Operation & Maintenance Manual

SB Clamp

2013-ABCO-SB-400-OMM-01

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1 INTRODUCTION

1.1 Purpose

The purpose of this manual is to instruct and inform. It includes all data essential to the operation, maintenance and warranty service of your SB series subsea control Umbilical clamping system. This manual covers all SB Clamp series. This is a generic manual that is sent by ABCO Subsea alongside all of its SB Clamp orders. Project specific information and drawing(s) shall be included as pdf attachments to this document.

1.2 Abbreviations

Table 1-1: Abbreviations within Document

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>OMM</td>
<td>Operations Maintenance Manual</td>
</tr>
<tr>
<td>SB</td>
<td>Swing Bolt</td>
</tr>
<tr>
<td>MDR</td>
<td>Marine Drilling Riser</td>
</tr>
<tr>
<td>DP</td>
<td>Drill Pipe</td>
</tr>
<tr>
<td>OD</td>
<td>Outer Diameter</td>
</tr>
<tr>
<td>Umb</td>
<td>Umbilical</td>
</tr>
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1.3 Product Definition

The ABCO SB-BOP Clamp is designed for Umbilical clamping to an auxiliary line of a Marine Drilling Riser (MDR), a Drill Pipe (DP) or a structural cable such as a Pod Line or other application winch line. The SB-BOP Clamp has been designed in multiple sizes to accommodate variations in clamping configurations: the SB-3 will secure Umbilicals from Ø1.5-in to Ø2.88-in OD, the SB-4 will secure Umbilicals from Ø2.75-in to Ø4.5-in OD, and the SB-6 will secure Umbilicals up to Ø6.0 in. Please see the attached specification sheet(s) for project specific line/Clamp application.
1.4 Clamp Specifications

Table 1-2: Clamp Specification Table

<table>
<thead>
<tr>
<th>Description</th>
<th>SB-3</th>
<th>SB-4</th>
<th>SB-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Umb Line Sizes (OD):</td>
<td>Ø1.5 in - Ø2.88 in [38 mm – 73 mm]</td>
<td>Ø2.75 in – Ø4.5 in [70 mm – 114 mm]</td>
<td>Ø4.5 in – Ø6.0 in [114 mm – 152 mm]</td>
</tr>
<tr>
<td>Weight in Air:</td>
<td>13.0 lbs [5.9 kg]</td>
<td>14.0 lbs [6.3 kg]</td>
<td>17.5 lbs [7.9 kg]</td>
</tr>
<tr>
<td>Weight in Water:</td>
<td>7.3 lbs [3.3 kg]</td>
<td>7.3 lbs [3.3 kg]</td>
<td>9.2 lbs [4.2 kg]</td>
</tr>
<tr>
<td>Length:</td>
<td>7.0 in [178 mm]</td>
<td>9.8 in [249 mm]</td>
<td>11.56 in [294 mm]</td>
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<tr>
<td>Width:</td>
<td>7.5 in [191 mm]</td>
<td>7.7 in [196 mm]</td>
<td>9.47 in [241 mm]</td>
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<td>Height:</td>
<td>8.4 in [213 mm]</td>
<td>6.6 in [168 mm]</td>
<td>6.5 in [165 mm]</td>
</tr>
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<td>Support Line to Umb Offset Distances, (Center-Center)</td>
<td></td>
<td>8.6 in [218 mm] to 17.9 in [455 mm]</td>
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<tr>
<td>Pipe Mount Line Size (OD):</td>
<td>Ø3.5 in [89 mm] to Ø7.0 in [178 mm] OD</td>
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<tr>
<td>Cable Sizes (OD):</td>
<td>Ø3/4 in [19 mm] to Ø2 in [50.8 mm]</td>
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<tr>
<td>Max Torque (Gate Closure Shaft):</td>
<td></td>
<td>35 ft<em>lbf [47 N</em>m]</td>
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<tr>
<td>Max Torque (Cable Lock):</td>
<td></td>
<td>60 ft<em>lbf [81 N</em>m]</td>
<td></td>
</tr>
<tr>
<td>Max Torque (AR Clamp):</td>
<td></td>
<td>60 ft<em>lbf [81 N</em>m]</td>
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</table>

1.5 Specific Drawing

All project specific drawings will be attached to the end of this document in pdf format.
2 OPERATIONAL DOCUMENTATION

2.1 Clamp Installation

The SB-BOP Clamps are typically installed at 50-75 ft intervals, though in severe current environments Clamps may be placed at a closer spacing. Clamps are usually placed one per Riser joint length and are made up to the support line at the cellar deck level while the riser joint make-up occurs and the string is statically supported at the drill floor level. ABCO rates SB Clamps to a given permissible load, often between 350 lbf [1,560 N] and 1,200 lbf [5,338 N], depending on the size of the Umbilical.

