



# **Ground Reinforcement Systems made of recycled Plastics**

**Quality assurance**

**RAL-GZ 806**

Edition August 2016

**RAL**

DEUTSCHES INSTITUT FÜR GÜTESICHERUNG UND KENNZEICHNUNG E. V.

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Price group 10

To be obtained from:

**Beuth-Verlag GmbH**  
– Burggrafenstraße 16 – 10787 Berlin  
Phone: 49 (0)30 26 01-0 Fax: +49 (0)30 26 01 12 60 Email: [info@beuth.de](mailto:info@beuth.de)  
Website: [www.beuth.de](http://www.beuth.de) – [www.mybeuth.de](http://www.mybeuth.de)

**Ground Reinforcement Systems made of  
recycled Plastics**

**Quality assurance  
RAL-GZ 806**

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These Quality and Test Regulations had been worked out by RAL Deutsches Institut für Gütesicherung und Kennzeichnung e. V. within the principles for quality labels in a validation process in cooperation with experts and relevant public concerned. In the first half-year of 2016, the Quality and Test Regulations have been adjusted to practice.

Sankt Augustin, August 2016

**RAL DEUTSCHES INSTITUT  
FÜR GÜTESICHERUNG  
UND KENNZEICHNUNG E. V.**

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# **General Quality and Test Regulations for Ground Reinforcement Systems made of recycled Plastics**

## **1 Scope of application**

These General Quality and Test Regulations specify the general guidelines for contents and scope of the control measures for Ground Reinforcement Systems of recycled Plastics.

Within the scope of the Special Quality and Test Regulations, requirements for individual sectors of Ground Reinforcement Systems are treated by detailed demand profiles.

The General Quality and Test Regulations are overall rules valid for all sectors of quality regulations. The Special Quality and Test Regulations are issued for each scope of quality assurance and are the specific rules for the manufacturers of this sector. Being particularly valid, these rules have priority to the General Quality and Test Regulations.

The quality assurance of the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. are divided in the following scopes:

- Special Quality and Test Regulations for non-sealed Ground Reinforcement Systems
- Special Quality and Test Regulations for Erosion Protection Grids

The General Quality and Test Regulations are valid only in combination with the respective Special Quality and Test Regulations.

### **1.1 General information**

The quality surveillance determined in the General and the following Special Quality and Test Regulations cover the requirements requested for ground reinforcement systems of recycled plastics according to standards OECD 202: 2004, DIN 1072 and EN 124.

Moreover, the fulfilment of additional requirements is stipulated and ensured by a quality assurance system consisting of self- and external monitoring.

The aim of these Quality and Test Regulations is to create quality assurance provided by the manufactures for the Ground Reinforcement Systems of recycled plastics. The special requirements to the sections indicated in paragraph 2.1 are listed in the respective Special Quality and Test Regulations.

### **1.2 Definitions**

Ground Grids are elements having a non-closed surface and base. Thus, they serve as non-sealed area usable for different applications.

Erosion Protection Grids prevent or retard ground erosion mechanism by protecting the soil surface to water and wind.

Only the office initiates external samplings. Sampling shall be effected by an external and neutral sampler. The dates for sampling shall be determined by these Quality and Test Regulations resp. are effected according to the instructions of the quality committee.

In case of self-sampling, the sample shall be taken by a person instructed by the manufacturer.

Non-sealing condition is defined by the run-off coefficient and depends on the regional characteristics (share and permeability of paved areas, soil characteristics, vegetation, terrain slope, preceding humidity, ice coverage) as well as on the intensity and duration of the precipitation event. The effect of the regional characteristics can change with intensity and duration of the precipitation.

Ground Reinforcements are elements suitable to protect the soil against mechanical influences and to guarantee a lasting and sustainable use of the surface.

A Production Company is a company producing the ground reinforcements and the manufacturing facilities are all the sites manufacturing for a company.

### **1.3 Related applicable specifications, principles and guidelines**

Those paragraphs of related applicable specifications, principles and guidelines in its most recent version and related to the scope of validity of the General and Special Quality and Test Regulations are to be complied with.

#### **1.3.1 Regulations, standards and guidelines**

Those paragraphs of standards in its most recent version and related to the scope of validity of the General and Special Quality and Test Regulations are to be adhered to. Proof of adherence to the bases according to paragraph 1.3 must be provided to the Gütegemeinschaft in the framework of initial test and external monitoring.

OECD 202	OECD guidelines for the testing of chemicals – daphnia sp. acute immobilisation test
DIN 1072	Roads and road bridges, load assumptions, review of bridges according to the hitherto bridge class 24
DIN EN 124	Gully and manhole covers for vehicular and pedestrian areas - construction principles, inspections, labelling, quality survey
DIN EN ISO 9001	Quality management systems – success through quality
DIN 4102-1	Fire behaviour of building materials and components – part 1: building materials, terms, requirements and tests
DIN EN ISO 4892-2	Plastics – artificial irradiation or weathering in appliances – part 2: xenon arc lamps (ISO 4892-2: 2013)
DIN EN 12061	Systems of plastic pipes – fittings of thermoplastics – test method for impact strength
DIN EN 2039-1	Plastics – determination of hardness – part 1: ball indentation test
DIN EN 15342	Characterisation of plastic recyclates: recyclates of PS
DIN EN 15344	Characterisation of plastic recyclates: recyclates of PE
DIN EN 15345	Characterisation of plastic recyclates: recyclates of PP
DIN EN 15348	Characterisation of plastic recyclates: recyclates of PET

## Quality and Test Regulations

REACH            Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals

DWA (German Association for Water, Wastewater and Waste) work sheet "Planning, construction and operation of facilities for infiltration of rainwater"

