

HARKEN®

REFLEX™ FURLING

Unit 1, 2, 3

Installation Manual – Intended for specialized personnel or expert users

5320 12 -19

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Asymmetric spinnaker furler



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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

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

The Harken Reflex™ furling system for asymmetric spinnakers is used for handling free-flying downwind and reaching sails. These sails have a loose positive luff that is longer than the leech and are called asymmetric spinnakers, cruising spinnakers, or gennakers. The furling system is also for code straight-luffed sails. Attachment methods vary according to sail type. Use of this product for other than normal sailboat applications is not covered by the limited warranty.

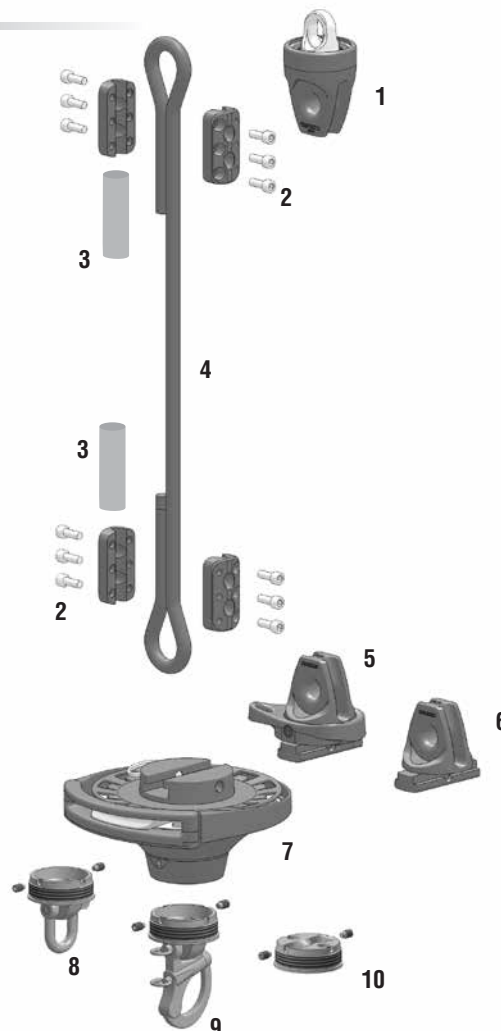
Safety precautions



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.

Part Descriptions

- 1) Head swivel for Reflex torsion cable
- 2) Torsion cable clamps
- 3) Heat-shrink tube
- 4) Reflex torsion cable
- 5) Tack swivel terminal for Reflex torsion cable
- 6) Fixed tack terminal
- 7) Drive unit
- 8) D-shackle threaded adapter (optional)
- 9) Snap shackle threaded adapter
- 10) 2:1 soft attach threaded adapter
- 11) Fork-head swivel
- 12) Fork-tack with swivel
- 13) Fork-tack
- 14) Cable-less head swivel
- 15) Cable-less tack plate



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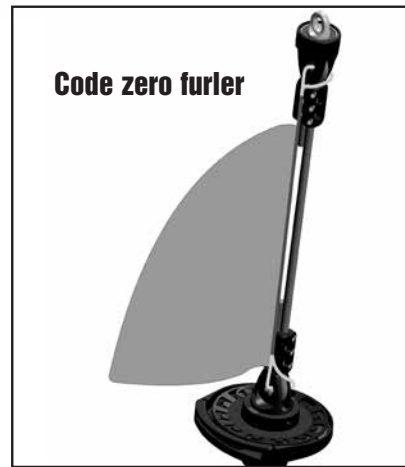
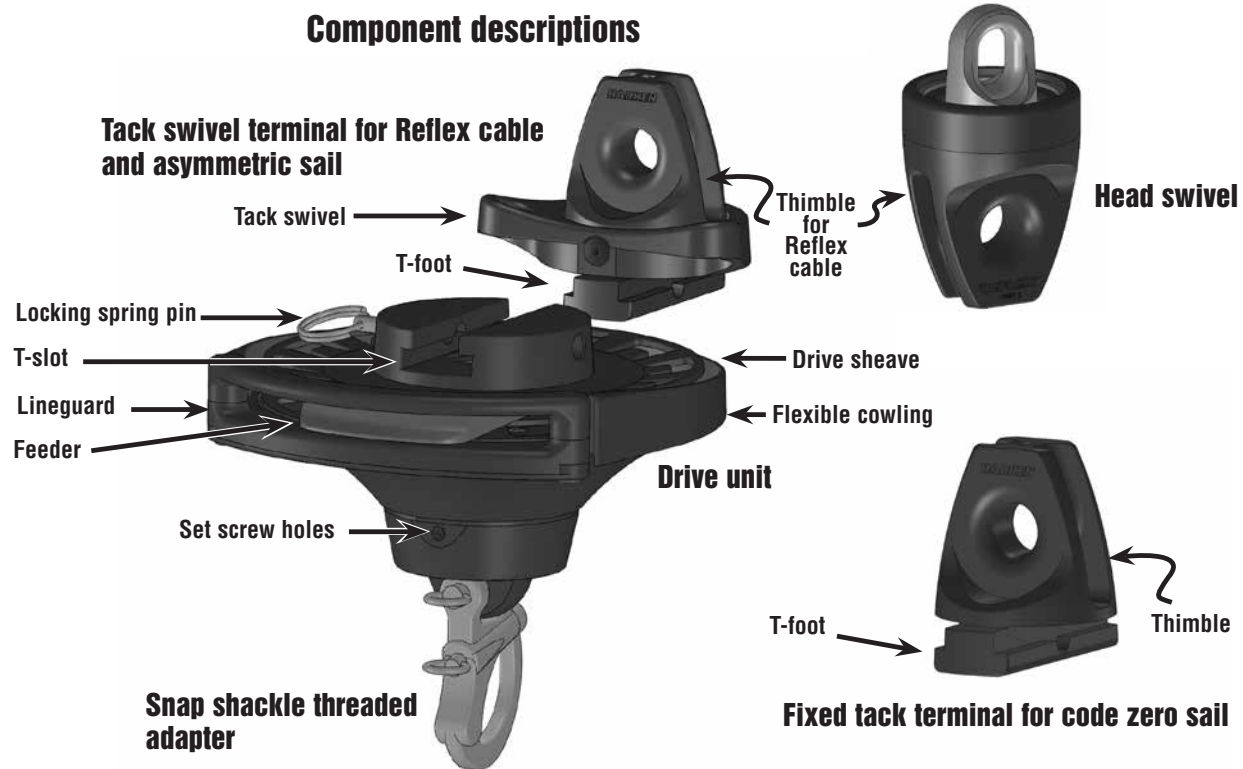


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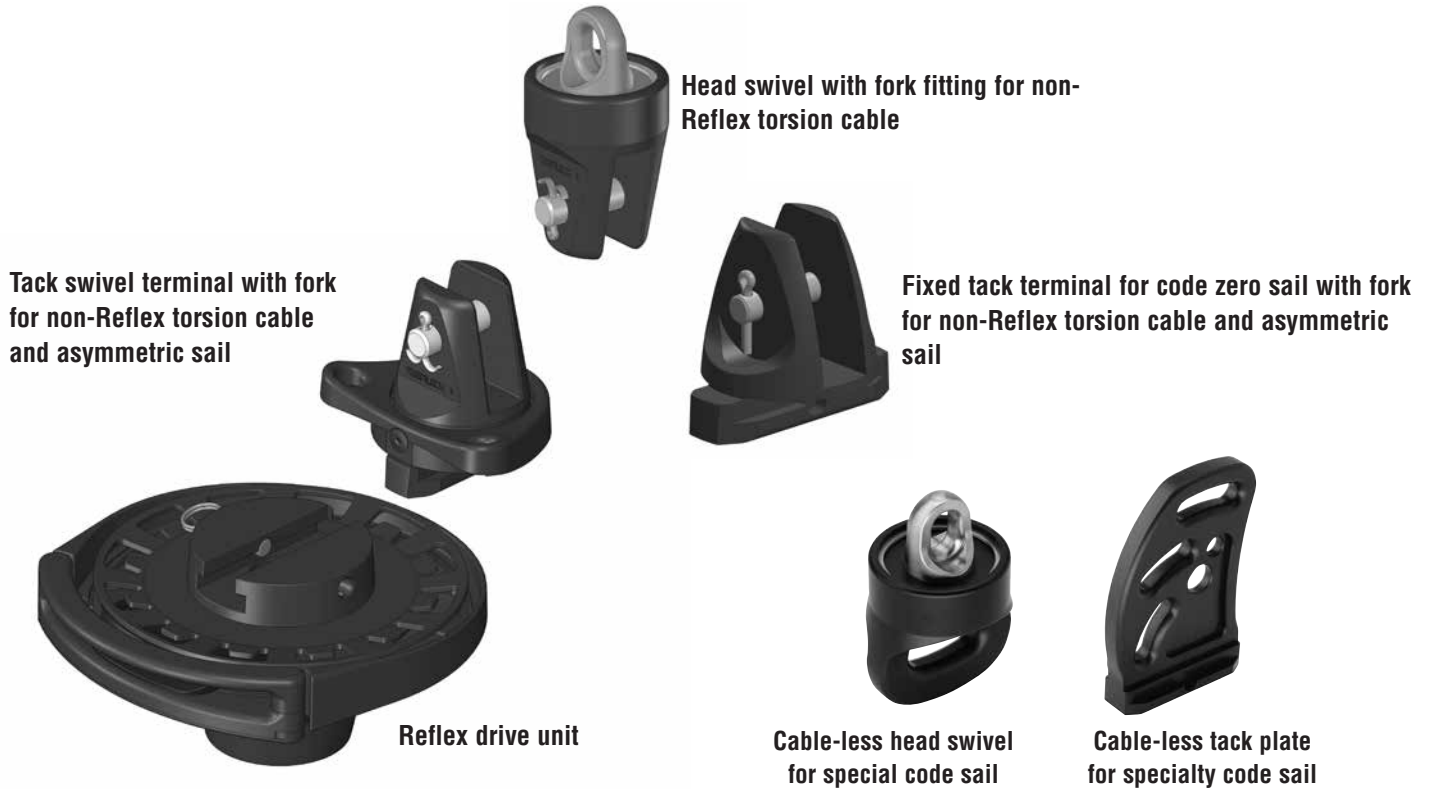
Component descriptions



Sizing check

Check recommended boat and sail size. **Note:** If you also plan to use the system for code zero sails, the loads will be higher so max boat and sail size will be smaller. If using for multihulls downsize maximums by 10%.

Unit size	Unit part no.	Intended application	Typical boat length		Maximum sail area	
			m	ft	m ²	ft ²
1	7351.10	Asymmetric spinnaker	7.5 - 11	25-36	112	1200
	7361.10	Code zero	6.7 - 10	22-32	60	650
2	7352.10	Asymmetric spinnaker	10 - 14	34 - 45	168	1800
	7362.10	Code zero	9 - 12	30 - 40	84	900
3	7353.10	Asymmetric spinnaker, monohull	13 - 17.7	44 - 58	223	2400
		Asymmetric spinnaker, multihull	12 - 16.7	39 - 55	223	2400
3	7363.10	Code zero, monohull	12 - 16.5	39 - 54	158	1700
		Code zero, multihull	11 - 15	36 - 50	140	1500



Sizing check

Check recommended boat and sail size. **Note:** If you also plan to use the system for code zero sails, the loads will be higher so max boat and sail size will be smaller. If using for multihulls downsize maximums by 10%.

Unit size	Unit part no.	Description	Intended application	Typical boat length		Maximum sail area	
				m	ft	m ²	ft ²
1	7351.37	Head swivel with fork fitting	Asymmetric spinnaker	7.5 - 11	25-36	112	1200
	7351.39	Tack swivel terminal with fork fitting					
	7351.38	Tack terminal with fork fitting	Code zero	6.7 - 10	22-32	60	650
	7351.24	Cable-less head swivel	Specialty code sail with load carrying luff fibers	7.5 - 11	25-36	112	1200
	7351.23	Cable-less tack plate					
2	7352.37	Head swivel with fork fitting	Asymmetric spinnaker	10 - 14	34 - 45	168	1800
	7352.39	Tack swivel terminal with fork fitting					
	7352.38	Tack terminal with fork fitting	Code zero	9 - 12	30 - 40	84	900
	7352.24	Cable-less head swivel	Specialty code sail with load carrying luff fibers	10 - 14	34 - 45	168	1800
	7352.23	Cable-less tack plate					
3	7353.37	Head swivel with fork fitting	Asymm. spin. monohull	13 - 17.7	44 - 58	223	2400
	7353.39	Tack swivel terminal with fork fitting	Asymm. spin. multihull	12 - 16.7	39 - 55	223	2400
	7353.38	Tack terminal with fork fitting	Code zero monohull	12 - 16.5	39 - 54	158	1700
			Code zero multihull	11-15	36 - 50	140	1500
	7353.24	Cable-less head swivel	Specialty code sail with load carrying luff fibers	13 - 17.7	44 - 58	223	2400
	7353.23	Cable-less tack plate					

Main system components



Head swivel with soft cover

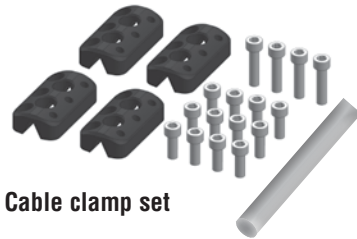


Reflex torsion cable

Unit number	Cable length
7351.10.16M	16.15 m (53')
7351.10.18M	18.29 m (60')
7351.10.20M	20.12 m (66')
7352.10.20M	20.12 m (66')
7352.10.23M	22.87 m (75')
7352.10.25M	25 m (82')
7353.10.22M	22 m (72')
7353.10.26M	26 m (85')



Tack swivel terminal



Cable clamp set

Heat-shrink tubing



Drive unit

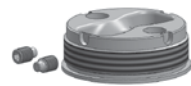


Snap shackle threaded adapter

Optional components



Fixed tack terminal for code zero sail



2:1/soft attachment threaded adapter



D-shackle threaded adapter



D shackle only

Asymmetric furler - main components	Unit 1	Unit 2	Unit 3
Unit - Includes Reflex cable. See length of cable in chart above. Components included in kit are listed below.	7351.10.16M	7352.10.20M	7353.10.22M
	7351.10.18M	7352.10.23M	7353.10.26M
	7351.10.20M	7352.10.25M	
Head swivel with soft cover*	7351.28 (includes CV803 soft cover)	7352.28 (includes CV804 soft cover)	7353.28 (includes CV805 soft cover)
Tack swivel terminal*	7351.26	7352.26	7353.26
Drive unit	7351.10BASE	7352.10BASE	7353.10BASE
Reflex torsion cable (ordered by the foot)*	7371	7372	7373
Torsion cable clamp set*	7357	7358	7367
Snap shackle threaded adapter	7351.20	7352.20	7353.20
Heat-shrink tubing	HCP2070	HCP2070	HCP2165
Optional components			
Fixed tack terminal (code zero sail)*	7351.27	7352.27	7353.27
Reflex torsion cable (by the foot) for extra sails*	7371	7372	7373
Reflex torsion cable spool (305 m - 1000')*	7371.SPOOL	7372.SPOOL	7373.SPOOL
D-shackle threaded adapter	7351.21	7352.21	7353.21
D shackle only - high resistance (HR)	2109 (6 mm HR)	2116 (8 mm HR)	2123 (10 mm HR)
2:1/soft attachment threaded adapter	7351.22	7352.22	7353.22

