



HARKEN[®]

Cruising Jib Reefing & Furling Installation Manual

Unit 1, 2



WARNING!: Strictly follow all instructions to avoid an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

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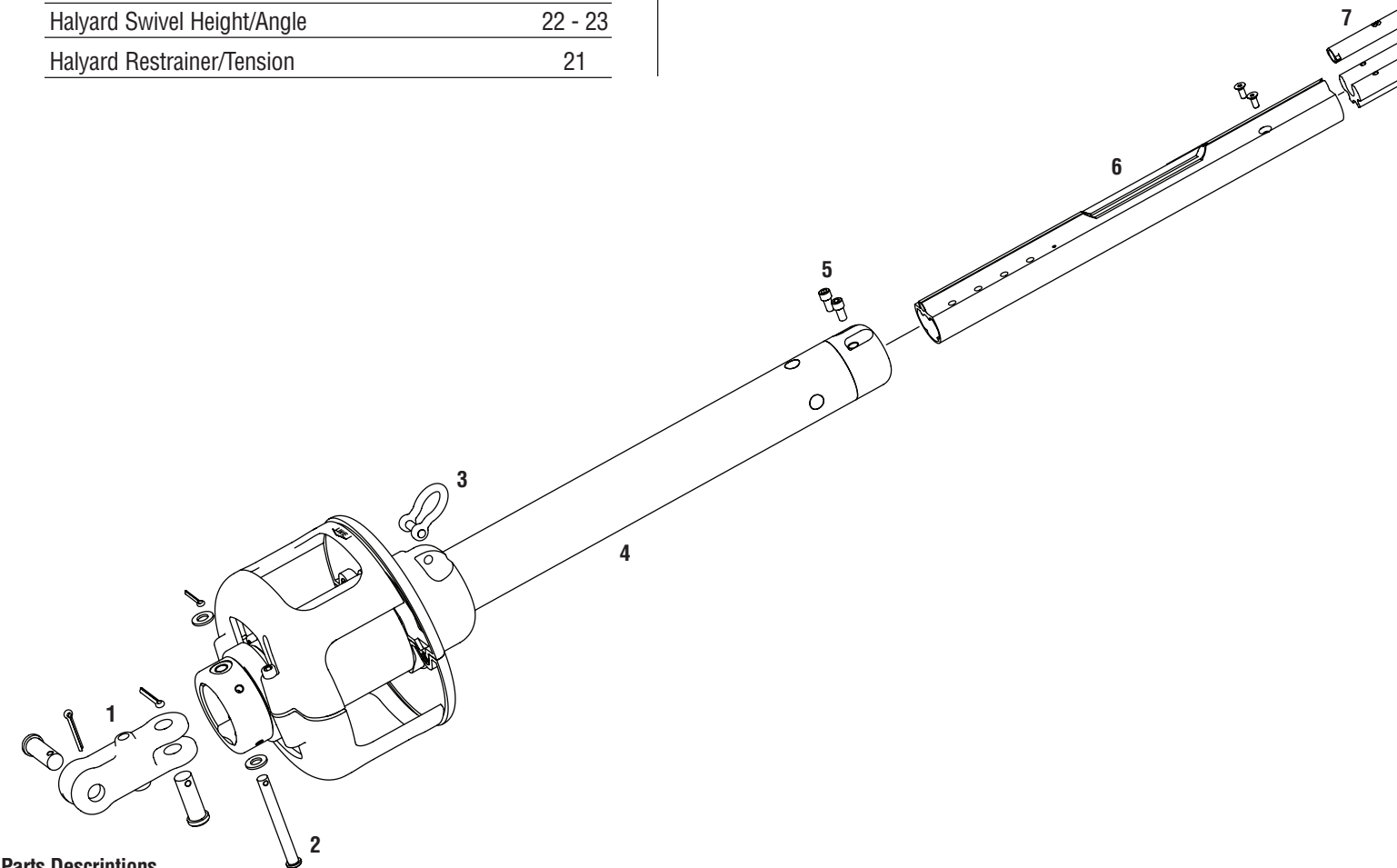
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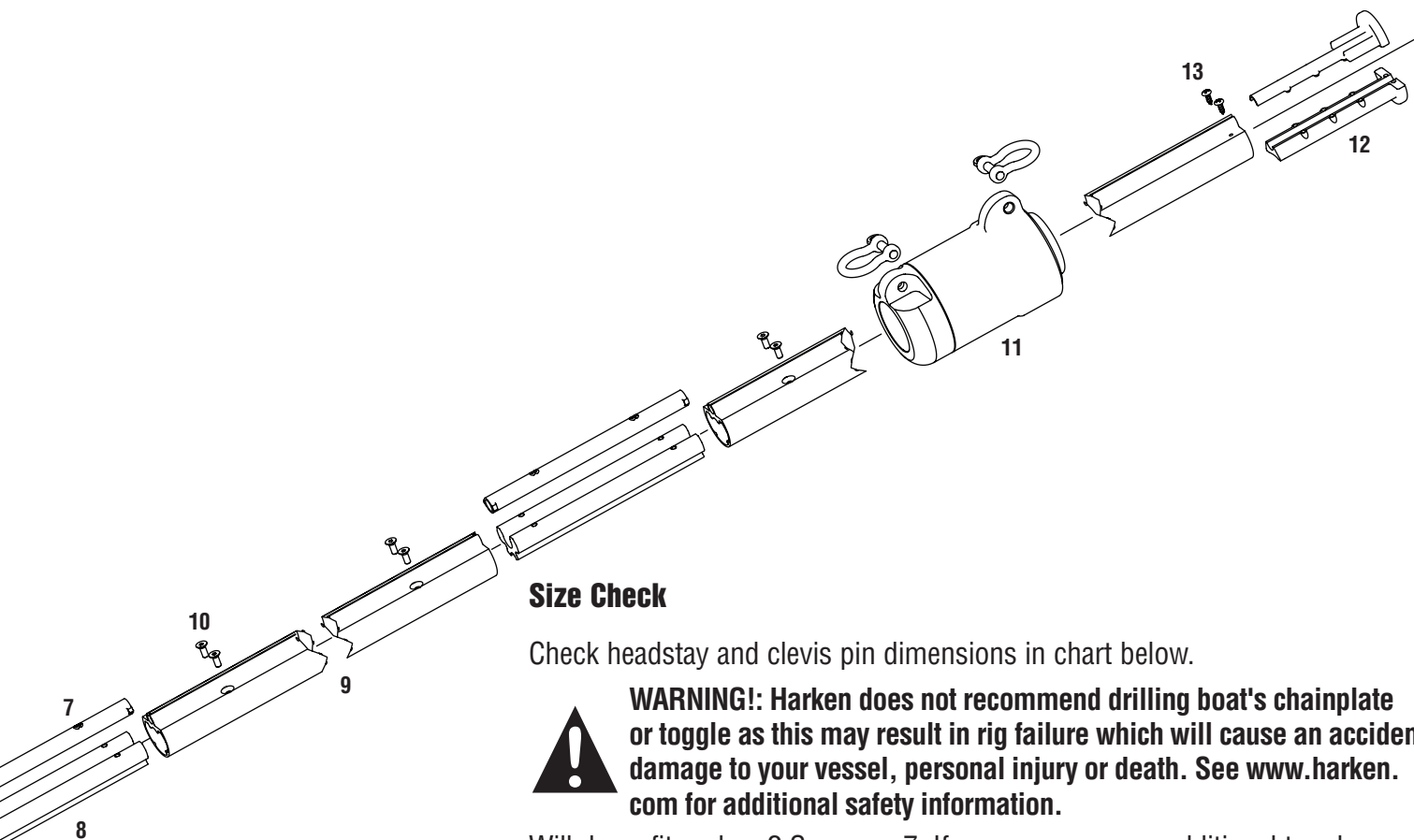
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Parts Descriptions

- | | | | |
|--------------------|---------------------------|----------------------|---------------------|
| 1) Toggle Assembly | 5) Foil Clamp Screws | 9) 7' (2.13m) Foil | 13) Trim Cap Screws |
| 2) Crosspin | 6) 2' (610mm) Bottom Foil | 10) Connector Screws | |
| 3) Shackle | 7) Connector Isolator | 11) Halyard Swivel | |
| 4) Drum Assembly | 8) Connector | 12) Trim Cap | |



Size Check

Check headstay and clevis pin dimensions in chart below.



WARNING! Harken does not recommend drilling boat's chainplate or toggle as this may result in rig failure which will cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

Will drum fit on bow? See page 7. If necessary use an additional toggle to slightly raise the unit. To clear anchor use Harken Long Link Plates, which can be cut to various lengths.

UNIT 1	Part No.	Description	Wire Ø	
	7311.10	Cruising Unit 1	1/4", 9/32", 5/16"	6mm, 7mm, 8mm
			Rod Ø	
			-8, -10	5.72mm, 6.35mm
	Toggle Part No.	Description	Chainplate Clevis Ø	
	7411.20 1/2	Eye/jaw reversible	1/2"	12.7mm
UNIT 2	7311.20 1/2	Jaw/jaw	1/2"	12.7mm
	7311.20 5/8	Stud/jaw	5/8"	15.9mm
	7311.21 1/2	Long link plate w/toggle	1/2"	12.7mm
	7311.21 5/8	Long link plate w/toggle	5/8"	15.9mm
	Part No.	Description	Wire Ø	
	7312.10	Cruising Unit 2	5/16", 3/8", 7/16"	8mm, 10mm, 11mm, 12mm*
			Rod Ø	
			-12, -17, -22	7.14mm, 8.38mm, 9.53mm
	Toggle Part No.	Description	Chainplate Clevis Pin Ø	
	7412.20 5/8	Eye/jaw reversible	5/8"	15.9mm
	7312.20 5/8	Jaw/jaw	5/8"	15.9mm
	7312.20 3/4	Stud/jaw	3/4"	19.1mm
	7312.21 5/8	Long link plate w/toggle	5/8"	15.9mm
	7312.21 3/4	Long link plate w/toggle	3/4"	19.1mm
	*7/16", 11mm and 12mm requires large bore 41009 isolators. They have a "12" stamped on the outside. 41009 Isolators are shipped with 7412.20 3/4 stud jaw toggle and 7312.21 3/4 long link plate assembly			





Bottom Foil
w/Feeder



Foils



Halyard Swivel

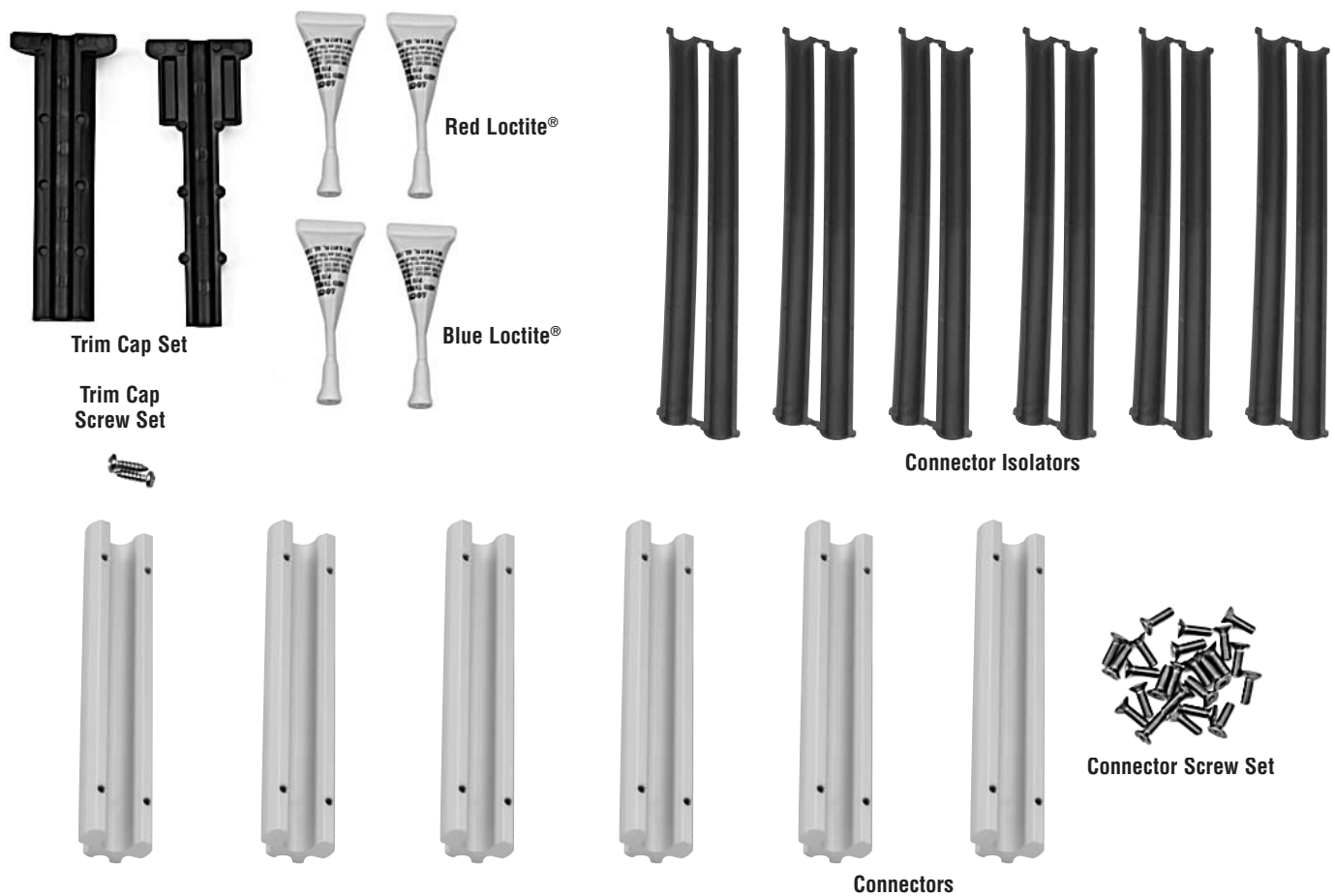


Line

Main Components

Description	Unit	Part No.	Qty
Drum Assembly	1	HFG146	1
2'(610mm) Bottom foil		7311.33	1
7'(2.13m) Foil		7311.30	6
Halyard Swivel		H-36596C	1
7mm Double braid polyester line		HFG233	70'(21.3m)
Drum Assembly	2	HFG188	1
2'(610mm) Bottom foil		7312.33	1
7'(2.13m) Foil		7312.30	8
Halyard Swivel		H-37317C	1
8mm Double braid polyester line		HFG235	100' (30.4m)