ZTE-Stb 94        Additional technical terms of contract and guidelines for earthworks for road constructions

OECD 202        Guidelines for the testing of chemicals

Requirements for the substructure according to ZTVE-Stb 94

ISO 18262, part 1 + 2        Plastics – Mixed recyclates of polypropylen and polyethylen

UBA (Federal Environment Office) texts 55/2011 "REACH and recycling of plastics"

## 2 Quality and Test Regulations

Overall quality and test regulations for all product ranges:

Quality characteristics	Quality criteria	Test requirements
Material can be recycled	No materials shall be used that are non-recyclable	Product data sheet giving proof for reusability
Use of recyclates	At least 25 % of recyclates shall be used as production material	Product data sheet indicating material composition
Ecotoxicity harmlessness	No ecotoxic substances shall be released by mounting and using the product	Examination is made according to OECD 202
Aggregates (Additives)	Additives or aggregates may only be used in order to fulfil the requirements of the General and respective Special Quality and Test Regulations (media resistance / brittleness). They shall not counteract reusability.	Product data sheet of the material, e. g. with dynamic differential calorimetry.

## 3 Monitoring

### 3.1 General information

Monitoring is subdivided into:

- Initial test
- Self-monitoring
- External monitoring
- Retest

### 3.2 Initial test



Fulfilment of the initial test requirements is the basis for awarding and use of the quality label of the Gütegemeinschaft. During the initial test, it is to be checked whether the products of the applicant fulfil completely the requirements of the General and respective Special Quality and Test Regulations. The applicant is obliged to submit to the Gütegemeinschaft the complete documentation necessary to initiate and effect the test. Moreover, he must submit at least the number of products (50 pcs. individual ground grids and 10 kg basis material) enabling the external examiner appointed by the Gütegemeinschaft to test the quality level of the applicant. The initial test is initiated by the quality committee of the Gütegemeinschaft and an officially recognised examination body or a sworn valuer will be engaged to effect the test.

Moreover, the initial test serves the purpose to find out whether the conditions for an adequate compliance with the General and respective Special Quality and Test Regulations are fulfilled. The applicant is obliged to submit to the external examiner during the initial test on demand the hitherto existing documentation, such as documents confirming the participation in specialised courses and proof of effected self-monitoring.

The external examiner issues a test report. One copy each of the test report is sent to the applicant and to the quality committee of the Gütegemeinschaft.

### **3.3 Self-monitoring**

For compliance with the General and respective Special Quality and Test Regulations, each user of the quality label has to effect continuous and always reproducible self-monitoring for all the quality assured products.

The user of the quality label shall make thorough documentation of the self-monitoring. These records shall be stored in due form for five year and submitted in case of external monitoring.

The user of the quality label may use a certified and regularly audited QM system (e. g. DIN EN ISO 9001) for processing and self-monitoring.

### **3.4 External monitoring**

External monitoring serves the purpose to find out whether the Quality and Test Regulations as well as the requirements fixed for the correct carrying out of the tests are still fulfilled by the user of the quality label. External monitoring is to be effected without prior notice, regularly and based on the General and respective Special Quality and Test Regulations by an external examiner in the production facilities of the user of the quality label. To this end, the user of the quality label is obliged to put regularly at the disposal of the external examiner of the Gütegemeinschaft quality assured products, primarily out of the current production. The examiner in charge shall prove on site his identity by presenting a written order issued by the quality committee of the Gütegemeinschaft. The examination process shall not be delayed by the obligation to proof the identity.

During the external monitoring, the examiner shall check the internal handling of the self-monitoring and evaluate the results with regard to completeness and conclusiveness.

Moreover and without being asked, the user of the quality label shall proof that the related applicable specifications, principles and guidelines according to paragraph 1.3 are available in the most recent version as working basis.

External monitoring shall take place annually within the first two years of the membership. If there are no complaints during these two examinations, the examination intervals can be extended to biennial examinations. If, however, any complaint occurs during the enlarged examination intervals, an annual examination is required.

### **3.5 Retest**

If deficiencies are detected during the external monitoring effected by the appointed examiner with regard to quality assurance according to the General and respective Special Quality and Test regulations at the user of the quality label, he has to report them immediately to the Gütegemeinschaft, regardless of the issuance of a corresponding test report.

Hereupon, the chairperson of the Gütegemeinschaft may impose, after consultation with the quality committee, a retest for which time, content and scope of this test are determined by the quality committee of the Gütegemeinschaft.

If even the retest is failed, the chairperson of the Gütegemeinschaft may take, after consultation with the quality committee, additional measures according to paragraph 5 of the implementing provisions.

### **3.6 Examination costs**

The costs for each implemented monitoring or test shall be borne by the applicant resp. user of the quality label.

### **3.7 Test and monitoring reports**

A test report is to be issued for each implemented test or monitoring by the appointed external examiner. The applicant resp. user of the quality label shall receive a copy of the test report.

## **4 Marking**

Those products for which proof of fulfilment according to the General and respective Special Quality and Test Regulations is provided and for which a quality label was awarded, may be marked with the following quality label:



The quality label shall be complemented by a product-related addition according to the General and respective Special Quality and Test regulations.

Only the implementing provisions of the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. are applicable for awarding and bearing of the quality label.

## **5 Modifications**

Modifications to the General and respective Special Quality and Test Regulations including editorial changes, require prior written consent from RAL in order to be effective.

They will be notified to the users of the quality mark by the board and shall take effect after an adequate transitional period and with the prior consent of the general assembly.

## Quality and Test Regulations

### Special Quality and Test Regulations for non-sealing Ground Reinforcement Systems

#### 1-1 Scope of application

These Special Quality and Test Regulations determine content and scope of the ergonomic requirement profile to reinforcements of areas (non-sealing) within the construction sector and also in the private area (e. g. gardening).

