423.

Vekoma Suspended Looping Coaster vertical spindle main axle

Vekoma Rides Manufacturing has issued a service bulletin relating to the company's Suspended Looping Coaster model no. Mk 1201.

According to the document, the bulletin has been released to provide detailed information on the assembly and disassembly procedure of the main axle vertical spindle and rear axle vertical spindle. Additional clarification has been given to this procedure following the failure of a spindle during disassembly at one of Vekoma's customers.

This NAFLIC Technical Bulletin follows on from an earlier bulletin, no. 416.

The information contained within is that of the manufacturer and not NAFLIC. When following the advice from the manufacturer, you are reminded of your duties and responsibilities under HSG175 regarding modifications.

Issuing Entity:	Bulletin No.: SB-002_05
Vekoma Rides Parts & Services B.V.	Release Date: 19-08-2016
Schaapweg 18	Effective Date: Immediately
6063 BA VLODROP	Supersedes: 1-SB-002-311006/2-SB-002-311006/1-SB-002-060214/2-SB-002-060214/2-SB002-170214/SB-002_04
The Netherlands	
CoC Number: 12049585	Completion Date: N.A.

Service Bulletin

Original Ride Manufacturer: See table page 2 and 3	Affected Production Dates: All rides as mentioned in table page 2 and 3
Ride Name: Suspended Looping Coaster	Affected Serial Nos: table page 2 and 3
Model No: Mk1201	476

Abstract of issue:

Assembly and disassembly procedure vertical spindle main axle Suspended Looping Coaster.

Reason for release:

This service bulletin gives detailed information on the assembly and disassembly procedure of the main axle vertical spindle and rear axle vertical spindle. Additional clarification has been given to this procedure because a spindle failed during disassembly at one of our customers.

Action to be taken:

Add these instructions to your operation and maintenance manual. In case the release date of the operation and maintenance manual precedes the release date of this service bulletin, this service bulletin is leading.

Date	Revision date	Comment
06-02-2014	01	Service bulletin updated. Section 1.1.1, item 5 updated.
17-02-2014	02	Vekoma Manufacturing B.V. and Vekoma International B.V. replaced by Vekoma Rides Manufacturing B.V..
29-03-2016	03	Chapter 2 and affected serial Nos added to this Service Bulletin. Several (small) changes made to the content
30-03-2016	04	Small changes due to final check
19-08-2016	05	Additional clarification on vertical spindle assembly and disassembly procedure as a result of a spindle failure during dissassembly at one of our customers .

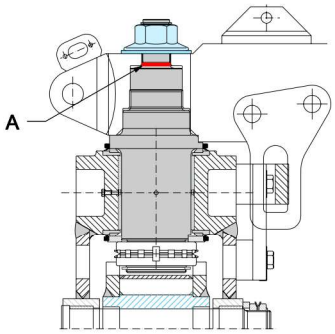
IB-nr.	Original Ride Manufacturer	Project number	Drawing number (01201-52-)
32001	Vekoma International B.V./Vekoma Manufacturing B.V.	92604	0301 / 0304
32002	Vekoma International B.V./Vekoma Manufacturing B.V.	93144	0170 / 0171
32003	Vekoma International B.V./Vekoma Manufacturing B.V.	93137	0170 / 0171
32004	Vekoma International B.V./Vekoma Manufacturing B.V.	94103	0170 / 0171
32005	Vekoma International B.V./Vekoma Manufacturing B.V.	94117	0170 / 0171
32007	Vekoma International B.V./Vekoma Manufacturing B.V.	94119	0170 / 0171
32008	Vekoma International B.V./Vekoma Manufacturing B.V.	94124	0170 / 0171
32009	Vekoma International B.V./Vekoma Manufacturing B.V.	94133	0170 / 0171
32010	Vekoma International B.V./Vekoma Manufacturing B.V.	94136	0170 / 0171
32011	Vekoma International B.V./Vekoma Manufacturing B.V.	95107	0170 / 0171
32012	Vekoma International B.V./Vekoma Manufacturing B.V.	96398	0170 / 0171
32013	Vekoma International B.V./Vekoma Manufacturing B.V.	95164	0170 / 0171
32014	Vekoma International B.V./Vekoma Manufacturing B.V.	95170	0170 / 0171
32015	Vekoma International B.V./Vekoma Manufacturing B.V.	96350	0170 / 0171
32016	Vekoma International B.V./Vekoma Manufacturing B.V.	96362	0170 / 0171
32017	Vekoma International B.V./Vekoma Manufacturing B.V.	96344	0170 / 0171
32018	Vekoma International B.V./Vekoma Manufacturing B.V.	96356	0170 / 0171
32019	Vekoma International B.V./Vekoma Manufacturing B.V.	96289	0170 / 0171
32020	Vekoma International B.V./Vekoma Manufacturing B.V.	97119	0170 / 0171
32021	Vekoma International B.V./Vekoma Manufacturing B.V.	97103	0170 / 0171
32022	Vekoma International B.V./Vekoma Manufacturing B.V.	97163	0170 / 0171
32023	Vekoma International B.V./Vekoma Manufacturing B.V.	97330	0301 / 0304
32024	Vekoma International B.V./Vekoma Manufacturing B.V.	97154	0301 / 0304
32025	Vekoma International B.V./Vekoma Manufacturing B.V.	97197	0301 / 0304
32026	Vekoma International B.V./Vekoma Manufacturing B.V.	97332	0170 / 0171
32027	Vekoma International B.V./Vekoma Manufacturing B.V.	97331	0301 / 0304
32028	Vekoma International B.V./Vekoma Manufacturing B.V.	97123	0301 / 0304
32029	Vekoma International B.V./Vekoma Manufacturing B.V.	98130	0301 / 0304
32030	Vekoma International B.V./Vekoma Manufacturing B.V.	99262	0301 / 0304
32031	Vekoma International B.V./Vekoma Manufacturing B.V.	98182	0301 / 0304

