

# Certification of New Technology

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# World Certification Conference, May 30<sup>th</sup> 2003, Tokyo

Title: Certification of new technology, presented by DVGW, Germany

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## **Abstract**

During the last years the European market has become a reality in the gas sector. In this time several EC directives, i.e. the Gas Appliances Directive, the Efficiency Directive, the Pressure Equipment Directive and the Construction Products Directive, have been published and transferred into national legislation. In combination with European standards these directives harmonize the basic legal requirements of the EU member countries. This is demonstrated by the CE-marking of a product which confirms the conformity with the common relevant protection levels by means of specific assessment procedures, both laid down in the EC directives. The CE-marking substitutes the former national approvals and test marks concerning the legal requirements in the different national markets.

For a lot of new items, the general requirements of directives in the European Community are existing and can be used as a basis of testing and certification. The origin of these directives was to create tools beside standards to allow the free trade in the European Union for products fulfilling these minimum safety requirements, standards should follow as soon as possible. Normally the elaboration of a European standard is a long lasting process, lasting at least 6 years, in most cases more then 10 years.

Progress goes on – even in old technologies as gas technology. There are from time to time new materials, electronics are becoming a dominant part of gas appliances, complete new techniques appear on the market. A certification organisation has to meet the challenge of new materials, appliances coming up, established standards may be considered as a guideline, they are no longer in all details basis of a certification.

DVGW has for over 50 years maintained a testing and certification system which ensures implementation and ongoing compliance with the safety and quality standards contained in the DVGW Codes of Practice. This System is also very well suitable for assessing new technologies. This contribution describes the procedures and risk analysis undertaken by DVGW to evaluate the conformity of new gas technologies according to the basic requirements of the European directives and leading to a valid CE-marking.

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## **I. Certification as means for ensuring safety and quality in the marked**

The technical rules and bases for testing of DVGW Deutscher Verein des Gas- und Wasserfaches e.V. have for decades set the standards for safe, ecological and hygienic products and processes. They offer companies in the gas and water industry valuable organisation and rationalisation tools for everyday working, which also are relevant in litigation. The recent amendment to the Energy Management Act, for example, gives official status to the presumption that compliance with the DVGW Codes of Practice constitutes the "state of the art" - a measure of trust that has to be lived up to.

However, even the most demanding codes and most detailed standards can only work if the requirements they embody for products and processes are met in practice. For this reason DVGW has for over 50 years maintained a testing and certification system which ensures implementation and ongoing compliance with the safety and quality standards contained in the DVGW Codes of Practice.

With certification procedures it is important to distinguish between the regulated area, in which testing and evaluation is carried out, for example, in accordance with European Directives or national regulations, and the non-regulated area of voluntary procedures which is not covered by regulations but is covered by national rules or European standards. For the regulated procedures the certification bodies are accredited by national agencies and may be nominated to the EU Commission; for non-regulated procedures there are other, comparably strict principles for accreditation.

## **II. The European approach**

During the last years the european market has become a reality in the gas sector. In this time several EC directives, i.e. the Gas Appliances Directive, the Efficiency Directive, the Pressure Equipment Directive and the Construction Products Directive, have been published and transferred into national legislation. In combination with European standards these directives harmonize the basic legal requirements of the EU member countries. This is demonstrated by the CE-marking of a product which confirms the conformity with the common relevant protection levels by means of specific assessment procedures, both laid down in the EC directives. The CE-

marking substitutes the former national approvals and test marks concerning the legal requirements in the different national markets.

The European Commission has established the „Global Approach For Certification And Testing“ for the conformity assessment, that means testing and certification of products. This approach is based on considerations to perform the assessment of a product by different means. Beside conformity assessment based on technical standards also a quality assessment during production stage is possible. Therefore several different conformity assessment modules are available which can be applied in different combinations depending on the safety requirements of each directive. The directives distinguish between certification and surveillance modules. In some cases only a conformity declaration of the manufacturer is sufficient.

