

Test report

No.: 2026-0384-VU

Date of test: May bis Juni 2026

Testers: Dipl.-Ing. Pröhl,
M. Eng. Schuto

No. of pages: 15

**Applicant/
manufacturer:** DIRAK GmbH
Königsfelder Straße 1
58256 Ennepetal

Test specimens: Different specimens: see pages 11 - 15

**Test procedures /
bases:** Random vibration test:
base standard: DIN EN 60068-2-64 (09/2020)
test standard: DIN EN 61373 (04/2011)

Shock test:
base standard: DIN EN 60068-2-27 (02/2010)
test standard: DIN EN 61373 (04/2011)

Delivered on: May 18th, 2026

Date of report: June 01st, 2026

1 Test equipment and regulation

1.1 Vibration and shock test

Electro dynamic shaker:

PM:

Calibration date:

Accelerometer:

PM:

Calibration date:

Accelerometer:

PM:

Calibration date:

Total uncertainty of measurement [%]*:

LDS V8-LPT750C with connected slip table LPT 750 and power amplifier SPA 56K

V9

02/2026

PCB J320C34

V300

12/2025

PCB J320C34

V301

01/2026

± 0.72

Electro dynamic shaker:

PM:

Calibration date:

Accelerometer:

PM:

Calibration date:

Accelerometer:

PM:

Calibration date:

Total uncertainty of measurement [%]*:

LDS V875-LPT750C with connected slip table LPT 750 and power amplifier SPA 40K

V8

01/2026

PCB J320C34

V300

12/2025

PCB J320C34

V301

01/2026

± 0.72

^{*)} Given are the uncertainties of measurement according to *EA-4/02 M:2022*. These are within the scope of the accreditation the smallest measurable uncertainties of measurement with a coverage probability of approx. 95 % with a coverage factor $k = 2$. Uncertainties of measurement without specifications of the units are relative values related to the measured value, unless otherwise noted.

2 Testing methods

2.1 Visual checks

Before, during and after the vibration and shock tests the specimens were subjected to a visual check.

2.2 Random vibration test (long-term test)

The vibration test was conducted in accordance with the standard DIN EN 61373 (2011) Category 1, Class B. The category and class were specified by the customer.

The test parameters were defined as follows:

Excitation mode:	random
Frequency range:	5 Hz to 150 Hz
Power density:	<u>vertical, horizontal 1 + 2:</u> 5 Hz – 20 Hz 0.964 (m/s ²) ² /Hz 20 Hz – 150 Hz -6 dB / octave
Effective acceleration:	<u>vertical, horizontal 1 + 2:</u> 5.72 m/s ² (RMS)
Test directions:	3 directions (X, Y, Z)
Test duration:	approx. 5 h / direction
Total test duration:	approx. 15 h (effective vibration time)
Test temperature:	room temperature

Following customers instructions, the test was conducted with the profile “vertical” in all three directions.

Diagram 1 on page 7 shows exemplarily the regulating channel’s excitation during the long-term test.

2.3 Shock test

The shock test was conducted in accordance with the standard DIN EN 61373 (2011) Category 1, Class B. The category and class were specified by the customer.

The test parameters were defined as follows:

Shock pulse:	half sine
Shock duration and amplitude:	<u>± vertical, ± horizontal 1 + 2:</u> 30 ms at 50m/s ²
Test directions:	6 directions
Number of shocks:	3 / direction
Test temperature:	room temperature

Following customers instructions, the test was conducted with the profile “longitudinal” in all three directions.

Diagrams 2 and 3 on pages 8 and 9 show the regulating channel’s shock excitation in the positive and negative directions.

2.4 Random vibration test (function test)

The vibration test was conducted in accordance with the standard DIN EN 61373 (2011) Category 1, Class B. The category and class were specified by the customer.

The test parameters were defined as follows:

Excitation mode:	random
Frequency range:	5 Hz to 150 Hz
Power density:	<u>vertical, horizontal 1 + 2:</u> 5 Hz – 20 Hz 0.031 (m/s ²) ² /Hz 20 Hz – 150 Hz -6 dB / octave
Effective acceleration:	<u>vertical, horizontal 1 + 2:</u> 1.01 m/s ² (RMS)
Test directions:	3 directions
Test duration:	approx. 10 min / direction
Total test duration:	approx. 30 min (effective vibration time)
Test temperature:	room temperature

Following customers instructions, the test was conducted with the profile “vertical” in all three directions.

