

# USER'S MANUAL

## GUIDE TO INSTALLATION, HANDLING AND INSPECTION OF ACERA HIGH PERFORMANCE ROPES



### High performance mooring solution

Since HMPE ropes were first introduced into the market, its usage has become widespread in many applications. HMPE ropes have not only replaced wire ropes, but have also replaced many traditional fiber ropes. The main reasons for this have been safety and long term cost savings. Although the initial cost of using HMPE is higher, the long term savings on maintenance, environmental costs, and safety make HMPE a worthwhile investment.

HMPE offers many advantages; such as, light weight, high strength, floats, excellent abrasion resistance, and resistance to UV.

### Changing from Wire Mooring to HMPE Ropes

When changing from steel wire mooring to HMPE, all deck surfaces and equipment that have been in contact with steel must be grinded and repainted. Synthetic rope provides some advantages over wire in the way it interfaces with deck equipment. Wire rope will eventually cut through the deck hardware and expose the core subjecting it to rust and other damage. The sharp edges created by the metal on metal contact can damage synthetic ropes as well as personal injury.

While synthetic rope will not cause these negative effects, should the end user want to convert the vessel from wire to synthetic rope, surface preparation is needed prior to installing synthetic rope. Extra chafe gear is also recommended such as the Timm™ Chafe Guard. Timm™ Chafe Guard is designed to protect ropes from surface abrasion when in contact with steel surfaces like chocks, leads and bitts. The Timm™ Chafe Guard is made from cross woven, reinforced, high- tenacity polyester for added protection.

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### Some other considerations using a synthetic rope

When using synthetic ropes on a winch, there are many things to consider including the rope's coefficient of friction and how the line stacks on the drum, especially when used on a split drum winch system. This is due to the impacts the number of wraps needed, in order to prevent slippage from the working side to the storage side of the drum and the subsequent compression and damage to the line. With any HMPE rope, at least 6-10 wraps are recommended on the working side of the drum. In addition, the flange between the working and storage side of the drum should have fairings that are rounded to prevent acute bending.

#### Important areas that will need extra attention and smooth surface:

- > Winch drum and flanges
- > Storage part of the mooring drum
- > Bitts, guide rollers and roller fair leads
- > Chocks and bollards

### Mooring Rope Installation

After surfaces have been prepped, the mooring rope 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 on the rope. As the line is wound onto the winch, it should be closely packed to minimize areas where the rope may bury into the layers of the winch. Install each layer in the gaps of the previous layers or crossed over each other to support each subsequent layer. Never stack the layers on top of each other.

Every precaution needs to be taken to prevent twist from being introduced into the mooring rope during use. Twist is often overlooked as a contributing factor in the reduced life of HMPE mooring ropes. Installing rope on the winch at sea between ports, a round table or a hanging swivel is required to avoid any twist on the mounted ropes.

### Use of Mooring Tails

When HMPE ropes are used as mooring, a synthetic tail in combination as a stretcher is required.

OCIMF recommendations of MBL for synthetic mooring tails are 25% higher than that of the mooring rope to which they are attached. For nylon mooring tails, the equivalent number is 37% higher than the mooring rope. Reason being that fatigue analysis has shown that cyclic loading subjects mooring tails to a higher rate of fatigue resulting in reduced strength over time. Stretchers go often under the term weak link, and tests conducted on failures have revealed that mooring tails can undergo a substantial reduction in breaking strength in a relatively short period of time.



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Careful management is required to ensure that the integrity of the mooring configuration is not compromised. In typical mooring arrangements, the weakest link is the winch breaks that is set to release at 60% of the MBL of the mooring rope. The strongest point is often the Timm™ Boss Link shackle used to connect between the mooring rope and the mooring tail. As a connection between mooring rope and stretcher, stretchers can also be cow hitched to the HMPE rope.

### Inspection Procedures for HMPE Ropes

It is recommended to have a conservative approach when evaluating a rope. Careful consideration should be taken before making recommendations for further use. Visual inspections can only provide an estimation of the rope's condition. Residual strength can only be measured through destructive test methods.

#### **Maintain an effective inspection and maintenance program, where following should be considered:**

- > Appoint a qualified inspector
- > Establish training requirements
- > Establish written procedures for periodic evaluation
- > Keep a logbook with inspection results, dates and signatures
- > Keep record of the number of operations, time of each operation and relevant external factors
- > Keep record of unusual events that may have damaged the rope

A visual inspection can only identify visible damages to the rope, unless a sample of the rope is sent in for laboratory testing. A visual inspection cannot detect previous exposure to variables such as peak load or heavy handling, and remaining break strength can only be identified through conducting a destructive break test. Overloading, shock loading, impact loading, long duration of sustained loading, and heat exposure are examples of unusual events that may damage the rope.

It is therefore highly recommended to monitor the rope with respect to the points mentioned above. Log information together with a visual inspection lays the best foundation for establishing accurate and well justified recommendations.

The easiest way to visually inspect fiber rope is to do it when the rope is spooled onto the drum after an operation. It is recommended to carry out a visual inspection of the rope after each operation. In addition it is recommended to lay the entire rope out flat on a smooth surface for visual inspection with certain intervals. However, the end user should decide inspection intervals based on technical

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circumstances, external conditions, expected number of connections and log results at each set interval.