Parts



Other Components

Description	Unit	Part No.	Qty	Size
Trim cap set	1	HFG182 (H-37443B/H-37444B)	1	—
Trim cap screw set		HFS1127	3	—
Red Loctite® (foil screws)		HFG739	2	—
Blue Loctite® (foil clamp screws)		833	1	—
Connectors		7311.31F	6	6" (152mm)
Connector isolators		H-41008	6	—
Connector screw set		HFG149 (30 - HFS980)	1	—
Foil clamp screw set		H-41153	3	—
Bow shackles		2110	3	6mm
Trim cap set	2	HFG197 (H-37445B/H-37446B)	1	—
Trim cap screw set		HFS1127	3	—
Red Loctite® (foil screws)		HFG739	2	—
Blue Loctite® (foil clamp screws)		833	1	—
Connectors		7312.31F	8	9" (229mm)
Connector isolators		H-37330C	8	—
Connector isolator for 7/16", 11mm, 12mm Wire*		H-41009	9	—
Connector screw set		HFG196 (38 - HFS1060)	1	—
Foil clamp screw set		H-41154	3	—
Bow shackles		2117	3	8mm

*H-41009 Connectors are shipped with 7312.20 3/4 stud/jaw toggle and 7312.21 3/4 long link plate w/toggle.

Allen Wrenches (Supplied)

Description	Unit	Qty
M2.5, M4, M5	1	1 Each
M3, M4, M6	2	1 Each

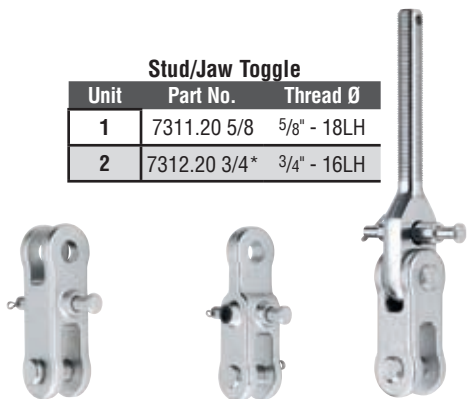
1. Harken toggle assembly required. Sold separately.
2. Mating turnbuckle components must be purchased separately.
3. Headstay may require cutting and shortening to fit Harken toggle. Headstay may remain uncut by replacing lower stud of turnbuckle with stud/eye thus eliminating extra toggle.
4. Rod rigging requires Harken rod adapter stud.
5. Order Harken 7404 Lead Block Kit and one additional 7403 if necessary. Fits 1" (25mm) stanchions.



WARNING!: Headstay condition should be checked by a professional rigger before reusing. Wire that is old or damaged may break suddenly causing an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

ALL UNITS Harken Toggle (Sold Separately)

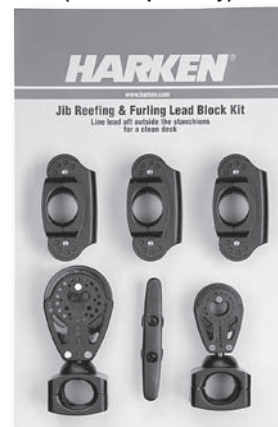
Stud/Jaw Toggle		
Unit	Part No.	Thread Ø
1	7311.20 5/8	5/8" - 18LH
2	7312.20 3/4*	3/4" - 16LH



ROD RIGGING Harken Rod Adapter Stud Required (Sold Separately)



7404 Lead Block Kit (Sold Separately)



Includes 3 x 7403; 1 x 7401;
1 x 7402; 1 Horn Cleat

Jaw/Jaw Toggle	
Unit	Part No.
1	7311.20 1/2
2	7312.20 5/8

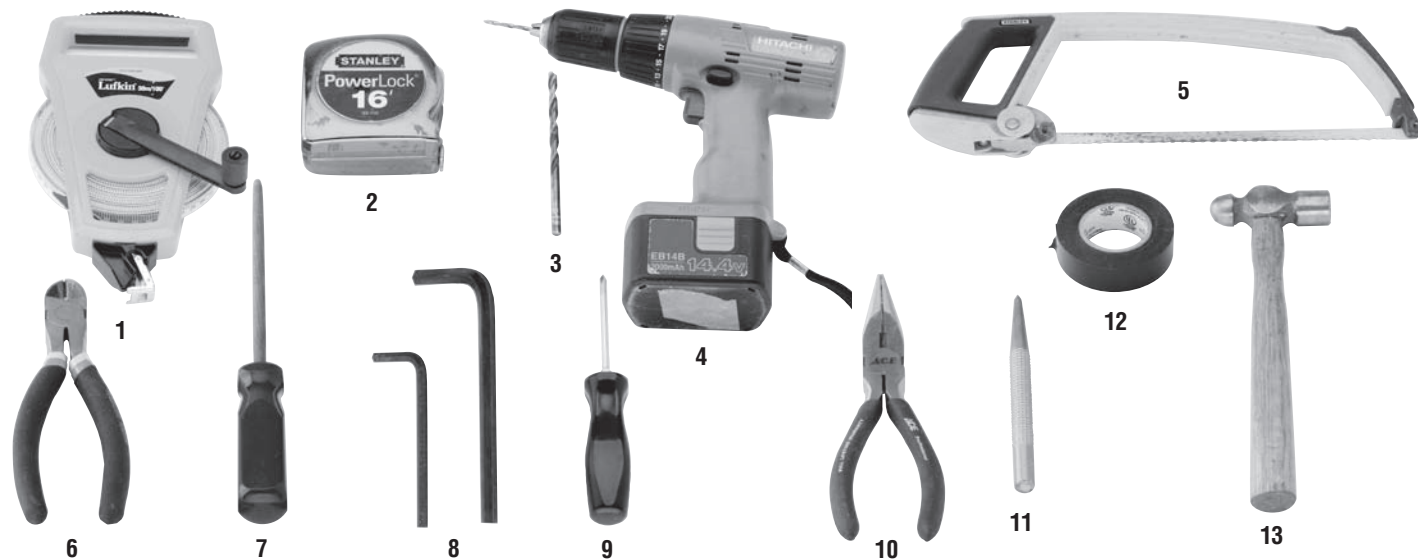
Eye/Jaw Toggle	
Unit	Part No.
1	7411.20 1/2
2	7412.20 5/8

*Includes 9 H-41009 large bore connector isolators
** Requires drum assembly with four threaded holes in base. See page 16.

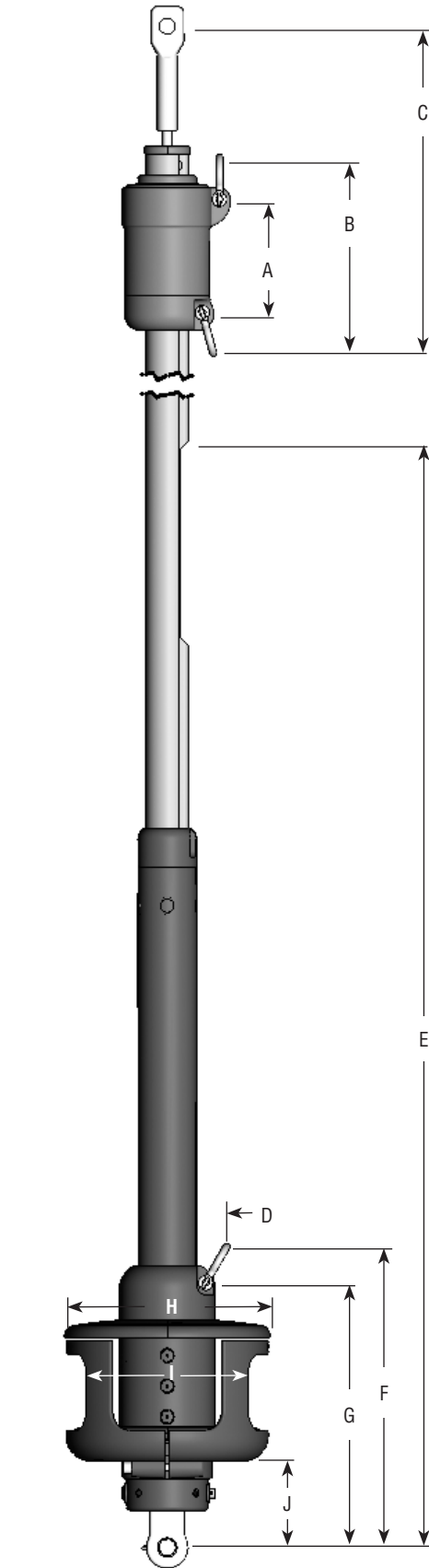
Long Link Plate w/Toggle	
Unit	Part No.
1	7311.21 1/2
	7311.21 5/8
2	7312.21 5/8
	7312.21 3/4*

Rod Adapter Stud		
Unit	Part No.	Thread Ø
1	7422 -8	1/2" - 20RH
	7423 -10	1/2" - 20RH
1 & 2	7424 -12	5/8" - 18RH
2	7425 -17	5/8" - 18RH
	7426 -22	3/4" - 16RH

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. Drill bit – 1/8" (3mm)	8. Allen wrenches (provided)	13. Hammer
4. Power drill	9. Phillips screwdriver	
5. Hacksaw	10. Needle-nose pliers	



Luff Length

Note offsets above and below sail.
 A shorter luff may be required if a halyard restrainer is necessary (page 23) or a toggle or long toggle assembly is used to raise drum.
 If luff of sail is not long enough to put halyard swivel near top of headstay foil, make sure a pendant must be added. (See page 22).

Tack Setback

Note setback for tack shackle and cut the sail accordingly.

Luff Tape Size

Both units require #6 (5/32" or 5 mm) luff tape.

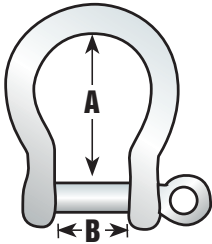
Luff Tape Length

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
1	1 1/16" (27mm)	1/2" (13mm)
2	1 3/4" (44mm)	1 1/16" (17mm)



Suncover

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

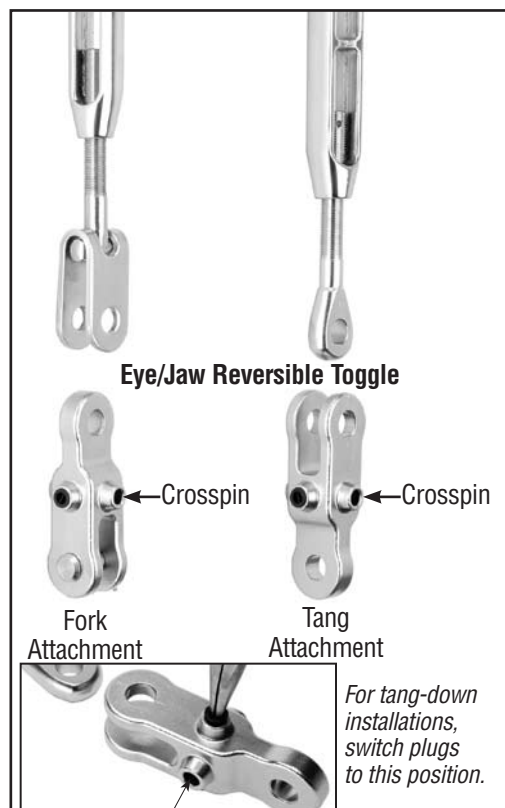
Note: If a long link plate is used, add the following dimensions to feeder, shackle and drum height (based on whether plate is used full-length or shortened to one of five hole positions). Do not add to halyard swivel or top terminal dimensions.

