

HARKEN®

MKIV JIB REEFING & FURLING

Unit 2E, Unit 3E

Installation Manual – Intended for specialized personnel or expert users

4676 07/16



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Please read these instructions carefully before installing, servicing, or operating the equipment.
This manual may be modified without notice. See: www.harken.com/manuals for updated versions.

PLEASE SAVE THESE INSTRUCTIONS

Safety Precautions/Parts Descriptions

Introduction

This manual gives technical information on installation and service. This information is **destined exclusively** for specialized personnel or expert users. Installation, disassembling, and reassembling by personnel who are not experts may cause serious damage to property or injury to users and those in the vicinity of the product. If you do not understand an instruction contact Harken.

The user must have appropriate training in order to use this product.

Harken accepts no responsibility for damage or harm caused by not observing the safety requirements and instructions in this manual. See limited warranty, general warnings, and instructions in www.harken.com/manuals.

Purpose

Harken® Jib Reefing and Furling is designed for rolling sails on sailboats to reduce sail size or to completely roll so wind has little effect on the sail. Use of this product for other than normal sailboat applications is not covered by the limited warranty.

Safety Precautions



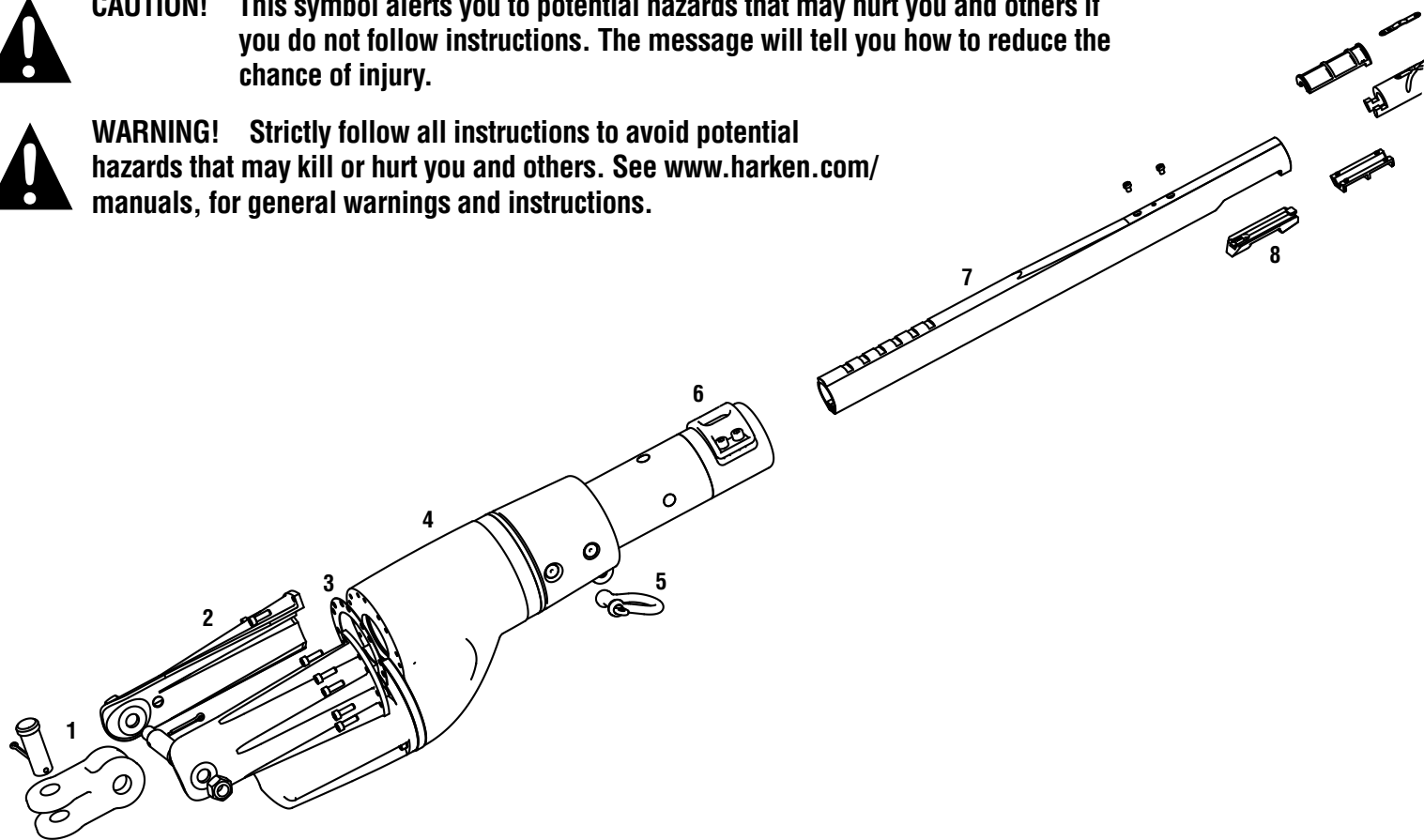
WARNING! This symbol alerts you to potential hazards that may kill or hurt you and others if you don't follow instructions. The message will tell you how to reduce the chance of injury.



CAUTION! This symbol alerts you to potential hazards that may hurt you and others if you do not follow instructions. The message will tell you how to reduce the chance of injury.

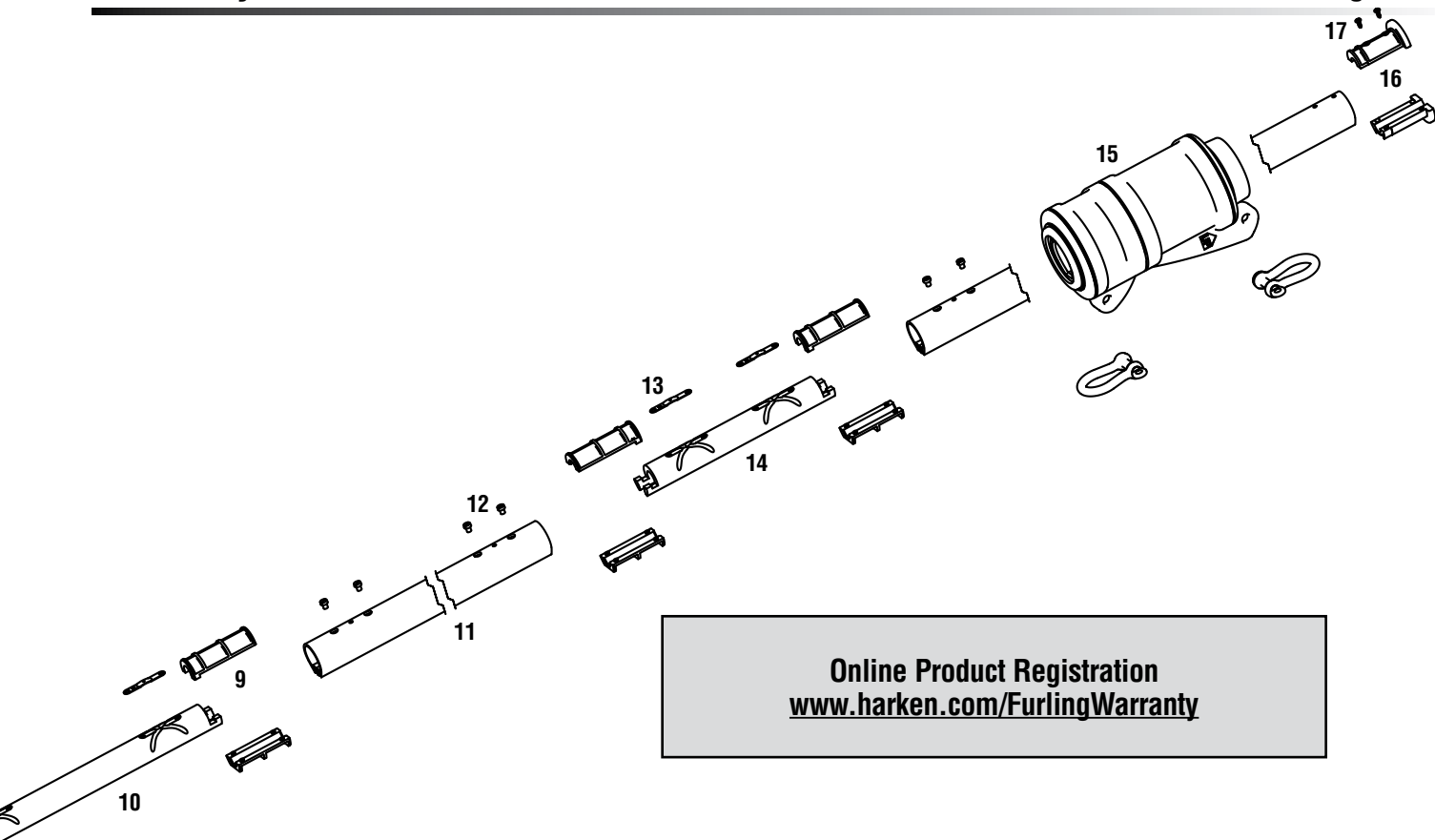


WARNING! Strictly follow all instructions to avoid potential hazards that may kill or hurt you and others. See www.harken.com/manuals, for general warnings and instructions.



Parts Descriptions

- | | | | | |
|-------------------|----------------------------|----------------------|---------------------|---------------------|
| 1) Jaw/Jaw Toggle | 5) Shackles | 9) Connector Bushing | 13) Connector Wedge | 17) Trim Cap Screws |
| 2) Link Plates | 6) Foil Clamp | 10) Bottom Connector | 14) Connector | |
| 3) Isolator | 7) 2' (610 mm) Bottom Foil | 11) 7' (2.13 m) Foil | 15) Halyard Swivel | |
| 4) Lower Unit | 8) Feeder | 12) Connector Screws | 16) Trim Cap | |



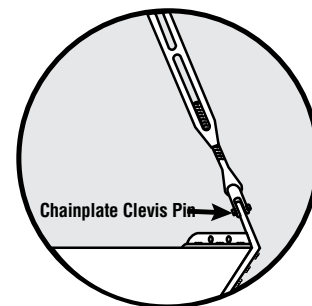
Size Check

1. Check headstay and clevis pin dimensions in chart below.



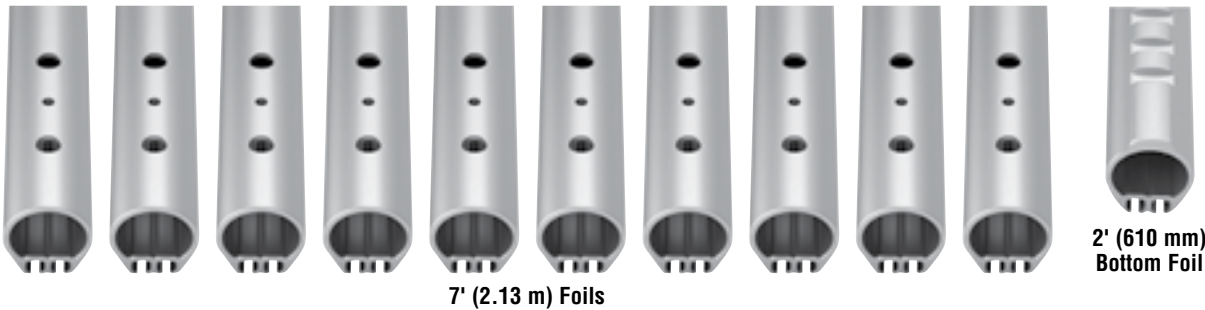
WARNING! Do not drill boat's chainplate or toggle. This may result in rig failure. Use the correct size toggle and clevis pin.

- Do not drill boat's chainplate or toggle. Bushings may be required to fit boats with smaller clevis pin sizes.
- Will lower unit fit on bow? See page 7. If necessary, use an additional toggle to slightly raise unit.



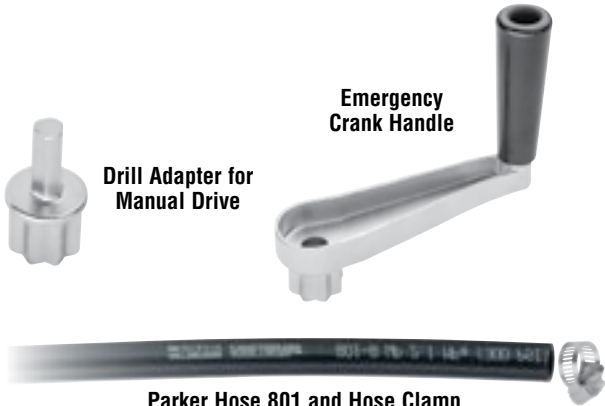
| UNIT 2E | Part No. | | Description | | Wire Ø | |
|-------------|----------------------------|-----------------------------------|---------------|---------------------------|---------------------|--|
| | 7412.13 12V 7412.13 24V | MKIV Electric Unit 2E | 5/16", 3/8" | 8 mm, 10 mm | | |
| | | | Rod Ø | | | |
| | | | -12, -17, -22 | 7.14 mm, 8.38 mm, 9.53 mm | | |
| | Toggle Part No. | | Description | | Chainplate Clevis Ø | |
| 7412.22 5/8 | | Jaw/jaw toggle w/short link plate | | 5/8" | 15.9 mm | |
| 7413.22 3/4 | | Jaw/jaw toggle w/short link plate | | 3/4" | 19.1 mm | |

| UNIT 3E | Unit Part No. | Description | Wire Ø | |
|-------------|-----------------------------------|-----------------------|---------------------|-------------------|
| | 7413.13 12V 7413.13 24V | MKIV Electric Unit 3E | 7/16", 1/2" | 11 mm, 12 mm |
| | | | Rod Ø | |
| | | | -22, -30 | 9.53 mm, 11.10 mm |
| | Toggle Part No. | Description | Chainplate Clevis Ø | |
| 7413.22 3/4 | Jaw/jaw toggle w/short link plate | 3/4" | 19.1 mm | |
| 7413.22 7/8 | Jaw/jaw toggle w/short link plate | 7/8" | 22.2 mm | |



Halyard Swivel

**Lower Unit
Unit 3E**



**Drill Adapter for
Manual Drive**

**Emergency
Crank Handle**

Parker Hose 801 and Hose Clamp

| Main Components | | UNIT 2E | | UNIT 3E | |
|--------------------------------------|-------------|---------|-------------|---------|--|
| Description | Part No. | Qty | Part No. | Qty | |
| 7'(2.13 m) Foil | 7412.31 | 8 | 7413.31 | 10 | |
| 2'(610 mm) Bottom foil | 7412.33 | 1 | 7413.33 | 1 | |
| Halyard Swivel | H-39794 | 1 | H-39392 | 1 | |
| 12V Lower Unit with Clamp | 7412.13 12V | 1 | 7413.13 12V | 1 | |
| 24V Lower Unit with Clamp | 7412.13 24V | 1 | 7413.13 24V | 1 | |
| Drill Adapter for Manual Drive | 7431 | 1 | 7431 | 1 | |
| Emergency Crank Handle | 7430 | 1 | 7430 | 1 | |
| Parker Hose 801 1/2" ID, 2' (610 mm) | — | 1 | — | 1 | |
| Hose Clamp | — | 1 | — | 1 | |



**Lower Unit
Unit 2E**



**Electric
control box**



Circuit Breaker



Digital System Switch

| Electric Components | | UNIT 2E | | UNIT 3E | |
|---------------------|------------------------|-------------|-----|-------------|-----|
| | Description | Part No. | Qty | Part No. | Qty |
| 12-VOLT | Electric control box | BEB500.12.1 | 1 | BEB500.12.1 | 1 |
| | 40 AMP circuit breaker | HCP1918 | 1 | HCP1918 | 1 |
| | Digital System Switch | DSDBK2 | 1 | DSDBK2 | 1 |
| 24-VOLT | Electric control box | BEB500.24.1 | 1 | BEB500.24.1 | 1 |
| | 30 AMP crcuit breaker | HCP1917 | 1 | HCP1917 | 1 |
| | Digital System Switch | DSDBK2 | 1 | DSDBK2 | 1 |