The requirement profiles are subdivided in four classes and shall be considered in the Quality and Test Regulations:

- Group I areas used by pedestrians, cyclists, light motorcycles and designed for a load Up to 15 kN \* (equivalent to 30 t/m<sup>2</sup>)
- Group II areas such as footpaths, pedestrian zones (pedestrian precincts) and comparable areas as well as parking facilities for cars and loads up to 125 kN \* equivalent to 250 t/m<sup>2</sup>).
- Group III areas such as paths, fire rescue paths \*\*, roadside verges, parking facilities designed for all kind of road vehicles for load up to 250 kN \* (equivalent to 500 t/m<sup>2</sup>).
- Group IV areas used with high wheel loads, e. g. fire rescue paths \*\*, logistic areas, parking facilities for lorries and busses and loads up to 400 kN \* (equivalent to 800 t/m<sup>2</sup>).

\* see paragraph 3.5 resp. after corresponding substructure ZTVE-Stb 94

\*\* referring to DIN 14090 areas for fire engines, after corresponding substructure ZTVE-Stb 94

#### 1-1.1 Particularities

These Special Quality and Test Regulations apply only in conjunction with the General Quality and Test Regulations.

#### 1-2 Special Quality and Test Regulations for non-sealing Ground Reinforcement Systems

Quality features	Quality criteria	Test requirements
Way of ground reinforcement	No specification	
Surface of the upper side	At least 85 % shall be non-sealed or have a run-off coefficient < 0.4	Test made by computerised calculation resp. proof by manufacturer
Surface of the underside	At least 50 % shall be non-sealed resp. penetrable for roots or have a run-off coefficient < 0.4	Test made by computerised calculation resp. proof by manufacturer

Quality and Test Regulations

<b>Quality features</b>	<b>Quality criteria</b>	<b>Test requirements</b>
Height	At least 30 mm. The height shall be measured from the underside of the sole to the upper edge of the plate. Thus, potential bulges at the underside of the sole (for reinforcement, anchoring) are not measured	Determination by measuring
Usability – mounting	Shall be evaluated in all the categories with the first three valuation levels	Field test
Usability – compound	Shall be evaluated in all categories with the first three valuation levels	Field test
Usability – risk of injury	Shall be evaluated in all categories with the first three valuation levels	Field test
Usability – clearing in winter	Shall be evaluated in all categories with the first three valuation levels	Field test
Usability - removability	Shall be evaluated in all categories with the first three valuation levels	Field test
Usability – recyclability	Shall be evaluated in all categories with the first three valuation levels – according to checklist attached	Field test
Raw material / material	Product to be made of at least 25 % recycled used plastics and recyclable	Proof by documentation of QM/QS
Visual quality	Moulding shall be completely filled, uniform colouring and structuring, preferably burr-free and free from overfilling, as well as undercuts and other disturbing factors excluded and planarity ensured	Visual test
Dimensions and tolerances	Shall be defined in a data sheet	Product data sheet (requirements see 3.1)

## Quality and Test Regulations

<b>Quality features</b>	<b>Quality criteria</b>	<b>Test requirements</b>
Rupture safety	In case of a fall from 3 m height no damage shall occur	Impact test following DIN EN 12061  Test temperature: -10 °C
Pressure resistance (surface)	No spalling shall occur  The permanent deformation shall not be larger than +/- 5 mm	Pressure test following DIN EN 124 for the respective class applied for The test force shall be applied on the sample with a test speed of 50 mm/min
Pressure resistance (point load / chamber)	During the ball indentation test no spalling shall occur. The permanent deformation shall not be larger than +/- 5 mm	During the ball indentation test following DIN EN 2039-1, a 2/3 times bigger round test body shall be pressed into the corners of the ground reinforcement systems with the help of a testing machine with 2000 N and a test speed of 50 mm / min.
Pressure resistance (point load / chamber) stress group IV	Before failure (rupture) the component shall reach at least 5000 N	During the ball indentation test following DIN EN 2039-1, a 2/3 times bigger round test body will be pressed into the corners of the ground reinforcement systems with the help of a testing machine with 2000 N to the first crack. The forces of the respective weakest and strongest corner shall be averaged and this average shall not be lower than 5000 N.
Quality consistency during ageing process and sun simulation	No spalling shall occur. The permanent deformation shall not be larger than +/- 5 mm	Test according to DIN EN ISO 4892-2, quality test according to DIN EN 124 resp. tension test according to DIN EN ISO 527-1.

Quality and Test Regulations

Quality features	Quality criteria	Test requirements
Visible marking of the product	Marking is required in such a way that it ensures the traceability of the product. The following information is indispensable: <ul style="list-style-type: none"> <li>- Name of manufacturer and/or product name</li> <li>- Month and year of production</li> <li>- Type/article number (unmistakable traceability shall be ensured)</li> <li>- Recycling label</li> <li>- Optional provision: country code (unmistakable marking "made in ... " / "produced in ..." or using ISO code of ISO 3166</li> <li>- Optional provision CE marking</li> <li>- Classification: group I - IV</li> </ul>	Sample test by Gütegemeinschaft
Locating surface	Flatness of surface and lower surface shall comply with the product data sheet	Product data sheet resp. flatness max. 3 % deviation referred to the length
Trafficability	No spalling shall occur. The occurrence of ruttings, cuppings and other deformations shall not be larger than 5 mm in total	In case of different wheel pressures – filling pressure and combination in field test (test track).
Dimensional stability at different temperatures	Layer stability shall be guaranteed at all temperatures. Balancing elements resp. measures shall be recognizable and revisable from the technical descriptions of the manufacturer.	The reinforcement grids are tested within three temperature ranges (-16 / 23 / 90 °C) (± 3 °C tolerance). The difference between maximum expansion at 90 °C and shrinkage at – 16 °C shall range within 3 % (based on actual size at 23 °C).