Unit 1	1/2" (12.7mm) Clevis Pin	Add 13 ¹ / ₄ " to 6 ³ / ₈ " (337mm to 162mm)
	5/8" (15.9mm) Clevis Pin	Add 11 ¹ / ₄ " to 4 ³ / ₈ " (286mm to 111mm)
Unit 2	5/8" (15.9mm) Clevis Pin	Add 16 ¹ / ₈ " to 8 ¹ / ₄ " (410mm to 210mm)
	3/4" (19.1mm) Clevis Pin	Add 13 ⁹ / ₁₆ " to 5 ¹¹ / ₁₆ " (344mm to 144mm)

Unit	A	B	C Max	D	E	F	G	H	I	J	Toggle Used
1	35/8" 92mm	6" 152mm	12" 305mm	13/8" 35mm	Min 33 1/4" (845mm) Max 40 7/16" (1027mm)	Min 9 1/4" (235mm) Max 11 7/8" (302mm)	Min 8 1/4" (210mm) Max 10 13/16" (275mm)	65/8" 167mm	3 1/16" 78mm	Min 2 1/2" (64mm)* Max 5 1/16" (129mm)**	*1/2" (12.7mm) **5/8" (15.9mm)
2	4 1/2" 114mm	8" 203mm	16" 406mm	1 11/16" 42mm	Min 42 7/16" (1078mm) Max 50 3/4" (1289mm)	Min 11 3/4" (298mm) Max 14 7/8" (378mm)	Min 10 3/8" (264mm) Max 13 1/2" (343mm)	8 3/16" 208mm	3 13/16" 97mm	Min 3 3/8" (86mm)* Max 6 1/2" (165mm)**	*5/8" (15.9mm) **3/4" (19.1mm)

Use dimensions of the 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 allows fine tune adjustment of mast rake.



Most boats have a chainplate with a single tang. If boat has two plates forming a jaw, reverse eye/jaw toggle so eye is down.

Important: Remove black plastic caps and install them so that crosspin will be 90 degrees to main clevis pin.

Unit	Thread
1	5/8" - 18LH
2	3/4" - 16LH

Unit	Clevis Pin
1	3 1/4" (83mm)
2	4" (102mm)

Eye/Jaw Reversible

Unit	Clevis Pin
1	1/2" (12.7mm)
2	5/8" (15.9mm)

Stud/Jaw

Unit	Clevis Pin
1	3/4" (19.1mm)
2	5/8" (15.9mm)

Make sure your toggle looks like this!

Jaw/Jaw

Unit	Clevis Pin
1	1/2" (12.7mm)
2	5/8" (15.9mm)

Make sure your toggle looks like this!

Long Link Plate w/Toggle

Unit	Clevis Pin
1	1/2" (12.7mm)* 5/8" (15.9mm)**
2	5/8" (15.9mm)* 3/4" (19.1mm)**

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. When using smaller wires, marine eye may fit. See Page 14.
4. Rod adapter nosepiece for Harken rod adapter stud.

WARNING!: Using a threaded nosepiece with only adhesive at the upper rod eye terminal may result in headstay system failure which can cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

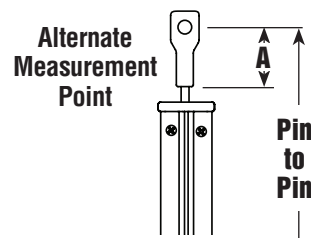


Preparation for Assembly

Top Foil Length Worksheet

Measure A and add to this chart and "length chart" below		
	Inches	mm
A		
B	.5	13
E	24.0	610
F	16.4	416
G		
Total A+B+E+F+G		

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



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
3 X 84 = 252		3 x 2133.6 = 6400.8
4 X 84 = 336		4 x 2133.6 = 8534.4
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
Example-If result from Step 3 is:		
500 inches "D" = 420 inches 12,000mm "D" = 10,668mm		
5	Result (C) Top Foil Length	

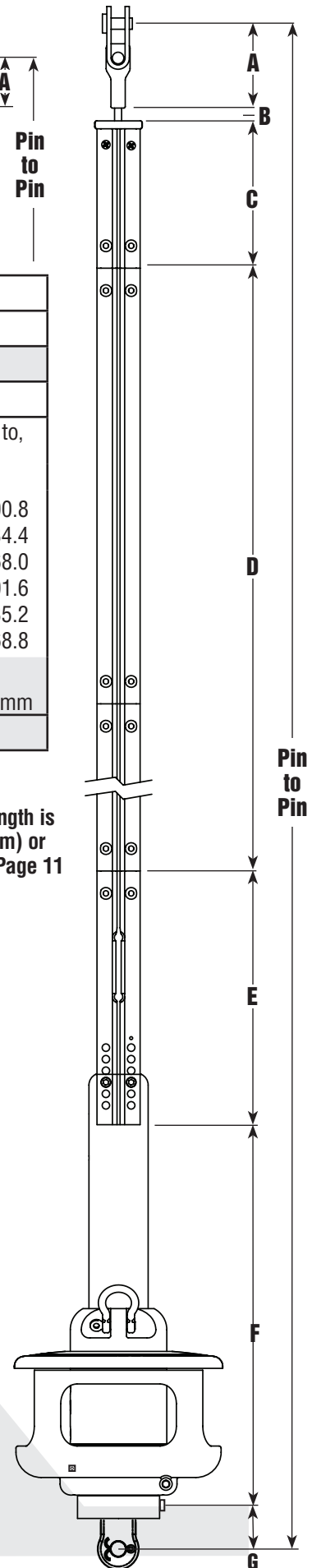
If top foil length is 6³/₄" (171mm) or less, go to Page 11

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.

Pin-to-Pin Length Worksheet			
Dimensions		Inches	mm
A	Center of Pin to Bottom of Terminal		
B	Bottom of Terminal to Top of Foil	.5	13
C	Top Foil Length		
D	Number of Foils _____ x 84" (2133.6 mm)		
E	Bottom Foil	24.0	610
F	Bottom of Foil to Crosspin	16.4	416
G	Crosspin to Clevis Pin		
Pin-to-Pin Length			

G Toggle Distance from Lower Clevis Pin to Crosspin Hole					
Toggle Part No.	Type	Clevis Pin		G Distance	
7411.20 1/2	Eye/Jaw Reversible	1/2"	12.7 mm	1.75"	44 mm
7311.20 1/2	Jaw/Jaw	1/2"	12.7 mm	1.50"	38 mm
7311.20 5/8	Stud/Jaw	5/8"	15.9 mm	4.00"	102 mm
7311.21 1/2	Long Link Plate w/Toggle	1/2"	12.7 mm	14.75"	375 mm
7311.21 5/8	Long Link Plate w/Toggle	5/8"	15.9 mm	15.25"	387 mm
Note: If long link plate is shortened, dimension must be changed or foil will be too short. Measure distance from crosspin down to where clevis pin attaches toggle to boat and use this dimension in G above.					



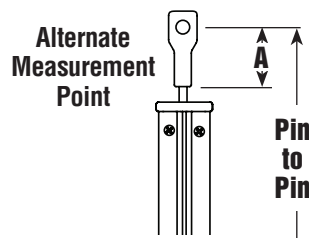
Preparation for Assembly

Top Foil Length Worksheet

Measure A and add to this chart and "length chart" below

	Inches	mm
A		
B	.7	18
E	24.0	610
F	19.1	484
G		
Total A+B+E+F+G		

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



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
4 X 84 = 336	4 x 2133.6 = 8534.4	
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	8 x 2133.6 = 1920.4	
Example-If result from Step 3 is:		
500 inches "D" = 420 inches 12,000mm "D" = 10,668mm		
5	Result (C) Top Foil Length	

If top foil length is 9 1/8" (232mm) or less, go to Page 11

Length Check

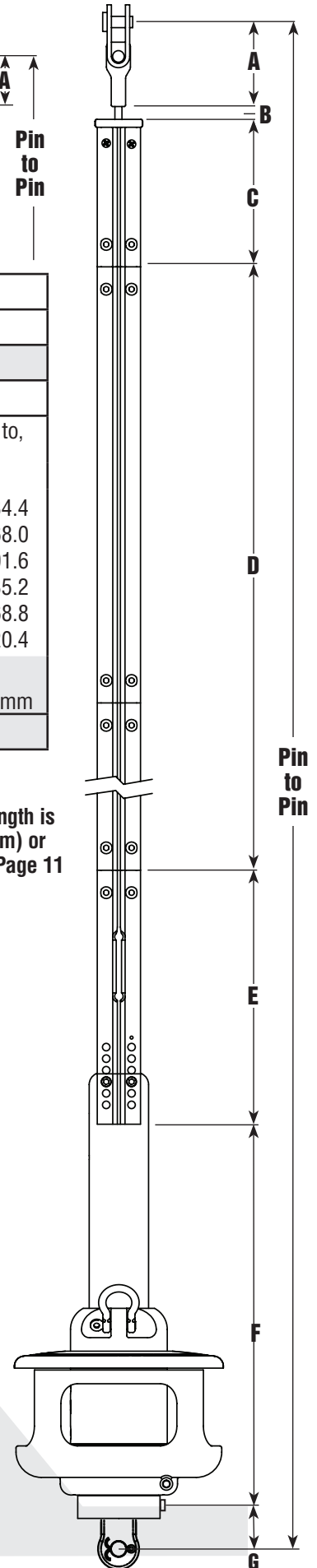
After completing worksheet above fill in A, C, D and G below. Add "A" through "G" to confirm total equals your pin-to-pin measurement.

Pin-to-Pin Length Worksheet			
Dimensions		Inches	mm
A	Center of Pin to Bottom of Terminal		
B	Bottom of Terminal to Top of Foil	.7	18
C	Top Foil Length		
D	Number of Foils _____ x 84" (2133.6 mm)		
E	Bottom Foil	24.0	610
F	Bottom of Foil to Crosspin	19.1	484
G	Crosspin to Clevis Pin		
Pin-to-Pin Length			

G Toggle Distance from Lower Clevis Pin to Crosspin Hole

Toggle Part No.	Type	Clevis Pin		G Distance	
7412.20 5/8	Eye/Jaw Reversible	5/8"	15.9 mm	2.00"	51 mm
7312.20 5/8	Jaw/Jaw	5/8"	15.9 mm	2.00"	51 mm
7312.20 3/4	Stud/Jaw	3/4"	19.1 mm	5.10"	130 mm
7312.21 5/8	Long Link Plate w/Toggle	5/8"	15.9 mm	18.10"	460 mm
7312.21 3/4	Long Link Plate w/Toggle	3/4"	19.1 mm	18.75"	476 mm

Note: If long link plate is shortened, dimension must be changed or foil will be too short. Measure distance from crosspin down to where clevis pin attaches toggle to boat and use this dimension in G above.



Use one of the following special techniques for short foils to ensure sufficient bearing surface for foil in area of halyard swivel.



Unit 1	Unit 2
Top foil length from worksheet:	
6³/₄" (171mm)	9¹/₈" (232mm)
No change necessary.	



Cut top trim cap

Cut-Offs
Do Not Use

Unit 1	Unit 2
Top foil length from worksheet:	
6¹/₂" - 4" (165 - 102mm)	9" - 5³/₄" (229 - 146mm)
Cut top trim cap as shown above.	



Cut-Offs
Do Not Use

Unit 1	Unit 2
Top foil length from worksheet:	
3¹/₂" - 1¹/₂" (89 - 38mm)	5¹/₂" - 2¹/₂" (89 - 64mm)
Actual Top Foil	
4" (102mm)	5³/₄" (146mm)
Do not cut top foil to length from worksheet. Cut top foil to 4" (102mm) or 5 ³ / ₄ " (146mm) and shorten trim cap as shown in middle photo above. Shorten bottom foil per chart below.	

	Top foil length from worksheet		Actual top foil		Shorten bottom of bottom foil by this amount	
	in	mm	in	mm	in	mm
UNIT 1	3 ¹ / ₂	89	4	102	0	0
	3	76	4	102	1	25
	2 ¹ / ₂	64	4	102	1 ¹ / ₂	38
	2	51	4	102	2	51
	1 ¹ / ₂	38	4	102	2 ¹ / ₂	64
UNIT 2	5 ¹ / ₂	140	5 ³ / ₄	146	0	0
	5	127	5 ³ / ₄	146	1	25
	4 ¹ / ₂	114	5 ³ / ₄	146	1 ¹ / ₂	38
	4	102	5 ³ / ₄	146	2	51
	3 ¹ / ₂	89	5 ³ / ₄	146	2 ¹ / ₂	64
	3	76	5 ³ / ₄	146	3	76
	2 ¹ / ₂	64	5 ³ / ₄	146	3 ¹ / ₂	89



Unit 1	Unit 2
Top foil length from worksheet:	
1" - 1¹/₂" (25 - 13mm)	2" - 1¹/₂" (51 - 13mm)
Do not use short top foil. Use full length foil and clamp foil higher in drum assembly.	

