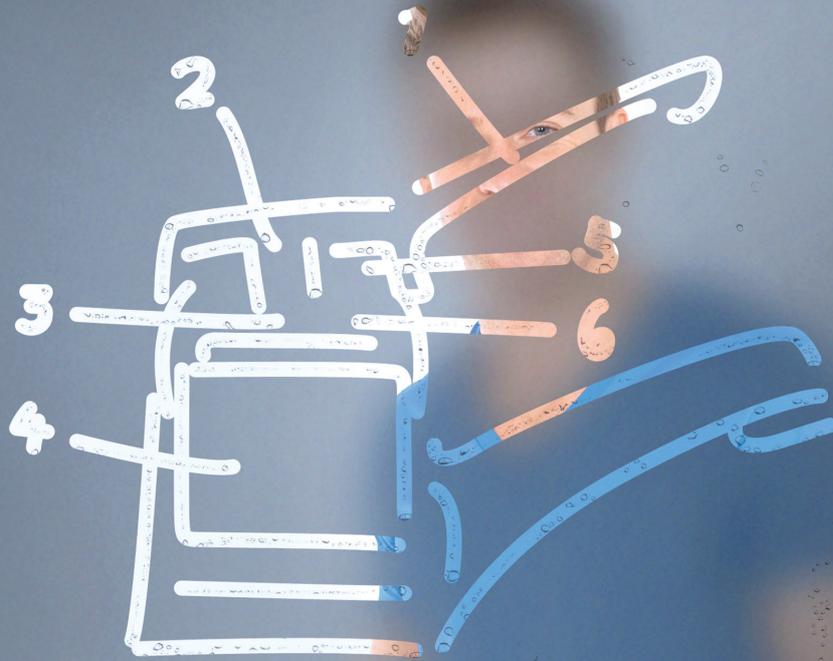


From the idea to production

The Aqua® plastics portfolio for the sanitary and water industries



 **BASF**

We create chemistry



The Aqua® portfolio – grown out of many years of experience

Day in, day out we rely on clean water – from its transport and supply to its treatment. Materials which are used here come into contact with water during the preparation of food and in daily hygiene just as they do in farming and industrial water treatment. When it comes to selecting the materials to be used, it is not only technical properties such as hydrolysis resistance, compressive strength, and ease of processing that play a crucial role but it is above all the purity of the drinking water and thus aspects of health and safety.

BASF has **many years of experience** of producing and using plastics that will come into **contact with drinking water and food**. Under the name **Aqua®**, the company offers a **comprehensive range of engineering plastics** optimized specifically for components that come into contact with drinking water and food.

It comprises products under the trademarks **Ultramid® (polyamide, PA)**, **Ultradur® (polybutylene terephthalate, PBT)** and **Ultraform® (polyoxymethylene, POM)** and is supplemented by the tried-and-tested polyarylsulfones **Ultrason®** that are resistant to high temperatures. The portfolio therefore includes materials which are approved for contact with cold, warm or hot water.

In addition to complying with the requirements for contact with drinking water, the plastics are also **approved for food contact (FC)** and are produced according to **good manufacturing practice (GMP)**. The special requirements placed on plastics that come into contact with drinking water include particularly low migration values, a high level of taste neutrality and the confirmation that long-term contact with the plastic will not cause accelerated algae growth. In this way, the company brings together **all engineering plastics with demanding approvals** for household and food use in one compact portfolio.

From the idea to the finished component – materials and applications

The Aqua® range comprises products from four product lines: the partially crystalline Ultramid® (PA), Ultradur® (PBT), Ultraform® (POM) and the amorphous high-temperature material Ultrason®.

Ultramid® (PA) is noted for having excellent mechanical properties (strength, toughness) and can be used both unreinforced and with glass fiber reinforcement; its good resistance to chemicals and hydrolysis makes applications involving both contact with cold, warm and hot water possible. Ultramid® D3EG10 FC Aqua shows reduced water absorption and particularly high rigidity and strength even under conditioned circumstances.

Ultradur® (PBT) is used in particular in cold and warm applications. Thanks to its very low water absorption, a high level of dimensional stability is guaranteed. The material is also used both unreinforced and with glass fiber reinforcement and thus covers a wide range of possible mechanical requirements. Ultradur® also shows very good resistance to weathering. Our new Ultradur® HR grades now also permit more demanding applications that are in short-term contact with hot water.