## Quality and Test Regulations

Quality features	Quality criteria	Test requirements
Media resistance	The product features shall not change considerably under the influence of salts, lyes, oils, fats, fertilisers. No spalling shall occur. The permanent deformation shall not be larger than $\pm 5$ mm	At first, the products shall be exposed to the different media (see appendix 1-6-6), afterwards the pressure stability shall be tested by a pressure test following DIN EN 124
Guarantee promise	The warranties shall go beyond the statutory requirements, a warranty period of at least 6 years is necessary (in case of correct mounting and use)	Product data sheet

### 1-3 Monitoring

Paragraph 3 of the General Quality and Test Regulations is valid or regulating monitoring. The practicability test is excluded. This test is made for a period of 3 years and explained separately.

### 1-4 Marking

Paragraph 4 of the General Quality and Test Regulations is valid for marking.

For marking of quality assured products, the quality label of the Gütegemeinschaft is used in combination with the product related amendment "ground reinforcement systems" according to the following image of the label:



### 1-5 Modifications

Paragraph 5 of the General Quality and Test Regulations is valid for modifications.



## **1-6 Attachments to the Special Quality and Test Regulations for non-sealing Ground Reinforcement Systems**

### **1-6.1 Plastics**

The ground reinforcement grids shall be produced of at least 25 % recycled and recyclable polyolefins resp. other suitable used plastics. Proof of origin of the material shall be made by a certificate.

The ground reinforcement grids shall be produced of sorted fractions of commercial waste and / or Duales System Deutschland according to certain process technologies. Carefully treated secondary materials of thermoplastics (especially plastic packagings of industrial and house-to-house collections of Duales System Deutschland) represent the base material for the ground grids. Primary plastic materials used in packagings consist to a high percentage of polypropylen and polyethylen of high resp. low density. Other kind of plastic materials are used in limited quantities.

According to DIN 4102, the plastics polyethylene and polypropylene without fireproofing equipment are to be allocated to fire classification II, i.e. flammable construction material. The main criterion is defined by “continues to burn after removing the source of ignition during the fire test”. As during the further processing, i.e. mechanical recycling of plastic packagings of Duales Systems Deutschland, no modifications occur, all the characteristics of the basic materials including fire behaviour will be preserved when manufacturing recycled products. For this reason, product safety must be guaranteed also for finished products made of these recyclates. This applies especially for processed fractions from collections of Duales System Deutschland, as these can be mixed with numerous waste fractions and soiled. Therefore it is necessary to provide proofs of quality by presenting Quality and Test Specifications. In order to comply with the material requirements of finished products made of recyclates, reference is made to guideline of the Umweltbundesamt “REACH and Plastic Recycling”.

Please note: According to DIN 4102, fire classification II is defined by “burns within a flame, extinguishes outside the flame”. In order to achieve these conditions, cost-intensive additives referred to as flame retardants are necessary during the further processing of recycled plastic materials. Moreover, fire classification I requires permanent test certificates by an accredited testing institute.

The Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. recommends not to use flame-retardant additives for the product group ground grilles.

### **1-6.2 Dimensions**

The dimensions and tolerances as a basis for the tests to be effected according to this quality assurance shall be defined in a product data sheet and are attached to these Quality and Test Regulations.

During the initial test, all dimensions and tolerances shall be determined. However, only the functional dimensions are used for evaluation. During the monitoring tests (self-monitoring and external monitoring), the dimensions marked as test dimensions are to be determined.

### **1-6.3 Impact test**

Impact strength is tested according to DIN EN 12061. The test item shall be dropped from a specified height to flat concrete floor. The test floor shall have a thickness of 100 mm and a mass of at least 20 times as big as the mass of the test item. The exact drop height is stated

in paragraph 1-2-15 of DIN EN 12061. In addition to the specified conditioning temperature of  $23\text{ °C} \pm 2$ , a test is made with a test temperature of  $-10\text{ °C}$ . The duration of the conditioning Quality and Test Regulations

depends on the respective wall thickness. The thickest wall shall be taken as determination base in case of different wall thicknesses. The time intervals shall be taken from DIN EN 12061. The test consists of a visual examination on ruptures and cracks.

#### **1-6.4 Ball indentation test**

During the ball pressure test following DIN EN 2039-1 a round and 2/3 times bigger test item shall be pressed into the corners of the ground reinforcement systems with the help of a testing machine with 2000 N and a test speed of 50 mm / min.

Group IV shall be tested as follows:

During the ball pressure test following DIN EN 2039-1 a round and 2/3 times bigger test item shall be pressed into the corners of the ground reinforcement systems with the help of a testing machine with a test speed of 50 mm / min to the first crack. The forces of the respective weakest and strongest corners are averaged and this average shall not be lower than 5000 N.

The force is determined in comparison to the distance and presented graphically in a diagram.

#### **1-6.5 Sun simulation according to DIN EN ISO 4892-2**

The sun simulation serves the purpose of determining the aging process and the effect of different global radiation, heating/cooling and humidity to the sample. Testing is made with an un-installed sample and a cycle test under simulated outdoor conditions is made. This test consists of 15 subsequently made dry climate cycles and 10 subsequently made moist climate cycles. The exact settings for day/night as well as moist and dry climate shall be taken from standard DIN EN ISO 4892-2. After this test, a visual matching on appearance, contour changes and corrugation is made. A final pressure test according to DIN EN 124 resp. tensile test according to DIN EN ISO 527-1 provides data suitable for comparison with the original condition.