Diagram 4 on page 10 shows exemplarily the regulating channel's excitation during the long-term test.

The following figures show the test specimens undergoing the vibration and shock tests.



Fig. 1: Specimens during the vibration and shock test in direction vertical



Fig. 2: Specimens during the vibration and shock test in direction horizontal 1

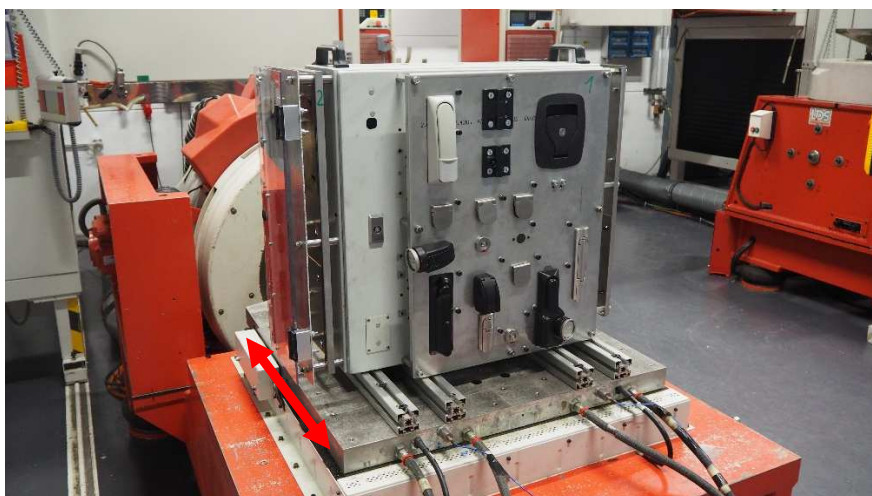


Fig. 3: Specimens during the vibration and shock test in direction horizontal 2

3 Test procedure

The tests were conducted in the following order:

- | | |
|---|-----------------------------|
| 1. Random vibration test, long term test,
direction vertical | May 18 th , 2026 |
| 2. Shock test, direction vertical | May 18 th , 2026 |
| 3. Random vibration test, function test,
direction vertical | May 18 th , 2026 |
| 4. Random vibration test, long term test,
direction horizontal 1 | May 19 th , 2026 |
| 5. Shock test, direction horizontal 1 | May 19 th , 2026 |
| 6. Random vibration test, function test,
direction horizontal 1 | May 19 th , 2026 |
| 7. Random vibration test, long term test,
direction horizontal 2 | May 19 th , 2026 |
| 8. Shock test, direction horizontal 2 | May 20 th , 2026 |
| 9. Random vibration test, function test,
direction horizontal 2 | May 20 th , 2026 |

4 Result

The visual inspection of the specimens after testing could not detect any cracks, chipping, deformation, abrasion, or other mechanical damage.

The specimens did not self unlock during the tests.

The customer will continue investigations on the test specimens.

Processed by:

Approved by:

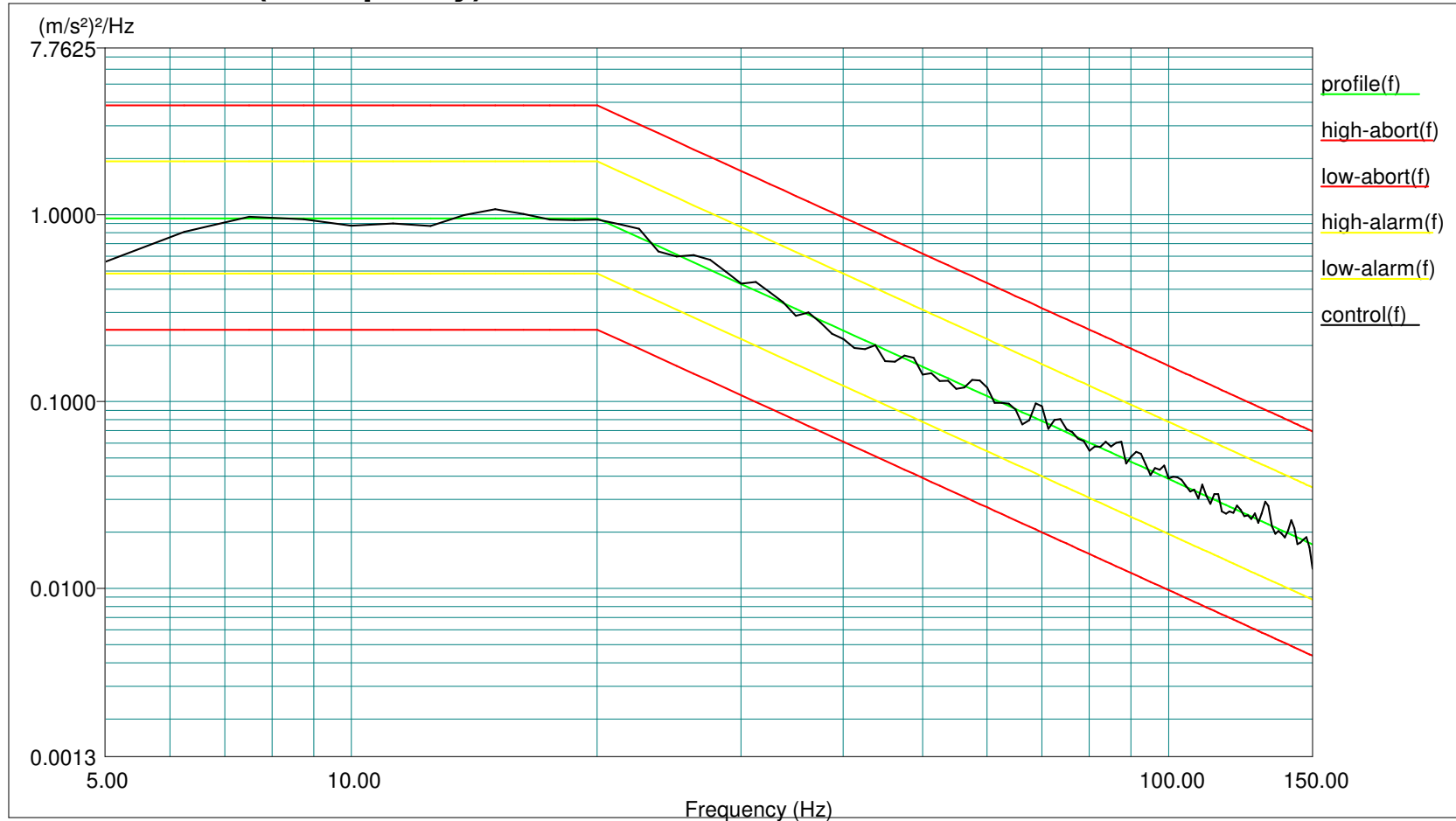


(Dipl.-Ing. Pröhl)
(Head of laboratory)



(M. Eng. Schuto)
(Test engineer)

Diagram 1: Long-term test regulating channel (exemplarily)



