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Update on wear limits – Zierer Wave Swinger Ride

To whom it may concern

Regarding some confusion on some wear limits we would like to update our customers with an extract from our service/maintenance manual of the latest Wave Swinger Model.

Remark:
Please note that the attached text and drawings relates to our latest Wave Swinger – Park model. So, there might be some slight differences in comparison with the hanging system of our older Wave Swingers as well to the transportable Wave Swinger models. For example:

- chain rings are used on the older Wave Swinger models instead of our new chain shackles
- transportable model does not have the 1,6to., 1,0to. shackles and has no nylon bush at the center bore hole of the spreader bar
- ...

The indicated allowable tolerances and wear limits are valid for all Zierer Wave Swinger models, and relate to the original Zierer parts and units.

For questions don´t hesitate and get in contact with us.

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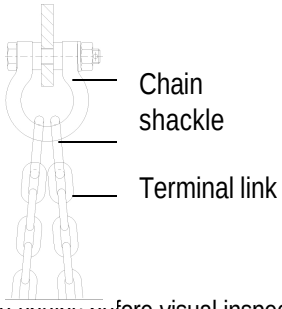
Wear Limits and Non-Destructive Testing

Material wear of 3% is to be reported to the manufacturer; components showing a material wear of 5% should be replaced. However, this is only a rough guideline and the system must be inspected and maintained on a regular basis. Unusual noises or instability occurring during operation should be reported to the manufacturer in order to make necessary adjustments or to even replace components before they reach the wear limit.
At the end of each season but at least ***once a year*** all structural components, such as sweeps, basket and mast base along with any attachments and fasteners have to be inspected thoroughly. After 3 to 5 years or when cracks in material or in welding seams appear the components should undergo non-destructive material tests.

Seat Chains, Seat Chain Terminal Links and Chain Shackles

After a maximum of 1200 hours of operation or semi annually a thorough check of chains and suspension has to be carried out. Chain links and terminal links worn down to a remaining strength of 3.5mm must be exchanged. The measurement has to be taken at those links, which show the most wear. It is the responsibility of the ride owner to see to these inspections being carried out.
Chain shackles should be inspected together with the seat chains and have to be replaced if the remaining strength is 6.0mm (1mm wear) or less.



Visual Inspection

Look for external failures, deformation, cracks, wear and corrosion pits. If necessary clean the chains before visual inspection. Only use cleaning agents, which do not affect the material of the chain.

Replacement

a) Wear
Terminal links and chain with links which show wear of more than 10% of the nominal thickness (in this case 0,5mm) are to be discarded.
b) Elongation caused plastic deformation
When the outside length of a chain link (terminating link) has exceeded 3% of the nominal dimension (28,3mm) due to plastic deformation, the chain (or the terminating link) has to be exchanged.
c) Enlargement of pitch through wear
Chains, which have experienced an enlargement of the pitch (pitch = inner length) of 8% caused by wear, including single links, (In this case inner length = 20mm) are to be discarded. On suspension links and end links the enlargement of pitch may not exceed10%.

Checking for Flaws

The chains have to undergo a special examination after maximum 3 years. The chains can be examined either by using the crack detection method, (magnetic crack detection or dye penetration test) or a load test with subsequent visual inspection. This load test is to be performed with 1,5 times the load capacity. Subsequent to the load test the chains have to undergo another visual inspection. If deformed and damaged links are detected the respective chain has to be replaced.

ESSENTIAL INFORMATION FOR THE USE OF CHAINS MADE OF STAINLESS STEEL

Improper treatment of stainless steel chains will lead to loss of rust protection!!
If the protective layer on the chain surface is damaged the chain is no longer protected against corrosion.
Please follow the instructions below to avoid loss of rust protection:

- Do not drag the chains along steel or metal parts during installation.
- Do not do any grinding (using an angle grinder for instance) or welding jobs near the chains. Sparks too will damage the chain surface.
- Do not use tools, which are normally used for working on untreated steel (for example wire brushes, grinding wheels ...)
- Always remove industrial dust by cleaning the chains regularly.
- Tempering colors as caused by welding for instance, will also result in corrosion if the stains are not thoroughly removed from the chains.