Connector Bushings



Plastic
Connector
Wedges



Foil Screws



Trim Cap



Trim Cap Screws



Feeder



Prefeeder



Bow Shackles



Bottom
Connector



Connectors

| Other Components | UNIT 2E | | | UNIT 3E | | |
|-------------------------------|-------------|-----------------------------------|-----|-----------------------------------|-----|---------------|
| | Description | Part No. | Qty | Part No | Qty | Size |
| Connectors | | 7412.31F | 7 | 7413.31F | 9 | 9.75" (248mm) |
| Bottom Connector | | 7412.32F | 1 | 7413.32F | 1 | 14" (356mm) |
| Connector bushing set | | HFG296 (16 EA H-42032/H-42033) | 1 | HFG297 (20 EA H-42073/H-42074) | 1 | — |
| Plastic connector wedge set | | HFG300 (18 EA H-39487) | 1 | HFG324 (22 EA H-39487) | 1 | — |
| Foil screw set | | HFG348 (38 EA HFS1106) | 1 | HFG349 (46 EA HFS1106) | 1 | — |
| Trim cap set | | HFG681 (H-37403/H-37404) | 1 | HFG682 (Missing) | 1 | — |
| Trim cap screw set | | HFG672 (3 EA HFS1127) | 1 | HFG672 (3 EA HFS1127) | 1 | — |
| Prefeeder | | 947 | 1 | 947 | 1 | — |
| Feeder with screw and tab | | H-39559 | 1 | H-39756 | 1 | — |
| Bow shackle | | 2117 (8 mm) | 1 | 2124 (10 mm) | 1 | — |
| Blue Loctite® | | 833 | 1 | 833 | 1 | .017 oz. |
| Red Loctite® | | HFG739 | 2 | HFG739 | 2 | .017 oz. |
| Injector, 1 oz. 5200 Adhesive | | HFG725 | 1 | HFG725 | 1 | 1 oz. |



Blue Loctite®
Red Loctite®



Injector



5200
Adhesive



3, 4, 5, 6, 10 mm

| Tools | UNIT 2E | | UNIT 3E | |
|-------------|---------|---------------|---------|----------------|
| Description | Qty | Size | Qty | Size |
| Hex keys | 1 Ea | 3, 4, 5, 6 mm | 1Ea | 3, 4, 6, 10 mm |

Toggles

1. Harken jaw/jaw toggle and link plate assembly required. **Sold separately.**
2. Mating turnbuckle components, with eye at lower end, must be purchased separately. See page 8.
3. Headstay may require cutting and shortening to fit Harken toggle. Some headstays may remain uncut by replacing lower stud of turnbuckle with stud/eye thus eliminating extra toggle.
4. Rod rigging requires Harken rod adapter stud.



WARNING! Wire or rod that is old or damaged may break suddenly, causing an accident. Headstay condition should be checked by a professional rigger before reusing.

5. Fuse, 5A ,for wiring switches.
6. Harken 7406 through-deck fitting for routing power wires through the deck. Fits 1/2" ID parker hose supplied with unit. Includes three (3) 6 mm x 35 mm fasteners and hose clamp. See page for template.



Harken Toggle/
Link Plate Assembly
(Sold Separately)



| Jaw/Jaw Toggle w/ Link Plate | |
|------------------------------|-------------|
| Unit | Part No. |
| 2E | 7312.22 5/8 |
| | 7413.22 3/4 |

| Unit | Part No. |
|------|-------------|
| 3E | 7413.22 3/4 |
| | 7413.22 7/8 |

ROD RIGGING
Harken Rod Adapter
Stud Required
(Sold Separately)



| Rod Adapter Stud | |
|------------------|----------|
| Unit | Part No. |
| 2E | 7424 -12 |
| | 7425 -17 |
| | 7426 -22 |

| Unit | Part No. |
|------|----------|
| 3E | 7426 -22 |
| | 7427 -30 |

Tools You Will Need



| | | |
|---|----------------------------------|---------------------------|
| 1. Long tape measure | 6. Side cutters | 11. Center punch |
| 2. Short tape measure | 7. Rat-tail file | 12. Rigging or black tape |
| 3. Power drill | 8. Hex keys (provided) | 13. Scissors |
| 4. Drill bit – 5/32" (4mm) | 9. Slotted/phillips screwdrivers | 14. Metal straight edge |
| 5. Hacksaw | 10. Needle-nose pliers | 15. Hammer |
| 16. 5 mm Ball-end hex key wrench (recommended but not required) | | |

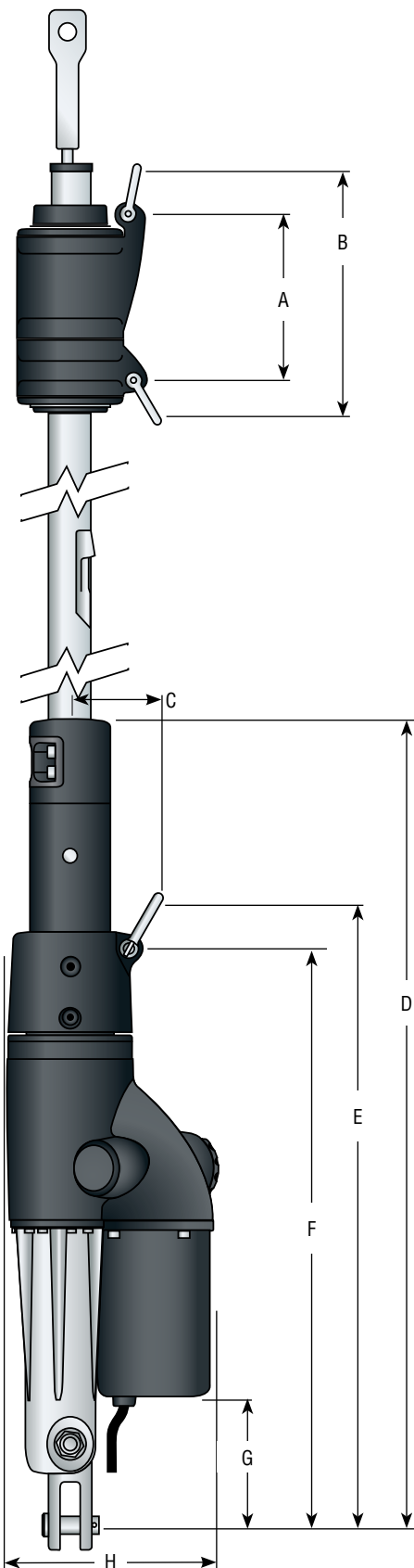
Adhesive Alert

MKIV Furlers are shipped with 3M® 5200 adhesive. Use adhesives on dry connectors and foils using the special injection system described in the assembly section. Parts may immediately be exposed to rain. Cure is best at 70 F (22C) with 50% humidity. Do not apply at temperatures below 40 F (5C) and above 100F (38C).

Although adhesive has not cured it will remain in place on foil joints whether they are left on the ground or raised up on boat. Foils can be raised immediately after assembly and sails fitted.

Note: A small amount of adhesive may bulge out of injection ports. If possible let system sit for a couple days before sailing. If adhesive gets on sails remove using acetone. For faster-curing adhesive, purchase 4200 Fast Cure.

Note: Damaged foils can be repaired. Use a hand-held propane torch to heat joints until foils can be pulled apart.



Luff Length

Note offsets above and below sail.
A shorter luff may be required if a halyard restrainer is used or an additional toggle assembly is used to raise unit.
If luff of sail is not long enough to put halyard swivel near top of headstay foil, a pendant must be added. See page 29.

Tack Setback

Note setback for tack shackle and cut sail accordingly.

Luff Tape Size

Unit 2E and 3E require #6 (6/32" or 5 mm) luff tape.

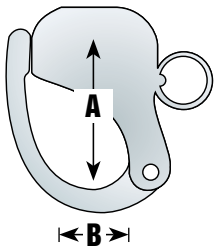
Luff Tape Length

Cut off top of luff tape so it is 18 to 24" (450 to 600 mm) below head of sail. This allows head to lag behind rest of sail to help flatten sail. It will also help head to roll more smoothly.
Note feeder height and extend bottom of luff tape downward so it is below feeder. This will prevent luff tape from catching in feeder as sail is lowered.

Tack and Head Shackles

Make sure tack and head shackles fit sail rings. Minimum inside dimensions of standard head and tack shackles are:

| Unit | A | B |
|------|----------------|-----------------|
| 2E | 1 3/4" (44 mm) | 1 1/16" (17 mm) |
| 3E | 1 7/8" (48 mm) | 1 3/16" (21 mm) |



Sun cover

Sun covers may be installed on either side of sail. Be sure to match other sails in the customer's inventory.

See toggle dimensions in appendix

| Part No. | A | | B | | C | | D | | E | | F | | G | | H | |
|---------------------------------|--------|-----|--------|-----|-------|----|----------|-----|----------|-----|----------|-----|--------|-----|---------|-----|
| | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm |
| 7412.13 with 7312.22 5/8 toggle | 5 3/8 | 143 | 9 1/8 | 231 | 3 1/4 | 82 | 33 1/16 | 841 | 24 1/2 | 622 | 22 5/8 | 574 | 4 1/2 | 116 | 8 11/32 | 212 |
| 7412.13 with 7413.22 3/4 toggle | 5 3/8 | 143 | 9 1/8 | 231 | 3 1/4 | 82 | 33 11/19 | 856 | 25 3/32 | 637 | 23 1/4 | 590 | 5 3/16 | 132 | 8 11/32 | 212 |
| 7413.13 with 7413.22 3/4 toggle | 7 5/16 | 186 | 11 5/8 | 296 | 3 1/4 | 82 | 32 1/2 | 826 | 25 3/32 | 637 | 23 1/4 | 590 | 5 3/16 | 132 | 8 11/32 | 212 |
| 7413.13 with 7413.22 7/8 toggle | 7 5/16 | 186 | 11 5/8 | 296 | 3 1/4 | 82 | 33 3/16 | 840 | 25 11/16 | 652 | 23 13/16 | 605 | 5 3/4 | 146 | 8 11/32 | 212 |

Use dimensions of Harken toggle below to build stay to correct length.

Tip: Turnbuckles should be 1/2 to 2/3 open to allow shortening for new wire stretch and for fine-tuning mast rake.



Note: Turnbuckle assembly with eye at lower end not supplied by Harken

| Unit | Clevis Pin Ø | Pin-to-Pin Length |
|------|----------------|-------------------|
| 2E | 5/8" (15.9mm) | 25/8" (67mm) |
| | 3/4" (19.1mm) | 39/32" (83mm) |
| Unit | Clevis Pin Ø | Pin-to-Pin Length |
| 3E | 3/4" (19.1 mm) | 39/32" (83 mm) |
| | 7/8" (22.2 mm) | 37/8" (98 mm) |

Options for Snaking Stay into Foils

1. Swage stud at end of wire.
2. Open end of wire and install Norseman or Sta-Lok® stud after foil is assembled.
3. Rod adapter nosepiece for Harken rod adapter stud: Threaded nosepiece must have a positive lock of as well as adhesive. Use Harken stud with cotter pins. See page 22.

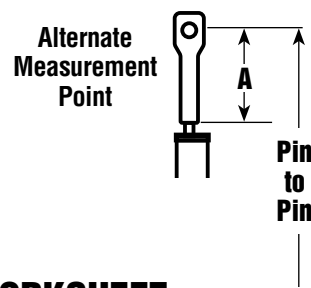


WARNING! Using a threaded nosepiece with only adhesive at the upper rod eye terminal may result in headstay system failure. Make sure there is a mechanical lock.



| Measure A and add to this chart and length chart below | | |
|--|--------|-----|
| | Inches | mm |
| A | | |
| B | 63 | 16 |
| E | 24 | 610 |
| F | 17.5 | 445 |
| G | | |
| Total A+B+E+F+G | | |

Make sure upper measurement points of A and Pin-to-Pin are the same.



TOP FOIL LENGTH WORKSHEET

| | | |
|--|-----------------------------|----------------------|
| 1 | Pin-to-Pin Length | |
| 2 | Subtract ABEFG | - |
| 3 | Result (Pin-to-Pin - ABEFG) | |
| 4 | Subtract D | - |
| To find "D" pick number from chart below that is closest to, but not greater than total from step 3. | | |
| Inches | | mm |
| 5 x 84 = 420 | | 5 x 2133.6 = 10668.0 |
| 6 x 84 = 504 | | 6 x 2133.6 = 12801.6 |
| 7 x 84 = 588 | | 7 x 2133.6 = 14935.2 |
| 8 x 84 = 672 | | 8 x 2133.6 = 17068.8 |
| 9 x 84 = 756 | | 9 x 2133.6 = 19202.4 |
| Example-If result from Step 3 is: | | |
| 500 inches "D" = 420 12,000 mm "D" = 10,668 mm | | |
| 5 | Result (C) Top Foil Length | |

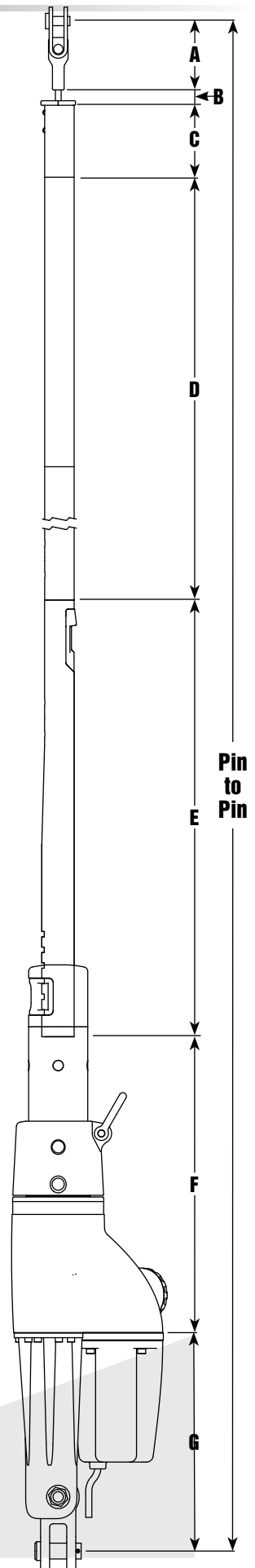


Length Check

After completing worksheet above fill in A, C, D and G below. Add "A" through "G" to confirm total equals your pin-to-pin measurement.

| Length Chart | | |
|--|--------|-----|
| Dimensions | Inches | mm |
| A Center of Pin to Bottom of Terminal | | |
| B Bottom of Terminal to Top of Foil | 63 | 16 |
| C Top Foil Length | | |
| D Number of Foils _____ x 84" (2133.6mm) | | |
| E Bottom Foil | 24 | 610 |
| F Bottom of Foil to Top of Link Plates | 17.5 | 445 |
| G Top of Link Plate to Clevis Pin | | |
| Pin-to-Pin Length | | |

| G Toggle Distance from Lower Clevis Pin to Top of Link Plates | | | | | |
|---|-------------------------|------------|------|------------|-----|
| Toggle Part No. | Type | Clevis Pin | | G Distance | |
| | | in | mm | in | mm |
| 7312.22 5/8 | Jaw/Jaw with Link Plate | 5/8 | 15.9 | 11.67 | 296 |
| 7413.22 3/4 | Jaw/Jaw with Link Plate | 3/4 | 19.1 | 12.27 | 312 |



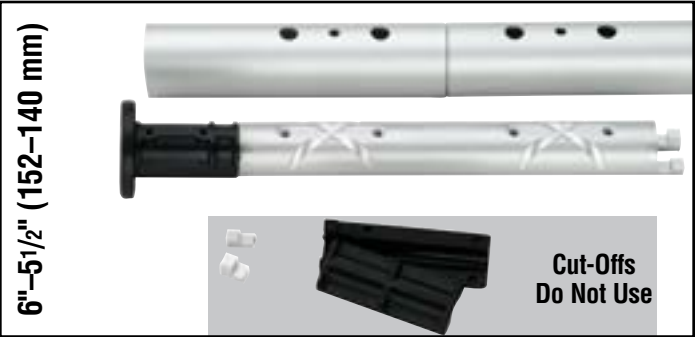
If top foil is shorter than 8 11/16" (221 mm), use one of the following special techniques to ensure sufficient bearing surface for the foil in the area of the halyard swivel.