#### **1-6.6 Trafficability**

In order to test the stability of the upper structure on condition of rolling load, the present report describes the trafficability test in real time. During a test period of three years, the rolling stress is tested with different wheel loads/ filling pressures. The influence of ventilation is examined as well as the effect of additional horizontal forces, selectively by break forces as well as extensively, e. g. by snow-clearers. The load is generated by occurring traffic (factory traffic).

The test area is at least 8 m<sup>2</sup> each and it is integrated in the test track according to the information of the manufacturer and can be conducted with specific fillings. Thus, the creation of real conditions is guaranteed (4 m<sup>2</sup>, ..).

#### **1-6.7 Media resistance**

The Ground Reinforcement Grids are tested on their resistance to potentially quality influencing media such as oils, combustibles (diesel and super), lyes, fats, fertilisers and salt water.

Test regulation:

## Quality and Test Regulations

Motor oil is used for the test on resistance to oils. For the test, the grid is put completely in motor oil type 10W40 for 168 h at a temperature of  $23\text{ °C} \pm 2$ . Afterwards, a pressure test is made according to DIN EN 124 and compared with a sample not put in motor oil.

Super E10 and diesel are used for the test on resistance to combustibles. For the test, the grid is put completely in fuel for 168 h at a temperature of  $23\text{ °C} \pm 2$ . Afterwards, a pressure test is made according to DIN EN 124 and compared with a sample not put in fuel.

Undiluted windscreen cleaning fluid with antifreezes to  $-30\text{ °C}$  is used for the test on resistance to lyes. For the test, the grid is put completely in undiluted windscreen cleaning fluid for 168 h at a temperature of  $23\text{ °C} \pm 2$ . Afterwards, a pressure test is made according to DIN EN 124 and compared with a sample not put in fuel.

Sunflower oil is used for the test on resistance to fats. For the test, the grid is put completely in sunflower oil for 168 h at a temperature of  $23\text{ °C} \pm 2$ . Afterwards, a pressure test is made according to DIN EN 124 and compared with a sample not put in sunflower oil.

Lawn fertiliser (Cornufera 20 + 5 + 8) with 2 % N total azote, 8.9 % N ammonium azote, 6.1 % N carbamide azote and 5.0 % N methylene urea is used for the test on resistance to fertilisers. For the test, the grid is put completely in dissolved granulated fertiliser for 168 h at a temperature of  $23\text{ °C} \pm 2$ . Afterwards, a pressure test is made according to DIN EN 124 and compared with a sample not put in such solution.

In order to test the resistance to salts, a grid shall completely be covered with road salt. The grid will then be stored for 24 h at  $-16\text{ °C}$  and then be poured with water and stored for another 24 h at  $-16\text{ °C}$ . Afterwards, it shall be stored for 168 h at  $5\text{ °C} \pm 2$ . Finally, a pressure test according to DIN EN 124 is made.

Quality and Test Regulations

## **Special Quality and Test Regulations for Erosion Protection Grids**

### **2-1 Scope of application**

These Special Quality and test regulation determine the contents and scope of the ergonomic profile for Erosion Protection Grids.

#### **2-1.1 Particularities**

These Special Quality and Test Regulations are valid only in combination with the General Quality and Test Regulations.

### **2-2 Quality and Test Regulations**

#### **2-2.1 Shear test for connecting systems**

The stability of the connecting systems is obligatory to ensure the function of erosion protection. It is thus necessary that the Erosion Protection Grids are equipped with connecting elements that withstand a pressure of 500 N / connecting element for at least 3 min. One connecting element is tested. Extrapolation is made to one running meter.

During the shear test of the connecting elements, one connecting element shall be pressed away vertically from the top. The speed of the pressing-off fixture shall be 50 mm / min.

The pressing power is determined in comparison to the distance and presented graphically in a diagram. One connecting element is tested and extrapolated to one running meter.

#### **2-2.2 Tensile test**

A combination shall have a tensile force of 5000 N / running meter at a tensile speed of 10 mm / min.

The tensile force of the connection between 2 plastic plates shall be determined by means of a tensile test sample. Each connection is tested separately, but not the completely mounted plates.

The arithmetic average of the tensile strength of three connecting elements shall be extrapolated to the tensile strength per meter considering the number of connecting elements per running meter.

The following determinations are valid:

- Drawing speed: 10 mm/min.
- Conditioning: min. 24 h in the air at a temperature of  $23 \pm 2$  °C.

### **2-3 Control**

Paragraph 3 of the General Quality and Test Regulations is valid for control regulations.

### **2.4 Marking**

Paragraph 4 of the General Quality and Test Regulations is valid for marking.

## Quality and Test Regulations

For marking of quality assured products, the quality label of the Gütegemeinschaft is used in combination with the product related amendment “Erosion Protection Grid” according to the following image of the label:



### 2-5 Modifications

Paragraph 5 of the General Quality and Test Regulations is valid for modifications.

Attachments

## **Attachments to the General and Special Quality and Test Regulations**

### **3.1 Product data sheets of the Ground Reinforcement Systems**

**Document number: DB\_PROD\_\_\_\_\_**

A data sheet is to be issued for each product separately for the initial test, in case of quality relevant modifications within the production process and relocation of production facilities (even limited in time).

The product data sheet has to ensure that all relevant data are presented clearly. Test certificates and self-measurements are to be delivered clearly documented. The product data sheet shall give complete information on:

- Indication of relevant dimensions (obligatory: height) and tolerances,
- Indication of sealing degree of the surface and ground floor
- Material composition
- Fire behaviour
- Density
- Weight per m<sup>2</sup>
- Description of the connecting system

The data sheet shall be added in printing to the samples and handed in electronically with the application.

