These shaft clamping elements consist of just two conical rings which require the minimum of radial space, so providing compact assemblies, and enabling use within small hub diameters. The design offers the maximum versatility of design, but does require the customer to provide their own thrust ring assembly. Whilst only providing low torque transmission per unit they can be combined (up to 4 units) to increase torque capacity. When fully clamped these units provide excellent gas tight sealing. Many designs of thrust rings are possible and sketches to the left are two typical designs. These units do not self centre, so require external means of centring the hub.

Recommended tolerances for full torque transmission are:-

<table>
<thead>
<tr>
<th>Up to 38m shaft Ø:-</th>
<th>Shaft</th>
<th>Hub</th>
<th>H7</th>
</tr>
</thead>
<tbody>
<tr>
<td>40mm and above shaft Ø:-</td>
<td>Shaft</td>
<td>Hub</td>
<td>H8</td>
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</table>

Clamping surfaces to be finished to Rz ≤ 15 μm.

Factor for combining elements in one assembly.

<table>
<thead>
<tr>
<th>Number of Elements</th>
<th>Torque Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.55MNm</td>
</tr>
<tr>
<td>3</td>
<td>1.86MNm</td>
</tr>
<tr>
<td>4</td>
<td>2.03MNm</td>
</tr>
</tbody>
</table>

### Dimensions

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Dimensions mm</th>
<th>Torque Cap. M Nm</th>
<th>Axial Force N</th>
<th>Axial Force necessary to clamp Nm</th>
<th>Approx. Weight gms</th>
<th>Min. Hub Dia* mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCK50-6x9</td>
<td>6 x 9</td>
<td>D: 4.5 L: 3.7</td>
<td>2.4</td>
<td>0.8</td>
<td>115</td>
<td>3.8</td>
</tr>
<tr>
<td>RCK50-7x10</td>
<td>7 x 10</td>
<td>D: 4.5 L: 3.7</td>
<td>3.0</td>
<td>0.9</td>
<td>105</td>
<td>3.9</td>
</tr>
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<td>120</td>
<td>5.3</td>
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<td>115</td>
<td>25.4</td>
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<td>RCK50-14x19</td>
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<td>D: 12.3 L: 3.3</td>
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<td>32.4</td>
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<td>100</td>
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<tr>
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<td>18 x 23</td>
<td>D: 16.3 L: 3.3</td>
<td>35.2</td>
<td>3.8</td>
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*Minimum outside diameter of hubs manufactured in medium carbon steels with yield strength ≤ 320 N/mm². For hub types, and other materials, refer to page 3.

† Clamping Rings for shafts up to 200mm diameter are available to order.
These clamping elements use a single lock nut to apply the clamping pressure, thereby enabling quick assembly and removal. The lock nut can be secured in position by bending over a tab of lock washer. The thin walls of the clamping cones, combined with low hub pressures enables use with soft materials, such as aluminium, and small hub diameters.

Use type CCE 54 where axial space is restricted and torque is low.

Type CCE 55 is for higher torque transmission.

Recommended tolerances for full torque transmission are:

- Shaft h8
- Hub H8
- Clamping surfaces to be finished to $R_z \leq 15 \mu m$.

*Minimum outside diameter of hubs manufactured in medium carbon steels with yield strength $\geq 320 \text{ N/mm}^2$.

For hub types, and other materials, refer to page 3.

For assembly and disassembly instructions refer to page 24.
Cross Shaft Clamping Elements

In order to make the best selection of a Cross Shaft Clamping Element for your application a number of factors must be taken into consideration. These include the shaft diameter; the outside diameter of the hub of connecting component; the drive torque to be transmitted, and axial thrust loads, and tilting or bending loads, maximum shaft speeds, operating temperature, and general design parameters and space restrictions.

**Shaft Diameter:**
The shaft diameter will determine the particular size of clamping element in any series, and by reference to the catalogue details the suitability of that to meet the other parameters can be checked. Also hollow shafts must be checked for any load carrying strength, see below.

**Hub Outside Diameter:**
The Hub Diameter has to be sufficient to support the stresses imposed by the shaft clamping element. The catalogue gives maximum hub diameters for medium carbon steel, but for other materials and method of determining refer below. Generally if hub diameter is over 2.5 times shaft diameter all series are suitable, but for smaller ratios consider types RCK 80, ACE 81, CCE 54 and CCE 55, and for very thin walled hubs use types RCK 19, RCK 20 and RCK 25.

**Determination of Minimum Hub Diameter and Max. Hollow Shaft Bore:**
The following calculations are for static conditions only, considering only stresses imposed by the clamping element. The hub diameter is controlled by the pressure applied by the outer cone of the clamping element; the shape of the hub bore and total length of hub; and yield stress for permanent elongation of 0.2%.