Ultraform® is a C-POM, with very good processing properties and outstanding hydrolysis resistance. On account of its high level of rigidity and strength even at higher temperatures, Ultraform® is mainly used without reinforcement. At the same time it shows very good resilience.

Ultrason® belongs to the group of amorphous high-temperature thermoplastics. All Ultrason® grades display excellent hydrolysis resistance even at high temperatures. Ultrason® S (PSU) has the lowest water uptake. Ultrason® P (PPSU) also has an exceptionally high level of impact strength which is shown among other things in very high stress cracking resistance. Because of this property profile Ultrason® P can be used among other things for fittings with extremely high longevity requirements. It also has, among other things, approvals in accordance with ISO 9080. The glass-fiber reinforced Ultrason® E grades are characterized by high dimensional stability and good mechanical properties which is important for highly-loaded parts like pump impellers.

An overview of the entire portfolio is given in Table 1.

Fig. 1: Fitting made of Ultrason® P3010



The following products from the Aqua® range also show very good laser markability:

Ultramid® A3EG7 FC Aqua bk23285
 Ultramid® A3EG10 FC Aqua bk23285
 Ultramid® D3EG10 FC Aqua bk23285

Ultradur® B4520 FC Aqua UNC
 Ultradur® B4300 G6 FC Aqua UNC
 Ultrason® P3010
 Ultrason® S3010 NAT

Table 1: Aqua® portfolio with approvals

| Products | KTW-BWGL | DIN EN 16421 | WRAS | ACS | NSF |
|---|-----------|--------------|---------|-----|-----|
| Ultramid® A3EG10 FC Aqua Black 23285 | ✓ 4 1 | ✓ | ✓ 4 2 1 | DI | ✓ |
| Ultramid® A3EG7 FC Aqua Black 23285 | ✓ 4 2 | ✓ | ✓ 4 2 | DI | ✓ |
| Ultramid® A3EG7 FC Aqua uncolored | ✓ 4 2 | ✓ | ✓ 4 2 | DI | ✓ |
| Ultramid® A3K FC Aqua uncolored | ✓ 4 1 | ✓ | ✓ 4 2 1 | DI | ✓ |
| Ultramid® D3EG10 FC Aqua Black 23285 | ✓ 4 4 | ✓ | ✓ 4 2 | DI | ✓ |
| Ultramid® S3EG6 Balance Aqua uncolored | ✓ 4 4 1 | ✓ | ✓ 4 2 1 | DI | DI |
| Ultraform® N2320 AQUA AT uncolored | ✓ 5 2 0,4 | ✓ | ✓ 4 2 1 | ✓ | ✓ |
| Ultraform® S2320 AQUA AT uncolored | ✓ 5 2 0,4 | ✓ | ✓ 4 2 | ✓ | ✓ |
| Ultradur® B4300 G6 FC Aqua uncolored | ✓ 4 4 | ✓ | ✓ 4 2 1 | DI | DI |
| Ultradur® B4300 G6 HR FC Aqua uncolored | ✓ 4 2 | ✓ | * * | DI | DI |
| Ultradur® B4520 FC Aqua uncolored | ✓ 4 2 1 | ✓ | ✓ 4 | DI | DI |
| Ultrason® P 3010 | ✓ 5 5 | ✓ | ✓ 4 1 | ✓ | ✓ |
| Ultrason® E 2010 G4 uncolored | ✓ 4 4 | ✓ | ✓ 4 1 | ✓ | DI |
| Ultrason® E 2010 G6 uncolored | ✓ 4 4 | ✓ | ✓ 4 1 | ✓ | DI |
| Ultrason® S 3010 natural | ✓ 4 4 | ✓ | ✓ 4 1 | ✓ | ✓ |

4 = cold 2 = warm 1 = hot

* = WRAS passed for colored grade

DI = Disclosure of ingredients to ACS or NSF

✗ The number in the droplet refers to Table 7 of the KTW-BWGL (version of 7. March 2022) and indicates the permission to use the tested material in applications with a conversion factor equal or lesser than the stated number.

