



HCL

CLAMPING SOLUTIONS



HCL
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HCL

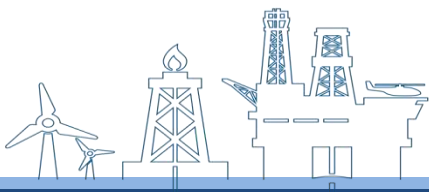
CLAMPING SOLUTIONS

Presentación Productos HCL Smart®

Steven Pearce. *IEng, MIMechE*

Export Sales Manager

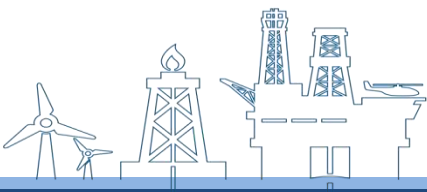




Base en UK



Manufactura Automatizada





Clientes alrededor del mundo



saipem



subsea 7





Clientes alrededor del mundo





Smart® Products



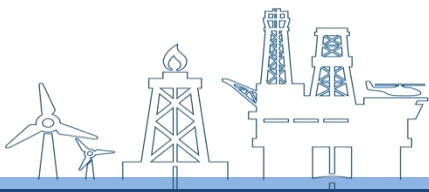
Compuesto Premium sistemas de hebilla y banda basados en polímeros diseñados específicamente para soluciones de sujeción submarina.





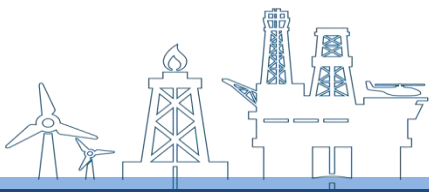
Smart® Tie





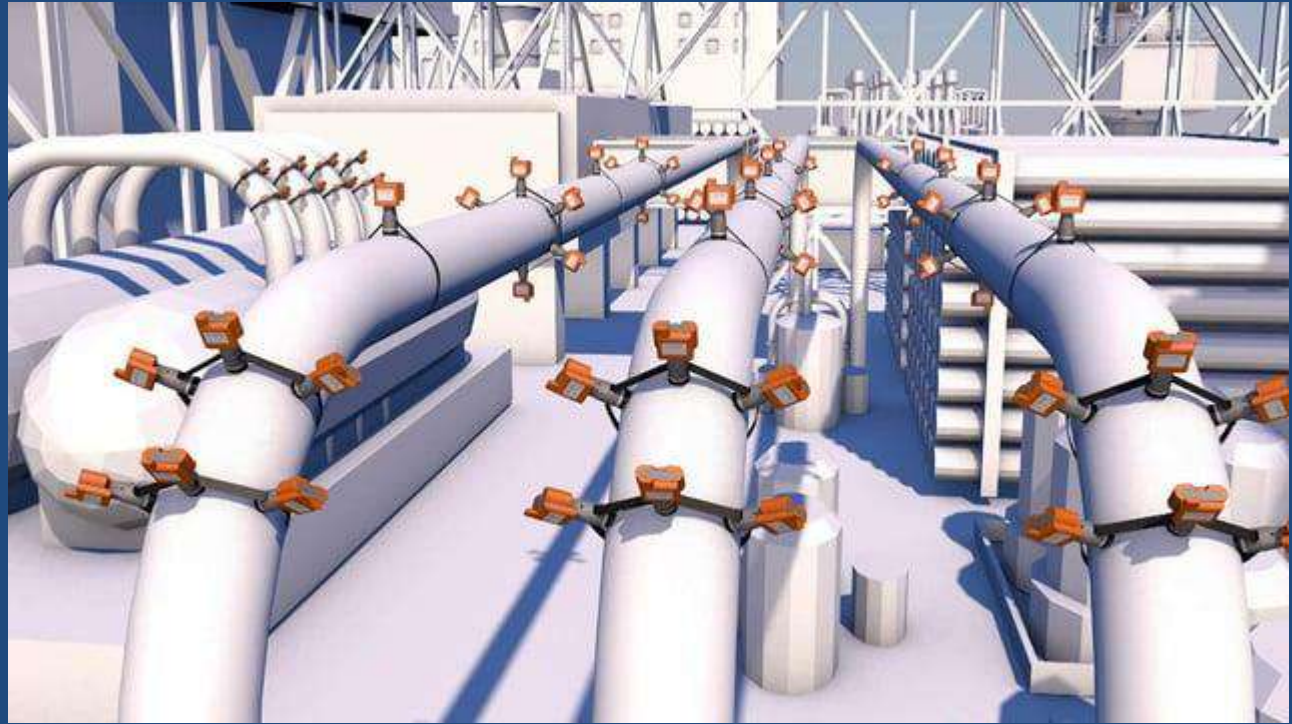
Sensor Adjunto





Sensor Adjunto

- Velocidad para adaptarse
- Sensores multiples – solo 1 banda.
- EX seguro.



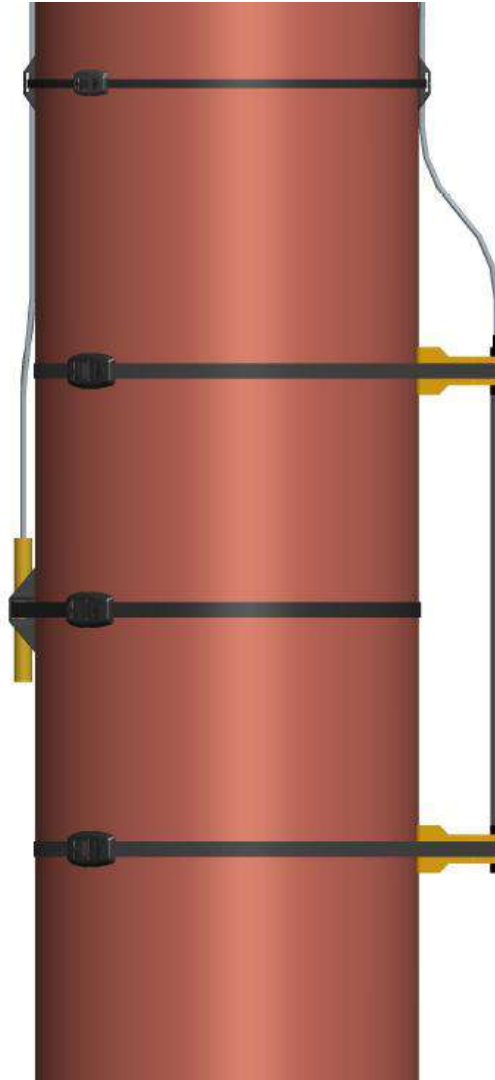


Smart[®] Band Hybrid





- Sin penetración de recubrimiento existente
- No require buzos de alto nivel
- No require Planta de Poder
- Se ajustará a cualquier pilote irregular
- Ligero & fácil de Movilizar
- No requiere soldadura



