

VSL - THREAD BAR SYSTEMS



REINFORCING
POST-TENSIONING
GEOTECHNICAL
MARINE TIES
MINING & TUNNELING
FORMWORK TIES
MICROPILES

CONSTRUCTION SOLUTIONS

VSL have been manufacturing and designing bar systems for use by the construction industry since 1971. These have proven to be one of the most popular tools of Engineers wishing to induce and control loads and forces in structures.

Recently VSL has joined with SAH to market SAS Thread Bars in ASIA PACIFIC for the construction industry.

The bar systems are available for the following applications

- Reinforcing systems
- Post-tensioning systems
- Geotechnical systems
- Micropiles
- Mining & tunneling
- Marine ties
- Formwork ties

VSL Thread Bars are available in the following grades

B 500
S 670
Y 1050 / Y1035
Y 1100

Reinforcing Systems are available in grade B500 from dia 12mm to 50mm and grade S670 from dia 18mm to 75mm respectively.

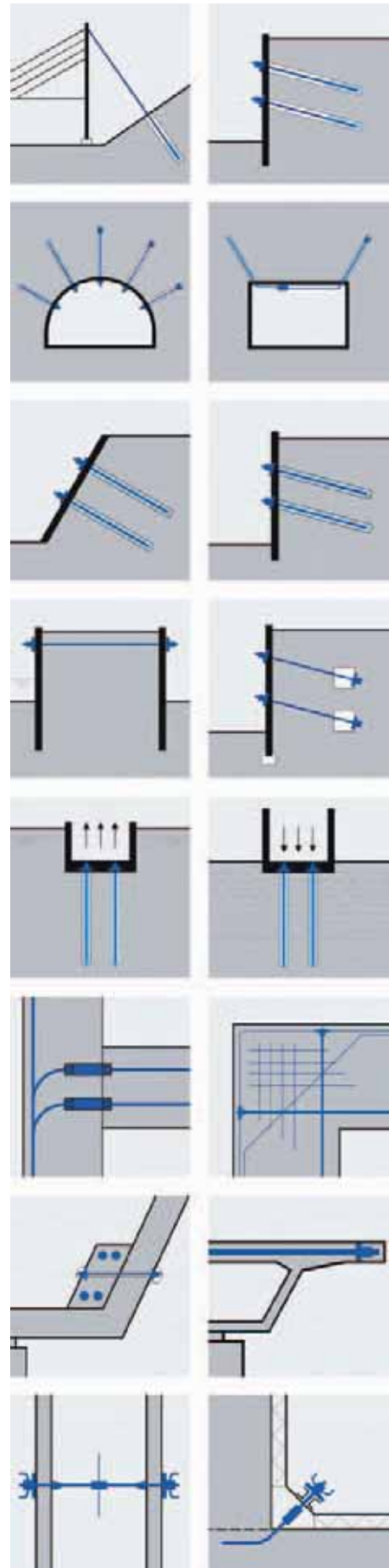
Post-tensioning Systems are available in grade Y1050 bars from dia 18mm to 47mm and in grade Y1035 from 57mm to 75mm. CT Stress Bars with architectural systems are available from 26mm to 75mm, which is ideal for application of post tensioning forces on relatively short tendons.

Geotechnical Systems are available in grade B 500 from dia 16mm to dia 50mm and in grade S670 / Y1050 from 18mm to 75mm.

In the sector of Tunnelling and Mining, VSL offers B 500 from dia 20mm to 32mm, S670 from 18mm to 30mm, S450 from 16mm to 25mm and S650 from 22mm to 30mm.

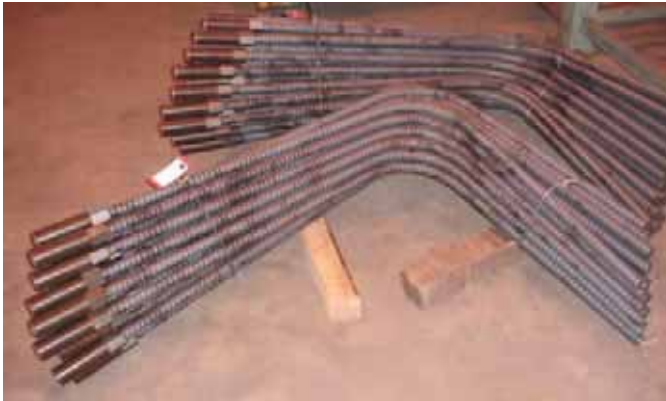
Formwork Ties are available in grade Y1100, Type FA & Type FS (weldable), the available diameters are dia 15, 20 & 26.5mm.