*Order these components for extra sails. **Note:** Each extra sail has a head swivel, torsion cable, clamp, and track terminal

Main components



Head swivel with soft cover



Fixed tack terminal



Drive unit



2:1/soft-attachment threaded adapter

Optional components



Snap shackle threaded adapter



D-shackle threaded adapter



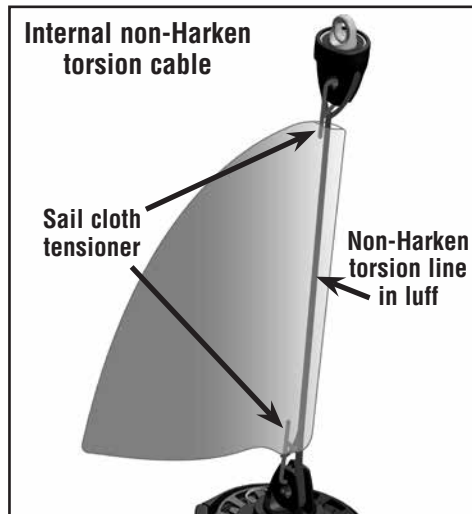
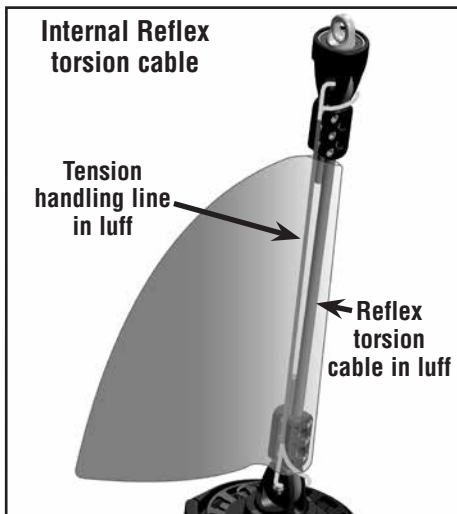
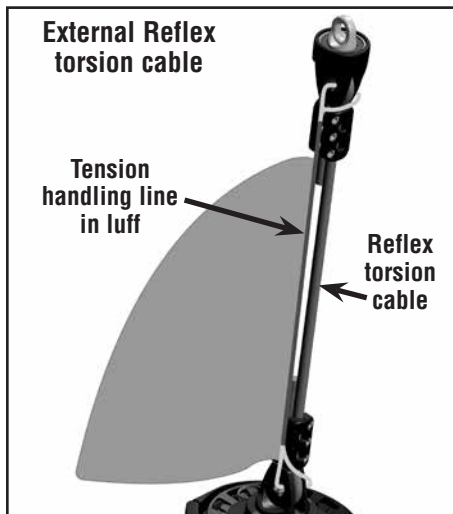
D shackle only

Code zero furler - main components	Unit 1	Unit 2	Unit 3
Unit - Includes these parts, no Reflex cable	7361.10	7362.10	7363.10
Head swivel with soft cover*	7351.28 (includes CV803 soft cover)	7352.28 (includes CV804 soft cover)	7353.28 (includes CV805 soft cover)
Fixed tack terminal*	7351.27	7352.27	7353.27
Drive unit	7351.10BASE	7352.10BASE	7353.10BASE
2:1/soft attachment threaded adapter	7351.22	7352.22	7353.22
Optional components			
Reflex torsion cable (by the foot)**	7371	7372	7373
Torsion cable clamp set**	7357	7358	7367
Snap shackle threaded adapter	7351.20	7352.20	7353.20
D-shackle threaded adapter	7351.21	7352.21	7353.21
D shackle only - high resistance (HR)	2109 (6 mm HR)	2116 (8 mm HR)	2123 (10 mm HR)

*Order these components for extra sails. **Note:** Each extra sail has a head swivel and fixed tack terminal. See note regarding Reflex cable.

** See diagrams below regarding use of Reflex torsion cable to improve furling.

Using the Reflex torsion cable with a code zero sail: The Reflex torsion cable is designed for furling an asymmetric spinnaker and transmits torque at lower halyard/luff loads than other types of torque cables. The Reflex torsion cable improves furling when used with a code zero type sail. **IMPORTANT! Unit 1 and 2: Always make sure there is a tension handling line as shown below. Unit 3 exception: The unit 3 Reflex torsion cable has a high strength, low stretch Dyneema® core to handle code zero halyard/luff loads.**



Purpose of fork-attach components

Head and tack swivels with fork and pin interface sails with existing torsion cables. The forks are designed to accept thimbles supplied by various non-Harken torsion cables. See sailmaker instructions for dimensions of fork.

Fork terminal components



Fork-head swivel with soft cover



Fork-tack with swivel for asymmetric sails



Fork-tack for code zero sails

Combine with these components



Drive unit



Snap shackle threaded adapter



D-shackle threaded adapter



2:1/soft attachment threaded adapter

Forked components For use with non-Reflex cable	Unit 1	Unit 2	Unit 3
Fork-head swivel with soft cover*	7351.37 (includes CV803 soft cover)	7352.37 (includes CV804 soft cover)	7353.37 (includes CV805 soft cover)
Fork-tack with swivel - for asymmetric spin	7351.39	7352.39	7353.39
Fork-tack for code zero sails	7351.38	7352.38	7353.38
Combine with these components			
Drive unit	7351.10BASE	7352.10BASE	7353.10BASE
Snap shackle threaded adapter	7351.20	7352.20	7353.20
D-shackle threaded adapter	7351.21	7352.21	7353.21
2:1/soft attachment threaded adapter	7351.22	7352.22	7353.22

Purpose

The cable-less tack plate and head swivel have slots for sewing webbing to the sail. Cable-less sails have continuous unidirectional fibers in the luff of the sail to handle the load from tack to head. The tack plate's integral T-fitting secures to the Reflex drive unit via the quick release T-slot. The compact solution allows for longer luff lengths.

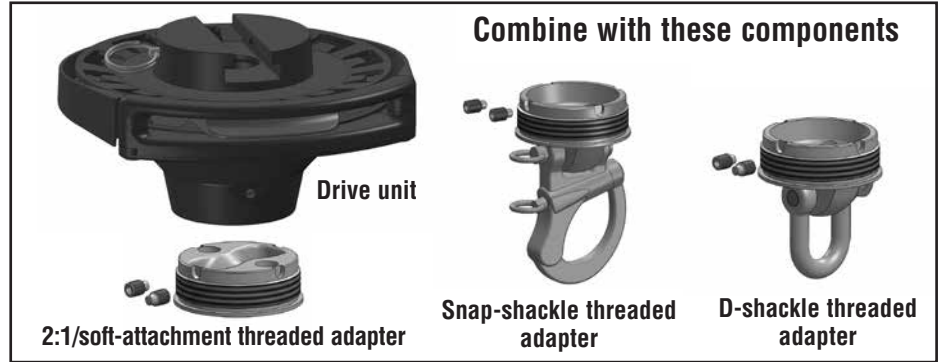
Main components



Cable-less tack plate



Cable-less head swivel



Cable-less furler - main components	Unit 1	Unit 2	Unit 3
Cable-less tack plate	7351.23	7352.23	7353.23
Cable-less head swivel	7351.24	7352.24	7353.24
Combine with these components			
Drive unit	7351.10BASE	7352.10BASE	7353.10BASE
Snap shackle threaded adapter	7351.20	7352.20	7353.20
D-shackle threaded adapter	7351.21	7352.21	7353.21
2:1/soft attachment threaded adapter	7351.22	7352.22	7353.22

Sail attachments: Sailmaker will web-on the head swivel and tack fitting so it is part of the the sail.

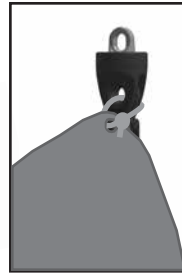


Continuous furling line - Talk to your rigging supplier about furling line construction using a structural cover over a nonstructural core. **Note:** Have the rigger capture the aft block in the loop before making the loop. The furling line loop can load into the stanchion leads and the drive unit after the line is spliced into a loop.

Determining furling line length - Refer to the chart below for line size and length. Double the loop length and add enough length for the overlap in the end-for-end splice.

Unit	Line diameter	Length of loop - cruise	Length of loop - race
1	6 mm (1/4")	Measure from furler to aft cockpit block	Use J dimension, plus bow sprit, minus 60 cm (2')
2	8 mm (5/16")		
3	10 mm (3/8")		

Sail attachments: asymmetric spinnaker - Use a shorter soft shackle for head of sail and a longer soft shackle for the tack of sail. Consult a rigging supplier, a knot tying book or see resources linked on www.harken.com/knots.



7356 fairlead kit - For cruising, lead the furling line loop back to the cockpit. Leads fit 25 mm (1") stanchions. Includes two double fairleads, a double fairlead with cleats, and aft block with bungee.

7355 double fairlead - Order if additional stanchion positions are required.

7360 aft block with bungee - Order for race boat attachment nearby shrouds.



Aft block with bungee



7355 fairlead



7356 kit

Tools Required



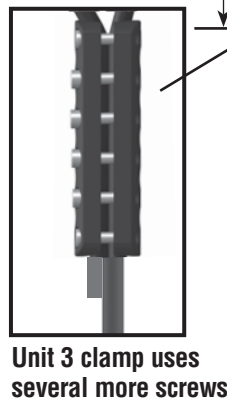
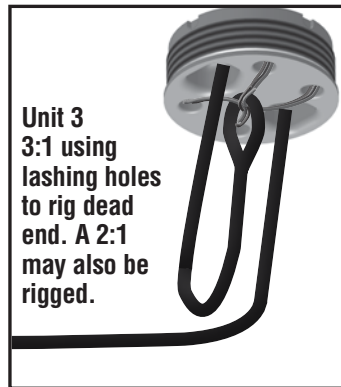
- | | |
|-----------------------|---|
| 1. Long tape measure | 4. Hacksaw or large Felco® cutter (C16) |
| 2. Short tape measure | 5 Heat gun |
| 3. Metric hex keys | |

Reflex cable - Luff length - Asymmetric spinnaker

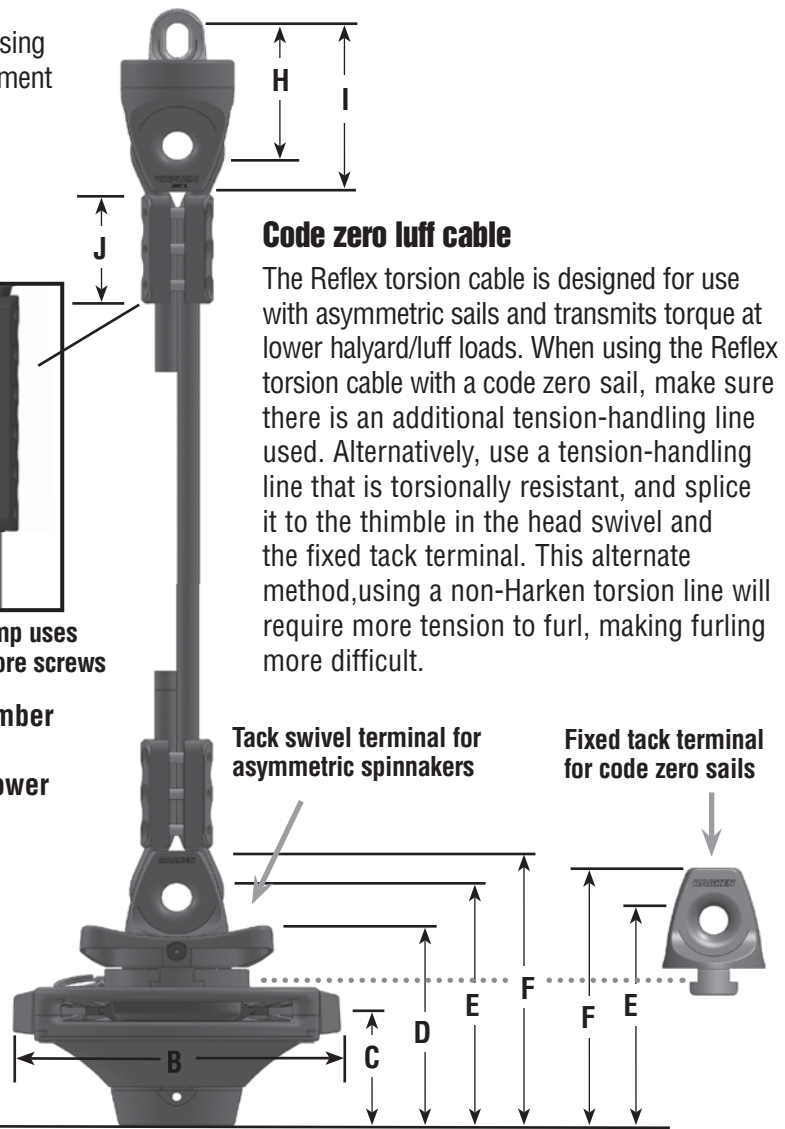
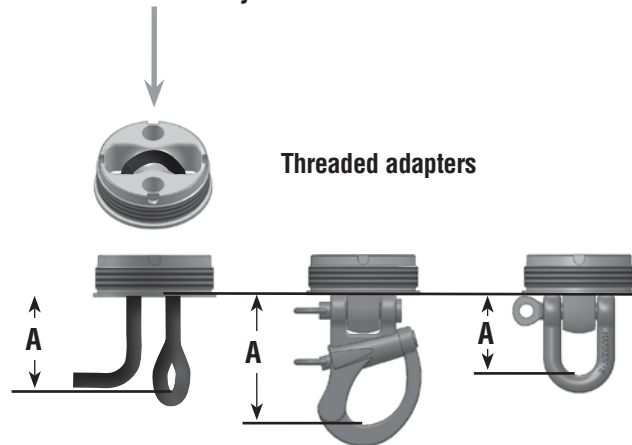
Note offset H at the top and offset D at the bottom. When using system for asymmetric spinnakers, D represents the attachment point to the tack swivel terminal.

Reflex components - Luff length - Code zero

Note offset H at the top and offset E at the bottom representing the attachment points for the sail cloth.



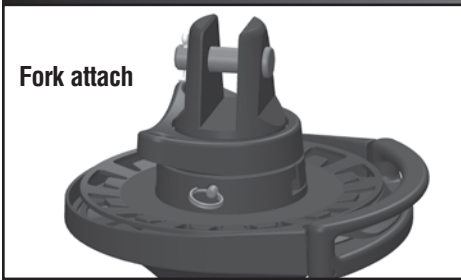
IMPORTANT! When using a 2:1 or 3:1 tack line, remember that it is pulling against the halyard. Downsize the diameter of the 2:1 tack line so that it does not overpower the stretch of the halyard.



Code zero luff cable

The Reflex torsion cable is designed for use with asymmetric sails and transmits torque at lower halyard/luff loads. When using the Reflex torsion cable with a code zero sail, make sure there is an additional tension-handling line used. Alternatively, use a tension-handling line that is torsionally resistant, and splice it to the thimble in the head swivel and the fixed tack terminal. This alternate method, using a non-Harken torsion line will require more tension to furl, making furling more difficult.