Corrosion Marina

Instalación ICCP

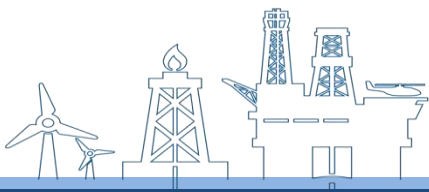




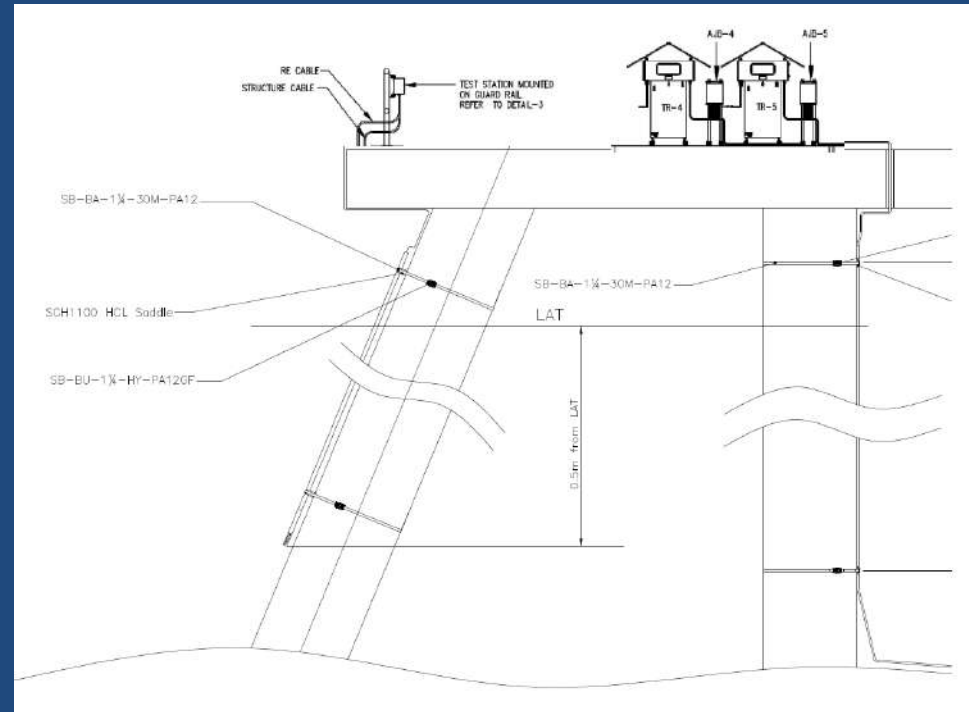
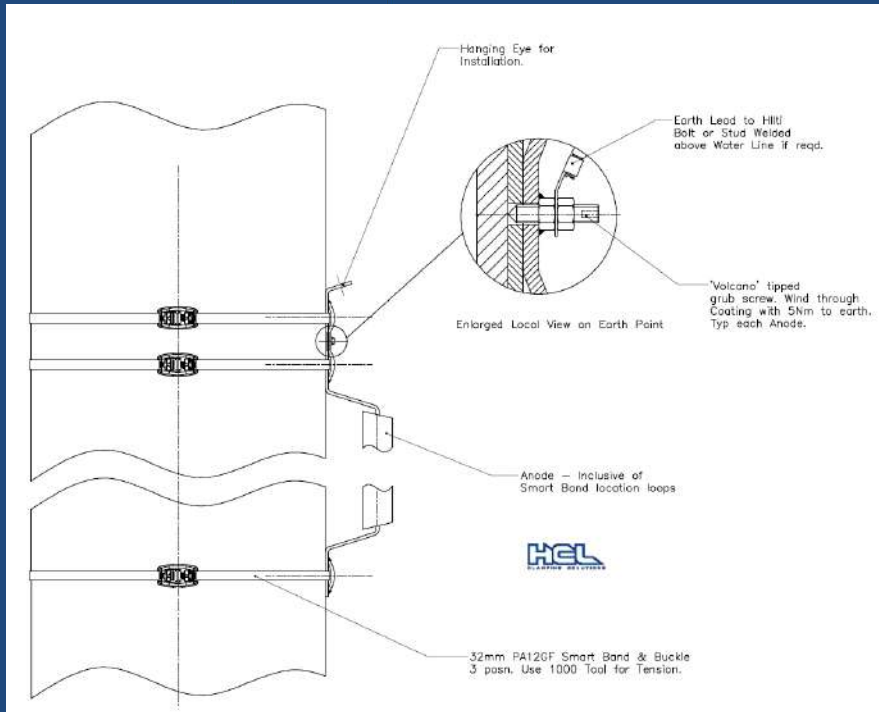
Corrosion Marina

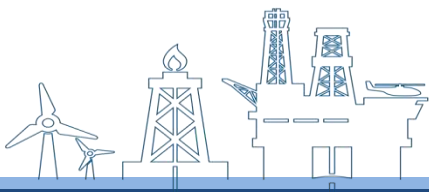
Instalaciones de Sacrificio



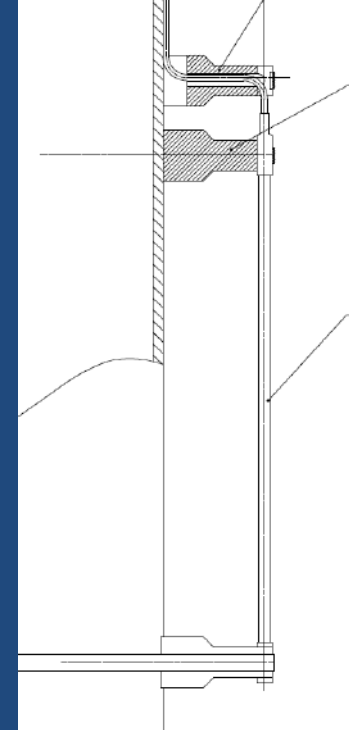
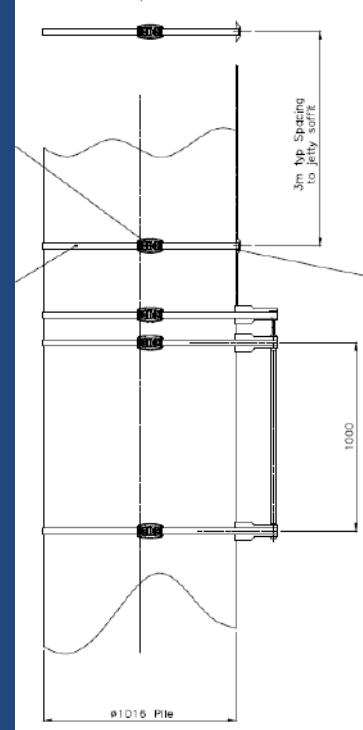
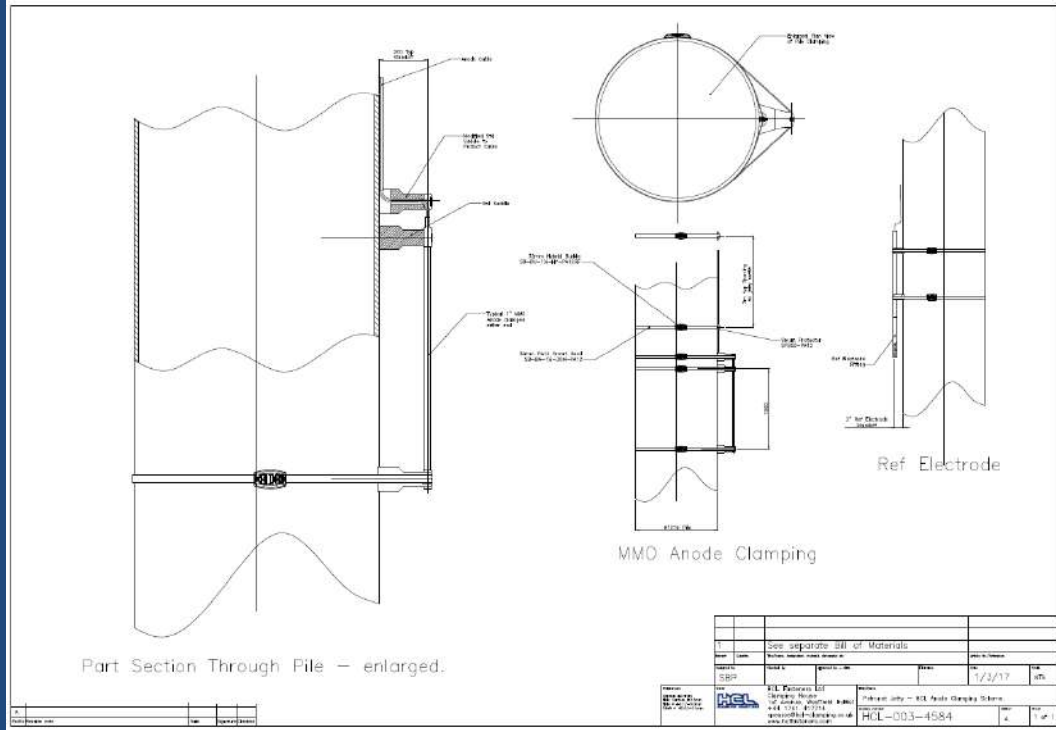


Diseño & Ingeniería

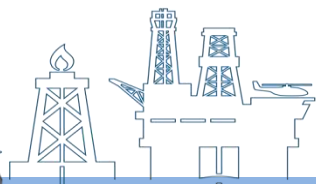


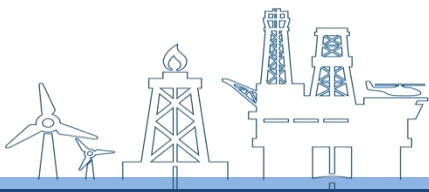


Diseño & Ingeniería



Corrosion Marina





- Funda siempre se ajusta al Pilote
- Instalación fácil c/cero visibilidad
- 100% no-metalico
- Tension constant del arco
- Sin contracción/estiramiento de la funda
- Herramientas de instalación de bajo costo
- Evita puntos calientes de corrosion en grietas



Corrosion Marina

Accesorio funda Protectora usando Smart® Band



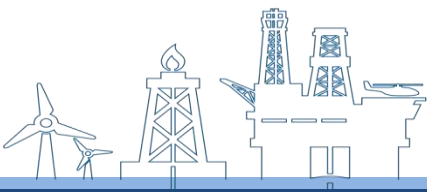


Especificaciones montaje Series 100.



Método
completo
disponible en
HCL.



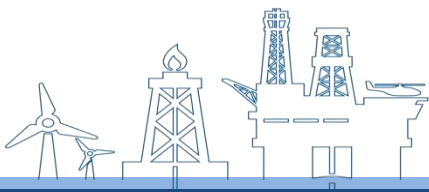


Historia de casos Series 100.

