

1 GENERAL

These operating instructions must be observed before and/or during the installation and operation of THIELE conveyor chains, flight bars or chain sets.

It is also essential to comply with the operating and repair instructions for the machines and systems in which the chains are installed.

Please refer to the delivery documents for detailed information on the composition of the delivered chain strands or chain sets.

Due to extensive improvements, individual changes from the previous edition are not marked with a #.

2 SAFETY NOTES

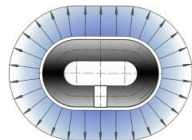
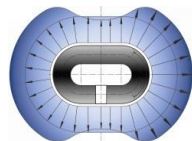
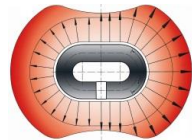
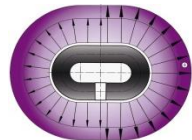
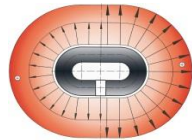
- All activities with or on conveyor chains and associated systems may only be carried out by trained and qualified persons.
- Always observe the safety instructions of the mine, the local accident prevention and industrial safety regulations and the operating instructions of the conveyor system and any other connected machinery.
- Always wear personal protective equipment.
- Do not wear loose clothing, jewellery or rings when working on the equipment as such items can become caught up in the machinery.
- It is strictly forbidden to work on the equipment if under the influence of drugs or alcohol (including residual) or if taking medication likely to impair performance.
- Operators must inspect the safety devices before each use and, if necessary, carry out a functional test.
- The equipment and machinery must only be operated when they are in perfect technical condition.
- Ensure that all safety devices fitted to equipment and machines are present and fully functional.
- Immediately rectify any malfunctions that could affect the safety of persons or machinery.
- Access to the chain conveyor, e.g. for inspection, is only permitted when
 - the conveyor has been shut down
 - the conveyor has been secured against unintentional start-up
 - the roof zone is protected by shield supports or canopies
 - there is no danger of sudden coal bursts from the face.
- Conveyor chains are only intended for use in chain conveyor systems. They must not be used as lifting attachments or slings or for carrying, towing or securing equipment, as there is no working load limit assigned to them.
- After-welding of chain links can significantly reduce their technical capabilities. Welding is only permitted after prior consultation with and on written approval from THIELE.
- Used chains must be scrapped immediately to prevent possible misuse.

3 THIELE CHAIN GRADES

The round-link steel chain is a robust component that is designed for transmitting the high forces generated by chain scraper conveyors operating in the harsh environment of the deep mining industry. These chains are capable of withstanding the impact forces of the payload material and are also resistant to dirt and contamination. Wear and tear and/or corrosion attack can be reduced by selecting the right chain for a particular type of application.

Note that highly tempered chains are more prone to corrosion attack.

For technical data and standards please refer to the THIELE works standards (TWN) or the THIELE catalogues, which are available for download on the THIELE homepage www.thiele.de.

			Crown hardness ¹⁾	Leg hardness ¹⁾
<p>THD chains</p> <p>The preferred choice for armoured face conveyors (AFC)</p>	TWN 0102		345 - 375 HBW	345 - 375 HBW
<p>TSC chains</p> <p>The preferred choice for plough chains</p>	TWN 0026, TWN 0100		385 - 414 HBW	345 - 375 HBW
<p>TSD chains</p> <p>The preferred choice for beam stage loader conveyors (BSL)</p>	TWN 0024, TWN 0025		424 - 453 HBW	345 - 375 HBW
<p>TIP chains</p> <p>A higher quality chain for tougher applications</p>			355 - 383 HBW	355 - 383 HBW
<p>TRQ chains ²⁾</p> <p>Preferred when there is a high proportion of rock, as when driving roadways and tunnels</p>			424 - 453 HBW	424 - 453 HBW

1) Brinell hardness measurement

For conversion to tensile strength see DIN EN ISO 18265, Table B.2, variations possible when measuring hardness according to Vickers or Rockwell.

2) The maximum chain speed of 0.5 m/sec must be strictly observed.

Selecting the right chain for the job will have a significant impact on chain durability.

Strict observance of these Operating Instructions will ensure an optimal chain service life.

4 STORAGE AND HANDLING PRIOR TO COMMISSIONING

THIELE offers the following anti-corrosion protection to suit different underground conditions and surface storage times:

- Tectyl dipped – for short-term storage under good storage conditions
- Hot-dip galvanized – for long-term storage and corrosive operating conditions

All chains must be stored in a dry location for maximum corrosion protection.

