



1979-2019 | 40 Jahre GÜTEGEMEINSCHAFT

KUNSTSTOFF  
FENSTERPROFILSYSTEME



**40 YEARS OF GÜTEGEMEINSCHAFT**  
**QUALITY FOR PVC WINDOWS**

# FROM A QUALITY MARK TO A WARRANTY MARK ... EDITORIAL

## ... or 'the attitude matters'

If we look at the development of the Gütegemeinschaft, we look at a history based on necessities (= definition of and adherence to a promise of quality) accommodating expectations of future requirements (= illustration of the complete system respecting requirements from clients and the environment). The quality spirit remains key, not only to comply with specifications but as part of our DNA: quality is an attitude, which we embody with all our members and display to the outside. In this context, all products and components are of equal importance, just as the production processes and the characteristics of the complete system. It is this holistic approach, which allows us to map the entire value chain while at the same time credibly addressing subjects such as "healthy living" and "sustainability". Thereby, the quality mark becomes a warranty mark, a vision in a European context, which we started implementing together.

## The test mark, which could not be a quality mark | as of 1979

The foundation of the Gütegemeinschaft in 1979 laid the basis for the quality assurance of the intermediate product "profile". At this time, the RAL quality mark "PVC window" already existed. To avoid a confusion of the market, both Gütegemeinschaften entered into a cooperation agreement agreeing not to introduce another quality mark. Admittedly, this was a compromise for the Gütegemeinschaft in Bonn allowing it to continue its internal quality assurance. According to the agreement, RAL quality assured PVC windows had to be manufactured with QKE "PVC window profiles" carrying the K-mark. This test mark was created by our Gütegemeinschaft and is protected by national and international intellectual property law. It has created unified quality characteristics and looks like a stylised cross section of a window profile.



Dr. Michael Stöger | President

The “emancipation” of the Gütegemeinschaft became visible already in 2006 when the new logo of the Gütegemeinschaft took up the stylised K of the test mark.

### From a test to a quality mark | as of 2008

In summer 2008, the revision of RAL GZ-716-1 took place: growing markets, increasing requirements for the window profiles as well as the success of laminated profiles led to a number of new developments, which made the adaptation of the quality guidelines to technological progress necessary. Yet it did not end there.

The loss of the non-profit character of all Gütegemeinschaften required a new set up of the Gütegemeinschaft as part of the Qualitätsverband. 30 years after its foundation, the Gütegemeinschaft was outsourced from the Qualitätsverband, to become an independent association, for the first time awarding the new RAL quality mark. Yet, still based on the quality assurance for profile extrusion only.

The most important change concerned the inclusion of white PVC-U profiles with a wall thickness of nominal 2,7 mm (inner and outer visible surface): These formerly called “RAL-B” profiles were subject to the same test criteria and requirements as those profiles subject to quality assurance “RAL-A”. Following the 2008 revision, laminated profiles were up valued: requirements for foils, adhesives and lamination processes were determined more precisely.

### Quality mark for the system of window profiles | as of 2013

The extension of the quality assurance to the complete PVC window system required new processes in the system monitoring, which were documented in an entirely revised quality and test guideline RAL-GZ 716. While previously tests of the profile and its components were sufficient, the new RAL-GZ 716 also required test certificates for the finished PVC window. The quality assurance of components was likewise tightened: the artificial weathering of foils was more than doubled and adhesive/primer systems are subject to stricter admissibility criteria. The new standard should become visible in a new layout as well.

The quality mark as introduced in 2013 symbolizes the window with all its system components. The registered trademark demonstrates the actual emancipation from a mere PVC product and its K-mark.

In 2018, the revised RAL-GZ 716 includes more components: connectors, reinforcements and shells. Thereby, the quality assurance of the window profile system encompasses the entire value chain.

### From the quality mark to a warranty mark | as of 2019

The quality-defining characteristic of the current RAL-GZ 716 is the durability of PVC window profile systems. Anticipating the requirements of the future, we are developing a concept allowing the quality mark to represent a “sustainable construction product” respecting elements such as healthy indoor climate and sustainability.



URKUNDE



## 40 JAHRE GÜTEGEMEINSCHAFT KUNSTSTOFF-FENSTERPROFILSYSTEME E. V.

RAL gartuliert der Gütegemeinschaft Kunststoff-Fensterprofilssysteme e. V. zum 40-jährigen Bestehen und verleiht ihr aufgrund ihrer Verdienste um das RAL Gütezeichensystem diese Urkunde.



RAL wünscht der Gütegemeinschaft Kunststoff-Fensterprofilssysteme e. V. für die Zukunft weiterhin viel Erfolg.

Bonn, den 16.11.2019

RA Rüdiger Wollmann  
Hauptgeschäftsführer

RA Thomas Roßbach  
Geschäftsführer

Thereby we anticipate today the requirements for construction products tomorrow. On this basis, the quality mark shall apply to become a European warranty mark as a next step. We look forward to see whether these developments obtain relevance in a European context.

Accordingly, we may be proud on our history, in which we always made an effort to address current topics professionally, establishing ourselves in the market with confidence.

We have a clear focus on the next steps: Quality is a brand – because the attitude matters.

*Dr. Michael Stöger | President*

# THE 1960s/70s

## HEADING TOWARDS THE GÜTEGEMEINSCHAFT

More than 65 years ago, PVC was first used as a material for windows. While initially used for the corrosion-resistant lining of steel and aluminium profiles, first self-supporting PVC-U profiles for windows were developed in the early 1960s.

At this time, first discussions among PVC window manufacturers and PVC industry considered how the quality of these new products could be assured. Against this background, a working group composed of raw material suppliers, profile extrusion companies and window manufacturers formulated first requirements for quality and testing of profiles in 1963. The extrusion technique and window manufacturing quickly evolved. This dynamic required a lifting of the topic 'quality assurance' on to the level of an association: Therefore, in 1967 an interest group "PVC windows" was founded within the Qualitätsverband, which was engaged in the quality of profiles and windows. One year later the first draft of a quality guideline for the K-quality mark (RAL) PVC window was tabled.

### Quality assurance following RAL-RG 716/1 emerges

Clear requirements for window quality could only be developed gradually – a work that the QKE continued with determination. The association understood that the quality assurance for PVC windows had to set requirements for PVC profiles as well as for windows.

