Fibreglass & Removable Anchors
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Fibreglass Materials & Technical Data

CTS GFRP Technical Data

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>Area</th>
<th>Load Capacity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ultimate Test</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum Load</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design Load</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Ultimate)</td>
<td>(Maximum)</td>
</tr>
<tr>
<td>22 mm</td>
<td>0.59 in²</td>
<td>222.5 kN</td>
<td>178 kN</td>
</tr>
<tr>
<td>7/8 in</td>
<td>382.73 mm²</td>
<td>50 kips</td>
<td>40 kips</td>
</tr>
</tbody>
</table>

Basic Anchor Design

![Basic Anchor Design Diagram]
CTS HPolystal Technical Data

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>Area</th>
<th>Ultimate Load Capacity</th>
<th>Maximum Test Load</th>
<th>Design Load</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.7 mm</td>
<td>46.6 mm²</td>
<td>70.8 kN</td>
<td>42.5 kN</td>
<td>35.4 kN</td>
<td>96 g/m</td>
</tr>
<tr>
<td>5/16 in</td>
<td>0.072 in²</td>
<td>15.9 kips</td>
<td>9.5 kips</td>
<td>8.0 kips</td>
<td>3.4 oz/m</td>
</tr>
</tbody>
</table>

Please note: Fibreglass material does not have a yield point. The ultimate strain is 3%.

Polystal Anchors (cross sections through the anchor head)
CITS - FIBREGLASS CABLE BOLTS

An extensive research program is currently in progress at the University of British Columbia (UBC) to assess the viability of various continuous fibre reinforced polymer composites for the use of cable bolting in Canadian mines. The program has been divided into two phases.

Phase I was sponsored by HDRK. During this investigation, a prototype fibre glass cable bolt (FCB) was jointly developed by CON-TECH SYSTEMS using the Polystal material. Its viability was assessed through laboratory testing, field testing and trial installations. During the evaluation of the FCB, many important aspects other than pull out load were investigated. This phase has been completed and served as the framework for Phase II.

Phase II is currently in progress under the sponsorship of the British Columbia Science Council. This portion of the study will also assess various existing composites as cable bolt reinforcement.

CON-TECH SYSTEMS LTD. fabricates the composite fibreglass cable bolt for the increasing demands of the mining industry for a cuttable rock support for continuous hard rock mining methods.

The composite selected to replace steel had to meet the following criteria:
- Must be cuttable
- High tensile and with moderate shear strength
- Flexible
- Does not effect mill process
- Low health and environmental risk
- Non flammable

Polystal material meets all the above criteria and C.T.S. has developed a system using 4/P77 construction profile polystal rods (ultimate load capacity 28 tonnes) which are manufactured into a cable in the C.T.S. plant in Delta B.C.

### Property Comparison Between Steel and Polystal

<table>
<thead>
<tr>
<th>Property</th>
<th>Prestress Steel</th>
<th>Polystal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength MPA</td>
<td>1670</td>
<td>1520</td>
</tr>
<tr>
<td>Yield Strength MPA</td>
<td>1470</td>
<td>0</td>
</tr>
<tr>
<td>Ultimate Strain %</td>
<td>6</td>
<td>3.3</td>
</tr>
<tr>
<td>E. Modulus MPA</td>
<td>210,000</td>
<td>51,000</td>
</tr>
<tr>
<td>Specific Weight</td>
<td>7.85</td>
<td>2.0</td>
</tr>
</tbody>
</table>

![Stress-Strain Diagram](image)

- **Polystal®**: $B_z = 1520$ MPA, $E = 51000$ MPA, $\epsilon_u = 3.3\%$
- **BSt 420 S**

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FG-6
Removable Bar Anchor System
Removable Thread Bar in ROBUSTA Anchor Sleeve

- BEARING PL
- CTS HEX NUT
- SMOOTH PE. OR PVC SLEEVE
- SEAL (TAPE)
- ROBUSTA ANCHOR SLEEVE (L)
- CTS - MUKUSOL THREAD BAR

BAR SIZE
- 15 MM (5/8")
- 26.5 MM (1")

ANCHOR SLEEVE (L)
- 800 MM (2'-8")
- 1400 MM (4'-7")

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