KATRADIS MARINE ROPES INDUSTRY S.A.

USER'S MANUAL

MOORING TAILS

-NIKA-Nylon

-NIKA-Polyester

-Mixed Polyester/Nikasteel®

USER'S MANUAL

The use of mooring tails is highly recommended with low elongation lines, such as steel wire ropes and high performance synthetic ropes (UHMWPE, Aramid and LCP) for the mooring of the tankers, LNG's & LPG's, but also for the Cruise ships & Bulk Carriers. Synthetic tails provide the necessary elasticity and safety in the mooring system and therefore lower the peak loads on the main mooring line. This elasticity provides protection from surging and shock loading to the main mooring rope and deck equipment and safer operation especially in exposed mooring berths. Tails also provide long-term performance benefits and longer service life of the lines attached to them (reduction of the peak loads, wear mitigation).

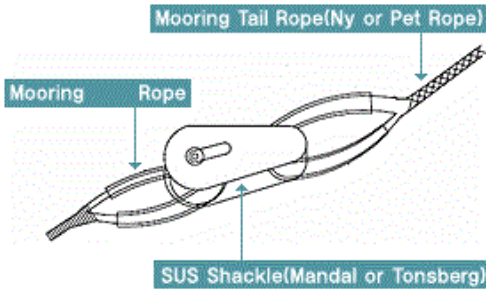
Tails may be constructed from various materials of moderate to high elasticity, including Polyester, Polyester/Polyolefin composites or Nylon (Polyamide).

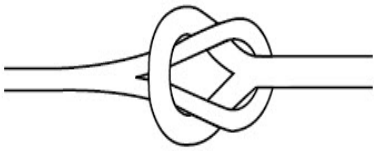
Tails should be properly matched to the mooring line to which they are attached. Tails of different lengths should be used depending on the location of the berth.

CONNECTION TO THE MOORING LINE

The tails are connected to the working end of the primary mooring line, after the latter has been properly installed on the winch drum, either by cow hitch or by shackle or link. Cow hitch connection needs special preparation in order to reduce the pressure from the points of contact between the 2 ropes. Aramid ropes must not be connected by cow hitch due to the localized bending fatigue, axial compression and crushing phenomena imposed on the fibers.

Cow Hitch connection of UHWPE NIKA-SIRI® S-12 with NIKA Nylon tail





IMPORTANT: Ground/ dock personnel that handle the mooring tail must make sure that the tail-rope line has no induced twisting. If twists have been induced, care must be taken to straighten the assembly by rotating the tail until both parts (tail and primary mooring rope) are in a straight-line status with no twists. If twists are left on the assembly, the primary mooring line's strength will be reduced by as much as 7% per turn per meter.

OUR MOORING TAILS ARE ACCORDING TO THE LATEST REGULATIONS AND RECOMMENDATIONS OF OCIMF FOR THE SAFE MOORING OF THE TANKERS, LNG & LPG VESSELS.

"STANDARD" LENGTH

The standard recommended overall length for mooring tails is 11 meters. However, for exposed mooring berths a 22 meter tail provides additional elongation in the mooring arrangement and is considered as standard for such open berth moorings. However, specific projects may require even longer tails due to special conditions. Dedicated ships in these situations may be equipped specifically beyond the "standard" considered lengths.

REMARK: For the tails, the length supplied is measured as slack on deck and not under tension as per ISO 2307.

MATERIALS USED & MINIMUM BREAKING LOAD REQUIREMENTS

According to OCIMF guidelines, synthetic mooring tails made of Polyester and Polyester/Polyolefin composites must have at least 25% higher MBL, and Nylon (Polyamide) 37% higher MBL than the primary mooring line to which they are attached. It has been proven by various tests that tails can suffer a substantial reduction in breaking strength in a relatively short period of time.

TAIL CONFIGURATIONS

Single-Leg

Standard single-leg tails have a 1.8 meter (6.0 foot) soft eye on one end and a 0.8 meter (3.0 foot) soft eye on the other end protected with special NIKA Eye Protectors. Terminations on either end and abrasion (chafe) protection on the body can be added on request. Splices must have at least 5 tucks each.

Grommet

Standard grommet tails (also called strops) have 1.8 – 2.0 meter (6.0 - 6.6 foot) and 0.8 – 1.0 meter (3.0 - 3.3 foot) soft eyes formed by lashings. Eyes are adequately protected with special NIKA Eye Protectors. 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. Terminations, abrasion (chafe) protection on the body and/or additional seizing can be added on request.

