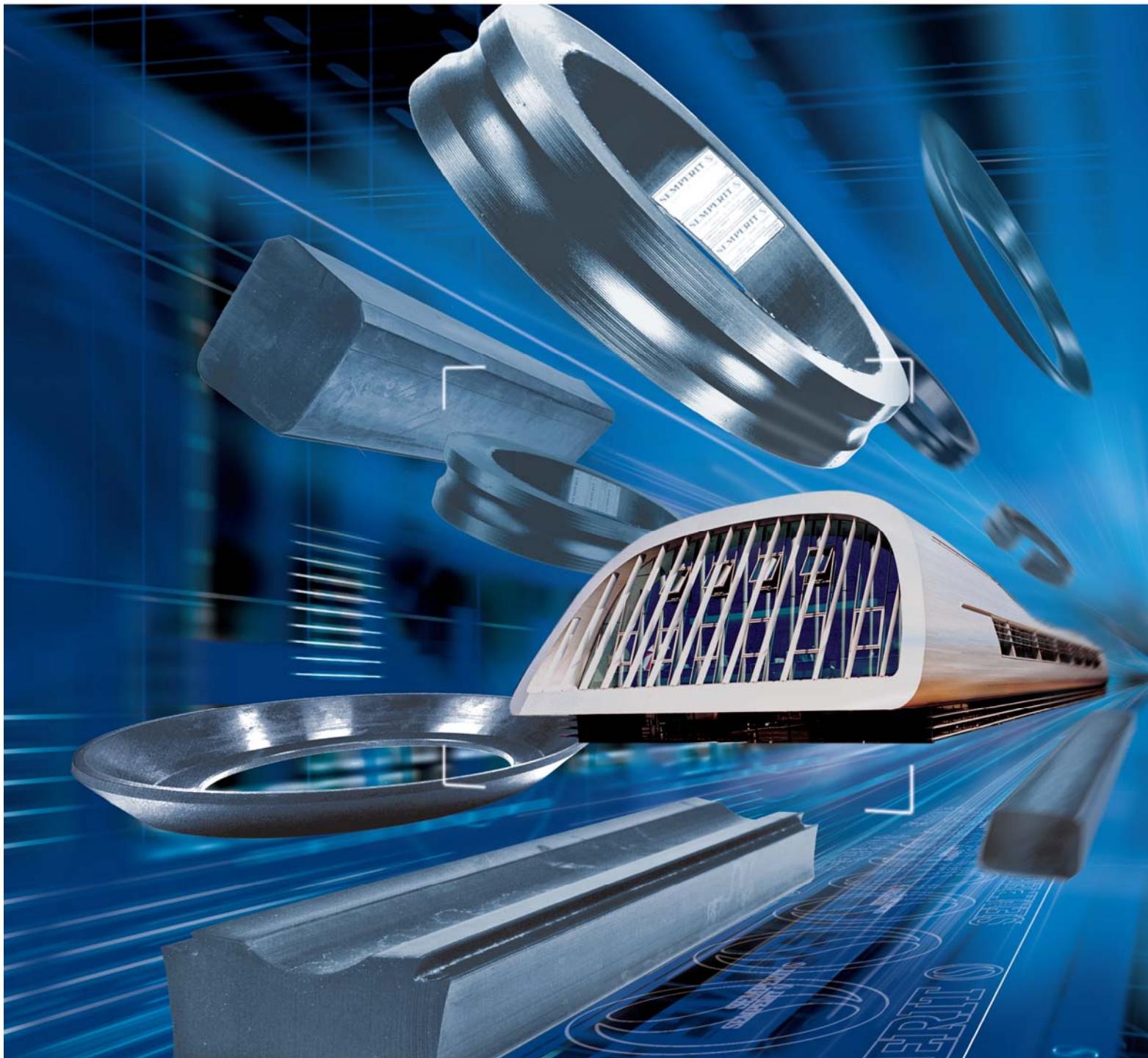


SEMPERIT

USER Instructions sheave liners

ROPEWAY ENGINEERING



semperform®
A MEMBER OF THE SEMPERIT-GROUP

Ropeway engineering

SEMPERFORM ROPEWAY ENGINEERING USER INSTRUCTIONS SHEAVE LINERS

Overview

This user instruction sheet contains important information on Semperit sheave liners for skilifts. In detail this document contains only information on sheave liners made from rubber in the so called "ready-to-fit" version with textile carcass.

