

# CL TORQUE

**Carbo**  
**Link**

# SOLID CARBON TORSIONAL FORESTAYS

MADE IN SWITZERLAND  
SINCE 2000

AS 9100D AEROSPACE & DEFENCE CERTIFIED



- 01** PROJECTS
- 02** MATERIAL PROPERTIES
- 03** ADVANTAGES
- 04** OUR EXPERIENCE
- 05** SUMMARY & CONTACT

# 01 PROJECTS

18m > 50m+  
Manual furling units  
Hydraulic furling units  
Reckmann, Cariboni, Winmar, KZ interfaces and more  
250NM > 2000NM working torque



**MORGANA**



**SAUDADE**



**KENORA**



**PRB**



**HIGHLAND FLING 115**



**SAMURAI**

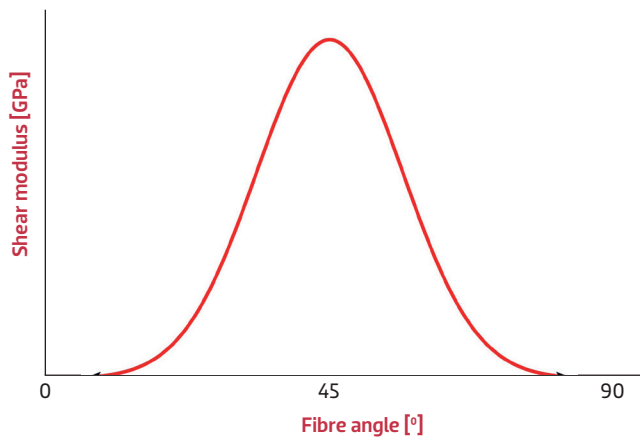
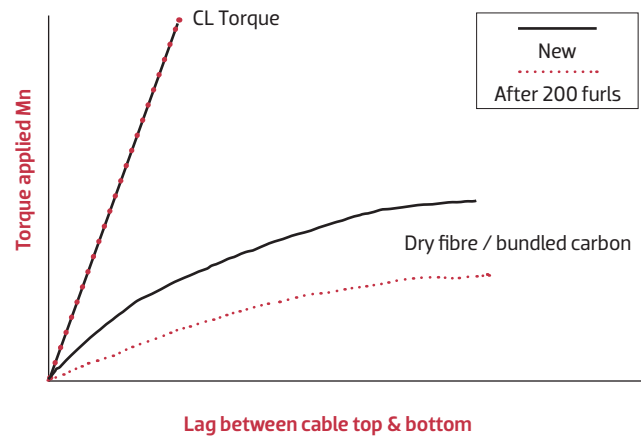
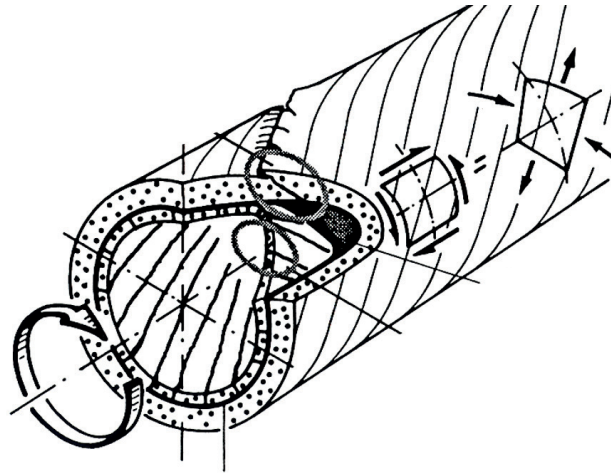


**CANOVA**



**KAURIS IV**

## 02 MATERIAL PROPERTIES



### SEPARATED LOAD PATHS

- Unidirectional fibres at the core transfer tensile load
- +/-45 bi-axial fibres on the outer layers transfer all torsional load
- Solid +/-45 fibres are stiff in both tension and compression
- This drives 99% torsional efficiency during the furl

### ESSENTIAL TO PLACE FIBRES IN THE SAME DIRECTION AS THE LOAD PATH

- Outer layer of +/-45 fibres ensure the cable is always at the maximum shear modulus
- Cable is stiff in both tension and compression
- Driving the most efficient furl
- Any other production process result in compromises to fibre angle
- Results in reduced torsional stiffness and significant lag after even the 1st or 2nd furl

### ADVANTAGES

- Direct torque transfer from bottom to top
- Torque behaviour independent to stay tension
- Cable can be furled in both directions
- No loss in torsional stiffness from 1<sup>st</sup> to 200<sup>th</sup> furl
- Specifically designed for desired torque requirements

## 03 ADVANTAGES



### CARBO-LINK TORQUE CABLES

- Proven torsional efficiency
- Minimal lag from furling unit to top swive
- Can be furled in both directions
- Consistent behaviour from 1<sup>th</sup> to 200<sup>th</sup> furl
- Specifically designed for the torque requirements
- Sailed over 80,000NM on IMOCA 60 'PRB'
- 2 laps around the planet with IMOCA 60 'Finistere Mer Vent' plus all IMOCA qualifiers and training
- 'WinWin' & 'Saudade' sailed many miles + competed in numerous regattas

### CARBO-LINK SOLID CABLES

- Toughened resin = Ultimate chafe & impact resistance
- No creep, bedding in or elongation over time
- No need to send away for service
- Simple health monitoring = visual inspection and NDT
- Bespoke fittings = simple interfacing with all hardware

## 04 OUR EXPERIENCE



- Limiting the oil flow to the furling unit is the safest way to not overload the system
- Most of our cables are designed for between 800NM and 1000NM working torque
- Real-time usage across all boats is around 600NM – 650NM for superyachts
- IMOCA's are running with around 250NM on manual furling units
- It is not possible to reef the headsail or to partially furl through a tack
- Flexi-snap battens have not proved to be a problem with Carbo-Link torque cables
- Successful collaboration and interfacing with Reckmann, Carboni and WinMar
- Furling with more tension in the forestay results in the most efficient furl
- However, ultimate forestay tension is limited by the safe furling load of the swivel
- Please refer to manufacturers guidelines for all swivel and furling unit information & specifications

## 05 SUMMARY & CONTACT



### KEY TAKEAWAY

- Minimal lag
- Highest torsional stiffness in tension & compression
- No reduction in torsional stiffness over time
- Simple inspection & service on-site

### MOVING FORWARD

- Assign designated Project Manager
- Finalise specifications, project deliverables, location and time frame
- Assess furling unit details, such as flow and torsional capacity
- Explore interface solutions with furling unit
- Discuss upper swivel concepts & interfaces
- Engineering analysis & approval
- Produce cable and deliver for dressing
- Dress, step & sea trial to configure the system

### CONTACT

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