

THE STATUS OF STANDARDIZATION WORK ON RESPIRATORY PROTECTIVE EQUIPMENT BY  
THE GERMAN STANDARDS INSTITUTE AND THE EUROPEAN COMMITTEE FOR STANDARDIZATION

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The standardization of respiratory protective equipment by the German Standards Institution (DIN) has a long tradition. The Working Committee "Respiratory Protective Equipment", established in its present form in 1929, is responsible for writing standards on this equipment. The committee concentrates on generating standards for respiratory protective equipment used in workplaces and rescue operations. Prior to 1968, DIN Standards included only classification, terminology, marking of filters, cylinders for compressed air and respirator oxygen, cylinder valves and threads. In addition to these DIN standards, specifications existed that applied only to respiratory protective equipment for miners and firefighters, and that covered some particle filters for gas masks and respirators. There is also a small number of specifications pertaining to self-rescue devices for mining use only.

When the Law on Technical Equipment (changed this year from Maschinenschutzgesetz to Geratesicherheitsgesetz) became effective in 1968, standardization work was intensified. The law requires that all technical products be in accordance with the state of the art. (One of its appendices lists all documents, such as standards and specifications, that apply to state-of-the-art technical products. Another appendix lists all of the testing institutions accepted by the Ministry of Labour and Social Affairs.) However, even though it supposedly covers all technical products from heavy equipment to toys, the law does not apply to mining, firefighting and related equipment. In addition, the law does not require that technical products be tested and approved.

After the law was passed, the committee started immediately to write DIN Standards that contain complete performance specifications as minimum requirements. The work on some of the most important types of respiratory protective equipment has now been completed, while work on other devices in this category is nearing completion. Final work on this group of devices may be completed within the next two to four years. Some of the new DIN Standards are derived from extensive experiences, while others are based on limited data that had to be collected.

The DIN Standards for such devices as full face masks, particle filters, and compressed air breathing apparatus are based on proven and regularly-updated specifications obtained from firefighting, mining and dust-protection applications. Research was done to collect data for DIN Standards on disposable respirators, pressure-demand breathing apparatus, dust helmets, and powered air-purifying respirators.

The following details are included in the new DIN Standards because of field experience:

- Full face masks. Since an explosion caused some components to leak and protection was lost, these masks must now pass a 10-second flame test. The connectors have to be checked regularly with a standardized gauge because aging permitted easy and inadvertent separation of mask and apparatus in some cases.
- Half mask. These masks must be tested for leaks at the face seal -- this test was not previously required.
- Mouthpiece assemblies. These devices will be tested to verify that they perform as reliably as those used on field-proven miner's equipment.

- Gas only and gas/particle (= combined) filters. Manufacturers traditionally specified filter capacity and, because of excellent cooperations between the institutions representing the users and themselves, there were no difficulties in obtaining the proper filter for specific applications. However, because of the Law on Technical Equipment and increased imports, minimum requirements concerning filter capacity, resistance to air flow, marking etc. must now be specified.
- Particle filters. In the future, these filters will be tested with an aerosol spray composed of sodium chloride or mineral oil. Additional tests on particle filters used by some industries may be necessary; for example, filters for mining applications may be tested with coal dust.
- Disposable respirators. This type of respirator used foam rubber as its filtering medium for several years. Foam rubber filtering was eventually found to be ineffective and very few of these respirators were being sold. At that point, disposable respirators, most of which were introduced from the U.S., received wide acceptance in European countries, but they often did not perform adequately. The problems that resulted were evaluated, and two distinct factors emerged that influenced the acceptance of a disposable respirator: how comfortably the device can be worn and how comfortably the wearer can breath.

The first factor is affected by the weight and size of the device as well as its appearance. Since recently-developed disposable respirators are more comfortable to wear than the traditional ones, users accept them more readily. The second acceptance factor is influenced by the amount of carbon dioxide build-up resulting from dead space in the mask and the microclimate (the temperature and humidity of the inhaled air). Due to the simplicity of their design, the breathing comfort of well-designed, traditional masks and respirators is excellent.

The initial selection of a disposable respirators is normally based on one of these acceptance factors. However, once the device is actually used, it is usually rejected because of poor comfort of breathing. The following problems with disposable respirators, which are not directly related to the wearer's judgement, still exist: distortion of the face mask resulting from repeated usage, respirator instability during handling and use, and more leakage in the face seal than is assumed and acceptable. The new DIN Standards include tests to verify that these parameters of respirator performance are acceptable.

- Compressed air breathing apparatus. The new DIN Standards also cover pressure-demand breathing apparatus which, until the present time, has not been accepted. The requirements for breathable air and compressor performance have been revised at 200 and 300 bars pressure.

In Germany and in other European countries, research work is being conducted on various physiological and psychological factors associated with the use of respiratory equipment. Some of these factors are as follows: 1) tolerance of breathing resistance, 2) tolerance of respirator air temperature and humidity, 3) influence of equipment weight on the ability to work and the service life of self-contained breathing apparatus, 4) suitable medical checks for users of breathing apparatus, and 5) suitable training instruction on breathing apparatus.

In addition to the individual efforts to standardize respiratory protective equipment in the Federal Republic of Germany and most of the other European countries, standardization work on this type of equipment is being done by the European Committee for Standardization (CEN). Technical committee CEN/TC 79 started this effort in 1974, because the European Economic Community requested that standards in Europe be harmonized to reduce or eliminate trade barriers. Respiratory protective equipment and other types of equipment were given high priority.

Committee CEN/TC 79 has completed 12 documents of the approx. 20 standards to be written. Many of this committee's findings correlate to those of the DIN Working Committee in Germany. However, one of the problems was that the threaded connections for compressed air in some countries are identical to the oxygen connections in other countries. This type of problem might be best solved by International Standards Organizations (ISO) recommendations and subsequent national legislation, not by national or European standardization. At present there is no general solution to this problem available. The primary advantage of this approach is that new comparable national standards in various countries have relatively few differences. Another benefit derived from this approach is that a list of equivalent terms in the field of respiratory protective equipment has been made available. The list contains 450 items for which equivalent terms are given in three official CEN languages -- English, French, and German. Additional lists containing these terms in other languages will be made available.

This report may give the impression that all standardization work for respiratory protective equipment has virtually been completed. However, everyone actively involved in standards work in Europe knows that much work remains to be done to harmonize standards established throughout the European Community, and to get one country to accept a standard or test certificate approved in another country.