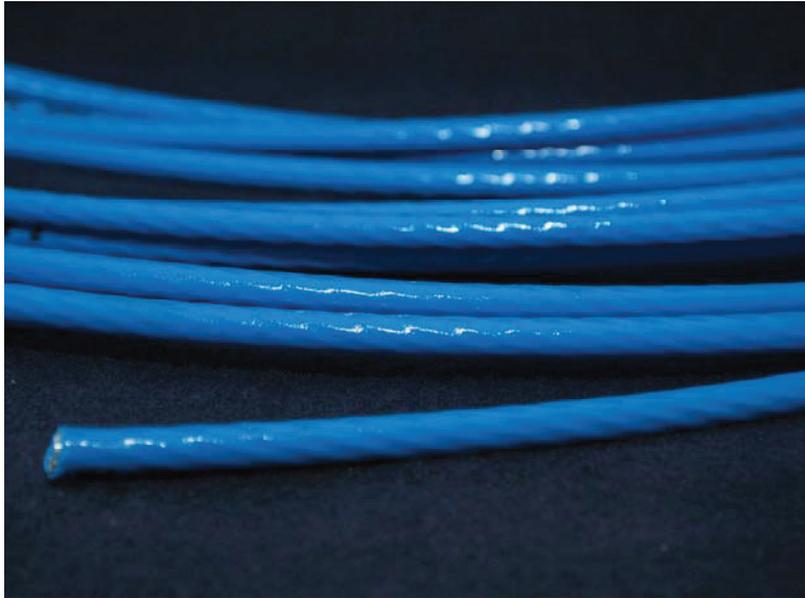


User manual

Pfeifer Drako PTX300



author	TCC – vwo, Rev. PM sco	dated	01.10.2013
name	PTX Nutzerhandbuch 01102013.doc		
pages	9	© 2010 Pfeifer DRAKO	Rev1.1

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

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Please note - DRAKO PTX 300 can be used within the scope of the actual certificate concerning the examination of conformity KP 195/2 as of 31th of March 2014. The certificate concerning the examination of conformity provides a maximum number of trips, a maximum number of years till replacement of the ropes and further discard criteria. The achievement of the limits of use depends on the actual conditions of use. The elevator company is responsible for the operation of ropes in its elevators and has to do all necessary tests before the use.

1 Introduction

The PTX rope (plastic-sheathed traction rope with high strength wires) combines the properties of a steel core rope (high breaking force, low elongation, etc.) and a closed polyurethane sheath with a high friction coefficient. The technical data are summarised in Table 1. Fig. 1 shows the rope structure.

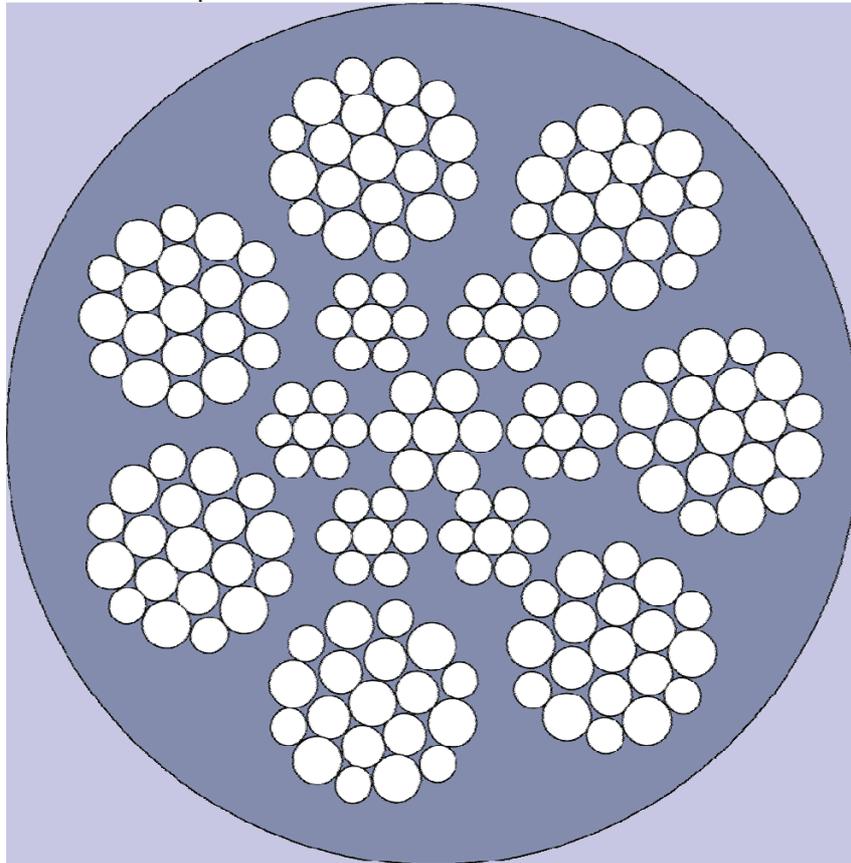


Fig. 1: PTX300 rope structure
(7x19 W IWRC sZ)

