

VESSEL MOORING SYSTEM



samson
THE STRONGEST NAME IN ROPE



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THE SAMSON MOORING ADVANTAGE





MOORING LINE SELECTION

Not an off-the-shelf decision

For owner/operators in today's shipping industry, safe working conditions, maximizing service life, and mitigating unnecessary failure of mooring lines are top priorities. Through proper vessel evaluation and selection of high modulus polyethylene (HMPE) ropes, Samson will show you how to achieve all three.

We used to talk about mooring lines. However, with the advances in fiber and coating technology, and the innovations in chafe protection, we now talk about mooring systems. Selecting the right mooring system is not a "one-size-fits-all" proposition. Each component of the system should be considered independently; primary or secondary line, pendant, chafe protection, hardware, etc. Based on your specific needs, each component is selected to give you the best overall system and performance.

We understand the factors that weigh into these decisions and will help you select the system to get the job done correctly and safely, providing the best value for your investment. We want your system to be as safe as possible for as long as possible. It may seem counter intuitive for a supplier to help you get more life out of their products; but at Samson, that is exactly what we do. We understand that adding real value to your business is how we become a valuable vendor.

Knowing the intended use or application of the rope is not enough. There are a number of other factors should be considered when selecting a mooring line:

- > **Rope construction: jacketed vs. non-jacketed**
- > **Understanding abrasion**
- > **Maximize service life: mitigate abrasion**
- > **Proper installation procedures**
- > **End-for-ending**
- > **Line rotation**
- > **Inspection guidelines**
- > **Residual test program**

This technical guide will aid you in selecting the mooring in system that is right for your operation.

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THE SAMSON MOORING ADVANTAGE



THE SAMSON MOORING ADVANTAGE

You won't get this anywhere else

Beyond selecting the right line for each component of your mooring system, Samson also provides an unparalleled service package we call The Samson Advantage. The Samson Mooring Advantage is designed for both new builds and retrofits, and adds value with critical pre- and post-sale services and an ongoing partnership program. This approach is driven by safety and is a proven model that cannot be duplicated by any other rope manufacturer.

Whether it is vessel inspections prior to the sale, crew training for proper rope handling and splicing, establishing inspection and retirement schedules, or residual testing and/or laboratory analysis, the Samson team is available to you anywhere in the world.

ADVANTAGES OF HMPE OVER WIRE

- > Size-for-size stronger than wire
- > Weighs 85% less than the wire it replaces
- > Typically outlasts wire 3-to-1
- > OCIMF recognizes HMPE as an acceptable alternative to wire

COST EFFECTIVE

- > More efficient mooring times
- > No re-lubing or environmental issues
- > Less damage to ship equipment
- > Able to splice and repair on board

SAFETY

- > Fewer hand and back injuries
- > Lighter and easier to handle
- > Reduced recoil

PRE-SALE SERVICES

- > Onboard mooring equipment surveys to understand and determine the most suitable products for your application
- > Thorough understanding of key mooring industry regulations and standards such as OCIMF
- > Library of mooring-related technical bulletins and case studies

POST-SALE SERVICES

- > A customized mooring line manual
- > On-site crew training, which includes: line handling, inspections, repair, splicing, use of chafe protection
- > Annual inspection programs to establish retirement criteria

The Samson Advantage is our commitment to ensuring safe and long-term operational benefits from our high-performance products from installation to retirement.



As an integral part of The Samson Advantage, Samson's field technicians provide onboard inspections, repairs, and splicing assistance.

MOORING LINE SELECTION CONSIDERATIONS



MOORING LINE SELECTION CRITERIA

ROPE DESIGN: JACKETED VS. NON-JACKETED

One of the best ways to combat unforeseen situations and prevent failure is to select the mooring line and tail, or pendant, appropriate for your vessel. Many ship owners, managers, and terminal operators are aware of the advantages of ropes made with Dyneema® fiber and have become accustomed to asking for jacketed mooring lines. There is a perception in the industry that jacketed construction provides a longer service life because the strength member, typically made with a high-performance fiber, is protected by the outer jacket. This is a misconception. Typically, the jacket wears faster than the core, resulting in the need to replace the entire line due to the integrated construction of the jacket and core.

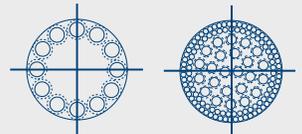
Misconceptions of jacketed mooring lines can be costly

For use on split-drum winches, Samson has always promoted its non-jacketed mooring lines in conjunction with specialized chafe protection in high-contact areas as a superior option to a completely jacketed mooring line. The advantages of non-jacketed lines are numerous: they are stronger than jacketed lines size-for-size and they are easy to inspect and repair. Unlike jacketed lines, which rupture in the areas that suffer the greatest abrasion and have to be replaced, only the chafe protection on a non-jacketed rope has to be replaced, saving time and money.