Low Tensile Architectural bars (MT 600) are available in grade 620 from diameter 30mm to 60mm with threads on ends. Details for architectural application refer to specific catalogues.



VALUE ADDED SERVICES - SYSTEMS & SOLUTIONS

- Cutting of thread bars to required length
- Bending of bars
- Torquing according to specifications
- Assembly of nail plate inner cap and other fittings
- Corrosion protection



Bend to requirements



Assembled with required fittings

Corrosion Protection System

- **Hot Dip Galvanized**
according to DIN EN ISO 1461
thickness around 100 mm



- **Epoxy Coated**
according to ASTM A934
thickness around 250 mm



- **Double Corrosion Protection**
according to EN 1537



- **Heat Shrink Sleeve**
according to ISO 527, ASTM D-2240,
ASTM D-638, EN 12068
- **Denso Flex Tape**
according to DIN 30672 and EN 12068



REINFORCING SYSTEMS

VSL-SAS Thread Bars are available in two grades B 500 & S 670. The below are advantages of using our Reinforcing thread bar system.

- Screwable thread ribs along full length of the bar
- Robust, site proven cleaning thread
- Cutting or extension possible at any position of the bar
- Mechanical thread bar splicing up to 100% allowed in one section
- Thread bar diameter 12mm - 50mm with approval in most of the countries
- Galvanized or epoxy coated bars with accessories available
- B 500 - Reinforcing thread bar coupling system replaces many other bar connection systems
- Individual customized bar lengths available
- A simple and low cost solution



Coupling Bar



End Anchorage


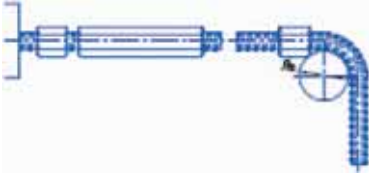



Comparison of S670 bars over B 500 bars







- high utilization due to rearrangement
- increasing of the percentage of reinforcing from 9 to 20%
- reserves, when 670 N/mm² is under-utilized
- S670 & B500 are weldable
- S670 up to Ø 43 mm bendable
- B500 up to Ø 50 mm bendable

Bar characteristics refer to geotechnical systems



REINFORCING SYSTEMS

Coupler System Assembly		
Accessory	Coupling system	Thread bar orientation
Coupler, standard T 3003 Lock nut T 2040 / T 2003		Lengthwise moveable and rotateable
Hexagonal coupler T 3010 Lock nut T 2040 / T 2003		Lengthwise moveable and not rotateable
Turnbuckle T 3105 Lock nut T 2040 / T 2003		Lengthwise moveable and not rotateable
Reducing coupler T 3102 Lock nut T 2040 / T 2003		Connecting bars with different diameters
Contact coupler T 3006		Only for connecting compression bars

End Anchorage Assembly		
Accessory	End Anchorage system	Type of Load
Anchor piece T 2073 Lock nut, short T 2040		Tensile Load
Anchor nut T 2002 Anchor plate T 2139 Lock nut, short T 2040		
Anchor piece T 2073 Lock nut, short T 2040		Compression Load
Anchor nut T 2002 Anchor plate T 2139 Lock nut, short T 2040		
Anchor piece T 2073 Anchor nut T 2024		Alternating Load
Anchor nut T 2024 Anchor plate T 2139		

POST-TENSIONING SYSTEMS

VSL-SAS Thread bar is a high tensile alloy steel bar with coarse right-hand thread over its full length. The system is proven worldwide and offers versatility in a range of applications.

Manufactured in accordance with the DIN standards, the system also offers general conformance with BS4486. The system also got ETA approval. The thread bars are hot rolled quenched and tempered, followed by stretching (further tempering) operation to achieve the necessary performance.

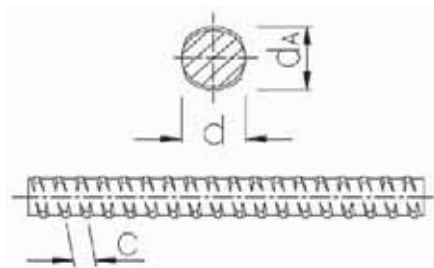
Thread bar configurations				
System	Type of Thread	Rolling process	MAX. Bar Length	Architectural Components available
SAS Thread Bars 18mm - 75mm	Fully threaded (right hand)	Hot Rolled	11.85m	No
CT Stress Bar 26mm - 40mm 56mm 75mm	Short / full thread Short / full thread Short thread	Cold Rolled Cold Rolled Cold Rolled	11.85m 7.5m 7.5m	Yes Yes Yes
MT 600 Bar (Architectural) 30mm - 60mm	Short / full thread	Cold Rolled	11.85m	Yes