This user instruction sheet does not include the pressed liners which are open on one side, liner profiles and individual constructions for specialised fields of application.

For detailed information on the products mentioned above please order detailed documentation separately.

This user instruction sheet contains information about the responsibility of the operator and is intended for professionals. If you have any questions please don't hesitate to ask our team.



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Selection of the correct sheave liner



Only apply sheave liners for skilifts on specified rolls. Any change of a roll makes user defined pretesting necessary. That constitutes a hazardous change of operational performance.

Consequences that might occur could be, for example, overheating, breakdown or derailing.

Only parts made by Semperit are allowed to set in service as so called Semperit original spare parts. Only use spare parts whose technical specification meets the needs of the plant manufacturer.

The electrical conductivity of the liner is defined by the plant manufacturer. It is imperative that all spare parts must have the same electrical conductivity.

If any problems occur please contact our team or the after sales department of your plant manufacturer.

Under no circumstances rework the sheave liners. No changes to the liner profile are necessary nor permitted.



Damaged or snagged sheave liners must be renewed. It is **not permissible** to set used liners back in service. Damage in the structure of the sheave liners is not visible on the surface.

Storage of sheave liners

The characteristics of the product could change in case of inappropriate conditions during storage or by improper use of goods.

Goods made with rubber change their product characteristics continuously over time, in order to slow down this process it is important to minimize exposure to oxygen, ozone, heat, solar radiation, solvents, and compression or stress.

The sheave liners have to be stored at low air temperature and ideally in darkness. Temperature should be in between -10°C and +25°C.

The distance between the product and the nearest heat source (e.g. radiator) must be at least 1 meter. The specification for storage and attendance is defined in DIN 7716 (ISO 2230) standard.

Semperit sheave liners for skilifts may contain the materials A470 or A438 which are classified at B2 as flammable. (DIN4102-1 „Fire behaviour of building materials and components, Part 1: Building materials – Definitions, requirements and testing, issue May 1998, Section 6.2).

Maximal period of storage

We are unable to determine a maximal period of storage. In Addition to our general terms and conditions, Semperit provides a minimal mileage of 30.000km for original Semperit sheave liners. This warranty is valid 18 months after start-up, but no longer than 2 years after delivery.

The physical characteristics change due to the conditions during storage. If any damages, hardenings, stainings, cracks, outbursts, deformations, soaked or sticky or any other changes to the conditions at delivery are visible, the sheave liner must not set in operation.

Before the application of a proper sheave liner by the criterias mentionend above later than 2 years after delivery, evry liner has to be checked seperately. The responsibility for the duration of storage is in the hands of the operator.

Application of sheave liners

The sheave liners are applied by pressing the liner on the hub of the roller. Appropriate equipment is necessary in order to perform a qualified application.

If you have any questions concerning the application process, please feel free to ask the plant manufacturer. He is happy to give you any advice on handling the application process.

It is important to check every liner before application on the ring. Although Semperit is certified by ISO 9000, damages might have occurred during delivery. Potential damages on the surface of the liner (e.g. burrs, nicks, etc.) mean the liner must be scrapped using appropriate methods. In case of inappropriate handling the liner might get damaged. Any

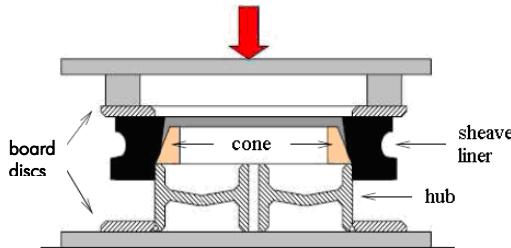
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deformation or other damage has to be checked by the plant manufacturer.

Before starting the application process, both the liner and the ring must be cleaned. In particular grit and oily or greasy deposits must be removed.