Table 1: Technical data for PTX300

DRAKO PTX 300

Nominal rope Ø	Rope strength class	Minimum breaking force F_{min}	Approx. weight per unit length	Approx. metallic cross-section
mm		kN	kg/100 m	
6	2700	28.0	11.3	12.1
6.5	2700	28.0	12.0	12.1

This rope has been tested intensively in independent test laboratories following the guidelines of a risk analysis. The rope and the tests were attended to by the notified body – TÜV Süd, Germany – and transferred into the certificate concerning the examination of conformity KP195/1 for the PTX300. The certificate is attached as Appendix 1.

For successful use of the DRAKO PTX 300 rope the lift design should follow the requirements of the rope and not vice versa. In particular when replacing the ropes in existing systems without adaptation of the system, the advantages of the special construction of the rope usually cannot be exploited.

Beware of mechanical, chemical and environmental effects on the plastic sheath; all stages of the lifecycle should be considered here. These stages are:

general requirements,
packing and unpacking,
transport,
storage,
handling and installation,
operation,
inspection and discarding and
disposal.

The following chapters describe the typical requirements. Please ensure that these requirements are met. It is allowed and desired that you should create new requirements that are based on your own experience and guarantee an increase in safety. Please ensure, however, that the basic requirements are always met.

2. General requirements

- 1) In all stages contact is to be avoided with substances that can destroy the plastic sheath of the rope. On no account may the following substances come into contact with the plastic sheath:
 - a. dimethylformamide,
 - b. tetrahydrofuran,
 - c. N-methylpyrrolidone,
 - d. toluene.

These materials cause a partial or complete dissolution of the plastic sheath. Other substances such as ketones, short-chain esters and halogenated hydrocarbons cause the plastic sheath to swell up. The swelling process and the loss of strength are irreversible. The following must also be avoided:

- e. alcohols (alcohols can change the plastic sheath, particularly at temperatures > 80 °C)
 - f. hot water (hot water at a temperature of > 60°C causes a progressive hydrolytic change of the plastic sheath)
 - g. water getting into the plastic sheath
 - h. fuels (also including alcohols)
 - i. acids and alkalis (brief contact is possible if the plastic sheath is cleaned with cold water immediately afterwards)
- 2) The rope should not come into contact with sources of heat, since the plastic sheath can melt. The surface temperature of the rope during storage should not exceed 40 °C or maximally 80 °C for brief periods. The standard usage temperature is 0 °C to 40 °C.
 - 3) Grinding and welding close to the rope is strictly forbidden. Swarf, molten parts, etc. can damage the plastic sheath.
 - 4) In order to prevent cuts, do not use sharp tools to open the packaging.
 - 5) In case of contact with oils, greases, lubricants, etc., a clean, dry cotton cloth moistened with a little brake cleaner can be used for cleaning. The brake cleaner is to be completely removed immediately after application!
 - 6) To avoid soiling, the rope should only be unpacked immediately prior to installation.
 - 7) If the rope is covered with dust (concrete, cement, sand, etc.), this must be removed with a clean and dry cloth.
 - 8) Contact with sharp edges must be avoided, e.g. when unpacking and/or installing. If this does happen, however, the sheath and the rope must be inspected for cuts and bends over the entire length. If damage is discernible the damaged rope must be replaced by a new one.

3. Packing and unpacking

- 9) The PTX rope must be spooled on a reel or coil with a diameter D of ≥ 250 mm.
- 10) The core of the reel must be soft or covered with a film.

- 11) The unwinding method for bare steel wire ropes also applies in full to the PTX rope.
- 12) Do not use sharp tools or tools with sharp edges.