IB-nr.	Original Ride Manufacturer	Project number	Drawing number (01201-52-)
32032	Vekoma International B.V./Vekoma Manufacturing B.V.	99272	0301 / 0304
32033	Vekoma Rides Manufacturing B.V.	91000	0211 / 0212
32035	Vekoma Rides Manufacturing B.V.	91084	0301 / 0304
32036	Vekoma Rides Manufacturing B.V.	91004	0211 / 0212
32037	Vekoma Rides Manufacturing B.V.	91013	0301 / 0304
32038	Vekoma Rides Manufacturing B.V.	60007	0411 / 0418
32039	Vekoma Rides Manufacturing B.V.	60032	0301 / 0304
32040	Vekoma Rides Manufacturing B.V.	60158	0411 / 0418
32041	Vekoma Rides Manufacturing B.V.	60468	0601 / 0608
32042	Vekoma Rides Manufacturing B.V.	60617	0701 / 0706

Table 1: Affected serial Nos.

1 Issue: spindle failure during disassembly

End February 2016 Vekoma was informed by one of its customers that a vertical spindle (with article number 3009834) of their Suspended Looping Coaster failed during disassembly. The spindle in question failed just below the thread of the elastic flange nut on top of the chassis. See the figure below on the left for the failure location (A). See the picture below on the right for the failure itself.



Based on this failure, several events have been put into motion. As part of this, a detailed failure mode and effect analysis has been carried out to investigate any hazard exposure to the passengers and other park visitors. Conclusion from this analysis is that this spindle failure is not a hazardous event. Therefore, it is safe to continue operation.

Pay extra attention to this particular connection (for loose nut with stub) during daily inspection.

Also, a detailed root cause analysis has been carried out to investigate the cause of this spindle failure. One of the results of this analysis is that additional clarification needs to be given on the assembly and disassembly procedure of the vertical spindle. This additional information is given in this service bulletin.

Assembly of the vertical spindle in the main axle and chassis needs to be performed according to Chapter 2 of this service bulletin. Disassembly of the vertical spindle needs to be performed according to Chapter 3 of this service bulletin.

Chapter 4 provides additional information on the lubrication of the main axle bushings.

In case of any doubt or questions about the assembly and/or disassembly procedure of the vertical spindle described in this service bulletin, please contact VRP&S. All specified tooling is commonly available, but can also be purchased at Vekoma. In case of any doubt on suitability of the tooling, please contact VRP&S.

2 Assembly instructions of the vertical spindle

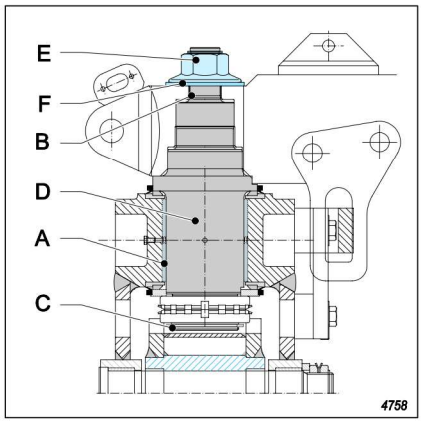
2.1 Preparations

1 Make sure that all parts to be assembled are within tolerance and NDT tested in accordance with the Operation and Maintenance Manual (OMM) specifications.