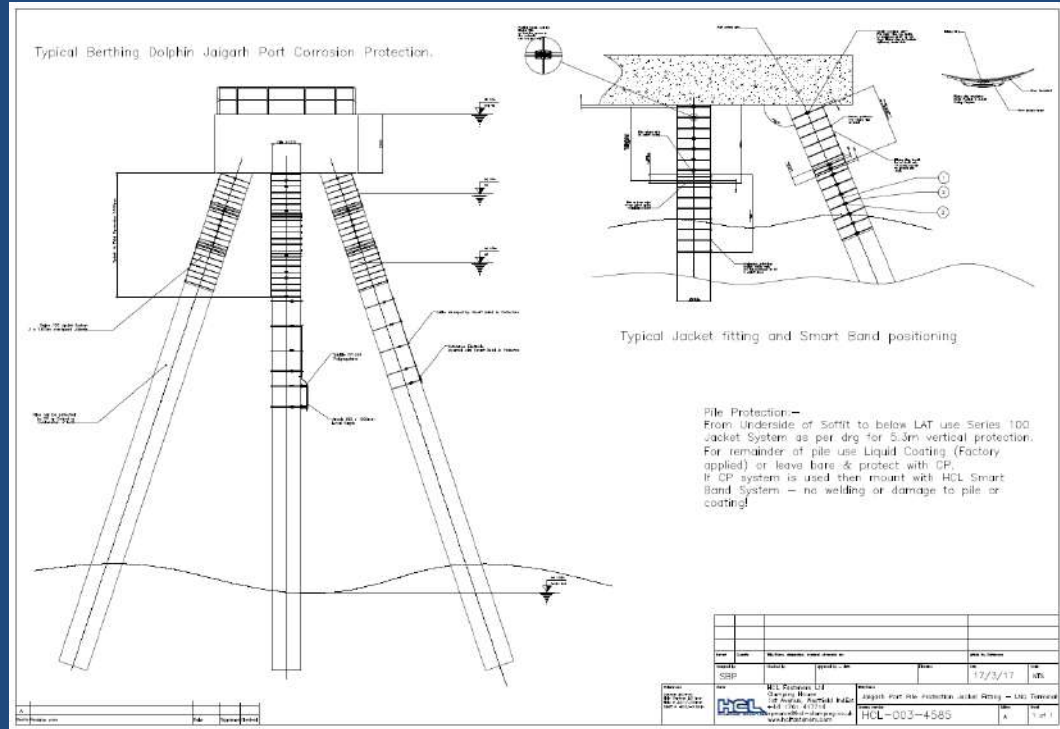
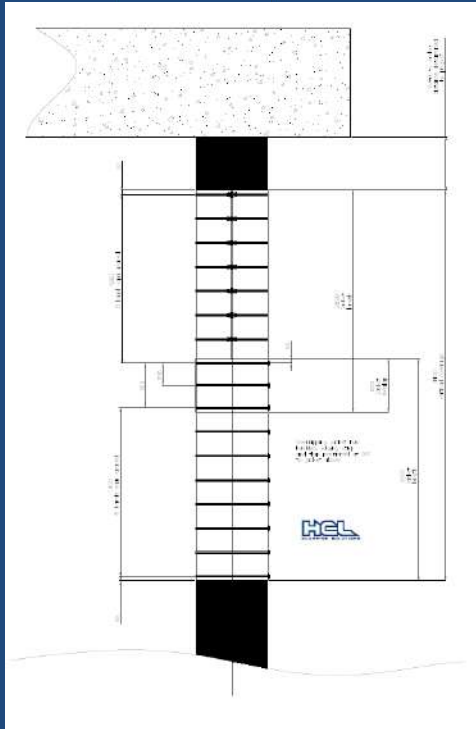


Proyecto:-
Puerto
Brisbane,
Australia.





Diseño & Ingeniería





Smart® Band Compacta



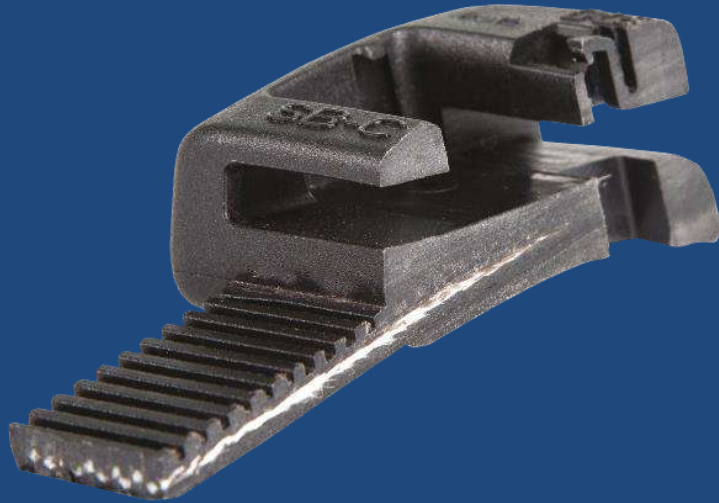


Smart® Band Compacto (centro) comparación.





Smart® Band Compacto





Correa compensadora Smart® Band

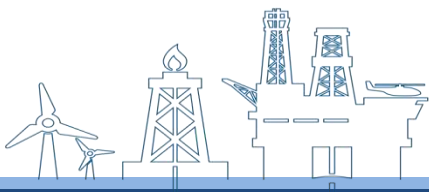
Desarrollo conjunto con proveedor extranjero líder.





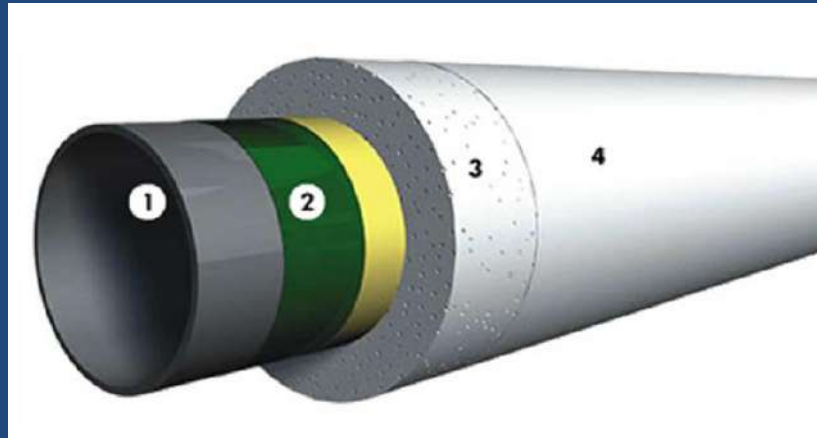
Correa compensadora Smart® Band

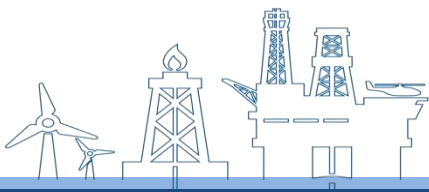




Correa compensadora Smart® Band

- Aguas Ultra Profundas
- 5 LSPP (Syntatic polypropylene) & C25 Silicon
- Compensa hasta 10% de contracción hidrostática.



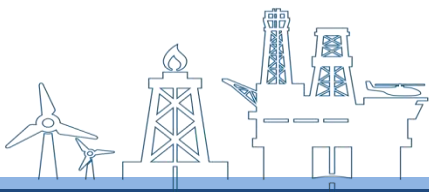


Correa compensadora Smart® Band

Proyecto Kaombo.

