

FITTINGS AND VALVES



etec Enamel in Water Supply Networks

High-performance surface protection for fittings and valves

Enamel in the Past and Today

The histories of enamel and metal are closely entwined. The use of enamel can be proven since the early Bronze Age (1800 B.C.). Numerous civilised peoples of prehistory and early history have left us cultural and artistic objects designed with enamel.

Enamelling saw a heyday in Byzantium in the early middle ages; from there it spread into large parts of Europe. Sacral objects, jewellery, but more and more also objects of daily use were refined with enamel.

The first time that iron was enamelled was at the end of the 18th century. At the beginning of the 20th century, it found its way into the artisanal and industrial manufacture e. g. of cookware, stoves, bath and shower tubs, signboards etc.

The industrial use of enamel has extended enormously within few decades. The focus is on steel and cast iron enamelling. The pre-condition was

the development of new enamel qualities which can be applied in one layer and with reduced layer thicknesses, depending on the requirements, and at that remain elastic and shock-resistant. A well-known area of application is the so-called “white goods”, household appliances such as washing machines and dishwashers, stoves and baking ovens. **Since 1957, Düker supplies shut-off gate valves with inside enamel.**

Enamel is on principle a glass which is melted onto metallic or glass surfaces.

Specialised enamel frit manufacturers melt down the materials quartz, feldspar, borax, soda, potash, aluminium oxide and metal oxides at a temperature of approx. 1.400 °C. Rotary furnaces assure a bubble-free, homogenous melt. By sudden cooling (water quenching) of the melt and then grinding, a granulate is obtained – the so-called enamel frits.

Definition:

“Enamel designates a glass-like material which originates from the complete or partial melting of oxidic raw materials. This inorganic substance with additives is applied to an item made of metal or glass in one or more layers and melted on at temperatures above 480 °C.”

enamel frits

etec Enamel – the Optimum Formula

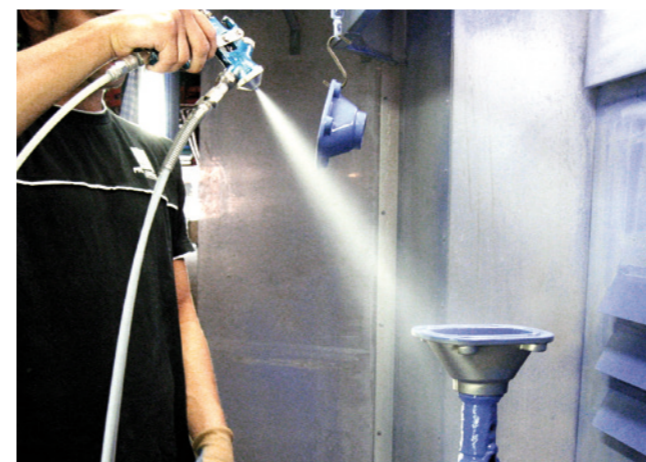
The enamel frits used for etec enamel are a formula that was specifically made up for Düker. It is adapted optimally to the requirements of the **base material ductile cast iron**, the manufacturing process and particularly to the necessary resistance and food safety for the use in **drinking water** and in **underground installation**. For example, the necessary impact resistance is reached through the inclusion of very fine particles which prevent the expansion of cracks in the enamel.

An important pre-condition for a faultless enamelling is a clean ferritic structure of the cast iron surface. Apart from the permanent control of the iron

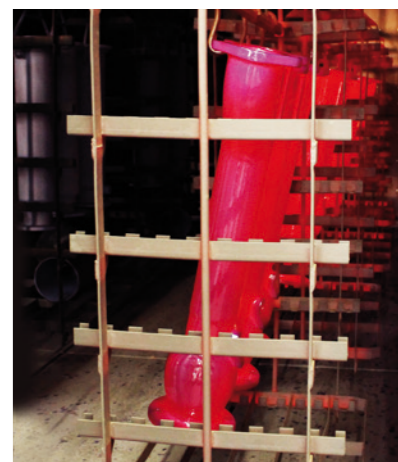
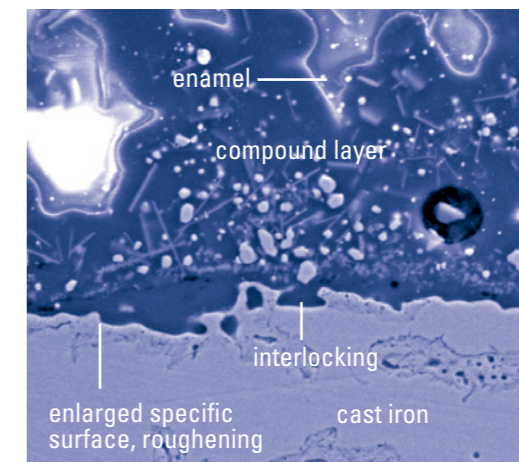
melt, a thermal-mechanical pre-treatment of the cast iron surface is inevitable. The surface is cleaned with abrasive shot blasting material. In addition, this process enlarges the surface and therefore allows an optimal adhesion and interlocking.