4. Transport and storage

- 13) During transport and storage it is important to avoid all the mechanical and chemical stresses already mentioned above that could lead to aging before use.
- 14) Avoid sharp edges.
- 15) Use soft slings or straps for handling.
- 16) It is forbidden to transport the reel in such a manner that the rope layers are in contact with a hard surface. The flattening of the rope means an undefined additional stress, which may lead to premature failure.

5. Handling and installation

- 17) Avoid all the risks to the rope mentioned above, in particular the contact with sharp edges, such as sheet metal parts of lift shaft doors, etc.
- 18) Retain the natural curvature of the rope from production and spooling when installing.
- 19) Avoid twists when hanging the rope in the shaft. Twisting can lead to excessive lengths of the individual wires in the strands. This can lead to the formation of so-called 'bird cages' when running over pulleys, leading to the necessity to discard the rope.
- 20) Avoid diagonal pull or at least keep it to a minimum (preferably less than 0.5 degrees).
- 21) Do not pull the rope off to the side. It is advantageous to mount the coil, for example, on a rotating holder (e.g. DRAKO Vario Clou).
- 22) Pull the rope off straight.
- 23) Bends and kinks must be avoided at all costs.
- 24) If you notice a kink, carefully untwist it without a load on the rope. There may be no discernible lasting deformations (except for the natural rope curvature from production/spooling). Do not load the rope if it has a kink.
- 25) Work only with clean and above all grease-free materials, such as gloves, cloths and lifting devices, etc.
- 26) Avoid contact of the rope with greased objects in the lift shaft such as guide rails.
- 27) Clean the rope immediately if it comes into contact with lubricants.
- 28) The running or pulling of a dirty rope through the rope grooves is to be avoided.

6. Operation

- 29) The rope should run vibration-free and noiselessly over the pulleys over the full bending zone. If this is not the case, the plastic sheath might be damaged or the alignment of the sheaves to the ropes is not correct (fleet angle). A detailed analysis of the ropes and sheaves is necessary. If damage to the sheath or the rope is found, all ropes in use are to be replaced by new ropes.
- 30) The DRAKO PTX 300 plastic-sheathed rope may be operated only in the intended rope grooves. The traction sheaves must be made of steel or cast steel with a round groove with a groove radius r of 3.05 mm to maximally 3.6 mm (recommended up to 3.35 mm) for the nominal rope diameter d of 6.0 mm, and a radius r of 3.3 mm to 3.6 mm for the nominal rope diameter d of 6.5 mm, without undercut. A drawing of the permitted groove dimensions and tolerances is attached to the test certificate.
- 31) Coatings and/or paints in the grooves of the traction sheave are to be avoided. In particular anti-corrosion greases or oils in the grooves of the traction sheave and the pulleys are to be thoroughly removed before contact with the ropes.
- 32) The rope connections (wedge sockets NG 6.5) must be designed for use in combination with the plastic-sheathed ropes. If this is not the case, the rope can slip out of the rope connection. The nominal diameter of the rope connection must match the nominal diameter of the rope. The sliding of the rope out of the rope connection must be avoided!
- 33) The following friction coefficients are to be used for the calculation of the traction:
- loaded $\mu = 0.25$ (see EN81-1, M.2.1.1),
 - operation $\mu = 0.23 - 0.21$ (see EN81-1, M.2.1.2) e.g. for rope speed 1 to 2 m/s and
 - $\mu = 0.5$ for the blocked counterweight (see EN81-1, M.2.1.3)

The prerequisite is a clean, lubricant-free groove surface.

- 34) The following points must be observed for sufficient traction:

The prerequisite for trouble-free operation is a clean, lubricant-free groove surface. The same applies to the rope surfaces.

T_1/T_2 should be ≤ 1.6 for normal operation (see EN81-1, M.2.1.1). In case of a blocked counterweight (counterweight on buffers, see EN81-1, M.2.1.3) the empty lift car may not be lifted (rope slippage or limited drive torque). In case of an emergency stop (see EN81-1, M.2.1.2) the system must be decelerated to less than the nominal speed.

- 35) As is also the case with bare ropes, the traction must be checked in every case following the initial installation.

36) If the DRAKO PTX 300 is installed as a replacement for a different plastic-sheathed suspension rope in an existing system, then the system-specific documentation must be checked without fail and any prescribed checks of the traction and rope groove diameter must be carried out.

7. Inspection and discarding time

37) Inspect the entire length of the rope including the rope connections, the bending zones and the transitions from the bent to the unbent zone.

38) The inspection should take place at least once a year, but must be adapted to the current frequency of use.