NOTE: Any corrosive material touching stainless steel chains may cause deterioration of the chains rust protection!

That means only correct treatment of the chains will guarantee rust-free chains. Improper handling and disregarding the above guidelines will probably lead to strong corrosion of stainless steel chains within only one year.

Neither Zierer nor the chain manufacturer will grant any warranty in case of improper treatment of stainless steel chains. Therefore please check every new stainless steel chain for any damages immediately when rec eiving it. Later complaints cannot be considered since inexpert treatment and handling of the chains must be assumed.

The above guidelines for proper treatment also apply to all stainless steel parts that have been installed in attractions and ride manufac tured by Zierer.

Shackles

The shackles have to be checked when inspecting the seat chains. They have to be replaced when the wear measures 1,5mm-2,0 mm.

S Hooks

Maintenance / Replacement of S-hooks

The S-hook is a special product manufactured and supplied only by ZIERER Karussell u. Fahrzeugbau GmbH. For safety reasons it is absolute necessary to follow the instructions of the manufacturer regarding maintenance and / or replacement.
Subsequent treatment of the S-hooks by a third party is not permitted. Especially surface welding of the unit moulds (radius) leads to embrittlement of the material and can cause fractures. The S-hook has to be replaced if the wear measures more than 1.5 – 2.0 mm more on the unit moulds.

Spreader Bars

Examine together with the chains. The spreader bar needs to be exchanged if the maximum allowed wear of 1,5 - 2,0mm at the boreholes for the shackles is reached. Also check the polyamide bushing in the center for cracks and to replace it if necessary.

Lifting Cables:

In accordance with DIN 15 020, and TÜV Bayern both sets of lifting cables have to be magnaflux tested or have to be replaced at least every two years of operation

In addition, these cables have to be checked daily over the entire length for wire breaks, corrosion, abrasion, structural abnormalities or deformation and may have to be replaced at even shorter intervals if necessary.

Wire Breaks

Wire breaks initially occur after a certain running period and then continue to occur after increasingly shorter time periods.

a) a) The wire rope is to be replaced when the number of breaks and the wear increases to 10% and more within 0,5 meters anywhere along the cable.

b) The wire rope is to be discarded immediately when wire break clusters appear.

c) The wire rope is to be disc arded immediately when a wire strand is fractured.

Corrosion

Corrosion occurs particularly in corrosive environment, e.g. sea climate. Wire ropes stored outdoors for longer periods will also corrode. Corrosion of the outer wires can easily be noticed by visual inspection. Corrosion of wires not visible from the outside is difficult to detect. Both, the static breaking strength as well as the stability of the wire rope will be reduced by corrosion due to corrosion pits and reduction of the metallic cross section.

The cable must be replaced when the cable diameter in any given spot has decreased by 10% compared to the nominal size, even though no wire breaks are visible.

Abrasion

Wire abrasion occurs as "internal abrasion" due to the movements of strands and wires against each other by bending the wire rope and as "external abrasion" due to movement between wire rope and pulley. A dusty environment increases the abrasion. Both the static breaking strength as well as the stability of the wire rope becomes reduc ed by abrasion, due to fretting pits and reduction of the metallic cross section.

The wire cable has to be replaced if anywhere along the cable the cable diameter is decreased by 10% compared to the nominal size, even though there are no visible wire break s.

Structural Changes

Strain on the wire rope during operation causes structural changes, which will reduce the rope diameter.

