China Bridge and road construction –** Highway Bar-Boljare Monte Negro - (strand anchors delivery, and Gewi bar delivery)

**GIM-Građevinski institut Macedonia-** Project-konvektorska stanica- Monte Negro etc..(Micropiles)

**Euro-asfalt d.o.o.-Sarajevo , tunnel „ 8 Mart“ –** ( Diorit supply Atlas copco drilling machine + drilling tools and spare parts)...etc..

**PHOTO**

**Post tensioning works; OVM system - Viaduct „ Ričice“ –Bosnia and Herzegovina  
Contractor- Euro-asfalt – Sarajevo – 2017**



**Post tensioning works; OVM system – Viaducts – koridor Vc – Odzak Svilaj Highway –Bosnia and Herzegovina.  
Contractor;Euro-asfalt d.o.o.- Sarajevo -2015**





**Slope suport project; Mrtvica 1 , Mrtvica 2 - South Serbia- coridor 10  
Diorit supply SDA anchors, strand anchors,Gewi bars.Contractor- Integral inženjering – RS ,  
subcontractor – Vektor integra- Sarajevo 2015/2016/2017**



**Slope suport project; Grdelica - South Serbia- coridor 10  
Diorit supply SDA anchors – Contractor Trace- Bulgaria , subcontractor ; Hyca – Cz 2016/2017**



**Slope suport project; Tunel Manajle - South Serbia- coridor 10  
Diorit supply Strand anchors – Contractor Euroa-Alliance - Bulgaria , subcontractor ; Maxpro-  
Zemun. 2016/2017**



**Slope suport project; Tunel „ Pehare i Ričice“  
Diorit supply SDA anchors – Contractor Euroa-ASFALT-STRABAG – coridor Vc – Zenica bypas  
2016/2017**



**..and many others...**

**DIORIT IN REGION:**

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<a href="mailto:mario.vrdoljak@diorit.biz">mario.vrdoljak@diorit.biz</a>	
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<a href="mailto:milovan.vlahovic@diorit.biz">milovan.vlahovic@diorit.biz</a>	