Qantas Departure Hall Project in Sydney, using CT Bars



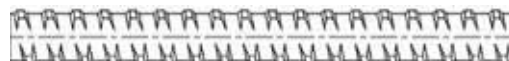
Qatar Sports City - Y1050, dia 75 mm bars



VSL-SAS Thread Bar (d: Nominal Diameter)

POST-TENSIONING SYSTEMS

VSL SAS THREAD BAR CHARACTERISTICS



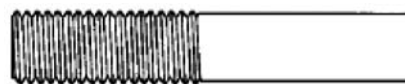
Dimensions (mm)			Nominal Area (mm ²)	Nominal Mass (kg/m)	Nominal Tensile Strength / Load		Nominal Proof Stress (Mpa)	Minimum Elongation at max force %
d	dA	C			(MPa)	kN		
18	21	8	241	1.96	1050	255	950	5
26.5	31	13	551	4.48	1050	580	950	5
32	37	16	804	6.53	1050	845	950	5
36	42	18	1020	8.27	1050	1070	950	5
40	46	20	1257	10.21	1050	1320	950	5
47	53	21	1735	14.10	1050	1820	950	5
57	64	21	2581	20.95	1035	2671	835	4
65	72	21	3331	27.10	1035	3447	835	4
75	82	24	4448	35.90	1035	4572	835	4

VSL CT STRESS BAR CHARACTERISTICS



Dimensions (mm)			Nominal Area (mm ²)	Nominal Mass (kg/m)	Nominal Tensile Strength / Load		Nominal Proof Stress (Mpa)	Minimum Elongation at max force %
d	dA	C			(MPa)	kN		
26	28.2	6	531	4.40	1080	575	930	3.5
29	31.2	6	661	5.44	1080	715	390	3.5
32	34.4	6	804	6.59	1080	870	930	3.5
38	37.4	6	1018	7.88	1030	1050	835	3.5
40	41.4	6	1257	9.72	1030	1295	835	3.5
56	58.5	6	2463	19.33	1000	2460	810	3.5
75	78.1	6	4418	34.68	1000	4418	810	3.5

VSL MT 600 BAR CHARACTERISTICS



Dimensions (mm)			Nominal Area (mm ²)	Nominal Mass (kg/m)	Nominal Tensile Strength / Load		Nominal Proof Stress (Mpa)	Minimum Elongation at max force %
d	dA	C			(MPa)	kN		
30	32.0	3	707	5.55	620	416	460	16
36	38.7	4	1018	7.99	620	515	460	16
45	47.8	4	1590	12.48	620	945	460	16
60	64.1	6	2827	22.19	620	1665	460	16

Note: d : Nominal Diameter

dA : Major Diameter of Thread

C : Thread Pitch

GEOTECHNICAL SYSTEMS

VSL offers to the geotechnical market the VSL Thread bar system for unstressed applications such as soil nails, rock bolts, micro piles and others. The bars have a characteristic quality of B500 or S670. Bar systems for both temporary and permanent applications can be supplied.



The bars meet the requirements of the relevant norms and standards. Both qualities are hot rolled with a coarse thread over the entire length.

B500: Left hand thread as well as right hand up to Ø 75mm

S670: Right hand thread up to Ø 75mm

The bars have a higher ductility (class H according to Eurocode 2)

System Components

The VSL Bar systems comprise all system components usually required for geotechnical applications. Details can be found in the inserts. Special components can be supplied on demand.



Corrosion Protection

The type of corrosion protections elected for unstressed bars depends on the duration of use, the potential damage in case of failure of a group of nails as well as on the prevailing environmental conditions. Both temporary and permanent systems are available and VSL offers the range of corrosion protection option as specified in the Norms, such as the Swiss code SIA V191/1. Generally the corrosion protection shall vary according to environment and project specifications.