Level: 100 %

Control RMS: 5.605237 m/s^2

Full Level Elapsed Time: 05:00:00

Lines: 200

Frame Time: 0.800000 Seconds

Demand RMS: 5.613488 m/s^2

Remaining Time: 00:00:00

DOF: 154

dF: 1.250000 Hz

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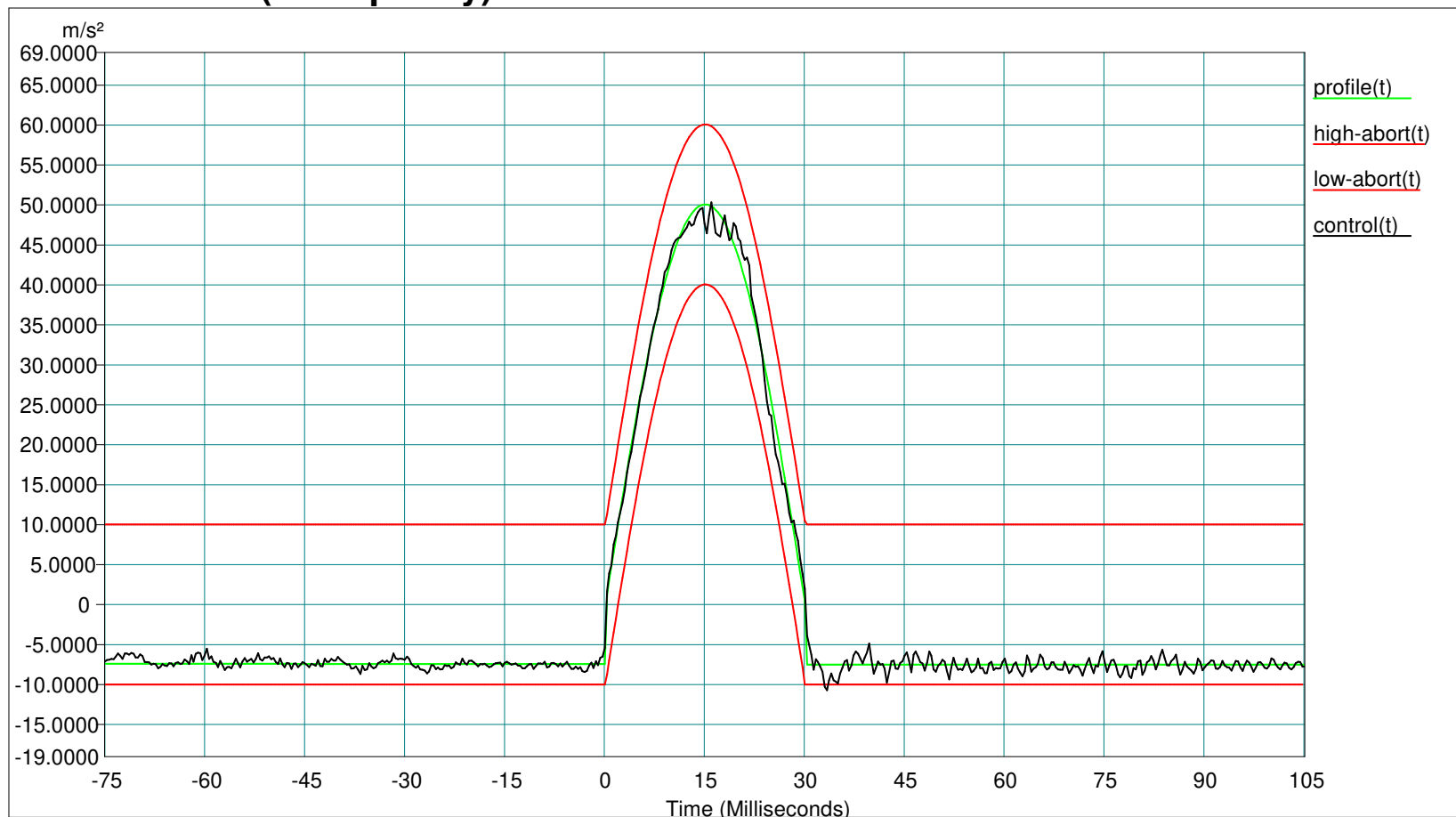
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The findings presented in this report apply exclusively to the specimen submitted for testing. No part of this publication may be duplicated without the prior consent in writing of the testing laboratory.

Diagram 2: Shock test regulating channel, positive direction (exemplarily)



Level:	100 %	Block Size:	2048	Elapsed Pulses:	11
Frame Time:	0.682667 Seconds	Control Peak:	50.253544	Control RMS:	8.793630
dT:	0.000333 Seconds	Demand Peak:	50.000000	Demand RMS:	8.806992
Pulse Type:	Half Sine	Amplitude:	50.000000	Pulse Width:	29.999999 ms
				Full Level Elapsed Pulses:	3
				Remaining Pulses:	6