- Inicial $\text{Ø}660.1\text{mm}$, Final $\text{Ø}648.5\text{mm}$





Abrazaderas





Abrazaderas





Protectores Smart®





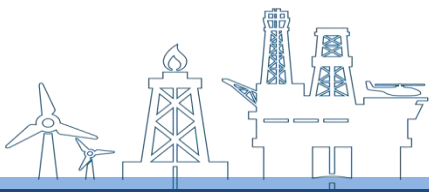
Tirante y Protectores Smart®



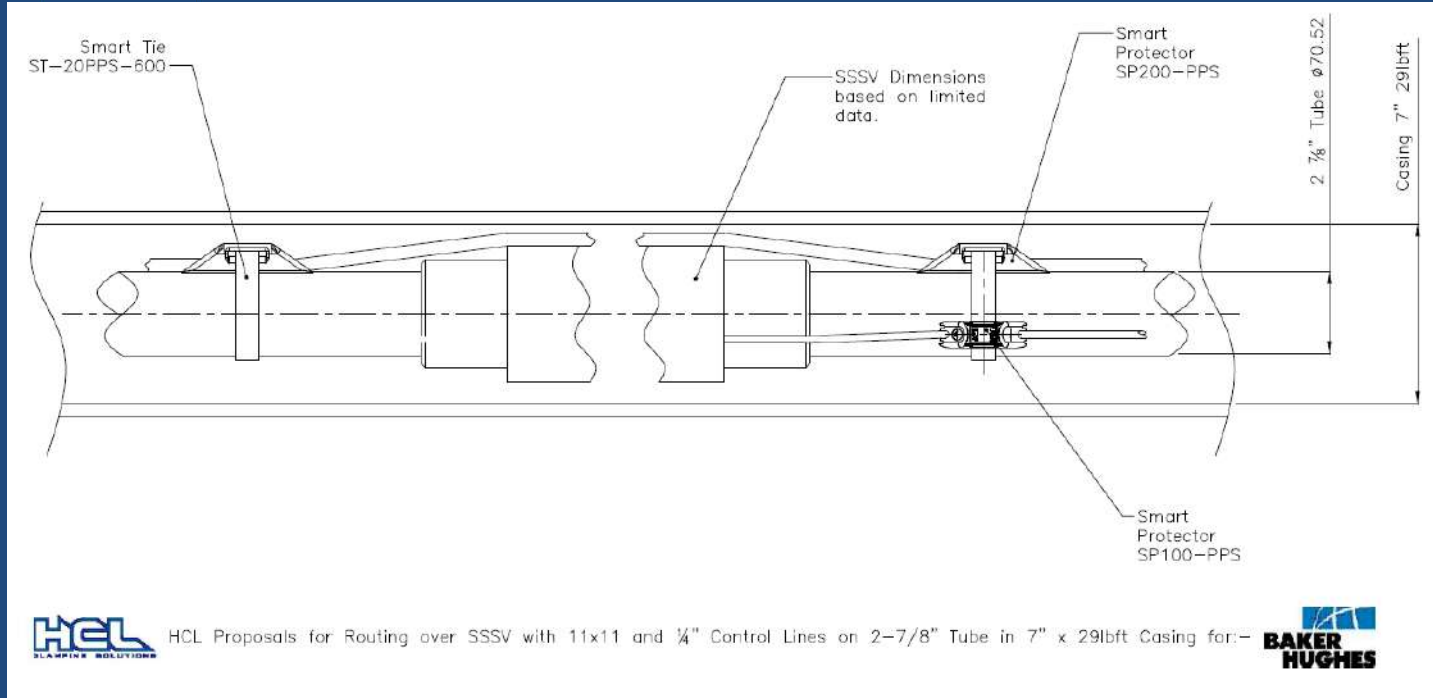


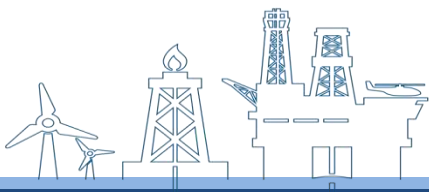
Hoyos Subterráneos



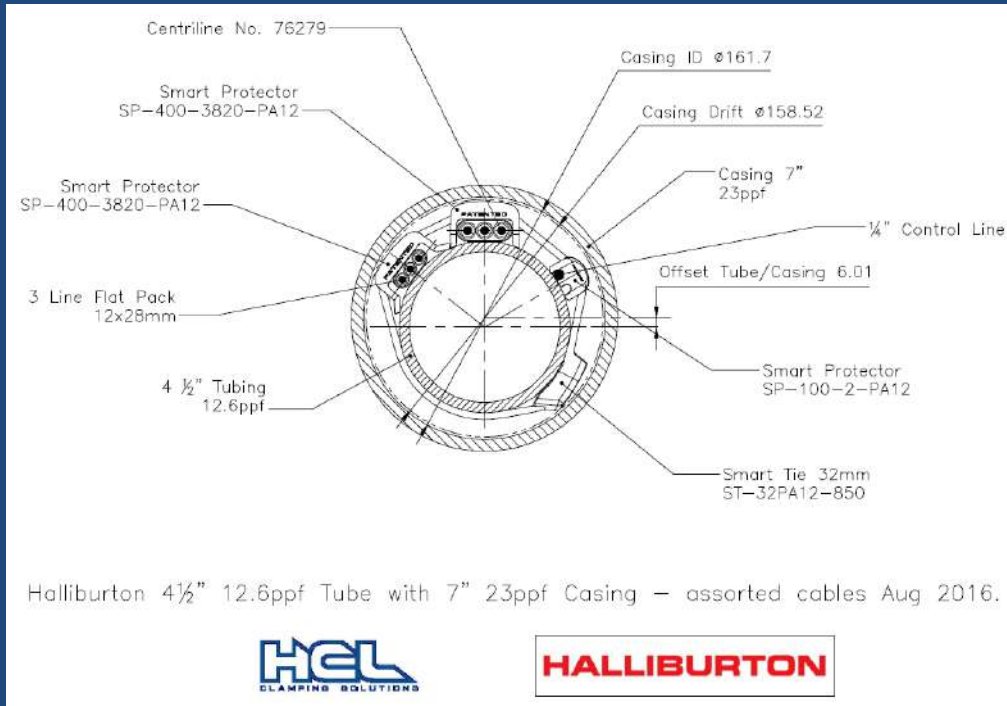


Servicios Técnicos





Servicios Técnicos



Herramientas de Instalación





SM-FT-1000 Herramienta Instalación



1000 series herramienta manual.

Control de llave de Torque





SM-FT-2000 Herramienta Instalación



2000 series
herramienta manual



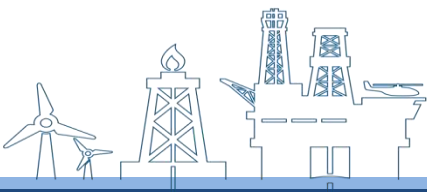


SM-FT-3000 Herramienta Instalación



3000 series - herramienta
montaje neumática





2000 Herramienta en Oman



3000 Herramienta en Colombia





Beneficio Productos HCL

- No Corrosivo
- Alta Resistencia
- Alta Retención
- Larga Vida
- Resistancia a la Compresión Hidrostática
- Seguros
- Rápido para ajustar
- Económico
- Tiempos de entrega cortos



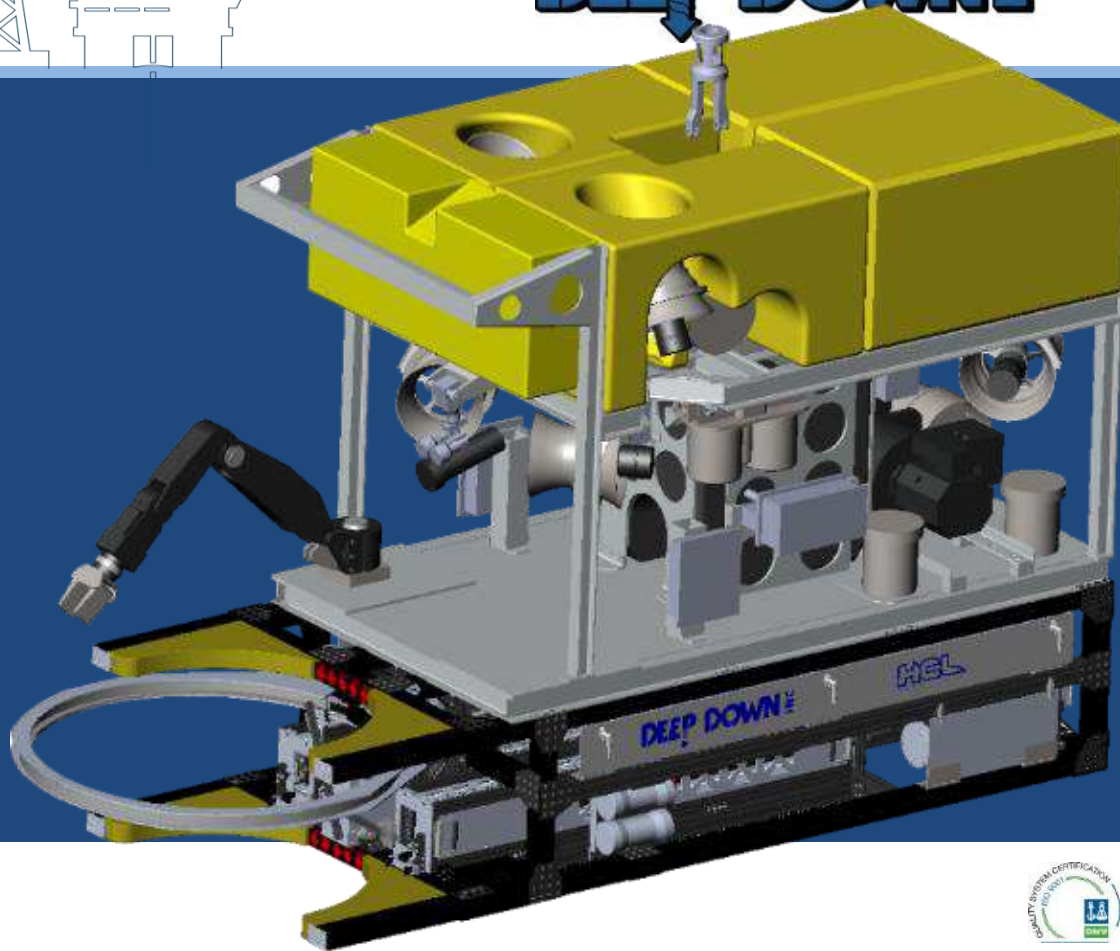
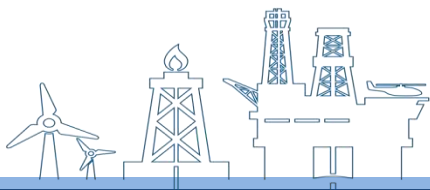


Costa afuera, Submarino y Marino



DEEP DOWN[®]

Asociaciones



HCL
CLAMPING SOLUTIONS

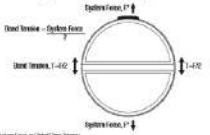


Datos Técnicos

5] Tensile Strength

5.1] System Tensile Tests - Introduction

System tensile testing of Smart™ Tie and Smart™ Band is carried out in vertical or horizontal. It involves testing the strength of the tie or band under static or dynamic loads. The test results are used to determine the tensile strength of the system. The test results are used to determine the tensile strength of the system. The test results are used to determine the tensile strength of the system.



