Please read these instructions carefully before using or servicing the equipment. This manual may be modified without notice. See: www.harken.com/manuals for updated versions. PLEASE SAVE THESE INSTRUCTIONS
Introduction

This user manual contains important information for the correct use of the Integral Hydraulic Cylinder. Read all instructions carefully before use. If you do not understand these instructions, contact Harken. Do not use the Integral Hydraulic Cylinder unless you have a sufficient level of sailing training and experience.

Description

The Harken Integral Hydraulic Cylinder is designed for use on sailboats and is sized according to boat and rigging. When ordering, always have your choice confirmed by a Harken representative or other sailing professional. The limited warranty does not cover use of product outside of normal sailboat applications.

Parts ordered separately

Standard eye/jaw toggle

Tools Required

Hex driver, 3 mm
Loctite®, Blue 242

WARNING! Cylinders are capable of exerting very high loads and can break associated components. Inspect all standing backstay and forestay rigging components to ensure they are in good condition. Failure to inspect components may result in sudden breakage at high loads.
Installation

Review all instructions carefully prior to installation of your new Integral Hydraulic Cylinder.

1. Carefully unpack the cylinder and check for visible defects. If any signs of damage are present, contact your dealer at point of purchase or Harken.

2. Extend cylinder to prepare for installation.
   Turn release knob counterclockwise completely.
   Attach the bottom (end) clevis to the deck, and attach the upper (rod) clevis to the main halyard. Pull rod clevis as necessary to fully extend the cylinder.
   When cylinder is extended, detach from deck and main halyard.

3. Check installation site for clearance.
   Attach a standard eye/jaw toggle to the cylinder’s bottom clevis before securing to the chainplate.
   • Install two pins in different orientation to accommodate stay movement so the aluminum won’t fatigue during use.
   • Standard toggles fit all Harken cylinders.

   **NOTICE:** Be sure to include toggle length in cylinder length for deduction from stay.

4. Mount cylinder rod end up.
   When mounting, orient pump handle to your preference.
5. Check to see if gauge is aligned to your preference. If necessary, you may loosen set screws on bottom of cylinder tube (above release knob) completely. Rotate cylinder tube to adjust gauge to 1 of 4 positions as noted in diagram.

6. When gauge is in preferred position, re-tighten set screws. Make sure screws install into pump housing dimples.

**CAUTION! Limit cylinder rotation to avoid problems or damage.**

7. Attach cylinder to backstay.
   - Use 3 mm hex driver to remove screw from clevis pins.
   - Attach lower clevis to toggle/chainplate. Open the release valve and extend the cylinder.
   - Attach upper clevis to backstay.

8. Use Blue 242 Loctite® when installing screws to prevent loosening.

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**Bleed Pump**

All Harken Integral Hydraulic Cylinders are cycled and tested at factory prior to shipment. However, oil can become displaced inside cylinder during shipment or storage. Bleed pump prior to use.

1. With cylinder in vertical position, rod end up, fully extend the cylinder.

2. Open release valve and pump for one (1) minute. When complete, the pump and cylinder are bled.

<table>
<thead>
<tr>
<th>Gauge/Cylinder Rotation Direction</th>
<th>Limit of Rotation Relative to Pump Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clockwise*</td>
<td>1/4-turn (90°)</td>
</tr>
<tr>
<td>Counter-Clockwise**</td>
<td>1/2-turn (180°)</td>
</tr>
</tbody>
</table>

*O-ring will expand and bulge. **Overturning may lead to thread engagement issues.
The Harken Integral Hydraulic Cylinder is easy to use and offers unique, double-acting pump action to move oil twice as fast as a single-acting pump. Follow these simple steps for cylinder operation.

### Increase tension
1. Turn pressure release knob clockwise to close. The resting position for the pressure release knob is closed.
2. Move pump handle in and out until desired tension is achieved.