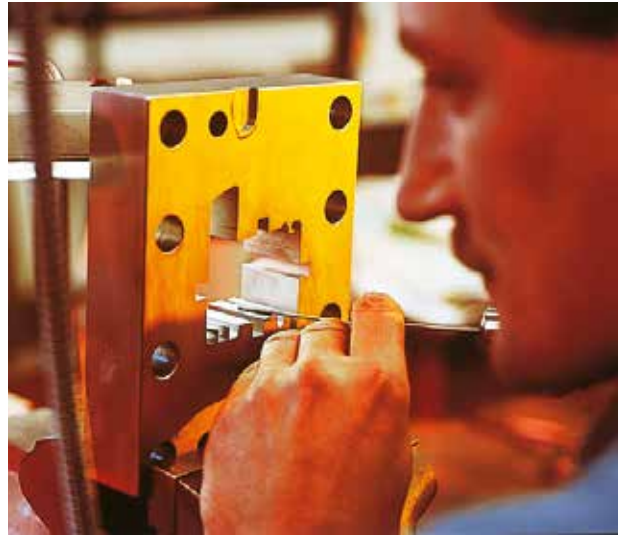
Accordingly, QKE and Gütegemeinschaft PVC windows (a predecessor of the Gütegemeinschaft Windows, Facades and Doors e.V, Frankfurt) entered into a cooperation agreement. Together they developed a draft, which served as a basis for the quality assurance for PVC profiles and windows. Thereby, the QKE could rely on expertise from long-term tests of its Gütegemeinschaft PVC pipes. From this, the first version of the quality assurance RAL-RG 716/1 emerged in 1977 – yet without external quality control. The first quality assurance from the raw material, via the profile toward the final window was successfully created.

**'Throughout the past 40 years, the RAL quality assurance has become an indispensable part of our industry; developing, establishing and safeguarding quality standards for PVC window profile systems.'**

*Dr. Michael Szerman | Vice-President*

### Towards the Gütegemeinschaft on second try

In 1966, a first attempt to create the Gütegemeinschaft PVC windows within the QKE failed mainly because the PVC window could not yet distinguish itself from timber and aluminium windows. Years later, a second attempt succeeded. On the one hand,



Pictures (f.l.): Model of the first series manufactured PVC window in the world: a 1954 Mipolam elastic from Troisdorf. (©Rainer Hardtke, KMV Troisdorf) | ©Profine GmbH | ©Bauelemente Bau Ausgabe 12/1979

the product was well established on the market; on the other hand, there was an increasing desire by profile houses within the QKE to implement a harmonized monitoring mark for PVC profiles. Hence, November 16, 1979 they founded the "RAL Gütegemeinschaft window profiles within the Qualitätsverband Kunststoffherzeugnisse e.V.". It was the youngest Gütegemeinschaft within the QKE. During its founding session the quality committee was created which awarded the new test mark for PVC window profiles based on test reports, internal as well as external monitoring reports.

### Aims of the Gütegemeinschaft

It was the aim of the Gütegemeinschaft to set up an independent and consequent manufacturing control enabling a guaranteed and consistent quality. Furthermore, product standards should be set. The growing competition between profile houses required the definition of quality characteristics respected

by everyone, ultimately ensuring the functionality of windows. In this context, the Gütegemeinschaft was guided by the principles of the RAL.

### What is RAL?

RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V. was founded as a Reichs-committee for delivery terms in 1925. By its own account, it was in charge of 'clarity in identification marking and the reliability of marking of goods and services for the protection of the economy and consumers'. Then as now, companies, regularly controlled by third-party verifiers, ensured the reliability and objectivity of the RAL quality assurance via adherence to quality and test guidelines. ■



# THE 1980s

## GROWING TOGETHER

Caused by the construction boom of the 1980s, the PVC window obtained a market share of 40% and drew level to the previously dominating timber window. However, the construction business moved from new buildings towards renovation and maintenance. This was not to the disadvantage of the PVC window industry: It was only a matter of time before the approximately 70 million window units had to be renovated.

### Cooperation of the Gütegemeinschaften in Bonn and Frankfurt

A new cooperation agreement was signed by the Gütegemeinschaft PVC windows with the newly founded Gütegemeinschaft window profiles in 1980. Its aim was to accelerate the work on the RAL-RG 716/1 together. Furthermore, the agreement defined again that quality assured PVC windows could be manufactured only with quality assured PVC window profiles. The uniform RAL test mark for PVC window profiles averted the danger of confusing logos in the construction sector. At the same time, the window manufacturer was sure to build a fully functional PVC window if he builds it with quality assured PVC profiles. A common quality committee served as a forum of exchange between the partners.

### Further development of the quality and test guidelines

In close cooperation between raw material producers, profile houses and window manufacturers the Gütegemeinschaften in Bonn and Frankfurt drafted the quality and test guidelines of the RAL-RG 716/1 (Part I-III) which determined requirements for material, profiles and assembling.

Their part 'PVC window profiles', which first consisted of the two parts 'PVC-U' and 'rigid PUR- structural foam', was continuously developed by our Gütegemeinschaft in the 1980s. Hence, at the end of the 80s part I comprised the six parts 'PVC-U' and 'rigid PUR- structural foam', 'PVC-U and PMMA', 'PVC-U and PMMA with solid, thermosetting core material', 'PVC rigid foam and aluminium reinforcement' and 'PVC-U with coating'.

Next to the continuous factory production control, this part, for the first time, foresaw a regular third-party supervision, completed by the Süddeutsche Kunststoffzentrum (SKZ). The Gütegemeinschaft PVC windows held the responsibility for the parts 'suitability proof of the window systems (II)' and 'quality assurance of window assembly (III)' as it awarded the RAL quality mark 'PVC window'. In 1985, following the RAL recognition process, the revised and extended quality and test guidelines became compulsory. ■



Pictures: ©Profine GmbH (l.) and comic in ©Bauelemente Bau issue 01/1980

# HARMONISED QUALITY CRITERIA FOR THE WHOLE SECTOR

## GUEST ARTICLE BY KLAUS JENSEN

The PVC window profile systems (rigid) were developed in the early 1960's after the first profile system, made from PVC covered steel profiles, was put on the market already in 1956. The initiative was with small companies at first who had understood the obvious disadvantages of conventional materials such as wood, steel or aluminium. PVC should improve the quality of their products. They asked bigger companies such as Pasche-Schön, Dynamit Nobel AG (Troisdorf) and Georg Volz (Gevo) at Rehau to extrude their product developments.

Naturally, this led to own developments at the larger plastic converters, furthered also by the pipe manufacturers, which saw market opportunities for the fu-

ture. They strive for a fast market penetration for this material, which was still new for the sector. It had a clear role model: the PVC pipe, which had been successfully introduced to the market years before. This had also been furthered by the foundation of the Quality Association Pipes within the Plastics Pipe Association in Bonn.