8 11/16" (221 mm) No special treatment required.



8 5/8" – 6 3/8" (219–162 mm) Do not use plastic bushing above top connector.



6"–5 1/2" (152–140 mm) Do not use plastic bushing above top connector. Shorten top of connector and if necessary shorten trim cap.



5 1/4"–3 5/8" (133–92 mm) Do not use plastic bushing above top connector. Cut connector right at cross formed by glue dispersion channels. Use single foil screw in top foil only.



3"–1" (76–25 mm) Shorten top foil and adjoining full length foil so two screws are used to assemble joint instead of four. Do not use plastic bushings above top connector.

| Top Foil Length from Worksheet | 1. Initial top foil cut length | 2. Cut through middle hole in top foil.* | 3. Shorten full length adjoining foil by cutting through middle hole.* | 4. Shorten connector | 5. Shorten trim cap |
|--------------------------------|--------------------------------|--|--|----------------------|---------------------|
| | | Resulting Top Foil Length | | Length | |
| 3" (76 mm) | 7 1/4" (184 mm) | 5 1/8" (130 mm) | | 4 1/2" (114 mm) | No |
| 2 1/2" (64 mm) | 6 3/4" (172 mm) | 4 5/8" (117 mm) | | 4 1/2" (114 mm) | No |
| 2" (51 mm) | 6 1/4" (159 mm) | 4 1/8" (105 mm) | | 4 1/2" (114 mm) | No |
| 1 1/2" (38 mm) | 5 3/4" (146 mm) | 3 5/8" (92 mm) | | 3 3/4" (95 mm) | Yes |
| 1" (25 mm) | 5 1/4" (133 mm) | 3 1/8" (79 mm) | | 3 3/4" (95 mm) | Yes |



*To allow for saw cut, position blade so upper half of middle hole is preserved.

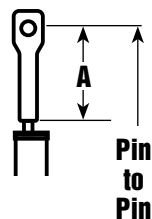


Under 1" (25 mm) Eliminate top foil and run foil higher in torque tube.

| Measure A and add to this chart and length chart below | | |
|--|--------|-----|
| | Inches | mm |
| A | | |
| B | 1 | 25 |
| E | 24 | 610 |
| F | 15.41 | 391 |
| G | | |
| Total A+B+E+F+G | | |

Make sure upper measurement points of A and Pin-to-Pin are the same.

Alternate Measurement Point



TOP FOIL LENGTH WORKSHEET

| | | |
|--|-----------------------------|----------------------|
| 1 | Pin-to-Pin Length | |
| 2 | Subtract ABEFG | - |
| 3 | Result (Pin-to-Pin - ABEFG) | |
| 4 | Subtract D | - |
| To find "D" pick number from chart below that is closest to, but not greater than total from step 3. | | |
| Inches | | mm |
| 7 x 84 = 588 | | 7 x 2133.6 = 14935.2 |
| 8 x 84 = 672 | | 8 x 2133.6 = 17068.8 |
| 9 x 84 = 756 | | 9 x 2133.6 = 19202.4 |
| 10 x 84 = 840 | | 10 x 2133.6 = 21336 |
| 11 x 84 = 924 | | 11 x 2133.6 = 23470 |
| Example-If result from Step 3 is: | | |
| 800 inches "D" = 756 inches 20,000mm "D" = 19,202mm | | |
| 5 | Result (C) Top Foil Length | |

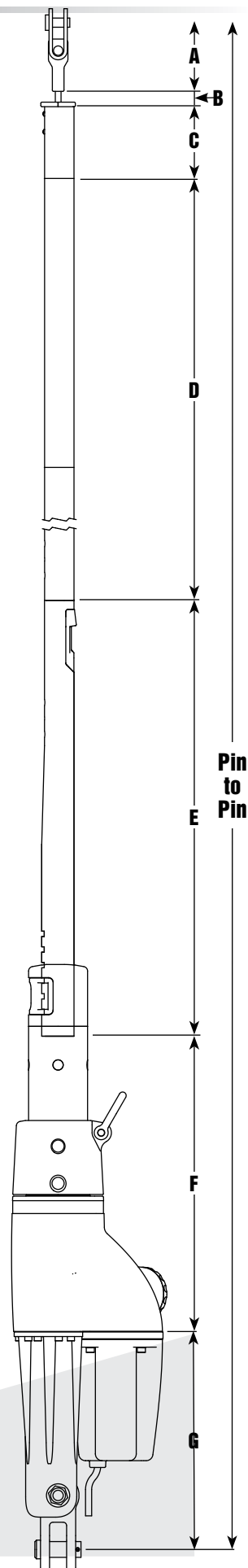
UNIT 3E

Length Check

After completing worksheet above fill in A, C, D and G below. Add "A" through "G" to confirm total equals your pin-to-pin measurement.

| Length Chart | | |
|--|--------|-----|
| Dimensions | Inches | mm |
| A Center of Pin to Bottom of Terminal | | |
| B Bottom of Terminal to Top of Foil | 1.00 | 25 |
| C Top Foil Length | | |
| D Number of Foils _____ x 84" (2133.6mm) | | |
| E Bottom Foil | 24.00 | 610 |
| F Bottom of Foil to Top of Link Plates | 15.41 | 391 |
| G Top of Link Plate to Clevis Pin | | |
| Pin-to-Pin Length | | |

| G Toggle Distance from Lower Clevis Pin to Top of Link Plates | | | | | |
|---|-------------------------|------------|------|------------|-----|
| Toggle Part No. | Type | Clevis Pin | | G Distance | |
| | | in | mm | in | mm |
| 7413.22 3/4 | Jaw/Jaw with Link Plate | 3/4 | 19.1 | 12.27 | 312 |
| 7313.22 7/8 | Jaw/Jaw with Link Plate | 7/8 | 22.2 | 12.85 | 327 |



If top foil is shorter than 93/4" (248 mm), use one of the following special techniques to ensure sufficient bearing surface for the foil in the area of the halyard swivel.



93/4" (248 mm) No special treatment required.



95/8" – 71/8" (244 – 181 mm) Do not use plastic bushing above top connector.



7" - 51/2" (178 – 140 mm) Do not use plastic bushing above top connector. Shorten top of connector and if necessary shorten trim cap.



53/8" - 4" (137 – 102 mm) Do not use plastic bushing above top connector. Cut connector right at cross formed by glue dispersion channels. Use single foil screw in top foil only.



31/2" - 11/2" (89 – 38 mm) Shorten top foil and adjoining full length foil so two screws are used to assemble joint instead of four. Do not use plastic bushings above top connector.

| Top Foil Length from Worksheet | 1. Initial top foil cut length | 2. Cut through middle hole in top foil.* | 3. Shorten full length adjoining foil by cutting through middle hole.* | 4. Shorten connector | 5. Shorten trim cap |
|--------------------------------|--------------------------------|--|--|----------------------|---------------------|
| | | Resulting Top Foil Length | | Length | |
| 31/2" (89 mm) | 69/16" (167 mm) | 5" (127 mm) | | 47/8" (124 mm) | No |
| 3" (76 mm) | 61/16" (154 mm) | 41/2" (114 mm) | | 47/8" (124 mm) | No |
| 21/2" (64 mm) | 69/16" (167 mm) | 4" (102 mm) | | 47/8" (124 mm) | No |
| 2" (51 mm) | 51/16" (129 mm) | 31/2" (89 mm) | | 43/8" (111 mm) | Yes |
| 11/2" (38 mm) | 49/16" (116 mm) | 3" (76 mm) | | 33/4" (95 mm) | Yes |



*To allow for saw cut, position blade so upper half of middle hole is preserved.



Under 11/2" (38 mm) Eliminate top foil and run foil higher in foil clamp.

Confirm foil length by laying foils alongside stay with turnbuckle components.

Pull stay out so it is straight. Attach Harken toggle to bottom of stay using crosspin. Make sure toggle straps are straight. Adjust turnbuckle so that length of stay with Harken toggle will fit boat. Ideally, turnbuckle will be half to two-thirds open to allow for rig adjustment.

Attach one link plate to lower unit. Line up lower unit so link plate hole lines up with crosspin in Harken toggle. Make sure toggle is tensioned when measuring.



Line up bottom foil so foil clamp is centered or just below center of notches in bottom foil.



Note: Position top foil so that with top cap the foil will ride below terminal (see chart below). If wire fitting at top of stay is swage, foil must ride just below shoulder of swage. Mark cut line on foil. Wrap tape around foil as a guide so cut is straight.

| Unit | |
|------|--------------|
| 2E | 5/8" (16 mm) |
| 3E | 1" (25 mm) |



Cut foil to length using hacksaw.



Deburr inside edge using rat-tail file.



Prepare top foil for drilling.

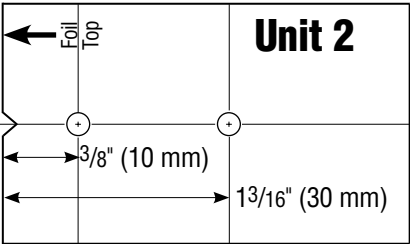
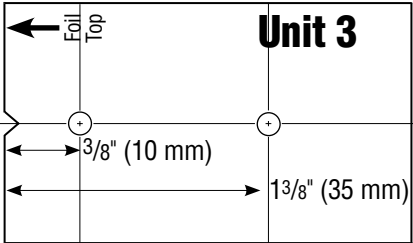
Tip: Mark top foil to distinguish from cutoff piece.

Scribe line on top of foil to mark drill holes. Lay top foil alongside cutoff piece and use a flat metal object (i.e. metal ruler) to scribe top line of foil.



Cut out template at right. Line up template with top of foil and scribed line. Tape in place. Use center punch to mark holes. Check center punch marks to confirm (see chart below).

| Unit | Center Punch Marks | |
|------|--------------------|-----------------|
| 2E | 3/8" (10 mm) | 1 3/16" (30 mm) |
| 3E | 3/8" (10 mm) | 1 3/8" (35 mm) |



Drill two (2) holes for trim cap. See chart below for correct drill size

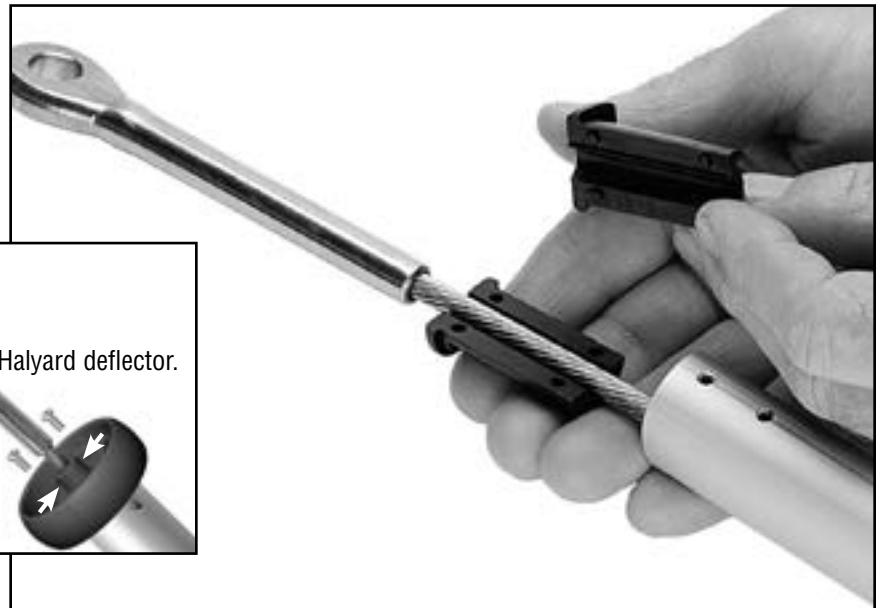
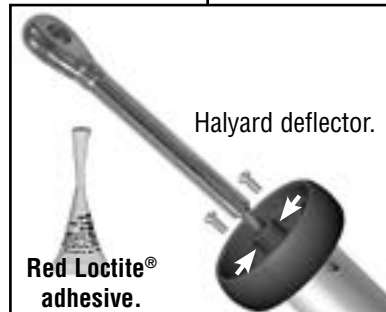
| Unit | Drill Ø |
|--------------|--------------|
| 2 | 5/32" (4 mm) |
| 3 (3/4, 7/8) | 5/32" (4 mm) |



Lay top foil in line with others. Slide stay into top foil and down line of foils or slide each foil up stay.



Install trim cap. Place each side over wire.
If installing halyard deflector, use red
Loctite® adhesive on screw holes..



Push trim cap into foil to start, then tap
in using hammer.
Install trim cap screws.



Place halves of plastic bushings on stay so
hooked part of longer section faces out.

**Tip: With foil screw holes up as shown
below, place longer half of bushing
with hook on upper half.**



Slip connector on wire, mating hook of plastic bushing with connector.



Put a drop of red Loctite® adhesive into screw holes.



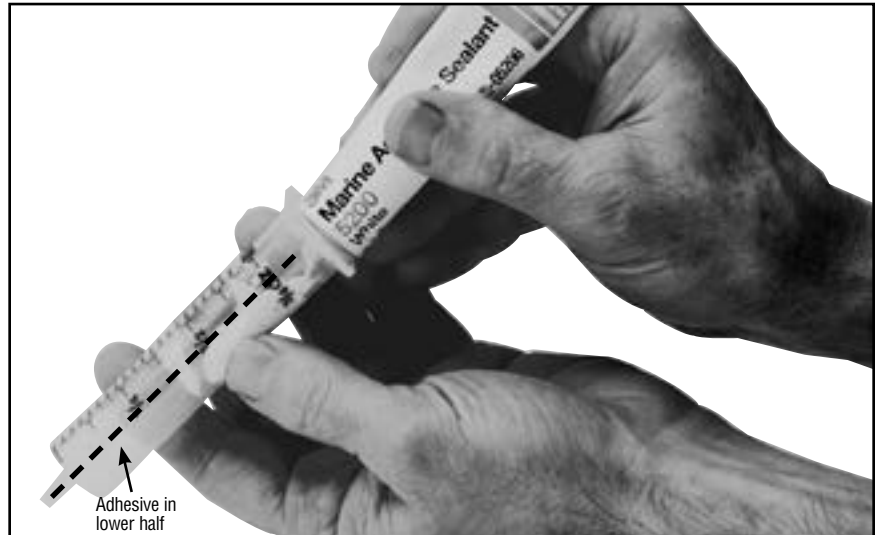
Hold plastic wedge in place with thumb as you insert into foil. Line foil holes with connector screw holes.