**Notice:** It is impossible to over-tighten the knob or damage the valve by hand.

### Decrease tension
1. Turn release knob counterclockwise to open. Release speed depends on how far the knob is turned.

**WARNING!** Backstay cylinders can overload jib halyard and jib luff components including furlers. Be sure to check and/or ease jib halyard before tensioning backstay.
**Operation**

**Relief Valve Settings**

The Integral Hydraulic Cylinder relief valve is preset at our factory to limit the tension to the maximum load of the recommended cable of the rigging for which it is used. Each cylinder is set to provide a specific maximum pull force.

**FACTORY-SET MAXIMUM PULL FORCE BY CYLINDER**

<table>
<thead>
<tr>
<th>Type</th>
<th>Cylinder Part No.</th>
<th>Maximum Pull Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>HCI025110345</td>
<td>3500 lb 1590 kg</td>
</tr>
<tr>
<td>-10</td>
<td>HCI035130345</td>
<td>5000 lb 2270 kg</td>
</tr>
<tr>
<td>-12</td>
<td>HCI040160385</td>
<td>6500 lb 2950 kg</td>
</tr>
<tr>
<td>-17</td>
<td>HCI045160385</td>
<td>8700 lb 3950 kg</td>
</tr>
</tbody>
</table>

**IMPORTANT:** If release is set beyond max factory set pressure relief, warranty may be voided.

**Reading Cylinder Gauge**

The easy-to-read analog gauge displays oil pressure in thousands of pounds per square inch. Refer to the table below to convert oil pressure to pull force.

**Notice:** Gauge needle may go beyond specified relief setting during pump action then return to the maximum specified relief setting. This is normal and is part of the cylinder design.

Cylinder tension can be increased by adjusting the pressure relief setting. Contact your Harken Service Representative for assistance.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Max wire Ø in mm</th>
<th>Stroke in mm</th>
<th>Pin center length (closed)* in mm</th>
<th>Weight** lb kg</th>
<th>Gap/pin Ø in mm</th>
<th>@ 1000 psi 69 bar lb kg</th>
<th>@ 2000 psi 138 bar lb kg</th>
<th>@ 3000 psi 207 bar lb kg</th>
<th>@ 4000 psi 276 bar lb kg</th>
<th>@ 5000 psi 345 bar lb kg</th>
<th>Breaking load lb kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCI025110345BCC</td>
<td>-6 5/32 5.5 13.6 345 29.8 758 7.3 3.32 1/16 11.1</td>
<td>1236 561</td>
<td>2473 1122</td>
<td>3500 1587</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>7000 3175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI035130345BCC</td>
<td>-10 7/32 7 13.6 345 29.8 758 7.3 3.32 1/2</td>
<td>1236 561</td>
<td>2473 1122</td>
<td>3709 1682</td>
<td>4946 2243</td>
<td>6182 2804</td>
<td>12364 5608</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI040160385BCC</td>
<td>-12 7/8 8 15.2 385 32.8 834 10.8 4.92 3/8</td>
<td>15.9</td>
<td>2098 952</td>
<td>4197 1904</td>
<td>6295 2855</td>
<td>8394 3807</td>
<td>10492 4759</td>
<td>20984 9518</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCI045160385BCC</td>
<td>-17 7/8 9.5 15.2 385 32.8 834 10.8 4.92 3/8</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For pin center length open add stroke length to pin center length closed.  **Rod ends (forks) included in weights.  *** Max relief setting is 5,000 psi/345 bar.
Inspection
Perform a visual inspection of the Integral Hydraulic Cylinder prior to each use to ensure clean, unobstructed working conditions.

Care and Maintenance
Harken cylinders should give years of reliable service. If cylinder is properly bled, and clean environment is maintained, no regular maintenance is required. Seals should be changed every ten years (dependent on use) unless cylinder eases without pressure relief valve releasing the pressure first. If you experience any problems with your Harken Integral Hydraulic Cylinder, contact your Harken Service Representative.

Warranty
Harken warrants that each Harken product, when properly used and maintained, will be free from defects in material and workmanship from the date of receipt of the product by the final customer. Harken products are covered by two different kinds of warranties, on the basis of the purchaser and use made of them. For complete warranty or for information relating to a specific warranty concern, please refer to the following:

Harken Catalog, Website: www.harken.com/manuals
Call or Email the Nearest Harken Distributor or
Harken Corporate Headquarters

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