MOORING TAIL CONSTRUCTIONS

NIKA-Nylon tails (non-floating) are produced from LR Type Approved ropes in 8-strand and in 12/24-strand constructions. Double braided construction is also available upon request. Nylon yarn material used is an Industrial bright white continuous filament high tenacity yarn of minimum 9 gramsf/denier, adequately UV stabilized and thermostabilized. When wet, Nylon loses approx. 10% of its dry strength, which is recovered when dry again. Elongation at breaking load is approx. 30% (15% at 50% of MBL). NIKA-Nylon, due to its snapback reaction, has been tested in-house, connected to UHMWPE NIKA-SIRI® rope with cow hitch and there was no impact in the cow hitch connection (the UHMWPE NIKA-SIRI® rope broke at its specified load far from the cow hitch connection).

NIKA-Polyester tails (non-floating) are produced from Polyester ropes in 8-strand and in 12/24-strand constructions. Double braided construction is also available upon request. Polyester yarn material used is an Industrial bright white continuous filament high tenacity yarn of minimum 9 gramsf/denier, adequately UV stabilized and thermostabilized. When wet, Polyester retains its dry strength. Elongation at breaking load is approx. 18% (9% at 50% of MBL).

Mixed Polyester/Nikasteel (Special Polyolefin grade) tails are produced from Polyester & Nikasteel® combination ropes in 8-strand and in 12/24-strand constructions. There are various types available with different floating & strength properties. Polyester yarn material used is an Industrial bright white continuous filament high tenacity yarn of minimum 9 gramsf/denier, adequately UV stabilized and thermostabilized. Nikasteel® fibers are a special melt mixture of high quality European raw materials (Polypropylene, High Density Polyethylene, UV stabilizer and other improving elements). HDPE contents min 15% - max 50% as per EN ISO 10572. When wet, Polyester & Nikasteel® retain their dry strength. Elongation at breaking load is approx. 18% (9% at 50% of MBL).

All our ropes & tails are UV stabilized at 160 KLY suitable for Dubai & Florida sunshine.

The high quality of the raw materials used in all rope constructions, the diligent production and high quality control levels as per LRQA ISO 9001 & own standards, result in higher residual strength when compared to competitor's tails, improved abrasion resistance and energy absorption.

MAINTENANCE, STORAGE & INSPECTION

After each use, please inspect the full length for signs of abrasion, cuts or for possible chemical contamination. Always wash with fresh water and let dry in order to remove any dirt or sea salt (that will act as "razors" and damage the fibers when dry).

Store the tails in a clean environment, under mild environmental conditions (avoid storage in high temperatures) and away from direct sunlight.

Store the ropes away from heat generating sources and acid (especially sulfuric acid) and alkaline environment. Good ventilation of the storage place is also preferable

CAUTION: Do not cover the tails if wet, especially the Nylon and do not leave them connected to the primary mooring line on the winch drum.

For more details, please consult our Synthetic Rope User's Manual on our site:
http://www.katradis.com/download/Manual_Synthetic_Ropes_2.1_EN.pdf

RETIREMENT & RESIDUAL STRENGTH

According to 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 load (MBL). Discard / retirement criteria are described in Annex A.

Brief description of manufacturing & fabrication process

The manufacturing process follows ISO 9001:2008 quality system and includes the following basic production steps:

- The twisting level where the yarns are twisted in twisting machines
- The stranding level includes the construction of the strands in special one-for-one stranding machines.
- The braiding of the rope is completed in the braiding level in Herzog's braiding machines
- Then, the rope coil is weighed and specimens are prepared for breaking load testing
- After all quality control tests have been satisfactorily finalized, we place the coil on a rotating base, unlay and measure the required length (for the slack on deck final length). Then the special NIKA Protectors are inserted for each eye splice section, the eye splice is formed (with minimum 5-tucks fabrication per splice). Then follows the marking and packaging to give a complete final product which is taken away for storage and/or transport.

Description of quality control arrangement

The product quality control involves the following quality control steps/procedures:

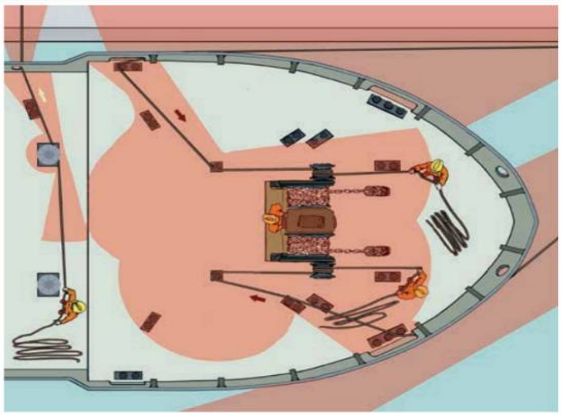
- Tenacity testing of the ***yarns***.
- Yarn-To-Yarn abrasion test of the ***yarns***
- UV resistance tests of the ***yarns***
- Breaking strength testing of the rope yarns (***twisted yarns***)
- Breaking testing of rope specimens per batch order.