39) Discolourations of the sheath over the course of time due to dirt deposits in the environment and in the pulleys have no effect on the rope as long as it can be ascertained that the discolouration was not caused by the effect of lubricants or other chemicals.

40) The number of trips specified in KP195/1 is a maximum number of trips that must be set as a limit value for the respective system configuration.

A trip is the sum of all starts in one direction before a change of direction. A start is to be counted if the travel distance l is greater than $10 \times d$, i.e. readjustment processes are excluded. The limit was selected such that the readjustment processes are accounted for and the service life is practically not affected by the length of the bending zone.

It is essential to observe the further criteria mentioned in Appendix 2 'Memo Discard Criteria: DRAKO PTX 300' that can occur before the specified maximum number of trips.

41) If protruding wire ends are visible and/or bulges/'bird cages' form, this is usually a sign of alignment errors in the system.

The rope must be discarded if the specified number of trips is reached or if the types of damage to the rope and/or plastic sheath described in Appendix 2 as discard criteria occur.

We also offer you support in the construction phase of your lift with DRAKO PTX300. Contact us at: elevator_products@drako.de

Mülheim an der Ruhr, 25/09/2013

PFEIFER DRAKO Drahtseilwerk GmbH & Co. KG

8. Appendix

Appendix 1 Certificate concerning the examination of conformity KP195/1 PTX 300

Appendix 2 Memo Discard Criteria: DRAKO PTX 300

Appendix 3 Sketch Grooves sizes for 6.0 and 6.5mm DRAKO PTX 300



Certificate concerning the examination of conformity

Certificate no:	KP 195/2
Certification body:	TÜV SÜD Industrie Service GmbH Zertifizierungsstelle für Produkte der Fördertechnik Westendstr. 199 80686 München - Germany
Applicant / Certificate holder:	Pfeifer Drako Drahtseilwerk GmbH & Co. KG Rheinstraße 19 - 23 45478 Mülheim an der Ruhr - Germany
Date of application:	2014-03-25
Manufacturer:	Pfeifer Drako Drahtseilwerk GmbH & Co. KG Rheinstraße 19 - 23 45478 Mülheim an der Ruhr - Germany
Product:	Rope drive with a rope with plastic coating for use as part of the drive for traction drive lifts
Type:	DRAKO PTX 300 ($d_{Nom} = 6 \text{ mm}$ and $d_{Nom} = 6.5 \text{ mm}$)
Test laboratory:	TÜV SÜD Industrie Service GmbH Zentralbereich Fördertechnik – Sonderbauten Abteilung Aufzüge und Sicherheitsbauteile Gottlieb-Daimler-Straße 7 70794 Filderstadt - Germany
Date and number of the test report:	2014-03-31 KP 195/2
Test specifications:	- 95 / 16 / EC, Annex I - EN 81-1:1998+A3:2009 (D)
Result:	The equipment fulfills the requirements of the test specifications for the respective scope of application stated in the annex, page 1 - 4, of this certificate, keeping the mentioned conditions.
Date of issue:	2014-03-31

Certification body for lifts and cranes

Chadi Nouredine
Chadi Nouredine



**Annex to the certificate concerning the examination of conformity
no. KP 195/2 dated 2014-03-31**

1 Scope of application

1.1 Rope drive with a rope with plastic coating (TPU) for use as part of the drive for traction drive lifts

Type: **DRAKO PTX 300**
Nominal rope diameter: **6 mm or 6.5 mm**

1.2 Technical data

Nominal diameter d_{Nom} including plastic sheathing (TPU)	6 mm or 6.5 mm
Diameter inner steel rope d_{St}	5 mm
Rope construction	7x7+7x19 W sZ
Lay and direction	right-hand regular lay
Nominal wire strength	> 1770 N/mm ²
Minimum breaking load F_{min}	28 kN

1.3 The rope drive with a rope with plastic coating of type DRAKO PTX 300 shall be used in lifts according to the following definitions:

DRAKO PTX 300 ($d_{Nom} = 6 \text{ mm}$)				
Suspension	1:1	1:1	2:1	2:1
With additional pulley	no	yes	no	yes
Maximum number of trips	3.3 million	1.65 million	1.1 million	0.83 million
Numbers of single bends of the rope part with highest levels of wear	1	2	3	4

