TÜVNORD

Test report

Handrail holder

Determination of structural properties (type 3540, 3541, 3542, 3543)

2410-E-361, 05-10-2026, Hermeta Metaalwaren B.V.



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1. Summary

1.1 Summary of test report

Contractant and scope	
Assignor	Hermeta Metaalwaren B.V. 1e Industrieweg 1 4147 CR Asperen Nederland
Contact person	Mr. F. Bel
Reference Description of the product	Hermeta handrail holder, type 3540, 3541, 3542, 3543 Aluminium handrail holder for affixing handrails in residential buildings.
Results	The tested products as described under 2.2 **meet** the requirements for handrailing in context of the Dutch National Annex in the Eurocode (NEN-EN 1991-1-1+C1+C11 NB 2019, page 15).
Test executed by	Mr. R. de Bode
Period of execution	Sep-Oct 2026
Report date	05-10-2026
Reported by	Mr. R. de Bode Sr. inspector product safety
Reviewed by	Mr. A.J. Piers Unit Manager

2. Test overview

2.1 Introduction

Hermeta Metaalwaren B.V. assigned TÜV NORD Nederland B.V. with the execution of a test on a type of aluminium handrail holder by signing the agreement "*Overeenkomst drukproef en praktijkproef aan aluminium leuninghouders*" with reference "*2410-E-361*".

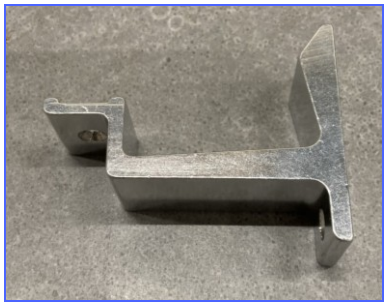
TÜV NORD Nederland B.V. was asked to perform a test on a handrail holders in context of requirements in a Dutch National Annex for the Eurocode NEN-EN 1991-1-1+C1+C11 NB 2019 - page 15, for handrailing. To determine whether or not the handrail holders will meet these requirements, when used to affix a handrail.

This report contains the details of the samples, execution of the tests and the test results.

2.2 Test samples

In total 5 to 7 aluminium handrail holders of the types 3540, 3541, 3542, 3543 were produced and selected by the assignor and sent to TÜV NORD to conduct the tests.

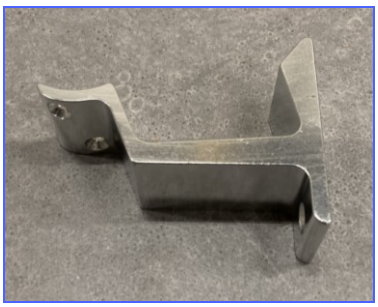
TÜV NORD Nederland was not responsible for selection of the samples.



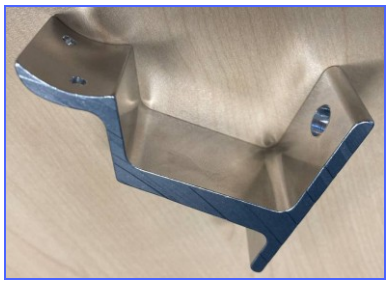
3540



3541



3542



3543

Overview: examples of the handrail holders, as received

2.3 Requirements

Eurocode NEN-EN 1991-1-1+C1+C11 NB 2019, Annex NB.A sets specific Dutch national requirements for static horizontal loads on railings/balustrades/parapets.
The tests as conducted in this report are performed in the context of NB.A.1 clause (2), that sets the following requirement (Dutch language):

> "*Voor leuningen en dergelijke die slechts zijn bedoeld om steun te verlenen langs bijvoorbeeld wanden en trappen, en buiten het in (1) beschreven toepassingsgebied vallen, moet een vrije geconcentreerde belasting van F_k = 1 kN in rekening zijn gebracht. De geconcentreerde belasting F_k kan in verticale en in horizontale richting aangrijpen.*"

and NB.A.2 clause (2), that sets the following requirement (Dutch language):