A 12-strand mooring line system, such as AmSteel®-Blue or AS-78 with Saturn Dynalene chafe protection, provides the ultimate in cut and abrasion resistance, and the rope maintains its strength for the long-term. The combination allows the ship owner to easily inspect the lines, and, if necessary, repair and re-splice them in only the affected areas of the line. Chafe protection is applied to the areas of the line susceptible to abrasion and, should this protection become worn or damaged, it can be easily reinstalled or replaced.

For use on single drum winches, Samson recommends jacketed mooring lines like Turbo-75 and Turbo-RC.

	ADVANTAGES	DISADVANTAGES
Jacketed	<ul style="list-style-type: none"> High strength, low weight Core is completely protected by outer jacket Firm, round profile Potential for higher heat resistance on the cover Typically less expensive 	<ul style="list-style-type: none"> Impossible to inspect the core (strength member) The cover will wear faster than the core Doesn't float Jacket can rupture Difficult to repair or splice
Non-Jacketed	<ul style="list-style-type: none"> Higher long-term residual strength because of 100% Dyneema® fiber Easy to inspect, repair, and splice Cut and abrasion resistant Floats No jacket ruptures Chafe protection can be easily replaced 	<ul style="list-style-type: none"> Higher content of Dyneema® fiber increases cost



Samson offers both jacketed and non-jacketed Dyneema® fiber-based lines. Our jacketed constructions include Turbo-EPX that utilizes a polyester jacket over a Dyneema® fiber core, while our non-jacketed lines include AmSteel®-Blue, which is a 12-strand single braid made with 100% Dyneema® fiber.

PENDANTS OR TAILS: AN INTEGRAL PART OF THE ULTIMATE MOORING SYSTEM

Proper selection of the mooring pendant also affects the performance of the mooring line. Recent studies have included the effects of tail length with varying materials. Depending on their application, there has been some success with increased tail lengths of 72 feet (22 meters) and nylon pendants have been found to be beneficial due to their increased elastic elongation.

MOORING LINE SELECTION CONSIDERATIONS



Saturn Dynalene's innovative construction allows easy inspection without removal.

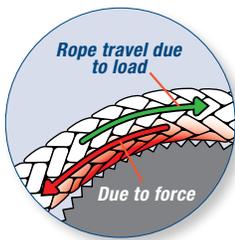


Adding chafe protection will greatly lengthen the service life of HMPE lines.

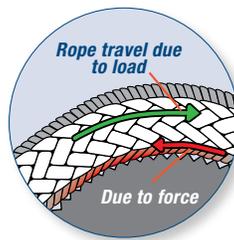
UNDERSTANDING ABRASION

Abrasion is one of the biggest culprits of line damage. There are two types of abrasion: internal abrasion caused by the relative movement of internal and external yarns; and external abrasion caused by contact with external surfaces, such as roller and panama chocks.

An unprotected rope moving over a rough surface, such as a poorly maintained chock, can be subjected to both. Upon inspection, it's easy to see when the external strands are abraded by a rough surface. Often, fibers can be left behind on the surface that caused the abrasion and the surface of the rope readily shows abraded yarns.



WITHOUT CHAFE GEAR (HMPE ON METAL)
Friction caused by poorly surfaced deck hardware causes both external abrasion to surface strands and abrasion to internal strands by creating relative movement between the fibers in the rope.



WITH CHAFE GEAR (HMPE ON HMPE)
External abrasion is primarily limited to the chafe gear itself, and the relative movement of internal and external fibers is greatly reduced or eliminated completely.

MAXIMIZE SERVICE LIFE: MITIGATE ABRASION

DECK EQUIPMENT Vessels that have used wire rope often have significant damage and scoring to the deck equipment caused by the repeated wear and abrasion of wire rope mooring lines. These abrasive surfaces can damage or significantly reduce the life expectancy of HMPE ropes. Ignoring deck conditions can be a costly mistake. There are no synthetic lines that will perform to their maximum capability with poorly maintained deck equipment. Take preventative measures to mitigate these issues by repairing all rope contact points to a smooth and consistent surface before installation of the new mooring lines.

CHAFE PROTECTION The addition of chafe protection in the areas of the line most likely to suffer from abrasion is critical for the rope's longevity. Samson high-performance synthetic ropes have been engineered to provide ease of handling and inspection, extreme strength, and long service life. Dyneema® fiber, a major component in many of Samson's high-performance ropes, is extremely cut and abrasion resistant. While properly designed and engineered ropes take maximum advantage of this resistance, in the real world environment of the commercial marine industry, protecting ropes from abrasion and cutting significantly increases service life. These are either sleeves that slide on the rope or are spliced into a line, depending on the type of chafe gear and the construction of the rope.