Loading Injector with Adhesive

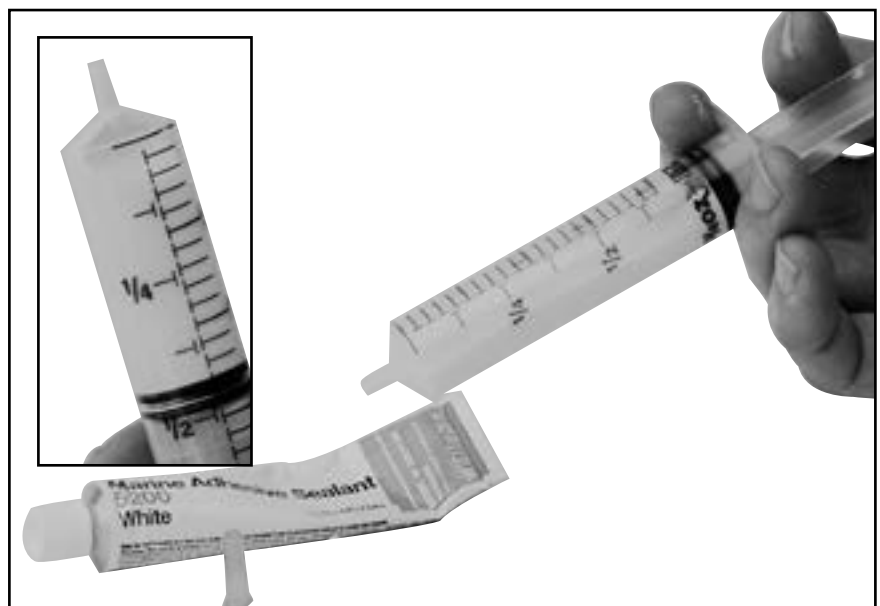
Tip: In cooler weather, keep sealed adhesive in pocket to keep warm. Use instructions below to fill injector less than half way; you will only use a small amount of adhesive. Refill if needed but do not keep open sealant for long periods. Use adhesive within 3 hours.

Use cap of adhesive to break seal. Remove injector tip cap and plunger. Hold injector at an angle with applicator tip facing down. Squeeze adhesive into tube so lower half of injector is full as shown. Keep tip free of sealant to let air inside.



Start plunger into injector and immediately hold upright so plunger is down and applicator tip is up.

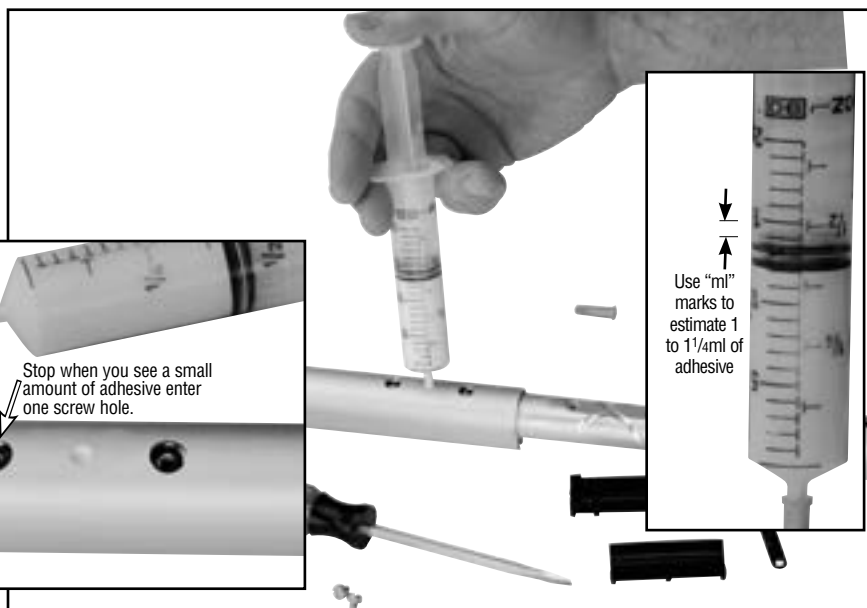
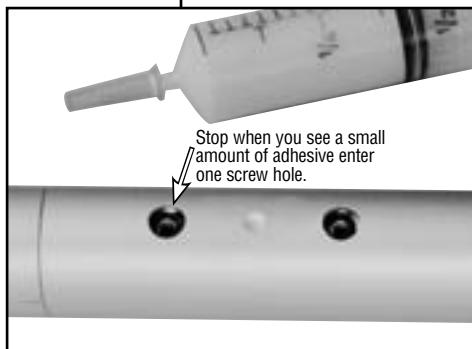
As sealant runs down towards plunger an air pocket will form near tip. Push plunger to evacuate air. You are now ready to begin injecting adhesive.



Inject only a small amount of adhesive into middle hole.

| Unit | Adhesive (ml) |
|-------------------------------------|--------------------|
| 2 | $\frac{3}{4} - 1$ |
| 3 ($\frac{3}{4}$, $\frac{7}{8}$) | $1 - 1\frac{1}{4}$ |

Tip: When you see a small amount of adhesive enter one screw hole, stop. You have applied enough adhesive.



Tighten screws into connector holes. Make sure a drop of adhesive entered each screw hole. If not, apply to screw.

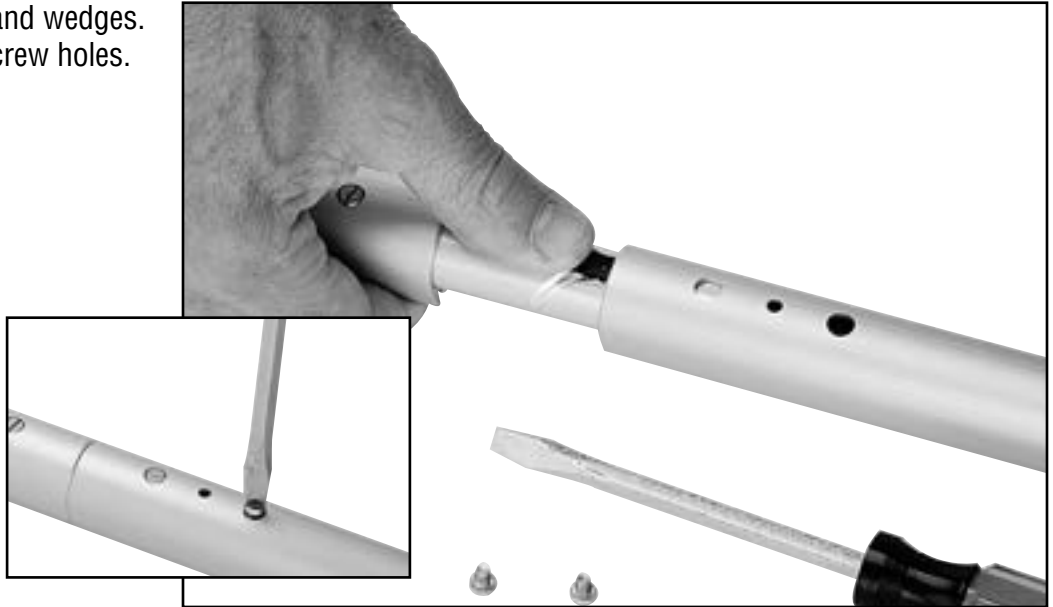


Use bushings, connector, wedge and adhesive in other screw hole and insert into other foil. Use adhesive (see chart below for amount).

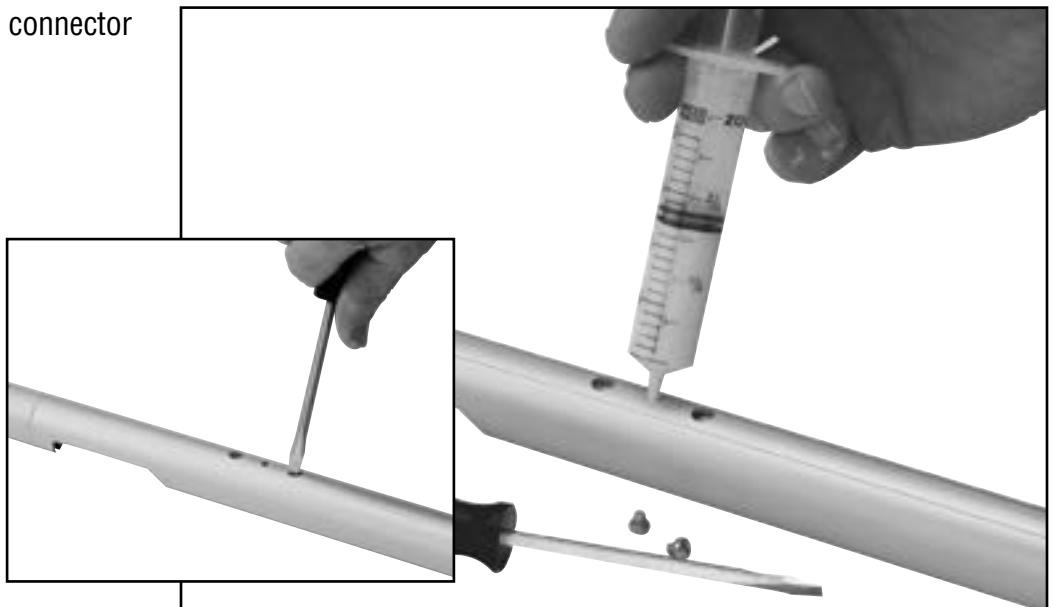
| Unit | Adhesive (ml) |
|-------------------------------------|--------------------|
| 2 | $\frac{3}{4} - 1$ |
| 3 ($\frac{3}{4}$, $\frac{7}{8}$) | $1 - 1\frac{1}{4}$ |



Continue installing connectors and wedges. Make sure to use adhesive in screw holes.



Continue assembly. Use bottom connector to assemble bottom foil.



Slide halyard swivel onto foil above feeder window. Make sure taller “half” is up as shown.

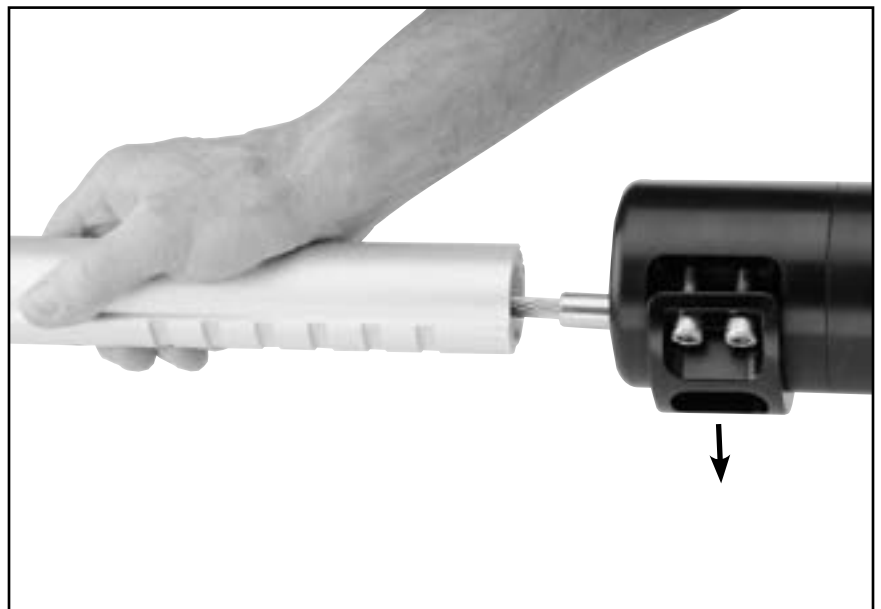


Loosen foil clamp screws at top of lower unit assembly.



Slide assembly onto foils.

Tip: Face clamp downward so it clears foil notches during installation.



ROD RIGGING

Apply a few drops of red Loctite® to threads of nosepiece. Screw main threaded stud portion onto bronze nosepiece until flats align with two cotter pin holes in terminal body.

Tip: Turn nosepiece completely into threaded stud portion. Flats will be close and may only require a small half turn to align with cotter pin holes.

Insert two cotter pins and spread. Clean excess Loctite® from terminal body using special care to ensure that there is no red Loctite® on threaded stud.



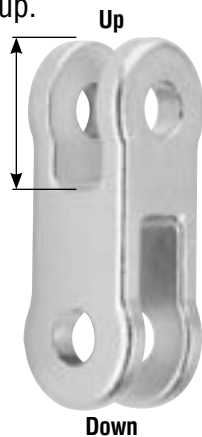
Assemble turnbuckle.

Note: If using Sta-Lok® or Norseman® stud, you must use a washer above stud as shown below.

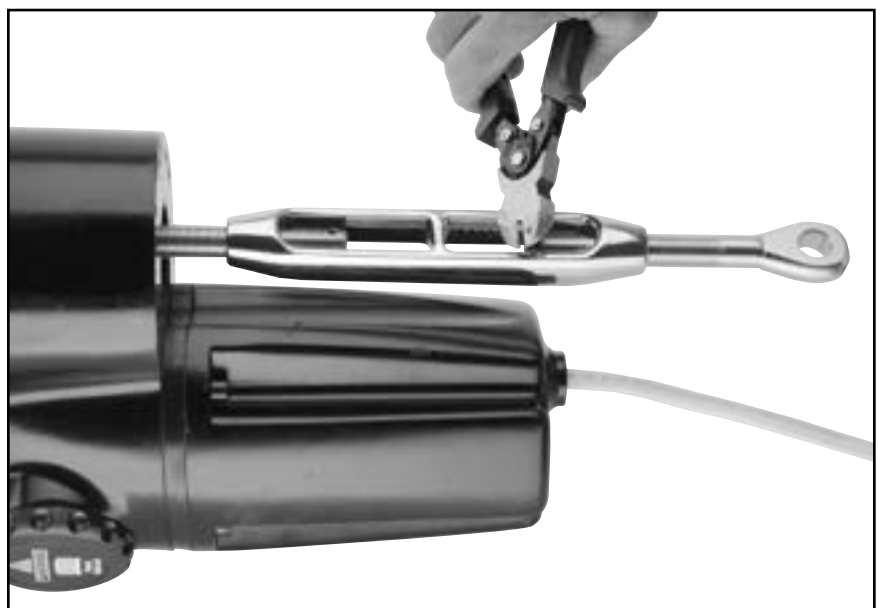


Connect eye to toggle jaw using special clevis pin. Secure using cotter pin.

Make sure shallow jaw is up.



If stay length is set use side cutters or needle-nose pliers to bend cotter pin to secure turnbuckle.



Determine correct position for isolator.
Capture isolator on screws and screw
one link plate to lower unit. Use
blue Loctite® on screws.



Capture special crosspin between link
plates as you secure second plate to
lower unit. Use Blue Loctite® on screws.



Tip: Use a ball-end hexkey to install screws so wrench can articulate.



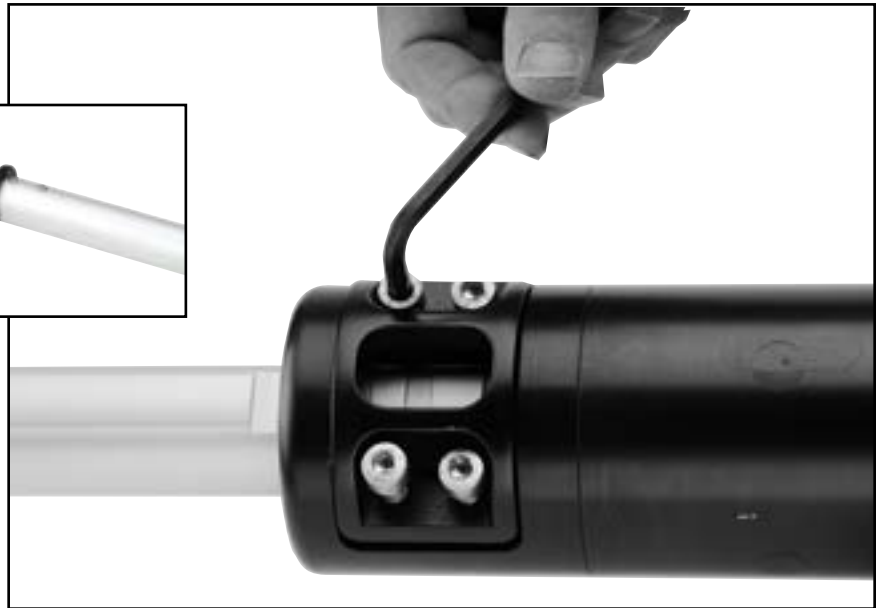
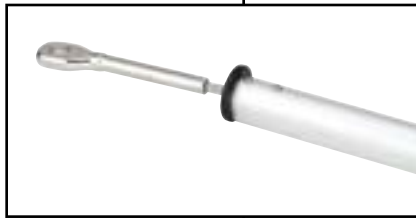
Recess turnbuckle into lower unit assembly, slip link plates over special crosspin and secure using fasteners. Use blue Loctite® on screws.