Rock Bolt ~Ø 20 to 40mm with grout or resin

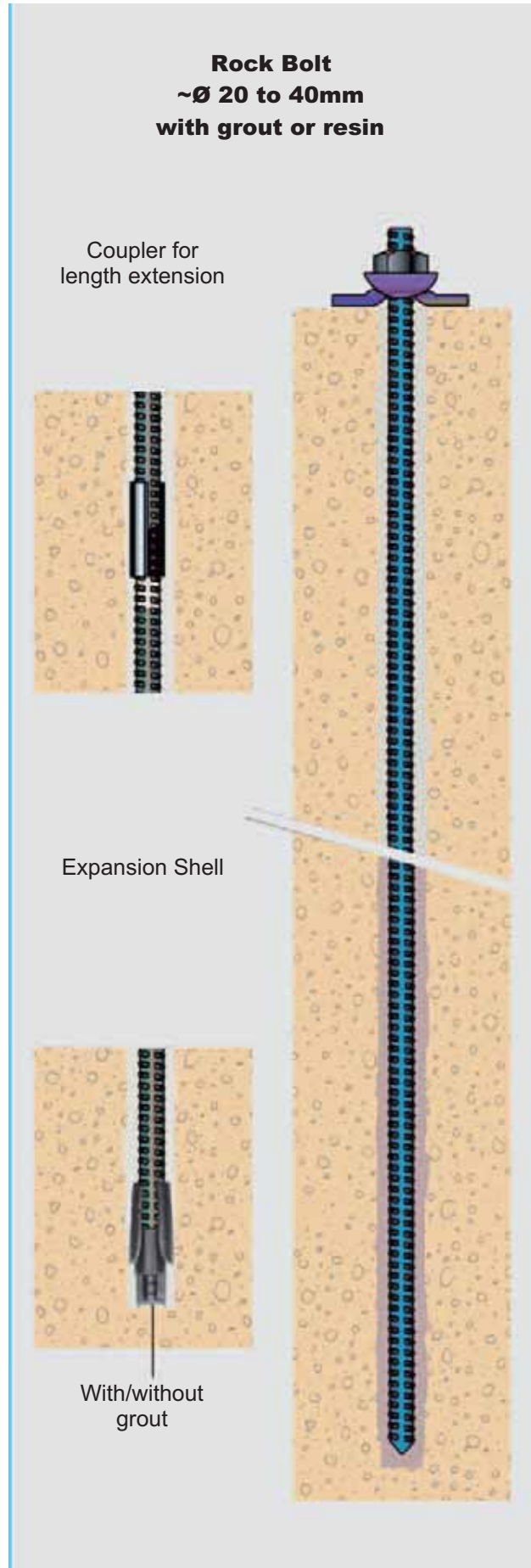
Coupler for
length extension



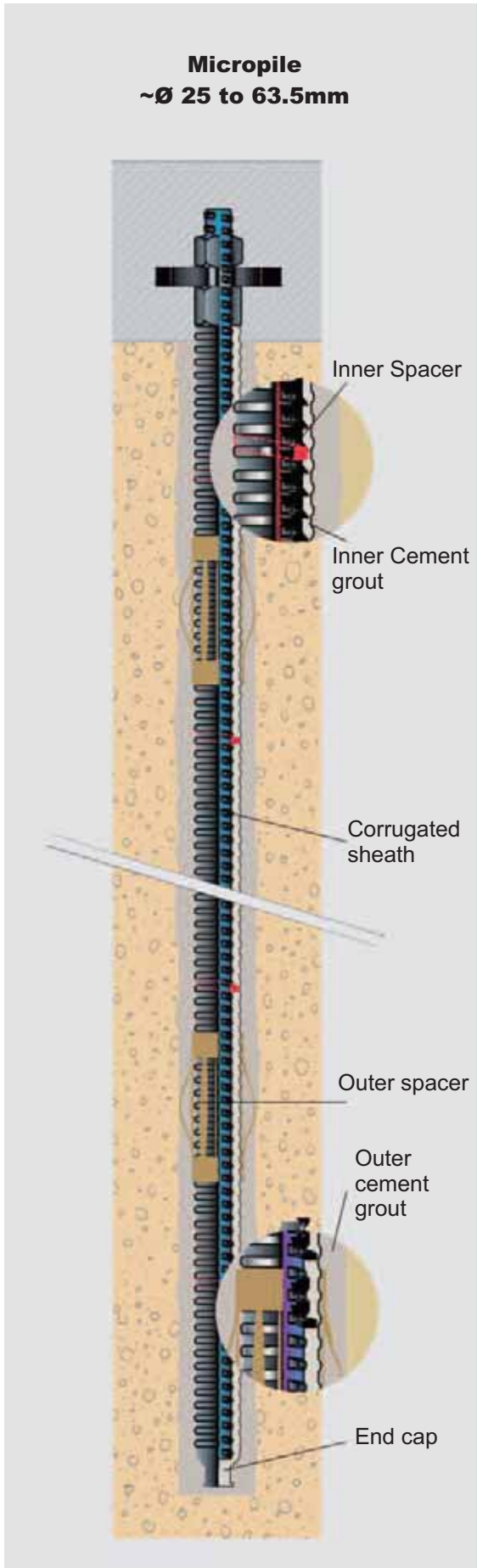
Expansion Shell



With/without
grout



GEOTECHNICAL SYSTEMS



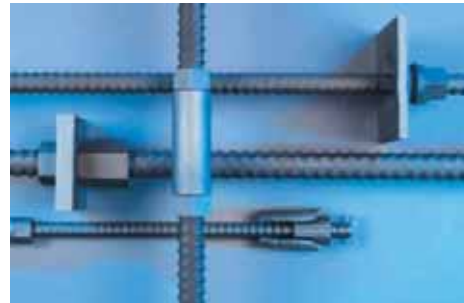
Tests carried out at the Federal Institute for Testing Materials and Research in Dübendorf/Zurich demonstrate the suitability of both types of bars.