1. Ignored case in standard test series
Note: In the case of a tie or band, the tensile force is applied across the width of the tie or band. The test results are used to determine the tensile strength of the system.

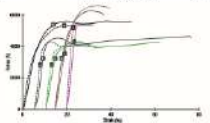
5.1.1] System Tie Diameter and Circumference Table

Tie Diameter	Tie Circumference
100 (3.94)	314 (12.32)
125 (4.92)	392 (15.43)
150 (5.91)	471 (18.54)
175 (6.89)	550 (21.65)
200 (7.87)	628 (24.76)
225 (8.86)	707 (27.87)

5.2] Smart™ Tie System Tensile Tests

5.2.1] Smart™ Tie System (10") System Tensile Test

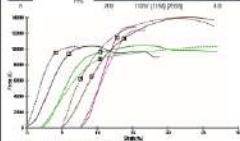
Line No.	Band Size	Material	Tie Diameter	System Tensile Strength	Circumferential Pull (kN)
1	100	FRP	100	4800 (1078.11)	118
2	100	FRP	100	4800 (1078.11)	118
3	100	FRP	100	4800 (1078.11)	118
4	100	FRP	100	4800 (1078.11)	118
5	100	FRP	100	4800 (1078.11)	118
6	100	FRP	100	4800 (1078.11)	118
7	100	FRP	100	4800 (1078.11)	118
8	100	FRP	100	4800 (1078.11)	118
9	100	FRP	100	4800 (1078.11)	118
10	100	FRP	100	4800 (1078.11)	118



Note: Circumferential pull is 7% below the tie.

5.2.2] Smart™ Tie System (12") System Tensile Test

Line No.	Band Size	Material	Tie Diameter	System Tensile Strength	Circumferential Pull (kN)
1	100	FRP	100	5000 (1122.02)	122
2	100	FRP	100	5000 (1122.02)	122
3	100	FRP	100	5000 (1122.02)	122
4	100	FRP	100	5000 (1122.02)	122
5	100	FRP	100	5000 (1122.02)	122
6	100	FRP	100	5000 (1122.02)	122
7	100	FRP	100	5000 (1122.02)	122
8	100	FRP	100	5000 (1122.02)	122
9	100	FRP	100	5000 (1122.02)	122
10	100	FRP	100	5000 (1122.02)	122



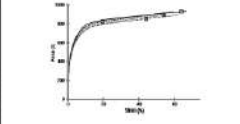
Note: Circumferential pull is 7% below the tie.

5.3] Smart™ Band System Tensile Tests - Standard Buckle

5.3.1] Smart™ Band System (12") Standard - FRP

Note: The figure shows the test results for the standard buckle. The figure shows the test results for the standard buckle.

Line No.	Band Size	Material	Tie Diameter	System Tensile Strength	Circumferential Pull (kN)
1	100	FRP	100	4800 (1078.11)	118
2	100	FRP	100	4800 (1078.11)	118
3	100	FRP	100	4800 (1078.11)	118
4	100	FRP	100	4800 (1078.11)	118
5	100	FRP	100	4800 (1078.11)	118
6	100	FRP	100	4800 (1078.11)	118
7	100	FRP	100	4800 (1078.11)	118
8	100	FRP	100	4800 (1078.11)	118
9	100	FRP	100	4800 (1078.11)	118
10	100	FRP	100	4800 (1078.11)	118

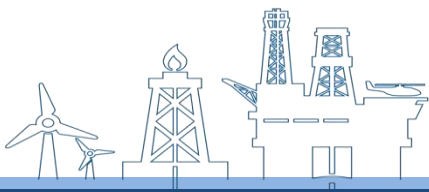


Note: Circumferential pull is 7% below the tie.



Sección 5] Resistencia a la Tracción

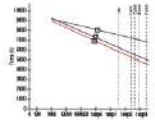




Datos Técnicos

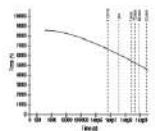
6.1.1] Snap Ring 25mm (1 1/8") Height Spacers in Air

Note: The Snap Ring 25mm height spacers in Air and spacers in Water demonstrate that stress is transferred to the cable during the tightening process by stretching the 101.17000 cable to the specified target setting. To further illustrate this, a constant position (1.8mm) and the load force is recorded over 100 days. The cable stretching continues to happen over the 100 days and over the lifetime of the product.



6.1.2] Snap Ring 25mm (1 1/8") Height Spacers in Water

Note: The Snap Ring 25mm height spacers in Water and spacers in Air demonstrate that stress is transferred to the cable during the tightening process by stretching the 101.17000 cable to the specified target setting. To further illustrate this, a constant position (1.8mm) and the load force is recorded over 100 days. The cable stretching continues to happen over the 100 days and over the lifetime of the product in water.



It should be noted that moisture uptake by the 101.2 material accelerates the rate of stress relaxation during the first 6 weeks of loading (this period not shown in the graph).



7] Axial Retention

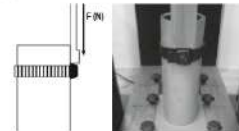
Axial Retention is an important consideration when clamping cables to down-hole pipes. The clamping retention of the cable must be large enough to cope with two aspects of the installation:

1. The weight of the cable
2. The impact resistance when design and joints are an occurrence. Open end installations need very careful consideration to the force measurement. Force may vary from a high force to a low force and oscillates.

7.1] Banded Axial Retention

The following jig setup on a tensile testing machine was used to measure the axial retention for Snap Ring and Snap Ring products. The tests include a compression and a axial ring.

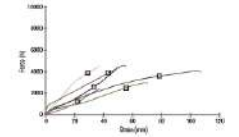
Test per ISO 2013
Load Speed: 0.05mm/min
Steel Axle (Surface Finish: Serial Standard Field), G4 also TREAT 40 (37) (to stress direction)



7.1.1] Snap Ring 20mm (3/4") Axial Retention

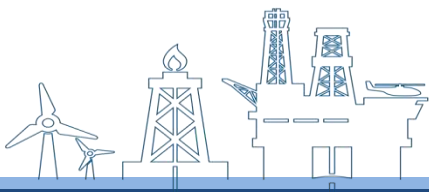
LN	Part No.	Material	Size (mm)	Quantity	Material	Material	Material
1	FR01				Steel	Steel	Steel
2	Snap Ring 20mm (3/4")	FR01			Steel	Steel	Steel
3	Snap Ring 20mm (3/4")	FR01			Steel	Steel	Steel
4	FR01				Steel	Steel	Steel
5	FR01				Steel	Steel	Steel
6	FR01				Steel	Steel	Steel

Note: Axial Retention values with their confidence and actual values of test application.



Sección 6.1.5] Relajación de estrés en agua





Datos Técnicos

8) Hailer Testing

Hailer testing is conducted on equipment that replicates the action of the rollers (dependent on the "C" or "S" application).

A test pipe filled with Smart® products is passed under rollers that have been built to apply a controlled force to the pipe and associated Smart® products.



Roll Type — 40220mm including a 3.17mm coating.

Rollers — 4042mm including a 1.78mm coating (303 Stainless Steel) with a thickness of 18mm thick.

A vertical force of up to 1500 Newton is applied through the rollers.

The pipe is rotated forward and back under the rollers.

Product	Loading		
	Roll	Roller Pressure	Roller Speed
Smart® 100T Band	5000	75	1/2000
Smart® 100T Protector Band	5000	75	1/2000
Smart® 100T Hybrid Band	5000	75	1/2000
Smart® 100T Smart® Band	5000	75	1/2000

Note: Minimum product is 10mm width to be able to handle the hailer roller system using a 10mm roller.

9) Impact Strength

Impact strength is of particular interest in the use of HCL Smart® products.

Whether in a horizontal, vertical or a bonding application there is a good chance that Smart® products will encounter considerable impact at times.

The following table is derived from various tests involving strength of various weight items to be used in HCL.

The standard energy equation — Energy (Joules) — is applied where:

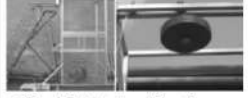
m = Mass (kg) g = Gravity 9.81 (m/s²) h = Height (m)

9.1) Smart® Band Impact Strength

The weight is adjusted accordingly to set the correct impact energy but the Standard Impact units of the weight is always 1000mm (4 inches) in diameter.

Smart® Equipment	Material	Maximum Impact Energy (Joules)	Level of Injury to a Worker
Smart® 100T Band	303 SS	10000+	None
Smart® 100T Protector Band	303 SS	10000+	None
Smart® 100T Hybrid Band	303 SS	10000+	None
Smart® 100T Smart® Band	303 SS	10000+	None
Smart® 100T Band	303 SS	10000+	None
Smart® 100T Protector Band	303 SS	10000+	None
Smart® 100T Hybrid Band	303 SS	10000+	None
Smart® 100T Smart® Band	303 SS	10000+	None

The actual maximum strength after repeated maximum energy tests is approximately 100% of the above values — 10000 Joules (J).