External abrasion without protection



External abrasion with protection



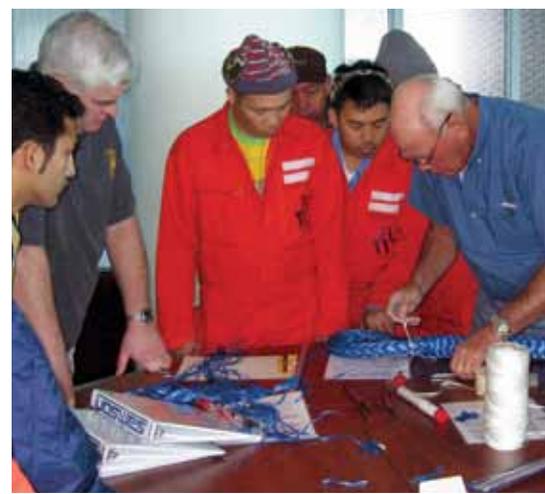
Internal abrasion without protection



Internal abrasion with protection



Samson chafe protection products are perfectly suited to combat the causes of cutting and abrasion encountered in mooring operations.



Samson field support technicians frequently assist with wire rope mooring line replacements while vessels are underway, complete with crew training in splicing, inspection, maintenance and proper rope-handling techniques.

INSTALLATION

After surfaces have been prepped, the working line should be installed on the winch with significant back tension. The device used to create the tension should have a smooth and consistent surface, and the installation speed or tension applied should not generate excessive heat build-up in the rope.

As the line is wound onto the winch, it should be closely packed to minimize areas where the rope may “dive” or bury into the layers of the winch. Install each layer in the valleys of the previous layers or crossed over each other to support each subsequent layer. Never stack the layers on top of each other.

When the line is used, eight to ten wraps must always remain on the tension side of the split-drum winch at the line's full extension. Furthermore, every precaution needs to be taken to prevent twist from being introduced into the line as it is used. Twist is often overlooked as a contributing factor in the reduced life of rope made with Dyneema® fiber. (See Samson's technical bulletin: Effect of Twist on Braided Rope at SamsonRope.com)



Eight to ten wraps must always remain on the tension side of the split-drum winch at the line's full extension.

EXTENDING MOORING LINE SERVICE LIFE

There are two ways to extend the service life of your mooring lines: end-for-ending the lines and line rotation. Since Samson's high-performance mooring lines are 85% lighter than the equivalent wire ropes, and significantly lighter than other synthetics like polyester, both techniques are easily handled by typical crews without the need for additional equipment like spooling trucks.

END-FOR-ENDING MOORING LINES The forward, or working, end of the line is subjected to repeated loading, deck-dragging damage, and hardware abrasion. By reversing the line, putting the unused, new end forward, the total service life of the mooring line can be extended. Lines should be carefully inspected using Samson's inspection guidelines to determine if the mooring line is worn or damaged beyond repair for a length extending too far down the line. Careful consideration should be taken regarding the benefits of reversing the line versus replacing it with a new mooring line.

ROTATING MOORING LINES To extend the service life of your Samson mooring lines, it is suggested that you consider setting a scheduled rotation of lines. On a given vessel, mooring lines will often experience different levels of cyclic and absolute loading, depending on the layout of deck equipment and the direction of mooring forces. A procedure that can be easily conducted on board without additional equipment is line rotation from one station to the other. Using the Samson recommended winch installation guidelines, the crew could rotate the lines to even out the residual strength. Residual strength of synthetic ropes should be tested at intervals to set safe rope retirement or rotation schedules.

End-for-ending and rotating Samson's lightweight, high-performance mooring lines are easily handled by typical crews without additional equipment.



INSPECTION GUIDELINES AND RESIDUAL STRENGTH TESTING

Regular inspections and repair as needed will extend the working life of high-performance mooring lines.

Any rope that has been in use for a period of time will show normal wear and tear. Some characteristics of a used rope will not reduce strength while others will. Below we have defined normal conditions that should be inspected on a regular basis.

The following criteria should be considered when inspecting 12-strand ropes made with Dyneema® fiber:

If upon inspection you find any of these conditions, you must consider the following before deciding to repair or retire it:

- > The length of the rope,
- > the time it has been in service,
- > the type of work it does,
- > where the damage is, and
- > the extent of the damage.

In general, it is recommended to:

- > Repair the rope if the observed damage is in localized areas.
- > Retire the rope if the damage is over extended areas.

*REFERENCES Cordage Institute International, *International Guideline CI2001-04, Fiber-Rope Inspection and Retirement Criteria: Guidelines to Enhance Durability and the Safer Use of Rope*, 2004.