### **3.2 Production facilities**

**Document number: L\_FERTB\_\_\_\_\_**

All production facilities shall be indicated.

### 3.3 Checklist documentation usability test

Document number: CL\_GEBT1 \_\_\_\_\_

#### Preliminary remarks

The examiner shall evaluate the usability of the sample to be tested. He/she commits that only the sample to be tested shall be determining the evaluation.

With his signature, the examiner confirms that he/she was neither employed by a company member of the Gütegemeinschaft during the past three years nor has there been any other kind of interest resp. business relation to such a company. A culpable contravention leads to the exclusion of the examiner and to payment of a penalty amounting to EUR 10,000.00. An examination is carried out by three examiners independent of each other who acquired the necessary knowledge during a training event oriented to the General and Special Quality and Test Regulations for Ground Reinforcement Systems made of recycled Plastics.

#### Examiner

Surname, given name \_\_\_\_\_

Company \_\_\_\_\_

Position \_\_\_\_\_

The sample to be tested has a total range of at least 8 m<sup>2</sup>. The production company shall provide 10 m<sup>2</sup>. A foundation contractor shall mount the sample according to the mounting instructions also to be delivered while the examiners documenting this procedure are present.

#### Sample

Product name \_\_\_\_\_

Evaluation period       Mounting       6 months       12 months  
 19 months       24 months       30 months  
 36 months       remove

Production company \_\_\_\_\_

With his/her signature, the examiner confirms the correctness of all given details. He/she also confirms having read and considered all details on the sheet of paper.

Place, date \_\_\_\_\_

Examiner's signature \_\_\_\_\_

Attachments

**Checklist**

**Document number: CL\_GEBT2\_\_\_\_\_**

Ability to be laid (to be evaluated when being laid)

- Comprehensibility of the laying instruction (in German language)
- Handling of the elements (when delivered)

<b>Comprehensibility of the laying instruction</b>	Very easy to understand	Easy to understand	Understandable	Difficult to understand	Very difficult to understand	Not to be understood
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

<b>Handling</b>	Very easy to handle	Easy to handle	Can be handled	Difficult to handle	Very difficult to handle	Not to be handled
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

**Surface bonding (evaluation after 6, 12, 18, 24, 30, 36 months)**

- General impression (visual and physical overall impression)

<b>General impression</b>	Very good	Good	Satisfactory	Adequate	Inadequate	Fail
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

- Deformations,
- Ruttings,
- Formation of cuppings and bulges



Attachments

	None	Hardly any	Few	Great number	Very large number	unusable
<b>Deformations</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						
<b>Ruttings</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						
<b>Cupings/bulges</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

**Risk of injury**

- Demolitions
- Splitterings

	None	Hardly any	Few	Great number	Very large number	unusable
<b>Demolitions</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						
<b>Splitterings</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

**Maintenance in winter and summer**

- Clearing with snow shovel
- Clearing with snow blower
- Clearing with snowplough
- Suitability for lawn care with lawnmower

Attachments

	Very good	Good	Satisfactory	Adequate	Inadequate	Fail
<b>Clearing with snow shovel</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						
<b>Clearing with snow blower</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						
<b>Clearing with snowplough</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						
<b>Suitability for lawn care with lawnmower</b>						
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

**Dismounting possibilities (evaluated when dismantled after 36 months)**

<b>Comprehensibility of the mounting instruction</b>	Dismounting very simple	Dismounting simple	Dismounting possible	Dismounting difficult	Dismounting very difficult	Dismounting impossible
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation						

on by the examiner						
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### Recycling / Recyclability

Recycling / Recyclability	No processing required	Simple processing step required	Recyclable with processing steps	Hardly recyclable as substantial processing steps required	Hardly recyclable as required processing steps ecologically and economically unreasonable	Not recyclable as processing at present technically impossible
Test classification by the examiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Argumentation by the examiner						

### 3.4 Determining of the water absorption capacity of the soil

#### General information

Infiltration of rainwater requires adequate seepage resp. water absorption capacity of the soil and must be proved at chosen locations, e. g. before a binding land-use plan comes into force.

The permeability of the soil is indicated by the coefficient of permeability (kf) in m / s. The usual coefficient of permeability required for water to seep away completely is between  $1 \times 10^{-3}$  (coarser-grained sand, high permeability) and  $1 \times 10^{-6}$  m / s (silty sand, low permeability).

Amendment B to DWA worksheet A 138 "Planning, construction and operation of facilities for infiltration of rainwater" describes different methods to determine the water permeability. Common methods are, for example:

- Approximate estimation by pedological information: If the subsoil is already known, e. g. because of already existing ground explorations, a coefficient of permeability can be roughly allocated to the soil,
- Laboratory methods, e. g. with window samplings followed by determination of the waterlogged permeability in the lab, e. g. with subsurface seepage,
- Field methods, e. g. determination of the infiltration rate by double-cylinder infiltrometer,

Infiltration test

#### Execution of an infiltration test in case of surficial seepage

The infiltration test is one possibility to determine the infiltration capacity very easily. This method is suitable above all in case of superficial infiltration due to the required water volume and, if necessary, values to be read in considerable depth.

Attachments

Sequence of steps:

1. Excavate test pit with dimensions of at least 50 cm x 50 cm und a depth of about 1 m below the level planned for the water inlet.

2. Fill the test pit up to about 1 m with water. In case of substantial drops, water shall be refilled repeatedly to this level.

The objective is to get a water saturation of the soil. Normally, this takes about 1 hour.