> "*De geconcentreerde belasting F_k, is een vrije belasting. F_k kan in horizontale richting aangrijpen, afhankelijk van het gestelde in tabel NB.A.1, op ieder punt van de afscheiding ter plaatse van zone a, zone b en van zone (a + b). De grootte van de geconcentreerde last F_k is beschreven in tabel NB.A.1. F_k werkt op een oppervlakte van 0,2 m × 0,2 m. Indien de vloerafscheiding bestaat uit constructieonderdelen met een kleinere oppervlakte, dan grijpt de volle belasting aan op het vlak van constructieonderdelen dat is gelegen binnen de afmetingen van 0,2 m × 0,2 m. De geconcentreerde last moet ten minste gedurende de in die tabel aangegeven tijdsduur op de vloerafscheiding aangrijpen.*"

To determine the Ultimate Limit State (ULT) the Eurocode part 0, "*NEN-EN 1990:2002+A1+A1/C2:2011 Eurocode – Grondslagen van het constructief ontwerp*" and the connected Dutch National Annex, Table NB.5 is applied to obtain a partial factor for leading variable action of 1,35 $Q_{k,1}$ (when following CC:1 for residential buildings).

From the requirement F_k = 1 kN above the following requirements apply:

Serviceability Limit State (SLS) = *1 kN (no permanent deformation allowed)*
Ultimate Limit State (ULS), 1 kN × 1,35 = *1,35 kN*

Remark 1: Requirements above are set for complete handrailings. The assignor manufactures handrail holders and is not responsible for the complete handrailing, which excludes selection of the handrail, selection of fasteners, execution of the affixing to the handrail and surface (wall) and other external factors.

Remark 2: In consultation with the assignor it is decided to apply F_k in vertical direction (downwards), as this is how the products are designed: for support.

3. Description of the test

When testing the handrail holder as a single item it proves difficult to demonstrate that the ultimate limit state (ULS) is reached or passed. A universal test machine applying and logging an increasing vertical force to obtain F_{max} will show the force at which the handrail holder will deform, but could slightly deviate from the behavior of a “real” situation. It might not show if the handrail holder will break, since the aluminium handrail holder will bend well before breakage, which in theory will still be a safe situation for a person. Therefore it is decided to test the handrail holders in a complete handrailing setup. To demonstrate whether or not the handrail holder including the handrail will reach (and pass) the SLS and ULS values as required.

3.1 Test 1, handrailing set – test load (practical test)

A test setup was made by means of the following components:

- Wooden handrail 100 cm, diameter 45 mm;
- Steel welding table (to exclude influences from e.g. a concrete wall and plugs);
- M8 bolts and nuts for mounting / M4 bolts and nuts for mounting;
- Universal screws for mounting the handrail;
- Small size lifting sling 1000 kg / Steel bow shackle;
- Dial gauge (range 0-50 mm, reading 0.01 mm);
- Electric actuator + sling (8,4 kg) + test weight (93,2 kg) = 101,6 kg → 1,00 kN;
- Electric actuator + sling (8,4 kg) + test weight (129,7 kg) = 138,1 kg → 1,35 kN;
- Electric actuator + sling (8,4 kg) + test weight (158,6 kg) = 167,0 kg → 1,64 kN.

Test sequence (see Annex A for photo 2 of test setup):

- Two aluminium handrail holders are mounted to a steel welding table by means of M8 bolts and nuts or M4 bolts and nuts (depending on type) at a separation distance of 700 mm;
- A wooden handrail is mounted to the handrail holders by two fitting universal screws per holder;
- A dial gauge is firmly placed on top of the wooden handrail, on top at the position of the left handrail holder, reading is noted;
- An electric actuator is attached to a wooden handrail by means of the steel bow shackle (around the wooden handrail) positioned directly next to the left handrail holder (inside the area between the two holders) and attached to a test weight of 93,2 kg[-1];
- The actuator is operated to steadily lift the test weight until it hangs fully free;
- After one minute the reading on the dial gauge is noted;
- The actuator is operated to steadily release the weight;
- After one minute the reading on the dial gauge is noted;
- The test is repeated with the weight of 129,7 kg and again with the weight of 158,6 kg;
- Any visual observations / deviations during the test are noted.

[-1] In this setup some part of the force will be transferred to the right handrail holder. However, when the largest weight is applied the ULS value on the left handrail holder certainly exceeds the factor 1,35 as detailed in paragraph 2.3 in this report.

3.2 Test 2, single handrail holder – press-test

Additionally another test is performed to obtain strength information on the individual handrail holders. A press-test is conducted on three handrail holders per type, to determine the maximum force F_{max} until further permanent deformation at lower forces.