Compression



NOT PERMANENT—REPAIR

- WHAT**
- > Visible sheen
 - > Stiffness reduced by flexing the rope
 - > Not to be confused with melting
 - > Often seen on winch drums
- CAUSE**
- > Fiber molding itself to the contact surface under a radial load

CORRECTIVE ACTION
Flex the rope to remove compression.

Pulled Strand



NOT PERMANENT—REPAIR

- WHAT**
- > Strand pulled away from the rest of the rope
 - > Is not cut or otherwise damaged
- CAUSE**
- > Snagging on equipment or surfaces

CORRECTIVE ACTION
Work back into the rope.

Melted or Glazed Fiber



REPAIR OR RETIRE

- WHAT**
- > Fused fibers
 - > Visibly charred and melted fibers, yarns, and/or strands
 - > Extreme stiffness
 - > Unchanged by flexing
- CAUSE**
- > Exposure to excessive heat, shock load, or a sustained high load
- CORRECTIVE ACTION**
If possible, remove affected section and re-splice with a standard end-for-end splice. If re-splicing is not possible, retire the rope.

Inconsistent Diameter



REPAIR OR RETIRE

- WHAT**
- > Flat areas
 - > Lumps and bumps
- CAUSE**
- > Shock loading
 - > Broken internal strands
- CORRECTIVE ACTION**
If possible, remove affected section and re-splice with a standard end-for-end splice. If re-splicing is not possible, retire the rope.

Discoloration/Degradation



REPAIR OR RETIRE

- WHAT**
- > Fused fibers
 - > Brittle fibers
 - > Stiffness
- CAUSE**
- > Chemical contamination
- CORRECTIVE ACTION**
If possible, remove affected section and re-splice with a standard end-for-end splice. If re-splicing is not possible, retire the rope.

Cut Strands



REPAIR OR RETIRE

- WHAT**
- > Two or more cut strands in proximity
- CAUSE**
- > Abrasion
 - > Sharp edges and surfaces
 - > Cyclic tension wear
- CORRECTIVE ACTION**
If possible, remove affected section and re-splice with a standard end-for-end splice. If re-splicing is not possible, retire the rope.

Abrasion



REPAIR OR RETIRE

- WHAT**
- > Broken filaments and yarns
- CAUSE**
- > Abrasion
 - > Sharp edges and surfaces
 - > Cyclic tension wear
- CORRECTIVE ACTION**
Consult abrasion images* and rate internal/external abrasion level of rope. Evaluate rope based on its most damaged section.
- Minimal strength loss (continue use)
 - Significant strength loss (consult Samson)
 - Severe strength loss (retire rope)
- *Refer to images on Inspection & Retirement Pocket Guide or Samson app



Request a copy of this handy reference tool from your Samson representative, or download the Samson app.



INSPECTION TOOLS AND REFERENCE MATERIALS

In addition to performing on-site inspections, Samson offers several tools to assist crews in inspecting and repairing mooring lines. From posters to display on the vessel, to pocket reference guides and online tools to a handy app for iPhone & iPad — Samson puts years of knowledge at your fingertips.



Samson offers a range of tools to assist in inspecting high-performance synthetic lines.

