VSL GC ANCHORAGE TECHNOLOGY

GC ANCHORAGES

Technical Data
Characteristics
Applications

VSL'S LATEST FOR POST-TENSIONING

Light components for easy handling and installation

Meets ETAG with proven materials

PT-PLUS ® duct system for enhanced corrosion protection

VSL has developed a new anchorage designed to satisfy the increasing expectations of the construction industry. The VSL GC type anchorage is an evolution optimizing new requirements with well proven materials while maximizing cost effectiveness.

The result is:
– lighter components
– ease of handling and placing
– fatigue resistance according to international guidelines and standards

The challenge for the VSL R&D Department was to further develop the EC and SC anchorage systems and to enhance the market friendliness. VSL has a long tradition in developing post-tensioning: revolutionary in 1966 as the first with strands, later on, in 1974 and 1992 with the introduction of casting (EC) and composite material (CS), and finally today with the GC System.

The GC consists of standardized anchorage units using up to thirty-seven 15 mm (0.6") diameter strands and can be used with both steel or plastic PT-PLUS® ducts. Equipped with an additional retainer plate, the GC anchorage can also be used as a dead-end anchorage. It can be used for couplers and external cables.

The VSL GC System is compatible with ETAG (European Technical Approval Guidelines) and other state approval requirements. It has also been tested at cryogenic temperatures for its use in LNG/LPG tanks.

Fixing of casting at recess former

Installed anchorage type GC 6-27

Technical data and characteristics

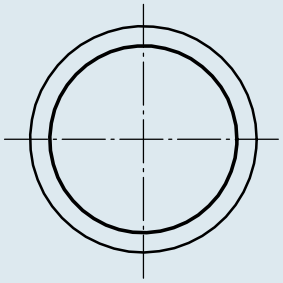
Strand properties

Strand type		15 mm (0.6")	
		prEN 10138 – 3 (2006) Y1770S7 / Y1860S7	ASTM A 416-06 Grade 270
Nominal diameter d	(mm)	15.7	15.2
Nominal cross section Ap	(mm^2)	150	140
Nominal mass M	(kg/m)	1.17	1.10
Nominal yield strength fp0,1k	(MPa)	1560 / 1640[1)]	1676[2)]
Nominal tensile strength fpk	(MPa)	1770 / 1860	1860
Nominal breaking load Fpk	(kN)	265.5 / 279	260.7
Young's modulus	(GPa)	approx. 195	
Relaxation[3)] after 1000 h at 20 °C and 0.7 x Fpk	(%)	max. 2.5	

1) Characteristic value measured at 0.1 % permanent extension
2) Minimum load at 1 % extension for low-relaxation strand
3) Valid for relaxation class acc. to prEN 10138-3, or low-relaxation grade acc. to ASTM A 416-06

Duct dimensions

Duct diameter for steel and PT-PLUS® duct



Inside duct diameter: d
Outside diameter: D

Tendon unit 0.6"	Steel duct[1)] minimum (mm) d/D	PT-PLUS®[2)] plastic duct (mm) d/D
6-3	40/45	-
6-4	45/50	-
6-7	55/62	58/63
6-12	75/82	76/81
6-19	90/97	100/106
6-22	100/107	100/106
6-27	110/117	115/121
6-31	120/127	130/136
6-37	130/137	130/136

1) The dimensions given are according our ETAG documents. Bigger diameters are possible
2) VSL PT-PLUS® ducts for 3 and 4 strands are not available
3) Dimensions are subject to modification

Duct spacing and cover

Standard steel duct

In determining minimum spacings and concrete cover requirements, reference should be made to applicable standards and recommendations.

PT-PLUS® plastic duct with protection shell

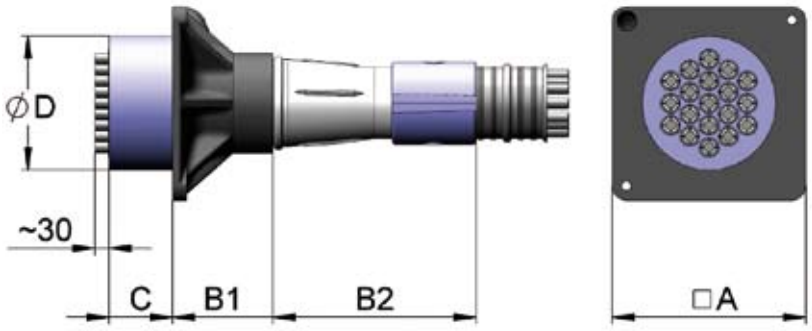
VSL Protection Shells are recommended to be fixed on the duct at tendon supports for tendon radii $R \leq 2\ R_{min}$ (see next page).

PT-PLUS® duct coupler
– Half-shell
– Clamp

Technical data and characteristics

Stressing anchorage VSL type GC

Grout and local zone reinforcement are not shown. Spirals and/or rectangular stirrups are, however, required to control local zone stresses. Please contact the nearest VSL representative.



Main data

Tendon unit 0.6“	Dimensions 0.6“				
	A	B1	B2	C	D
6-3	130	120	-*	50	95
6-4	140	120	-*	55	110
6-7	180	135	-*	60	135
6-12	230	220	-*	75	170
6-19	290	150	300	95	200
6-22	325	150	490	100	220
6-27	350	170	450	110	240
6-31	375	170	410	120	260
6-37	410	170	600	135	280

Dimensions in mm

Subject to modification

* These castings have no trumpet

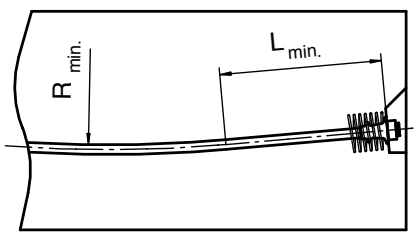
Max. prestressing force may be applied when concrete reaches 80% of its nominal strength. Max. prestressing force is 75% of min. tendon breaking load (temporary overstressing to 80%).
Where PT-PLUS® plastic ducts are used the trumpets for the GC have short, profiled extensions for PT-PLUS® coupling.

Friction

The following values may be assumed when using the equation $P_x = P_0 \cdot e^{-\mu(\alpha + \Delta\phi x)}$

	Range	Recommended value
Steel duct	$\mu = 0.16$ to 0.20 $\Delta\phi = 0.004$ to 0.008 m^{-1}	$\mu = 0.18$ $\Delta\phi = 0.006$ m^{-1}
PT-PLUS® plastic duct	$\mu = 0.10$ to 0.14 $\Delta\phi = 0.005$ to 0.012 m^{-1}	$\mu = 0.14$ $\Delta\phi = 0.007$ m^{-1}

Minimum radius of tendon curvature and minimum tangent length



$R_{min} = 3 \times \sqrt{F_{pk}\{MN\}} \geq 2.5m$

$L_{min} = 0.8m$ for $F_{pk} \leq 2MN$
$= 1.0m$ for $F_{pk} \geq 2MN$
$\leq 7MN$
$= 1.5m$ for $F_{pk} \geq 7MN$

LNG Tank – Shanghai, PR China (2007-2009)

Suvarnabhumi Airport – Bangkok, Thailand (2008)

The GC anchorage system has gained worldwide acceptance for many projects. In addition to its ease of handlings, customers particularly appreciate its compatibility with international standards and guidelines.

LNG Tank – Fujian, PR China (2007)

Flyover Palembang – South Sumatra, Indonesia (2008)

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