All Clamps are assembled and ready for installation upon arrival to the customer.

The wire rope supported Clamps are complete and ready for installation as they come from the factory with the exception of the Clamp affixed to a wire rope using an Anti-Rotation (AR) Clamp. AR Clamps are similar to the structural mount configurations and typically come in two parts: the AR Clamp that affixes to the wire rope and the SB Clamp that uses a locking pin to lock the SB Clamp to the AR Clamp during running operations. The Clamps supported by a pipe structural member typically come in two parts: a Base Bracket which can be permanently attached to the MDR or DP and the Clamp sub-assembly that uses a locking pin that is used to lock the SB Clamp to the Base Bracket during running operations.

The following sections cover installation procedures for the SB Clamp (all types and sizes).

2.1.1 SB Installation to Auxiliary Line System

Different Base Bracket sizes are available, depending on pipe size. All SB Auxiliary Line (pipe) versions utilize a modular Clamp interface, and all are installed using the same process below.

- If urethane protection is utilized, insert the urethane sleeves over the U-bolts prior to installing to the Kill or Choke Line.
- The retention pin (locking pin) for Clamp to base locking is located on the same side as the Clamp Gate opening. The Base Bracket orientation will determine whether the Clamp opens from the Left or Right. All Base Brackets on any single support line should have the same operational orientation.
- Clamp Assemblies which protrude from the syntactic foam have a Base Bracket permanently mounted to the auxiliary line support and the Clamp assembly shall be added or removed from the Base Bracket at the cellar deck level as the MDR is run and retrieved.
- When the Umbilical slot is provided in the syntactic foam, the whole Clamp assembly can remain mounted on the riser joints. It is recommended that the SB Clamp be installed and removed at the cellar deck level if the Clamp protrudes beyond the OD of the buoyancy. A 1/2-in shift due to tolerance stack-ups of the buoyancy should be taken into account as the Clamp could protrude beyond the OD of the buoyancy if the buoyancy were to shift, thus exposing the Clamp.
a) Determine the Clamp spacing and locate saddle Clamp relative to the suspended riser joint and the crew working on the Cellar Deck.

b) Place the U-bolt(s) around the Kill or Choke Line within the dedicated mounting pocket (if applicable) if foam is present. Offset the U-bolts toward the lower end of the riser 3-4 inches from the center of the pocket to allow hand access to the Clamp and removable locking pin.

c) Place the Saddle-Shim assembly over the U-bolt ends and fasten by making up four (4) 1/2-in washers and Nylock nuts on the ends of the U-bolts.

d) If urethane protection is utilized, place the urethane pad between the Saddle Bracket and the Kill or Choke Lines before completing the Saddle Bracket installation over U-bolt ends.

e) Torque all four (4) 1/2-in Nylock Nuts to 25 ft*lbf [34 N*m].

f) To attach the Clamp Assembly, slide the slot on the bottom of the Shim Adapter over the lugs of the Shim Bracket so the holes on the opposite side line up. Insert the Locking Pin through the Base and Shim Bracket to secure. Note: the rubber buttons on the base of the Clamp will require a low compression force to facilitate installation of the locking pin.
Figure 2-2: SB Clamp Make-up, Auxiliary Line System Example

h) Using a regulated air wrench, complete the Clamp make-up by tightening the Gate Closure Shaft until the max torque of 35 ft*lbf [47 N*m] is applied or until Clamp halves make contact.

Figure 2-3: SB Clamp Installed to Aux Line System
2.1.2 SB Clamp Installation to Structural Cable System (Cable Lock)

The order of Clamp attachment is similar to that of the rigid line support described above, the Clamp is first locked to the support wire rope, then the Umbilical is made up to the Clamp.

a) Attach the Clamp to the wire rope by placing the wire rope into the slot in the Cable Lock Assembly.

b) Using a regulated air wrench, lock the wire rope in the assembly by tightening the Drive Shaft. Apply 60 ft*lbf [81 N*m] to the Cable Lock Assembly Drive Shaft. To ensure a firm grip the Clamp can be “bucked” once or twice with a torque wrench.

c) Open the Clamp Gate by swinging the Gate Closure Shaft out of the Gate and pull the Umbilical into the bore of the Clamp. Close the Gate and swing the Shaft closed and make up the Gate Closure Shaft 2-3 threads, sufficient to maintain the Gate latched around the Umbilical. Adjust Umbilical tension as required.

d) Using a regulated air wrench, close the gate by tightening the Gate Closure Shaft until the max torque 35 ft*lbf is applied or until Clamp halves make contact.
Figure 2-5: Clamp Drive Shaft Make-Up
2.1.3 SB Clamp Installation to Structural Cable System (AR Clamp)

The order of Clamp attachment is similar to that of the rigid line support described above. The AR Clamp is first locked to the support wire rope. The SB Clamp is then made up to the AR Clamp and the Umbilical made up to the SB Clamp.

a) Attach the AR Clamp to the wire rope by placing the wire rope into the slot within the AR Clamp Body.

