



Test laboratory No. 1752
accredited by CAI of Czech Republic
according to ČSN EN ISO/IEC 17025:2018

TECHNICAL REPORT No.2021-0176-01-r00

Vibration test of protectors – 1 pc 24" × 0.688" Box protector and 1 pc 24" × 0.688" Pin protector. The test was performed according to the standards EN 60068-2-6 ed. 2.

Project: EXQUIP-test_of_thread_loosening-2101
Offer number: 2021-0176-01 of 10th November, 2021
Order number: 2021-0176-01 of 21st January, 2022
Release date: 25.2.2022

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APPENDICES

No.	Name of attachment	No. of Pages
1	Vibration load	1
2	24" Pin protector after vibration durability test	1
3	24" Box protector after vibration durability test	1

REVISION

Rev. No.	Author and description of changes	Date	Pages affected
00	Ing. Martin Donát, Ph.D. – new document	25.2.2022	All pages

WARNING:

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Test Center AV R&D declares that the test specimen was delivered by the customer. Results are related to the supplied test sample.

Test results are related to the test specimen, which are given in this technical report.

Test Center AV R&D is not responsible for data provided by the customer.

1. INTRODUCTION

It will be performed the vibration test of 1 pc 24" Box protector and 1 pc 24" Pin protector. Test will be performed within the scope of accreditation of the AV R&D Test Center (testing laboratory no. 1752) according to EN 60068-2-6 ed. 2.

Vibration test according to customer specification:

- Test condition:
 - Vertical vibration: amplitude 8.4 mm, acceleration 4 g,
 - Frequency of vibration: 15 Hz, 900 cycles per minute, total 1.000.000 cycles,
 - Ambient temperature: 23±5 °C,
 - Number of samples: 2 pcs of test samples (first sample 24" Box protector, second sample 24" Pin protector),
 - Fixation: 3 bolt through the sample holes to the shaker.
- Assessment of test:
 - Assessment for loosening of protector connections, inspection of visual and loosening torque after the test.

The output of the above tests will be technical report prepared by the contractor in English language. The technical report will include:

- Identification of test samples,
- Description of the preparation and actual implementation of each test,
- Photo documentation.

The technical report will not include the calculation of the measurement uncertainty.

2. SUPPLEMENTS, DEVIATIONS

Test specimens were fixed by 5 bolts in compare to order 2021-0176-01. Change in number of fixing points was approved by customer.

The test was performed in the form of subcontracting. The test engineer AV R&D was personally by the preparation and realization of all tests. Customer was present by the realization of test specimen No. 1.

3. TEST SPECIMEN**3.1. Passing the test specimen through Test Center AV R&D**

Receipt and inspection of the test specimen:

- Received by Ing. Martin Donát, Ph.D.on 7.2.2022 state: without damage
- Checked by Ing. Martin Donát, Ph.D.....on 8.2.2022 state: without damage, compliance with specification

A visual inspection of the test specimen was performed. Test specimen was undamaged and can be used for testing.

Identification of the test specimen:

- 24" Pin protector **EXQUIP_220208_Pin_protector_vz01**
- 24" Pin connector **EXQUIP_220208_Pin_connector_vz01**
- 24" Box protector **EXQUIP_220208_Box_protector_vz01**
- 24" Box connector **EXQUIP_220208_Box_connector_vz01**

3.2. Description of test specimen

Test specimen no. 1 was composed of 24" Pin connector and 24" Pin protector, see Fig. 1.

Test specimen no. 2 was composed of 24" Box connector and 24" Box protector, see Fig. 2.