A test setup was made by means of the following components:

- Steel tool;
- Solid aluminium tool, representing a piece of handrail / piece of wooden handrail 45 cm diameter;
- M8 Bolt + washers + hex cap nut / M4 Bolts + washers + hex nut, depending on type;
- Universal testing machine;
- Load cell 50 kN;
- Logging software.

Test sequence (see Annex A for photo 5 of test setup):

- An aluminium handrail holder is mounted to the solid aluminium tool by means of two small bolts;
- The aluminium handrail holder with aluminium tool / piece of wooden handrail is mounted to the steel tool;
- The tool is placed in the universal machine;
- A vertical force is applied to the test tool with 10 mm/min to reach F_{max};
- The maximum force Fmax is noted from the test curve;
- The test is performed on 3 samples;
- Any visual observations / deviations during the test are noted.

4. Test Results

4.1 Test 1, handrailing set – test load (practical test)

Railing Holder Type	Residual deformation after release of load 1 kN, after 1 min. [mm]	Residual deformation after release of load 1,35 kN, after 1 min. [mm]	Residual deformation after release of load 1,6 kN, after 1 min. [mm]
3540	0,6	1,0	1,5
3541	0,1	0,4	0,8
3542	0,2	0,8	2,1
3543	0,0	0,1	0,6

Table 1, test results for test with handrailing setup

Visual inspection:

No breakage, no cracks, no abnormalities noticed during the test. Little to no permanent deformation is measured after the first test sequence.

After the third sequence only a small amount of permanent deformation is measured and visible when compared to a holder as received.

4.2 Test 2, single handrail holder – press-test

Railing Holder Type	F_{max} sample 1 [kN]	F_{max} sample 2 [kN]	F_{max} sample 3 [kN]	Average [kN]
3540	2,16	2,25	2,12	2,17
3541	2,05	2,11	2,17	2,11
3542	2,33	1,63	2,05	2,01
3543	2,04	2,02	1,90	1,99

Table 2, test results for vertical press-test on individual handrail holders

Visual inspection:

No abnormalities noticed during the test. Permanent deformation visible after execution of the test.

5. Conclusion / Discussion

5.1 Statement of conformity

When tested in accordance with chapter 3 in this report the Hermeta handrail holder types: 3540, 3541, 3542, 3543, as part of a handrailing set, function well within the requirements as laid out in Eurocode NEN-EN 1991-1-1+C1+C11 NB 2019, Annex NB.A (detailed in paragraph 2.3 in this report).

The test results apply only to the tested samples as sent in for this test.

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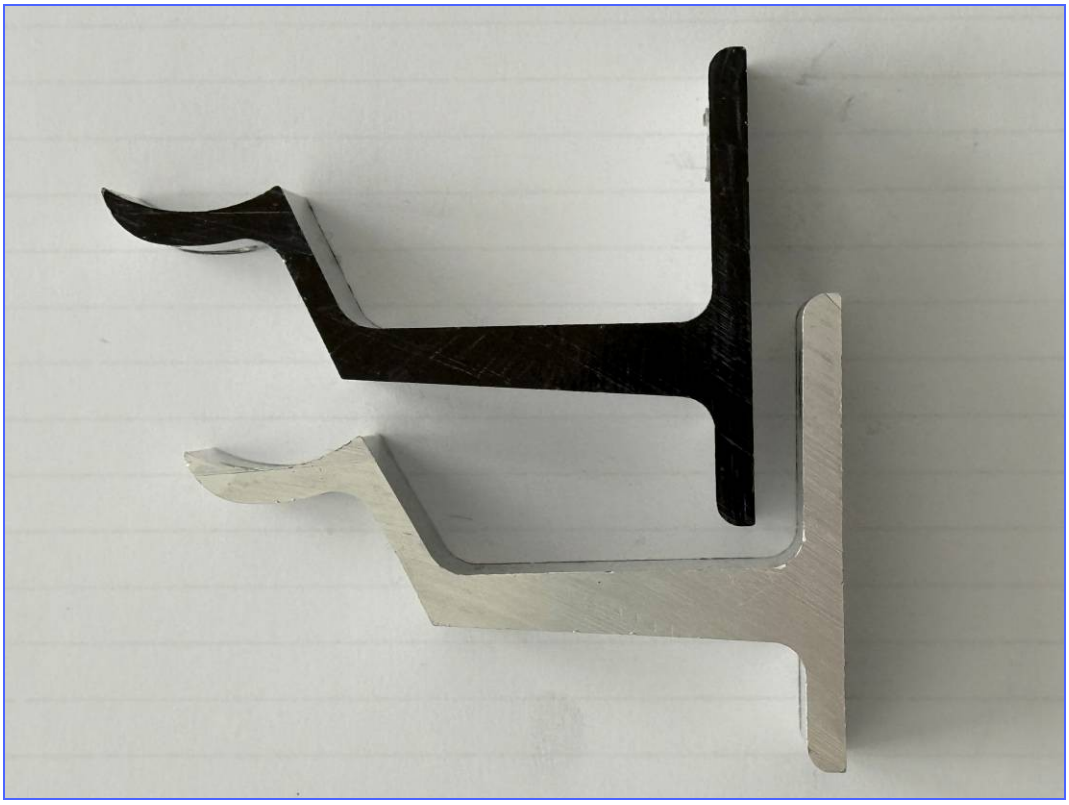
A. ANNEX (PHOTOS)