2 Make sure that all parts to be assembled are cleaned with degrease spray.

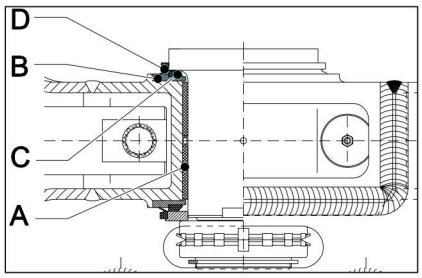
Take special care to:

- the inside of the hole (A) for the vertical spindle in the main axle;
- the threads at the top (B) and bottom (C) of the vertical spindle (D);
- the thread of the elastic flange nut (E);
- both sides of the washer (F).



3 Assemble the following parts:

a. the bearing bushes (A);
b. the spacer (B);
c. the bearing ring (C);
d. the V-seal (D).

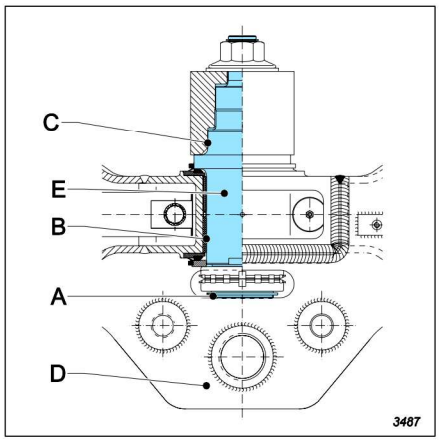


2.2 Assembly procedure vertical spindle in main axle

1 Put the main axle (D) down on two trestles.

2 Lubricate the following:

- the thread at the bottom (A) of the vertical spindle (E) according to TS-G01;
- the inside of the hole (B) for the vertical spindle in the main axle according to TS-L03;
- the stationary and bearing surfaces of the vertical spindle (C, B) according to TS-L03.



3 Install the vertical spindle (E) into the main axle (D).

Make sure that the vertical spindle moves down straight, otherwise the surface of the bearings will be damaged.

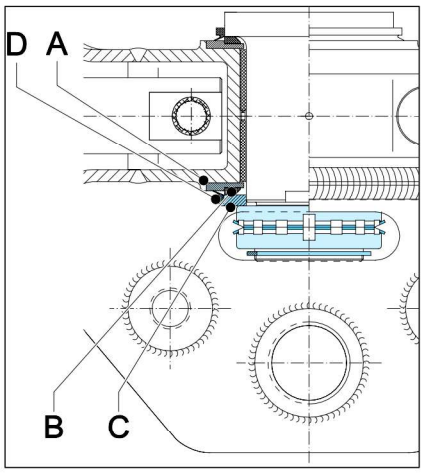
4 Assemble the following parts:

a. the spacer (A);

b. the bearing ring (B);

c. the ring (C);

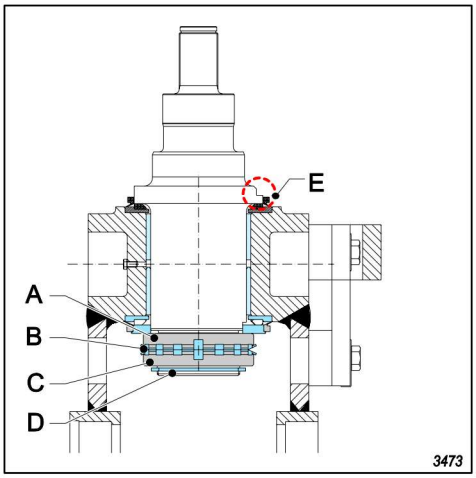
d. the V-seal (D).



2.3 Assembly procedure locknuts at the lower side of the main axle

Note

Use proper and calibrated tools (e.g. SKF tools/sockets) for the procedure steps given below. While torqueing, lock the vertical spindle against rotation by using the flat side of the vertical spindle (area E).