	Snap shackle A	D-shackle A	Diameter B	Line height C	Tack swivel D	Hole top E	Thimble top F	Hole bottom H	Thimble bottom I	Clamp height J	
UNIT 1	7351.10 Reflex furling system - Asymmetric spinnakers										
	55 mm	28 mm	140 mm	54 mm	94 mm	114 mm	131 mm	53 mm	83 mm	50 mm	
	2.16"	1.12"	5.5"	2.13"	3.7"	4.5"	5.17"	2.08"	3.27"	1.97"	
	7361.10 Reflex furling system - Code zero sails										
UNIT 2	55 mm	28 mm	140 mm	54 mm		103 mm	120 mm	53 mm	83 mm	50 mm	
	2.16"	1.12"	5.5"	2.13"		4.04"	4.71"	2.08"	3.27"	1.97"	
	7352.10 Reflex furling system - Asymmetric spinnakers										
	61 mm	38 mm	167 mm	64	111 mm	134 mm	152 mm	76 mm	93 mm	60 mm	
2.41"	1.49"	6.59"	2.52"	4.35"	5.28"	5.97"	2.98"	3.67"	2.36"		
UNIT 3	7362.10 Reflex furling system - Code zero sails										
	61 mm	38 mm	167 mm	64		121 mm	138 mm	76 mm	93 mm	60 mm	
	2.41"	1.49"	6.59"	2.52"		4.76"	5.47"	2.98"	3.67"	2.36"	
	7353.10 Reflex furling system - Asymmetric spinnakers										
88 mm	48 mm	215 mm	89 mm	157 mm	199 mm	131 mm	109 mm	124 mm	166 mm		
3.47"	1.89"	8.47"	3.5"	6.18"	7.85"	5.17"	4.29"	4.87"	6.54"		
7363.10 Reflex furling system - Code zero sails											
88 mm	48 mm	215 mm	89 mm		181 mm	196 mm	109 mm	124 mm	166 mm		
3.47"	1.89"	8.47"	3.5"		7.12"	7.70"	4.29"	4.87"	6.54"		

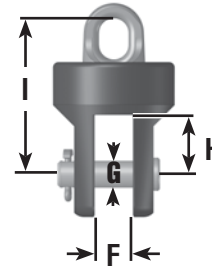


Fork attach

Note offsets in chart to determine luff length when using non-Harken torsion cables.

IMPORTANT! When using soft attach adapter with a 2:1 or 3:1 tack line, remember that it is pulling against the halyard. Downsize the diameter of the 2:1 tack line so that it does not overpower the stretch of the halyard.

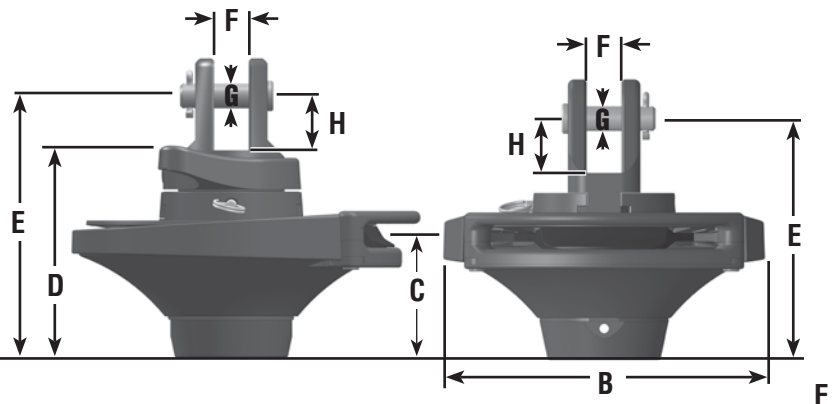
Head swivel fork-attach terminal for asymmetric spinnakers and code sails.



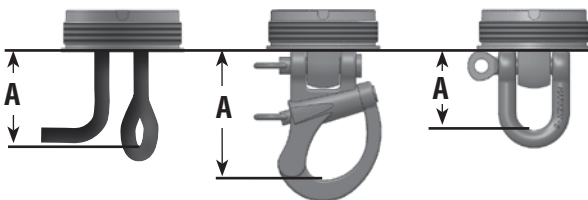
3:1 using lashing holes to rig dead end. A 2:1 may also be rigged.

Tack swivel terminal for asymmetric spinnakers

Fixed tack terminal for code zero sails



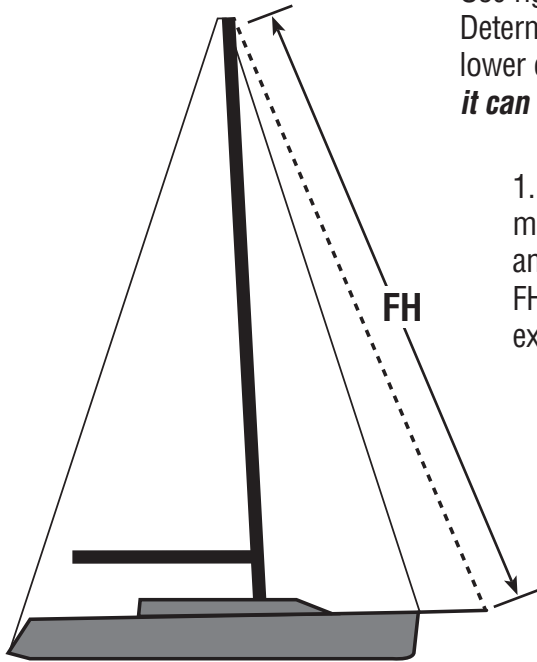
Threaded adapters



	Snap shackle A	D-shackle A	Diameter B	Line height C	Tack swivel D	Pin center E	Fork width F	Pin diameter G	Pin to throat H	Haly to pin I	
UNIT 1	7351.10 Reflex furling system - Asymmetric spinnakers										
	55 mm	28 mm	140 mm	54 mm	94 mm	114 mm	14 mm	7.9 mm	22 mm	63 mm	
	2.16"	1.12"	5.5"	2.13"	3.7"	4.48"	.55"	.311"	.88"	2.49"	
	7361.10 Reflex furling system - Code zero sails										
UNIT 2	55 mm	28 mm	140 mm	54 mm	-	105 mm	14 mm	7.9 mm	22 mm	63 mm	
	2.16"	1.12"	5.5"	2.13"	-	4.14"	.55"	.311"	.88"	2.49"	
	7352.10 Reflex furling system - Asymmetric spinnakers										
	61 mm	38 mm	167 mm	64	111 mm	136 mm	18.3 mm	12.6 mm	28 mm	74 mm	
2.41"	1.49"	6.59"	2.52"	4.35"	5.37"	.72"	.498"	1.11"	2.92"		
UNIT 3	7362.10 Reflex furling system - Code zero sails										
	61 mm	38 mm	167 mm	64	-	125 mm	18.3 mm	12.6 mm	28 mm	74 mm	
	2.41"	1.49"	6.59"	2.52"	-	4.94"	.72"	.498"	1.11"	2.92"	
	7353.10 Reflex furling system - Asymmetric spinnakers										
88 mm	48 mm	215 mm	89 mm	157 mm	190 mm	20.3 mm	15.8 mm	35 mm	100 mm		
3.47"	1.89"	8.47"	3.5"	6.18"	7.48"	.80"	.622"	1.39"	3.92"		
7363.10 Reflex furling system - Code zero sails											
88 mm	48 mm	215 mm	89 mm	-	173 mm	20.3 mm	15.8 mm	35 mm	100 mm		
3.47"	1.89"	8.47"	3.5"	-	6.80"	.80"	.622"	1.39"	3.92"		

Determining Reflex torsion cable rough length

Use rig dimension to determine cable length. Determine final measurements when building the lower cable terminal. **Tip: If the cable is too long, it can be shortened later.**

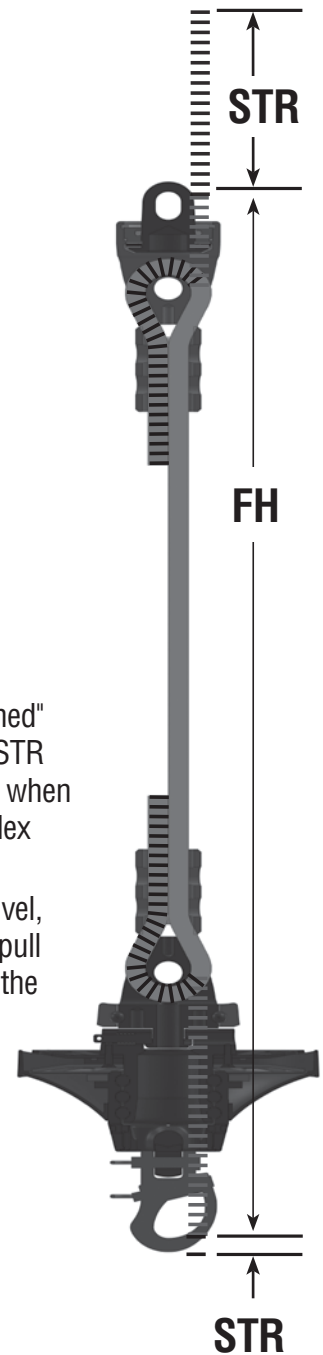


1. Extend bow sprit. Use long tape measure secured to halyard shackle and hoist to masthead. Measure FH length from full-hoist shackle to extended bowsprit fitting.

2. The required untensioned cable length roughly equals the FH length. **For unit 3, add 260 mm (10") to the FH length if using for Asymmetric spinnaker and 80 mm (3") if using a code zero sail.** The length may seem too short as illustrated by the "straightened" cable beyond the FH length as seen on the diagram. See ends labeled STR at right. The STR length is gained back by stretch over the full torsion cable when the system is tensioned when hoisting the spinnaker. Note: The amount of halyard tension to furl the sail using the Reflex torsion cable is moderate compared to other systems.

The best way to determine the cable length is to secure the torsion cable to the head swivel, hoist the cable without sail, attach the assembled lower unit to the bow of the boat, and pull the cable through the lower unit. This procedure is described in the assembly portion of the manual.

Tip: For example, untensioned system will appear short if laid out on the dock. When tensioned the system will stretch.



Note: When using an A2 sail, it is important to maximize the cable length so the sail can be at full hoist. The best way to achieve the maximum is to add to the cable length, then adjust the cable length after sailing. When sailing, tension the halyard only enough to pull slack out of the Reflex torsion cable.

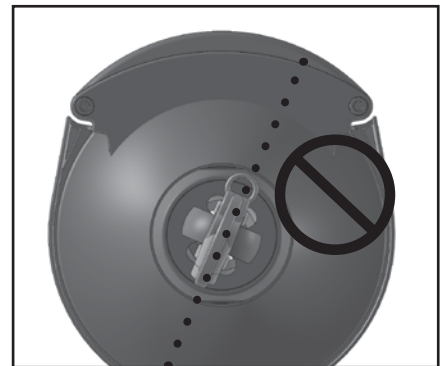
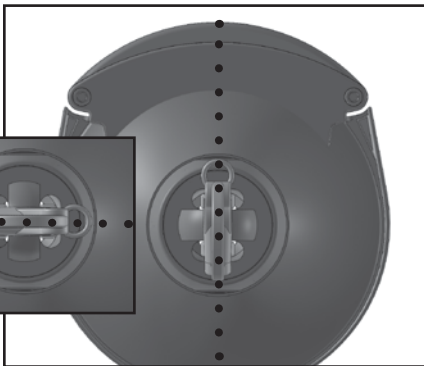
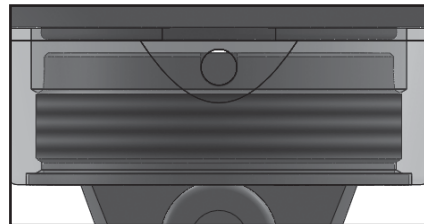
Thread the adapter completely into the drive unit until it stops.



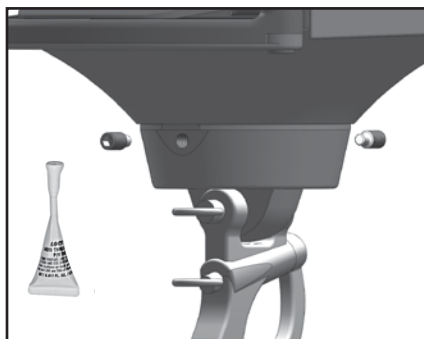
Back the adapter out no more than one (1) rotation until the set screw holes line up with the recesses at the top of the threaded adapter. Sight into one of the set screw holes to confirm alignment.

IMPORTANT! Make sure the adapter is either parallel or perpendicular to the feeder opening.

The parallel or perpendicular position will depend on the fitting on the bow sprit or extended bow fitting.

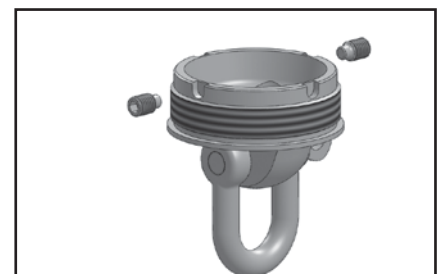
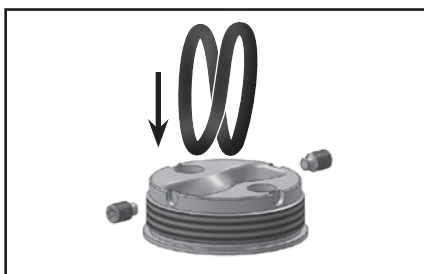


Install set screws using threadlocking solution such as blue Loctite® adhesive.



2:1 soft attach threaded adapter installs the same way as above. **Tip: Load the loop or 2:1 adjuster in the adapter before installing.**

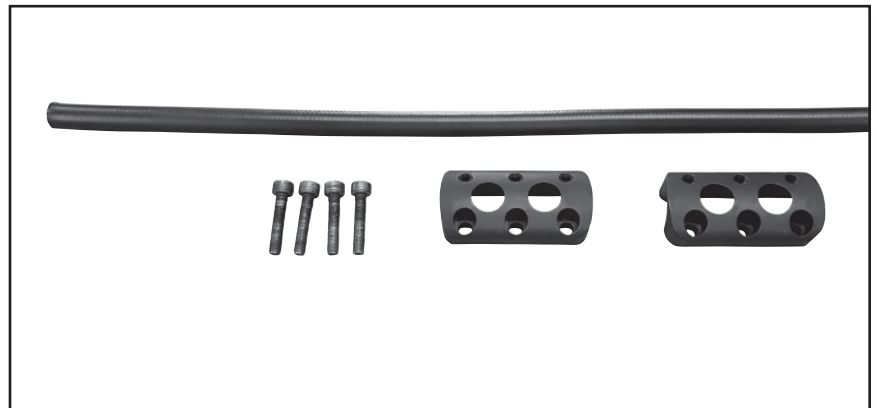
Tip: The D-shackle adapter and snap shackle adapters use the same threaded bases so you can switch the shackles to change types.