Applications for cold water:

- Water meters
- Toilet flushing

Applications for warm water:

- Showerheads
- Mixer taps

Applications for hot water:

- Fittings

Approvals and disclosure of formulation for national and international markets

Within Europe, the drinking water approvals are managed on a country-specific basis. They are administered by commissioned institutes which carry out tests in accordance with the corresponding requirements and issue certificates. The relevant approval regulations and recommendations include **KTW-BWGL** (Bewertungsgrundlage für Kunststoffe und andere organische Materialien im Kontakt mit Trinkwasser), **WRAS** (Water Regulations Advisory Scheme) in Great Britain and **ACS** (Attestation de conformité sanitaire) in France.

All plastics in the Aqua® portfolio have the approvals in line with KTW-BWGL, DIN EN 16421: 2015-05 and WRAS in cold water applications, and a large proportion of them have them for warm and hot water, too. An overview of the different regulations can be found in Table 2.

In order to make it easier for the finished components to be approved, BASF provides its customers with all the necessary declarations of compliance and test reports for Germany and Great Britain. If the customer requires approvals from the notified certification bodies, the ACS, the American NSF or other institutes, BASF assists by disclosing the formulation to the institutes.

The products in the Aqua® portfolio are suitable for plastic components where approval of the material for drinking water or food contact is mandatory.

Table 2: Overview of food law and drinking water requirements

The products with the name suffix FC meet the following food law regulations (if applicable):

| |
|--|
| 21 CFR FDA § 177.1500 „Nylon resins“ (only repeated-use applications) |
| 21 CFR FDA § 178.3297 „Colorants for polymers“ (only repeated-use applications) |
| 21 CFR FDA § 177.2470 „Polyoxymethylene copolymer“ (only repeated-use applications) |
| 21 CFR FDA § 177.1660 „Polytetramethylene terephthalate“ (only repeated-use applications) |
| 21 CFR FDA § 177.1655 „Polysulfone resins“ (only repeated-use applications) |
| REGULATION (EU) No. 10/2011 OF THE COMMISSION |
| REGULATION (EC) Nr. 2023/2006 – GMP |
| REGULATION (EC) Nr. 1935/2004 |

The name Aqua® refers to approvals according to the following drinking water regulations and recommendations:

| |
|------------------------------|
| KTW-BWGL |
| DIN EN 16421: 2015-05 |
| WRAS |
| ACS |
| NSF |

For questions regarding compliance with further regulations and declarations of compliance, please contact your local BASF representative or Plastics Safety: plastics.safety@basf.com.



For perfect production – BASF's part development service

BASF is able to test customer components from the Aqua® plastics family in its own **flow laboratory**. Here it is possible to study the long-term resistance to chlorinated water of water meters, pipe fittings or other parts which carry drinking water at different temperatures, pressures, pH values and flow speeds, also over the course of many thousands of hours. The flow experiments can be followed by burst pressure tests or other **customer-specific tests**.