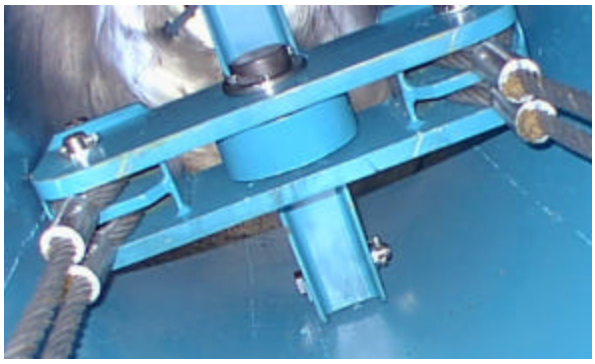
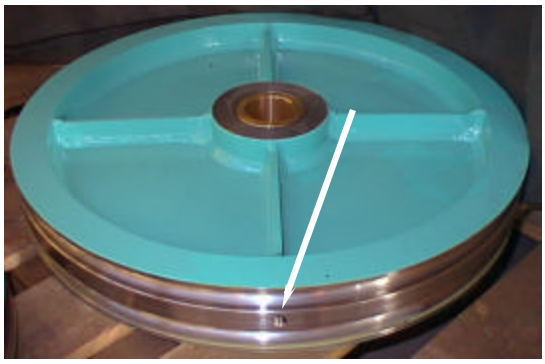
The cable must be replaced when over a longer stretch the cable diameter has decreased by 15% compared to the nominal size, even though there are no visible wire breaks.

Deformation

Deformations of the wire rope are visible changes in the rope structure. Deformation usually generates a destabilization of the rope structure, at least near the deformed area.
When a wire rope is visibly deformed an exchange of the lift cable sets is recommended, as the destabilization of the rope structure also means increased abrasion. The consequential damage leads to an accelerated rate of wire breaks, which are crucial for the replacement state of wear.

Please proceed as follows to exchange the cables:

1) Bring the ride to its load/unload position.
2) For manual lowering use the setup unit (see function description of hydraulic system, 4.3.5), the carrousel is lowered until it comes to rest on the basket stops and the lift cables become slack.
3) Slide up securing pins. The pins attaching the cables to the basket may now be removed through the basket openings by using the special tool.
4) Remove the top dome, the cover plate on the side of the mast and the safety clip above the pulleys
5) The cross-brace inside the mast is now accessible. The cable attachment bolts may now be removed.
6) Now the pulleys can be removed. For easier lifting and disassembly an eyebolt can be inserted into the borehole on the pulleys. Pull out the center pins