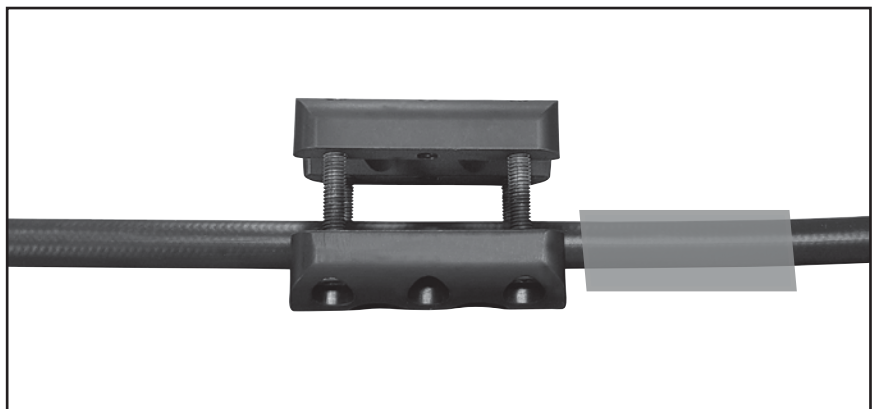
Loctite is a registered trademark of Henkel AG & Company KGaA.

IMPORTANT! - Secure the torsion cable to the head swivel first. Wait to cut the torsion cable to length until you can check the length by dry fitting into the assembled drive unit with tack swivel and threaded adapter in place.

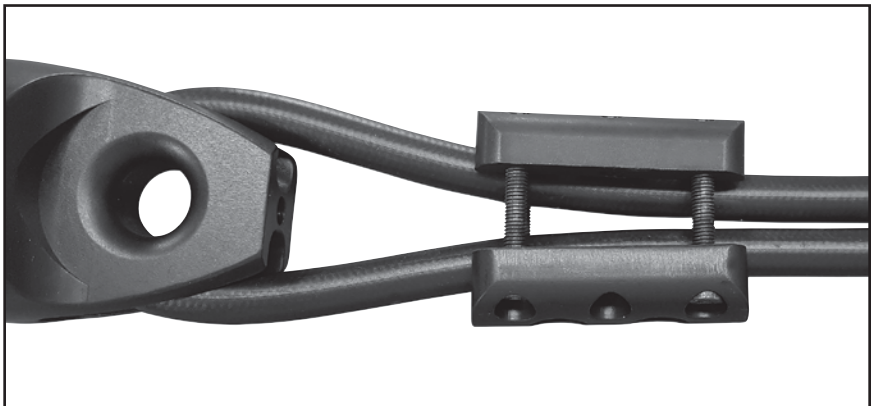
1. Locate the clamp halves and the long fasteners as shown.



2. Cut heat-shrink tubing to half length and slide the half onto the cable. Assemble the clamp halves near the cable end using four (4) longer screws threaded into the corner holes. Turn several turns as shown and leave enough space to load the cable end.

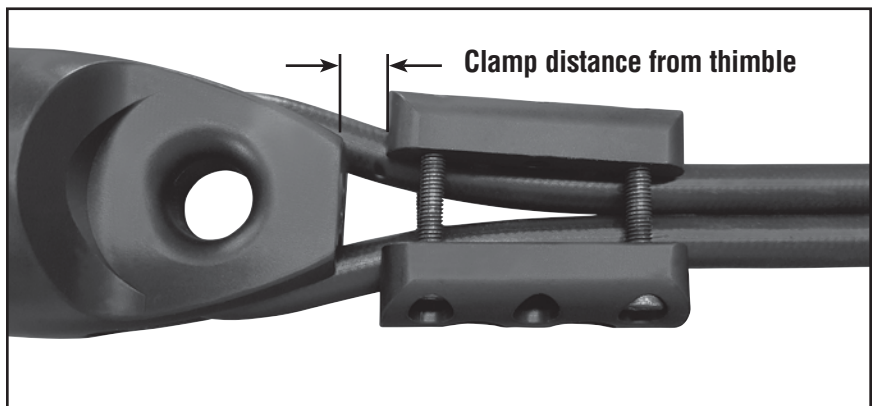


3. Insert the end of the cable through thimble at the head swivel and position it at the desired location on the cable. Slide the clamp assembly over the end of the cable as shown. **Tip: Secure the head swivel in a vise when building the terminal to hold it in place.**



4. Push the clamp assembly toward the thimble. Squeeze the torsion cable at the thimble. Position clamp about the distance shown below. Make the tail of the cable about 90 mm (3.5") beyond the clamp.

Unit	Distance from thimble
1 and 2	10 mm (3/8")
3	20 mm (3/4")



IMPORTANT! - Secure the torsion cable to the head swivel first. Wait to cut the torsion cable to length until you can check the length by dry fitting into the assembled drive unit with tack swivel and threaded adapter in place.

5. Gradually tighten each of the four (4) corner fasteners, alternating to maintain a relatively even gap between clamp halves. When the gap is about 8 mm (5/16"), locate two (2) of the short fasteners supplied. Apply blue Loctite® adhesive and thread the fasteners into the two remaining screw locations. It is not necessary to tighten these at this time.

Unit 3 Tip: After sailing, you will be tightening fasteners further. To help screws rotate with cured Loctite, apply a small amount of grease or anti-seize to the underside of the fastener heads.

6. Continue to tighten the four (4) corner fasteners until the gap between the clamp halves is around 5 mm (3/16"). Now tighten the center fasteners until snug.

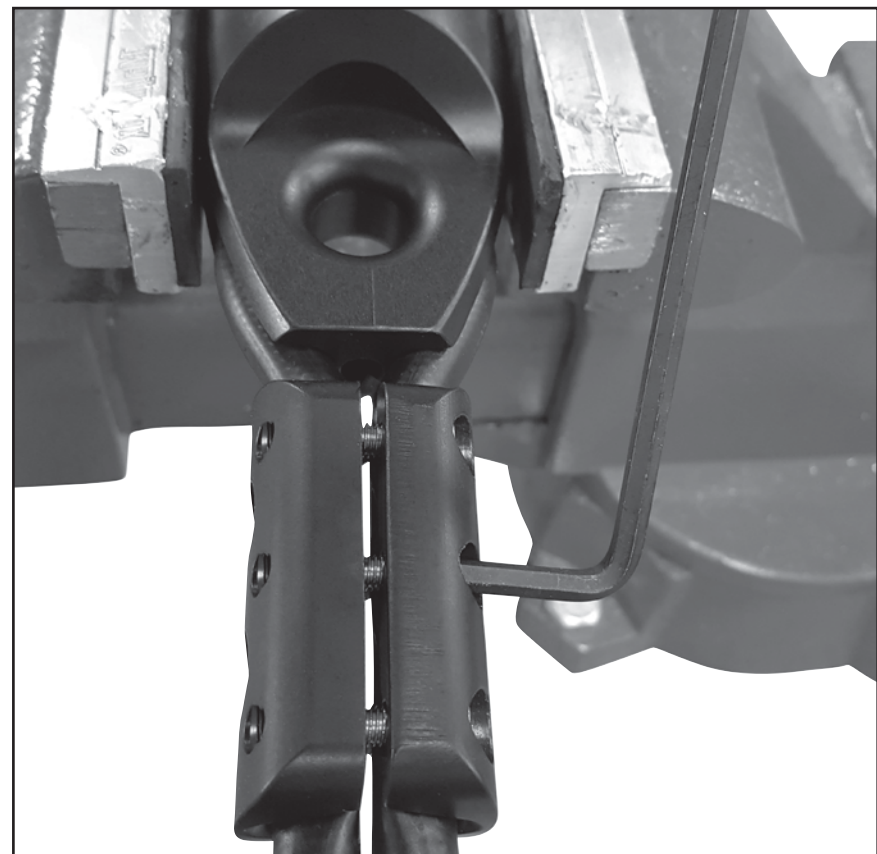
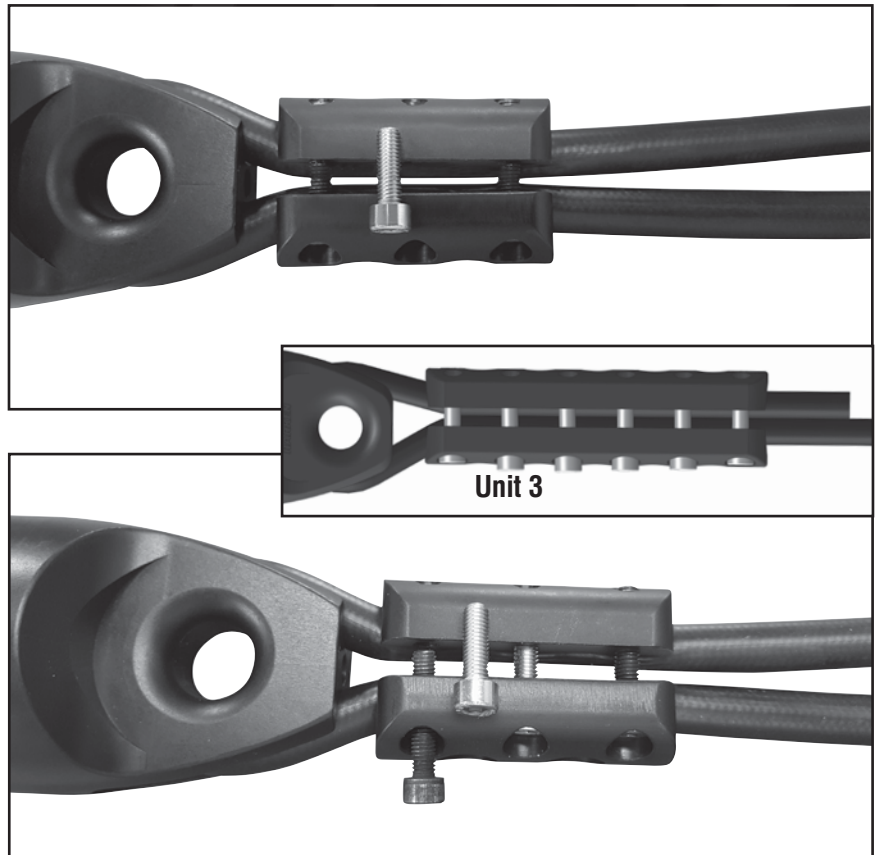
7. Remove each of the long corner fasteners and replace with a short fastener using blue Loctite.

8. Gradually tighten all fasteners, alternating to maintain a relatively even gap between the clamp halves. Assembly is complete when all fasteners achieve a maximum torque of:

Unit	Torque
1 and 2	5.6 Nm (4.2 ft-lb)
3	40.67 Nm (30 ft-lb)

The gap between the clamp halves should be even and nearly closed.

IMPORTANT! After sailing with the cable for the first time in significant wind and subsequent tension, the strands in the torsion cable will shift and condense and require additional clamp force. Retighten all screws in the upper and lower cable clamps. The clamp halves should close together.

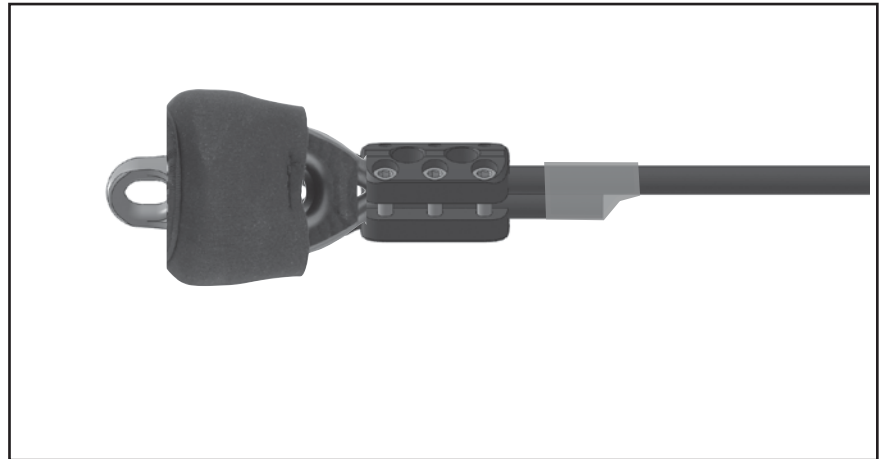


9. Slip heat-shrink tube over end and use heat gun to cover end and main cable.

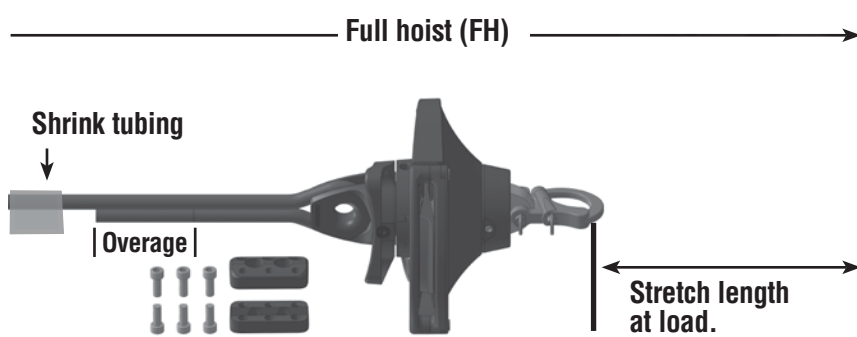
IMPORTANT! Be careful not to damage cover of Reflex cable.

10. If assembling away from the boat, lay cable out straight. Install tack terminal and snap shackle adapter on drive unit. **Note:** See following pages for preferred method of determining length at boat.

IMPORTANT! Slide the heat-shrink tubing onto the cable before slipping the cable into the thimble. Slip the cable into the thimble and check to make sure the unit is shorter than the (FH) full-hoist length by the amount shown in the chart. Clamp cable.



Tip: The finished tail will be about 100 mm (4"). Leave a longer tail as overage so you can make the cable longer if necessary. See following pages on determining length at boat. Unlike fibrous torsion cables, the Reflex torsion cable transmits torque at lower halyard loads. Too much tension can damage cable.

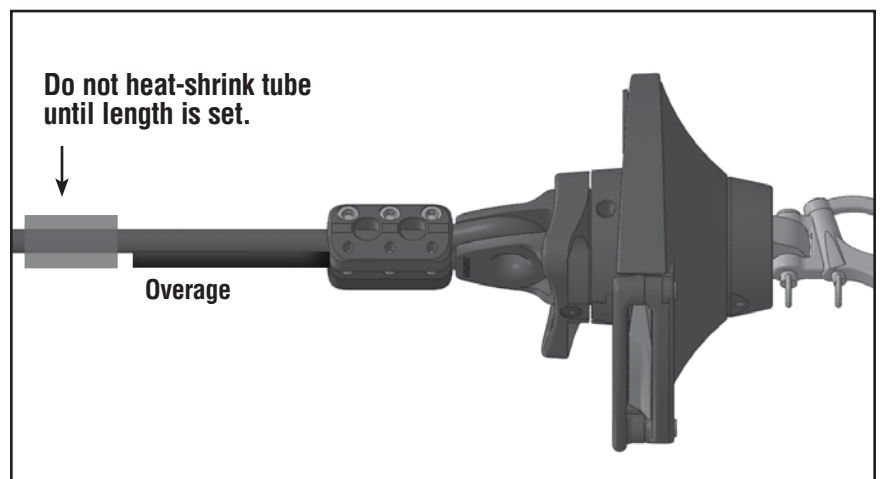


Note: The unit 3 torsion cable has a Dyneema® core and can handle relatively higher halyard loads.