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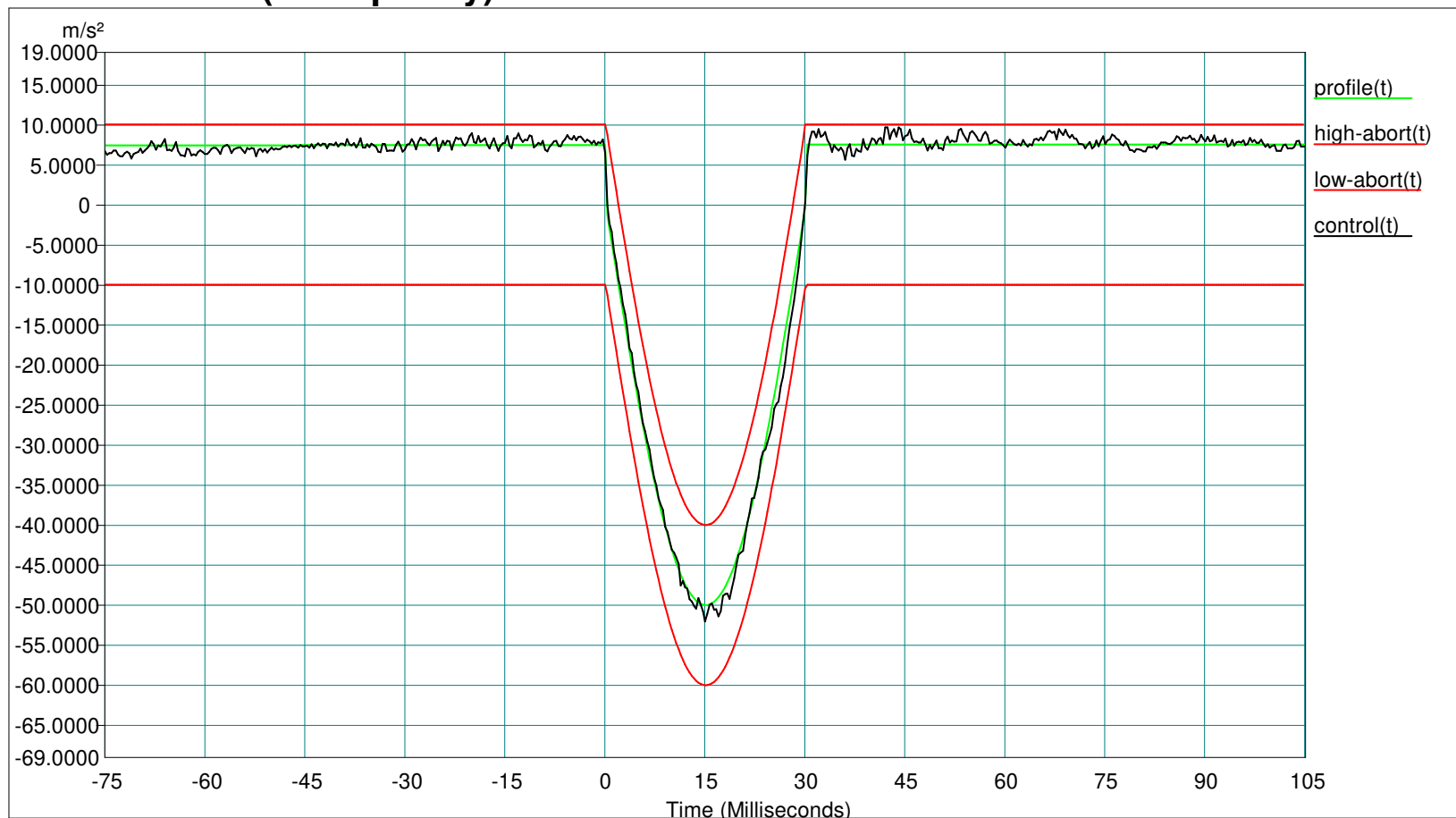
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Diagram 3: Shock test regulating channel, negative direction (exemplarily)



Level:	100 %	Block Size:	2048	Elapsed Pulses:	17
Frame Time:	0.682667 Seconds	Control Peak:	52.067585	Control RMS:	8.924046
dT:	0.000333 Seconds	Demand Peak:	50.000000	Demand RMS:	8.806992
Pulse Type:	Half Sine	Amplitude:	50.000000	Pulse Width:	29.999999 ms
				Full Level Elapsed Pulses:	6
				Remaining Pulses:	0