9.2) Smart® Protector Impact Strength

The impact force capability of the SP-100 or 100T Protector was being tested by impact testing using a 100mm diameter ball. The maximum height and weight of the assembly devices reflected the maximum impact energy load.



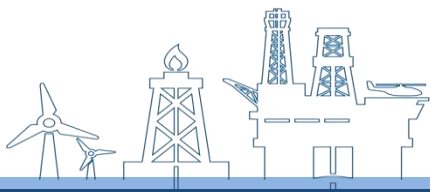
The impact testing was conducted using an impactor of a variable weight, dropping it from various heights. Flaps progressively reduce both factors until the Smart® Protector remains the intact. Note that the test is conducted using a 100mm diameter ball. The standard 100mm and 100mm diameter and constant weight such as an SSP could be used that would give it more impact strength if it is slower rate.

Ball Weight (kg)	Weight (kg)	Impact Energy (J)	Result
Ball 1	4.535	1.250	OK
Ball 2	2.268	0.625	OK
Ball 3	1.134	0.313	OK



Sección 8] Prueba Rodillo/Stinger 19 & 32mm Smart® Band Híbrido Carga en la banda 100T-70 ciclos sin rotura.





Datos Técnicos

11] Half Shell Minimum Bending Radius

Due to a dynamic environment, umbilicals and hoses are often subjected to significant bending. The best Minimum Bend Radius (MBR) is usually a function but to ensure absolute compliance and to get a good rocky back, they are often subjected to a much higher MBR.

Smart® Band has been well proven to stand an MBR of less than one meter for this type of application.

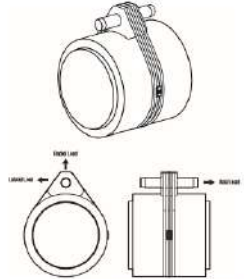


Photo courtesy of LockheedMiddletown
 15000psi Smart® Band (PVC) (SF, cleaned) on a 1m diameter Half Shell Test Machine (Steel Shell) at 0.5m Water depth @ 100m to 1000m. Found a resolution Lockheed West Coast of Argyle

11] Piggyback Pipe Lay

11.1] Smart® Band Piggyback Performance

The industry has been unable to define the performance of Smart® Band Straps (100% PVC) in wet conditions as used in a Piggyback Stack Pipe Lay application. During the tests a Piggyback Stack arrangement was tested with a 400mm diameter pipe. The added axial bending, the increase in weight of the saddle was considered negligible for the shorter pipe, for larger lengths, the system break strength was considered.



100 Barriers = Smart® Product Technical Back = Half Shell Minimum Bending Radius / Piggyback Pipe Lay / Hydrostatic Compression = Page 17

11.1.1] Smart® Lightning Fuses

Plastic Lightning Fuse Type	Min Pressure	Operation Indication
Smart® (100% PVC) - Smart® (PVC) (SF)	Min. 200 (20)	Red (20)
Smart® (100% PVC) - Smart® (PVC) (SF)	Min. 200 (20)	Red (20)
Smart® (100% PVC) - Smart® (PVC) (SF)	Min. 200 (20)	Red (20)

11.1.2] Smart® Resilient

Strap (100% PVC) Smart® Band	Strap (100% PVC) Smart® Band
Strap (100% PVC) Smart® Band	Strap (100% PVC) Smart® Band
Strap (100% PVC) Smart® Band	Strap (100% PVC) Smart® Band
Strap (100% PVC) Smart® Band	Strap (100% PVC) Smart® Band

Note: It should be noted that these tests were only carried out in the particular arrangements above and that the actual use of the test cells, as piggyback arrangements may vary significantly in practice. For further test information please contact HCL.

12] Hydrostatic Compression

In deep water applications, hydrostatic compression is a factor that needs to be taken into account when objects are submerged. In applications such as drilling, seabed production and lay-up, the high pressures in deep water have a crushing effect on the material causing the overall diameter to reduce. The elongation (strain) results in the ability to lay-up the material in diameter to give results not achievable in the object being lifted.

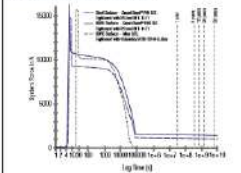
Smart® Band is tested to cope with hydrostatic compression when compared with traditional steel strapping under the influence of its lower elongation. Elongation is higher under tension from steel and so compression quickly as compression takes place.

12.1] Typical Hydrostatic Compression Test Simulation

The following graphs give an example of a Smart® Band PVP around a 500mm diameter ball and arrangement. The test steel was made from a polyethylene surface to simulate a piggyback stack. The Smart® Band is tightened using a calibrated SMA-47-1000 and over a period of 24 hours the diameter is reduced by 2.7mm to simulate the strain caused by increasing hydrostatic compression. The system is then left for 11 days to ensure as any creep that might take place. In this graph, the data has been reinterpreted to give the maximum resistance over many years.

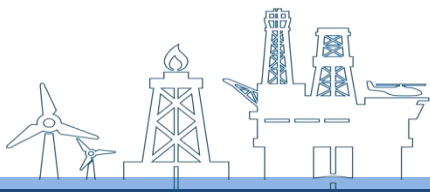
Note: The graph gives a resolution that the diameter and weight measurement each affect. The latter being a further 10% of weight 1000.

12.1.1] Retention Force (F) against Log (Time (t))



Sección 11.1] Rendimiento de Piggyback Saddle





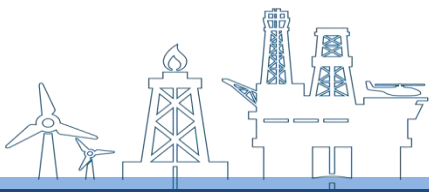
Inspección Geocean 7 Años



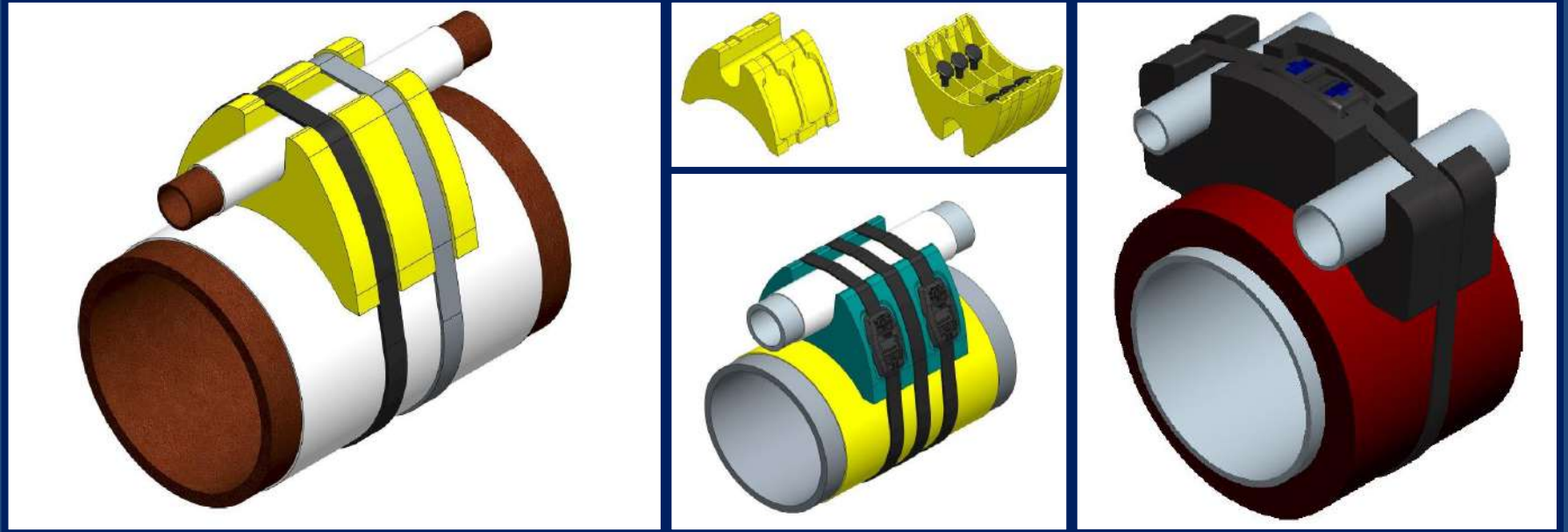
Línea de mar en buenas condiciones.
Abrazaderas línea de mar en buenas condiciones. (Anodo, tuercas abrazaderas)

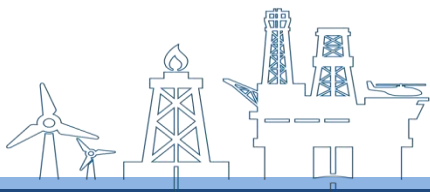
Abrazaderas de manguera (Smart Bands) vistas en agua fresca, están en buenas condiciones.