In the course of liberalisation of the European Single Market, Directives were developed to ensure the free movement of goods and services. One of these is the EC Gas Appliance Directive, which covers appliances for:

- heating (room heating)
- water heating
- refrigerating and air conditioning
- cooking, roasting and baking
- laundry
- lighting

Safety, control and governing devices are also covered if designed as components of gas appliances.

Based on active cooperation in European standardisation and regulation, DVGW was appointed and recognised at an early stage as a European certification body for gas appliances under the EC Gas Appliance Directive. As a so-called "Notified Body" it is authorised to carry out certification and surveying procedures under the EC Gas Appliance Directive.

Enactment into German national law of the EC Gas Appliance Directive made the European Single Market a reality in the gas sector as well. The directive specifies the crucial safety requirements for gas appliances and the conditions for displaying the CE mark, which all member states are required to recognize as proof of general suitability for use. This proof can be supplied by various measures in accordance with EC certification procedures. For the EC Gas Appliance Directive three steps are essentially required for series appliances:

Certification according to the basic requirements of the Directive based inter alia on a type examination to harmonised European standards by a Notified Body.

The manufacturer itself must issue an EC conformity declaration regarding the conformity of the series products with the type examined. This, together with successful EC type examination and monitoring, authorises the manufacturer to apply and display the CE mark. A Notified Body monitors the validity of the conformity declaration through regular checking, a quality assurance system recognised under the Directive for product or production quality or individual testing.

Since 1.1.1996 the CE mark has been the sole entitlement for access to the European Single Market for correspondingly certified products. In the field of gas appliances it replaces the former DVGW or DIN-DVGW test mark. To ensure traceability of certification conditions and control the monitoring procedures, the Notified Bodies in Europe operate a voluntary product identification number (PIN) system through which each duly marked certified product can be uniquely identified. This system forms the basis for a planned uniform European certification register which will document all product certification.

The EC Gas Appliance Directive covers only part of the range of gas products within the European Single Market. Besides many commercial and most industrial gas appliances, a number of accessories (e.g. gas valves, flexible hoses, pipes and flue systems) are not covered unless they are an integral part of an appliance. Again, the Directive does not cover the components of gas installations, gas distribution or gas transport.

For products which are not covered by an EC Directive, national DVGW or DIN-DVGW certifications under the DVGW Codes of Practice remain reliable evidence of compliance with the generally accepted rules of technology. Such products include pipelines, valves, pressure governors, pipeline accessories and the entire range of water industry products. For these, national DIN-DVGW and DVGW test mark will continue to be the requirement for access to the German market pending the arrival of applicable European regulations.

### **III. New gas technologies**

Progress goes on – even in old technologies as gas technology. There are from time to time new materials, electronics are becoming a dominant part of gas appliances, complete new techniques appear on the market. A certification organisation has to meet the challenge of new material, appliances coming up, established standards may be considered as a guideline, they are no longer in all details basis of a certification.

Examples for these new appliances and materials are:

- Fuel cells,

- absorption heat pumps,
- new non metallic material for parts of appliances (heat exchanger, tubing, controls),
- microprocessor based and safety related electronics,
- smart control of a building including gas appliances.

In Europe, there are a lot of existing European and national standards for most classical appliances, but no specific requirements for new appliances and material as above mentioned.

For a lot of new items, the general requirements of directives in the European Community are existing and can be used as a basis of testing and certification. The origin of these directives was to create tools beside standards to allow the free trade in the European Union. There are only very global safety aims, normally laid down as annex I of a directive. The correspondence of a product with these minimum requirements of a directive is the basis for a European certification and the possibility to sell the product in any of the member states of the European Community. This tool for testing and certification was established after a period more then 20 years for unifying the standards in different member countries. The aim was to allow free trade with products fulfilling these minimum safety requirements, standards should follow as soon as possible. Normally the elaboration of a European standard is a long lasting process, lasting at least 6 years, in most cases more then 10 years.

The original purpose of the directives to allow free trade is now also very useful for certification of new products not described in the standards. It is assumed, that the minimum safety requirements are sufficient for a safe design of a product, the certification should be based on the conformity assessment procedures laid down in these directives.

