



TECHNICAL REPORT

**RECOMMENDATIONS FOR
JOB SITE TESTS OF
PLASTIC ANCHORS AND SCREWS**

TR 051
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1 GENERAL

The recommendations in this Technical Report (TR) are applicable for

- Plastic anchors for fixing of external thermal insulation composite systems with rendering (ETICS) with a European Technical Assessment (ETA) on the basis of EAD 330196-01-0604 [1],
- Screws for fixing of external thermal insulation composite systems (ETICS) with a European Technical Assessment (ETA) on the basis of EAD 330912-00-0601 [2],
- Screws for masonry and lightweight concrete for fixing of façade elements, insulation panels, frames for lightweight partitions, roof truss or similar with a European Technical Assessment (ETA) on the basis of EAD 330424-00-0601 [3],
- Plastic anchors for redundant non-structural systems in concrete and masonry with a European Technical Assessment (ETA) on the basis of EAD 330284-00-0604 [4].

In the absence of national requirements, the characteristic resistance of plastic anchors or screws may be determined by job site tests carried out on the material actually used, if the plastic anchor or screw has an ETA for the same intended use with characteristic values for the same type of base material as is present on the construction works.

Types of base materials for plastic anchors and screws are:

- Normal weight concrete,
- Clay and calcium silicate solid masonry units,
- Hollow or perforated masonry units,
- Autoclaved aerated concrete,
- Lightweight aggregate concrete.

The characteristic resistance to be applied to a plastic anchor or screw shall be determined by means of at least 15 pull-out tests carried out on the construction works with a centric tension load acting on the plastic anchor or screw. These tests are also possible in a laboratory under the same conditions as used on construction works.

Execution and evaluation of the tests as well as issue of the test report and determination of the characteristic resistance should be under the responsibility of approved testing laboratories or supervised by the person responsible for the execution of works on site.

The number and position of the plastic anchors or screws to be tested shall be adapted to the relevant special conditions of the construction works in question and, for example, in the case of blind and larger areas be increased such that reliable information about the characteristic resistance of the plastic anchor or screw embedded in the base material in question can be derived. The tests shall take account of the most unfavourable conditions of practical execution.

2 ASSEMBLY

The plastic anchor or screw to be tested shall be installed in accordance with the manufacturer's installation instructions (e.g. preparation of drill hole, drilling tool to be used, drill bit, drilling method, setting tool, thickness of fixture) and as far as spacing and edge distances are concerned be distributed in the same way as foreseen for the intended use (fixing of ETICS or fixing of façade elements, insulation panels, frames for lightweight partitions, roof truss or similar).

Nailed-in plastic anchors according to [1] shall be installed through the insulation material on site (having the largest thickness of fixture used at the job site) according to the manufacturer's installation instructions. The insulation material has to be removed carefully before the test rig is attached to the anchor. Any adverse influence on the anchor (e.g. bending) should be avoided during this step.

For plastic anchors installed into a drilled hole: Depending on the drilling tool hard metal hammer-drill bits or hard metal percussion drill bits in accordance with ISO 5468 [5] with the cutting diameter at the upper tolerance limit shall be used.

3 EXECUTION OF TESTS

The test rig used for the pull-out tests shall allow a continuous slow increase of load controlled by a calibrated load cell. The load shall act perpendicularly to the surface of the base material and be transmitted to the plastic anchor or screw via a hinge. The reaction forces shall be transmitted to the base material in adjacent masonry units or at a distance of at least 150 mm from the plastic anchor or screw. The load shall be continuously increased so that the ultimate load is achieved after about 1 minute. Recording of load is carried out at the time the ultimate load (N_1) is achieved.

4 TEST REPORT

The test report shall include all information necessary to assess the resistance of the tested plastic anchor or screw. It shall be included in the construction documents. The following information is necessary:

- Construction product: name of the anchor,
- Construction work; building owner; date and place of tests, air temperature,
- Type of structure (ETICS or VETURE Kits or fixture) to be fixed,
- Masonry (type of brick, strength class, all dimensions of bricks, mortar group),
- Visual assessment of masonry (flush joints, joint clearance, regularity),
- Type of plastic anchor or screw, including fixing length, total length and nominal diameter
- Type of attachment to be fixed
- Drilling method
- Cutting diameter of hard metal hammer-drill bits, value measured before and after drilling,
- Test rig,
- Results of tests including ultimate load N_1 and failure mode
- Nailed-in plastic anchors: After removing the EPS-block the anchor shaft does not show any cracks and/or breaks that influence the performance of the anchor.
- Tests carried out or supervised by; Signature

5 EVALUATION OF TEST RESULTS

For plastic anchors with an ETA according to EAD 330196-01-0604 and screws according to EAD 330912-00-0601 the characteristic resistance N_{Rk1} is obtained from the measured values of N_1 as follows:

$$N_{Rk1} = 0,6 \cdot N_1 \leq 1,5 \text{ kN}$$

with: N_1 = the mean value of the five smallest measured values at the ultimate load

Nailed-in plastic anchors: Cracks and/or breaks have to be assessed regarding their influence on the load carrying capacity of the anchor as well as on the corrosion outside of the base material according to EAD 330196-01-0604 [1] test for verification of installation suitability (nailed-in anchor mounted with EPS layer).

For screws with an ETA according to EAD 330424-00-0604 or plastic anchors with an ETA according to EAD 330284-00-0604 the characteristic resistance N_{Rk1} is obtained from the measured values of N_1 as follows:

$$N_{Rk1} = 0,5 \cdot N_1 \leq F_{Rk,ETA}$$

with: N_1 = mean value of the five smallest measured values at the ultimate load

$F_{Rk,ETA}$ = characteristic resistance given in the ETA for the comparable base material

The determined resistances are only valid for the construction works for which the tests have been performed, the type of anchor or screw tested and the drilling method used for the installation.

6 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment is of relevance.

- [1] EAD 330196-01-0604
Plastic anchors for fixing of external thermal insulation composite systems with rendering
- [2] EAD 330912-00-0601
Screw anchors for fixing of external thermal insulation composite systems
- [3] EAD 330424-00-0604
Screw for masonry and lightweight concrete
- [4] EAD 330284-00-0604
Plastic anchors for redundant non-structural systems in concrete and masonry
- [5] ISO 5468:2007-1
Rotary and rotary impact masonry drill bits with hardmetal tips. Dimensions