



ZF Friedrichshafen AG · Tittlinger Straße 28 · 94034 Passau1

Commercial Vehicle Technology
Axle and Transmission Systems for Busses and Coaches

To:

Department TUNQ...
From
Phone
E-mail 02/01/2021
Date

Quality information – AV133 axle, suspect screws used in flange shaft connection

Ladies and Gentlemen,

By this letter, ZF informs you about a potential issue with certain AV133 axles delivered to you regarding a potentially impaired screw connection on the flange shaft.

Issue description

ZF has identified single cases of breaking screws during the assembly process in Passau. In such cases the affected screws have been replaced immediately. During the investigation, it has been found that affected screws may not break during torqueing and may not have been detected by the torque and angle-controlled screwdriver in the assembly process. Subsequently, ZF anticipates that axles with potentially suspect screws have been delivered to you.

Those suspect screws have been used for the connection of flange shafts on the axles delivered to you.

Potential consequences (in case of failure of whole bolt connection)

If undetected, there is a potential loss of drive torque in case of failure of the whole bolt connection including a slight oil leakage. There is no loss of the flange shaft to be expected due to immediate detection caused by loss of drive torque.

Root Cause

Following an investigation, ZF has determined the root cause to be an issue with pressing tools at the sub-supplier.

Potentially affected ZF axles

Our supplier informed us that several delivery batches produced with the specific pressing tool may be affected. Based on this information, ZF has identified the axles that are potentially affected and listed those in annex 1.

Chairman of the Supervisory Board: Dr.-Ing. Franz-Josef Paefgen
Board of Management: Wolf-Henning Scheider (CEO), Dr. Konstantin Sauer,
Michael Hankel, Wilhelm Rehm, Dr. Martin Fischer, Dr. Holger Klein
Headquarters: Friedrichshafen ·
Trade register of the municipal court of Ulm HRB 630206

ZF Friedrichshafen AG
Donaustraße 25-71
94034 Passau
Germany
Phone +49 851 494-0
Fax +49 851 494-905000

Rework of Potentially Affected Axles

Due to the potential issue identified herein, ZF requests that you inspect and replace the identified potentially affected AV133 flange shaft connection as described in annex 2 on all axles/vehicles.

For axles/vehicles still on stock, the rework shall be done immediately.

For vehicles already in the field, rework shall be done within scheduled maintenance or service work but not later than 250,000km and shall be finished before 2022.

All rework shall be done following the ZF repair instructions (attached as annex 3).

Please contact us in case you need support for doing the rework.

In case you have vehicles or axles still on stock coordination on ZF side will be done by 0-mile team.

Please coordinate with your responsible ZF OEM contact from the TUQ customer service team if support from ZF is needed for rework of the vehicles in the field.

ZF remains available to answer questions and coordinate the next steps wherever necessary.

Thank you for your understanding and cooperation.

Sincerely,

Director
Customer Service & Quality

Manager
Technical Service Axles

Annex 1 List of suspect axles
Annex 2 Issue summary (presentation)
Annex 3 repair instructions AV133 buses

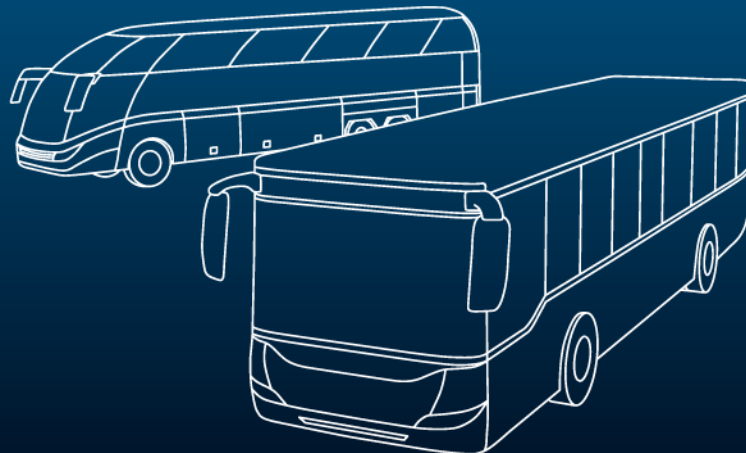
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AV133 Suspect screws at flange shaft connection

TUQX | T/TUQX



Agenda

1. Issue description
2. Root cause
3. Scope of rework



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Issue description



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AV133 Suspect screws at flange shaft connection

Issue description

Issue:

In July 2020 torx screws broke in Passau assembly line. During intensive root cause investigation together with the screw-supplier it was identified as a supplier caused failure due to a faulty pressing tool. Affected time period is between April to September 2020. The affected type of screw is used for the flange shaft connection of the AV133 city bus axle which is classified as risk class B acc. to VDI 2862.