#### **IV. Certification of new products/technology**

Any certification of new technology is based on tests and evaluations and an adequate risk analysis, specified to the product. There are some general, minimum requirements that should be fulfilled from any new product:

- The appliance or the product should be suitable from the gas distributed in the country of destination for the use of this product (normally natural gas, where the main component is methane, hydrogen is only in a quantity of less then 20 % in the distributed gas; normally the gas is composed with stable components and nearly free of toxic gases.

- Safety related micro electronic should be protected to operate under normal functional conditions by a fluctuation of tension within given limits and under the influence of EMC phenomena to a certain level.
- The appliance should not operate and having a non volatile lock-out position, if the functional pre-conditions are no longer available.
- No accessible parts should be overheated to create a danger for persons and material.
- The combustion products should be discharged by adduct to the free atmosphere.
- Material used for gas carrying parts should be sufficient resistant against gas and gas components for the expected lifetime of the whole appliance or for installations for at least 30 years.
- The user should not have the possibility to create a dangerous situation in case of operating against the instructions when using the foreseen handles, nods, etc.

Beside of these main safety points, the intended purpose of the new product or the new technology should also be fulfilled.

Examples:

- Sufficient efficiency of a heat pump,
- production of electricity with a fuel cell,
- better operation by smart electronic components.

## **V. Pre-conditions for a certification**

Any certification is normally based on a test report or on other test results for evaluations. These tests or evaluations are based on global safety and function requirements as described above.

For new products or new technologies, a small group of experts from

- Manufacturers,
- public authorities,
- test experts,
- experts for the certification.

Are discussing the matter and try to fix the main points in the context of similar products for a test programme. This preliminary test programme will be published and can be used from test houses to perform tests and to make a risk analysis and functional tests of the new technology. Modifications are possible during testing and performing safety related evaluations.

Functional tests are also performed, the requirements for safe installation and operation are also considered.

Depending on the test results a complete certification or a limited certification can be recommended from the test house.

## **VI. Certification approach**

The kind of certification depends on the new technology itself: If the new technology is only a modification of an existing one and does not deviate in the fundamental layout, a complete certification for a long period (normally 5 to 10 years) is possible.

Often a new technology is without long lasting experience from practical use, only a limited certification is possible.

The manufacturer gets a certificate stating, that the new product or the new technology meets the basic requirements but because of lack of long lasting experience with the product, the manufacturer has to fulfil the following conditions:

- The number of items placed to the market has to be limited to a low number (normally around 100),
- any place of installation has to be noted by the manufacturer,
- the user has to be informed about the new product and the preliminary certification,
- the manufacturer has to perform periodical checks of the products,
- after a limited period (1 to 3 years) of experimental use of the technology, it has to be decided if a prolongation of the certification can be performed, changes are necessary or the product has to be withdrawn from the market.

By doing this, a lot of results are collected from the interested parties which can be used as basis for further standardisation of these new products.

## **VII. Check of certification**

A certification is granted for new products by identifying each item by type and serial No. For the normal certification, a periodical check of the product is performed in different ways, depending on the possible safety risk from the appliance and depending to the choice of the manufacturer:

- Annual check of the products and the checks during production from the manufacturer. This procedure is normally performed within a short time delay after certification and at least once a year. For new products, a higher frequency of checks can be considered,

- or by an auditing and re-auditing of the QM-system for a production of the manufacturer.
- The QM-system of production has the assumption, that the products should be more or less identical if the QM-system works sufficiently well. For new products or new technologies, the classical tools of the QM-system for production are doubtful, because there is no long lasting experience for this new technology and there are no adequate requirements and verification methods in international standards like ISO 9001 to guarantee, that software copies are transferred in a safe way to any produced, programmer microprocessor. There are no reliable test methods available to check the classical configuration of these microprocessors. The control after certification of this new technology is complicated and difficult and not very well established.

### **VIII. Certification procedure**

A manufacturer has produced a sufficient number of new products, having already some experiments with the performance and some ideas how to install and use this product. He gets in contact with a certification body presenting the new product to the specialists from the test house and from the certification organisation to clarify the next steps to be done.