### A common aim

The quality association aimed at implementing the guidelines it had developed, thereby establishing harmonised quality criteria for the whole sector. This has been perfectly achieved in particular due to the use of test engineers. These could execute independent material tests at the relevant



companies' sites without prior notice. Own and external control furthered quality.

The good experiences of the "Quality Association Plastic Pipes" quickly led to using the gained knowledge and experience for window profiles. Finally, the "Quality Association Window Profiles" was created. Amongst others, this was also based on the personal union of both associations. I am referring to Dieter Utz, Edwin Keller and Egon Barth. Building upon their experience from the pipe manufacturing, they considerably furthered the success of PVC window profiles.

### **The first meetings of the quality association**

In my opinion, the first meetings of the quality association took place in 1966 when gentlemen of established companies met in Bonn and decided to set a common basis for the quality of profiles. Participants included Kömmerling, Rehau and Dynamit Nobel. Established raw material suppliers that passed on the quality spirit to their clients joined them. Dr. Kohl from Kömmerling was the first president of the quality association. He was succeeded by Gerd Hammerstein and Klaus Jensen until 2008.

### **Major success for the whole sector**

The foundation of the quality association was a major success for the whole sector. The PVC window profile replaced other major raw materials largely with a market share of over 50%. This success is clearly based on the ever-good collaboration between profile houses, window manufacturers, raw material suppliers and quality associations. This is equally true for Germany as for Europe.

Almost all major profile houses committed to a common quality spirit, became members of the "Quality Association Window Profiles Bonn". This is a great success that deserves to be further developed.

My best wishes for the quality association to succeed in doing so.

**'The success of the PVC window is clearly based on the ever-good collaboration between profile houses, window manufacturers, raw material suppliers and quality associations.'**



Dipl.-Ing. Klaus Jensen | shaped the work of the Gütegemeinschaft for more than 20 years as chairman of the Board



Dipl.-Phys. Egon Barth (l.) | First chairman of the Quality Committee; active until 2009

# WALL THICKNESS WAS THE PREDOMINANT SUBJECT

## INTERVIEW WITH EGON BARTH

Egon Barth, born in 1929, managed the department “substance and system testing” at Dynamit Nobel until his retirement in 1991. In his function as the first chairperson of the quality committee, he contributed considerably to the creation and development of the quality safeguarding, which still exists today. Until his 80th birthday, he remained active for the Quality Association. Earlier this year, we had the opportunity to meet the physicist for an interview at his home.

### **Mr. Barth, could you tell us something about your personal background: How did you get to Dynamit Nobel?**

After completing my studies of physics in Jena and my employment by VEB Leuchtstoffwerk in Bad Liebenstein, I fled with my family to West Germany in 1960. I then took up employment with Dynamit Nobel in Troisdorf. In 1954, they had developed the first PVC window Mipolam Elastic from a “quite rigid soft PVC”. As of 1965, windows in Troisdorf were made from increasingly impact resistant PVC. The properties of semi-finished PVC products and profiles made

therefrom have been subject to regular application-technological inspection at our department “substance and system testing”.

### **What made PVC windows so interesting to you?**

I got to PVC windows via plastics pipes. In the test laboratory of Dynamit Nobel 20 year old samples could be found, being subject to a long term inside pressure test. I wanted to continue this work. Thereby, via the Fachnormenausschuss Kunststoffe FNK and the Kunststoffrohrverband KRV, in which I was active, I

came in touch with the Quality Association. The results of our testing were integrated into the first RAL guideline for PVC windows and profiles.

### **You are mentioning profile testing: What exactly has been examined?**

In Troisdorf, profiles have not only been tested on their mechanical short-term quality but also with regard to their long-term performance: we have tested corner welding for instance. Furthermore, in Troisdorf as well as in Spain we tested natural and artificial weathering on white window profiles. These long-term tests took about 20 years. We assessed aging behaviour like changes of colour and of mechanical values such as impact strength, tensile strength and E-modulus. The results from these long-term tests served as the basis for the requirements of the RAL quality safeguards for window profiles.

### **This means you participated to the development of quality guidelines since the beginning. How did your test results become part of the quality safeguards?**

The results from the test laboratory were published in the quality committee and discussed and verified on a technical level. Fortunately, what had served the product window profile in terms of quality was implemented into the quality guidelines. Yet, on the issue of wall thickness, the quality committee could not assert itself. It was decreased considerably. However, ultimately the German quality and test guidelines prevailed and were later implemented by the Dutch and the Belgians as well.

### **Why was the safeguarding of PVC windows' quality important to you?**

Right from the beginning, attempts were made to slim PVC windows. The first PVC window profiles' inner and outer sight surfaces had a thickness of 4 mm. With a growing number of profile extruding companies, economies had to be made and profiles had to become slimmer. The quality safeguarding was important to sustain the quality of PVC window profiles. Otherwise, we would have been faced with "American conditions" where the wall thickness for sliding windows was appr. 1 mm only. Today, a class A will have a visible inner and outer sight surface of a nominal 3 mm, a class B will have 2.7 mm. This means this battle was fought and lost in the Quality Association. At this point, we failed.

**'The quality safeguarding was important to sustain the quality of PVC window profiles. Otherwise, we would have been faced with "American conditions"'**

### **Why was the matter of wall thickness so important to you?**

It was not possible to slim wall thickness any further due to its negative impact on mechanical properties, stability and weather resistance. In our tests, we noticed slight erosion on the weathered profile surfaces. In the course of weathering, material was stripped in a micro range and the wall thickness decreased even more. As a result, thinner profiles failed more easily. To be precise, this means that profiles with a wall thickness of 4 mm could easily perform for 50 years and longer, while thinner profiles could

not. This was a predominant topic we dealt with until after the year 2000.

### **Which other topics concerned the Quality Association in its early years?**

Material testing was a main topic. Furthermore, substance and system tests such as continuous-operational testing and differential climate testing were completed. In the alternating thermal testing temperatures from -20° and + 60°C have been tested to assess the deformation in particular of coloured profiles. To simulate heating from insolation, we used infrared light. Thereby we discovered that PMMA profiles were at a higher deformation risk leading to the cracking of corners. Based on these results, some critical PMMA colours were taken off the market. It is well known that ultimately, foil lamination prevailed as the technology of choice.