3. Get again a water level of 1 m by refilling.

4. Actual metering: For at least 1 hour, the falling water level shall be metered every 15 minutes and afterwards, averaged over these at least 4 measured values. The drop per 15 min. shall then be converted into the kf value (m / s).

Example:

After 15 min	reading	5 cm	drop	5 cm	} Average (average figures) = 2.75 cm / 15 min
After 30 min	reading	8 cm	drop	3 cm	
After 45 min	reading	10 cm	drop	2 cm	
After 60 min	reading	11 cm	drop	1 cm	

Conversion info kf value (m / s)

2.75 cm = 0.028 m

15 min = 900 s

==>  $0.028 \text{ m} / 900 \text{ s} = 3.11 \times 10^{-5} \text{ m} / \text{s}$

Comparison to the range relevant for infiltration:  $1 \times 10^{-3}$  and  $1 \times 10^{-6} \text{ m} / \text{s}$

# Sample form for the execution of an infiltration test in case of surficial seepage

Applicant: \_\_\_\_\_

Parcel number ("Flurnummer"): \_\_\_\_\_

Local subdistrict: \_\_\_\_\_

Location of test pit (freehand hand, if any): \_\_\_\_\_

Dimensions of the test pit (depth, dimension of the floor): \_\_\_\_\_

Exploitation of ground water:     no     yes, depth at \_\_\_\_ m below ground level

Short description of the soil:

- Gravel        \_\_\_\_\_ (coarse-grained, fine-grained, sandy, clayey)
- Sand            \_\_\_\_\_ (coarse-grained, fine-grained, clayey)
- Clay            \_\_\_\_\_ (perhaps sandy)
- Own description \_\_\_\_\_

Water level in the test pit at the beginning of the measurement: \_\_\_\_ m

Reading after		Drop after	
15 min	cm	15 min	cm
30 min	cm		cm
45 min	cm		cm
60 min	cm		cm
Average drop			cm / 15 min
kf value			m / s

Conclusion: Range relevant for infiltration  $1 \times 10^{-3}$  and  $1 \times 10^{-6} \text{ m / s}$

- yes                     no

Infiltration test initiated, supervised and performed: \_\_\_\_\_

\_\_\_\_\_  
Place, date

\_\_\_\_\_  
Signature

### **3.5 Laying instructions**

The guarantee for quality assured products is linked to the correct way of laying.

The bearing stratum is a load-distributing stratum between cover and planum and must be sufficiently load-bearing and water permeable in compressed condition. In the sense of the General and respective Special Quality and Test Regulations, the lower part of the superstructure can serve as root area because of its vegetation characteristic (FLL, 2008). The bearing stratum shall be constructed according to the motto: As much densification as necessary, as much permeability as possible. Depending on the aim of use, the bearing stratum must comply with different standards. The users of the quality label undertake to ensure the professional laying by training events for building contractors. The following standards and guidelines are considered: DIN 18299, DIN 18300, DIN 18315, DIN 18318, DIN 18320, DIN EN 13286-2, DIN 18121, DIN 18123, DIN ISO 10390.3.6.

In general, professional laying is described as follows:

- Ground reinforcement
- Base layer: 3 cm compressed filling material
- Drainable layer
- Substructure (10-40 cm) depending on the aim of use
- Contaminant proof geotextile, foundation base

Implementing provisions

## **Implementing Provisions for Awarding and Use of the Quality Label Products of recycled Plastics**

### **1 Quality base**

The quality base for the quality label consists of the General and respective Special Quality and Test Regulations made of recycled plastics. They are amended and developed further according to the technical progress.

### **2 Awarding**

2.1 Upon request, the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. awards the authorization to use the quality label for products made of recycled plastics in combination with the respective product related amendment.

2.2 The written application is to be handed in to the office of the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. together with a legally signed declaration of obligation (sample 1).

2.3 The application is checked by the quality committee. Without prior notice, the quality committee examines products of the applicant according to the General and respective Special Quality and Test Regulations. They may inspect the production facility of the applicant, examine the products of the applicant with regard to their compliance with the General and respective Special Quality and Test Regulations as well as demand for the documentation and search the files mentioned in the quality base. They issue a certificate on the test result that is sent to the applicant and to the board of the Gütegemeinschaft. The quality committee may charge a sworn examiner or an officially recognized test institute with these tasks. The person in charge has to prove his identity before starting his examination tasks. The examination costs are to be borne by the applicant.

2.4 In case of a positive test result and upon proposal of the quality committee, the board of the Gütegemeinschaft awards the quality label to the applicant. The awarding is certified (sample 2). In case of a negative test result, the quality committee postpones the application. The postponement is to be justified in writing.

### **3 Use**

3.1 User of the quality label may use the quality label in combination with the product relevant amendment only for products complying with the General and respective Special Quality and Test Regulations.

3.2 The Gütegemeinschaft is solely entitled to have produced labeling means (metal stampings, embossers, printing matters, seals, rubber stamps and so on) and to give them to the users of the quality labels, and to specify more concretely the way of use.

3.3 The board may stipulate special instructions for the use of the quality label for advertising and for joint advertising in order to maintain the integrity of competition and to prevent malpractice. Also for Individual advertising, it shall be acted on the same maxim so that individual advertising is not interfered.

3.4 If the right to use the label has been withdrawn legally binding, the certificate of awarding and all the labeling means are to be returned. There is no claim for refund. The same applies if the right to use the label has been expired in another way.

## **4 Monitoring**

4.1 The Gütegemeinschaft is entitled and engaged to control the use of the quality label and the adherence to the General and respective Special Quality and Test Regulations. The continued monitoring is to be proved to RAL by a monitoring contract with a neutral test institute or a person in charge with the inspection.