Secure to toggle using locknuts.



Check foil height at top, set and secure using hex key.



Slide halyard swivel above feeder. Place feeder in foil recess. Push screw down so tab catches under foil. Tighten screw.

Note: Screw will turn with some difficulty. It is plastic coated to prevent loosening due to vibration.

IMPORTANT! When removing screw, loosen no more than one full turn. Slide screw up and remove feeder.



Have extra cotter pins and locknuts on hand to replace used ones at base of unit and for turnbuckle.

Hold foils and loosen foil clamp screws until you can pull clamp out to lower foils.

Lower foils.

Remove link plates.



CAUTION! Make sure drum assembly and foils are securely lifted using a halyard before adjusting turnbuckle. Foils can drop suddenly causing injury to hands.

Adjust turnbuckle.

Replace used cotter pins and locknuts. Lower unit and install clevis pin and new cotter pin.

Lift foils so top is below upper terminal.

| Unit | |
|------|--------------|
| 2E | 5/8" (16 mm) |
| 3E | 1" (25 mm) |



Raise lower unit and use halyard to lift and hold it so top of unit is about 5' (1.5 m) from deck. Raise foils using second halyard and secure. **Allow room above for turnbuckle take up.**

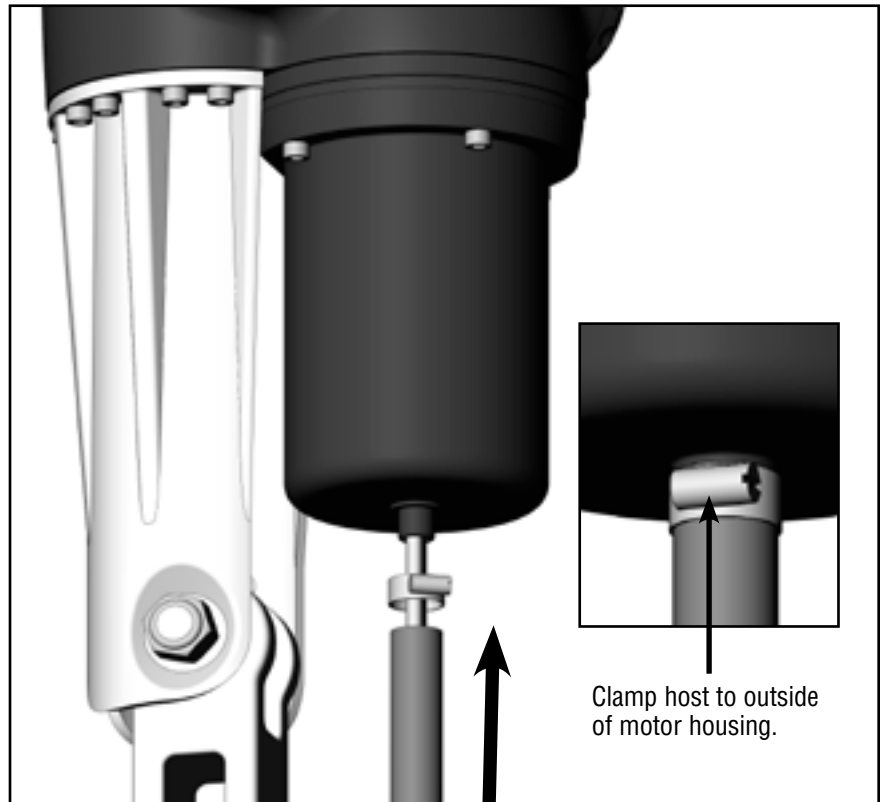


You must use supplied 1/2" ID Parker hydraulic hose to keep electric motor compartment water tight.

Slip hose over the wire. Use stainless steel hose clamp to securely tighten the hose to the coupling extension tube. If supplied hose is too short, use a similar 1/2" ID hydraulic hose.

Secure other end of hose to watertight through deck fitting so that wires enter a dry area of the boat.

Outer diameter of hose is 19.7 mm (.775").



Use optional 7406 Power Cable Through-Deck Fitting for a watertight routing of the power cable through the deck.

See drilling template on page 45.

Hole saw Ø 1 3/8" (35 mm)

Drill size 1/4" (6.25 mm)

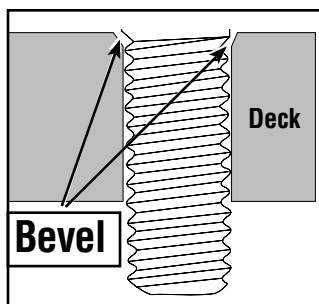
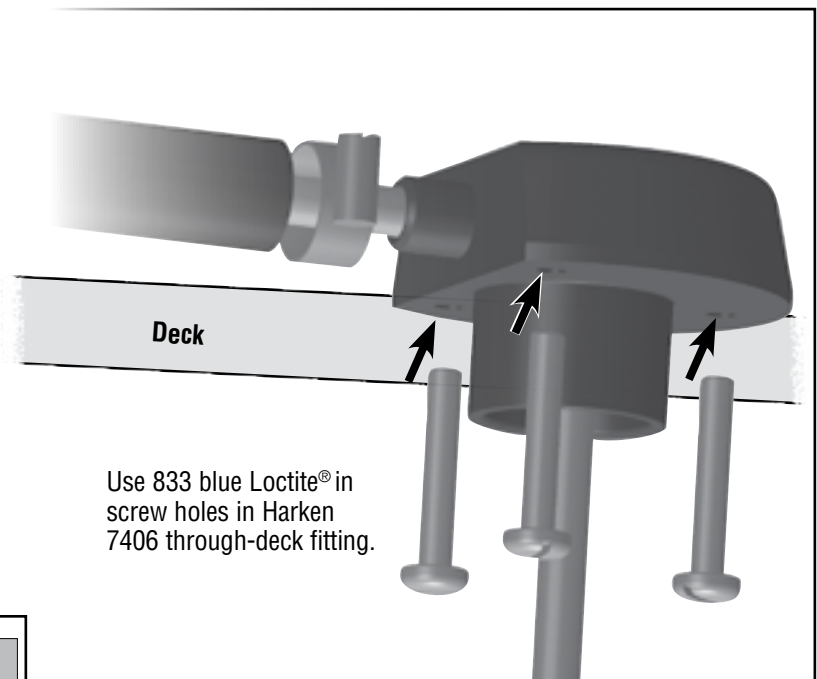
Fasteners (Provided) 6 mm x 35 mm

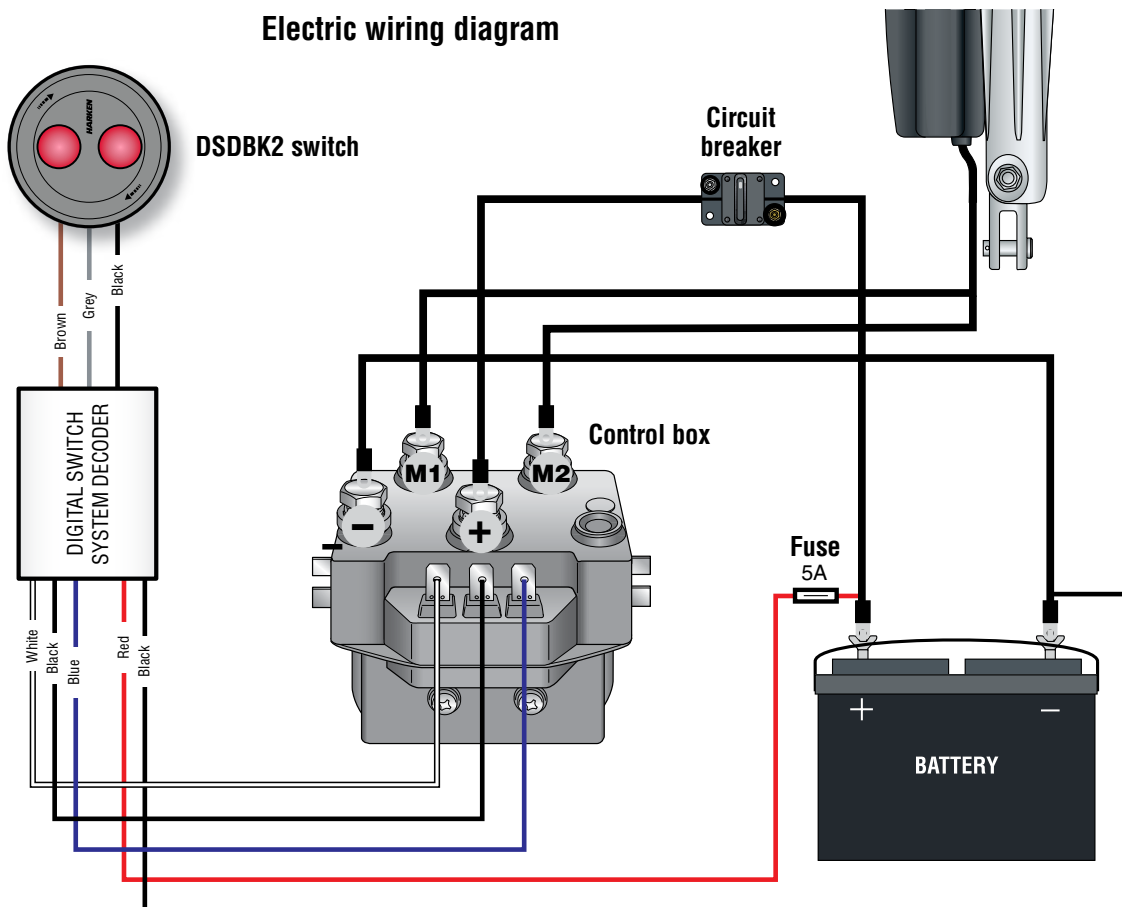
If required, shorten fasteners or purchase longer 6 mm stainless steel screws. Use washers, not provided.

Drill large hole and fastener holes.

Make a slight bevel at the top of the screw holes to allow sealant to form a small ring.

Use sealant around large deck hole and in deck screw holes.





| Wire | 12- or 24-Volt System Wire Size/Run Chart | | | | | | | |
|------|---|-------------|--------------------|---------|--------------------|---------|--------------------|---------|
| Run | 0-5 m | 0 - 16.4 ft | 5 - 10 m | 32.8 ft | 10 - 15 m | 49.2 ft | 15 - 20 m | 65.6 ft |
| Size | 10 mm ² | 6 AWG | 16 mm ² | 4 AWG | 25 mm ² | 2 AWG | 35 mm ² | 1 AWG |

Remote Switch wire size— 14 AWG (2mm²).

Electrical System (see performance charts in appendix)

Fasten electric control box containing solenoids to bulkhead or wall. Electrical terminals may face up or sideways. Do not install box up-side-down. The control box will not work.



WARNING! Mounting control box upside down will cause the system to not operate which may lead to an accident, resulting in damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

Install remote circuit breaker between power supply and electric control box.

Locate pushbuttons in a convenient spot for easy furler operation. Use 14 AWG (2 mm²) for Remote Switches.

Refer to wiring diagram for Wire Size/Run Chart above for connection information. Use ring terminals at end of connection.



Halyard Wraps

The most serious problem with furling systems occurs when the jib halyard wraps around the headstay foil. Halyard wraps will keep you from furling or unfurling and may cause serious damage to the unit and the halyard.



WARNING! In severe cases, a halyard wrap can cause loss of control of boat and/or headstay can break suddenly. Make sure halyard is clear of top foil before using system.

If Halyard Wraps

If halyard wraps, do not force unit to turn. Attempt to open sail by carefully furling in and out a little at a time. If sail will unfurl, lower it by releasing jib halyard. Severe halyard wraps can only be cleared by a professional going aloft and freeing halyard.

If sail will not furl or unfurl, try to remove jib sheets and manually wrap sail around headstay.



WARNING! Do not go aloft on boat's halyards if there has been a halyard wrap. Do not use boat. Damage to halyard, headstay, stay terminals, or connections as a result of a halyard wrap may cause these parts to break suddenly causing mast to fall down while person is aloft. Sailing or motoring with boat after a wrap can result in the headstay breaking and mast falling down. Before using boat, have a professional rigger inspect and replace parts as necessary using following methods.

A professional rigger must carefully inspect the masthead area using a secure hoisting method. Inform rigger that there has been a halyard wrap so they can avoid an accident by relying on standing rigging or halyards. Inspection must be done while rigger is suspended from a separate crane or mast must be lowered to perform inspection. Some professionals may rig a new line through internal masthead sheaves to serve as a temporary headstay to hold mast in place. Wire, rod rigging, terminals, toggles, clevis pins or cotter pins must be inspected and replaced if they show any signs of damage.

Prevent Halyard Wraps

To prevent wraps, the halyard must exert a slight pull to the rear. This allows the foils to turn while halyard remains stationary.



WARNING! Sail must be fitted to foil length before using to prevent halyard wraps and possible headstay loss.

1. Halyard swivel should be within top 4–6" (100–152 mm) of foil unless a halyard restrainer is used.
2. Halyard must pull slightly to rear (8–10°).
3. Halyard must be snug, but not too tight.

Test furler at dock, but if water is smooth an incorrect lead angle may not be apparent. Halyard wraps usually occur in wave action when lead angle is not correct. The 8–10° angle shown at right is critical.



Pendants

If the your sail luff is not long enough to position halyard swivel high enough to create an 8–10° angle as shown, you must add a pendant. Pendants should be made of plastic-coated wire and be permanently attached so sail height will be correct. Adjustable- length pendants are not acceptable, as they might not be adjusted correctly during a sail change.

1. Raise sail, but do not attach tack shackle.
2. Position halyard swivel correctly near top of headstay.
3. Secure halyard.
4. Tie a piece of rope to sail tack.
5. Lead line through tack shackle on furling drum.
6. Tension sail.
7. Measure distance from tack shackle to sail tack and permanently attach pendant of this length to head of sail.
8. Repeat procedure for every jib in your sail inventory.



Halyard Deflector/Halyard Restrainer

To prevent wraps, jib halyard must pull slightly to rear. On most boats, halyard lead angle is acceptable if halyard swivel is raised to top of foil. On some boats halyard sheaves are located too close to headstay and a Halyard Deflector or Halyard Restrainer must be used.

Halyard restrainers should be used only when required by masthead geometry. Restrainers tend to limit sail luff length and may cause problems if not installed properly.

If your boat needs a Halyard Deflector, use Part No. 7303 for a Unit 2, 7304 for a Unit 3; or a Halyard Restrainer, use Part No. 945.

Restrainer should be mounted as high as possible on face of mast. Position restrainer so that foils will not hit it when under load.

The restrainer should deflect halyard as little as possible or you may experience difficulty in tensioning sail luff, friction when furling, and possible damage to foils. To decrease deflection angles, shorten sail luff.

Tip: Boats used in charter service should have a halyard restrainer, regardless of masthead geometry.

Halyard Tension

The jib halyard should be firm, but not too tight.

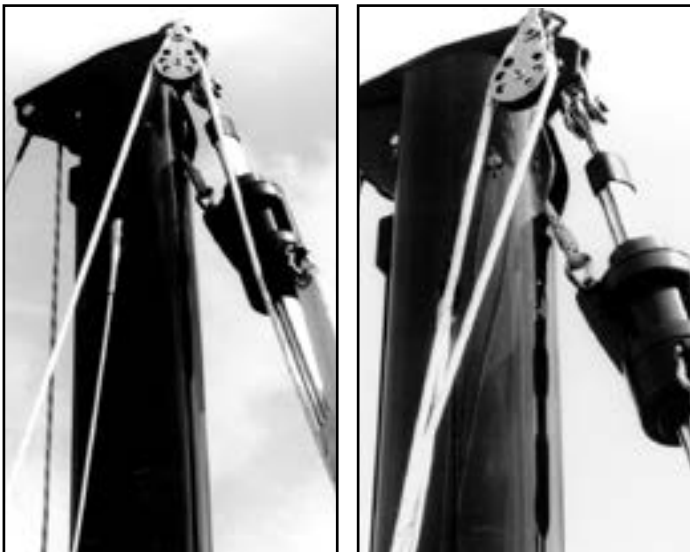
Tip: The luff foil system supports sail along its length so halyard tension is used only to shape sails, not to support them. Use enough halyard tension to remove some wrinkles along luff of sail. Do not tension halyard enough to cause vertical wrinkles in luff of sail. Tension to adjust position of draft in sail to suit sailing conditions. Halyard should be firm but not tight. If in doubt, release halyard tension. To protect sail, ease halyard when boat is not in use.