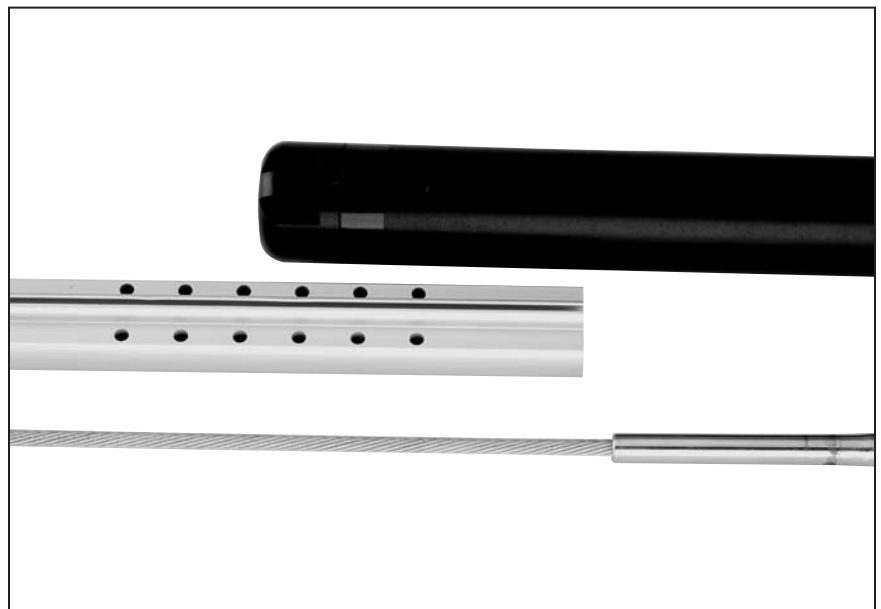
Confirm foil length by laying foils alongside stay with turnbuckle components.

Pull stay out so it is straight. Attach Harken toggle to bottom of stay. 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.

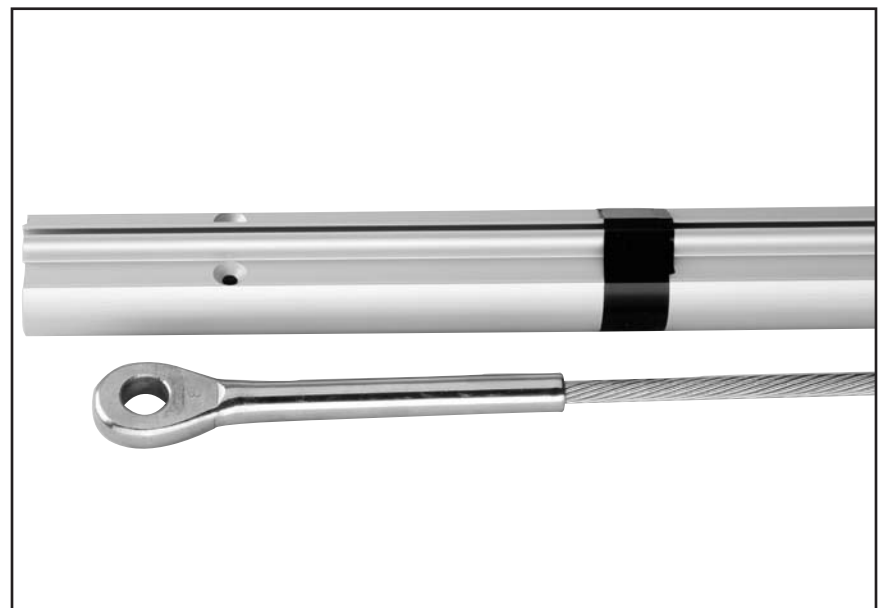
Line up drum assembly so holes below drum line up with holes in Harken toggle. Make sure toggle is tensioned when measuring.



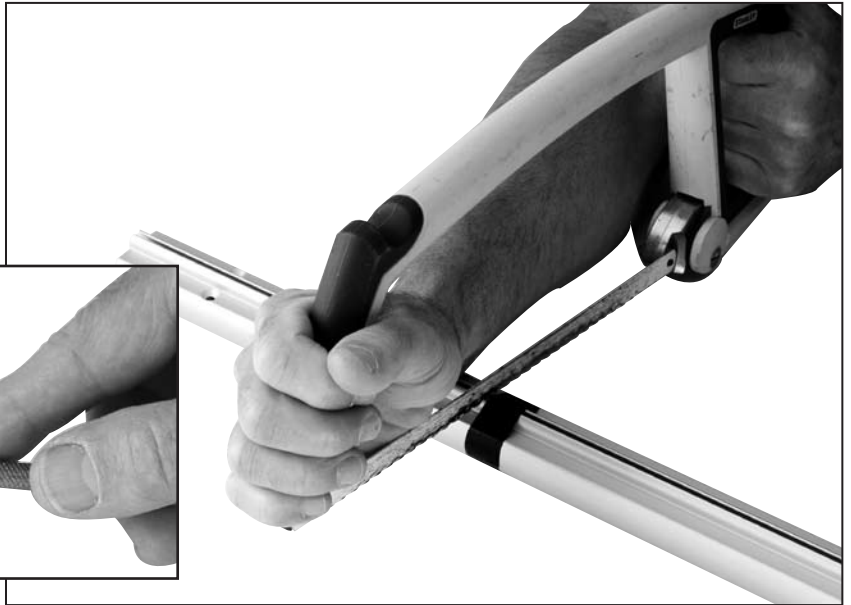
Line up bottom foil so clamp screw holes are lined up with third row of holes as shown.



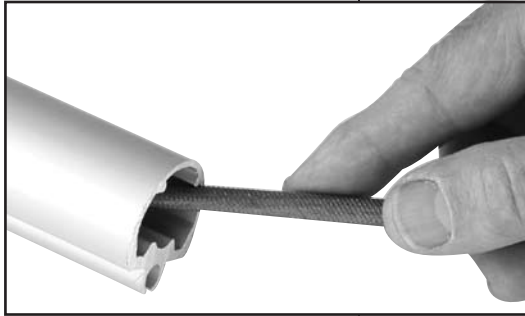
Note: Mark top foil so foil with trim cap will ride 1/2" (12mm) below terminal. If wire fitting at top of stay is swage, foil must ride just below shoulder of swage. Mark cut line on foil. Wrap tape around foil as a guide so cut is straight. Check length to see if it matches results from chart on Page 9 (Unit 1) or Page 10 (Unit 2).



Cut foil to length using hacksaw.



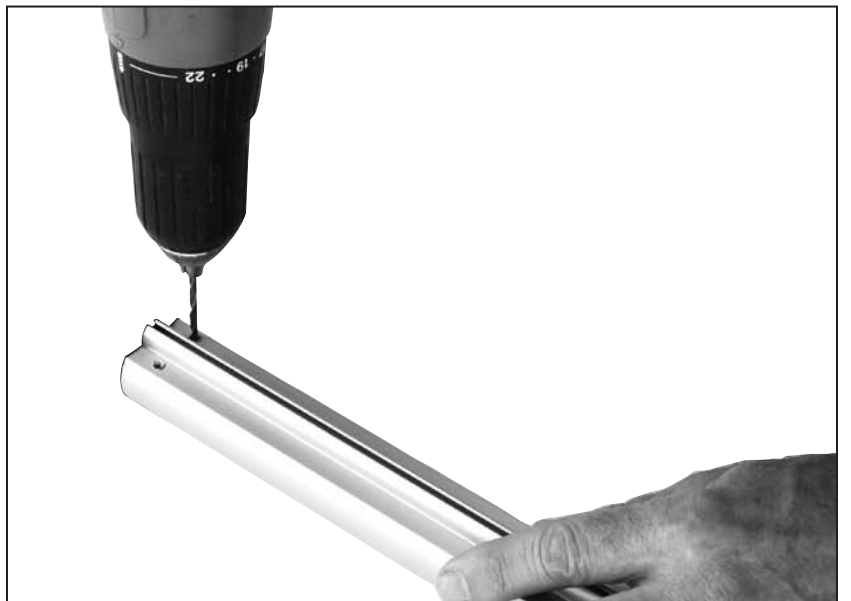
Deburr inside edge using rat-tail file.



Insert trim cap. Use centerpunch to mark two top foil trim cap holes $\frac{1}{2}$ " (12mm) down from top of foil on each side of sail groove.



Remove trim cap. Drill two $\frac{1}{8}$ " (3mm) holes in foil for self-tapping screws.

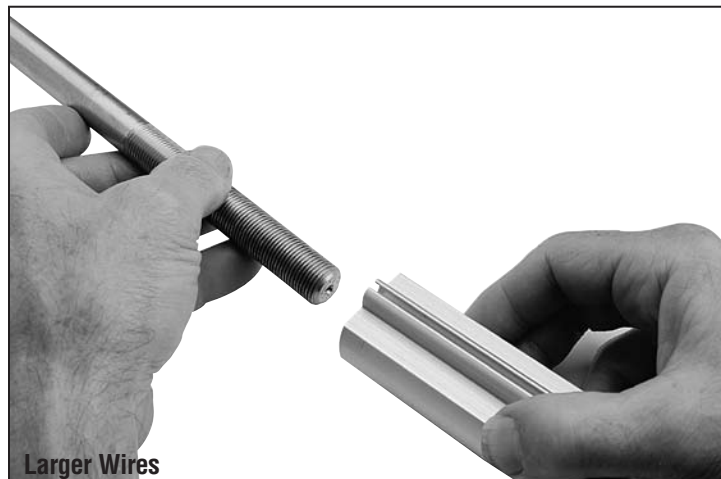




Smaller Wires

Unit	Wire Ø
1	1/4", 6mm, 9/32", 7mm
2	5/16", 8mm, 3/8", 10mm

Slide foils on stay starting from bottom or top. In most cases marine eye will fit through foil.



Larger Wires

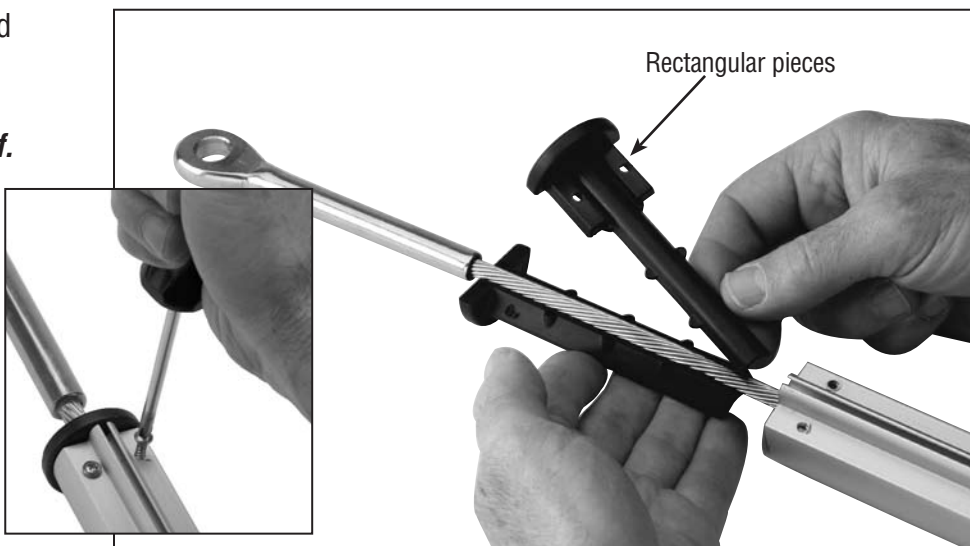
Unit	Wire Ø
1	5/16", 8mm
2	7/16", 11mm, 12mm

Swage stud fitting or wire end must pass through foil. Use Norseman-/Sta-Lok-type terminal with wire end.

Place halves of trim cap over wire and insert into top foil.

Tip: With foil groove up, have rectangular pieces on the upper half.

Install self-tapping trim cap screws.



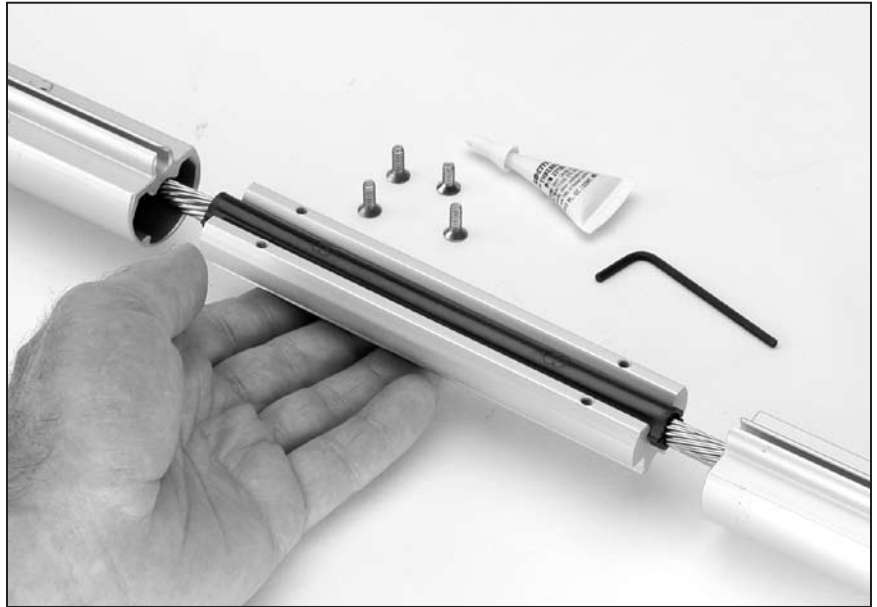
Fold halves of plastic isolator over wire.