Services of VSL

VSL are in a position to offer beyond the supply of micropiles, soil nails and rock bolts - the following services:

- Pre-design and consultancy services to Engineers and contractors
- Installation, grouting and supervision
- Rental or sale of equipment such as jacks, pumps, mixers and torque wrenches
- Execution of anchor and micropile tests

In addition to our unstressed VSL anchors, we also offer post-tensioned anchors according to Swiss code SIA V191, including electrically isolated anchors for permanent use. For these applications, we can supply adequate documentation. Anchors in accordance with other codes and specifications can also be supplied. We can undertake anchor load controls on anchors which have already been installed, even when the anchor head has no thread and the protruding length of the strand is not sufficient for normal retensioning.



Advantages

The robust coarse thread for both bar types means the system is very user friendly on site, components remain threadable despite the usual site conditions and the bar can be easily cut or coupled resulting from unforeseen changes on site. The bar has a very good bond behavior. The characteristics of the S670 bar are such that the diameters of the installed threadbar, when subjected to tension only, can be reduced by 1 unit and thus economical solutions both in materials and drilling can be achieved. For example, a Ø 32mm B500 bar has a working load of 250kN (according to the DIN Norm); the same working load can be achieved with a Ø 28mm S670bar. This is also valid for combined stresses if corresponding checks are carried out.

Quality Assurance

The production of both types of bars and system components is carried out according to ISO 9002.

GEOTECHNICAL SYSTEMS

B 500 / S 555 Bar characteristics									
Dimensions (mm)			Nominal Area (mm ²)	Nominal Mass (kg/m)	Nominal Tensile Strength / Load (MPa) kN		Nominal Proof Stress (Mpa)	Working Load Fd (Din 1045)	Minimum Elongation at max force %
d	dA	C							
12	14	7	113	0.89	550	62	500	32	6
14	16	7.5	154	1.21	550	85	500	44	6
16	19	8	201	1.58	550	110	500	57	6
20	23	10	314	2.47	550	175	500	91	6
25	29	12.5	491	3.85	550	270	500	140	6
28	32	14	616	4.83	550	340	500	177	6
32	36	16	804	6.31	550	440	500	231	6
40	45	20	1260	9.87	550	690	500	360	6
50	56	26	1960	15.40	550	1080	500	560	6
63.5	70	21	3167	24.86	700	2215	555	1006	5

Fd = F0.2k/1.75 (working load according to DIN 1045, Ed 1988)

S 670 Bar characteristics									
Dimensions (mm)			Nominal Area (mm ²)	Nominal Mass (kg/m)	Nominal Tensile Strength / Load (MPa) kN		Nominal Proof Stress (Mpa)	Proof Load Fyk (F0.2k)	Minimum Elongation at max force %
d	dA	C							
18	21	8	254	2.00	800	204	670	170	5
22	25	8	380	2.98	800	304	670	255	5
25	28	10	491	3.85	800	393	670	329	5
28	32	11	616	4.83	800	493	670	413	5
30	34	11	707	5.55	800	565	670	474	5
35	40	14	962	7.55	800	770	670	645	5
43	48	17	1452	11.40	800	1162	670	973	5
57.5	63	20	2597	20.38	800	2077	670	1740	5
63.5	70	21	3167	24.86	800	2534	670	2122	5
75	82	24	4418	34.68	800	3535	670	2960	5

MARINE TIE ROD SYSTEMS

The construction of heavy marine bulkhead for various docking facilities uses our TIE rod system. Docking facilities for barge, ship and offshore facilities have found the system to be cost effective.