Attention: Be aware that the ring must be completely clean. We suggest flushing the ring with clean water.

The sheave liner has to be applied using a flash-free cone with de-burred edges. Under no circumstances pull the liner on sharp edges or overstretch it.



Mounting of the sheave liner on a cone

The mounting process to put the liner on the ring has to be horizontally. We recommend using a second ring, but be aware to prevent any damage to this ring.

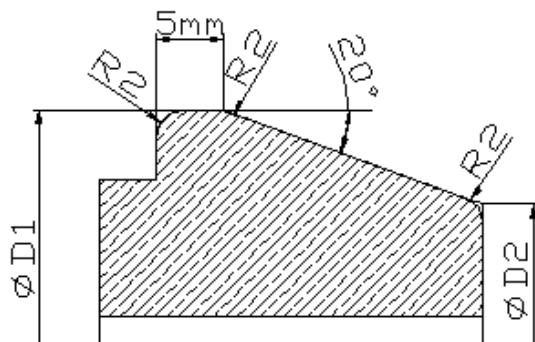
It is very important to put the sheave liner on the ring axially parallel, in case the liner might get overstretched. In this case the liner is damaged and has to be removed.



To simplify the mounting process, lubricate the sheave liner and the hub with clean water or soap water. **Under no circumstances should oil or grease be used to lubricate the liner.** It is not allowed to use any solvent to clean the rope.

To prevent the sheave liner from slipping once it is mounted on the ring use only a minimal amount of soap water during the application process. The application of too much soap water will result in a slipping liner.

Excessive water or soap water must be removed.



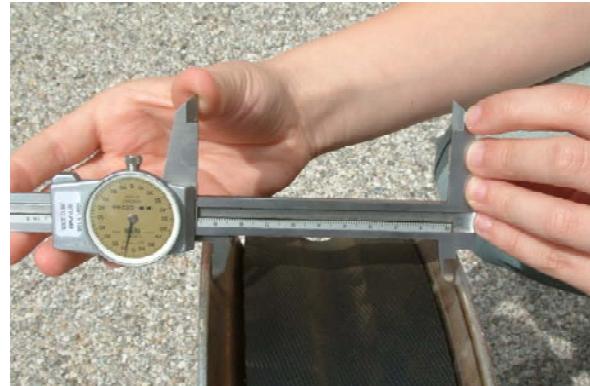
Diameter of the cone:

D1... hub diameter of the roller

D2... inner diameter of the cone is typically 5 to 6mm smaller than the inner diameter of the sheave liner

symmetric. If there are any mountains or valleys the liner has to be removed.

The distance in between the flanged wheels has to be checked. The correct distance is specified in the drawings of the plant manufacturer. If the distance exceeds the specified value on the drawing, then the service performance decreases and could fracture the flanged wheels.



Checking the distance in between the flanged wheels

Screws and bolts must be tightened to the manufacturer's recommended torque settings. Also the distance in between the two halves must be as defined in the standards of the plant manufacturer.



Attention: The inspection guidance mentioned above refers only on the liners. Any additional inspections and checks recommended by the plant manufacturer must be observed.

The manufacturing dimensions of Semperit liners differ to the assembly dimensions, this is due to increased pre-stressing for our high service performance. If any liner does not fit perfectly, it has to be removed.

Run-in

Before a sheave liner could be handled by operation conditions, it should run for about 2 to 4 hours at low performance and low speed (2 to 3 m/s). This has a positive influence on the lifecycle service performance of the liner.

Exposure of sheave liners

The admissible exposure of liners (velocity and load) was defined by the plant manufacturer during the engineering process. The permissible strain of the liner (velocity and load) was defined by the plant manufacturer; it is not acceptable to exceed the permissible strain.

Inspection before start-up

After the successful application, the liner has to be checked visually. First of all the rubber has to fit on the ring and be mounted centrically. The chamfer must run rotationally



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Method to check gliding of the sheave liner

Once a year:

It is necessary to check every liner in the plant, if any damage, abrasion or hardness are visible.
If any problems on a particular sheave liner occur, these liners have to be checked regularly.

