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PRODUCT INFORMATION

USER INFORMATION

Mooring ropes in service

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Mooring ropes in service

Selection

At the time of publication of this brochure few uniform international rules are in force relating to mooring ropes on sea going vessels, despite this field being most sensitive to personal and environmental safety. Aside from guidelines released by classification societies, which cover little more than minimum requirements, on the following pages we take account of recommendations in the OCIMF's 'Mooring Equipment Guidelines' and the international standard ISO 3730 'Mooring Winches' in respect of ropes with special properties making them suitable for mooring operations. The subjects 'mooring' and 'towing' appear in this chapter deliberately, in view of the developments and growing importance of synthetic textiles in this area. Furthermore, we find it appropriate to make comparisons with steel rope in this context, although this is also treated in a separate chapter.

Even prior to vessel construction the design and selection of all deck equipment is closely coordinated with the characteristics and service conditions of rope materials.

Hence the positioning and specifications of winch drums, rollers and chocks must satisfy requirements of mooring ropes in terms of size, flex, dynamic load properties and material. Efficiency and life of ropes depend critically on how rope guiding equipment and winches, in particular automatic winches, are conditioned, controlled and maintained.

In view of the large (almost confusing) variety of synthetic ropes on offer today, it makes sense to break down into categories:

- SWR = Steel Wire Rope
- TWR/HMPE = Textile Wire Rope
- TF1 = Textile Fibre Rope with high wear resistance
- TF2 = Textile Fibre Rope with medium wear resistance
- TF3 = Textile Fibre Rope with low wear resistance

The charts under 'Textile ropes in comparison' (elsewhere in this chapter) and 'Mooring ropes for seagoing ships' (next page) provide assistance in selection of and dimensioning for mooring lines.

The table 'Mooring ropes for seagoing ships' on the following page offers a summary of data that can also be applied to any conventional types of vessel, in consideration of any further factors which may have an influence. Due to the variety of rope constructions, the table lists no rope sizes (diameters) as these are indicated in other rope data tables in this chapter.

Notwithstanding the above, wind, current, tides, swell, and ice each generate forces acting on mooring systems that can hardly be calculated accurately enough to allow the perfect mooring arrangement to be designed. Consequently, when selecting mooring ropes, an adequate safety margin should be taken into account.

Dimensioning

Recommended diameter

Winch drum diameter (first value), bending diameter of rollers and chocks (second value), relative to rope diameter of

- Steel Wire Rope SWR 12-16/10-12
- Textile Wire Rope TWR 6-10/4-6
- Fibre Rope HMPE-type 6-10/4-6
- Fibre Rope PP-type 4-6/4
- Fibre Rope PA-/PET-type 6/4-6

Actual rope force

Recommended maximum force acting on the rope, value relative to minimum breaking force of rope:

- Steel Wire Rope SWR 0,55
- Textile Wire Rope TWR/HMPE 0,55
- Textile Fibre Rope TF1 0,50
- Textile Fibre Rope TF2 0,475
- Textile Fibre Rope TF3 0,45

Drum load

Recommended minimum breaking force of rope, value relative to drum load of mooring winch:

- Steel Wire Rope SWR 3,75
- Textile Wire Rope TWR/HMPE 3,75
- Textile Fibre Rope TF1 4,1
- Textile Fibre Rope TF2 4,3
- Textile Fibre Rope TF3 4,5

Optimum deployment

For an optimum mooring line arrangement, the following rules must be observed:

- Alignment of ropes as symmetrical as possible to mid-ship position
- Smallest possible inclination of all lines to horizontal level of vessel
- Transverse lines positioned as vertical as possible to longitudinal axis of vessel
- Spring lines positioned as parallel as possible to the longitudinal axis of the vessel
- All lines in use should be of same size and material. (Possible exceptions: long bow and stern lines, as well as spring lines in view of their differing longitudinal alignment)
- Long bow and stern lines contribute little to load bearing

The contents of this chapter are meant to serve as a supplement to, not a substitute for, local, national, and international legislation established by appointed bodies such as port authorities, classification societies, etc.

Special considerations

- Use steel ropes (minimum elongation) or elongation-resistant textile fibre ropes (e.g. HMPE, Dyneema) where loading facilities require vessel to remain in fixed position.
- Use textile wire rope or textile fibre rope with high dynamic load resistance in ports with intensive surface or ground swell.
- The breaking force of stretchers used in connection with steel wire ropes to increase elasticity of the complete line should exceed the breaking strength of the steel rope by minimum 37% for polyamides (nylon, perlon) and 25% for all other synthetics.
- Rope-to-rope connections must be properly spliced, not knotted
- No splices between a steel rope and a textile rope.
- Use thimbles, or preferably special links (Fairlead shackles) to connect steel with textile rope.

Mooring ropes for seagoing ships

Summary

Mooring Winch	Mooring Rope							Ship
	Type and Category					Transverse Lines (without Spring, Bow and Stern Lines)		
	SWR Steel Rope	**TWR** atlas dura winchline duraflote	**TF1** hmpe ti-flex	**TF2** Polyamide Polyester powerflote cx powerflote clt	**TF3** Polypropylene powerflote			
Drum Force	Breaking Force					Qty.	Length	Size
kN	kN	kN	kN	kN	kN	pce	m	tdw
50	190	190	210	220	230	6	180	10.000
80	300	300	330	350	360	6	200	15.000
125	470	470	520	540	560	7	200	25.000
160	600	600	660	690	720	8	200	40.000
200	750	750	830	860	900	8	220	75.000
250	950	950	1050	1090	1140	10	220	120.000
315	1180	1180	1300	1360		12	220	150.000
400	1500	1500	1650			14	250	200.000
Breaking Force rel.:	1,0	1,0	1,1	1,15	1,2			

Distinguishing between different rope constructions and classification into categories is useful in helping to compensate lower wear resistance by increasing breaking force, or vice versa, to finally achieve maximum safety. Characteristics like resistance to flexural fatigue, cyclic dynamic loading, friction and wear are factors enabling correlation of breaking forces and stress actually applied to a mooring rope.

General information on handling and maintenance, inspection and discard criteria are covered separately in the chapters 'Textile ropes in service' and 'Steel ropes in service'