Estimated stretch at initial loading								
Full hoist (FH) length	Unit 1		Unit 2		Unit 3 Asymmetric		Unit 3 Code Zero	
14 to 16 m (45 to 53')	150 mm	6"	-	-	-	-	125 mm	5"
16 to 18 m (53 to 59')	190 mm	7 1/2"	250 mm	10"	50 mm	3"	175 mm	7"
18 to 20 m (59 to 66')	230 mm	9"	300 mm	12"	60 mm	3.5"	225 mm	9"
20 to 23 m (66 to 75')	280 mm	11"	350 mm	14"	75 mm	4"	280 mm	11"
23 to 25 m (75 to 82')	-	-	450 mm	16"	85 mm	4.5"	330 mm	13"
25 to 26 m (71 to 85')	-	-	-	-	110 mm	5"	380 mm	15"

11. Follow the same procedure used to build the head swivel terminal.

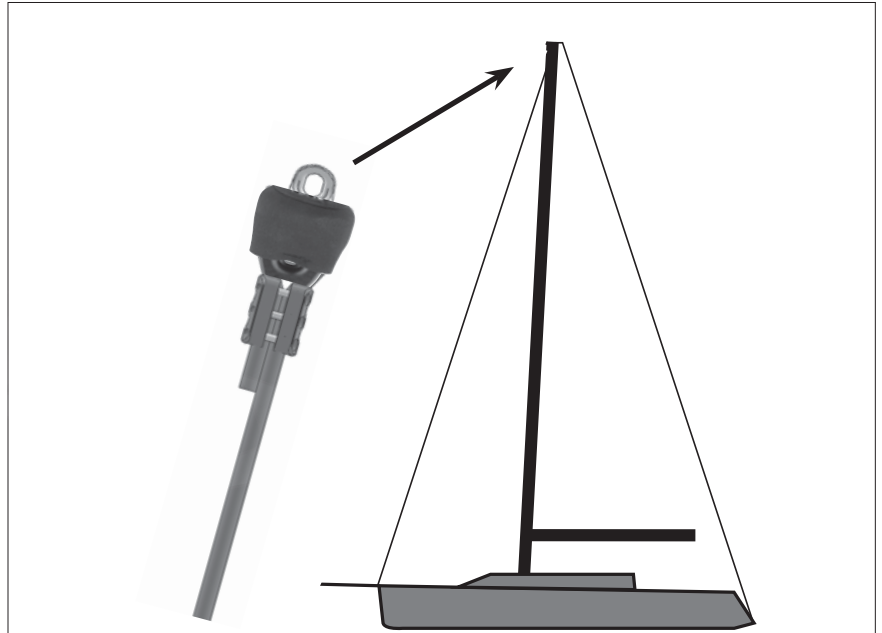
Note: Wait to shrink the heat-shrink tubing and wait to cut overage length until the sail is hoisted and sailed. Adjustments to length may be necessary. See length check, and final fit and finish at end of assembly section. Steps 8 - 9.



Physical length determination at the boat - Preferred method

Moore the boat so you can reach the end of the sprit from the dock. Have the mast in forward setting for running; use a halyard to pull the mast forward.

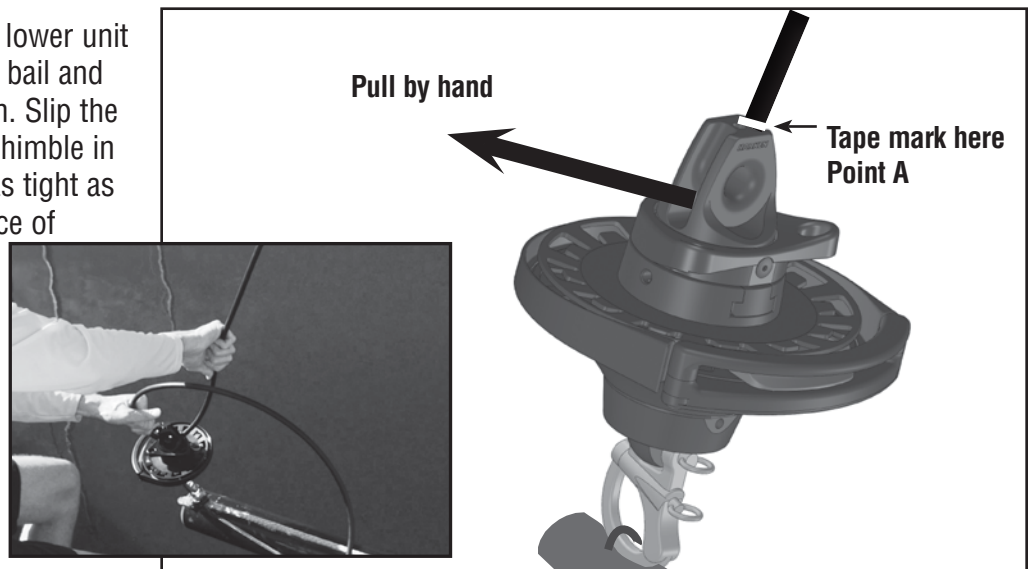
1. Dry-fit setup at boat: Hoist the head swivel with cable installed to the top of the mast. Bottom end of cable will be open, no lower unit.



Install the tack swivel terminal on the drive unit by pulling the locking spring pin and slipping the T-foot of the terminal into the T-slot in the drive unit. Make sure the snap shackle threaded adapter or alternate adapter is assembled to secure the unit to the boat.



2. Finding cut length: Attach the lower unit assembly to the tack line or fixed bail and pull the tack line all the way down. Slip the bottom of the cable through the thimble in the tack terminal. Pull the cable as tight as you can **by hand**, and wrap a piece of electrical tape **where the cable enters the thimble**. This is point A. Point A will likely be the cut point. Cable stretch will account for the distance around the thimble and the clamp height.

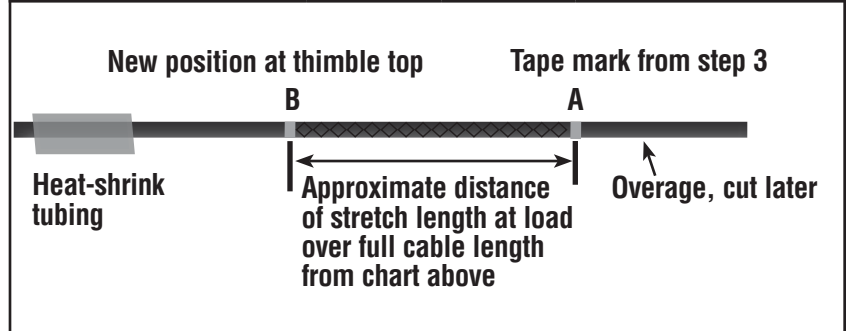


3. Fine-tune stretch length: Lower the system and lay the cable out on the dock. Tape mark A from step 2 will roughly be the torsion cable cut point.

To fine-tune the length, refer to the chart at right. Measure up the cable from A, and use tape to mark B from chart. When the lower cable terminal is built, B will be located at the point where the cable enters the thimble. The distance A to B represents the amount of stretch over the entire cable length when the torsion cable is tensioned when hoisted.

IMPORTANT! Over-tensioning the halyard can make furling more difficult and can damage components.

Amount to pull through thimble - A to B estimated stretch length at load				See Unit 3 chart next page	
Full hoist (FH) length	Unit 1		Unit 2		
14 to 16 m (45 to 53')	150 mm	6"	-	-	-
16 to 18 m (53 to 59')	190 mm	7 1/2"	250 mm	10"	-
18 to 20 m (59 to 66')	230 mm	9"	300 mm	12"	-
20 to 23 m (66 to 75')	280 mm	11"	350 mm	14"	-
23 to 25 m (75 to 82')	-	-	450 mm	16"	-

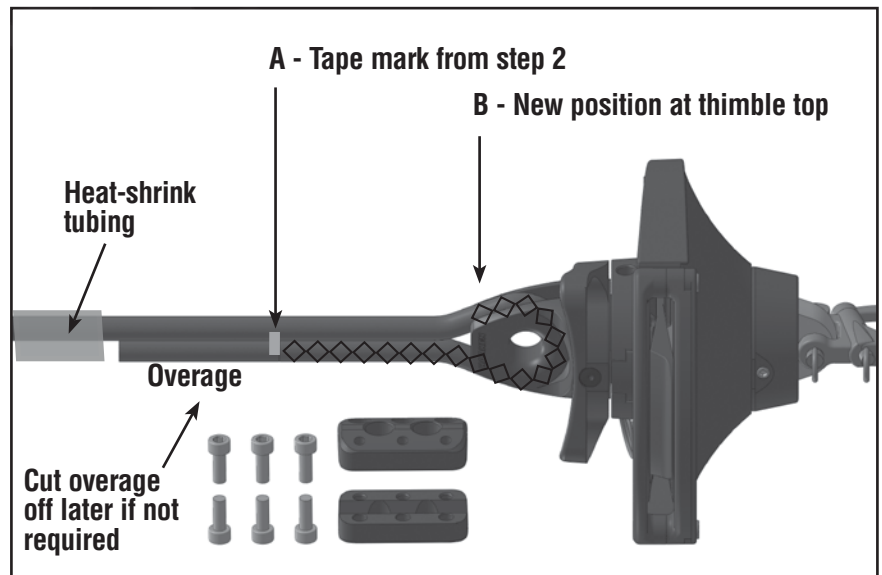


IMPORTANT! Slide the shrink wrap onto the cable before slipping cable into thimble.

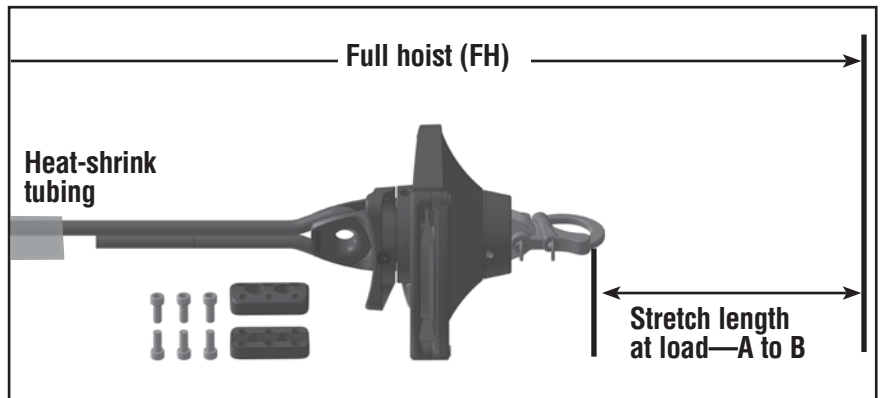
 Diamond pattern above and below represents length "gained back" by stretch of the cable over its full length

4. Setting the length - Slip the cable into the thimble and pull it through until tape mark B from step 3 is at the point where the cable enters the thimble.

Note: The mark for cutting may seem short by about 240 mm (9.5") or more. That 240 mm or more will be close to the cable stretch over the length of the cable when the halyard tensions. **Tip: Plan on overage length so you can lengthen or shorten the cable after sailing.**



Note: When assembled, the length of the system will be shorter than the FH by the A to B stretch length. **Tip: Plan on overage length so you can lengthen or shorten the cable after sailing.**



Assembly

Unit 3 - Determining Cable Length at Boat: Adjusting Length

3. Fine-tune stretch length: Lower the system and lay the cable out on the dock. Adjust the length to account for stretch using the chart at right. Measure the cable from A, higher on the cable, the distance indicated in the chart. This is mark B. Use tape to mark B. When the lower cable terminal is built, B will be located at the point where the cable enters the thimble. The distance A to B represents the amount of stretch over the entire cable length when the torsion cable is tensioned when hoisted.

Note: Asymmetric sails do not require high halyard tension to furl. Using the Unit 3 Reflex cable for code zero sails will require higher halyard tension and will have more stretch. This stretch is only for a cable that has not been stretched before. The next successive loadings will have less stretch.

IMPORTANT! Slide the heat-shrink wrap onto the cable before slipping cable into thimble.

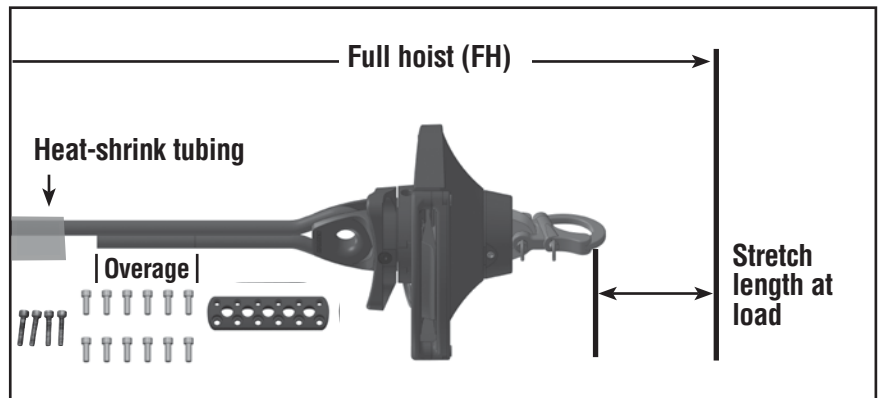
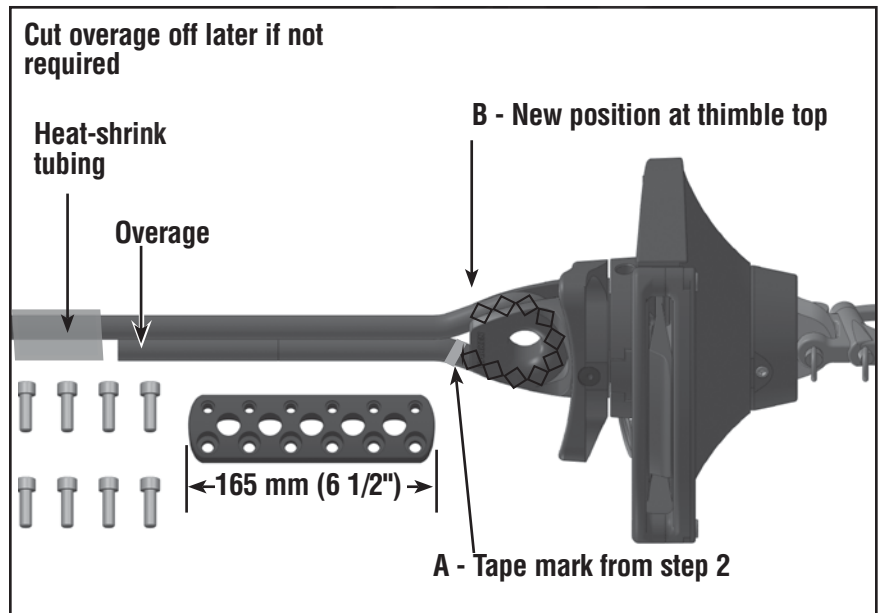
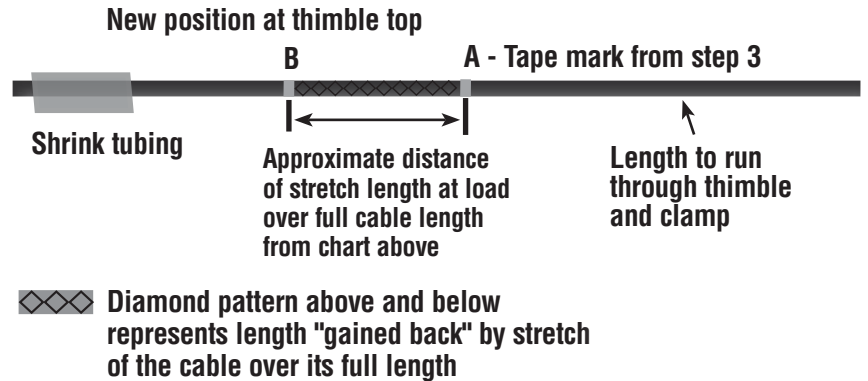
4. Setting the length - Slip the cable into the thimble and pull it through until tape mark B from step 3 is at the point where the cable enters the thimble.