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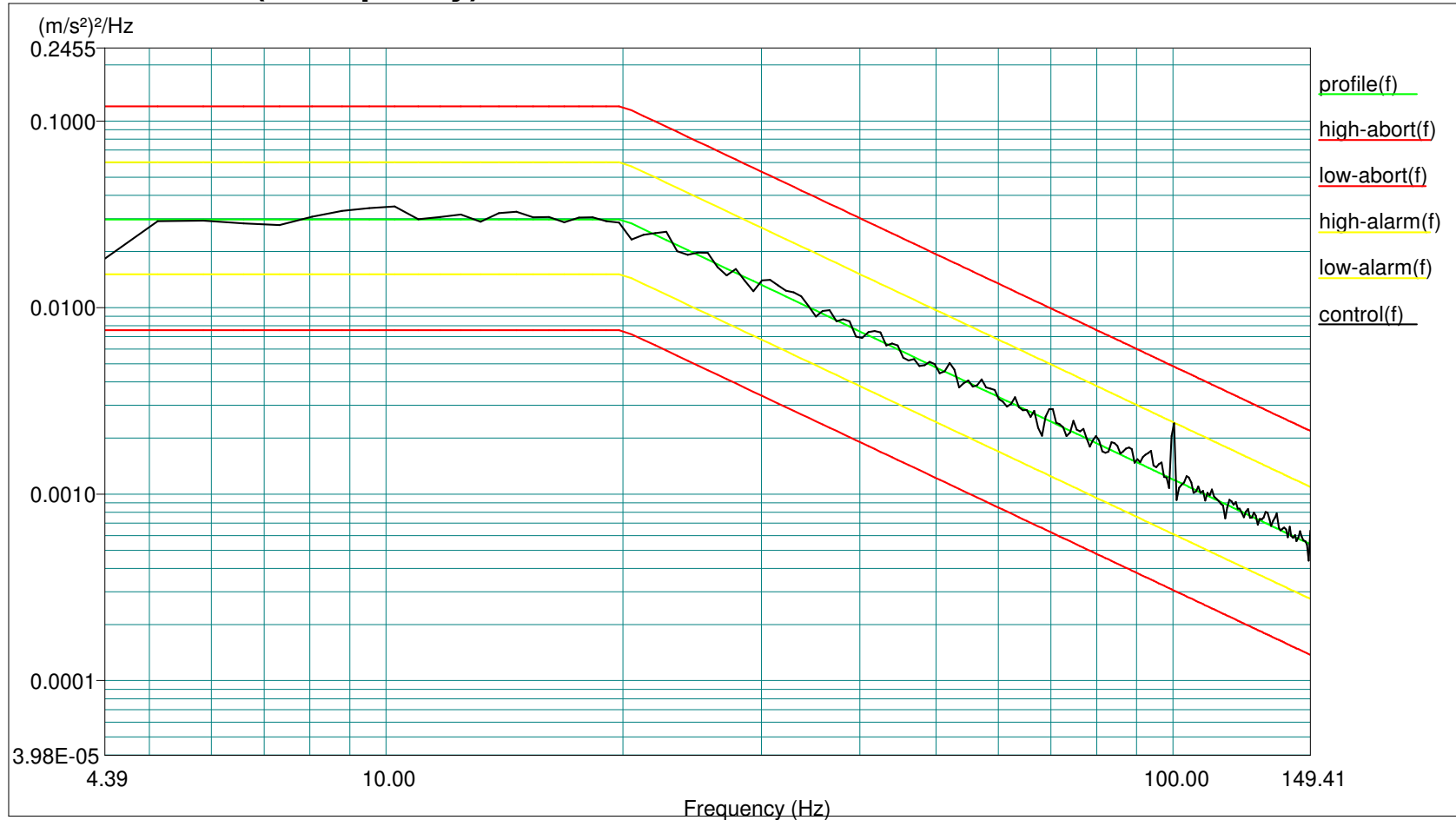
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Diagram 4: Function test regulating channel (exemplarily)