Affected product:

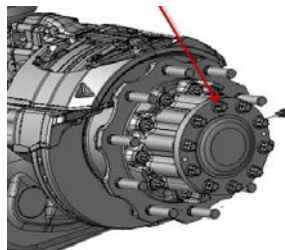
- Part no.: 0750.108.991
- Properly class: 10.9
- Dimension: M18x1,50x45,0
- Applied torque: 440 Nm

Usage of the screw:

20 screws per axle used for the hub-flange shaft connection



0750.108.991



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Root cause



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AV133 Suspect screws at flange shaft connection

Root cause

- Supplier has analyzed issue with ISHIKAWA and 5Why
- Root cause has been identified – worker error and usage of faulty tool (wrong radius 0,8mm during forming step 3)
- Failure has been reproduced at supplier
- Sorting actions on suspect batches showed failure rates between 1,37% (screw .991) and 3,13% (screw .691)

D 4 Fault Causes



D 4 Fault Causes

5 Why Analyse

Activities	1. Question Why	2. Question Why	3. Question Why	4. Question Why	5. Question Why	Measures
What is the basic problem?						
Conditioning	Screws broken under head	Due to a crack under the head	Because of an older compression at station 4	Because the tool pushes down the flange of the part	Because there is no angle under the head at the 3rd station – wrong tool mounted	Tool plan was checked, at the 3rd station an angle was added and is accordance with the new production tool plans (PHE22)
				Due to the head of the 4th station the tool radius is larger than required (R1)	Because of the 3rd station the head radius is smaller than necessary (R0.8)	Heads are measured on the parts coming from the tools of the 3rd and 4th station and samples are stored
(Effectiveness %)					100	
Activities	1. Question Why	2. Question Why	3. Question Why	4. Question Why	5. Question Why	Measures
Why was the error not detected?						
Error was not detected under the current control plan	All controls were carried out according to ISO 9001 by taking samples	Torque, Hardness measurements and torque tests were carried out	Heat treatment material testing were carried out	No sample broken under head	Error rate is very low! During the checks the parts did not break off under the head.	Process control and outgoing inspection plans have been extended to include control of cracks formation under the head.

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Scope of rework



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AV133 Suspect screws at flange shaft connection

Scope of rework

Complaint:

Screws with potential cracks used for the flange shaft connection on AV133 city bus axles

Root cause:

Supplier caused failure due to bad tooling

Remedy:

Change of the 20 potentially affected screws per axle

Damage parts handling:

Old screws shall be scrapped after the rework

Needed spare parts:

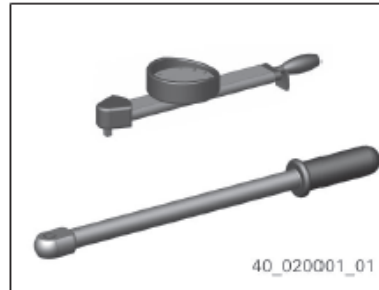
20 pcs. Torx screw 0750.108.991

Needed tools:

Torque wrench 5870.203.016 (140 Nm to 800 Nm)

Accepted rework time:

1,5h per axle



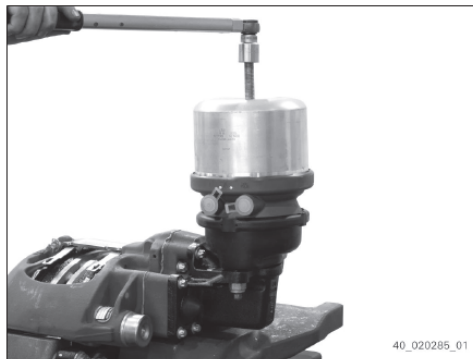
AV133 Suspect screws at flange shaft connection

Scope of rework

Important: During rework refer always to the repair instruction 4472.751.101c for AV133 axles especially for all safety relevant instructions

Step 1:

Lock the wheel head to avoid turning by bolting the emergency loosening screw of the brake chamber (only for axle not yet installed in the vehicle). For axles already installed the weight of the vehicle is sufficient.

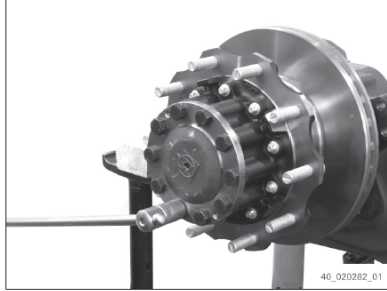


AV133 Suspect screws at flange shaft connection

Scope of rework

Step 2:

Loosen bolted connection of the flange shaft and remove the screws. The flange shaft should not be pulled out



Step 3:

Bolt in new screws and tighten Torx screws. Tightening torque: **440 Nm**