Add **unit 3 clamp length** of 165 mm (6 1/2") as measured from point A. Add 100 mm (4") for tail. **IMPORTANT!** - Plan on longer overage length if you are not sure so you can lengthen or shorten the cable after sailing.

Note: When assembled, the length of the system will be shorter than the FH by the A to B stretch length. **Tip: Plan on overage length so you can lengthen or shorten the cable after sailing.**

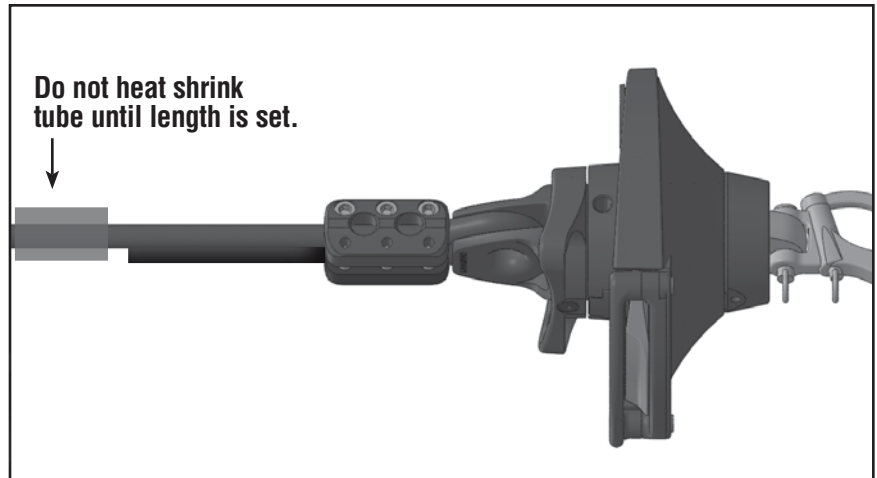
Unit 3 - Amount to pull through thimble - A to B estimated stretch length at loading*				
Full hoist (FH) length	Asymmetric spinnaker		Code zero	
17 to 18 m (55 to 60')	40 mm	2.5"	125 mm	5"
19 to 20 m (61 to 65')	50 mm	3"	175 mm	7"
20 to 21 m (66 to 70')	60 mm	3.5"	225 mm	9"
22 to 23 m (71 to 75')	75 mm	4"	280 mm	11"
23 to 24 m (76 to 80')	85 mm	4.5"	330 mm	13"
25 to 26 m (71 to 85')	110 mm	5"	380 mm	15"

*Note: Stretch is for a cable that has not been stretched before. The next successive loadings will have less stretch.



6. Building the tack terminal: Follow the procedure used to build the head swivel terminal from pages 14 and 15.

Tip: Wait to shrink the heat-shrink tubing until the sail is hoisted and sailed in case length adjustments are necessary.



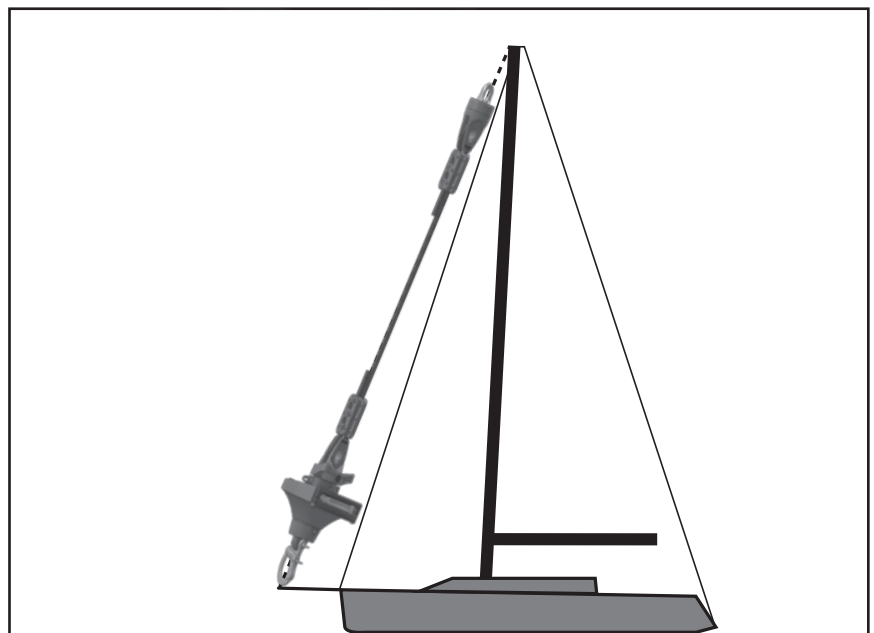
8. Checking the length: Attach the drive unit to the bow fitting or pole. Hoist the cable without sail to check the length. Use the halyard winch to tension the halyard enough to straighten the cable.

Tip: Unlike fibrous torsion cables, the Reflex torsion cable transmits torque at lower halyard loads. IMPORTANT! Over-tensioning the halyard can make furling more difficult and can damage components.

Adjust the tack line if necessary.

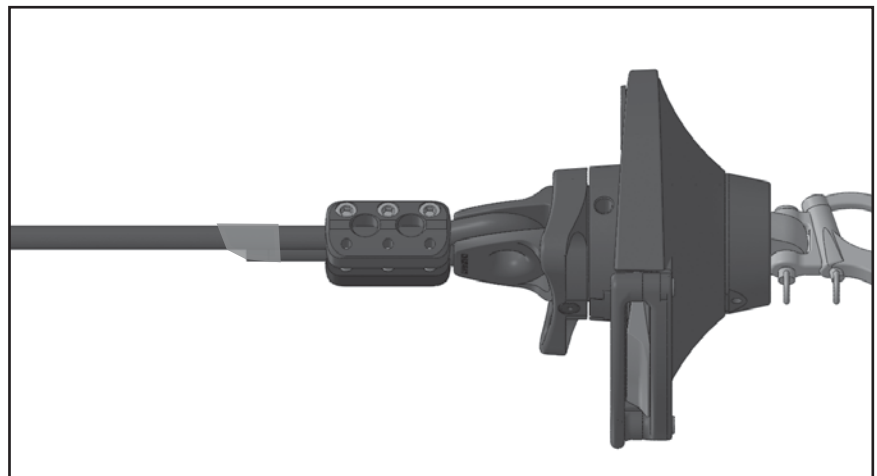
Tip: If necessary, cut the cable so that the overage length is manageable. You can tape the overage cable to itself so that you can sail with the overage.

Note: The unit 3 torsion cable has a Dyneema® core and can handle higher halyard loads.



IMPORTANT! After sailing with the cable for the first time in significant wind, retighten all screws in upper and lower cable clamps. The clamp halves should close together. Use a torque setting of about 40 Nm (30 ft-lb).

9. Final cut and finish: Once you have sailed with the system and are comfortable with the length, cut the cable so there is about a 90 mm (3.5") tail. Use the heat-shrink tube to finish it. Use a large cable cutter or Dremel-type small circular saw to cut it after assembly and applying halyard loads.



Make sure the torsion cable is not attached to the drive unit. Load the looped furling line into the line guard.



Work the line into the space between the drive sheave and the flexible cowling.



Rotate the drive sheave as you press the line into position around the drive sheave. Load the final part by pulling the line from outside the drive unit.



Commissioning

Mounting fairleads to stanchions: Furling line can lead down either side of boat. The leads are designed for running furling line **outboard** of the stanchions.

Note: Do not run the line on the inboard side of stanchion.

Plan the lead system referring to the diagram below. Mount the lead with cleats so it is easily accessible. The aft block with bungee keeps some tension on the furling line.

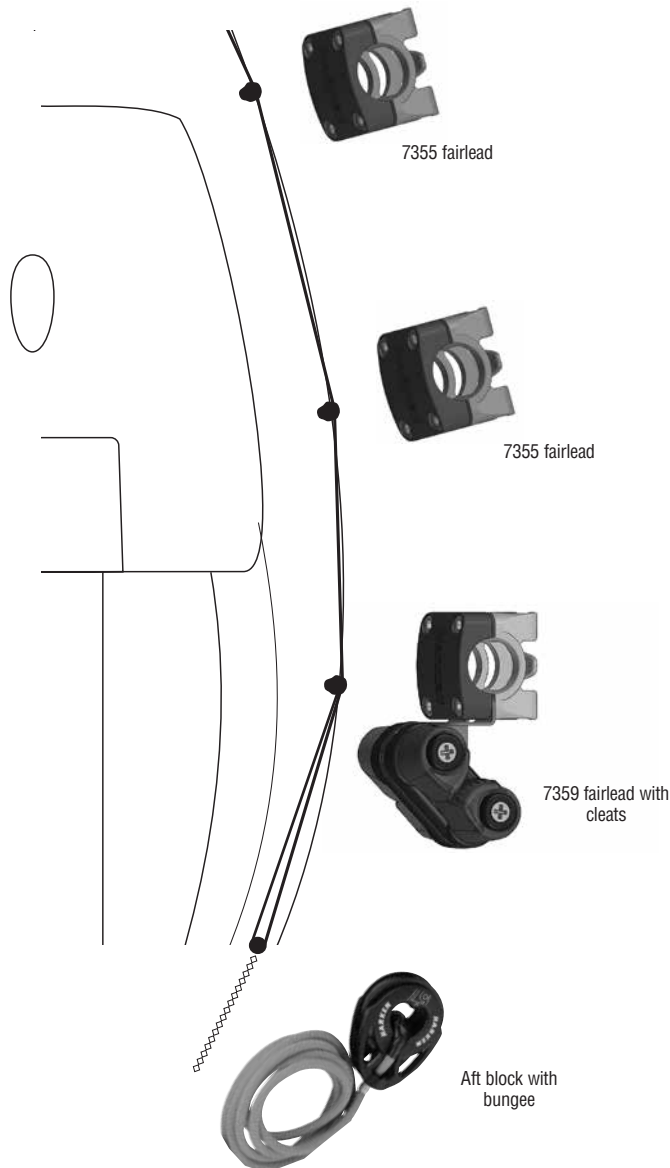
Remove four (4) screws on stanchion leads.

Note: Clamp leads to stanchion so the black plastic clamp side is inboard and the metal line guide is outboard.

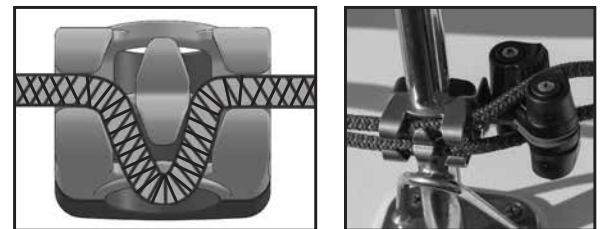
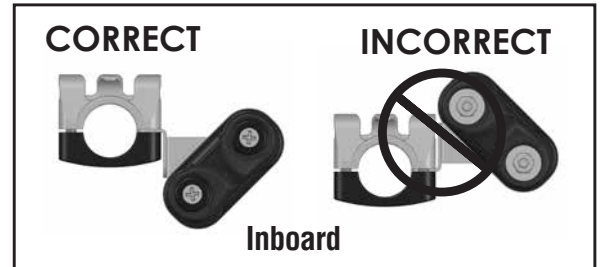
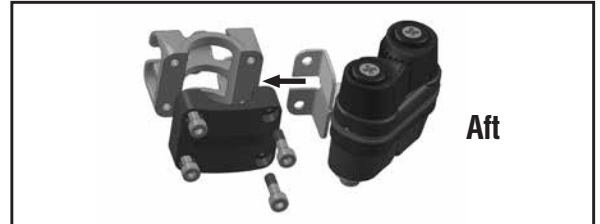
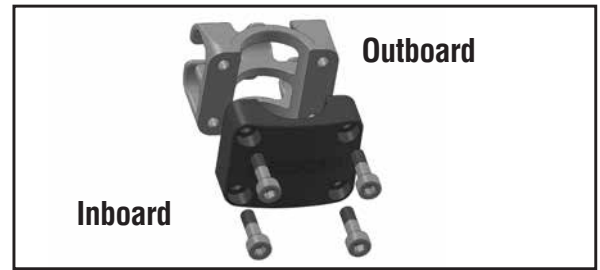
Tip: Start all four (4) screws before tightening.

Mount double cam assembly to the aft double fairlead when assembling on stanchion. Make sure cleat faces aft and angles inboard.

Tip: Install forward screws first so fairlead stays in place on stanchion. Slip double cleat assembly into slot and secure using aft screws. Align fairlead before tightening.



Mounting Fairleads - Line to Cockpit



Installing continuous furling line loop: Follow instructions in manual to load the furling line into the furler. Load the line into the fairleads by bending into the openings. Push the line into place.

Secure the aft block bungee towards the stern.

Tip: Once length is determined, use a small clip on the tail to quickly install and remove the furling line.

For racing: Mount the aft block with bungee near the shrouds. By using a clip at the end of the bungee cord you can easily clip it to port side or starboard. For distance racing, furling can always be on the weather side.

Pre-hoist checklist

There are several assembly steps described in detail in the installation manual

- Lower drive unit attached to bow with line guard facing aft
- Looped furling line installed on drive unit and led aft
- Head swivel and tack swivel clamped to torsion cable and length checked
- Soft-attach shackle available for attaching head of sail to head swivel
- Soft-attach lashing or shackle available and sized for attaching tack to swivel tack terminal

Preparation for first sail hoist: Sail is in bag, unfurled.

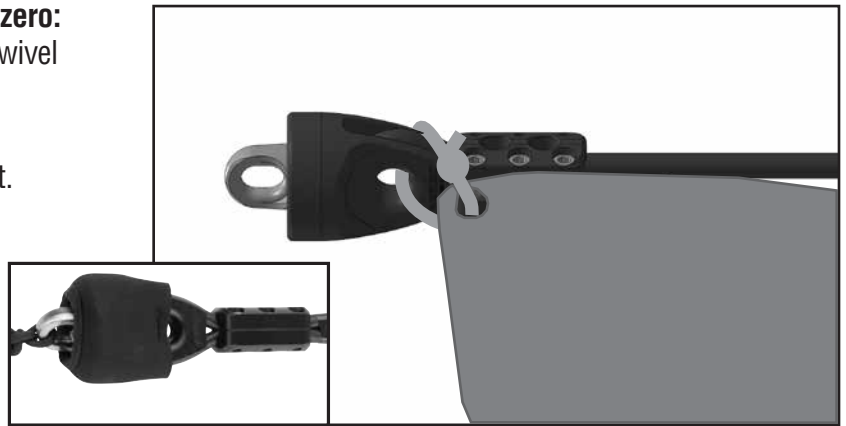
Tip: Pick light breeze conditions. Have no jib or have jib furled. Subsequent hoists will be much easier because sail will be furled.