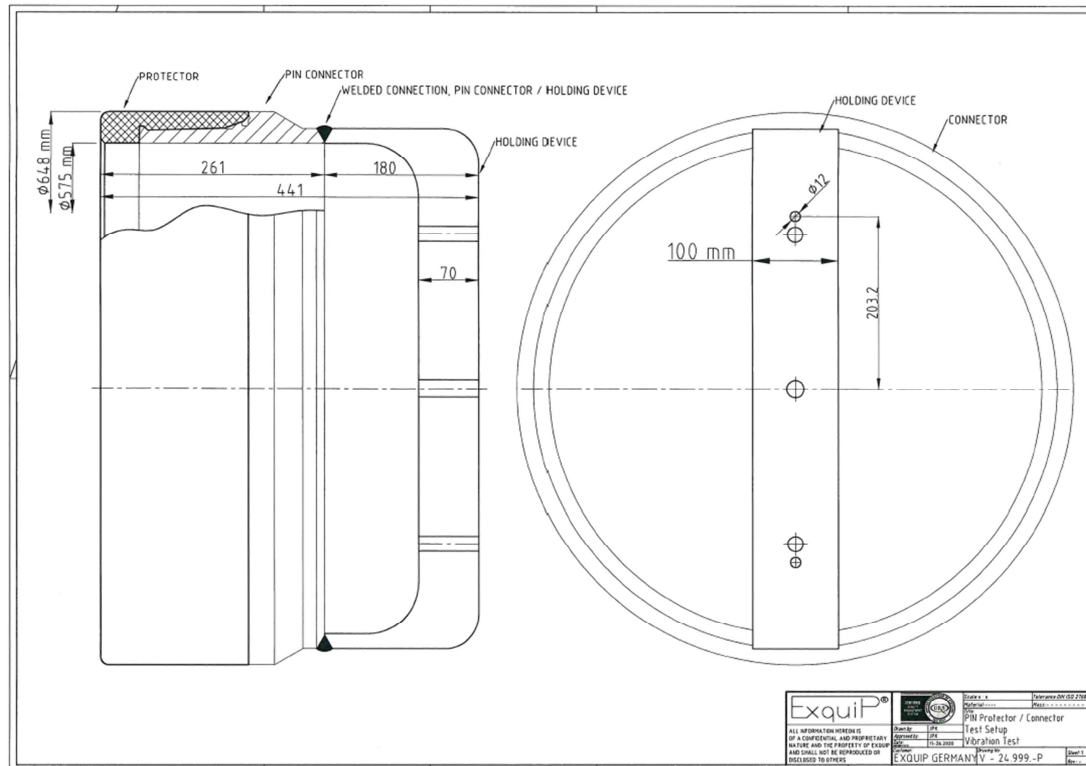


Fig. 1 – Test specimen no. 1

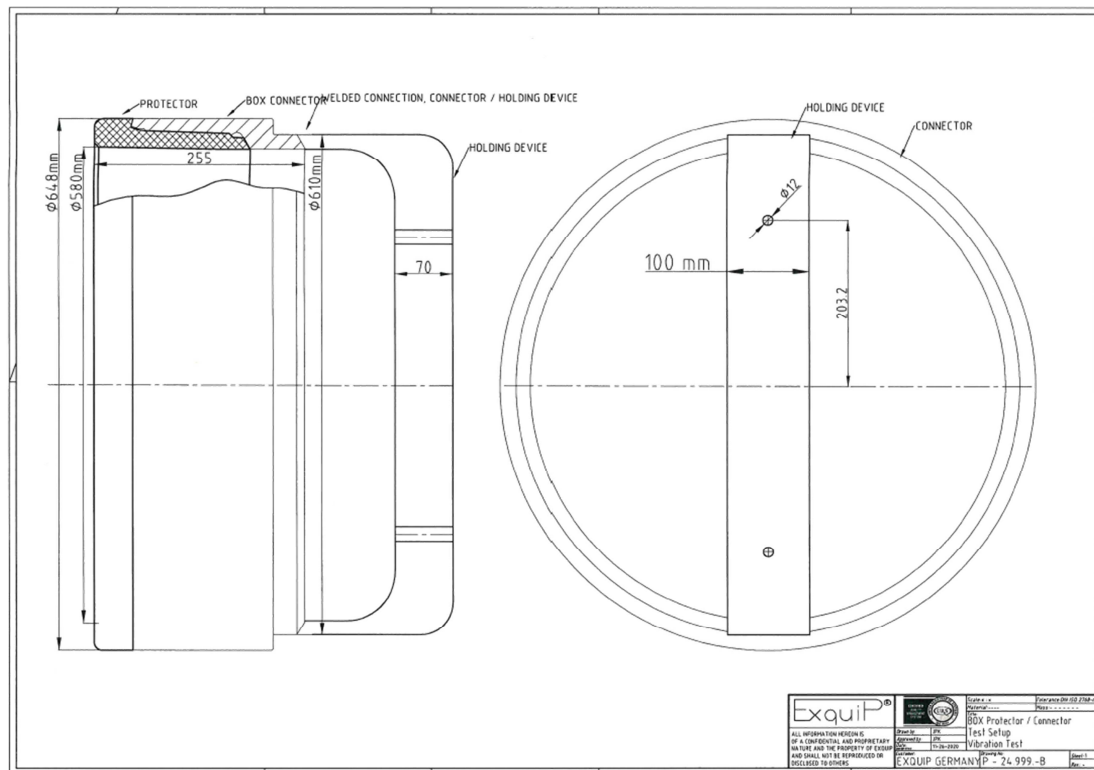


Fig. 2 – Test specimen no. 2

3.3. Test specimen preparation

3.3.1. Test specimen no. 1

Two holes were drilled into the holding device. These holes are located 101.6 mm (4 inches) from central axis of 24" Pin protector.