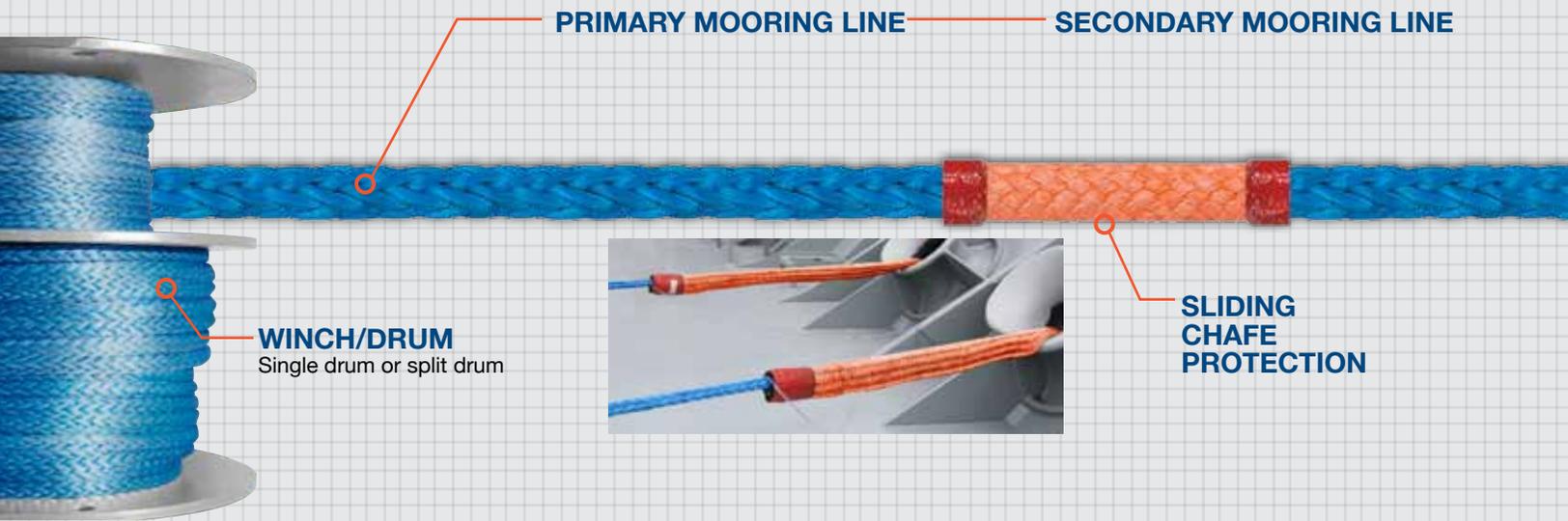
RESIDUAL TEST PROGRAM

Samson offers residual strength testing to aid operators/owners in establishing retirement criteria. Samson is home to the most robust research and development team in the industry. These resources test and analyze thousands of ropes each year. Through proper documentation and testing, your line replacement schedule will be predictable and manageable.

Samson's testing capabilities include certified elongation and breaking testing up to 1.1 million pounds.



ULTIMATE MOORING SYSTEM COMPONENTS



PRIMARY MOORING LINE

SECONDARY MOORING LINE

WINCH/DRUM

Single drum or split drum

SLIDING
CHAFE
PROTECTION



PRIMARY MOORING LINES

AMSTEEL®-BLUE

{872} CLASS II 12-STRAND

FEATURES AND BENEFITS:

- > Made with Dyneema® fiber
- > Wire rope replacement
- > Size-for-size as strong as wire
- > 1/7th the weight of wire
- > Similar elastic elongation to wire rope
- > Torque-free construction
- > Flexible
- > Easy to inspect and splice in the field
- > Floats
- > Excellent abrasion resistance

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	41.8 lb	51.7 mm	78.4 lb	87.0 lb
Weight per 100 m	62.2 kg	76.9 kg	117 kg	129 kg
ISO 2307 Strength*	83.5 t	103 t	152 t	173 t

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

AT PERCENT OF BREAK STRENGTH	10%	20%	30%
Elastic Elongation Percentage	0.46%	0.70%	0.96%

AS-78

{814} CLASS II 12-STRAND

FEATURES AND BENEFITS:

- > Made with Dyneema® SK78 fiber
- > Enhanced creep properties
- > 30-40% lighter than aramid ropes of the same strength
- > A size-for-size strength replacement for wire rope at only 1/7th the weight
- > Easy to inspect
- > Excellent abrasion resistance
- > Flexible, torque-free construction
- > Floats
- > Highly flex-fatigue resistant

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	41.8 lb	51.7 mm	78.4 lb	87.0 lb
Weight per 100 m	62.2 kg	76.9 kg	117 kg	129 kg
ISO 2307 Strength*	83.5 t	103 t	152 t	173 t

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

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PENDANT (TAIL) CONNECTION

DOCK SIDE CHAFE PROTECTION

MOORING PENDANT (TAIL)



TURBO-75

{864} CLASS II DOUBLE BRAID

FEATURES AND BENEFITS:

- > Made with Dyneema® fiber
- > 1/7th the weight of wire
- > Abrasion resistant
- > Firm construction
- > Excellent drum spooling capabilities
- > Easy to handle
- > Retains shape with use
- > Excellent cut resistance
- > Durable
- > Floats

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	43.3 lb	59.5 mm	85.5 lb	99.0 lb
Weight per 100 m	64.4 kg	88.5 kg	127 kg	147 kg
ISO 2307 Strength*	74.8 t	95.3 t	138 t	166 t

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

AT PERCENT OF BREAK STRENGTH	10%	20%	30%
Elastic Elongation Percentage	0.30%	0.50%	0.80%



TURBO-RC

{861} CLASS II DOUBLE BRAID

FEATURES AND BENEFITS:

- > Made with Dyneema® SK78 core and cover
- > Enhanced creep properties when under static load and at elevated temperatures
- > 1/7th the weight of wire
- > Abrasion resistant
- > Firm construction
- > Excellent drum spooling capabilities
- > Easy to handle
- > Retains shape with use
- > Excellent cut resistance
- > Durable

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	43.3 lb	59.5 mm	85.5 lb	99.0 lb
Weight per 100 m	64.4 kg	88.5 kg	127 kg	147 kg
ISO 2307 Strength*	74.8 t	95.3 t	138 t	166 t

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

AT PERCENT OF BREAK STRENGTH	10%	20%	30%
Elastic Elongation Percentage	0.30%	0.50%	0.80%