We strongly recommend keeping records containing the information mentioned below :

- Date of changing the liners
- Operational performance listed in miles or operating hours
- Date of inspection of individual liner
- Measured values checked by inspections (operational temperature, hardness, etc.)
- Any kind of unusual incidents or observations

Maintenance of the rope

Oil or grease are materials that are related to rubber and have influences on the product characteristics of the liners. Semperit has developed a wide knowledge in the production of rubber materials.

We know that the operational service of a liner can be seriously affected by the smallest of changes. In particular when the rope has to be changed. We suggest that in case you have to change the rope it's very important to change the liners too.

Once a week:

Once a week the liners have to be inspected for abrasion, operating temperature and hardness. Therefore only few liners should be inspected by randomized examination.

We recommend checking the operating temperature by an infrared working temperature sensor. To check the operating temperature the plant should be stopped after all-out operation. Also the temperature on the surface has to be checked. The operating temperature will rise slowly after stopping the plant, but will reach its peak within a few minutes. The maximum value is the operating temperature.

Under no circumstances use any temperature sensor which pierces the liners. This could harm the liner seriously.

We suggest marking the liner and the ring by a waterproof pen. It's a simple method to check if the liner is slipping on the ring.

1) Interaction of greasy rope and rubber

Requirements on lubricant regarding the interaction of the materials are written in chapter A.2.2. of EN 12385-8. The inspection has to be done by DIN ISO 1817 (DIN 53521). In addition to this standard the tests has to be done by a standardized temperature of 50°C.

Grease which does not fit the requirement, is not allowed to be used. This is because any physical characteristics might change significantly. In case of a newly developed grease, we recommend to analyse any potential chemical abrasion of the grease on the liner.

Only products which meet the requirements are allowed to be applied. This method does not specify the amount of grease to be used .

2) Amount of grease

The lubrication should be limited to the strands of the rope (chapter 5.3.1. "Schmierung" in EN12385-8).

Any grease, even if it's tested by the specification mentioned above, has influence in the physical specifications of rubber.

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That's why the amount of grease should be as little as possible; otherwise it could harm the liners. Take care that only the strands should be lubricated, because grease could harm the liners.

A thick amount of grease on the rope or on the liner is **not permissible**.

3) Solvent

Because of potential chemical reactions the lubricant and the solvent must not corrode the liners.

The solvent must evaporate after the application process and vaporize within a few minutes. It should only be used on small areas of material.

Change of sheave liners

Liners for skilifts made from rubber are subjected to uneven abrasion and wear like automotive tyres. This is due to many factors like temperature, environment, etc.

Sometimes the abrasion of liners differ even if they are mounted on the same supporting pillar a lot. Deterioration of one single liner initiates a breakdown of the other liners of the supporting pillar. That is why we recommend renewing all liners even if only one is damaged.

Typically we find one of three cases:

1) Mechanical abrasion

Mechanical abrasion has to be checked regularly. The specification of the plant manufacturer has to be observed. The liner is applied correctly if the rope puts only radial force on the roller.

If any abrasion occurs, this could be an indication of an incorrect mounting of the liner. In this case we suggest notifying your plant manufacturer.

Worn sheave liners may affect the safety of passengers. Therefore the minimum profile diameter of the sheave liner must be defined by the plant manufacturer.

2) Thermal corrosion of sheave liners

Because of dynamic strain the rubber warms itself up (churning of the rubber).

The point of maximum heat is located a few millimetres under the surface of the groove.

The hardening process of the rubber is accelerated by high air temperature.

At the beginning of the hardening process only slight impacts are visible on the surface of the liner, typically in form of crack-lines.

Next the bottom of the groove breaks open and the liner crumbles. This process might happen within a short amount of time. Thermal corrosion can occur very quickly if the plant is subjected even to short periods of overloading.



Thermal corrosion of sheave liners

Cracks, high hardenings (rise of 5 Shore A) or high operating temperature (over 80°C) is a significant sign of thermal abrasion.

Measuring the correct operating temperature is listed in the section on daily inspections.

If there are any holes besides hair-line cracks visible on the surface the sheave liner has to be renewed.

If any questions occur please don't hesitate to contact the plant manufacturer.