### Inspection Points

All rope will be severely damaged if subjected to rough surfaces or sharp edges. In use, rope should be inspected regularly for evidence of twisting, external wear, cuts, chafe, surface abrasion, etc. During an inspection we recommend the inspector to monitor the condition of the Timm™ Acera™ rope with regards to the following points:

- > Splice terminations
- > Protective jacket
- > Abrasion or cuts
- > Kinks, twisting, knots, deformation
- > Heat damage

### External abrasion

The outer filaments of the rope will quickly fuzz up after usage for ropes without protective jacket.. This is due to surface filaments breaking and roughening the surface of the rope and creating a cushion shielding the fiber underneath.

This condition should stabilize and not progress. If the surface roughness increases, excessive abrasion is taking place and strength is being lost. When inspecting this, the following parameters should be taken into account:

- > Look for strands that have suffered more excessive abrasion than what can be expected. Note the amount, location and measure the outside diameter.
- > Look for broken strands. Note the type and depth of damage, amount of broken strands, frequency, and location.

Inspections of rope with jacket can use the same method as listed above. Instead of measuring strands, the inspector measures the area and condition of the jacket instead of strands. With regards to external abrasion, one might assume that if the protective jacket is unharmed, the rope inside is unharmed as well. This will not always be the case as heat damage can occur on the center HMPE core and not show on the outer jacket.

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### Step-by-step: Installation Guide

#### To do before installation:

In case new ropes are not installed immediately, store them in a dry and clean area, preferably under deck. Before new installation, check all steel deck equipment for eventual rust and sharp steel edges caused by steel wires and remove thoroughly by grinding/blasting.

Make sure that rollers in fairleads actually roll and assess if there is no risk that the rope gets stuck in the space between the rollers and the fairlead body, which then could deteriorate the rope. Also make sure that newly painted deck equipment is well painted and smooth.

#### To do at installation on split drums:

Uncoil the rope, preferably from the outside, using a turntable or by lifting up employing a swivel. (Uncoiling the rope from the inside is not so critical for 12-strand braided constructions, but it can cause problems with over-braided ropes).

Bring some tension on the rope by wrapping it around a bollard or capstan. The tension should not necessarily be more than hand-tension. A rope-stopper can also be used to create tension. When spooling the rope onto the winch, guide the rope in place on the storage drum and avoid the rope from tipping, which causes torsion.

Make sure that the first 2-3 layers are very tight, and follow up with cross-overs to avoid that the upper layers get stuck in between the layers below.

From the storage drum, spool over 1 layer (with a minimum of 6-10 turns) onto the working drum.

#### To do after installation:

Timm™ Acera™ ropes do not require much maintenance. A visual inspection after each operation upon coiling the rope back up on the drum is sufficient.

Extra attention shall be paid to those spots where the rope touches the steel (fairleads, bollards, capstans), especially when the rope comes out in the fairlead at the same spot all the time.

For places with heavy wear, Timm recommends to apply loose heavy duty protection sleeves with Velcro closing that can be moved over the rope. These Power Guard sleeves can be supplied for different rope dia-meters and in different lengths.

It is recommended to sometimes have a look inside the rope to assess if there is powdered fiber, sand or dirt inside the rope. This shall only be done with the fingers and never with tools. Powdered fiber indicate internal wear/abrasion. Signs of internal abrasion requires immediate attention.

### Step-by-step: Damages and Repair

A fiber rope is a soft product that is susceptible to damage. If damaged, it is important to assess how severe the damage is, and if the rope can continue in service without serious danger for personnel or to the ship itself.

First, it must be noted that the surface of Timm™ Acera™ ropes will become woolly. This is not damage; the wholly top layer provides protection to the fibers underneath.

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### Damages that do not, or hardly, affect the strength of the rope are:

- > Compression
- > Pulled out yarns or strands (if not broken)

### Damages that DO affect the strength of the rope are:

- > Surface abrasion of 10% or more
- > Melting as result of overloading or rope-on-rope abrasion under tension crossings
- > Cut yarns or strands more than 10%
- > Knots (decreasing the breaking load with 50%)

### To do in case of break:

Depending on where the rope broke, the cut section can be removed and the rope can easily be re-spliced in accordance with the manufacturer's instructions.

In case the rope breaks in a very critical moment (for example during a towage), re-splicing the rope takes too long time. In that case, as a last resort, a knot can be made. But remember that the breaking load in that case is reduced with 50%.

### Summary:

- > Avoid putting on Timm™ Acera™ ropes without having checked all steel deck equipment for rust, sharp edges and metal burrs, or on new parts that have not been painted well.
- > Don't use Timm™ Acera™ ropes on roller fairleads that do not roll or have a too small diameter. Timm™ recommends a diameter not less than 4 times the rope diameter.
- > Do not install Timm™ Acera™ ropes in positions where the ropes have to work together with conventional winch lines and/or mooring ropes. As conventional ropes have a larger elongation, ropes with Timm™ Acera™ will take most of the load and risk breaking.
- > Avoid more than one layer of rope spooled onto the tensioning part of the split drum winch. The top layer will only be drawn in between the lower layers and will get stuck.
- > It is recommended to not constantly exceed a Working Load of 20% of the new rope strength.
- > Try to avoid the rope being exposed to peak loads (shockloads).
- > In general, avoid using ropes that show signs of wear all over. If it is just on a specific spot, consider to cut out the bad spot and re-splice the rope.

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