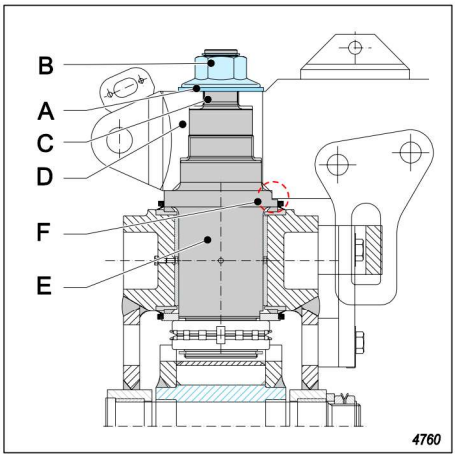
1 Lubricate according to TS-G01:
   a. the thread of the locknuts (A+C);
   b. both sides of the lock washers (B).
2 Tighten the first locknut (A) to a torque of 200 Nm. *All play is now removed.*
3 Loosen the first locknut (A) and re-tighten to a torque of 100 Nm.
4 Install new lock washers (B). *Re-use of a lock washer is prohibited.*
5 Tighten the second locknut (C) to a torque of 150 Nm, while holding the first locknut (A). Use a hook spanner.
6 Examine if the lock washers did not rotate after torqueing the locknut (C). Otherwise the internal tab of the lock washers could be damaged. If the lock washers are damaged, they need to be replaced.
7 Close the locking washers to lock the locknuts. Do not damage the locknuts.
8 Assemble the retaining ring (D).
9 Cover the untreated areas around the locknuts (bottom of vertical spindle) with corrosive-preventive coating according to TS-S05.

Use proper and calibrated tooling (e.g. SKF tools/sockets) for the assembly of the lock nuts (C) at the bottom of the vertical spindle. Other tooling will damage the lock nuts, which can result in premature failure.

2.4 Assembly procedure main axle in chassis

1 Lubricate the following:

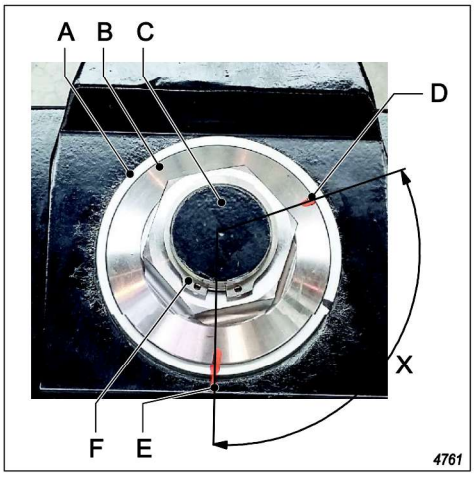
- the inside of the hole for the vertical spindle (E) in the chassis (D) according to TS-L03;
- the stationary and bearing surfaces of the vertical spindle (E) according to TS-L03;
- The top of the chassis (D) underneath the pressure washer (A) according to TS-G01;
- both sides of the pressure washer (A) according to TS-G01;
- the thread and the flange of the elastic flange nut (B) according to TS-G01;
- the thread at the top (C) of the vertical spindle (E) according to TS-G01.



2 Place the chassis (D) over the vertical spindle (E). Align the flat side of the vertical spindle with the alignment rim on the chassis (area F).

Make sure that the vertical spindle goes in straight. Otherwise, the surface of the chassis will be damaged. If necessary, the front main beam head of the chassis can be heated up to 50°C above ambient temperature or a small hand press can be used to slide the spindle into the chassis.

2.5 Assembly procedure elastic flange nut at upper side of the chassis



1 Assemble the pressure washer (A).

2 Place the elastic flange nut (B) on the vertical spindle (C).

Use a new elastic flange nut. Re-use of an elastic flange nut is prohibited.

3 Tighten the elastic flange nut (B) to a torque of 250 Nm. *Always use a calibrated torque wrench and aproper socket (e.g. SKF socket).*

4 Make a first mark (D) on the elastic flange nut, which is the starting point for the final tightening of the elastic flange nut.

5 Make a second mark (E) on the chassis, X = 120° clockwise from mark (D).

6 Turn the elastic flange nut from the first mark (D) over 120° clockwise to the second mark (E) in order to achieve the required pretension. *This has to be done in one smooth movement. Use a calibrated torque multiplier (see as example the picture below on the left) or a calibrated hydraulic torque wrench (see as example the picture below on the right) and a proper socket.*

7 Assemble a new retaining ring (F).

8 Cover the untreated areas around the elastic flange nut with corrosive-preventive coating according to TS-S05.

3 Disassembly instructions of the vertical spindle

3.1 Disassembly of the main axle

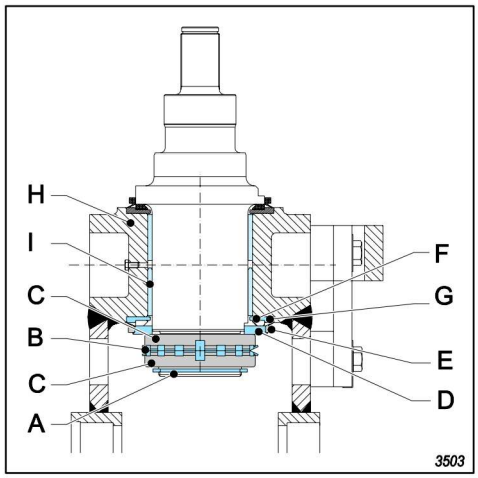
1 Support the main axle before performing of the following steps. The weight of the main axle is approximately 120 kg.