Tip: Temporarily secure the furled jib sheets downward toward the deck to help keep the Reflex furling system, spinnaker sheets, and halyard outside of the jib sheets.

Securing head, asymmetric spinnaker and code zero:

Attach the head of the sail to the eye in the head swivel using a soft shackle or lashing.

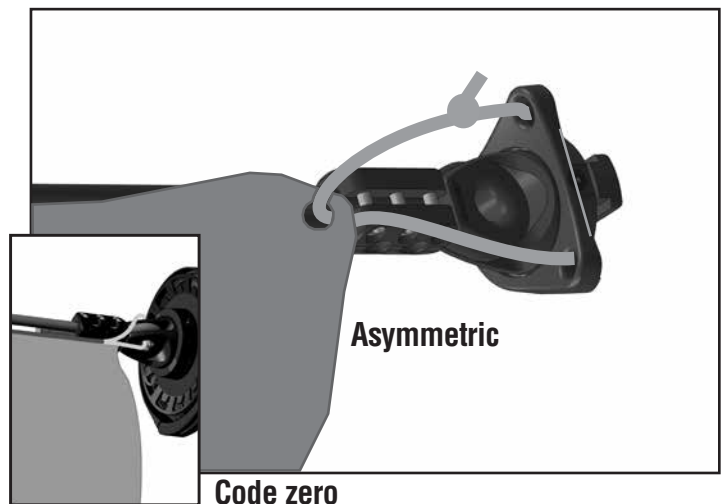
Note: Head swivel has a soft cover to protect mast.



Securing tack, asymmetric spinnaker: Secure tack of sail using soft-attach long shackle secured to the tack swivel. Make length adjustable for adjustment when sail is finally fitted.

Securing tack, code zero: Secure to hole in thimble.

IMPORTANT! After sailing with the cable for the first time in significant wind, retighten all screws in upper and lower cable clamps. The clamp halves should close together. Use a torque setting of about 40 Nm (30 ft-lb).



Load the Reflex tack terminal into the T-slot on the lower drive unit. Attach the unit to the bow sprit or a fixed point on the bow ahead of the stay. Attach halyard to head swivel and check halyard and sheet leads. Hoist and trim spinnaker.

Halyard tension: Tension the halyard to pull slack out of the Reflex torsion cable. Adjust the tack line if necessary. Use the winch to pull the halyard until the rolled sail is straight. **IMPORTANT! Over-tensioning the halyard can make furling more difficult as you load components. Unlike fibrous torsion cables, the Reflex torsion cable transmits torque at lower halyard loads. Too much tension can damage components.**

IMPORTANT! If using a code zero sail, always use a tension handling line. See code zero page to follow.

Furling

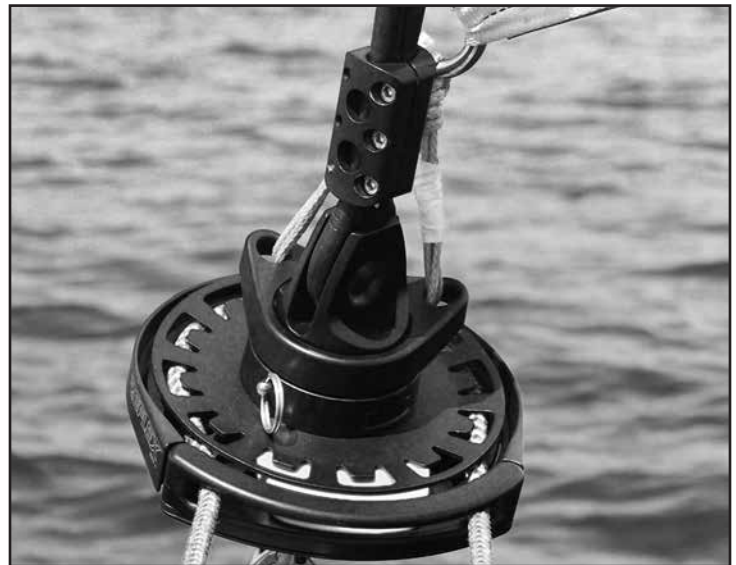
Prepare both spinnaker sheets so they are ready to run. Pull the continuous furling line and the lower drive unit rotates the Reflex torsion cable which immediately rotates the head swivel, furling the sail around the torsion cable beginning at the top.

Tip: When furling, control the amount the sail flogs. From a broad reach, ease the sheets to reduce sail power. Start furling and then ease more.



When furling an asymmetric spinnaker, the sail tack is on a swivel and does not begin furling until most of the sail is furled. When furling a code zero sail, the sail tack is fixed.

Continue furling by easing the sheet part way and furling so flogging is minimized and there is some drag on the sheets. Furl until the clew pennant or sheets are securely wrapped around the furled sail.



The furling action when furling an asymmetric spinnaker and tack swivel terminal is top-to-bottom; furling starts at the sail head and moves downward.



Furling

Prepare both spinnaker sheets so they are ready to run. Pull the continuous furling line. The lower drive unit rotates the head and tack of sail. The furling action is along the luff.

IMPORTANT! When using the Reflex torsion cable with a code zero type sail, always use a tension handling line as shown below. To furl a code zero sail that has a preexisting non-Harken torsion cable sewn into the luff, use either the thimbles or the eyes to secure to the head swivel and fixed tack terminal.

EXCEPTION: The Reflex unit 3 torsion cable has a Dyneema® core and can handle higher halyard loads. When hoisting for the first time tension the halyard to set the cable and take out the stretch.

Tip: When furling, control the amount the sail flogs. From a broad reach, ease the sheets to reduce sail power. Start furling and then ease more.

Continue furling by easing the sheet part way so flogging is minimized and there is some drag on the sheets. Furl until the clew pennant or sheets are securely wrapped around the furled sail.

Lower furled sail and stow.



Lowering: Lower the rolled sail and remove the entire unit from the retracted sprit, or use the T-slot and leave the lower drive unit with furling line and sheets on the bow. Coil the furled sail in a large bag. Tip: A large rectangular bag (3:1 ratio) stows nicely. If removing the lower drive unit, gather the furling line and sheets into the bag.



Hoisting furled sail:

After the initial hoist and furl, the Reflex system will be ready for hoisting while furled. These items were covered previously in the first sail-hoist section.

Checklist:

- Head of sail securely attached to head swivel
- Tack secured to tack swivel terminal
- Tack swivel terminal loaded into T-slot in lower drive unit
- Unit secured to bowsprit or bow fitting
- Furling line led aft below jib sheets to aft lead block
- Spinnaker sheets attached, and led around forestay and aft to spinnaker blocks outside and above all other sheets
- Halyard attached

Hoisting steps:

- Pull tack out to pole if adjustable
- Pull bowsprit out
- Hoist furled sail from the weather side to avoid having to go under the foot of the jib. The head swivel stays ahead of the rig. Work the furled sail outboard and forward while hoisting furled sail.

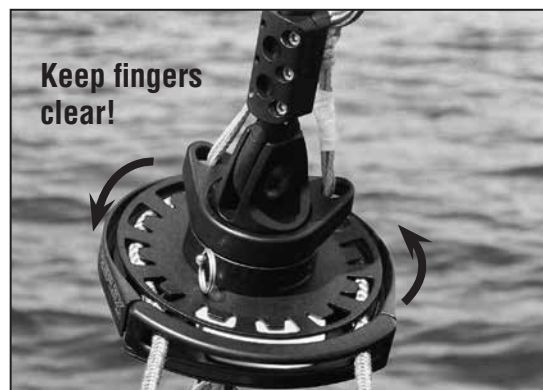
Unfurling sail:

Make sure sheets are led correctly and leeward sheet is ready to trim. Make sure that the furling line is clear to run and people are clear of the line.

As you are unfurling, head up a little so wind begins to unfurl the sail. As it is filling, bear off to reduce the wind in the sail. Let the sail unfurl and spin the furling line.



WARNING! Stand clear of the drive sheave and the furling line when sail is unfurling. Trying to grab the line and slow it can result in injury. Keep fingers clear of the spinning drive sheave.



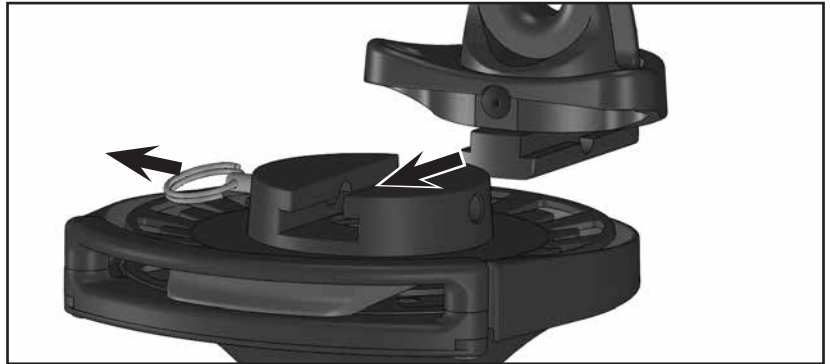
Sail changes: Changing furled sails is easy. Components are available for each sail.

Asymmetric spinnakers - Order these additional parts:

- Head swivel
- Tack swivel terminal
- Reflex torsion cable
- Torsion cable clamp set

Code zero sails - Order these additional parts:

- Head swivel
- Fixed tack terminal
- Reflex torsion cable
- Torsion cable clamp set



The sail may have an existing torsion line in the luff. Talk to your sailmaker about installing a Harken Reflex torsion cable. Requires a separate Dyneema® type tension-handling luff line.

Changing sails: With the new sail furled and ready to go, changing sails is quick and easy. Simply pull the spring pin, slide out one (1) assembly and slide the new sail assembly into the lower drive unit. You can even switch from a free-flying sail to a code zero sail. Or switch sail to a cable-less sail with integral Harken web on plates.
 Note: Code sails use a fixed tack with no swivel. Switch sheets and hoist as normal.

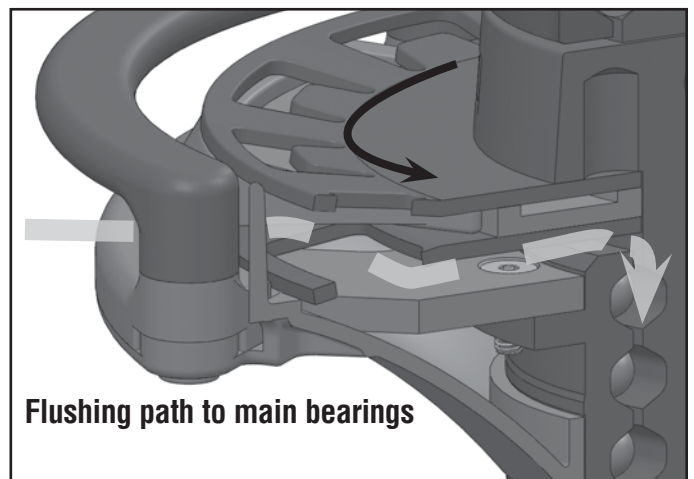
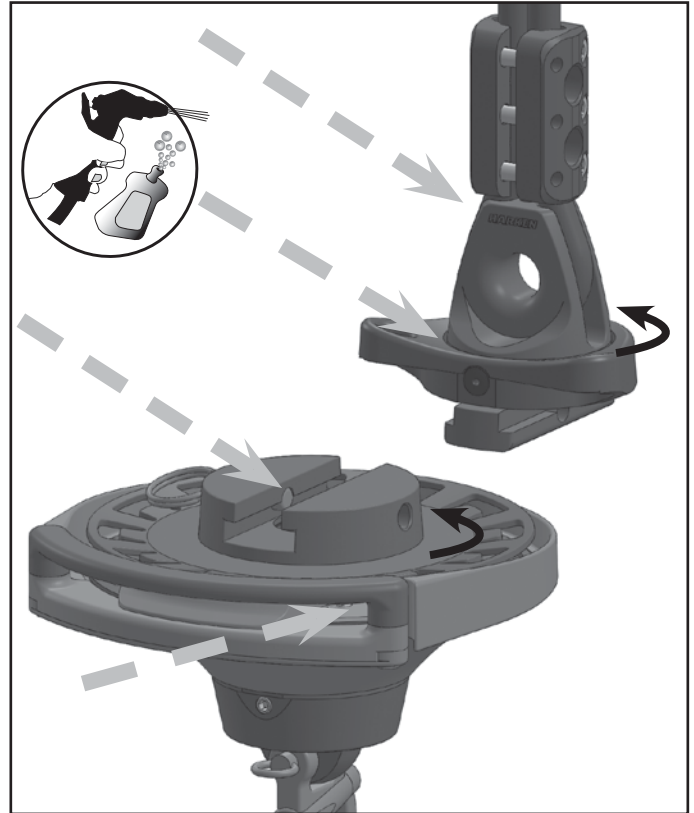
General cleaning procedure: Keep your equipment clean and free-running by frequently flushing with fresh water. Periodically clean with mild detergent and water solution. Spin components to distribute soap solution evenly. Flush with fresh water. Use this process for flushing procedures below.

Head swivel: Flush exterior of swivel, inside the thimble, and the clamp mechanism. Inspect all components for signs of chafing, wear, or damage and replace if necessary.

Reflex tack swivel terminal: Flush bearings with soapy water and rinse as you rotate tack swivel.

T-slot mechanism: Periodically remove the Reflex swivel tack terminal from the T-slot and flush parts. Be sure to operate and flush the spring pin.