DRAKO PTX 300 ($d_{Nom} = 6.5 \text{ mm}$)				
Suspension	1:1	1:1	2:1	2:1
With additional pulley	no	yes	no	yes
Maximum number of trips	4.5 million	2.25 million	1.5 million	1.2 million
Maximum number of trips with reverse bending	--	600.000	--	400.000
Numbers of single bends of the rope part with highest levels of wear	1	2	3	4

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

2 Conditions of application

2.1 The requirements of Directive 95/16/EC ('Lifts Directive') concerning the deviations of the rope drive from the harmonised standard EN 81-1:1998+A3:2009, number 9 are guaranteed, if the steel wire rope of type DRAKO PTX 300 with the construction 7x7+7x19 W sZ with the parameters: $R_0 > 1770 \text{ N/mm}^2$, minimum breaking load $F_{\min} = 28 \text{ KN}$, with a nominal rope diameter $d_{\text{Nom}} = 6 \text{ mm}$ or $d_{\text{Nom}} = 6.5 \text{ mm}$, right-hand regular lay, is used and

- the rope safety shall be is at least $v = 12$,
- the ropes shall only be used in completely closed lift wells,
- the ropes shall not be used for fire-fighters lifts,
- lubrication and cleaning of the ropes is not allowed,
- the ropes shall not be exposed to open fire or sparks (attention at the mounting works of the ropes) and
- the junction of the rope termination shall be installed without major lateral deflection.

2.2 Decision for rope discard

The ropes have to be discarded after reaching a determined value of time or trips (it depends which case occurs first):

Discard criterion DRAKO PTX 300 ($d_{\text{Nom}} = 6 \text{ mm}$)				
Suspension	1:1	1:1	2:1	2:1
With additional pulley	no	yes	no	yes
Maximum number of trips	3.3 million	1.65 million	1.1 million	0.83 million
Maximum number of years till re- placement of the ropes	8 Years	8 Years	8 Years	8 Years

Discard criterion DRAKO PTX 300 ($d_{\text{Nom}} = 6.5 \text{ mm}$)				
Suspension	1:1	1:1	2:1	2:1
With additional pulley	no	yes	no	yes
Maximum number of trips	4.5 million	2.25 million	1.5 million	1.2 million
Maximum number of trips with reverse bending	--	600.000	--	400.000
Maximum number of years till re- placement of the ropes	10 Years	10 Years	10 Years	10 Years

A reversed bend is only considered if the distance from the ropes contact on two consecutive stationary pulleys does not exceed 200 times the rope diameter. (EN 81-1:1998+A3:2009 (D), Annex N.2.2)

Additionally, according to the manufacturer, the ropes must be discarded:

- in case of positional displacement of the steel rope inside the plastic sheathing,
- in case of deformation of the plastic sheathing (e.g. blistering, crease, necking),
- in case of torsions of the ropes,
- in case of escaping steel wire throughout the plastic sheathing, with a number greater than 3 on a distance of $6x d$ or greater than 9 on $30x d$ ($d = \text{nominal rope diameter}$)
- in case of coat cracks that extend to the inner steel rope with a number greater than 5 on a distance of $6x d$ or greater than 10 on $30x d$
- in case of plastic sheathing damage with large separations of a length greater than $5x d$ and
- in case of wire rope strand breakage

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.