**‘Then as now I am of the opinion: the white profile is safest.’**

### **What did you enjoy most when working with the Quality Association?**

I did enjoy the work as such: being free in performing the testing and supporting the development of new approaches. With regard to coloured profiles, this concerned the development of PMMA and foil lamination later on. The first tests on mechanical properties and weathering failed, because the coating was not properly stabilised and hence cracked. Our results were used directly for their improvement and formed the basis for today’s coloured profiles.

However, to be honest, I do not consider dark foils to be the real McCoy because they heat up faster when exposed to high temperatures having a critical impact on the surface of the profile.

Therefore, then as now I am of the opinion: the white profile is safest – due to its high resistance to temperature and its durability. Darker profiles age faster. Coming back to the Quality Association: I enjoyed the work also because I could voice and sometimes enforce my opinion in the quality committee. For instance, if it comes to certain characteristics such as a high impact value even below - 40°C. Impact resistance was a matter of the recipe. It’s a characteristic that decreases in performance with raising age of the profile. Hence, the higher the impact resistance the more durable the profile.

### **On that note: how old are the profiles in your own house?**

Our own PVC windows have lasted for 50 years. A few years ago, some window sashes had to be replaced because of “blind” thermopane glazing, while the sash-profiles were still intact. The window frames are still in service. Therefore, I am proud to have contributed to the durability of PVC window profiles today.

**Mr. Barth, thank you for these personal insights into your work and the early years of the Quality Association. We wish you all the best.**

*The interview was conducted by Bernhard Elias and Claudia Könsgen*



Picture: ©Rehau AG + Co

## THE 1990s

# EAST EUROPE OPENS UP TO THE WORLD MARKET

The iron curtain fell. Despite the recessive mood in the world economy and a light stagnation in the construction sector, the unification of Germany led to a sharp increase of window manufacturing. This lasted until the end of the 1990s. Additionally, the gradual opening of the eastern window market caused increased sales in Europe.

### European collaboration and standardization

At this time, national and international standardization activities related to PVC windows increased: the main driver was the need for a European minimum value for wall thickness. Previously, diverging climate

zones and opinions about quality prevented any agreement on the matter. A common draft by Germany and the Netherlands should support a conciliation of opinions: After long discussions between the Gütegemeinschaft and neighbouring European associations different product classes were introduced. National associations were in charge of choosing the appropriate class.

Furthermore, the Gütegemeinschaft supported the development of the European standards for PVC profiles (EN477/478/479). Additionally, it was agreed to test the impact value in line with the relevant ISO standards. In this context, the participants agreed to



organize round robin tests together. Thereby they gained experiences with different profile recipes.

### To defy a climate of PVC restrictions

Until the early 1990s PVC profiles were stabilized with lead-barium-cadmium compounds, in Europe. Once the German Ministry for Employment re-classified dusty cadmium compounds as problematic, profile houses had to adapt their recipes. The substitution of barium-cadmium compounds with calcium-zinc compounds was largely completed after three years. Furthermore, the Bund-Länder-Committee 'Environment' and the Enquete Commission of the German Parliament demanded a replacement of lead stabilizers. The German profile industry demanded a transition phase to comply with the request: there was no long-term experience allowing for warranty, as for instance for weldability or weather resistance. The Gütegemeinschaft warned that a hasty phase out of

lead stabilizers would have severe consequences for the market. It asked to await tests results allowing for an assessment of the optimum stabilization.

At the same time, a discussion on restricting PVC put pressure on the industry: concerted efforts of producers, converters and employees succeeded in removing existing restrictions on PVC use in public procurement. The association drafted position papers and participated to demonstrations, for instance.

In this context, PVC opponents continuously attacked the Gütegemeinschaft asking for recycling options for PVC windows. Focused on the matter, several members of the Gütegemeinschaft united to organise the collection and recycling of old PVC windows. The aim was to close the material loop of PVC window profiles, as required by the circular economy law back then.

### Revision RAL RG 716/1 required

In the meantime, almost all PVC window profiles sold in Germany carried the RAL test mark of the Gütegemeinschaft. The PVC window profile as a product needs explanation and continues to develop. Therefore, the expert committees revised the quality and test guidelines extensively. The revisions of 1994 and 1998 incorporated the newest insights from national and European standardization work as well as all questions concerning gaskets. Furthermore, new test methods for white, coloured and laminated profiles were integrated, on top of system descriptions and assembly guidelines.

Thereby, by the end of the 1990s, RAL guideline RG 716/1 comprised the five parts 'PVC window



Picture: ©Profine GmbH

profiles' (part 1 to 7 including test methods), 'sealing profiles', 'system audit', 'window manufacturing' and 'assembly'. To the yet six independent elements in part I a seventh element 'foil laminated PVC window profiles' was added. The revised quality guideline integrated the converting of recycle into all seven parts.

The revised RAL guidelines also respected the general requirements and test methods from CEN. For this purpose, the participation to the committee 'questions of international standardization' served useful. Based on this close collaboration, the development of the product standards should support the consideration of the Gütegemeinschaft interests. ■

**'For the future, the greatest challenges will be the digitization in which we will integrate our understanding of quality characteristics and create new standards.'**

*Dipl.-Ing. Peter Czajkowski | Chairman Quality Committee*



Extract from the quality association's booklets „Kunststofffenster im Profil“ (special print from Kunststoffe booklet 1/95 (I.)) and „Kunststofffenster aus ökologischer Sicht“ (special print from the magazine BmK booklet 2/95)

# GERMAN WINDOW MARKET MILESTONES

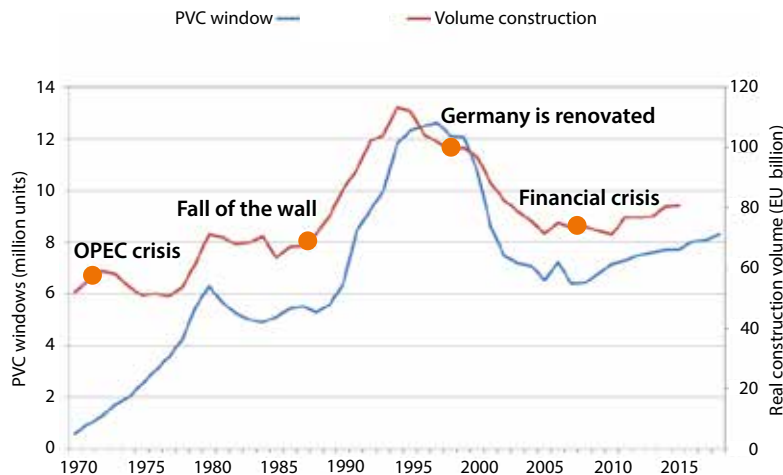
## The 1970s: Continuously growing window market

Since its market launch in 1964 the PVC window develops at great speed, in particular in the 1970s and contrary to the general trend in an economically very difficult time.