3) Miscellaneous reasons of breakdown

Beside the two major reasons for liners failing, many other causes like lightning, frozen liners, lack of grease, etc. could damage the liner. If any of these reasons mentioned above applies to your plant, please contact your plant manufacturer.



For safety reasons do not use damaged liners.
You are welcomed to contact us for help in investigating the failure.



Typical damage of improper use of grease

Sheave liners which appear to be giving an unusual operational performance, have an unusual appearance, unusual sound of operation or slipping of the sheave liner might be damaged. The cause of the problem must be clarified. Please notify your plant manufacturer.

summary

Grade of abrasion	task
Abrasion of the sheave liner more than defined standard of plant manufacturer	swap
Small cuts on the surface of <1mm	Daily observation
Thermal abrasion	swap
Rise of hardness more than 5 Shore A	swap
Operation temperature > 80°C	Swap the liner, please

	contact your plant manufacturer
Corrosion on surface	Swap the liner, please contact your plant manufacturer
Worn sheave liner	swap
Damage by lightning or equivalent	Swap the liner, please contact your plant manufacturer
non typical body structure or sound of operation	please contact your plant manufacturer

Demounting of sheave liners

The demounting of sheave liners has to be done by the standards of the plant manufacturer. Take care that no damage occurs to the roller. This could damage the new sheave liner.

Semperit suggests to document the operation hours, operation mileage and abrasion of the sheave liners.



Under no circumstances make changes to the plant without notice to your plant manufacturer.

Even a modification of the profile of the sheave liner is a significant change which has to be clarified with your plant manufacturer.

Modifications on any safety parts concerning regulations, legal requirements have to be checked. Moreover the 2000/9/EG standard of the European Union dated by 03/20/2000 of skilifts has to be checked.

Disposal

If you don't offend against any standard or law, national or international, the liners should be disposed like car tyres.

We suggest disposing of your used sheave liners by dumping or by thermal recycling in plants that are state approved. Disposal by burning without any environmental protections is against the law.

To safeguard our environment, we suggest to dispose of your used sheave liners by a professional recycling company who has specialized on recycling of rubber.



Under no circumstances set any used sheave liner back in service again even if it's renewed by turning or grinding.

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Warning:

Information like figures, calculations, test values or data is based on our customers advice. It is the result of tests conducted over years. Since the application of the product may have an impact on the use of the product, this information is meant only as a rough guide. In each individual case it is the task of the customer alone to examine if the specific quality criteria of our products are sufficient for the specific purpose of application. Inappropriate use, excessive load or admission with non-permissible media may impair the function of our products. Our experts are glad to answer any of your questions.

Any and all transactions concluded with SEMPERIT shall be based on our General Terms and Conditions. We assume warranty and liability based on our General Terms and Conditions, applicability of any other general terms and conditions shall be excluded. Liners and lining strips for sheaves and conveyor belts shall be subject to special warranty provisions; warranty claims do especially not exist if a defect can be traced back to external impacts, e.g. improper storage, installation maintenance or inappropriate or improper use, order specifications, negligence and natural wear as well as interference with the product by the customer or third persons.

In Addition to our general terms and conditions we provide a minimal mileage of our sheave liners of 30.000 km. This warranty is valid for 18 months started by date of operation, but at maximum for a period of two years started by date of delivery.

The Semperit gurantee applies if any defect in quality occurs within the time listed above provided that:

- a) User instructions have been observed,
- b) The maintenance for the rope used grease, mentioned in chapter „maintenance of the rope“ recommended has been tested on potential chemical reactions. Moreover the tests had been accomplished by no chemical reactions,
- c) The strain on the textile carcass has reached it's maximum strain capacity only for a short amount of time,
- d) Notify Semperit as soon as possible, in case of problems in product quality.

We can only provide warranty if the delivered product has any failures which can be investigated on production or material failures. In that case we will provide a compensation delivery and charge the difference of today's price and warrantee minimal mileage.

We cannot accept warranty if any problem occur in case of invalid storage, invalid application, invalid maintenance, invalid product characteristics specifications, any interventions of third parties etc.



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