Unloading and reloading must be done using suitable procedures so that the identification markings, especially those used to pair-off the chain strands, are not lost or damaged. Avoid dragging the chains across the ground.

Handle chains very carefully at temperatures below minus 20° C as they are particularly sensitive to shock or impacts under low temperature conditions and may suffer incipient damage leading to premature chain failure.

It should also be noted that TSC and TSD chains are not recommended for use on face conveyors operating in wet environments or under aggressive working conditions because of the susceptibility to corrosion that comes with their high strength rating.

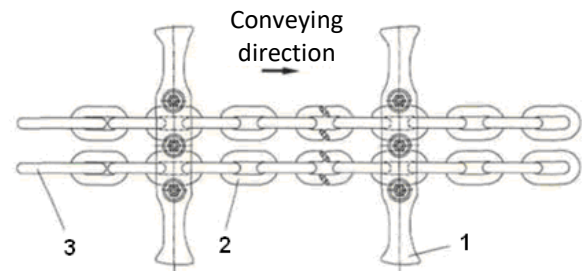
In the event of doubt contact THIELE before commissioning the system.

5 INSTALLATION

5.1 Installing the Chain Assembly

The new chain assembly comprises fully fitted and paired single chain strands consisting of the following components:

1. Flights/ scraper bars with the connecting elements
2. Chain links (paired)
3. Connectors



The flight bars are attached to the horizontal chain links. When fitting some types of flight bar note the correct orientation, i.e. the direction of movement.



ATTENTION!

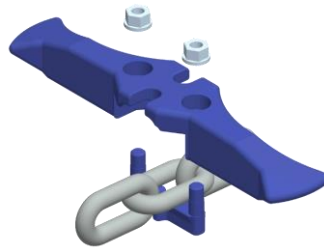
When loading and unloading the chains ensure that the strands are arranged in pairs and the connecting elements are complete and correctly attached!

5.2 Flight-Bar Spacing

The distance between adjacent flight bars will depend on the conditions of use, but should not exceed about 1 metre in length.

5.3 Flight Bars for Single-Strand Chain Conveyors (EKF-Flight bars)

The flight bars for single-strand chain conveyors are usually directional and must be fitted according to the marking.



5.4 Flight Bars for Twin-Strand Inboard Conveyors

Note the differences between the following three types of flight bar:

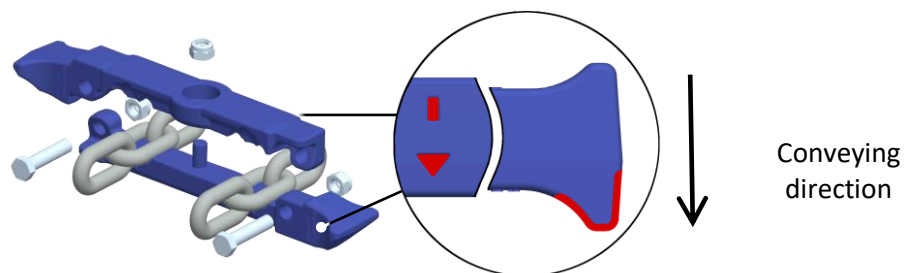
a) SINGLE-STRAND FLIGHT BARS (E-Type FLIGHT BARS)

When using split flight bars always observe the conveying direction!

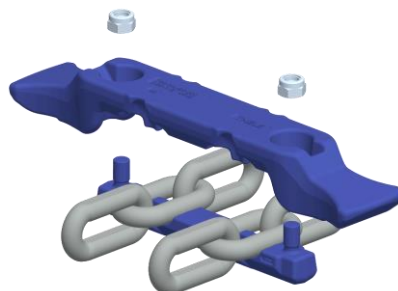
The right conveying direction is indicated by a direction arrow and the shape of the flight bar tips (marked in red in the diagram).

Ensure that the bolt heads point in the conveying direction.