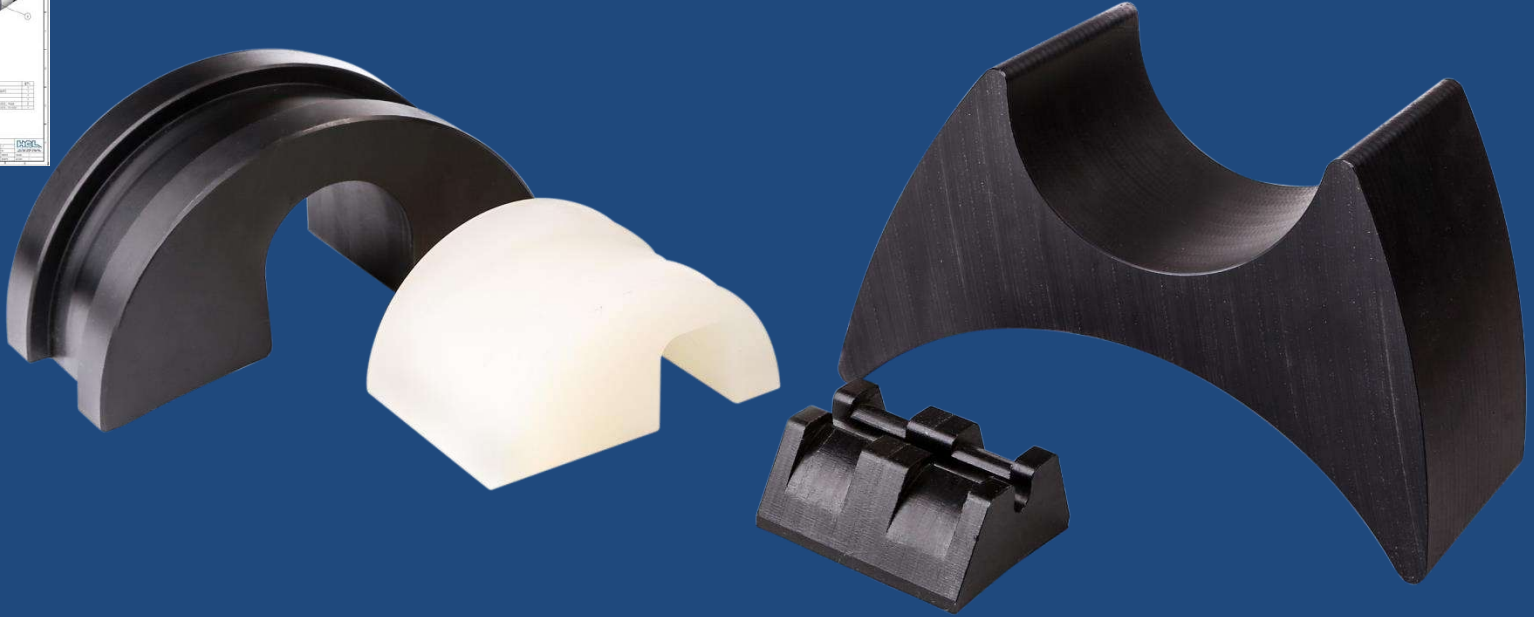
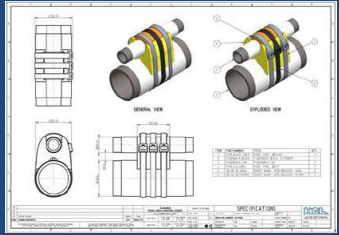


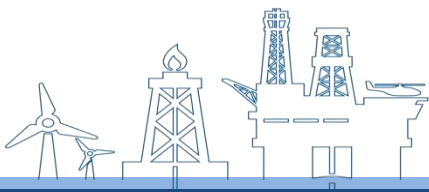
Diseño & Ingeniería



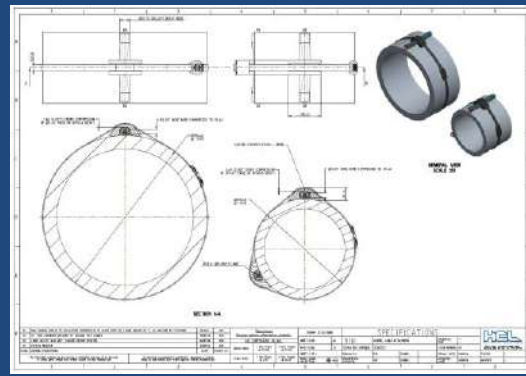
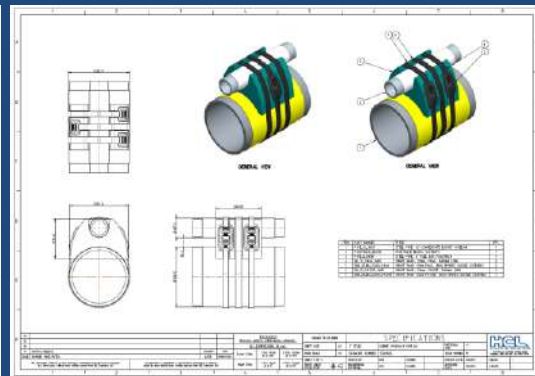
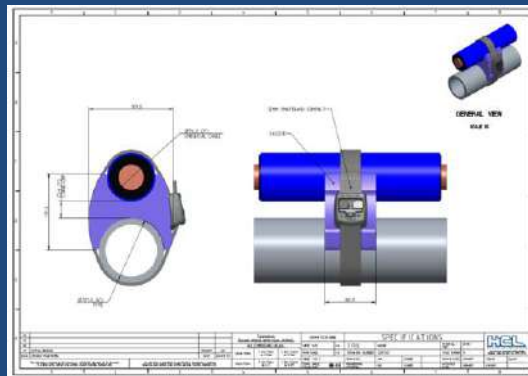
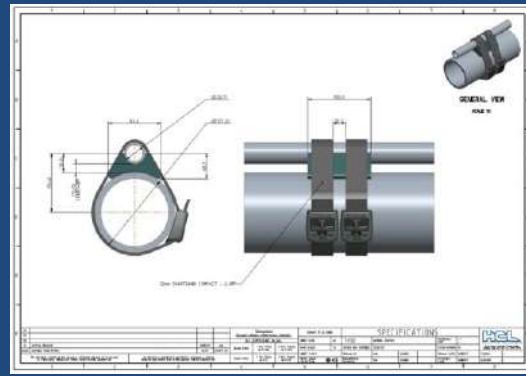
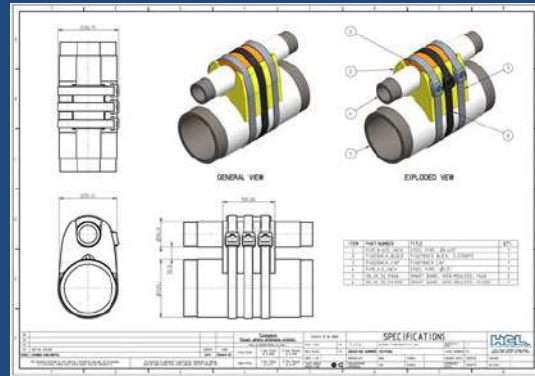
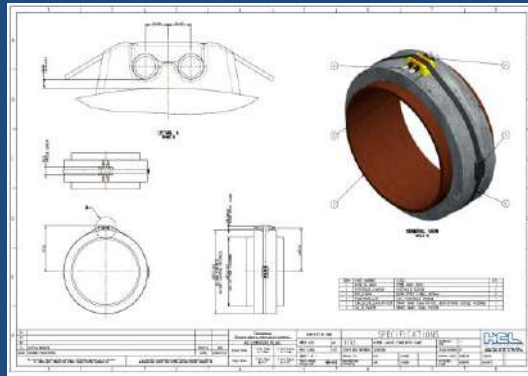


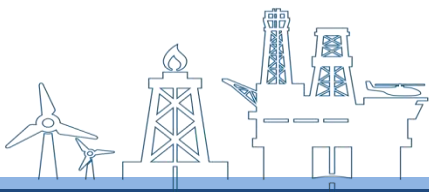
Sillines Smart®





Diseño & Ingeniería





Entrenamiento en Sitio





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Cliff Head (Roc Oil)
Rosa (Total)
Holland LG4 (Total)
Kaombo (Total)
Egina (Total)
Greater Plutonio
Kashagan
Enfield (Woodside Petroleum)
Pyrenees (BHP Billiton)
Tombua Landana (Chevron)
Pazflor (Total)
Girassol (Total)
Bongkot (Perenco)
CLOV (Total)
BARD Wind Farm
Thannet Wind Farm

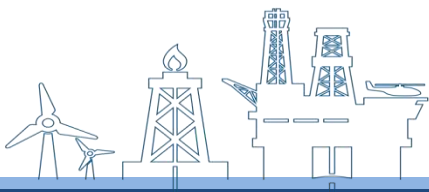
Balder Phase 3 (Exxonmobil)
Vincent (Woodside Petroleum)
West Nile Delta (BP)
Malikai (Shell)
Big Foot (Chevron)
Thunderhawk (Murphy Oil)
Schiehallion (BP)
Clair (BP)
Stones (Shell)