Table 1. Tail constituent yarns technical information

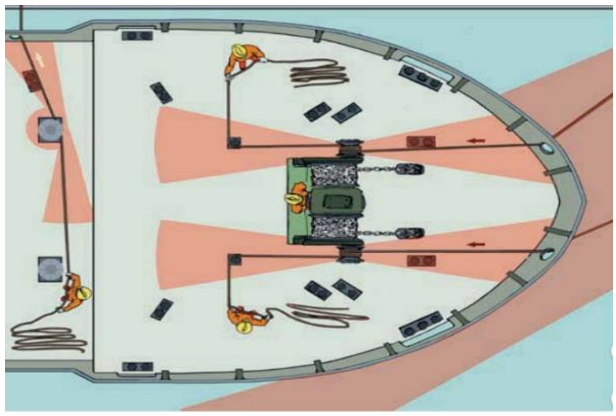
Property	Nylon	Polyester	Nikasteel®
Density	1,14 kg/dm^3	1,38 kg/dm^3	0,92 kg/dm^3
Tenacity	> 9gr/den	> 9gr/den	> 8gr/den
Elongation (at break)	30%	18%	18%
Melting point	218 ^{0}C	265 ^{0}C	165 ^{0}C
UV resistance	Excellent	Excellent	Excellent

Safety issues

STAY AWAY from the snap back area, as indicatively shown in the drawing below, when the line is under tension. The primary mooring UHMWPE ropes have a very reduced snap back reaction, limited and almost negligible, however, but the connected tails absorb energy and will snapback.



IT IS IMPOSSIBLE TO WORK THE LINES WITHOUT THE CREW STANDING IN SUCH LARGE SNAP BACK ZONES.



THE CREW CAN WORK THE LINES WITHOUT STANDING IN THE SNAP BACK ZONES.

Any work that must be performed near to a line under tension, must be done very quickly and with extreme caution.

ANNEX A – DISCARD / RETIREMENT CRITERIA

ROPE TYPE AND CONDITION	Resplice (if localized)	Retire
For 12strand ropes		
-Bulk of surface yarns or strands reduced by 50% or more for a linear distance equal to the rope diameter	X	X
-Rope suspected of being shock loaded		X
-Exposure to excess temperature as specified for type of fibre		X
-Burns or melting visible for a length of over four rope diameters	X	X
-Abrasion on inside radius of eye, with bulk of surface yarns or strands reduced by 50% or more	X	X
-Rust on nylon (might indicate chemical damage)	X	X
-Oil and grease	Wash in mild detergent	
-Heavy surface fuzz-progressive	X	X
	Remove source of abrasion	
-UV degradation, splinters on yarn surface		X
For braided cover and core ropes		
-More than four consecutive pulled cover stands (which cannot be reincorporated into cover braid)	X	X
-More than 3 cut cover strands	X	X
-Multiple cut yarns of filaments within distance of one pitch length	X	X
-Core visible through cover, because of cover damage		X
-Core damage-pulled, cut, abraded, powdered, or melted strands		X
-Herniation-core pokes through cover (sheath)		X
-5% of yarns cut or badly abraded in score between strands	X	X

-Cover yarns cut or abraded more than 50% on one or more crowns of rope	X	X
-Strand cut to 5% of diameter within one lay length	X	X
-Powdering between adjacent strand contact surfaces	X	X
-Hockle or backturn	X	X
-10% abrasion of one strand within one lay length	X	X
Thermal damage		
-Hard, melted, flattened areas of the rope which can indicate serious damage to the rope	X	X
-Melting or fusing affecting 20% or more of rope yarns		
--If within one lay length	X	
--If over more than one lay length		X
Short-term exposure to temperature above 65 ˚C		X

Information regarding packaging and traceability

The marking on the tails consists of **metal labels (2 metal labels per tail)** where the unique code number of is marked permanently for traceability purposes. This marking is being carried out in a way that it is visible, legible and indelible. This unique product code number is the reference to the manufacturer's certificate.