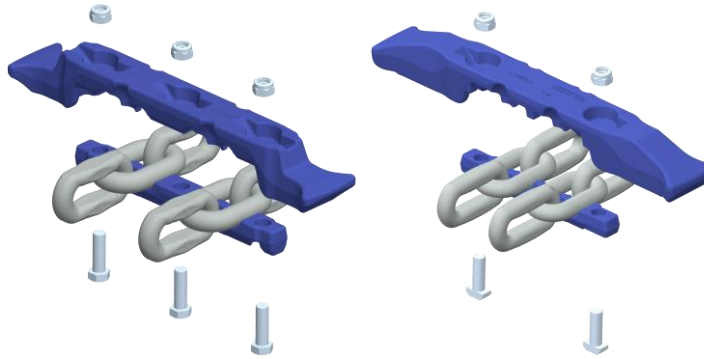
Contact THIELE if further clarification is required when using special fasteners such as Huckbolts (Huck lockbolts) rather than normal bolt connections.



b) FLIGHT BARS WITH STIRRUP

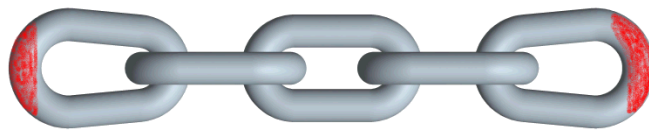


- c) FLIGHT BARS WITH STRAP
(can be fitted with hexagonal bolts or T-head bolts)



5.5 Outboard Chain Assemblies

On outboard chain assemblies the outer crowns at each end of the individual chain strands are slightly wider (by about 1 mm) and are colour-marked to facilitate the fitting of the chain connectors.



(depicted oversized in the drawing)

5.6 Nuts and Bolts

When fitting the screw connection ensure that the screw head is not tilted or twisted but is seated flat against the contact surface of the strap.

Observe the following instructions for fitting flight bars.

1. Tighten all nuts without applying full torque until the components are correctly positioned.
2. First tighten the middle nut (if present) followed by the outer nuts to the pre-assembly tightening torque given in Table 1.
If different values are specified, e.g. if flight bars have been supplied by other manufacturers, ensure that these are observed.
3. Tighten the nuts again, working out from the inside outwards, to the torque setting M_A .

It is recommended that a torque-adjustable nutrunner or torque wrench be used here. Using non-adjustable tools presents a risk of damaged bolts (too high a torque) or joints becoming loose (too low a torque).

Table 1: STANDARD TIGHTENING TORQUES for flight bar nuts:

Bolt size (Strength class 10.9)	Preassembly torque [Nm]	Final torque $M_A (\pm 10 \%)$ [Nm] ¹⁾
M20	400	517
M20 x 1,5	450	558
M24	700	890
M24 x 2	750	949
M27	1 000	1 304
M27 x 2	1 100	1 378
M30	1 400	1 775
M30 x 2	1 600	1 912

1) VDI 2230 sheet 1 appendix A; $\mu_K=0,1$

When using security locknuts the tightening torques shown in the table must be applied. The bolt ends should project by 0.5 to 2 thread pitches.

Check the tightening torques of the bolts at every fifth flight bar and keep a record of the results. Extend the check range if a cluster of under-torqued bolts is found.

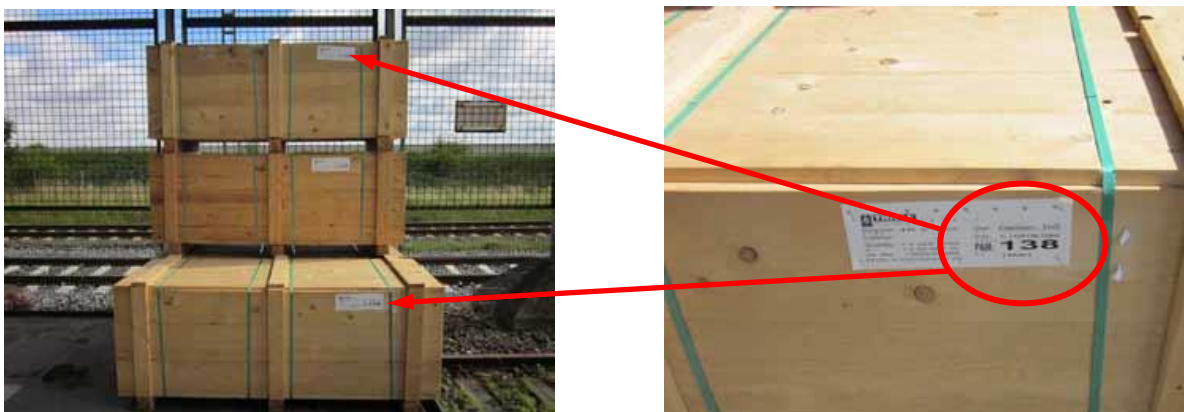
After 2 - 4 weeks check again that the bolts are correctly seated and retighten them, unless they have been secured by other means, e.g. by Loctite or welding.