The oil boycott of the OPEC, causing an energy crisis also in Germany, may have led to an increased exchange of single for thermopane glazing. Ultimately, this was also supported by the Law on the Energy Industry from 1978 mandatorily requiring double-glazing. Thereby, the PVC window acquired a market share of 40% by the end of the 1970s drawing level with the previously dominating timber windows.

## Fig. 1: PVC windows in Germany and the construction volume

While in the 1980s the PVC window market generated increasing market shares and reached 50% of the total window market, the construction volume and the PVC window market then proceeded very similarly.



Figures: Profine GmbH and Bundesinstitut für Bau-, Stadt- und Raumforschung



Picture: ©Rehau AG + Co

### The 1980s: Difficult years

The German economy has been in an economic downturn for years, also manifesting itself in the construction sector. The balance shifted towards the renovation market, amounting to 70%. Although the construction industry recovers by the mid-1980s, it does not attain the same level as the PVC window had by the end of the 1970s.

### The 1990s: Window market explodes to 12 million PVC windows

This changed fundamentally after the reunification in the 1990s. A major reason was the renovation need in the new Länder. Furthermore, Germany lacked around 2.5 million dwellings. All in all the amount of installed PVC windows doubled from 6 to 12 million units. The production volume reached the highest level since the market launch of PVC windows in Germany. In the second half of the 1990s, the market share was at 50% – trend: upwards.

### The 2000s: The East is renovated ...

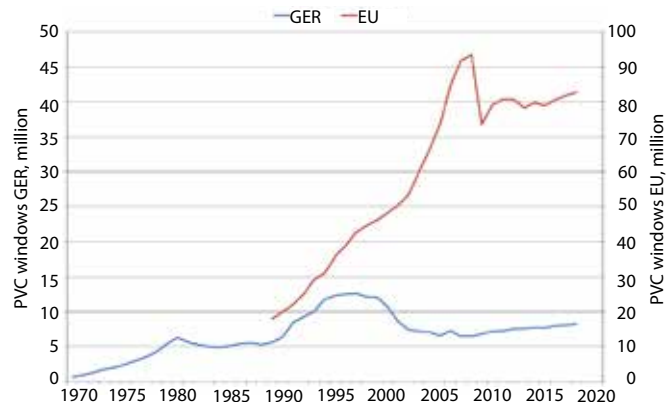
... at least in terms of window replacement. With the onset of the new century, the quota of newly installed windows fell back to the level of 1990s and settles at 7 million window units, i.e. a market share of 55%. Fortunately, the financial crisis of 2008 did not affect the German window market to a dramatic extent. However, the European market lost almost 17 million windows due to the crisis. It took several years, before growth was recorded again.

### The 2010er: Germany – Economic driver

The positive business climate in Germany, in particular the stable, high-level economic situation quickens the construction industry in the 2010s. Strong incentives from new constructions and renovation projects define the window market. PVC windows expect an average growth of 4% until 2021, the largest growth compared to other frame materials. Missing capacities and skills shortage in the construction sector are the only limits.

**Fig. 2: PVC windows in Germany and Europe**

*While in Germany the demand settles at 6 million, it grows drastically in Europe and slows down only due to the financial crisis.*



# AT NOON THERE IS JUST THE ANSWERING MACHINE

## GUEST ARTICLE BY STEFAN FRIEDRICH

Already during my job interview, my to-be employer (Dr. Rudolf Heitzmann) told me: “extrusion is not science. It is different everyday although the machine remains the same”. This well-intended advice should teach me that I, the young university graduate with all my freshly acquired knowledge, should not expect to be involved in the discussions of the PVC profile industry.

**‘There was always a common denominator: the respect for the function that a window profile has to complete throughout its life time.’**

Exactly this unpredictability of the extrusion probably led the men of action of their time to create a community of like-minded people. In the beginning, it was not exactly clear what should be achieved. On the one hand, the group of mainly German founders sought protection from foreign copycats. On the other hand, they searched for a quality benchmark. Contrary to what we know today, there was not “state of the art technology” concerning PVC window profiles. Everything was new.

**“God does not play dice”\* – The Quality Association does**

There were no reference values for the physical properties of the products. Not even test methods to obtain such values existed. Hence, the first quality

guideline fixed core values based on experience. They did not have any theoretical background and were based on nothing but the (brief) experiences made with PVC as a material plus a rather large safety buffer. Let me take the wall thickness as an example. The “RAL wall thickness” of 3.0 mm which was known for a long time has been fixed during one of the first meetings of the quality association. The value was not chosen based on a particular loading capacity or other performance of a wall this thick. No. At the time of the meeting the usual wall thickness was 3.5 mm and everybody agreed that here “some economies” were possible.

Albeit diverging interests of the individual participants, there was always a common denominator: “the respect for the function that a window profile has to complete throughout its life time”. This common understanding was the basis for the material and profile parameters in the regulations of the quality association. Thereby always keeping an eye on safety and potential wrong handling of the new product.

**“At noon there is just the machine”**

The idea of a quality association was implemented in the form of a registered association. The budget was small but the pioneering spirit and motivation of all participants was immense. The office was only staffed part time and by the “retirees” Edwin Keller and RA Dieter Utz as well as (the part time employee

\*Quotation of Albert Einstein



and good soul of the quality association) Mrs. Wien. Often, the office was only manned in the morning leading to the expression “at noon there is just the machine” as a reaction to the answering machine’s response.

Back then, the quality association focused mainly on the PVC window profile. In few, so called sub-committees, test methods were developed and the necessary requirements and parameters were discussed and fixed. The exchange took also place internationally and it is thanks to the representatives of the profile houses that the European standard (EN12608) for PVC window profiles exists. Within 15 years (1986 to 2001) of European collaboration, this standard has been created on the basis of RAL GZ 716/1. Based on this European development (of standards), the more globally acting profile houses and the growing needs of the (international) construction industry, there was increasing pressure on the quality association to adapt to the challenges of the modern age.

### The Young and Wild

Hence, it cannot surprise that it were the young representatives in the quality committee, which met outside the regular meetings to discuss the necessity of adaptations. They met in “conspirative” meetings to exchange their views and to prepare a new beginning in terms of staff and structure. Being aware of the need for a broad and solid support to such a structural cut in the association, the established members of the quality committee were likewise involved over time. A board consensus on the need for a restructuring was formed which was finally implemented by the General Assembly 2008.