Level: 100 %

Control RMS: 1.001403 m/s²

Demand RMS: 0.994294 m/s²

Full Level Elapsed Time: 00:09:59

Remaining Time: 00:00:00

Lines: 200

DOF: 154

Frame Time: 1.365333 Seconds

dF: 0.732422 Hz

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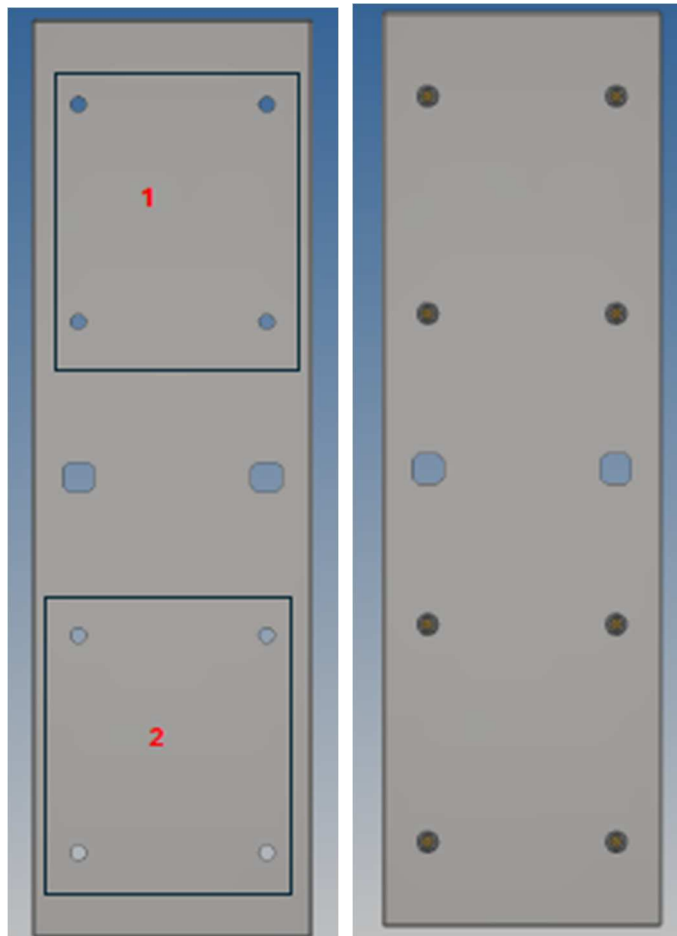
Fig. 5: Arrangement of the specimens (sheet metal 1)



Blech 1 Dok Nr. 1 10105447

1. 207-8907.00-00000
2. 248-9653.00-MIM03
3. 308-9014.00-00000 + 300-9401.00-09000 (m.tec PHZ mit Schnappdaumen)
4. 207-9129.00-00000
5. 218-9618.00-00000
6. 218-9243.00-000XX
7. 248-9608.00-00005
8. 248-9609.00-00005
9. 200-9496.00-00000
10. 307-9363.RH-00000
11. 248-8070.00-00001
12. 248-9608.00-00005
13. 248-9609.00-00005
14. 282-9522.00-00000
15. 207-9161.00-00000 + 300-9400.00-09000 (m.tec PHZ mit verstellbarem Schließdaumen)
16. 307-9365.00-00000

Fig. 6: Arrangement of the specimens (sheet metal 2)



Blech 2 Dok. Nr.: 10105530

1. 294-9501.00-00020
2. 294-9502.00-00020

Fig. 7: Arrangement of the specimens (sheet metal 3)



Blech 3 Dok Nr. 1 10106628

1. 207-9136.00-07038
2. 248-9653.00-MIM03
3. 248-8278.RH-00005
4. 207-9129.00-00000
5. 218-9618.00-00000
6. 218-9243.00-000XX
7. 248-8278.RH-00005
8. 248-9653.00-MIM05
9. 307-9363.RH-00000
10. 248-8070.00-00001
11. 248-9653.00-MIM05
12. 248-9609.00-00005
13. 282-9522.00-00000
14. 207-9169.00-00000
15. 307-9365.00-00000

Fig. 8: Arrangement of the specimens (sheet metal 4)