5.7 Paired Chain Strands

Each two chain strands that have to be installed as a pair in the conveyor system are clearly allocated and marked for identification during the manufacturing and packing processes.

The pairing numbers for identical chain sets can be found as follows:

a) On tags affixed to the chains and also on labels attached to the shipping crates.



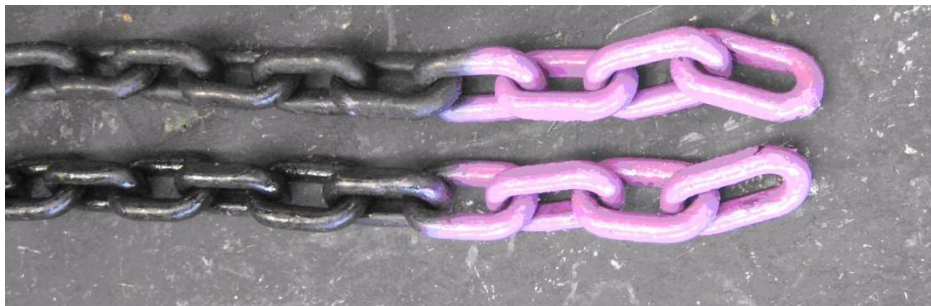
Paired chain sets may be packed into different crates for shipping purposes.

The images above show such an example. In this case the two sets of chain pair number 138 have been split into two different crates. Both crates are marked accordingly, with the pair number being clearly visible from the outside.

b) The 5th link from the end of the chain strand (the face is colour marked) is stamped with the same number.



c) One end of each chain pair is also marked with the same colour.



The chain pairs should be fitted as shown (the coloured ends go together).

6 ADAPTER CHAINS

Adapter chains, which usually comprise one set of chain strands containing 5, 7, 9, 11 or 13 links, allow the length of the chain to be exactly adjusted in two link stages.

Adapter chains can be used for the following reasons:

- to shorten the chain assembly due to excessive chain slack
- to shorten the chain assembly due to increased wear during running-in
- to shorten the chain assembly due to the settling behaviour of the line pans
- to shorten the chain assembly due to wear
- to extend the chain assembly, e.g. if a damaged area needs to be replaced.

7 CHAIN SPROCKETS

Always use new sprockets when running new chains, as new chains wear out faster when used sprockets are fitted.

8 CHAIN CONNECTORS

The individual chain strands are joined together with chain connectors. New locking devices (e.g. spring pins or lock nuts) must be used each time the connectors are fitted (also applies to connectors that are opened-up when in situ or are being re-used).

The re-use of locking devices is strictly prohibited.

Always observe the operating instructions for the chain connectors.

9 FLIGHT BARS

When connecting the flight bars to the chain take special care to prevent any possibility of crevice corrosion affecting the chain links lying within the flights.

THIELE has established on the basis of long-standing experience that crevice corrosion can be effectively prevented by ensuring the chain is a loose fit (leaving an air gap between flight bar and chain).

This allows relative movement between chain and flight bar and prevents corrosion pitting. It also has other positive effects on the running behaviour of the chain as the flight bars and sprockets come under increasing wear and tear.

If the requirement is to have a tight chain fit (force fit – the chain is clamped within the flight bar) it is essential to use a hot-dip galvanized chain.

The forces transmitted by the sprockets must be directed entirely through the chains. The flight bars must not therefore impact against the sprockets, as this can lead to broken straps or even fractured bolts.

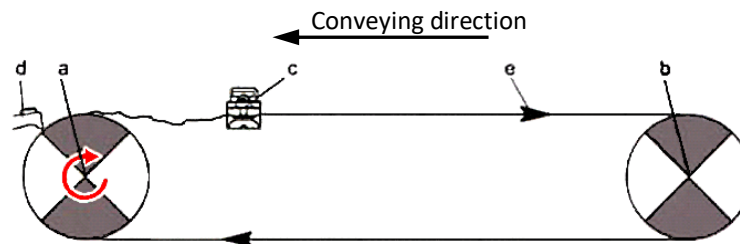
Broken or bent flight bars must be replaced immediately to avoid the risk of 'derailing' and to prevent blockages in the bottom race.