3.3.2. Test specimen no. 2

Four holes were drilled into the holding device. These holes are located 101.6 mm (4 inches) and 203.2 mm (8 inches) from central axis of 24" Box protector

4. TEST DESCRIPTION

4.1. Competences and responsibilities

Person responsible for:

Tests coordination Ing. Martin Donát, Ph.D. Test engineer

Tests preparation Ing. Martin Donát, Ph.D. Test engineer

Expert opinions and results interpretations Ing. Jiří Jelínek Test guarantor

4.2. Place and date

4.2.1. Test preparation

- Test specimen no. 1 on 21. 2. 2022
- Test specimen no. 2 on 22. 2. 2022

4.2.2. Tests

- Test specimen no. 1 on 21. 2. ÷ 22. 2. 2022
- Test specimen no. 2 on 22. 2. ÷ 23. 2. 2022

4.3. Cooperation

Test Center AV R&D:

- Tests preparation, tests coordination, technical report.

Customer:

- Exquip Germany GmbH. – delivery of test specimen, test condition specification, tightening torques specification for 24" Pin protector and 24" Box protector.

External laboratory no. 002:

- performing tests,

4.4. Test conditions

4.4.1. Vibration durability test

Test parameters:

- Vertical vibration: amplitude 8.4 mm, acceleration 4 g,
- Frequency of vibration: 15 Hz, 900 cycles per minute, total 1.000.000 cycles,
- Ambient temperature: 23±5 °C,
- Number of samples: 2 pcs of test samples (first sample 24" Box protector, second sample 24" Pin protector),

4.5. Used equipment

4.5.1. Vibration durability test

Equipment:

- Electrodynamical shaker UDC R24C, ID JMD6ET1
- Controller APEX SL, ID 813-18-1307

Measuring instrument:

- Acceleration sensor UDC 10B10TX, ID 1153,
- Acceleration sensor UDC 10B10, ID5323

4.6. Quantities measured during the tests

4.6.1. Vibration durability test

Quantities measured during tests are listed in Tab. 1

Method in scope of accreditation	Quantity	Sensor	Description
External laboratory SOP ETC-204.01-02 (IEC 60068-2-6)	Acceleration (excitation)	2 pcs - uniaxial acceleration sensor	Vibration control: Armature of electrodynamic shaker

Tab. 1 – Vibration durability test – measured quantities

4.7. Measured points

4.7.1. Vibration durability test

Two acceleration sensors were placed on the armature of the electrodynamic shaker, see Fig. 3. Both accelerometers were fixed with bolt and were used for vibration control of electrodynamic shaker. Vibration control strategy arithmetic mean from both acceleration sensors was used.



Fig. 3 – Acceleration measurement points

5. TEST PREPARATION

5.1.1. Vibration durability test

Vibration tests were performed on electrodynamic shaker UDC R24C.

An initial measurement of acceleration was performed before starting the test. Measured data from initial measurement were checked by test guarantor and test engineer AV R&D. Test guarantor and test engineer AV R&D agreed to start the test subsequently.

5.1.2. Test specimen no. 1

Test specimen no. 1 was mounted on the armature of electrodynamic shaker by 5 pcs of bolt M10, tensile grade 8.8 and 4 pcs of plain clamps with bolts M10, tensile grade 8.8, see Fig. 3. Tightening torque 50 Nm was used for bolts.

24" Pin protector was screwed on Pin connector. Tightening torque 200 Nm was used for Pin protector.

5.1.3. Test specimen no. 2

Test specimen no. 2 was mounted on the armature of electrodynamic shaker in the same way as test specimen no. 1.

24" Box protector was screwed on Box connector. Tightening torque 200 Nm was used for Box protector.