- 2.3 The discard criteria described in Section 2.2 through cracks in the plastic sheathing shall be applied only when caused by wear. In case of cracks in the plastic sheathing caused during installation of the ropes or added from external damage (e.g. installation and maintenance), the DRAKO PTX 300 ropes must be replaced immediately.
- 2.4 The rope traction of the suspension ropes must be calculated according to EN 81-1:1998+A3:2009, annex M or in an equivalent manner.
- 2.5 When using DRAKO PTX 300 the diameter of the traction sheave shall be $D_T \geq 120$ mm.
- 2.6 The traction sheave shall be designed with a hardened or unhardened semi-circular groove made of steel or cast iron (opening-angle $30^\circ \leq \gamma \leq 60^\circ$, radius $3.05 \text{ mm} \leq r \leq 3.60 \text{ mm}$ for $d_{Nom} = 6 \text{ mm}$, radius $3.30 \text{ mm} \leq r \leq 3.60 \text{ mm}$ for $d_{Nom} = 6.5 \text{ mm}$).
- 2.7 The pulley shall be designed with a semi-circular groove (opening-angle $30^\circ \leq \gamma \leq 60^\circ$, radius $3.05 \text{ mm} \leq r \leq 3.60 \text{ mm}$ for $d_{Nom} = 6 \text{ mm}$, radius $3.30 \text{ mm} \leq r \leq 3.60 \text{ mm}$ for $d_{Nom} = 6.5 \text{ mm}$).
- 2.8 When using DRAKO PTX 300 the diameter of the pulley shall be $D_P \geq 120$ mm.
- 2.9 During examinations and tests before putting the lifts into service or during periodic examinations, the traction capability must be according to EN 81-1:1998+A3:2009 annex E and D.
- 2.10 The car shall be maintained at floor level without slip when loaded to 125 % of rated load according to EN 81-1:1998+A3:2009.
- 2.11 It shall be ensured that any emergency braking causes the car, whether empty or with rated load, to decelerate with a value not exceeding the setting of the buffer, including reduced stroke buffer.
- 2.12 It shall not be possible to raise the empty car when the counterweight is resting on the buffers, and the lift machine is operated in the "up" direction.
- 2.13 There shall be a use and maintenance manual with description regarding the detection of the discard criterion.
- 2.14 The lateral deflection angle of the ropes shall not exceed 0.5°
- 2.15 All further requirements of EN 81-1:1998+A3:2009 referring to rope drives must be met, e.g. like:
- junction of the rope termination (80% of the minimum breaking load)
 - distribution of load of suspension
 - protections at traction sheaves and pulleys (bracket against derailing of the rope, nip guards)
 - visual examination on the traction sheave is guaranteed
- 2.16 Due to the determined maximum permissible trip number, the lifts must be equipped with a safely counter (e.g. safe from power cuts and non-resettable electrical counter). In case of reaching the determined maximum permissible trip number the elevator control system shall stop the lift safely at floor level and automatically shut down the lift system.

3 Remarks

- 3.1 The test results relate only to the test object and the associated examination of conformity.
- 3.2 The application area of the rope drive of type DRAKO PTX 300 is limited to the examined system configurations according the test report no. K 195/2. For an extension of the operating range further examinations with the deviating rope configurations shall be performed.
- 3.3 A criterion - divergent from the DIN 15020 - concerning discarding the rope, has been defined by the rope manufacturer.
- 3.4 If new knowledge should occur, the notified body reserves the right to give additional conditions concerning the use of the rope drive, or to modify existing conditions.
- 3.5 The certificate concerning the examination of conformity may be used only in connection with the pertinent Annex and the list of authorized manufacturers (see enclosure of the certificate). This enclosure will possibly be updated as specified by the certificate holder and issued with a new stand.

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Industrie Service

- 3.6 The certificate no. KP 195/2 can be added to the required reading technical dossier as a help for decision of the notified body.
- 3.7 The product shall be clearly labelled with the name of the manufacturer and the type specification, to be able to check the conformity of the examined product with the series production.
- 3.8 During installation of the ropes, the twisting of the rope or turning up of individual rope segments of the ropes shall be prevented.
- 3.9 Every change of direction shall be counted as one complete trip by the automatic counter device.
- 3.10 The manufacturer has created an instruction manual to detect the criteria for rope discard of the rope drive of type DRAKO PTX 300 (see document of the manufacturer Pfeifer Drako Drahtseilwerk GmbH & Co. KG dated 2014-03-31 (3 pages)).

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

Memo

DISCARD CRITERIA

DRAKO PTX 300

Appendix to TÜV SÜD certificate concerning the examination of conformity: DRAKO PTX 300 (7x19W IWRC sZ)

From TCC / PM

Date 31.03.2013

Ref Memo – DISCARD CRITERIA: DRAKO PTX 300

Introduction:

Ropes running over traction sheaves and pulleys show that they have reached their discarding time by criteria that increase with time or by excessive damage. In the case of steel wire ropes with a non-transparent plastic sheathing, these criteria are the specified maximum number of trips and time of operation and/or excessive damage to the rope and/or its sheath. The criteria for the DRAKO PTX 300 are summarised in this memo.

IT IS IMPORTANT TO NOTE that over the lifetime of the rope (with regard to both the number of bending cycles and the length of service), as mentioned in the TÜV SÜD Certificate concerning the examination of conformity, there should be no excessive damage resulting in the rope having to be discarded. This has been proven by tests at the IFT at the University of Stuttgart and by internal tests.

However, wear of system components during operation, errors in alignment, installation and/or maintenance as well as excessive soiling may result in increased stress on the suspension rope, leading to premature damage.