After clarifying obstacles for a certification, the following steps could follow:

- Elaboration of a test programme,
- a short discussion of the test programme and perhaps of limitations of certifications in the relevant national/European Community,
- tests, risk analysis and comments from the test house,
- limited or full certification, if all foreseen tests are passed,
- review of the installation codes and amendment/extension of them,
- check of the production or the products – normally with a higher frequency than for well established technologies.

Information of other Notified Bodies and authorities of the certification of new items  
 Withdraw of the certification, if the requirements for the production are not fulfilled or if there are accidents not foreseen when establishing test procedures and certification modes.

If there are major accidents, the Notified Body will inform the media to give warnings to the consumers and users. In parallel, all installers are informed, that no longer an installation of these products is allowed.

## **IX. The DVGW Certification Body**

The DVGW Certification Body has been established since 1996 as an autonomous institution in the DVGW statutes. Within the organization it reports to top management, and is accountable for implementation of strategy only to the certification advisory board as the steering committee. The advisory board has an appropriate number of representatives of the interest groups involved in certification. It establishes policy for the Certification Body's strategic and operational activities and supervises their implementation.

The DVGW Certification Body is neutral and works independently of any third party interests. Its staff do not have any consultancy function. The head of the Certification Body has decision-making authority on the contents of all certification issues, recognition of testing laboratories, auditors and experts, and determining certification procedures. The income and expenditure of the DVGW Certification Body are accounted separately from the DVGW overall budget. All these are important prerequisites for the necessary technical and commercial independence and associated general recognition of its activities.

Its neutrality and independence under its statutes are just as natural in its work as the direct access to comprehensive specialist know-how. In the European standardisation and regulatory procedures the DVGW Certification Body works closely with German and international experts in the gas and water industry. Close contacts with the DVGW research facilities ensure that the latest results of research and development continually flow into the testing and certification activities. Ten certification committees, nine experience pooling circles, eight examination committees and one coordination committee ensure the involvement of industry experts in important issues of interpretation and decisions on individual cases. These committees are regularly integrated into the activities of the Certification Body.

Customers of the DVGW Certification Body have the following benefits:

- The services of the DVGW Certification Body are available to all interested parties irrespective of their membership in an association. All certification customers in Germany or abroad are treated equally.
- In its activities the DVGW Certification Body focuses on quality, reliability and non-profit priorities.
- Industry-specific meshing of the individual certification procedures ensures maximum benefits to individual interest groups and the industry as a whole.

There has been an agreement since 1934 between the German standards organisation DIN Deutsches Institut für Normung e.V. and DVGW under which the DVGW Certification Body is authorised to issue the DIN-DVGW test mark in addition to its DVGW test mark for gas and water supply products which comply fully with the

relevant DIN (EN) standards. This conformity has to be confirmed by the DVGW Certification Body on the basis of appropriate testing and continuously monitored.

For national certification of gas industry products, the emphasis is on the following aspects:

- safety of the products used
- ecological use of gas as a fuel
- suitability for building inspectorate installation requirements and the intended use
- functionality
- long-term reliability of the products.

In the case of water supply installations the following criteria in particular are investigated:

- hygienic effect, i.e. preventing backflow or testing non-metallic materials which come into contact with drinking water
- resistance to pressure and mechanical i.e. hydraulic effect on pipeline systems or domestic installations due to pressure loss or waterhammer effects
- suitability for the intended use
- functionality
- long-term reliability of the products.

## **X. International relations**

The European certification market is difficult to understand for many manufacturers, particularly in the areas not regulated by legislation. The DVGW Certification Body is working energetically on making the different certification procedures from one country to the next easier for its customers. For this purpose it has concluded an agreement with the Austrian Gas and Water Industry Association (ÖVGW) and the Swiss Gas and Water Industry Association (SVGW), the Dutch water test institute (KIWA) and the French building products test institute (CSTB) on mutual recognition of test reports on gas and water industry testing in the non-regulated area.

One important step towards cooperation at the international level was taken in 1997 through the cooperation agreement with the North American International Approval Services (IAS), now incorporated in the Canadian Standards Institute (CSI), the Hungarian test institute MBVTI and the Czech test institute in Brno. Cooperation with other European and international Bodies is welcomed.