### I wanted to build a House

My commitment to the quality association was always coined by the desire to build a “house” for the PVC window profile. A “home”, in which challenges and tasks could be discussed and addressed. A system in which quality can be depicted, described and demonstrated. On a scale, that does not only show the necessary but also the extraordinary.

Quality, maybe better excellence, remains a permanent task, which deserves a special effort. It pays back in the end.



Dipl.-Phys. Stefan Friedrich | Active, long-standing member, former chairman of the Board and the Quality Committee



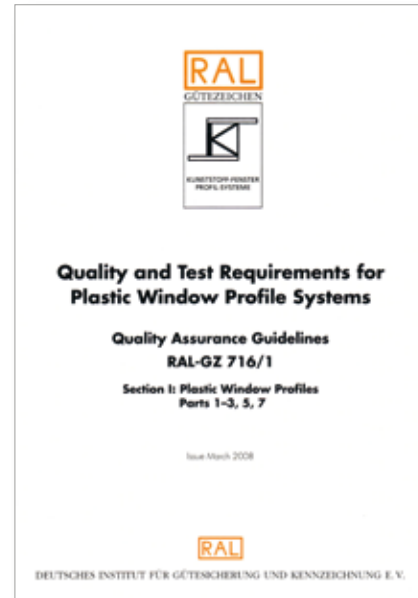
Picture: ©Profine GmbH

## THE 2000s TURNING POINTS

In the early 2000s foil laminated profiles caused new market growth for the PVC window. The PVC window sector grew compared to timber and aluminium. The market share in 2005 was 55%.

The subject 'wall thickness' was back on the agenda. The quality committee planned to include profiles of class B following EN12608 into the quality assurance. This meant that profiles with a wall thickness of at least 2.5 mm of visible, and at least 2.0 mm of invisible surfaces could obtain the test mark. This intention caused intense discussions: arguments against thinner profile walls included decreasing corner strength.

Advocates of the proposal responded that B-profiles had been present on the market for the longest time and urgently needed to be controlled. Ultimately, the GKFP agreed to include B-profiles into the RAL quality assurance during its General Assembly in 2007.



### Amended version of RAL-GZ 716/1, March 2008

The revisions became necessary to implement technical adaptations updating the quality and test guidelines dating back to 1998–2000. The Gütegemeinschaft tabled an amended version of part I into which class B profiles had been included. To err on the side of caution in this matter, the quality committee agreed to set the impact values for class B profiles at the same high level as class A.

For the first time problems with foil laminated profiles were reported, which exhibited folding, also called foil displacement. Soon a group of experts from foil and adhesive producers as well as lamination companies was asked to identify the causes and to take countermeasures as needed. This complex and time-consuming project required a careful analysis of compatibility, combination and mode of action

of three intermediate products. Hence, the gained insights and requirements could be implemented into the new RAL-GZ 716 only in 2013.

### **Bonded PVC window systems**

The ift Rosenheim and our committee 'VERKLEBEN', founded in 2006, both dealt with bonded glazing. The ift, Holzforschung Austria and the University of Biel presented a guideline for bonded glazing systems during the Rosenheimer Fenstertage in 2007. At the same time, the Bundesverband flat glass published a compass for bonded windows. In 2009, we were ready to publish chapter III, part A containing for the first time a guideline for quality assurance of bonded glazing in PVC profile constructions. A great challenge consisted of synergizing all involved components of the bonded window. The present chapter allowed its authors to set a standard that created transparency and additional security for the bonding of PVC window systems.

Chapter III (system description and suitability proof) were likewise revised, aiming to create a common intersection 'test specimen and procedures' with the RAL GZ 695 of the Gütegemeinschaft windows and doors. This also contained a reference to Environmental Product Declarations for PVC windows to ensure that quality assured systems are in line with the latter. It was published in 2010.

It deserves a special mentioning that the revised RAL-GZ 716/1 from 2008 permitted the Gütegemeinschaft to award the quality mark instead of a test mark.

### **'A new wind is blowing'**

Beyond all the novelties in the Gütesicherung, the General Assembly marked a turning point in 2008, also because the QKE Board passed on its mandate. Previously, the Gütegemeinschaft focused mainly on the resolution of technical issues.

Now, the Qualitätsverband should dissolve into the Gütegemeinschaft – a justified move, since already back then, the Gütegemeinschaft was the strongest limb within the QKE. Furthermore, the new association should develop towards becoming a trade association. Ultimately, the merger was not possible due to the law on associations.

**'I wish the Gütegemeinschaft to have continued success and consistency in its pursuit of "customer benefit and practicability" without losing sight of the balance between possible and feasible.'**

*Ralf Grewenig | Quality Committee*

Nevertheless, the impact was noticeable: current test criteria were scrutinized, the quality assurance aligned to market and product needs and go beyond the requirements of EN12608. The commitment for an all-out quality standard was to be defended inside and outside of Germany. To better reach experts and public, we report in the expert magazine Bauelemente Bau regularly ever since.

The activities on the European level were new as well: the Gütegemeinschaft launched first talks with the Centre Scientifique et Technique du Bâtiment (CSTB), investigating possibilities for cooperation in future,

common audits. The consolidation of third party monitoring according to RAL and NF should decrease the operational effort for profile houses. First test audits took place in 2009.

### **The Gütegemeinschaft becomes a registered association**

The last and maybe most important step was taken on July 15, 2009 when the Gütegemeinschaft was registered as a separate legal entity in the association register of the City of Bonn, number VE 9064. ■



First Joint Audit of the Gütegemeinschaft and CSTB in July 2009



The Board of the Gütegemeinschaft from 2009 (f.l.):  
Stefan Friedrich | Winfried Tänzer | Dr. Michael Stöger



## THE 2010s TAKING IT TO THE NEXT LEVEL

Early in the decade, the overall positive business climate in Germany had also a positive impact on the window sector. Additional drivers for activities in the construction sector were the climate goals of the German government and the EU Directive on Energy Performance of Buildings. Both caused an increased demand for PVC windows with up to date thermal insulation values and high technical quality.

### Focal point systems engineering

Upon completion of chapter III by the subcommittee UAIII, it became obvious that systems engineering will play a central role in the future. The amount of interested external experts grew continuously leading

to the creation of the business unit group for systems engineering. Until today, the task of this technical panel is to deal with technical matters on the interfaces of the individual intermediate products of the PVC window system until the window manufacturer.

