<table>
<thead>
<tr>
<th>Material Combination</th>
<th>SCM−SUS</th>
<th>FC−SUS</th>
<th>AL−FC</th>
<th>SUS−S10C</th>
<th>SUS−SCM</th>
<th>SUS−SUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening Method</td>
<td>2460</td>
<td>6.5</td>
<td>990</td>
<td>1113</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Tightening Torque</td>
<td>6.1</td>
<td>5.7</td>
<td>919</td>
<td>36.6</td>
<td>2370</td>
<td>6520</td>
</tr>
</tbody>
</table>

**Tightening Torque Calculation Example**

The proper bolt axial tightening force and proper tightening torque can be determined by using the following equations:

1. \[ T = f A \times P \] (Equation 2)
2. \[ T = 0.35k (1+1/Q) \times 0.55 \times 0.45 \times 0.215 \times 0.195 \times 0.185 \times 0.165 \] (Equation 2)

where:
- \( T \) is the tightening torque [kgf·cm]
- \( fA \) is the tightening coefficient
- \( k \) is the torque coefficient
- \( Q \) is the tightening coefficient

**Proper Bolt Axial Tightening Force and Proper Torque Calculation Example**

The minimum value of tensile strength is 1040N/mm².

- The yield load is 90% of the minimum value of tensile strength.
- The proper bolt axial tightening force and proper tightening torque can be determined by using the following equations:

1. \[ fA = 0.35k (1+1/Q) \]
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**Proper Bolt Axial Tightening Force and Proper Torque**

- The torque coefficient varies with the conditions of use. Values in this table should be used as rough referential values.
- The proper size of a dowel pin under repeated shearing load of 800 kgf (pulsating) should be determined. (The material of Dowel Pins is SUJ2. Hardness 58HRC~)
- The yield load, strength class 12.9, is 1074 [mm²], should be selected. (Under a load of 200 kgf, M5, 14.2 [mm²], should be selected.)
- If the dowel pins are of a roughly uniform size, the number of the necessary tools and extra pins can be reduced.
- If there are not exactly the same number of threaded holes, the number of dowel pins can be determined on the basis of the number of holes on the side of the larger number.

**Strength of Dowel Pins**

- The maximum strength of a dowel pin, \( P_{max} \), is given by the following equation:

\[ P_{max} = \frac{1}{2} \pi D^2 \cdot b \]

where:
- \( D \) is the root diameter of the bolt (core dia.) [mm]
- \( b \) is the shear stress [kgf/mm²]

**Materials**

<table>
<thead>
<tr>
<th>Steel Bolt</th>
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</tr>
</thead>
<tbody>
<tr>
<td>M24×3</td>
<td>M20×2.5</td>
</tr>
<tr>
<td>M16×2</td>
<td>M14×2</td>
</tr>
<tr>
<td>M12×1.75</td>
<td></td>
</tr>
</tbody>
</table>

**Surface Treatment for Bolt and Torque Coefficient Dependent on the Combination of Material for Area to be Fastened and Material of Female Thread**

- Black Oxided
- Not treated or Treated with Phosphate.
- Manganese Phosphate

**Steel Bolt**

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