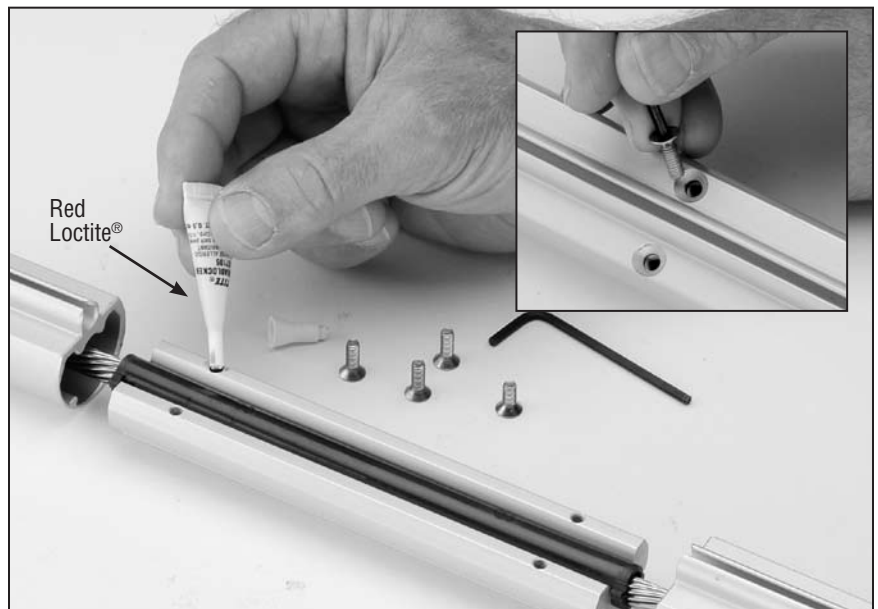
Assembly

Assemble Connector/Assemble Foil/Slide on Halyard Swivel

Place connector over plastic isolator so tabs on isolator are to side.



Put red Loctite® in screw holes and assemble. Continue with rest of foils. Make sure bottom foil with feeder gap will be at bottom.



Slide halyard swivel onto foils so swivel portion is towards top of stay.

Tip: Taller "half" will be facing up.

Slide drum assembly onto foils.



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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.

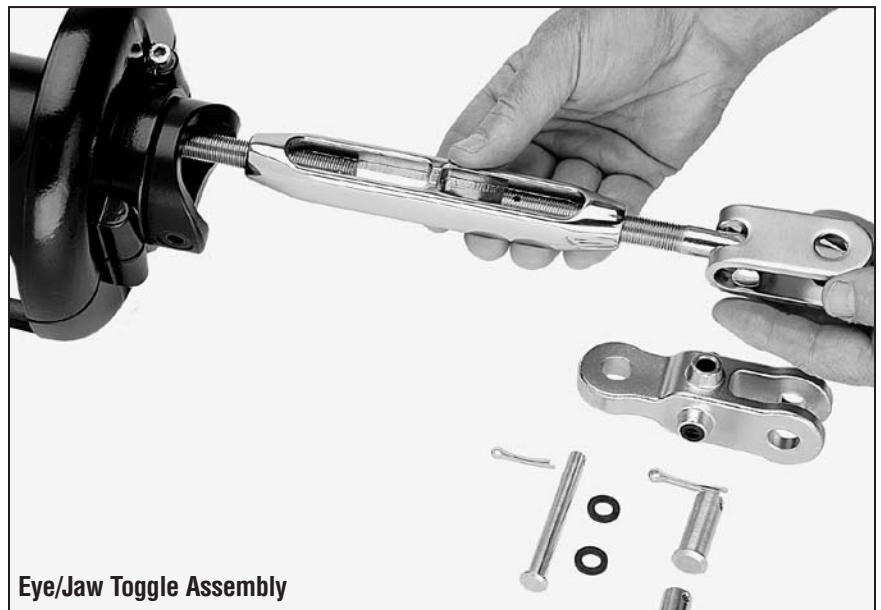
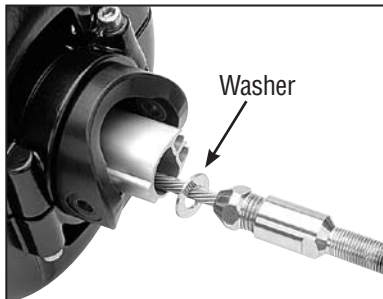
Tip: Turn nosepiece completely into threaded stud portion. Flats will be close and may only require a small half turn to align with cotter pin holes.



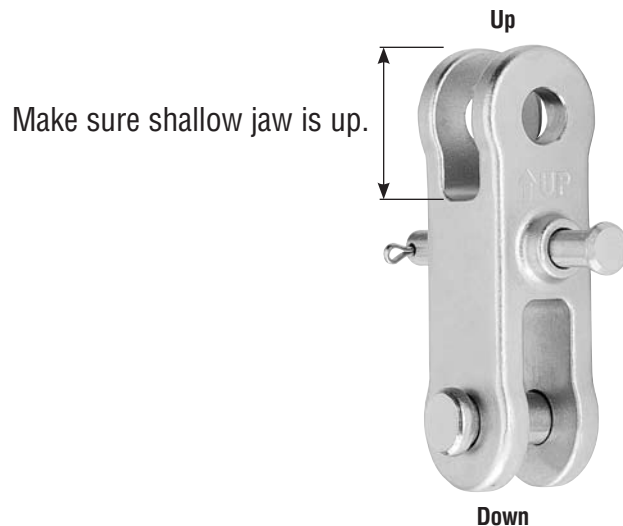
Insert two cotter pins and spread. Clean excess Loctite® from terminal body using special care to ensure that there is no red Loctite® on threaded stud.

Assemble turnbuckle and attach Harken toggle.

Note: If using Sta-Lok® or Norseman® stud, you must use a washer above stud as shown below. Use a fender washer to fit large-diameter cruising foil.



Eye/Jaw Toggle Assembly



Jaw/Jaw Toggle Assembly



Eye/Jaw Toggle Assembly



Stud/Jaw Toggle Assembly

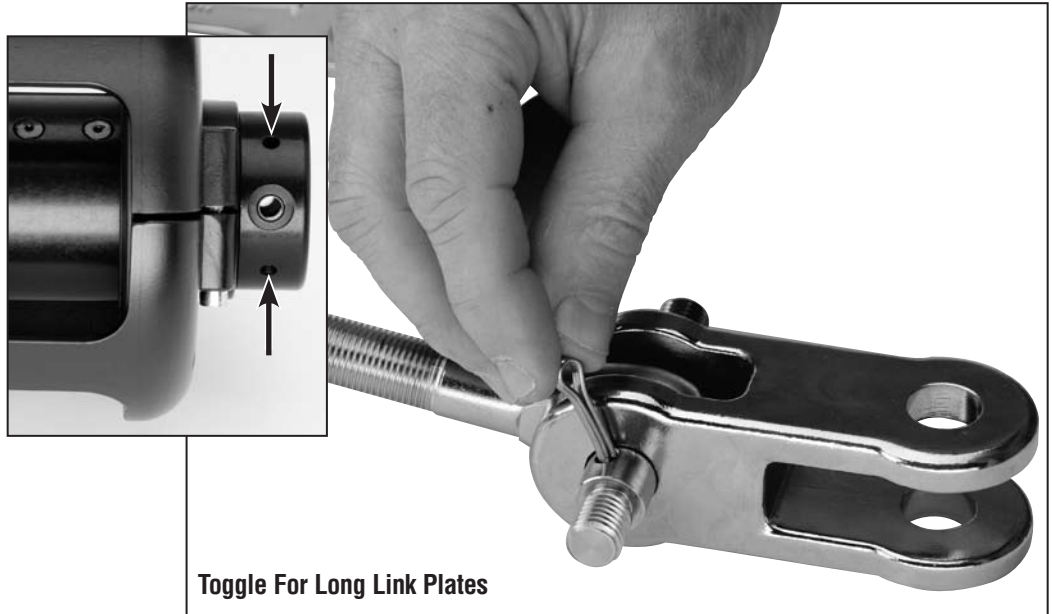
Make sure drum assembly has four threaded holes in base.

Determine height of long link plates to provide anchor clearance and cut to length.

Cut at scribe mark. Deburr edges.

Make sure shallow jaw is up.

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



Toggle For Long Link Plates

Apply Isolator.

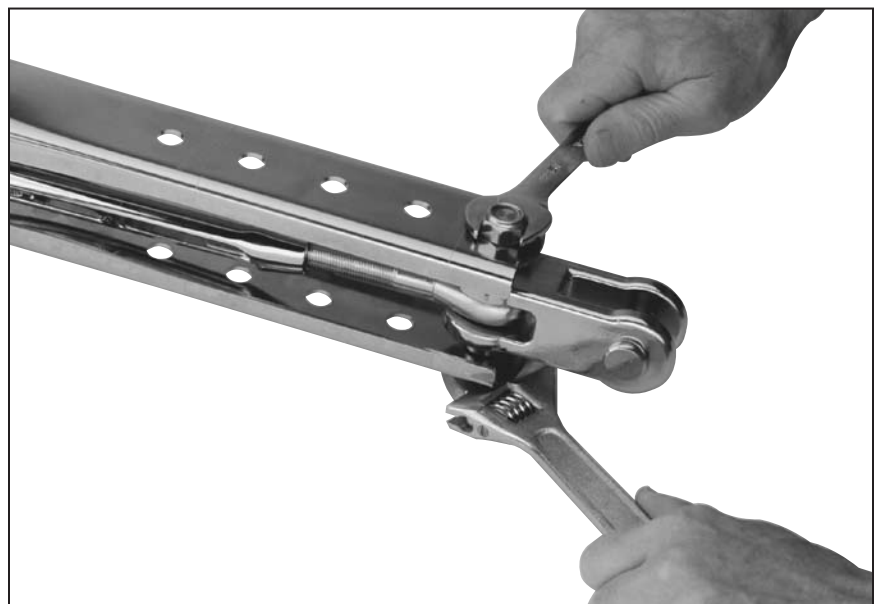
Fasten one long link plate to drum assembly using fasteners. Use blue Loctite® on screws.



Fasten second long link plate to drum assembly and secure to clevis pin using locknuts.



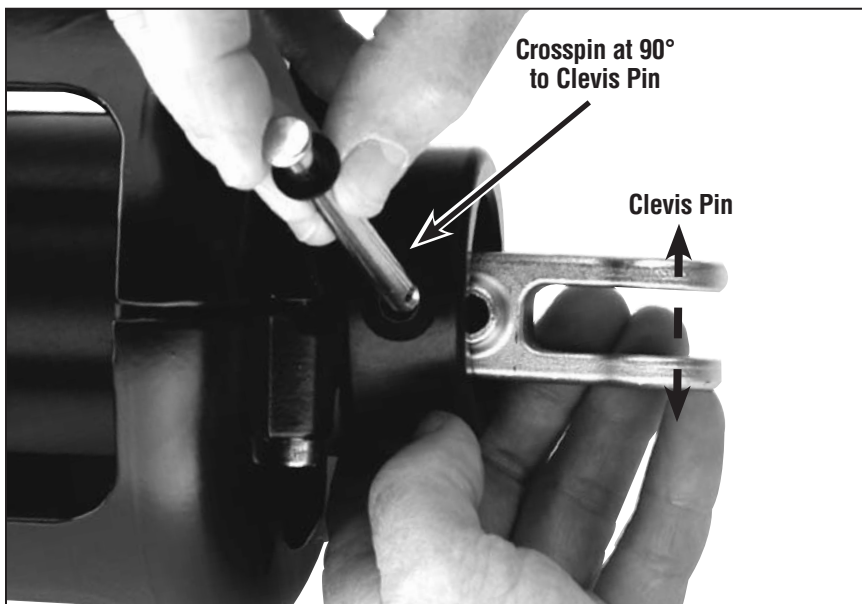
WARNING!: Stay must attach to toggle. Do not attach stay to crosspin at drum assembly because crosspin and plates may fatigue and break causing an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.



Slide lower drum assembly over turnbuckle and attach using long crosspin. Use plastic washers provided.



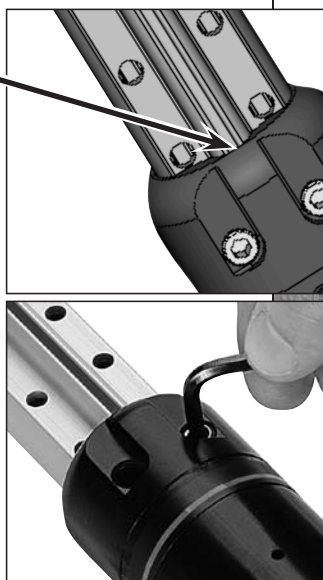
WARNING! Crosspin must be 90 degrees to clevis pin that attaches unit to boat. If pins run same direction toggle will fatigue and could break suddenly causing an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.



Lift foils so top of foils ride about 1/2" (12mm) below upper terminal.



Lining these holes up with top of drum assembly insures screws are lined up with foil holes.



Have extra cotter pins on hand to replace used ones at base of unit and for turnbuckle. Hold foils and remove foil clamp screws. Lower foils.

Remove crosspin holding lower unit to turnbuckle. Raise drum assembly and use halyard to hold unit at about 5' (1.5m) above deck. Raise foils and secure with second halyard. ***Allow room above for turnbuckle take up.***



WARNING! To avoid injury, make sure drum assembly and foils are securely lifted using a halyard before adjusting turnbuckle. Failure to do so may result in furler dropping suddenly, causing damage to the furler or severe injury. See www.harken.com for additional safety information.