Halyard Deflector



Halyard Restrainer



Spinnaker Halyards

Spinnaker halyards occasionally cause problems with furling.



WARNING! Make sure halyards are clear of top foil before using system. In severe cases, spinnaker halyards can jam furler causing loss of control of boat.

On many boats it will not be possible to attach spinnaker halyard to bow pulpit or it may be "sucked" into jib when furling.

On some boats the spinnaker halyard lays across headstay and will catch on halyard swivel, foils or jib halyard. To prevent problems it may be necessary to install a masthead bail to move spinnaker halyard block forward and to one side.

Boats with external halyards may find it necessary to flip both ends of spinnaker halyard behind spreaders to prevent fouling with furling system.

Headstay Tension

A furling system will work best if headstay is tight.

A loose headstay is difficult to rotate and can cause unusual wear on foil joints.

To adjust headstay tension, remove sail and follow instructions on page 27.

Tip: Before adjusting headstay tension, slack mainsheet and vang.



Backstay Adjusters

Backstay adjusters allow headstay tension to be varied to change sail shape to match conditions. They permit a very tight headstay to be eased when boat is not in use. For best performance, consider adding a backstay adjuster; either a block and tackle, a mechanical adjuster like those offered by Harken, or a hydraulic adjuster.

Remember to keep headstay tight for best performance when furling or reefing.

If your boat is fitted with an adjuster be sure that it is tensioned **before** the halyard is tensioned. If not, backstay adjuster may increase halyard tension and could damage the sail or furling system.

Racing boats often slack the headstay completely when sailing downwind. Check to be sure that foil does not jam against upper headstay terminal when backstay is released. To prevent this, it may be necessary to shorten foil slightly.





Raise Sails

1. Install prefeeder by securely tying end of line to a deck fitting or to toggle below furler so it is 2' (610 mm) below feeder.
2. Shackle tack of sail to lower unit. Install shackle so screw pin head is on same side as sun cover.
3. Secure genoa sheets to clew of sail.
4. Attach genoa halyard to halyard swivel.
5. Pass luff tape through prefeeder and feeder into foil groove.
6. Attach head of sail or pendant at head of sail to halyard swivel.
7. Hoist sail.
8. Attach genoa tack to Lower Unit shackle.
8. Once sail is raised, determine the direction of furling so suncover will shield sail from UV rays when furled.
9. Suncover on port side of sail, furl clock-wise. Suncover on starboard, furl counter-clockwise.

Tip: Once you have determined the direction of furl to match the suncover, mark remote furler switches, i.e. "furl/unfurl" or "in /out".

Tip: New sails are often stiff and may hang up on prefeeder during raising. Do not force sail when it hangs up—lower and remove twist. Sails "break in" with use and will become easier to raise.

Storm Sails

Most people will use one multi-purpose genoa for all their sailing, but it is not good seamanship to go offshore without storm sails.

Heavy-air working jibs and storm sails may be used with your unit. These sails need to have luff tape added to allow them to be raised in headstay foils.

These sails will generally require pendants to ensure that halyard swivel is properly positioned at top of headstay. See page 29.

Remember that heavy-air working jibs and storm jibs may be reefed and furled like any other sail.

Furl and Reef

To furl or reef, ease jib sheets and press correct switch to furl sail.

In very light air, it may be necessary to place some tension on jib sheet to insure a tight furl.

To furl in a breeze, ease sheets gradually and furl sail in smaller increments until sail is furled or reefed.

When furling or reefing, make sure that nothing is jammed. Review swivel height, lead angle, halyard restrainer information. Make sure operator has a good view of sail and stops furling when sail is rolled and sheets have a wrap or two on the furled sail. Stop immediately if sheets jam or halyard wraps. If operator does not have a good view, station a crew member with good visibility and communicate to operator. If motor is laboring stop and check for reason. Consult the Troubleshooting Guide on page 36.



WARNING! Failure to stop and free a wrapped halyard can result in breakage of halyard or headstay, possibly resulting in an accident, damage to your vessel, personal injury or death.

Reefing Tips

A sail may be partially furled before you resume sailing. This is known as reefing.

Many sailors find it helpful to place marks on foot of sail so that they can reef to a variety of predetermined jib sizes. This allows marks to be placed on jib lead tracks or toe rail so that lead block position can be changed to correspond to reefed jib.

Sails are generally reefed to balance boat and to reduce heeling moment. Sails may also be reefed to improve visibility or to slow boat while sailing in congested areas or entering or leaving harbors.

Secure Sail

When furling prior to leaving your boat in slip or on mooring, be sure that you get a tight furl and continue furling system until sheets wrap around rolled sail two or three times. Some people secure sail with shock cord or sail ties.



Race Conversion

Race conversion allows use of both grooves for sail changes and tacking genoas on deck for use of maximum luff length genoas.

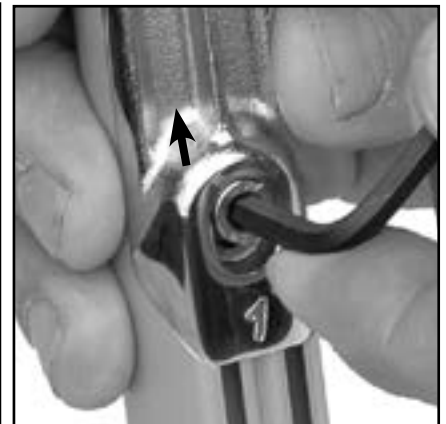
Halyard Swivel Below Feeder

Use halyard to lift halyard swivel up, away from feeder. Loosen screw **one revolution only**. Slide screw up and hold. Remove feeder carefully—bottom end first. **Don't lose the feeder overboard!** Lower swivel onto lower unit. Replace feeder.

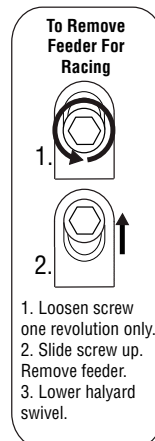
Remove Feeder



Loosen screw **one revolution only**.



Slide screw up and hold.



Carefully remove feeder—bottom end first. **Don't drop the feeder overboard!**

Before using the system, make sure that the emergency handle can rotate and not hit the bow pulpit.

Cordless drill adapters work well, but there must be a fully-charged cordless drill on hand at all times. Because a cordless drill may lose power, always have an emergency handle onboard.



WARNING! You must have a reliable manual drive procedure in place before using the system. Failure to have a manual drive procedure can lead to an accident. See www.harken.com/manuals for additional safety information.



Furling on Reefing with Manual Power

In the event of power failure it is necessary to go forward and lower sail or furl by hand.



WARNING! You must observe all personal safety precautions including using a harness and secure tether and personal flotation device (PFD) when going forward to bow. Failure to have a tether system and PFD can result in falling overboard and death.

1. Disconnect power.
2. Communicate to all crew members that you are going to work on the furler. Tell them to not attempt to restore power while you are working on the furler.
3. Have an emergency handle available.
4. Using all personal safety precautions including PFD, harness and tether, go forward.
5. Check to make sure the power is off to the furler.
6. Remove the manual drive socket by unthreading the cap as shown above.
7. Use the emergency handle or a cordless drill to turn the foil until the sail is reefed or furled.
8. Inform crew members when you are finished.
9. Attempt to restore power to the furler.





Clean and Lubricate

Keep unit clean. When you wash boat, flush unit with soap and fresh water. Occasionally lower sail and flush halyard swivel with soap and fresh water.

Foils may be cleaned by washing with soap and water. A scrap of luff tape may be run up foil to scrub inside grooves. Sail luff tapes may be sprayed with McLube® to reduce friction during sail changes.



WARNING! Spray sails off boat so McLube® spray does not contact deck. Decks sprayed with McLube will be very slippery which can lead to slipping and falling overboard.



WARNING! Parts can wear, loosen, or corrode and can break at load. Periodically inspect items listed below and any others as necessary. See www.harken.com/manuals for additional safety information.

Inspect

Inspect unit for signs of chafe, wear or damage.

Inspect clevis and cotter pins below and inside lower unit for signs of loosening. Check headstay tension for signs of loosening.

Inspect swage fitting and lower toggle for signs of stress corrosion.

Inspect Norseman or Sta-Lok terminal or rod terminal for signs of loosening.

Inspect all screws on unit to be sure they have not loosened.

Inspect foil to make sure that it has not dropped into lower unit.

Periodically inspect wire for signs of wear or unraveling.



Storage – Mast Down

In areas where it freezes, do not store system where water can accumulate in foils. When water freezes it will rupture aluminum. Store foils under cover, with grooves facing down or on an angle so water will run out.

Storage/Transporting

Do not store or transport system with lower unit extending beyond mast. Remove lower unit and halyard swivel for storage and transport.

After Storage or Transport

After storing or transporting unit, clean thoroughly including tack and halyard swivel ball bearings. See instructions above.

Loosen Foil Clamp Before Slacking Backstay

In order to prevent foils from locking against upper stay terminal when backstay is released, loosen foil clamp screws and lower foil before loosening backstay.

Troubleshoot

| Problem | Probable Cause | Solution |
|--|--|--|
| Sail will not furl or is difficult to furl. | Jib halyard is wrapping around headstay because angle between mast and halyard is too shallow | See installation instructions regarding optimal halyard angle. It may be necessary to mount a halyard restrainer on front of your mast to hold halyard to rear. |
| | Jib halyard is wrapping around the headstay because halyard swivel is too low. | See installation instructions regarding optimal halyard swivel height. A wire pendant may be needed at head of sail to raise halyard swivel to proper height. |
| | Jib halyard is too tight. | Ease jib halyard. |
| | Foils riding on turnbuckle. | Raise foils. See adjusting turnbuckle on page 27. |
| | Foils too high, binding on swage eye. | Lower foils until clear. See adjusting turnbuckle on page 27. |
| | Spare halyard is wrapping in sail as it furls. | Secure spare halyards away from furling headstay by flipping them behind spreaders |
| | Salt or dirt in bearings. | Flush bearings with freshwater and lubricate with dry spray lubricant such as McLube® |
| | Sail full of wind. | Luff completely before furling or reefing. |
| | Sail flogging too much. | Release a short length of sheet, furl a small amount and repeat. |
| | Foil out of clamp. | Reinstall foil in lower unit and tighten clamp screws. |
| | Halyard swivel installed upside down. | Remount swivel correctly. |
| Sail will not unfurl or will not unfurl completely. | Jib halyard is wrapping around headstay because angle between mast and halyard is too shallow. | See installation instructions regarding optimal halyard angle. It may be necessary to mount a halyard restrainer on front of your mast to hold halyard to rear. |
| | Jib halyard is wrapping around the headstay because the halyard swivel is too low. | See installation instructions regarding optimal halyard angle. |
| | Foils riding on turnbuckle. | Raise foils. See adjusting turnbuckle on page 27. |
| | Foils too high, binding on swage eye. | Lower foils. See adjusting turnbuckle on page 27. |
| | Jib halyard is too tight. | Ease jib halyard. |
| | Spare halyard is wrapping in sail as it furls. | Secure spare halyards away from furling headstay by flipping them behind spreaders |
| | Salt or dirt in bearings. | Flush bearings with freshwater and lubricate with dry spray lubricant such as McLube® |
| Sail will not furl completely. | Spare halyard catching in sail as it furls. | Move halyards away from furling headsail as above. |
| Headstay rotates in jerks or elliptically. | Insufficient tension on headstay. | Tighten headstay and/or backstay to eliminate sag in headstay. |
| Sail does not stay furled. | Sail not furled tightly on stay. | Keep some tension on sheets when furling in light air to get a tight, secure wrap. |
| Sail will not go up. | Luff tape will not go into groove. | Check luff tape for fraying. |
| | | Check luff tape size. |
| | Sail catching at prefeeder. | Flake sail more loosely on deck. |
| Sail will not raise completely or luff will not tension. | Dirt in groove. | Attach a halyard and downhaul to a small section of luff tape and clean groove by raising and lowering. |
| | Halyard swivel is hitting end stop. | Luff of sail is too long and must be recut. |
| Sail will not come down. | Angle between halyard and mast is too sharp and halyard is pulling too much to the rear. | Halyard must be routed from a point higher on mast. This may require that halyard turning block aloft be replaced or sail shortened. |
| | Halyard is wrapping on headstay. | Angle between headstay and halyard is too shallow and must be optimized per installation instructions. |
| Ultraviolet cover rolls up inside of sail. | Halyard swivel off foil. | Sail luff too long or foil is too short or low and must be lengthened or raised. |
| | Wrong switch used to furl sail. | Unroll sail and use other switch to furl. Alternatively, rewire switch if preferred. Once correct one is determined, label switch "furl" and the other "Unfurl." |

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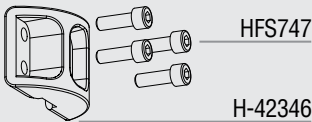
Online Product Registration
www.harken.com/FurlingWarranty

Warranty
www.harken.com/manuals
 or call, write, email or fax Harken, Inc.,
 Pewaukee, WI USA