2 Remove the retaining ring (A)

3 Open the lock washers (B).

4 Remove the following components by using proper and calibrated tools (e.g. SKF tools/sockets):

   a. the locknuts (C);
   b. the lock washers (B);
   c. the ring (D);
   d. the V-seal (E);
   e. the bearing ring (F);
   f. the spacer (G).



5 Lift the chassis and the vertical spindle and remove the main axle (H).

If necessary, a small hand press can be used to remove the main axle.

6 Remove the bearing bushes (I), only if they are damaged or outside the rejection dimension.

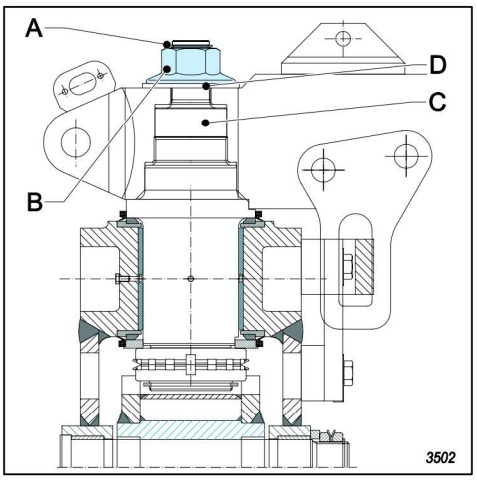
Use proper and calibrated tooling (e.g. SKF tools/sockets) for the disassembly of the lock nuts (C) at the bottom of the vertical spindle. Other tooling will damage the lock nuts, which can result in premature failure.

3.2 Disassembly of the vertical spindle from the chassis

1 Remove the retaining ring (A)

2 Remove the elastic flange nut (B) and the washer (D).

Use a calibrated torque multiplier (see picture below on the left) or a calibrated hydraulic torque wrench (see picture below on the right) and a proper socket. Do not use self-made tooling. Always loosen the flange nut with a tool that is placed in plane with the chassis.



3 Remover the vertical spindle (C).

If necessary, use a pulley puller. It is not allowed to apply any high or excessive impact loads on the head of the spindle.

4 Always perform NDT examination on the vertical spindle according to the Operation and Maintenance Manual after disassembly.

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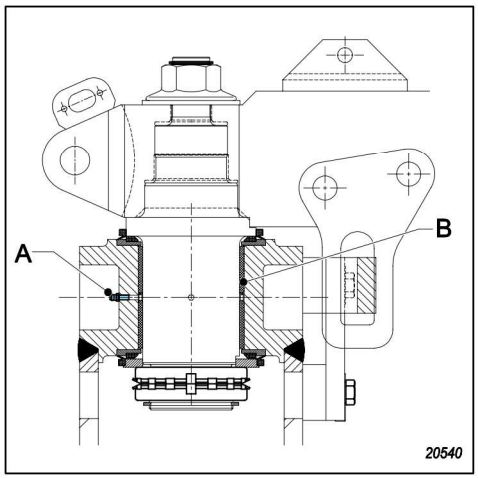
4 Lubrication of main axle bushings

The bushings (B) in the main axle need to be lubricated every 1000 ride cycles or weekly (whatever comes first) according to TS-L03, independent on the type of bushing (either bronze or orkot). This means that in all cases a grease nipple (A) needs to be present or installed. In case a hex bolt is installed, replace the bolt with a grease nipple. In case no hole is present for mounting of the grease nipple, the main axle needs to be modified. See drawing 01201-73-0010 for specific details on this modification.



According to the ASTM F853/ F1193 latest revision:

Supplemental bulletins delivered by the manufacturer to the owner / operator that were not provided at the time of hand over of the amusement ride and contain new information or newly recommended inspections or testing, or both, will be released as a Safety Alert, Service Bulletin or an Notification, with the following criteria in order to carry the force and effect of this practice:

"Safety Alert"	For notifications that recommend immediate action.
"Service Bulletin"	For notifications that do not recommend immediate action but do recommend future action.
"Notification"	For notifications that do not necessarily recommend future action but are promulgation of information.

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