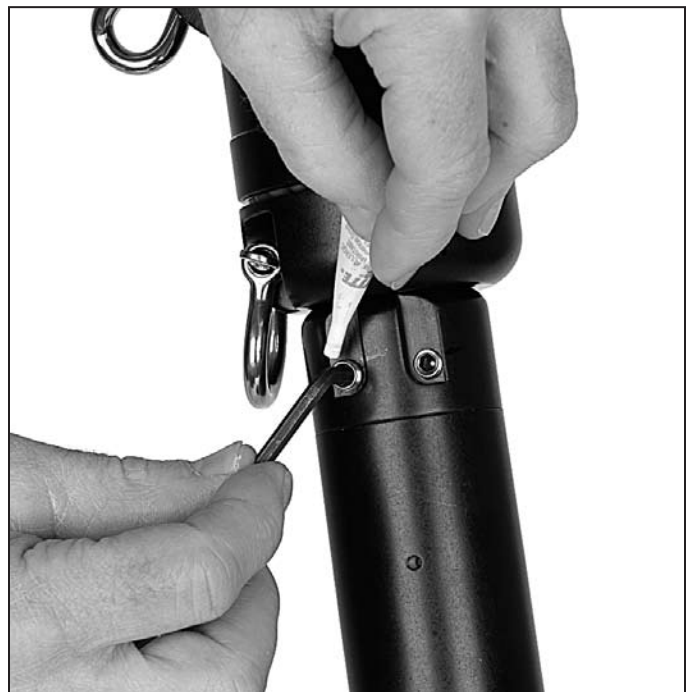
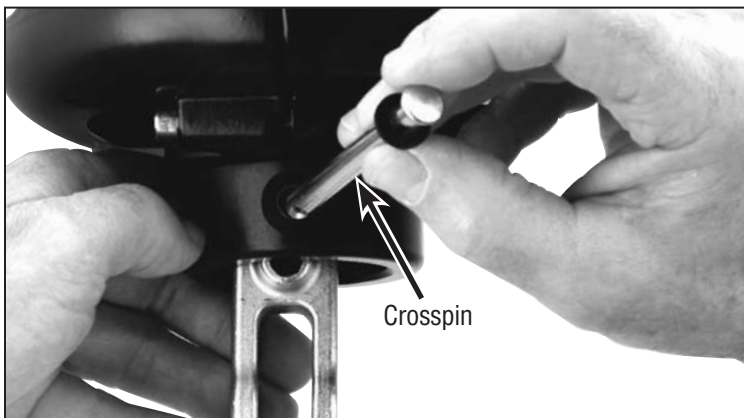
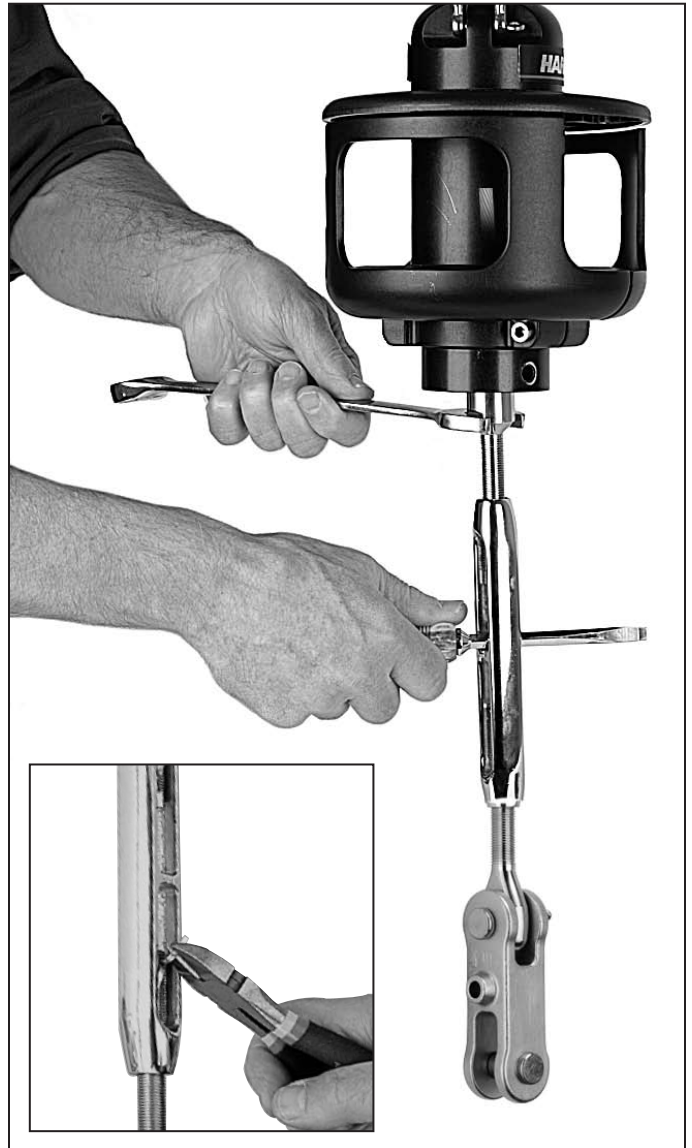
Adjust turnbuckle. Use sidecutters or needlenose pliers to bend cotter pin. Replace used cotter pins. Lower unit and install crosspin and new cotter pin.

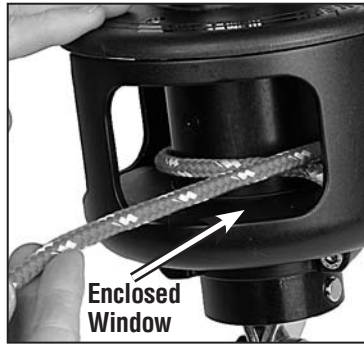
Lift foils so top is 1/2" (12mm) below upper terminal.

Use blue Loctite® on foil clamp screws when you replace them.



WARNING! Stay must attach to toggle. Do not attach stay to crosspin at drum assembly because crosspin and plates may fatigue and break causing an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.





Run line through **enclosed window** in guard and into hole in bottom plate of spool. Tie a small overhand knot and pull it up under drum assembly.



WARNING! If line is led through opening between two enclosed windows it can ride above lineguard and jam furler. This can cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

Note location of sun cover. Charge system by rotating furler to wrap line on drum.

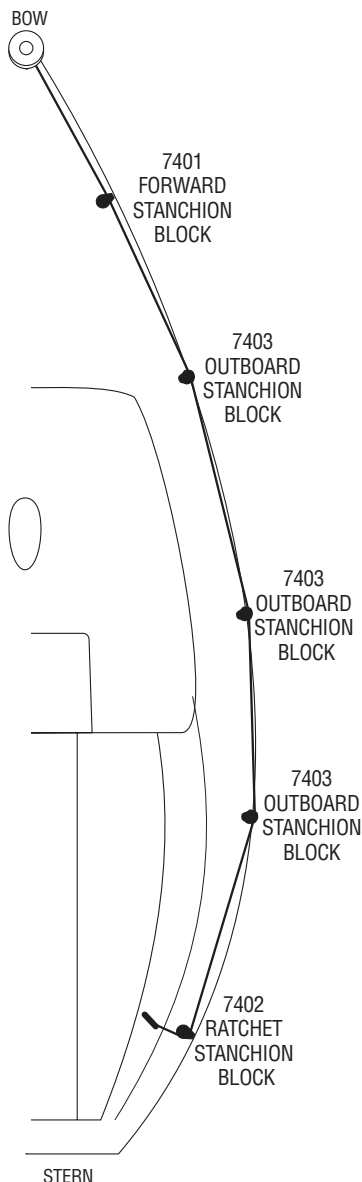
Tip: Sun cover to starboard—turn clockwise to charge. Sun cover to port—turn counter-clockwise. Tension line while charging.

Mount Lead Blocks

Furling line can be led down either side of boat. If boat is in slip, consider mounting opposite dock.

Remove four screws on stanchion blocks. Clamp blocks to stanchions. See instructions below.

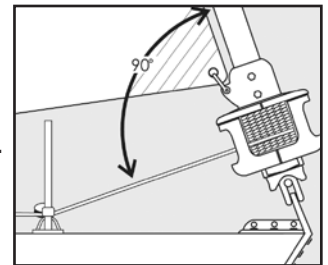
Tip: Start all four screws before tightening.



7401 Forward Stanchion Block

Position 7401 Forward Stanchion Block so line enters drum at right angles to headstay and centers vertically in opening. Install so line is inside stanchion.

Correct block position is critical to even line spooling and ease of furling.



7403 Outboard Stanchion Blocks

Install 7403 Outboard Stanchion Blocks so line is outside stanchions.

Number and placement of leads depends on boat length and number/configuration of stanchions.



7402 Ratchet Stanchion Block

Mount 7402 Ratchet Stanchion Block as furthest-aft lead to prevent line overrides in drum when unfurling. Position ratchet block so line turns at least 90°.

Install so line is inside stanchion.

Lead line through block so ratchet makes clicking sound when pulling line to furl sail.

Tip: Make sure ratchet switch is in "ON" position. If there is no clicking sound, lead line through block in opposite direction.

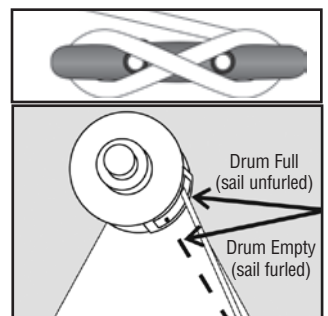
Lead line to Furling Line Cleat in cockpit.



HCP168 Furling Line Cleat

Install so line is angled as shown. Use #10 (5 mm) fasteners.

Note: As furling line lead changes, make sure line doesn't chafe against line guard. Rotate line guard if necessary.



Halyard Wrap

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



WARNING!: In severe cases, a halyard wrap can cause loss of control of boat and/or headstay can break suddenly which can cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

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

Prevent Halyard Wraps



WARNING!: Sail must be fitted to foil length before using to prevent headstay loss which will cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

1. Halyard swivel should be within top 4" (100mm) 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.

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 going aloft and freeing halyard.

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

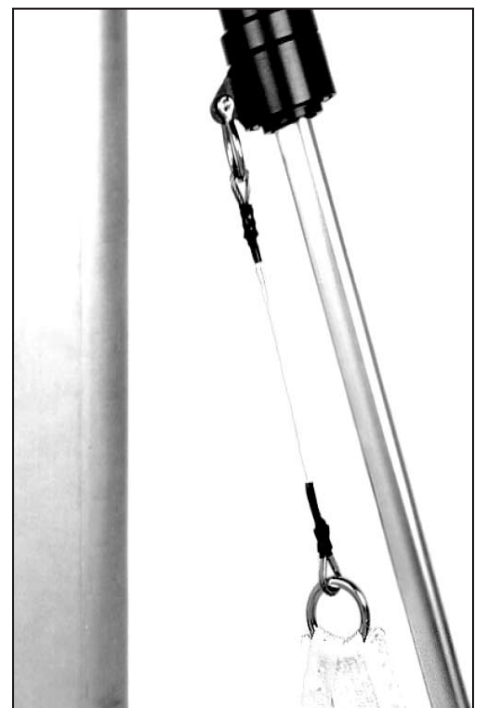
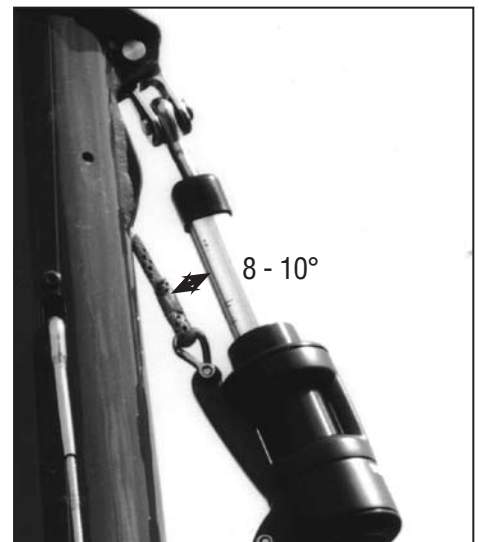
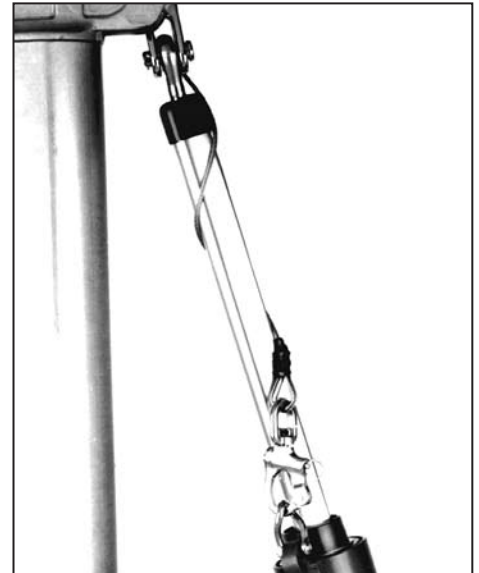
Testing at dock does not indicate halyard angle is correct. In wave action, halyard may wrap if lead angle is not correct. The 8-10° diverging angle shown at right is critical.

Pendants

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

Installing a Pendant

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 a pendant of this length to head of sail.
8. Repeat this procedure for every jib in your sail inventory.



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 restrainer must be used.