Minimum Hub Dia. \( D_{m} = D \sqrt{\frac{\sigma + \Phi C}{\sigma - \Phi C}} \)

Where
- \( D = \) Clamping element outside diameter mm
- \( \sigma = \) Yield strength of material N/mm²
- \( \Phi = \) Surface pressure on hub N/mm²
- \( C = \) Constant for Hub shape - see drawings

The tables in the catalogue give minimum hub diameters for hubs manufactured in medium carbon steel (080M40 or C45) or other material where \( \sigma = 320 \text{ N/mm}^2 \). Values for \( \sigma \) on other commonly used hub materials are:

- 220 Grade Cast Iron \( \sigma = 150 \text{ N/mm}^2 \)
- 260 Grade Cast Iron \( \sigma = 180 \text{ N/mm}^2 \)
- Mild Steels \( \sigma = 220 \text{ N/mm}^2 \)
- 070M55 (En9) \( \sigma = 350 \text{ N/mm}^2 \)
- Stainless Steel \( \sigma = 200 \text{ N/mm}^2 \)
- Aluminium \( \sigma = 100 \text{ N/mm}^2 \)

For hollow bored Shafts:

Max. Bore in Shaft \( D_{m} = d \sqrt{\frac{\sigma - 1.6 \Phi}{\sigma}} \)

Where
- \( d = \) Clamping element bore mm
- \( \Phi = \) Surface pressure on Shaft N/mm²

For solid shafting yield strength of material \( \sigma \) must be higher than surface pressure \( \Phi \).

**Maximum Shaft Speed:**
The centrifugal forces generated by high shaft speeds can reduce torque capacity and increase stress loads on hubs. Consult Cross & Morse if speed of shaft results in outer clamping diameter \( D \) running above 25M/sec.

**Operating Temperature:**
Maximum temperatures should not exceed 100°C. At temperatures above 70°C the locking screws should be rechecked after 1 hour operation, whilst assembly is still warm.
**Installation Instructions**

**Installation and Removal of Cross Shaft Clamping Elements**

**Types RCK 10, 11, 12, 13, 15, 16, 61, 70, 71, 80 and ACE81**

**Installation:**
1. Slacken all screws in element by approx. two turns.
2. Remove two or three screws completely, and fit into equally spaced empty release thread holes. Tighten these screws lightly so as to ensure inner and outer cones are kept apart.
3. Clean all contact surfaces including screw threads, and lightly oil with clean thin unmodified oil.*
4. Insert clamping element into hub and push onto shaft and locate.
5. Move screws from release holes and replace in original holes.
6. Tighten all screws finger tight and align hub.
7. Tighten all screws evenly in a diametrically opposite sequence (see typical progression in sketch) using a torque wrench, initially at half screw catalogue torque, then 3/4 value, and finally full torque. Check all screws at full torque until no further rotation of screws occurs.

**Disassembly:**
1. Slacken all clamping screws by couple of turns, completely removing as many as release holes in element. 2. Fit screws in release holes and tighten in sequence as clamping to force inner and outer cones apart. 3. Carefully remove hub and clamping element from shaft, and take element from hub.

**Types RCK 40 and 45**

**Installation:**
1. Clean all contact surfaces, and lightly oil with clean thin unmodified mineral oil.*
2. Fit hub to shaft and insert clamping element.
3. Tighten all screws finger tight and align hub.
4. Tighten all screws evenly in a diametrically opposite sequence (see typical progression in sketch) using a torque wrench, initially at half catalogue torque for screw, then at 3/4 value, and finally at full torque. Check all screws are at full torque until no further rotation of screws can be achieved.

**Disassembly:**
1. Release clamping screws in same sequence as for clamping. Element should now self release. If required lightly tap clamping screws to aid release. If still not released remove light coloured screws completely and replace with next larger metric size and tighten these screws to jack the cones apart.

**Type RCK 50**

**Installation procedure depends detailed design, but following is typical:**
1. Clean all contact surfaces, and lightly oil with clean thin unmodified mineral oil.*
2. Push hub onto shaft and insert spacer sleeves and clamping ring sets according to application drawing.
3. Insert distance ring if fitted and attach clamping flange lightly tightening screws. Align hub.
4. Tighten all screws in a diametrically opposite sequence, in several stages up to max. torque for screw size.

**Disassembly:**
The taper of the individual rings is such that the assembly should automatically release when the locking screws are slackened. If not light tapping on the hub circumference should release them.

**Types CCE 54 and 55**

**Installation:**
1. Clean all contact surfaces, and lightly oil with clean unmodified mineral oil.*
2. Turn locking nut anticlockwise until outer sleeve loose on inner cone.
3. Position hub on shaft and insert clamping element.
4. Align hub and tighten locking nut to catalogue torque value, and bend suitable tab on lock washer to prevent further rotation.

**Disassembly:**
1. Release bent washtab and undo nut until sleeve loose.
2. Remove clamping element. If tight give end of tab gentle tap to release.

**Types RCK 19/20 and 95**

**Installation:**
1. Clean all contact surfaces, and lightly oil with clean unmodified mineral oil.*
2. Slacken all clamping bolts by a couple of turns.
3. (RCK 19/20 only) Fit clamping element on outer diameter of hub, and slide assembly onto shaft and position. (RCK 95 only) Fit shaft ends equally into clamping element ensuring small clearance between shafts.
4. Tighten all bolts in a diametrically opposite sequence, in several stages up to max. specified torque.

**Disassembly:**
Slacken all bolts and gently tap on bolts to release clamping element.

*WARNING: Never use, lubricant containing Molydenum or E.P. additives, synthetic lubricant, or grease.