UNIT 2E

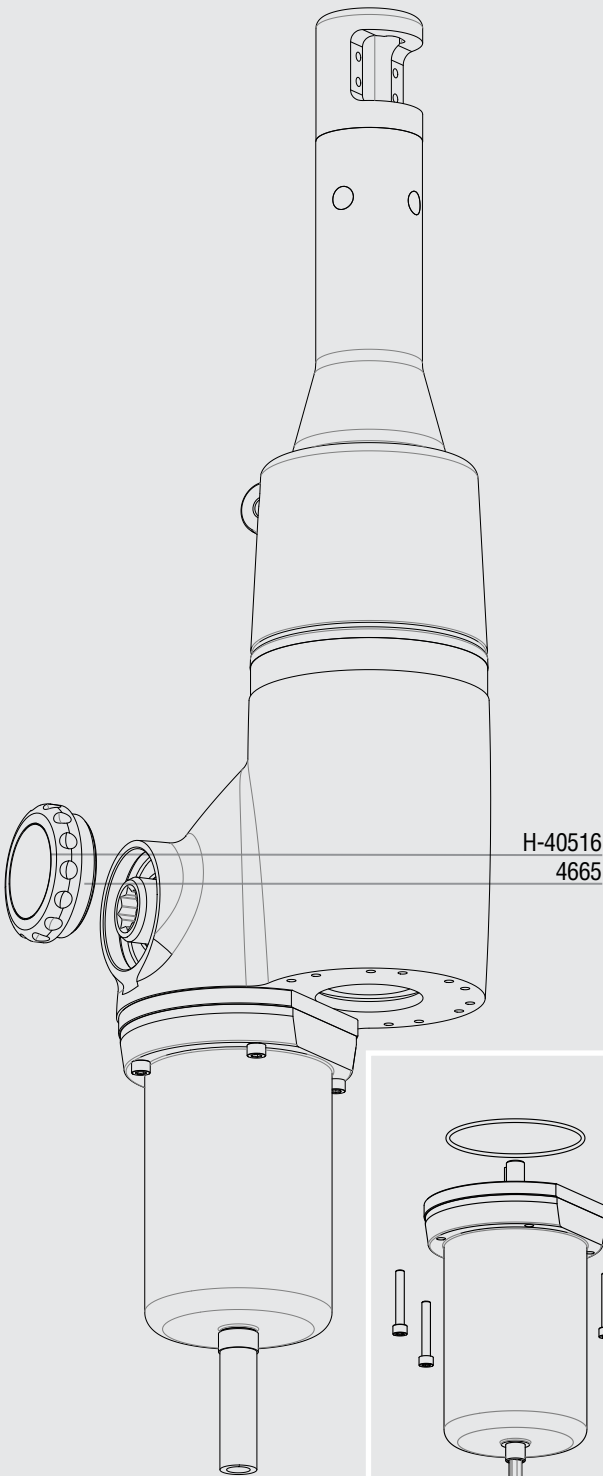
UNIT 2E

7412.13BASE 12V / 7412.13BASE 24V

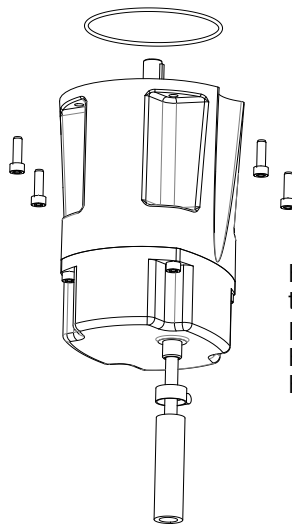


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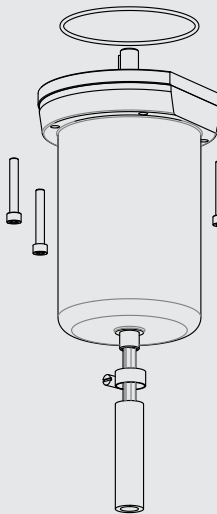
| Description | Order | Part No. |
|------------------------------|----------|------------------------|
| Torque Tube Screws | 4 | HFS747 |
| Torque Tube Clamp | 1 | H-42346 |
| Lower Unit 12V | 1 | 7412.13BASE 12V |
| Manual Drive Cap | 1 | H-40516 |
| Cap Safety Label | 1 | 4665 |
| Lower Unit 24V | 1 | 7412.13BASE 24V |
| Manual Drive Cap | 1 | H-40516 |
| Cap Safety Label | 1 | 4665 |
| Motor Housing Kit 12V | 1 | H-73616 |
| Motor Housing Kit 24V | 1 | H-73805 |



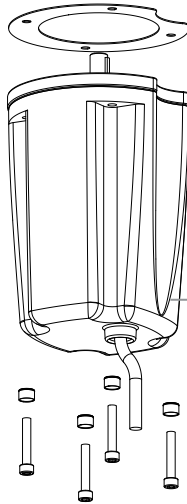
2



Housing style 2014
to Mid-2016
Replace with
H-73616 12V
H-73805 24V



Housing style
mid-2016 to
present
H-73616 12V
H-73805 24V



Housing style used
on Unit 2E purchased
before December 2013
Replace with
H-73616 12V
H-73805 24V

3

UNIT 2E

UNIT 2E

HFG672



HFG681

HFS1127

H-38028A

MP-127



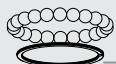
H-39794

MP-127



MP-127

H-38028A



7412.13 FOILSET



HFG348

7412.31
7412.32

HFG626

HFG296



HFG300



4676



833

HFG739



HFG722



947

HFG200/HFG201



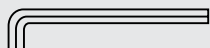
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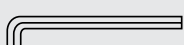
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HFG644



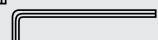
HFG643



HFG640



HCP1089



4

4

6

| Description | Order | Part No. |
|-------------------------------------|----------|------------------------|
| Trim Cap Set w/o Screws | 1 | HFG681 |
| Trim Cap Screw Set | 1 | HFG672 |
| Trim Cap Screw | 3 | HFS1127 |
| Halyard Swivel w/o Shackles | 1 | H-39794 |
| Torlon® Ball Bearings | 92 | MP-127 |
| Clip / Smalley Ring | 2 | H-38028A |
| Foil Set | 1 | 7412.13 FOILSET |
| Foil (7' / 2.13 m) Luff | 8 | 7412.30 |
| Foil (2' / 610 mm) Bottom | 1 | 7412.33 |
| Foil Screw Set | 1 | HFG348 |
| Foil Screw | 38 | HFS1106 |
| Connector Set w/o Bushings | 1 | HFG626 |
| Connector (9' / 229 mm) | 7 | — |
| Connector Bottom (13' / 330 mm) | 1 | — |
| Connector Bushing Set | 1 | HFG296 |
| Connector Bushing (Curved / Longer) | 16 | H-42032 |
| Connector Bushing (Flat / Shorter) | 16 | H-42033 |
| Connector w/Bushings | 1 | 7412.31 |
| Connector (9' / 229 mm) | 1 | — |
| Connector Bushing (Curved / Longer) | 2 | — |
| Connector Bushing (Flat / Shorter) | 2 | — |
| Foil Screw | 4 | — |
| Connector Wedge | 2 | — |
| Connector w/Bushings Bottom | 1 | 7412.32 |
| Connector Bottom (13' / 330 mm) | 1 | — |
| Connector Bushing (Curved / Longer) | 1 | — |
| Connector Bushing (Flat / Shorter) | 1 | — |
| Connector Wedge Set | 1 | HFG300 |
| Connector Wedge | 18 | H-39487 |
| Feeder Set | 1 | H-39559 |
| Feeder | 1 | H-33931B |
| Feeder Screw | 1 | HFS1129 |
| Tab | 1 | H-35671A |

5

| Description | Order | Part No. |
|------------------------------|----------|------------------|
| Instruction Manual | 1 | 4676 |
| Loctite® Blue | 1 | 833 |
| Loctite® Red | 2 | HFG739 |
| 5200 Adhesive Set | 1 | HFG725 |
| 5200 Marine Adhesive Sealant | 1 | HFG722 |
| Injector | 1 | HFG200 HFG201 |
| Prefeeder | 1 | 947 |

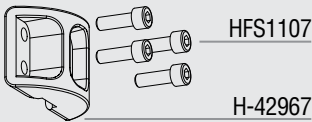
6

| Description | Order | Part No. |
|--------------------------------------|----------|-------------|
| Halyard Restrainer (Optional) | 1 | 945 |
| Sheave/SS Inner Race Only | 1 | 945ASSY |
| Clevis Pin (5/16" x 1 1/4" 18-8) | 1 | SP-038 |
| Bracket-Large | 1 | HCP394 |
| Cotter Pin (3/32" x 3/4" 18-8) | 1 | HFS181 |
| Bow Shackle (8 mm) | 3 | 2117 |
| Hex Keys | | |
| 6 mm | 1 | HFG644 |
| 5 mm | 1 | HFG643 |
| 4 mm | 1 | HFG640 |
| 3 mm | 1 | HCP1089 |

UNIT 3E

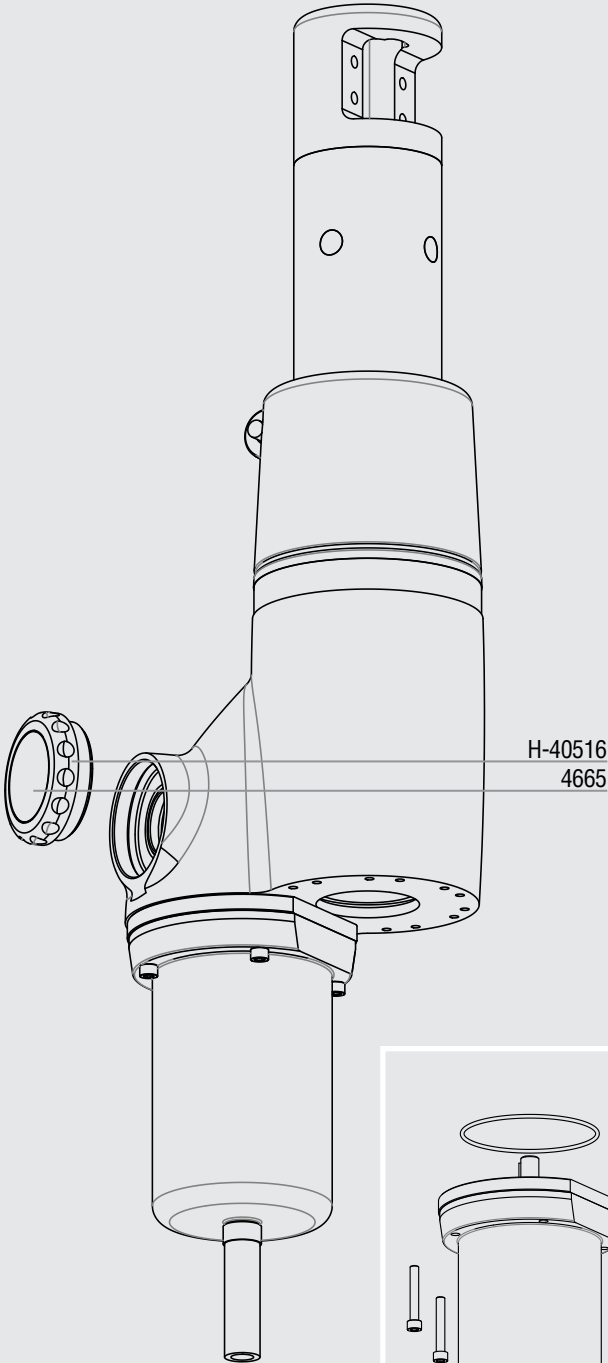
UNIT 3E

7413.13BASE 12V / 7413.13BASE 24V



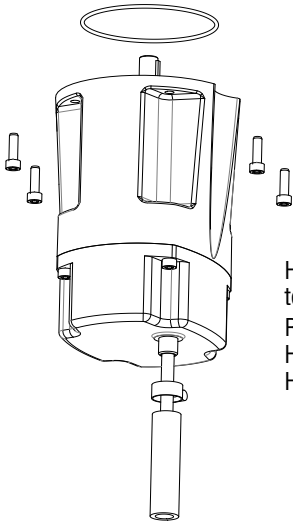
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2

| Description | Order | Part No. |
|------------------------------|----------|------------------------|
| Torque Tube Screws | 4 | HFS1107 |
| Torque Tube Clamp | 1 | H-42967 |
| Lower Unit 12V | 1 | 7413.13BASE 12V |
| Manual Drive Cap | 1 | H-40516 |
| Cap Safety Label | 1 | 4665 |
| Lower Unit 24V | 1 | 7413.13BASE 24V |
| Manual Drive Cap | 1 | H-40516 |
| Cap Safety Label | 1 | 4665 |
| Motor Housing Kit 12V | 1 | H-73616 |
| Motor Housing Kit 24V | 1 | H-73805 |

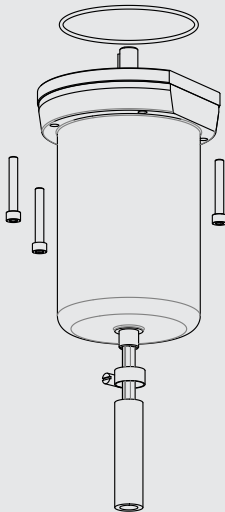


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H-40516
4665

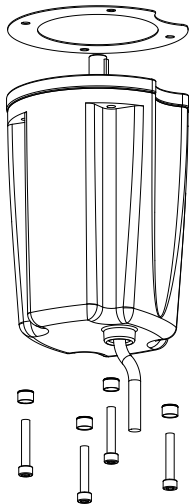


Housing style 2014
to Mid-2016
Replace with
H-73616 12V
H-73805 24V

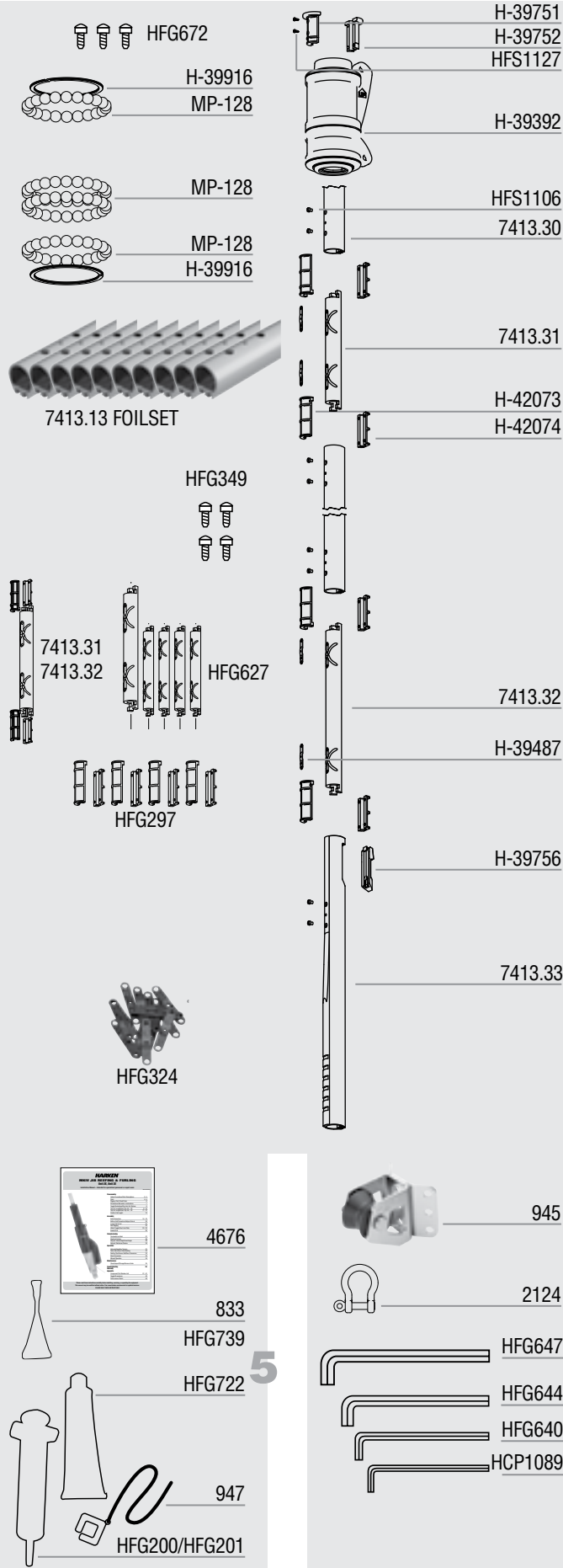


3

Housing style
mid-2016 to
present
H-73616 12V
H-73805 24V



Housing style used
on Unit 3E purchased
before December 2013
Replace with
H-73616 12V
H-73805 24V



4

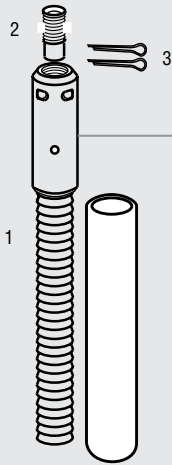
| Description | Order | Part No. |
|---|----------|------------------------|
| Trim Cap w/o Screws | | |
| Top (with Holes) | 1 | H-39751 |
| Bottom (with Pegs) | 1 | H-39752 |
| Trim Cap Screw Set | 1 | HFG672 |
| Trim Cap Screw | 3 | HFS1127 |
| Halyard Swivel | 1 | H-39392 |
| Torlon® Ball Bearings | 88 | MP-128 |
| Clip / Smalley Ring | 2 | H-39916 |
| Foil Set | 1 | 7413.13 FOILSET |
| Foil (7' / 2.13 m) Luff | 10 | 7413.30 |
| Foil (2' / 610 mm) Bottom | 1 | 7413.33 |
| Foil Screw Set | 1 | HFG349 |
| Foil Screw | 46 | HFS1106 |
| Connector Set w/o Bushings | 1 | HFG627 |
| Connector | 9 | — |
| Bottom Connector (9 ³ / ₄ " / 247 mm) | 1 | — |
| Connector Bushing Set | 1 | HFG297 |
| Connector Bushing Top (Curved / Longer) | 20 | H-42073 |
| Connector Bushing Bottom (Flat / Shorter) | 20 | H-42074 |
| Plastic Connector Wedge Set | 1 | HFG324 |
| Plastic Connector Wedge | 22 | H-39487 |
| Feeder with Screw and Tab | 1 | H-39756 |
| Feeder | 1 | H-38332B |
| Feeder Screw | 1 | HFS1130 |
| Tab | 1 | H-38372A |