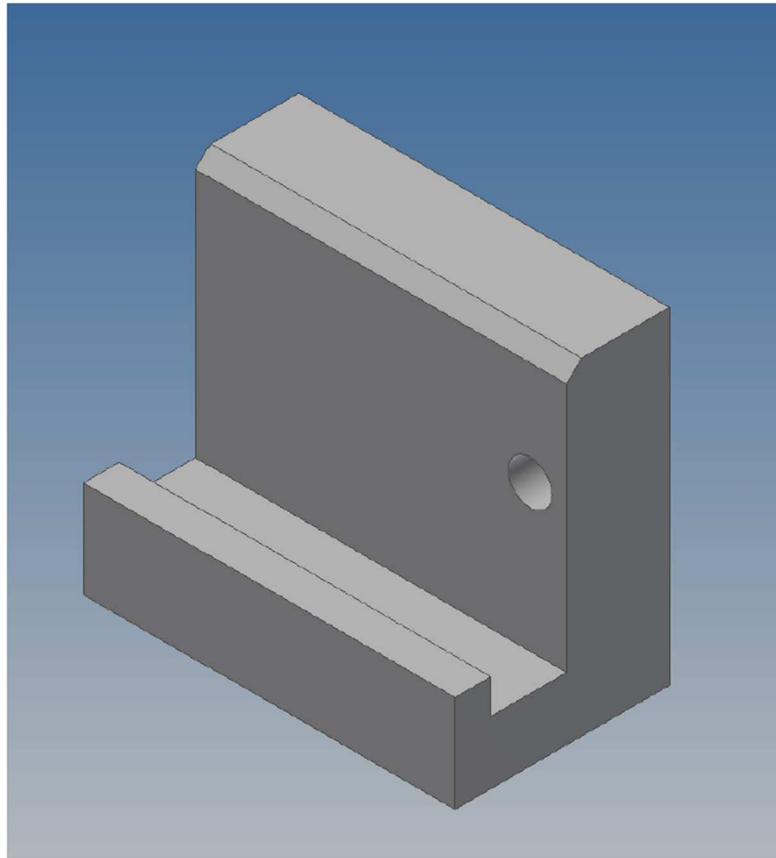
Blech 4 Dok.Nr.: 10105516

1. 294-9511.00-00030
2. 294-9512.00-00030

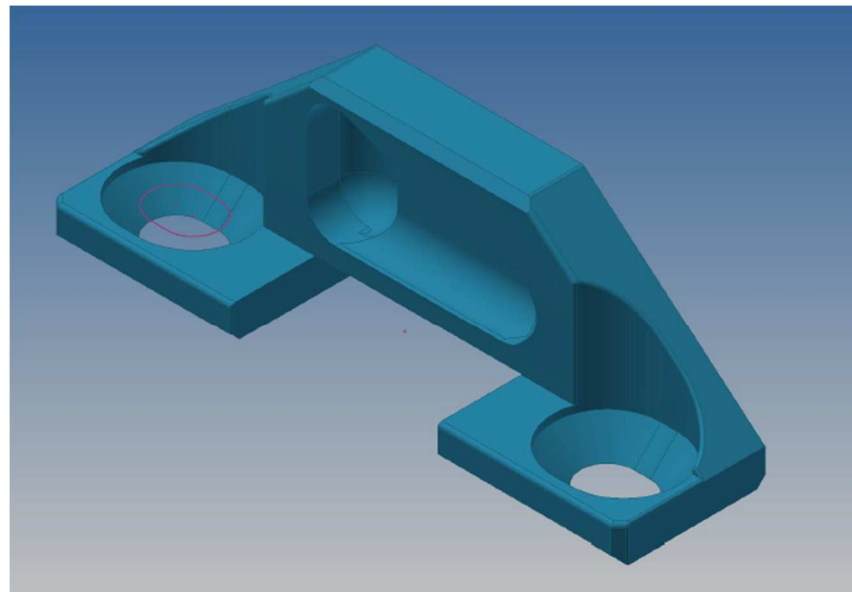
Fig. 9: Arrangement of the specimens (sheet metal 5)

Blech 5

Flachstangenverschluss mit Kompression



Führung für Kugel Dok.Nr.: 10105438



Verschlussshaken Dok.Nr.: 10105892