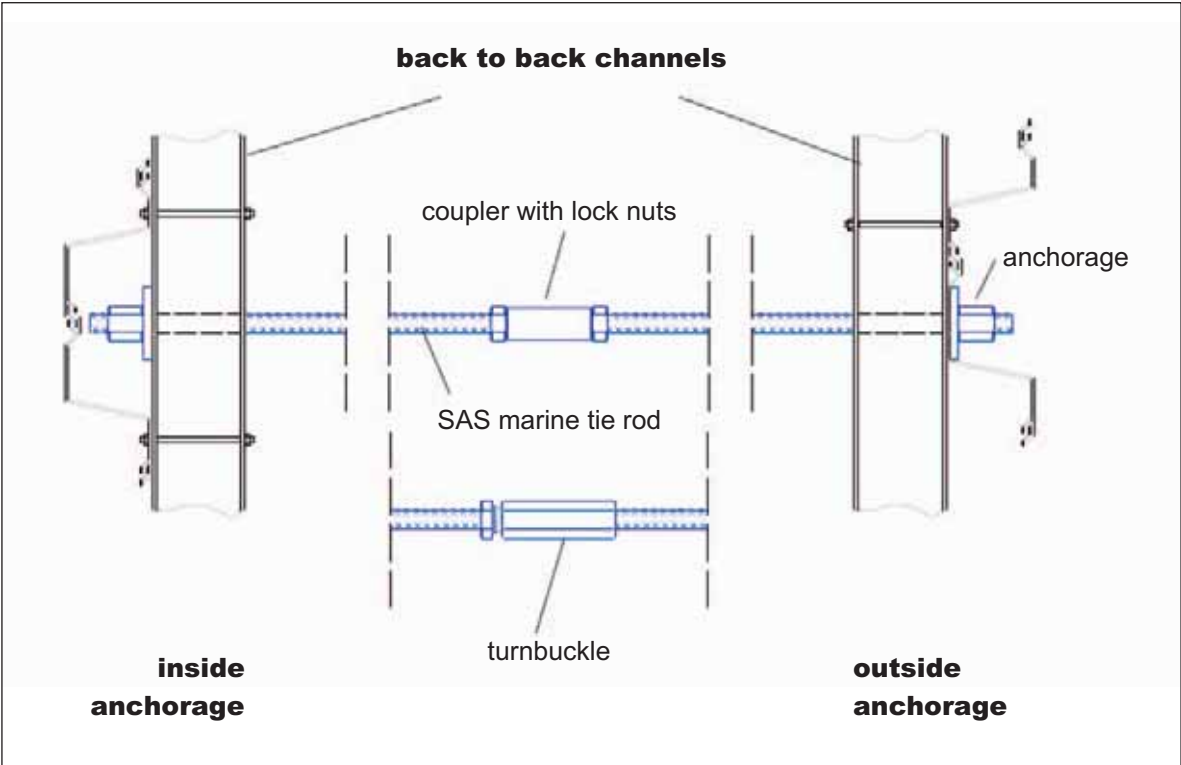
The continuous rolled on threads provide contractors much more flexibility during installation. The self cleaned and rugged threads eliminate the problems of acquiring dirt at various site locations. Longer thread bars help to accommodate or adjust for the minor misalignment occurs during sheet piling installation.

The higher strength to weight ratio together with the elimination of strength loss due to threading allow engineers to specify a more efficient product.

Tie Rods are available at grade B 500, S670, S1050 & S1035.



Marine works - Ras al kaimah port Phase 1, UAE



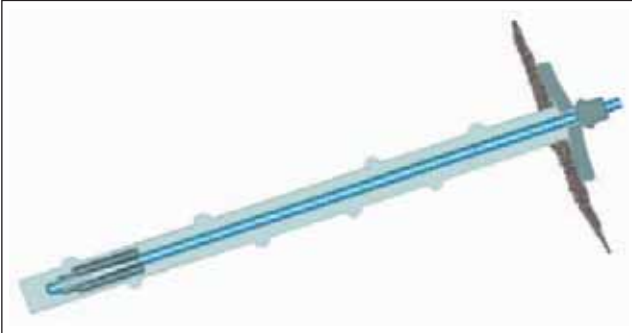
Sheet Pile Anchorage Details

MINING & TUNNELLING

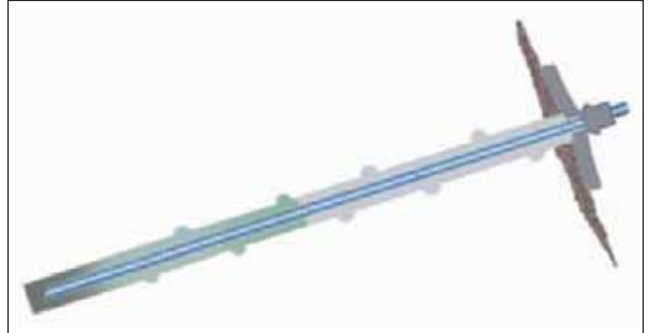
VSL-SAS thread bar systems B450 & S600 are used in Mining application and B500 & S670 are used in Tunneling applications, details are available in specific catalogues. The bars are prepared at ends with point tip, chisel tip or saw tip.