### Platform for bonding technology

In the course of time, the Gütegemeinschaft took a leading role in bonded glazing technology (today's term: direct glazing) and organized its first own symposium on bonding technology in 2011. In 2014, B+L published a study on this topic, concluding that there was room for improvement. Compared to Austria or Switzerland, where every second window is bonded,



the share in Germany was at 10% only. In 2019, the symposium took place for the sixth time with 100 participants, thereby demonstrating the growing interest in the topic.

## **‘The high quality and functionality of the finished product must continue to be the central driving force for the Gütegemeinschaft.’**

*Georg Weng | Quality Committee*

### **From the profile to a system**

Since the foundation of the expert group ‘systems engineering’ it became more and more obvious that the quality assurance for only the profile was not sufficient anymore: the system with all its components along the value chain had to be included. While

coherent, this was a labour-intensive decision. After three years of preparation the time had come. In 2013, the General Assembly passed the new RAL-GZ 716 replacing RAL-GZ 716/1: the former focuses on the entire system – with all components assembled to the window and constructional elements. In future also the connection to the building structure will be added.

Since then, the entire value chain is subject to a consistent quality assurance. Interactions can be observed, ensuring that the window manufacturer can work with an utilizable window system of high quality. For the suitability proof, individual test methods and rules for monitoring have been synchronized with RAL-GZ 695 of the window manufacturers. Thereby, the award of the quality mark for PVC window profile systems is directly linked to the manufactured window. Also other European countries showed a strong response to the new version.

The quality mark, in its new design, was awarded for the first time during the Fensterbau Frontale 2014.

### **Revision 2016: further components are incorporated**

Three years after the publication of RAL-GZ 716 the first revision became necessary to include also reinforcement, connectors and shells. In this context, first icons for listed components were released to be used for promotional purposes.

### **The European Model: combo and triple audits**

The consolidation of monitoring visits by important certification bodies, the Gütegemeinschaft expected



©Picture: Profine GmbH

a noticeable relief of system houses. Upon completion of a successful test audit at Rehau in Wittmund (2009), the concept was transferred to almost all system houses and permanently established. It foresees that one auditor completes a single audit covering three systems, allocates the necessary samples to the corresponding test institutes and draws up a common audit report. The three participating systems are Komo (KIWA, NL), NF 126 (CSTB, F) and Technical Appendix to RAL-GZ 716 (GKFP, D).

### Direct connection to the public

Due to the many developments in particular, the Gütegemeinschaft increased its public relations in several directions. A series of technical guidelines covers the window manufacturer's need for information. The experts of the profile houses, adhesive and foil producers drafted a technical guideline on lamination in close collaboration. Together with the Pro-K we produced a 'special recommendation for the planning and use of coloured PVC profiles'. Recently, the expert group profiles/machines produced the

technical guideline 'welding of PVC-U profiles'.

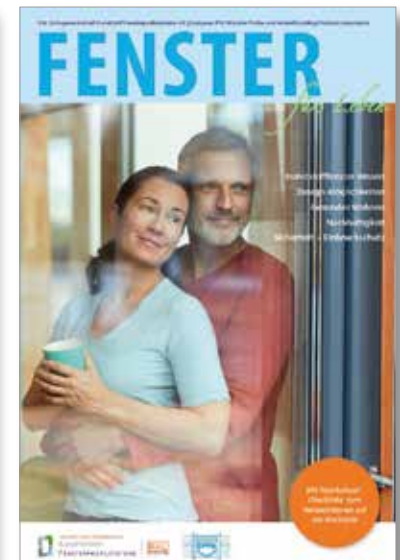
Since 2017, the Gütegemeinschaft regularly publishes topical brochures for the target group building owners, planners, architects and end consumers. They are published as targeted supplements in special interest magazines drawing to the advantages of PVC windows. The most recent supplement was published in spring 2019 called 'Fenster fürs Leben'. ■



Current board of the Gütegemeinschaft (f.l.):  
Dr. Michael Szerman | Peter Czajkowski | Dr. Michael Stöger



RAL-GZ 716 issue 2013 (I.) and the topical brochure „Fenster fürs Leben“ from spring 2019





Picture (l.): ©VadymTynenko–stock.adobe.com

# FROM THE PROFILE TO THE SYSTEM – THE LEAP INTO A NEW DIMENSION

## GUEST ARTICLE BY KLAUS VON BARBY

The coalition between some window profile extrusion companies in 1979 was caused mainly by the introduction of quality requirements for PVC window profiles, based on the material.

The aim was to increase the dissemination of PVC windows in the market, mainly to safeguard consumers. Therefore, a new quality guideline was drafted aiming at the awarding of a quality mark for profiles, based upon external testing from an independent institute.

The majority of companies in the 1990's not only acted as extrusion companies but also as system houses. From the beginning, quality as a personal responsibility was the leading spirit for function, concurring of the different components glass / fittings / gaskets / reinforcements etc. This had to be demonstrated externally, as a preliminary stage for the

quality mark "window" – quality characteristics had to be fixed upon which the quality assurance "window" could be build.

Consequently, the entire RAL quality and test guidelines had to be revised. Provider of components (gaskets, glass, fittings) had to be involved. At first, these could not understand why system houses would get involved to such an extent, as part of a quality guideline.

During meetings, it was hence important to remind companies of the need to work towards the holistic approach of systems. A further important task was the intensive coordination with the Quality Association with regard to creating a quality mark for systems, away from the quality mark for profiles only but certainly not in competition to the quality mark "window".

A lot of persuading by the Quality Association PVC Window Profiles was indispensable, yet at times difficult and cumbersome. Via strict links between the RAL quality guidelines for systems and the RAL – GZ 695 quality guidelines for windows, doubts could be dispelled.

Accordingly, RAL – GZ 716/1 had to be revised in line with these modifications. With the introduction and agreement of the General Assembly of the Quality Association, the development of a quality mark “window system” has been finally initiated in 2013. Thereby, it adopted the new spirit and responsibility of the system houses via the RAL quality association. The extended quality certification officialised the already existing responsibility of the system houses for systems.

The newly created system pass certifies the eligibility of the system to the market. As previously mentioned, these systems do not only consist of profiles but also include other components. Hence, the latter had to be included into the quality spirit of the system, working towards the common goal of a “quality mark system/system pass”. As a result, manufacturers of components had to be eligible for membership to the Quality Association. Furthermore, an increasing amount of foreign companies obtained membership, which was highly welcomed. In 2018, the new draft of the completely revised quality guideline RAL-GZ 716 went through the recognition procedure of RAL.