**ISO strength specifications are for unspliced rope. All other strength specifications are for spliced rope.*

For assistance in selecting the best line for your vessel/application, please contact your Samson technical sales representative or email CustServ@SamsonRope.com

SECONDARY MOORING LINES



**SAMSON
PATENTED
TECHNOLOGY**

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	33.0 lb	44.7 mm	60.8 lb	79.4 lb
Weight per 100 m	49.1 kg	66.5 kg	90.5 kg	118 kg
ISO 2307 Strength*	66.2 t	86.6 t	120 t	158 t

QUANTUM-12 {873} CLASS II 12-STRAND

FEATURES AND BENEFITS:

- > Made with Dyneema® fiber
- > Wire rope replacement
- > Excellent abrasion resistance
- > High coefficient of friction
- > Flexible
- > Excellent grip
- > Lightweight
- > Floats



**SAMSON
PATENTED
TECHNOLOGY**

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	41.5 lb	55.4 mm	74.8 lb	99.0 lb
Weight per 100 m	61.8 kg	82.4 kg	111 kg	147 kg
ISO 2307 Strength*	52.4 t	63.0 t	95.7 t	120 t

PROTON®-8 {830} CLASS II 8-STRAND

FEATURES AND BENEFITS:

- > Made with Dyneema® fiber
- > High strength-to-weight ratio
- > Grips winches, bits, and capstans
- > Heat resistant
- > Low water absorption
- > Torque-free construction
- > Firm, yet flexible
- > High coefficient of friction
- > Easy to splice in the field



**SAMSON
PATENTED
TECHNOLOGY**

Additional sizes available. Please contact customer service or see SamsonRope.com for specifications.

SIZE / WEIGHT / ISO STRENGTH

Diameter (INCHES)	1-5/16"	1-1/2"	1-3/4"	2"
Diameter (MM)	32 mm	36 mm	44 mm	48 mm
Weight per 100 ft	39.7 lb	51.8 mm	70.4 lb	92.0 lb
Weight per 100 m	59.1 kg	77.1 kg	105 kg	137 kg
ISO 2307 Strength*	58.5 t	83.0 t	115 t	146 t

QUANTUM-8 {863} CLASS II 8-STRAND

FEATURES AND BENEFITS:

- > Made with Dyneema® fiber
- > Wire rope replacement
- > Abrasion resistant
- > Excellent grip
- > Excellent drum spooling capabilities
- > Compression resistant on winch
- > Lightweight
- > Flexible
- > Retains shape with use

*ISO strength specifications are for unspliced rope. All other strength specifications are for spliced rope.

For assistance in selecting the best line for your vessel/application, please contact your Samson technical sales representative or email CustServ@SamsonRope.com

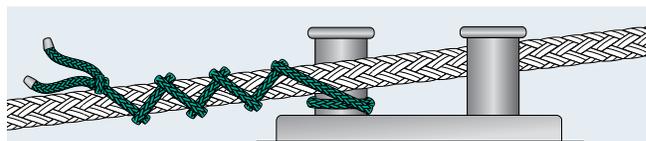
SECONDARY MOORING LINE STOPPERS

Mooring line stoppers are only for use on synthetic fiber secondary mooring lines, or mooring lines not deployed on winches. Stoppers are used to maintain the tension of the secondary mooring line while the crew removes the line from the capstan and puts the secondary line around bits or cleats. Tenex-TEC should not be used on high performance secondary lines. It should only be used on Class I secondary lines made from fibers like polyester, nylon, or a polyester/polypropylene blend like SSR-1200. AmSteel®.Blue—like all 100% Dyneema® fiber lines—has a very slippery surface with a low coefficient of friction, and will not perform well as a secondary line; hence they are normally used on winches. Samson recommends using Proton®-8, Quantum-8, or Quantum-12 for secondary lines. Due to the fact that secondary lines will be a similar diameter to primary lines, Samson recommends Tech-12 as a stopper due to its high strength and good grip.

Samson recommends that mooring stoppers be regularly inspected and retired after five years of service regardless of their physical appearance. Mooring stoppers with cut strands or other physical deformations that may severely affect residual break strength should be retired immediately.

Even though Samson stoppers come with certificates of compliance, like all synthetic ropes, strength can deteriorate. To ensure safe use of stoppers for mooring or installation of mooring lines on winch drums, care and attention to all safe rope handling guidelines must be employed.

Samson recommends that mooring stoppers be regularly inspected and retired after five years of service regardless of their physical appearance.



Standard "tie-up" method of 3/4" diameter Tech-12 on a braided mooring line. Use 1-1/4" Tenex for Class I or larger diameter mooring lines.