VSL-SAS systems available in different applications:

- Fully grouted anchors
- Resin anchors
- Expansion shell anchor



Expansion shell anchor



Resin anchor



Saw tip



Chisel tip



Point tip



Expansion shell bolt

- Shape of thread ribs make SAS thread bars resistant against rough handling
- Continuous thread profile guarantees good bonding characteristics between bolt and grout or resin interface
- High working capacity and elongation as well as high shear strength
- For mining applications only naturally hard SAS thread bars are allowed
- High working capacity due to high-ductile SAS thread bars: ratio $f_u/f_y = 1, 2 - 1, 5$
- New developed thread bar S 650 Ø 22 mm with higher charpy impact value of 27 Joule according to new drafted British Standard BS 7861

SOIL NAILS

Soil nails are used for stabilizing slopes and excavations. They find an efficient application in granular soils of medium to high density with sufficient internal friction, so that a good load transfer along the soil nail is possible, and only slight creep movements occur in the supported soil mass. The soil nails are installed as the excavation progresses from top to bottom.

VSL-SAS system is widely used for soil nails to reinforce existing ground.

Advantages of our system

- Can be used for temporary and permanent applications
- Simple components, easy to install and test
- Durable threads, allows splicing at any point along the length.
- High tensile and shear strength
- High ductility
- High bond strength
- Ability to accommodate structural and non structural face attachments



Cap d'Ail - Lou Clapas, France

Temporary nail

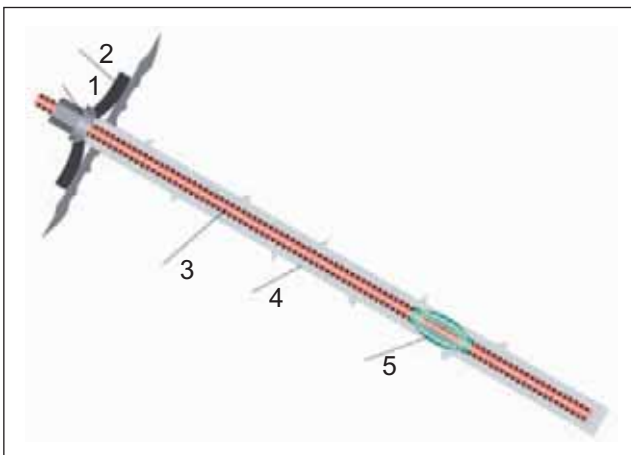
Single corrosion protection (SCP)
(service life ≤ 2 years)

1. Anchor nut
2. Domed or flat bearing plate
3. Thread bar
4. Cement grout
5. Spacer

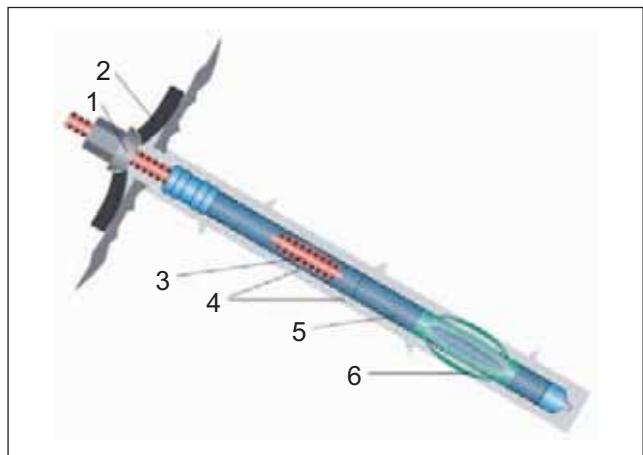
Permanent nail

Double corrosion protection (DCP)
(service life > 2 years)

