

CERTIFICATION REPORT

no. 11 0004211 11-012nd Copy**Ordering party:**Growermetal s.r.l.
Via Nazionale, 3
I-23885 Calco (LC)**Production plant:**

Growermetal, Calco/Italy

Test:

Implementation of vibration tests for evaluating locking performance of wedge lock washers M8 of type Twin-Lock made of stainless steel A4 and carbon steel produced by company Growermetal as well as tests of a competitor's product according to DIN 25201-4:2004-06 and the draft of DIN 25201-4:2010-03.

Object of the test:

Wedge lock washers M8 of type Twin-Lock made of stainless steel A4 and carbon steel by different manufacturers.

This certification report consists of 4 page(s).

The results of the tests are only valid for the sample(s) given in the report. This document was originally written in German. In case of doubt the German version shall prevail. Copying of the report is only allowed of an unchanged and complete version. To give a modified or abridged version is only allowed with permission of the MPA NRW.

1 Content of the order

MPA NRW (testing authority) was asked to test the performance of wedge lock washers M8 of type Twin-Lock® made of stainless steel A4 and carbon steel produced by company Growermetal by the implementation of vibration tests.

Purpose of the examination of the wedge lock washers was to show differences in locking effects of the same products made by different manufacturers.

2 Basis of the test

The tests were based on:

- DIN 25201-4:2004-06 Design guide for railway vehicles and their components - Bolted joints - Part 4: Securing of bolted joints.
- Draft of DIN 25201-4:2010-03 Design guide for railway vehicles and their components - Bolted joints - Part 4: Securing of bolted joints.
- DIN 65151:2002-08 Aerospace series - Dynamic testing of the locking characteristics of fasteners under transverse loading conditions (vibration test)
- DIN EN ISO 7093-1: 2000-11 Plain washers - Large series - Part 1: Product grade A

3 Sampling

The wedge lock washers M8 of type Twin-Lock® made of stainless steel A4 and carbon steel produced by Growermetal were taken from stock of the plant in Calco/Italy for the test in presence of the signatory. The comparative products - originally packed and sealed - were provided by the ordering party. The batch numbers of all samples were recorded.

4 Test stand for implementation of test and adjusting trials

The evidence of the locking performance of wedge lock washers was provided on the test stand which corresponded to the requirements of DIN 65151 and also fulfils the requirements of the draft of E DIN 25201-4:2010-03 appendix B by the testing authority. The measuring system for length and force are calibrated according to class 1. The calibration reports were seen.

5 Test parameter and test implementation

5.1 Setting trials

Before testing the setting trials were implemented according to the requirements of point B.3 of the draft DIN 25201-4. Flat washers according to DIN EN ISO 7093-1 were used.

5.2 Frequency used in tests

The frequency of the traverse displacements used was 12,5 Hz.

5.3 Parts tested

For all tests only new sets were used.

5.4 Preload and lubrication

The tested sets were tightened by a wrench until the required preload corresponding to table B.1 of the a.m. norm was reached.

For the screws M8 made of stainless steel A4-80 this means a preload $F_{v,}$ of 8,5 kN and for the screws in quality 8.8 a preload of $F_{v,}$ of 9,1 kN.

The tested sets were lubricated according to part B.5.2 of a.m. norm with a lubrication-oil HD 30. For screws made of stainless steel also a molybdenum-sulfide-compound was used.

5.5 Execution of trial

During all tests the preload, the traverse displacement under load and the number of load alterations were measured and registered. Furthermore the residual preload after 2000 cycles was measured.

6 Test results

During all trials 2000 cycles were reached. All tested samples withstood not less than 2000 cycles.

For a better overview all test results are shown in the following chart:

Pos.	Manufacturer	Test object	Number of samples	Material	Surface	Size	Preload Fv/80 % (kN)	Ø Residual Fv kN / % after 2000 cycles (kN)
1	Growermetal	wedge lock washer Twin-Lock	10	Stainless steel A4	bright	M 8	8,5 / 6,8	7,157 / 84,2
2	Competitor's product	wedge lock washer	5	Stainless steel A4	bright	M 8	8,5 / 6,8	6,871 / 80,8
3	Growermetal	wedge lock washer Twin-Lock	10	carbon steel	Delta Protect	M 8	9,1 / 7,28	7,725 / 84,9
4	Competitor's product	wedge lock washer	5	carbon steel	Delta Protect	M 8	9,1 / 7,28	7,134 / 78,4

Conclusion: All tested wedge lock washers made of stainless steel A4 of type Twin-Lock and those of the competitor reached the number of 2000 cycles using a residual preload of > 80 % of the nominal preload.

Also all samples of the tested wedge lock washers made of carbon steel reached the number of 2000 cycles test. However, the wedge lock washers of type Twin-Lock produced by Growermetal show a higher residual preload than the one of the competitor which, in some cases, not reached the residual preload's limit value of 80 %.

Dortmund, 19th April 2012

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 Dipl.-Ing. Hans Förster