For the application as **wet enamel**, the enamel frits are ground down with water and additives – but without solvents – to the so-called **enamel slurry**. In this step, the texture and the distribution of particle sizes are adjusted painstakingly in order to ensure the process reliability of the application.

Subsequently, the enamel slurry is applied to the metal surfaces by flooding or spraying. In a drying furnace, the water is extracted from the enamel slurry at a temperature of approx. **100 °C**.



spraying-on of enamel slurry



glance into the enamelling furnace

After that follows the burning phase at approx. 750 °C. This process forms not only a micro-mechanical interlocking of the enamel and the metal which is roughened up through shot-blasting. Enamel and metal also react chemically with each other and form a compound layer, which is not present in normal coatings

Complete Enamelling – a Modern and Integral Surface Protection

Inside enamel

Inside enamel has been the standard lining for all Düker valves since 1957. In addition, Düker also supplies fittings with inside enamel. The advantages of inside enamel are obvious:

Protection against inside corrosion:

Enamel is diffusion-resistant and therefore protects the cast iron. Even in case of a local damage to the enamel, the compound layer between enamel and cast iron prevents a corrosion creep.

Protection against incrustation:

Enamel is extremely smooth. In enamelled shower tubs, it sometimes has to be roughened up in order to avoid slipping. In the drinking water pipeline, the smooth surface avoids effectively the adhesion of iron ochre and other dirt, particularly in the sealing zone of the valves.

Protection against biofilm and hygienic risks:

Enamel is an inorganic material and is therefore just as suitable for the transport of water as glass. It is not by accident that glass bottles and jars, in spite of the introduction of plastic materials, are still the favourite packing for beverages in upper-class gastronomy and in many health-conscious people's homes. Bacteria and germs do not find nutrient grounds on enamel and cannot build up a biofilm. Water cannot dissolve any elements out of the enamel.

Resistant to ageing:

Enamel does not age, as thousands of years old works of art still prove. Unlike plastic materials, enamel does not become brittle through the dissolving of softening agents etc.

Outside enamel

Complete enamelling is an enormous challenge for many manufacturers. In particular for the valves, the design must be adapted in a way that all surfaces can be enamelled all around and with as few machined surfaces as possible. Düker has completely revised their valve programme in the last few years and implemented not only optimal functioning but also the complete enamelling.

Protection against outside corrosion:

Several years ago, a re-adjustment of the enamel formula allowed to reach the resistance to soil class III (heavily aggressive soils) as per DVGW worksheet GW 9.

Protection against mechanical stress:

etc enamel is impact-resistant and extremely hard so it is very well protected against friction, scratching or pressure.

Enamel defies all weathers

A particularly intelligent solution is the use of outside enamel on pillar hydrants, which defy all weathers for decades.

Absolutely UV-resistant:

Unlike many other materials, enamel does not chalk and maintains its colour intensity for many decades. **An important information: chalking is not only an optical problem.** When epoxy coatings begin to chalk, the corrosion protection is also affected!

Dirt-repellent:

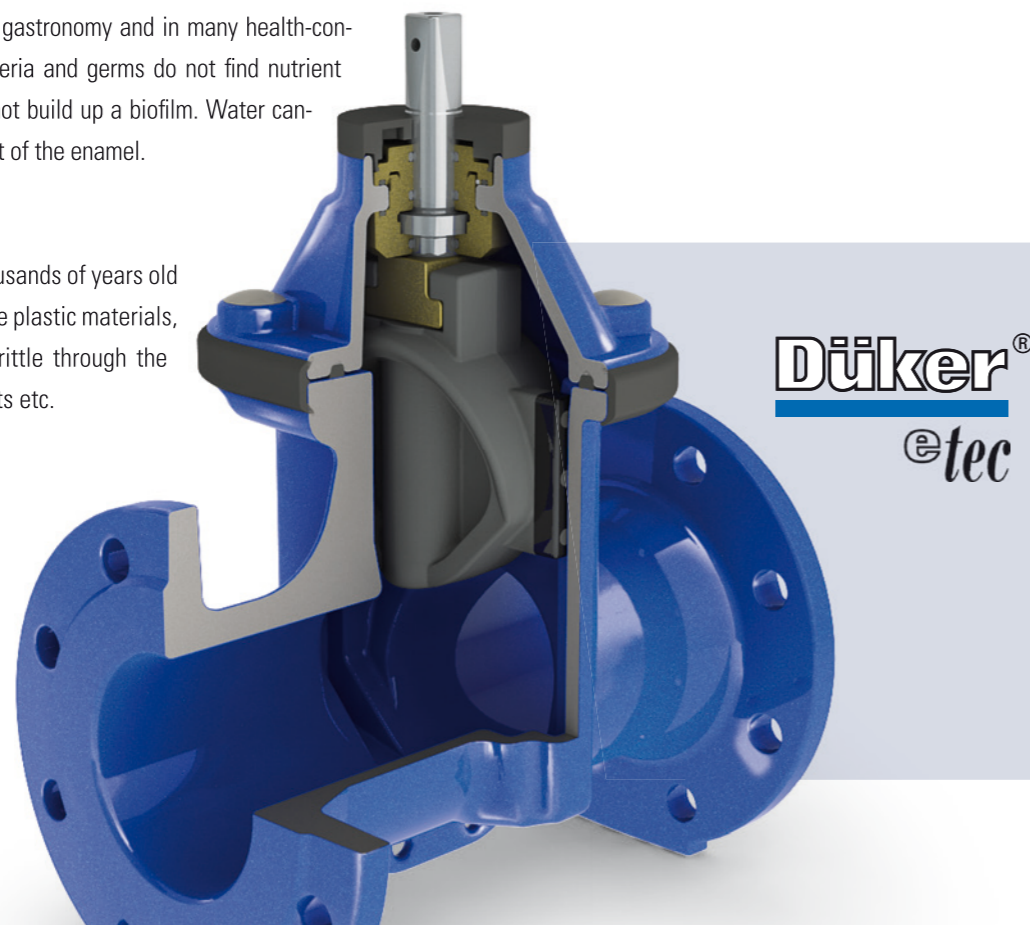
Due to its permanently smooth surface, enamel is easy to clean and therefore practically graffiti-resistant.

Resistant to climate:

Enamel is resistant to all weathers and temperatures and therefore suitable for all climate zones.

Brilliant colours:

Düker pillar hydrants are available in various colours. Further to the red and etc blue shades, we also supply them in yellow, lemon green, light grey or anthracite grey.



Durable and sustainable

The various arguments can be summarized in one sentence: "Enamelled fittings and valves are extremely durable due to their multiple advantages."

Enamelled components in water supply networks are a sustainable investment into the future. Enamel is sustainable and environmentally friendly in production and disposal:

- none of the raw materials is in any way scarce in nature.
- during melting, no poisonous or detrimental gas is set free.



- enamelled castings can be melted down and thus recycled without problems.

Both the manufacturer of the enamel frits and Düker themselves have introduced an environmental management system certified as per ISO 14001.

Certified Quality “Made by Düker”

The New EN ISO 11177

In October 2016, the international standard EN ISO 11177 "Enamels and Enamelling - valves and pressure pipe fittings with inside and outside enamel for the supply of raw and drinking water - quality requirements and inspection" replaced the former German standard DIN 51178. The content is largely identical with DIN 51178, only normative references were updated.

The new international standard treats both **inside enamelling** and **complete enamelling**. It was developed following the guidelines of the German Federal Environmental Agency (UBA) for the hygienic evaluation of organic materials in contact with potable

water (KTW guidelines). The product requirements of the standard are based on the real operational demands on enamelled valves and pressure pipe fittings in raw and potable water supply pipelines. With valves and fittings which were inspected as per this standard, the user can rely on elevated operational safety.

Furthermore, the dev association (Deutscher Email Verband, German Enamellers' Association) has published "Quality requirements and testing regulations for enamelled cast iron valves and pressure pipe fittings for the supply of raw and drinking water". Based on the ISO standard, certain requirements were increased, some of them considerably.

All enamelled valves and fittings by Düker correspond in all details to the new EN ISO 11177 and the dev guidelines.

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*e*tec



Quality Certified and Documented

The observance of EN ISO 11177 and the dev guidelines for the enamelling of valves and fittings for water supply is not only documented through the Düker quality management system as per EN ISO 9001:2008.

On top of this, Düker subjects themselves on a voluntary basis to a regular third-party monitoring by the MPA Hannover institute. A corresponding report about the latest monitoring can be obtained from the factory at any time.

dev
deutscher email verband

MPA
HANNOVER

FITTINGS AND VALVES

DRAINAGE TECHNOLOGY

GLASS LINING TECHNOLOGIES

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