MOORING PENDANTS (TAILS)

EFFICIENT MOORING PENDANTS DESIGNED TO REDUCE DYNAMIC LOADS ON PRIMARY MOORING LINES

Samson recommends the use of mooring pendants with our primary high-performance mooring lines to provide elasticity in the mooring system. This elasticity provides safer operations and protection from surging and shock loading, especially in exposed mooring berths. Pendants also provide long-term performance benefits and longer service life.

KEY ASPECTS OF MOORING PENDANTS (TAILS)

- > **CONNECTION** The tails are to be connected to the primary mooring line by cow hitch (see below, or by shackle or link—typically Mandel, Tonsburg, or Boss.)
- > **RETIREMENT/RESIDUAL STRENGTH** Per OCIMF guidelines, it is recommended to retire mooring tails after 18 months of use, or prior to residual strength reduction to 60% of the original minimum break strength (MBS).
- > **STANDARD LENGTH** The standard recommended overall length for mooring tails is 11 meters (36.1 feet); however, for exposed moorings a 22 meter (72.2 foot) tail provides additional elongation in the mooring arrangement.
- > **MINIMUM BREAK STRENGTH** Per OCIMF guidelines, polyester and blended mooring tails have a 25% higher MBS, and nylon (or polyamide) mooring tails should have a 37% higher MBS than the primary mooring line.

PENDANT (TAIL) CONFIGURATIONS



SINGLE-LEG

Standard single-leg pendants have a 2 meter (6.6 foot) soft eye on one end and a 1 meter (3.3 foot) soft eye on the other end. Hardware and chafe protection can be added upon request.



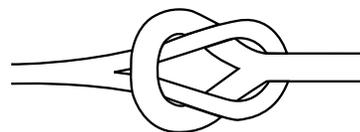
GROMMET (STROP)

Standard grommet pendants have 2 meter (6.6 foot) and 1 meter (3.3 foot) soft eyes formed by lashings. The body of the grommet is lashed together 3 meters (9.8 feet) from each eye lashing. Grommet strength is 1.6x the single-leg rope strengths. Hardware, chafe protection, and additional whipping can be added upon request.

HTP-12 PENDANT {703} is a round-plait 12-strand construction of high-tenacity polyester treated with our proprietary Pro-Gard Marine Finish. It has been tested and proven to meet the OCIMF guidelines of 85% strength efficiency for cow-hitch connections. HTP-12 is a safer, more efficient mooring pendant that provides higher residual strength when compared with parallel-core type constructions. See product details in *Samson's Commercial Marine Product Specifications*.

RP-12 NYLON PENDANT {323} is a round-plaited 12-strand construction of nylon treated with our proprietary Pro-Gard Marine Finish. This combination provides reduced wet-strength loss, improved abrasion resistance, and high energy-absorbing properties in single-leg or grommet pendants. This line meets OCIMF guidelines and, in 22 meter (72.2 foot) lengths, provides additional elongation for exposed terminal moorings. See product details in *Samson's Commercial Marine Product Specifications*.

COW HITCH CONNECTION



After properly installing the mooring lines on the winch drum, the pendants should be attached to the working end of the mooring line. This is done by a cow hitch connection per OCIMF guidelines.



It is important to choose a mooring pendant that provides adequate elongation to reduce dynamic loads induced on the primary mooring lines, especially in exposed mooring berths.

Hardware, chafe protection and extra whipping can be added to pendants upon request.



HTP-12



RP-12 Nylon



Cow hitch connection, shown with pigtailed to assist in separating the connection.

HIGH-PERFORMANCE CHAFE PROTECTION



MAXIMIZING SERVICE LIFE Samson's innovative chafe protection extends the service life of high-performance lines



SATURN DYNALENE {988}

FEATURES AND BENEFITS:

- > Made with 100% Dyneema® fiber
- > Coated with Samson's proprietary Saturn coating for enhanced abrasion resistance
- > Easy inspection without removal
- > Excellent durability
- > Lightweight
- > Flexible
- > Floats

An innovative construction that allows easy inspection without removal. Made with 100% Dyneema® fiber and coated with Samson's proprietary Saturn coating for enhanced abrasion resistance.



DC MOOR-GARD {705}

FEATURES AND BENEFITS:

- > Made with 100% Dyneema® fiber
- > Coated with Samson's proprietary Saturn coating for enhanced abrasion resistance
- > Fixed or adjustable for easy positioning
- > Easily moved for rope inspection
- > Lightweight
- > Flexible
- > Floats

Tightly-woven sliding chafe sleeve made with Dyneema® fiber provides maximum protection. Coated with Samson's proprietary Saturn coating for enhanced abrasion resistance.