6. REALIZATION OF THE TEST

Tests were realized in extern laboratory No. 002 in this order:

- Vibration durability test of test specimen No. 1
- Vibration durability test of test specimen No. 2

7. EVALUATION AND TEST RESULTS EXTERN LABORATORY NO. 002 [2]

Results of tests related to the contract for work No. 2021-0176-01 of 21. 1. 2022 are listed in this chapter.

At customer's request, Test Center AV R&D provides photo documentation in electronic form to the customer. Secured data service of customer will be used for data transmission.

7.1. Vibration durability test

The vibration load acting on the test specimens during vibration durability test is shown in the Appendix 1, Fig. 4.

7.1.1. Test specimen no. 1

The 24" Pin protector did not loosen during vibration durability test.

24" Pin protector release torque was 180 Nm after the vibration durability test.

The 24" Pin protector was without visible damage after the vibration durability test.

Photo documentation of 24" Pin protector after the vibration durability test is in Appendix 2, Fig. 5

7.1.2. Test specimen no. 2

The 24" Box protector did not loosen during vibration durability test.

24" Box protector release torque was 130 Nm after the vibration durability test.

The 24" Box protector was without visible damage after the vibration durability test.

Photo documentation of 24" Box protector after the vibration durability test is in Appendix 3, Fig. 6

8. SUMMARY

8.1. Summary of the tests

The vibration durability tests of 1 pc 24" Pin protector and 1pc 24" Box protector were performed.

Test conditions of vibration durability test are listed below:

- Vertical vibration: amplitude 8.4 mm, acceleration 4 g,
- Frequency of vibration: 15 Hz, 900 cycles per minute, total 1.000.000 cycles,
- Ambient temperature: 23±5 °C.

8.2. Vibration durability test of 24" Pin protector

The 24" Pin protector did not loosen during vibration durability test.

24" Pin protector release torque was 180 Nm after the vibration durability test.

The 24" Pin protector was without visible damage after the vibration durability test.

8.3. Vibration durability test of 24" Box protector

The 24" Box protector did not loosen during vibration durability test.

24" Box protector release torque was 130 Nm after the vibration durability test.

The 24" Box protector was without visible damage after the vibration durability test.

8.4. Expert opinions and results interpretations

Test specimens of 24" Pin protector and 24" Box protector meet the requirement of vibration durability test in vertical direction according to the standards IEC 60068-2-6.

9. REFERENCES

[1] IEC 60068-2-6 ed.2 Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)