Fig. 2: Break or yield stress of different Aqua® products

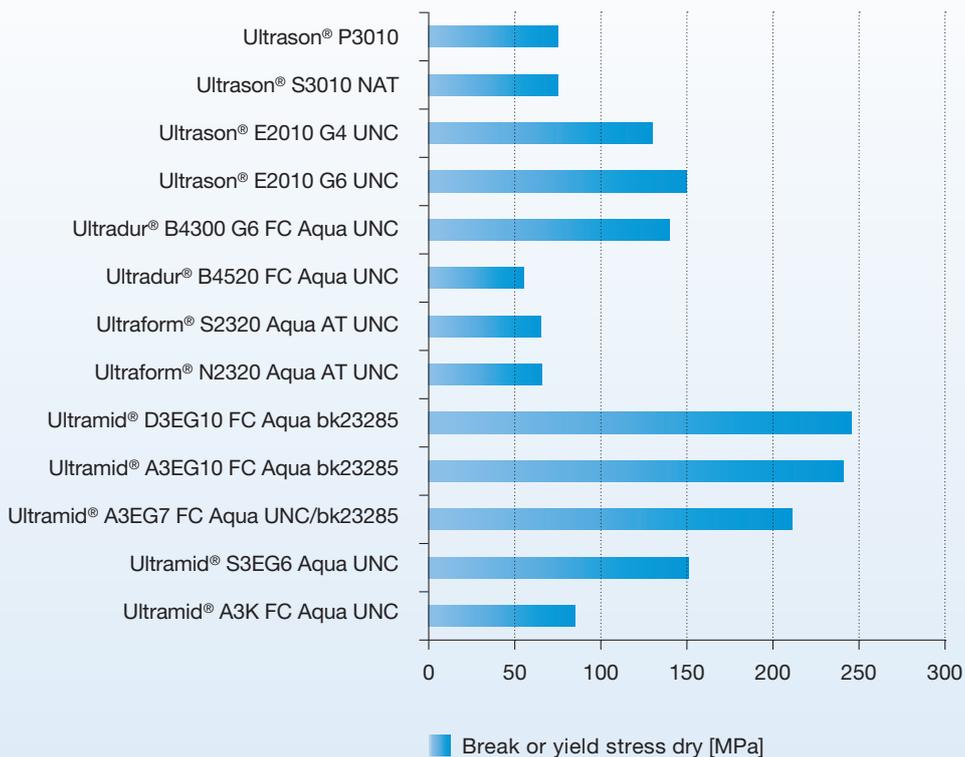


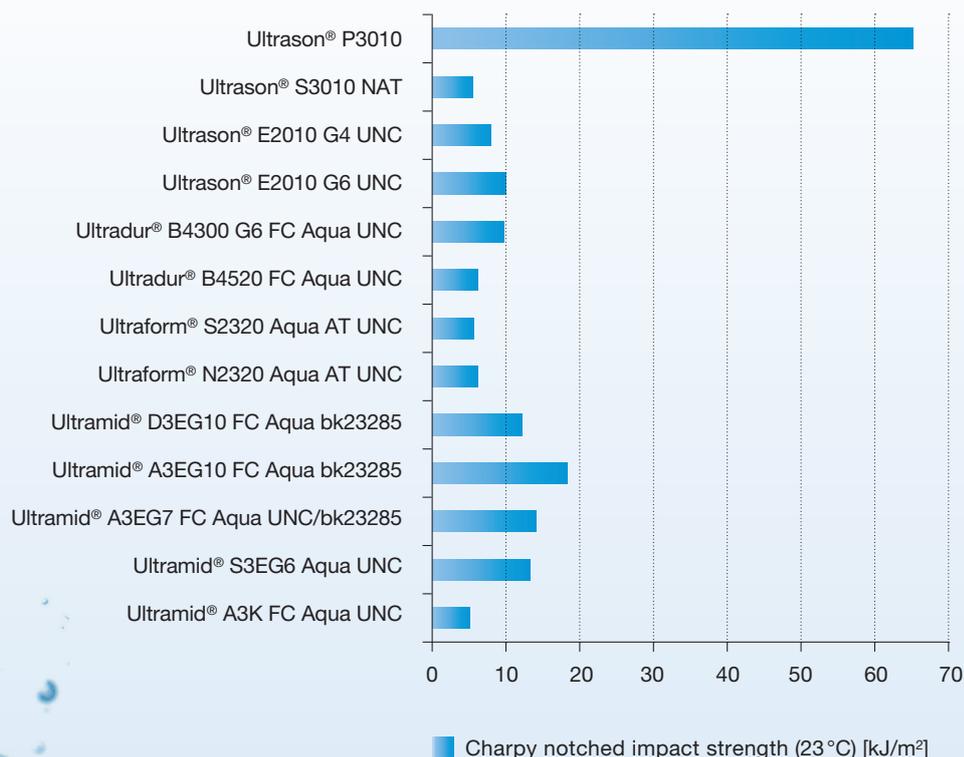


Fig. 3: Ultrasonic® Fatigue Testers made from Ultramid® D3EG10 FC Aqua (left), Ultradur® B4520 FC Aqua (middle), Ultrason® P3010 (right)

In this way, extensive data has already been collected in relation to the products in the Aqua® portfolio. This data is constantly being expanded with further short-term and long-term tests. A pre-requisite for acquiring this knowledge about fatigue performance and endurance strength is to have universal test specimens whose behavior can be predicted virtually and verified experimentally. This is why the **Ultrasonic® Fatigue Tester**, a particular BASF test specimen, is currently being used to systematically build up additional knowledge (see Fig. 3).

This knowledge is applied in the development of components, e.g. water meters, fittings and applications where short-term stress and constant loading are a key issue. As such components, which are usually critical to safety, can only be made from plastics for which sufficient test results exist, the investigations are focused on the material groups in the Aqua® portfolio so that tailor-made support can be given to customers for their part development. Together with the drinking water approvals that exist for these materials, this allows both **development and approval periods to be shortened considerably**.

Fig. 4: Charpy notched impact strength of different Aqua® products



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Note

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed. (September 2022)

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