DC GARD {706}

FEATURES AND BENEFITS:

- > Made with 100% Dyneema® fiber
- > Superior durability
- > Can be removed for rope inspection
- > Cut resistant
- > Lightweight
- > Flexible
- > Floats

Tightly-braided cover made with Dyneema® fiber provides maximum protection. Designed for use in applications where frequent handling and use put a premium on rope protection and resistance to snagging.

If operating in regions where extreme heat is an issue, contact Customer Service for information about Samson's TC Gard made with Technora®

SAMSON
PATENTED
TECHNOLOGY

VULCAN A synthetic emergency tow-off pendant Product Code: 893

Emergency tow-off pendants (ETOPs), commonly referred to as “fire wires,” provide a means of towing the ship away from the dock in the event of a fire. Wire rope is currently used in this application; however, the handling of these heavy wire ropes has resulted in many injuries to deckhands. Samson has developed a synthetic alternative called Vulcan, which is significantly lighter and eliminates “fish-hooks,” broken wires that protrude from the wire rope that result in hand injuries. Maintenance costs are also reduced when using synthetic ropes in comparison with wire ropes. The patented synthetic ETOP Vulcan is made of Technora® fiber in conjunction with a proprietary fire-resistant coating that meets the OCIMF required breaking strength after exposure to flames and a high-temperature environment. Contact customer service for order assistance and pricing.



*2011: SeaTrade Award
Finalist for Innovation in
Ship Operations, Vulcan
Emergency Tow-Off Pendant,
Seatrade Magazine*

technora®
The Power of Aramid

ETS: EMERGENCY TOW SYSTEM
An emergency kit for your vessel

Samson’s Emergency Towing System (ETS) offers a complete package in compliance with resolution MSC.35(63) of the 1994 Solas Convention. Proven AmSteel®-Blue towlines and high visibility messenger lines provide the strength and durability to do the job while remaining light and easy to handle. In one easy to store container, this ETS has a total assembly weight of 492 lb (224 kg) or 1,060 lb (480 kg) with all the necessary equipment for quick deployment. AmSteel®-Blue towlines are class certified to ABS and DNV Standards.

KIT INCLUDES:

- > AmSteel®Blue main towline
- > 400 feet of 5/8" diameter AmSteel®Blue messenger line
- > Durable, insulated polyurethane tote
- > Lighted retrievable buoy



This easy to store kit includes all the necessary equipment for quick deployment.

SAMSON & DSM DYNEEMA:

Strong relationship delivers customer benefits



Samson and DSM Dyneema—redefining the strongest and safest rope for maritime solutions.



The strong and successful partnership between Samson—“The Strongest Name in Rope”—and DSM Dyneema—Creator of Dyneema® “The World’s Strongest Fiber”—is delivering innovative, high-quality solutions for customers around the world.

As a leader in rope design and manufacturing, Samson has a long history of supplying synthetic lines made with Dyneema® to all markets, with a proven track record of high performance and long service life. In the LNG marketplace, the two companies have collaborated since 1996, when AmSteel®-Blue was developed to take full advantage of the benefits of 100% Dyneema®, and quickly became the most trusted steel wire rope replacement on the market.

According to DSM Dyneema President Gerard de Reuver, Samson was DSM Dyneema’s first ever trademark license partner: “Samson’s incorporation and promotion of the Dyneema® brand and materials with their high-quality products have been instrumental in the success of DSM Dyneema in the rope and LNG mooring line markets.” Mr. de Reuver adds: “In fact, the total volume of business we have done with Samson, currently makes the company the single largest DSM Dyneema customer.”

Samson President, Tony Bon adds: “Samson has been working with DSM Dyneema since we converted our first tanker fleet to AmSteel®-Blue in the 1990s. DSM is our largest supplier, and through our partnership we leverage each other’s application knowledge and technical capabilities through joint development and testing programs. This collaboration has allowed us to deliver the best combinations of fibers, rope constructions and coatings to our customers, resulting in improved performance, reliability, and service life.”

FOR MORE INFORMATION



SamsonRope.com
We’ve put all our information here for easy downloading for anyone with access to the web. We think it is the best resource for information on high-performance synthetic ropes available anywhere.

- > Rope specifications
- > Product breakdowns by application and industry
- > Technical bulletins
- > Case studies
- > Splicing instructions



Detailed product information and specifications are available in Samson’s *Commercial Marine Products*.



Samson App

For the iPhone and iPad this handy app features:

- > Inspection and retirement criteria
- > Internal and external abrasion inspection information
- > Splice instructions

Download it at SamsonRope.com



AmSteel® is a registered trademark of Samson Rope Technologies, Inc.
Dyneema® is a registered trademark of Royal DSM N.V.
Dyneema® is DSM’s high performance polyethylene product.

CORPORATE HEADQUARTERS
2090 Thornton Street, Ferndale, Washington 98248 USA
Tel +1.360.384.4669 | Fax +1.360.384.0572 SamsonRope.com