4.2 Each user of the quality label has to make his own provisions in order that the General and respective Special Test Regulations are adhered to. He is obliged to perform a steady quality control. He has to record carefully operational self-monitoring. The quality committee resp. their persons in charge may search the files at any time. The quality assured products of the user of the quality label are subjected to the monitoring tests by the quality committee or their person in charge within the scope and the frequency corresponding to the related requirements of the General and respective Special Quality and Test Regulations. He has to bear the costs for testing.

4.3 At any time, examiners may check quality assured products and search the files. During the operating times, the examiners may inspect the manufacturing facilities at any time.

4.4 In case of a negative test result or in case of complaints relating to a quality assured product, the quality committee induces a retest.

4.5 A certificate is to be issued by the test institute in charge for each test result. One copy each is sent to the Gütegemeinschaft and to the user of the quality label.

4.6 In case that unjustified rejection of products, the complainant bears the costs, if the rejection is justified, the concerned user of the quality label bears them.

## **5 Punishment for offences**

5.1 If the quality committee notes defaults within the quality assurance, they propose punishments to the Gütegemeinschaft. According to the seriousness, they are as follows:

5.1.1 Additional constraints within the scope of self-monitoring,

5.1.2 Increase of external monitoring,

5.1.3 Warning,

5.1.4 Contractual penalty up to EUR 10,000.00,

5.1.5 Temporary or permanent withdrawal of the quality label.

5.2 Users of the quality label may be cautioned if they contravene paragraph 3 or 4.

5.3 Instead of a warning, a contractual penalty up to EUR 10,000.00 for each particular case may be imposed. This contractual penalty is to be paid to the Gütegemeinschaft Produkte aus Recycling-Kunststoffen within 14 days after the assessment was final.

5.4 The measures indicated in 5.1 may be combined.

5.5 Users of the quality label contravening repeatedly resp. seriously paragraph 3 or 4 are stripped of the quality label temporarily or permanently. This is also valid for users of the quality label who delay resp. hinder examinations.



## Implementing provisions

5.6 Before measures are taken, the person concerned is to be heard.

5.7 The punishment measures according to paragraphs 5.1-5.5 become effective with their legal force.

5.8 In urgent cases, the chairman of the Gütegemeinschaft may withdraw the quality label temporarily and with immediate effect. The board of the Gütegemeinschaft has to confirm this within 14 days.

## **6 Complaint**

6.1 Users of the quality label may issue a formal complaint to the quality committee against punishment measures within 4 weeks after their delivery.

6.2 If the quality committee rejects the complaint, the complainant may take legal action according to paragraph 11 of the constitution of the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. within 4 weeks after delivery of the assessment.

## **7 Re-awarding**

If the right to use the quality label was withdrawn, it can be re-awarded at the earliest 3 months later. The procedure is determined according to paragraph 2. The board of the Gütegemeinschaft may, however, impose further conditions.

## **8 Modifications**

These implementing provisions and the samples (declaration of obligation, certificate of awarding) are respected by RAL. Modifications, including editorial changes, require prior written consent from RAL in order to be effective. They shall take effect after an adequate transitional period and after announcement of the board.

## Declaration of Obligation

- 1 The undersigned / the undersigning company applies herewith to the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V. for
  - admission as a member \*)
  - awarding of the right to use \*)  
the quality label Products of Recycled Plastics with the product relevant amendment according to paragraph 2 of the Declaration of Obligation
  
- 2 The undersigned / the undersigning company confirms that he / they have taken note of the
  - General Quality and Test Regulations for ground reinforcement systems of Recycled plastics
  - Special Quality and Test Regulations for non-sealing ground reinforcement systems \*)
  - Special Quality and Test Regulations for erosion protection grids \*)
  - constitution of the Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V.,
  - constitution of the quality label for the quality label Products of Recycled Plastics,
  - implementing provisions for awarding and use of the quality label Products of Recycled Plastics with samples 1 and 2,and herewith acknowledges as obligatory for himself.

---

Place, date

---

stamp and signature of applicant

---

\*) please mark with a cross where applicable

Sample 2 to the implementing provisions

# Certificate of Awarding

Based on the test report on hand of its quality committee the  
Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V.  
awards hereby to

---

(name of company)

the recognized and by registration at the German Patent and Trademark Office as collective  
label protected quality label Products of Recycled Plastics in combination with the product  
relevant amendment



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The use of this quality label assumes that the adherence to the Quality and Test Regulations  
is controlled.

Bad Berneck, \_\_\_\_\_

Gütegemeinschaft Produkte aus Recycling-Kunststoffen e. V.

---

Chairman

---

Managing Director



## History

In 1925, the German private sector and the German government at that time founded the "Reichs-Ausschuss für Lieferbedingungen (RAL)". The common aim was the standardization and specification of technical terms of delivery. To this end, fixed quality requirements and their control were necessary and the system of quality assurance arose. For its implementation, the creation of an impartial institution was necessary as self-governing body for all parties participating in the market. Thus, the hour of birth tolled for RAL.

## RAL today

RAL acts as an independent service provider with its fields of activities. RAL is recognized as non-profitmaking institution and bears the legal structure of a registered association. Its bodies are the chairmanship, the advisory board, the general assembly and the management board.

As a sign of independence and neutrality, the guidelines of RAL activities are fixed by the advisory board. Members of the advisory board are representatives of leading organizations of the economy, consumers as well as agriculture and of federal ministries and further federal organizations. They have permanent seat and vote in this board. Furthermore, four quality communities are elected by the general assembly as representatives of the RAL members onto the board.

## RAL competence fields

- RAL creates quality labels
- RAL creates registrations, agreements and attestations

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