5

| Description | Order | Part No. |
|------------------------------|----------|------------------|
| Instruction Manual | 1 | 4676 |
| Loctite® Blue | 1 | 833 |
| Loctite® Red | 2 | HFG739 |
| 5200 Adhesive Set | 1 | HFG725 |
| 5200 Marine Adhesive Sealant | 1 | HFG722 |
| Injector | 1 | HFG200 HFG201 |
| Prefeeder | 1 | 947 |

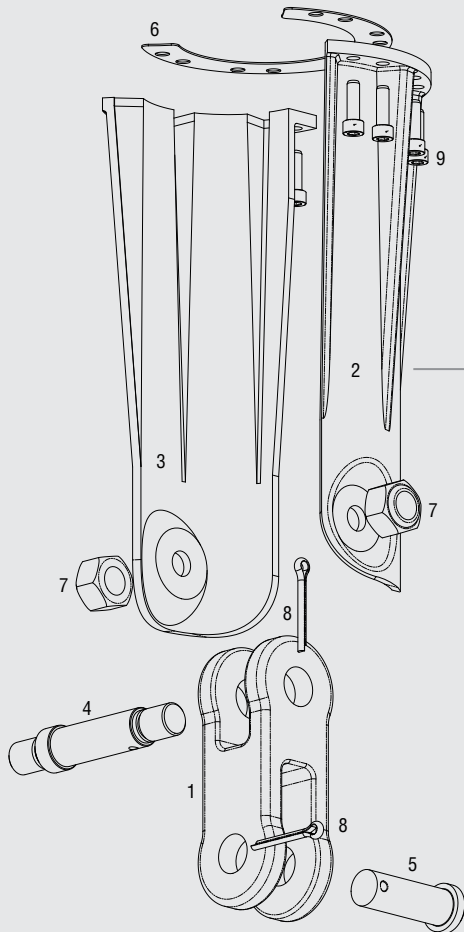
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| Description | Order | Part No. |
|--------------------------------------|----------|-------------|
| Halyard Restrainer (Optional) | 1 | 945 |
| Sheave/SS Inner Race Only | 1 | 945ASSY |
| Clevis Pin (5/16" x 1 1/4" 18-8) | 1 | SP-038 |
| Bracket-Large | 1 | HCP394 |
| Cotter Pin (3/32" x 3/4" 18-8) | 1 | HFS181 |
| Bow Shackle (10 mm) | 3 | 2124 |
| Hex Keys | | |
| 10 mm | 1 | HFG647 |
| 6 mm | 1 | HFG644 |
| 4 mm | 1 | HFG640 |
| 3 mm | 1 | HCP1089 |



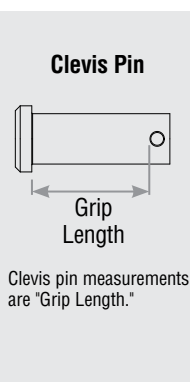
7424 -12
7425 -17
7426 -22
7427 -30

7



7413.22 3/4
7413.22 7/8

8



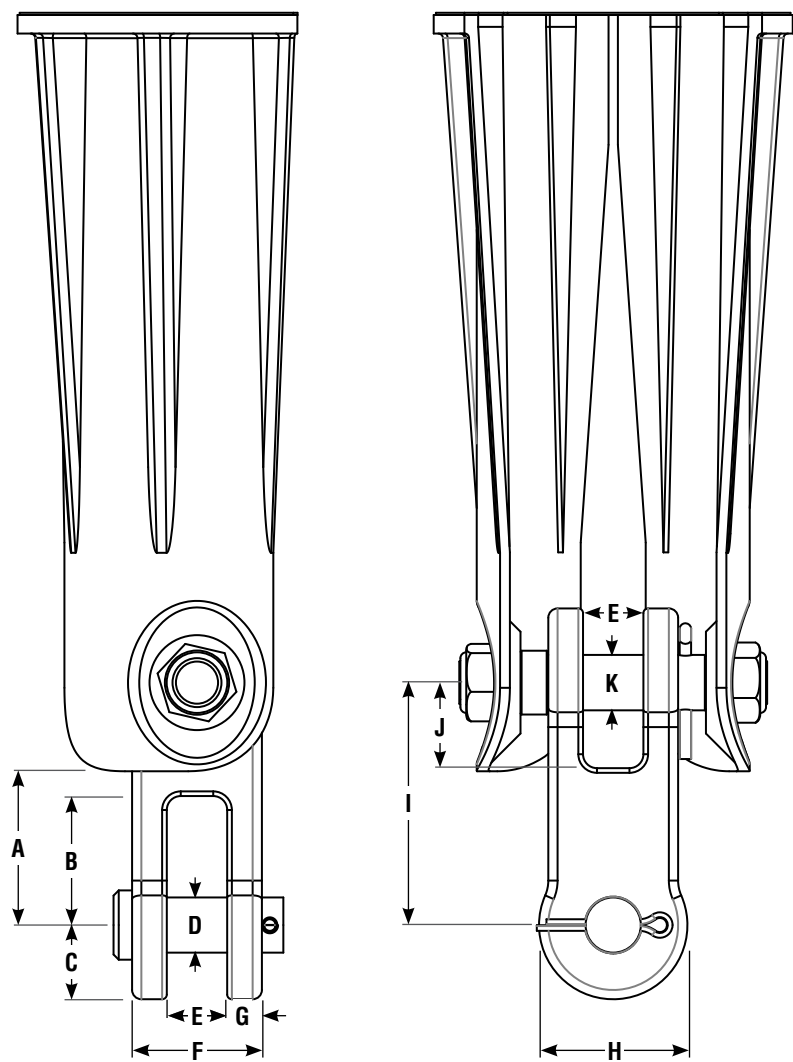
Clevis pin measurements
are "Grip Length."

| UNIT 2E | | | |
|----------|---|----------|-----------------|
| No. | Description | Order | Part No. |
| 7 | Rod Adapter Stud w/Nosepiece (-12) | 1 | 7424 -12 |
| 1 | Stud (Main Body) | 1 | H-41531 |
| 2 | Nosepiece -12 | 1 | H-41527 |
| 3 | Cotter Pin (3/32" x 1" 18-8) | 2 | HFG193 |
| 7 | Rod Adapter Stud w/Nosepiece (-17) | 1 | 7425 -17 |
| 1 | Stud (Main Body) | 1 | H-41531 |
| 2 | Nosepiece -17 | 1 | H-41526 |
| 3 | Cotter Pin (3/32" x 1" 18-8) | 2 | HFG193 |
| 7 | Rod Adapter Stud w/Nosepiece (-22) | 1 | 7426 -22 |
| 1 | Stud (Main Body) | 1 | H-41812 |
| 2 | Nosepiece -22 | 1 | H-41811 |
| 3 | Cotter Pin (3/32" x 1 3/4" 18-8) | 2 | HFG319 |
| | Stud Cap (7/8" ID x 5 1/2" RED) | 1 | HFG303 |

| UNIT 3E | | | |
|----------|---|----------|-----------------|
| No. | Description | Order | Part No. |
| 7 | Rod Adapter Stud w/Nosepiece (-22) | 1 | 7426 -22 |
| 1 | Stud (Main Body) | 1 | H-41812 |
| 2 | Nosepiece -22 | 1 | H-41811 |
| 3 | Cotter Pin (3/32" x 1 3/4" 18-8) | 2 | HFG319 |
| | Stud Cap (7/8" ID x 5 1/2" RED) | 1 | HFG303 |
| 7 | Rod Adapter Stud w/Nosepiece (-30) | 1 | 7427 -30 |
| 1 | Stud (Main Body) | 1 | H-41814 |
| 2 | Nosepiece -30 | 1 | H-41813 |
| 3 | Cotter Pin (3/32" x 1 3/4" 18-8) | 2 | HFG319 |
| | Stud Cap (7/8" ID x 5 1/2" RED) | 1 | HFG303 |

| No. | Description | Order | Part No. |
|----------|--|----------|--------------------|
| 8 | Jaw/Jaw Toggle w/Link Plates—5/8" Pin | 1 | 7312.22 5/8 |
| 1 | Toggle (5/8") | 1 | H-41300 |
| 2 | Starboard Leg of Link Plate | 1 | H-51527 |
| 3 | Port Leg of Link Plate | 1 | H-51520 |
| 4 | Crosspin (5/8" x 3.9") | 1 | H-51528 |
| 5 | Clevis Pin (5/8" x 1.46") | 1 | H-42397 |
| 6 | Isolator | 1 | H-44998 |
| 7 | M12 Nylon Locking Nut | 2 | HFS937 |
| 8 | Cotter pin (5/32" x 1 1/4" 18-8) | 2 | HFS203 |
| 9 | Link Plate Screw (M6 x 1 x 20 SK Cap) | 10 | HFS748 |
| 8 | Jaw/Jaw Toggle w/Link Plates—3/4" Pin | 1 | 7413.22 3/4 |
| 1 | Toggle (3/4") | 1 | H-41489 |
| 2 | Starboard Leg of Link Plate | 1 | H-47224 |
| 3 | Port Leg of Link Plate | 1 | H-47181 |
| 4 | Crosspin (.747" x 4.15") | 1 | H-42583 |
| 5 | Clevis Pin (3/4" x 1.766") | 1 | H-42403 |
| 6 | Isolator | 1 | H-44998 |
| 7 | M16 Nylon Locking Nut | 2 | HFS991 |
| 8 | Cotter Pin (5/32" x 1 1/4" 18-8) | 2 | HFS203 |
| 9 | Link Plate Screw (M6 x 1 x 20 SK Cap) | 10 | HFS748 |
| 8 | Jaw/Jaw Toggle w/Link Plates—7/8" Pin | 1 | 7413.22 7/8 |
| 1 | Toggle (7/8") | 1 | H-42562 |
| 2 | Starboard Leg of Link Plate | 1 | H-47224 |
| 3 | Port Leg of Link Plate | 1 | H-47181 |
| 4 | Crosspin (.872" x 4.15") | 1 | H-42584 |
| 5 | Clevis Pin (7/8" x 1.96") | 1 | H-42404 |
| 6 | Isolator | 1 | H-44998 |
| 7 | M16 Nylon Locking Nut | 2 | HFS991 |
| 8 | Cotter Pin (5/32" x 1 1/4" 18-8) | 2 | HFS203 |
| 9 | Link Plate Screw (M6 x 1 x 20 SK Cap) | 10 | HFS748 |

Toggle Dimensions



| Part No. | A | | B | | C | | D | | E | | F | | G | | H | | I | | J | | K | |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm |
| 7312.22 5/8 | 1.449 | 36.80 | 1.396 | 35.46 | 0.831 | 21.11 | 0.618 | 15.70 | 0.688 | 17.48 | 1.44 | 36.58 | 0.376 | 9.55 | 1.662 | 42.21 | 2.644 | 67.16 | 0.932 | 23.67 | 0.662 | 16.81 |
| 7413.22 3/4 | 2.073 | 52.65 | 1.739 | 44.17 | 1 | 25.40 | 0.744 | 18.90 | 0.814 | 20.68 | 1.75 | 44.45 | 0.468 | 11.89 | 2 | 50.80 | 3.268 | 83.01 | 1.153 | 29.29 | 0.747 | 18.97 |
| 7413.22 7/8 | 2.655 | 67.44 | 2 | 50.80 | 1.156 | 29.36 | 0.868 | 22.05 | 0.94 | 23.88 | 1.938 | 49.23 | 0.499 | 12.67 | 2.312 | 58.72 | 3.85 | 97.79 | 1.35 | 34.29 | 0.872 | 22.15 |

Performance Curves



7406 Through-Deck Fitting Drilling Template

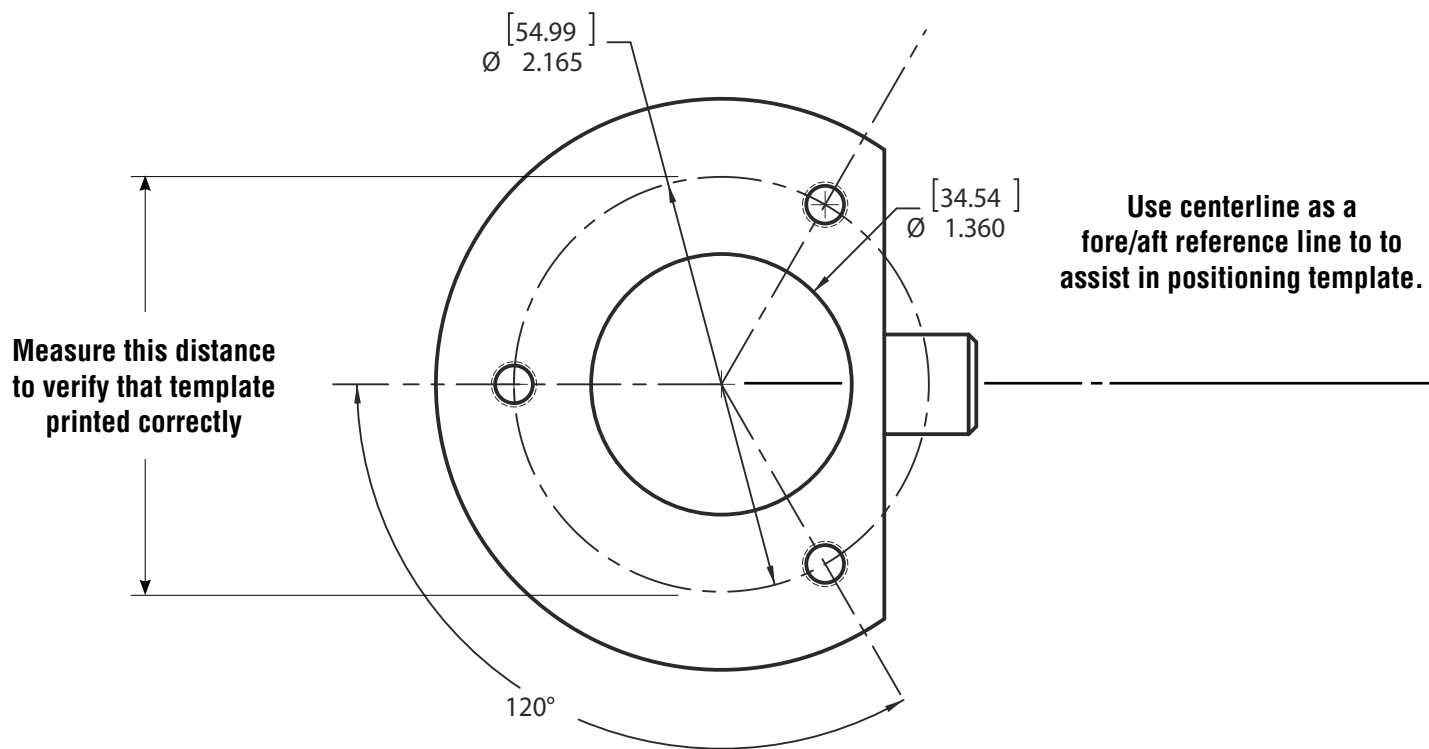


7406 Aluminum through-deck fitting for routing wires belowdecks

7406 Aluminum Through-Deck Fitting

IMPORTANT! Measure template carefully to verify that it is the correct size before drilling.

Hole saw Ø 1³/₈" (35 mm)
Drill size 1/4" (6.25 mm)
Fasteners Provided 6 mm x 35 mm



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