The process of a holistic RAL quality guideline – a raw material – profile – components – system could only succeed because of the intensive participation to the different committees and bodies by the

profile houses’ employees well supported by the office of the Quality Association.

Hence, all parties can be satisfied with their participation to the extensive definition and implementation of quality – despite individual resistance and sometimes long and cumbersome discussions.

### **,The development of a quality mark “window system” has been finally initiated in 2013.’**

Conclusion: We all have achieved something and the effort made for an increased acceptance by the market was worth it! A lot remains to be done to further support and develop the quality spirit “PVC Window Profiles” – all the best for this undertaking!



Klaus von Barby | Former member and chairman of the Quality Committee for more than 20 years

# FUTURE CHALLENGES OUTLOOK

Who knows with certainty what the future may bring. Hence, it seems wise to consider developments, which are relevant for the future already today. Trends, such as: constructions activity remains high, our life focuses even more on the 5" screen of our smartphone, European tasks remain more important for Europeans than national unilateralism, and, young people demand clearly to not only discuss climate goals, but to act accordingly. Which conclusions can we draw from this?

The tense situation on the housing market, in particular in urban areas, and the profitable investment opportunities on the real estate market are unlikely to change in the coming years. It is expected that the continuous high construction activity will have a positive impact on the business climate of the profile houses. This is a good basis for innovation and quality.

Making the quality mark RAL-GZ 716 fit for the future, we need to open up to topics of equal importance to consumers, politicians and the market. Previously, durability of the window system was a key quality characteristic. Nowadays, topics such as 'healthy living' and 'environmental-friendly construction products' gain importance as part of the sustainability discussion. 'Healthy living' primarily means avoiding 'harmful emissions' indoors. The entire value chain needs to work on this challenge together.

Whether or not a construction product is environmental-friendly can be demonstrated with Environmental Product Declarations (EPD), which need to be revised in the upcoming years. The energy needs and environmental impact outlined therein are well known to our industry. A chapter on toxicological impacts on humans and the environment of the declared products will complete the assessment in the future. Accordingly, future EPDs declare what European Ecolabel, Product Environmental Footprint (PEF) require as well.

The new Gütezeichen should be carefully aligned to PEF requirements and ensure compatibility. Operational and simple information paths should allow for the completion of this task with a limited effort. The extension of the quality mark initiated the Gütegemeinschaft's journey towards becoming a European warranty mark. The challenge will be to arrive on time.

The share of international memberships to the Gütegemeinschaft amounts to 42% with an upward trend. This is a consequence of the international business operations of our members. Therefore, today all our publications are available in multiple languages.

As audits are carried out across borders as well, the corresponding quality guidelines require harmonization. In this context, we launched the first project.

Furthermore, we need to consider the accreditation of the Gütegemeinschaft as a certification body.

The master data project constituted virgin soil for the Gütegemeinschaft. Its goal is to develop a uniform data catalogue of all system houses that an IT-interface can translate and export into the window manufacturer's software. The project is almost completed. This created the basis for concretising digitization along the entire value chain. The next, certainly more complex step is already on the horizon, i.e. the data-link to 'Building Information Modelling' (BIM).

Another idea requires further consideration. Online monitoring as a core element of factory production control and information transfer constitute an ideal basis for trimming down the Gütesicherung, thereby speeding up the system. Furthermore, continuity would prevail over sampling, although the latter cannot be abolished entirely.

Where does innovation take place? Smart home applications can be named here. It remains to be seen how many of the ideas and product developments become accepted in the market. Yet it is certain that PVC window profiles with hollow chambers can be easily equipped offering scope for creativity. A topic, the Gütegemeinschaft should prepare for.

In the past years, we strongly increased our activity in European standardization. Retrospectively this proved to be sensible as the 'harmonised product standards' are increasingly used as technical regulations. Already the scope of EN 14351-1 holding 100 pages proves the complexity of the topic and demonstrates which expertise is required from

system houses today and tomorrow. The collaboration of the Gütegemeinschaft to drafting EN12608-ff and the 'controlled loop recycling from used PVC windows', initiated and developed by the industry, also demonstrates this.

I would be glad if you shared my view that the good, old 'answering machine' still has the power and dynamic to speed up, joining the frontrunners. Now we need to action our possibilities; therefore, the Gütegemeinschaft serves as the right platform.

In either case, I wish all the best to the Gütegemeinschaft, enabling it to celebrate a successful 50th anniversary in 2029.



Dipl.-Ing. Gerald Feigenbutz | Managing Director



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## Text sources

**25 Jahre Qualitätsverband Kunststoffzeugnisse e.V. (QKE) | Anforderungen an PVC-Fensterprofile und Gütesicherung in der Bundesrepublik Deutschland**, 1988 | **bauelemente bau**, Ausgaben 1979–2019 | **Besondere Aspekte der Gütesicherung von Kunststoff-Fensterprofilen**, 1988 | **Die Gütesicherung beim Kunststofffenster**: Dipl.-Ing. Egon Morianz, Sonderdruck aus Fenster und Fassade 12 (1985) Heft 1+2 | **Die Gütesicherung der Kunststoff-Fenster**: Dipl.-Phys. Egon Barth, Dipl.-Ing. (FH) Günther Hundertmark, Edwin Keller. Sonderdruck aus der Zeitschrift BmK – Bauen mit Kunststoffen und neuen Baustoffen Heft 4/95 | **Geschäftsberichte des QKE**, 1980/81–2017 | **Gütezeichensatzung zur Errichtung und Anwendung des Prüfzeichens für Kunststoff-Fensterprofile**, 1979 | **Kooperationsvereinbarungen zwischen QKE und Gütegemeinschaft Kunststoff-Fenster e.V.**, Gießen, 1976 | **Kooperationsvereinbarungen zwischen Gütegemeinschaft Kunststoff-Fensterprofile (GKFP) im QKE und Gütegemeinschaft Kunststoff-Fenster e.V.**, Frankfurt, 1980 | **Kunststoff-Fenster aus ökologischer Sicht**: Dipl.-Phys. Egon Barth, Dipl.-Ing. (FH) Günther Hundertmark, Edwin Keller. Sonderdruck aus der Zeitschrift BmK – Bauen mit Kunststoffen und neuen Baustoffen Heft 2/95 | **Protokolle QKE, GKFP und (gemeinsamer) Güteausschuss**, 1979–2019 | [www.gkfp.de](http://www.gkfp.de) | [www.ral-guetezeichen.de](http://www.ral-guetezeichen.de)