Figure 2-6: AR Clamp Installation to Wire Rope Illustration 1
b) Using a regulated air wrench, lock the wire rope in the assembly by tightening the two (2) Drive Shafts. Apply a make-up torque of 60 ft*lbf [81 N*m]. To ensure a firm grip the Clamp can be “bucked” once or twice with a torque wrench.

![Figure 2-7: AR Clamp Installation to Wire Rope Illustration 2](image)

c) To attach the Clamp Assembly, slide the slot on the bottom of the Shim Adapter over the lugs of the Shim Bracket so the holes on the opposite side line up. Insert the Locking Pin through the Base and Shim Bracket to secure. Note: the rubber buttons on the base of the Clamp will require a low compression force to facilitate installation of the locking pin.

d) Open the Clamp Gate by swinging the Gate Closure Shaft out of the Gate and pull the Umbilical into the bore of the Clamp. Close the Gate and swing the Shaft closed and make up the Gate Closure Shaft 2-3 threads, sufficient to maintain the Gate latched around the Umbilical. Adjust Umbilical tension as required.

e) Using a regulated air wrench, close the gate by tightening the Gate Closure Shaft until the max torque 35 ft*lbf [47 N*m] is applied or until Clamp halves make contact.
2.2 Removal Instructions

Clamp removal can be accomplished by performing the steps in Sections 2.1.1, 2.1.2 and 0 in reverse order in accordance with the clamp configuration.
3 CLAMP MAINTENANCE

The following sections cover the assembly procedure for various SB Clamp configurations.

The SB Clamp assembly is a relative passive device; however, for optimal service in the field the following processes should be routine procedure whenever the Clamp is used:

- Always rack-mount the Clamps and wash with potable water immediately upon recovery.
- Inspect the Clamps after Riser or Cable retrieval for damaged, broken, or bent components.
- Check threaded parts for worn or damaged threads.
- Ensure that all Drive Shaft threads remain lubricated with molybdenum-based grease.

3.1 Assembly, Support Bracket

The Support Bracket is consumed by the SB Clamp Assembly and it interfaces the Clamp to the Saddle Bracket.

a) The Gate Closure Shaft is first fitted with the Cone Washer with the countersunk side facing downwards. To retain the Cone Washer against the head of the Gate Closure Shaft, an O-ring is added to the shaft.

b) Apply molybdenum-base grease to Gate Closure Shaft threads.

c) Make up the shaft and washer to the Swivel Nut, approximately 3/4 in [19 mm] of the shaft thread length should protrude from the bottom of the Swivel Nut.

d) Install a Reduced height 1/2-in Nylock nut to the end of the Gate Closure Shaft and fully thread onto the end.

e) Install the Gate Closure Shaft and Lock Nut assembly into the Support Bracket and secure into position using two (2) Ø3/8-in x 3/4-in [9.5-mm x 19-mm] dowel pins.

f) Install the gate Hinge to the Support Bracket, noting that the hinge is not symmetrical and that the drilled and tapped holes should appear outboard of the hinge axle; secure into position by inserting the Ø3/8-in x 2.5-in [10-mm x 64-mm] dowel pin.
3.2 Assembly, SB Clamp (Auxiliary Line & AR Clamp Mounted)

a) Assemble the Support Bracket by completing the instructions outlined in Section 3.1.

b) Place the Nitrile Inserts into the Clamp Gate and Base with the arrows (where applicable) on the Insert bores pointing towards the Hinge on the Base and the Closure Shaft on the Gate. Insert the two (2) #12 Screws for each insert into the opposite side of the Gate and Base to secure the Nitrile Inserts.

c) Place a Shim Adapter on flat surface or within a vice; mount the Support Bracket Assembly on to the Shim Adapter.

d) Place the SB Clamp Base over the Support Bracket Assembly, ensuring that the four mounting holes line up in each part/assembly. Apply Loc-Tite™ to and Install four (4) 3/8-16 x 1.5-in bolts, nuts and washers into the mounting holes. Torque 3/8-in fasteners to 20 ft*lbf.