If excessive damage does occur during the rope lifetime specified in the conformity test certificate, it is strongly advised that the lift installation company performs additional inspections in order to identify possible causes of the damage, including:

- improper installation,
- unequal rope tensions,
- improper rope guidance,
- etc.



3 1. März 2014

PFEIFER DRAKO

Criteria:

The DRAKO PTX 300 must be exchanged if it meets any of the following criteria:

DRAKO PTX 300 ($d_{Nom} = 6 \text{ mm}$)				
Suspension	1:1	1:1	2:1	2:1
With additional pulley	no	yes	no	yes
Maximum number of trips	3.3 million	1.65 million	1.1 million	0.83 million
Numbers of single bends of the rope part with highest levels of wear	1	2	3	4

DRAKO PTX 300 ($d_{Nom} = 6.5 \text{ mm}$)				
Suspension	1:1	1:1	2:1	2:1
With additional pulley	no	yes	no	yes
Maximum number of trips	4.5 million	2.25 million	1.5 million	1.2 million
Maximum number of trips with reverse bending	--	600.000	--	400.000
Numbers of single bends of the rope part with highest levels of wear	1	2	3	4

The ropes must also be discarded in the following cases:

- positional displacement of the steel rope inside the sheath,
- deformation of the sheath (such as like blistering, creasing, necking),
- permanent deformation due to twisting of the rope,
- wire ends protruding through the sheath if more than 3 over $6 \times d$ or more than 9 over $30 \times d$ ($d = \text{nominal rope diameter}$),
- tears in the sheath extending to the rope if more than 5 over $6 \times d$ or more than 10 over $30 \times d$ ($d = \text{nominal rope diameter}$),
- damage to the sheath with large-scale detachment over a length of more than $5 \times d$ ($d = \text{nominal rope diameter}$) and
- strand breakage.



3 1. März 2014

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

Examples of sheath tears caused by wear:

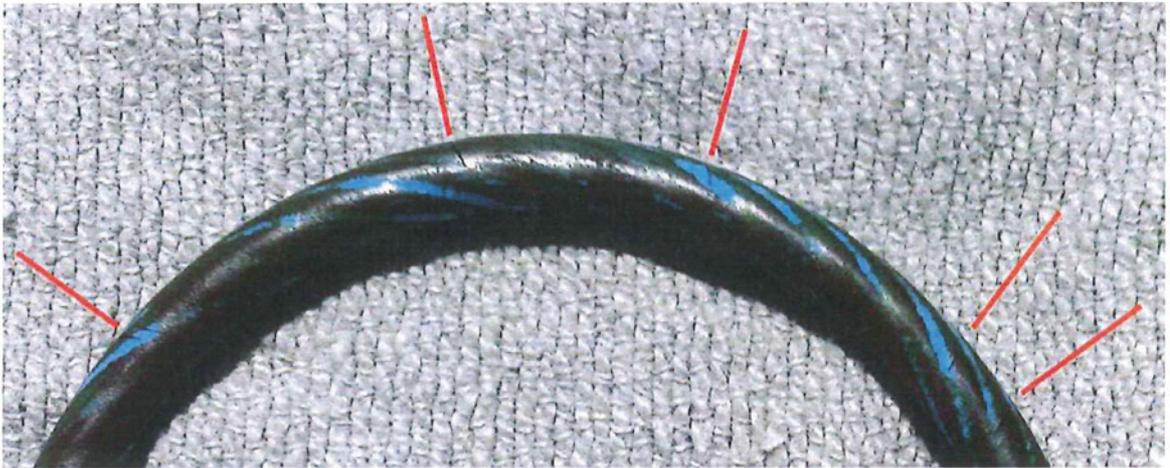


Fig. 1: Sheath tears on very dirty rope section

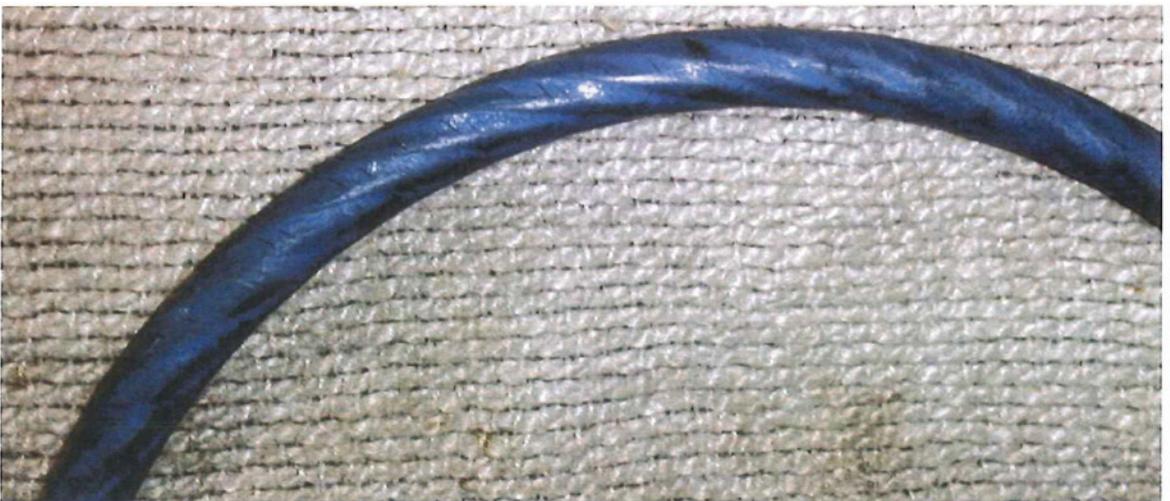


Fig. 2: Sheath tears on barely dirty rope section

In cases where there are tears in the plastic sheath, but the criteria listed above are not exceeded, the system can continue to be used safely.

31.03.2014
PFEIFER DRAKO Drahtseilwerk GmbH & Co. KG

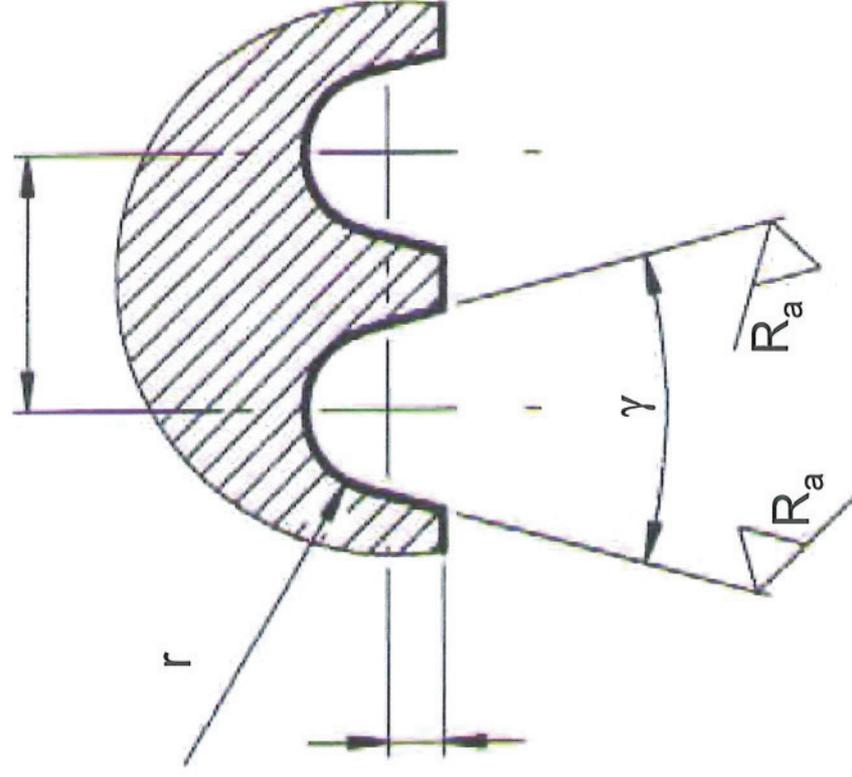


31. März 2014

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

Groove sizes for 6.0mm and 6.5mm DRAKO PTX 300

- Groove or sheave hardened or non-hardened
- Groove radius
 - ◆ for d=6.0mm: $r=3.05\text{mm}$ up to $r=3.6\text{mm}$, recommended up to $r=3.35\text{mm}$
 - ◆ for d=6.5mm: $r=3.30\text{mm}$ up to $r=3.6\text{mm}$
- Roughness of groove $R_a=2.4\mu\text{m}$ (corresponds to N7/N8)
- Groove opening angle $\gamma=30^\circ$ up to 60°



0 2. Okt. 2013

Verfasser	PM AZT - sco	Stand	01.10.2013
Projekt	PTX 300	Zeichnung Rille PTX 300 01102013_en	
Seiten	1	© 2010 Pfeifer DRAKO	Rev1.1