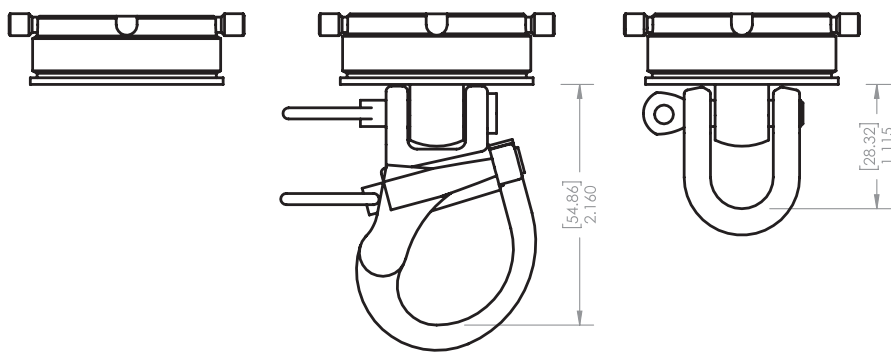
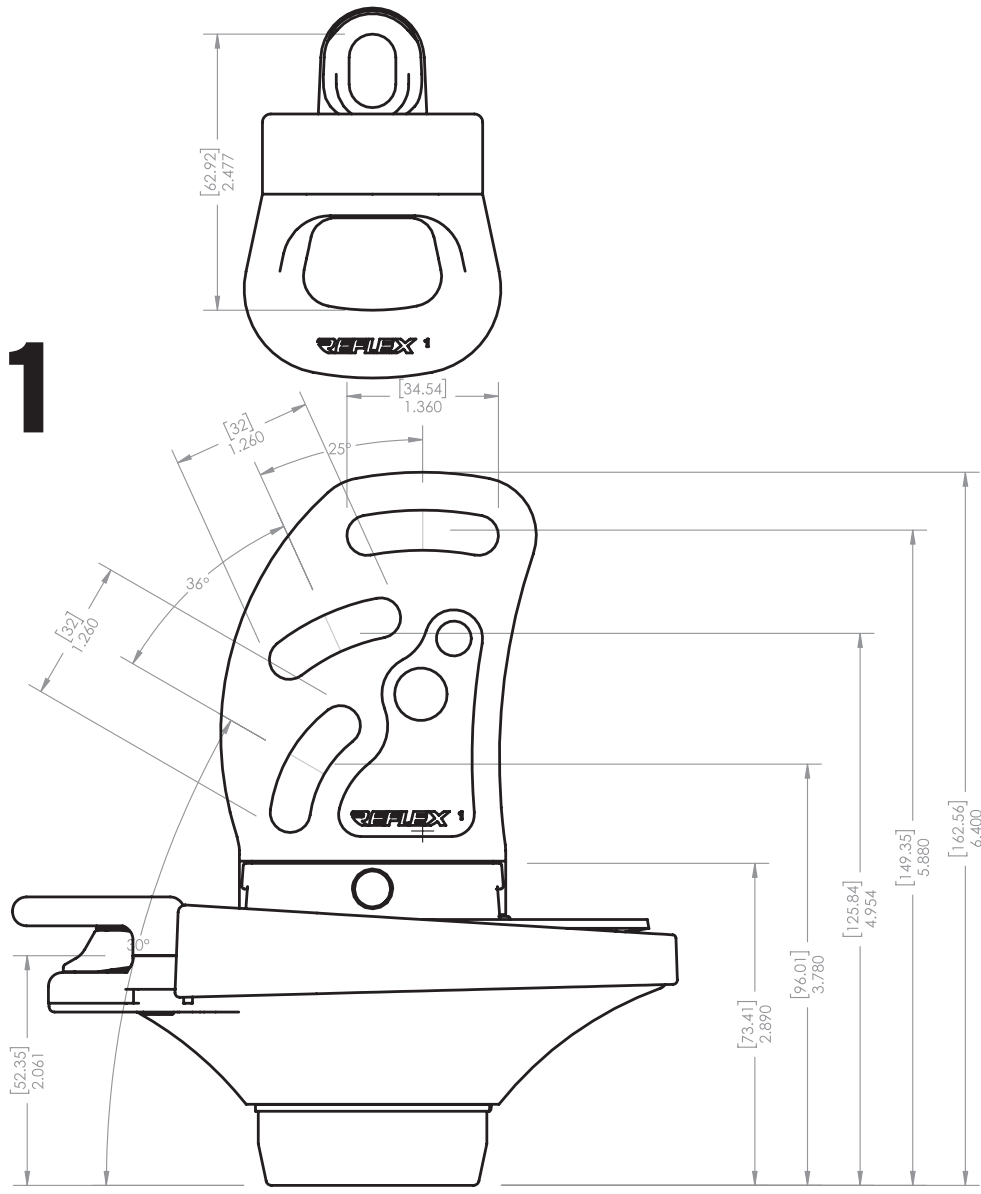
Lower drive unit: Remove furling line and flush lower unit on either side of the feeder. Rotate the drive sheave to flush bearings. **Tip: The drive unit easily removes from the sail for thorough flushing. Turn unit upside down and flush interior.**



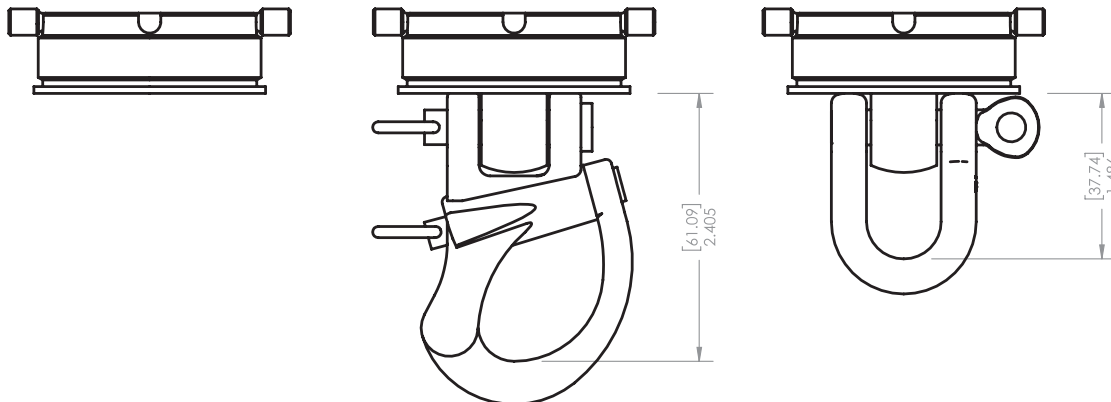
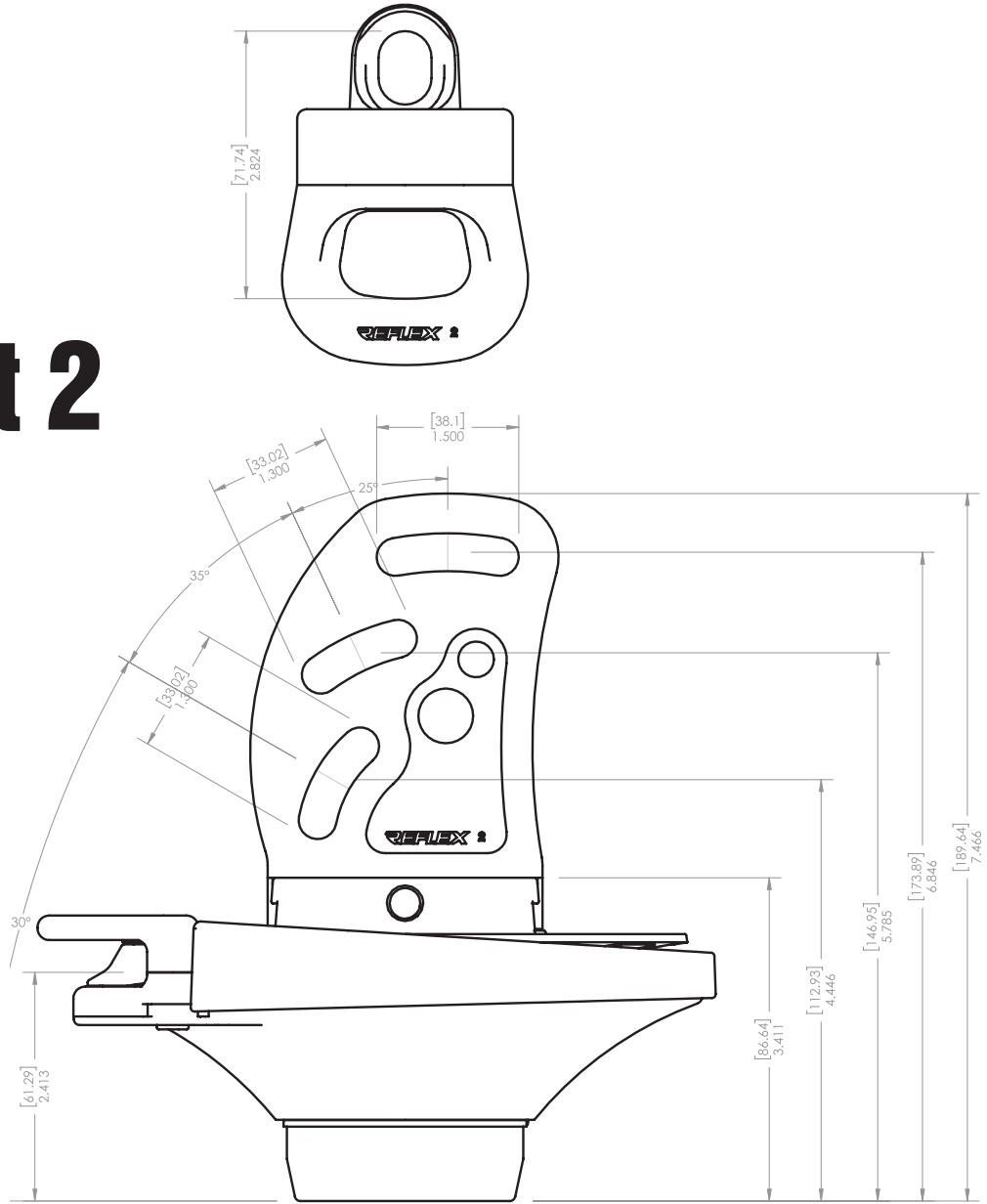
Inspection: Carefully examine all fasteners and tighten as necessary. Inspect all shackles and soft attachments for signs of chafing, splices failing, or wear. Replace as necessary.

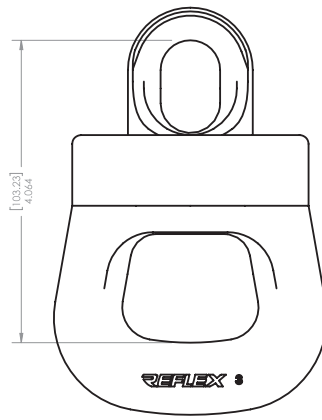
Storage: Make sure all parts are rinsed and dry before long-term storage.

Unit 1

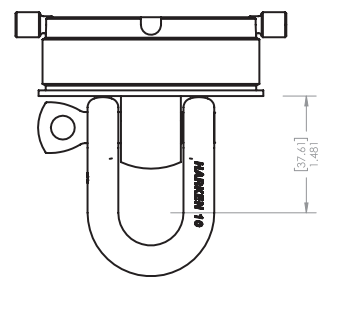
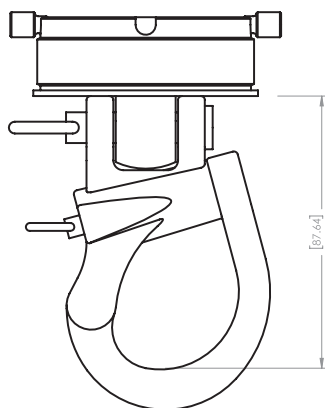
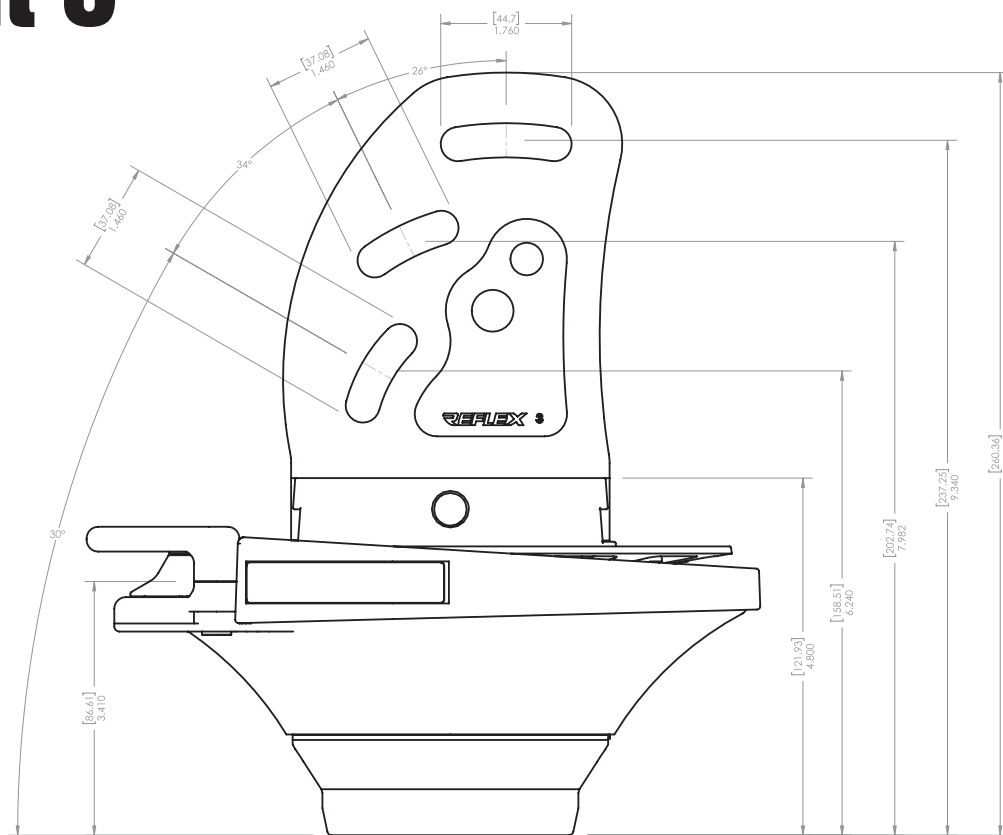


Unit 2





Unit 3



Reflex furler

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

HARKEN®

Corporate Headquarters

N15W24983 Bluemound Rd, Pewaukee, WI 53072 USA
Telephone: (262) 691-3320 • Fax: (262) 701-5780
Web: www.harken.com • Email: harken@harken.com

Harken Australia Pty, Ltd.

1B Green Street, Brookvale, N.S.W. 2100, Australia
Telephone: (61) 2-8978-8666 • Fax: (61) 2-8978-8667
Web: harken.com.au • Email: info@harken.com.au

Harken France

ZA Port des Minimes, BP 3064, 17032 La Rochelle Cedex 1, France
Telephone: (33) 05.46.44.51.20 • Fax: (33) 05.46.44.25.70
Web: harken.fr • Email: info@harken.fr

Harken Italy S.p.A.

Via Marco Biagi, 14, 22070 Limido Comasco (CO) Italy
Telephone: (39) 031.3523511 • Fax: (39) 031.3520031
Web: harken.it • Email: info@harken.it

Harken New Zealand, Ltd.

158 Beaumont Street
Unit 11, Orams Marine Centre
Westhaven, Auckland, 1010, New Zealand
Telephone: (64) 9-303-3744 • Fax: (64) 9-307-7987
Web: harken.co.nz • Email: harken@harken.co.nz

Harken Polska Sp. z o.o.

ul. Przasnyska 6A, 01-756, Warszawa, Poland
Tel: +48 22 561 93 93 • Fax: +48 22 839 22 75
Web: harken.pl • Email: polska@harken.pl

Harken Sweden AB

Main Office and Harken Brandstore: Västmannagatan 81B
SE-113 26 Stockholm Sweden
Telephone: (46) 0303 61875 • Fax: (46) 0303 61876
Mailing address: Harken Sweden AB, Box 64, SE -440 30 Marstrand
Web: harken.se • Email: harken@harken.se

Harken UK, Ltd.

Bearing House, Ampress Lane, Lymington, Hampshire SO41 8LW, England
Telephone: (44) 01590-689122 • Fax: (44) 01590-610274
Web: harken.co.uk • Email: enquiries@harken.co.uk

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