As soon as a derailed flight bar has been detected the conveyor must be stopped and the flight bar removed and replaced as necessary.

10 TENSIONING THE CHAIN ASSEMBLY

The level of chain pretension must match the operating conditions. Note that insufficient pretension force will result in a slack chain and this in turn will increase the risk of kinking. On the other hand, excessive pretension force will cause increasing wear and may result in frictional oscillation in the system.

Our service personnel will be happy to draw up specifications based on your operating parameters.



- a) main drive b) auxiliary drive c) chain securing device d) blocking pawl e) conveyor running direction during tensioning



Note that the conveyor manufacturer's instructions on tensioning the chain assembly are to be strictly observed at all times.

Further information can be obtained on request from our service personnel.

11 COMMISSIONING THE CHAIN ASSEMBLY



No one is permitted to remain in the danger zone when the conveyor is being started up. When starting up the system for the first time hazards not generally present during normal operation may arise due to incorrect assembly etc. Always keep a safe distance from the conveyor.

Prior to conveyor start-up carry out the following:

- Align the conveyor.
- Remove all tools, auxiliary items etc. from the conveyor.
- Make sure that the maximum driving force that is applied when starting-up against a blocked conveyor does not exceed the relevant test force. Given the possibility of asymmetrical loading the driving force applied to twin inboard chain systems must be no greater than approximately 150 % of the test force applied to a single-strand chain assembly. The limitation is normally provided by the adjustable coupling.



Note that solid conveyor blockages with almost no delay time will essentially cause the chains to be overstressed to the point of failure. Damage of this kind will not be covered under warranty.

After having examined the conveyor and eliminated any faults proceed to check the interplay between the individual components that make up the installation.

To do this, carry out a test run with an unladen conveyor (short conveyors are to be run for at least 1 hour, longer conveyors of 200 m and more for at least four hours).

Apply a bio-degradable lubricant (e.g. PLANTOLUBE L 32 GN supplied by Fuchs) to the auxiliary drive to optimise the running-in behaviour of the components. After the trial run check has been completed check the chain pretension.

Now perform a trial run of about six hours with the conveyor in a laden condition. During this time:



- gradually increase the load on the conveyor,
- check the manner in which the chain rolls off the sprockets,
- check continuously for any chain slack forming,
- monitor power consumption at the electric motors.

After the trial proceed to run the conveyor to empty and examine the chains, flight bars and connectors for visible signs of damage and unusual noises. If no defects are found during this inspection the conveyor can be released for operational purposes.

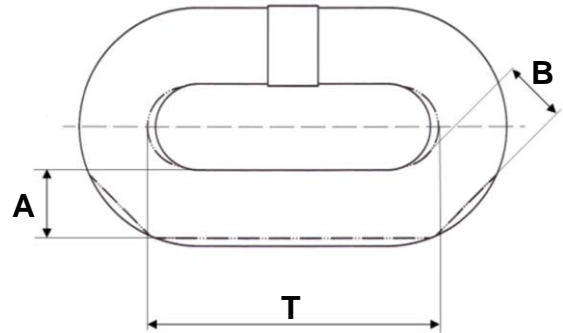
12 TRANSPORTING MATERIALS

Using a chain conveyor to transport materials and equipment is generally prohibited as such payloads cannot be safely positioned on the chain or chain assembly.

13.2 Conveyor Chains

THIELE recommends to replace the conveyor chains under the following circumstances:

- on face conveyors (AFCs): when chain elongation in pitch (dimension T) is more than 3.5 % from new*,
- on stage loaders (BSLs): when chain elongation in pitch (dimension T) is more than 5.0 % from new*,
- when friction wear (dimension A) at the legs is more than 30 % for round-link or flat chains and 20 % for S-flat chains respectively,
- when the crowns have developed 'flats' (dimension B) of more than 15 % in relation to the nominal diameter of the chain.