Photo 1, Test in progress (parts in photo are edited (blurred) to improve clarity of the setup)



Photo 2, After the initial test the sling was replaced by a steel bow shackle for ease of use and positioning



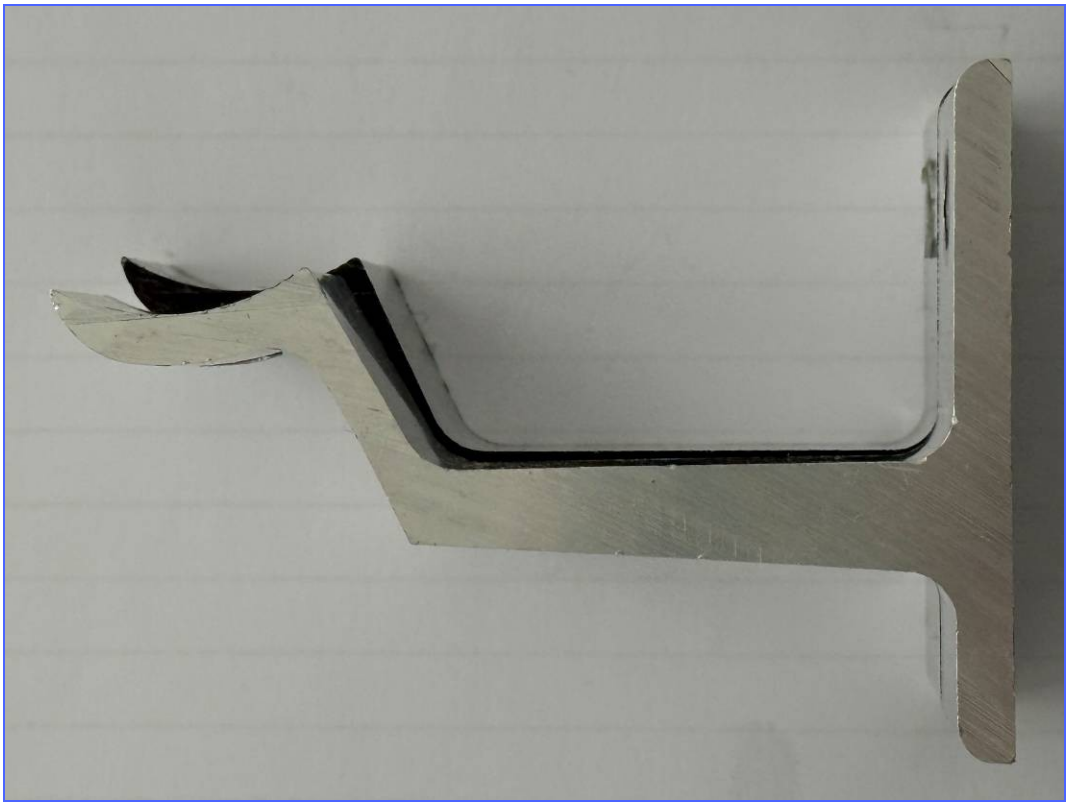


Photo 3, 4, Informative: Comparison between handrail holder 3543 as received (coloured with black marker) versus handrail holder after full test sequence



Photo 5, Rigid steel test frame, mounted handrail holder and mounted aluminium tool.

TÜVNORD



TÜV NORD Nederland

Ekkersrijt 4401
5692 DL Son en Breugel

T +31 499 - 339 500

info-nl@tuv-nord.com
www.tuv.nl

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