1. Anchor nut
2. Domed or flat bearing plate
3. Thread bar
4. Cement grout
5. Corrugated sheathing
6. Spacer












Temporary nail



Permanent nail

THREAD BAR SYSTEMS

VSL Thread-Bars

yield stress / ultimate stress areas of application	nom.-Ø	yield load	ultimate load	cross section area	weight	elongation				
[N/mm ²]	[mm]	[kN]	[kN]	[mm ²]	[m/to]	[kg/m]	A _{gt} [%]	A ₁₀ [%]		
SAS 500 (BSt 500 S) / grade 75										
 B 500 / 550 reinforcing systems	12	57	62	113	1123,6	0,89	6	10		
	14	77	85	154	826,4	1,21				
 geotechnical systems	16	100	110	201	632,9	1,58				
	20	160	175	314	404,9	2,47				
	25	245	270	491	259,7	3,85				
	28	310	340	616	207,0	4,83				
	32	405	440	804	158,5	6,31				
	40	630	690	1260	101,3	9,87				
 S 555 / 700 / grade 80	50	980	1080	1960	64,9	15,40			5	
	63,5	1760	2215	3167	40,2	24,86				
<i>alternative SAS 550 (BSt 550 S) grade 75 available</i>										
SAS 450 / grade 60										
 S 450 / 700 mining	16	93	145	207	617,3	1,62		15		
	25	220	345	491	259,7	3,85		(A ₅)		
SAS 650 / grade 90										
 S 650 / 800 mining	22	247	304	380	335,6	2,98		18		
	25	319	393	491	259,7	3,85		(A ₅)		
	28	400	493	616	207,0	4,83				
	30	460	565	707	180,2	5,55				
SAS 670 / grade 97										
 S 670 / 800 geotechnical systems	18	170	204	254	500,0	2,00	5	10		
	22	255	304	380	335,6	2,98				
	25	329	393	491	259,7	3,85				
 tunneling / mining	28	413	493	616	207,0	4,83				
	30	474	565	707	180,2	5,55				
	35	645	770	962	132,5	7,55				
	43	973	1162	1452	87,7	11,40				
	57,5	1740	2077	2597	49,1	20,38				
63,5	2122	2534	3167	40,2	24,86					
75	2960	3535	4418	28,8	34,68					
SAS 950 / 1050 / grade 150										
 Y 950 / 1050 post-tensioning systems	18	230	255	241	510,2	1,96	5	7		
	26,5	525	580	551	223,2	4,48				
	32	760	845	804	153,1	6,53				
	36	960	1070	1020	120,9	8,27				
	40	1190	1320	1257	97,9	10,21				
Y 950 / 1050	47	1650	1820	1735	70,9	14,10	5	7		
Y 835 / 1035	57	2155	2671	2581	47,7	20,95	4	7		
	65	2780	3447	3331	36,9	27,10				
	75	3690	4572	4418	27,9	35,90				
CT 1080										
930 / 1080 post-tensioning systems	26	495	575	531	227,3	4,40	3,5			
	29	615	715	661	183,8	5,44				
	32	750	870	804	151,7	6,59				
835 / 1030	38	850	1050	1018	127,2	7,86				
	40	1050	1295	1257	102,9	9,72				
810 / 1000	56	1995	2460	2463	51,7	19,33				
	75	3580	4418	4418	28,8	34,68				
SAS 900 / 1100 – Type FA / grade 160										
 Y 900 / 1100 – Type FA formwork ties <i>weldable</i>	15	159	195	177	694,4	1,44			3	7
	20	283	345	314	390,6	2,56				
Type E	26,5	461	568	551	223,2	4,48	4	7		
SAS 850 / cold rolled grade 120										
 S 850 – Type FS formwork ties <i>weldable</i>	15	140	170	191	666,7	1,50	10	(A ₅)		
	20	245	280	331	384,6	2,60				
	26,5	385	490	586	217,4	4,60				
MT 600										
460 / 620 architectural	30	309	416	707	180,2	5,55	16	(A ₅)		
	36	441	595	1018	125,2	7,99				
	45	701	945	1590	80,1	12,48				
	60	1235	1665	2827	45,1	22,19				

accessories for all dimensions and applications available

THREAD BAR SYSTEMS

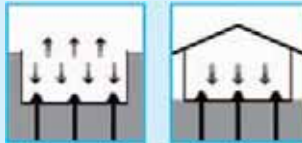


**For details information
on accessories, refer to
individual catalogues.**



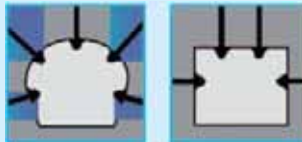
Bar Anchors / Soil Nails

Securing of slopes and embankments
High efficiency for permanent and temporary applications



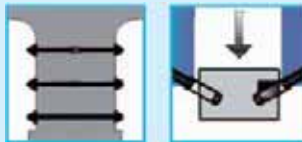
Micropiles

Securing of up-lift forces (tension) and foundations (compression) as well as alternating loads
Securing dams, high rise buildings and other constructions in seismic areas



Rock Bolts

Securing of rock walls
Tunnels and caverns
Mesh fixing
Avalanche protection



Other Applications

Tension members
Suspension masts
Foundations
Repair & strengthening



VSL LOCATIONS

Americas

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