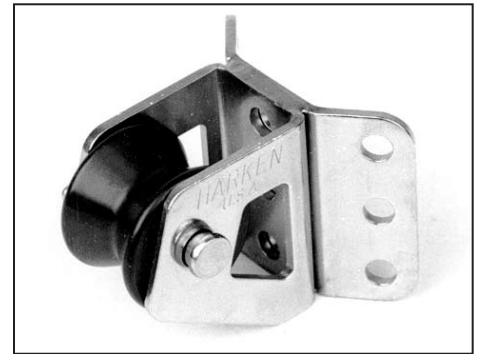
Halyard restrainers should be used only when required by masthead geometry. Restrainers tend to limit sail luff length and may cause problems if not installed properly.

If your boat needs a halyard restrainer, use Harken part 944.

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.





Spinnaker Halyards

Spinnaker halyards occasionally cause problems with furling.



WARNING! In severe cases, spinnaker halyards can jam furler causing loss of control of boat which can cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

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 furling line from unit and follow instructions on Page 24.

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. It may be necessary to shorten foil slightly to prevent this.





Raise Sails

- 1) Shackle tack of sail to drum. Install shackle so screw pin head is on same side as suncover.
- 2) Secure genoa sheets to clew of sail.
- 3) Attach genoa halyard to halyard swivel.
- 4) Pass luff tape through feeder into foil groove.
- 5) Attach head of sail or pendant at head of sail to halyard swivel.
- 6) Hoist sail.

Tip: *New sails are often stiff and may hang up at feeder 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 22.

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 the jib sheets and pull furling line.

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

In a breeze, you must **completely** luff sail by **totally** slacking jib sheets before furling.

The furling line should pull readily. The amount of force required is related to amount of wind, but a Unit should never require use of a winch to furl. If the sail will not furl, or if furling requires a great deal of effort, there is a problem with system. Consult the Troubleshooting Guide on Page 28. Do not use a winch to force a system to turn.

You may use a winch to make furling easier, if you are certain that system is operating properly.



Reef

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 while 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. Be sure to securely cleat furling line to a standard horn cleat.

You may also lock your system by aligning holes in bottom of drum and basket and then using a line to secure drum.

Be sure that mooring lines are not placed across furling line where they may cause chafe.





WARNING! Periodically inspect items listed below and any others as necessary. Failure to inspect can cause an accident, damage to your vessel, personal injury or death. See www.harken.com for additional safety information.

Inspect

- 1) Unit for signs of chafe, wear or damage.
- 2) Foil clamp screws for signs of loosening. Check headstay tension for signs of loosening.
- 3) Swage fitting and lower toggle for signs of stress corrosion.
- 4) Norseman/Sta-Lok® terminal/rod terminal for signs of loosening.
- 5) All screws on unit to be sure they have not loosened.
- 6) Foil to make sure that it has not dropped into drum assembly.
- 7) Wire for signs of wear or unraveling.

Replace Line — Unit 1

Use HFG233 furling line or source a good quality line with good wear characteristics. Use 9/32" (7mm) line with break strength exceeding 2500 lbs (1130 kg). Smaller boats or smaller sails may allow 5/16" (8mm) line.

Replace Line — Unit 2

Use HFG235 furling line or source a good quality line with good wear characteristics. Use 5/16" (8mm) line with break strength exceeding 3740 lbs (1700 kg). Smaller boats or smaller sails may allow 3/8" (8mm) line.

Replace Line — Both

If a larger diameter line is desired, consult with a rigger about using tapered line with a high strength core and cover removed in forward part of line.

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 drum assembly extending beyond mast. Remove masthead clevis pin and shift furler up so drum assembly can be strapped securely to mast. Some people remove drum assembly and halyard swivel for storage and transport.

After Storage or Transport

After storing or transporting unit, clean thoroughly including ball bearings. See instructions above.

Remove Furler

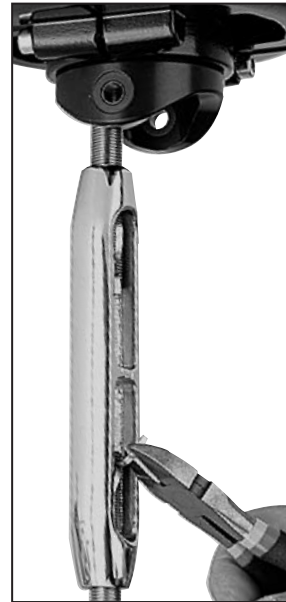
Foils can lock against upper stay terminal when backstay is released. To prevent this loosen foil clamp screws and lower foil before loosening backstay.

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.

At least twice a year unit should be cleaned more thoroughly by removing line (first note direction of spool) and flushing bearings with soap and fresh water. After unit has dried, apply a dry spray lubricant such as McLube®.

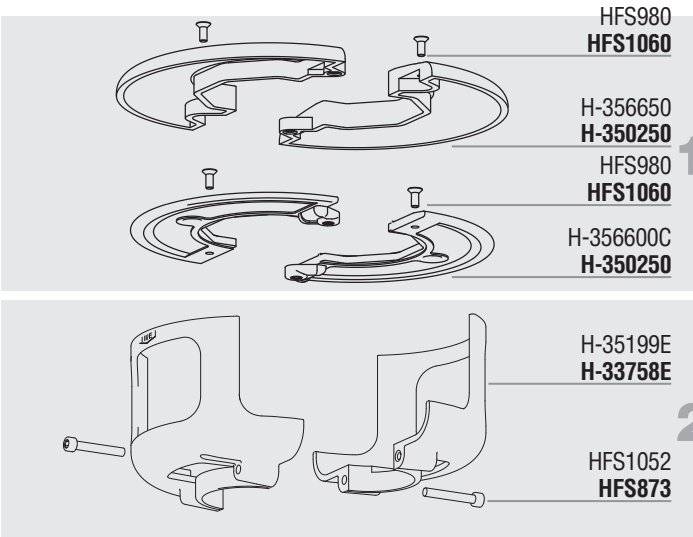
Foils may be cleaned by washing with soap and water. A scrap of luff tape may be run up foil to scrub inside the grooves. Foils may be sprayed with McLube® spray to reduce friction during sail changes.



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 20.
	Foils too high, binding on swage eye.	Lower foils until clear. See adjusting turnbuckle on Page 20.
	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®
	Furling line tangled in drum.	Overrides are best prevented by using a 7402 ratchet block as the last furling line lead to maintain proper drag on line while unfurling.
	Stop knot catching.	Make sure knot is a single overhand and is pushed up inside drum.
	Sail full of wind.	Luff completely before furling or reefing.
	Sail flogging too much.	Release a short length of sheet, pull some furling line and repeat.
	Jib sheets are not free.	Free jib sheets.
	Foil out of drum assembly.	Reinstall foil in drum assembly and tighten foil clamp screws.
	No wraps of furling line on drum.	Remove sheets. Rotate stay wrapping as much furling line on drum as possible.
	Lineguard assembly has slipped down.	Tighten line guard assembly screws securely.
	Line through 7402 ratchet backwards.	Rerun line.
	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 20.
	Foils too high, binding on swage eye.	Lower foils. See adjusting turnbuckle on Page 20.
	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®
	Furling line is not free.	Free furling line.
Sail will not furl completely.	Insufficient furling line on drum.	Remove sheets. Rotate stay, wrapping as much furling line on drum as possible.
	Too much line on drum.	Adjust amount of line on drum or change position of forward lead block to allow line to roll evenly on drum.
	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.	Maintain drag on sheets while furling.
	Furling line not secure.	Secure furling line.
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.
	Dirt in groove.	Clean groove.
Sail will not raise completely or luff will not tension.	Halyard swivel is hitting end stop.	Luff of sail is too long and must be recut.
	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 any halyard turning blocks aloft be replaced or sail shortened.
Sail will not come down.	Halyard is wrapping on headstay.	Angle between headstay and halyard is too shallow and must be optimized per installation instructions.
	Halyard swivel off foil.	Sail luff too long or foil is too short or low and must be lengthened or raised.
Ultraviolet cover rolls up inside of sail.	Furling line is wrapped on drum in wrong direction.	Remove sheets. Pull line to remove all furling line from drum. Turn stay to rewind line on drum in opposite direction. Line guard and cowl alignment may need to be adjusted.
Line jams between guard and plastic spool plate.	Line is not led through windows.	Pull line through enclosed window.

Warranty — Online at www.harken.com or call, write, email or fax Harken, Inc., Pewaukee, WI USA