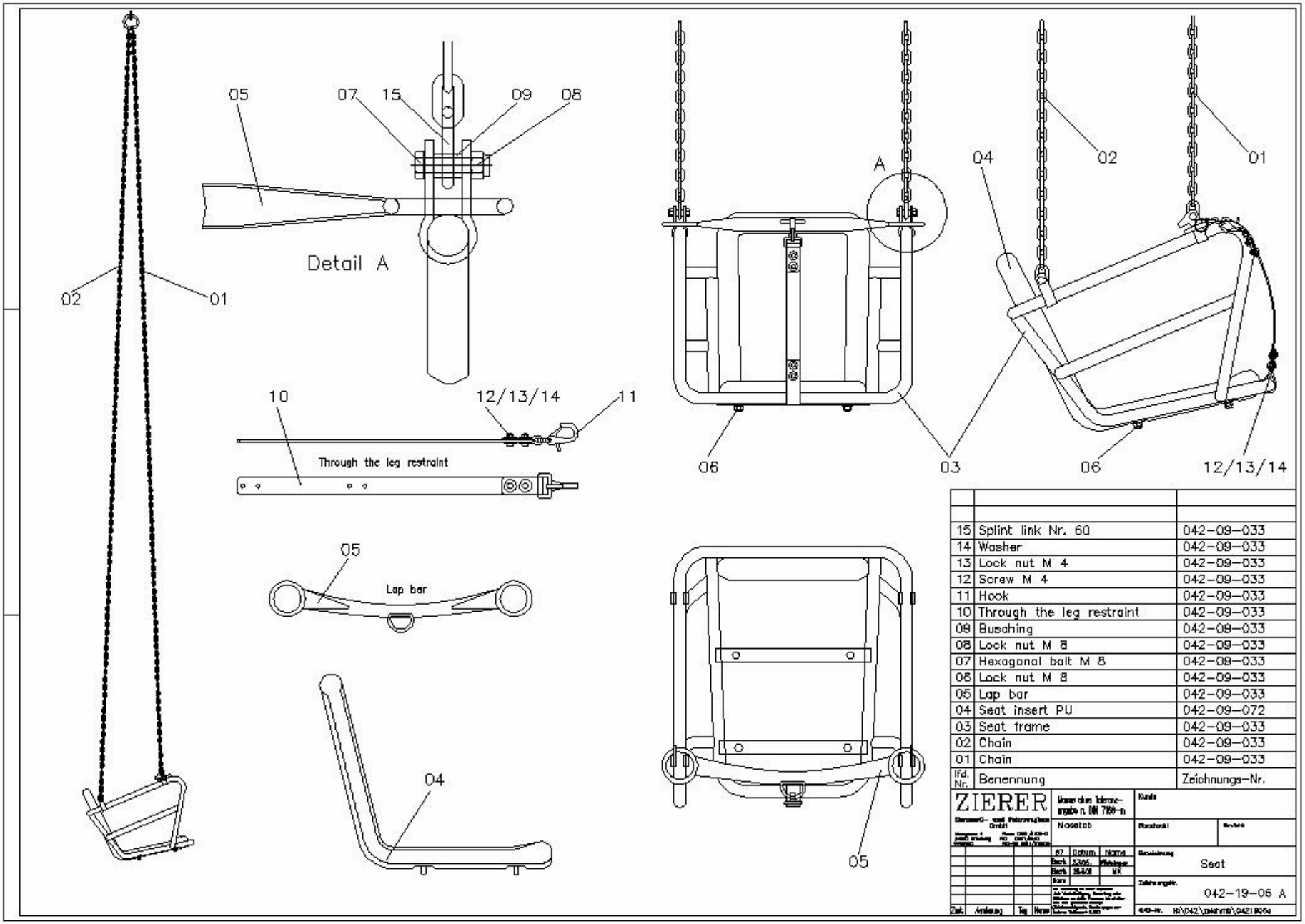


Picture 24

Special care must be taken of the nylon washers between the pulleys and the walls.

7) Now the cables can be exchanged.
When inserting the new cables make sure they are not twisted.
8) Installment is in reverse order to the sequence of disassembly. Make sure all safety plates and safety pins are put back in place.

Sheaves

Every time the lifting cables are replaced, the rib treads of the sheaves have to be inspected with a radius gauge (r = 9,5mm), using the light gap method. When a rib tread deviates from the contour of the radius gauge the respective sheave must be replaced as well. Tolerances are not permissible, since these can again cause deformation of the new wire rope and lead to wire breaks at an accelerated rate.



lfd. Nr.	Benennung	Zeichnungs-Nr.
15	Splint link Nr. 60	042-09-033
14	Washer	042-09-033
13	Lock nut M 4	042-09-033
12	Screw M 4	042-09-033
11	Hook	042-09-033
10	Through the leg restraint	042-09-033
09	Busching	042-09-033
08	Lock nut M 8	042-09-033
07	Hexagonal bolt M 8	042-09-033
06	Lock nut M 8	042-09-033
05	Lap bar	042-09-033
04	Seat insert PU	042-09-072
03	Seat frame	042-09-033
02	Chain	042-09-033
01	Chain	042-09-033

