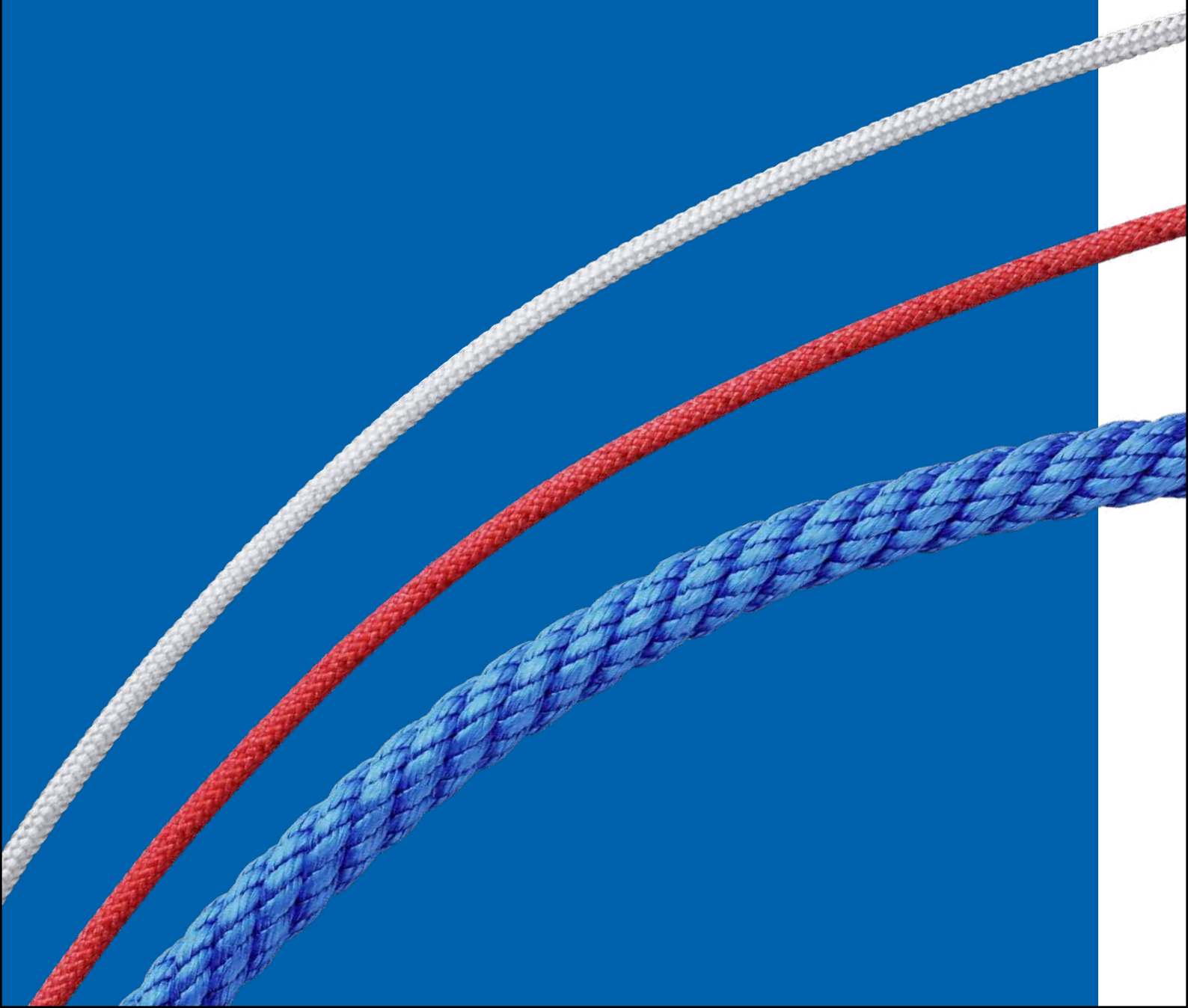


Technical information sheet

# Synthetic Fiber Ropes in Indoor Swimming Pools



# Kunstfaserseile in Hallenbädern

## Initial situation

Stainless Steel and galvanized materials can only be used to a limited extent in indoor swimming pools, as they corrode at an accelerated rate in the chlorinated, moist environment. Moreover, corrosion on stainless steel is hardly visible, so that Jakob Rope Systems does use any stainless steel products for safety-relevant tasks or suspensions above people in this environment.