e) Place the hinge side of the Gate Body onto the Hinge, ensuring that the two mounting holes line up. Apply Loc-Tite™ to two 3/8-16 x 1.0-in bolts and washers and install into the mounting holes. Torque 3/8-in fasteners to 5 ft*lbf.
Figure 3-1: Generic Example: SB Clamp (Auxiliary Line System) Exploded View
Figure 3-2: Generic Example: SB Clamp (Auxiliary Line System) Spare Parts Kit
3.3 Assembly, Cable Lock

a) Place the Cone Washer over the end of the shaft with the countersunk side facing away from the head of the shaft.

b) Apply anti-galling grease to the Closure Shaft.

c) Place the Gate section “Dog” of Cable Lock Assembly over the shaft with the radius section facing towards the Swivel Nut.

d) Insert the Swivel Nut into the Cable Lock Main Body; secure into location using two (2) Ø3/8-in x 1-in [10-mm x 25-mm] dowel pins. Note: the dowel pins are secured into location once the Cable Lock Assembly is installed to the SB Clamp Assembly.

e) Insert the Closure Shaft, Cone Washer, and Gate into the Cable Lock Main Body to engage the Swivel Nut; turn Closure Shaft so that it passes through the Swivel Nut by at least 1-in of thread.

f) Fasten the Reduced height 1/2-in Lock Nut to the Closure Shaft and fully thread onto the end until bottomed out.

Figure 3-3: Generic Example: Cable Lock Assembly Exploded View
3.4 Assembly, SB Clamp (Structural Cable Mounted)

a) Assemble the Cable Lock by completing the instructions outlined in Section 3.3.

b) Place the Nitrile Inserts into the Clamp Gate and Base with the arrows on the Inserts pointing towards the Hinge on the Base and the Closure Shaft on the Gate. Insert the two #12 Screws into the opposite side of the Gate and Base to secure the Nitrile Inserts.

c) Place the Support Bracket Assembly and Clamp Main Body on top of the Cable Lock Assembly, ensuring that the four mounting holes line up in each part/assembly. Apply Loc-Tite to four 3/8-16 x 1.25-in bolts, nuts and washers and install into the mounting holes, apply 20 ft*lbf of torque.

d) Place the hinge side of the Clamp Gate Body onto the Clamp Hinge, ensuring that the two mounting holes line up. Apply Loc-Tite to two 3/8-16 x 1.0-in bolts and washers and install into the mounting holes, apply 5 ft*lbf of torque.

Figure 3-4: Generic Example: SB Clamp x Cable Lock, Exploded View
Figure 3-5: Generic Example: SB Clamp x Cable Lock, Spare Parts Kit
3.5 Repair Procedure

ABCO recommends that any damaged or dysfunctional parts be replaced or returned for repair. Parts modified in the field could void any warranty.

3.6 Parts and Spares List

It is recommended to carry 5% of the operating stock for spares. Spare parts kits are available to replace damaged parts of the Clamps. Call for current pricing.

3.7 Options and Modification

3.7.1 Wire Line – Auxiliary Line Conversion

The SB-BOP Clamp is designed to mount to either a Wire Rope or to a standard ABCO modular base bracket, which allows the Clamp to fit onto the Choke and Kill Line or to a wire rope with the use of an AR Clamp assembly or a Cable Lock assembly. The Clamp is equipped with a Shim Bracket that allows the Clamp to be placed at any height inside / outside the syntactic foam. The shortest Shim Bracket is 1.25 in tall, and each subsequent size is 0.50 in taller. Refer to Figure 3-6 for an illustrative example of various Shim Brackets.

Multiple clamps can be run simultaneously down the same pipe or wire rope with the use of a Y-Bracket as shown in Figure 3-7.

![Figure 3-6: Various Shim Sizes Illustrated](image)
3.7.2 Bare Joint

Clamps that mount to bare joints are equipped with a special Over Ride Saddle Bracket. This bracket has the Shim Bracket outer interface built into the Saddle Bracket with deflector profiles to permit the Clamp base to remain on the Kill or Choke line during running operations without being damaged during passage through the diverter housing. This also gives the Clamp the lowest possible profile.

4 WARRANTY POLICY

ABCO Subsea Inc. stands by every product we make, but in the happenstance that a problem does occur under normal working conditions ABCO will replace any component that is found defective in material or workmanship. Replacement parts will be shipped FOB Houston to the Client’s base of operations.

5 APPENDIX

Attached to this document should be project specific drawing(s), including the following;

- General Assembly Drawing(s)