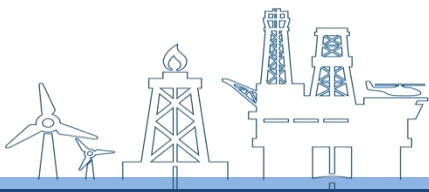
Smart[®] Band





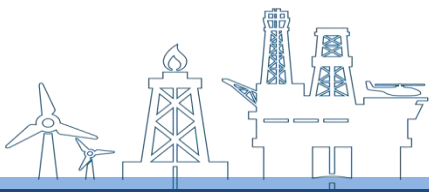
Proyectos alrededor del mundo





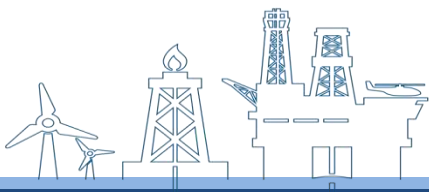
Proteccion de Cable



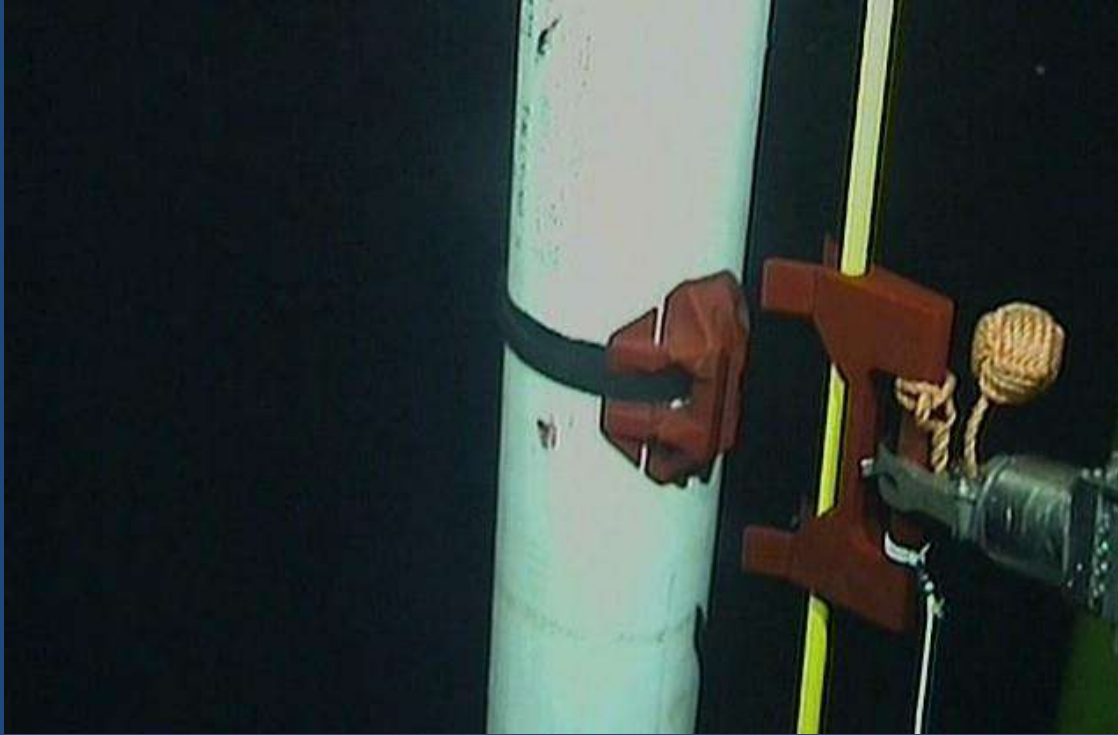


Bongkot





ENGINA





Apache

Cliff Head



HCL
CLAMPING SOLUTIONS



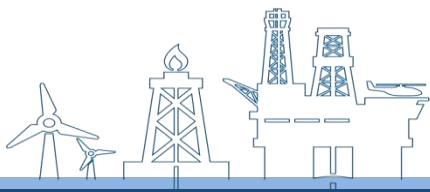


Technip

Vincent

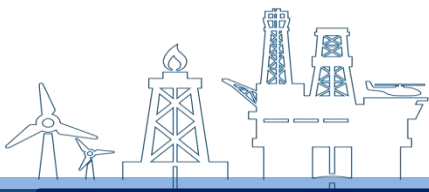


HCL
CLAMPING SOLUTIONS



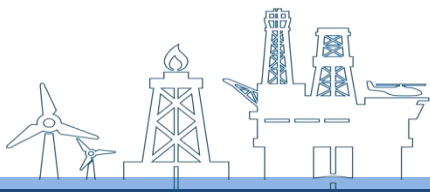
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VIV Strakes





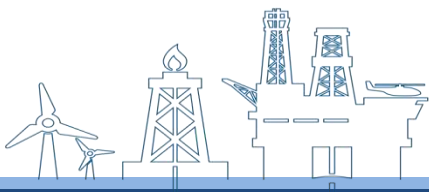
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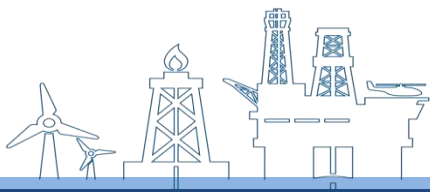
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Y mucho más

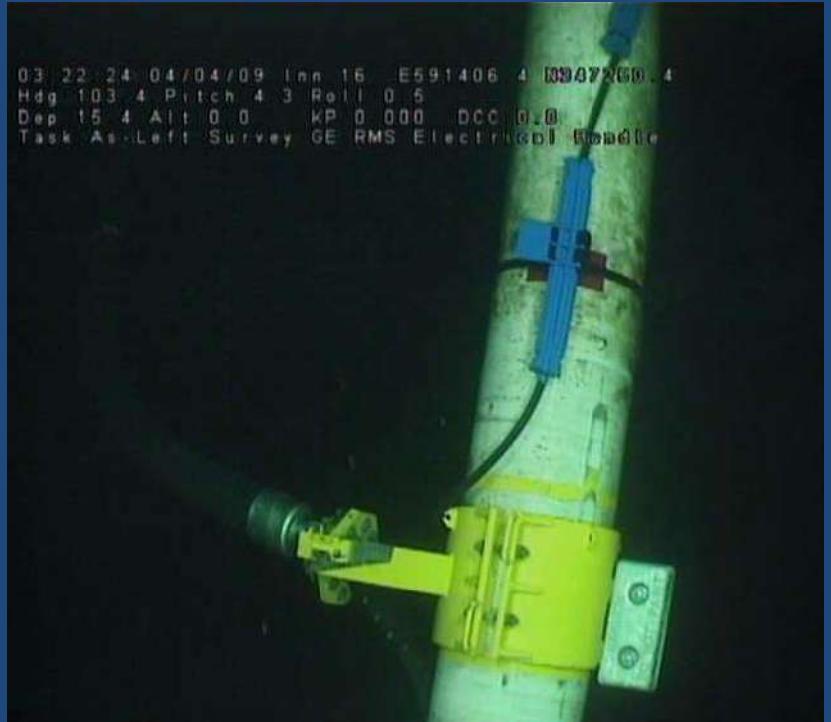
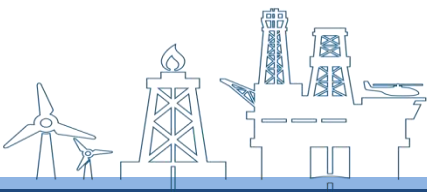




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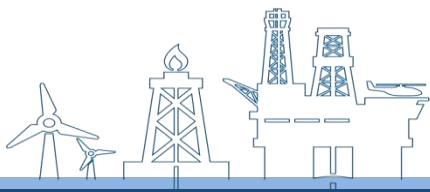


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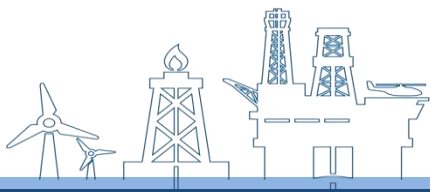
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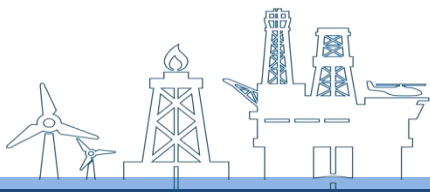
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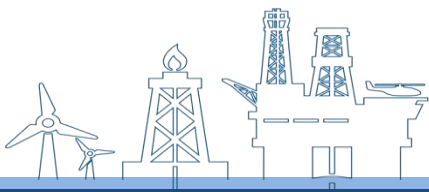


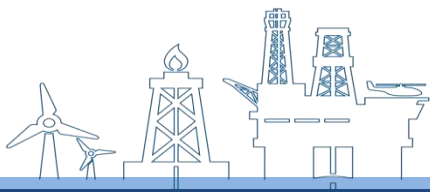


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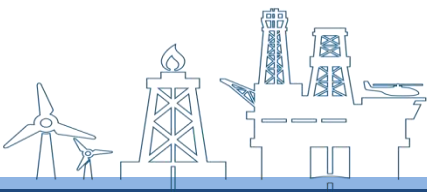




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- Alta Retención
- Larga Vida
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- Tiempos de entrega cortos
- Pre-ensamblados





Gracias.

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