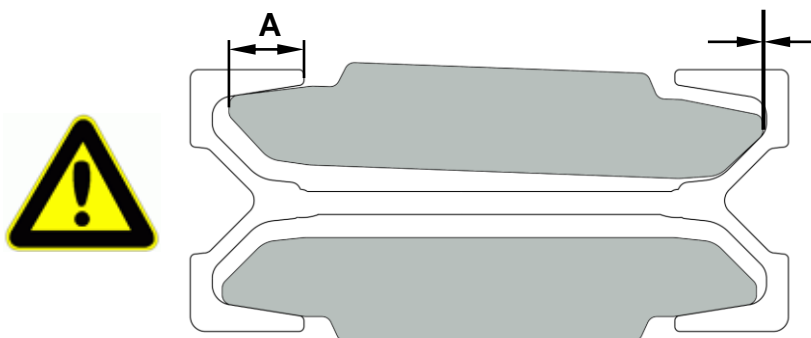
Note: Sprocket wear and chain wear act in opposition to each other (not the other way round, as is often assumed). A slightly worn chain runs better over a new sprocket than over a worn sprocket.

* After consulting THIELE it may be considered acceptable to continue to run the chain with new sprockets or with special sprockets fitted.

13.3 Flight Bars

If the flight bars are to operate properly they must be able to run freely within the pan profiles. Flight bars that have reached discard point run the risk of being derailed from the pan profile and causing damage.

THIELE recommends that regular checks be performed to measure the overlap (dimension A) between the pan profile and the flight bars (see diagram). Note that the overlap will depend not only on the amount of wear at the flight bar but also on wear at the pan profile.



Consult the manufacturer of the conveyor system to establish the minimum overlap required for safe operation.

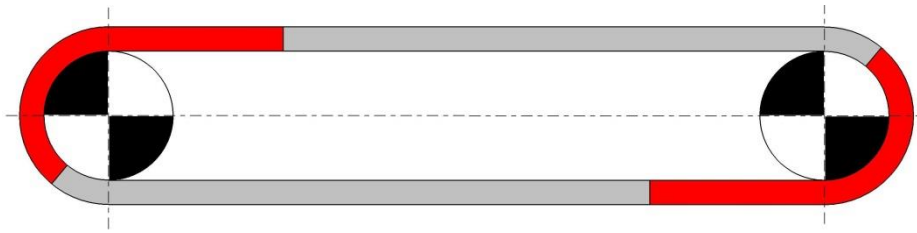
The overlap can best be checked in the conveyor 'snaking' area where the flight bars are pressed against one side of the pan profile. Repeat these tests over the entire length of the face conveyor and chain assembly as the conveyor is snaked forward.

14 SIMULTANEOUS USE OF NEW AND USED CHAIN STRANDS

Used chains may occasionally have to be run alongside new chain strands, for example when a new face is being started up.

THIELE generally advises against mixing used chain sections with new chains.

However, where this is unavoidable it is essential to ensure that the segments of chain passing simultaneously over the main and auxiliary drives, respectively, are either both used sections of chain or new sections:



Note that when using twin inboard chain assemblies the new or used sections of chain must always be installed in pairs.

The drive direction of the chain should be reversed so as to bring the 'flats' out of contact with the sprocket's power transmission points. The chain should be turned by 180° about its longitudinal axis so that friction wear can be transferred to the opposite legs.

New sprockets should also be fitted if the chain has stretched by more than 1.5 %.

The flight bars are to be moved to the next horizontal chain link.

15 TEMPORARY STORAGE

If the chain assembly is to be placed in temporary storage between two periods of service, e.g. when a panel has been worked out or if the chain is intended for further deployment as part of a face transfer, it must be cleaned immediately after dismantling (e.g. by sandblasting) and then preserved.

We recommend dipping in Tectyl or alternatively the application of a thick-oil coating (do not use old oil for this purpose).

There is always an increased risk of corrosion damage occurring if chains are stored below ground. This is not covered by guarantee or warranty. Underground storage is therefore only permitted after an anti-corrosion agent has been applied and this period should be for a few days only.

16 STOPPAGES

If the coal panel or face is temporarily stopped for a period of several days the chain assembly should be set in motion for 30 minutes at least once a day in order to prevent corrosion build-up. If necessary, protect the chain and connectors from corrosion by running the system for a short period and lubricating it with Fuchs Plantolube.

In the event of longer stoppages lasting several days or weeks, as may occur after an underground fire, it is absolutely essential to fit a new chain. If this is not done there is a very high probability of chain failure occurring.

17 ENVIRONMENT

Ensure that all lubricants are used in an appropriate and environment-friendly way.

Comply with local regulations when scrapping and disposing of discarded steel and other parts.

Dispose of packaging waste in accordance with local regulations.

18 THIELE OPERATING AND MOUNTING INSTRUCTIONS

Current operating and installation instructions are available as a PDF download on the homepage.



19 IMPRINT

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