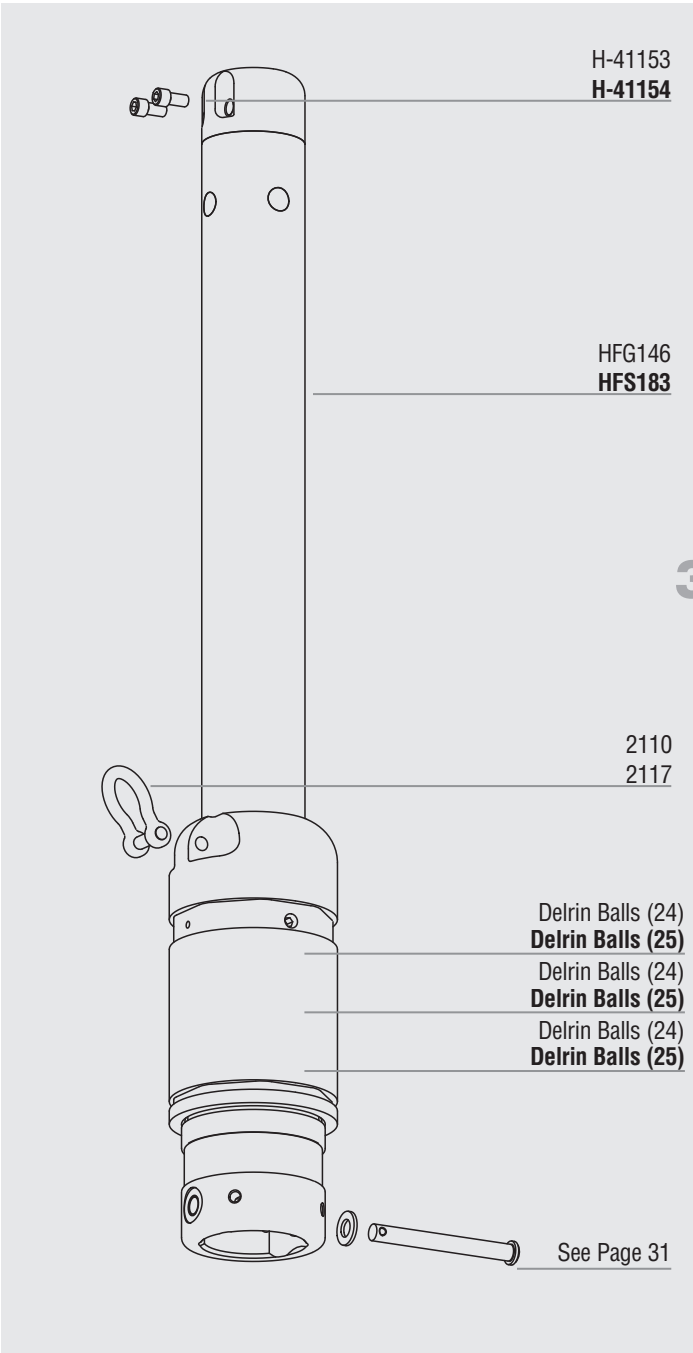


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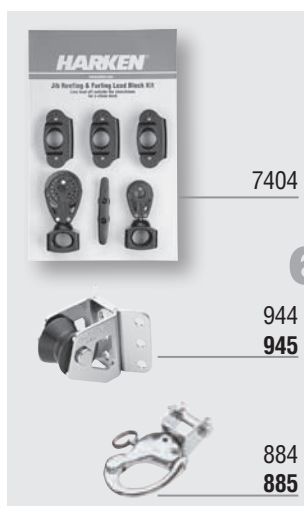
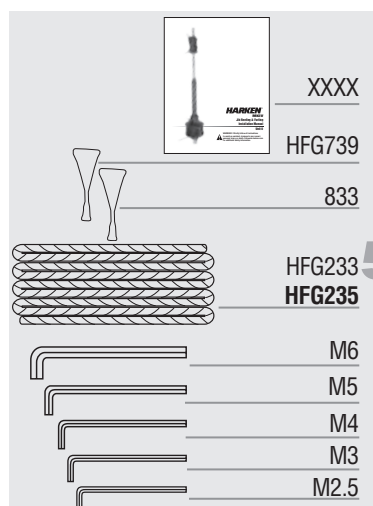
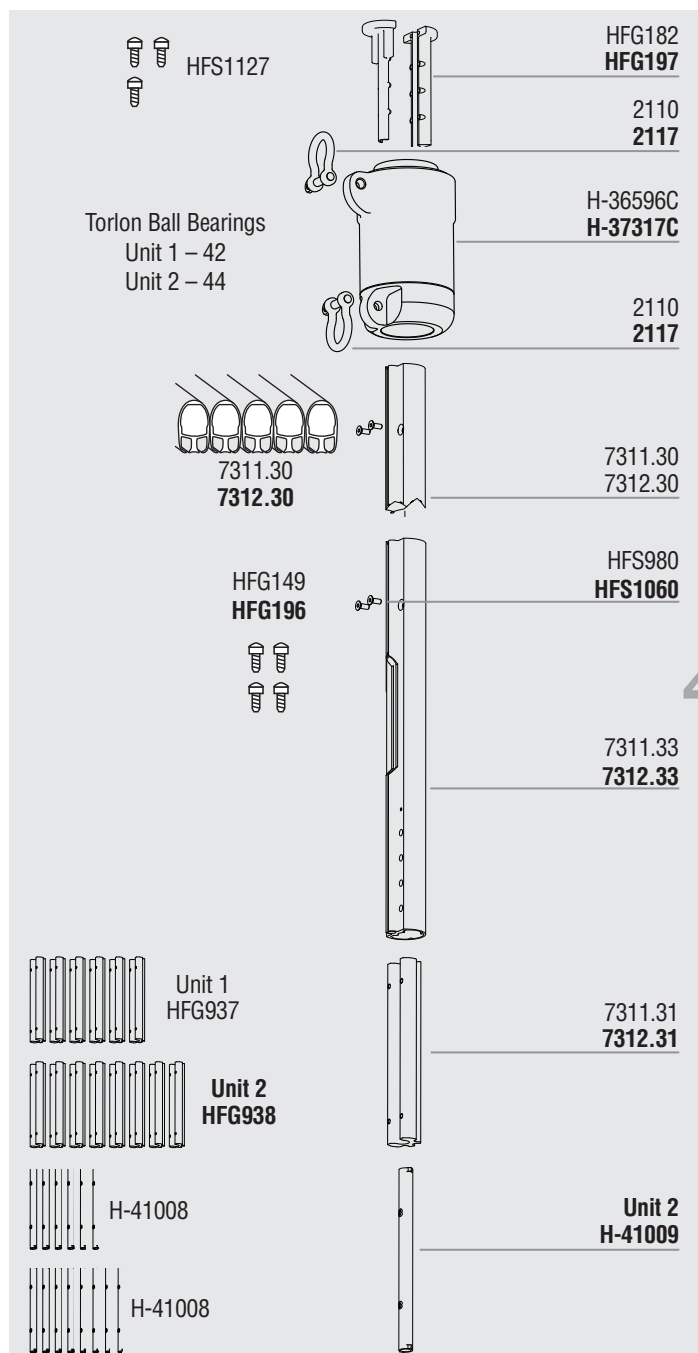
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Description	Order	Unit 1	Unit 2
Top Cover Assembly w/Screws	1	HFG686	HFG689
Top Cover	2	H-356650	H-350250
Top Cover Screw	2	HFS980	HFS1060
Bottom Flange Assembly w/Screws	1	HFG687	HFG690
Flange	2	H-35600C	H-35465C
Bottom Flange Screw	2	HFS980	HFS1060
Guard Assembly	1	HFG688	HFG691
Guard Set	2	H-35199E	H-33758E
Guard Screw	2	HFS1052	HFS873
Torque Tube Screw Set	1	H-41153	H-41154
Torque Tube Screw	2	HFS	HFS
Hub Assembly	1	HFG146	HFG183
Ball Plugs	3	H-35144A	H-33860A
Delrin Ball Bearing		(72) HBB152	(75) HBB153
Shackle	1	2110	2117



3



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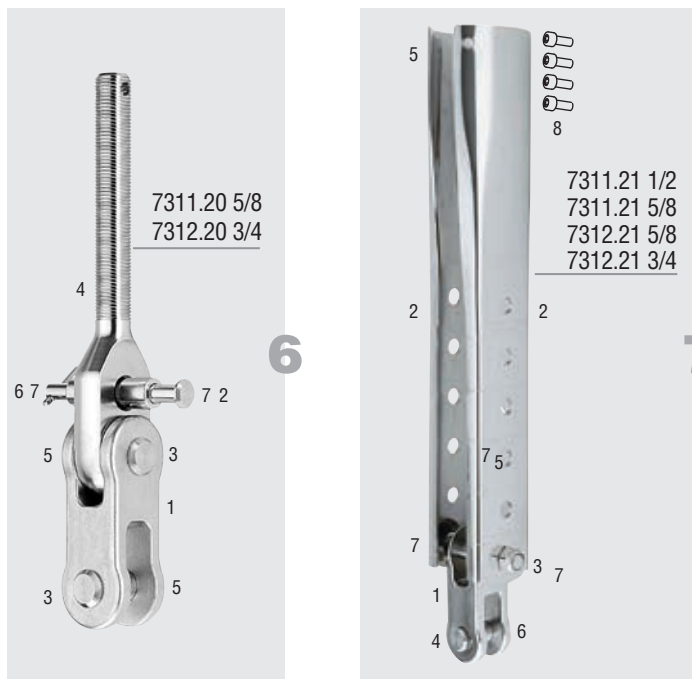
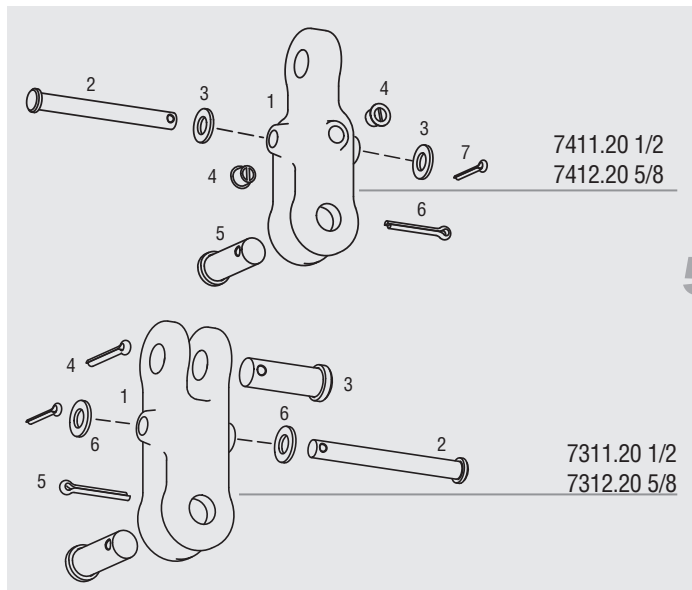
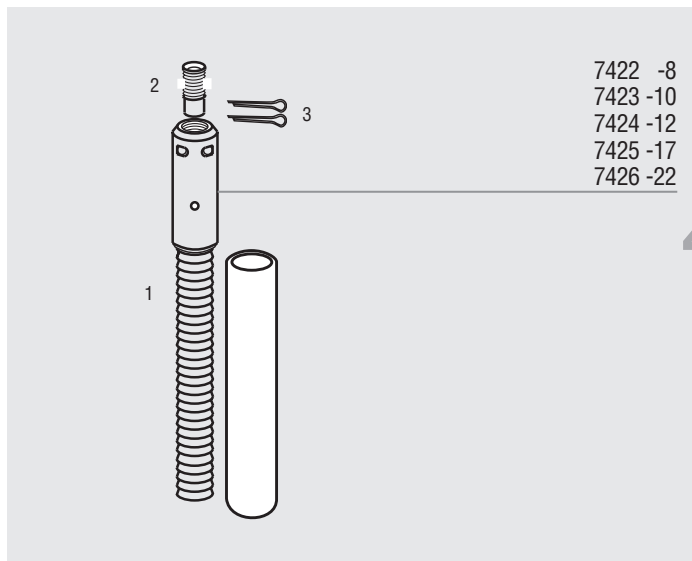
Description	Order	Unit 1	Unit 2
Trim Cap Set w/o Screws	1	HFG182	HFG197
Trim Cap Screw Set	2	HFS1127	HFS1127
Trim Cap Screws	1		
Halyard Swivel w/o Shackles	1	H-36596C	H-37317C
Bow Shackle	2	2110	2117
Torlon Ball Bearings		(42) HBB14	(44) HBB7
Clip/Smalley Ring	2	H-36602A	H-38028A
Foil Set (6 Luff/1 Bottom) (8 Luff/1 Bottom)	1	HFS100	HFS101
Foil (7'/2.13 m Luff)	1	7311.30	7312.30
Foil (2'/610 mm) Bottom w/Feeder	1	7311.33	7312.33
Connector Set (Unit 1–6) (Unit 2–8)	1	HFG937	HFG938
Connector w/Isolator	1	7311.31	7312.31
Connector Screw Set (#1–30)(#2–38)	1	HFG149	HFS196
Connector Screw	1	HFS980	HFS1060
Connector Isolator Set (Unit 1–6) (Unit 2–8)	1	H-41008	H-37330C
Connector Isolator for 7/16", 11mm, 12 mm Wire*	1	—	H-41009

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Description	Order	Unit 1	Unit 2
Instruction Manual	1		
Red Loctite®	2	HFG739	HFG739
Blue Loctite®	1	833	833
Allen Wrenches			
M2.5	1	HCP1387	—
M3	1	—	HCP1089
M4	1	HFG640	HFG640
M5	1	HFG642	—
M6	1	—	HFG644
7mm Double Braid Polyester (70', 21.3 m)	1	HFG233	—
8mm Double Braid Polyester (100', 30.4 m)	1	—	HFG235

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Description	Order	Unit 1	Unit 2
Lead Block Kit	1	7404	7404
29 mm Outboard Lead Assembly	1	7403	7403
57 mm Carbo Ratchet Assembly	1	7402	7402
40 mm Carbo Assembly	1	7401	7401
Horn Cleat	1	HCP168	HCP168
Halyard Restrainer	1	944	945
Sheave/SS Inner Race Only	1	944A	945A
Clevis Pin (1/4" x 1.0625" 18-8)	1	HFG467	HCP208
Bracket-Large	1	HCP393	HCP394
Cotter Pin (1/16" x .500" 18-8)	1	HFS118	HFS181
Snap Shackle	1	884	885



No.	Description	Order	Unit 1	
4	Rod Adapter Stud w/Nosepiece	1	7422 -8	7423 -10
1	Stud (Main Body)	1	H-41536	H-41536
2	Nosepiece	1	H-41534	H-41535
3	Cotter Pin	2	HFG193	HFG193
No.	Description	Order	Unit 1 & 2	
4	Rod Adapter Stud w/Nosepiece	1	7424 -12	
1	Stud (Main Body)	1	H-41531	
2	Nosepiece	1	H-41527	
3	Cotter Pin	2	HFG193	
No.	Description	Order	Unit 2	
4	Rod Adapter Stud w/Nosepiece	1	7425 -17	7426 -22
1	Stud (Main Body)	1	H-41531	H-41812
2	Nosepiece	1	H-41526	H-41811
3	Cotter Pin	2	HFG193	HFG319

No.	Description	Order	Unit 1	Unit 2
5	Jaw/Jaw Toggle	1	7311.20 1/2	7312.20 5/8
1	Toggle	1	H-42336	H-42316
2	Crosspin	1	H-42396	H-42398
3	Clevis Pin	2	H-42395	H-42397
4	Cotter Pin	2	HFS220	HFS203
5	Cotter Pin	1	HFS181	HFS220
6	Nylon Washer	2	HFS1109	HFS1005
5	Eye/Jaw Toggle Reversible	1	7411.20 1/2	7412.20 5/8
1	Toggle	1	H-37675C	H-37647C
2	Crosspin	1	H-42396	H-42398
3	Nylon Washer	2	H-42397	HFS1005
4	Cross Hole Plug	2	H-43207	H-42045
5	Clevis Pin	1	HFS220	H-42397
6	Cotter Pin	1	HFS181	HFS203
7	Cotter Pin	1	HFS1109	HFS220
6	Stud/Jaw Toggle	1	7311.20 5/8	7312.20 3/4
1	Toggle	1	H-41300	H-41489
2	Crosspin	1	H-42396	H-42398
3	Clevis Pin	2	H-42397	H-42403
4	Stud	1	H-42307	H-43210
5	Cotter Pin	3	HFS220	HFS203
6	Cotter Pin	1	HFS181	HFS220
7	Nylon Washer	2	HFS1109	HFS1005

No.	Description	Order	Unit 1	
7	Long Link Plate w/Toggle		7311.21 1/2	7311.21 5/8
1	Toggle	1	H-42159	H-41300
2	Plates	2	H-42178	H-42178
3	Upper Clevis Pin (Custom)	1	H-42170	H-42171
4	Lower Clevis Pin	1	H-42395	H-42397
5	Isolator	2	H-42182	H-42182
6	Cotter Pin	2	HFS220	HFS203
7	Nylock Nut (M12)	2	HFS846	HFS846
8	Allen Cap Screws (M6 x 1 x 12mm)	4	HFS876	HFS876

* (5/8" x 1 1/2" 18-8) ** (3/4" x 1 13/16" 18-8)

No.	Description	Order	Unit 2	
7	Long Link Plate w/Toggle		7312.21 5/8	7312.21 3/4
1	Toggle	1	H-41300	H-41489
2	Plates	2	H-41304	H-41304
3	Upper Clevis Pin (Custom)	1	H-41302	H-41525
4	Lower Clevis Pin	1	H-42397	H-42403
5	Isolator	2	H-41497	H-41497
6	Cotter Pin	2	HFS203*	HFS203**
7	Nylock Nut (M12)	2	HFS937	HFS937
8	Allen Cap Screws (M8x1.25x16 A4 (SH))	4	HFS336	HFS336

* (5/8" x 1 1/2" 18-8) ** (3/4" x 1 13/16" 18-8)

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