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Appendix 1 – Vibration load

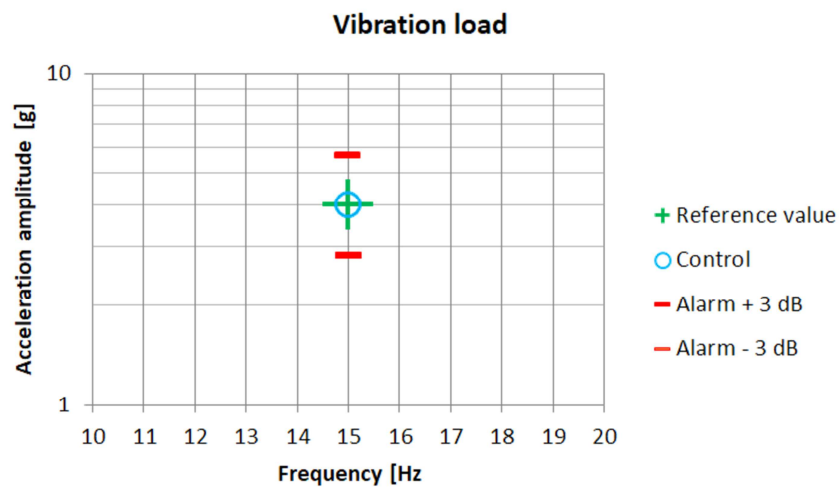


Fig. 4 – Vibration load

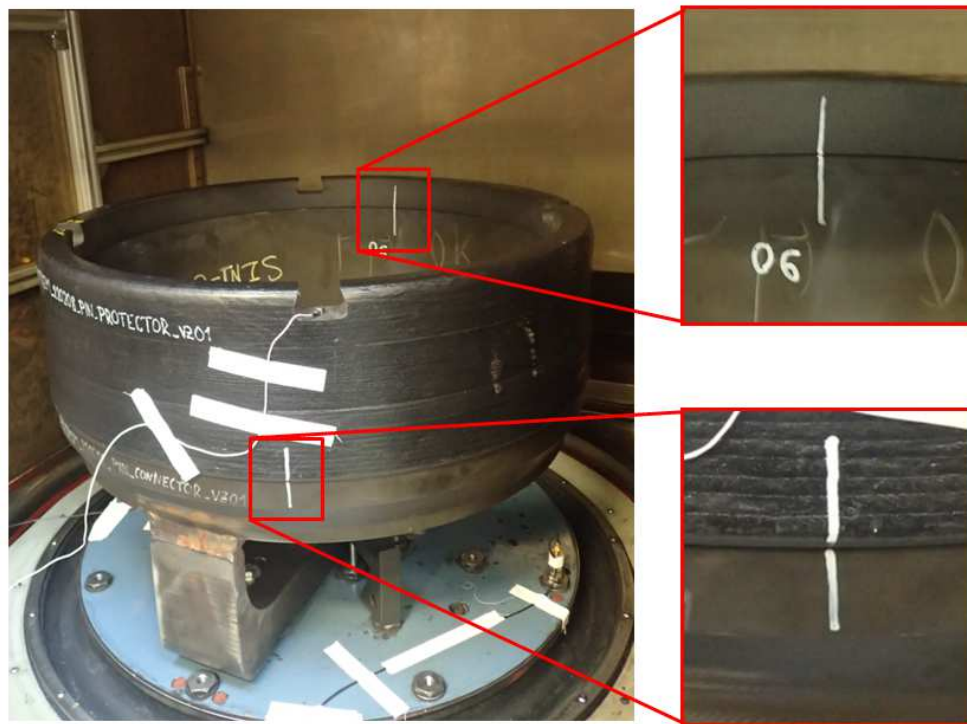
Appendix 2 – 24" Pin protector after vibration durability test

Fig. 5 – 24" Pin protector after vibration durability test

Appendix 3 – 24” Box protector after vibration durability test

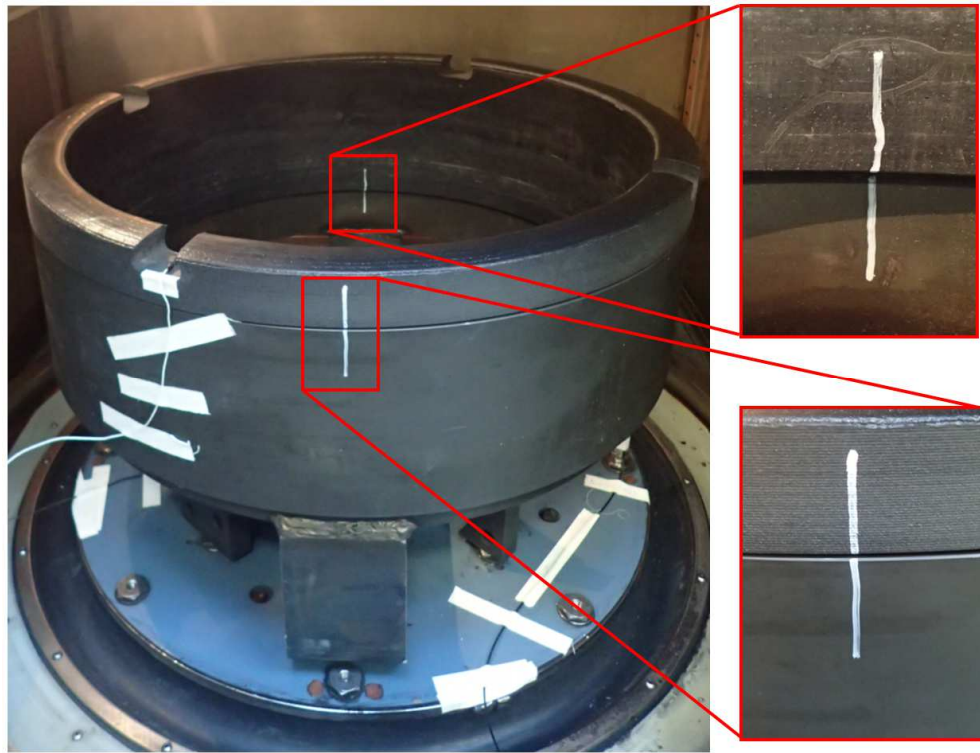


Fig. 6 – 24” Box protector after vibration durability test

END OF TECHNICAL REPORT