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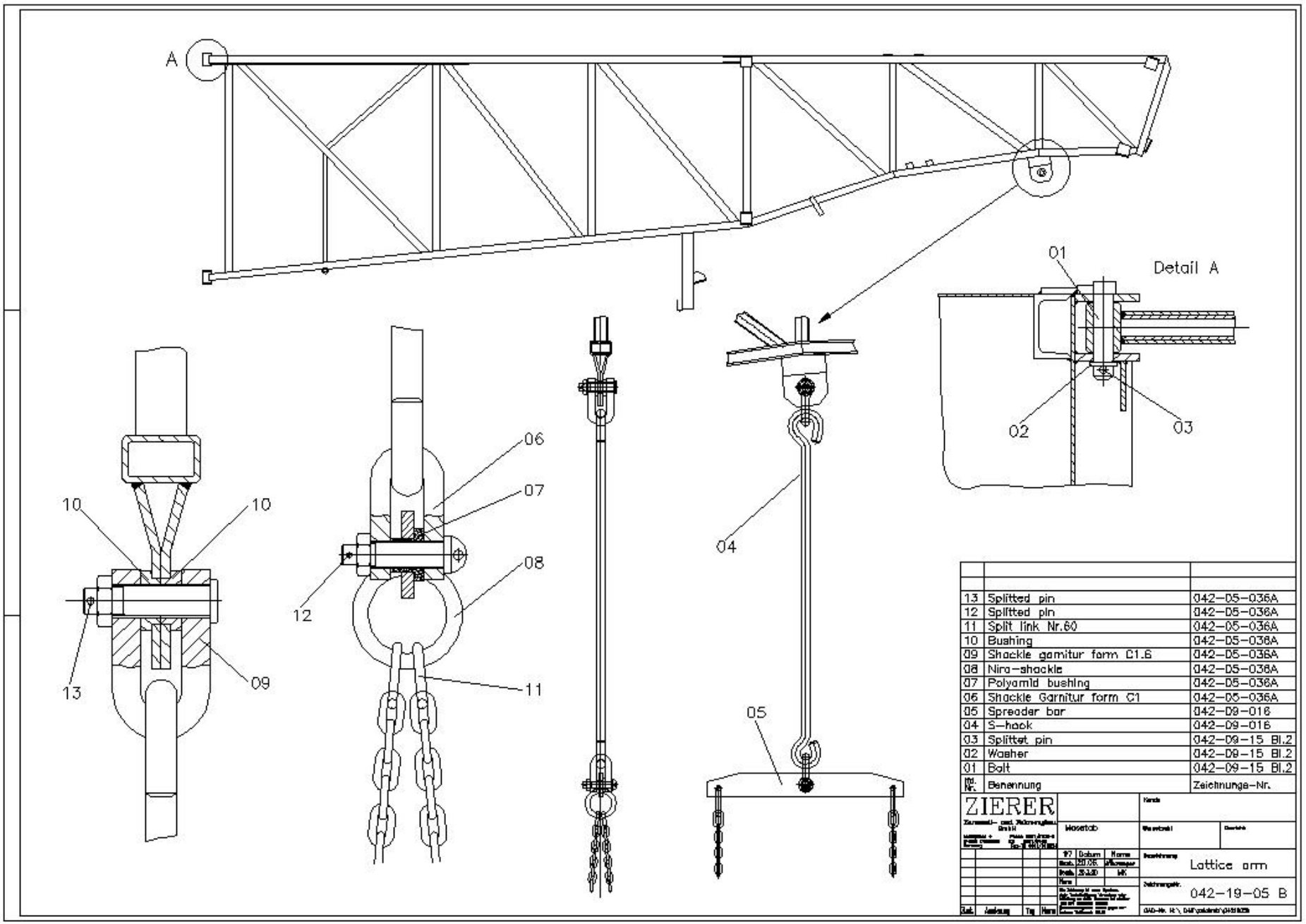
Maße ohne Toleranzangabe n. DIN 7168-m

Maßstab

Name

Seat

042-19-06 A



Pos. Nr.	Benennung	Zeichnungs-Nr.
13	Splitted pin	042-05-036A
12	Splitted pin	042-05-036A
11	Split link Nr.60	042-05-036A
10	Bushing	042-05-036A
09	Shackle garnitur form C1.6	042-05-036A
08	Nira-shackle	042-05-036A
07	Polyamid bushing	042-05-036A
06	Shackle Garnitur form C1	042-05-036A
05	Spreader bar	042-09-016
04	S-hook	042-09-016
03	Splittet pin	042-09-15 Bl.2
02	Washer	042-09-15 Bl.2
01	Bolt	042-09-15 Bl.2

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Maßstab

Kunde

Werkstoff

Oberfläche

Bearbeitung: Lattice arm

Zeichnungsnr.: 042-19-05 B