However, some synthetics are quite suitable for use, for example, as ropes in indoor swimming pools. Information on materials, application limits and inspection possibilities is given below.

## Materials

Polyolefins such as polypropylene (PP) or polyethylene (PE) have proven themselves as materials, e.g. in water sports nets. These are known for their good resistance to acids and alkalis, and in addition, they almost do not swell.

For safety-relevant applications, however, higher-quality materials, preferably Dyneema, should be used. The fiber manufacturer DSM has carried out extensive tests with various chemicals in which the fibers were exposed to the substance for several thousand hours and the breaking strength was usually not impaired.<sup>1</sup> The company Tridelta Siperma indicates a good resistance to aqueous chlorine solutions at 20°C for PE-UHMW materials.<sup>2</sup> We therefore recommend the use of Dyneema SK 78 ropes for swimming pool applications.

## Conditions of use, inspection and discarding

**Safety factor:** According to the Machinery Directive, "The working coefficient of textile fiber ropes or belts [...] is normally 7 [...]."<sup>3</sup>

A further restriction is given, for example, by DGUV Information 215-313: here the so-called intrinsic safety is achieved by doubling the operating coefficients. For ropes and webbing made of textile fibers used to suspend loads above people, a safety factor of at least 14 should therefore be provided.<sup>4</sup>

For a spliced eye, another 20% must be deducted from the specified breaking force of the rope. The total safety factor between the maximum expected load and the specified minimum breaking load of the rope should therefore be 17.5.

**Temperature range:** Dyneema ropes must not be used above temperatures of 70°C, since the material slowly loses strength and the coating begins to flow out.<sup>5</sup> Caution is therefore advised in the vicinity of headlights and/or warm electric cables!

**Rope diameter and construction:** Many high-strength fiber ropes already offer good load-bearing capacities with 2–3 mm diameter, but the ropes should be easily visible and controllable. Therefore, a minimum diameter of 5 to 6 mm should be provided regardless of the load. As a general rule, braided ropes should be used as a preferred rope construction, as these do not untwist under load. Twisted / layed constructions should be avoided.

**Inspection:** The ropes should be inspected regularly, e.g. annually, for fringing and deformation at the end connections and on the free section. Fringing is an indication of external damage or wear to the fibers. Deformation such as local diameter reduction, waviness or cork-screwing already indicate broken yarns. In this case, the rope must be replaced immediately.

Since the use of high-strength fiber ropes in swimming pools is still a new field, we recommend that a suspension rope should be subjected to an annual tensile test during the first years of operation in order to detect any deterioration in good time. As a general rule, we recommend that textile fiber ropes should not be used permanently for more than 10 years and should therefore be replaced regularly.



Fig. 1: Example of fringe formation. [Jakob AG / Uni Stuttgart]



Fig. 2: Example of waviness. [Jakob AG / Uni Stuttgart]

## Summary

Fiber ropes made of Dyneema SK 78 can be used under certain conditions as suspension elements in indoor swimming pools. In particular, the maximum temperature range of 70 or 80°C and the higher safety factors of at least SF 17.5 compared with steel products should be taken into account. In the first years of operation, one rope should be tensile tested annually in order to detect any changes in breaking strength in good time.

<sup>1</sup> Chemical resistance of UHMWPE fiber from DSM Dyneema, cis ya101, 01.01.2016

<sup>2</sup> Beständigkeit von Siperma HP gegen Chemikalien und andere Medien, <https://www.siperma.com/ger/downloads/Siperma-HP-Chemische-Bestaendigkeit.pdf>, 2017

<sup>3</sup> Richtlinie 2006/42/EG vom 17. Mai 2006 über Maschinen (Maschinenrichtlinie), § 4.1.2.5 c)

<sup>4</sup> DGUV Information 215-313, Lasten über Personen Sicherheit bei Veranstaltungen und Produktionen von Fernsehen, Hörfunk, Film, Theater, Messen, Veranstaltungen. März 2017. § 1.2 und 2.1

<sup>5</sup> LIROS Unlimited Rope Solutions, Gesamtkatalog 2017/2018